

5.3.4 Aquatic biodiversity

The assessment found that there are no aquatic threatened species that require protection under the *Fisheries Management Act 1994* and no suitable habitat for aquatic threatened species was observed on the site. Despite this finding, it should be noted that the natural state of the majority of watercourses across the Precinct is ephemeral and that during times of flow these watercourses provide aquatic habitat and connect living areas for species that are not linked during dry conditions.

5.4 Bushfire

Although the land associated with the Oran Park Precinct has been largely cleared of vegetation, proposed development for urban purposes will involve the revegetation of the riparian corridors so creating a potential bushfire risk. Accordingly, the risk of bushfire was investigated so that appropriate management of risk could be incorporated into the draft ILP.

Work was commissioned to assess existing and potential bushfire hazards across the site (**Appendix G**). The aim of the study was to ensure that the statutory requirements for bushfire protection are met and that innovative management frameworks are achieved across bushfire and vegetation issues.

The assessment took into account the existing conditions of the site, the proposed removal and regeneration of vegetation, and proposed positioning of new development. It also considered the relevant legislative requirements of the *Rural Fires Act 1997*, the *Threatened Species Conservation Act 1995*, and the *Environmental Planning and Assessment Act 1979*, as well as the policy requirements of Planning for Bushfire Protection 2006 (PBP 2006).

5.4.1 Bushfire conditions

Due to its past and current use for agricultural purposes, the Precinct has generally been cleared of vegetation. However, some remnant vegetation still exists.

On the eastern side of the Precinct, vegetation is primarily confined to South Creek, although smaller patches are also found along unnamed ephemeral creek lines. On the western side of the Precinct, there are dense thickets of African Olive along the ridgeline and a small regenerating remnant of Cumberland Plain Woodland in the northwest. The draft ILP proposes the removal of the African Olive. Several pockets of paddock trees are also dispersed throughout the site. East of The Northern Road the Precinct is gently undulating, sloping towards the northeast. The western side of the Precinct is dominated by a steep north-south ridgeline and associated valleys.

When developed, the main riparian corridors will be located throughout the urban fabric of the Precinct as shown in **Figure 13**. The riparian corridors will interface with both residential development and employment land.

The Cobbitty Rural Fire Service Brigade is nearest to the Precinct as it has direct access along Cobbitty Road. Narellan is the closest NSW Fire Brigades station and is located approximately 5 kilometres from the southern boundary.

5.4.2 Potential impacts and assessment

The potential risk of bushfire on a site is derived from a combination of factors, including vegetation structure, the slope of the land and the topographic position of the asset. Bushfire risk is increased where land slopes and development is at a higher elevation than vegetation, because fires travel at a greater speed and at greater intensity up an incline.

In the case of the Oran Park Precinct, residential and employment land uses will adjoin the riparian corridors and areas of regenerating bushland, potentially creating a bushfire risk. Based on the draft ILP, the Precinct was generally found to have a low to medium fire risk, due to the gentle sloping nature of the land (generally less than 5%), the linear nature of vegetation proposed for retention and regeneration, and the low fuel loads associated with the vegetation communities throughout the Precinct.

However, towards the northwest corner of the Precinct there are some areas that fall within the extreme risk area, due to steep topography and the nature of existing and proposed vegetation. Higher risk areas were also nominated in the vicinity of the Oran Park Raceway, which again is an area of the Precinct with steep terrain.

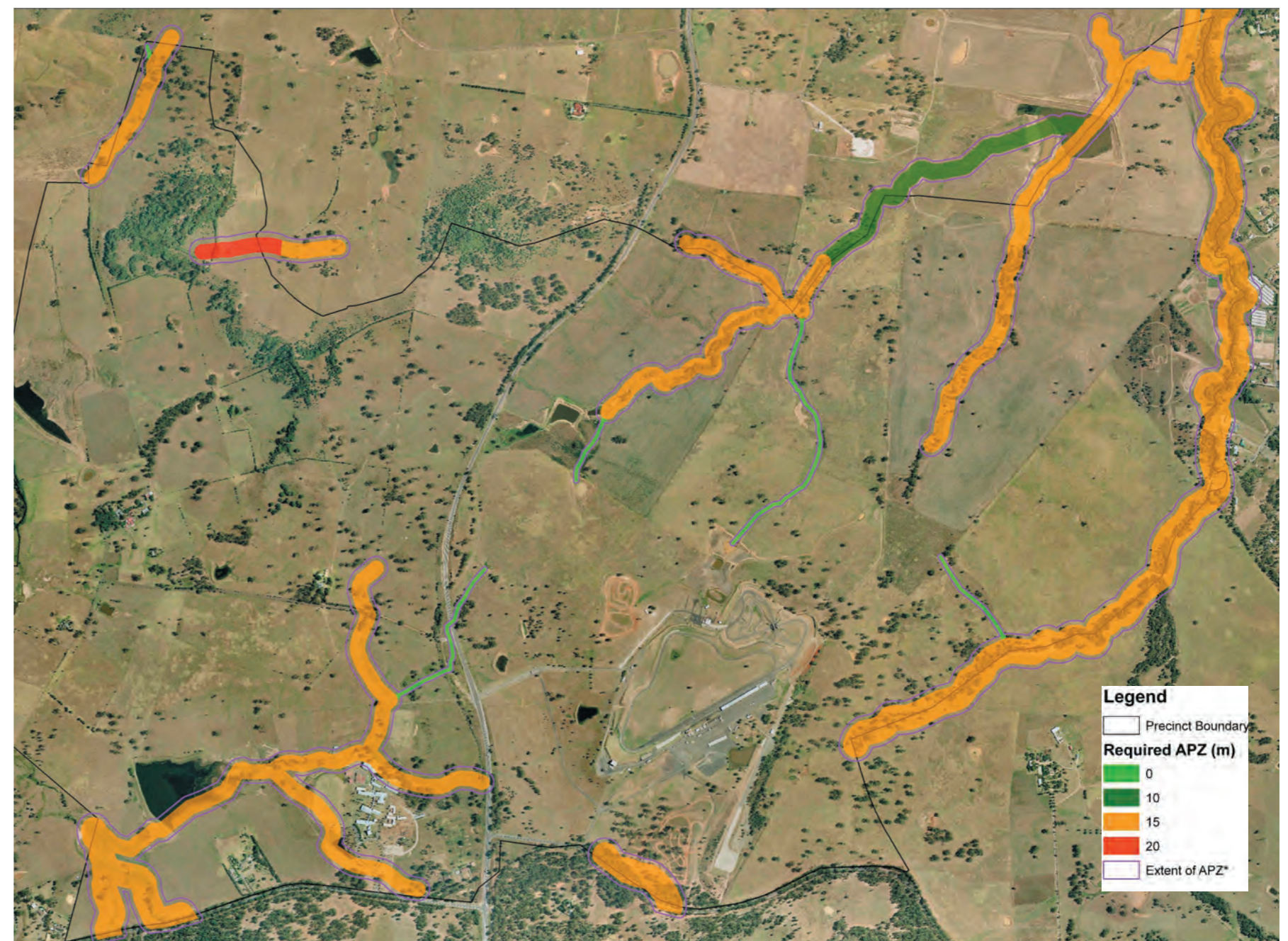


Figure 27 – Asset Protection Zones

Source: Eco Logical Australia

5.4.3 Management response

Asset Protection Zones

As shown in **Figure 27**, the bushfire risk will generally require an APZ of 15 metres for sites adjacent to future bushland, with the exception of one Category 2 riparian corridor in the northwest corner of the Precinct requiring an APZ of 20 metres. This requirement, however, could potentially be reduced by way of a performance based APZ solution. In most cases the APZs can be wholly contained within perimeter road reserves and front yard setbacks. However, for the transitional lands adjacent to the Denbigh curtilage an APZ of 10 metres in the form of perimeter road or trail will suffice as the hazard is likely to be located up slope from buildings.

Additional protection measures will be appropriate for some land uses, as follows:

- **Schools:** Require APZs more than double the width of those required for residential areas. Schools should be designed so that sports fields are located in the APZ.
- **Employment lands:** PBP 2006 generally applies. However, a perimeter road should separate employment land and adjoining vegetation.
- **Childcare facilities:** Require larger APZs and should not be placed near bushfire hazards.

Provisions for APZs will be included in the DCP in accordance with Planning for Bushfire Protection 2006.

The APZs which meet 'acceptable solution' requirements are identified below in **Table 6**. Where these minimum APZs are implemented, buildings immediately adjacent to the APZ will require construction to Level 3 of AS3959-1999. However, if lower construction standards are used, development will need special protection - meaning that APZ widths will be increased beyond those shown below.

It is noted that alternative solutions for APZs may be appropriate in some instances – particularly in order to manage land take or for reasons of design. While this is to be avoided, in these instances measures such as increasing construction standards or implementing appropriate fuel management regimes will be necessary.

Table 6 - APZ requirements

Slope (degrees)	Woodland (metres)		Forested Wetlands (metres)	
	Residential	Special Protection	Residential	Special Protection
Up slope/flat	10	40	15	50
Down slope				
>0-5	15	50	20	60
>5-10	20	60	25	75
>10-15	25	70	35	90
>15-18	30	75	45	95

Source: Eco Logical Australia from Planning for Bushfire Protection (2006)

Other management measures

With the establishment of appropriate APZs as set out in Table 6 there will be no significant risk of bushfire to the Oran Park Precinct. Nevertheless the following additional measures will be implemented in the DCP to further mitigate potential impacts:

- Where appropriate, perimeter roads or fire trails for emergency access and egress will be provided in accordance with PBP 2006.
- Neighbourhood parks and Category 3 riparian zones will be managed as 'fuel reduced' areas and no additional APZs will be necessary, provided that perimeter roads are constructed.
- Temporary APZs will need to be established around each stage of the development. This could be avoided if lots fronting the riparian interface are developed first and APZs established from the outset.
- APZs are to be located outside Core Riparian Zones.

5.5 Aboriginal cultural heritage

Aboriginal cultural heritage (ACH) refers to the historic, archaeological, social and aesthetic values of a place, object or tradition that relates to Aboriginal occupation either before or after European arrival.

The Development Code incorporates the Aboriginal Cultural Heritage Framework which sets out the processes for establishing and protecting Aboriginal cultural heritage, including protocols for how Aboriginal communities are to be involved in identifying their heritage. ACH is to be recognised and protected in consultation with the Aboriginal community and may involve high priority areas for protection, medium priority areas where impacts need to be mitigated or off-set and areas of low cultural heritage significance. Areas may also require further detailed assessment including surveys and excavations. Amongst the objectives in the GCDC for indigenous cultural heritage is that of incorporating areas of ACH into the open space network as a means of protection and conservation.

Prior to European settlement, the Camden region was occupied by various Aboriginal language groups including the Darug, Dharawal and Gundungurra people. Although these groups have not lived in the area of the Oran Park Precinct for quite some time, the Camden region was an attractive area for occupation by Aboriginal groups and thus the potential for further discovery of archaeological artefacts is high. Accordingly, a Stage 2 cultural heritage investigation of the Precinct was undertaken (located at **Appendix H**).

The investigation took into account the statutory requirements of the *National Parks and Wildlife Act 1974* (as amended), the objectives of the GCDC and the Aboriginal Cultural Heritage Framework.

5.5.1 Existing conditions

Accounts of early settlers indicate that several Aboriginal groups lived in the Camden area and that a number of corroborees were held on the Denbigh Property, overlooking Cobbitty Creek.

Most of the over 4,000 archaeological sites recorded on the Cumberland Plain are open artefact scatters. Previous specialist investigations in the Cumberland Plain area have found that the primary determinant for Aboriginal open site locations is proximity to water, while ridge top locations between drainage lines may also contain limited archaeological evidence. As the Oran Park Precinct is located at the head waters of South Creek (a third order stream) and contains ridge features, it has the potential to contain Aboriginal archaeological artefacts.

Based on previous work in the region and using general stream order models, the Aboriginal Heritage Study predicted that the location of archaeological features within the Precinct would vary according to gross geomorphic factors and proximity to water. It was further predicted that land used for agriculture would be in the least disturbed condition and thus the most likely area where Aboriginal sites would have survived. Land that had been used for public purposes, such as the Raceway, was classified as having moderate potential for containing intact deposits, while rural residential land was classified as having the lowest potential.

5.5.2 Impacts and assessment

A surface survey across the Precinct has identified that there is extensive archaeological evidence for indigenous use of these landscapes prior to and at European contact. The sites identified during the survey and areas of ground-truthed sensitivity are shown in **Figure 28**. Land within Zone 1 (shown in yellow and approximately 163 hectares in area) was nominated as having the highest potential for containing intact archaeological deposit. It should be noted that at the time of field surveys, the proposed changes to the precinct boundary had not been finalised. Further survey work may therefore be required in the areas proposed to be included in the Oran Park Precinct.

During the survey of the Precinct, 44 sites and four potential archaeological deposits (PAD) were recorded. A range of sites were encountered across the Precinct, including open lithic scatters, isolated surface finds, scarred trees and flaked glass artefacts. Sites were recorded on less than 50% of the exposures encountered and appear to be primarily concentrated in proximity to higher order creeks and at the junction of lower order tributaries. Fifteen identified sites and the four PADS are located within the Zone 1 areas as shown in yellow in **Figure 29**. Zone 1 has good potential for intact archaeological evidence (see **Table 7**).

No areas within the Precinct were identified as having very high or high archaeological potential. However, a significant proportion of land was assessed as having good archaeological potential, mostly within the Denbigh curtilage and to a lesser extent in the riparian corridors. As these areas will not be subject to a high level of development, they provide the opportunity to achieve a meaningful indigenous outcome within the Precinct.

Table 7: Management zones and outcomes

Management Zone	Archaeological sensitivity	Management outcome
Zone 1	Good potential for intact archaeological evidence	Conservation zone (CZ) to be selected from this zone. Remainder to be developable, but may require salvage of representative landscapes.
Zone 2	Moderate potential for intact archaeological evidence	Developable land. Some salvage of representative landscape units not in Zone 1 may be required.
Zone 3	Low potential for intact archaeological evidence	Developable land with no constraints – no further archaeological work required.
Zone 4	No potential for intact archaeological evidence	Developable land with no constraints – no further archaeological work required. Clearances not technically required for these lands as likelihood of relics surviving here is so low.

Source: Jo McDonald Cultural Heritage Management

5.5.3 Management response

A Conservation Management Strategy (CMS) is to be applied to the Oran Park Precinct with the aim of conserving a representative sample of intact archaeological landscapes.

Four management zones were defined within the Oran Park Precinct, ranging from Good Archaeological potential (Zone 1) to No Archaeological sensitivity (Zone 4). A Conservation Zone - representative of an intact landscape - is to be selected from Zone 1 lands, and it is foreseen that, once identified, no development or archaeological investigation would occur within this area.

Generally a desired conservation outcome would be between 5-10% of the development area, although there is no standard currently applied by DEC in Western Sydney. (See Appendix H for the selection criteria for suitable landscapes as conservation areas). Approximately 163 hectares of land within the Oran Park Precinct has been identified as falling in Zone 1 representing around 7% of the total land area from the Precinct which is within the above standard.

Within the Zone 1 landscapes, four PAD sites were nominated. It is recommended that a conservation outcome for the Oran Park Precinct should focus on the ridge tops surrounding the Denbigh homestead (PAD-OP4).

However, the three other Zone 1 landscapes (PAD-OP1, PAD-OP2 and PAD-OP3) also offer landscapes with potential conservation value. All four PAD sites should be further investigated to determine the appropriate representative conservation zones.

Specifically, the Zone 1 ridge slopes, hills and ridgelines within the Denbigh land (about 60% of PAD-OP4) will provide a suitable Conservation Zone, and the riparian corridors associated with the two defined PADs to the north of the Precinct (PAD-OP1 and PAD-OP3) will provide representative riparian land forms. PAD-OP2 was also identified as a representative riparian land form. However, given that the two northern PADs provide the same representation and could be connected, they are considered to provide adequate representation. The riparian corridors also facilitate a Conservation Zone and are to be conserved as Category 1 and 2 Core Riparian Zones as described in Section 5.3.3 of this report. This approach is consistent with the objectives in the GCDC of incorporating areas of ACH into the open space network as a means of protection and conservation.

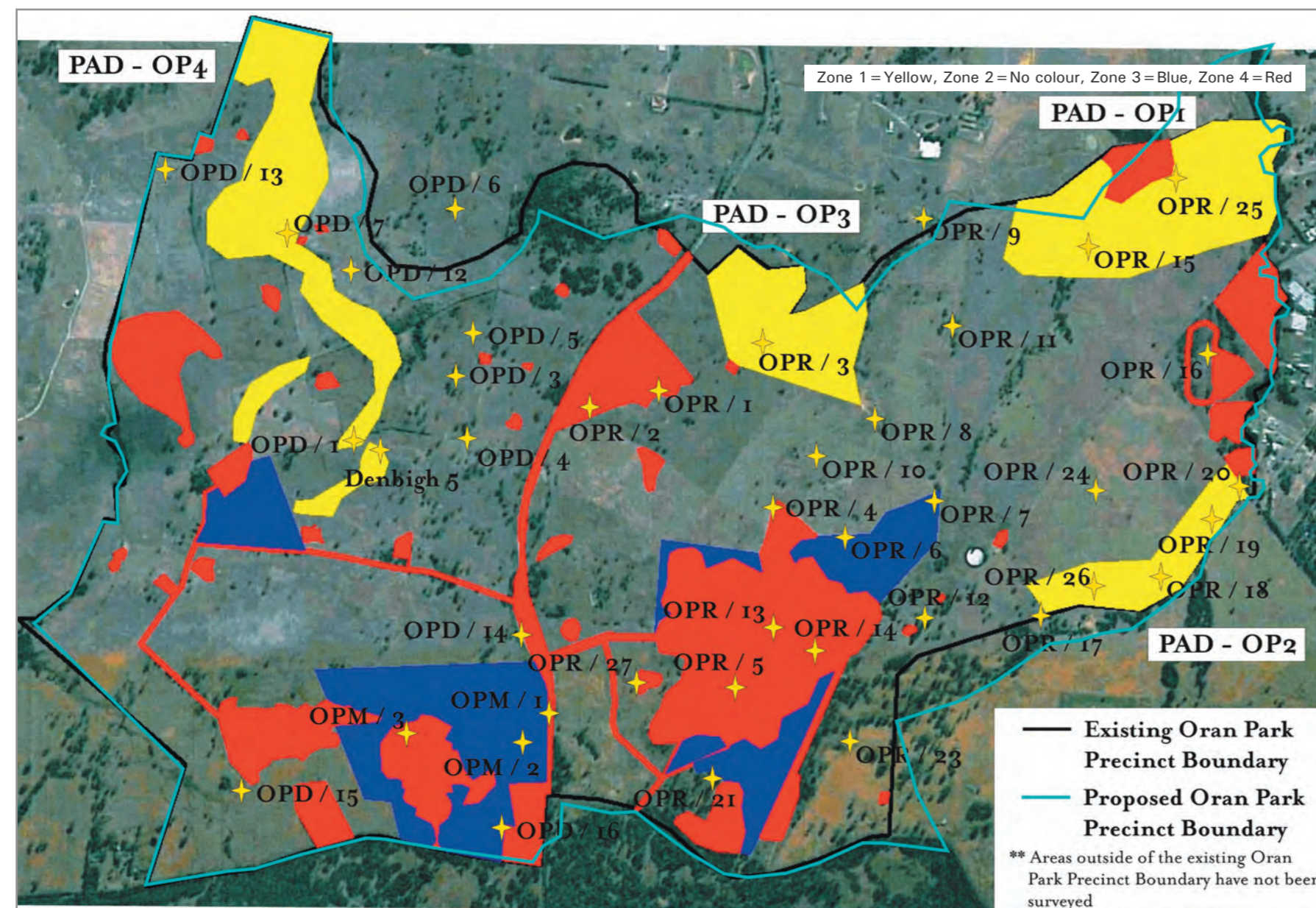


Figure 28 – Potential Aboriginal Heritage

Source: Jo McDonald Cultural Heritage Management

Of the four PADs nominated, it is considered that the Denbigh Homestead provides the best opportunity for an indigenous heritage outcome – and that this should be explicitly identified as part of the Management Strategy. While this property will remain a working farm, it is currently managed for its heritage values and could similarly be managed for its indigenous values (with focus particularly on the Zone 1 lands).

Together, the combined ridge slopes and riparian corridors will provide the necessary representative land forms, and a Plan of Management will ensure appropriate protection and management of archaeological and cultural values within the Conservation Zones.

The land falling within the Zone 1 areas but outside of the defined conservation area will all be deemed developable. However, where they will be impacted by development, a program of archaeological salvage excavation will be required prior to their destruction. Management principles will guide the selection of areas for salvage in accordance with current best practice (i.e. sampling a defined area usually around 6 hectares in size and achieving open area excavation in the order of 100 metres squared). Recommendations for specific areas of salvage will be made once the Conservation Zones have been identified.

The salvage of Zone 1 lands will provide archaeological evidence and context for conservation areas and mitigation against the destruction by development of the 21 identified surface sites from the 1,145 hectare development area.

Once the conservation areas have been identified, development impacts finalised and locations chosen for salvage, a ‘whole of development’ Section 90 consent can be sought from DEC for the Oran Park Precinct in accordance with the GCDC.

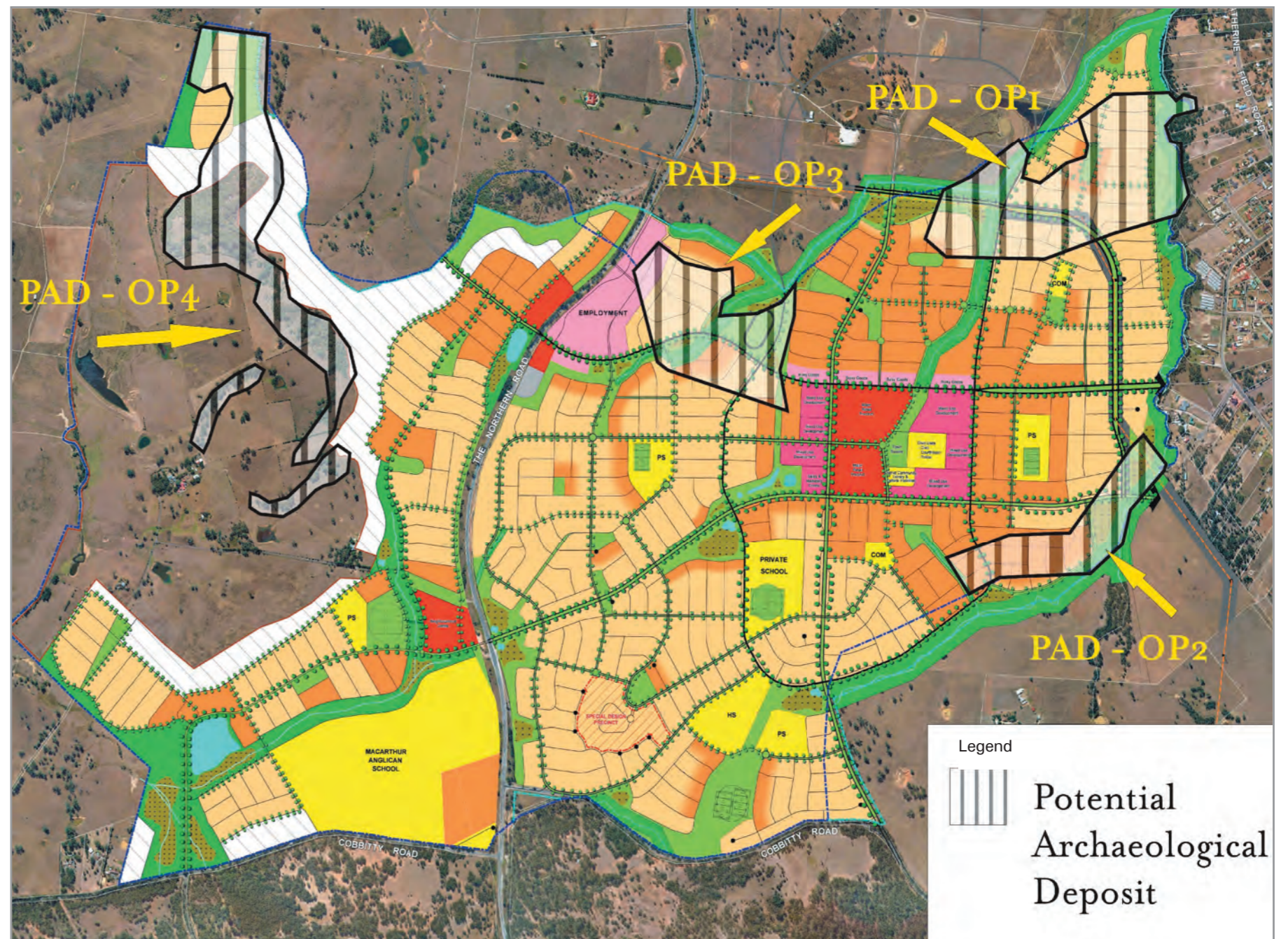


Figure 29 – PAD Sites

Source: Jo McDonald Cultural Heritage Management

Further discussion is required with Aboriginal stakeholders to develop an indigenous heritage strategy for the Oran Park Precinct. The stakeholders involved in the consultation process will provide individual reports on the cultural significance of the sites and landscapes within the Precinct. These cultural significance assessments should be taken into consideration in conjunction with the scientific significance of the landscapes when developing a conservation outcome.

5.6 Non-indigenous cultural heritage

Europeans have occupied the Camden area since the early 1800s as its geology, microclimate and proximity to the Nepean River make it ideal farming country. Accordingly, the Oran Park Precinct has a long history of agricultural use. More recently the Precinct became the home to Oran Park Raceway, which has played an important role in international, national and local motor racing events.

The GCDC requires that precinct planning respects cultural heritage. Given the historical importance of the Precinct, the GCC commissioned a Heritage Assessment of the Precinct (see **Appendix I**). The aim of the assessment was to identify and describe the heritage values within the

Precinct, review existing documentation for identified heritage items and recommend appropriate measures to ensure a comprehensive and co-ordinated approach to protecting and integrating heritage assets in the draft ILP.

5.6.1 Existing conditions

Denbigh

The Denbigh Estate is located on the western side of the Precinct and is the only item within the Oran Park Precinct that is listed on the State Heritage Register (SHR). It is also listed on the Register of the National Estate, in the Camden LEP and on the NSW National Trust Register. Denbigh is considered to be of State heritage significance as it is an intact example of a continuously functioning early farm complex on its original 1812 land grant. The heritage item consists of a 'rare and remarkable' group of dwellings, early farm buildings and associated plantings with characteristics of the Loudon model of homestead, and is sited within an intact rural landscape setting that is fundamental to its interpretation.

There are three dwellings on the property: Denbigh, Bangor and Cluny Hill. While Denbigh is the most significant, all three are located within the heritage curtilage of the estate and are linked by a gravel driveway that enters the site from The Northern Road, as shown in **Figure 30** and **31**. The Denbigh Estate is possibly the most extensive and intact collection of early farm buildings in the Cumberland/Camden region and is of cultural, social, scientific and aesthetic significance.

Denbigh is of cultural significance as it was an early contact point for Aboriginal and European culture.



Figure 30 – Heritage features

Source: Godden Mackay Logan and Jackson Teece



Figure 31 – Denbigh Driveway

Source: Godden Mackay Logan

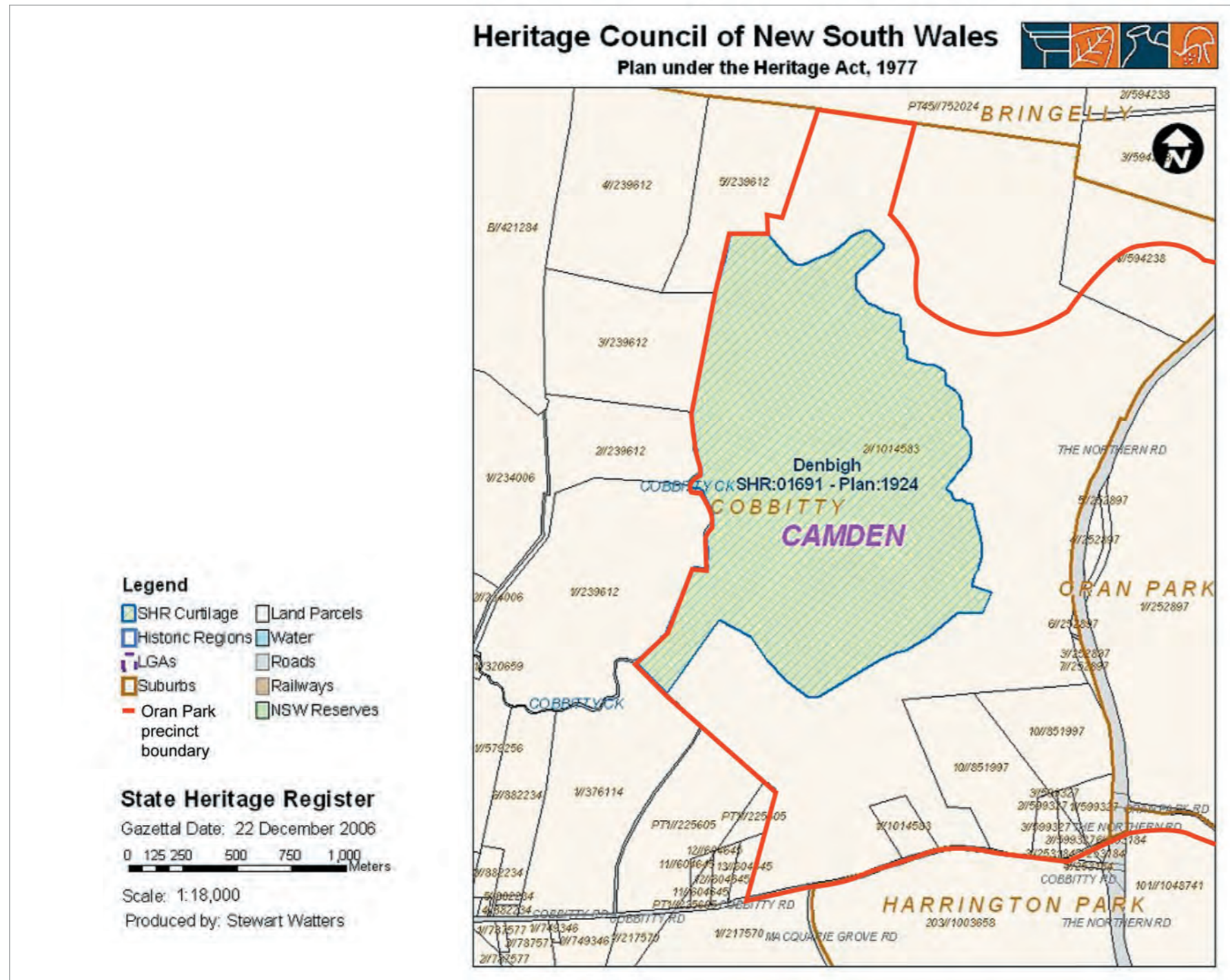


Figure 32 – State Heritage Register

Source: Heritage Council of NSW

The site is of social significance due to its various landowners over the years. Denbigh was originally granted to Charles Hook in 1812. Thomas Hassall, a pioneering Anglican minister, was the next landowner. Hassall made few changes to the estate, but was responsible for the introduction of a private road from the estate to Cobbitty Road. Hassall had a strong association with the early Heber Chapel and township of Cobbitty, thus giving Denbigh associative significance.

Following Hassall’s death in 1868 Andrew McIntosh and his family leased the Denbigh Estate and lived in the quarters attached to the coach house whilst the Denbigh Homestead continued to be occupied by Hassall’s family. It was not until 1886 that McIntosh’s sons purchased the Denbigh Estate and took occupation of the homestead. The McIntosh family subsequently purchased the adjoining properties of Sand Hill and Oak Flat in 1910 and continue to occupy the estate today.

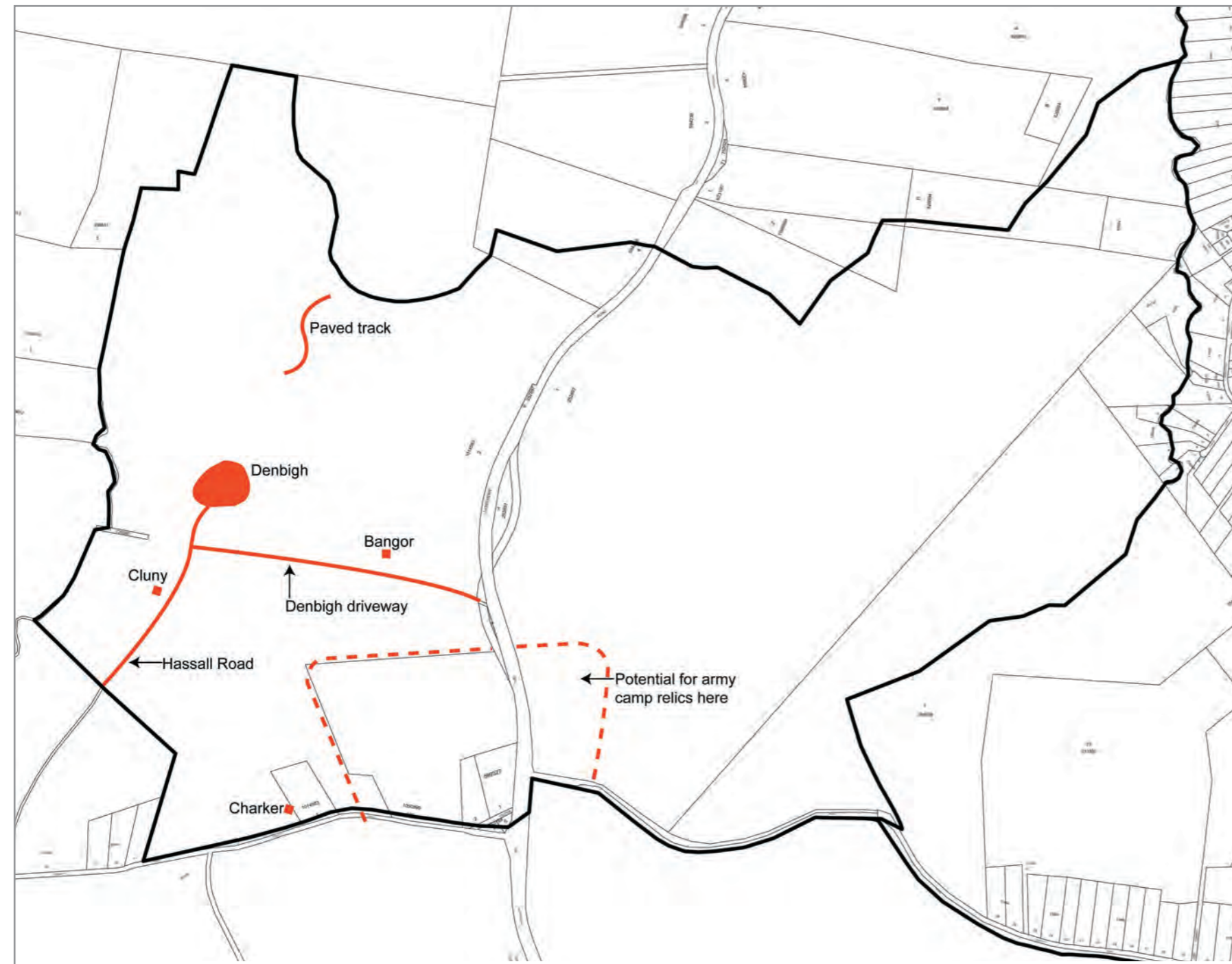
The Denbigh Estate also has the potential to be of scientific significance. As few changes have been made to the land, the Denbigh Homestead has become a rare example of an intact colonial farm complex with the potential to reveal, through archaeological relics, items of scientific significance such as evidence of early European farming practices and Aboriginal occupation.

Denbigh also has high aesthetic significance due to its unique valley setting largely uninterrupted by inappropriate intrusions. The ridgelines running through the middle of the estate create a bowl shape valley, providing the estate with a private setting. The ridgeline defines the curtilage of the setting and provides significant views towards the homestead and the surrounding landscape as far away as the Blue Mountains. Views towards Denbigh are dominated by the topography of its setting and the densely wooded areas which both conceal and frame it.

To protect the heritage and historical values of the Denbigh Homestead Complex a heritage curtilage to the property was listed in the State Heritage Register on 22 December 2006 (see Figure 32). The area encompassed within the curtilage is characterised by its closed setting in the valley when viewed from the ridges to the east, north and west. Gently undulating and open pastoral/grazing land to the south and southwest further contribute to the setting of the homestead. The curtilage of the property adds to the significance of the heritage item and strengthens the pastoral and agricultural nature of the homestead.

Narellan Camp

During World War II, a military facility known as Narellan Camp, occupied the four points of the intersection of Cobbitty Road and The Northern Road - the extent of which is shown in Figure 33. During its occupation, the camp was used as a training facility for the Eastern Area Command and other units. The whole facility was removed when the war ended, leaving only areas of bitumen and concrete. The area is of scientific significance as it has a high potential to contain relics such as bunkers, bomb shelters and gun placements.



Oran Park Raceway

The Oran Park Racing Circuit was established by the Singer Car Club in 1962 and is located along Cobbitty Road east of The Northern Road. Originally the raceway consisted of one circuit only (now known as the South Circuit) but in 1970 an additional circuit (known as the North Circuit) was built in preparation for the Australian Grand Prix.

While not a listed heritage item, the Raceway has potential social significance because of its history of hosting major national racing events, including the Australian Grand Prix, the Australian Touring Car Championship, the annual Toby Lee Trophy, and the biggest series in Australian Motor Sport in the 1980s, the Grand Final Round of the Shell Australian Touring Car Championship. Since the 1990s, race meetings for both V8 Super Cars and Super Trucks have been held at the Raceway and continue to be so today.

Oran Park House

Oran Park House is located outside of the Oran Park Precinct, however the Precinct boundary encroaches upon its proposed heritage curtilage. Oran Park House is listed as a heritage item in the Camden LEP and has been recommended by the Heritage Council of NSW for inclusion on the SHR. It is likely to be of State significance as a significant intact cultural landscape of the Cumberland Plain dating from 1815. The estate includes a house, outbuildings, associated farms structures, pastureland and plantings that have historic, social and scientific/research significance.

Netherbyres and Charker

An 1840 plan records six properties created on the subdivision of 'Netherbyres', on the eastern side of The Northern Road and Cobbitty Road. Although aerial photographs from 1947 do not show any farm houses or other buildings on these lots, it is reasonable to assume that some accommodated farm structures at some time between 1840 and 1947 and thus would have the potential to accommodate archaeological relics.

Also on the 1840 plan is a property with a house called 'Charker', a short distance west of the intersection of The Northern Road. There is a house positioned on the property today, although it appears to be a later structure. There is, however, potential for archaeological relics of the original house to remain.

Figure 33 – Locations with potential archaeological resources

Source: Godden Mackay Logan

5.6.2 Impacts and assessment

Based on an assessment of the draft ILP, the following potential impacts of the draft ILP on the heritage values of the Precinct were identified.

Potential archaeological resources

There is some potential for the survival of historical archaeological relics within the Precinct at Denbigh, Bangor and Cluny Hill, other homesteads, farm houses/building and the Narellan Camp. Development for urban purposes could disturb potential archaeological relics that could provide evidence of:

- pre-settlement landscape and the landscape soon after settlement;
- early agriculture and stock handling activity; and
- nineteenth and early twentieth century domestic occupation.

Where relics exist they would most likely be concentrated around former habitations and along historic roadways. Areas with high potential for archaeological relics are shown at **Figure 33**.

Denbigh Homestead and associated landscape

The layout of the draft ILP provides for the conservation of the Denbigh colonial landscape, preserving over 200 hectares of land. The configuration and size of the SHR curtilage is sufficiently large to allow protection of remnants of the pastoral landscape, auxiliary buildings of value, key view lines and plantings.

Despite this, the Heritage Assessment has identified three areas where the development footprint of the draft ILP impacts on view corridors leading to and from Denbigh as discussed below.

- **Former Hassall Road landscape corridor:** The draft ILP's proposed 'Hassall Road' landscape corridor to the southwest of the SHR curtilage boundary narrows at its southern edge and is cut off from the remainder of the former Hassall Road by low density residential development as it runs southwest towards Cobbitty Road. This could impede the visual connection with the remainder of the former Hassall Road and compromise interpretation of this significant landscape element.
- **Visual links from Cobbitty Road looking towards the Denbigh Estate:** The proposed southern-most medium density housing area located around the Southern Boulevard West, close to the southern boundary of the SHR curtilage, could obscure or compromise the view line from Cobbitty Road into the heritage setting.
- **Driveway from The Northern Road (east of Bangor):** The intimate views from the original entrance drive to the Denbigh Homestead site are important to its rural landscape character. The draft ILP shows the retention of the original road alignment. However, proposed medium density residential development to the north of the original entrance drive could compromise the rural landscape character of this part of the driveway and the approach to the homestead.

The Northern Road

The rural character of The Northern Road and the vistas through to historic properties and surrounding farmlands are of potential significance. The proposed landscape buffers provided to the west of The Northern Road and in part to the east, ensure that the rural character of this historical access route is retained. However, the low density residential development to the east of The Northern Road, located between the Southern Boulevard and the East-West Road has the potential to impact upon the rural landscape character of The Northern Road.

Oran Park Raceway

The Oran Park Raceway is to be demolished. The draft ILP interprets the social significance and former use of the location for motor racing by retaining part of the alignment of the track.

Oran Park House and associated landscape

There will not be any adverse impacts on the significance of Oran Park House and its associated landscape. As the riparian corridor between the Oran Park Precinct and Oran Park House will be revegetated, any views of new development will be obscured. Views towards Oran Park House will be retained due to the realignment of Cobbitty Road.

5.6.3 Management response

In response to the issues raised, the Heritage Assessment has recommended a range of measures to address the heritage values of the Precinct. These are summarized in this section. Development controls in relation to setbacks, building height and the management of archaeological relics are included in the Oran Park DCP.

Potential archaeological resources

Areas of potential archaeological significance have been identified and mapped. The map and specific controls have been included within the DCP which requires that further investigation be carried out in these areas in accordance with the NSW Heritage Manual and provisions of the *Heritage Act 1977*.

Denbigh Homestead and associated landscape

A number of changes to the draft ILP are discussed below, to protect the surviving views and landmark qualities of Denbigh. These are consistent with measures to protect the landscape qualities of the Precinct covered in **Section 5.1**.

- **Former Hassall Road landscape corridor:** To ensure an unimpeded visual connection with the remainder of the former Hassall Road and to retain an historic connection with the homestead site, the proposed 'Hassall Road' landscape corridor should be extended and widened up to the southern boundary of the Precinct. This will provide for interpretation of the former road by maintaining a visual link with the remainder of the former Hassall Road.

A provision is included within the DCP requiring a view corridor along the alignment of the former Hassall Road.

- **Visual links from Cobbitty Road looking towards the Denbigh Estate:** To ensure that an historic visual connection with the heritage setting is retained, it was suggested that an area of open space replace the proposed medium density development to the south of the SHR curtilage and that height and setback controls be developed to protect the visual link.

The draft ILP provides an extensive area of open space in this location and the land take from further provision would impact on density goals. Moreover, the view from Cobbitty Road is likely to be compromised as a result of proposed earthworks and landscaping as required by the SHR to reinforce the rural setting and minimise the impact of urban development on Denbigh. Accordingly, no action is required.

- **Driveway from The Northern Road (east of Bangor):** In recognition of the importance of the rural landscape character on the original Denbigh Homestead entrance drive a landscape buffer zone is provided on the southern side of the original entrance road alignment. This is considered satisfactory without resulting in greater land take.

In keeping with the principle of placing higher density in locations of greater amenity, medium density development in this location is appropriate as it is close to open space and a neighbourhood centre. The placement of a wide vegetated setback is considered adequate to overcome any potential impact medium density might have on the character of this historic landscape and as such amendments to the draft ILP are not considered necessary.

A provision requiring a wide landscaped setback along this alignment is incorporated in the DCP.

The Northern Road

It is recognised that The Northern Road will traverse an urban environment and retaining its rural character is not entirely feasible. However, as the rural character of The Northern Road and the vistas through to historic properties are of potential heritage significance, a landscape buffer to the east of The Northern Road between the proposed Southern Boulevard and the electricity substation will be incorporated into the draft ILP, thereby protecting the character of the road and integrating the landscaped acoustic mound wall proposed in **Section 5.8**. This has been addressed in the DCP.

Oran Park Raceway

The design of the draft ILP recognises the potential social significance of the Raceway by retaining the alignment of part of the former track as roads. There will be further potential for interpretation through naming streets and special places, such as parks after motor racing identities.

5.7 Water cycle management

Urban development increases the impervious proportions of catchments, leading to increases in the frequency, volume and magnitude of stormwater flows. This can result in erosion of streams and increased pollutants being washed into local waterways unless water cycle management measures are introduced.

It is an objective of the GCDC to ensure that any future development within the Growth Centres incorporates stormwater management and water sensitive urban design (WSUD) principles which mitigate these adverse environmental impacts.

In order to achieve this objective, specialists were commissioned to provide advice on flooding and stormwater quantity and quality management (**Appendix D**), leading to a WSUD Strategy for the Oran Park Precinct (**Appendix E**).

5.7.1 Flooding

Existing Conditions

The eastern side of Oran Park with a combined catchment area of 608 hectares comprises three major tributaries that discharge into South Creek. In addition to these tributaries, approximately 120 hectares of land front and drain directly to South Creek. A further 64.9 hectares of land drains west under The Northern Road and into the Nepean River catchment. The average catchment slope on this side of the Precinct ranges between 1% and 4%.

On the western side of the Precinct the majority of the catchments drain into the Nepean River, via Cobbitty Creek although there is one catchment in the north which drains to South Creek. Approximately 214.7 hectares of the western side of the Precinct drain to the large existing dam located in the southwest corner.

The catchments within the Oran Park Precinct are shown in **Figure 34**.

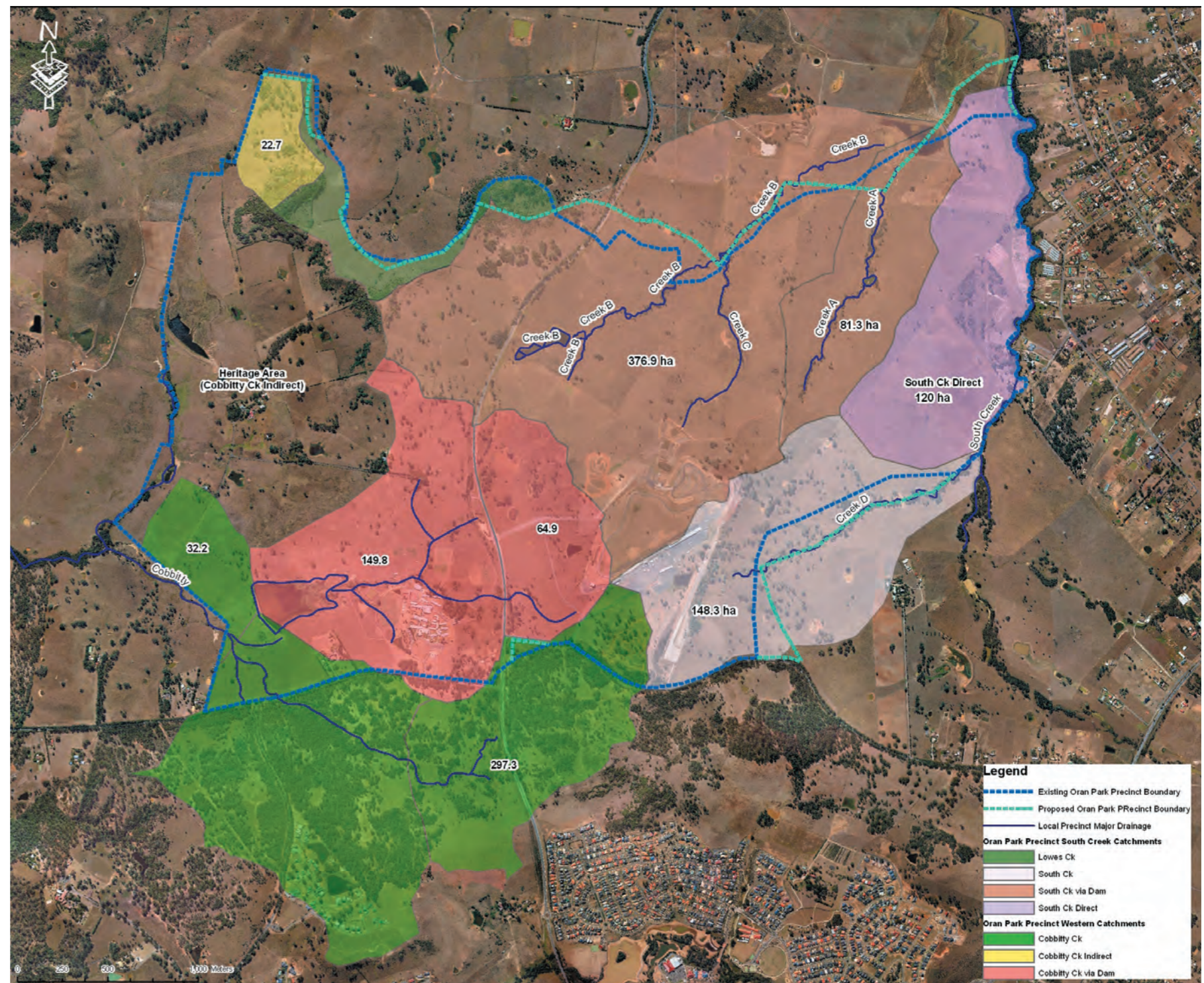
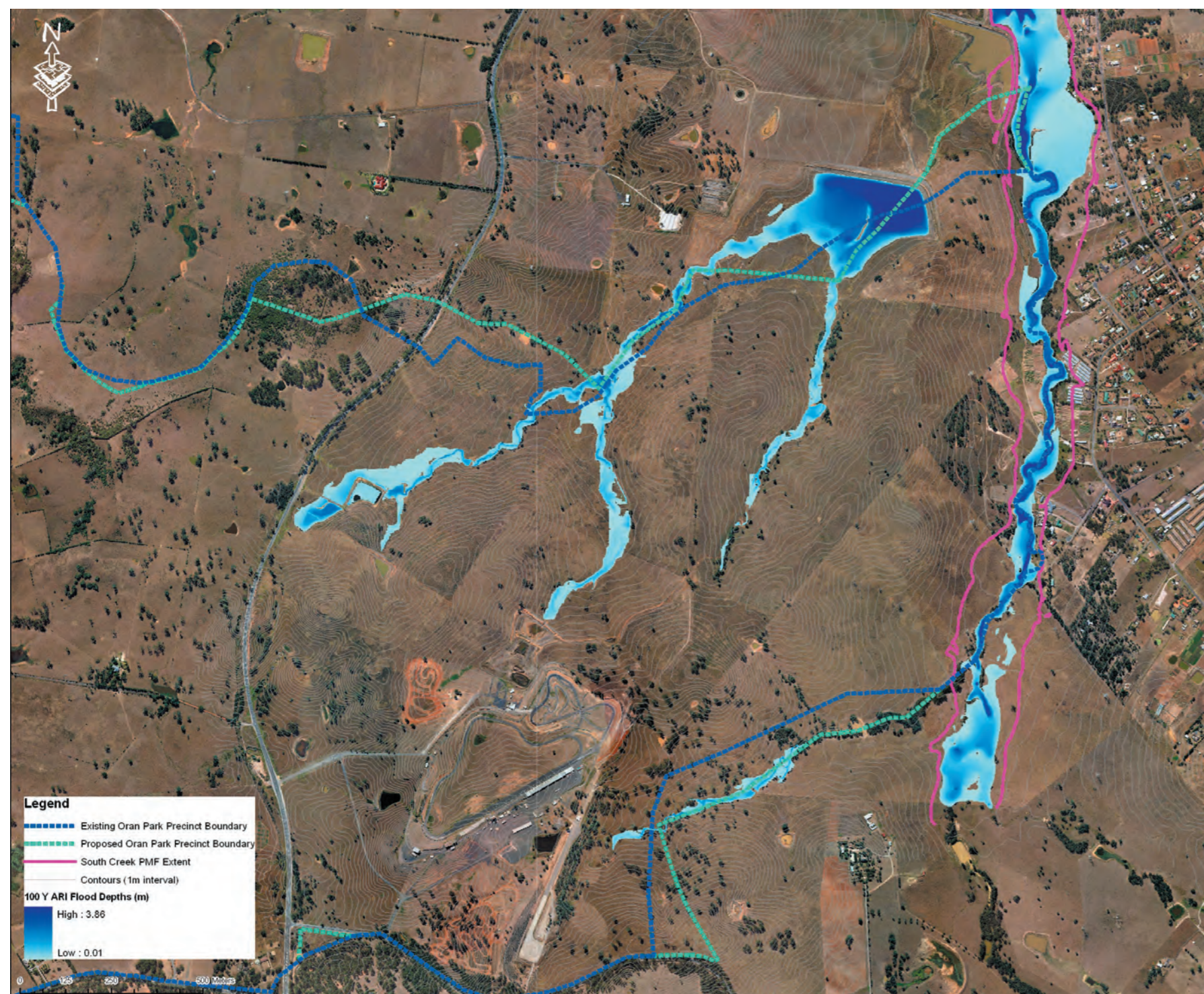


Figure 34 – Local Creek Catchments

Source: Brown Consulting



Impacts and assessment

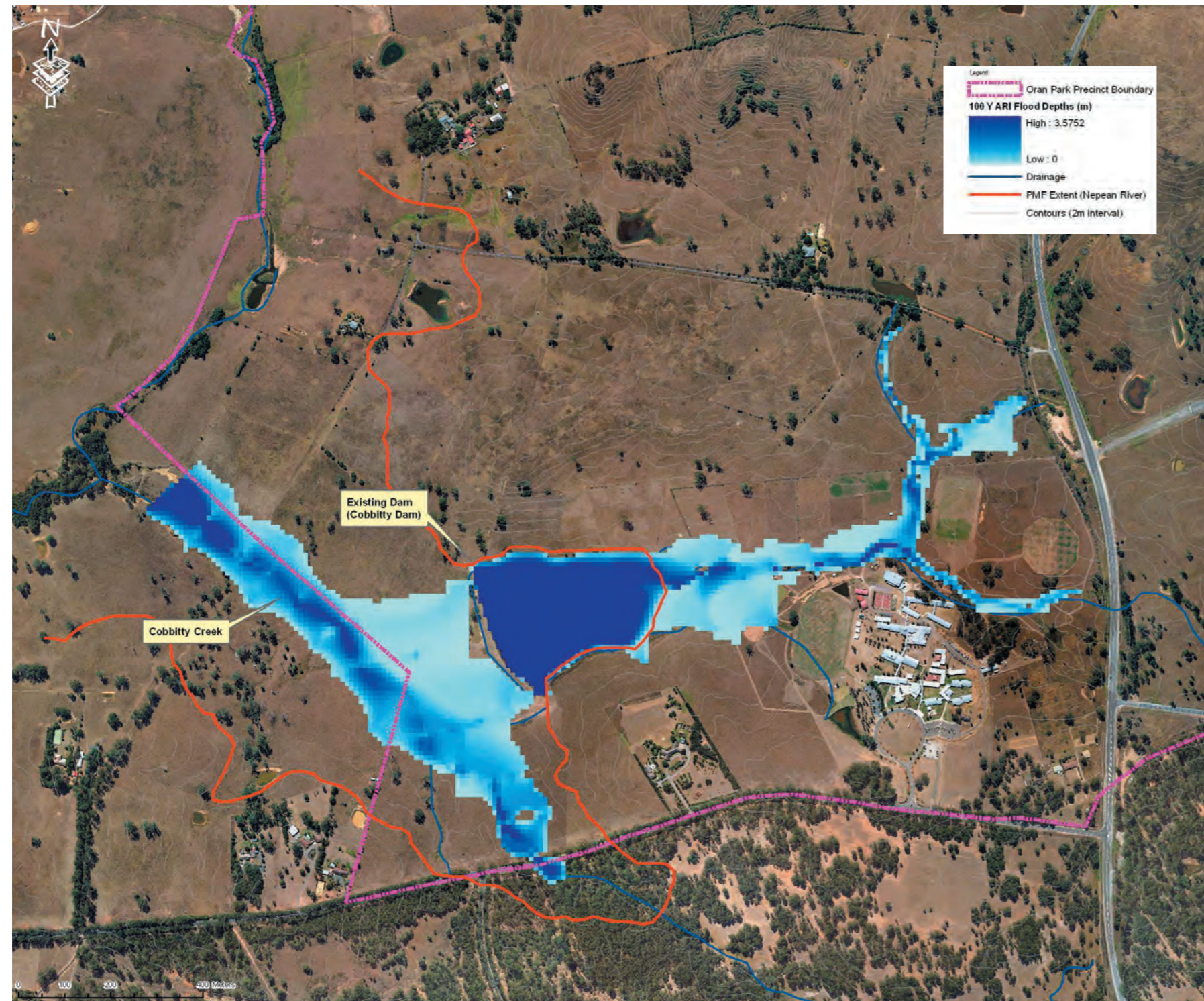
The hydraulic modelling for the existing situation indicated that the peak 100 year Average Recurrence Interval (ARI) flood level for South Creek varies from 82.68 metres AHD at the upstream southern boundary of the Precinct to 72.92 metres AHD at the downstream northern boundary. The existing 100 year ARI flood depth and the Probable Maximum Flood (PMF) extent in the east of the Precinct is shown in **Figure 35**. The modelled results for the developed scenario showed a maximum increase in flood level for the proposed 100 Year ARI storm event of 0.42 metres.

The hydraulic modelling results for Cobbitty Creek show that the existing peak 100 Year ARI flood level varies from 72.92m AHD at the upstream boundary to 66.51m AHD at the downstream boundary of the Oran Park Precinct. The existing 100 year ARI flood depth and the Probable Maximum Flood (PMF) in the western side of the Precinct is shown in **Figure 36**.

The large farm dam within the western side of the Precinct will be modified by being reduced in size and relocated away from the natural creek line. All other dams will be removed. This will re-instate the flood extent along the creeks line to more natural levels. As can be seen from **Figure 36**, the existing farm dam causes flood lines, to be greater than those along natural creek lines as the height of dams walls result in greater ponding of water.

Figure 35 – ARI flood depth and PMF extent for the eastern side of the Precinct

Source: Brown Consulting



The majority of the east of the Oran Park Precinct is not flood prone, and therefore the issue of flood evacuation does not significantly affect urban design as areas along South Creek within the flood fringe (PMF) are proposed to be filled.

Within the west of the Precinct, the Regional PMF from the Nepean River extends into the proposed development footprint. A flood evacuation plan will be required as part of the future development application process. It is noted however that this PMF extent is digitised from the Camden Flood Study and requires further verification.

Proposed lot and habitable floor levels would at a minimum conform to Camden Council requirements, with the habitable floor levels being 600mm above the 100 Year ARI flood levels throughout the Precinct.

Management response

The floor level of development fronting South Creek should be at least 600mm above the 100 year ARI flood level. The level of flood immunity for development around the dam in the south-west is to be the greater of either the 100 year ARI with a 600mm freeboard or the 500 year ARI flood level to account for any uncertainty in climatic conditions.

Further modelling needs to be carried out on the western side of the Precinct as part of the proposed regional flood study and for development application purposes to determine the extent of change to flood levels as a result of modifying the dam in relation to the natural creek line.

Figure 36 – ARI flood depth and PMF for Cobbitty Creek

Source: Brown Consulting

5.7.2 Stormwater

Existing Conditions

The main stormwater features present on the site are firstly, two existing drainage lines that convey stormwater flows from the eastern side of the Precinct to the large existing dam on the western side of the Precinct; secondly, Cobbitty Creek which runs along the southern boundary of the Precinct; and thirdly, South Creek and its tributaries which drain to the eastern side of the Precinct.

The modelling indicates that without stormwater detention, the development of the Oran Park Precinct would significantly increase by more than 150% the peak flow from the catchment.

Impacts and assessment

Without stormwater management measures, development has the potential to affect the existing hydrology of the Precinct and downstream areas with the following potential impacts on stormwater quantity:

- Increase in bank forming flows – as a result of increased impervious areas and a quicker catchment response time, leading to increased erosion potential of existing tributaries on South Creek.
- Increase in peak flows to South Creek and Cobbitty Creek resulting in increases in flood levels downstream of the Oran Park Precinct.
- Impediments to flow of creek crossings – the two proposed crossings of South Creek could lead to afflux at those structures, thereby increasing the flood level of South Creek and affecting flood planning levels of adjacent development.

To avoid these potential impacts, stormwater detention measures with the following storage capacity is required:

- Oran Park East – 242,600m³
- Oran Park West – 66,300m³.

Management response

A 'minor' and 'major' drainage system is recommended to manage local runoff. This typically allows safe passage of flood flows along the road once drainage pipe capacity is exceeded. Flows are also accommodated in the riparian corridors where riparian buffers are located.

The stormwater quantity management strategy for Oran Park is shown in **Figures 37** and **38**. The specific objectives include:

- Management of 'minor' flows using piped systems for the 5 year ARI (residential landuse) and 10 year ARI (commercial landuse) as per Camden Council's Development Guidelines.
- Management of 'major' flows using dedicated overland flow paths such as open space areas, roads and riparian corridors for all flows in excess of the 5 year ARI.
- Where practically possible, attenuating up to the 2 year ARI peak flow

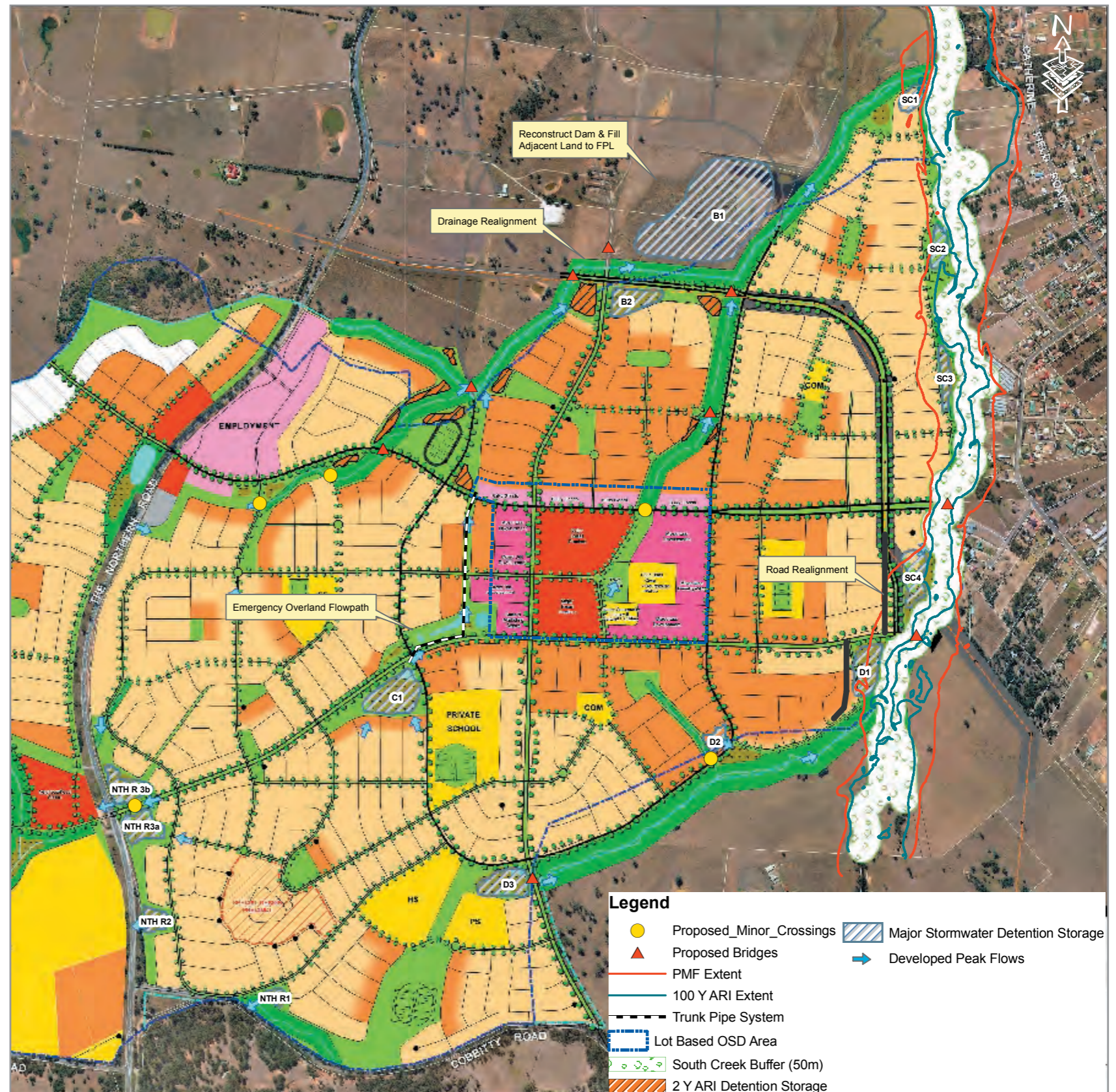


Figure 37 – Proposed stormwater quantity management strategy for Oran Park East

Source: Brown Consulting

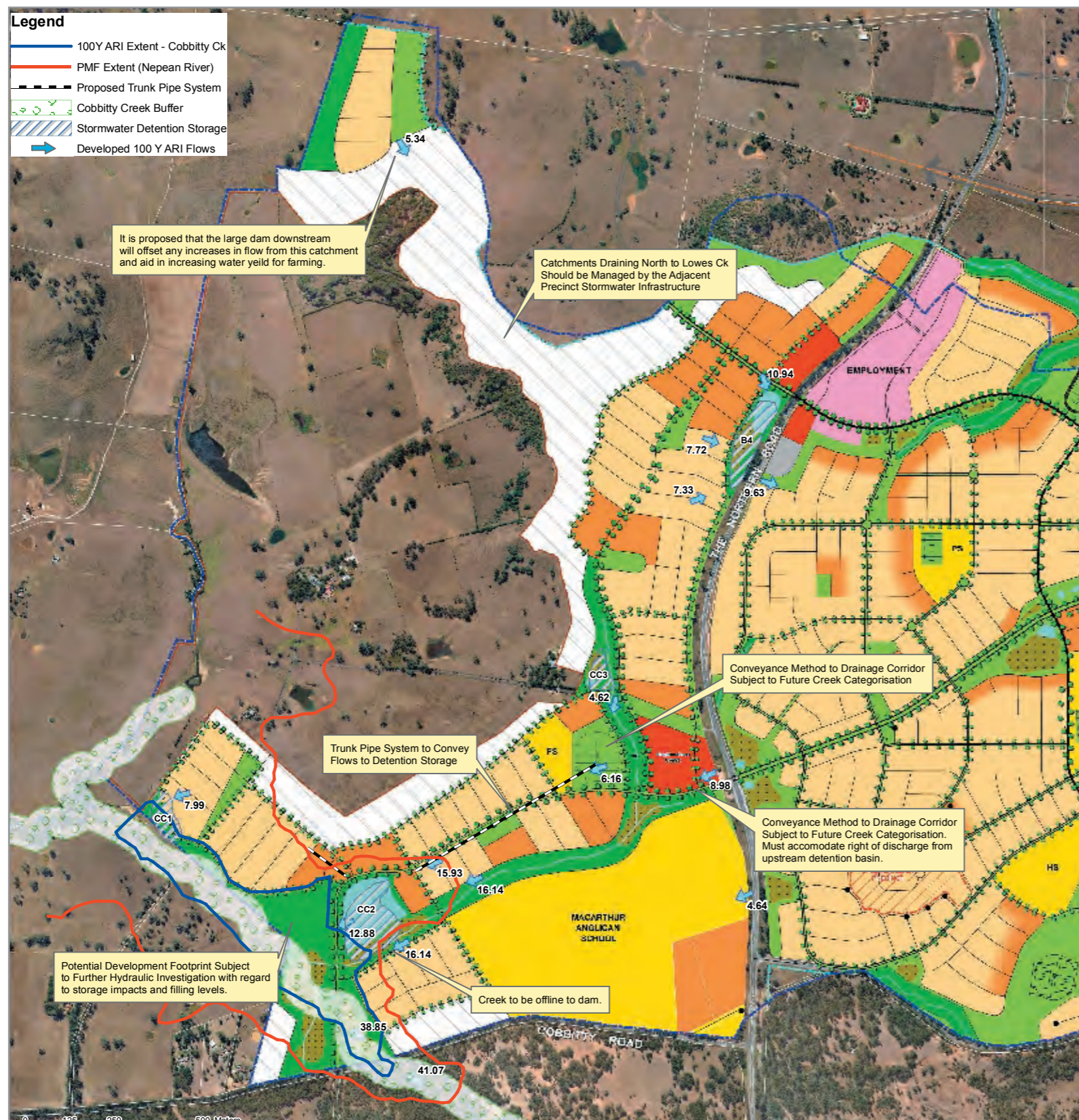


Figure 38– Proposed stormwater quantity management strategy for Oran Park West

Source: Brown Consulting

for discharges into Category 1 and 2 creeks. This will be achieved using detention storage within water quality features and detention basins.

- Facilitation of stormwater retention including the use of rainwater tanks and other water quality improvement features.
- Integration of stormwater quality and stormwater quantity management techniques.
- Provision of appropriate infrastructure to enable conveyance of 100 year ARI flows off the development to proposed detention storages.

5.7.3 Water Sensitive Urban Design

With the exception of South Creek, waterways across the Precinct are ephemeral receiving flows only after periods of moderate to heavy rainfall. Category 1, 2 and 3 creeks have been identified across the Precinct and several dams are dotted along these creeks and channels (see Section 5.3.3 of the report). The GCDC requires that development within the Growth Centres should protect Category 1, 2 and 3 riparian corridors.

The existing hydrology will be significantly impacted by urban development due to an increase in the impervious areas and the introduction of a large new population will increase demand on the potable water supply.

WSUD can be implemented at a lot, neighbourhood, precinct and regional scale. The objectives include:

- protection and enhancement of natural water systems (creeks, rivers and wetlands) within urban catchments;
- reducing potable water demand by using stormwater as a resource;
- minimising changes in water balance and flow patterns potentially resulting from urban development;
- protection and enhancement of water quality, by improving the quality of stormwater runoff from urban areas;
- adding long-term value while minimising development costs; and
- integrating stormwater management into the landscape by using stormwater treatment systems that serve multiple uses and provide a variety of benefits, including water quality protection, stormwater retention and detention, public open space and recreational and visual amenity for the community.

A Water Sensitive Urban Design (WSUD) strategy has been prepared for the Oran Park Precinct in accordance with the objectives outlined in the GCDC. The WSUD strategy takes into account salinity, erodible soils and the ephemeral nature of the creeks that cross the site. It also recognises the potential to rehabilitate and enhance the values of the local creek system.

The main elements of the strategy are shown in Figures 39 and 40 and include:

- Stormwater quantity control to mitigate the flooding impacts of the development on South Creek and erosive flows within minor creeks across the site. This is to be achieved through a two-pronged approach of minor and major On Site Detention (OSD) basins including:
 - minor flows up to the 5 year ARI will be detained in minor OSD basins adjacent to the creeks, and potentially lot scale OSD within the Town Centre and employment zone; and
 - flows up to the 1 in 100 year ARI event will be detained in major OSD basins.
- Stormwater quality control - stormwater treatment through a combination of regional wetlands and bioretention facilities and distributed street scale stormwater treatments, where required, to meet the stormwater quality reduction load targets.
- Riparian zone and creek management -
 - flows that meet the stream erosion index objectives established by DEC will flow into creeks;
 - flows beyond this level and up to the two year ARI event will bypass creeks via intercepting stormwater pipes to downstream storage for reuse or further attenuation. These elements will utilise and complement the minor OSD basins and ornamental water body storages;
 - erosion control and bank stabilisation measures within the waterway.

It is noted that the draft ILP shows stormwater detention and/or wetland/bioretention facilities within the core riparian zones on the western side of The Northern Road. This is inconsistent with the specialist consultants advice and best practice. The ILP will require amendment to ensure all wetland/bioretention facilities are located outside of the core riparian zone

The strategy for potable mains water conservation and reducing wastewater discharge from the site includes:

- potable water demand management through the use of water efficient fittings; and
- utilisation of alternative water sources on a fit-for-purpose basis including treated stormwater harvested on-site and recycled waste water either treated on-site or supplied by a dual pipeline.

Site specific elements of the WSUD strategy for Oran Park will be implemented through appropriate DCP controls.

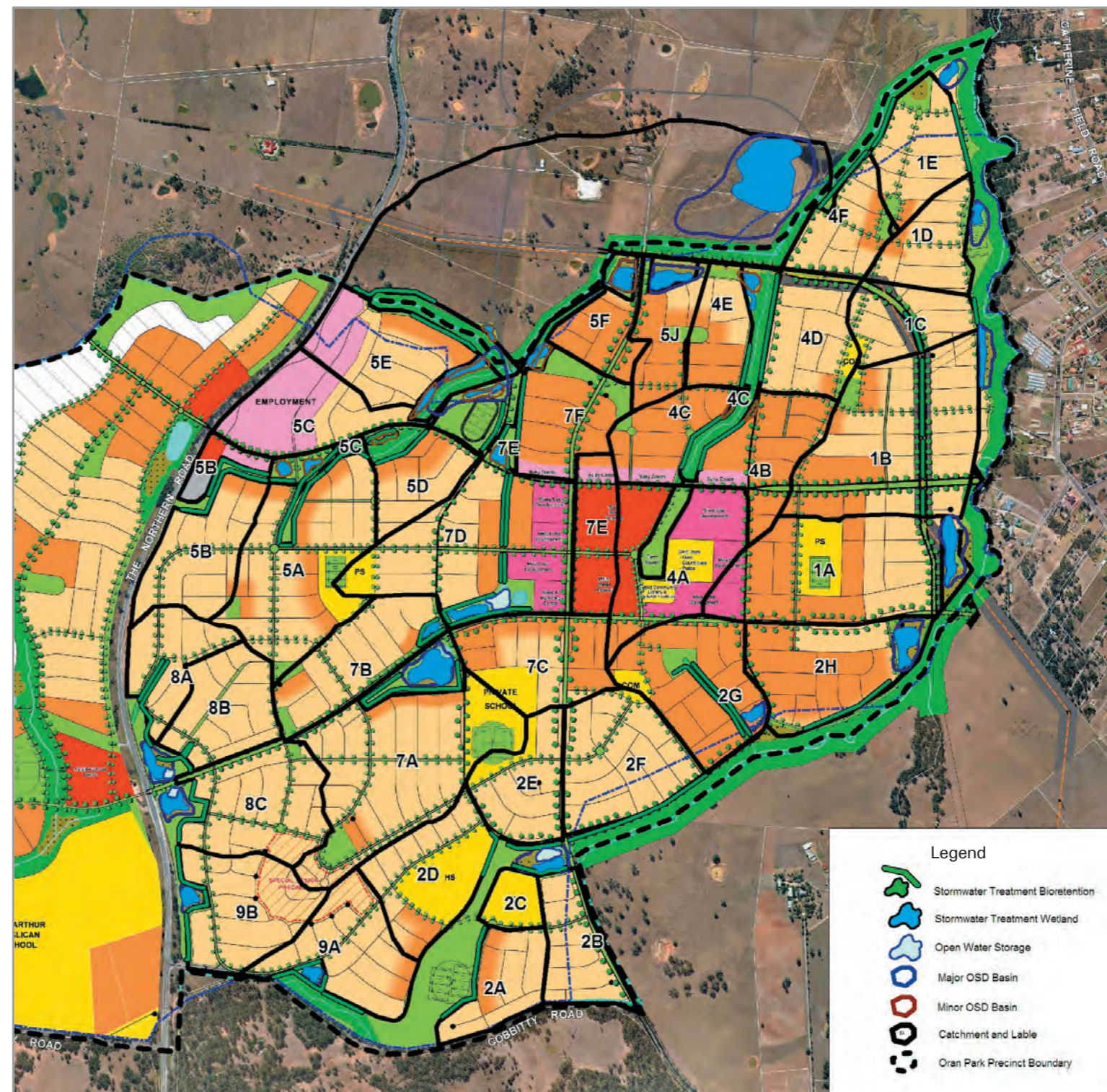


Figure 39 – Stormwater quality treatment for Oran Park East

Source: Ecological Engineering

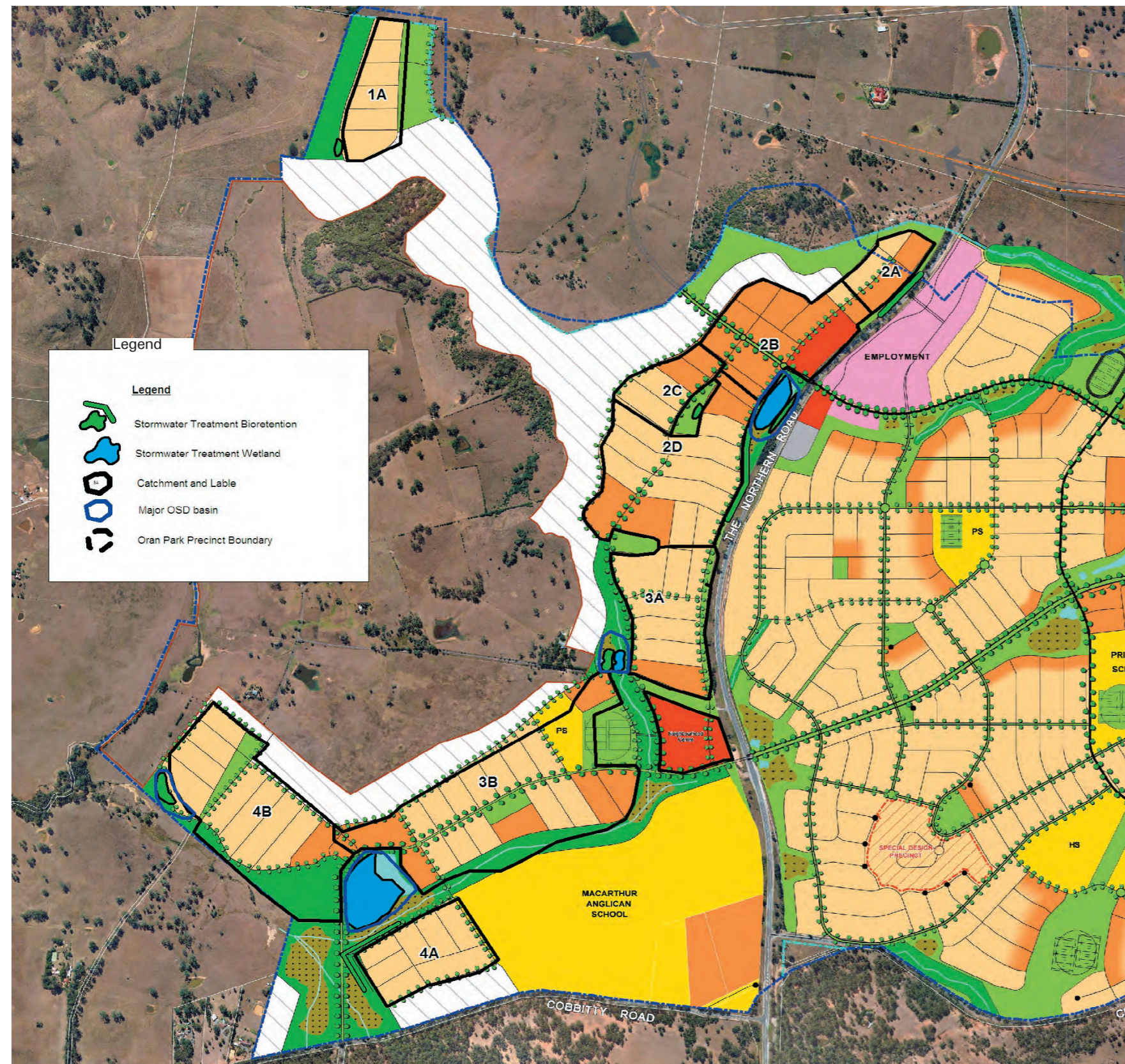


Figure 40 – Stormwater quality treatment for Oran Park West

Source: Ecological Engineering

5.8 Noise

The proposed development of the Oran Park Precinct will result in a mix of land uses with the potential to both generate and be affected by noise. In addition, The Northern Road, an arterial road, runs through the middle of the Precinct. Within this context, the GCDC seeks to provide adequate acoustic privacy for residential development and associated private open space. Accordingly, a Noise Impact Assessment was undertaken of the draft ILP (see **Appendix J**).

In accordance with the GCDC, the relevant guideline for managing road traffic noise is the Department of Environment and Conservation (DEC) Environmental Criteria for Road Traffic Noise (ECRTN). Industrial and operational noise from commercial developments is usually assessed in accordance with the DEC Industrial Noise Policy (INP).

The potential noise sources that could affect the Oran Park Precinct are:

- road traffic from major existing roads -The Northern Road, and Cobbitty Road, and major internal roads - the Southern Boulevard, East-West Road 1, North Spine Road, North-South West Road, North-South East Road and the Western Boulevard(see **Figure 42** for road locations);
- future light industrial/commercial development within the Precinct;
- future licensed premises and community developments within the Precinct, and
- the Camden Aerodrome.

5.8.1 Existing conditions

Traffic noise

Ambient noise data is useful for setting benchmark noise levels in an area already significantly affected by traffic or other noise and can be used for validation of noise prediction models. In this instance ambient noise levels were measured at three locations along The Northern Road to provide a representative sample of the acoustic environment to be found along this road.

Industrial and commercial noise

There are no industrial and commercial noise sources that currently affect the Precinct, however the draft ILP includes the Oran Park Town Centre, and other employment uses are proposed in the north of the Precinct. As the detail of these uses was not known at the time of the assessment, a noise prediction was not made.

Licensed and community development noise

There are no existing licensed premises near the Oran Park Precinct. Any future licensed premises would have to comply with noise criteria issued by the Liquor Administration Board.

Future community developments such as school facilities, childcare centres, multi purpose-halls and sporting fields would also be considered against their relevant standards.

Aircraft noise

The Precinct is located 2.4 km north-east of Camden Aerodrome. The acceptable level for aircraft noise is based on AS2021-2000. The assessment used the Australian Noise Exposure Forecast (ANEF) index to assess the cumulative impact of aircraft noise on the proposed land uses. The Oran Park Precinct will not be adversely affected by aircraft noise as it is located outside of the 20 ANEF contour.

Oran Park Raceway

Oran Park Raceway will cease to operate prior to development occurring. As such there will be no noise impact as a result of motor racing events.

5.8.2 Potential Impacts and assessment

Predicted traffic noise

The predicted road traffic noise impacts for the Oran Park Precinct are detailed in **Table 8**. The table shows exceedances will occur along all roads except minor streets, as well as along the Transit Boulevard and in the Town Centre. Therefore noise mitigation measures would be required for residential development at these locations to meet the DEC standards required by the Development Code.

Industrial and commercial noise

The modelling did not cover industrial/commercial noise as the exact types and locations of uses within the Oran Park Town Centre and elsewhere are unknown. However, the Noise Study concluded that there would be no impact on future commercial or residential development in the Precinct provided that future industrial and commercial development is in accordance with relevant standards.

Licensed and community development noise

The exact locations of licensed and community developments will be subject to future detailed planning. Impacts have been addressed in the assessment through the mitigation measures detailed in **Section 5.8.3**.

Table 8 – Traffic noise predictions

Road Type	ECRTN Daytime External Noise Criteria dB(A)	Predicted Daytime Traffic Noise*	Relevant Streets / Roads
Arterial Road	L _{Aeq, 15hr} 55	L _{Aeq, 15hr} 68	The Northern Road (TNR) (between Southern Blvd & Cobbitty Rd)
Transit Boulevard	L _{Aeq, 15hr} 55	L _{Aeq, 15hr} 70	Southern Boulevard East (between North Spine and TNR)
Sub-Arterial Road	L _{Aeq, 15hr} 55	L _{Aeq, 15hr} 67	Southern Boulevard West East-West Road 1 (west of TNR) North Spine (south of Southern Boulevard) The Northern Road (north of Southern Boulevard) Cobbitty Road (West of TNR)
Collector Street	L _{Aeq, 1hr} 60	L _{Aeq, 1hr} 67	Western Boulevard East-West Road 1 North-South West Road East-West Road 2 North-South East Road North Spine (north of EWR1) Cobbitty Road (east of TNR)
Local Street	L _{Aeq, 1hr} 55	L _{Aeq, 1hr} 60	Local Streets with approx 100 – 300vph
Minor Street	L _{Aeq, 1hr} 55	L _{Aeq, 1hr} 55	Local streets with 100vph or less
Town Centre Street	L _{Aeq, 1hr} 55	L _{Aeq, 1hr} 67	North Spine (between EWR1 and Southern Boulevard) Southern Boulevard (between North Spine and NSER) East West Road 1 (between TNR and Western Boulevard)

*Level at nearest residential façade dB(A)
Source: Renzo Tonin & Associates

Table 9 – Noise mitigation measures

Road Type	Typical building treatment for first row of dwellings	
	Bedrooms	Living Areas
Arterial	Windows closed; 12.38mm laminated glazing; acoustic seals on windows and doors	4m noise mound. Windows closed 6.38mm laminated glazing; acoustic seals on windows and doors; solid core 45mm doors on external facades
Transit Boulevard	Windows closed; 10.38/12/6 double glazing; acoustic seals on windows and doors	Windows closed; 10.38 laminated glazing; acoustic seals on windows and doors; solid core 45mm doors on external facades
Sub-arterial	Windows closed; 12.38mm laminated glazing; acoustic seals on windows and doors	Windows closed; 6.38mm laminated glazing; acoustic seals on windows and doors; solid core 45mm doors on external facades
Collector	Windows closed; 10.38mm laminated glazing; acoustic seals on windows and doors	Windows closed; 6.38mm laminated glazing; acoustic seals on windows and doors; solid core 45mm doors on external facades
Local	Windows closed; 6.38mm laminated glazing; acoustic seals on windows and doors	Windows closed; standard glazing
Town Centre	Windows closed; 12.38mm laminated glazing; acoustic seals on windows and doors	Windows closed; 6.38mm laminated glazing; acoustic seals on windows and doors; solid core 45mm doors on external faces

Source: Renzo Tonin & Associates

5.8.3 Management response

Traffic noise

A range of measures will be required to mitigate the impacts of traffic noise. As detailed in **Table 9**, these use typical building treatments rather than roadside noise walls and mounds, and would need to be applied to dwellings along all roads (except minor streets), the Transit Boulevard and in the Town Centre. An exception to this is The Northern Road, an arterial road, where noise mounds will be required to mitigate the high level of predicted noise. As there are no likely impacts on minor roads, special treatments are not required.

In addition to the measures in the table, the DCP includes a range of dwelling design options and architectural treatments that could be used alone or together with these measures.

Table 9 indicates that even residences on some of the quieter streets within the Precinct, such as collector and local streets, in addition to those dwellings fronting sub-arterial roads, may require specific acoustic treatments which could add significant costs to dwelling construction. This is because the ECRTN external noise criteria will be exceeded at the front façade of dwellings. However, these exceedances are only likely to occur during the day, during AM and PM peak hour traffic periods and only at the front of dwellings. At other times of the day and night, noise levels are likely to comply with the set criteria and outdoor private open space areas located to the rear of dwellings would also comply. It is therefore recommended that the daytime criteria be relaxed at the front façade of dwellings by approximately 5 dB(A) during peak hours as this would reduce the need for costly treatments, but still limit traffic noise levels during the rest of the day and night. This matter will need to be the subject of further departmental negotiation.

It is noted that the use of building (acoustic) treatments to mitigate traffic noise leaves areas at the front of dwellings exposed to noise and adequate ventilation must therefore be provided in rooms facing roads as windows would need to remain shut. This raises, in turn, issues in relation to sustainable (natural) methods of ventilation and requires innovative design to ensure that the requisite area of private open space attached to dwellings is not impacted by traffic noise.

It is further noted that the ECRTN goals for setback distances would require residential properties to be set back 200 metres from sub-arterial roads and 100 metres from collector roads. While the ECRTN recommended setbacks would be ideal, in most cases this would not be

feasible as it would impact on land take and ultimately on dwelling yield (and the Structure Plan's targets). Accordingly, a combination of setback distance, architectural treatment and internal dwelling layout and building design will be used.

An exception to this is the treatment of those parts of The Northern Road (an arterial road) where residential development is proposed. This will involve a combination of building treatments and landscaped noise mounds, which is in accordance with the guidelines of the Development Code. Similarly, the Development Code requires significant landscaped areas and service roads as an alternative to noise walls.

To manage and mitigate acoustic impacts on residential amenity, the following building design controls will be incorporated in the Oran Park DCP:

- Courtyards and open space areas are to be located away from the road.
- Adequate ventilation, in accordance with the Building Code of Australia (BCA) is to be provided to compensate for closed windows on street frontages, this may require mechanical ventilation.
- Higher than standard fencing with a suitably solid mass will be acceptable to reduce the level of noise in yard areas.
- Dwelling layouts are to be designed to minimise noise in living and sleeping areas.
- Wherever possible, dwelling access is to be located off smaller local roads to avoid reducing the efficiency of acoustic boundary walls with driveway access points fronting major roads.
- Compliance with the ECRTN external noise criteria at rear private open space areas.
- Building treatment and design is to be consistent with the internal noise goals of Australian Standard 2107-2000.
- To reduce the visual impact of traditional noise walls, landscaped earth mounds with lower height walls are to be used on arterial roads.

In addition to the above, 'quiet' road pavement surfaces such as Open Graded Asphaltic Concrete or Stone Mastic Asphalt can be used for roads where speed limits exceed 80 km/hr. As the impact of the surface is less effective at speeds less than 80 km/hr and as the speed limit for most roads in the Oran Park Precinct will be less than 80 km/hr, the more expensive 'quiet' surfaces will in most cases not be necessary.

Industrial and commercial noise

In order to ensure that future industrial and commercial development does not affect residential amenity, these forms of development will be required to comply with the amenity criteria set out in the Industrial Noise Policy (DEC 2000).

Licensed premises and community development noise

The noise impacts of licensed premises will be minimised through the location and design of building envelopes. In locations where physical noise treatments are not practical, separation distances of 100 metres or more will be maintained between residential areas and licensed premises.

In relation to community developments, noise from playing fields, schools and childcare facilities is a natural function of a lively, active and happy neighbourhood and these uses will be integrated into walkable neighbourhoods. Accordingly, only the following minimal design measures are proposed to minimise noise from these sources:

- Where possible, schools bus/car drop-offs should be located away from common boundaries with residential properties.
- Childcare centres should have solid boundary fences around play areas abutting dwellings.
- Construction of multi-purpose community facilities (halls) will incorporate acoustic design.

Hours of operation/use of sporting fields and multi-purpose halls will be determined by Camden Council in accordance with its usual policies.

5.9 Odour

As the Oran Park Precinct is located in a rural area with active farming, odour from nearby agricultural activities has the potential to impact on new urban development. In order to establish potential odour impacts, a Level 1 Odour Impact Assessment was prepared (see **Appendix K**). The assessment was conducted using the techniques described in the DEC Technical Notes 'Assessment and management of odour from stationary sources in NSW' (November 2006).

5.9.1 Existing conditions

Agriculture characterises land to the north and west of the Precinct, while to the east is the suburb of Catherine Fields which generally comprises small rural lots. South of the Precinct is Harrington Park 2 which is to be rezoned for residential redevelopment.

When studying potential odour impacts it is necessary to understand meteorological conditions as these ultimately determine the extent and distribution of impacts. The site was found to have north-east-east through to south winds in summer, southerly winds in autumn, north-west-westerly winds in winter and southerly winds in spring. Southerly winds are most dominant with an occurrence frequency of approximately 10%. Winds are strongest in spring with an average wind speed of 3 m/s¹.

From a desktop study, a number of potential sources of significant odour were identified within and near to the Precinct: grazing cattle within the Oran Park Precinct, two poultry farms located approximately 500 metres east of the Precinct and a turkey farm approximately one kilometre north of the Precinct. It was noted that there are other activities and operations conducted in the vicinity of the Precinct that could be considered odour sources, such as the use of manure-based fertilisers and cattle grazing, however these sources are infrequent and/or weak.

5.9.2 Potential impacts and assessment

Following site visits and further investigations of the operation of the identified potential sources of odour, it was found that only the two poultry farms located in Catherine Fields would have the potential to affect future development within the Oran Park Precinct. This is due to the proximity of the poultry farms to the Precinct, the nature of winds in the area and the absence of any odour treatment devices on the two farms.

The buffer zone required to mitigate odour impacts would potentially occupy approximately a third of the developable area of the Oran Park Precinct and is shown in **Figure 41**.

5.9.3 Management response

A Level 1 Odour assessment is only a screening test where generic values and basic details about an odour source are used to determine estimated odour impacts. Consequently the resultant recommendations tend to be conservative, as the specific details of the operation of potential odour sources are not fully known.

Given the potential impact of the poultry farms on the draft ILP, a Level 3 assessment, which is more detailed and site specific, will need to be undertaken prior to development of the affected area (shown in **Figure 41**) to determine with greater accuracy the extent of impact of the odour, as well as appropriate mitigation measures.



Figure 41– Separation distance required for protection from odour impacts

Source: Benbow Environmental

5.10 Roads, traffic and access

An important objective of the Growth Centres Development Code is to ensure the coordinated provision of transport infrastructure for new precincts in the Growth Centres. The Code further seeks to ensure that sustainable forms of transport, such as walking and cycling, are encouraged and that public transport services are provided upfront to encourage a public transport culture from the outset.

A transport assessment of the draft ILP for the Oran Park Precinct was prepared which included all modes of transport - walking, cycling, buses, cars and freight vehicles (see **Appendix L**). Recommendations were then made to ensure that the proposed layout of the draft ILP would meet the objectives of the GCDC.

The layout and road names used in the assessment are shown in **Figure 42**.

5.10.1 Road Network

Proposed conditions

The proposed road hierarchy for the Oran Park and Turner Road Precincts and the surrounding locality is shown in **Figure 43**. The main roads include:

- The Northern Road - an arterial road with 4 lanes, providing access to Harrington Park and Narellan;
- North Spine Road – a 4 lane sub-arterial which runs through the middle of the Town Centre on the eastern side of the Oran Park Precinct;
- East-West Road 1 – a part 4 and part 2 lane sub-arterial which links the western part of the Precinct with the Town Centre and will eventually continue through to the Catherine Fields Precinct;
- East West Road 2 – a 4 lane sub-arterial which links the north eastern corner of the Precinct with The Northern Road and the Southern Boulevard East
- Southern Boulevard (East) – a 4 lane sub-arterial which linking The Northern Road to the Town Centre and eventually to the North Spine Road in the Turner Road Precinct via the Catherine Fields Precinct.
- Southern Boulevard (West) – a 2 lane sub-arterial which links the intersection of Macquarie Grove Road and Cobbitty Road to The Northern Road.
- North South East Road and North South West Road – a 2 lane sub-arterial that forms a part of a ring-road around the Town Centre.
- Western Boulevard – a 2 lane sub-arterial linking the Southern Boulevard (West) to East West Road 1 in a parallel route to The Northern Road.

B-Double truck access to the employment area will be via Narellan Road and The Northern Road.



Figure 42 - Temporary road names for the Oran Park Precinct

Source: Growth Centres Commission

Impacts and assessment

Traffic modelling was used to predict the impact of locally generated car trips on the Precinct road network and to confirm whether or not the proposed form of the draft ILP is appropriate. The model was developed for 2016 and assumed full development of the Precinct. For the purpose of assessing the draft ILP it was expanded to include the Turner Road Precinct, The Northern Road, Cobbitty Road and Camden Valley Way.

Based on the findings of the analysis, much of the proposed road network operates within the nominated capacities during the AM peak, with the exception of traffic volumes on The Northern Road between Cobbitty Road West and the Southern Boulevard East. At this point, traffic volumes may be in excess of 2,000 vehicles per hour, which is close to capacity for a four lane road. In particular, a large proportion of vehicles are expected to make a right turn from The Northern Road northbound into the Southern Boulevard eastbound which may need to be managed. No capacity issues were raised in the PM peak.

The majority of intersections will operate within acceptable Levels of Service during the AM and PM peak hours. However, the assessment predicts that the following intersections will not have adequate capacity:

- The Northern Road/Southern Boulevard; and
- The Northern Road/Cobbitty Road East.

The assessment notes that the draft ILP shows local roads connecting to higher order roads, such as the North Spine Road (south of the Town Centre) which is contrary to the proposed hierarchy.

The proposed commercial/employment zone is well located in terms of its accessibility to the regional road network and the assessment concluded that there are no apparent rat runs or areas where heavy goods vehicles would use lower order roads to avoid network problems.

Management response

Whilst high traffic volumes are seen at the intersection of the Northern Road and the Southern Boulevard, the report recommends that the capacity of the intersection should remain as proposed because the provision of further capacity would affect other road users, such as pedestrians and cyclists by increasing crossing times. Rather it is recommended that vehicles should be encouraged to re-route to intersections with spare capacity further up The Northern Road.

The majority of the proposed road network is expected to operate satisfactorily, however, the following are recommended in order to improve the performance of the road network:

- Review the road hierarchy to reduce connections from local streets to sub-arterial roads.
- Reduce speed limits on local streets within residential areas to the west of The Northern Road to 50 kmph.

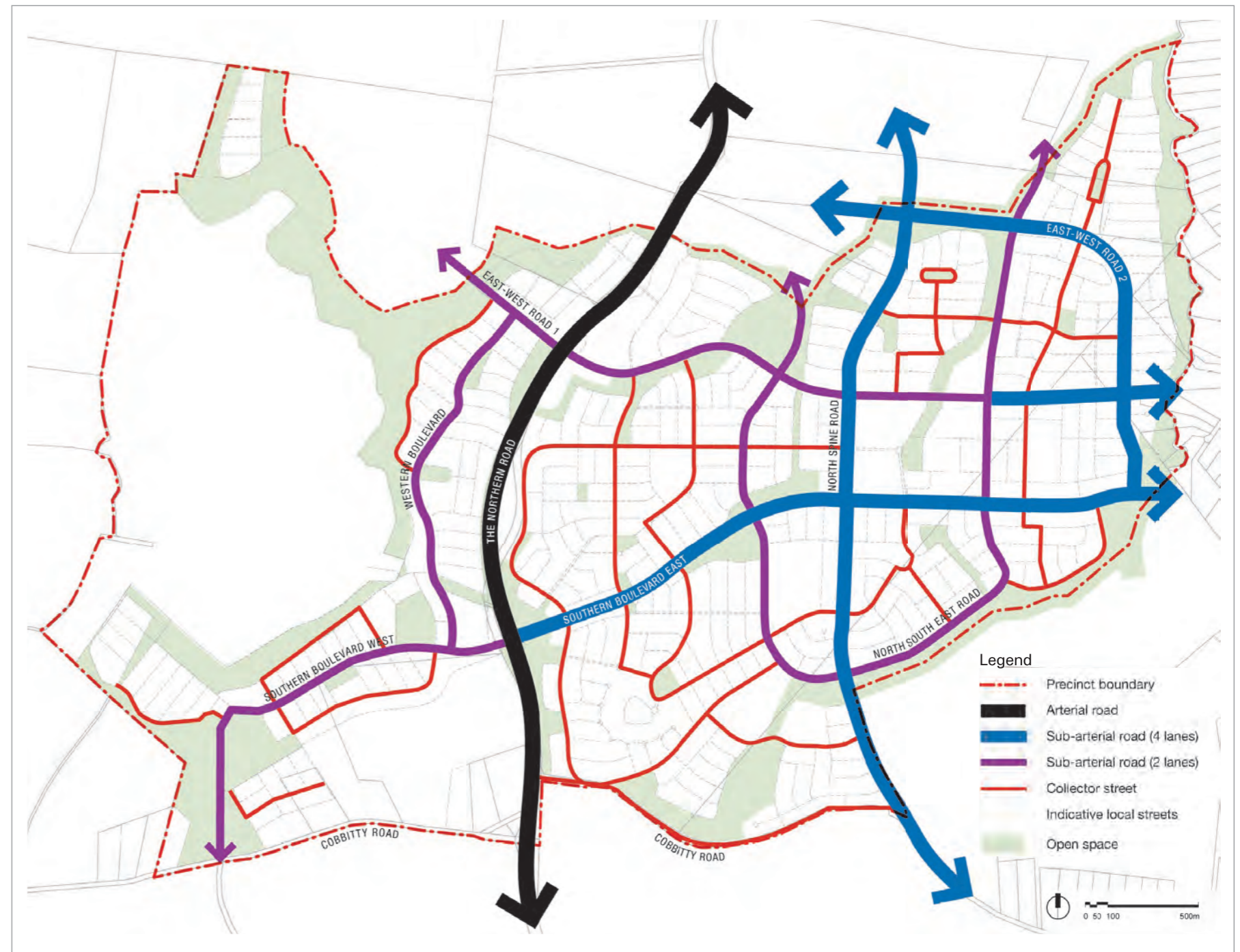


Figure 43 – Proposed road hierarchy for the Oran Park and Turner Road Precincts

Source: Maunsell

5.10.2 Public Transport Framework

Proposed conditions

Oran Park is a 'District Centre' under the NSW Ministry of Transport Service Planning Guidelines and will form a hub for bus routes. The number of bus services which have been allocated to the Oran Park Town Centre will warrant the provision of a bus interchange. Proposed bus routes are shown in **Figure 44**.

The provision of public transport within the Oran Park Precinct has been developed to cater for three different stages of the development. These are:

- Short term – buses will connect new communities to existing facilities at Harrington Park and Narellan with access to the rail network at Macarthur and Campbelltown stations.
- Medium term – Oran Park will become a destination for public transport services with connecting services to Narellan and Camden via Harrington Park.
- Long term – Leppington will become the new Regional Centre, with Oran Park, Narellan and Catherine Fields becoming District Centres.

Impacts and assessment

The public transport network plan for Oran Park provides 90% coverage of the Precinct, meeting the Ministry of Transport and the Growth Centres target. However, further negotiations with the Ministry of Transport will be required as detailed planning continues for the Precinct in order to determine final bus routes for local, district and regional bus services.

A bus interchange is required in the Oran Park Town Centre, with a drop-off stop to cater for up to 30 buses an hour. The interchange is proposed to be located within the western part of the Town Centre.

Management response

The bus interchange will be located within the Town Centre. A Part B DCP will be required to be developed and approved for the Town Centre, which will include provisions relating to the location and capacity of the bus interchange.

At this stage it is not considered necessary to amend bus routes or avoid steep roads. During detailed design, consideration will be given to the impact of topography on bus capability. Detailed road and intersection design will also consider the impact on bus manoeuvrability.

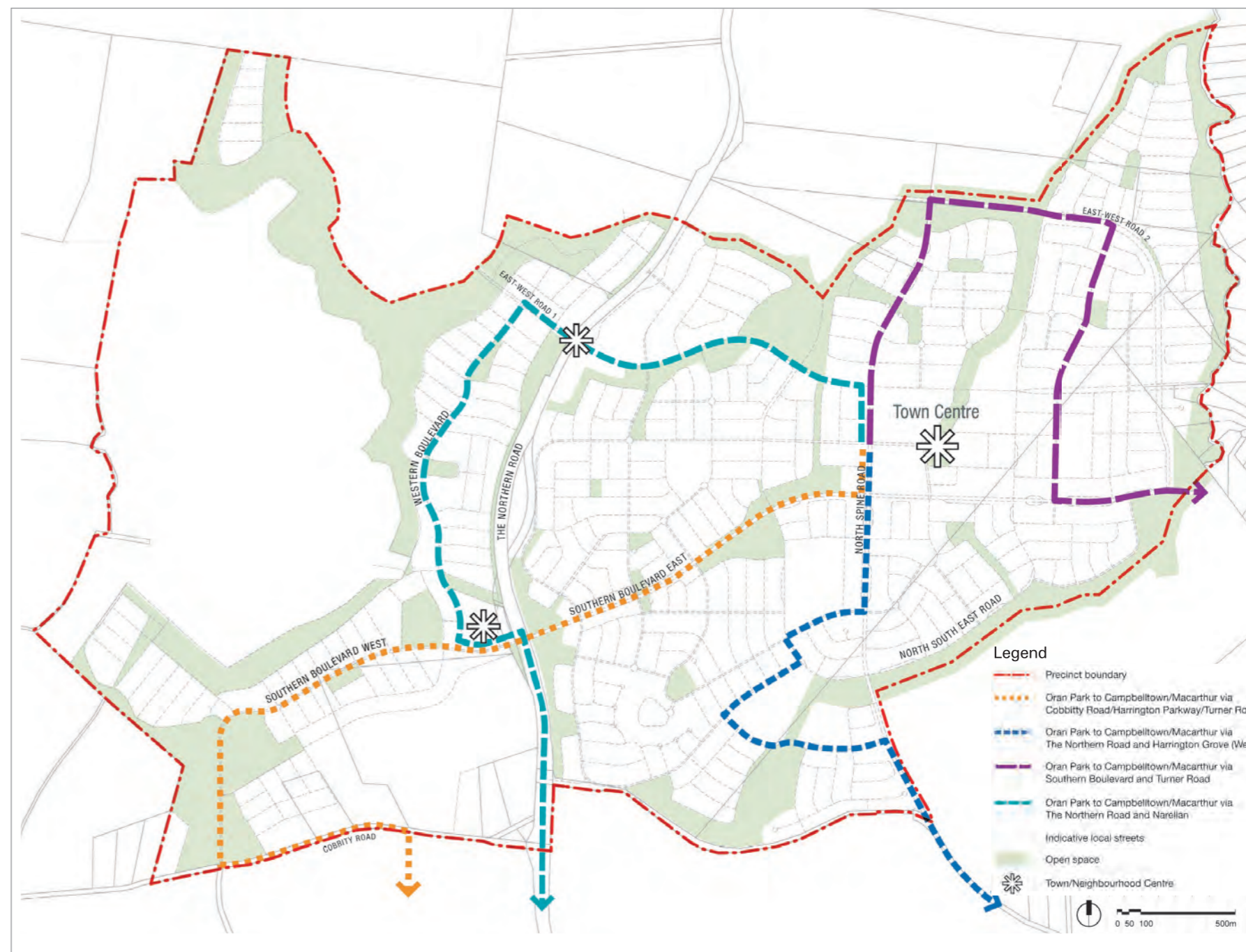


Figure 44 - Bus servicing strategy

Source: Maunsell

5.10.3 Walking and Cycling Networks

Proposed conditions

Cycle and pedestrian routes have been incorporated into the draft ILP. Pedestrian paths are provided on all streets and the cycle paths are shown in **Figure 45**. These have been designed to allow easy access from dwellings to local centres and public transport nodes.

Impacts and assessment

The analysis of draft ILP against the planning principles of the GCDC showed that:

- pedestrian / cycle connections were not provided between culs-de-sac to adjacent streets and / or green spaces; and
- some links had a high gradient, thereby affecting the comfort of cyclists.

If sections of a cycle route are too steep they are likely to discourage cycling as a preferred method of transport. The following sections of the cycle network were too steep due to natural topography:

- Southern Boulevard East – on approach to The Northern Road
- Southern Boulevard East, between the North Spine Road and the north-South East Road
- North Spine Road – on the approach to Cobbitty Road.

Walking and cycle routes are generally in accordance with the Growth Centres Development Code requirement of 400m walkable neighbourhoods. All high schools and primary schools will be accessible via the proposed cycle network.

Management response

The identified issues can be resolved through detailed planning. Generally, it is considered that the pedestrian and cycle network provides direct and continuous routes, however, during detailed design, consideration should be given to relocating or altering bike paths that are too steep and do not provide a comfortable route for cyclists. This could involve adjusting the road alignment along a smoother gradient or providing a stepped system, so that steep lengths are alternated with flat sections.

The cycle and pedestrian networks will be better integrated by ensuring any culs-de-sac are connected to adjacent streets or green spaces, and to facilitate safety these will be designed in accordance with 'Safer By Design' principles.

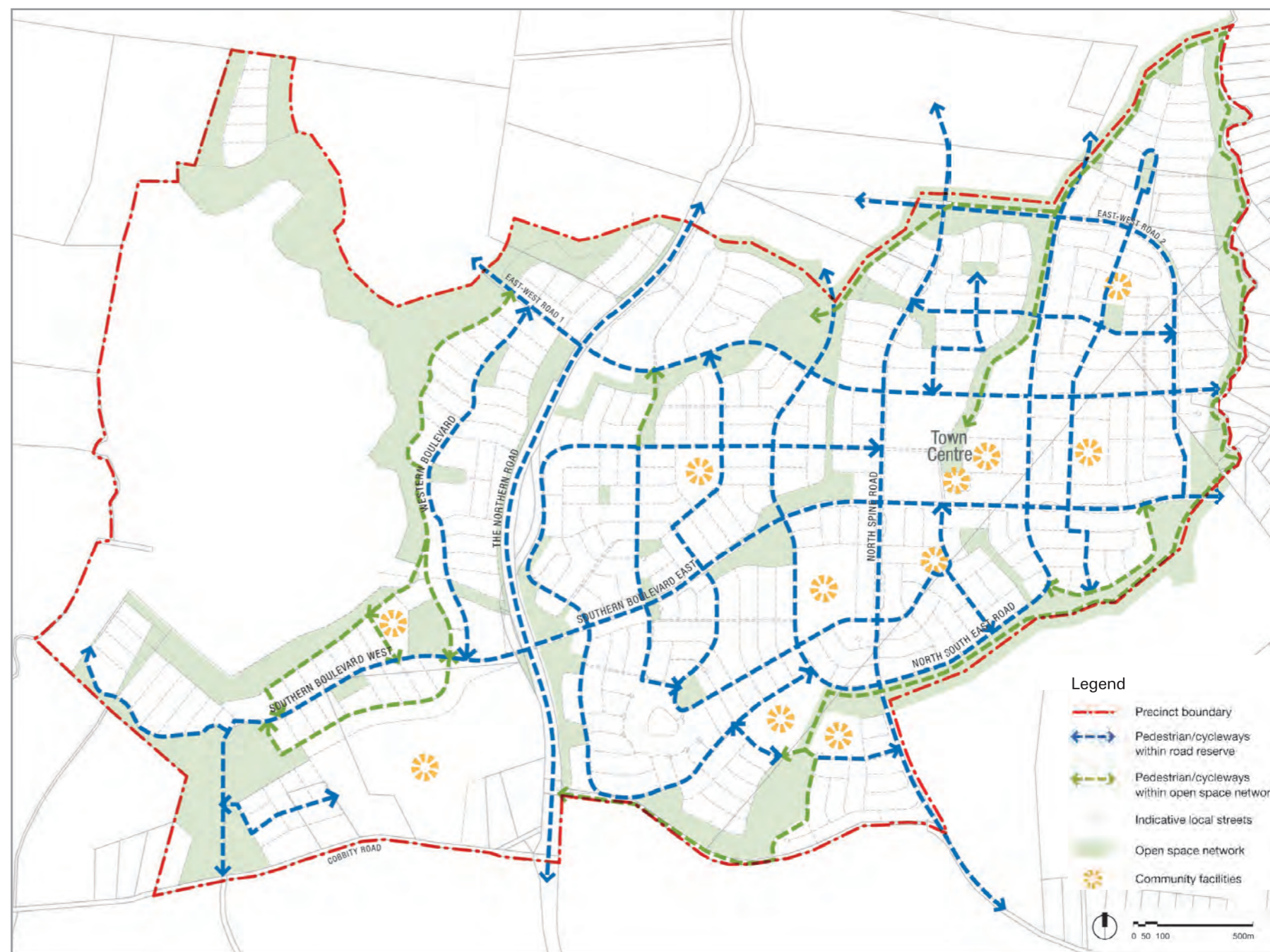


Figure 45 - Proposed pedestrian & cycle routes

Source: Maunsell

5.10.4 Air quality

South Western Sydney is known to experience high levels of air pollution. Despite this, due to the increased use of unleaded petrol and other emission control strategies, air quality in Western Sydney has actually improved in recent years. Nevertheless, private motor car usage remains a key contributor to reduced air quality.

In order to manage the issue of air quality, the State Government, through the Metropolitan Strategy and other policies, is seeking more efficient provision and use of public transport, and future communities therefore need to be designed to reduce dependency on private cars to reduce associated emissions.

As described in this section and elsewhere in this report, planning for the Oran Park Precinct is consistent with the above objectives in that the draft ILP facilitates walking, cycling and the use of buses, and walkable neighbourhoods concentrate shopping, schooling and community activities at the local level. At the level of district and regional planning, bus connections to public transport nodes further contribute to the reducing reliance on private vehicles.

In land use terms, a fundamental principle of the draft ILP is the early provision of local employment opportunities – so contributing to reducing travel to work trips, while heavy industry – another major contributor to poor air quality - is not a proposed use.

6.0 Population, density and employment

This chapter presents the forecast demographic characteristics of the likely incoming residential and worker population for the Oran Park Precinct. The specialist reports which form the basis of this chapter are included in **Appendices M** and **N**. Density targets set by the GCC are also discussed. The demographic profile has implications for the development and delivery of social infrastructure discussed in the following chapter.

6.1 Existing population

The Camden LGA is experiencing rapid population growth due to considerable urban development in the last decade or so. Between 1996 and 2001 the annual growth rate for Camden was 7.3%, which is substantially higher than the Sydney Statistical Division average of 1.3%.

In 1996, the Camden LGA had a population of 32,000, which grew to 43,700 in 2001. The population will continue to grow considerably in the next few years due to the approval of the Harrington Grove, the Mater Dei site, Manooka Valley, Mount Annan South, Spring Farm and Elderslie release areas. Once these are completed it is expected that the Camden population will increase to around 77,200 people.

Based on the 2001 census, Camden's population is younger, households are larger and median income is higher. Compared with the Sydney Statistical District:

- Camden's median age is 30 years versus 34 years in Sydney;
- 48% of Camden households are families with children compared with 36.6% in Sydney;
- the average Camden household consists of 3 people compared with 2.7 in Sydney; and
- median household income is \$1000 - \$1199 compared with Sydney's \$800 - \$999.

This profile has implications for long term planning and provision of a range of community services, education and open space/recreation facilities.

6.2 Future community

6.2.1 Density targets

The Planning Report for the South West Growth Centre, which supports the Structure Plan, nominated a dwelling yield of 8,000 and a population of 22,000 for the Oran Park Precinct. Based on preliminary assessment, the GCC increased the target yield to 8,500. Using the same parameters this would have resulted in a new population of approximately 23,400.

As outlined previously, detailed planning studies of the Precinct have indicated a revised yield of approximately 7560 dwellings.

The GCDC sets out the minimum net residential densities that need to be achieved in the Growth Centres (see **Table 10**). The distribution of dwelling types in the draft ILP is shown in **Table 11**.

Table 10 – Minimum net residential densities

Development type	Dwellings per hectare
Mixed use areas	66
High density	40
Medium density	20 - 40
Low density	12.5 - 20

Source: Growth Centres Development Code

6.2.2 Forecast population

Forecast household occupancy rates have been based on other release areas in the South West. When the assumed occupancy rates are applied to the development mix in the draft ILP (see **Section 4.2**), the anticipated size of the future population can be calculated. As shown in **Table 11**, the projected population for the Oran Park Precinct is approximately 22,900 with an average household size of 3 people.

Table 11 – Dwelling and population forecasts

Dwelling type	Number	Occupancy rate	Number of people
Apartment	696	1.8	1,253
Attached	2,413	2.9	6,998
Detached	4,451	3.3	14,688
Total	7,560		22,939

6.2.3 Demographic characteristics

The projected age distribution for the Oran Park Precinct (based on Edmondson Park) is shown in **Table 12** and anticipates that compared to other nearby release areas, the Precinct will be characterised by:

- A comparable proportion of young couples and families.
- A greater range of family types, reflecting the wider range of housing types and price markets to be provided.
- A comparable small proportion of empty nesters and older people - however this is expected to increase once wider district services and public transport become well established.
- An initial peak of young families that will reduce as the population becomes more diverse as more young adults and older people are attracted by established Town Centre facilities.

Forecasts of the ethnic make-up of the population are not included, as these tend to be unreliable over an extended timeframe of development and have little bearing on the broad nature of facilities proposed.

Table 12 – Forecast age distribution

Age cohort	Within 5 years of initial settlement (%)	10 years after settlement (%)	15 years after settlement (%)
0-4	12	9	7
5-9	9	10	7
10-14	7	8	9
15-19	6	7	8
20-24	7	7	8
25-34	24	18	15
35-44	18	19	17
45-54	10	10	12
55-64	4	6	8
65+	3	6	9
Total	100	100	100

Source: Elton Consulting

Based on this information, it can be concluded that:

- There will be greater population diversity in the Oran Park Precinct than has characterised other nearby release areas because the proposed mix of housing forms will provide a greater range of housing choices.
- The detached dwellings are likely to accommodate households with above average incomes and occupational status.
- The provision of smaller and medium density forms of housing will provide more affordable opportunities for first home buyers and lower income families.
- The higher proportion of medium density housing is likely to provide a significant stock of rental accommodation, resulting in a much higher degree of socio-economic diversity than characterises most release areas.

6.3 Employment and industry

Consistent with the Structure Plan and the objectives of the GCDC, planning at the regional and neighbourhood level must incorporate a range of local employment, retail and commercial opportunities.

In the context of future development in the South West Growth Centre, Oran Park will provide employment and retail opportunities both for people who live within the Precinct and also within the broader Camden region and the South West Growth Centre.

The capacity to absorb, and the need for, retail and commercial facilities within the Oran Park and Turner Road Precincts were assessed and the results included in **Appendix N**.

6.3.1 Employment land

Future growth in Sydney’s population and labour force will require more jobs and more employment land. Up to 500,000 additional jobs will be needed in Sydney by 2031, 80,000 of which will be needed in South West Sydney. The Sydney Metropolitan Strategy estimates a further 7,500 hectares of employment land may be needed in addition to the current 15,000 hectares.

Currently 2,346 hectares of industrial land is available in the South Western Sydney area in the local government areas of Camden, Campbelltown, Liverpool and Wollondilly, of which 470 hectares or nearly 20% is vacant. Of this:

- Smeaton Grange (84.11 hectares) and Moorebank (85.34 hectares) are the two largest nodes available in terms of land;
- Campbelltown has the lowest share of vacant land at 9.2%; and
- Wollondilly has the highest share of vacant land at 38.4 %, especially in Maldon.

Vacant sites are not evenly distributed, are tightly held across limited locations and parcel sizes and will be fully absorbed within five to six years.

The economic strategy for the Oran Park and Turner Road Precincts requires the provision of approximately 100 hectares of employment lands (comprising industrial and bulky goods uses) to be located on major routes and highly visible and suitable lands.

6.3.2 Need for jobs

The population in the Oran Park and Turner Road catchment will be approximately 35,500 by 2023. It is expected that in 2012 the number of residents seeking employment will reach nearly 6,000 (45% of the total resident population). By 2023 it is projected that the labour force will have increased to 15,970 workers in the catchment across all industries.

It is expected that, consistent with the Camden labour force, approximately 37% of this labour force will be blue collar workers – i.e. tradespersons, workers in the production and transport sector and labourers. In 2023, the number of blue collar workers seeking employment will reach 5,900. Assuming the Sydney average of 40 blue collar jobs per hectare of industrial land, it is estimated that the land required for blue collar employment self sufficiency will be approximately 148 hectares by 2023 (see **Table 13**). This equates to approximately 10 hectares per year if this full amount were to be supplied.

Table 13 – Blue collar self sufficiency – Oran Park and Turner Road Precincts

Year	2008	2010	2012	2014	2016	2018	2023
Forecast Population	772	5873	12134	21631	29125	33065	35479
Employed (45% of total population)	347	2643	5910	9734	13106	14879	15966
Blue Collar (37% of total population)	129	978	2187	3602	4849	5505	5907
Employment land required (hectares)	3	24	55	90	121	138	148

Source: MacroPlan Australia

6.3.3 ILP provision and assessment

Nearly 104 hectares of employment land is provided within the Oran Park (16.67 hectares) and Turner Road Precincts (87.33 hectares). While this would not lead to full self sufficiency in blue collar employment it would be likely to be adequate for the following reasons:

- Around 50% of residents in the Oran Park and Turner Road Precincts are expected to work in the wider region while around 30% or less would actually work in a business located or associated directly with the employment nodes at Turner Road and Oran Park.
- Many of the blue collar workers at Oran Park and Turner Road will seek employment opportunities at Lowes Creek or Bringelly as these industrial nodes begin to develop in the medium to longer term.

On a cautionary note, the economic assessment advises the product mix of early stages of development is likely to be lower employment yield uses such as warehousing, distribution and bulky goods which means that the estimated employment yield of 40 jobs per hectare may not be achieved in the early years. The employment yield could be as low as 10 jobs per hectare if warehousing and transport industries are the first to take up land parcels. This will increase the short term requirement for industrial land supply, including industrial service centres, if employment self containment is to be maximised.

The assessment further notes that it is not possible to deliver full employment self sufficiency in fringe development areas in early stages of a residential development due to a shortage in labour supply across various skills and the need for industry clusters to form.

In addition to the blue collar jobs to be provided within the Turner Road and Oran Park Precincts, the draft ILP for the Oran Park Precinct makes provision for 50,000 square metres of retail space which would be likely to generate 2000 retail jobs based on one position per 25m².

Up to 10,000 square metres of bulky goods space is allowed for in the Oran Park Town Centre and the use is restricted to 10,000m² in the employment lands. Assuming 20,000m² and one position per 40m² (JBA), this would generate another 500 jobs. In addition, there is no restriction on commercial space which could generate up to 250 jobs, if 5,000 square metres were to be provided in the Town Centre (based on one position per 20m²).

6.3.4 Management Response

As demonstrated above, together the quantum of industrial, bulky goods, retail and commercial land uses would contribute substantially to employment self-sufficiency at Oran Park and Turner Road. The 16.67 hectares of employment land at Oran Park is well located in terms of regional accessibility – both for distribution purposes and bulky goods customers.

The quantum of permissible bulky goods floor space is limited – so limiting any potential impacts on the viability of the Oran Park Town Centre while still contributing to the provision of jobs.

6.4 Retail facilities

The hierarchy of centres within the South West Growth Centre Structure Plan, nominates Oran Park as a large town centre. The Development Code states that mixed use town centres should be located at major intersections to maximise accessibility and retail exposure.

The economic assessment showed that the main existing retail competition for Oran Park is located to the south, including Narellan Town Centre, Mt Annan Marketplace and Camden Central Shopping Centre.

6.4.1 Need

In the short-term, the Oran Park Town Centre will serve as a town centre for the surrounding district, including the Turner Road Precinct, bringing the combined Oran Park and Turner Road catchment population to around 35,500 people at completion in approximately 15 years. In the longer term, Oran Park will form a district centre also serving a secondary catchment of Catherine Fields and Marylands Precincts increasing the total catchment to approximately 78,000 in 2036.

Total expenditure on retail trade per capita in the Camden Statistical District is approximately \$10,666 per annum with the largest allocation to the following:

- Supermarkets - \$3,787;
- Clothing and accessories - \$1,285;
- Restaurants and cafes - \$1,369; and
- Furniture and whitegoods - \$774.

Although it is difficult to predict with certainty the age, household structure and wealth of the future population, using the above spending patterns to formulate retail pools and accounting for expenditure leakage, it has been estimated that the total sustainable retail floorspace in Oran Park and Turner Road, assuming expenditure leakage, will be approximately 77,300 square metres in 2036 as summarised in **Table 14**. The estimates are based on competing shopping centres being established at Leppington 2020 and in Catherine Fields and Marylands as population is delivered in these Precincts.

Table 14 – Sustainable retail floor space Oran Park and Turner Road

Year	Floor Space (m ²)
2011	8,199
2016	30,283
2021	47,779
2026	58,156
2031	70,048
2036	77,278

Source: MacroPlan Australia

6.4.2 ILP provision and assessment

Table 14 shows that the Oran Park and Turner Road Precincts have the potential to sustain approximately 77,300m² of retail floorspace. As such, the assessment considers the provision of a retail town centre of between 45,000m² and 55,000m² floor space in Oran Park at the end of the development time frame as appropriate. The Town Centre is likely to include two full line discount department stores, two supermarkets and approximately 100 specialty stores.

In addition to the Town Centre, there is also potential for approximately 25,000m² of retail floorspace within other areas of Oran Park and Turner Road. This would include two neighbourhood centres of around 5,000 m² west of The Northern Road and 15,000m² at Turner Road. The demand for this floor space would be partially driven by the secondary expenditure pool from Turner Road, Catherine Fields and Marylands (assuming they are delivered at 2015).

The retail hierarchy for Oran Park, shown in **Table 15**, has been assessed to be broadly sufficient for the region.

6.4.3 Management response

To encourage economic growth of the region and to enable a high degree of self-containment and regional containment, the employment lands and mixed use retail centres are located within the 'Neighbourhood Centre', 'Local Centre' and General Industrial zones as defined by the draft amendment to the Growth Centres SEPP. The permissible uses within these zones allow for flexibility within each centre thereby encouraging growth yet still providing enough control to create a hierarchy of centres within each precinct.

Table 15 – Proposed retail hierarchy for the Oran Park Precinct

Centre	Location	Characteristics
Town Centre	Eastern side of Precinct bound by North Spine Road, East West Road 1, Southern Boulevard East and North-South East Road.	- 50,000m ² aggregate GFA for retail premises and bulky goods - 10,000m ² maximum bulky goods GFA within the 50,000m ² - no restriction on business or commercial office, residential or community uses - no restriction on industrial/retail premises size
Northern Neighbourhood Centre	West of The Northern Road on East West Road 1	- 5,000m ² aggregate GFA for retail premises - 1,500m ² maximum GFA for individual retail premises (other than landscape and garden supplies)
Southern Neighbourhood Centre	West of The Northern Road on Southern Boulevard East.	- 5,000m ² aggregate GFA for retail premises, - 1,500m ² maximum GFA for individual retail premises (other than landscape and garden supplies)
Employment Lands	Adjacent to the east of The Northern Road and East-West Road 1	- 2,500m ² maximum aggregate GFA for retail premises - 10,000m ² maximum aggregate GFA for bulky goods premises. - 500m ² maximum GFA for neighbourhood shops

The Development Code gives broad guidelines and objectives for employment and mixed use centres, however further detailed design guidelines will need to define the character and environment of these areas.

Bulky goods retailing is a specific sector within the retail market, and plays an important role in newly developing communities where there is generally high demand for the products sold in the bulky goods sector. Examples include furniture stores, homewares and related industries.

Siting bulky goods facilities is generally a challenge in established urban areas. However, new master planned precincts, provide the opportunity to locate these facilities more appropriately.

At Oran Park and Turner Road, the key drivers in relation to bulky goods has been to ensure that they are well located relative to key arterial roads and the proposed Oran Park Town Centre, and that the opportunity to ensure early provision of jobs is captured, particularly at Turner Road.

At Oran Park, it is proposed that a maximum of 10,000m² of bulky goods space be provided within the Town Centre. This will complement the general retail facilities, and will be well located relative to transport and the other facilities. A maximum of 10,000m² bulky goods GFA will also be permissible in the proposed employment land fronting The Northern Road on its eastern side. The maximum of 10,000m² bulky goods GFA will protect retailing with the Oran Park Town Centre.

7.0 Social infrastructure

This chapter identifies the need for social infrastructure such as schools, open space, recreation and community facilities in the Precinct.

Consistent with the Structure Plan and the objectives of the GCDC, planning at the regional and neighbourhood level must provide local facilities and services such as parks, shops, libraries, schools, health facilities, childcare, recreation facilities and the like. The draft ILP in conjunction with Council's Section 94 plan must provide land for social infrastructure of the right size in the right locations.

Oran Park is to be delivered over an approximate 15 year period. Accordingly, as emphasised by the Development Code, community facilities should be flexible and adaptable in order to be responsive and relevant to changing needs, expectations and life cycles.

Some social services and infrastructure (such as hospitals, regional sporting facilities, tertiary education, etc) for residents of the Precinct will, necessarily, be located elsewhere. Consistent with its status as the major centre for the South West Growth Centre and its proposed high accessibility by bus and rail services, it is understood that Leppington is the preferred location for these higher order services that will serve the whole Growth Centre population. Nevertheless, the Oran Park Town Centre will become, by virtue of its distance from Leppington (approximately 10 kilometres), an anchor for services and facilities servicing the southern third or so of the Growth Centre.

The relative uncertainty of the future composition and precise needs of the population within the Oran Park Precinct give rise to a need to plan for flexibility in social infrastructure so that service providers can respond and adapt as the particular requirements and lifestyle preferences of the population are ascertained. Nevertheless, planning is based on a population of around 23,200 at full development.

This chapter utilises information in the Oran Park Precinct Community Facilities and Open Space Assessment (see **Appendix M**), and the draft Oran Park Precinct Section 94 Contributions Plan.

7.1 Educational facilities

7.1.1 Requirements

The Department of Education (DET) provides the following guidance for the provision of schools in new release areas based on the number of dwellings:

- One public primary school per 1,500 to 2,000 new dwellings each with a minimum site area of 3 hectares;
- One public high school per 4,500 to 6,000 new dwellings on a site of 6 hectares.

Schools should be located:

- on collector roads, not arterials or sub-arterials, to reduce noise impacts;
- central to their catchment, with a catchment radius of 1.6km road distance to minimise the demand for bus transport and to maximise opportunities to walk to school (primary only);
- adjacent to community playing fields (an advantage but not mandatory);
- on land substantially regular in shape with a slope no greater than 1:10; above the 1 in 100 year flood level; and free of possible restrictions such as power easements, contamination etc.

The DET has confirmed that the following public schools would be required for the expected 7600 dwellings in the Oran Park Precinct:

- four primary schools; and
- one high school.

7.1.2 ILP provision and assessment

The draft ILP provides:

- four public primary schools with the three on the eastern side of The Northern Road having a designated areas of 3 hectares, and the one on the western side with a site area of 2.4 hectares;
- one government high school of 6 hectares in the southern part of the Precinct;
- a private (Catholic) primary and high school campus on 8 hectares; and
- the existing Macarthur Anglican College.

Primary schools

While the draft ILP satisfies public school provision requirements in relation to numbers, a number of issues need to be addressed:

- The 1900 forecast dwellings on the western side of the precinct support the provision of a standard size primary school. However, it is under the required size of 3 hectares and should ideally be located centrally within the catchment.
- There is no primary school proposed for the northern sector of the eastern side of the Precinct.
- Leading practice principles suggest that, where possible, schools should be co-located with other types of community facilities to create a community focal point and promote accessibility. Despite this, two of the schools on the eastern side of the Precinct are not co-located with community facilities. Should the schools be co-located it may be possible to reduce the land required for each facility, but without co-location standard size sites will be required for all facilities.

High Schools

The provision of one high school within the Precinct is supported by the DET, however concern has been raised in regard to its location as it is not centrally located within its catchment. No issues have been identified with regard to the proposed size and location of the Catholic school.

7.1.3 Management response

The following is a discussion of how the above issues in relation to the location and size of schools should be managed.

- The location of the primary school on the western side of the Precinct is considered suitable given that it is adjacent to the neighbourhood centre and public open space, and will contribute to the focus, liveability and sense of place intended in this locality. Further negotiation and discussion will nevertheless be required with the DET regarding the size of the site. However, it is noted that in terms of sustainable and economic use of land, the use by the primary school of the adjacent active open space would be ideal.
- The location of the public high school is considered suitable because:
 - the land is relatively flat;
 - it is co-located with a primary school;
 - it is adjacent to proposed open space and sporting fields; and
 - it is close to proposed bus routes along the North-South Spine Road, a sub arterial.
- Further discussions with the DET should be undertaken with regard to the siting of the primary school east of the town centre. Consideration should be given to relocating the school to the northern side of the main link road, adjacent to the proposed community facilities / open space in the north-east sector of the Precinct. This would better serve the catchment in this locality, but has the added benefit of facilitating co-location with other facilities and providing a stronger community focus in an area of proposed higher density. However, topography may be a constraint to this proposal and therefore further detailed site investigations will be necessary.
- Negotiations should occur with DET regarding the opportunity to reduce the land required for schools that are co-located with other community facilities, as well as opportunities for joint use of public open space.

7.2 Health facilities

7.2.1 Requirements

NSW Health and the Sydney South West Area Health Service have advised that a Community Health Centre will be established in Oran Park in about 2012. The facility will require approximately 5,500m² and good access to public transport and parking. Associated with this, it is likely that space will be required for complementary private medical and allied health services to create a health hub.

7.2.2 Provision and assessment

The proposed zoning and land uses for the Precinct permit general medical services and facilities in most areas: doctors can set up private consulting rooms everywhere except in the general industrial zone, while medical centres, as well as a Community Health Centre as required by NSW Health, will be permissible in the neighbourhood centres and Town Centre

At this stage the location of a Community Health Centre is not shown on the draft ILP. However, as the zoning within the Precinct does not restrict this use, there are no issues with the draft ILP.

7.2.3 Management response

The draft ILP is considered adequate and no additional measures or changes are required.

7.3 Community facilities

7.3.1 Requirements

Children's services

Childcare centres are generally provided by the private sector and are a permitted use within residential areas as well as neighbourhood centres, the Town Centre and employment land. As such they do not necessarily need to be designated on the draft ILP at this stage. However, Camden Council will require, through the draft Section 94 Plan, provision for places for long day-care/preschool and out of school hours care calculated according to the following ratios:

- 20 places for long day-care/preschool per 1000 population, based on 13% of the incoming population aged 0-4 years; and
- 8.8 places for out of school hours care per 1000 population, assuming 13.2% of the population aged 5-12 years.

Based on a population of 23,200 at full development, the Oran Park Precinct would therefore require approximately 320 long day-care/preschool places and approximately 50 out of school hours care places. This would translate into four long day-care/preschool centres, assuming an average size of 80 places, or eight centres, assuming 40 places. Out of school care could also be accommodated within these facilities.

Community facilities

Camden Council requires, through its Section 94 Plan, multi-purpose community centres based on 42 square metres per 1,000 people and land space at 2.5 times this requirement (i.e. 105 square metres per 1,000 people). A community centre of 350 – 500 square metres usually serves a population of 12,000 people.

Oran Park would therefore generate the need for around 960 square metres of community centre floor space and land area of approximately 2,400 square metres which would equate to two multi-purpose neighbourhood community centres to serve the whole Precinct.

The draft Section 94 Plan also identifies the need for a district community Centre to serve the wider catchment of Oran Park, Turner Road and Catherine Fields/Marylands.

Civic and cultural facilities

On the basis of the requirements of the draft Section 94 Plan for the Precinct, the combined catchments of the Turner Road and Oran Park Precincts would generate a need for a district cultural centre and a branch library. These are likely to be provided within the Oran Park Precinct.

Facilities and services for young people

Youth centres are provided on the basis of 20.8 square metres for a population of 1,000 people. On this basis a facility of about 740 square metres is required to serve the combined Oran Park and Turner Road populations.

Facilities and services for older people

Leading practice steers away from providing age-specific buildings, such as senior citizens buildings. Rather, multi-purpose buildings are preferred as these tend to be better utilised.

Residential care facilities are permitted uses within residential neighbourhoods and therefore may be provided anywhere within the Precinct without the need to identify sites at this stage.

Justice and emergency services

The precise requirements for these services within the Precinct and/or surrounding precincts have not yet been identified and will need to be assessed on an ongoing basis as Precinct development proceeds.

7.3.2 Provision and assessment

The draft ILP intends that the following will be located in the Oran Park Town Centre – all of which will contribute to its function as an active and economically viable place:

- branch library;
- multi-purpose community centre;
- cultural and civic centre;
- youth centre;
- Court House; and
- police station.

Children's services

The draft ILP identifies two specific locations for community facilities, in addition to opportunities within the Oran Park Town Centre. However it is proposed that all school sites be co-located with community facilities, providing adequate opportunities across the precinct for provision of childcare centres. Further detailed planning with regard to the specific locations of childcare centres will be required as precinct development proceeds.

Community facilities

The draft ILP provides for two local community centres, both on the eastern side of the Precinct. No community centre site is shown on the draft ILP for the western side of the Precinct. However, given that community facilities are permissible in neighbourhood centres there is potential for space to be used in the southern neighbourhood centre on the western side of the Precinct or space for some activities could be negotiated at the Macarthur School should the need arise.

In addition, the Oran Park Town Centre will accommodate a district multi-purpose community centre. Further detailed planning with regard to the specific locations of community centres will need to be undertaken.

Civic and cultural facilities

Locations in the Town Centre are intended for a library, a large multi-purpose community centre and for cultural and performance spaces. The mix of civic, community and cultural activities is particularly supported as in the longer term it will contribute to the activation and liveability of the Town Centre.

Facilities and services for young people

The draft ILP does not show a location for a youth centre – however, land use provisions do not significantly restrict its location.

Facilities and services for older people

Although residential care sites need not be identified at this stage, it is understood that a residential care facility is proposed for the site at the intersection of The Northern Road and Cobbitty Road.

7.3.3 Management response

Children's services

The following locations have been recommended as being suitable for potential childcare facilities:

- west of The Northern Road to serve the 1900 dwellings in this neighbourhood;
- adjacent to the neighbourhood centres;
- adjacent to the proposed primary schools;
- close to or within the Town Centre, and
- close to or within the employment lands on The Northern Road.

Community facilities

The population on the western side of the Precinct lacks a designated location for community facilities. However, given that community facilities are permissible in neighbourhood centres there is potential for space to be used in the southern neighbourhood centre or space for some activities could be negotiated at the Macarthur School should the need arise.

Leading practice principles suggest that community facilities should be clustered together with other public uses such as shops, primary schools or open space. The location of community facilities on stand alone sites in the midst of residential areas is not supported and therefore the location of the isolated community facility on the eastern side of the Precinct should be reconsidered. Another option would be considered would be to relocate one of the proposed community centres to the western side of the Precinct to overcome the barrier of The Northern Road.

The facilities offered in the community centres should be complementary, rather than identical, to expand opportunities for community activities. For example, one might have a youth or leisure focus and one have a community arts focus.

Civic and cultural facilities

The allocation of civic and cultural facilities is considered adequate. Further to this, the DCP will require that the Town Centre be subject to detailed design controls.

Facilities and services for young people

Further discussions are required to ascertain the most appropriate location for the proposed youth centre. Should an indoor recreation centre be developed in the Precinct, it is recommended that a youth centre be co-located with this facility.

7.4 Open space and recreation facilities

7.4.1 Requirements

The GCC has established an indicative parameter of 50–70 hectares of public open space for the Oran Park Precinct, including both active and passive uses. This is based on the GCDC requirement of 2.83 hectares per 1000 people.

Camden Council has agreed to the provision 0.4ha of local open space per 1000 people within the Oran Park Precinct. For an incoming population of approximately 22,900 people, 9.2 hectares of local open space would need to be provided.

In relation to calculating district open space, rather than applying a fixed standard, a demand based approach is to be used for the Oran Park and Turner Road Precincts based on consideration of Camden Council's recreation demand assessment study, ABS participation rates and the forecast size and characteristics of the incoming population. Regard will also be given to the quality of facilities to be provided and the availability of indoor facilities.

7.4.2 ILP provision and assessment

Local facilities

When providing local open space within the Precinct, Camden Council requires:

- a minimum area of 2,000 square metres, no further than 500 metres walking distance from any dwellings;
- a range of play spaces and recreational opportunities catering for different age groups; and
- co-location with other community uses where possible.

In accordance with the above requirements, the following open space strategy for local open space provision within the Oran Park Precinct has been recommended. The facilities nominated in **Table 16** have been costed and are included in the Section 94 Plan for the Precinct.

Table 16 – Local open space requirements

Facility	Total area required (ha)
6 x Children's Playgrounds (suitable for 0 – 4 year olds fenced with equipment)	1.8
6 x Play Spaces (suitable for 5 – 12 year olds with more independent play facilities)	1.8
2 x Managed Lawn Area/ Green Space (0.6ha in size) suitable for informal recreation use	1.2
2 x Sports Parks (2.0 ha each) including facilities for cricket, soccer, AFL, tennis, netball and basketball; plus lighting, change rooms and parking	4.2
Total	9

Source: Elton Consulting

The ILP provides 72 hectares in total of open space for active and passive recreation – 21.45 ha on the western side of the Precinct and 50.5ha on the eastern side. This does not include riparian corridors and riparian buffers.

Further assessment is required of the breakdown of the open space in the draft ILP in terms of local and district open space and land that is flood affected or otherwise constrained by detention basins, drainage facilities, vegetation for conservation and the like. This would confirm that there is sufficient open space in the Precinct suitable for active recreation purposes at a local and district level to meet the requirements recommended by Elton Consulting.

The draft ILP has identified significant land areas within riparian buffer zones for passive recreational use. These have potential to provide suitable opportunities to meet the passive recreational needs for the future population consistent with the GCDC which states that passive recreation uses are appropriate within the vegetated buffer of a riparian corridor.

Further negotiation with agencies about achievement of multiple objectives for open space (riparian corridors, APZ, recreation etc) will be required.

District facilities

The following design considerations for district open space have been identified:

- Minimum area of 5 hectares, located near public transport and no further than 2 kilometres from all dwellings. (the requirement of the district open space to be within 2 kilometres relates to smaller residential subdivisions and may not be feasible within a precinct like Oran Park).
- Provision of flexible training areas and a range of sporting activities including passive and recreational leisure activities.

A district open space strategy for the Oran Park and Turner Road Precincts is shown in **Table 17**. The facilities nominated in the district open space strategy have been costed on a preliminary basis and included within the Section 94 Plans for the two Precincts.

Table 17 – District open space requirements

Facility	Size
Leisure Centre designed to service 90,000 population	Range 6.5-10 hectares depending on components
'Adventure based' Recreation Centre designed to service wider population of 35,500	2.5-5 hectares depending on availability of land and layout of building
3 x District Standard Sports Ground.	6 hectares each in size

Source: Elton Consulting

An assessment of the draft ILP shows that insufficient land has been allocated for district open space. Although the draft ILP provides single fields for sport, these are distributed around the Precinct and as such result in duplication of smaller facilities, providing limited social benefit. Moreover, single sporting fields are not suitable for sporting competitions and multiple teams.

The assessment notes that the Oran Park precinct has the population to sustain a multipurpose sports facility containing multiple fields and courts which would add to its district centre status. This could provide a range of activity opportunities for a cross section of the community.

7.4.3 Management response

Further information is required on the breakdown of open space within the Precinct. The breakdown should include details of the following for both local and district open space:

- passive open space;
- active open space;
- flood affected open space;
- open space that will contain drainage facilities;
- open space that is constrained by power easements;
- open space that contains vegetation that is proposed to be retained; and
- open space within riparian buffers.

Once this breakdown is available, further assessment of, and possibly amendments to, the draft ILP may be required to ensure that adequate open space facilities are provided within the Precinct. Notwithstanding this, the local and district open space facilities nominated in **Tables 16** and **17** have been included within the draft Section 94 Plan, thereby ensuring that the funds to provide these facilities will be available.

Local open space and recreational facilities are to be designed to maximise the availability of the vegetated buffers for passive uses. Design controls will be incorporated into the Precinct DCP.

The draft ILP identifies a number of open space areas with playing fields, however this does not provide for the multi-purpose sports facility containing multiple fields and courts recommended by the assessment. Further consideration of this matter may result in amendments to the ILP, potentially consolidating the smaller field areas into one larger multi-purpose facility.

A leisure centre could be located in the Town Centre or adjacent to the employment land accessible off North South East Road. To ensure that this can occur in the future when the population has developed, it is recommended that land be allocated on the draft ILP. There are no zoning restrictions to this. Wherever possible the provision of open space should be based on joint use by schools and others.

8.0 Conclusions and recommendations

8.1 Overview

The purpose of the PPR is to support the precinct planning process for the Oran Park Precinct by documenting and integrating the environmental, social and economic analysis undertaken in support of the draft ILP for the Precinct. The report has documented and assessed the capability of the Oran Park Precinct to be rezoned for urban development – specifically for residential and employment uses – and has examined the environmental, human services and infrastructure issues and impacts associated with the proposal as shown in the draft ILP, within the context of:

- the requirements of the South West Structure Plan;
- the objectives and principles contained in the Development Code; and
- the provisions of the Growth Centres SEPP and other relevant legislation.

The assessment addressed the impacts of proposed development on the environmental features and biodiversity values of the land – South Creek and its tributaries, existing vegetation, ridgelines, view corridors and vistas, indigenous and non-indigenous heritage – and examined potential site constraints to development, including noise, odour, land capability and geotechnical conditions. In order to ensure that the draft ILP provides for the future needs of the incoming population, the report also assessed the adequacy of proposed road infrastructure, employment opportunities, community facilities and open space.

The development of the plan was an iterative process characterised by numerous revisions to address, manage or mitigate issues as they emerged. Provisions are incorporated in the Oran Park DCP to further manage or mitigate any potential impacts, to ensure sustainable environmental and social outcomes and to facilitate best practice design.

In preparing this report, the extent to which the draft ILP accords with the objectives of the Growth Centres SEPP and the Development Code was also examined. There were no matters identified where the proposal departs from the requirements or intent of either document and a summary of compliance with these instruments is attached to this report (see **Attachment 1**).

There are, however, variations between the draft ILP and the Structure Plan in relation to the boundaries of the Precinct, the size of the Town Centre, the inclusion of employment land, the planning parameters for dwellings and population, and a new north-south road (as an extension of Cobbitty Road). As explained in Section 4.4 of this report, all of these variances facilitate development and enhance the outcomes for the Oran Park

Precinct and none detract from the overall planning intent for the SWGC.

To promote a sustainable outcome and manage potential environmental impacts, the draft ILP incorporates the following key features:

- vegetated riparian corridors consisting of core riparian zones and buffers;
- a strategy for water sensitive urban design to manage stormwater run-off, detention and reuse;
- retention of remnant Cumberland Plain Woodland in line with the draft Growth Centres Conservation Plan - generally along South Creek, Cobbitty Road and the north-west corner of the Precinct;
- a robust network of arterial, sub-arterial and connector roads to facilitate public transport;
- Asset Protection Zones to manage bushfire risk;
- Conservation Zones to protect Aboriginal heritage and cultural values;
- transitional lands around the heritage curtilage of the Denbigh Estate;
- vegetated mounds along The Northern Road to attenuate noise; and
- the protection of important views, vistas and visual corridors.

Importantly, in accordance with economic and sustainable use of non-residential/employment land, areas are to be used for multiple purposes. For example, riparian corridors will incorporate Aboriginal conservation areas; vegetated corridors and open space will serve to protect critical views as well as non-indigenous heritage; and perimeter roads will serve as APZs.

The draft ILP provides for a fully socially integrated community through the inclusion of the following:

- land for six schools in accordance with departmental guidelines;
- land for community facilities – most co-located with other compatible facilities;
- 72 hectares of public open space for active and passive uses;
- a substantial Town Centre, two smaller neighbourhood centres and several walkable communities;
- employment land to provide local job opportunities; and
- a street layout that facilitates a mix of housing types and achievement of the GCC's dwelling yield target.

Based on the information provided in the specialist assessments, it is concluded that subject to the recommendations listed in **Section 8.3** and the provisions of the draft Oran Park Development Control Plan:

- there are no impediments or constraints to the land being developed for urban development;
- the draft ILP meets the requirements of relevant policies and statutory instruments; and
- the draft ILP provides for the orderly and economic development of the land.

Accordingly, it is recommended that, subject to the recommendation in **Section 8.3**, the Precinct be rezoned in accordance with the land uses described in **Section 8.2** below.

A number of recommendations indicate that further assessment of certain matters is required in relation, for example, to potential archaeological deposits and the final locations and treatments of some watercourses and riparian corridors. To assist in the identification of these and other issues that will be further investigated, a map identifying next steps is provided at **Attachment 3**.

8.2 Proposed land uses

The recommended land use zones for the Oran Precinct are illustrated in **Figure 46**. They are deemed appropriate to meet the intent of the draft ILP, achieve the GCC's land use objectives and to protect natural environmental values. The objectives of each zone, specific controls and permitted and prohibited uses are set out in the draft amendment to the SEPP.

In addition, the draft amendment to the SEPP designates land that would be subject to special controls in relation to vegetation clearing and sets maximum height and minimum lot sizes.

It is intended that the Oran Park DCP will control dwelling yield of 7,650 dwellings by splitting the Precinct into several sub-precincts and setting the minimum number of dwellings that must be achieved within each - as illustrated in **Figure 47**.

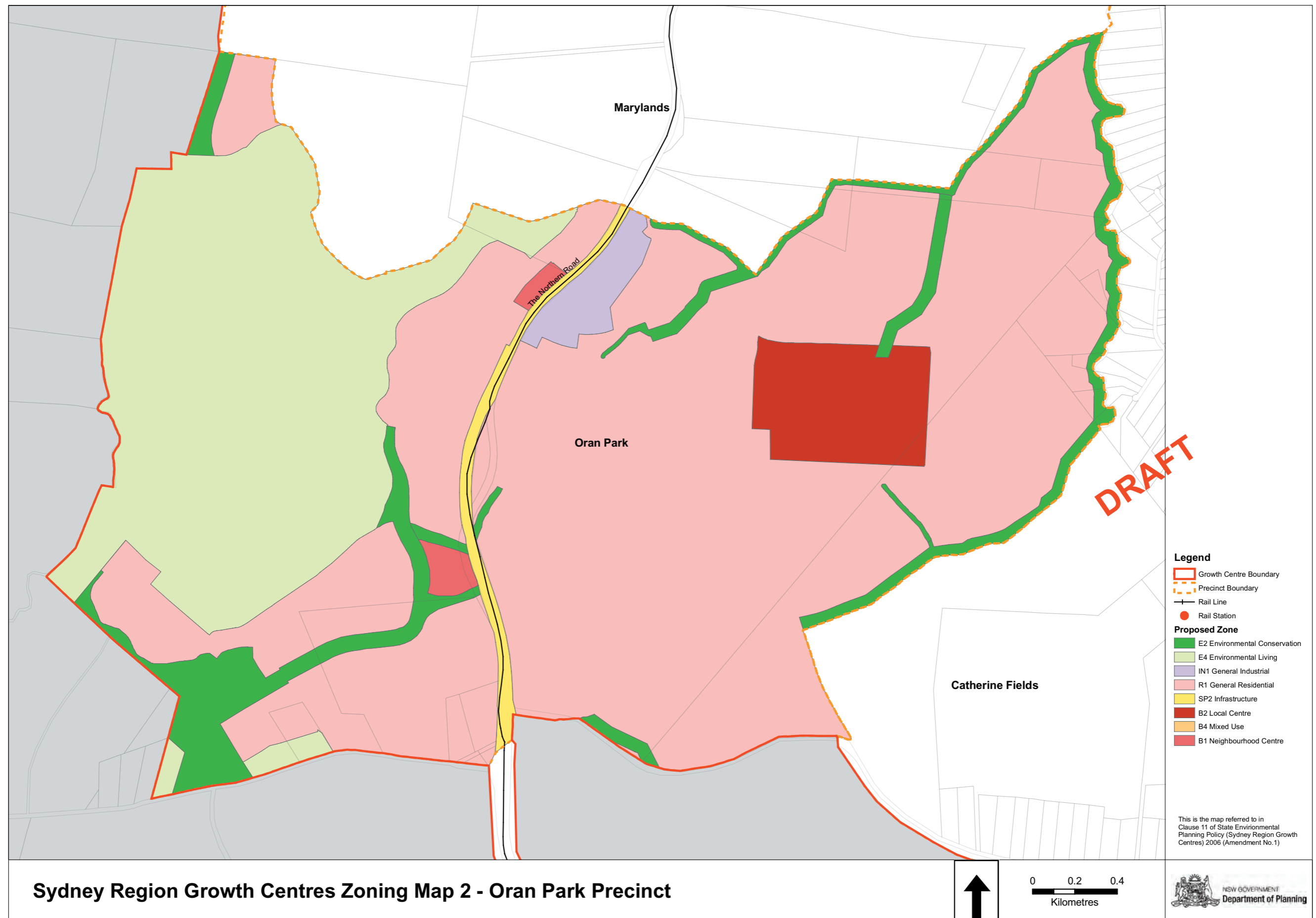


Figure 46 – Draft zoning map

Source: Growth Centres Commission

8.3 Recommendations

This section summarises the recommendations arising from the investigations and planning analysis undertaken for the Oran Park Precinct. The recommendations draw on:

- the analysis of the specialist contractors;
- the inputs of, and outcomes of negotiations with, Government agencies; and
- inputs from the Project Control Group and specialist staff at Camden Council.

It should be noted that this PPR has considered a wide range of views and that in some instances the advice of specialist contractors has had to be balanced against a range of competing needs. In these cases, the recommendations set out below may differ from the views of a particular consultant – but these differences have arisen only after careful consideration.

All relevant recommendations are incorporated in the Oran Park DCP.

8.3.1 Zoning and dwelling yield

Recommendation 1: The land known as the Oran Park Precinct is to be rezoned in accordance with the zoning map accompanying the proposed draft amendment to the SEPP.

Recommendation 2: The dwelling yield for the Precinct is to be in accordance the Oran Park DCP.

8.3.2 Landscape and visual character

(see section 5.1)

Recommendation 3: To mitigate the impact of future development on the rural landscape character, landscaping, revegetation and detailed design is to be in accordance with the Oran Park Precinct Landscape Strategy (see Figure 18).

Recommendation 4: The Denbigh curtilage area is to be protected by controlling built form, bulk and scale below the ridgeline and ensuring that existing vegetation along the ridgeline is rehabilitated, protected and managed. In addition, development of the transition lands shown on the ILP should not proceed unless a Part B DCP has been prepared and approved, to address the abovementioned issues.

Recommendation 5: The character of Cobbitty Road is to be managed through built form and setback controls and sensitive landscape treatments.

Recommendation 6: The visual impact of residential development is to be mitigated through the creation of a significant tree canopy via planting of trees in street verges, public parks and residential lots where possible.

Recommendation 7: Development of the area of the former main grandstand of the Oran Park Raceway, nominated in the draft ILP as a Special Design Precinct should not proceed unless a Part B DCP has been prepared and approved, to address issues such as access, pedestrian links, view sharing, the placement of dwellings, public spaces, and views to and from the former main grandstand.

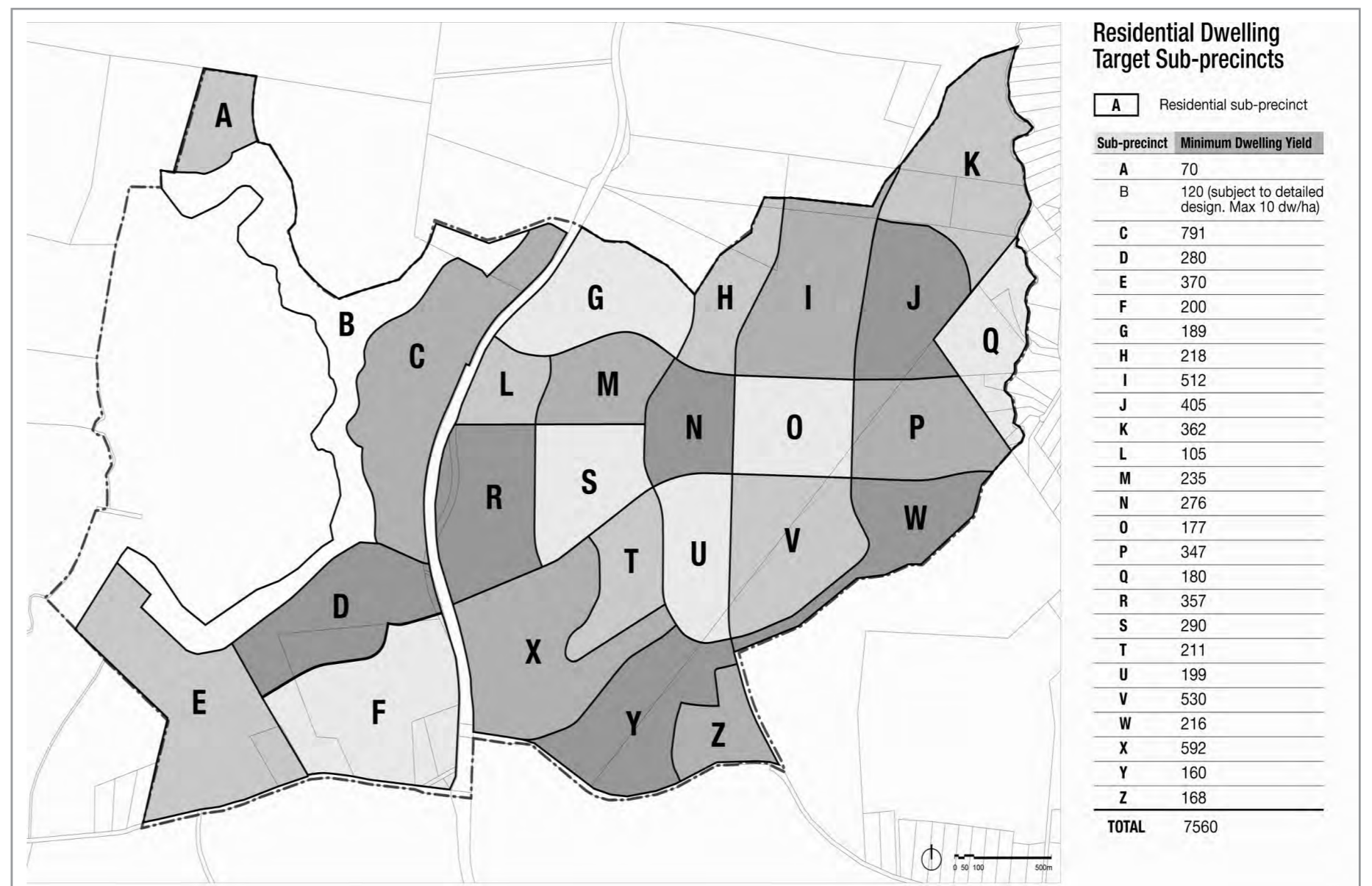


Figure 47 - Density Map

Source: JBA Urban Planning Consultants

8.3.3 Land capability *(see section 5.2)*

Recommendation 8: Development is to be restricted in areas identified as being subject to landslip, soil creep and erosion unless appropriate engineering works can provide acceptable levels of risk for the development.

Recommendation 9: Salinity management strategies are to be applied to areas affected by moderate to high levels of salinity, including management of associated problems of aggressivity and sodicity.

Recommendation 10: A Soil Management Plan is to be prepared and submitted with all subdivision applications directed at maintaining natural water balance; maintaining good drainage; avoiding disturbance or exposure of sensitive soils; retaining or increasing appropriate native vegetation in strategic areas; and implementing building controls and engineering responses where appropriate.

Recommendation 11: A Stage 2 environmental assessment is to be submitted for development applications on land identified as being potentially contaminated.

Recommendation 12: To ascertain the presence of unexploded ordnance within the former Narellan Army Camp, investigations are to be carried out in the areas of the former Grenade Range and 2nd Australian Army Troops Company workshop. Confirmatory instrumental sampling is to be conducted at campsites and in areas where munitions training may have taken place.

8.3.4 Biodiversity *(see section 5.3)*

Recommendation 13: The priority areas for conservation shown in **Figure 25** are to be retained and the following management measures implemented:

- patches of vegetation (CPW) with high ecological value and recovery potential remaining along South Creek and Cobbitty Road are to be retained and restored;
- significant remnant trees of CPW in the vicinity of the driver training area and the Denbigh transition zone are to be retained where possible within residential allotments or open space and linked where possible to stepping stone biodiversity corridors; and
- the patch of CPW around the dam in the north west corner of the Precinct is to be retained as open space and managed for habitat value and floristic biodiversity.

Recommendation 14: A detailed tree survey is to be undertaken at subdivision development application stage to identify the location of specific trees which should be retained. In particular, large hollow bearing Eucalypts in the north and west of the Precinct and around the Denbigh curtilage are to be targeted for retention.

Recommendation 15: The Olive Thicket in the northern part of the Precinct is to be removed and any natural canopy retained. The affected area should then be revegetated using CPW species.

Recommendation 16: A stepping stone biodiversity corridor to link the riparian corridor of South Creek to the habitats of Harrington Park 2 is to be provided. This is to contain remnant vegetation, public reserves and stormwater detention and/or treatments ponds.

Recommendation 17: A Conservation Management Plan (CMP) for the Precinct – to be agreed with Camden Council and DEC - is to be prepared which provides a detailed framework for the restoration and ongoing management of the identified conservation areas.

Recommendation 18: Riparian corridors are to be managed in accordance with the categorisation shown in **Figure 26**

8.3.5 Bushfire *(see section 5.4)*

Recommendation 19: Asset Protection Zones are to be in accordance with the requirements of Planning for Bushfire Protection 2006 and are to be incorporated within perimeter roads, front yard setbacks and within the buffer area to Core Riparian Zones.

Recommendation 20: Neighbourhood parks and Category 3 riparian zones are to be managed as 'fuel reduced' areas and bounded with perimeter roads to reduce the need for a wider APZ.

8.3.6 Aboriginal cultural heritage *(see section 5.5)*

Recommendation 21: A Conservation Management Strategy (CMS) is to be prepared to establish a Conservation Zone (from Zone 1 lands) which comprises a representative sample of intact archaeological landscapes. Once identified, no development or archaeological investigation is to occur within the nominated area.

Recommendation 22: The Conservation Zones are to be selected from the Zone 1 ridge slopes, hills and ridgelines within the Denbigh land (about 60% of PAD-OP4) and the riparian corridors associated with the two defined PADs to the north of the Precinct (PAD-OP1 and PAD-OP3).

Recommendation 23: Where land within Zone 1 areas, but outside of the defined Conservation Zone, is to be impacted by development, a program of archaeological salvage excavation is to be undertaken prior to development. The selection of areas for salvage are to be in accordance with current best practice (i.e. sampling a defined area usually around 6 hectares in size and achieving open area excavation in the order of 100 metres squared).

Recommendation 24: An indigenous heritage strategy is to be developed in consultation with Aboriginal stakeholders.

8.3.7 Non-indigenous cultural heritage *(see section 5.6)*

Recommendation 25: A detailed assessment of potential archaeological remains should be undertaken in accordance with the requirements of the NSW Heritage Manual and provisions of the *Heritage Act 1977*.

Recommendation 26: To ensure an unimpeded visual connection between the remainder of the former Hassall Road and the Denbigh Estate and to retain an historic connection with the homestead, the proposed 'Hassall Road' landscape corridor should be extended and widened up to the southern boundary of the Precinct.

Recommendation 27: The road running directly north-south from the Denbigh homestead to Cobbitty Road should be realigned to form a straight view corridor towards the homestead thereby retaining a visual connection.

Recommendation 28: A wide landscaped setback is to be provided on the northern and southern side of the road along the alignment of the Denbigh driveway in recognition of the heritage value of the rural landscape.

Recommendation 29: A vegetated buffer is to be incorporated on the eastern side of The Northern Road between the proposed Southern Boulevard and the electricity substation to reflect the rural character of The Northern Road.

Recommendation 30: The social significance of the Oran Park Raceway is to be interpreted by the alignment of part of the former track as roads and through naming streets and special places such as parks after motor racing identities. In addition, the general area of the former main grandstand is to be a Special Design Precinct.

8.3.8 Water cycle management *(see section 5.7)*

Recommendation 31: The floor level of development fronting South Creek is to be at least 600mm above the 100 year ARI flood level. The flood level for development around the dam in the south-west is to be the greater of either the 100 year ARI with a 600mm freeboard or the 500 year ARI flood level.

Recommendation 32: Further modelling must be carried out to determine the extent of change to the flood levels as a result of modifications to the dam in the south west corner of the Precinct.

Recommendation 33: The stormwater quantity management strategy should be implemented in accordance with **Figures 37** and **38**, subject to modifications to the draft ILP on the western side of The Northern Road to ensure all stormwater detention facilities are located outside of the core riparian zone.

Recommendation 34: The stormwater quality strategy should be implemented in accordance with **Figures 39** and **40**, subject to modifications to the draft ILP on the western side of The Northern Road to ensure all wetland/bioretention facilities are located outside of the core riparian zone.

8.3.9 Noise *(see section 5.8)*

Recommendation 35: The ECRTN external noise goals and AS 2107-2000 internal noise goals are to be adopted as the noise standards within the Precinct DCP for all new dwellings. Further negotiation is to be undertaken with DEC with regard to the relaxation of the noise criteria at the front of dwellings where it can be demonstrated that the AS2107-2000 internal noise goals can be met and where a suitable alternative area of outdoor space that meets the noise criteria can be provided on site.

Recommendation 36: To achieve the required noise goals on all roads except The Northern Road, noise mitigation measures are to be incorporated into building design involving a combination of setback distance, architectural treatment and internal dwelling layout.

Recommendation 37: In addition to the above, noise mounds are to be constructed along The Northern Road to mitigate the noise impacts on dwellings.

Recommendation 38: Industrial and commercial development is to comply with the amenity criteria set out in the Industrial Noise Policy (DEC 2000) to ensure that such development does not affect residential amenity.

8.3.10 Odour *(see section 5.9)*

Recommendation 39: A Level 3 Odour Assessment is to be undertaken prior to development in potentially affected areas (see **Figure 44**) to determine with greater accuracy the extent of impact of odour from surrounding poultry farms, as well as appropriate mitigation measures if required.

8.3.11 Roads, traffic and access *(see section 5.10)*

Recommendation 40: The road hierarchy is to be reviewed to minimise connections from local streets to sub-arterial roads.

Recommendation 41: Bus priority facilities – that is, bus jumps – should be provided on all key bus route intersections to facilitate buses maintaining running times.

Recommendation 42: Cycle and pedestrian routes are to be connected to community facilities and open space.

8.3.12 Community facilities *(see section 7.3)*

Recommendation 43: All primary schools within the Precinct are to be co-located with community facilities and open space.

Recommendation 44: Negotiations should occur with DET regarding the opportunity to reduce the land required for schools that are co-located with other community facilities.

Recommendation 45: Further discussions with the DET should be undertaken with regard to the siting of the primary school east of the Town Centre.

8.3.13 Open space and recreation *(see section 7.4)*

Recommendation 46: Further assessment of the proposed open space areas is to be undertaken to determine the breakdown of active and passive local open space and district open space within the Precinct. Land that is flood prone, containing vegetation, constrained by power easements or to contain detention basins also needs to be identified.

Recommendation 47: Local open space and recreational facilities are to be designed to maximise the availability of vegetated buffers for passive uses.

Recommendation 48: Once district open space facilities and their respective embellishments are identified, the costings of the embellishments and any required land acquisition are to be incorporated into the draft Section 94 Plan for the Oran Park Precinct and the nominated areas are to be identified on the draft ILP.