Figure 2 provides a Masterplan of the Shepherd St Precinct. Figure 3 shows a montage of the proposed adaptive re-use of the Paper Mill building.

Figure 2 Shepherd Street Precinct Masterplan (Source: SJB Architects)

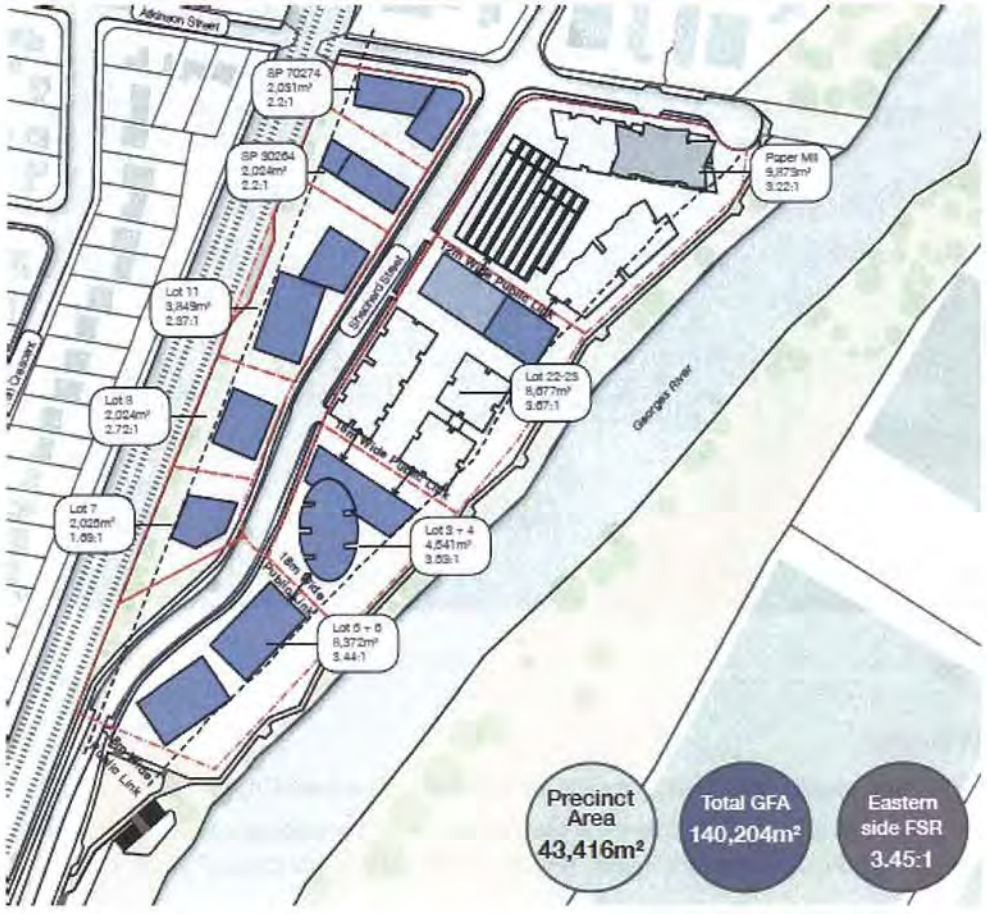

Figure 3 Paper Mill Montage (Source: Woods Bagot)

2.4. Key findings

Key findings relating to the site:

- The site is well located nearby public transport and services within the Liverpool City Centre
- The proposed development will displace the Liverpool Men's Shed, a community group which helps to break men's social isolation and support men's health, which is planned to be relocated at the end of the lease.
- The proposed tower heights are not in keeping with the area which is currently industrial and the nearest residential low to medium density housing. The proposed development will transform the site to an urban place.
- The proposed development will enhance the Georges River Corridor for residents of the proposed development and the broader community
- Small village shops at the Paper Mill building will contribute to the activation of the area and provide employment opportunities and opportunities for residents to connect with each other, public community space such as an unstaff library hub and meeting space should be considered
- Mill Park and Lighthorse Park will provide open space opportunities for future residents to connect with each other and support a more socially sustainable community, however there is a need for internal community meeting and activity spaces
- The proposed public/shared footpath, improved lighting and accessibility in Lighthorse Park, and bike share pods will support active transport to the Liverpool City Centre, and improve access to the facilities located there. The public/shared footpath should be connected to Liverpool Station, accessible, well-lit and have actives edges.

3. Policy and planning context

There are a number of Liverpool Council plans and policies that relate to social impacts of the proposed development:

Growing Liverpool 2023

Growing Liverpool 2023 is Liverpool City Council's 10-year community strategic plan. *Building Our New City* is Liverpool City Council's plan to renew the City Centre as outlined as a strategic project in *Growing Liverpool 2023*. A key project under this plan "Urban Breathing Space" focuses on strategies to increase visual and physical connection of the City Centre to the Georges River, including concepts such as:

- Provide a new river crossing and enhance the foreshore experience
- Upgrade the landscape and amenities of the park and foreshore
- Connect Riverpark Drive to Rail Concourse, and
- Connect rail concourse to the park and river.

Other relevant directions and strategies from *Growing Liverpool 2023* are

- Direction 2: Liveable safe city:
  - 2.b Create clean and attractive public places for people to engage and connect
- Direction 3: Healthy inclusive city
  - 3.a Foster social inclusion, strengthen the local community and increase opportunities for people who may experience barriers
  - 3.c Improve health and wellbeing and encourage a happy, active community
  - 3.d Plan, support and deliver high quality and accessible services, programs and facilities

Liverpool City Council Social Justice Policy

The *Social Justice Policy* provides guiding principles for Council to consider social impacts, outlining a *Social Justice Principles Checklist* of which seven points are particularly relevant to this SIA:

- Strategies have been put in place to provide access for:
  - Children
  - Young people
  - Older people
  - People with a Disability
  - People from culturally diverse backgrounds
  - Aboriginal and Torres Strait Islander people
  - People of diverse sexualities
  - Women
- The short and long term social, cultural, environmental and economic impacts have been considered and addressed
- Strengths in the community have been considered and encouraged
- Community diversity and community connections have been promoted

- Personal and community safety has been addressed
- Physical and psychological health is protected and promoted, and
- There is evidence that the initiative is likely to produce a fair and just outcome (through provision of public benefits that include quality open space and pedestrian and cycle connections; further public benefits including community development, place-making, public art and affordable housing would mitigate negative impacts and should be considered).

3.1. Analysis of implications

- The proposed development supports Liverpool Council's vision to create physical and visual connections between City Centre and the Georges River
- There are opportunities for the proposed development to contribute to the Urban Breathing Space project through upgrading the landscape and amenities of the foreshore and enhancing the foreshore experience
- The delivery of a public neighbourhood park at Mill Park supports Council's vision to improve health and wellbeing and encourage a happy and active community. However, community facilities and open space on site will need be well designed for safety and to support use by a range of age groups and needs in a highly dense environment (eg. passive and active, different sized gatherings etc)
- The dwelling mix will mostly result in a range of single, couple and family households in keeping with Liverpool's existing household structure, and is likely to be a culturally diverse community. However, as the housing proposed is 100% private housing, the development is unlikely to support a socio-economically diverse community. The gap between 'new' and 'existing' residents would be mitigated by the provision of affordable rental housing as part of the development and would deliver a needed public benefit and a fairer outcome. The model applied to include affordable housing at the Harold Park site (a former race track in Glebe) was the dedication of a 5,000m2 site for a community housing provider to develop and manage affordable rental housing. This model of land dedication could be applied as part of the proposed development.
- Opportunities to increase social inclusion particularly for different community groups who face barriers should be considered, to promote community diversity and connections. Community development programs and activities should be made available from the occupation of the first stage of the development and should actively link to neighbouring communities and Council's programs.

4. Pre and post-development community profile

The site is located in the ABS statistical area 1152563, in the suburb of Liverpool, in the Liverpool City Council LGA. This section identifies the existing resident population of the suburb of Liverpool, utilising data obtained from profile.id.

Figure 3 Location of the site in Statistical Area 1152563 (source: atlas.id)

4.1. About the Liverpool LGA

The Liverpool LGA is located in Sydney's south-western suburbs, around 25 kilometres from the Sydney CBD. Compared to Greater Sydney, Liverpool LGA has:

- A younger median age (33 years compared to 36 years)
- A lower median household income ($1,229 compared to $1,447)
- A much higher proportion of couples with children households (46% compared to 35%). Around 14% of households are single parent households with children (higher than Greater Sydney at 10.8%)
- A higher proportion of children aged 0 to 4 (7.8% compared to 6.8%), 5 to 11 (11% compared to 8.7%) and 12 to 17 years (9.3% compared to 7.4%)
- A much lower proportion of medium and high density housing (26% compared to 40%)
- A much higher proportion of residents from Non-English speaking backgrounds (36% compared to 26%). The main non-English languages spoken at home were Arabic (9.5%), Hindi (4.5%), and Vietnamese (4.4%)
- Higher unemployment (7% compared to 5.8%), and
- A lower SEIFA Index (951 compared to 1011), which means it is more highly disadvantaged.

4.2. Current population and age profile of Liverpool suburb

Total population in 2011

The population for Liverpool suburb was 24,005 with an average household size of 2.75 people per dwelling. Liverpool suburb had 13% population growth between 2006 and 2011, or +2,707 people.

Age profile 2011

Compared to Liverpool LGA, Liverpool suburb had a

- Higher proportion of babies and preschoolers aged 0-4 (8.6% vs. 7.8%)
- Higher proportion of young workers aged 25 to 34 (18.1% vs 14.6%)
- Higher proportion of seniors and elderly aged 70 and over (7.6% vs 6.1%)
- Lower proportion of primary school children aged 5 to 11 (9.2% vs 11%)
- Lower proportion of secondary school children aged 12 to 17 (7.2 vs 9.3%), and
- Lower proportion of parents and homebuilders aged 35 to 49 (20.5% vs. 22.3%).

Between 2006 and 2011 in Liverpool suburb, the age groups with the greatest percentage increase were:

- Elderly aged 85 and over (+27% or +60 people)
- Babies and preschoolers aged 0 to 4 (+26% or +427 children)
- Young workers aged 25 to 34 (+23% or +824 people), and
- Empty nesters and retirees aged 60 to 69 (21% or +315 people).

Table 3 provides a full age profile for Liverpool suburb and Liverpool LGA.

Table 3 Age profile Liverpool suburb 2006 to 2011 (source: profile.id)

Liverpool suburb - Total persons (Usual residence)	2011			2006			Change 2006 to 2011	
Service age group (years)	Number	%	Liverpool LGA %	No.	%	Liverpool LGA %	No.	% change
Babies and pre-schoolers (0 to 4)	2,063	8.6	7.8	1,636	7.7	8.3	427	26%
Primary schoolers (5 to 11)	2,211	9.2	11	2,045	9.6	11.8	166	8%
Secondary schoolers (12 to 17)	1,740	7.2	9.3	1,593	7.5	9.3	147	9%
Tertiary education and independence (18 to 24)	2,329	9.7	9.9	2,260	10.6	10	69	3%
Young workforce (25 to 34)	4,350	18.1	14.6	3,526	16.6	15.1	824	23%
Parents and homebuilders (35 to 49)	4,928	20.5	22.3	4,786	22.5	23	142	3%
Older workers and pre-retirees (50 to 59)	2,715	11.3	11.6	2,286	10.7	10.7	429	19%
Empty nesters and retirees (60 to 69)	1,838	7.7	7.4	1,523	7.2	6.3	315	21%
Seniors (70 to 84)	1,547	6.4	5.2	1,418	6.7	4.8	129	9%
Elderly aged (85 and over)	285	1.2	0.9	225	1.1	0.7	60	27%
Total population	24,005	100	100	21,298	100	100	2,707	13%

Population density

The current residential population density of Liverpool suburb (37.91 persons per ha) is much higher than the Liverpool LGA, (5.89 persons per ha).

4.3. Population diversity and wellbeing

ATSI Population

At 1.1% of the population (or 270 people), Liverpool suburb has a smaller proportion of Aboriginal and Torres Strait Islander residents compared to Liverpool LGA (1.5%) or Greater Sydney (1.2%).

Cultural and Linguistic diversity

66.2% of Liverpool suburb's population speaks a language other than English at home, which is much higher than Liverpool LGA (35.9%) and Greater Sydney (26.3%).

In Liverpool suburb, the most common languages other than English spoken at home in 2011 were Arabic (16.3%), Serbian (9.8%) and Hindi (4.4%).

Household income

Liverpool suburb has a lower median weekly household income ($947) than Greater Sydney ($1,447) and Liverpool LGA ($1,299).

SEIFA Index of Disadvantage

Liverpool suburb is relatively more disadvantaged (SEIFA score of 847.6) than Liverpool LGA (score of 951) or Greater Sydney (1011).

Unemployment Rate

Liverpool suburb has a higher unemployment rate (11.8%) than Liverpool LGA (7.0%) or Greater Sydney (5.7%).

4.4. Housing and households

Housing Type

Liverpool suburb currently has 47.6% high density dwellings, a greater proportion than across Liverpool LGA (10.8%).

Housing Tenure

Liverpool suburb has a higher proportion of households that were renting their home (45.9%) compared to Liverpool City (29.1%) and Greater Sydney (30.4%). Households that own their own home or are currently buying it through a mortgage make us 41.5% of households in Liverpool suburb, much lower than Liverpool City (62.8%).

Housing stress

Across Liverpool City, around 16.2% of households are under housing stress, much higher than Greater Sydney at 11.5% and higher than WSROC at 15%. The suburb of Liverpool has the highest level of housing stress in Liverpool City at 23.4% of all households.

Vacancy Rate

Since 2006, the vacancy rate in the Southwest Sydney subregion has been below 2%, indicating a severe shortage of private rental stock[4].

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a reg

[4] Housing NSW Housing Market Sna

Lone person households

Liverpool suburb has a greater proportion of lone person households (22%) than Liverpool LGA (15.2%).

Average Household Size

Liverpool suburb has an average household size of 2.75 persons per dwelling, which is lower than the average of Liverpool LGA (3.2) but higher than Greater Sydney (2.7).

Social housing

At 7.9% of all housing, Liverpool suburb currently has a similar proportion of social housing as Liverpool LGA (8.1%), and higher than Greater Sydney (5.5%).

4.5. Population forecasts post-development

This section provides estimates of the forecast population resulting from the proposed development on the combined sites using a range of household sizes of between 2.25 and 2.75 persons per household. The forecast population of the proposed development site is between 2,702 and 3,303 people (3,375 and 4,125 people total forecast population for the Shepherd Street Precinct).

Table 4 Forecast population of proposed development and Shepherd Street Precinct

Site	Size	Potential future population of the site		
		2.25 pp household	**2.5 pp household**	**2.75 pp household**
Proposed development	**1,201 dwellings**	2,702 people	3,003 people	3,303 people
Shepherd Street Precinct (Total)	**1,500 dwellings**	3,375 people	3,750 people	4,125 people

Change to Liverpool suburb population

Liverpool City Council does not have population forecasts by suburb. However, we can assume the following growth based on the proposed development and the Shepherd Street Precinct.

Table 5 Change to the population of Liverpool suburb post development, and post Shepherd Street Precinct

Site	Existing Liverpool suburb population (2011)	Forecast population range proposed development	Liverpool suburb population post development	% change (2011 Liverpool suburb population)
Proposed development	24,005	2,702 to 3,003 people	**24,879 to to 25,480 people**	**11-14%**
Shepherd Street Precinct	24,005	3,375 to 4,125 people	**25,552 to 26,303 people**	**14-17%**

Forecast age profile

The proposed development will likely have a similar density and dwelling mix to Rhodes West in Canada Bay. The age breakdown for Rhodes West has therefore been applied to the total forecast population of the proposed development to provide a forecast potential age profile for the area. Table 6 shows the potential age breakdown by service age group for the site based on a range of persons per dwelling.

Table 6 Estimated Age Breakdown (based on Rhodes West as benchmark) 2011

	Rhodes West	Forecast population subject site (based on 1,201 units, 2.25 pp dwelling) 2,702 people)	Forecast population subject site (based on 1,201 units, 2.5 pp dwelling, 3,003 people)	Forecast population subject site (based on 1,201 units, 2.75 pp dwelling, 3,303 people)	Forecast population Shepherd Street Precinct (based on 1,500 units, 2.25 pp dwelling, 3,375people)	Forecast population Shepherd St precinct (based on 1,500 units, 2.75 pp dwelling, 4125 people)
Age group	%	#	#	#	#	#
0 to 4	6.8	184	204	225	230	281
5 to 11	2.9	78	87	96	98	120
12 to 17	2	54	60	66	68	83
18 to 24	22.3	603	670	737	753	920
25 to 34	41.8	1130	1255	1381	1411	1724

35 to 49	16.4	443	492	542	554	677
50 to 59	5.2	141	156	172	176	215
60 to 69	2.7	73	81	89	91	111
70 +	0.9	24	27	30	30	37

Source: ABS Census of Population and Housing, profile.id for City of Canada Bay

Changes to population density

Population density is worked out based on Statistical Areas. Atlas.id define population density as *"the number of people per hectare of land by Statistical Area 1 (SA1). Land included in the calculation may not be used for habitation"*. Statistical Area 1152563, where the site is located currently has a population density of 36 persons per hectare, with the redevelopment of 20, 26, 28, 32-34, 33-31 Shepherd Street the density will increase to between 215 to 254 persons per hectare, and resulting from the redevelopment of the entire Shepherd Street Precinct it will be between 259 to 309 persons per hectare. By way of comparison, by 2031, Green Square in the City of Sydney will have a population density of around 211 persons per ha, and the high-density area of Rhodes West will have a population density of around 209.

4.6. Key findings

The community profile indicates the following in terms of social infrastructure, services and social sustainability in the Liverpool suburb area:

- Providing housing and facilities that are affordable is important due to the low median household income, high levels of housing stress, low SEIFA index of disadvantage and high unemployment of Liverpool suburb and Liverpool LGA. The provision of affordable rental housing through the proposed development should be explored.
- Community facilities and spaces should cater to the culturally diverse population in the area, particularly Arabic, Hindi and Serbian speakers. Appropriate recreation facilities, spaces for community and cultural events and gatherings, and information available in a range of languages will be important.
- The high working age population of the area will need community space outside of their homes to meet, participate in local health and wellbeing programs, recreate, form neighbourhood connections, hold club meetings, and have local get-togethers, particularly outside of working hours on weekends and in the evenings. This includes parks, exercise equipment, bike paths, restaurants and bars and free space in the public domain to connect to the community.
- Universally designed public spaces including provision for children, young people, people with disability, and for ageing in place will be important.
- The population density of the proposed development is significantly higher than the existing density of SA 1152563. This can create a very activated community, however, also creates demand for high quality community facilities and public and semi-private open space that can build connections between neighbours, and provide space away from their homes. There will be competing uses for these public and communal spaces (eg. Dog walkers v children playing) requiring well designed and managed community spaces that are robust and adaptable.

5. Socially sustainable high density

"There is not a problem with the high-rise typology, it's just about doing it well."

- Brian Jackson General Manager - Planning & Development Services City of Vancouver

The proposed development and the Shepherd St Precinct will be a highly dense environment, with population density up to 254 persons per ha when the entire area is complete. This will have significant impacts on the social sustainability of the residential areas, including residents' health and wellbeing, community cohesion, and access to facilities and services.

The level of density proposed isn't by itself a satisfactory guide to whether or not the development will provide adequate amenity for residents and neighbours; it will depend on how well it's designed and the level of public benefit it will give back to and connections with the broader community.

Australia has historically been a low-density suburban landscape. The greater Sydney area is being transformed in key areas close to transport to a city of urban places. Green Square in the City of Sydney will be Australia's most dense suburb at around 211 persons per hectare. The proposed redevelopment of the Waterloo by the NSW Government is said to be 700 persons per hectare (by the City of Sydney) and 220 persons per hectare by the NSW Government. By international standards this is comparatively low; Vancouver allows a density of 1,290 persons per hectare, equivalent to 84% more than what Sydney City Council says is proposed for Waterloo. The maximum permissible density is 2,620 persons/ha in Hong Kong and 2,560/ha in New York; almost four times higher than what's supposedly planned for Waterloo[5].

The myth that families with children do not live in medium or high density residential buildings in Australia has been exposed as false (particularly in Sydney in Pyrmont/Ultimo and Green Square). Infrastructure that meets the needs of a diverse community - families with children, young people, older people and middle aged people - needs to be part of developing new medium and high density mixed use areas.

This section provides an analysis of the impacts of high-density living including measures for improved social outcomes in high-density areas.

5.1. Benefits of socially sustainable high density residential areas

Done well, quality high-density living can have positive impacts for residents and communities. What is most important in delivering good outcomes for residents and the broader city are the overall numbers of people living in a development, whether the apartments enable a good quality of life or not, whether residents have access to the open space and community services that they need and the cumulative impact of these developments on the quality of the public realm below.[6] Connections to neighbouring places and communities, transport and services are also important.

[5] Hodyl, Leanne, The Winston Churchill Memorial Trust of Autralia, To investigate planning policies that deliver positive social outcomes in hyper-dense, high-rise residential environments,

[6] Hodyl, Leanne, The Winston Churchill Memorial Trust of Autralia, To investigate planning policies that deliver positive social outcomes in hyper-dense, high-rise residential environments,

High-density living can have a number of benefits including:

- Designing and building a public domain that encourages active transport such as walking and cycling
- Creating a market for facilities and services that would otherwise be located further away or not available to a smaller population, (such as walking and cycling networks, public transport networks, well-maintained green spaces, and community facilities and services)[7], and reducing reliance on car trips for these services and facilities
- Helping lower demand in other parts of the city less suited for housing, such as outer suburbs not connected to transport and employment
- Activating the public domain (over more of the day and evening), and building a sense of safety in public spaces as a larger population uses shared facilities including open space
- Shared and active spaces also create opportunities for residents to develop community cohesion, and identity
- As residents spend money locally, larger populations with easy walking, cycling and public transport access to local shops and services can boost the local economy.

5.2. Requirements for socially sustainable high density residential areas

When high-density areas are poorly designed and sited, and ineptly managed, social benefits can be lost and there can be severe negative impacts for residents. Higher density living can create stress, fear of crime, social isolation and community dislocation, and health problems. Vulnerable populations will be more susceptible to any negative impacts of higher density, including older people and children[8].

Green Square within the City of Sydney is a major development area converting previously industrial areas close to transport and the city centre into high-density living areas. The Green Square development area is 278 hectares and will eventually have 30,500 new dwellings. Development in the area has been guided by a masterplanning process including a dedicated DCP, Public Domain Plan, Public Art Plan and LEP for the town centre, benchmarking and planning for social infrastructure provision, and the delivery of quality local, district and regional level open space throughout the area. An Affordable Housing Strategy is also being implemented as part of the development of Green Square.

Research on the Green Square area and other best practice high-density areas has shown that the following considerations are crucial in creating a socially sustainable high-density development.

Housing[9]

A diversity of housing types and size including number of bedrooms, cost, low- and mid-rise apartment buildings, terraces and high rise is needed to cater to the varying needs of the community and build a diverse population. Housing should be of a good size, with storage, solar access particularly to living spaces, minimal noise transference, privacy, and water and energy saving features, to support quality of

[7] Kent, J., The Conversation, 'High density living can make us healthier, but not on its own", January 2015, https://theconversation.com/higher-density-living-can-make-us-healthier-but-not-on-its-own-34920

[8] Kent, J., The Conversation, 'High density living can make us healthier, but not on its own", January 2015, https://theconversation.com/higher-density-living-can-make-us-healthier-but-not-on-its-own-34920

[9] High Density Liveability, 'High Density Liveability Guide', http://www.highdensityliveability.org.au/

life and affordability. Housing should be universally designed to support a diverse community including allowing older people to age in place.

Infrastructure

Higher-density housing needs to be situated among quality public transport networks, jobs, schools, shops, services, open space, community and cultural facilities and active transport infrastructure that fit the needs of the resident community, particularly those of vulnerable communities including older people and children[10]. Facilities open to and attracting the broader population are also needed to build connections between the site and the surrounding community. Cafes, restaurants and bars, and local shops, are important locations for social interaction, and mixed-use developments can encourage greater social interaction[11]. The public domain should be of high quality and encourage walking and provide opportunities for free use through seating that supports people watching and socialising.

Social connection[12]

Intermediary common green spaces can help to create sub-communities in high density housing, "village-ifying" residents' experience. There should be a focus on the design of informal shared spaces, such as providing generous corridors and the presence of landscape in lift lobbies, to help develop neighbourliness and community. Recreation areas should be designed to feel safe, connected, and welcoming (as opposed to only owned by a small number of homogenous residents). Visual and physical connections to the street and the community at ground level should be activated and contribute to social connection rather than designed only for security. Provision of public community space/s and site specific place-making and public art are important to support social and place connection.

Open Space[13]

A hierarchy and diversity of connected, quality open spaces is needed, including private, semi-private, and public open space, and local parks as well as access to regional and district spaces. Open space needs to function as backyard, meeting places, access to play (for a range of ages from young children to young people), space for exercise and events/gatherings, and be adaptable to different uses and needs from different groups. Every open space area should have a purpose as well as versatility, including spaces that provide a 'heart' for communities and developments. The preparation of master plans that guide the provision and design of open space will help to ensure the appropriate delivery of a diversity of connected, quality open space.

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[10] Kent, J., The Conversation, 'High density living can make us healthier, but not on its own", January 2015, https://theconversation.com/higher-density-living-can-make-us-healthier-but-not-on-its-own-34920

[11] McNamara, N. and Easthope, H., 'Measuring Social Interaction and Social Cohesion in a High Density Renewal Area: the Case of Green Square', City Futures Research Centre, UNSW, https://www.sa.gov.au/__data/assets/pdf_file/0016/17530/Best_Practice_Open_Space_in_Higher_Density_Developments_Project_Summary_Report_June_2012.pdf

[12] Stalker, C. (Architectus), 'Socially Green': The Next Frontier for Liveable High Density Housing', February 2016, https://www.criterionconferences.com/blog/government/sociably-green-next-frontier-liveable-high-density-housing/

[13] City of Charles Sturt, 'Local Government Research Project into Best Practice Open Space Provision for Higher Density Infill Development', https://www.sa.gov.au/__data/assets/pdf_file/0016/17530/Best_Practice_Open_Space_in_Higher_Density_Developments_Project_Summary_Report_June_2012.pdf

McNamara, N. and Easthope, H., 'Measuring Social Interaction and Social Cohesion in a High Density Renewal Area: the Case of Green Square', City Futures Research Centre, UNSW

People in high density areas should be within 2 to 3 minutes or 250 metres of usable open space, of at least 0.25ha, including access to play and activity opportunities. Residents should live within 500 metres of higher quality neighbourhood, district or regional open space. Walking is the most popular recreation activity in Australia, therefore there should be a focus on connecting open space areas with walking paths as well as creating destinations to create opportunities for physical activity.

Connection to nature[14,15]

There is a growing body of research that indicates that living in high-density housing can lead to a collective "nature deficit". There should be opportunities for residents to experience natural elements in their day to day lives including through "biophilic" architectural elements such as green walls and roofs, indoor plants and nature-inspired design elements such as the use of fractal patterns in materials, as well as through access to green space. Visual and physical connections to natural public domains such as parks and landscape elements such as rivers are important.

5.3. Implications

- The open space provided on site, at Mill Park, and the upgraded Lighthorse Park should be connected and provide a variety of opportunities for active and passive recreation, for a range of demographic and cultural groups.
- Community infrastructure including the Paper Mill commercial areas should be delivered in a way that builds community in the precinct, as well as welcoming the broader community. Provide a public community space in the Paper Mill building at the early stages of the development for community meetings, birthday parties, and social, cultural, and recreational activities. Consider a small library hub (unstaffed) as an element of this community space.
- The development of a site specific place-making strategy that supports community connections and the transition from an industrial/suburban place to an urban place with identity drawing on past and future uses and people is important to support social and place connection. The integration of quality, place specific public art as part of the place-making strategy is important to support social and place connection. Provision of public community space/s at the early stages of the development for diverse community social, cultural, and recreational activities is important to support social and place connection.
- Diverse community needs including the needs of vulnerable populations such as older people and children need to be planned for
- There should be a range of housing types available including dwellings with a varied number of bedrooms.
- Housing should be universally designed and of a good size with natural light, storage, water and energy saving features, privacy and minimal noise transference, and
- There should be opportunities to connect with green space and nature. The walking path along the Georges River will be a good opportunity to provide this, as will biophilic architectural elements.
- Affordable rental housing should be provided as part of the development.

[14] Stalker, C. (Architectus), 'Socially Green': The Next Frontier for Liveable High Density Housing', February 2016,

[15] Newman, P., 'Biophilic Architecture: Rationale and Outcomes', Curtin University, http://www.aimspress.com/fileOther/PDF/environmental/environsci-02-00950.pdf

6. Existing social infrastructure and services

For a healthy, liveable and sustainable community, housing should be within walking, cycling, or close public transport distance to employment, education, good parks, shops, and community services and facilities. Quality social infrastructure and services play an important role in supporting and facilitating community harmony and connectedness. From a social sustainability perspective, quality, well-planned local open space has a multitude of benefits for a community. Planned elements - such as natural features and playgrounds - provide an outdoor community amenity to complement indoor facilities that are often more structured and provide opportunities for adventure, creative play and intellectual interest. Open space gives the community the opportunity to engage and build upon, the planned elements and allow for the place to evolve as the community does. Public open space allows the community the freedom to make it their own.

6.1. Definitions

For the purposes of this study social infrastructure refers to public and communal/semi-private community facilities, services and open space.

Community facilities

Community facilities are those indoor (built form) spaces for individuals and organisations to conduct and engage in a range of community development, recreational, social and cultural activities that enhance the community's wellbeing.

Public community facilities are those facilities that are accessible by the general public including community centres and childcare centres.

Communal or semi-private community facilities are those facilities located within medium and high-density buildings and are specifically created for the private use of those tenants.

Open space

Public open space includes parks, outdoor courts, and playgrounds. It is open space which is publicly owned, accessible to all members of the public, and can be planned and managed by local, state or federal government.

Communal open space (semi-private) is open to all residents of a development, or within a particular high density building. Examples of communal (semi-private) open space include communal gardens, green spaces, rooftop parks, swimming pools, or gyms only accessible to residents of that development.

6.2. Social infrastructure audit

6.2.1. Social infrastructure within 800 metres of the site and the Shepherd Street Precinct

Housing should be within walking, cycling, or close public transport distance to employment, education, good parks, shops, community services and facilities. The following social infrastructure is located within 800 metres of dwellings of the subject site and the Shepherd Street Precinct (within walking distance).

Community facilities

As shown in Figure 4, there are 11 community facilities within approximately 800 metres including:

- 1 community hall
- 1 Islamic private primary and high school
- 1 museum
- 1 shopping area
- 1 men's shed
- 3 fitness gyms, and
- 4 child care centres.

There are no public primary or secondary schools within 800 metres of the site.

Transport

As shown in Figure 4, public transport options near to the proposed development and the Shepherd Street Precinct include:

- Bus stops, with buses to Liverpool, Campbelltown, Bringelly, West Hoxton and Prestons 520m from the site, and
- Liverpool Railway Station, 970m from the site.

Open Space

As shown in Figure 4, there are seven open space areas within approximately 800m. This includes:

- 5 local parks - Mill Park, Discovery Park, Dunbier Park, College Park and Hazel Bradshaw Park
- 1 district park - Lighthorse Park (137,600m2)
- 1 sportsground – Woodward Park and Hillier Oval.

See **Appendix 1** for details of local and district social infrastructure within 800 metres of the site.

Figure 4 Map of social infrastructure within 400m and 800m of proposed development and the Shepherd Street Precinct

Childcare
1. Clovel Childcare and Early Learning Centre
2. Play 2 Learn
3. Happy Start Childcare
4. Just Kids Learning

Open Space
5. Mill Park
6. Discovery Park
7. Dunbier Park
8. College Park
9. Lighthorse Park
10. Hazel Bradshaw Park
11. Hillier Oval/Woodward Park

Education
12. Al Amanah College
13. Liverpool Public School

Facilities
14. Liverpool Men's Shed
15. Liverpool Community Centre
16. Shopping
17. Liverpool Regional Museum
18. Platinum Fight and Fitness
19. Crunch Liverpool
20. Squashlands Gym and Fitness
21. Whitlam Leisure Centre
22. Medical Centre 2000

Transport
23. Bus stop
24. Liverpool Train Station

6.2.2. Audit of social infrastructure in Liverpool City Centre

In addition to the social infrastructure located within 800 metres of the proposed development and the Shepherd Street Precinct, there is major social infrastructure located in the Liverpool City Centre as detailed in **Appendix 2** including:

- Liverpool City Library
- Liverpool Public School
- TAFE NSW South Western Sydney
- Liverpool Police Station
- Whitlam Leisure Centre
- Westfeld Shopping Centre.

There is 142.33ha of open space in Liverpool suburb, of which 58% is in parks greater than 10ha[16]. The audit provided in Table 10 shows that in addition to the open space and recreation facilities within 800m of the proposed development and the Shepherd Street Precinct, within Liverpool suburb there are six additional sports grounds.

Table 10 Additional open space within Liverpool suburb

Type	Facility Name	Description	Geographic Distance
Sportsground	Ireland Park	3 senior soccer fields, 2 junior soccer fields	2.2km
Sportsground	Lehmanns Oval	1 synthetic cricket wicket, 1 senior soccer field, 1 junior soccer field, 1 baseball diamond, 1 athletics track	2.35km
Sportsground	Paciullo Park	3 senior soccer fields, 1 junior soccer field	1.5km
Sportsground	Schell Park	1 synthetic cricket wicket, 1 senior soccer field	2.3
District Park	Bigge Park	District park with 4 tennis courts	1.2km
Sportsground	Collimore Park	3 multipurpose netball/basketball courts, 1 hockey field	1.4km

[16] Liverpool City-Wide Recreation Strategy 2020, adopted December 2003

6.3. Capacity and utilisation

The capacity and utilisation of existing social infrastructure was completed where possible through consultation with participating local community service providers and Council staff, review of existing plans and strategies, and site visits.

Schools

Consultation with Liverpool Public School:

- Liverpool Public School has "not a lot of space for growth", indicating that there are limited opportunities to increase teaching spaces to accommodate increased enrolments.
- According to the Liverpool Public School annual report, enrolments have been increasing each year and 726 students were enrolled in 2014.

Consultation with David Hargrave, Principal Liverpool Girls' High School:

- Liverpool Girls High School has expected enrolment of 1,040 in 2016, and capacity for 1100 students. The school is in high demand and already has a large number of demountable classrooms, and so cannot expand more
- Other schools in the area such as Ashcroft High School have falling enrolments and some empty classrooms, and
- The Principal expects that a large number of refugees from Syria will be resettled in the area, which will create additional demand for the school.

Early education and care

A 2013 study[17] indicated that at the time there was no undersupply of early education and care places in the suburb of Liverpool because of the very high vacancy rates in existing services. Currently, all services within 800m of the proposed development advertise vacancies on all days[18].

Function and exhibition space

Liverpool City Centre is well equipped with three private formal function spaces, however community exhibition and function space is limited to the community hall.

Hospitals and health

South Western Sydney Local Health District and Liverpool Hospital plans show that there is insufficient infrastructure in SWSLHD to meet current and future demand. Liverpool Hospital has recently undergone major redevelopment works and further work is required to meet demand to 2021. The Liverpool area faces challenging healthcare issues, with lower health status than the NSW average. 25% of Liverpool Hospital staff live within 5 km and 47% within 10 kilometres of the hospital.

Open space

The *Liverpool City-Wide Recreation Strategy 2020* (adopted December 2003) indicates that while open space provision in Liverpool LGA is high (and potentially in oversupply for the population), the majority is located in new release neighbourhoods and the Western neighbourhood, and there is a requirement for

[17] Childcare Viability Study, 20 Shepherd St Liverpool, Cred Community Planning

[18] mychild.gov.au

additional sports fields and affordable and accessible recreation opportunities. There are opportunities to improve open space to create quality and activated parks.

7. Community facility and service demand

This section provides an assessment of the number and type of community facilities required as a result of the proposed development based on best practice benchmarks and standards for community facility provision, which provide an indicative guideline only for the type of community facilities required by population size, population density, and current provision near the subject sites.

7.1. Benchmarking by facility type

Appendix 3 provides the benchmarks and standards used to determine the community facilities required based on the proposed population of the subject sites. Benchmarks utilised are from Department of Planning for Greenfield areas, City of Sydney Green Square Social Infrastructure Study, and NSW education and care utilisation rates. The upper population of 3,303 people (based on a potential 2.75 persons per household) has been used for benchmarking purposes.

Facility type	Proposed Development	Shepherd St Precinct	Current Provision
LOCAL			
Community meeting rooms	0.5	0.6	There is currently 1 community hall within 800m. However, it is old, small and single purpose, and given the high proportion of people who will be living in apartments, there will be demand for an onsite community space for residents to meet, participate in local programs, create local events, hold playgroups or store equipment. This should be general community space should also be considered as a priority to provide at the early stages of the development for community development activities.
Early education and care centre (child care)	61.2 places	67.4 places	There are 185 child care places within 800m of the proposed development. A 2013 study[19] indicated that at the time there was no undersupply of early education and care places in the suburb of Liverpool because of the very high vacancy rates in existing services. Currently, all services within 800m of the proposed development advertise vacancies on all days[20].
Playground (0 to 4 years)	0.4	0.4	There are currently no playgrounds for children 0 to 4 within 400m

[19] Childcare Viability Study, 20 Shepherd St Liverpool, Cred Community Planning

[20] mychild.gov.au

Facility type	Proposed Development	Shepherd St Precinct	Current Provision
Playground (5 to 11 years)	0.2	0.2	There are currently no playgrounds for children aged 5 to 11 years within 400m
DISTRICT			
Multipurpose community centre	0.2	0.2	There are no multipurpose community facilities in Liverpool. Existing facilities are old and single purpose (e.g. Dr James Pire Community Centre, Liverpool Community Centre)
Function and conference centre	0.2	0.2	There are 3 function and conference centres within the Liverpool City Centre
Primary School	0.2 schools or 57.5 places	0.2 schools or 71.8 places	Liverpool Public School is 1.05km away.
Secondary School	0.1 schools or 33 places	0.1 schools or 41.3 places	Liverpool Girls High School and Liverpool Boys High School are located 1.8 and 1.85km away.
Out of School Hours Care	15.3 places	19.1 places	There are no out of school hours care places within 800m of the proposed development. Working families require out of school hours care and out of school hours care services are best located within school grounds.
Seniors centre	0.2	0.3	The Hilda M Davis Seniors' Centre is 1.2km away. However, this is not a viable walking distance for many older people.
REGIONAL			
Library (central library)	0.1	0.1	Liverpool City Library is 1.2km away.
Indoor leisure centre (Dry)	0.1	0.1	The Whitlam Leisure Centre is 1.15km away.
Indoor Leisure	0.1	0.1	The Whitlam Leisure Centre is 1.15km away.

Facility type	Proposed Development	Shepherd St Precinct	Current Provision
Centre (wet/pool)			
Hospital	7.6 beds	9.5 beds	Liverpool Hospital has 877 beds but is currently at capacity
Primary Care (including mental health)	0.1 centres	0.1 centres	1 medical centre within 800m. Additional medical centres available in Liverpool City Centre
Fire stations	0.1	0.1	1 in Liverpool City Centre
Police stations	0.1	0.1	1 in Liverpool City Centre
TAFE	0.0	0.0	1 in Liverpool City Centre
University	0.0	0.0	0 (Nearest university is University of Western Sydney Bankstown Campus)

7.2. Community facilities needs analysis

An additional 2,702 to 3,303 residents in the proposed development and 3,375 to 4,125 residents in total in the Shepherd St Precinct will have an impact on access to existing community facilities and increase demand for particular services. Based on the forecast population, best practice in high-density areas, population benchmarks, existing provision and feedback from local services, the following priority demand for community facilities is expected:

General community space

There is one small community centre within 800m of the proposed development and the Shepherd Street Precinct. However, given the high proportion of people who will be living in apartments, there will be demand for a community space for residents to meet, participate in local programs, create local events, hold playgroups or store equipment. This should be general community space that is flexible and should be considered as a priority to provide at the early stages of the development as a place where community development activities can be provided.

CASE STUDY: Green Square Community Kiosk

The Green Square Community Kiosk is located in Joynton Avenue in Green Square. The Kiosk is located in the park and provides a small multipurpose community space including a kitchen, storage space and awning to support community and Council community development programs. The facility engages with outdoor seating and tables and is used for community meetings, the Infohub, English language classes and other community activities. The facility is compact and low cost. There is potential for a space like

this to be located onsite while through the stages of redevelopment.

Children

Aged 0 to 4 years

An additional 230 to 281 children aged 0 to 4 years in the Shepherd Street Precinct (184 to 225 in the proposed development) will create demand for between 69 to 84 child care places. This is likely to have little impact on surrounding centres. A 2013 study[21] indicated that at the time there was no undersupply of early education and care places in the suburb of Liverpool because of the very high vacancy rates in existing services. Currently, all services within 800m of the proposed development advertise vacancies on all days[22].

Places for children to play and socialise with other children will be important given the high number of children in the Liverpool suburb and the number of 2-bedroom apartments indicating couple and family households.

Children aged 5 to 11 years

The Shepherd Street Precinct will increase the number of children aged 5 to 12 by around 98 to 120 children (78 to 96 children in the proposed development). This will have an impact on local primary schools, creating demand for 59 to 72 places. There are no public primary schools within 800 metres of the site. Nuwarra Primary School in Moorebank has capacity for two more classrooms, however, Liverpool Public School is nearing capacity[23].

The increased population of children will need access to open space, play equipment, pedestrian and bike paths to participate in healthy social and physical activities. All children will be living in high density apartments and may require access to a community venue to hold birthday parties and other events.

[21] Childcare Viability Study, 20 Shepherd St Liverpool, Cred Community Planning

[22] mychild.gov.au

[23] Based on interviews with school principals available for an interview at time of preparing this SIA

Young people aged 12 to 17 years

There are only expected to be around 68 to 83 young people aged 12 to 17 years living in the Shepherd Street Precinct (54 to 66 young people in the proposed development). However, over the years the higher number of younger children will most likely remain living here and will need access to recreation space to gather with their friends and engage in positive activities. The Shepherd St Precinct will create demand for 34 to 41 secondary school places. There are a number of secondary schools located nearby that have the capacity for additional students, however others are nearing capacity[24].

Working aged people

One of the main age groups who will be living in the proposed development will be working age people. This includes single person households, couples without children, and single parent/couple households with children. This group will need community space outside of their homes to meet, participate in local health and wellbeing programs, form neighbourhood connections, hold club meetings, and have local get-togethers. The proposed communal and rooftop communal open space, the Paper Mill building and the proposed upgrades to Mill Park will be very convenient spaces to facilitate many of these social and health connectors. These open spaces will provide necessary neighbourhood parks in an area with a high supply of larger open space areas. There will be a need for access to local parks and open space in the evenings. Upgrades to Lighthorse Park and Mill Park should include lighting to allow for after work use.

Older people

There is not expected to be a large incoming population of older people aged 70+ (30 to 37 people in the Shepherd Street Precinct), however through good housing design there is potential for people to age in place and for proportion of older people in the population to increase. Communal facilities including space for group meetings and gentle physical activity such as Tai Chi and walking will support older people to age in place. There is one senior's centre in the Liverpool City Centre. The Liverpool Men's Shed caters particularly to men in retirement. The displacement of this facility could increase social isolation among this group. The Liverpool Men's Shed is planned to be relocated at the end of its lease.

Health facilities

South Western Sydney Local Health District and Liverpool Hospital planning show that there is insufficient infrastructure in SWSLHD to meet current and future demand. Liverpool Hospital has recently undergone major redevelopment works and further work is required to meet demand to 2021. The Liverpool area faces challenging healthcare issues, with lower health status than the NSW average. 25% of Liverpool Hospital staff live within 5 km and 47% within 10 kilometres of the hospital indicating a need for affordable housing to support key workers.

There is one medical facility approximately 1km from the site (14 minutes walk).

[24] Based on interviews with school principals

8. Open space demand

8.1. Public open space

The provision of public open space within neighbourhoods provides many benefits to a community. These include:

- Personal - improved physical and psychological health
- Social and community - strengthened family and community ties, and reduction of crime and anti-social behaviour
- Environmental - contrast to urban development, access to natural settings, improved visual landscape, and improved air quality from presence of trees, and
- Economic - attracts new residents to an area, property prices are higher adjacent to parks, and savings in health costs from increased physical exercise.

Whilst in the past the amount of public open space per person has been used as a guide for the provision of open space, recent trends and current good practice focuses on the provision of quality public open space rather than quantity. An overprovision of open space can mean that it is underutilised and empty, contributing to a sense of isolation and insecurity in the space[25].

The quality of open space is determined by its design, management/maintenance, sustainability, safety, accessibly, amenity and comfort. A variety of quality open spaces offers the new residents opportunities to build local networks and friendships and provides places for people to plant a tree, create or enjoy an artwork, grow some vegetables and contributes to building strong ownership of a new place.

In high density areas, residents should have access to both semi-private, communal and local level open space that can function as a "backyard", as well as access to activity and play opportunities and district and regional level open space. Open space should be connected with walking and cycling paths, to encourage use and provide opportunities for physical activity.

8.1.1. Benchmarking against standards

There are a number of different benchmarks and planning standards that are currently being used to determine open space needs for new developments. Demand for open space required to support a new community in the Shepherd St Precinct has been determined by looking at these different standards.

Open space

World Health Organisation

The World Health Organisation Guidelines have recommended a minimum allowance of 9m2 per person. Utilising the WHO standard, the forecast population of the proposed development would indicate a demand for 24,354m2 to 29,754m2 (or 2.44 to 2.98 ha). In total, the Shepherd St Precinct would require

[25] City of Charles Sturt, 'Local Government Research Project into Best Practice Open Space Provision for Higher Density Infill Development', https://www.sa.gov.au/__data/assets/pdf_file/0016/17530/Best_Practice_Open_Space_in_Higher_Density_Developments_Project_Summary_Report_June_2012.pdf

30,375m2 to 37,162m2of open space (or 3.04ha to 3.72 ha). The applicant is currently proposing to provide 30,000m2 of open space in the Shepherd St Precinct, reaching the benchmark for the lower population forecast. Additional open space is available within 800m of the Shepherd St Precinct including Lighthorse Park, which the applicant is proposing to upgrade.

City of Sydney

The City of Sydney's *Draft Open Space, Sports and Recreation Needs Study 2016* references the State Government's Recreation and Open Space Planning Guidelines for Local Government. (Department of Planning 2010) default standards for open space planning in NSW as a means to assess provision and identify shortfalls and gaps. As stated in these guidelines additional criteria beyond open space area provision such as population/ density and demographic profile, open space distribution, barriers, size, connectivity, and quality of visitor experience also need to be considered to ensure local open space provision and recreation needs are identified.

Default standards include 9% of site area for local and district level open space and 15% of site area for regional open space provision. Under these standards, the Shepherd St Precinct would create demand for 3,862m2 of local open space and 6,437m2 of regional open space.

Table 10 provides a summary of open space requirements using a range of current benchmarks and standards.

Table 7 Open Space Benchmarks and Provision

	Required for Proposed Development	Required for Shepherd St Precinct	Proposed for Shepherd St Precinct	Gap Shepherd St Precinct
WHO Standard (9m2 per person)	24,354m2 to 29,754m2	30,375m2 to 37,162m2	30,000m2	375m2 to 7,162m2
City of Sydney Standard **Local Open Space (9% of site area)** **Regional Open Space (15% of site area)**	Local: 2,787m2 Regional: 4,644m2 Total: 7,431m2	Local: 3,862m2 Regional: 6,437m2 Total: 10,299	Local: 30,000m2 Regional: 0m2 (Embellishments to Lighthorse Park) Total: 30,000m2	Local: No gap Regional: 6,437m2 Total: No gap
Liverpool Council/Growth Centres Commission	76,000m2 to 93,000m2	9.55 to 10.61ha	3ha	6.55 to 7.61 ha

Sporting fields

Table 8 provides a summary of sporting fields required to service the incoming population and current provision, utilising Department of Planning and Green Square Section 94 Plan benchmarks:

Table 8 Benchmarking outdoor sporting facilities

Facility type	Required for Proposed development	Required for Shepherd St Precinct	Current provision within Liverpool Suburb
Rugby field	0.5	0.6	1
Cricket oval	0.8	1.0	3
Indoor courts	0.3	0.4	Available at the Whitlam Leisure Centre
Soccer field	1.1	1.4	6
Netball courts	0.7	0.8	32
Tennis courts	1.8	2.3	4
Skate park/facility	0.6	0.7	No skate facilities in Liverpool. Moorebank Skate Park is 1.87km away.

See **Appendix 3** for benchmarks.

8.2. Open space needs analysis

8.2.1. Public open space

Total Population

The development achieves slightly below the benchmark provision of open space onsite for the forecast Shepherd St Precinct population. Proposed upgrades to nearby Mill Park should ensure that this provision "works hard", that is, it caters to a range of users and uses, and intensive use. The population will also be served by the existing provision of open space within 800m, including proposed upgrades to Lighthorse Park. The proposed shared pedestrian/cycle path along the Georges River will support active recreation for the Shepherd St Precinct community (walking and access to other open space e.g. Lighthorse Park), as well as providing a recreation opportunity for the surrounding community.

The Liverpool suburb area is well serviced with large open space areas and there is not considered to be a gap in provision of open space in general. Therefore, the proposed open space areas should provide neighbourhood or local parks that support residents who will be living in significantly highly dense neighbourhoods. They should act as "living rooms" or "public backyards". Currently, existing public open space in the area is mostly unembellished local and district parks and native bushland. While some of these parks are in close proximity to the site, they will not provide the benefits and social connectors the incoming community will require. Some of these benefits include:

- A space for meeting/chance encounters and informal socialising with neighbours
- A space residents can associate with the new development
- Opportunities for informal sports and recreation, and
- A venue for local small-scale events and gatherings.

Proposed upgrades to nearby Mill Park and the proposed open space onsite are an opportunity to provide for these needs.

There are opportunities for the development to provide additional public benefit through a contribution to improved district and regional open space off-site to address existing social disadvantage in the Liverpool LGA. Opportunities include:

- Contribute to improving Lighthorse Park including landscape and playground equipment upgrades, and provision for after work use e.g. through lighting
- Contribute to improving walk and cycle paths along the Western bank of the Georges River, connecting the proposed shared footpath to Bigge Park and the Casula Powerhouse Arts Centre

Children and youth

There is no play equipment within 400m of the proposed development, and existing playgrounds in the area (e.g. at Lighthorse Park) are basic and provide for a young age group under 10 years old. There is a need for play equipment that caters for a range of age groups and that is located closer to the development area, and in a multi-use site. Climbing walls can be incorporated into blank walls and park edges.

CASE STUDY: Outdoor ping pong, Eastwood, Sydney

Public space in Eastwood includes a popular outdoor ping-pong table.

CASE STUDY: Nature based play space

Natural, irregular and challenging play spaces provide health and learning benefits for children[26].

[26] Muñoz, S. A. (2009). Children in the outdoors: a literature review. Sustainable Development Research Centre. www.natureplaywa.org.au/library/file/Programs/playgrounds/Educationsynthesis_CNN%26N.pdf

Culturally diverse communities

Community consultation for the Liverpool City-Wide Recreation Strategy 2020 identified that with a culturally diverse population, there is also a need for space for a range of activities such as tai chi, table tennis, volleyball, basketball, and outdoor soccer, as well as family and community gatherings and BBQs. Recreation activities should be affordable. Multipurpose courts can act as a flat hard surface for basketball/tai chi and other activities. Consideration should also be given to access for people who do not speak English, as this group has a lower rate of participation in sport and recreation than other people from non-English speaking backgrounds and the broader community[27]. Women from diverse cultural backgrounds also have lower participation rates in active recreation than the general population[28].

People with a disability

Community consultation for the Liverpool City-Wide Recreation Strategy 2020 (adopted 2003) identified that key open space priorities for people with a disability were more seating, improved and wider footpaths, improved access to public toilets and more community gardens.

Sports facilities, playing fields and courts

There are a range of sports facilities in the Liverpool suburb. The proposed development will create demand for an additional 2 tennis courts and 1 cricket wicket (oval).

There is limited space for active informal recreation nearby to the proposed development, with College Park and Lighthorse Park located over 400m away. Sports facilities should be available in the evenings and on weekends for working age residents' use. The proposed upgrades to Lighthorse Park should include provision for active recreation at night such as lighting.

CASE STUDY: Multi-purpose courts, Box Hill, Victoria

The site is both a community space and provides and courts for multiple sport and recreation activities. There is also a 1km long path for walking and running.

Communal open space

Due to the height and density of the proposed development, there will be a requirement to utilise roof tops for passive and active recreation for tenants of buildings. This is becoming a common trend in many cities around the world including in Sydney and Melbourne. Semi-private/communal open space space within medium and high-density developments is becoming more common, including passive green

[27] Australian Bureau of Statistics, Migrants and Participation in Sport and Physical Activity, 2006

[28] ibid.

spaces, kick-about spaces, and community fruit, vegetable and herb gardens. In some apartment buildings, community gardens are an informal arrangement, with residents setting up committees to help keep the lawns and garden beds around their buildings in shape. But for an increasing number, communal gardens are being planted explicitly for residents to grow fruit, vegetables and herbs.

Currently there is approximately 14,000m2 of communal open space proposed for the Shepherd Street Precinct, of which 11,000m2 is proposed for 20, 26, 28, 32-34, 33-31 Shepherd Street, including communal rooftop gardens.

CASE STUDY: Signature apartments Redfern

Signature apartments are located in Redfern in Sydney. There are two common gardens at Signature apartments. The apartments also now have a community swap room where residents can leave goods they no longer want, or that they can borrow, and where bags of clothes can be left for a recipient family.

CASE STUDY: 1 Freshwater Place, Southbank, Melbourne

Freshwater Place is a residential complex containing 534 apartments, located on the Southbank side of Melbourne's Yarra River. The aim of the project was to provide residents with a functional outdoor space that would enhance their inner-city lifestyle and add value to the property. The green roof is part of the communal facilities, which include barbeque areas, pool, gym and function spaces. Residents and their guests have full access to the level 10 roof and it can be seen from most of the apartments as they extend many floors higher than the car park. Maintaining the green roof's aesthetic appeal is the priority for all maintenance activities. The green roof is an elevated landscape located on top of the nine-storey car park. It is made up of a series of garden mounds, a grass lawn, storage sheds and planter boxes for growing vegetables. A windbreak wall was added to protect the site from the strong southerly wind.

9. Housing affordability

The provision of affordable housing supports a diverse community and provides housing for local key workers such as hospital staff. Affordable housing is defined as "housing that is appropriate for the needs of a range of very low to moderate income households and priced so that these households are also able to meet other basic living costs such as food, clothing, transport, medical care and education"[29]. Generally, housing that costs less than 30% of gross household income is considered affordable[30]. Affordable housing encompasses a range of housing types including private rental housing, social housing managed by community housing providers or NSW Land and Housing Corporation, and boarding houses.

A second definition of affordable housing is a "specific type of housing built to be occupied by a range of low to moderate income households that are ineligible for public housing and also unable to participate effectively in the private rental market"[31]. Typically, affordable housing is managed by community housing providers, with rents set at 20-25% below the private rental market[32].

Affordable housing should be located close to employment opportunities, transport, community facilities and services and open space, as well as being energy and water efficient and cost efficient to maintain.

9.1. Housing market analysis

9.1.1. South West Sydney

The Centre for Affordable Housing's housing market snapshot[33] indicates that there is a lack of affordable housing in South West Sydney and insufficient diversity in the housing stock to meet local needs now and into the future. In South West Sydney, there is:

- A low proportion of private rental accommodation
- A long term very tight vacancy rate indicating a severe undersupply of private rental
- Strong increases in both rental levels and sales prices
- A decline in both rental and purchase affordability for lower income households
- Significant loss of affordable rental properties
- Very high proportion of lower income households in rental stress
- A large and growing number of low income renters, and

[29] Centre for Affordable Housing, What is affordable housing?
http://www.housing.nsw.gov.au/Centre+For+Affordable+Housing/About+Affordable+Housing/

[30] ibid.

[31] NSW Parliamentary Research Service Affordable Rental Housing: Current Policies and Options, 2015

[32] St George Community Housing, Submission to the Parliamentary Inquiry into Social, Public and Affordable Housing, 2014
http://www.tonygilmour.com/yahoo_site_admin/assets/docs/SGCH_submission.6741034.pdf

[33] Housing NSW Centre for Affordable Housing, 'Housing Market Snapshot: South West Sydney Subregion',
http://www.housing.nsw.gov.au/centre-for-affordable-housing/for-planners-of-affordable-housing/housing-snapshots/housing-market-snapshot-south-west-sydney-sub-region

- A high and growing number of lower income households currently resident in South West Sydney.

9.1.2. Liverpool LGA and Liverpool suburb

Proportion of private rental market housing that is affordable

As at December 2015, 4.7% of rental stock in the Liverpool LGA was affordable for very low income households, 31.3% was affordable for low income households, and 85.9% of the private market rental stock was affordable for moderate income households. There is a greater proportion of the private market rental stock that is affordable for low to moderate income households than in Greater Sydney, (3.5% affordable for very low income households,18.4% affordable for low income households, 60.4% affordable for moderate income households). The proportion of accommodation that is affordable to low to moderate incomes has increased slightly in the past five years (0.6 percentage points for very low income households, 1.4 percentage points for low income households, 5.7 percentage points for moderate income households). However, in their analysis taking into account all factors including household size, income, dwelling type and increasing rental prices, the Centre for Affordable Housing classifies the Liverpool LGA as having a high need for affordable housing[34].

Median rents

In the Sydney Southwest region, median rents for all dwelling types doubled between 2000 and 2013[35]. Median rents for one, two and three bedroom dwellings have increased significantly in Liverpool over the past year. In particular, the median rent for one bedroom dwellings has increased by 31.5% in Liverpool suburb and 33.3% in the Liverpool LGA.

Table 9Weekly rents for new bonds - March Quarter 2015 (source: NSW Government, Rent and Sales Report, December 2015)

	One bedroom		Two bedroom		Three bedroom	
	Median	Annual change in median	Median	Annual change in median	Median	Annual change in median
Liverpool suburb (2170 postcode)	$355	31.5%	$380	8.6%	$425.50	0.6%
Liverpool LGA	$360	33.3%	$380	8.6%	$470	4.4%
Greater Metropolitan Region	$450	0.0%	$490	2.1%	$490	4.3%

[34] Housing NSW Centre for Affordable Housing, 'Housing Market Snapshot: South West Sydney Subregion

[35] ibid

9.2. Affordable housing needs analysis

- There is an identified high need for affordable housing in the Liverpool LGA and in Liverpool suburb. While the proportion of private market rental housing that is affordable for low to moderate income households is higher than in Greater Sydney, increasing rental prices, high numbers of low-income residents, very tight vacancy rates, a lack of diversity of dwelling types and loss of affordable rental properties indicate a high need for affordable housing. Liverpool suburb has the highest levels of housing stress in the Liverpool LGA
- The Shepherd St Precinct is ideally located near to public transport and employment opportunities for key workers, including Liverpool Hospital[36]. In particular, the Shepherd St Precinct is located within 1km of Liverpool Hospital, and 25% of Liverpool Hospital staff live within 5 km and 47% within 10 kilometres of the hospital[37]
- There is a severe undersupply of private rental properties in the South West Sydney region, with vacancy rates below 2%, and
- There is a need to provide a diversity of housing types in Liverpool suburb and the Liverpool LGA to provide for local needs, including one and two bedroom dwellings. Lone households make up 22% of the suburb population, and there has been significant growth of 31.5% in rental prices for one bedroom dwellings in Liverpool suburb (33.3% increase in the Liverpool LGA) over the past year.

Liverpool City Council does not currently have any targets for the provision of affordable housing and the NSW Government has not set any affordable housing targets, although has noted that increased affordable housing in Sydney is a priority. By comparison, City of Sydney sets a target of 7.5% of all housing being affordable by 2030 and Parramatta City Council, 8%. The provision of affordable rental housing as part of the development of the Shepherd St Precinct is encouraged to provide a public benefit and mitigate negative impacts.

[36] Liverpool Residential Development Strategy (adopted 2008)

[37] Liverpool Hospital Operational Plan 2014

10.Social impacts and mitigation measures

This section looks at the potential social impacts of the proposed development and suggests mitigation measures to address identified impacts.

10.1. What are social impacts?

Impact assessment is a method for predicting and assessing the consequences of a proposed action or initiative before a decision is made. Social impact Assessment (SIA) refers to the assessment of the potential social consequences (positive, negative or neutral) of a proposed decision or action.[38] The International Association for Impact Assessment identifies social consequences or impacts as occurring in one or more of the following areas:

- People's way of life - how they live, work, play and interact with each other
- Their culture - their shared beliefs or customs
- Their community - its cohesion, stability, character, services and facilities
- The population - including increases or decreases in population numbers and population change
- Their political systems - the extent to which people are able to participate in decisions that affect their lives
- Their natural and built environment
- Their health and well-being
- Social equity and quality of life
- Access and mobility
- Their personal and property rights, and
- Their fears and aspirations and safety.[39]

10.1.1. Social sustainability

Quality of life is a key concept within social sustainability and can be defined as the degree to which societies provide living conditions conducive to health and well-being (physical, mental, social, spiritual). In addition to the social or human elements of social sustainability, there are a number of physical characteristics of social sustainability that are current best practice[40]:

- Safe and secure places
- Accessibility
- Provision of social infrastructure
- Promotion of social interaction and inclusion through design
- Diverse housing options, and

[38] Planning Institute of NSW, SIA National Position Statement, June,2009

[39] International Principle for Social Impact Assessment p.2, May 2003

[40] Based on the work of Jan Gehl

- Preservation of local characteristics.

Victorian Government[41] research identified that quality of life in high-density dwellings is affected by internal apartment amenity particularly:

- Daylight
- Space (including storage space)
- Natural ventilation
- Noise (including noise from internal spaces and services such as other apartments, garbage chutes, and external noise including traffic, trains and construction)
- Energy resources
- Sunlight
- Outdoor space

Research from the University of Newcastle identified a number of key success factors[42] in relation to achieving a socially sustainable community:

- ***Provision of social infrastructure***: Public facilities for basic needs, open spaces to facilitate social gatherings and public interaction, and provision of accommodation for different socioeconomic groups
- ***Availability of job opportunities***: Provision of employment and the working area offers a place for social contact and interaction, to improve the feeling of social well-being of citizens
- ***Accessibility***: Aspirations to live, work and participate in leisure and cultural activates without travelling too far, and to be housed in areas of convenience to access certain places in daily lives, with the freedom of movement
- ***Good urban design***: Pedestrian-oriented streetscapes, visual images of street furniture, and interconnectivity of street layouts
- ***Preservation of local characteristics***: Preservation of heritage items, local characteristics and distinctiveness in existing community networks has to be conserved and public art and landscapes can be utilised for this, and
- ***Ability to fulfill psychological needs***: Safety and security is an essential element in every neighbourhood. A sense of belonging is essential for a community.

10.2. Summary of social impacts and mitigation measures

Table 12 provides a summary of social impacts including their likelihood and their impact type.

Mitigation measures are proposed and are in accordance with Liverpool City Council's SIA Policy (section 9.5.1), and meet the following criteria:

a) Tangible - real, substantial, definite and capable of being assigned a value in monetary terms

b) Deliverable - something that can be done and realistically expected

c) Likely to be durably effective - longer-term lasting impact.

[41] Victoria State Government, 'Better Apartments Public Engagement Summary', December, 2015

[42] Michael Y MAK and Clinton J Peakock, School of Architecture and Built Environment, The University of Newcastle

Table 12 Potential Social impacts and Mitigation Measures

Potential Social Impact	**Type** Positive, negative, neutral	**Frequency** Cumulative/ Temporary/ Permanent	**Level** Severe, Moderate, Minimal significance	**Proposed Mitigation/enhancement Measure**
Population Change				
Significant increase to population of Liverpool suburb by 2,702 to 3,303 residents (proposed development), and a total of 3,375 to 4,125 residents (Shepherd Street Precinct) Higher proportion of student and working age residents aged 18 to 49.	Neutral	Permanent	Severe	Increased and improved access to social infrastructure services (as detailed in other mitigation measures) Improved pedestrian and cycle access to Liverpool Town Centre. Develop a place-making strategy that supports community connections and the transition from an industrial/suburban place to an urban place with identity drawing on past and future uses and people. Integrate quality, place specific public art as part of the place-making strategy.
Significantly higher density population than existing Liverpool suburb requiring access to social infrastructure and services nearby. From 36 persons per hectare (SA1152563) to around 353 persons per hectare post redevelopment of the entire Shepherd Street Precinct.	Negative	Permanent	Severe	Access to local social infrastructure (parks, meeting spaces, retail) from early stages of development to reduce impact on neighbouring areas. Delivery of community engagement and community building activities from early stages of development to connect new and existing residents Access to restaurants and entertainment on weekends and evenings will be important to activate the area. The proposed village shops at the Paper Mill building are an opportunity to

Potential Social Impact	**Type** Positive, negative, neutral	**Frequency** Cumulative/ Temporary/ Permanent	**Level** Severe, Moderate, Minimal significance	**Proposed Mitigation/enhancement Measure**
				cater for this need with restaurants and late evening operating hours. See mitigation measure for place-making (and public art) strategy above.
Housing				
Liverpool suburb has high levels of housing stress and high demand for rental housing. A high proportion of key services workers, such as at Liverpool hospital live and work nearby. Urban renewal can increase land values and purchase and private rental costs can be pushed beyond the reach of low to moderate income households. There is a need to provide a mix of households including for mixed tenures and incomes through the provision of affordable housing.	Positive (increase stock) Negative (increase prices)	Cumulative	Moderate	While targets in other jurisdictions range from 3-8% of new developments, Liverpool Council does not currently have an affordable housing target to apply. Provision of affordable housing as a public benefit and to mitigate social impacts should be considered as part of the proposed development.
Highly dense population requiring high-quality apartment design to enable a good quality of life.	Neutral	Permanent	Severe	Design apartments to ensure daylight and solar access, good ventilation, adequate storage space, energy efficiency and minimal noise including noise from the freight rail corridor.

Potential Social Impact	**Type** Positive, negative, neutral	**Frequency** Cumulative/ Temporary/ Permanent	**Level** Severe, Moderate, Minimal significance	**Proposed Mitigation/enhancement Measure**
Accessibility				
Increased population of older residents and people with a disability living in a high density environment requiring an accessible public domain nearby their homes to connect to community activities, services and facilities.	Positive	Permanent	Moderate	Pedestrian walkways and open space should be universally designed including the upgrading of the pedestrian path to the Liverpool City Centre which will improve the pedestrian and cycle link along the river to transport to Liverpool Station, for residents and the general public. Housing should be designed in line with the Livable Housing Guidelines to allow for ageing in place.
While there is a recreational pedestrian/cycle connection between the site and Liverpool City Centre, according to the Integrated Transport Assessment Shepherd Street (Smyth Consulting) there is currently not easy, direct and universally designed improved active transport connection between the site and the City Centre, to encourage walking/cycling and reduce car trips and increased traffic	Negative	Temporary	Severe	In accordance with the Integrated Transport Assessment investigate the re-opening of Woodbrook Road underpass to south of precinct, applying high quality design, lighting and public art.

Potential Social Impact	**Type** Positive, negative, neutral	**Frequency** Cumulative/ Temporary/ Permanent	**Level** Severe, Moderate, Minimal significance	**Proposed Mitigation/enhancement Measure**
Increased traffic on local and major roads from significantly increased residential population, and increased pressure on local public transport networks	Negative	Permanent	Moderate	Implement recommendations of the Active Transport Report including: ▪ Bike share pods (one on-site, one at Liverpool Station, and one at Casula Station) which will ultimately form part of a larger network in Liverpool ▪ Shuttle bus in peak hours to Casula Station and other destinations (for example Westfield, eat street) ▪ Re-opening of Woodbrook Road underpass to south of precinct using high quality design, lighting and public art. ▪ Car share spaces to reduce car ownership and encourage active transport options ▪ Pedestrian/cycle boardwalk along riverfront of precinct and upgrades to path from Atkinson Street to Newbridge Road including path widening to allow share path/2.5m and lighting to improve safety.
Community and recreation facilities/services				
The increased population and density of the Shepherd Street Precinct will create demand for a multipurpose community space for residents to meet, participate in	Neutral	Cumulative	Moderate	A temporary or permanent community space should be delivered at the early stages of the development to support community connections and to access information about the

Potential Social Impact	Type Positive, negative, neutral	Frequency Cumulative/ Temporary/ Permanent	Level Severe, Moderate, Minimal significance	Proposed Mitigation/enhancement Measure
local programs, create local events, or store equipment.				development (see Green Square Community Kiosk) A permanent community space should be provided as part of the Paper Mill building to support community, social and recreational activities (eg. dance/yoga classes, tai chi, children's parties). Consider a small library hub (unstaffed) as an element of this space. Activate the place in the evening through the adaptive reuse of the Paper Mill building, through the inclusion of restaurants and cafes and a public domain that supports walking and sitting and socializing/people watching. Explore pop-up (temporary) community and retails spaces as the development stages progress to minimized unused spaces. Provide some communal indoor spaces connected to rooftop open space areas to support community events, parties, and social, cultural and recreational gatherings.
The Shepherd Street indicates an increased demand for around 30,375m2 to 37,162m2of open space (24,318m2 to 29,727m2 for the proposed development). The applicant is proposing approximately 16,000m2 of open space (including upgraded Mill Park and upgrades to	Negative	Permanent	Moderate	Open space should be designed to cater to a range of users including: • Play equipment for a range of ages • Access for older people and people with disabilities and design including universal design principles, shade and seating

Potential Social Impact	**Type** Positive, negative, neutral	**Frequency** Cumulative/ Temporary/ Permanent	**Level** Severe, Moderate, Minimal significance	**Proposed Mitigation/enhancement Measure**
Lighthorse Park through landscaping and play equipment) and 14,000m2 of semi-private communal open space including rooftop gardens. Additional demand will be catered for by the current supply of open space in the Liverpool area. However, given the high density of the site, there may be conflict between users if a range of users are not catered for.				▪ Dog walking ▪ Space for a range of activities common in culturally diverse populations including Tai Chi, volleyball, table tennis, basketball, soccer and family gatherings and BBQs, and ▪ A space residents can associate with the new development. Upgrade neighbouring Mill Park including an outdoor gym, informal ampitheatre, BBQs and picnic areas to provide a quality neighbourhood park for local residents. Upgrade nearby Lighthorse Park including landscape upgrades, provision for evening use e.g. lighting, and playground equipment upgrades. Communal open space area on rooftops should target range of uses at different sites including dog off leash area, bbqs, community gardens
The significantly increased population indicates demand for an additional 2 tennis courts and one cricket wicket (oval).	Negative	Cumulative	Moderate	Investigate opportunities to provide additional sports facilities in the surrounding area.
Community identity and sense of belonging				
In such a high density community, in a reasonably disconnected site with no	Negative	Temporary	Moderate	Provide a general community space as a priority at the early stages of the development for community development

Potential Social Impact	**Type** Positive, negative, neutral	**Frequency** Cumulative/ Temporary/ Permanent	**Level** Severe, Moderate, Minimal significance	**Proposed Mitigation/enhancement Measure**
existing activity, there is a potential for the area to be socially disconnected.				activities. Improve pedestrian and cycle connectivity along the Georges River and to Liverpool City Centre
Health and wellbeing				
Small increased demand for local health services. Liverpool Hospital is currently at capacity.	Negative	Cumulative	Moderate	Monitor impact on Liverpool Hospital. Hospital which is currently at capacity. Department of Health to develop a plan (consistent with the staging of the development), to accommodate additional demand for hospital services.
Crime and safety				
The proposed development provides an opportunity for better safety along the existing shared path to Liverpool City Centre, and along the proposed Riverfront boardwalk through increase use and surveillance from private spaces.	Positive	Permanent	Moderate	None required
Residents living at the development in the early stages will be relatively isolated	Negative	Temporary	Minimal	Activate the development at the early stages through night activation activities, community engagement activities and through Mill Park

Potential Social Impact	**Type** Positive, negative, neutral	**Frequency** Cumulative/ Temporary/ Permanent	**Level** Severe, Moderate, Minimal significance	**Proposed Mitigation/enhancement Measure**
Local economy and employment opportunities				
The proposed development will provide increased employment opportunities through increased retail onsite and improve economic, social and cultural activation of the Liverpool City Centre and the area	Positive	Permanent	Minimal	None required
Needs of specific population groups				
Young people There will be a small impact on local high schools from the proposed development however, the cumulative impact of development in Shepherd Street Precinct and nearby may increase demand for places at already nearing capacity local high schools.	Neutral	Cumulative	Minimal	None required at this stage, but consideration should be given for future increased demand for high school places from increased local development. Department of Education to develop a plan (consistent with the staging of the development), to accommodate additional primary and secondary school places.
Children Increased demand for places at local primary schools. There are no schools	Negative	Cumulative	Moderate	Consideration should be given for future increased demand for a local primary school resulting from increased local development. Department of Education to develop a plan (consistent with the staging of the development), to

Potential Social Impact	**Type** Positive, negative, neutral	**Frequency** Cumulative/ Temporary/ Permanent	**Level** Severe, Moderate, Minimal significance	**Proposed Mitigation/enhancement Measure**
within walking distance of the site, and the continued impact of local development may increase demand for a local school nearby				accommodate additional primary and secondary school places.
Increased demand for places for children to play and socialise given the high number of children and families living in apartments	Neutral	Cumulative	Moderate	Incorporate universal design principles in the bike and pedestrian path to the Liverpool CBD, open space on site and the upgrade of Mill Park to create a child-friendly space

10.3. Conclusion

The proposed development is for 1,201 dwellings as part of the 1,744 dwelling Shepherd Street Precinct, and is forecast to have between 2,702 and 3,303 new residents at its completion. With this increase in population and density, the proposed development will have moderate negative social impacts on existing social infrastructure, services and sustainability within the suburb of Liverpool, most of which have capacity. Place-making and public art, together with social infrastructure and quality open space are required to support the successful transition from an industrial/suburban place to an urban space. There is significant supply of open space within 800 metres of the subject site, although much of this is not high quality. However, given the significantly higher density of the proposed development and the Shepherd Street Precinct, there will be a need to support social sustainability for future residents of the development through the delivery of social infrastructure, such as the neighbourhood park (Mill Park) and indoor community meeting places, at the development's early stages that will provide opportunities for community connection and engagement between new and existing residents. To support community activation and sustainability a new community space should be made available, through an adaptive reuse of the Paper Mill building. The population increase from the proposed development and the Shepherd Street Precinct indicates there will be increased demand for primary school and secondary school places and medical facilities, including an increase in health facilities at the already at capacity Liverpool Hospital, as well as demand for two additional tennis courts and one cricket wicket. The provision of affordable rental housing on the site is strongly encouraged.

The site is currently disconnected from the Liverpool City Centre and Liverpool Station, and this could result in resident isolation, and increased reliance on car transport having negative environmental and health impacts and significantly increased traffic. While the current pedestrian trip is around 12 minutes, the proposed mitigation measures of a pedestrian/cycle boardwalk, lighting and landscaping improvements in Lighthorse Park, bike share pods, a shuttle bus service, and upgrades to the shared pathway from Atkinson Street to Newbridge Road will address these impacts.

The proposed public benefits of approximately 16,000m2 of quality public open space/14,000m2 of communal open space (11,000m2 in the proposed development), increased housing stock and employment opportunities through increased retail, activation of the Liverpool City Centre, and services in the Paper Mill facility outweigh the negative impacts of increased density and population. To ensure that residents do not become socially disconnected, or have to leave the area to access services, there are opportunities to enhance the positive impacts by: providing a multipurpose space that can service the wider neighbourhood and that is connected to outdoor space to use for family gatherings; delivery of community building and community engagement activities from the early stages of development; and, that the public domain is universally designed, well lit and safe and provided at the development's early stages. The relocation of the Liverpool Men's Shed should be supported. With very high levels of housing stress in the Liverpool suburb, opportunities to contribute to an increased supply of affordable rental housing for key service workers in the Liverpool suburb should be considered.

Appendix 1 Audit of social infrastructure within 800m of the site

Type	Facility Name	Description	Geographic Distance	Current Walking Distance
Community Centre	Liverpool Men's Shed	Men's community group	On site (30 Shepherd St)	On site (30 Shepherd St)
Child care centre	Clovel Childcare & Early Learning Centre	38 place child care centre	235m	500m - 6 minutes
Education	Al Amanah College	Private Islamic co-educational primary and high school	260m	450 m - 5 minutes
Open space	Mill Park	Riverfront park with lawn and riparian vegetation	330m	350m - 4 minutes
Community Hall	Liverpool Community Centre	Small community hall for hire	338m	650m - 8 minutes
Child care centre	Play 2 Learn	58 place child care centre	345m	650m - 8 minutes
Open space	Discovery Park	Grass area	360m	1km -11 minutes
Open space	Dunbier Park	Playground equipment, community garden	360m	600m, 7 minutes
Open space	College Park	Grass area	490m	1.4km - 17 minutes
Shopping	Shops on Hume Hwy Near Atkinson St	Pharmacy, restaurants and Coles Express supermarket/service station	490m	900m - 10 minutes
Public transport	Bus stop	Buses to Campbelltown, Liverpool and other suburbs (Bringelly, West Hoxton, Prestons)	520m	1.1km, 15 minutes
Museum	Liverpool	Museum about the history of the	540m	1.3km - 14

Type	Facility Name	Description	Geographic Distance	Current Walking Distance
	Regional Museum	Liverpool area		minutes
Gym	Platinum Fight and Fitness Centre Liverpool	Fitness gym	575m	1km - 11 minutes
Open space	Lighthorse Park	Historic park with lawn, river, BBQ areas, playground	595m	750m - 9 minutes
Open space	Hazel Bradshaw Park	Grass area with trees	780m	270m, 3 minutes
Gym	Squashlands Gym and Fitness	Fitness gym	780m	1.3km - 15 minutes
Gym	Crunch Liverpool	Fitness gym	800m	1.2km - 15 minutes
Child care centre	Happy Start Childcare	60 place childcare centre	800m	1.4km - 18 minutes
Sports-ground	Hillier Oval/ Woodward park	Rugby league oval, cricket wicket, athletics track, 2 oztag fields, 32 concrete netball courts	800m	1.1km - 13 minutes
Medical	Medical Centre 2000	Medical centre	820m	1.1km - 14 minutes
Child care centre	Just Kids Learning	29 place child care centre	842m	1.5km - 18 minutes
Public transport	Liverpool Station	Major train station and suburban bus interchange	970m	1.2km - 15 minutes

Appendix 2 Additional district social infrastructure in the Liverpool suburb

Type	Facility Name	Geographic Distance
Shopping	Australia Post	910m
Education	Liverpool Public School	1.05km
Education	TAFE NSW South Western Sydney	1.1km
Police	Liverpool Police Station	1.15km
Sport and Recreation Centre	Whitlam Leisure Centre	1.15km
Library and Community Centre	Liverpool City Library	1.2km
Senior's Centre	Hilda M Davis Senior's Centre	1.2km
Community Centre	Dr James Pirie Community Centre	1.2km
Education	All Saints Catholic Girls High School	1.4km
Education	All Saints Catholic Primary School	1.45km
Shopping	Aldi Supermarket	1.45km
Shopping	Westfield Shopping Centre (including supermarkets, banks and other services)	1.45km
Cinema	Event Cinemas Liverpool	1.5km
Education	All Saints Catholic Boys High School	1.55km
Medical	Liverpool Hospital	1.65km
Medical	Sydney South West Private Hospital	1.75km
Education	Liverpool Girls High School	1.8km
Education	Liverpool Boys High School	1.85km

Appendix 3 Social infrastructure and recreation infrastructure benchmarking

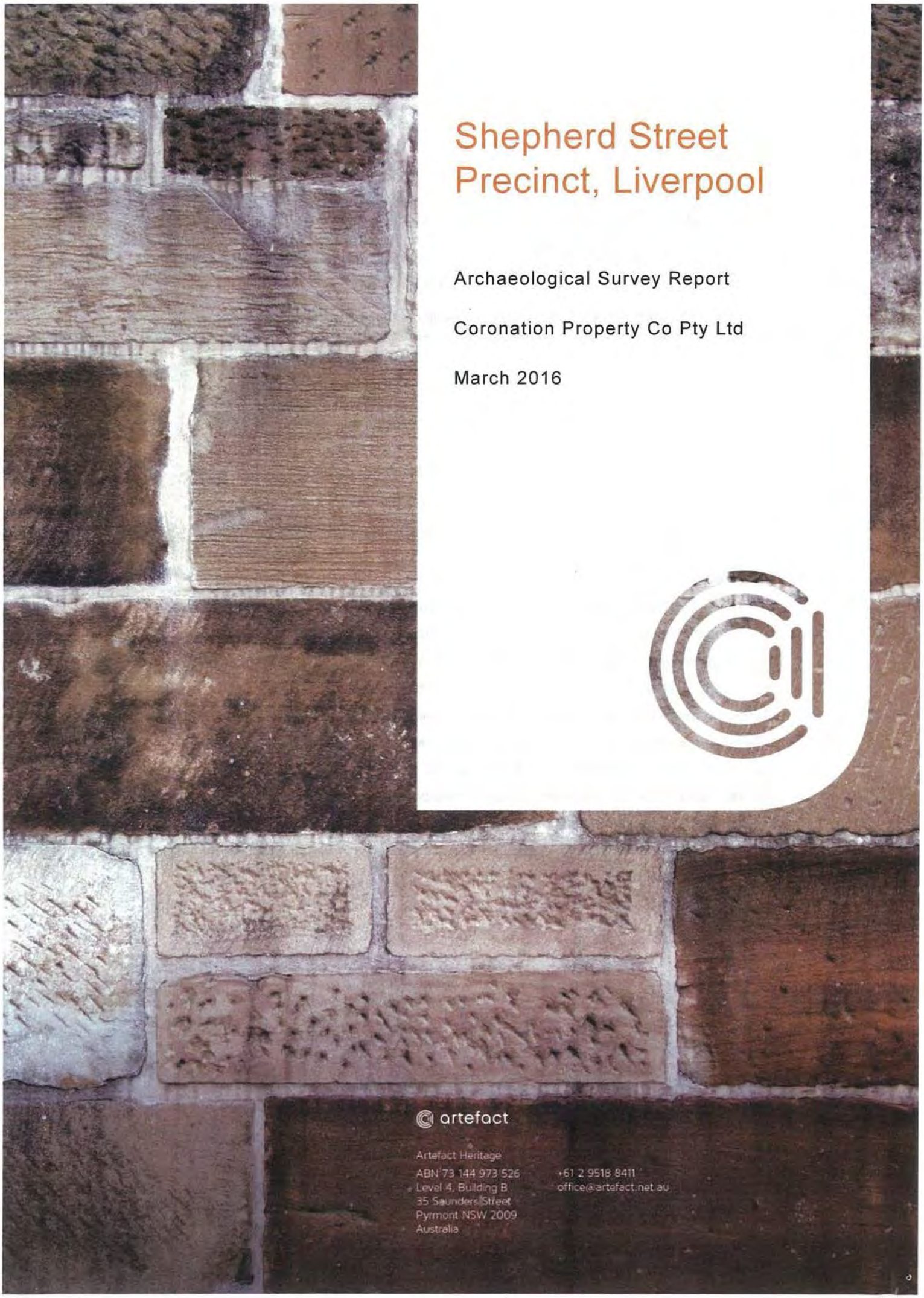
FACILITY	BENCHMARK
LOCAL/NEIGHBOURHOOD LEVEL (catchment of 6 - 20,000 people)	
Community meeting room/small hall/small community centre	1:6,000 people
Early education and care (0 to 5)	0.28 places per child (based on national utilisation rates in Australia of 40% of all children aged 0 to 5 accessing care on average 3.5 days per week)
Playgrounds	1 playground per 500 children aged 0 to 4 years within 400m of all dwellings
	1 playground per 500 children aged 5 to 11 years within 400m of all dwellings
DISTRICT LEVEL FACILITIES (catchment of 20,000 to 50,000 people)	
Community exhibition space	1:20,000 to 30,000 people
Secondary School	1 government high school for up to 1,200 students or 1 place each for 60% of children aged 5 to 11[43]
Primary School	1 primary school for 500 students aged 6 to 12 years or 1 place each for 50% of 12 to 17 year olds

[43] 60% of Liverpool LGA's children aged 5 to 11 attend Government primary schools, 50% of 12 to 17 year olds attend Government secondary schools

FACILITY	BENCHMARK
Multipurpose Community Centre	1:20,000 to 30,000 people
Function and conference centre	1:20,000 to 30,000 people
Seniors Centre	1:15,000 to 20,000 people
Youth Centre	1 for every 3,000 young people aged 13 to 19
Early Child health centre	Catchment defined by NSW Health. Outreach/home visits are now a common aspect of service delivery
Branch Library	1:30,000
Out of School Hours Care	0.16 places per child aged 6 to 12 years (based on National Usage rates in Australia of 16% all children accessing OSHC)
REGIONAL FACILITIES (50,000 +)	
Library (central library)	National standard - 1:50,000 to 150,000 people
Indoor leisure centre (Dry)	1: 50,000 to 100,000 people
Indoor Leisure Centre (wet/pool)	1: 30,000 to 60,000 people
Aged care	88 places per 1,000 people aged 70+

FACILITY	BENCHMARK
Hospital	2.3 beds per 1,000 people
Primary Care (including mental health)	1 new primary care centre per 50,000 people
Fire stations	1 fire station for every 60,000 people
Police stations	1 police station for every 108,000 people
TAFE	1 TAFE per between 300,000 and 500,000 people
University	1 University for every 150,000 people
OPEN SPACE/PARKS	Local Open Space - City of Sydney – 9% of site area Regional Open Space – City of Sydney - 15% of site area
	Total open space - World Health Organisation - 9m2 per person
Rugby Field	1:7,000 people
Cricket Oval	1:4,000 people
Indoor courts (# of courts)	1:10,000
Netball courts (# of courts)	1:3,000
Soccer field	1:5,000

FACILITY	BENCHMARK
Tennis courts	1:1,800
Skate park/facility	1:6,000 to 10,000



Shepherd Street Precinct, Liverpool

Archaeological Survey Report

Coronation Property Co Pty Ltd

March 2016

artefact

Artefact Heritage
ABN 73 144 973 526
Level 4, Building B
35 Saunders Street
Pyrmont NSW 2009
Australia

+61 2 9518 8411
office@artefact.net.au

EXECUTIVE SUMMARY

City Plan Services has engaged Artefact Heritage, on behalf of Coronation Property Co Pty Ltd, to undertake an archaeological survey report (ASR) to accompany a planning proposal for a residential development at Shepherd Street, Liverpool (the study area). This report has been prepared in accordance with the requirements for an archaeological investigation as set out in the Office of Environment and Heritage (OEH) *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* (2010) (The 'Code of Practice').

The aim of this survey report is to identify whether Aboriginal objects would be impacted by the proposed works and to recommend if any further management or mitigation measures are required

Overview of findings

It was found that:

- No Aboriginal sites and/or places were located within the study area.
- The study area has been subject to significant ground disturbance.
- The study area was assessed as demonstrating low archaeological potential.

It is therefore recommended that:

- The proposed 'Shepherd Street Precinct' development is able to proceed without the need for further archaeological and/or Aboriginal heritage assessment.
- If the project design should change or if areas not surveyed are added to the scope of proposed works, further archaeological assessment would be required.
- If Aboriginal objects are uncovered during works an archaeologist, the TLALC and OEH must be notified. Further investigation and approvals may be required.
- If human remains are identified during archaeological test excavation or during any stage of the proposed works, work should cease, the site should be secured and the NSW Police and the OEH should be notified. Further investigation and approvals may be required.
- A final copy of this report (with updated study area and proposed design) should be forwarded to TLALC for their records.

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FIGURES

PHOTOS

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1.0 INTRODUCTION AND BACKGROUND

1.1 Introduction

City Plan Services has engaged Artefact Heritage, on behalf of Coronation Property Co Pty Ltd, to undertake an archaeological survey report (ASR) to accompany a planning proposal for a residential development at Shepherd Street, Liverpool (the study area). This report has been prepared in accordance with the requirements for an archaeological investigation as set out in the Office of Environment and Heritage (OEH) *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* (2010) (The 'Code of Practice').

The aim of this survey report is to identify whether Aboriginal objects would be impacted by the proposed works and to recommend if any further management or mitigation measures are required.

1.2 Study Area

The study area incudes land contained within 20, 26, 28, 32-34, 31 and 33 Shepherd Street, 2 and 5 Atkinson Street, Liverpool, and Mill Park, Casula NSW (Lot 1 DP247485, Lot 23 DP859055, Lot 22 DP859055, Lot 3 DP247485, Lot 4 DP247485, Lot 5 DP247485, Lot 6 DP247485, Lot 13 DP247485, Lot 15 DP1129945 and Lot 10 DP881265) (Figure 1). The study area is located within the Parish of St Luke, County of Cumberland.

1.3 Project Description

Coronation Property Co Pty Ltd have submitted a Planning Proposal for a residential development, in Shepherd Street, Liverpool (study area).

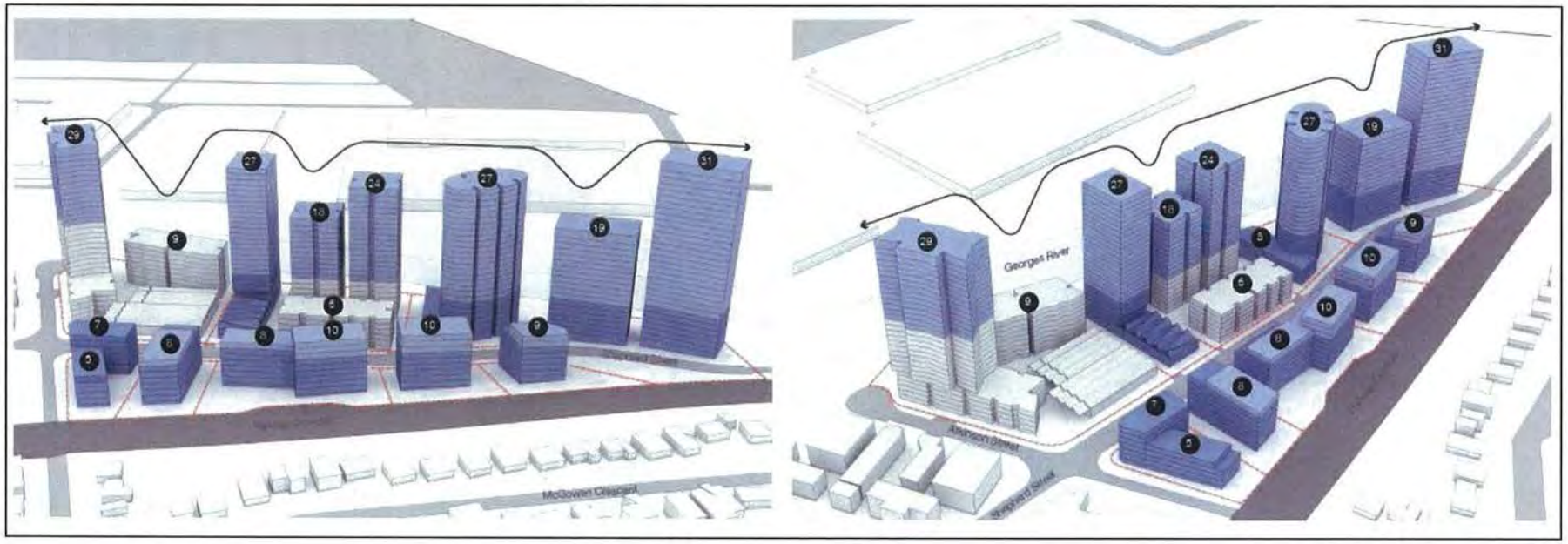
The Planning Proposal seeks an amendment to the Liverpool LEP 2008 to allow for a maximum building height of 103 metres and a maximum floor space ratio of between 3:5 and 4:5:1 across the sites within the precinct.

It is proposed that the Shepherd Street precinct will be developed into a residential precinct with local retail activities within the Heritage Mill Building. A concept plan has been developed for the site (Figure 1 and Figure 2), which includes:

- Construction of residential towers of various heights. The proposed number of units within the study area is approximately 1450.
- A new street network including new street connections from Shepherd Street down to the river frontage and realigning and upgrading the existing street connection through to the Casula Powerhouse. The new street network will include additional on-street parking;
- A riverfront boardwalk to connect to the Shepherd Street precinct with existing pedestrian cycle way infrastructure to the north and south of the development.

Figure 1: 'Shepherd Street Precinct' residential development (SJB Architects 2016)

Figure 2: Shepherd Street Precinct visualisation (SJB Architects 2016)



1.4 Objectives of the Study

The objective of this study is to prepare an ASR in accordance with the OEH code of practice. This report includes the following:

- A description of the proposal and the extent of the study area.
- Discussion of the environmental context of the study area.
- Discussion of the Aboriginal and historical context of the study area.
- A summary of the archaeological context of the study area including a discussion of previous archaeological work in the area.
- Description and analysis of the identified Aboriginal site within the study area.
- Development of a significance and impact assessment of the identified Aboriginal site, addressing archaeological values.
- Development of management and mitigation measures.
- Recommendations relating to the further mitigation of potential impacts to the identified site.

1.5 Investigator and Contributors

Alexander Timms (Archaeologist) prepared this report. Dr Sandra Wallace (Principal Archaeologist) provided management input and completed the final review.

1.6 Aboriginal Community Involvement and Consultation

Artefact Heritage was in contact with the Tharawal Local Aboriginal Land Council (TLALC) throughout the Aboriginal heritage assessment process. A TLALC field representative was invited to attend the field survey on 21 August 2015. Donna Whillock represented TLALC during the field survey. A draft copy of this report was provided to TLALC for review and comment on 25 September 2015. TLALC reviewed the report and provided a cultural assessment letter report (Appendix 1).

It is recommended that a final copy of this report (with updated study area and proposed design) be forwarded to TLALC for their records.

2.0 LEGISLATIVE CONTEXT

This study has been undertaken in the context of several pieces of legislation that relate to Aboriginal heritage and its protection in New South Wales.

National Parks and Wildlife Act (1974) amended (2010)

The *National Parks and Wildlife Act* 1974 (NPW Act), administered by the OEH provides statutory protection for all Aboriginal 'objects' (consisting of any material evidence of the Aboriginal occupation of NSW) under Section 90 of the Act, and for 'Aboriginal Places' (areas of cultural significance to the Aboriginal community) under Section 84.

The protection provided to Aboriginal objects applies irrespective of the level of their significance or issues of land tenure. However, areas are only gazetted as Aboriginal Places if the Minister is satisfied that sufficient evidence exists to demonstrate that the location was and/or is, of special significance to Aboriginal culture.

The Act was recently amended (2010) and as a result the legislative structure for seeking permission to impact on heritage items has changed. Various factors are considered by OEH in the AHIP application process, such as site significance, Aboriginal consultation requirements, ESD principles, project justification and consideration of alternatives. The penalties and fines for damaging or defacing an Aboriginal object have also increased.

As part of the administration of Part 6 of the Act, OEH has developed regulatory guidelines on Aboriginal consultation, which are outlined in *Aboriginal Cultural Heritage Consultation Requirements for Proponents* (2010). Guidelines have also been developed for the processes of due diligence; *Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW* (2010), and for investigation of Aboriginal objects - *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* (2010) in accordance with the 2010 amendment to the Act.

Environmental Planning and Assessment Act (1979)

The *Environmental Planning and Assessment Act* (1979) (EP&A Act) is administered by the Department of the Premier and Cabinet and provides planning controls and requirements for environmental assessment in the development approval process. This Act has three main parts of direct relevance to Aboriginal cultural heritage. Namely, Part 3 which governs the preparation of planning instruments, Part 4 which relates to development assessment process for local government (consent) authorities and Part 5 which relates to activity approvals by governing (determining) authorities.

Planning decisions within LGAs are guided by Local Environmental Plans (LEPs). Each LGA is required to develop and maintain an LEP that includes Aboriginal and historical heritage items which are protected under the EP&A Act and the Heritage Act 1977.

The study area is within the Liverpool City Council LGA.

The Liverpool LEP 2008 (Part 5, Clause 5.10) make standard provision for the protection of Aboriginal objects and Aboriginal places of heritage significance. There are no Aboriginal heritage items within the study area that are listed in the Liverpool LEP 2008.

Aboriginal Land Rights Act (1983)

The *Aboriginal Land Rights Act* 1983 (the Land Rights Act) is administered by the NSW Department of Human Services -Aboriginal Affairs. The Land Rights Act established Aboriginal Land Councils (at State and Local levels). These bodies have a statutory obligation under the Land Rights Act to; (a) take action to protect the culture and heritage of Aboriginal persons in the council's area, subject to any other law, and (b) promote awareness in the community of the culture and heritage of Aboriginal persons in the council's area.

Native Title Act (1994)

The *Native Title Act* 1994 was introduced to work in conjunction with the Commonwealth Native Title Act. Native Title claims, registers and Indigenous Land Use Agreements are administered under the Act.

3.0 ENVIRONMENTAL AND HISTORICAL CONTEXT

3.1 Geology and Soils

The study area is located within the Cumberland Plain, which is part of the Sydney Basin bioregion. The underlying geology of the study area is Tertiary fluvial deposits consisting of clayey quartzose sand and clay (Figure 3); which sits on bedrock of shale or Hawkesbury Sandstone (Clark and Jones 1991).

The primary soil type across the area is the Blacktown soil landscape. The Blacktown soil landscape is typified by residual shallow friable brownish black loam over hard-set brown clay loam base. The western fringe of the study area is situated on the Luddenham soil landscape. The Luddenham soil landscape is typified by erosional shallow loams overlying sandy clay (eSpade 2015).

3.2 Landforms and Hydrology

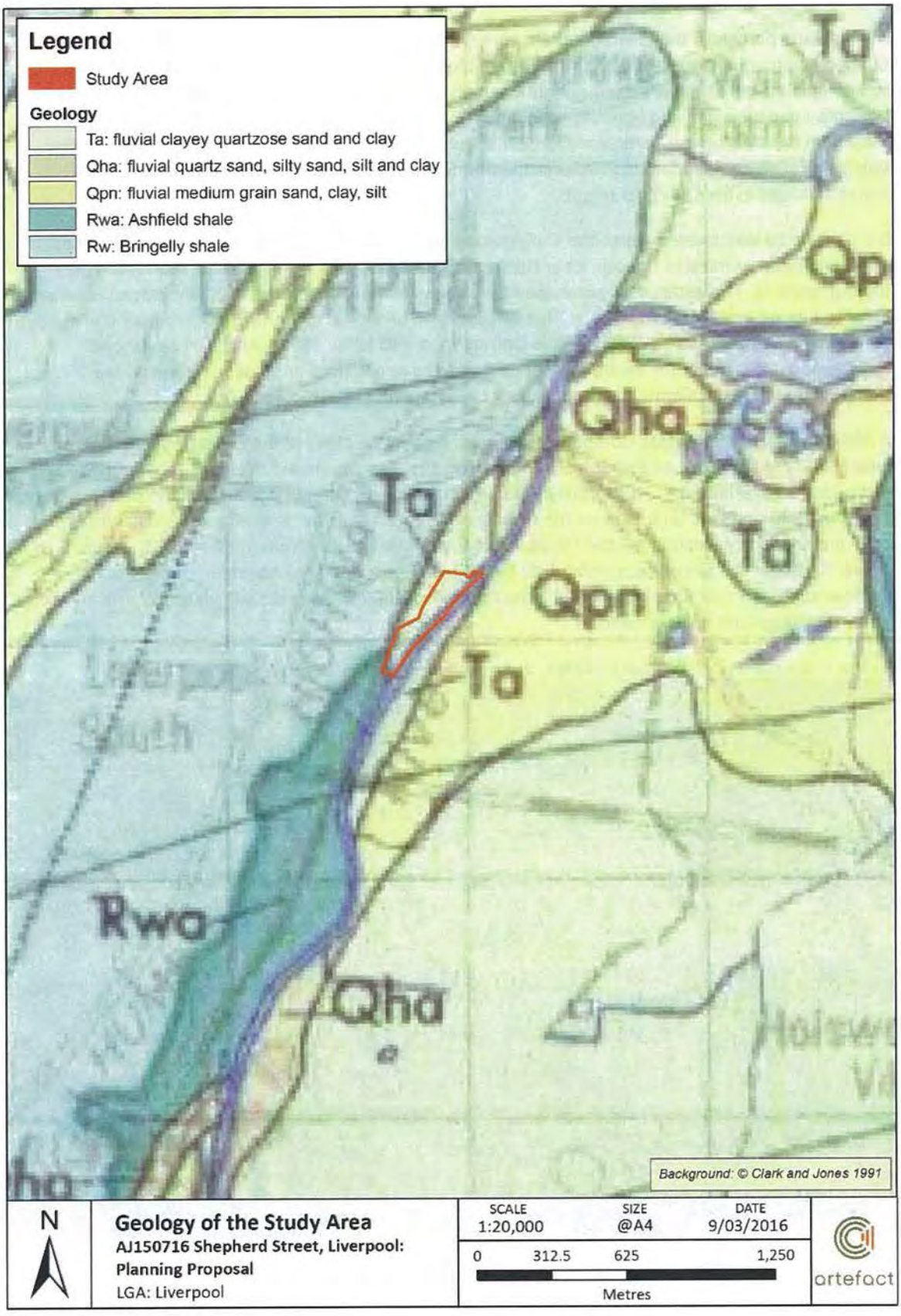
The Cumberland Plain is described as having low rolling hills and wide valleys (OEH 2011). The study area is located on relatively flat, raised banks of the Georges River; a fourth order stream. The source of the Georges River is located within the northwest Woronora Plateau and flows into Botany Bay. A review of historical imagery (Figure 8 to Figure 10) indicate that a number of shallow gullies and ephemeral first order tributaries ran perpendicular to the banks of the Georges River in the local region.

3.3 Vegetation and Resources

The study area would once have been covered by open Cumberland Plain and Alluvial Woodland. Tree species would have included Forest Red Gum (*E. tereticornis*), and Grey Box (*E. moluccana*). Honey Myrtle (*Melaleuca decora*) and Prickly Leaf Paperbark (*Melaleuca nodosa*) (Benson and Howell 1990). Plants were an important source of nutrition for Aboriginal people, common edible species being *Macrozamia*, a cycad palm with poisonous seeds that were detoxified and ground into a paste and *Xanthorrhoea*, or grass tree. The grass tree nectar was a high-energy food, the resin a strong hafting glue, and the flower spikes used for spear barbs.

From observations by early European colonists, only about twenty species of plant are identified as being used for food or manufacture by Aboriginal people of the Sydney region (Attenbrow 2010:41). It would be likely that this is only a fraction of what was actually used.

Figure 3: Geology of the region



3.4 Land Use History

The first land parcels in the Liverpool area were granted in 1798. In 1810 Governor Macquarie founded Liverpool and named it after the Earl of Liverpool. The road connecting Liverpool to Sydney was completed in 1813 and settlement grew rapidly. The rich soils on the floodplain of the Georges River provided for a growing agricultural industry (Figure 4). In the 1860s many small farmers moved away from the river after a particularly large inundation and the area became open to larger scale agriculture such as dairy farming. Up until the mid-twentieth century agriculture co-existed with suburban areas in the Liverpool region.

The study area was located within the Collingwood Estate (Bunkers Farm), a large agricultural estate, which had been granted to Captain Eber Bunker by Governor King on 18 August 1804 (HC NSW 2008) (Figure 5). The estate was purchased by James Henry Atkinson in 1853, who began to develop the area into an industrial estate (City Plan 2015a:11). The arrival of the Liverpool railway line in 1856 allowed new industries to be developed in Collingwood (HC NSW 2008). Atkinson developed Collingwood into a depot for the transfer of pastoral and agricultural produce; which included orchards/gardens, stockyards, an abattoir, wool washers and mill (Figure 6).

In 1864 The Australian Paper Company purchased a riverside block of the Collingwood estate and established the Collingwood Paper Mill in 1868. The site was developed over a number of decades, with additions overtime (HC NSW 2008). The property changed hands again when the paper mill closed in 1905 and was reopened as the Challenge Woollen Mills in 1910 (Figure 7). The woollen mills remained in operation until the 1970s. Historical aerial imagery from 1930 to 1961 (Figure 8 to Figure 10) show the disturbance generated by the mill. The study area has been cleared and flattened up to the river's edge. Over time the footprint of the mill spread southward with the addition of new buildings and holding ponds.

Figure 4: Liverpool, New South Wales. Joseph Lycett 1824 (SLV)

Figure 5: Parish of St Luke, Cumberland County – before construction of railway in 1856 (HLRV: nd). Study area in orange

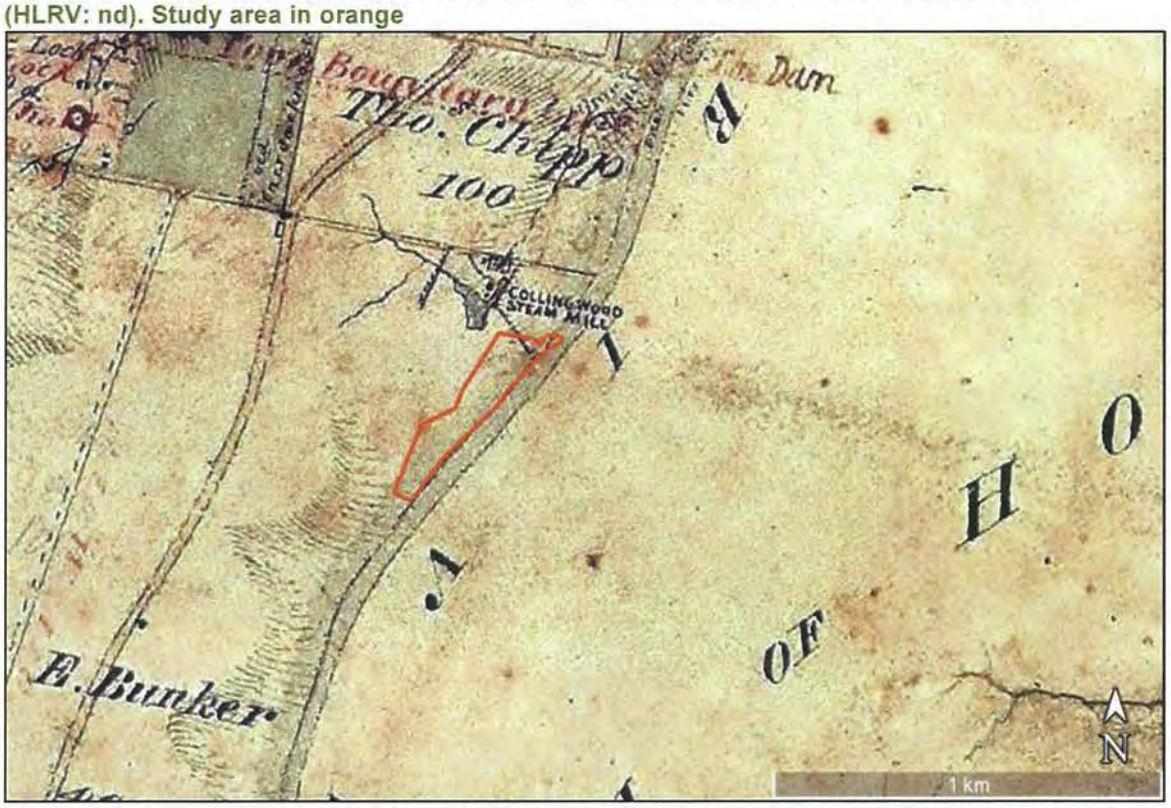


Figure 6: Village of Collingwood (NLA: 1856). Study area in orange

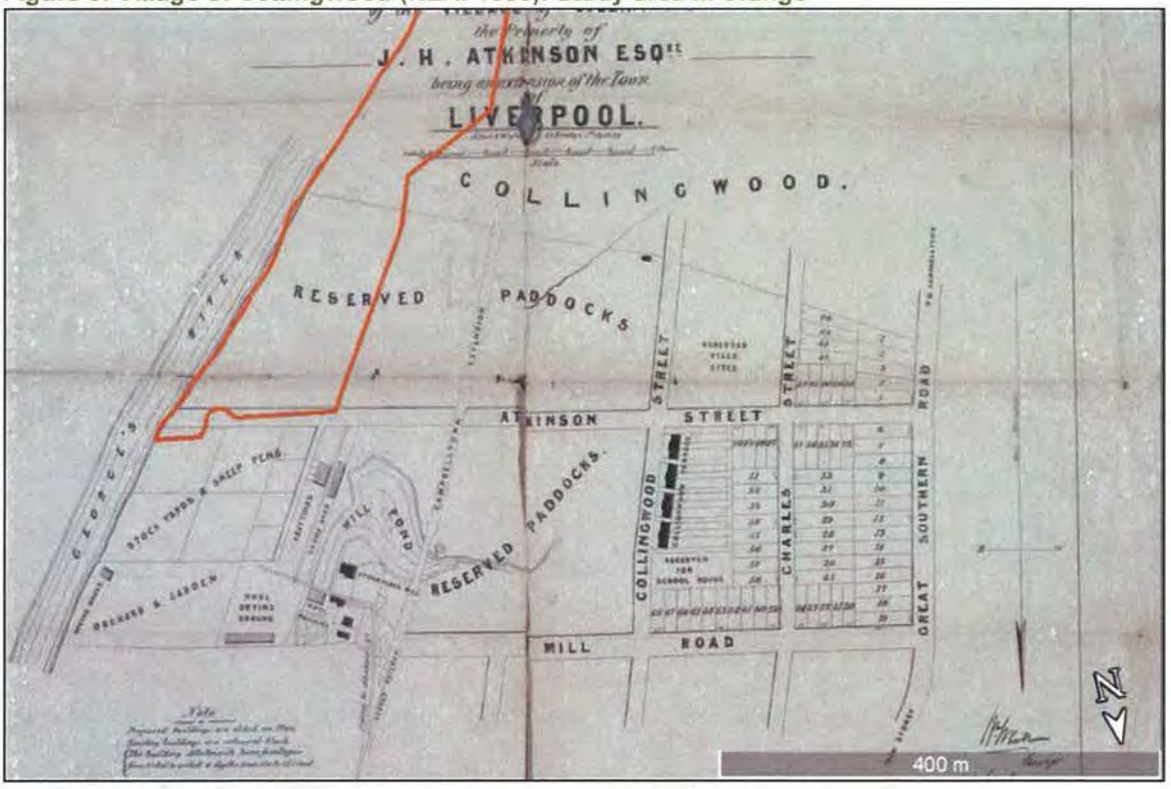


Figure 7: Challenge Woollen Mills from Liverpool Camp (Lennon 1932)

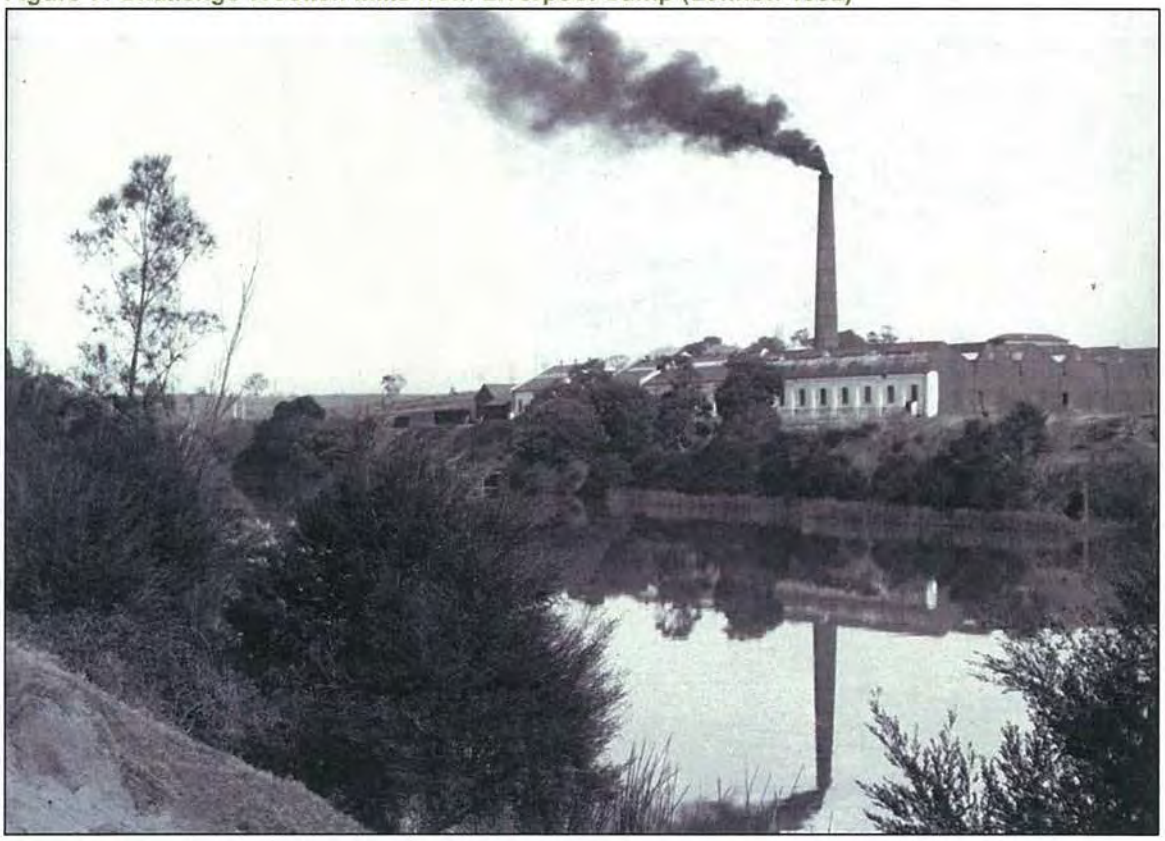


Figure 8: 1930 Aerial Image (LPI:1930). Study Area in orange.

Figure 9: 1943 Aerial Image (NSW Globe LPI:1943). Study Area in orange.

Figure 10: 1961 Aerial Image (LPI:1961). Study Area in orange.

4.0 ABORIGINAL HISTORICAL AND ARCHAEOLOGICAL CONTEXT

4.1 Aboriginal Material Culture

Early evidence of Aboriginal occupation within the Sydney Basin (which incorporates the Cumberland Plain) during the Pleistocene has been identified in several locations. A suite of radiometric dates (ANU – 3908; ANU – 4016 & ANU – 4017) taken from wood and charcoal samples were used to date deposits within the Cranebrook Terrace on the Nepean River, from which five stone artefacts recovered, to approximately 40, 000 years Before Present (yBP) (Nanson et al 1987). A large salvage excavation undertaken within a deep sand body at George Street, Parramatta identified a bi-model distribution of 4775 stone artefacts. Glossy heat treated silcrete artefacts were recovered from the upper 20 centimetres of the deposit while pre-Bondaian/Capertain stone artefacts, composed of silicified tuff, were recovered from the lower deposits (approximately 40-60 centimetres). Radiometric dating was applied to a charcoal sample retrieved from sediments below the concentration of the tuff artefacts, which was found during sieving. The date, therefore provides a maximum age of approximately 30, 000yBP for the site (WK – 17435) (Jo McDonald 2005a). Evidence of Late Pleistocene occupation has also been identified from a rockshelter at the foothills of the Blue Mountains (14,700 yBP) (Kohen et al 1981), and a coastal site south of Wollongong at Bass Point, which was dated to around 20,000 yBP (Lampert 1971).

Although there is evidence for Pleistocene occupation within the greater Sydney Basin the majority of Aboriginal archaeological sites, particularly within the Cumberland Plains, have been dated to the Holocene period within the last 5000 to 3000yBP. Many researchers propose that this reflects an increase in occupation intensity. The archaeological material record provides evidence of extended Aboriginal occupation of the Sydney Basin, but also provides evidence of a dynamic culture which has changed through time.

Ethno-historical observations along the south coast and the hinterlands demonstrate that the material culture of the local Aboriginal population would have included a wide range of items related to subsistence, shelter, and cultural practices (Kuskie 2008: 13). The existing archaeological record is limited to certain materials and objects that were able to withstand degradation and decay. As a result, the most common type of Aboriginal objects remaining in the archaeological record are stone artefacts, followed by bone and shell.

Archaeological analyses of these artefacts in their contexts have provided the basis for the interpretation of change in material culture over time. Technologies used for making tools changed, along with preference of raw material. Different types of tools appeared at certain times, for example ground stone hatchets are first observed in the archaeological record around 4,000yBP in the Sydney region (Attenbrow 2010: 102). It is argued that these changes in material culture are an indication of changes in social organisation and behaviour.

The Eastern Regional Sequence was first developed by McCarthy in 1948 to explain the typological differences he was seeing in stone tool technology in different stratigraphic levels during excavations such as Lapstone Creek near the foot of the Blue Mountains (McCarthy et al 1948). The sequence had three phases that corresponded to different technologies and tool types (the Capertian, Bondaian and Eloueran). The categories have been refined through the interpretation of further excavation data and radiocarbon dates (Hiscock & Attenbrow 2005; Jo McDonald 2005b). It is now thought that prior to 8,500 yBP tool technology remained fairly static with a preference for silicified tuff, quartz and some unheated silcrete. Bipolar flaking was rare with unifacial flaking predominant. No backed artefacts have been found of this antiquity. After 8,500 yBP silcrete was more dominant as a raw material source, and bifacial flaking became the most common technique for tool manufacture.

From about 4,000 yBP to 1,000 yBP backed artefacts appear more frequently. Tool manufacture techniques become more complex and bipolar flaking increases. It has been argued that from 1,400 to 1,000 years before European contact there is evidence of a decline in tool manufacture. This is evidenced by the reduction in frequency of backed blades as a percentage of the entire stone artefact assemblage. This reduction may be the result of decreased tool making, an increase in the use of organic materials, changes in the way tools were made, or changes in what types of tools were preferred (Attenbrow 2010: 102).

After European colonisation, Aboriginal people of the Cumberland Plain often continued to manufacture tools, sometimes with new materials such as bottle glass or ceramics. There are a number of sites in Western Sydney were flaked glass has been recorded, for example at Prospect (Ngara Consulting 2003) and Oran Park (JMcD CHM 2007).

4.2 Aboriginal Ethno-historical Context

Prior to the appropriation of their land by Europeans, Aboriginal people lived in small family or clan groups that were associated with particular territories or places. It seems that territorial boundaries were fairly fluid, although details are not known. The language group spoken on the Cumberland Plain is known as Darug (Dharruk – alternative spelling). This term was used for the first time in 1900 (Matthews and Everitt) as before the late 1800s language groups or dialects were not discussed in the literature (Attenbrow 2010:31). The Darug language group is thought to have extended from Appin in the south to the Hawkesbury River, west of the Georges River, Parramatta, the Lane Cove River and to Berowra Creek (Attenbrow 2010:34). This area was home to a number of different clan groups throughout the Cumberland Plain.

British colonisation had a profound and devastating effect on the Aboriginal population of the Sydney region, including Darug speakers. In the early days of the colony Aboriginal people were disenfranchised from their land as the British claimed areas for settlement and agriculture. The colonists, often at the expense of the local Aboriginal groups, also claimed resources such as pasture, timber, fishing grounds and water sources. Overall the devastation of the Aboriginal culture did not come about through war with the British, but instead through disease and forced removal from traditional lands. It is thought that during the 1789 smallpox epidemic, over half of the Aboriginal people of the Sydney region died. The disease spread west to the Darug of the Cumberland Plain and north to the Hawkesbury. It may have in fact spread much further afield, over the Blue Mountains (Butlin 1983). This loss of life meant that some of the Aboriginal groups who lived away from the coastal settlement of Sydney may have disappeared entirely before Europeans could observe them, or record their clan names (Karskens 2010:452).

The British initially thought that Aboriginal people did not live inland, but were confined to the coast taking advantage of the abundant marine resources available. The first major expeditions into the interior did not witness any Aboriginal people, but evidence of their existence was noted. In April 1788 Governor Philip led an expedition west to Prospect Hill. It was noted, '...that these parts are frequented by the natives was undeniably proved by the temporary huts which were seen in several places. Near one of these huts, the bones of kangaroo were found, and several trees where seen on fire (Stockdale 1789).

In 1789 Captain Watkin Tench led an expedition to the Nepean River. He noted that:

> *Traces of the natives appeared at every step, sometimes in their hunting huts which consist of nothing more than a large piece of bark bent in the middle and opened at both ends, exactly resembling two cards set up to form an acute angle; sometimes in marks on trees which they had climbed; or in squirrel-traps....We also met with two old damaged canoes hauled up on the beach* (Tench 1789).

It wasn't until rural settlement began in the western Cumberland Plain, around 1791 that the colonists and Aboriginal peoples came face to face. Relations quickly disintegrated, and tensions over land and resources spilled over. Governor King sanctioned the shooting of Aboriginal peoples in a General Order made in 1801 (Kohen 1986:24). Intermittent killings on both sides continued for over 15 years, including the Appin massacre and attacks at South Creek in 1816 (Karskens 2010: 225, Kohen 1986:23).

The Liverpool area is within Cabrogal land. The Cabrogal were Darug language speakers. The study area is located in close proximity to a high ridgeline which forms part of the Collingwood Aboriginal Place (Section 4.3.1). This area is said to be a meeting place for Darug, Dharrawal and Gandangara people at the boundary of their territories. The study area is seen to have an important place in Aboriginal history, which is reflected in its status as a registered Aboriginal Place.

The Aboriginal people were quickly disenfranchised from their traditional territories as colonists appropriated land and resources. The smallpox epidemics of 1789 killed a large portion of Aboriginal people of the Sydney region, even those who had not yet come into contact with Europeans. Despite this fragmentation of their culture Aboriginal people have continued to live along the Georges River to the present day. A large Aboriginal camp was located at Salt Pan Creek to the east of Liverpool until the 1930s when its people were forcibly removed to La Perouse.

Into the nineteen and twentieth centuries descendants of Darug language speakers continued to live in Western Sydney along with Aboriginal people from other areas of NSW.

4.3 Registered Aboriginal sites in the study area- AHIMS search results

An extensive search of the Aboriginal Heritage Information System (AHIMS) database was undertaken on the 21 July 2015. An updated AHIMS search was completed on the 8 March 2016. An area within a two kilometre radius of the study area was searched in order to gain information on the archaeological context of the area, and to ascertain whether there are any previously recorded Aboriginal sites within the study area. The details of the AHIMS search parameters are as follows:

GDA 1994 MGA 56	305005 - 311167, 6240246 - 6246582,
Buffer	50 m
Number of sites	30
AHIMS Search ID	182341

A total of thirty sites were identified by the extensive AHIMS search. The frequency of recorded site types is summarised in Table 1 below. The distribution of recorded sites within the AHIMS search area is shown in Figure 12.

The location of Aboriginal sites is considered culturally sensitive information. It is advised that this information, including the AHIMS data appearing on the heritage map for the proposal be removed from this report if it is to enter the public domain.

Table 1: Frequency of site features from AHIMS data

Site Types	Frequency	Percentage
Artefact	14	47
Modified Tree (Carved or Scarred)	8	27
Artefact, Potential Archaeological Deposit (PAD)	6	20
Potential Archaeological Deposit (PAD)	2	6

The AHIMS search results reveal that a majority of site types in the area are artefact sites (n=14, 47%) and modified trees (n=8, 27%); followed by artefact with potential archaeological deposit (PAD) sites (n=6, 20%) and PADs (n=2, 6%).

Spatial patterning of sites in the region have a close correlation to waterlines; most notable Georges River, which is the main water source in the area. Also areas that have been less impacted by development have a higher density of sites.

4.3.1 Collingwood Aboriginal Place

Collingwood Aboriginal Place is located 210 metres to the west of the study area. The site was gazetted in 2009 (OEH 2013). The site consists of a hilltop and ridgeline formation, which was used as a meeting place for Aboriginal people. Therefore, the Collingwood Precinct is a significant part of the landscape for Dharawal, Gandangara and Dharug people. As the area is a registered Aboriginal Place, all the protections and legislative obligations that apply to an Aboriginal site are in force for the land within the boundary of the Aboriginal Place.

Figure 11: Location and extent of Collingwood Aboriginal Place (Background: NSW Globe LPI)

Figure 12: AHIMS search results

4.4 Previous Archaeological Investigations

Smith 1989, Liverpool Release Areas: archaeological site survey and planning study

Smith found that generally the location of sites and site densities in the Liverpool area appeared to reflect the distribution and abundance of water. The absence of known stone sources within the Liverpool region suggests that stone was being transported over some distance to reach that area. This was reflected in the relatively small size of the artefacts and the low frequency of cortex. Using the results of the Liverpool assessment and building on previous predictive models the following predictive statements were proposed:

- Artefact scatters and isolated artefacts will be the most common site types recorded.
- Scarred trees are likely to occur where mature native vegetation has not been cleared.
- Sites will be concentrated primarily around creek lines followed by crests of hills with less sites located along hill slopes.
- Sites are likely to occur in higher frequencies at the confluence of two creek lines.
- Sites will generally be identified within 50 metres to 100 metres of water sources.
- The densities of artefact scatters will be related to the distance of the site from water sources.
- Silcrete will be the dominant raw material present.

Given the poor visibility of the assessment area Smith considered it likely that many more sites than those identified would occur within the study area.

Central West Archaeological and Heritage Services Pty Ltd 2002, an Aboriginal Archaeological Study of the Proposed Hoxton Park Partial Sewerage Transfer via Liverpool Submain

Central West Archaeological and Heritage Services (2002) completed an Aboriginal archaeological of the area between the Hoxton Park Release area and the Liverpool sewerage treatment plant (STP). The survey was completed in response to a proposal to transfer sewerage from Hoxton Park to the Liverpool STP requiring the development of a 7km pipe corridor. Archaeological survey was required for four kilometres of the corridor with an average width of 10-20 metres. Alignment runs approximately 800 metres north of the current study area.

Desktop analysis identified areas that may have had potential based on predictive modelling, namely areas close to creek lines on elevated flood free land. Upon inspection it was noted that the study area was heavily disturbed both in relation to previous construction and the flood prone nature of the area.

No sites were identified within the study area, however as a precaution archaeological monitoring was suggested for further works.

Biosis 2003, an Archaeological Assessment of a Proposed School Site, Horningsea Park, NSW

Biosis prepared an Aboriginal archaeological assessment of the proposed John Edmondson High School site approximately 8 kilometres southwest of the study area. The assessment built on previous predictive models for the Cumberland plain and predicted that stone artefacts would be the most common site type either in isolation or as a scatter and these would generally consist of silcrete artefacts whilst quartz may also be identified. The relationship between site frequency and distance to water was acknowledged however it was suggested that not enough it known about visibility bias and other resources to restrict areas of high potential to creek lines. The area may have been attractive as a local vantage point still in easy access of water.

The assessment did not identify any Aboriginal sites or objects within the investigation area. The area had been significantly impacted by market gardening and visibility was generally nil to 5 per cent. The investigation area was considered to have the potential to contain archaeological deposits however, given the location of the investigation area near watercourses and on a ridgeline.

Total Earth Care Pty Ltd 2008, Aboriginal Cultural Heritage and Archaeological Assessment of Collingwood and Discovery Parks, Liverpool

Total Earth Care completed an Aboriginal archaeological survey of Collingwood and Discovery Park in Liverpool; located to the west of the study area (See section 4.3.1). The survey was completed in response to a proposal to subdivide the park area into two lots, with one lot being developed into residential housing while the other was to remain as public land.

A single area of PAD was delineated as part of the survey, largely recorded given the regional views of the area based on previous predictive models. No current archaeological material was recorded.

While no AHIMS sites had been officially recorded in relation to the area, a previous report completed by McDonald (McDonald and Garling 1997) had recorded a hatchet located within the study area. While the hatchet had since been removed and placed in a museum, the original site area was relocated as part of the survey. McDonald's report also highlighted the potential of the underfloor deposit related to Collingwood house, a colonial property which was considered to have largely intact subsurface potential.

Based on the survey and the previous omission of the hatchet in heritage listing, Total Care registered AHIMS site CM1 as a conglomerate site encompassing the hatchet, based on its prior location and areas of potential recorded by both McDonald and during their survey.

Given that the archaeological site was located in the lot that would remain public land no further archaeological investigation was required.

Kayandel 2010, the Georges River Estuary Cultural Heritage Desktop Assessment.

Kayandel Archaeological Services prepared a desktop study of the archaeological and heritage sites located within the vicinity of Georges River Estuary. The desktop study was commissioned as part of the development of an estuary management plan which included the bank of the George River from Liverpool weir to Botany Bay. Assessment aimed to identify and collate existing information on the Georges river estuary and provide management recommendations of the heritage values of the area. Research was limited to sites located within 80m of the river bank with an upper cap of 120 sites for the report.

Assessment included searches of a variety of sources including AHIMS, heritage and shipwreck databases as well as general interest searches. 26 reports, books or web links were analysed as directly relevant to Aboriginal heritage in the area with 112 sites recorded within the study area.

Review highlighted that there was insufficient knowledge of both Aboriginal and historic heritage in the study area. Kayandel recommended that field inspections of previous sites be undertaken as a priority given the insufficient detail recorded particularly in reference to early recordings.

Artefact 2011, Light Horse Park, Liverpool: Aboriginal Heritage Due Diligence Assessment and Statement of Heritage Impacts for non-Indigenous heritage for the proposed route of electricity feeder lines.

Artefact completed both a due diligence assessment and non-Indigenous heritage assessment for the site of a proposed electricity feeder line within Light Horse Park, Liverpool; located 500 metres north of the study area.

The due diligence assessment did not locate any Aboriginal sites and/or places within the study area and identified a high degree of ground disturbance due to landscaping, infrastructure and historical agriculture. In addition, it was noted that Light Horse Park was the site of a formal municipal landfill. The due diligence assessment concluded that the study area within Light Horse Park contained low archaeological potential and that no further Aboriginal heritage work was required.

Navin Officer 2014. Moorebank Intermodal Terminal Aboriginal Heritage Assessment

Navin Officer (2014) completed an Aboriginal Heritage Assessment for the proposed development of the Moorebank Intermodal Terminal (MIT). The archaeological investigations at the MIT are directly relevant to the current constraints analysis; as the MIT project was located approximately 800 metres to the south of the current study area; bordered by the M5 to the north, Moorebank Avenue to the east, East Hills railway line to the south and Georges River to the west. Therefore, the MIT is located on the same alluvial terrace/flats landform associate with the eastern side of Georges River.

An archaeological survey was conducted across the area in 2010. The survey identified eight new Aboriginal sites and one PAD. Five of the sites consisted of surface isolated artefacts and low density (<3) artefact scatters. Three of the sites represented potential scarred trees. The PAD area was based on the potential for natural deposits below fill, adjacent around a small lake basin.

Navin Officer conducted an archaeological test excavation within the MIT site in 2012. The subsurface testing program used a combination of mechanic and hand excavated test pits. A total of 59 test pits were excavated, targeting areas where surface artefacts or PADs that had been identified. The three major zones of archaeological potential identified by Navin Officer (2014:54) were the Georges River Riparian Corridor (100 metres either side of the river), minor tributary zones (100m either side of tributaries, including prior waterlines identified on historical aerial imagery) and elevated slopes and riverside margin of the alluvial terrace located at the edge of Georges River. During the test excavation, a total of 264 artefacts were identified within 26 test pits.

Further test excavations were undertaken in the area referred to as LCC Northern Powerhouse land in 2013; which is located to the southwest of the current study area, in proximity to Georges River. Mechanical and manual test excavation took place across the PAD. During the test excavations, a total of 14 artefacts were identified within 9 of the 45 test pits excavated (Navin Officer 2014:54).

From the results of the survey and two phases of excavation, it was concluded:

- Where intact deposits occur, artefact density is highest on the tertiary terrace edge along Georges River. Aboriginal occupation appears focused in this area.
- The results reflected the findings of the potential at the tertiary terrace within the river corridor. Landforms further removed from the river corridor had lower archaeological sensitivity.
- Minor tributaries are more likely to have Archaeological material, if they are associated with other resources zones (i.e. Georges River corridor).

AHMS 2015. SIMTA Intermodal Terminal Facility – Stage 1: Aboriginal Heritage Impact Assessment.

AHMS completed an Aboriginal heritage impact assessment as part of concept approval of stage 1 of the SIMTA intermodal terminal facility project, located next to the MIT site (Navin Officer 2014). As part of the approval process for stage 1 of the project the Secretary's Environmental Assessment Requirements (SEARS) required further investigation of PADs delineated in the original survey report completed by AHMS in 2012.

Assessment involved the excavation of 13 one x one metre test pits spaced at 20 metre intervals with a focus on the banks of the George River and either side of Anzac Creek.

28 artefacts were recovered from the site associated with the Georges River (MA14) which was interpreted to represent low level activity on the upper slope and ridge areas within the area. The test excavations identified silty deposits (exceeded 1 metre in some areas), with evidence of disturbance limited to the upper soil profile. Occupation was dated using OSL dating and recorded as representing occupation at 3.4ka and 18ka. Based on the antiquity associated with the site, MA14 was considered to have high research potential and of local if not state significance. Assessment recommended salvage of up to 100m^2 of the site if impact could not be avoided.

4.4.1 Previous Archaeological Investigations within the Study Area

City Plan Services completed two Aboriginal cultural heritage due diligence assessments for 20 and 28 Shepherd Street, Liverpool (within the current study area) in 2015. The due diligence assessments were completed as a requirement of the DA consultation requirements.

City Plan Services 2015a, 20 Shepherd Street, Liverpool

City Plan Services completed a due diligence assessment for 20 Shepherd Street, Liverpool (2015a). The due diligence assessment was related to the proposed residential development associated with the proposal for this letter report. The due diligence assessment did not locate any Aboriginal sites and/or places within the property, but identified that the Georges River was a major resource within the region. Due to the proximity of the study area to the Georges River it was concluded that Aboriginal settlement within the area was likely. However, the due diligence identified a high degree of ground disturbance due to the establishment of the Collingwood Paper Mill and subsequent decades of development. The due diligence assessment concluded that 20 Shepherd Street had low archaeological potential and that no further Aboriginal heritage work was required.

City Plan Services 2015b, 28 Shepherd Street, Liverpool

City Plan Services completed a due diligence assessment for 28 Shepherd Street, Liverpool (2015b). The due diligence assessment was related to the proposed residential development associated with the proposal for this letter report. The due diligence assessment did not locate any Aboriginal sites and/or places within the property and identified a high degree of ground disturbance associated with previous development, across most of the site. However, it was noted that land located close to Georges River had evidence of only minimal ground disturbance (referred to as 'Zone 5'). Due to the archaeological sensitivity of land located close to Georges River, it was concluded that Zone 5 was likely to contain unidentified Aboriginal cultural material. As a result, further archaeological investigation was recommended for 28 Shepherd Street.

4.5 Geotechnical Surveys within the Study Area

Two properties contained within the study area were subject to a geotechnical assessment by Asset Geotechnical. The assessment included both 20 Shepherd Street (Asset Geotechnical 2014) and 28 Shepherd Street (Asset Geotechnical 2015). The location of the geotechnical boreholes is shown in Figure 13 and a summary of results of testing are presented in Table 2 and Table 3. The results of the investigation are discussed below.

Asset Geotechnical 2014, 20 Shepherd Street, Liverpool

20 Shepherd Street is located within the northeast extent of the study area. The geotechnical survey involved drilling of five boreholes (Figure 13) to a target depth of approximately 3 metres into the rock. Drilling was carried out by auger drilling then washbore drilling to refusal at bedrock (Asset Geotechnical 2014:2).

The results of the geotechnical survey indicate that a dense layer of fill covers the entire area; between 1.6 metres to 6.9 metres in depth (Table 2). The fill material is made up of a mixture clay, sand and gravel.

Natural alluvial sand and clay is present below the fill layer. It is unknown if the alluvial deposits were cut prior to fill deposits being introduced to the area. The bore holes reveal a bedrock of shale material starting at depths between 9.7 metres and 13 metres.

Asset Geotechnical 2015, 28 Shepherd Street, Liverpool

28 Shepherd Street is located within the central portion of the study area. The geotechnical survey involved drilling of six boreholes (Figure 13). Drilling was carried out by a track mounted drilling rig, with auger drilling and a TC bit on refusal at bedrock (Asset Geotechnical 2015:2).

The results of the geotechnical survey indicate that a dense layer of fill covers the entire area; between 1.6 metres to 3.5 metres in depth (Table 3). The fill material is made up of a mixture clay, sand and gravel.

Natural alluvial or slope wash sand and clay is present below the fill layer. It is unknown if the alluvial deposits were cut prior to fill deposits being introduced to the area. The bore holes reveal a bedrock of shale material starting at depths between 7.3 metres and 9.5 metres.

Table 2: 20 Shepherd Street – summary of geotech results

Bore Hole ID	Depth (m)	Description
BH1	0.0 – 0.2	**Asphalt**
	0.2 – 0.6	**Fill:** Sandy gravel
	0.6 – 1.4	**Fill:** Clayey sand. Trace of sandstone and ballast fragments
	1.4 – 2.4	**Fill:** Sand
	2.4 – 3.5	**Fill:** Sandy clay
	3.5 – 8.3	**Alluvial:** Sand
	8.3 – 10.2	**Alluvial:** Sandy clay
	10.2 – 14.75	**Bedrock:** Shale
BH2	0.0 – 0.2	**Asphalt**
	0.2 – 0.6	**Fill:** Sandy gravel, trace of ballast material
	0.6 – 0.8	**Fill**: Sandy clay
	0.8 – 3.8	**Fill:** Clay, trace of gravel and sand
	3.8 – 5.3	**Alluvial:** Sandy silty clay
	5.3 – 8.3	**Alluvial:** Sand
	8.3 – 12	**Alluvial:** Sandy clay
	12 – 16.75	**Bedrock:** Shale
BH3	0 – 0.1	**Asphalt**
	0.1 – 0.5	**Fill:** Sandy gravelly clay
	0.5 – 1.0	**Fill:** Sand
	1.0 – 2.6	**Fill:** Sandy clay, inclusions of terracotta fragments
	2.6 – 6.8	**Alluvial:** Clay
	6.8 – 9.7	**Alluvial:** Clayey sand
	9.7 – 12.83	**Bedrock:** Shale
BH4	0 – 0.4	**Fill:** Clayey sandy gravel
	0.4 – 1.7	**Fill:** Sandy gravelly clay
	1.7 – 2.0	**Fill:** Clayey sand
	2.0 – 4.2	**Fill:** Clayey sand, possible coal tar contamination
	4.2 – 5.7	**Fill:** Clayey sand
	5.7 – 6.9	**Fill:** Clay, trace of sand
	6.9 – 11.0	**Alluvial:** Sand
	11.0 – 13.0	**Alluvial:** Sandy clay, with wood fragments
	13.0 – 16.08	**Bedrock:** Shale
BH5	0 – 0.1	**Asphalt**
	0.1 – 0.3	**Fill:** Clayey gravelly sand
	0.3 – 1.0	**Fill:** Gravelly sandy clay
	1.0 – 1.6	**Fill:** Clayey sand, with ash deposits
	1.6 – 3.3	**Alluvial:** Sand
	3.3 – 5.5	**Alluvial:** Sandy clay
	5.5 – 9.5	**Alluvial:** Clayey sand
	9.5 – 11.4	**Alluvial:** Sandy clay
	11.4 – 14.32	**Bedrock:** Shale

Table 3: 28 Shepherd Street – summary of geotech results

Bore Hole ID	Depth (m)	Description
BH1	0.0 - 0.4	**Fill:** Gravelly clay
	0.4 – 1.2	**Fill:** Sandy clay, with brick fragments
	1.2 – 1.6	**Fill:** sandy clay
	1.6 – 2.8	**Alluvial or slope wash:** Clay
	2.8 – 4.6	**Alluvial or slope wash:** Clay, trace of sand
	4.6 – 9.5	**Alluvial:** Clayey sand
	9.5 – 13.59	**Bedrock:** Shale
BH2	0.0 – 1.6	**Fill:** Gravelly clay, with brick fragments
	1.6 – 3.1	**Alluvial or slope wash:** Clay
	3.1 – 5.8	**Alluvial or slope wash:** Clay
	5.8 – 8.3	**Alluvial:** Sandy clay
	8.3 – 8.5	**Residual:** clay
	8.5 – 11.4	**Bedrock:** Shale
BH3	0.0 – 1.6	**Fill:** gravelly clay, with shale fragments
	1.6 – 5.6	**Alluvial or slope wash:** Clay
	5.6 – 6.8	**Alluvial:** Clayey sand
	6.8 – 7.3	**Residual:** Shaley clay
	7.3 – 10.27	**Bedrock:** Shale
BH4	0.0 – 3.5	**Fill or slope wash:** Clay
	3.5 – 5.8	**Alluvial:** Sand, with clay
	5.8 – 8.2	**Alluvial:** Clayey sand
	8.2 – 11.2	**Bedrock:** Shale
BH5	0.0 – 1.2	**Fill:** Gravely clay
	1.2 – 2.8	**Fill:** Sandy clay
	2.8 – 5.5	**Alluvial:** Sandy clay
	5.5 – 6.0	**Alluvial:** Sandy clay
	6.0 – 8.6	**Alluvial:** Clayey sand
	8.6 – 9.0	**Bedrock:** Shale
BH6	0.0 – 1.0	**Fill:** Clay
	1.0 – 2.0	**Fill:** Clayey sand
	2.0 -4.4	**Alluvial:** Clayey sand
	4.4 – 7.35	**Alluvial:** Clayey sand
	7.35 – 8.6	**Residual:** Clay
	8.6 – 9.0	**Bedrock:** Shale

Figure 13: Location of geotechnical survey

5.0 PREDICTIONS

5.1 Aboriginal Land Use

Assumptions about Aboriginal land use patterns are made on the basis of archaeological information gained from the local area, from observations made by Europeans after settlement of the area, and from information known about available natural resources.

As Aboriginal people were mobile hunter-gatherers, it would be likely that they moved across the landscape between resources. It would also be likely that movement was related to socio/cultural factors such as gatherings and ceremonial obligations. Campsites would have provided temporary residences such as bark structures. It is difficult to ascertain whether a campsite existed at a given location, but correlations between stone artefact density and campsites are often assumed. While it would be likely that knapping would have occurred at a campsite, it would also be likely that knapping would have occurred during movement across the landscape, as tools were prepared or repaired during hunting and gathering activities.

5.2 Predictive Model

The predictive model comprises a series of statements about the nature and distribution of evidence of Aboriginal land use that is expected in the study area. These statements are based on the information gathered regarding:

- landscape context and landform units
- ethno historical evidence of Aboriginal land use
- distribution of natural resources
- results of previous archaeological work in the vicinity of the study area
- predictive modelling proposed in previous investigations

Predictive statements are as follows:

- stone artefacts/artefact scatters will be the most likely Aboriginal site types
- Identification of artefact sites will be dependent on visibility and vegetation density- artefacts will more frequently be identified on eroded surfaces.
- Based on the spatial patterning of recorded Aboriginal sites and on findings from previous studies in the area, the highest numbers of sites and sites with the highest densities of artefacts are likely to be located along main waterways.
- Modified trees may be identified within the study area if suitable old growth trees remain
- Areas of PAD may be identified where suitable depth of deposit exists, in areas that feature a relative lack of disturbance and ready access to freshwater and resources.

It is probable that the only material traces of Aboriginal occupation remaining will be stone artefacts and/or modified trees. The potential for shelter sites, middens, quarries, rock engravings and axe grinding grooves is limited by the landscape context and historical land use and amount of fill in the area. Areas of PAD would be dependent on landform and levels of disturbance. Areas of PAD would not be identified across steep slopes, swampy deposit, in areas of flooding, or in areas of high disturbance.

6.0 SURVEY METHODOLOGY

6.1 Site Definition

An Aboriginal site is generally defined as an Aboriginal object or place. An Aboriginal object is the material evidence of Aboriginal land use, such as stone tools, scarred trees or rock art. Some sites, or Aboriginal places can also be intangible and although they might not be visible, these places have cultural significance to Aboriginal people.

OEH guidelines state in regard to site definition that one or more of the following criteria must be used when recording material traces of Aboriginal land use:

- the spatial extent of the visible objects, or direct evidence of their location
- obvious physical boundaries where present, e.g. mound site and middens (if visibility is good), a ceremonial ground
- identification by the Aboriginal community on the basis of cultural information

For the purposes of this study an Aboriginal site was defined by recording the spatial extent of visible traces or the direct evidence of their location.

PADs are areas where sub-surface stone artefacts and/or other cultural materials are likely to occur (OEH 2010: 38). These areas may be associated with recorded sites but are often greater in extent, taking in areas around the visible artefacts where there is a potential for further buried artefacts to exist. PADs may also be present where no visible artefacts are located. This may be the case when there is no ground surface visibility, but the area is seen to have a high likelihood of containing subsurface artefacts.

6.2 Survey Methodology

The sample survey of the study area was conducted on 21 August 2015 by Alexander Timms and Kim White (Artefact Heritage). Donna Whillock from TLALC also attended the survey. Full coverage of the study area was not possible due to the density of development and vegetation throughout the study area. Concrete and asphalt surfaces cover a great deal of the study area and undeveloped areas along the river were densely vegetated. As such, there was little visibility throughout the study area. However, site survey was useful in clarifying landform features and confirming information acquired through archival research.

A sample survey of the study area is acceptable under the Code of Practice with justification. There were two main reasons for conducting a sample survey, including density of vegetation and development. Buildings and hard surfaces obscured the ground surface across substantial portions of the study area.

The survey was undertaken in accordance with the Code of Practice. A handheld Global Positioning System (GPS) was used to track the path of the surveyors and to record site coordinates. An aerial map of the study area was also carried by members of the survey team in the field. All accessible sections of the study area were covered on foot and examined for traces of Aboriginal occupation.

A photographic record was kept of all sections of the study area that were accessible. Photographs were taken to record landform units within the study area, vegetation, levels of disturbance, and areas of archaeological potential. Scales were used for photographs where appropriate.

Figure 14: Survey units

7.0 SURVEY RESULTS

7.1 Effective Survey Coverage

A sample survey of the study area was undertaken, which targeted exposed areas. Sample survey was necessary as the density of vegetation along the riverside obscured visibility and prevented access. Also, much of the area has been built up and is covered in concrete surfaces or structures. The survey coverage and landforms are summarised in Table 4 and Table 5.

Table 4: Survey coverage

Survey Unit	Landform	Survey unit area (m2)	Visibility (%)	Exposure (%)	Effective Survey Coverage (m2)	Effective Coverage (%)
1	Flat, river terrace	16270	20%	10%	325	2
2	Flat, river terrace	7790	30%	40%	935	12
3	Flat, Low crest, slope, river terrace	24042	30%	40%	2885	12

Table 5: Landform Summary

Landform	Landform area (m2)	Area effectively surveyed	% of landform effectively surveyed	Number of sites
Flat	28610	8583	30%	0
Slope	17973	5392	30%	0
River terrace	1240	124	10%	0
Low crest	280	28	10%	0

7.2 Survey Observations

The study area has been cleared of most of the original vegetation and extensive modification of the natural landforms has occurred. Therefore, the study area has been divided into three survey units based on property boundaries. The results of each survey unit is discussed below.

7.2.1 Survey Unit 1

Survey unit 1 is located in the north portion of the study area. Survey unit 1 includes 20 and 26 Shepherd Street and the adjoining river frontage land (Figure 14).

The old mill building and associated concrete/bitumen yard cover a majority of survey unit 1. The old mill building is located on the southwest corner of survey unit 1, fronting Shepherd Street (Photo 1 and Photo 2). The building on the corner of Shepherd and Atkinson Streets seen on the aerial image (Figure 14) has since been demolished (Photo 3). Some minor landscaping has been undertaken along the north side of the old mill building (Photo 4). 26 Shepherd Street is covered in hardstand, primarily utilised as a vehicle storage area (Photo 6). The entire area is located on a modified flat landform. Large amounts of fill would have been introduced to the area to create a flat construction pad for the mill building and car yard (Photo 1 to Photo 6).

On the eastern edge of the survey unit, the terrain drops sharply down to the river terrace. This area is densely vegetated with woody weeds and vines (Photo 7) such as Lantana, Green Cestrum (Green Poison berry), Morning Glory and Balloon Vine (ACS 2015a:5). Due to the terrain and vegetation cover, much of this portion of survey unit 1 was inaccessible. A part of the northern extent of the river edge was able to be surveyed, as the slope had been terraced out to create garden beds by locals (Photo 8 and Photo 9). However, visibility was still poor, as the area is disused and weeds have been allowed to grow. Within the areas of ground surface exposure, mixed grey brown clayey silt was evident.

Within the drop in terrain adjacent the mill yard, stepped vertical walls displayed silt and clay deposits will brick and rubble inclusions (Photo 10). Based on the geotechnical investigation and visual evidence, it is clear that the area has been built up significantly with introduced fill deposits.

Photo 1: Survey Unit 1 – Shepherd Street frontage, northeast aspect

Photo 2: Survey Unit 1 – south side of old mill, west aspect

Photo 3: Survey Unit 1 – demolished structure, north aspect

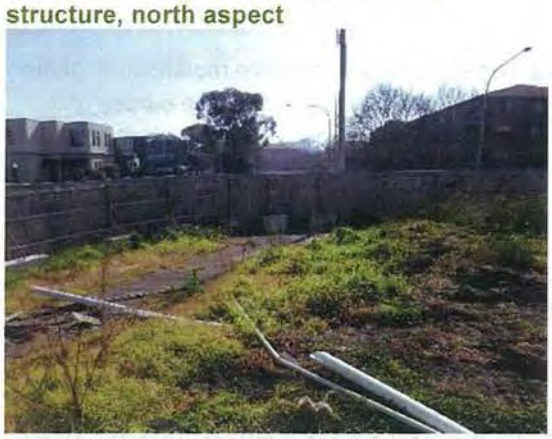


Photo 4: Survey Unit 1 – minor landscaping, west aspect

Photo 5: Survey Unit 1 – rear yard of mill building, south aspect

Photo 6: Survey Unit 1 – 26 Shepherd Street, southeast aspect

Photo 7: Survey Unit 1 – densely vegetated water front, north aspect

Photo 8: Survey Unit 1 –accessible area at end of Atkinson St, east aspect

Photo 9: Survey Unit 1 – terraced garden area, northwest aspect

Photo 10: Survey Unit 1 – steep drop in terrain at rear of mill, west aspect

7.2.2 Survey Unit 2

Survey unit 2 is located in the central portion of the study area. Survey unit 2 includes 28 Shepherd Street and the adjoining river frontage land (Figure 14).

The area is accessed from a driveway off Shepherd Street (Photo 11), which slopes down into 28 Shepherd Street, which is a flat site. The area contains a toilet block Photo 12 and large steel framed shed (Photo 13 and Photo 14). The structures are framed by open areas of weed and grass which offered minimal ground visibility (Photo 15 and Photo 16).

On the eastern edge of the survey unit, the terrain drops sharply down to the river terrace. This area is densely vegetated with woody weeds such as Camphor Laurel, Mulberry and Privet and also shrubs such as Lantana, Blackberry, African Boxthorn, Green Cestrum and Golden Wreath Wattle. (ACS 2015b:4). Due to the terrain and vegetation cover, this portion of survey unit 2 was inaccessible (Photo 17 and Photo 18).

A due diligence assessment of 28 Shepherd Street indicated that the small strip of land fronting the river was potentially undisturbed. However geotechnical results on the edge of the river front indicated that 1.6 metres of fill is located in this area (Figure 13). It is likely that the entire property, right up to the riverfront, has been filled in to create a flat surface for construction.

Photo 11: Survey Unit 2 – entrance driveway, west aspect

Photo 12: Survey Unit 2 – toilet block, northeast aspect

Photo 13: Survey Unit 2 – large steel frame shed, east aspect

Photo 14: Survey Unit 2 – interior of steel frame shed, southeast aspect

Photo 15: Survey Unit 2 –grassed area on north side of shed, southeast aspect

Photo 16: Survey Unit 2 – grassed area on south side of shed, northwest aspect

Photo 17: Survey Unit 2 – densely vegetated river front, northeast aspect

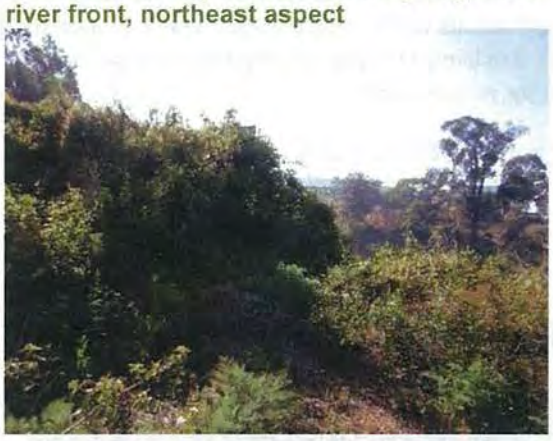
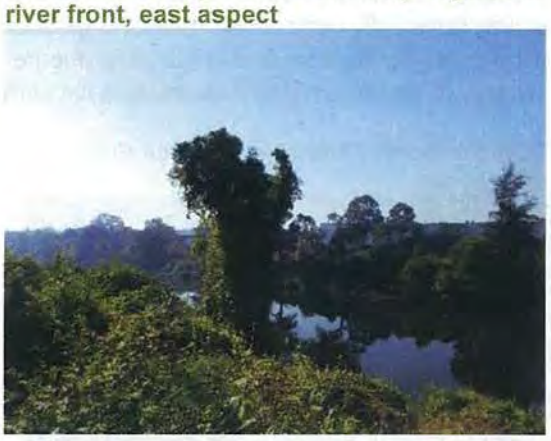


Photo 18: Survey Unit 2 – densely vegetated river front, east aspect



7.2.3 Survey Unit 3

Survey unit 3 is located in the southern portion of the study area. Survey unit 3 includes 31, 32 and 33 Shepherd Street, a portion of Mill Park and the adjoining river frontage land (Figure 14).

The survey unit is situated on a low rise, gently sloping land and modified flat. Generally, the highest elevation is located in the central west edge of the survey unit, with the land sloping down to the north, east and south. Four industrial properties are located in the northern section of survey unit 3 (31, 32 and 33 Shepherd Street); evidence of land modification is evident around these properties due to the tiered terrain (Photo 19 and Photo 20). The entire area is covered in buildings, concrete or bitumen surfaces. Therefore, there is no ground surface visibility within the area (Photo 19 to Photo 22).

Powerhouse Road (which runs off Shepherd Street), runs along the western edge of survey area 3 and continues down along the edge of Mill Park (Photo 22 and Photo 23). The southern section of the survey area is within the northern extent of Mill Park. It is visually evident that the area has been infilled by imported deposits (Photo 24). Numerous ground exposures show the deposits to be brown silt with inclusions of modern rubbish (Photo 25). A drop in the terrain shows the extent of fill in the area (Photo 26 and Photo 27).

The eastern edge of the survey unit, adjacent the river, is densely vegetated with woody weeds shrubs and vines. This portion of survey unit 3 was inaccessible due to the density of vegetation (Photo 28).

Photo 19: Survey Unit 3 – stepped slope between 32-33 Shepherd St, southeast aspect

Photo 20: Survey Unit 3 – stepped slope, between 31-33 Shepherd St, south aspect

Photo 21: Survey Unit 3 – rear yard of 33 Shepherd St, southwest aspect

Photo 22: Survey Unit 3 – rear of 31 Shepherd St, north aspect

Photo 23: Survey Unit 3 –Powerhouse Rd, southwest aspect

Photo 24: Survey Unit 3 - area of fill in Mill Park, southwest aspect

Photo 25: Survey Unit 3 –example of exposure in Mill Park, north aspect

Photo 26: Survey Unit 3 – area of fill in Mill Park, north aspect

Photo 27: Survey Unit 3 –drop in terrain showing extent of fill, northwest aspect

Photo 28: Survey Unit 3 – densely vegetated river front, northeast aspect

8.0 ANALYSIS AND DISCUSSION

8.1 Disturbance Levels

Historical research suggests that the entire area has been subject to significant ground disturbance through decades of agricultural and industrial use. An early parish map of the area indicated that the terrain in the area was a gentle slope down to Georges River (Figure 5). During the industrial occupation of the study area, the land surface has been built up and flattened, creating a sharp drop down to the Georges River.

The geotechnical surveys conducted within the study area show that over the history of the site, between 1.6 metres and 6.9 metres of fill have been introduced. The depth of fill was confirmed during visual inspection of the exposed banks on the northeast portion of survey unit 1 (section 7.2.1). The only part of the study area that has not been subject to geotechnical investigation is survey area 3. However, during the archaeological survey, it was identified that a significant amount of fill has been added to the area (section 7.2.3).

It is therefore clear that the entire study area has been significantly disturbed through historical land use.

8.2 TLALC Heritage Report

Tharawal Local Aboriginal Land Council (TLALC) provided a report regarding the fieldwork and the potential for archaeological material within the proposed area of works. The report concluded that nothing of Aboriginal cultural significance was located during the survey and development may proceed without the need for further archaeological assessment. A copy of TLALC report is attached in Appendix 1.

8.3 Analysis of Archaeological Potential

Archaeological data gathered in the locality suggests that artefacts would be found across the landscape in varying densities, with higher densities expected in close proximity to water sources. While the geology of the study area does not typically hold high archaeological sensitivity; investigations by Navin Officer (2014) and AHMS (2015) to the south of the study area has identified a significant amount of artefactual material on a similar landform. The proximity to the main trunk of Georges River, which was a major resource to Aboriginal people in the region, increases the potential of archaeological material.

The main limitations to the survivability of archaeological material in the study area includes the extent of excavation and levelling activities associated with the historical industrial facilities onsite. The geotechnical investigation has identified varying depths of fill over the study area (between 1.6 metres and 6.9 metres), covering natural alluvial soils of sand and silty sand that are likely to have been truncated during land modification. The high degree of disturbance was confirmed during the survey. Due to amount of disturbance the study area is assigned a low archaeological potential.

9.0 SIGNIFICANCE ASSESSMENT

9.1 Assessment Criteria

Archaeological significance refers to the archaeological or scientific importance of a landscape, site or area. This is characterised using archaeological criteria such as archaeological research potential, representativeness and rarity of the archaeological resource and potential for educational values. These are outlined below:

- Research potential: does the evidence suggest any potential to contribute to an understanding of the area and/or region and/or state's natural and cultural history?
- Representativeness: how much variability (outside and/or inside the subject area) exists, what is already conserved, how much connectivity is there?
- Rarity: is the subject area important in demonstrating a distinctive way of life, custom, process, land-use, function or design no longer practised? Is it in danger of being lost or of exceptional interest?
- Education potential: does the subject area contain teaching sites or sites that might have teaching potential?

No cultural values or significance were identified by TLALC during the archaeological survey (Appendix 1).

9.2 Archaeological Significance Assessment

Archaeological significance of the study area has been determined based on both the findings of the historical research and observations made during field survey as well as the landscape and archaeological context of the study area.

Previous studies have indicated that land bordering Georges River have a potential for high archaeological significance; however, the study area has undergone significant ground disturbance which greatly reduces significance. The study area is located within an area that has been assessed as having low representative and rarity values for Aboriginal archaeological material and / or sites. Aboriginal objects may be present in areas of low archaeological significance, but are likely to be in disturbed contexts. The study area is assessed as having low levels of both scientific and research potential and as demonstrating overall low archaeological significance.

9.3 Impact Assessment

Coronation Property proposes to develop a residential precinct at Shepherd Street, Liverpool. A full summary of the proposal is presented in Section 1.3 and the preliminary master plan is shown in Figure 1.

Construction works will impact upon the ground surface, including excavation to varying levels. These sub-surface impacts will be associated with vegetation clearance, levelling the ground surface, as well as construction of foundations/basements for proposed structures. Ancillary works will include revegetation works and pedestrian boardwalk construction within the riparian corridor of Georges River. The proposed development will not impact upon any recorded Aboriginal objects. The proposed works will not impact upon any areas of moderate or high archaeological potential.

10.0 MANAGEMENT AND MITIGATION MEASURES

10.1 Guiding Principles

The overall guiding principle for cultural heritage management is that where possible Aboriginal sites should be conserved. If conservation is not practicable, measures should be taken to mitigate against impacts to Aboriginal sites.

The nature of the mitigation measures recommended is based on the assessed significance of the site or sites. The final recommendations would also be informed by cultural significance, which will be discussed within the TLALC report.

10.2 Mitigation Measures

The current assessment has established that the study area demonstrates low archaeological potential and low archaeological significance. The assessment confirmed that no previously recorded Aboriginal sites and/or places and no areas of archaeological potential are located within the boundaries of the study area.

No further Aboriginal archaeological investigation is required for the study area.

If Aboriginal objects are uncovered once works commence, work in the vicinity of the find must cease and an archaeologist, the OEH, and the TLALC must be informed. It is an offence under the *National Parks and Wildlife Act 1974* (as amended 2010) to disturb or destroy an Aboriginal object without appropriate approvals. If human remains are found, work must cease, the site must be secured and the NSW Police and OEH notified. An Aboriginal Heritage Impact Permit (AHIP) would be required before works recommence. Further archaeological investigations may also be required.