Statement of Environmental Effects



Stage 1 - Parklands Estate, Jordan Springs

Date: February 2015

APP

Program & Project Delivery | Design & Technical Services | Real Estate | Independent Assurance Services | Consulting & Advisory

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Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Contents

Executive Summary 7

1. Introduction 1
1.1. Consultation with Penrith Council Urban Design Review Panel 1
1.2. Background 2
1.3. Structure of this report 5

2. Site Analysis 6
2.1. Site Location and Context 6
2.2. The Western Precinct - Jordan Springs 6
2.3. Parklands Estate 8
2.4. Parklands Estate: Stage 1 – Development Site 9
2.5. Acid Sulphate Soils 13
2.6. Utilities and Infrastructure 13
2.7. Surrounding Land Uses 13

3. Proposed Development 19
3.1. Overview 19
3.2. Residential 19
3.3. Non-Residential 21
3.4. Landscaping and open space 21
3.5. Access, Traffic and Parking 23
3.6. Accessibility 24
3.7. Servicing and Waste Management 25
3.8. Lighting and Signage 25
3.9. Stormwater 26
3.10. Sediment and Erosion Control 26
3.11. Materials and Finishes 26
3.12. Site Preparation 28
3.13. Development Statistics 28

4. Statutory and Planning Framework 30
4.1. Environmental Planning Instruments 30
4.2. Zoning and Permissibility 30

5. Environmental Assessment 36
5.1. Urban Form and Structure 36
5.2. Future Character 37
5.3. Design Quality and Amenity 40
5.4. Overshadowing 42
5.5. Access and Movement 43
5.6. Traffic and Parking 44
5.7. Conservation 48

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

5.8. Landscape and Open Space 50
5.9. Environmental Impacts 54
5.10. Natural Hazards 58
5.11. Construction Impacts 60
5.12. Social Impacts 60
5.13. Economic Impacts 64
5.14. Site Suitability 64
5.15. Public Interest 64

6. Conclusion 65

Appendices 66

Appendix A – URDP Minutes & Response 67
Appendix B – Site Survey 68
Appendix C – Architectural Design Package 69
Appendix D – Building Code of Australia Report 70
Appendix E – Landscape Design Package 71
Appendix F – Engineering – Road Layout & Drainage 72
Appendix G – Parking and Traffic Assessment 73
Appendix H – Waste Management Plan 74
Appendix I – Stormwater Design (Detailed) 75
Appendix J – Perspectives/Photomontages 76
Appendix K – Compliance Assessment: Western Precinct Plan – Development Control Strategy 77
Appendix L – Compliance Assessment: Development Control Strategy – Residential Development Forms 78
Appendix M – State Environmental Planning Policy No. 65: Design Quality Residential Flat Development 79
Appendix N – Species Impact Statement 80
Appendix O – Acoustic Impact Assessment 81
Appendix P – Building Sustainability Index: BASIX Certificates 82
Appendix Q – Bushfire Assessment & Management Report 83
Appendix R – Quantity Surveyors Report 84
Appendix S – Lend Lease approval/agreement 85

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Figures

Figure 1: Aerial locality and contex map (source: www.nearmap.com.au) 6
Figure 2: Precinct Map showing site location (source: Architectus, 2015) 7
Figure 3: Aerial view of Jordan Springs as at 30 November 2014 (source: www.nearmap.com.au) 8
Figure 4: Aerial image showing site locatiionand configuration (source: Architectus, 2015) 9
Figure 5: General configuration of stage 1 development site (source: Ecological; 2015) 10
Figure 6: View looking north west across the future drainage channel and development site 10
Figure 7: View looking southwest across the site from the corner of Lakeside Pde & Jordan Spring Blvde 11
Figure 8: View looking south west across the site from Jordan Springs Boulevard 11
Figure 9: View of the site looking south west along Jordan Springs Boulevard 12
Figure 10: View looking north west along Jordan Springs Boulevard showing residential development north of the site 14
Figure 11: View looking north east along Jordan Springs Boulevard towards the developing Town Cenre 14
Figure 12: View looking northward along Tyler Street showing residential commercial interface. Road 3 with extent the line of this Tyler Street Southward and retain the existing view corridor 15
Figure 13: View looking north along Lakeside Parade to the Town Centre (opposite the northeast corner of the site) 15
Figure 14: View of Town Centre from Lakeside Parade across the park and town lake 16
Figure 15: View looking north to the town centre from boundary of Lot 3991, vacant land in the foreground 16
Figure 16: View looking west along proposed drainage corridor and Winnamatta Regional Park 17
Figure 17: View looking south west towards the Winnamatta Regional Park, south of the development site. 17
Figure 18: View looking south east across the site showing low density residential in the distance 18
Figure 19: View looking east across the adjacent lake to developing residential precinct 18
Figure 20: Stage 1 Development Site and Building layout (Source: Mosca Pserras Architects) 20
Figure 21: Extract of Building 2 Ground Floor Plan showing proposed commercial and SoHo spaces (source:MPA; 2015) 21
Figure 22: Stage 1 Landscape plan and site layout (source: Clouston Associates; 2015) 22
Figure 23: Perspective image showing use of proposed materials and finishes on Building 2 27
Figure 24: View looking north east along Lakeside Parade showing six (6) storey mixed use building under construction with lower two (2) storey commercial to the west 38
Figure 25: View of Parklands Estate looking south east along Jordan Springs Boulevard. 39
Figure 26: Extract from road layout plan (Source: JWP; 2015) 44
Figure 27: Extract of EEC flora communities surveyed on the site (Source: Cumberland; 2015) 49
Figure 28: Extract of Fauna Survey Map (Source: Eco Logical; 2015) 50
Figure 31: Noise logger locations relative to the proposed development site (source: Acoustic Logic; 2015) 55
Figure 32: Planning for bushfire safety (Source: Ecological; 2015) 59

Tables

Table 1 Summary of SREP 30 Amendment to land area/use 3
Table 2 Summary of Development Approvals for the Western Precinct 4
Table 3 Summary of dwelling mix 20
Table 4 Summary of proposed parking 24
Table 5 Summary of building materials and colours 27
Table 6 Development Statistics 28
Table 7 Key Relevant planning instruments and controls 30
Table 8 Summary of setback and articulation controls 39
Table 9 Summary of separation distances achieved within the site and over boundaries 41
Table 10 Summary of road design 43
Table 11 Penrith DCS Off- Street Car Parking Requirements 45
Table 12 Penrith DCP 2010 Accessible Parking Rates 47
Table 13 Summary of proposed bicycle parking 47
Table 14 Noise Requirements by Australian Standards.(source: Acoustic Logic, 2014) 54

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table 15 Summary of measured background noise (source: Acoustic Logic, 2014) _____ 55
Table 16 Summary of BASIX achievements _____ 57
Table 17 Ecological APZ Calculation (source: Ecological; 2015 p. 7)_____ 58
Table 18 Summary of BOSCAR Statistics for the Penrith LGA (by premises) (Source: www.boscar.nsw.gov.au)_____ 61
Table 19 Consideration of the proposal against the CPTED principles. _____ 63

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Executive Summary

This Statement of Environmental Effects (SEE) is submitted to Penrith City Council (Council) on behalf of CID Group Pty Ltd in support of a Development Application for Stage 1 of Parklands Estate at Lots 3989 and 3991 in DP1190132, Jordan Springs Boulevard, Jordan Springs.

The proposal seeks consent for the redevelopment of the land to achieve a high density residential and mixed use development, containing the following:

- Four (4) residential flat buildings containing 138 residential apartments;
- One (1) mixed use building containing 614m^2 ground floor commercial, retail and business premises with shop top housing above, to include 63 residential apartments;
- Car parking for 371 vehicles in two (2) level basements below each building footprint;
- Associated entry roads, stormwater, services and infrastructure;
- Public Domain and landscape works, including 2,400m² of public open space; and
- Site preparation works including tree removal and land forming earth works.

The application has been assessed having regard to the heads of consideration under Section 79C(1) of the *EP&A Act 1979*, including the provisions of all relevant Commonwealth and State Legislation in relation to protection of biodiversity and conservation values and the relevant SEPPs, Council LEP, DCPs, Codes and Policies.

The site is zoned "Urban" under the Sydney Regional Environmental Plan No. 30 St Mary's (SREP). The use of the site for "housing", "commercial" and "retail" purposes is permitted with Council Consent. A Precinct Plan has been adopted under SREP 30, known as the Western Precinct Plan (WPP) this plan identifies the site as forming part of the Village Centre Urban Character Area allowing for residential development in varying forms including apartments and shop top housing. The related Development Control Strategy anticipates building forms and heights of between two (2) and six (6) storeys.

As demonstrated throughout the SEE, the development does not give rise to adverse or significant environmental impact and is generally consistent with the desired future character of Jordan Springs as expressed in the Village Centre Urban Character Statements and recent developments occurring within the precinct reflecting a range of building types from single dwellings to six (6) storey mixed use developments.

An assessment of the potential environmental effects of the proposed development as described in the preceding sections of this report has been undertaken in relation to the following:

- Urban Form and Structure
- Future Desired Character (Bulk, mass and scale; built form; setbacks);
- Residential Amenity (Solar Access, Ventilation, Privacy);
- Landscape and Open space;
- Conservation (flora and fauna);
- Access and Movement;
- Residential Amenity;
- Water (Stormwater and Drainage);
- Environmental Hazards (Bushfire protection);
- Socio-Economic Impacts/Benefits; and

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

- Construction Impacts.

In summary the proposed development:

- Will have no significant impact on the Endangered Ecological Communities of the Cumberland Plain Woodland or the Cumberland Plain Land Snail;
- Is not inconsistent with the western precinct target to achieve a minimum density of 15 dwellings per hectare;
- Provides a suitably design road network, reflecting the desired modified grid pattern promoting legibility and permeability for cars, pedestrian and cyclists;
- Promotes the use of active and alternative modes of transport by delivering increased density in the town centre within walking distance to services, amenities and public transport;
- Achieves and active street corner interface is delivered by the inclusion of ground floor non-residential tenancies located at the junction of Jordan Springs Boulevard and Lakeside Parade, the focus of height and scale at this point positively reinforces the corner site location of the site and its location within the town centre;
- Provides high levels of visual amenity and outlook for residents with the majority of apartments orientated to obtain an outlook to areas of open space including the central lake, proposed open space, the secret garden and regional park;
- Makes a positive contribution to the availability of recreation space within the Western Precinct and expends the range of recreational opportunities for future residents;
- Contributes to the delivery of housing and jobs within proximity to identified future public transport connections along Jordan Springs Boulevard;
- Contributes and diversifies the available housing stock and provides a range of apartment types and sizes. Increasing the availability of smaller dwellings, including one (1) bedroom apartments, may contribute to housing affordability and the delivery of adaptable housing will provide for social inclusion of the elderly and mobility impaired;
- Will not adversely affect the local road traffic network; and
- Will achieve building sustainability targets for water, energy and thermal performance.

The proposal will not result in any significant environmental impacts and is considered worthy of Council's support.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

1. Introduction

This Statement of Environmental Effects (SEE) is submitted to Penrith Council in support of a Development Application (DA) for redevelopment of land at Lots 2989 and 3991 in DP1190132, Jordan Springs for Stage 1 of the Parklands Estate, to include a High Density Residential and Mixed Use Development, containing the following:

- Four (4) residential flat buildings containing 138 residential apartments;
- One (1) mixed use building containing 614m^2 ground floor commercial, retail and business premises with shop top housing above, to include 63 residential apartments;
- Car parking for 371 vehicles in two (2) level basements below each building footprint;
- Associated entry roads, stormwater, services and infrastructure;
- Public Domain and landscape works, including 2,400m² of public open space; and
- Site preparation works including tree removal and land forming earth works.

The DA seeks approval for the proposed development under Section 76A of the *Environmental Planning and Assessment Act 1979* (the EP&A Act) and is Nominated Integrated Development under section 91 requiring consent from the NSW Rural Bushfire and NSW Office of Water.

In accordance with clause 44 of SREP 30, subdivision of the land adjacent to a Regional Park requires a referral to the Director General of National Parks and Wildlife.

Biodiversity Certification for the site was issued prior to the gazettal of SREP 30 under the, now repealed, *Commonwealth Environment Protection (Impact of Proposals) Act 1974* and the *Environmental Reform (Consequential Provisions) Act 1999*. Accordingly, no further assessment of ecological impact is required under the *Environment Protection & Biodiversity Conservation Act 1999*. In addition, the development of the St Marys was previously assessed by the Australian Heritage Commission pursuant to the requirements of the *Australian Heritage Commission Act 1975* and does not require further consideration in this regard.

This DA should be read in conjunction with the Western Precinct Plan prepared by JBA Planning adopted by Penrith Council on 23 March 2009 in accordance with Part 3 of the Sydney Regional Environmental Plan No. 30 – St Marys.

This report describes the site, its environs, the proposed development, and provides an assessment of the environmental impacts and identifies the steps to be taken to protect or lessen the potential impacts on the environment. Within this report, references to "the site" mean the land to which this DA relates.

The Capital Investment Value of the proposed development exceeds $20 million. In accordance with State Environmental Planning Policy (Regional and State Development) 2011, the consent authority for the Development Application is the Sydney West Joint Regional Planning Panel (JRPP).

1.1. Consultation with Penrith Council Urban Design Review Panel

A meeting was held with the Penrith Urban Design Review Panel and Council's Planning Assessment Staff to discuss the broad redevelopment of the land comprising Parkalnds Estate, including a master plan and stage 1 development application. The issues raised that are relevant to the stage 1 application are summarised as follows:

- Six (6) storeys may be suitable in the Village Centre Character Area, subject to detailed architectural design;

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

- The panel was supportive of:
  - The visual connectivity through the site to the regional park;
  - Sequence of well connected green spaces and the addition of the central square;
  - The restrained road network to reduce environmental impact and maximise green spaces;
  - Appropriate distribution of height and scale responding to the local context;
  - The slightly higher ground floor level above street level;
  - Articulation of upper levels of indicative building forms;
  - Maintenance of green edge treatment.
- The panel recommended further consideration be given to:
  - The capability of the ground floor non-residential uses to be adapted for residential use in the future;
  - Commercial tenancy with no direct road frontage/streetscape presence, may affect viability and amenity (due to orientation and shading);
  - Thermal comfort of the commercial forecourt, orientation/shading/wind;
  - Dedication of open space needs to consider access and long term maintenance and management arrangements to be negotiated with Council;
  - Amenity of southern facing units due to the character/visual amenity likely to arise from a combination of engineered drainage channel, macro-fauna fence and APZ/fire trail. Greater care is to be taken in considering the outlook from these apartments;
  - Building setbacks to allow for adequate deep soil planting;
  - Indicative building envelopes could come forward subject to design edge;
  - Building depths are consistent and separation between building roads is required;
  - Consideration of kerbside parking required; and
  - Indicative architecturals are visually congested.

A detailed summary of the matters raised and the applicant's response are provided **Appendix A** of this SEE.

1.2. Background

The site was formerly occupied and used by the Australian Defence Industries (ADI). In 1993, the NSW Government identified the land as being suitable for urban renewal and residential redevelopment and included the site in its Urban Development Program (UDP).

The former ADI site had a land area of 1, 545 hectares and is located within the Penrith and Blacktown Local Government Areas (LGAs). To overcome the cross authority boundary the Sydney Regional Environmental Plan No. 30 – St Marys (SREP 30) was developed. SREP 30, informed by a detailed Regional Environmental Study (RES) established the key planning framework to address land use and zoning, biodiversity, heritage (indigenous and colonial), contamination and remediation, water management, transport, urban form, employment and housing.

SREP 30 was gazetted on 19 January 2001 and was made deemed State Environmental Planning Policy (SEPP) on 1 July 2009.

Since gazettal, the SREP has been amended to increase the area of the Regional Park to ensure the preservation of an Endangered Ecological Community (EEC), the Cumberland Plain Woodland, a summary of the change in the distribution of land are and use is provided in **Table 1.**

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table 1 : Summary of SREP 30 Amendment to land area/use

Land use	SREP 30 (at gazettal)	SREP 30 (amendment)
Regional National Park	630 hectares	900 hectares
Public Open Space (embellished)	48 hectares	48 hectares
Urban land	730 hectares	510 hectares

The reduction in the area of urban land reduced the anticipated dwelling yield by approximately 39 per cent from an initial 8, 000 dwellings to 4,900 dwellings.

SREP 30 is structured to require land within it to first be declared by the Minister as a "release area" and then have a precinct plan prepared and adopted by the relevant local planning authority. The 1, 545 hectares of ADI site into six (6) precincts, the site is located within the Western Precinct.

1.2.1. **The Western Precinct – Jordan Springs**

The Western Precinct is located on the north-west edge of the SREP 30 lands (refer to **Figures 2** and **3**) and is zoned wholly for urban purposes, intended to deliver residential and limited non-residential (commercial, retail and business) floor space. The Western Precinct is otherwise known as Jordan Springs.

The Western Precinct Plan establishes the broad framework to guide urban form and is supported by a Development Control Strategy that guides the finer grain detail of the precinct. These were adopted by Penrith Council on 23 March 2009.

The Western Precinct Plan envisages the following:

- a Village Centre including a commercial core providing a mix of retail, commercial, community uses combined with public open space with higher density residential;
- low density residential development throughout the remainder of the precinct;
- A road local road network connecting to the broader Penrith LGA via connections to The Northern Road and Ninth Avenue as well as developed precinct to east, such as the Central Precinct;
- water management infrastructure (stormwater basins); and
- local open space and riparian corridors.

Under the adopted Western Precinct Plan, once complete Jordan Springs would accommodate a total of 3, 000 dwellings and be home to 6, 500 residents.

1.2.2. **St Marys Development to Date**

Since gazettal of SREP 30 in 2001 and development of the precinct commencing in 2004, the following milestones have been achieved:

- 950 residential lots have been delivered to market, with 481 dwellings constructed with a further 150 under construction, accommodating a total of 1, 200 residents;

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

- The construction of a village centre providing a local supermarket combined with complimentary specialty stores;
- Construction of catholic secondary school and public primary school have been completed;
- Local social infrastructure, including project skilling and employment centre, community resource hub (recreation and health and education needs);
- Significant areas of public open space have been constructed and delivered to the new and growing community including an eight (8) local parks and playgrounds across the six precincts and a large regional Oval with multipurpose playing field, two (2) tennis courts and basketball/netball courts along with associated parking, amenities, playground and BBQ facilities;
- Allocation of 38 affordable housing allotments provided by the develop to the NSW Government, integrated with the broader community;
- The delivery of 450 of 490 federally funded affordable housing lots; and
- Road, services infrastructure construction and delivery.

1.2.3. **Previous Development Applications (Western Precinct)**

Stage 1 of the Parklands Estate forms part of the broader area of the Western Precinct, known as Jordan Springs. Accordingly the proposed development should be considered in the context of the existing approved development. A summary of the consents granted to date for the Western Precinct is provided in **Table 2**.

Table 2 : Summary of Development Approvals for the Western Precinct

DA Reference	Description of Approved Development
DA09/1317	Construction of Sales Office and Information Centre
DA10/0208	Superlot Subdivision that connect with main street
DA10/0608	Construction of the Town Square, Main Street and Southern entry Boulevard together with associated landscaping and public domain embellishment.
DA10/0851	Construction of Village Lake (Environmental Impact Statement)
	Construction and Operation of Woolworth and associated at grade car park
DA14/0294	Mixed Use Development - Construction of a Community Title Subdivision Development Including Attached and Detached Housing (69 Dwellings), Mixed Use Residential Flat Buildings (160 Units) with Ground Floor Commercial / Retail Tenancies and Associated Road Construction, Car Parking, Landscaping, Drainage Works and Earthworks (Undetermined)
DA14/0050	Infrastructure – Drainage Channel, associated Landscaping and earthworks (undetermined)

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

1.3. Structure of this report

This SEE is structured as follows:

- Section 1 – Introduction;
- Section 2 – Site Analysis;
- Section 3 – The Proposed Development;
- Section 4 – Statutory and Planning Framework;
- Section 5 – Environmental Assessment; and
- Section 6 – Conclusion.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

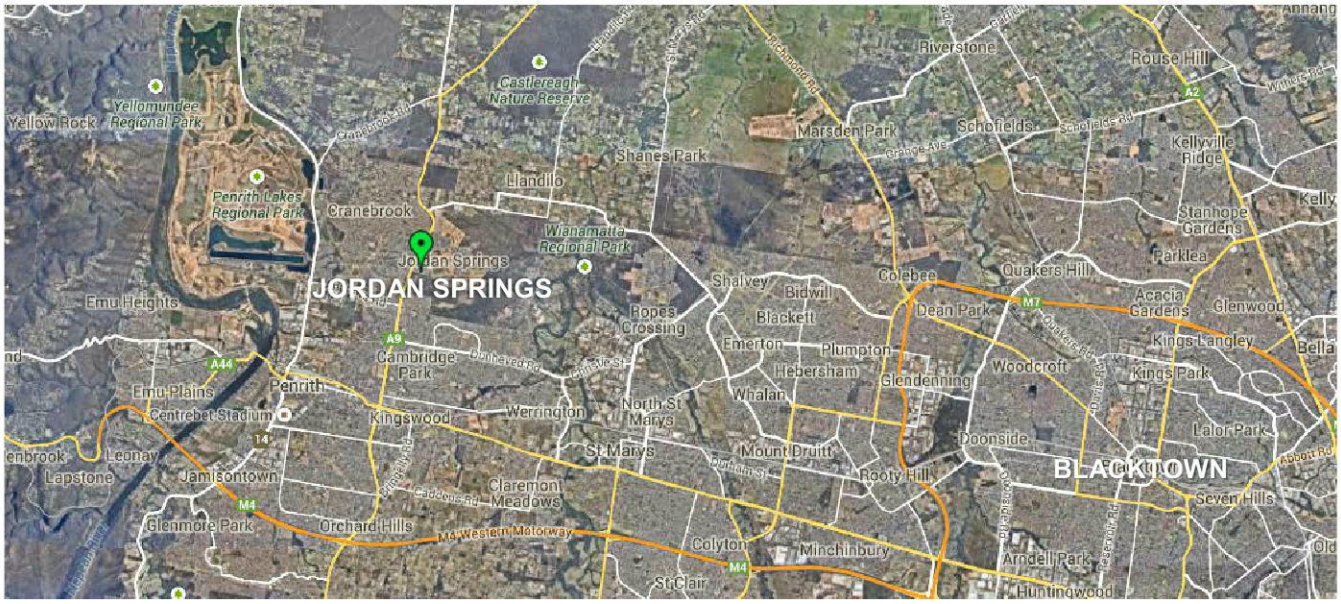
2. Site Analysis

2.1. Site Location and Context

The Parklands Estate is located within Jordan Springs that forms the Western Precinct of land covered by Sydney Regional Environmental Plan 30 St Marys. St Marys is located approximately 45 kilometres west of the Sydney CBD, 5 kilometres north-east of the Penrith City Centre and 15 kilometres west of the Blacktown City Centre. Refer to **Figure 1**.

The western precinct is one (1) of six (6) precincts on the 1, 545 hectare former Australian Defence Industries site located in the Local Government Areas of Penrith and Blacktown City Councils (**Figure 2**).

Figure 1: Aerial locality and contex map (source: www.nearmap.com.au)



2.2. The Western Precinct - Jordan Springs

The Western Precinct is located on the south-western edge of the former ADI lands (refer to **Figure 2**), north of the Winnamatta Regional Park and forms the suburb of Jordan Springs located with the Penrith Local Government Area.

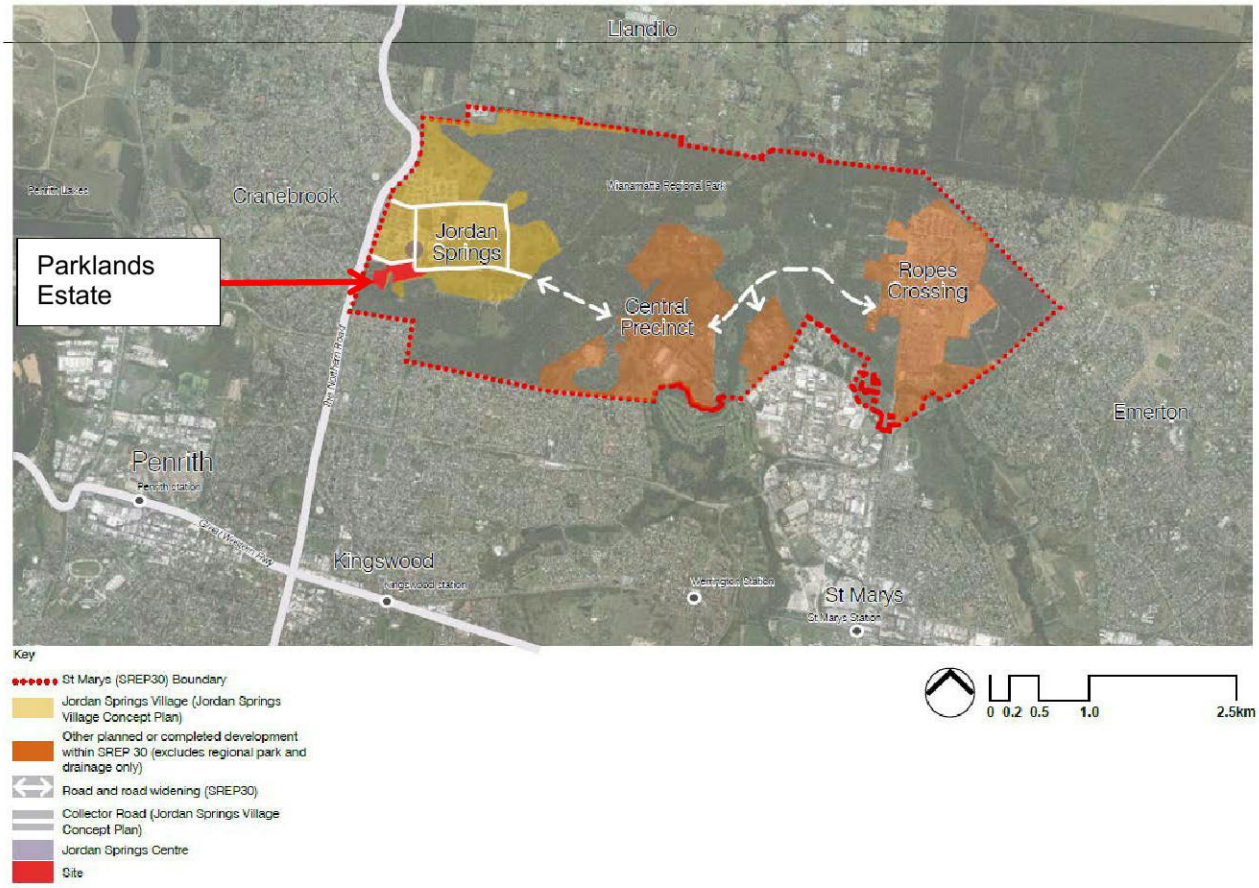
Jordan Springs is a predominantly residential suburb, focused around a core of mixed use residential, commercial and retail premises to achieve a Town Centre. The Winnamatta Regional Park wraps around the suburb to north, east and south of existing and future residential development and is a defining characteristic of the area.

Two (2) main collector roads serving as entry points from The Northern Road are provided including Greenwood Parkway to the north and Jordan Springs Boulevard to the south. The road network would generally be described as a grid pattern, providing accessibility and connectivity for vehicles, cyclists and pedestrians.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

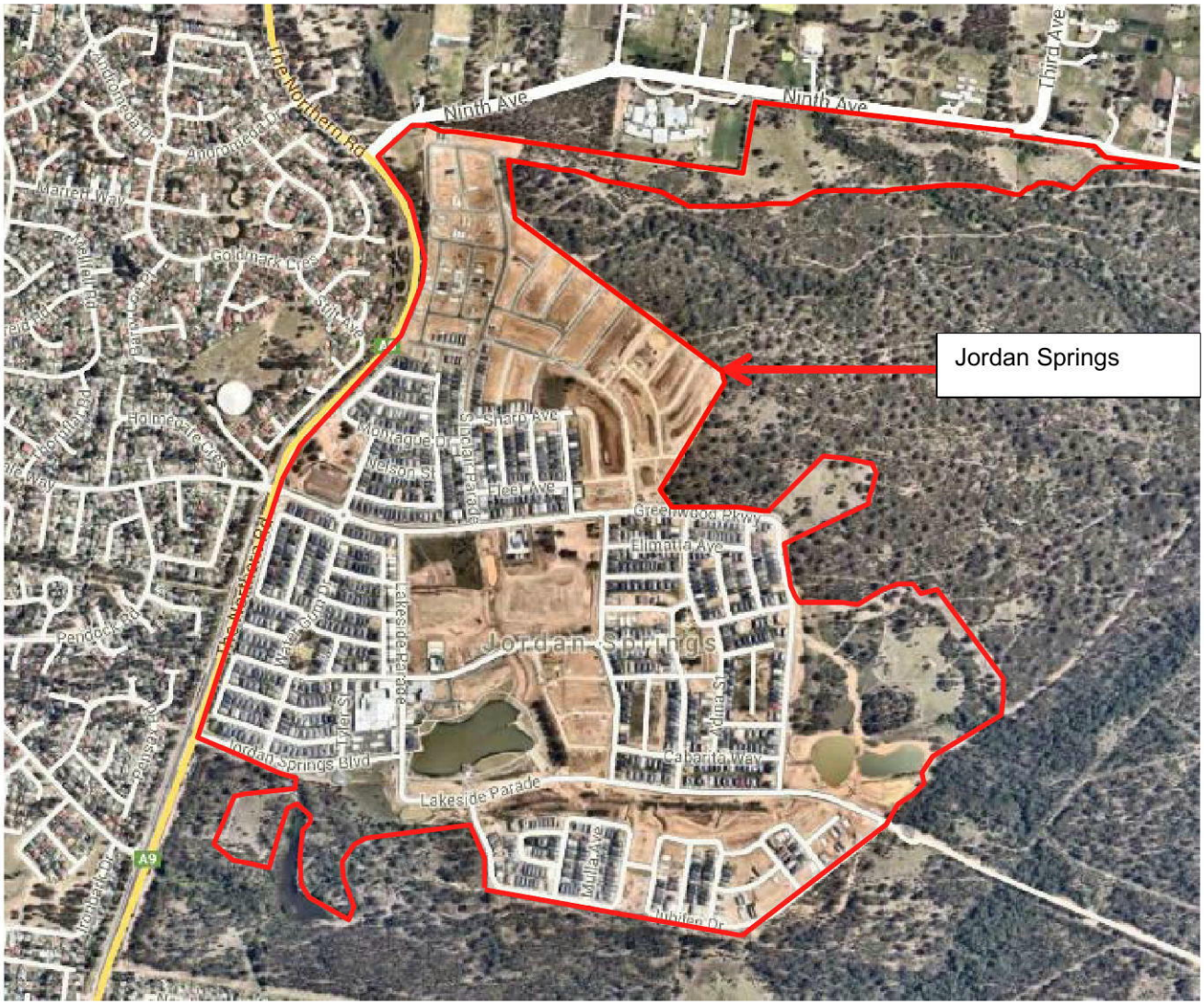
An aerial view of Jordan Springs showing the progress of development as at November 2014 is shown in **Figure 3**.

Figure 2: Precinct Map showing site location (source: Architectus, 2015)



Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Figure 3: Aerial view of Jordan Springs as at 30 November 2014 (source: www.nearmap.com.au)



2.3. Parklands Estate

The future Parklands Estate is located at the south western edge of Jordan Springs, north of the Winnamatta National Park and comprises land legally described as Lots 3989, 3990 and 3991 in DP1190132. The estate lands are of an irregular configuration shown in **Figure 4** with an approximate area of 6.5 hectares (ha).

The following section provides an overview of the key features of the site.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Figure 4: Aerial image showing site locatiionand configuration (source: Architectus, 2015)



2.4. Parklands Estate: Stage 1 – Development Site

Stage 1 is located in the north eastern corner of the site, at the intersection of Jordan Springs Boulevard and Lakeside Parade extending south west to the boundary of the Western Precinct separated from the Winnamatta Regional Park by a drainage channel and the macro-fauna fence. Refer to **Figure 5**.

The proposed development for Stage 1 of Parklands Estate relates to land legally described as follows:

- Lot 3989 in DP1190132; and
- Lot 3991 in DP1190132.

The proposed development site is of an irregular configuration and has a cumulative area of approximately 4 hectares.

2.4.1. **Existing Use**

The site is presently undeveloped and comprises former pasture and grazing land supporting regenerated bushland with a mix of mature and young growth stands of trees combined with open grassland. A temporary stormwater detention basin is currently constructed in the southeast corner of the site at the junction of Lakeside Parade and Cordyline Loop (Refer to **Figure 4**).

2.4.2. **Topography**

The site gently slopes from the north-west to the south-east corner of the site with an approximate 6 metre landform change. **Appendix B** includes Site Survey, which provides further details.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Figure 5: General configuration of stage 1 development site (source: Ecological; 2015)



Figure 6: View looking north west across the future drainage channel and development site



Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Figure 7: View looking southwest across the site from the corner of Lakeside Pde & Jordan Spring Blvde



Figure 8: View looking south west across the site from Jordan Springs Boulevard



2.4.3. **Bushfire**

The site is classified as Bushfire Prone Land due to the proximity of large areas of unmanaged bush land within the adjacent Regional Park.

2.4.4. **Water and Drainage**

Runoff and overland of water across the site currently follows the natural slope of the land grading gently from Jordan Springs Boulevard in a southerly direction towards the proposed drainage channel that runs parallel to the southern boundary of the site.

Detailed investigations as part of the planning informing the development of the Western Precinct Plan indicate that the whole of the Western Precinct (Jordan Springs) is outside the Probably Maximum Floor level of the South Creek. Consequently the development site is not identified as being flood prone land.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Figure 9: View of the site looking south west along Jordan Springs Boulevard



2.4.5. **Geology, Soil and Groundwater**

The local geology is typical of western Sydney's principally Bringelly Shale bedrock weathered and overlain with alluvial floodplain deposits composed largely of clays and thinner and discontinuous layers of sand and gravel.

The Western Precinct generally has a relatively high proportion of surface shale bedrock and less alluvium, such as the clays found in the Central Precinct.

Two (2) groundwater- systems are present within the St Marys site. These include a:

- shallow (regolith soil) aquifer; and
- deep (fractured shale bedrock) aquifer.

Both systems comprise a complex of scattered and discontinuous sub-aquifers of limited area and volume.

2.4.6. **Contamination**

A detailed contamination investigation was undertaken of the St Marys ADI site in the 1990s prior to the release of the land for urban redevelopment purposes. Consequently the site was remediated and validation certificates were issued by a NSW Environmental Protection Authority accredited Site Auditor. In relation to land within the Western Precinct the following Site Audit Statements were issued:

- Part Western Sector covered by SAS CHK001/1; and
- Part Southern West Sector covered by SAS CHK001/1, 001/6 and 00117.

The information presented in the remediation and validation reports for these sectors has been used to develop a Contamination Management Plan for Jordan Springs which is included in the adopted WPP. The majority of the precinct, including the development site, has been assessed by the site auditor to pose a negligible risk to the public or the environment with regard to chemical contamination or explosive ordnance.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

2.4.7. **Transport and Access**

The main entry to Jordan Springs is via The Northern Road (to the east of the development site) and Jordan Springs Boulevard. Entry to the Parklands Estate will be via two (2) planned entries from Jordan Springs Boulevard and a third from Lakeside Parade (bounding the site to the west).

Local bus services are available connecting Jordan Springs to Penrith Rail Station and urban centre. These bus routes are available along Jordan Springs Boulevard and run at half hour intervals on most weekdays.

The Western Precinct Plan includes provision for the augmentation of local public transport networks to include services along Jordan Springs Boulevard, a bus stop is planned immediately adjacent to the north-east corner of the development site.

Active transport modes, including walking and cycling, are a key feature of Jordan Springs. A network of cycle ways are incorporated into the precinct plan to connect residential areas of the estate with the village centre, as well as providing connection to the broader transport grid.

2.5. Acid Sulphate Soils

The site is not known to contain potential acid sulphate soils.

2.6. Utilities and Infrastructure

The site has access to existing utilities and infrastructure constructed as part of earlier stages of the development for Jordan Springs, including sewer, water, gas, electricity and telecommunications infrastructure. The services would need to be extended to the site as part of the proposed works. Liaison with the relevant authorities would be undertaken as required.

2.7. Surrounding Land Uses

The suburb of Jordan Springs is currently undergoing development and generally reflects an area in transition from a naturalistic setting of open grassland and sporadic stands of young and mature vegetation to a urban environment containing a village centre supporting a range of commercial and retails uses and higher density residential in the form of townhouses and residential flat buildings giving way to traditional low density single dwelling houses.

The locality immediately surrounding the site is described in detail in the following sections.

To the North

To northern boundary of the site adjoins Jordan Springs Boulevard a four (4) lane collector road connecting to the Northern Road in the west leading past low density residential development to Jordan Springs Town Centre located immediately opposite the site to the north extending westward (refer to **Figure 10**).

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Figure 10: View looking north west along Jordan Springs Boulevard showing residential development north of the site



Figure 11: View looking north east along Jordan Springs Boulevard towards the developing Town Cenre



Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Figure 12: View looking northward along Tyler Street showing residential commercial interface. Road 3 with extent the line of this Tyler Street Southward and retain the existing view corridor



Figure 13: View looking north along Lakeside Parade to the Town Centre (opposite the northeast corner of the site)



The town centre comprises a mix of open at grade car park, with two (2) – three (3) storey form commercial and retail buildings (refer to **Figures 11** to**13**). A six (6) storey mixed use building is currently under construction to the north east of the site on the corner of Lakeside Parade and Water Gum Drive. Refer to **Figures 13** and **14.**

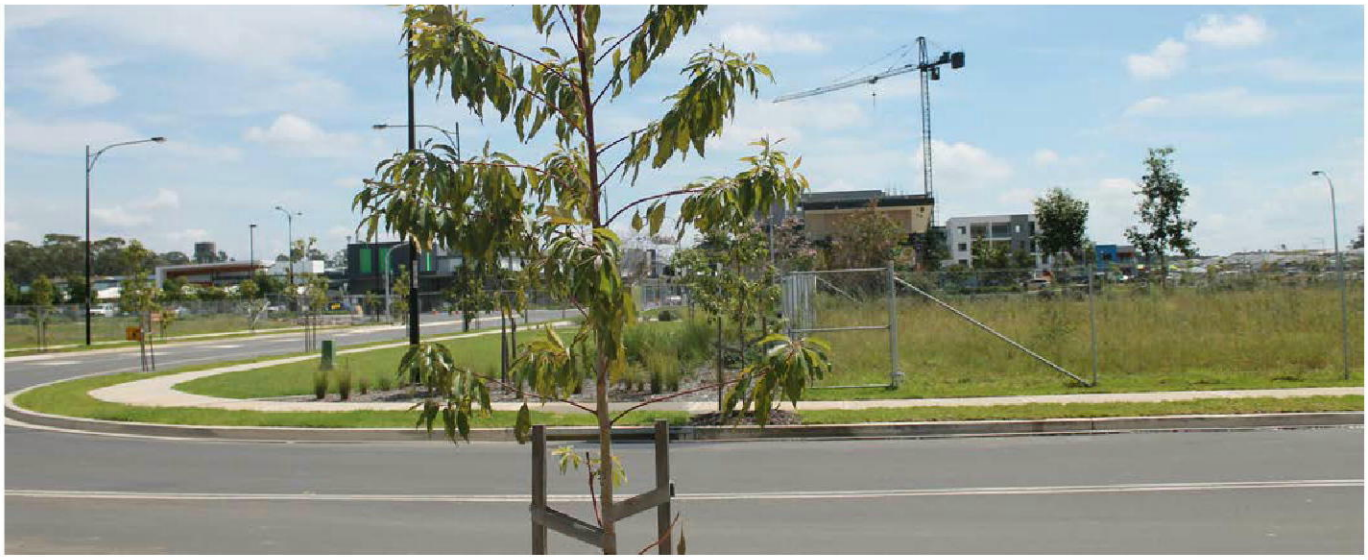
Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Figure 14: View of Town Centre from Lakeside Parade across the park and town lake



Land to the immediate north of Lot 3991 (located in the southeast corner of the development site) is currently a vacant block intended for future higher density residential development (refer to **Figure 15**).

Figure 15: View looking north to the town centre from boundary of Lot 3991, vacant land in the foreground



To the South

To the immediate south of the site is a drainage channel beyond which is the Winnamatta Regional Park and future open space. Refer to **Figures 16** and **17**)

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Figure 16: View looking west along proposed drainage corridor and Winnamatta Regional Park



Figure 17: View looking south west towards the Winnamatta Regional Park, south of the development site.



To the East

To site is bound to the east by Lakeside Parade and Corydyline Loop that is currently fenced off from access due to ongoing road and residential construction works. Refer to **Figures 18** and **19**.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Figure 18: View looking south east across the site showing low density residential in the distance



Figure 19: View looking east across the adjacent lake to developing residential precinct



To the West

To the west of the site is Lot 3990 that will form later stages of the Parklands Estate beyond which is the Winnamatta National Park and the Northern Road. Refer to **Figure 19**.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

3. Proposed Development

3.1. Overview

The application seeks approval for Stage 1 of the Parklands Estate, to include a High Density Residential and Mixed Use Development, containing the following:

- Four (4) residential flat buildings containing 138 residential apartments;
- One (1) mixed use building containing 614m^2 ground floor commercial, retail and business premises with shop top housing above, to include 63 residential apartments;
- Car parking for 371 vehicles in two (2) level basements below each building footprint;
- Associated entry roads, stormwater, services and infrastructure;
- Public Domain and landscape works, including 2,400m² of public open space; and
- Site preparation works including tree removal and land forming earth works.

3.2. Residential

The proposed development responds to the design principles set out in the Western Precinct Plan and seeks consent for a mixed use development in part, comprising 201 residential apartments described in detail below and by the architectural drawings including photomontage images and shadow diagrams are provided at **Appendix C**.

The proposed residential element of the development is characterised as “residential flat building” and “shop top housing” and contains a total of 201 residential apartments over the proposed five (5) building elements. Each building has been named after indigenous flora endemic to the locality and the site, consistent with the park land aesthetic and estate name.

The five (5) main buildings elements described as follows:

- Building 1 (Castlereagh) is a part 3, part 4 four (4) storey apartment building and is located in the north east corner of the development site with a frontage to Jordan Springs Boulevard and proposed “Road 3”
- Building 2 (Cumberland) is a six (6) storey mixed use building containing ground floor commercial premises (as a general term) and shop top housing above. Building 2 is located on the corner of Jordan Springs Boulevard and Lakeside Parade;
- Building 3 (Woodland) is a four (4) storey apartment building located at the south of Building 2 on the corner of Lakeside Parade and proposed ‘Road 1”;
- Building 4 (Pimelea) is a four (4) storey apartment building located at the south of the development site, opposite Building 3 with a road frontage to proposed “Road 1”; and
- Building 5 (Dillawynia) is a four (4) storey apartment building located at the south of the development site with a frontage to Lakeside Parade.

Each building makes provisions for adaptable housing, designed in accordance with Class C of AS4299 indicative floor plan layouts for these units showing pre and post adaptation are provided in the Architectural Design Package (**Appendix C**). These apartment layouts and the development generally have been reviewed as part of the Building Code of Australia compliance review (refer to **Appendix D**). The provision for adaptable housing reflects a mix of one (1) and two (2) bedroom apartments and accounts for 10 per cent of the total development.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

The general site layout is shown in **Figure 20** below and summary of the proposed dwelling mix for each building is detailed in **Table 3**.

Figure 20: Stage 1 Development Site and Building layout (Source: Mosca Pserras Architects)

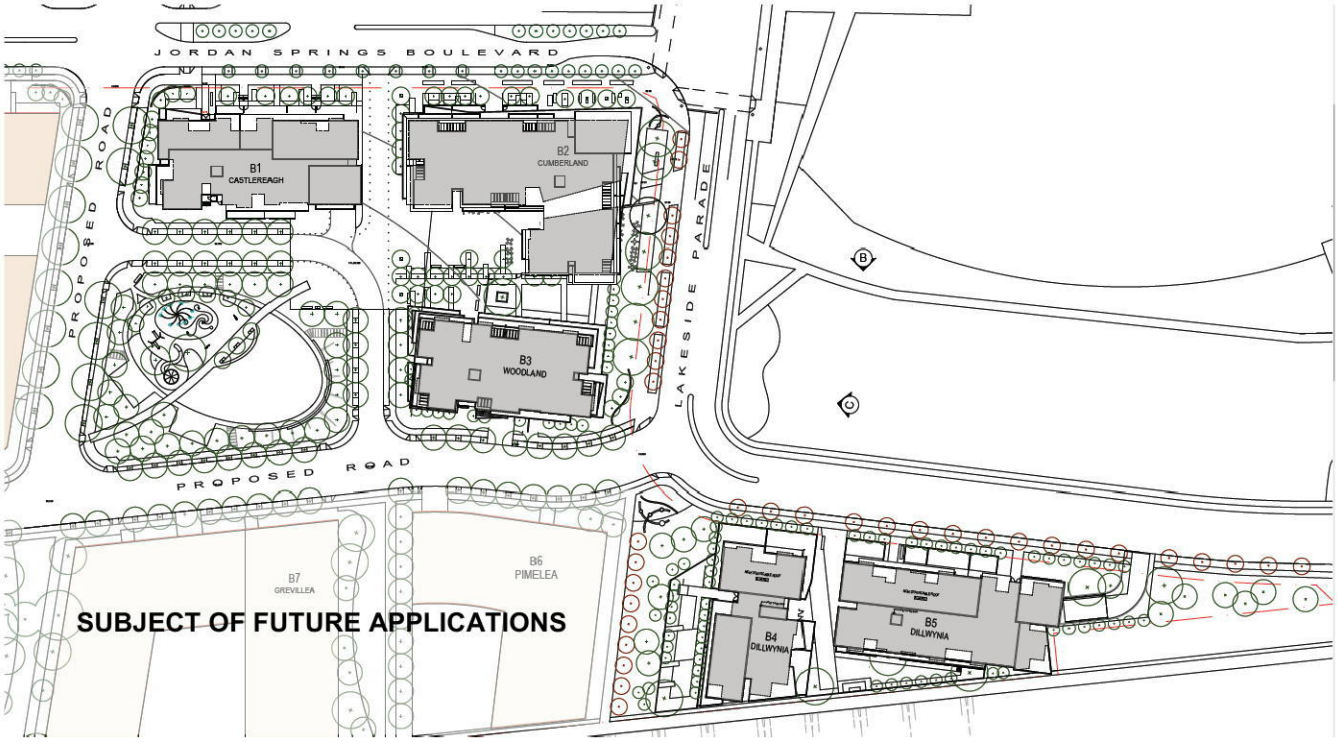


Table 3 Summary of dwelling mix

Building No.	1 Bedroom	2 Bedroom	3 Bedroom	SoHO
Building 1 (Castlereagh)	6 (inc. 3 adaptable)	26	1	0
Building 2 (Cumberland)	6 (inc. 4 adaptable)	47	12	3
Building 3 (Woodland)	1 (adaptable)	35 (inc. 5 adaptable)	5	0
Building 4 (Piemlea)	4	20 (inc. 4 adaptable)	0	0
Building 5 (Dillatynia)	8 (inc. 4 adaptable)	32	0	0
Total	25 (12%)	160 (80%)	16(8%)	

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

3.3. Non-Residential

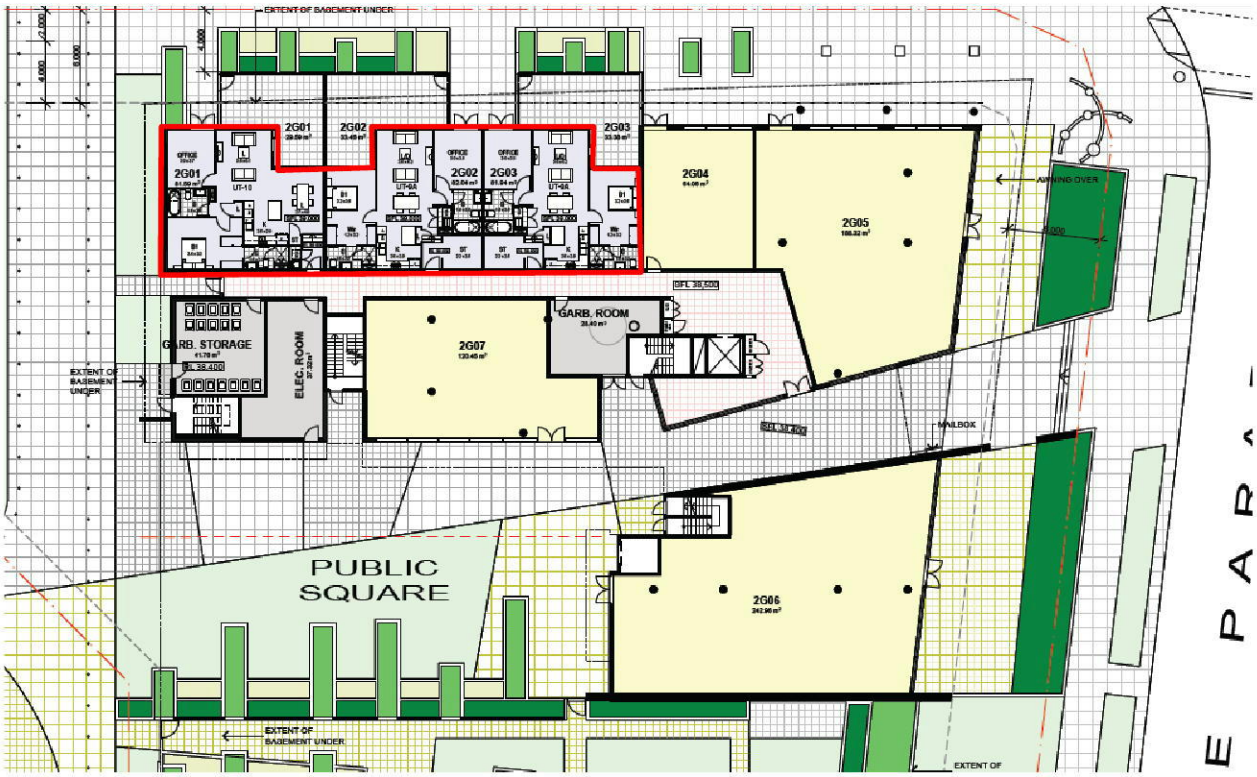
Building 2 located at the corner of Jordan Springs Boulevard and Lakeside Parade provides 626m² non-residential floor space across four (4) tenancies and three (3) SoHo style apartments.

The non-residential tenancies are divided by a pedestrian plaza that passes through Building 2 before opening out on to a public square with views out to the future pocket park. The tenancies have been orientated to street frontages and the public square providing ground level activation and opportunity for casual surveillance.

Tenancies range in size from approximately 65m² to 243m². Large tenancies have multiple entrance points and flexible floor plan layouts to enable future use for a range of commercial, retail and business premises that would service the day to day needs of local residents.

At the north western edge of Building 2, orientated to Jordan Springs Boulevard are three (3) SoHo style apartments with direct street access and separated living areas (outlined red in **Figure 21**).

Figure 21: Extract of Building 2 Ground Floor Plan showing proposed commercial and SoHo spaces (source:MPA; 2015)



3.4. Landscaping and open space

3.4.1 Landscaping

The development will provide a total of 9,670m² landscaped area of which 2,707m² or 28 per cent is deep soil.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

A landscape design strategy has been developed by Clouston Associates for Parklands Estate. The design strategy has sought to achieve a balance between the natural landscape setting of the Wianamatta Regional Park that wraps around the estate to the west and south and the urban setting of the Jordan Springs, including the Town Centre to the north and north east.

A key principle in the landscape design has been to enhance the parkland character and setting. The strategy will be implemented through maximising planting opportunities along street edges, between buildings and as formal and informal gardens. Plantings will predominantly be native and endemic species interspersed with exotics to provide diversity in colour and texture while also delivering a complex habitat and planting structure, involving low, middle and upper storey plantings.

As outlined in the attached landscape plans, the development has two (2) main precinct elements:

- The commercial centre; and
- Residential

Figure 22: Stage 1 Landscape plan and site layout (source: Clouston Associates; 2015)



The proposed landscape concept reflects the importance of a strong relationship between the overall Jordan Springs development and the Town Centre, while simultaneously introducing features and a design language to identify the estate as a distinct place in its own right.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

3.4.2 Open Space

Provision has been made for active and passive recreation spaces throughout the site, including the following:

- Ground level public square and pedestrian plaza passing through Building 2 to Jordan Springs Boulevard and Lakeside Parade. The public square will support active ground level non-residential uses as well as providing a pedestrian link between central park and town centre to the north east.
- A central park proposed to be used for the purposes of public open space is located to the south of Building 1 and west of Buildings 2 and 3 providing enhanced visual amenity to residents and additional active and passive spaces. The park includes active play areas and equipment for young children combined with open grass field for informal play, sporting games and passive recreation. The park will also include public art water feature that draws on the mythology of the Secret Garden;
- Each apartment has a private terrace or balcony; and
- Buildings 3, 4 and 5 have a dedicated area of common open space for residents to enjoy.

A detailed design package has been prepared by Clouston Associates and is provided at **Appendix E.**

3.5. Access, Traffic and Parking

3.5.1 Vehicle Access

Two (2) of the main vehicle entry points to the Parklands Estate will be constructed as part of Stage 1. These include:

- Road 1 is a local road and provides an entry to the estate from Lakeside Drive. Road 1 is the southern-most road and runs in an west-east direction;
- Road 3 is a local road running north-south connecting to Jordan Springs Boulevard. Road 3 will form one of three estate entries; and
- Road 4 a small local road and part shared zone, dog legs around the proposed pocket park connecting Road 1 and 3 and providing access to Building 1. The shared zone is located at the northeast corner connecting the ground level pedestrian plaza and park.

Roads 1 and 3 will allow for two (2) lanes of traffic and kerb side parking. Road 4 serves a limited number of dwellings and is narrow in width. It is not intended to permit parking along the Road 4.

Detailed road design and sections have been prepared by J. Wyndham Prince and are provided at **Appendix F.**

3.5.2 Pedestrian and Cycle

Use of active transport modes are encouraged throughout the western precinct, this has been continued in the Parklands Estate and the development site.

Pedestrian footpaths will be provided as part of the proposed local road network and will connect to the broader area. As the local road network will serve only residents and provide future connection to public open space at the southwest edge of the site, the potentially low volumes of traffic will enable safe use of the road by cyclists without the need for a dedicated lane.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

3.5.3 Parking

The development will provide on-site parking for 371 cars, 10 motorcycles and 55 bicycles. Parking is provided within basement level car parks each two (2) storeys generally contained to the building footprints. A breakdown of the parking is provided in **Table 4** below.

Table 4 Summary of proposed parking

Building	Basement Entry	Basement Level 1	Basement Level 2
Building 1	Proposed Road 4	• 16 standard resident spaces affi(including 4 stacked); • 3 accessible resident spaces; • 7 visitor spaces; • 3 motorcycle spaces; and • 5 bicycle spaces.	29 Standard resident spaces
Buildings 2 and 3	Proposed Road 1	• 38 standard residential spaces (including 6 stacked) spaces; • 8 accessible resident spaces; • 23 standard non-residential spaces (including 6 stacked); • 2 non-residential accessible spaces; • 21 visitor spaces; • 20 bicycle spaces; and • 7 motorcycles	• 113 standard resident spaces (including 26 stacked); • 2 accessible resident spaces; and • 15 bicycle spaces.
Buildings 4 and 5	Lakeside Parade	• 32 standard resident spaces; • 8 accessible resident spaces; • 13 visitor spaces; and • 15 bicycles.	• 51 standard resident spaces; and • 4 accessible resident spaces.

A detailed traffic and parking assessment has been undertaken by GTA consultants and is prepared at **Appendix G**.

3.6. Accessibility

An Access Report has been undertaken by Matt Shuter and Associations and is provided at **Appendix D**. The proposed development is capable of complying with the deemed to satisfy:

- the functional circulation space requirements of AS1428.1 (2009) (Incorporating Amendment No. 1);
- the intent of the DDA and Disability (Access to Premises- Buildings) Standards 2010; and
- the deemed to satisfy/performance requirements of the BCA (2014).

The pedestrian network through the site will provide accessible paths of travel to link all buildings, common use facilities including landscaped open space areas.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

3.7. Servicing and Waste Management

3.7.1 Servicing

All loading and unloading of goods in relation to the ground level non-residential uses and waste servicing for Buildings 1 and 2 will occur within the shared loading/servicing zone, located between Buildings 1 and 2. The shared zone will establish direct vehicle access between Jordan Springs Boulevard and Proposed "Road 4", to allow service trucks to enter and exit in a forward direction.

3.7.2 Waste Management

A Waste Management Plan which covers the demolition, construction and operational phases of the proposal is provided at **Appendix H.**

Each residential building contains a dedicated waste storage room at ground level with access direct access to a street to facilitate kerb side collection of waste by Council. Apartments within each of the residential buildings, above ground level, will be connected to the waste storage rooms at ground level by chute. Management of the bins will be the responsibility of the future strata/building managers.

A dedicated non-residential waste room is provided at ground level in Building 2. Applications for future use of the tenancies will need to consider and adopt suitable waste management plans and practices in line with Council's adopted DCP.

3.8. Lighting and Signage

3.8.1 Lighting

External lighting will be provided to common areas, driveways and footpaths. It is envisaged that the lighting system would utilise low level bollard lighting.

The proposed lighting will use concealed fixtures where possible, with luminaries integrated into landscaping elements so as to complement the parkland character. The lighting will be designed to avoid glare for pedestrians and adjacent dwellings and will comply with AS 4282 to control the obtrusive effects of outdoor lighting.

3.8.2 Signage

Estate signage will be erected on low level retaining walls at the two (2) road entries to the estate. The design and colour palette used is consistent with the theme adopted throughout Jordan Springs, providing continuity and connectivity to the broader area.

The signage while low scale will be visible from adjoining streets to guide residents and visitors to the estate to ensure legibility of the site. It is anticipated that signage would also be used throughout the estate to guide and direct residents and visitors to the various buildings and public spaces.

Any business identification signage in relation to the non-residential uses would be sought as part of a further and separate application for first use of the ground floor tenancies within Building 2.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

3.9. Stormwater

3.9.1 Local Street Drainage

The development will involve construction of the local street drainage system for Roads 3, 4 and part of Road 1. The Local Street Drainage Network will connect to the Drainage Channel running parallel to the southern boundary of the site, connecting to the east lake.

A detailed local street drainage system has been developed by J.Wyndham Prince for the Parklands Estate and is provided at **Appendix F**.

3.9.2 Site Stormwater Drainage

A Stormwater Management Plan (SMP) has been prepared by S&G Consulting Engineers Pty Ltd. The SMP has been designed to integrate with the broader JWP road drainage plans and details the following:

- Concept stormwater drainage layout for each of the proposed buildings and associated public domain areas;
- Concept stormwater drainage layout for the proposed public open space – central park;
- Stormwater pump station from all basement level car parks; and
- Rainwater tank details.

The SMP concept design package is provided at **Appendix I** to the SEE.

3.10. Sediment and Erosion Control

A detailed sediment and erosion control plan for the development has been prepared by J. Wyndham Prince and is provided at **Appendix F.** The plan generally details the following:

- Implementation and maintenance of a sediment fence along the southern boundary of the site and around the proposed spoil stock pile (to be no more than 2 metres high);
- Construction of an interim sediment basin (to the south of the bunded stockpile);
- Establishment of stabilised site entry from Jordan Springs to manage and mitigate the tracking of spoil material out of the site and onto the adjacent road network; and
- Filter rolls will be implemented at kerb inlet pits to capture any sediment being transported by site runoff.

3.11. Materials and Finishes

Each of the buildings will be constructed using a mix of Austral Facebrick in colours “Shorthorn Mix”, “Whitsunday” and “Grand Piano” punctuated contrasting rendered and painted elements in “Frozen Forest”, “Natural White B1” and “Tea House GR23”.

Feature materials including Sandstone cladding, louvred screening in “Light Grey” and “Australian Cedar” will enhance the buildings finish and provide shading and privacy.

The external finishes complement the architectural style and form of the development and the parklands setting as shown in the rendered photomontages provided at **Appendix J** and Cover Sheet provided as part of the Architectural Design Package at **Appendix C.** The colours and materials scheme is summarised in **Table 5**, below**.**

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Figure 23: Perspective image showing use of proposed materials and finishes on Building 2



Table 5 Summary of building materials and colours

Building Element	Proposed Material/Colour Finish
External wall (1)	Austral Bricks “Shorthorn Mix”
External wall (2)	Austral Bricks “Whitsunday”
External wall (3)	Austral Bricks “Majestic Grey”
Powder coated Louvres/Screen (4)	Eurowood Innovative Coating “Light Grey”
External General Paint (5)	“Grand Piano”
Sandstone Cladding (6)	Amber “Teakwood Sandblast”
Aluminium Inter-lock Cladding (7)	Fielders Finesse Colorbond Dulux “Woodland Grey”

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Building Element	Proposed Material/Colour Finish
External Feature Walls (8)	Dulux “Frozen Forest”
External General Paint (9)	Dulux “Natural White B1”
External General Paint (10)	Dulux “Tea House GR23”
Balcony glass balustrades (11)	Frosted glass “white”
Balcony glass balustrades (12)	Frosted glass “Light Green”
Window, Door Frames and Balcony balustrades(13)	Powder Coated Aluminium “Charcoal 8851 Satin”

3.12. Site Preparation

3.12.1. Tree Removal

Eight (8) existing trees are proposed to be removed from the development site, including:

- Three (3) trees in the north and north east of the adjacent to Jordan Springs Boulevard and Lakeside Parade; and;
- Five (5) trees in the south and south east of the site adjacent to the rear boundary and Drainage Channel.

A detailed tree removal plan has been prepared by J. Wyndham Prince and is provided at **Appendix F.**

3.12.2. Excavation

The proposed development involves the construction of the three (3) basement level car parks. Excavation of between 5 metres and 6 metres, due to the variable land form of the site, will be required to construct the basement level parking beneath each building.

3.12.3. Earthworks and Landforming

Moderate cut and fill will be undertaken as part of the development and will include decommissioning the existing stormwater detention basin currently located in the southwest corner of the site.

The proposed earthworks will maintain the gentle gradient of the site, details are provided in the cut and fill plan prepared by J.Wyndham Prince at **Appendix F**.

3.13. Development Statistics

Table 6 provides a summary of key development statistics.

Table 6 Development Statistics

Element	Permitted/Required	Proposed
Site Area	Not specified	19,800m²
Gross Floor Area	N/A	19,462m²
Density	15 dwellings/ha	>15 dwellings/ha

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Element	Permitted/Required	Proposed
Building Height	6 Storeys	3 - 6 Storeys
Deep Soil	1,980m² 10 per cent	5,544m² 28 per cent
Parking		
Car	362	371 spaces
Bicycle	Not specified	55 spaces
Motorcycle	Not specified	10 spaces

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

4. Statutory and Planning Framework

Section 79C(1)(a) of the EP&A Act identifies the relevant strategies, policies, planning instruments and development controls applying to the proposed development.

4.1. Environmental Planning Instruments

The relevant environmental planning instruments and development controls applying to the proposed development are:

- Environment Protection and Biodiversity Conservation Act 1999;
- Environmental Planning and Assessment Act 1979;
- Water Management Act 2000;
- Rural Fires Act 1997;
- Sydney Regional Environmental Plan No. 30 St Marys;
- State Environmental Planning Policy No. 55 – Remediation of Land;
- State Environmental Planning Policy No. 65 - Design Quality Residential Flat Buildings;
- State Environmental Planning Policy (Building Sustainability Index: BASIX) 2004;
- State Environmental Planning Policy (Infrastructure);
- State Environmental Planning Policy (State and Regional Development) 2011;
- Western Precinct Plan and Development Control Strategy; and
- Penrith Development Control Plan 2010 (PDCP 2010).

An assessment of the proposal's consistency and for compliance with the relevant planning instruments and controls is set out in Section 5.1. **Table 7** provides a summary of the relevant instruments and development standards and controls.

4.2. Zoning and Permissibility

Sydney Regional Environmental Plan No. 30 St Marys (SREP 30 St Marys) is the relevant environmental planning instrument applying to the land. Under the provisions of SREP 30 St Marys the land is zoned "Urban" wherein development for the purpose of "housing" and "retail or commercial premises" are listed as permissible with the consent of the relevant planning authority.

Table 7 Key Relevant planning instruments and controls

Legislation	Development Standard / Control
Commonwealth Legislation	
Environmental Protection and Biodiversity Conservation Act 1999	The *EPBC Act 1999* is the Australian Government's key piece of environmental legislation. The Act focuses on Matters of National Environmental Significance (MNES). The site contains several listed Endangered Ecological Communities (EEC), classified as MNES. Their presence was determined via a search of the EPBC database and site specific investigation.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

State Legislation	
Environmental Planning and Assessment Act 1979	Section 5A requires consideration of the potential for significant impact following the identification of the presence of EECs and determination as to whether the proposed development will have a significant effect on threatened species, populations or ecological community or their habitats.
Rural Fires Act 1997	Section 100B subdivision of land for residential purposes requires the approval of Rural Fire Service
Water Management Act 2000	Section 91 Approval of the NSW Office of Water is required for works within 40 metres of a drainage channel to the south.
State Environmental Planning Policies	
SEPP 55 Remediation of Land	SEPP 55 requires the Penrith City Council to consider the likelihood of contamination on the site together with the need for remediation (if applicable).
SEPP 65 Design Quality for Residential Flat Buildings	Application involves construction of residential flat buildings greater than 3 storeys requiring the design to be verified by a registered architect and to demonstrate consistency with the 10 design principles and rules of thumb contained within the Residential Flat Design Code.
SEPP State and Regional Development	Part 4 of the SEPP appoints a regional panel to carry out the functions of Council in the assessment of applications listed under schedule 4A, including development with a capital investment value exceeding $20 million dollars. A quantity surveyors report is provided at **Appendix R**.
SEPP Infrastructure	Consideration is to be given to Clause 85 and 86 due to proximity of development to rail corridor. Consideration is to be given to Clause 101 and 103 due to development with frontage to a classified road.
SREP 30 – St Marys	SREP 30 provides the primary planning framework to guide development.
Clauses 12 – 16	Require the preparation and adoption of a precinct plan prior to development consent.
Clause 20	Imposes development consent restrictions on the consent authority. Namely the consent authority must be satisfied: ▪ That the proposed development will not be inconsistent with the performance or zone objectives applying to the site; ▪ Has considered any relevant development control strategies; ▪ A precinct plan has been adopted and it has been considered in the assessment of the application; and ▪ Consistency of the proposal within any planning agreement has been considered.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Clause 21	The SREP contains performance objectives that describe the desired environmental, social and economic outcomes for development.
Clause 22	Development should support the goals of Ecological Sustainable Development for the Sydney Region.
Clause 23	▪ Development is to minimise adverse impact on the air quality of the relevant local government area; and ▪ Contribute to regional air quality by reducing vehicle trips by encouraging higher levels of active and public transport use, and promote energy-efficient housing.
Clause 24	Site planning within the urban zone is to have regard to significant stands of trees and where practicable retain them; Adverse impact on the Regional Park and Regional Open Space zones resulting from development of the urban zone is to minimised; Infrastructure is to be located to minimise impact on conservation values;
Clause 25	Development should not affect items or areas of indigenous and non-indigenous heritage.
Clause 26	A full range of community services should be delivered to meet the needs of the future community
Clause 27	A range of passive and active recreation spaces are to provided, demonstrating suitable accessibility and utility while maximising cultural and natural environmental values.
Clause 28	Water quality, water usage and runoff should be minimised through the life cycle of any project. In particular: ▪ Changes in local flow regimes due to the development are to be minimised for rainfall events up to the 50% AEP rainfall event; ▪ Gross pollutants are to be collected at or close to stormwater outlets to prevent increase in sediment/litter entering creeks as a result.
Clause 29	Development is to have regard to soil constraints to ensure that the risk of adverse environmental and economic impacts is minimised.
Clause 30	▪ Development should support the use of public and active modes of transport. ▪ Development should deliver a legible and connected street network; ▪ An overall net neighbourhood density target of at least 15 dwellings per hectare should be achieved to support a compact urban form supporting opportunities for walking and public transport use; ▪ High trip generating uses to be located adjacent to major transport routes; ▪ The overall development of the precinct should deliver a suitable range of services and land uses to minimise demand for trips outside the precinct; ▪ Development should achieve high levels of public transport use.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Clause 31	▪ Development should result is attractive and safe neighbourhoods; ▪ New community to be integrated with the existing community; ▪ Development to provide a range of housing types and designs , within proximity to public transport, services, retail, community and recreational facilities. Combined with distinguishable private and public space and legible street layout; ▪ Urban design should reflect CPTED principles.
Clause 32	▪ Jobs created within the precinct should approximate the number of residents (i.e. 5,300 jobs) ▪ Retail and commercial development delivered shall not threaten the viability or dominance of regional and district centres; ▪ Local retail shall be delivered early in the program of development works; and ▪ Land use conflict is to be minimised.
Clause 33	▪ Deliver housing choice, based on size and type; ▪ Each precinct should contain a range of housing densities and styles.
Clause 34	Development to incorporate best practice energy management and implement energy efficient principles, wherever possible.
Clause 35	▪ Building design and construction to minimise waste generation; ▪ Facilitate appropriately design and scaled local activities which reuse, recycle and reprocess waste.
Local Environmental Plans	
Penrith LEP 2010	Zone objectives and development standards do not apply to land controlled by SEPP 30 St Marys.
Concept Plans, Precinct Plan and Development Control Strategies/Plans	
Western Precinct Plan	The Western Precinct Plan (WPP) is adopted under clause 16 of SREP 30 and sets a broad framework for the development of the precinct, including: ▪ Road layout; ▪ Establishment of Character areas;
Urban structure and major land uses	▪ Identifies dwelling density and population target (i.e. 2,450 dwellings and 6,400 residents); and ▪ Village C to accommodate 660 dwellings
Future Character Areas	Village Centre Character Area, allowing: ▪ 2 – 4 storeys with provision for up to 6 storeys; ▪ Walkable pedestrian friendly environment (wide footpath); ▪ Designed for accessibility; ▪ Mixed use developments encouraged ▪ Buildings articulation to be used as a means of reducing visual bulk and

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

	creating varied building forms contributing to interesting streetscapes; ▪ Corner designs to accentuate key street junctions; ▪ Civic spaces to be designed to promote use by cafes and restaurants, particularly where northern outlook to and over the lake is available; ▪ Suitable and integrated landscape response to be developed; ▪ Concept plan to be developed and approved at first stage of subdivision.
4.4 Subdivision Density	▪ Permeable modified grid pattern promoting permeability and legibility; ▪ Bicycle links; ▪ CPTED principles; ▪ Provide appropriate interface between residential and park land; ▪ Promote passive surveillance at park and street edges; ▪ Establishing housing diversity and mix. ▪ Deliver well connected and distinct landscape and open spaces that are strategically located to optimise views/vistas and reinforce street hierarchy.
4.5 Dwelling Density	▪ Targeted dwelling density is measured across all zoned land; ▪ Density measure is based on net developable area (as opposed to gross developable area); and ▪ Density is a target rather than a fixed requirement.
4.6 Phasing of development	Development will commence in the south-western corner of the precinct and concentrate on the village centre.
4.7 Access and Movement	▪ Establish and maintain the street hierarchy; ▪ Ensure permeability and connectivity; ▪ Street design to balance the needs of motor vehicles, pedestrian and cyclists; ▪ Establish good public transport at early stages of the development.
4.8 Conservation	▪ Manage impact of domestic and feral animals; and ▪ Manage the impact of weed infestation.
4.9 Landscape and Open Space	▪ Identifies distribution and hierarchy of public open space throughout the precinct (i.e. pocket parks have an area of 0.25 – 1 ha); ▪ Specifies walking catchments for open space; ▪ Identifies the potential future use of open space; ▪ Identifies principles that have guided the locational distribution of parks throughout the precinct.
4.10 Bushfire Measures	▪ APZ along the southern edge of the precinct 10 metres wide ▪ Certain development adjacent to the regional park requires an APZ ranging from 40 metres to 70 metres; ▪ APZ may contain managed vegetation; ▪ Bushland/development interface areas are to accessible via a perimeter road linked to the internal network; and

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

	▪ Development and roads within 100 metres of the regional park to meet the relevant industry standards.
4.11 Water Cycle and Soils	▪ Implement rainwater tanks on residential site; ▪ Use of recycled water where appropriate; ▪ Use of water saving devices; ▪ Use of gross pollutant traps; ▪ Design of pit and pipe systems to carry flows up to 10 year ARI Storm ▪ Reduce ground area available for water infiltration to overcome salinity issues; ▪ Reduce areas of fill and land forming works; ▪ Provide erosion and sediment control plan; ▪ Drainage channel to the south is identified as riparian corridor in Figure 19, requiring a requiring a vegetated buffer.
4.12 Efficient Resource Use Strategy	▪ Promote public and active transport use; ▪ Adopt passive solar heating and cooling design principles & encourage the use of insulation; and ▪ Minimise waste generation.
Development Control Strategy	▪ Section 5.2 – Street Types; ▪ Section 5.3 Public Domain; ▪ Section 5.5 Character Area – Village Centre Character Area; ▪ Section 5B – Built form Housing – Shop top and Apartments; ▪ Section 5.7 General Housing Siting and Design Controls; ▪ Section 5C Non- Residential Built Form Refer to **Appendix K** and **L.**
Penrith DCP 2010	Part 2, Section 2.11 – Part B– Car Parking for commercial areas outside the Penrith City Centre and St Mary's Centre ▪ Commercial Premises (Office and Business Premises) 1 space/40m² of GFA

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

5. Environmental Assessment

The following is an assessment of the potential environmental effects of the proposed development as described in the preceding sections of this report. The assessment includes only those matters under section 79C(1) of the EP&A Act that are relevant to the proposal.

- Urban Form and Structure;
- Future Desired Character (Bulk, mass and scale; built form; setbacks);
- Residential Amenity (Solar Access, Ventilation, Privacy);
- Landscape and Open space;
- Conservation (flora and fauna);
- Access and Movement;
- Residential Amenity;
- Water (Stormwater and Drainage);
- Environmental Hazards (Bushfire protection);
- Socio-Economic Impacts/Benefits;
- Construction Impacts; and
- Public Interest.

5.1. Urban Form and Structure

5.1.1. Dwelling Density

The Western Precinct Plan sets a residential density target of 15 dwellings per hectare. The overall density of the precinct is based on net developable areas and is apportioned across "village centres" identified in Figure 12 *Dwelling Yield Plan* of the WPP. The stage 1 development site forms part of Village C with an anticipated dwelling yield of 660 dwellings.

The proposed development will deliver 201 dwellings or 30.4 per cent of the anticipated dwelling yield for Village C. Taking into account the existing and approved residential development within Village C it is anticipated that once completed Village C would exceed the projected dwelling target and density.

Notwithstanding the above, the density is an approximate and is not set as an upper limit to all future development. Importantly Clause 30 (6) of SREP 30 states the following:

> *"urban form is to maximise the potential for public transport, walking and cycling to replace car travel, with an overall net density of* ***at least*** *15 dwellings per hectare"* (**emphasis added).**

Based on the provisions of the SREP 30 the target density is a minimum. The subject site is located within the Village Town Centre opposite the main retail and commercial precinct within easy walking distance of all major amenities of the Jordan Springs Town Centre, encouraging both walking and cycling (the latter if desirable to connect to nearby public open space).

The proposed increased dwelling density is considered to be consistent with the provisions of SREP 30 that encourages an urban form consistent with reduced car travel, such as well-located high density development as that proposed. Furthermore the proposal delivers a range of apartment types and sizes contributing to housing diversity and typology consistent with Clause 33 (1) of the SREP.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

5.2. Future Character

The site is located on land identified on Figure 13 of WPP as being located within the Village Centre Character Area, which indicates typical dwelling types can (amongst others) include shop top and apartment housing.

The provisions of the Development Control Strategy (DCS) contained in Section 5 of the WPP provide detailed numerical controls relating to the described forms of residential development, the proposed development has been considered against these controls in detail in **Appendices K** and **L**.

The development involves the construction of residential apartments and shop top housing that is generally compliant with the numerical controls and character statements provided for the village centre. The form and scale of each building has sought to respond to specific circumstances of the site with enhancing the regional park backdrop though a series of interconnected landscape spaces, while balancing scale, height and form in response to variable development characters of the newly developing town centre and low density residential neighbourhood.

In particular the development reflects the following desired attributes as outlined in Table 3 of WPP/DCS:

- Building heights that range from three (3) to six (6) storeys;
- Buildings are vertically articulated to provide visual interest and negate potential bulk and mass at the street edge. In particular where the site shares an interface with the low density residential development, height and scale is three storeys in height and no more than 9 metres, comparable to most single housing;
- Bulk and mass is focused at the northern eastern corner, to define the junction of the main collector roads of Jordan Springs Boulevard and Lakeside Parade and respond to the town centre location;
- Active uses are provided at ground level optimising views to the central lake and promoting positive streetscape interaction and casual surveillance;
- The development provides public spaces to include a square and central park; and
- The site is located within 5 minutes' walk of open space and public transport.

The development is considered to align with the likely future character of the area as expressed through the development controls applying to the land.

5.2.1. Building Height (Storeys)

An assessment of each building has been undertaken against the Residential Design Controls, contained in Table 4 of the DCS and is provided at **Appendix L.** In general each of the proposed buildings with respect to boundary setbacks, open space and building heights comply with these numerical controls.

Stage 1 comprises five (5) distinct buildings with street wall heights ranging from three (3) to six (6) storeys. The variable building heights have been used to respond to the evolving character of Jordan Springs and the mix of "urban characters" reflected within the immediate context of the site.

In accordance with residential development controls and urban character objectives contained in the DCS, building height has been focused on the corner of the two (2) main collector roads, Jordan Springs Boulevard and Lakeside Parade. This concentration of height reinforces the prominence of the corner edge and serves to distinguish the town centre and the main retail street of Lakeside Parade.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

The proposed six (6) storey scale of Buildings 2 and 3 is comparable with the scale of development permitted within the Village Centre and is consistent with a development currently under construction to the north of the site on the corner of Lakeside Parade and Water Gum Drive (refer to **Figure 24**). As this Figure depicts the wide carriageways comfortably support larger building forms without adverse impact on Streetscape amenity.

Figure 24: View looking north east along Lakeside Parade showing six (6) storey mixed use building under construction with lower two (2) storey commercial to the west



Moving away from the commercial/retail core of the town centre the building heights are graduated to provide a visible transition that steps down in a westward direction along Jordan Springs Boulevard and southward along Lakeside Parade. These lower building heights respond to change in context towards low density residential development (north and northeast of Building 1) and the naturalistic bushland setting (to the south of Buildings 4 and 5).

Along Jordan Springs Boulevard the graduated and stepped form of Building 1 combined with the generous street setbacks of 7.5 metres and additional 30 metres of road width serves to mitigate any potential for bulk and scale at the street edge or from the dwellings opposite. Refer to **Figure 25** below. Building 1 at the north eastern edge of the development site is vertically articulated to present with a three (3) storey form to street of no more than 9 metres in height, comparable to the heights of single dwellings located on the northern side of Jordan Springs Boulevard.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Figure 25: View of Parklands Estate looking south east along Jordan Springs Boulevard.



5.2.2. Building Setbacks and Articulation

Table 6 provides an overview of the preferred building setbacks and articulation zones contained in the Residential Development Controls of the Western Precinct, DCS.

Table 8 Summary of setback and articulation controls

Form of Residential Development	Primary street setback	Secondary street setback	Articulation zone
Apartment	2.0 metres	2.0 metres	1 metre
Shop top housing	Nil	Nil	-1.5 metres

The proposed development has adopted a continuous 7.5 metre primary street setback to the ground floor of Buildings 1 – 3 orientated to Jordan Springs Boulevard and Lakeside Parade. Buildings 4 and 5 to the south are setback 4 metres from the street. All levels above ground are set forward of the ground level.

Notwithstanding the identified non-compliance with the numerical setback and articulation zones, the proposed development is considered to achieve well balanced and articulated building forms that respond to their immediate context.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

The proposed street level setbacks allow for ground level residential courtyards to be provided to Building 1 and SoHO apartments of Building 2 before giving way to open forecourts fronting the commercial tenancies allowing for positive streetscape activation.

Articulation above ground level for each building is achieved through the use of strong horizontal lines created by balconies. These alternate from being set at an angle or square to the adjacent road alignment. The projection of balconies over the ground floor facades deliver human scale at ground level and adds visual interest, as shown in **Figure 24**. The varied angles of the balconies delivers a subtle distinction to each building façade, allowing each to have its own identify tied together through a cohesive palette of materials and colours combined with a continuity of the modern contemporary form.

Beyond the balconies, the facades of buildings are staggered. The effect of which is to provide a visual break in building and wall lengths allowing pedestrians to read the building form as sectional as opposed to long and unbroken form.

Building mass is not only moderated through the interplay of setbacks and physical articulation but is achieved through purposeful choice in materials and colours. The use of light weight permeable materials such as glass for balcony balustrades reduces visual bulk at the street edge. While darker elements for the sixth storey Buildings 2 and 3 make these elements visually recessive.

As outlined in the discussion of building height above, at appropriate points the buildings step to respond the surrounding context of the site providing visual interest. These vertically articulated forms combined with horizontal definition of key building elements work together to deliver a development that compatible with its context and will contribute to the architectural diversity of Jordan Springs Town Centre encompassing positive characteristics of the existing streetscape and the desired future character of the area.

5.3. Design Quality and Amenity

As the development involves the construction of a residential flat building of three (3) storeys or more the provisions of State Environmental Planning Policy No. 65 – Design Quality Residential Flat Buildings (SEPP 65) and the associated Residential Flat Design Codes (RFDC) apply.

In accordance with the provisions of SEPP 65 Mosca Pserras Architects (MPA) have prepared the following documents:

- A Design Verification Statement signed by a registered architect;
- A statement in relation to the 10 Design Principles; and
- An assessment of the development against the RFDC “Rules of Thumb”.

The supporting architectural statements are provided at **Appendix M.**

Throughout the design process consultation has been undertaken with Lend Lease, owner and developer of the adjacent lands. Lend Lease have viewed the plans and provided their written support for the proposed development and it design. A copy of the endorsed plans is provided at **Appendix S**.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

5.3.1. Solar Access and Ventilation

Solar access and natural ventilation in residential design is key to providing high levels residential amenity. The RFDC rule of thumb promotes the following design benchmark:

- 70 per cent of apartments should receive 3 hours day light at the winter solstice between 9.00am and 3.00pm;
- The proportion of single aspect apartments should be limited to a maximum floor plan depth of 8 metres and reflect no more than 10 per cent of a development yield, where site constraints permit;
- Building depths should be restricted to 10 – 18 metres;
- 60 per cent of apartments should allow for natural cross ventilation; and
- 25 per cent of kitchen should have access to natural ventilation.

Analysis of the development against the amenity provisions of RFDC has been undertaken by MPA, who conclude the following:

- 70 per cent of apartments receive 3 hours day light, this proportion of apartments receiving 2 hours increases to 78 per cent;
- 66 per cent (133 apartments) are naturally cross ventilated;
- Apartment depths range from 8.5 metres to 14.2 metres. As such no apartment has a depth of over 18 metres and all internal hallways have access to natural light;
- Where apartment depths exceed 8 metres to the back wall, no kitchen more than 8 metres from a window; and
- The number of single aspect apartments is limited to 4 per cent of the total yield (i.e. 4 out of 201 apartments).

5.3.2. Apartment layout and sizes

The proposed development provides a range of apartment sizes and layouts. As outlined in **Appendix M** prepared by MPA all apartments comply with the minimum floor area requirements of the RFDC.

5.3.3. Privacy

5.3.3.1. Visual Privacy

The development achieves reasonable internal separation between building forms. **Table 9** (below) provides an overview of the development against the preferred separation/setback distances. Where distances are below the RFDC guide In this regard, the design has incorporated extended blade walls and screening devices to ensure that direct lines of sight are obscured.

Table 9 Summary of separation distances achieved within the site and over boundaries

Building elements	Required Separation	Proposed Separation
East facing windows of Building 1 and west facing windows of Building 2	Building 1 is a maximum of 4 storeys requiring a total of 12 metres (6 metres apportioned)	12 metres
Southern facing balconies, north wing of Building 2 and northeast facing balconies of the eastern wing	Up to 4 storeys: 12 metres; increasing to 18 metres for storeys 5 to 8	15 metres from the balcony edge increases to 16 metres to habitable room windows
Southern façade windows in the eastern	• Up to 4 storeys: 12 metres (6	Minimum separation of 10.5

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Building elements	Required Separation	Proposed Separation
wing of Building 2 and north facing balconies of Building 3	metres apportioned); and • 5 to 8 storeys: 18 metres (9 metres apportioned)	metres
South facing balconies, north wing of Building 2 and north facing balconies of Building 3	• Up to 4 storeys: 12 metres (6 metres apportioned); and • 5 to 8 storeys: 18 metres (9 metres apportioned)	25 metres
South facing balconies of Building 3 and north facing balconies of Buildings 4 and 5	Buildings 4 and 5 are a maximum of 4 storeys requiring 12 metres between habitable spaces and balconies.	13.4 metres (minimum)

5.3.3.2. Acoustic Privacy

Where internal separation distances are between indoor and outdoor living spaces are below the SEPP 65 requirement acoustic privacy is enhanced through the use of screening devices to restrict the transmission of noise.

5.4. Overshadowing

Shadow Diagrams are provided in the set of architectural drawings prepared by MPA provided at **Appendix C** and demonstrate the following:

- The proposed development will not affect the solar access of the rear yards and private open spaces of existing residential development to the north and northwest of the site;
- The proposed development does not affect the existing commercial and retail development located north and north east of the site;
- The proposed development will not adversely affect solar access of future residential development to the east of the site on the opposite side of Lakeside Parade;
- The proposed central park will receive a minimum of 3 hours solar access to 50 per cent of the park between 9.00am and 12.00pm at winter solstice. This will improve at periods prior to and following resulting in a reasonable level of amenity to suit its intended purpose;
- North facing apartments of Buildings 4 and 5 (located to the south of the site) will receive 3 hours solar access with shadow likely to fall over the eastern edge of Building 4 by 3.00pm;
- North facing apartments of Building 3 and the public square are the most affected elements within the development, spending the majority of the winter solstice in shadow. Notably, this is a worst case scenario and solar access would improve at other times of the year. In this regard, shadows of summer solstice show that these spaces will receive uninterrupted sun on 31 December. At this time the courtyards would be thermally regulated by tree plantings and shade structures;
- At 3.00pm the shadows extend over Church Street and the front facades of residential dwellings on the opposite side of Church Street. Contributing to a loss of sun over the public domain and potential living spaces of the existing dwellings.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

In general the site and building layouts have sought to maximise the number of buildings and as a consequence apartments orientated to the north of the site. As outlined in Section 5.3.1 this results in 70 per cent of all apartments receiving 3 hours of daylight rising to 78 per cent for apartments with 2 hours of day light.

The extent of overshadowing of adjacent developments is minimal and the development achieves compliance with the adopted standard of the RFDC for solar access. In this regard the development is considered to achieve a reasonable level of amenity.

5.5. Access and Movement

The proposed road network builds on the street hierarchy of the WPP (refer to Figure 15 of same) proposing a local road network extending from the identified major collector roads of Jordan Springs Boulevard and Lakeside Parade.

As outlined in Section 3 of this SEE, entry to the Parklands Estate, in particular Stage 1 is via two (2) main entry points, including:

- Road 3 running north-south connecting Jordan Springs Boulevard and Road 1; and
- Road 1 provides an entry to the estate from Lakeside Drive and runs east west.

A third entry reserved for the purpose of servicing the site is provided between Buildings 1 and 2 and is intended to operate a shared zone, allowing for the safe entry and exit of service vehicles to support non-residential uses and promote pedestrian permeability and connectivity to the central square.

The proposed road access and layout to support stage 1 is shown in **Figure 26** below, a comprehensive set of design plans including sections prepared by J. Wyndham Prince are provided at **Attachment F**.

The road layout reflects a modified grid pattern to promote permeability and legibility whilst avoiding hard edged lines that would disrupt the naturalistic setting of the estate. Each road is a Local Road, designed in accordance with Table 2 of the DCS. In particular Local Street Type L3 has been used for Roads 1 and 3 (refer to **Table 10**). Road 4 is also consistent with this design type but has elected to modify the design using the “options” to provide a footpath on only on side of the road and reduce on street parking due to the low level use and the envisaged pedestrianized nature of the shared zone.

A summary of the proposed road design is provided in **Table 10.**

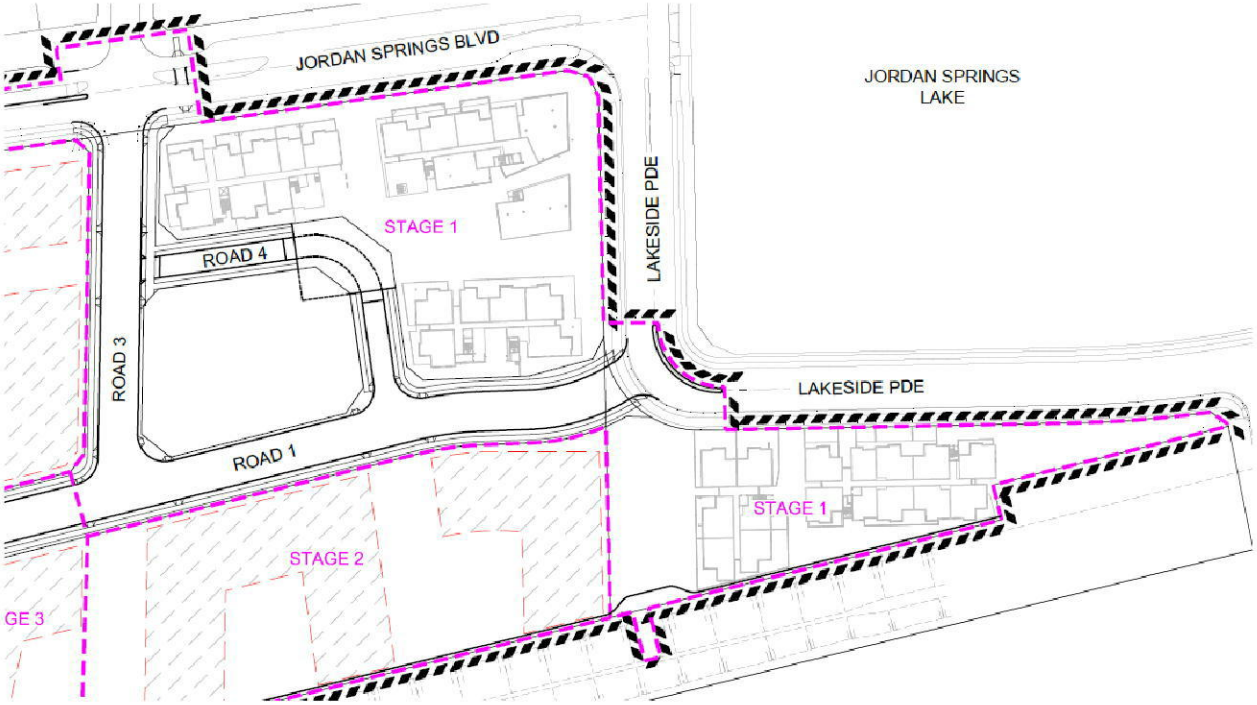
Table 10 Summary of road design

Road	Category	Design Requirements
Road 1	Local Road	11 metre carriageway – 6 metre lanes and 5 metre parking 3 m wide footpaths and/ or shared paths on both sides of the road (except on the western side of Central Park)
Road 3	Local Road	11 metre carriageway – 6 metre lanes and 5 metre parking 3 m wide footpaths and/ or shared paths on both sides

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Road	Category	Design Requirements
		of the road
Road 4	Local Road including Shared Zone	4.5 m one way service egress driveway crossover to service loading and unloading activities and waste collection

Figure 26: Extract from road layout plan (Source: JWP; 2015)



The road layout within Stage 1 of the Parklands Estate proposal maintains consistancy with the semi formal grid pattern which exists within the surrounding area. The road layout proposed for Stage 1 has been selected based on its ability to blend in with the naturalist parkland setting which it forms apart of. Additionally, the small block lengths promote ease of movement and walkability within the Western Precinct.

5.6. Traffic and Parking

GTA Consultants have prepared a traffic and parking impact assessment to consider the capacity of the existing and future road network to absorb the projected traffic increase. A copy of the report is provided at **Appendix G**

5.6.1. Traffic

GTA consultants have undertaken traffic analysis of the proposed development taking into account existing and likely future traffic flows post development.

Stage 1 of the Parklands Estate comprises 201 residential apartments and 614m² of commercial floor space supported by a total of 371 car parking spaces. GAT forecast that when complete the development will contribute a total of 113 trips per hour during weekdays AM/PM peak hours and 90 trips per hour during the Saturday peak

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

hour. Of these trips 75% would access Jordan Springs via the intersection of Jordan Springs Boulevard and The Northern Road.

The traffic generation of the proposed development combined with all currently approved development within Jordan Springs will result in traffic generation during the weekday AM and PM peak hour or 2,144 movements per hour and 2,408 movement per hour respectively. Saturday peak hour traffic volumes are anticipated to be 2,225 per hour.

A proportion of the estimated daily traffic volumes will be local trips contained within Jordan Springs. These internal trips are estimated to account for 25 per cent of residential/commercial trips and 50 per cent of retail trips. Consequently, the daily traffic volumes that are forecast to travel to and from The Northern Road during the weekday AM and PM peak hour is estimated to be 1,609 movements per hour and 1,741 movements per hour respectively. The Saturday peak hour traffic volume is estimated to be 1,623 movements per hour.

Long term traffic modelling using SIDRA has been undertaken for the Stage 1 (opening 2016) and 10 years post development (2026). The output of this model indicates that the proposed signal arrangement at the intersection of The Northern Road and Jordon Springs Boulevard would operate satisfactorily and accommodate the estimated traffic flow for all developments within the Jordon Springs area (including Parklands Estate; Stage 1).

GTA conclude that the proposed development would not have an adverse impact on the surrounding road network and its operations. The detailed traffic assessment is provided at **Appendix G**.

5.6.2. Parking

5.6.2.1. On Site Parking

A total of parking spaces have been provided to support Stage 1, Parklands Estate. A detailed breakdown of the parking calculation demand and provision is provided in **Table 11** (reproduced from the GTA Traffic report; 2015).

Table 11 Penrith DCS Off- Street Car Parking Requirements

Building	Use	DCP Parking Rate	DCP Off Street Parking Requirement	Parking Provision
Building 1	1 bedroom units (6)	1 space per unit	6	48
	2 bedroom units (26)	1.5 spaces per unit	39	
	3 bedroom units (1)	2 spaces per unit	2	
	Visitor Parking	1 space per 5 dwellings	7 (6.6)	7
	Sub- total		**54**	**55**
	1 bedroom units (8)	1 space per unit	8	162
	2 bedroom units (45)	1.5 spaces per unit	68	
	3 bedroom units (10)	2 spaces per unit	20	

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Building	Use	DCP Parking Rate	DCP Off Street Parking Requirement	Parking Provision
Building 2 & 3	Visitor Parking	1 space per 5 dwellings	13 (12.6)	21
	Commercial (614m^s)	1 space per 40m^2	15	25
	Sub- total		**124**	**208**
	1 bedroom units (1)	1 space per unit	1	-
	2 bedroom units (35)	1.5 spaces per unit	53	
	3 bedroom units (5)	2 spaces per unit	10	
	Visitor Parking	1 space per 5 dwellings	8(8.2)	-
	Sub-total		**72**	-
	Total (2 and 3)		**196**	**208**
Building 4 & 5	1 bedroom units (12)	1 space per unit	12	95
	2 bedroom units (52)	1.5 spaces per unit	78	
	Visitor Parking	1 space per 5 dwellings	13(12.8)	13
	Sub total		**103**	**108**
Total			**353**	**371**

The Development Control Strategy that supports the Western Precinct Plan does not provide non-residential parking rates. As such the "commercial premises (including business & office premises)" parking rates outlined within the PDCP 2010 have been used as a guide. Notably an excess of parking has been provided in this instance, it is considered that this will allow for future flexibility in the range of potential uses capable of being supported.

As detailed in **Table 11** the quantity of off street parking complies with the provisions of the DCS and DCP.

All car park design and layouts have been designed in accordance with the Australian Standards for Off Street Car Parking (AS/NZS2890.1:2000), detailed consideration of the basement level car parks design including access, circulation, ramp gradients and clearance heights has been by GTA and is addresses in Section 4 of their report provided at **Appendix G.** The report concludes that the proposed car parking layout is expected to operate satisfactorily.

5.6.2.2. Accessible Parking

In accordance with the PDCP 2010 the provision of parking spaces for disabled persons should be in range of 1 – 4 % of the total parking spaces required for that particular use and comply with AS 2890.6 – 2009. **Table 12**

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

provides a summary of the Accessible Parking Rates as stated within the Penrith DCP 2010 and the number of accessible car spaces proposed within the development.

Table 12 Penrith DCP 2010 Accessible Parking Rates

Building	Use	DCP Total Parking Provisions	DCP Parking Requirement	Proposed Accessible Parking Provisions
Building 1 car park	Residential	54	1 – 3 spaces	3
Building 2 & 3 car park	Residential	181	2 – 8 spaces	10
Building 2 & 3 car park	Commercial	15	1 space	2
Building 4 & 5 car park	Residential	103	1-5 spaces	12

5.6.2.3. Off Site (street) Parking

In accordance with the road design guidelines provided in Table 2 of the DCS, all local roads provided in Stage 1 have been designed to accommodate on street parking allowing a 2.5 metre wide verge area in addition to 6 metre land width.

Based on the above the proposed development complies with the design guidelines provided for the WPP. Refer to Road Design Package, including cross section detail prepared by J. Wyndham Prince provided at **Appendix F**.

5.6.2.4. Bicycle Parking

The DCS does not provide specific guidance on the rate of bicycle parking to support future development within the WPP.

Notwithstanding the above, provision for and maximizing active transport modes such as bicycle use is a key objective of the WPP as such the proposal provides for secure, dedicated parking of bicycles within the basement level of each building. The distribution and provision of such is summarized in **Table 13**.

Table 13 Summary of proposed bicycle parking

	Building 1	Buildings 2 & 3	Buildings 4 & 5	Total
Provision for Bicycle Parking	5 spaces	35 spaces	15 spaces	55 Spaces

Combined with the provision of dedicated bicycle parking there is sufficient capacity within individual apartments and on balconies to also store bicycles. Given that the majority of balconies exceed the 10m² minimum prescribed by the DCS use of balconies in this manner would not affect their use for passive recreation and enjoyment.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

5.6.2.5. Loading and Unloading

To minimise the impact of servicing activities on traffic flow along major collectors a shared zone from Jordan Springs Boulevard between Buildings 1 and 2 connecting to proposed Road 4 has been included.

This shared zone will for the most part be used by pedestrians and bicycles connecting to the central park, square and associated retail and commercial premises. It will during times also be used as servicing associated with the collection of waste from Buildings 1 and 2 and loading and unloading for the business at ground level of Building 2.

A 4.5 metre one way service egress driveway crossover is proposed from the shared zone on to Jordon Springs Boulevard.

5.7. Conservation

The stage 1 development site has been identified in the Western Precinct Plan and confirmed by site specific survey and investigation by Cumberland Ecology as containing flora and fauna communities listed under the *Environmental Protection and Biodiversity Conservation Act 1999* (Commonwealth) and the *Threatened Species Conservation Act 1997* (NSW) as an Endangered Ecological Community (EEC). As the development involves the removal of trees and grass of the CPW community, a seven (7) part test of significance is required to be undertaken in accordance with Section 5A of the *Environmental Planning and Assessment Act 1979.*

In this regard a detailed species impact assessment has been undertaken by Cumberland Ecology and is provided at **Appendix N.** The following sections detail those matters of relevance to the stage 1 development and the described scope of works.

5.7.1 Flora – Vegetation Removal

The stage 1 development site has been identified in the Western Precinct Plan and confirmed by site specific survey and investigation by Cumberland Ecology as containing the regenerating Cumberland Plain Woodland (CPW) flora community. CPW present on the site occurs as a mix of the following:

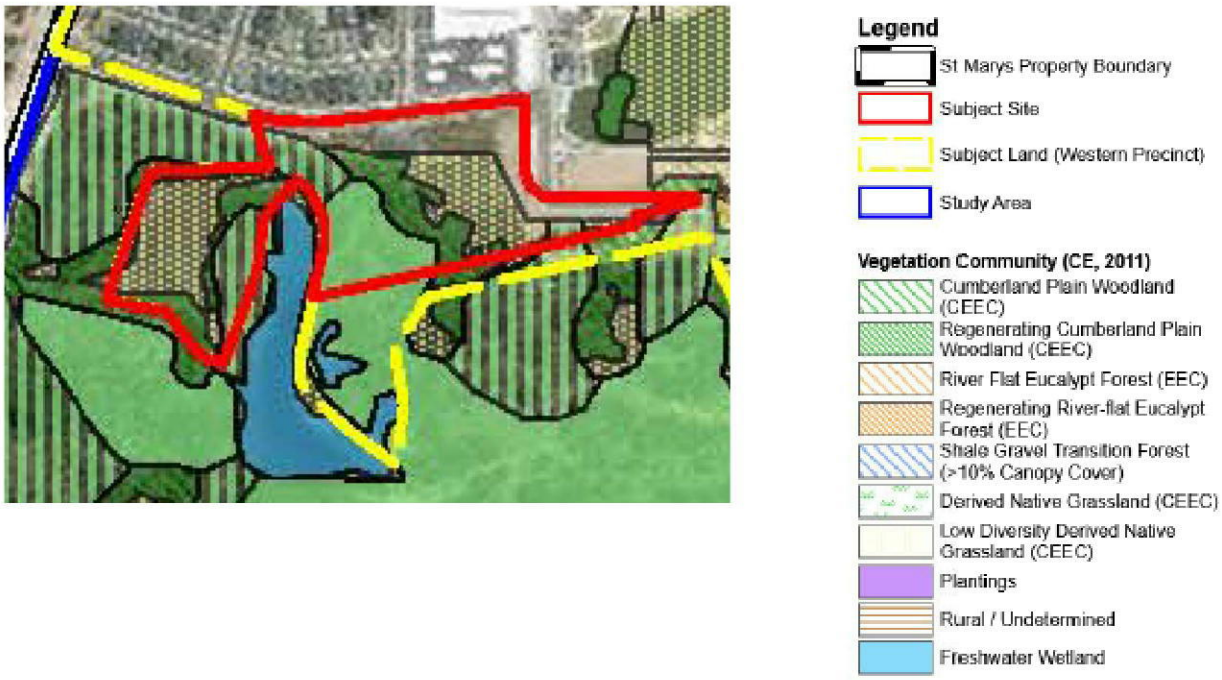
- Young and degraded woodland in various stages of regeneration; and
- Low diversity derived native grassland.

The proposed development will require the removal of all grassland and trees from the site, there are approximately eight (8) trees within the stage 1 development site. The existing vegetation in this location is noted in the Cumberland Ecology has been highly disturbed with limited potential to regenerate naturally into woodland due to the dissimilarity of its native cover abundance.

Cumberland Ecology has assessed the potential impact of the proposed removal in the context of the broader development of the WPP and determined that the removal of Cumberland Plain Woodland (CPW) (trees and grass) would not cause significant impact to either EEC due to the large and viable representativeness of CPW within the regional park.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Figure 27: Extract of EEC flora communities surveyed on the site (Source: Cumberland; 2015)



The proposal to remove trees and grasses identified as belong to a protected community has therefore satisfied section 5A of the *EP&A Act 1979* and the relevant provisions of SREP 30 and the WPP.

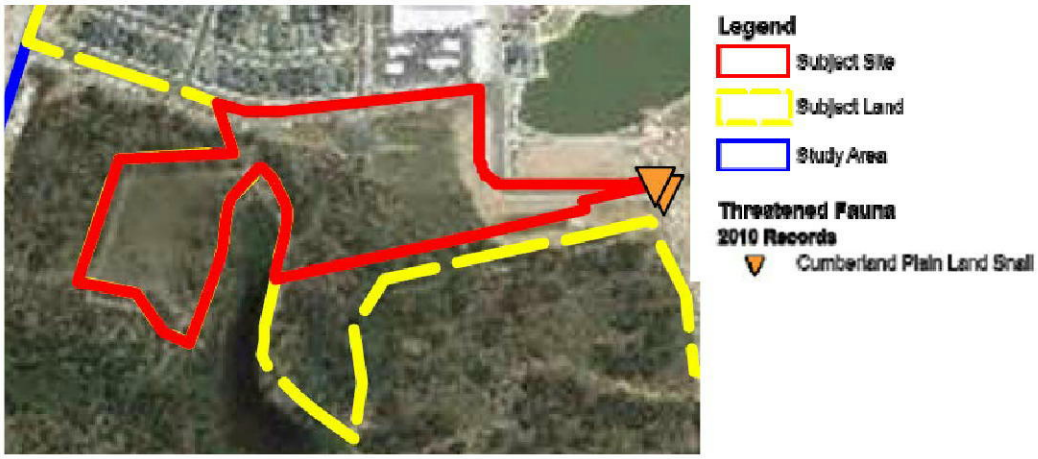
5.7.2 Fauna

The development site for stage 1 is predominantly open grass land with sporadic trees, numbering eight in total. Grass land areas provide minimal fauna habitat due to the limited structural complexity that is necessary for roosting, foraging or nesting of most species (Cumberland; 2015 p. 4.36). Species that commonly occur in these habitats are abundant in agricultural areas where native vegetation has been removed. Alternatively fauna that prefers foraging in grassland such as eastern grey kangaroos and the Australian Raven may be found in grassland habitats.

Fauna Surveys were undertaken by Cumberland Ecology in accordance with the guidelines issued by the Office of Environment and Heritage (OEH) over a period of 3 years from 2011 to 2013. As detailed in **Figure 28** the fauna is limited to the Cumberland Plain Land Snail surveyed in the south western corner of the site.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Figure 28: Extract of Fauna Survey Map (Source: Eco Logical; 2015)



The proposal to removal of 1.96 hectares of low diversity DNG (identified as part of the broader CPW community) will contribute to potential loss of Snail habitat. However, the Snail has been surveyed by Cumberland Ecology in most or all of the larger patches of CPW across broader SREP lands and is represented in the regional park that contains more than 400 hectares of Habitat.

Moreover, while Snails were surveyed to be within proximity to the development site, their density or occurrence is significantly greater in areas of mature woodland growth where there is a higher incidence of leaf litter, bark and logs providing shelter.

Cumberland Ecology concludes that due to the isolated and fragmented nature of CPW on the development site the long term viability of a subpopulation of snails is limited as they would be susceptible to drought or disease. Furthermore the conservation of the large and connected tract of CPW within the regional park is considered an adequate conservation measure for long term viability of the species within the St Marys SREP lands.

5.8. Landscape and Open Space

5.8.1. Landscaped Area and Deep Soil

Clouston Associates have developed a comprehensive landscape strategy for stage 1 of the development focused around the integration of the site into the existing context of Village Centre and Village Lake. The overall objectives are:

- Provide an attractive public domain using quality landscape elements consistent with the surrounding existing and proposed streetscapes.
- Provide public open space areas to serve both the Parklands Estate community and that of the surrounding suburbs.
- Provide clear and attractive building entries using feature landscape treatments.
- Maximise communal landscape opportunities through use of podium spaces.
- Use the landscape to enhance the natural parkland qualities of the site and the physical and visual connections to the regional park.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

- Utilise native planting where possible to enhance the bush qualities of the site utilising exotics only for specific purposes such as deciduous trees for seasonal solar control. as possible. Selecting species that are tolerant of the particular conditions that the site and building presents (shade, full sun, high wind, shallow soil etc) to ensure its ongoing visual amenity and minimise maintenance and irrigation requirements.

Overall the proposed landscape scheme will deliver a total of 9,670m² of landscaped area across Stage 1, equal to 48.8 per cent of the site area for stage 1. As a proportion of this a total of 28 per cent will be delivered as deep soil planting.

Plantings within the Stage 1 have been selected to best respond to the local conditions and provide low maintenance and attractive landscaping spaces which will enhance the visual amenity for future residents and visitors to the area.

The character of the plantings will follow a native theme, in keeping with the bushland setting. Utilising native species will help to increase the ecological value of the site whilst also maintaining the maintenance and watering requirements during establishment. Details of the species which are proposed to be planted within Stage 1 can be found in **Appendix D.**

5.8.2. Open Space

A comprehensive and integrated approach to the public and private open space has been adopted to provide a cohesive and refined response that will define the future identity of the Parklands Estate. This landscape design approach has achieved a network of connected landscaped corridors and recreation spaces both private and public to support passive and active recreation opportunities.

A combination of hard and soft landscape elements play aesthetic and functional roles, elevating the visual amenity of the development and where necessary providing legibility through signage and delineation of spaces through access control including fencing, gates and formal garden beds.

A detailed landscape design package has been prepared by Clouston Associates and is provided at **Appendix D.**

5.8.2.1. Public Domain

The proposed development scheme delivers two (2) main public domain spaces that form the focal point of the development. These formal spaces are connected by a series of landscaped street edges and pedestrian networks. The primary public domain works include the:

- The Public Square; and
- Central Park.

The Public Square

The public square is located in the north east corner of the site and has been designed to respond and contribute to the active ground level uses provided as part of Building 2 including SoHo apartments and commercial/retail tenancies. Importantly as this area of the site is an extension of the town centre, spaces have been designed to reflect an urban character and achieve continuity with the streetscape identity Jordan Springs Boulevard and Lakeside Parade, through consistent materials, finishes, planting and street trees.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

The square also provides a practical and visual link between the Town Centre, the Lake and Central Park (refer to **Figure 29**).

Figure 29: View of the proposed public square looking north east



Central Park

The Central Park has a total area of 2,400m² and is defined as a "pocket park" within the open space hierarchy of the WPP.

The delivery of open space within Village C is identified in Figures 18 and 19 of the WPP to occur to the north and the south of the site, comprising a local park and pocket park with a cumulative area of 1.7 hectares. The delivery of additional open space within the hierarchy established for Jordan Springs is considered to contribute to the amenity of local residents by providing an expanded recreational opportunity both in terms of facilities potentially offered in the park and the encouragement of residents located further away to utilise cycle networks that connect the park with the broader open space network.

The park is intended as a multi-functional space, providing residents with areas for both passive and active recreational activities enabling the formation and sense of community to develop between residents within the

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Parklands Estate. Moreover, the location of the park within the centre of Stage 1 will elevate the visual amenity of residents living in apartments facing south and west by providing a pleasant and leafy outlook.

Given that the proposed development may increase the anticipated density of Jordan Springs, the proposed park would make a positive contribution to ensuring that projected demand for local open space outlined in Section 4.9.1 of the WPP is met.

Figure 30: View of looking east of Central Park and the eastern elevation of Building 3



View Corridors and Vistas

Site planning and layout has sought to retain, enhance and create where possible views and vistas through the site towards the natural attributes of the area including the Regional Park to the south and constructed landmarks such as the Town Centre and Jordan Springs Lake.

The view corridor along Lakeside Parade through the village centre is continued through a publicly accessible pedestrian access link to the Regional Park (refer to **Figure 23**). This element will be themed around the history or environment of the site and will incorporate interpretive elements the first of which will be located at the corner of Jordan Springs Boulevard and Lakeside parade.

West along Jordan Springs Boulevard another of the north south through site links provides access between the mixed use buildings into the heart of the site, This creates a view corridor incorporating the central open space, through to the Regional Park, reinforcing the developments connection to its context.

5.8.2.2. Private Open Space

Private Open Space is provided in the form of balconies, courtyards and ground level recreational spaces that are delineated from adjacent public domain areas by fences and vegetation.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

- A detailed breakdown of all balcony areas is provided on the Data sheet forming part of the architectural design package and demonstrates that each dwelling has in excess of 10m² per dwelling; and
- A total of 1,045m² Private (common) open space provided at ground level for the exclusive use of residents of Parklands Estate, equal to 5.2 per cent of the area of stage 1.

Taking into account the availability of public open space within the proximity to the site including the proposed central square and planned parks to the north east around the Central Lake and south, there is considered to be a sufficient and balanced mix of private and public open space to meet the needs of future residents.

5.9. Environmental Impacts

5.9.1. Noise

An acoustic assessment has been undertaken by Acoustic Logic has been provided for this proposal. The objective of the assessment was to identify and assess potential noise impacts related to the proposal to ensure that future occupants will reasonable residential amenity acceptable. The assessment identified two (2) potential noise sources including:

- Road traffic noise arising from the anticipated traffic volumes travelling along Jordan Springs Boulevard and Lakeside Parade at the completion of development; and
- Noise emissions form the operation of mechanical services (typically air conditions and car park fans) associated with the development.

The assessment provides detailed explanations of the sources of this noise and recommendations as to how to limit the auditability of noise and ensure that there is no adverse impact to future residents. A full copy of the report can be found in **Appendix O.**

5.9.1.1. Road Traffic Noise

An assessment of road traffic noise intrusion carried out by Acoustic Logic (refer to **Appendix O**) has considered the proposed development against the following industry standards:

- AS2107-2000: Acoustics – Recommended Design Sound Level and Reverberation Times for Building Interiors
- AS 3671: Acoustics Road Traffic Noise Building siting and construction; and
- State Environmental Planning Policy (Infrastructure) due to its proximity to a major road.

A summary of the applicable noise level requirements from the relevant Australian Standards are outlined in **Table 14.**

Table 14 Noise Requirements by Australian Standards.(source: Acoustic Logic, 2014)

Space	Noise Criteria L_{eq}
Bedroom	Night – 35 dB(A) (10 pm to 7am)
Living Room	Day – 40 dB(A) (7 am to 10pm)
Private Offices	40 dB(A) (7 am to 10pm)

To determine the potential for impact, attended and unattended noise loggers were used to collect existing background noise readings from various locations, these are shown in **Figure 31** reproduced below. A summary of

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

the predicted traffic noise levels at the completion of all development within Jordan Springs is present in the **Table 15** below;

Figure 31: Noise logger locations relative to the proposed development site (source: Acoustic Logic; 2015)

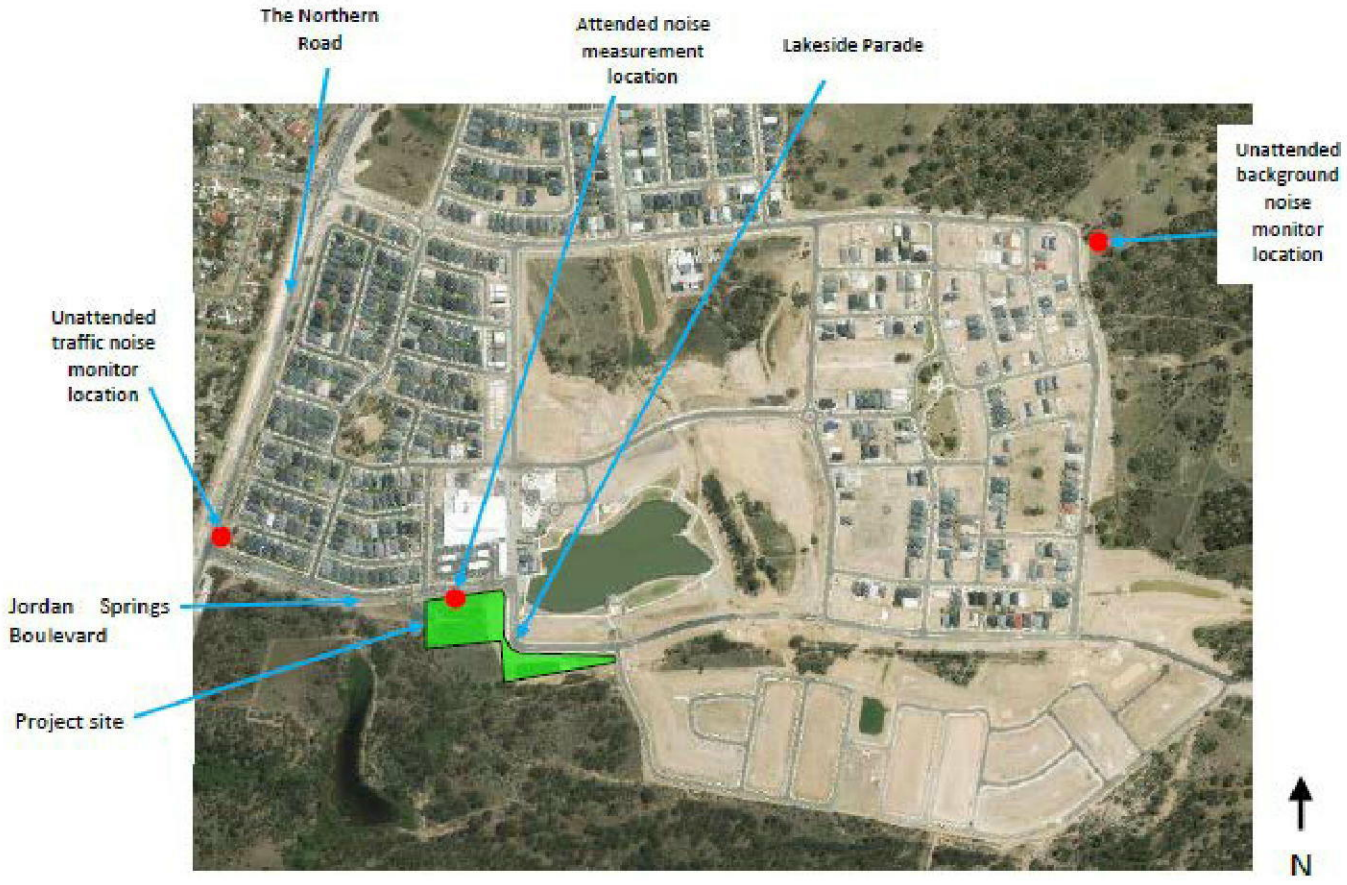


Table 15 Summary of measured background noise (source: Acoustic Logic, 2014)

Location	Predicted Mean Traffic Noise Level During Peak Hour (day time period)
Jordan Springs Boulevard north of the project site - -5 m distance from kerb	67 dB(A)L_{eq}
Lakeside Parade east of the project site – 5 m distance from kerb	66 dB(A)L_{eq}

To moderate the anticipated long term impact of road traffic noise on future residents, the report recommends that construction attenuation measures, as outlined in Section 5 of the report. These generally include:

- Apartments windows orientated to Lakeside Parade and Jordan Springs Boulevard to be attenuated using double glazed and laminated glass to reduce the potential noise intrusion.
- Roof and ceiling structures to living rooms and bedrooms be insulated with 75mm fibreglass and 13mm thick plasterboard, separated by a 250mm cavity.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Subject to the recommendations of Section 5 of the Acoustic Logic report being implemented at Construction stage the proposed development will deliver suitable residential amenity in the long term.

5.9.1.2. Noise from Mechanical Plant

It is anticipated that operation of mechanical services within Stage 1 will consist primarily of air conditioning units and ventilation to the basement level car parks. The details of these devices have not yet been decided and as such have not been assessed and may be suitably addressed at later stages of the construction process to ensure compliance with the BCA in relation to noise transmission.

5.9.2. Water

5.9.2.1. Water Conservation

The provisions of SREP 30 and the associated WPP seek to implement water conservation principles. In accordance with these objectives and the related provisions of SEPP BASIX the development aims to reduce the consumption of potable water through the construction and implementation of appropriate water saving devices and technologies to include the following:

- Water tanks with a cumulative capacity of 32,000 litres for the purpose of watering common open space;
- Use of WELS fixtures and fittings to basins and taps with a minimum 5 star rating;
- Use of showerheads with a minimum 3 star rating;
- Use of toilets with a minimum 4 star rating.

The application is supported by a BASIX Certificate provided at **Appendix P**. In conjunction with the design elements of the buildings a detailed landscape plan has been developed for the estate. Plant types have been selected on the basis on minimising water demand and for this reason expansive areas of open grass have been minimised and drought tolerant species preferred.

The landscape setting of the development strives to achieve a balance between the built form and open space, bearing in mind the expressed desired on the WPP to reduce the extent of landscaping to reduce watering requirements.

5.9.2.2. Water Quality

The development adjoins a natural drainage line that runs parallel to the southern boundary of the site. This drainage line is identified in Figure 19 of the WPP as being a riparian corridor.

As shown in the architectural design package the Buildings 4 and 5 are setback from the rear boundary by approximately 2 metres and as such are located within 40 metres of a watercourse. In accordance with the provisions of Section 91 of the *Water Management Act 2000* the development would constitute a “controlled activity” and requires the consent of the NSW Office of Water.

As outlined in Section 1.2.3 of this SEE that presents the Background of the development to Jordan Springs the natural drainage channel is currently the subject of a Development Application DA14/0050. The subject DA proposes a formalised “engineered” drainage channel. The extent of these works will modify the channel design and stabilise the surrounding embankments to enable the management of design flood events.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

The proposed development will connect to the future drainage channel when complete and includes the provision for the installation of a gross pollutant trap to capture debris prior to discharging water from the site. The drainage design for the site has taken into account the need to manage design flows during storm events and will not compromise the existing flow regime consistent with Clause 28 of SREP 30 to manage water quality and the associated details of Section 4.11 of the DCS.

5.9.3. Energy

BASIX Certificates prepared by Aminga Holdings have been issued for each of the proposed buildings. All buildings have passed or exceeded the BASIX Targets of 40 per cent water reduction and 20 per cent energy reduction. A summary of the reduction targets achieved for each building is provided in **Table 16**.

Table 16 Summary of BASIX achievements

Building No	Water reduction	Energy reduction	Thermal comfort
Building 1 & 3	41	28	Pass
Building 2	41	29	Pass
Buildings 4 & 5	41	22	Pass

The development has been demonstrated as being capable of satisfying the requirements of SEPP BASIX.

5.9.4. Soil

During construction, rain events and wind, may lead to the disturbance of exposed soils. It is envisaged that these impacts will be controlled through adoption of appropriate site management practices including;

- A sediment and erosion control plan to stop soil from being washed off site and/or into the stormwater system has been prepared and is provided at **Appendix F**; and
- Spoil excavated from the site, will be managed in accordance with the WMP provided at **Appendix H**.

5.9.5. Waste

Waste generation for the project life cycle, including demolition, construction and operational matters, has been addressed in the compliance assessment of the development, provided at **Appendix H.**

The development is supported by adequate waste storage and management facilities to ensure the proper operation and management of the site, including:

- Suitably designed and located residential and non-residential waste storage rooms;
- Waste rooms have been located to allow for bins to be moved to and from the kerbside for collection;
- Waste garbage rooms and chute at each residential floor ensuring ease of access to services for future residents.

In conjunction with this a detailed waste management plans have been prepared and are provided at **Appendix I.**

- All works undertaken during construction shall be monitored and strict safety measures implemented in accordance with the BCA guidelines and standard Occupational Health and Safety Regulations.
- Hours of construction will be undertaken in accordance with Council's requirements, and adjoining properties will be notified prior to commencement of works on site.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

5.10. Natural Hazards

The site is located adjacent to a heavily wooded regional park and is identified on Bushfire Planning Maps as being bushfire affected and proposes redevelopment for the purpose of a high density mixed use and residential flat building development. Accordingly approval is required from the Rural Fire Service (RFS) under the provisions of *Rural Fires Act 1997*.

5.10.1. Bushfire

The site is identified on Figure 20 of the WPP as requiring the provision of a 10 metre asset protection zone. A site specific bush fire assessment has been undertaken by Ecological Australia (refer to **Appendix Q**) to assess the potential bushfire threat and develop appropriate built form and management responses aimed at ensuring the protection and safety of future residents.

5.10.2. Bushfire Threat Assessment and Asset Protection

To ensure effective protection from a potential bushfire, Eco Logical completed a threat assessment based on vegetation types and slope in accordance with the guidelines published by the Rural Fire Service, *Planning for Bushfire Protection*. The identification of bushfire threat is then used to establish effect Asset Protection Zones (APZ) for new development. The APZ will act as a "buffer" to limit the impact of bushfire on development.

A summary of the threat assessment and recommended APZs are reproduced below in **Table 17.**

Table 17 Ecological APZ Calculation (source: Ecological; 2015 p. 7)

Direction	Slope[1]	Vegetation[2]	PBP APZ[3]	Proposed APZ	Comment
South	Downslope >0-5°	Woodland	15m	>25m	A minimum 25 metre drainage corridor and minimum 4 metre wide fire trail provide an adequate APZ
Northwest	Upslope	Woodland	10m	>100m	The road reserve and land cleared for residential development provide an adequate APZ
West	Downslope >0-5°	Freshwater Wetland	10m	>100m	

[1] slope most significantly influencing fire behaviour of the site having regard to vegetation found. Slope classes are according to PBP.

[2] Predominant vegetation is identified, according to PMP and *"where a mix of vegetation types exist the type providing the greater jhazard is said to be predominate".*

[3] Assessment according to PBP

As demonstrated in **Table 17** above, the proposed development provides APZs in excess of those required based on the assessed fire threat and the guidelines Planning for Bushfire Protection. Section 4 of the report provides detailed recommendations for the ongoing management of the APZ to ensure that its continued effective performance in managing bush fire impact is maintained through the life of the development.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

5.10.3. Building Standards for Bushfire Prone Land

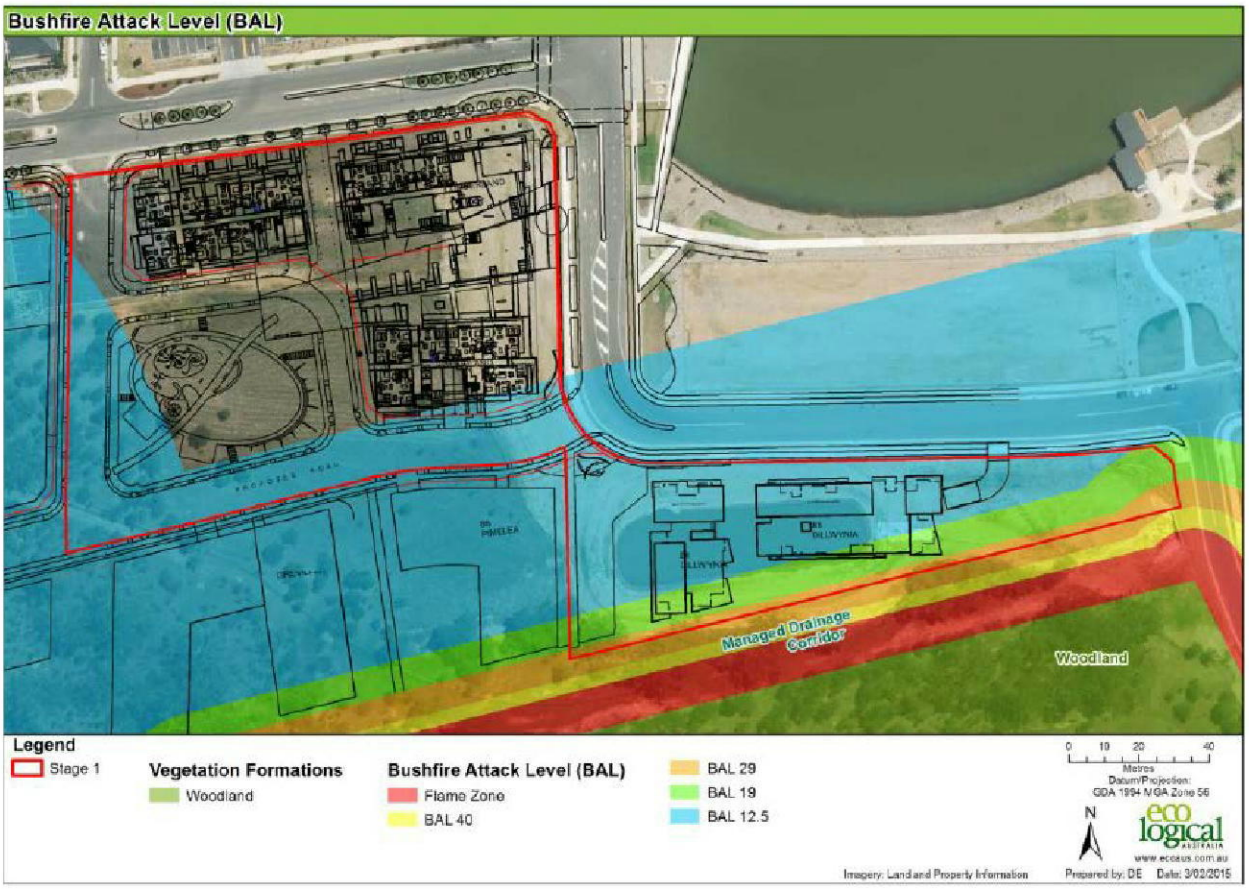
In conjunction with providing separation and management of Asset Protection Zones, development on bushfire prone land is required to demonstrate consistency with AS3959-2009: Construction of Buildings in Bushfire Prone Area. The building standard is determined by the assessed Bushfire Attack Level (BAL) that reflects the combination of vegetation, slop and separation (APZ).

As shown in in **Figure 32** Eco Logical has classified each of the buildings as having a low to moderate risk as follows:

- Buildings 4 and 5 located at the southern edge of the site BAL19 (shown green);
- Land to the north and small portion of Building 3 has a low risk with a BAL12.5 (shown blue); and
- Building 1 and 2 are not affected.

The above information will be used to ensure that appropriate measures are implemented in the detailed design of the buildings at Construction Certificate stage.

Figure 32: Planning for bushfire safety (Source: Ecological; 2015)



5.10.4. Access and Egress

Ecological have considered the suitability of the proposed access, egress and servicing of the site, to include:

- Internal local road layout and connection to the existing and broad Jordan Springs Road network; and

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

- Proposed southern fire trail to include a 4 metre wide access road (3 metre in the southern drainage lot and 1 metre within Lot 3991).

The assessment has resolved that the both the proposed road design and fire access corridor will comply with the deemed to satisfy provisions of Planning for Bushfire Protection.

Taking into account the above the proposed development is considered to be consistent with the Clause 31 to deliver safe neighbourhoods and Section 4.10 providing adequate and development specific bushfire protection measures of the DCS. For full details of the assessment and associated recommendations refer to **Appendix Q**.

5.10.5. Flood

Section 4.11 of the WPP indicates that the whole of the Western Precinct is located outside the maximum probable flood area and so is not required to provide flood evacuation plan or design to accommodate/mitigate against flood impacts. The proposal satisfies clause 28 of SREP 30 in this regard.

5.11. Construction Impacts

There will be a short term and temporary impact on the surrounding locality arising from construction works, these impacts will relate to:

- Visual impact, arising from the removal of vegetation, excavation and erection of scaffolding;
- Noise associated with construction works; and
- Increase in the number of heavy vehicle movements within the immediately surrounding road network.

These impacts are transient and will be suitably controlled through the following:

- Construction impacts will be managed through the implementation of a Construction Management Plan (CMP) for the development. The CMP will be developed at detailed design stage prior the issue of a construction certificate.
- During construction, the storage and removal of waste shall be undertaken in accordance with the guidelines outlined within the Waste Management Plan (WMP). The WMP is provided at **Appendix W**.

5.12. Social Impacts

The proposed development delivers a high density mixed use and residential development within the identified Village Centre of Jordan Springs. As outlined in Section 5.1, the delivery of 201 apartments will potential increase the density of Jordan Springs and the number of dwellings anticipated to be delivered in Village C (estimated in Figure 12 of the WPP as being 660). The increased delivery of housing and residents will contribute to increased demand for local services and amenities.

Notwithstanding the above, the proposal is considered to provide a suitable site response that will make a positive social contribution to Jordan Springs and Penrith LGA through the following:

- 614m² of non-residential floor space that will contribute to job creation for local residents consistent with the objectives of SREP 30 to deliver housing and jobs within close proximity;
- the proposal will contribute to the overall quantum of housing and diversify the typology and size contributing to a broader demographic base;
- the delivery of alternate housing types in the form of apartments of varying size may contribute to a more affordable housing option within Jordan Springs;

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

- The development incorporates adaptable housing that will allow for aged or mobility impaired residents thereby contributing to social integration;
- Increased delivery of housing within close proximity to the town centre and public transport connections may reduce the number of vehicle trips within Jordan Springs and reduce travel times of future residents and workers accessing services; and
- The delivery of additional open space and public domain areas contributes to the range of recreational opportunities for residents. The inclusion of open space beyond that anticipated in the WPP and DCS may also offset any increased demand arising from increased density beyond the envisaged 15 dwellings per hectare.

5.12.1. Safety, Security and Crime Prevention

5.12.1.1. Crime Risk Assessment Social Impacts

The proposed development contains 201 residential apartments and is required to undertake a risk assessment to avoid introducing unforeseen risks to future developments and their locality. There are four (4) main steps in the risk assessment process, these include:

1. Identifying Risk;
2. Analysing Risk;
3. Evaluating Risks; and
4. Development of Risk Treatments.

The Bureau of Crime Statistics and Research (BOSCAR) collect and store data in relation to reported crime within NSW. **Table 18** includes an extract summary of incidents recorded by BOSCAR, based on premises type across the Penrith LGA for 2014. As the development is mix of land uses, both the residential and retail/commercial incidents have been included.

Table 18 Summary of BOSCAR Statistics for the Penrith LGA (by premises) (Source: www.boscar.nsw.gov.au)

Offence	Rate of Incidence		
	Residential	Retail/wholesale	Office
Domestic violence	889	24	0
Assault (non-domestic)	279	105	6
Sexual offences	239	11	2
Break and enter (non-dwelling)	6	121	14
Robbery	12	34	1
Motor vehicle theft	260	37	1
Steal from motor vehicle	594	61	0
Steal from person	14	47	1
Malicious damage to property	1,326	192	25

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Of the recorded offences, with the exception of domestic violence, acts were more commonly perpetrated against men by men aged between 20 and 39 years. In the majority of incidents, the offender was of a non-indigenous background and in 92.2 per cent of circumstances occurred without alcohol as a contributing factor.

Taking into account the recorded incidents by land use, it is evident that there is a significant bias towards incidents occurring within residential premises with the majority of offences involving malicious damage to property, domestic violence and steal from motor vehicle. In relation to non-residential forms of development, incidents predominantly relate to break and enter (non-dwelling), malicious damage to property and assault (non-domestic).

The statistics provided in **Table 18** above are broad statistical trends based on recorded crimes for Penrith LGA broadly, more detailed assessment of the "hot spot" crime maps available online from BOSCAR indicate that Jordan Springs does not attract high incidents of the identified crimes. This may in part be due to its relatively low density of development and location away from key transport hubs such as train and bus inter-changes. The surrounding area is undergoing substantial redevelopment, transitioning from a rural land to medium to high density residential development with small scale retail and commercial premises.

Combined with the potential for existing forms of crime to perpetuate, the redevelopment of the area may also contribute to an increase in the potential risk for the following incidents:

- Littering and illegal dumping;
- Residential nuisance (noise and the like) and
- Property damage/Vandalism (i.e. Graffiti, landscaping);

Notwithstanding, the above, the development will contribute to around the clock activation of the area through the co-location of residential and non-residential uses. This may discourage and reduce certain acts of antisocial behaviour, such as malicious damage to property, break and enter and theft from motor vehicle, due to the increased potential for surveillance, increased population density and activation of public areas.

Based on the above, there is the potential for an appropriately designed development to make a positive contribution in respect to the risk potential of certain forms of crime. Simultaneously, the incidence of litter and dumping and nuisance offences may increase due to rising population and introduction of non-residential uses.

Development of Risk Treatments

The development is not considered to contribute to an increased potential for the rate of crimes within the Penrith LGA. While it is noted that that spectrum of incidents may increase, the development has been designed to mitigate against the potential for this to occur. In particular the development incorporates the following design elements that may reduce the potential impacts:

- Ground floor level active uses to Jordan Springs Boulevard and Lakeside Parade promoting use and increasing casual surveillance of the street level during the day;
- Balconies of units orientated to all street frontages existing and proposed, providing casual surveillance of the streets and ground level tenancies over weekends and at night combined with suitable levels of lighting throughout the evening will discourage anti-social behaviour within public domain areas;
- Suitable and adequate waste management facilities are provided within the development to discourage and overcome the need to leave rubbish or bulky items on the verge;
- Access controlled entries will restrict access to the buildings and the secure basement level car parking;

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

- Well designed and lit places to ensure clear and unobstructed sightlines and overcome potential concealment.

The development in general is considered unlikely to contribute to the risk of anti-social behaviour and incorporates positive design elements to promote a safe and secure neighbourhood.

5.12.1.2. Crime Prevention Through Environmental Design

The proposed development has been designed and laid out to reinforce the principles of Crime Prevention Through Environmental Design (CPTED), as outlined in **Table 19** below.

Table 19 Consideration of the proposal against the CPTED principles.

Principle	Design Response/Consideration of Issue
(1) Surveillance	
(a) Casual Surveillance;	• Casual surveillance is promoted through units designed and laid out to overlook common areas and the adjoining street network. • ground level active uses reinforced by positive street level design will encourage the use of common areas and promote a sense of safety through activity. • Common areas will be appropriately lit at night to allow for surveillance.
(b) Sightlines	• Pedestrian entries and paths within the site are visible from adjoining dwellings, running in a direct linear path with minimal gradient changes and blind corners. • Sightlines within common spaces are preserved by low level planting to preserve visibility and avoid concealment. Low level lighting used at night will enhance visibility and not produce glare.
(2) Access Control	Access to the residential components of the buildings including to the basement level parking will be security controlled at all times of the day.
(3) Territorial Reinforcement	• A sense of community will be fostered through the provision of well-designed and centrally located common open space, where residents can meet and relax together. • Clear delineation of space is achieved through a mix of landscaping used to define public and private spaces, together with access control measures, fencing, locked doors and signage.
(4) Space Management	• Well-designed common spaces capable of supporting active and passive needs of residents will foster a sense of ownership by residents, encouraging self-regulated management. • Ground floor active uses and fences will serve to manage street setbacks. Where fencing is used style and form will retain visual connectivity to adjacent streets. • The operation and maintenance of the site will be overseen by a building manager.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

5.13. Economic Impacts

The development is likely to generate positive economic impacts as a result of construction and ongoing use of the site in respect to the following:

- generates employment opportunities on the site by providing of non-residential floor space within the development;
- the increased resident and worker populations will contribute to increased retail expenditure within Jordan Springs Town Centre and the Penrith LGA;
- delivers local employment opportunities during the construction phase and operational phase for site management; and
- provides for an economic multiplier effect as a result of construction and ongoing use. In particular the development may act as a catalyst for further investment in the area.

5.14. Site Suitability

The sites as part of the former ADI site, was earmarked for development by the State Government some 10 years ago. The proposed development is consistent with the primary planning instruments that envisage higher density residential development support by active street level uses within the urban village character area.

This report has demonstrated that the site has sufficient capacity to accommodate the proposed development with minimal adverse impact to the adjacent national park and has been appropriately designed to respond to the built form context of the low density residential, suburban character and town centre. There are no significant natural or cultural constraints that would hinder the proposed development, and accordingly the site is considered suitable for the proposed development.

5.15. Public Interest

As demonstrated by this report, the proposed development will not result in any significant or unreasonable impacts on the adjoining residential land to the north or national park to the site. The proposal will deliver a total of 201 new residential dwellings within a developing urban environment within walking distance of services and public transport. The delivery of alternate residential accommodation in the form of high density apartments will make a positive contribution to the range of dwelling types.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

6. Conclusion

The proposal seeks consent for the redevelopment of the land to achieve a high density residential and mixed use development, containing the following:

- Four (4) apartment buildings containing 138 residential apartments;
- One (1) mixed use building containing 614m^2 ground floor commercial, retail and business premises with shop top housing above, to include 63 residential apartments;
- Car parking for 371 vehicles in two (2) level basements below each building footprint;
- Associated entry roads, stormwater, services and infrastructure;
- Public Domain and landscape works, including 2,400m² of public open space; and
- Site preparation works including tree removal and land forming earth works.

The application has been assessed having regard to the heads of consideration under Section 79C(1) of the *EP&A Act 1979*, including the provisions of all relevant Commonwealth and State Legislation in relation to protection of biodiversity and conservation values and the relevant SEPPs, Council LEP, DCPs, Codes and Policies.

The proposal provides a well-designed residential community development which is generally consistent with the performance objectives of the SREP 30 and the associated controls of the Western Precinct Plan, Village Centre Concept Plan and Development Control Strategy. In particular the proposed development responds to key objectives of SREP 30 to deliver an urban form that encourages the use of active and public transport modes by locating residential densities within the town centre.

The proposal generally achieves a reasonable level of neighbourhood amenity and streetscape, visual and acoustic privacy, solar access and design for climate, stormwater, crime prevention, accessibility and waste management.

The built form and massing is located within a landscaped setting, setback from adjoining properties. The bulk and scale of the proposed development is in compatible with the character of the locality and is enhanced by extensive landscaping to a high standard.

The traffic generated by the development can be accommodated by the existing road network and each use is supported by an appropriate level of onsite parking.

As demonstrated by the SEE and supporting technical report the development does not result in significant adverse impacts on the, environment or the amenity of the neighbourhood and based on the assessment undertaken, approval of the proposed development is sought.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Appendices

Appendix A	URDP Minutes & Applicant Response
Appendix B	Site Survey
Appendix C	Architectural Design Package
Appendix D	Building Code of Australia Report
Appendix E	Landscape Design Package
Appendix F	Engineering – Road Layout and Drainage
Appendix G	Traffic and Parking Assessment
Appendix H	Waste Management Plan
Appendix I	Stormwater Design (Detailed)
Appendix J	Perspectives/Photomontages
Appendix K	Compliance Assessment: Western Precinct Plan – Development Control Strategy
Appendix L	Compliance Assessment: Development Control Strategy – Residential Development Forms
Appendix M	State Environmental Planning Policy No. 65: Design Quality Residential Flat Development
Appendix N	Species Impact Statement
Appendix O	Acoustic Impact Assessment
Appendix P	Building Sustainability Index: BASIX Certificates
Appendix Q	Bushfire Assessment & Management Report
Appendix R	Quantity Surveyors Report
Appendix S	Lend Lease approval/agreement

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Appendix A – URDP Minutes & Response

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Appendix B – Site Survey

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Appendix C – Architectural Design Package

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Appendix D – Building Code of Australia Report

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Appendix E – Landscape Design Package

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Appendix F – Engineering – Road Layout & Drainage

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Appendix G – Parking and Traffic Assessment

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Appendix H – Waste Management Plan

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Appendix I – Stormwater Design (Detailed)

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Appendix J – Perspectives/Photomontages

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Appendix K – Compliance Assessment: Western Precinct Plan – Development Control Strategy

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Appendix L – Compliance Assessment: Development Control Strategy – Residential Development Forms

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Appendix M – State Environmental Planning Policy No. 65: Design Quality Residential Flat Development

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Appendix N – Species Impact Statement

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Appendix O – Acoustic Impact Assessment

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Appendix P – Building Sustainability Index: BASIX Certificates

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Appendix Q – Bushfire Assessment & Management Report

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Appendix R – Quantity Surveyors Report

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Appendix S – Lend Lease approval/agreement

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Urban Design Review Panel Minutes & Response

A meeting was held with the Penrith Urban Design Review Panel. Table 1 provides a summary of matters raised that are of relevance to the application for Stage 1 of the Parklands Estate and provides a response where appropriate.

Table 1 Summary of Penrith Urban Design Review Panel

Urban Design Review Panel Comment	Applicant Response
General	
Future applications seeking consideration of 8 storey building forms will need to demonstrate that they are "not inconsistent" with the Western Precinct Plan (WPP), Development Control Strategy (DCS) and Western Precinct Concept Plan, pursuant to Clause 20 of SREP 30.	This DA is for Stage 1 of the application that seeks consideration of buildings up to six (6) storeys, consistent with the relevant controls of the WPP, DCS and concept plan and the desired future character of the village centre character area.
Village C1 has an anticipated 20 dwelling yield located within a bushland character area where single dwellings houses are identified as being the preferred residential development type. This site is outside the village centre shown on the concept plan.	Stage 1 is not located within Village C1. This matter will be further addressed by a future master plan.
The DCS imposes limits apartment buildings to the village centre character area.6 storeys may be considered on landmark sites with the agreement of PCC and based on individual merit.	Stage 1 includes the provision for two (2), six (6) storey buildings located at the corner of Jordan Springs Boulevard and Lakeside Parade.
Council will not support a concept plan seeking to "lock in" absolute heights in the absence of a specific Stage DAs supported by appropriate architectural detail	These matters relate to the master plan.
The following design elements were considered by the panel as being positive:	
View of the regional park from intersection visual connection to lake.	The siting and layout of building and roads has sought to optimise the number of apartments with outlooks and views to key physical attributes. The maintenance of the view corridor along Lakeside Parade between Buildings 4 and 5 to the southern Regional Park was considered a key element in and retaining visual amenity for the broader community as a key attribute to Jordan Springs and its broader character and identity.
Sequence of green spaces, connection street running through structure of 2D layout.	A detailed landscape package has been developed for Stage 1 delivering a connected sequence of landscaped edges around a central park and public square. Refer to **Appendix E** of the Statement of Environmental Effects (SEE).
Central square nice touch	Comments noted. Detailed design package is provided at **Appendix E.**

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Urban Design Review Panel Comment	Applicant Response
Limited road network reduces environmental impact and loss of green amenity.	Road layout has built on the structure of the adopted WPP and demonstrates consistency with the modified grid pattern and detailed design controls of the DCS. Opportunities for soft landscaping and deep soil have been optimised including suitable plantings within verge areas to connect to earlier stages of development within and throughout Jordan Springs.
The proposed 3 – 4 storey building heights at the western edge of the site and the 4 – 6 storey heights at the eastern edge is generally appropriate in the context of the structure plan.	The massing and height of the buildings forming part of Stage 1 have been designed to respond to their immediate context. Refer to **Section 5** of the SEE.
8 storey form appropriate to the south of the Central Park towards the street frontage.	Comments noted. This matter relates to later stages of the development and the master plan.
Relatively short interface with 1 and 2 storey development however 2 – 3 storeys at street edge is an appropriate response.	Building 1 located at the north western edge of Stage 1 has adopted a 3 storey form and is of a comparable scale to the adjacent residential development. The resulting interface relationship is considered in Section 5 of the SEE. Buildings 2 and 3 located at the north eastern corner of the site relate to the town centre more so than the low density residential development located to west along Jordan Springs Boulevard. This scale and height is consistent with current development to the north of the site occurring at the corner of Lakeside Parade and Water Gum Drive.
Indicative architecturals contemplate ground floor level slightly higher relative to ground level, i.e. terrace/balconies 1m ground above ground.	This design element has been carried forward to the DA as a measure of enhancing privacy and delineating private from public space at street level.
Plan presented at meeting – layering of top floors.	These design changes have been carried through to the DA. As outlined in Section 5 of the SEE, building heights and articulation has been individualised for each building to respond to the changing context and provide suitable building heights and scales.
Apartment frontages to central park would have distinctive landscape design, bear in mind how much space between the street footpath and building to create terrace gardens	The majority of ground level apartments have been provided with courtyards consistent with SEPP65/RFDC. Refer to Architectural plans and SEPP 65 statements prepared by Mosca Pserras Architects.
Buildings at back, deeper site area, going to 'U' shaped configuration	This is being considered for future development.
Edge treatment can work effectively, maintained green edge.	Comments noted. Green edge along has been retained and carried through to the DA. Refer to landscape package at **Appendix E.**

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

The following matters raised concern:	
Delivery of commercial floor space is noted as being restricted to the corner of the site. The panel has questioned the demand for this space and whether there is the potential for future residential conversion.	The developer has already received market interest in the proposed commercial space as such a lack of demand is not anticipated. Notwithstanding the above, these spaces are capable of adaptation should the need arise.
Concern raised regarding viability and amenity of the inward facing tenancy (i.e. rear facing of building 2)	Concern noted. As indicated above, preliminary market advice has been positive in terms of the potential future up take of these spaces.
The commercial forecourt will be heavily shaded and has the potential to act as a wind tunnel	The design of this space is considered unlikely to result in the creation of a wind tunnel. Overshadowing diagrams prepared in support of the DA and provided at **Appendix C** indicated that while the central courtyard will be heavily shaded at the winter solstice the situation will improve at other times of the year.
Consideration to be given to the long term access, maintenance and connectivity of proposed central open space dedication to Council. May require an access easement.	The layout and access arrangements facilitate unrestricted access any legal instruments required to formalise these arrangements may be resolved as part of a future application.
Drainage channel engineered, bushfire constraints with Asset Protection Zones and Macro Fauna fencing may present an unattractive, unsafe environment requiring an appropriate design response for south facing edges and common areas.	The south facing edges have a single level terrace for casual recreation purposes. These spaces are capable of supporting additional landscaping for visual interest.
Building setbacks will need to allow for adequate deep soil landscape opportunities within the development.	As outlined in the Section 5 of the SEE and the detail landscape package provided at **Appendix E** a total 31 per cent of the site landscaped of which 28 per cent is deep soil.
Indicative envelope, subject to design of edge, could come forward.	Building setbacks retained and carried forward to the DA. Setbacks are used to provide ground level courtyards and forecourts enhancing the streetscape. Refer to Section 5 of the SEE.
It was agreed that the Macro-fauna fence should be relocated to the south of the passive open space and secret garden. This will allow for the provision of a continuous walking path or track around the full extent of the waterbody, providing a great passive recreation opportunity for local and wider residents of Jordan Springs.	Comments noted. This relates to land outside the development and ownership of the applicant/development.
The current extent of 8 storeys i.e. one block on its own looks odd.	The proposed height and forms of buildings beyond stage are undergoing review and will be evolved to address these matters.
Building depths are consistent and some separation between buildings road [SIC] is required.	Refer to Architectural Package provided at **Appendix C**.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Messy situations with irregular building envelopes at 'elbow' would depend on design.	Refer to Architectural Package provided at Appendix C.
Consideration of appropriate kerbside parking locations.	This will be considered in the future development application for the remainder of the site.
Indicative architecturals are currently visually congested.	Refer to Architectural Package provided at **Appendix C**.
Summary statements	
Sketch up model of alternatives where push height around, explore some of the options, examine for street level vantage points.	This comment refers to buildings subject of a future master plan application.
Structured Plan - comfortable with, initial concern with scale to residential developments to north west but as 3 storey probably ok.	Refer to previous comments in relation to height and bulk. Detailed consideration of this issue is considered in Section 5 of the SEE.
Presentation to regional park and drainage channel, heights, treatments needs cascading balconies and terraces.	Refer to comments above in relation to the landscape treatment of the southern terraces to Buildings 4 and 5.
Spaces between building to continue vistas currently available.	Stage 1 generally retains existing view corridors and vistas.
Regional park won't be concealed from town centre and surrounding streets.	Stage 1, generally retains and extends the line of existing view corridors obtained along existing streets. In particular the view corridor long Lakeside Parade towards the Regional Park.
Precincting of developments is satisfactory, further investigation on little block facing Jordan Springs Boulevard helpful.	These blocks are not subject of the current application. The siting and layout of the buildings will be reviewed and the design evolved where necessary.
Buildings land in relation to streets and park and way individual dwelling access public frontages is critical, also landscaping.	Refer to SEPP 65 Design Principles assessment and detailed landscape packages for discussion on interplay of building siting, layout and its relationship to landscape hierarchy and character.
Landscape component was bit detailed for conceptual level, entry level and signs bit over the top.	Comments noted.
Consideration to maintenance level required for the areas that Council will have to maintain.	Plans are indicative. The extent of landscape elements (hard and soft) can be refined through the assessment process.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

PENRITH

Our Ref: UDRP15/0001
Contact: Peter Wood
Telephone: (02) 4732 7577

11 February 2015

APP Corporation Pty Ltd
Level 7 116 Miller Street
NORTH SYDNEY NSW 2060

Attention: Allison Smith

Dear Allison,

Urban Design Review Panel Meeting
Proposed Master Plan for Residential & Mixed Use Development
Lot 3989 Lakeside Parade, Jordan Springs

Thank you for attending Council's Urban Design Review Panel on 4 February 2015

The attached minutes are provided as a summary of the key points raised during the Panel meeting. We hope that you have found participation in the Panel process beneficial and that it will assist both yourself and Council reaching a determination of your proposal.

If you require any further assistance regarding the attached advice please contact me on (02) 4732 7577.

Yours faithfully

Peter Wood
Development Assessment Co-ordinator

Penrith City Council
[illegible]
NSW [illegible]
[illegible]
[illegible]
penrithcity.nsw.gov.au

Please note: this advice is to assist you with your development proposal. It is not a full assessment of the proposal. The applicant is responsible to address all relevant requirements.

PENRITH
CITY COUNCIL

PENRITH

Urban Design Review Panel Advice	
Date of Issue	11 February 2015
Reference	UDRP15/0001
Proposal	Master Plan for Residential & Mixed Use Development
Address	Lot 3989 Lakeside Parade JORDAN SPRINGS NSW 2747

It is understood that the Parklands Estate Masterplan will be proposed as a Concept Plan Development Application and a concurrent Stage 1 DA. Whilst the panel has indicated that building heights of up to 8 storeys may be appropriate in some proposed locations, it remains to be demonstrated that this is not inconsistent with the Western Precinct Plan, Development Control Strategy and Western Precinct Concept Plan pursuant to Clause 20 of Sydney Regional Environmental Plan No.30 – St Marys which restricts Council from granting consent.

In this regard it should be noted that the Precinct Plan denotes the western portion of the subject site as Village C1 with a dwelling yield of 20 dwellings and primarily bushland edge being suitable for detached dwellings. The concept plan shows this area to be outside of the Village Centre Character Area.

Furthermore the Development Control Strategy limits apartment buildings to the Village Centre Character Area and states:

'6 storey height limit may be considered on agreed key landmark sites identified in consultation with PCC in the Village Centre Character Area based on individual merits of the DA.'

Given the above it is unlikely that Council will support a concept plan seeking to 'lock in' absolute heights in the absence of specific Stage development applications supported by appropriate architectural detail.

Assuming that the above adopted plans can be updated with agreement from Lend Lease where required and/or variations demonstrated to be justified to the satisfaction of Council, the following aspects of the proposal are considered positive as outlined at the panel meeting:

- View of regional park from intersection visual connection to lake.
- Sequence of green spaces, connection street running through structure of 2D layout.
- Central square nice touch,
- Limited road reduces environmental impact and loss of green amenity.
- Building heights of 3-4 storeys western part of site and 4-6 storeys eastern part of site generally appropriate in the context of the structure plan proposed.
- 8 storey built form appropriate to the south of the Central Park towards the street

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

frontage.

- Relatively short interface with 1 and 2 storey development however 2-3 storeys at street edge is an appropriate response.
- Indicative architectural drawings contemplate ground floor level slightly higher relative to ground level, i.e. terraces/balconies 1m above ground.
- Plan presented at meeting, layering of top floors,
- Apartment frontages to central park, would have distinctive landscape design, bear in mind how much space between street footpath and building to create terrace gardens.
- Buildings at back, deeper site area, going to U shaped configuration.
- Edge treatment can work effectively, maintained green edge.

The following aspects of the proposal raise some concern for the panel as outlined at the meeting:

- Although the commercial component is restricted to the corner, maybe newsagent, what if there' s no call for commercial, can it be converted to residential?
- Concern with inward commercial space, depending on what goes into shops as to whether it would be activated. Will struggle as shaded in mid winter, tunnel.
- The south facing, under cover commercial forecourt has no solar access and is a potential wind tunnel if relying on pedestrian connection.
- Dedicated of open space and access easement to Council at later date, requires consideration as to edge treatments for long term access and maintenance.
- Drainage channel engineered, bushfire constraints with Asset Protection Zones and Macro Fauna fencing may present an unattractive, unsafe environment requiring an appropriate design response for south facing edges and common areas.
- Building setbacks will need to allow for adequate deep soil landscape opportunities within the development sites.
- Indicative envelope, subject to design of edge, could come forward
- It is agreed that Macro fauna fencing should be relocated to the south of the passive open space and secret garden. This would allow for the provision of a continuous walking path or track around the full extent of the waterbody, providing a great passive recreation opportunity for local and wider residents of Jordon Springs.
- The current extent of 8 storeys i.e. one block on its' own looks odd.
- Building depths are consistent and some separation between buildings road is required.
- Messy situations with irregular building envelopes at 'elbow' would depend on design.
- Consideration of appropriate kerbside parking locations.
- Indicative architecturals are currently 'visually congested.'

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Summary (Brett Newbold)

- Sketch up modelling of alternatives where push height around, explore some of the options, examine from street level vantage points.
- Structured plan – comfortable with, initial concern with scale to residential developments to north west, but as 3 storey probably ok.
- Presentation to regional park and drainage channel, heights, treatments needs cascading balconies and terraces.
- Spaces between building continue vistas currently available.
- Regional park won't be concealed from town centre and surrounding streets.
- Precincting of developments is satisfactory, further investigation on little block facing Jordan Springs Blvd helpful.
- Buildings land in relation to streets and park and way individual dwelling access public frontages is critical, also landscaping.
- Landscape component was bit detailed for conceptual level, entry level and signs bit over the top.
- Consideration to maintenance level required for the areas that Council will have to maintain.

11/2/15.

Peter Wood
Development Assessment Co-ordinator

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015



Notes:-

No boundary survey has been undertaken.
Bearings and dimensions are from title only and are subject to confirmation by boundary survey.

Bearings relate to MGA Grid North taken from DP1176163.

Levels are based on Australian Height Datum (AHD)
using SSM 80426 with a reduced level 47.288
Class B
Order 2

Contours are an indication of landform and should not be taken in preference to spot levels shown.

Contour interval 1m

SCHEDULE OF BOUNDARIES

LINE	BEARING	DISTANCE	ARC	RADIUS
1	261°58'50"	203.82	-	-
2	286°09'31"	6.145	-	-
3	334°30'53"	6.145	-	-
4	358°41'34"	66.985	-	-
5	133°47'05"	37.415	41.54	26.50
6	268°52'33"	104.280	-	-
7	85°23'50"	37.735	37.76	311.005
8	305°04'32"	5.80	-	-
9	348°36'00"	0.615	-	-
10	75°58'14"	67.504	-	-
11	345°58'14"	10.0	-	-
12	75°58'14"	112.258	-	-
13	75°57'55"	222.043	-	-
14	12°02'20"	47.355	-	-
15	2°42'15"	16.975	-	-
16	358°53'20""	11.29	-	-
17	335°40'55"	8.6	-	-
18	337°30'40"	13.945	-	-
19	326°36'10"	12.69	-	-
20	315°25'30"	14.78	-	-
21	313°52'40"	3.16	-	-
22	41°43'55"	44.195	-	-
23	10°25'40"	11.15	-	-
24	187°11'20"	17.615	-	-
25	186°16'55"	25.125	-	-
26	194°42'50"	22.645	-	-
27	19°16'45"	84.45	-	-
28	113°58'55"	30.11	-	-
29	143°07'40"	49.98	-	-
30	99°28'30"	60.815	-	-
31	17°06'15"	135.98	-	-
32	85°14'10"	120.385	-	-
33	158°12'00"	53.84	-	-
34	48°20'15"	5.405	-	-
35	156°21'10"	23.00	23.52	32.20
36	135°25'30"	30.52	-	-
37	41°43'55"	15.72	-	-
38	358°41'35"	78.05	-	-
39	280°53'30"	31.97	32.025	157.659
40	88°31'35"	35.945	36.025	157.659

PREPARED BY
LAWRENCE group
Surveyors & Development Consultants
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W: www.lawrencegroup.com.au

Issue	Amendment	Date

LEGEND
- TOP OF BANK
- TOE OF BANK

CLIENT
CID GROUP

PROJECT
WESTERN PRECINCT - VC 2, 3 & 10
JORDAN SPRINGS

DRAWING TITLE
DETAIL & LEVEL SURVEY

TITLE INFORMATION
Lot: PROPOSED LOTS 3989, 3990, 3991
Plan No.: -
Title / Folio: -
L.G.A.: -
Parish: -
County: -

QUALITY ASSURANCE
Surveyor: DS
Drawn: GC
Checked by: PB Date: 25/06/13
Approved by: PB Date: 25/06/13
COMPLETION OF QUALITY ASSURANCE IS EVIDENCE THAT THE SURVEY WORKS UNDERTAKEN AND THE DRAWING HAVE BEEN VERIFIED AS CONFORMING WITH THE REQUIREMENTS OF THE QUALITY PLAN. WHERE THE QUALITY ASSURANCE IS INCOMPLETE ALL INFORMATION ON THE DRAWING IS INTENDED FOR PRELIMINARY PURPOSES ONLY AS IT IS UNCHECKED.

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Date of Survey: 17-20/06/13 Date of Plan: 25/06/13
Datum: AHD Co-ords: MGA
Scale: 1:800 (Original size A1)
Cad ref : 132673-DETL-001A Sheet 1 of 1
JOB NUMBER 132673
DRAWING NUMBER / ISSUE DETL-001/A

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015



Parklands Estate, Jordan Springs

drawing register

Drawing No:	Description Issue / Revision	Drawing Scales	Issue Date
AP01	Cover Sheet		
AP02	MASTER PLAN	1:1000	
AP03	DATA		
AP04	SITE PLAN	1:500	
AP05	Buildings 1,2 & 3-BASEMENT 2	1:250	
AP06	Buildings 1,2 & 3-BASEMENT 1	1:250	
AP07	Buildings 1,2 & 3-GROUND FLOOR	1:250	
AP08	Buildings 1,2 & 3-LEVEL 1	1:250	
AP09	Buildings 1,2 & 3-LEVEL 2	1:250	
AP10	Buildings 1,2 & 3-LEVEL 3	1:250	
AP11	Buildings 1,2 & 3-LEVEL 4	1:250	
AP12	Buildings 1,2 & 3-LEVEL 5	1:250	
AP13	Buildings 1,2 & 3-ROOF	1:250	
AP14	Building 4-BESEMENT 1 & 2	1:250	
AP15	Building 4-GROUND & LEVEL 1	1:250	
AP16	Builidng 4-LEVELS 2 & 3	1:250	
AP17	Building 4-ROOF	1:250	
AP18	Buildings 1,2 & 3-ELEVATIONS	1:250, 1:100	
AP19	Buildings 1,3,4 & 5-ELEVATIONS	1:250, 1:100	
AP20	Buildings 1,2,3 & 4-SECTIONS	1:250	
AP21	Buildings 1,2,3 & 4 ADAP. UNITS	1:100	
AP22	Shadow Diagrams	1:1500	

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- larger scale drawings and written dimensions take preference.
- do not scale from drawing
- all dimensions to be checked on site before commencement of work.
- all discrepancies to be brought to the attention of the author.

Notes

N

metres 0 1 5 10 1:250

CID GROUP

SYNERGY DEVELOPMENT GROUP

issue	details	by	date
A	DEVELOPMENT APPLICATION-STAGE 1	SB	13.02.15

amendments

project
PARKLANDS ESTATE

location
Jordan Springs Boulevard
JORDAN SPRINGS

project co-ordinator
SYNERGY DEVELOPMENT GROUP

client
CID GROUP

drawing title
Cover Sheet

date	checked	project arch.	drawn
30.09.14		SB	SB
scale	no		issue
	14016 AP01		A

mosca pserras architects

p 02 9601 3244 f 02 9601 6336

a po box 3353, liverpool westfield nsw 2170

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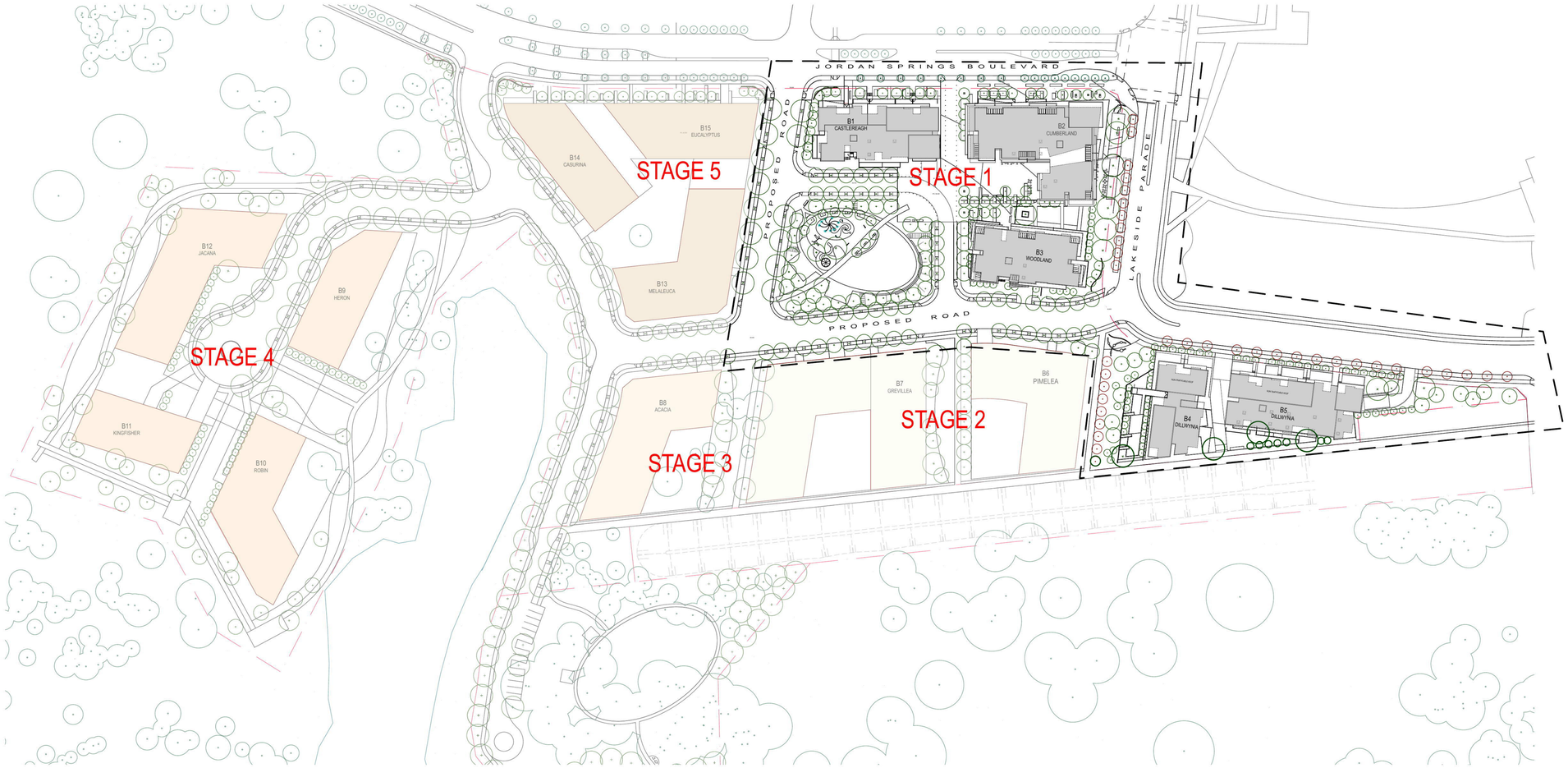
Version: 1, Version Date: 27/02/2015



1 MASPTERPLAN
1:1000

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Notes

N

metres 0 1 5 10 1:250

CID GROUP

SYNERGY DEVELOPMENT GROUP

issue	details	by	date
A	DEVELOPMENT APPLICATION-STAGE 1	SB	13.02.15

amendments

project
PARKLANDS ESTATE

location
Jordan Springs Boulevard
JORDAN SPRINGS

project co-ordinator
SYNERGY DEVELOPMENT GROUP

client
CID GROUP

drawing title
MASTER PLAN

date	checked	project arch.	drawn
30.09.14		SB	SB
scale	no		issue
	14016 AP02		A

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Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Jordan Springs Boulvard, JORDAN SPRINGS

DATE : 10.02.15

UNIT	APARTMENT TYPE			NSA								GFA	ORIENTATION living/bed	SOLAR ACCESS	CROSS VENTILATION
	1 BED	2 BED	3 BED	NOTES		INTERNAL	TERRACE	MISC/ COMM	TOTAL	ADAPTABLE	STORAGE				
BUILDING ONE - CASTLEREAGH															
GROUND															
1G.01		2B				83	34		117		✓		W/S	✓	✓
1G.02		2B				83	39		122		✓		N/W	✓	✓
1G.03	1B					63	28		91	✓	✓		N	✓	✓
1G.04		2B				83	39		122		✓		N	✓	
1G.05	1B					57	24		81	✓	✓		N	✓	
1G.06		2B				83	37		120		✓		N/E	✓	✓
1G.07	1B					58	18		76	✓	✓		S		
1G.08		2B				80	27		107		✓		S		
SUBTOTAL	**3**	**5**	**0**		686										
LEVEL 1															
1L.01		2B				83	18		101		✓		W/S	✓	✓
1L.02		2B				83	22		105		✓		N/W	✓	✓
1L.03		2B				83	15		98		✓		N	✓	
1L.04		2B				83	15		98		✓		N	✓	
1L.05	1B					57	6		63		✓		N	✓	
1L.06		2B				83	15		98		✓		N/E	✓	✓
1L.07		2B				83	18		101		✓		E/S	✓	✓
1L.08		2B				79	18		97		✓		S		
1L.09		2B				80	18		98		✓		S		
SUBTOTAL	**1**	**8**	**0**		808										
LEVEL 2															
12.01		2B				83	18		101		✓		W/S	✓	✓
12.02		2B				83	22		105		✓		N/W	✓	✓
12.03		2B				83	15		98		✓		N	✓	
12.04		2B				83	15		98		✓		N	✓	
12.05	1B					57	6		63		✓		N	✓	
12.06		2B				83	15		98		✓		N/E	✓	✓
12.07		2B				83	18		101		✓		E/S	✓	✓
12.08		2B				79	18		97		✓		S		
12.09		2B				80	18		98		✓		S		
SUBTOTAL	**1**	**8**	**0**		808										
LEVEL 3															
13.01			3B			102	18		120		✓		W/S	✓	✓
13.02		2B				83	18		101		✓		S		✓
13.03		2B				79	18		97		✓		S		✓
13.04		2B				83	18		101		✓		E/S	✓	✓
13.05		2B				83	15		98		✓		N/E	✓	✓
13.06	1B					57	6		63		✓		N	✓	✓
13.07		2B				83	15		98		✓		N/W	✓	✓
SUBTOTAL	**1**	**5**	**1**		645										

BUILDING ONE OVERALLS

	1 BED	2 BED	3 BED	TOTAL	GFA	INTERNAL	TERRACE	MISC	TOTAL	
TOTALS	**6**	**26**	**1**	**33**	**2947**	**2588**	**644**		**3232**	**3**

BUILDING TWO - CUMBERLAND

GROUND															
2G.01		2B		LIVE/WORK		81	29		110		✓		N/W	✓	✓
2G.02		2B		LIVE/WORK		82	33		115		✓		N	✓	
2G.03		2B		LIVE/WORK		81	33		114		✓		N	✓	
2G.04				COMMERCIAL				64	64						
2G.05				COMMERCIAL				188	188						
2G.06				COMMERCIAL				242	242						
2G.07				COMMERCIAL				120	120						
SUBTOTAL	**0**	**3**	**0**		975										
LEVEL 1															
21.01			3B			105	17		122		✓		S/W		
21.02		2B				83	19		102		✓		S		✓
21.03		2B				83	18		101		✓		W/S	✓	✓
21.04		2B				83	17		100		✓		N/W	✓	✓
21.05		2B				83	15		98		✓		N	✓	
21.06		2B				83	15		98		✓		N	✓	
21.07	1B					61	8		69	✓	✓		N	✓	✓
21.08			3B			104	11		115		✓		N/E	✓	✓
21.09		2B				82	15		97		✓		E	✓	
21.10		2B				83	20		103		✓		E	✓	
21.11		2B				83	17		100		✓		E/S	✓	✓
21.12		2B				83	15		98		✓		W/S		✓
SUBTOTAL	**1**	**9**	**2**		1170										
LEVEL 2															
22.01			3B			105	17		122		✓		S/W		
22.02		2B				83	19		102		✓		S		✓
22.03		2B				83	18		101		✓		W/S	✓	✓
22.04		2B				83	26		109		✓		N/W	✓	✓
22.05		2B				83	18		101		✓		N	✓	
22.06		2B				83	15		98		✓		N	✓	
22.07	1B					61	8		69	✓	✓		N	✓	✓
22.08			3B			104	11		115		✓		N/E	✓	✓
22.09		2B				82	23		105		✓		E	✓	
22.10		2B				83	18		101		✓		E	✓	
22.11		2B				83	14		97		✓		E/S	✓	✓
22.12		2B				83	15		98		✓		W/S		✓
SUBTOTAL	**1**	**9**	**2**		1170										
LEVEL 3															
23.01			3B			105	17		122		✓		S/W		
23.02		2B				83	19		102		✓		S		✓
23.03		2B				82	18		100		✓		W/S	✓	✓
23.04		2B				83	26		109		✓		N/W	✓	✓
23.05		2B				83	18		101		✓		N	✓	
23.06		2B				83	15		98		✓		N	✓	
23.07	1B					61	8		69	✓	✓		N	✓	✓
23.08			3B			104	11		115		✓		N/E	✓	✓
23.09		2B				82	23		105		✓		E	✓	
23.10		2B				83	18		101		✓		E	✓	
23.11		2B				83	14		97		✓		E/S	✓	✓
23.12		2B				83	15		98		✓		W/S		✓
SUBTOTAL	**1**	**9**	**2**		1170										
LEVEL 4															
24.01			3B			105	17		122		✓		S/W		
24.02		2B				81	21		102		✓		S		✓
24.03		2B				82	18		100		✓		W/S	✓	✓
24.04		2B				81	18		99		✓		N/E	✓	✓
24.05		2B				81	17		98		✓		N	✓	
24.06		2B				81	16		97		✓		N	✓	
24.07	1B					61	7		68	✓	✓		N	✓	✓
24.08			3B			103	11		114		✓		N/E	✓	✓
24.09		2B				80	18		98		✓		E	✓	
24.10		2B				81	17		98		✓		E	✓	
24.11		2B				81	19		100		✓		E/S	✓	✓
24.12		2B				82	15		97		✓		W/S		✓
SUBTOTAL	**1**	**9**	**2**		1158										

Jordan Springs Boulvard, JORDAN SPRINGS

DATE : 10.02.15

UNIT	APARTMENT TYPE			NSA								GFA	ORIENTATION living/bed	SOLAR ACCESS	CROSS VENTILATION
	1 BED	2 BED	3 BED	NOTES		INTERNAL	TERRACE	MISC/ COMM	TOTAL	ADAPTABLE	STORAGE				
LEVEL 5															
25.01			3B			105	9		114		✓		S/W		✓
25.02		2B				81	9		90		✓		S		✓
25.03	1B					63	37		100		✓		W/S	✓	✓
25.04	1B					61	9		70		✓		N/E	✓	✓
25.05		2B				81	9		90		✓		N	✓	✓
25.06		2B				81	9		90		✓		N	✓	✓
25.07	1B					53	12		65		✓		N	✓	✓
25.08			3B			104	10		114		✓		N/E	✓	✓
25.09		2B				81	8		89		✓		E	✓	✓
25.10		2B				81	8		89		✓		E	✓	✓
25.11	1B					63	8		71		✓		E/S	✓	✓
25.12		2B				81	17		98		✓		W/S	✓	✓
SUBTOTAL	**4**	**6**	**2**		1083										

BUILDING TWO OVERALLS

	1 BED	2 BED	3 BED	TOTAL	GFA	INTERNAL	TERRACE	MISC	TOTAL	ADAPTABLE
TOTALS	**8**	**45**	**10**	**63**	**6726**	**5225**	**1025**	**614**	**6864**	**4**

BUILDING THREE - WOODLAND

GROUND															
3G.01		2B				82	26		108		✓		W/S	✓	✓
3G.02		2B				82	58		140		✓		N/W	✓	✓
3G.03	1B					63	21		84	✓	✓		N		✓
3G.04		2B				82	29		111		✓		N		
3G.05		2B				82	68		150		✓		N/E	✓	✓
3G.06		2B				87	41		128		✓		E/S	✓	✓
SUBTOTAL	**1**	**5**	**0**		574										
LEVEL 1															
31.01		2B				82	18		100		✓		W/S	✓	✓
31.02		2B				82	32		114		✓		N/W		✓
31.03		2B				82	14		96	✓	✓		N		
31.04		2B				82	19		101		✓		N		
31.05		2B				82	31		113		✓		N/E	✓	✓
31.06			3B			118	17		135		✓		E/S	✓	✓
31.07		2B				81	15		96		✓		S		
SUBTOTAL	**0**	**6**	**1**		696										
LEVEL 2															
32.01		2B				82	18		100		✓		W/S	✓	✓
32.02		2B				82	35		117		✓		N/W	✓	✓
32.03		2B				82	15		97	✓	✓		N	✓	
32.04		2B				82	19		101		✓		N	✓	
32.05		2B				82	32		114		✓		N/E	✓	✓
32.06			3B			118	18		136		✓		E/S	✓	✓
32.07		2B				81	18		99		✓		S		
SUBTOTAL	**0**	**6**	**1**		696										
LEVEL 3															
33.01		2B				82	18		100		✓		W/S	✓	✓
33.02		2B				82	34		116		✓		N/W	✓	✓
33.03		2B				82	14		96	✓	✓		N		
33.04		2B				82	19		101		✓		N	✓	
33.05		2B				82	31		113		✓		N/E	✓	✓
33.06			3B			118	18		136		✓		E/S	✓	✓
33.07		2B				81	18		99		✓		S		
SUBTOTAL	**0**	**6**	**1**		696										
LEVEL 4															
34.01		2B				81	20		101		✓		W/S	✓	✓
34.02		2B				81	34		115		✓		N/W	✓	✓
34.03		2B				81	16		97	✓	✓		N	✓	
34.04		2B				81	21		102		✓		N	✓	
34.05		2B				81	33		114		✓		N/E	✓	✓
34.06			3B			117	18		135		✓		N/E	✓	✓
34.07		2B				79	17		96		✓		S		
SUBTOTAL	**0**	**6**	**1**		686										
LEVEL 5															
35.01		2B				81	18		99		✓		W/S	✓	✓
35.02		2B				81	8		89		✓		N/W	✓	✓
35.03		2B				81	8		89	✓	✓		N	✓	✓
35.04		2B				81	8		89		✓		N	✓	✓
35.05		2B				81	9		90		✓		N/W	✓	✓
35.06			3B			107	8		115		✓		E/W	✓	✓
35.07		2B				80	9		89		✓		S		✓
SUBTOTAL	**0**	**6**	**1**		676										

BUILDING THREE OVERALLS

	1 BED	2 BED	3 BED	TOTAL	GFA	INTERNAL	TERRACE	MISC	TOTAL	ADAPTABLE
TOTALS	**1**	**35**	**5**	**41**	**4024**	**3498**	**923**	**0**	**4421**	**6**

BUILDING FOUR - DILUWNIA

GROUND															
4G.01		2B				88	73		161		✓		N/E	✓	✓
4G.02		2B				88	76		164		✓		N/W	✓	✓
4G.03		2B				81	28		109	✓	✓		W	✓	
4G.04		2B				83	38		121		✓		W/S	✓	✓
4G.05		2B				84	57		141		✓		E/S		✓
4G.06	1B					55	28		83		✓		E		
SUBTOTAL	**1**	**5**	**0**		542										
LEVEL 1															
41.01		2B				88	18		106		✓		N/E	✓	✓
41.02		2B				88	19		107		✓		N/W	✓	✓
41.03		2B				81	18		99	✓	✓		W	✓	
41.04		2B				83	25		108		✓		W/S	✓	✓
41.05		2B				84	20		104		✓		E/S		✓
41.06	1B					55	11		66		✓		E	✓	✓
SUBTOTAL	**1**	**5**	**0**		542										
LEVEL 2															
42.01		2B				88	18		106		✓		N/E	✓	✓
42.02		2B				88	19		107		✓		N/W	✓	✓
42.03		2B				81	18		99	✓	✓		W	✓	
42.04		2B				83	25		108		✓		W/S	✓	✓
42.05		2B				84	20		104		✓		E/S	✓	✓
42.06	1B					55	11		66		✓		E	✓	✓
SUBTOTAL	**1**	**5**	**0**		542										
LEVEL 3															
43.01		2B				88	18		106		✓		N/E	✓	✓
43.02		2B				88	19		107		✓		N/W	✓	✓
43.03		2B				81	18		99	✓	✓		W	✓	
43.04		2B				83	25		108		✓		W/S	✓	✓
43.05		2B				84	20		104		✓		W/E	✓	✓
43.06	1B					55	11		66		✓		E	✓	✓
SUBTOTAL	**1**	**5**	**0**		542										

BUILDING FOUR OVERALLS

	1 BED	2 BED	3 BED	TOTAL	GFA	INTERNAL	TERRACE	MISC	TOTAL	ADAPTABLE
TOTALS	**4**	**20**	**0**	**24**	**2168**	**1916**	**633**	**0**	**2549**	**4**

Jordan Springs Boulvard, JORDAN SPRINGS

DATE : 10.02.15

UNIT	APARTMENT TYPE			NSA								GFA	ORIENTATION living/bed	SOLAR ACCESS	CROSS VENTILATION
	1 BED	2 BED	3 BED	NOTES		INTERNAL	TERRACE	MISC/ COMM	TOTAL	ADAPTABLE	STORAGE				
BUILDING FIVE - DILWYNIA															
GROUND															
5G.01		2B				83	48		131		✓		N/W	✓	✓
5G.02		2B				83	30		113		✓		S/W		✓
5G.03	1B					51	19		70		✓		S		
5G.04		2B				81	32		113		✓		S		
5G.05		2B				80	26		106		✓		S		
5G.06		2B				83	14		97		✓		N/E	✓	
5G.07		2B				83	53		136		✓		N/E	✓	✓
5G.08		2B				83	54		137		✓		N	✓	
5G.09		2B				83	52		135		✓		N	✓	
5G.10	1B					58	31		89	✓	✓		N	✓	✓
SUBTOTAL	**2**	**8**	**0**		867										
LEVEL 1															
51.01		2B				83	15		98		✓		N/W	✓	✓
51.02		2B				83	15		98		✓		S/W	✓	
51.03	1B					51	6		57		✓		S		
51.04		2B				81	20		101		✓		S		
51.05		2B				80	15		95		✓		S		
51.06		2B				83	13		96		✓		S/E		✓
51.07		2B				83	19		102		✓		N/E	✓	✓
51.08		2B				83	15		98		✓		N	✓	
51.09		2B				83	14		97		✓		N	✓	
51.10	1B					58	6		64	✓	✓		N	✓	✓
SUBTOTAL	**2**	**8**	**0**		878										
LEVEL 2															
52.01		2B				83	15		98		✓		N/W	✓	✓
52.02		2B				83	15		98		✓		S/W	✓	
52.03	1B					51	6		57		✓		S		
52.04		2B				81	20		101		✓		S		
52.05		2B				80	15		95		✓		S		
52.06		2B				83	13		96		✓		S/E		✓
52.07		2B				83	19		102		✓		N/E	✓	✓
52.08		2B				83	15		98		✓		N	✓	
52.09		2B				83	14		97		✓		N	✓	
52.10	1B					58	6		64	✓	✓		N	✓	✓
SUBTOTAL	**2**	**8**	**0**		878										
LEVEL 3															
53.01		2B				83	15		98		✓		N/W	✓	✓
53.02		2B				83	15		98		✓		S/W	✓	
53.03	1B					51	6		57		✓		S		
53.04		2B				81	20		101		✓		S		
53.05		2B				80	15		95		✓		S		
53.06		2B				83	13		96		✓		S/E		✓
53.07		2B				83	19		102		✓		N/E	✓	✓
53.08		2B				83	15		98		✓		N	✓	
53.09		2B				83	14		97		✓		N	✓	
53.10	1B					58	6		64	✓	✓		N	✓	✓
SUBTOTAL	**2**	**8**	**0**		878										

BUILDING FIVE OVERALLS

	1 BED	2 BED	3 BED	TOTAL	GFA	INTERNAL	TERRACE	MISC	TOTAL	ADAPTABLE
TOTALS	**8**	**32**	**0**	**40**	**3501**	**3072**	**773**	**0**	**3845**	**4**

STAGE ONE OVERALL TOTALS

	1 BED	2 BED	3 BED	TOTAL	GFA	INTERNAL	TERRACE	COMM	TOTAL	ADAPTABLE	STORAGE		SOLAR ACCESS	CROSS VENTILATION
	27	**158**	**16**	**201**	**19366**	**16299**	**3998**	**614**	**20911**	**21**	**201**		**146**	**133**
% MIX	13%	79%	8%										73%	66%

CARPARKING

1Bed	@	1.0	space	27.0
2Bed	@	1.5	space	237.0
3Bed	@	2.0	space	32.0
Visitors	@	1.0 per 5 units		40.2
Commercial	@	1.0 per 25 m2		24.6
Total required				360.8
Total provided				371.0

BASIX NOTES

Commitments for Residential flat buildings - Buildings 1,2,3,4 & 5

(a) Dwellings

(i) Water	Show on DA plans	Show on CC/CDC plans & specs	Certifier check
(a) The applicant must comply with the commitments listed below in carrying out the development of a dwelling listed in a table below.			
(b) The applicant must plant indigenous or low water use species of vegetation throughout the area of land specified for the dwelling in the "indigenous species" column of the table below, as private landscaping for that dwelling. (This area of indigenous vegetation is to be contained within the "Area of garden and lawn" for the dwelling specified in the "Description of Project" table).	✔	✔	
(c) If a rating is specified in the table below for a fixture or appliance to be installed in the dwelling, the applicant must ensure that each such fixture and appliance meets the rating specified for it.		✔	✔
(d) The applicant must install an on demand hot water recirculation system which regulates all hot water use throughout the dwelling, where indicated for a dwelling in the "HW recirculation or diversion" column of the table below.		✔	✔
(e) The applicant must install: (aa) a hot water diversion system to all showers, kitchen sinks and all basins in the dwelling, where indicated for a dwelling in the "HW recirculation or diversion" column of the table below; and (bb) a separate diversion tank (or tanks) connected to the hot water diversion systems of at least 100 litres. The applicant must connect the hot water diversion tank to all toilets in the dwelling.		✔ ✔	✔ ✔
(e) The applicant must not install a private swimming pool or spa for the dwelling, with a volume exceeding that specified for it in the table below.	✔	✔	
(f) If specified in the table, that pool or spa (or both) must have a pool cover or shading (or both).		✔	
(g) The pool or spa must be located as specified in the table.		✔	
(h) The applicant must install, for the dwelling, each alternative water supply system, with the specified size, listed for that dwelling in the table below. Each system must be configured to collect run-off from the areas specified (excluding any area which supplies any other alternative water supply system), and is to divert overflow as specified. Each system must be connected as specified.	✔	✔	✔

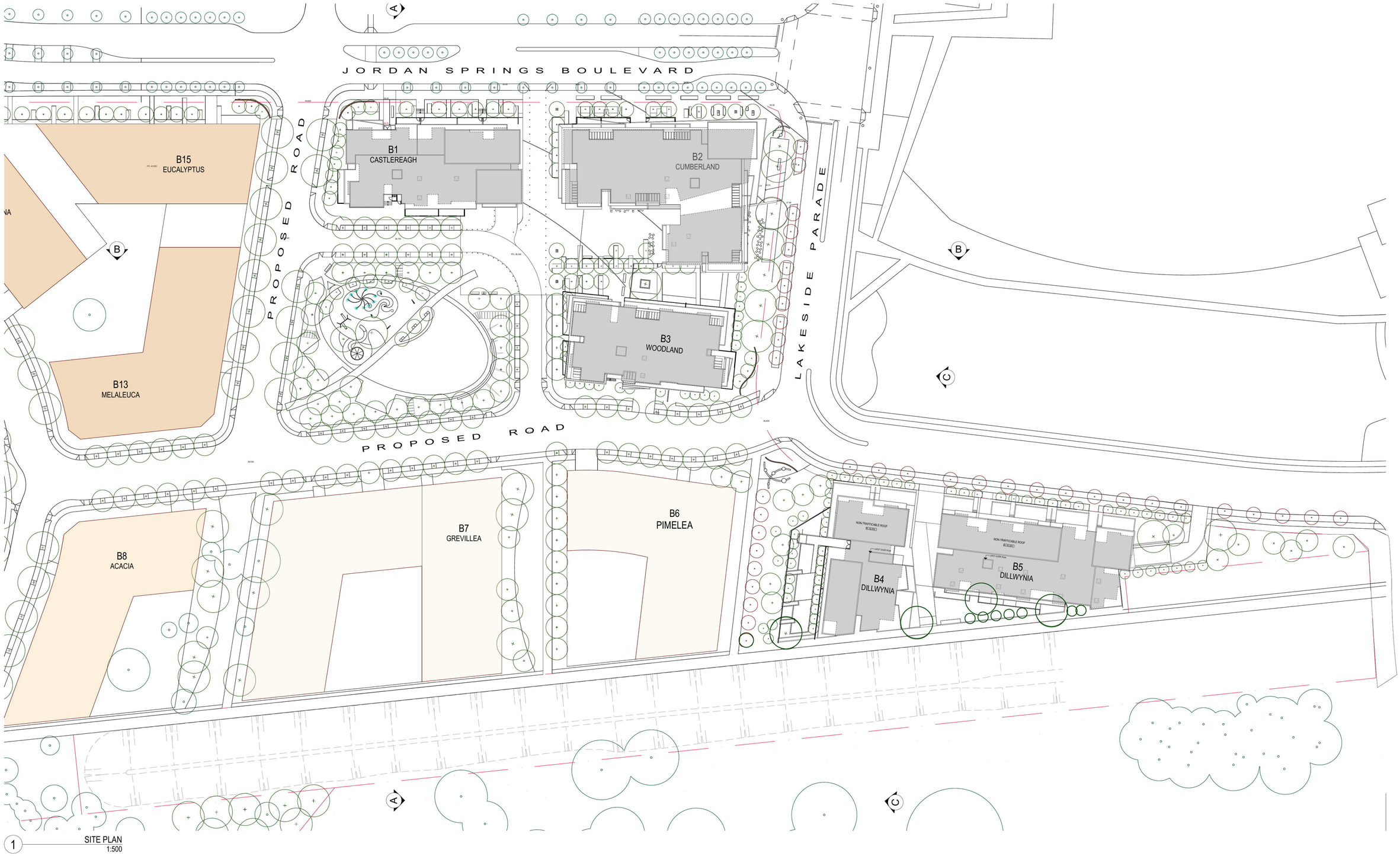
Dwelling no.	Fixtures: All shower-heads	All toilet flushing systems	All kitchen taps	All bathroom taps	HW recirculation or diversion	Appliances: All clothes washers	Volume (max volume)	Pool cover	Individual pool: Pool location	Pool shaded	Individual spa: Volume (max volume)	Spa cover	Spa shaded
All dwellings	3 star (> 4.5 but <= 6 L/min)	4 star	5 star	5 star	-	-	-	-	-	-	-	-	-

Alternative water source							
Dwelling no.	Alternative water supply systems	Size	Configuration	Landscape connection	Toilet connection	Laundry connection	Pool top-up	Spa top-up
None	-	-	-	-	-	-	-	-

(ii) Energy	Show on DA plans	Show on CC/CDC plans & specs	Certifier check
(a) The applicant must comply with the commitments listed below in carrying out the development of a dwelling listed in a table below.			
(b) The applicant must install each hot water system specified for the dwelling in the table below, so that the dwelling's hot water is supplied by that system. If the table specifies a central hot water system for the dwelling, then the applicant must connect that central system to the dwelling, so that the dwelling's hot water is supplied by that central system.	✔	✔	✔
(c) The applicant must install, in each bathroom, kitchen and laundry of the dwelling, the ventilation system specified for that room in the table below. Each such ventilation system must have the operational facilities specified for it in the table.		✔	✔
(d) The applicant must install the cooling and heating system/s specified for the dwelling under the "Living areas" and "Bedroom areas" columns of the table below. If the table specifies "none" for a system/s, then no system/s may be installed in that area of the dwelling. If no cooling or heating system is specified in the table for "Living areas" or "Bedroom areas", then no systems may be installed in any such areas. If the term "zoned" is specified for an air conditioning system, then the system must provide for day/night zoning between living areas and bedrooms.		✔	✔
(e) This commitment applies to each room or area of the dwelling which is referred to in a heading to the "Artificial lighting" column of the table below (but only to the extent specified for that room or area). The applicant must ensure that the "primary type of artificial lighting" for each such room in the dwelling is fluorescent lighting or light emitting diode (LED) lighting. If the term "dedicated" is specified for a particular room or area, then the lighting in that room or area must only be capable of being used for fluorescent lighting or light emitting diode (LED) lighting.		✔	✔
(f) This commitment applies to each room or area of the dwelling which is referred to in a heading to the "Natural lighting" column of the table below (but only to the extent specified for that room or area). The applicant must ensure that each such room or area is fitted with a window and/or skylight/s.	✔	✔	
(g) This commitment applies if the applicant installs a water heating system for the dwelling's pool or spa. The applicant must: (aa) install the system specified for the pool in the "Individual Pool" column of the table below (or alternatively must not install any system for the pool). If specified, the applicant must install a timer, to control the pool's pump; and (bb) install the system specified for the spa in the "Individual Spa" column of the table below (or alternatively must not install any system for the spa). If specified, the applicant must install a timer to control the spa's pump.		✔ ✔	
(h) The applicant must install in the dwelling: (aa) the kitchen cook-top and oven specified for that dwelling in the "Appliances & other efficiency measures" column of the table below; (bb) each appliance for which a rating is specified for that dwelling in the "Appliances & other efficiency measures" column of the table, and ensure that the appliance has that minimum rating; and (cc) any clothes drying line specified for the dwelling in the "Appliances & other efficiency measures" column of the table.		✔ ✔ ✔	 ✔
(i) If specified in the table, the applicant must carry out the development so that each refrigerator space in the dwelling is "well ventilated".		✔	

	Hot water	Bathroom ventilation system		Kitchen ventilation system		Laundry ventilation system	
Dwelling no.	Hot water system	Each bathroom	Operation control	Each kitchen	Operation control	Each laundry	Operation control
All dwellings	gas instantaneous 3 star	individual fan, ducted to façade or roof	interlocked to light	individual fan, ducted to façade or roof	manual switch on/off	individual fan, ducted to façade or roof	interlocked to light

	Cooling	Heating		Artificial lighting				Natural lighting	
Dwelling no.	living areas	bedroom areas	living areas	bedroom areas	No. of bed



1 SITE PLAN
1:500

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- do not scale from drawing
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- all discrepancies to be brought to the attention of the author.

Notes

N

metres 0 1 5 10 1:250

CID GROUP

SYNERGY DEVELOPMENT GROUP

issue	details	by	date
A	DEVELOPMENT APPLICATION-STAGE 1	SB	13.02.15

amendments

project
PARKLANDS ESTATE

location
Jordan Springs Boulevard
JORDAN SPRINGS

project co-ordinator
SYNERGY DEVELOPMENT GROUP

client
CID GROUP

drawing title
SITE PLAN

date	checked	project arch.	drawn
30.09.14		SB	SB
scale	no		issue
	14016 AP04		A

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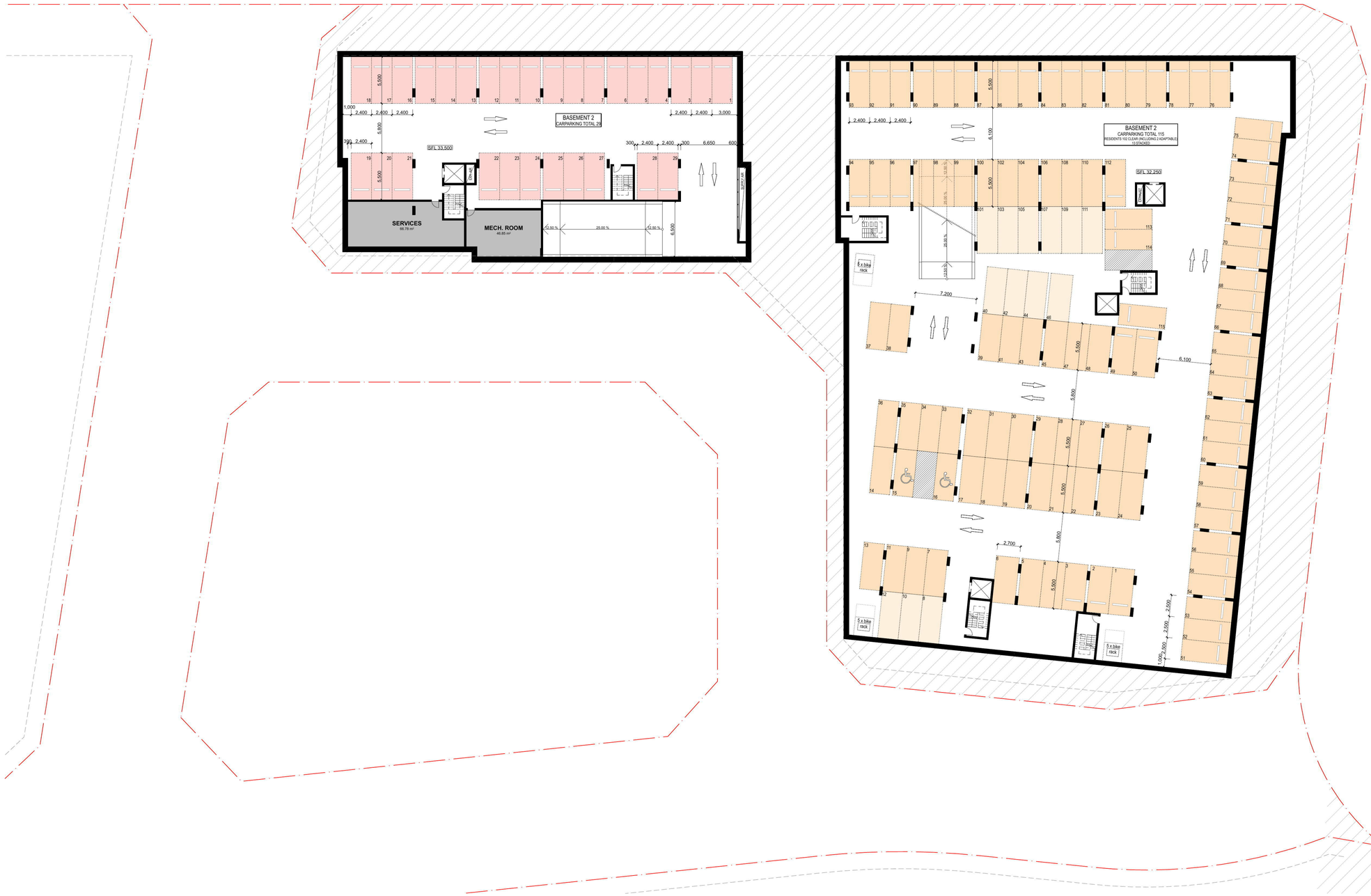

1 Basement 2
1:250

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metres 0 1 5 10 1:250

CID GROUP

SYNERGY DEVELOPMENT GROUP

issue	details	by	date
A	DEVELOPMENT APPLICATION-STAGE 1	SB	13.02.15

amendments

project
PARKLANDS ESTATE

location
Jordan Springs Boulevard
JORDAN SPRINGS

project co-ordinator
SYNERGY DEVELOPMENT GROUP

client
CID GROUP

drawing title
Buildings 1,2 & 3-BASEMENT 2

date	checked	project arch.	drawn
30.09.14		SB	SB
scale	no		issue
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1 Basement 1
1:250

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metres 0 1 5 10 1:250

CID GROUP

SYNERGY DEVELOPMENT GROUP

issue	details	by	date
A	DEVELOPMENT APPLICATION-STAGE 1	SB	13.02.15

amendments

project
PARKLANDS ESTATE

location
Jordan Springs Boulevard
JORDAN SPRINGS

project co-ordinator
SYNERGY DEVELOPMENT GROUP

client
CID GROUP

drawing title
Buildings 1,2 & 3-BASEMENT 1

date	checked	project arch.	drawn
30.09.14		SB	SB
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JORDAN SPRINGS BOULEVARD

PROPOSED ROAD

LAKESIDE PARADE

PROPOSED ROAD

CENTRAL PARK

PUBLIC SQUARE

PRIVATE OPEN SPACE

MAILBOX

EXTENT OF BASEMENT UNDER

AWNING OVER

ROLLER DOOR

RAMP UP 1:20

SFL 39.700

SFL 38.500

SFL 38.400

RL 38.600

RL 39.600

RL 38.400

GARB. STORAGE 41.76 m²

ELEC. ROOM 37.24 m²

GARB. ROOM 28.40 m²

GARB ROOM 21.80 m²

Notes:

*For landscaped design refer to landscape architect's drawings
*For road design refer to civil engineer drawings

1 Ground 1:250

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metres 0 1 5 10 1:250

CID GROUP

SYNERGY DEVELOPMENT GROUP

issue	details	by	date
A	DEVELOPMENT APPLICATION-STAGE 1	SB	13.02.15

amendments

project
PARKLANDS ESTATE

location
Jordan Springs Boulevard
JORDAN SPRINGS

project co-ordinator
SYNERGY DEVELOPMENT GROUP

client
CID GROUP

drawing title
Buildings 1,2 & 3-GROUND FLOOR

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30.09.14		SB	SB
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1 Level 1
1:250

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metres 0 1 5 10 1:250

CID GROUP

SYNERGY DEVELOPMENT GROUP

issue	details	by	date
A	DEVELOPMENT APPLICATION-STAGE 1	SB	13.02.15

amendments

project
PARKLANDS ESTATE

location
Jordan Springs Boulevard
JORDAN SPRINGS

project co-ordinator
SYNERGY DEVELOPMENT GROUP

client
CID GROUP

drawing title
Buildings 1,2 & 3-LEVEL 1

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1 Level 2
1:250

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Notes

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metres 0 1 5 10 1:250

CID GROUP

SYNERGY DEVELOPMENT GROUP

issue	details	by	date
A	DEVELOPMENT APPLICATION-STAGE 1	SB	13.02.15

amendments

project
PARKLANDS ESTATE

location
Jordan Springs Boulevard
JORDAN SPRINGS

project co-ordinator
SYNERGY DEVELOPMENT GROUP

client
CID GROUP

drawing title
Buildings 1,2 & 3-LEVEL 2

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1 Level 3
1:250

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metres 0 1 5 10 1:250

CID GROUP

SYNERGY DEVELOPMENT GROUP

issue	details	by	date
A	DEVELOPMENT APPLICATION-STAGE 1	SB	13.02.15

amendments

project
PARKLANDS ESTATE

location
Jordan Springs Boulevard
JORDAN SPRINGS

project co-ordinator
SYNERGY DEVELOPMENT GROUP

client
CID GROUP

drawing title
Buildings 1,2 & 3-LEVEL 3

date	checked	project arch.	drawn
30.09.14		SB	SB
scale	no		issue
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1 Level 4
1:250

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metres 0 1 5 10 1:250

CID GROUP

SYNERGY DEVELOPMENT GROUP

issue	details	by	date
A	DEVELOPMENT APPLICATION-STAGE 1	SB	13.02.15

amendments

project
PARKLANDS ESTATE

location
Jordan Springs Boulevard
JORDAN SPRINGS

project co-ordinator
SYNERGY DEVELOPMENT GROUP

client
CID GROUP

drawing title
Buildings 1,2 & 3-LEVEL 4

date	checked	project arch.	drawn
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1 Level 5
1:250

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metres 0 1 5 10 1:250

CID GROUP

SYNERGY DEVELOPMENT GROUP

issue	details	by	date
A	DEVELOPMENT APPLICATION-STAGE 1	SB	13.02.15

amendments

project
PARKLANDS ESTATE

location
Jordan Springs Boulevard
JORDAN SPRINGS

project co-ordinator
SYNERGY DEVELOPMENT GROUP

client
CID GROUP

drawing title
Buildings 1,2 & 3-LEVEL 5

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1 Roof
1:250

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metres 0 1 5 10 1:250

CID GROUP

SYNERGY DEVELOPMENT GROUP

issue	details	by	date
A	DEVELOPMENT APPLICATION-STAGE 1	SB	13.02.15

amendments

project
PARKLANDS ESTATE

location
Jordan Springs Boulevard
JORDAN SPRINGS

project co-ordinator
SYNERGY DEVELOPMENT GROUP
client
CID GROUP
drawing title
Buildings 1,2 & 3-ROOF

date	checked	project arch.	drawn
30.09.14		SB	SB
scale	no		issue
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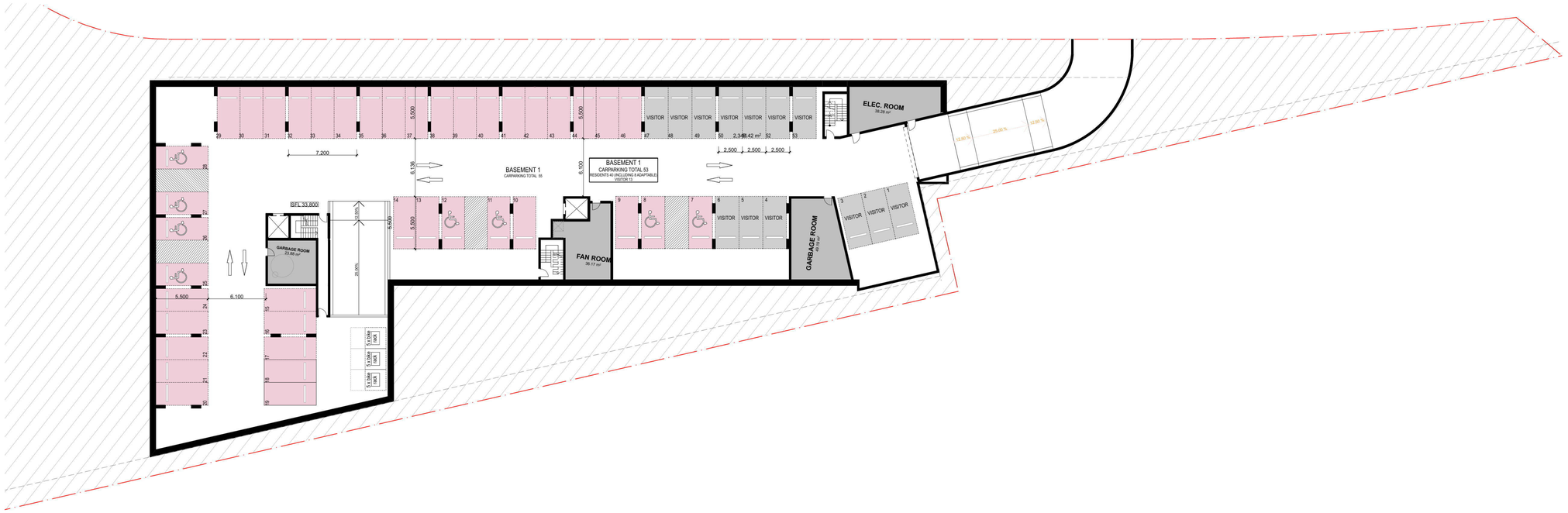
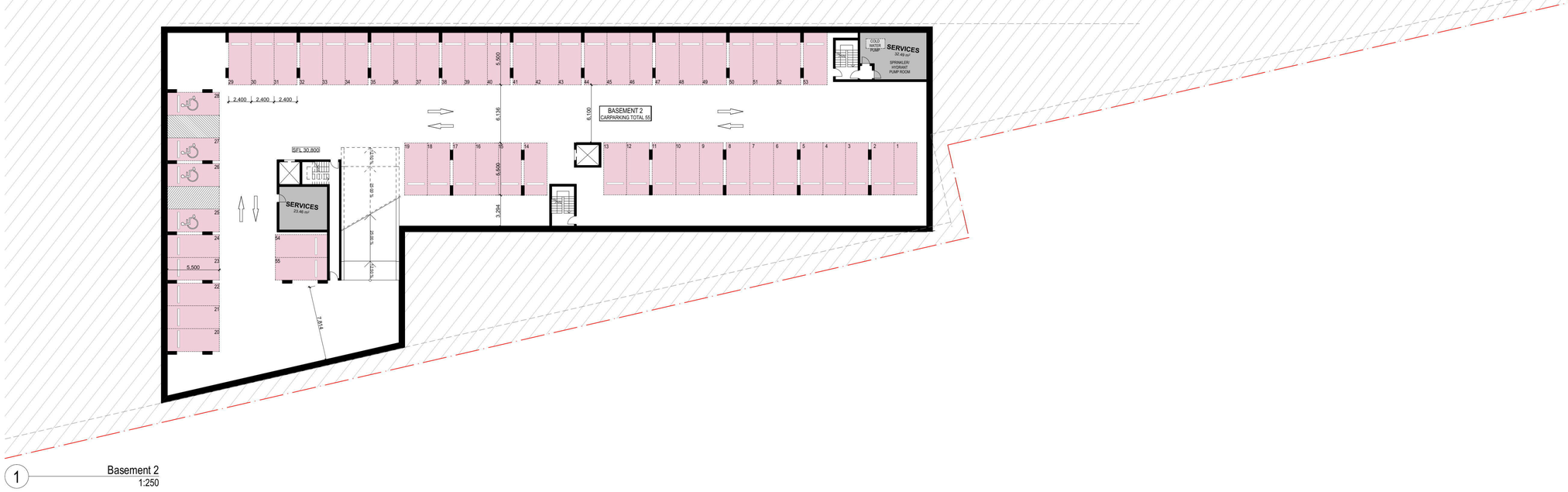


1 Basement 1
1:250



1 Basement 2
1:250

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Notes

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metres 0 1 5 10 1:250

issue	details	by	date
A	DEVELOPMENT APPLICATION-STAGE 1	SB	13.02.15

amendments

project
PARKLANDS ESTATE

location
Jordan Springs Boulevard
JORDAN SPRINGS

project co-ordinator
SYNERGY DEVELOPMENT GROUP

client
CID GROUP

drawing title
Building 4-BESEMENT 1 & 2

date	checked	project arch.	drawn
30.09.14		SB	SB
scale	no		issue
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1 Level 1
1:250

1 Ground
1:250

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Notes

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metres 0 1 5 10 1:250

CID GROUP

SYNERGY DEVELOPMENT GROUP

issue	details	by	date
A	DEVELOPMENT APPLICATION-STAGE 1	SB	13.02.15

amendments

project
PARKLANDS ESTATE

location
Jordan Springs Boulevard
JORDAN SPRINGS

project co-ordinator
SYNERGY DEVELOPMENT GROUP

client
CID GROUP

drawing title
Building 4-GROUND & LEVEL 1

date	checked	project arch.	drawn
30.09.14		SB	SB
scale	no		issue
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1 Level 3
1:250



1 Level 2
1:250

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Notes

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metres 0 1 5 10 1:250

CID GROUP

SYNERGY DEVELOPMENT GROUP

issue	details	by	date
A	DEVELOPMENT APPLICATION-STAGE 1	SB	13.02.15

amendments

project
PARKLANDS ESTATE

location
Jordan Springs Boulevard
JORDAN SPRINGS

project co-ordinator
SYNERGY DEVELOPMENT GROUP

client
CID GROUP

drawing title
Builidng 4-LEVELS 2 & 3

date	checked	project arch.	drawn
30.09.14		SB	SB
scale	no		issue
	14016 AP16		A

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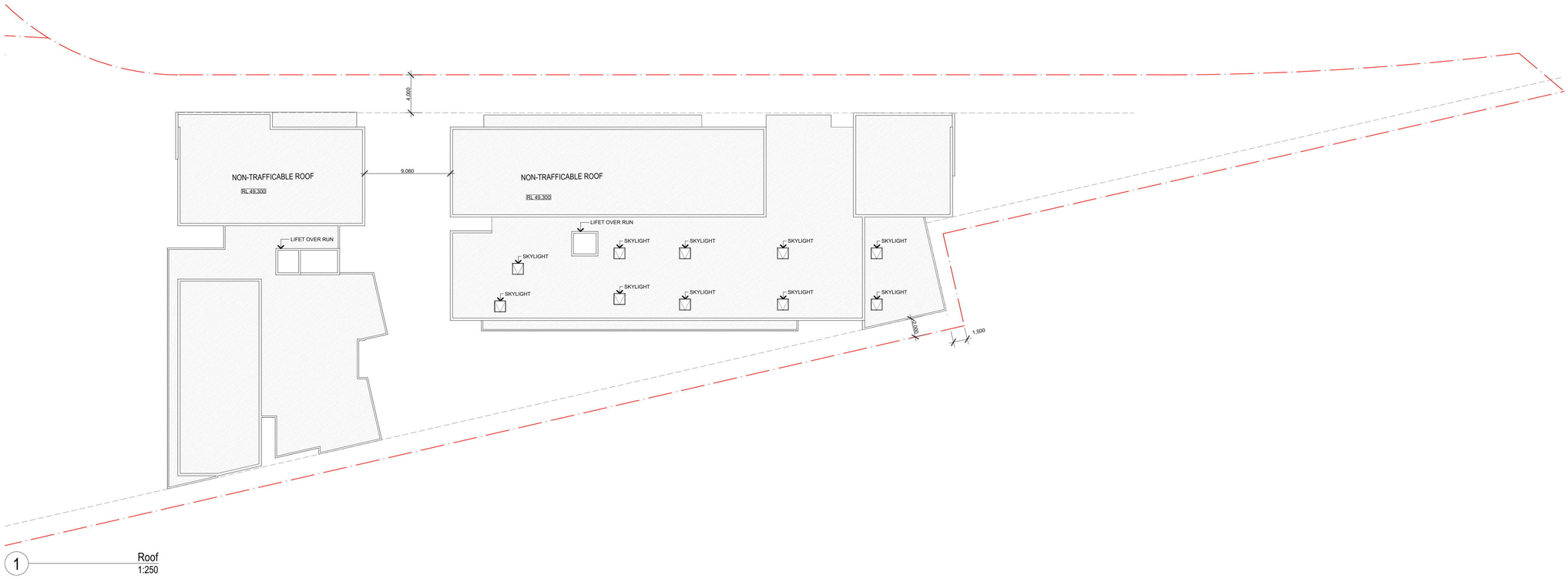

1 Roof
1:250

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Notes

N

metres 0 1 5 10 1:250

CID GROUP

SYNERGY DEVELOPMENT GROUP

issue	details	by	date
A	DEVELOPMENT APPLICATION-STAGE 1	SB	13.02.15

amendments

project
PARKLANDS ESTATE

location
Jordan Springs Boulevard
JORDAN SPRINGS

project co-ordinator
SYNERGY DEVELOPMENT GROUP

client
CID GROUP

drawing title
Building 4-ROOF

date	checked	project arch.	drawn
30.09.14		SB	SB
scale	no		issue
	14016 AP17		A

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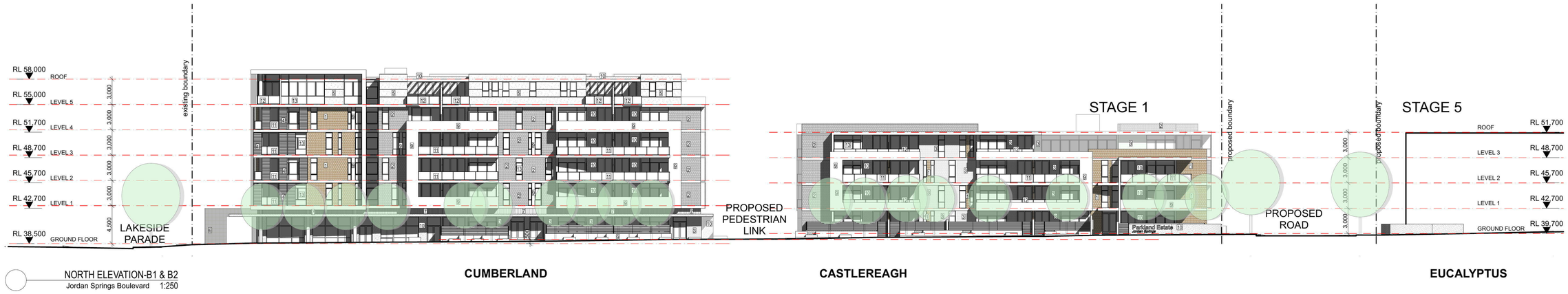
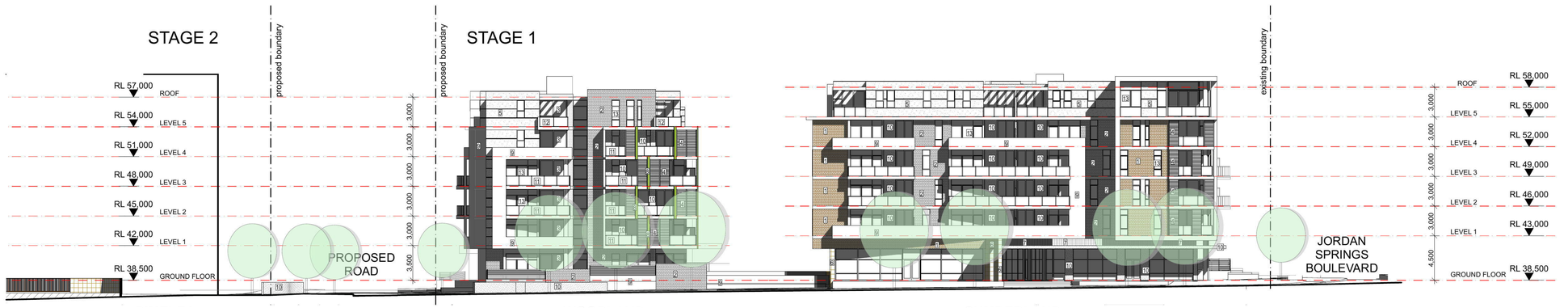


NORTH ELEVATION-B1 & B2
Jordan Springs Boulevard 1:250



EAST ELEVATION-B2 & B3
Lakeside Parade 1:250



WEST ELEVTION-B1,B2 & B3
Proposed Road (Central Road) T.B.A. 1:250

1 Austral bricks 'Terracotta' External walls	2 Austral bricks 'Whitsunday' External walls	3 Austral bricks 'Majestic Grey' External walls	4 Eurowood Innovative Coaring 'Light Grey' Powdercoared Louvres/Screns	5 Dulux 'Grand piano P15C1' External general paint	6 Amber 'Teakwood Sandblast' Sandstone Cladding	7 Fielders Finesse 'Colorbond Dulux.Woodland Grey' Aluminium Inter-lock Cladding	8 Dulux 'Frozen Forest' External feature walls	9 Dulux 'Natural White B1' External general paint	10 Dulux 'Tea House GR23' External general paint	11 Frosted glass 'White' Balcony glass balustrades	12 Frosted glass 'Light Green' Balcony glass balustrades	13 Powedr coated aluminium 'Charcoal 8851 Satin' Window & Door frames Balcony balustrades

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Notes

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metres 0 1 5 10 1:250

CID GROUP

SYNERGY DEVELOPMENT GROUP

issue	details	by	date
A	DEVELOPMENT APPLICATION-STAGE 1	SB	13.02.15

amendments

project
PARKLANDS ESTATE

location
Jordan Springs Boulevard
JORDAN SPRINGS

project co-ordinator
SYNERGY DEVELOPMENT GROUP

client
CID GROUP

drawing title
Buildings 1,2 & 3-ELEVATIONS

date	checked	project arch.	drawn
30.09.14		SB	SB
scale	no		issue
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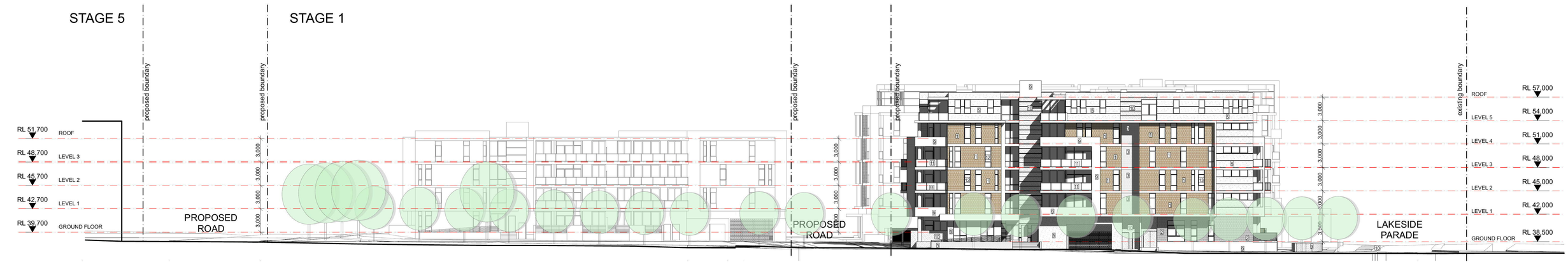
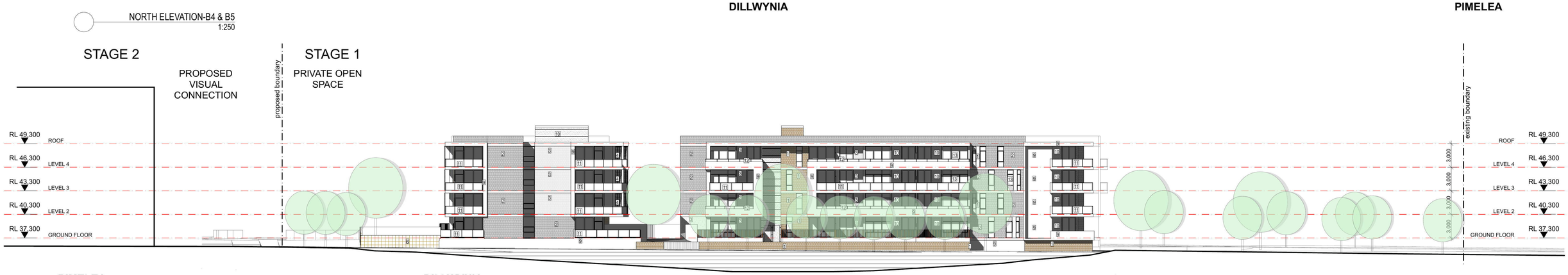


SOUTH ELEVATION -B1 & B3
Proposed Road T.B.A 1:250



NORTH ELEVATION-B4 & B5
1:250



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1	2	3	4	5	6	7	8	9	10	11	12	13
Austral bricks 'Terracotta'	Austral bricks 'Whitsunday'	Austral bricks 'Majestic Grey'	Eurowood Innovative Coaring 'Light Grey'	Dulux 'Grand piano P15C1'	Amber 'Teakwood Sandblast'	Fielders Finesse 'Colorbond Dulux.Woodland Grey'	Dulux 'Frozen Forest'	Dulux 'Natural White B1'	Dulux 'Tea House GR23'	Frosted glass 'White'	Frosted glass 'Light Green'	Powedr coated aluminium 'Charcoal 8851 Satin'
External walls	External walls	External walls	Powdercoared Louvres/Screns	External general paint	Sandstone Cladding	Aluminium Inter-lock Cladding	External feature walls	External general paint	External general paint	Balcony glass balustrades	Balcony glass balustrades	Window & Door frames Balcony balustrades

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metres 0 1 5 10 1:250

CID GROUP

SYNERGY DEVELOPMENT GROUP

issue	details	by	date
A	DEVELOPMENT APPLICATION-STAGE 1	SB	13.02.15

amendments

project
PARKLANDS ESTATE

location
Jordan Springs Boulevard
JORDAN SPRINGS

project co-ordinator
SYNERGY DEVELOPMENT GROUP

client
CID GROUP

drawing title
Buildings 1,3,4 & 5-ELEVATIONS

date	checked	project arch.	drawn
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	14016 AP19		A

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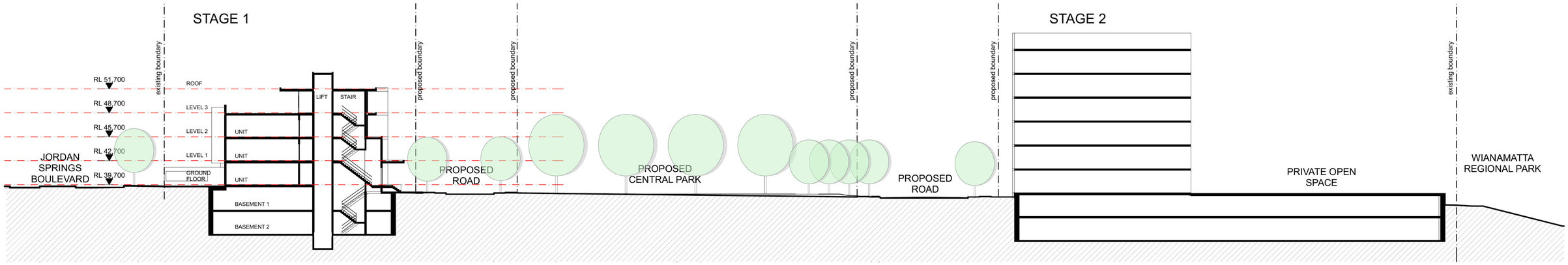

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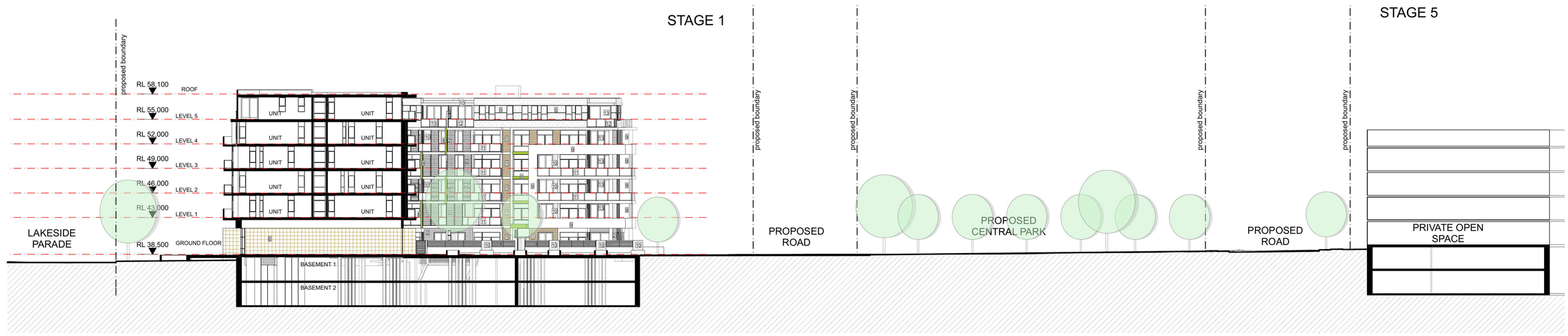

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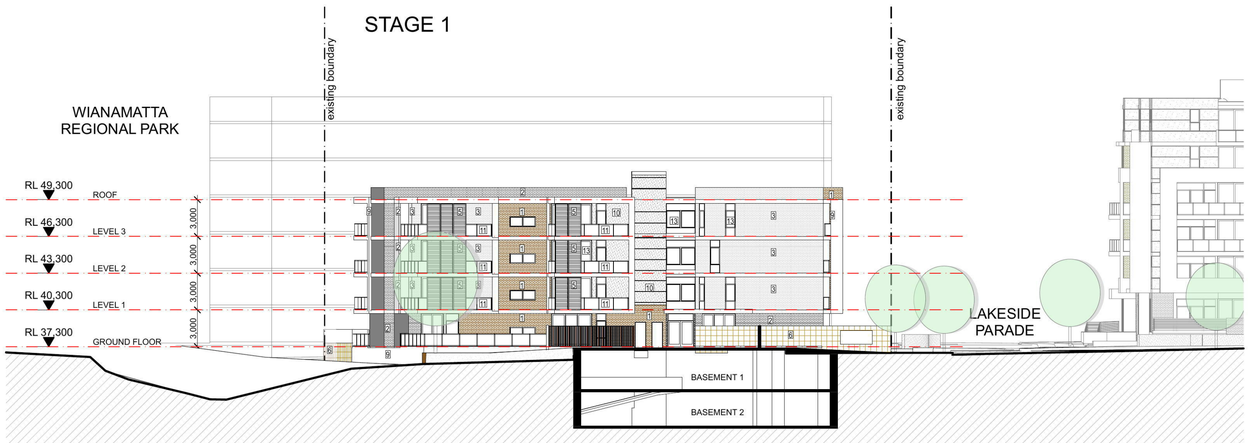

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Notes

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metres 0 1 5 10 1:250

CID GROUP

SYNERGY DEVELOPMENT GROUP

issue	details	by	date
A	DEVELOPMENT APPLICATION-STAGE 1	SB	13.02.15

amendments

project
PARKLANDS ESTATE

location
Jordan Springs Boulevard
JORDAN SPRINGS

project co-ordinator
SYNERGY DEVELOPMENT GROUP

client
CID GROUP

drawing title
Buildings 1,2,3 & 4-SECTIONS

date	checked	project arch.	drawn
30.09.14		SB	SB
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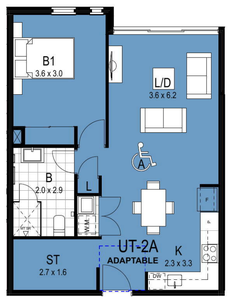

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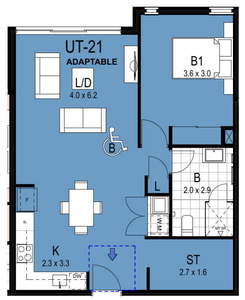

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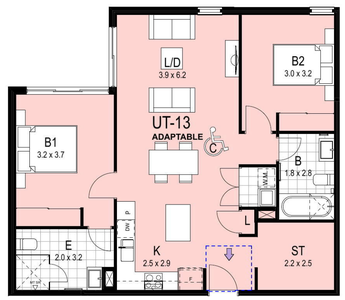

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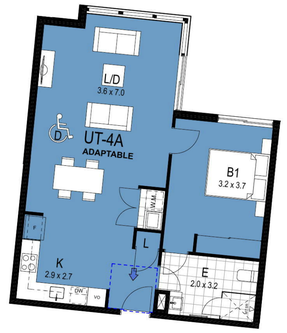

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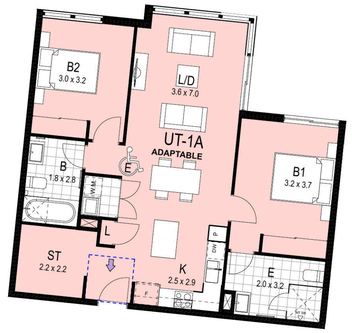

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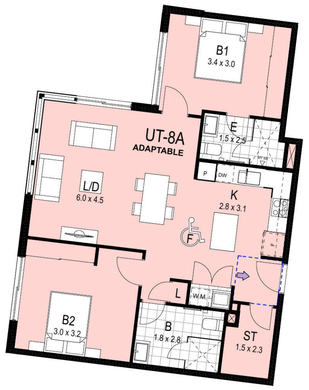

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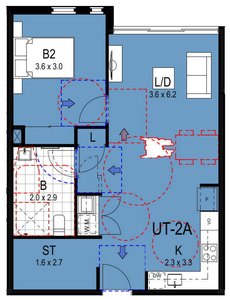

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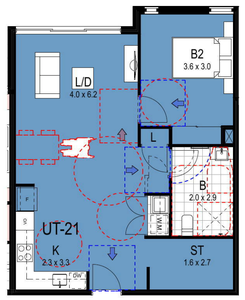

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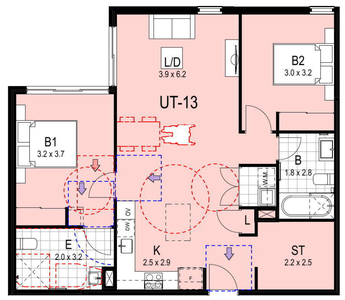

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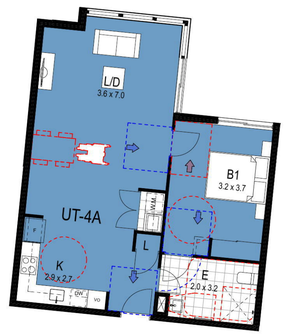

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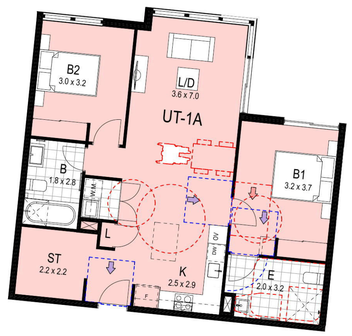

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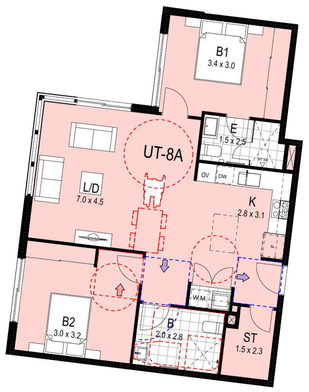

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Notes

N

metres 0 1 5 10 1:250

CID GROUP

SYNERGY DEVELOPMENT GROUP

issue	details	by	date
A	DEVELOPMENT APPLICATION-STAGE 1	SB	13.02.15

amendments

project
PARKLANDS ESTATE

location
Jordan Springs Boulevard
JORDAN SPRINGS

project co-ordinator
SYNERGY DEVELOPMENT GROUP

client
CID GROUP

drawing title
Buildings 1,2,3 & 4 ADAP. UNITS

date	checked	project arch.	drawn
30.09.14		SB	SB
scale	no		issue
	14016 AP21		A

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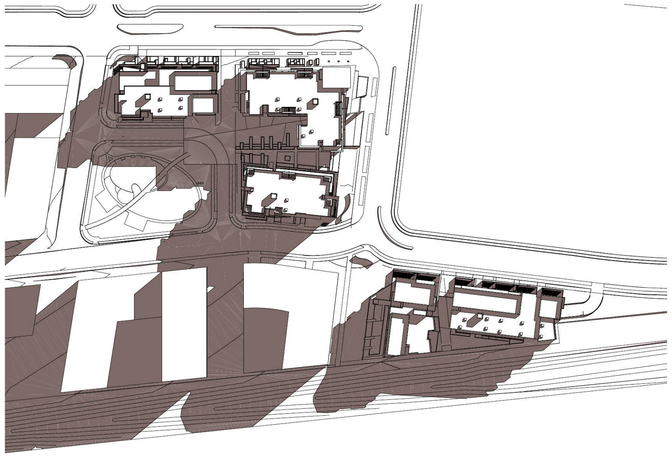

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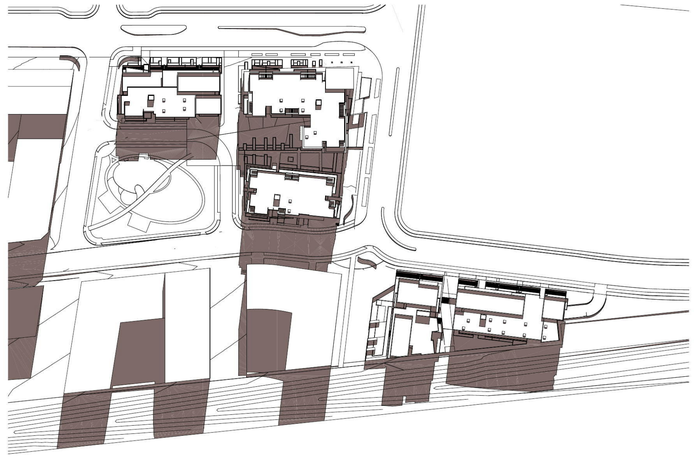

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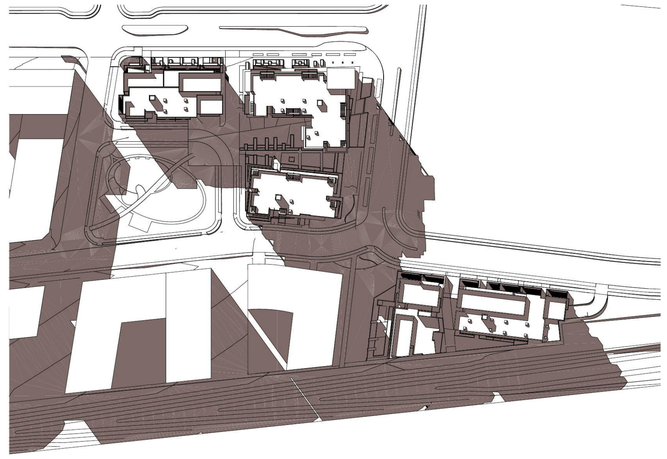

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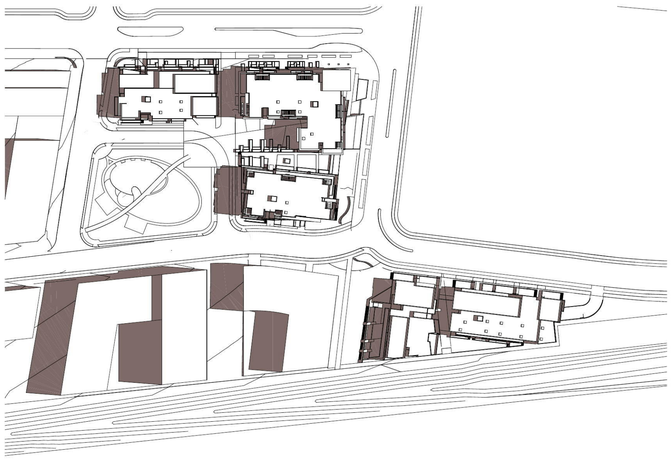

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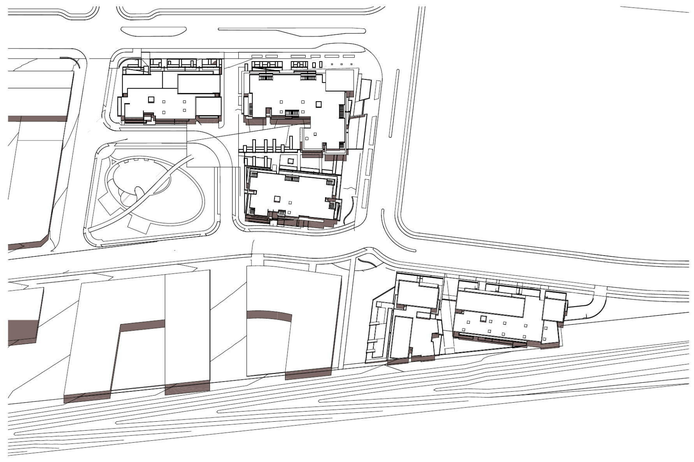

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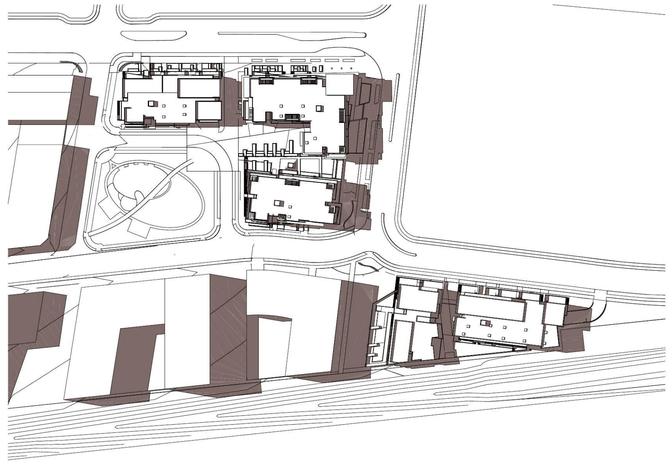

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CID GROUP

SYNERGY DEVELOPMENT GROUP

issue	details	by	date
A	DEVELOPMENT APPLICATION-STAGE 1	SB	13.02.15

amendments

project
PARKLANDS ESTATE

location
Jordan Springs Boulevard
JORDAN SPRINGS

project co-ordinator
SYNERGY DEVELOPMENT GROUP

client
CID GROUP

drawing title
Shadow Diagrams

date	checked	project arch.	drawn
30.09.14		SB	SB
scale	no		issue
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PARKLANDS ESTATE JORDAN SPRINGS

Landscape Stage 1 DA

S14-0080 Issue A 13/2/2015

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

MIXED USE DEVELOPMENT, JORDAN SPRINGS
LANDSCAPE DEVELOPMENT APPLICATION

Client:
Synergy Group for C.I.D Group

Prepared by:

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Document	Issue	Date	Status	Review	Verify	Validate
S14-0080	A	13/2/2015	For DA	JW	JW	ED

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

TABLE OF CONTENTS

SITE LOCATION & CONTEXT	DA 1
LANDSCAPE SITE ANALYSIS	DA 2
LANDSCAPE STRUCTURE PLAN	DA 3
LANDSCAPE MASTERPLAN	DA 4
STREET TREE STRATEGY	DA 5
STAGE 1 LANDSCAPE SPECIFICS	DA 6
STAGE 1 SITE PLAN	DA 7
CENTRAL PARK	DA 8
CENTRAL PARK LANDSCAPE PLAN	DA 9
CENTRAL PARK SECTIONS 1	DA 10
CENTRAL PARK SECTIONS 2	DA 11
CENTRAL PARK VIEW	DA 12
ACTIVE FRONTAGE AND FORECOURT	DA 13
CUMBERLAND LANDSCAPE PLAN	DA 14
CUMBERLAND SECTIONS 1	DA 15
CUMBERLAND SECTIONS AND VIEWS	DA 16
CASTLEREAGH LANDSCAPE PLAN	DA 17
CASTLEREAGH SECTIONS & VIEWS	DA 18
WOODLANDS LANDSCAPE PLAN	DA 19
WOODLANDS SECTIONS & VIEWS	DA 20
DILWYNIA WEST LANDSCAPE PLAN	DA 21
DILWYNIA EAST LANDSCAPE PLAN	DA 22
DILWYNIA SECTIONS & VIEWS	DA 23
RESIDENTIAL APARTMENTS	DA 24
LIGHTING STRATEGY	DA 25
MATERIALS AND FURNITURE PALETTE	DA 26
INDICATIVE PLANTING PALETTE	DA 27
PLANTING SCHEDULE	DA 28
LANDSCAPE CALCULATIONS	DA 29

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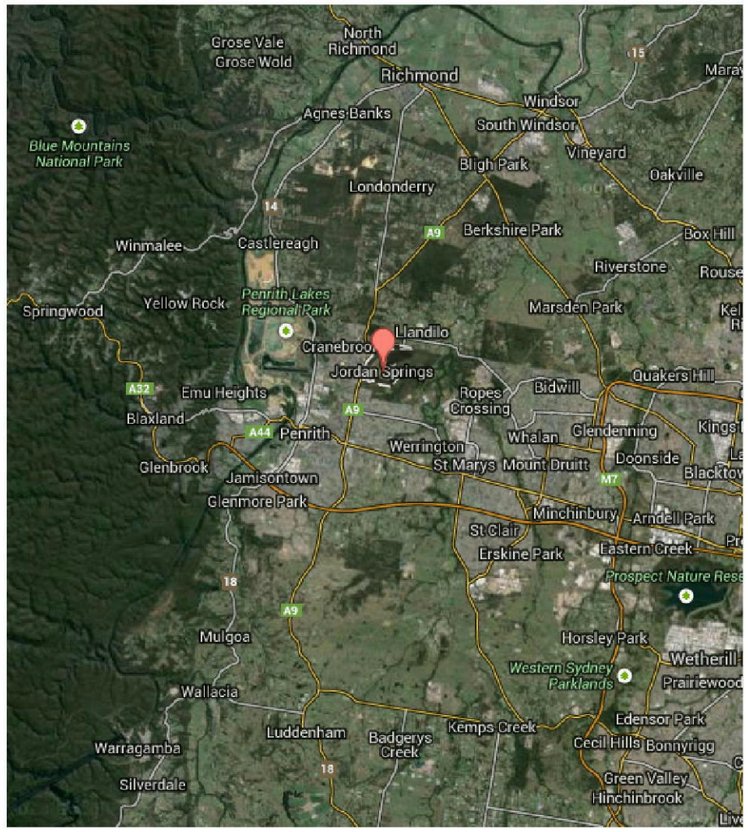
Version: 1, Version Date: 27/02/2015



Site Context (Source Google Maps)



Site Location (source Nearmap)

1. SITE LOCATION AND CONTEXT

The site is within the Jordan Springs residential estate under development by Lend Lease on land which was previously part of the ADI St Mary's site. The nearest major centre is Penrith approximately 7km or 10 - 15 minutes drive to the south west along The Northern Road. The Northern Road is currently undergoing upgrade works to increase its capacity.

Parklands Estate is located in the Jordan Springs Western precinct. The development in this precinct is well underway and is made up of a majority of low density detached homes with a some townhouse and medium density residential dwellings in key areas. The precinct contains the recently opened Town Centre and a network of open space areas including two major oval / recreation facilities.

Parklands Estate is situated to the south of Jordan Springs Boulevard and is bounded by the Wianamatta Regional Park to the south and east and the Village Lake across Lakeside Drive to the west. Along the southern boundary is a drainage reserve under development by Lend Lease. To the north, across Jordan Springs Boulevard, is the local town centre containing Woolworths, a fitness centre and other retail outlets. Also significant to the sites context is the Town Square located to the north east of the site opposite the town centre and adjacent the main Lake. This development application is for Stage 1 of the Parklands Estate and is situated in the north east side of the proposed development at the corner of Jordan Springs Boulevard and Lakeside Parade and includes the parcel to the south of Lakeside Parade where it turns east around the Village Lake.

The land has a gentle slope with an approximate 1:40 grade running east to west. The north west portion of the site has been previously cleared however the southwestern portion contains some existing native vegetation. The site is divided by a portion of the regional park containing a dam locally known as the 'Secret Garden'. This water body has the appearance of a natural lake with wetland species and has aesthetic appeal.

2. PLANNING CONTEXT

A number of planning documents apply to the site with controls relevant to the landscape and public domain. These have been taken into consideration in the design proposals and include:

- Jordan Springs Village Centre Design Guidelines (April 2011), Lend Lease
- St Marys Western Precinct Precinct Plan (May 2009), JBA
- DCP 2010 (Amended 22 July 2013), Penrith Council
- Wianamatta Regional Park, Conservation Management Plan (March 2011), NSW Department of Environment, Climate Change and Water
- Wianamatta Regional Park Plan of Management (February 2011), NSW National Parks and Wildlife Service (Part of the Department of Environment, Climate Change and Water)
- Wianamatta Regional Park Masterplan (March 2013), NSW Department of Environment, Climate Change and Water

3. LANDSCAPE MASTERPLAN STRATEGY

The landscape design strategy has been developed around the simple principle of maximising the parkland character of the estate creating and strong connections to the two significant bounding features of the Jordan Springs Town Centre and the Wianamatta Regional Park. As such from north west to south east the design transitions from a formal and structured urban landscape character to an informal, naturalistic landscape character. The two landscape character types are blended through the use of a majority of native species and reinforced through maximising soft landscape including street tree planting.

The proposed landscape concept plan continues the existing landscape themes along the site edges to provide continuity and connectivity with the Town Centre and broader Jordan Springs development. In the remainder of the proposed site features and design language are used to develop a sense of place for the estate within its context.

4. STREET TREE STRATEGY

Street trees across the site have been selected to enhance the bushland connection to the Regional Park utilising where possible, species endemic to the site, as well as species in keeping with the existing street tree planting on Jordan Springs Boulevard and Lakeside Parade for continuity with the surrounding development. Feature tree species will be utilised at the entrances off Jordan Springs Boulevard including natives and exotics.

Trees will be planted within a continuous verge on both sides of all streets and wherever possible will be planted at spacings to provide continuous shade to pedestrian paths when mature. The proposed tree species for each street is illustrated on DA 05.

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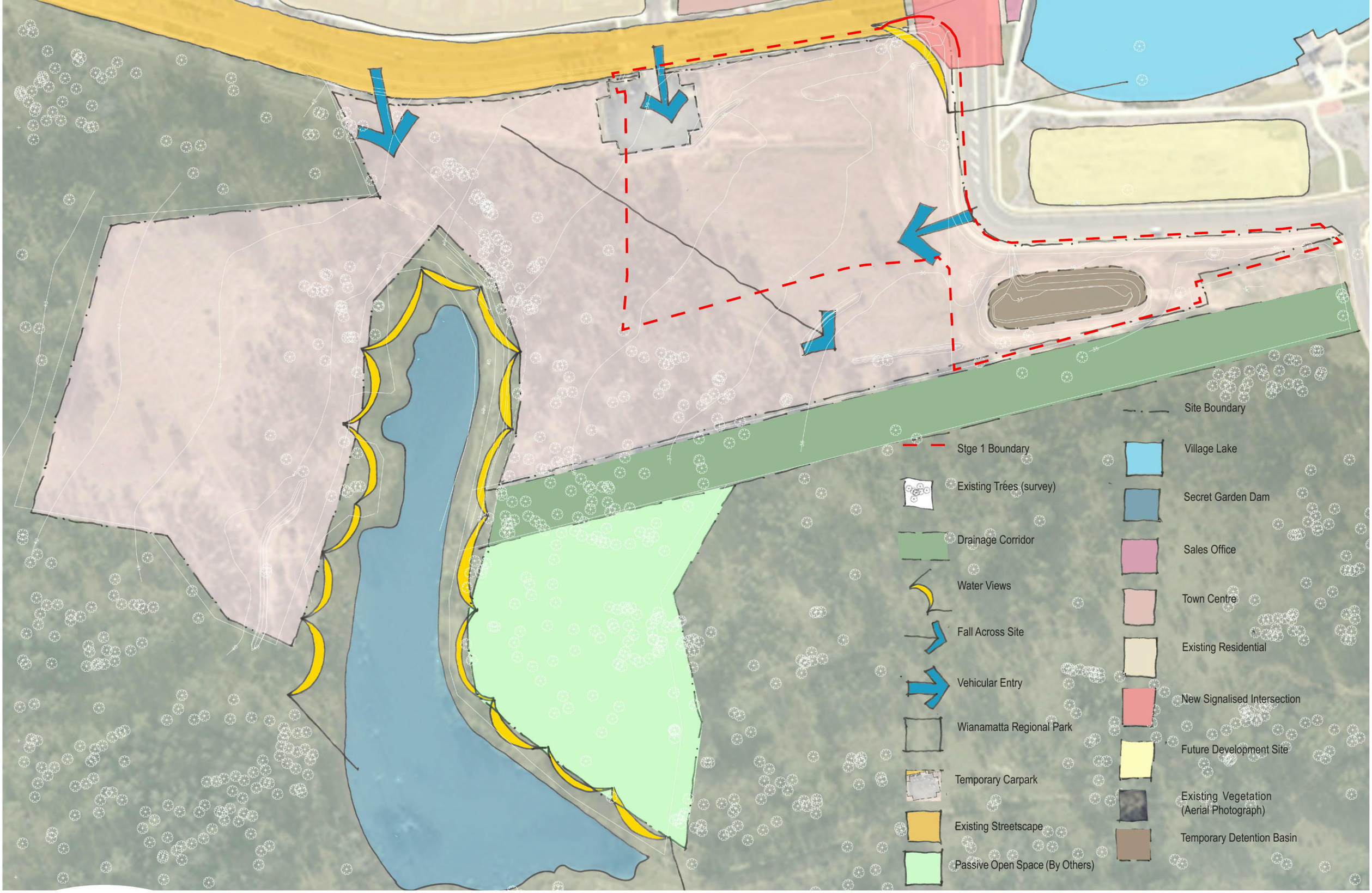

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CID GROUP

SYNERGY DEVELOPMENT GROUP

1:1500 @A3

0 15 30 45 75m

Stage 1 Parklands Estate • Jordan Springs

S14-0080 S1-DA 2

LANDSCAPE SITE ANALYSIS

Feb 13 2015
issue A

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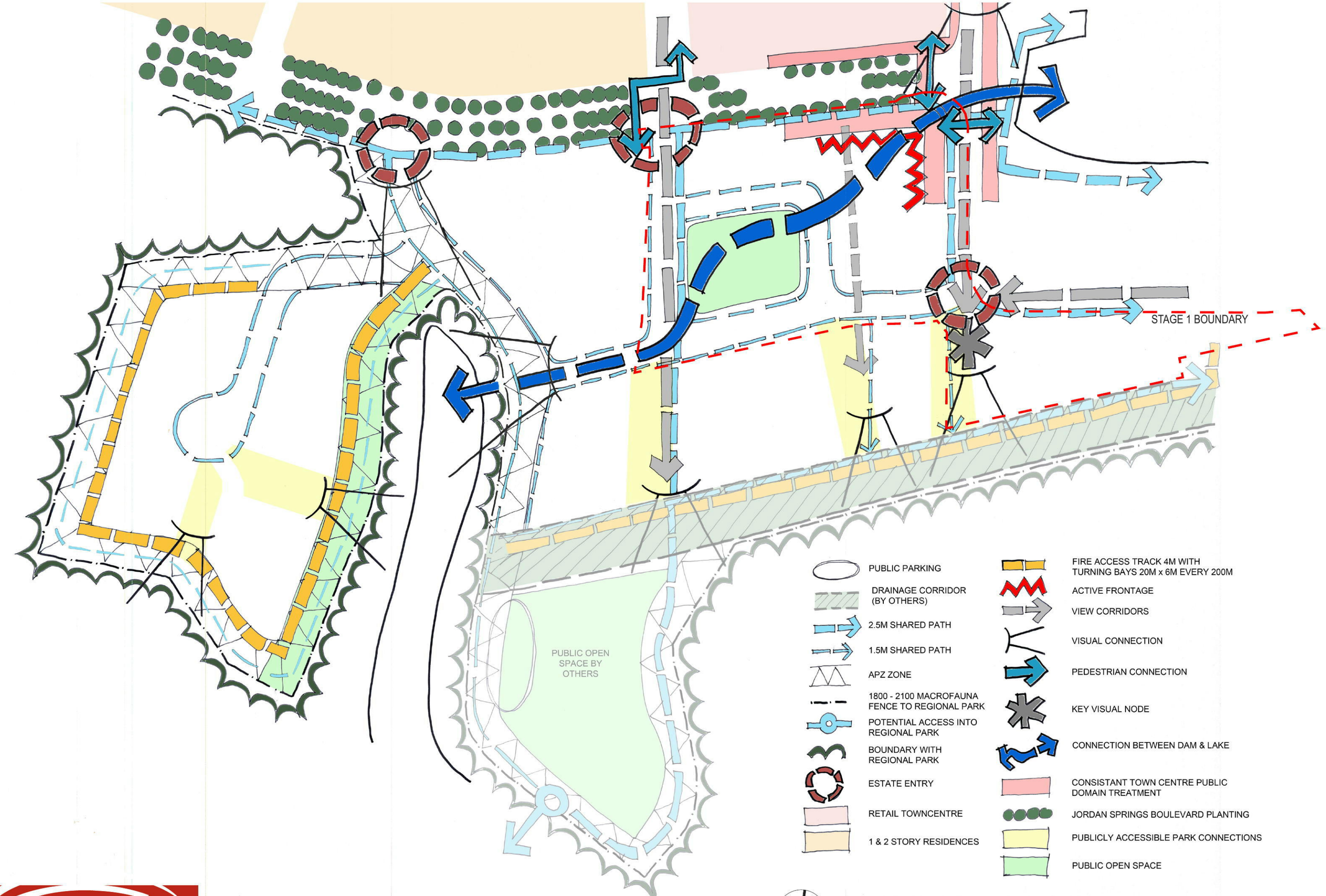

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0 15 30 45 75m

Stage 1 Parklands Estate • Jordan Springs

S14-0080 S1-DA 3

LANDSCAPE STRUCTURE PLAN

Feb 13 2015
issue A

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0 15 30 45 75m

Stage 1 Parklands Estate • Jordan Springs

LANDSCAPE MASTERPLAN

S14-0080 S1-DA 4

Feb 13 2015
issue A

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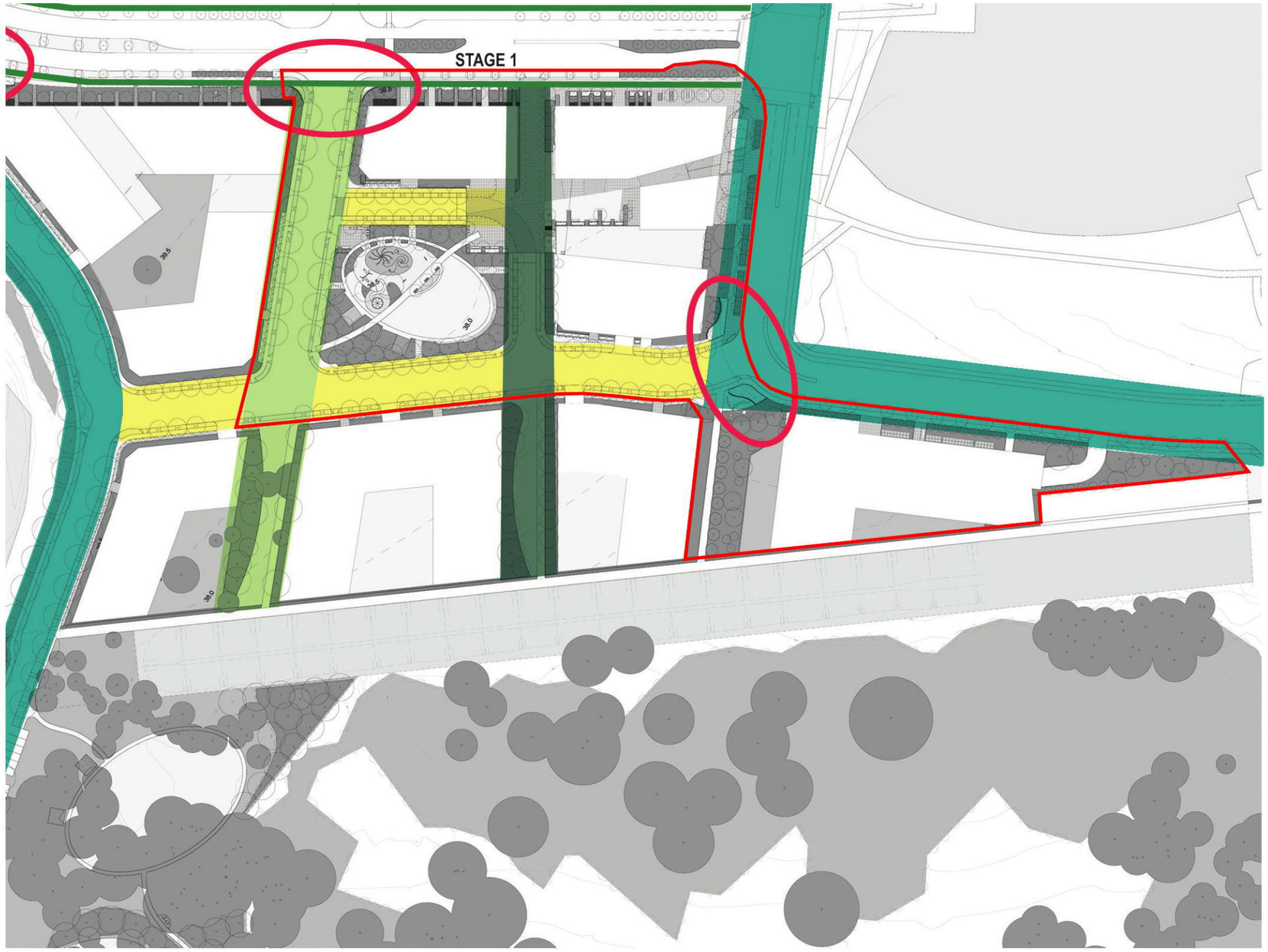



Corymbia punctata
(Cumberland Plain Woodland Species)



Corymbia citriodora
(Lakeside parade trees existing -
Planted by Lend Lease)



Eucalyptus sideroxylon
(Cumberland Plain Woodland Species)



Eucalyptus crebra
(Cumberland Plain Woodland Species)



Waterhousia floribunda - To match existing
Jordan Springs Boulevard Street Trees



Existing Waterhousia floribunda to Jordan
Springs Boulevard

Entry Feature Trees - Tristaniopsis
laurina 'Luscious' and Pyrus ussuriensis



1:1500 @A3

0 15 30 45 75m

Stage 1 Parklands Estate • Jordan Springs

STREET TREE STRATEGY

S14-0080 S1-DA 5

Feb 13 2015
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5. STAGE 1 LANDSCAPE DESIGN

The landscape for Stage 1 of the development is focused largely around the integration of the site into the existing context of Village Centre and Village Lake. The overall objectives are:

- Provide an attractive public domain using quality landscape elements consistent with the surrounding existing and proposed streetscapes.
- Provide public open space areas to serve both the Parklands Estate community and that of the surrounding suburbs.
- Provide clear and attractive building entries using feature landscape treatments.
- Maximise communal landscape opportunities through use of podium spaces.
- Use the landscape to enhance the natural parkland qualities of the site and the physical and visual connections to the regional park.
- Utilise native planting where possible to enhance the bush qualities of the site utilising exotics only for specific purposes such as deciduous trees for seasonal solar control. as possible. Selecting species that are tolerant of the particular conditions that the site and building presents (shade, full sun, high wind, shallow soil etc..) to ensure its ongoing visual amenity and minimise maintenance and irrigation requirements.

5.1 Existing Vegetation

The Stage 1 development site does not contain any significant existing trees or vegetation and as such all planting will be new. Erosion and sediment control measures will be put in place to ensure the significant existing vegetation within the surrounding areas and the regional park are not effected by the works.

5.2 Species Selection

Planting have be selected to best respond to the local conditions and provide low maintenance and attractive landscape spaces. The character of the planting will follow a native theme utilising, as much as possible, species that occur within the Cumberland Plain Vegetation Community that is endemic to the area. Utilising native species will help to increase the ecological value of the site whilst also minimising the maintenance and watering requirements during establishment. The final selection of species will be subject to availability from commercial nursery suppliers. The proposed species are illustrated on DA 27 and detailed on DA 28.

5.3 Landscape for Bushfire Protection

The landscape design will take into account the requirements for bush fire protection including the landscape treatments to the proscribed asset protection zones (APZ). In general the landscape will take into consideration Appendix 5 of Planning for Bush Fire Protection - 2006 (RFS). Specifically it will include the following:

- Maintaining clear 4m wide fire access paths with 6m wide turning bays at a maximum of 200m apart. Where possible these will include a narrower path for pedestrian use and an adjacent area of accessible surface such as reinforced grass. If required in these areas a 12m radius will be allowed where fire truck turning.
- Minimising use of flammable mulches in APZ zones.
- Maintaining canopy separation of trees or groups of trees of 2-5m.
- Understory planting to be a mix of low grasses and ground covers with 5-10m separation zones provided to avoid continuous runs of undergrowth. In particular a mix of grasses with ground covers will be important in these areas.
- Species in the APZ zones will be selected for their low fuel and fire deterrent properties including in particular those species identified in Appendix F5 of the Penrith DCP 2010.

5.4 Materials, Furniture and Fixtures

Materials, furniture and fixtures have been selected for their aesthetic qualities, durability, safety and ease of maintenance. Materials selected for the public domain have been chosen to be consistent with the surrounding constructed streetscapes and parks within Jordan Springs and in particular the adjacent Town Centre and Village Square. There will be bike racks, benches, picnic tables, shelters, BBQ's and bins within the public domain. The introduction of some additional modwood elements to enhance the parkland character. The proposed materials, furniture and fixtures are illustrated on DA 26.

5.5 Central Park Play Area

Equipment has been selected for its durability, creative play and aesthetic qualities. The priority of the design has been to provide a limited selection of very high quality items that are least likely to be damaged and require replacement.

Included in the equipment is some water play. The design utilises water play in a way that provides the maximum play value for a limited amount of water use. Water would be potable and drawn from the mains supply and discharged to the subsoil drainage in the sand pit. This represents the most economical use of the water as it is a relatively small amount and avoids the costly and maintenance intensive needs associated with treating and re-circulating water.

The play area will make use of sand as a soft fall surface. Sand will be washed sand suitable for use in play environments. Sand has been chosen because of its particular properties and benefits as a soft fall surface and the added creative value it brings to a play space. There are a number of common concerns regarding the use of sand in play areas that are mainly associated with objects that could make their way into sand (such as broken glass and dog/cat poo). These risks can be ameliorated by good design (plenty of bins/dog mess bins) and a regular maintenance regime as specified by Australian Standards (AS/NZS 4486.1 – Playgrounds and Playground Equipment, Part 1: Development, installation, inspections, maintenance and operation).

The benefits of sand as a play surface greatly outweigh any negatives. Some of these benefits include:

- Cheap and easy to replace.
- Greater fall heights – softer/safer landings.
- Accommodates the needs of varying skills, abilities and ages.
- Sensory stimulation associated with holding, pouring and walking on sand.
- Allows for solitary or group play.
- Children prefer natural play – reduces stress, anxiety and depression (in all age groups).
- Its properties are fascinating to children and it is a play feature in itself.
- It's easy for adults to play with children and participate in relaxing and conversational time for both child and adult.

5.6 Irrigation

Species selection within the public domain will be undertaken to avoid the need for irrigation within the areas to be dedicated to Council.

The planting within the residential sites will also be designed to minimise water use including the selection of low water species and zoning of planting with similar water requirements. The intention will be to avoid irrigation within areas such as screen planting zones in deep soil. Significant areas of the private domain however, will be located over the basement car park slab, these areas will be incorporate a low water use, automatic drip irrigation system. The system will be supplied from the on site storm water detention tank with a backup connection to the potable water supply.

5.7 Lighting

Lighting within the public domain will include typical street lights as required by Council or the RMS. Feature mood lighting will be incorporated to highlight landscape elements such as trees and artworks and structures. Lighting within the residential development will focus on providing adequate levels of light for circulation whilst minimising light spill into dwellings with some feature lighting in communal open space areas. This Strategy is illustrated in the Lighting Strategy DA 25.

5.8 Accessibility

The public domain and private landscape areas will be designed to meet Australian access standards (AS:1428) with accessible gradients, ramps and handrails where required.

5.9 Residential Development Management & Maintenance

Whilst there is a proportion of deep soil zones within the development lots the development proposals make creative use of podium areas for communal and private landscape areas. Podium areas are primarily intensive (+300mm growing media depth) and semi-intensive (150-300mm growing media depth). The different areas of communal and private landscape will be managed accordingly:

- All communal podium landscape areas will be under the management of the buildings body corporate. All communal landscape areas will be accessible by maintenance staff.
- Integrated planters on terraces will be accessible to and maintained by the residents.
- An external tap on terraces will provide water for the planters either by hand OR the resident may link up their own automated irrigation (which would be their own responsibility to maintain).
- Planters on terraces will be planted out as part of the project build. This will include planting that is particularly suitable to that environment and require minimal watering/irrigation.

5.10 Public Domain Maintenance

Consideration has been given to all of the proposed hard and soft landscape treatments with the aim of minimising maintenance requirements. Play equipment and street furniture has been selected for robustness and to minimise the likelihood of damage and/or the need for replacements.

Lawn areas have been designed to allow for council mowers and will avoid any small or pointed areas that are difficult to maintain. Where access vehicles are required to cross paved areas these will be constructed to withstand the additional loading. Crossing points for mowers will be distinguishable for maintenance staff.

The park will be maintained by the developer during the establishment period of 12 months prior to handover to Council.

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S14-0080 S1-DA 7

STAGE 1 SITE PLAN

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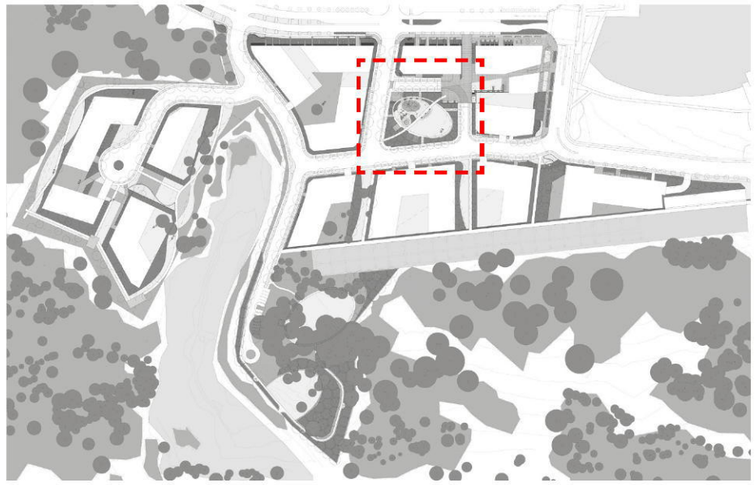


CENTRAL PARK

The central park will be the focal point of the Parklands Estate community. To this end the park is designed around two concepts; the cloister garden encapsulating the community and the spring. As for the local traditional owners, people all over the world have been brought together around springs, bringing the life and sustenance on which to build a community.

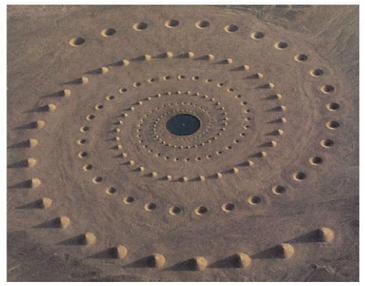
The park will be built around the form of a radiating ripple from a water drop. This from will be bisected by the pedestrian path connecting the Village Lake to the Secret Garden Damn. This will create two distinctive zones within the park. The the zone to the north will contain a playground themed around the spring. This park will take its inspiration from the movement of water and may incorporate a water play element such as a hand pump or mist sculpture. An element of auditory play is also intended with foot bells reflecting echoing drops of water. This space will also incorporate sheltered BBQ areas. The play area is intended to be sculptural in its form providing an element of art in addition to its function as a playground.

The second zone to the south will be a multi function open lawn surrounded by a amphitheatre style seating wall. This space is intended for informal activities such as kickabout and play, relaxing or picnicking as well as formal activities such as outdoor shows, community events or markets. A raised platform in the centre of the park will act as a casual seating opportunity and have the ability to be used as a stage for events when required.

The intention of the design of the park is to complement the existing network of open spaces within the wider Jordan Springs development. It will continue the principle of each park having its own destinct character or special element providing interest and variety to the community.

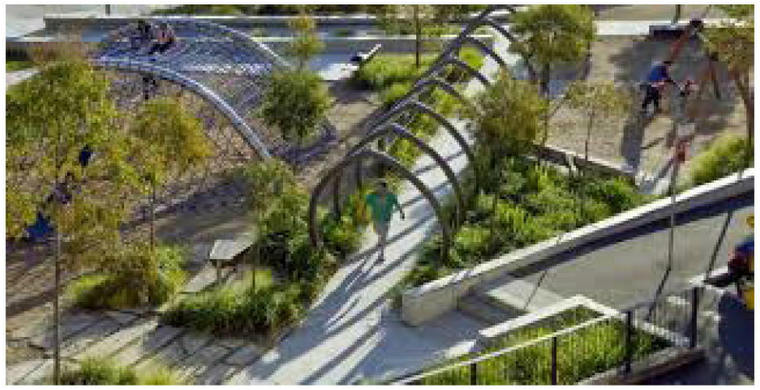
The park will reinforce the parkland character of the estate and will be planted with native species of clear trucked trees with low mixed ornamental natives and grasses creating the parks sense of enclosure. These planting will also ensure that casual surveillance from the surrounding residences and streets is maintained. If practical any existing trees within the site will be retained.

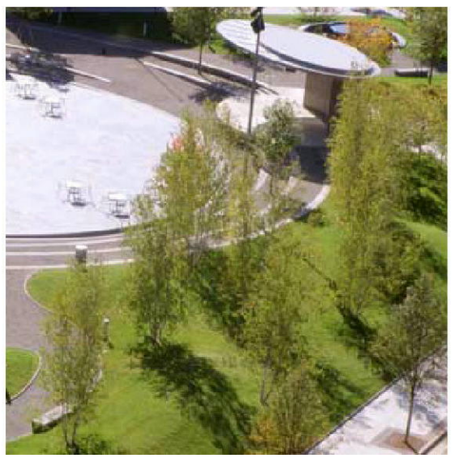
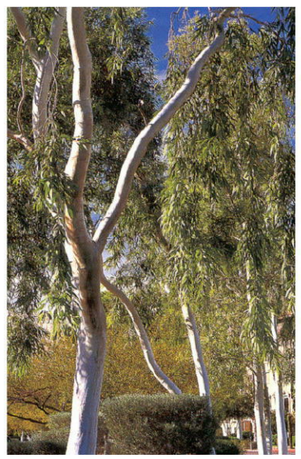
LANDSCAPE CHARACTER





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LEGEND

1. Shared Zone Plaza saw cut insitu concrete with interlocking concrete unit pavers.
2. Park Entry Plaza with seating, lights and bins. Saw cut insitu concrete.
3. Central Connecting Path. Sand blasted exposed aggregate insitu concrete.
4. Concrete Seat/Stage off form concrete.
5. Kick-about Lawn
6. Off form Concrete Seating Stairs
7. Grass Bank Behind Seating Stairs
8. Informal Access Points Concrete sleepers
9. Steel and Modwood BBQ Shelter with table setting
10. Mass planted native grasses with clear trunked Corymbia
11. Paving finish within the street to signify entry and exit to slow speed road environment interlocking concrete pavers unit.
12. Playground
    - a. Tower Slide
    - b. Swing
    - c. Diggers
    - d. 3x pumps with water channels in insitu oxide coloured concrete pavement
    - e. Sand soft fall
    - f. Trees in raised planters (blockwork)
    - g. Stepped edge to lower area to contain sand (insitu concrete)
    - h. Softfall ramp into sand area
    - i. Mist sculptural element, stainless steel.

○	BOLLARD
M	MAIL BOXES
BR	BIKE RACKS
CS	INSITU OFF FORM CONCRETE BENCH SEAT
B	WHEELIE BIN ENCLOSURE
RS	RESIDENTIAL TIMBER BENCH SEAT
S	GALLERIA BENCH SEAT
PSI	PICNIC SHELTER WITH 2X GALLERIA TABLE SETTINGS AND PARKSAPE BBQ

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CENTRAL PARK LANDSCAPE PLAN

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Road | Grass Verge with Trees | Footpath | Plaza with Bench Seats, Bins and Bike Racks with Shade Trees | Native Grass with Corymbia citriodora | Path | Native Grass with Corymbia citriodora | One Way Road | Plaza Forecourt Shared Zone | Public Landscaped Seating Lawn | "Cumberland"

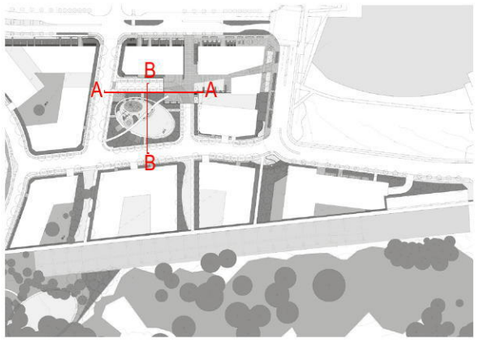
"Castlereagh"

SECTION A-A



Footpath | One Way Road | Footpath | Native Grass with Corymbia citriodora | Footpath | Sand Play | Central Path | Stage | Kick About Lawn | Footpath | Seating Wall | Native Grass with Corymbia citriodora | Footpath | Road

SECTION B-B



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CENTRAL PARK SECTIONS 1

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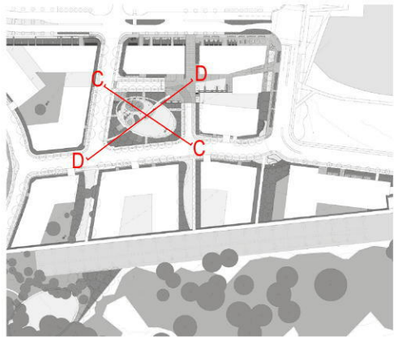

Road | Plaza Forecourt | Footpath | Mist Sculpture | Water Pumps | Diggers in Sand | Playground (sand) | Central Path | Stage | Seating Walls | Kick About Lawn | Native Grass with Corymbia citriodora | Footpath | Road

SECTION C-C



Road | Native Grass with Corymbia citriodora | Picnic Shelter | Footpath | Slide | Swings | Mist Sculpture, Water Pumps and Diggers in Sand | Playground | Native Grasses with Corymbia citiodora | Bike Racks | Plaza Forecourt | One Way Shared Zone

SECTION D-D

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S14-0080 S1-DA 12

CENTRAL PARK VIEW

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Version: 1, Version Date: 27/02/2015



CUMBERLAND URBAN FORECOURT

The north eastern corner of the site is proposed as a mixed precinct including ground level soho apartments and commercial / retial tenancies with apartments above. Importantly the area will be designed to provide continuity with the streetscape identity of Jordan Springs streetscapes along both Jordan Springs Boulevard and Lakeside Parade. To this end materials, finishes, planting and street trees will be in keeping with those used in these streets, building on the urban character of the town centre.

The view along Lakeside Parade through the village centre is continued through a publically accessible pedestrian access link to the Regional Park. This element will be themed around the history or environment of the site and will incorporate interpretive elements the first of which will be located at the corner of Jordan Springs Boulevard and Lakeside parade. The second will be located within the publiclonk to the Regional Park bookending the view. These will be experienced at two scales, firstly from a distance as the focal point of the vista and secondly up close, at a pedestrian level.

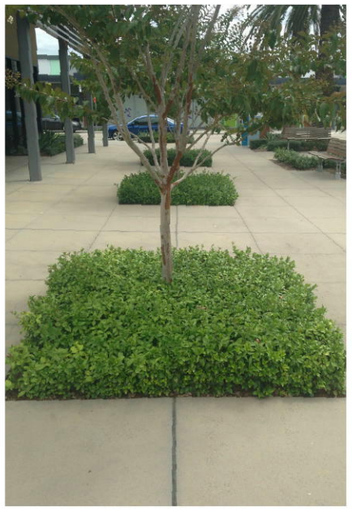
Connection, both physical and visual, to the Village Lake will also be a key connection between the estate and the wider Jordan Springs community. This will be achieved by a through site link allowing a publically accessible connection activated by non-residential uses, between the central park and the Lake. This connection further extends through the across the park to the Secret Garden completing the link between the sites to water features.

West along Jordan Springs Boulevard another of the north south through site links provides access between the mixed use buildings into the heart of the site, This creates a view corridor incorporating the central open space, through to the Regional Park, reinforcing the developments connection to its context.

Where residential apartments are located at ground level within this precinct additional landscape will be provided in concert with fences where required to provide a buffer for privacy. Where possible levels will also be used to provide privacy whilst maintaining casual surveillance of the streets.

EXISTING TOWN CENTER CHARACTER







LANDSCAPE CHARACTER













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LEGEND

1. Custom designed insitu concrete bench seats under shade of trees
2. Retail/commercial forecourt and streetscape to match existing along Lakeside Parade. insitu saw cut concrete
3. Sloped lawn with trees for shade
4. Insitu concrete retaining wall/seat edge to lawn edge
5. Space for outdoor dining (concrete unit paving)
6. Publically accessible through site link ramped up to building entry
7. Public lawn seating area with shade trees
8. One way service access for loading and garbage (insitu concrete saw cut)
9. Service exit onto Jordan Springs Boulevard
10. Private terraces (concrete unit paving)
11. Swale planting for drainage
12. Existing street planting
13. Feature screen planting with shade trees (deciduous to north)
14. Shared zone insitu saw cut concrete with interlocking concrete unit pavers
15. Public Artwork

O	BOLLARD
M	MAIL BOXES
BR	BIKE RACKS
CS	INSITU OFF FORM CONCRETE BENCH SEAT
B	WHEELIE BIN ENCLOSURE
RS	RESIDENTIAL TIMBER BENCH SEAT
S	GALLERIA BENCH SEAT
PSI	PICNIC SHELTER WITH 2X GALLERIA TABLE SETTINGS AND PARKSAPE BBQ

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CUMBERLAND LANDSCAPE PLAN

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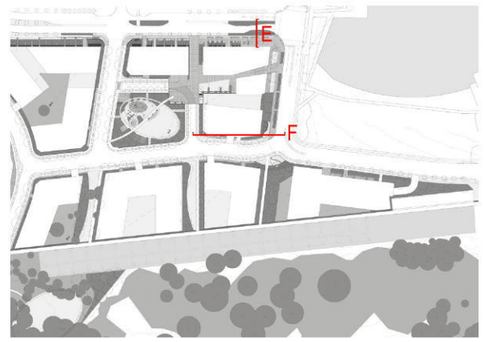
SECTION E-E





SECTION F-F

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S14-0080 S1-DA 15

CUMBERLAND SECTIONS 1

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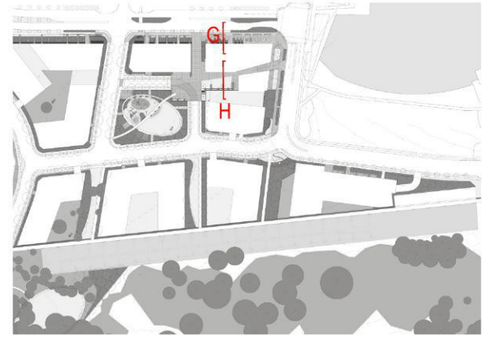
SECTION G-G



SECTION H-H







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CUMBERLAND SECTIONS & VIEWS

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LEGEND

1. *Eastern Entry from Jordan Springs Boulevard with feature planting and signage walls. Refer detailed plans*
2. *Feature screen planting with shade trees (deciduous to north)*
3. *Private terraces, concrete unit pavers*
4. *Terraced planting to souther building facade, rendered blockwork*
5. *One way service access for loadings and garbage saw cut insitu concrete*
6. *Service exit onto Jordan Springs Boulevard*
7. *Native mass planting with trees to soften building facades*
8. *Services forecourt saw cut insitu concrete*
9. *Residential Building Entries stone unit pavers*
10. *Concrete unit paving*

O	BOLLARD
M	MAIL BOXES
BR	BIKE RACKS
CS	INSITU OFF FORM CONCRETE BENCH SEAT
B	WHEELIE BIN ENCLOSURE
RS	RESIDENTIAL TIMBER BENCH SEAT
S	GALLERIA BENCH SEAT
PSI	PICNIC SHELTER WITH 2X GALLERIA TABLE SETTINGS AND PARKSAPE BBQ

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CASTLEREAGH LANDSCAPE PLAN

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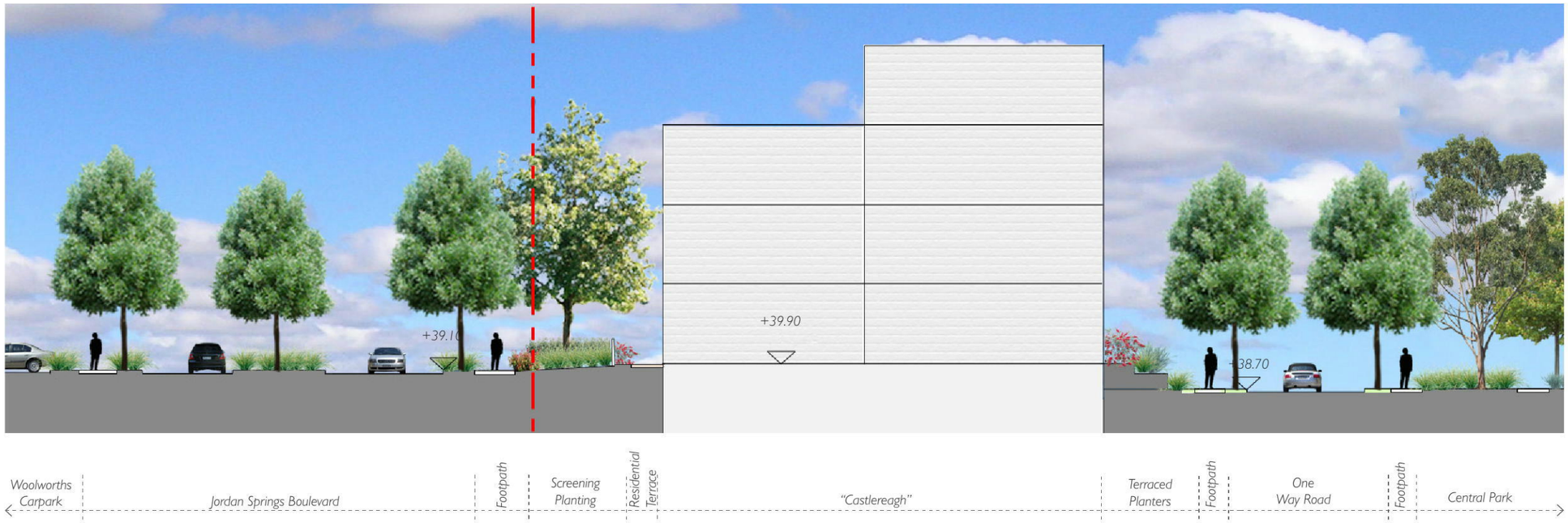
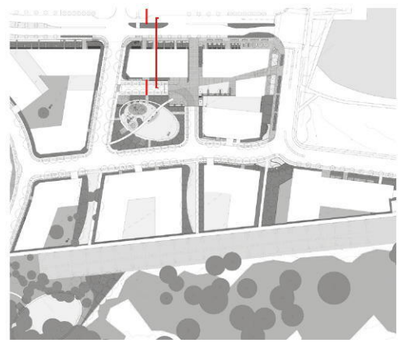


SECTION I-I



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CASTLEREAGH SECTIONS & VIEWS

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LEGEND

1. Streetscape treatment to match existing paving and planting to Lakeside Parade saw cut insitu concrete unit pavers
2. Mass screen planting to residential areas
3. Private terraces concrete unit pavers
4. Common open space over basement car park
5. Mailboxes
6. Terraced planters to street frontage rendered blockwork
7. Residential Entries, stone unit pavers
8. Timber bench Seating
9. Shade Structure, steel and timber
10. Deep soil planting in private courtyards

O	BOLLARD
M	MAIL BOXES
BR	BIKE RACKS
CS	INSITU OFF FORM CONCRETE BENCH SEAT
B	WHEELIE BIN ENCLOSURE
RS	RESIDENTIAL TIMBER BENCH SEAT
S	GALLERIA BENCH SEAT
PSI	PICNIC SHELTER WITH 2X GALLERIA TABLE SETTINGS AND PARKSAPE BBQ

CLOUSTON associates

CID GROUP

SYNERGY DEVELOPMENT GROUP

1:250 @A3

0 2 4 6 8 10m

Stage 1 Parklands Estate • Jordan Springs

WOODLANDS LANDSCAPE PLAN

S14-0080 S1-DA 19

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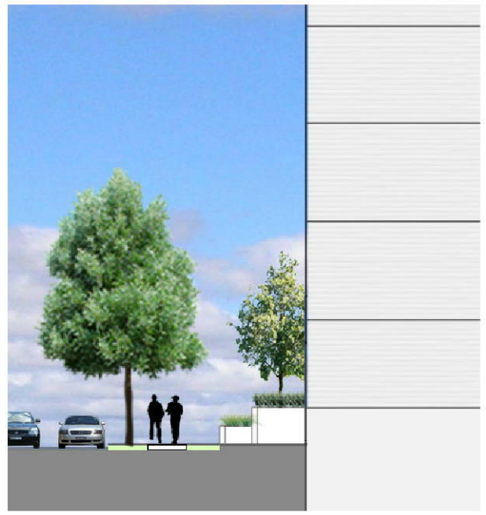
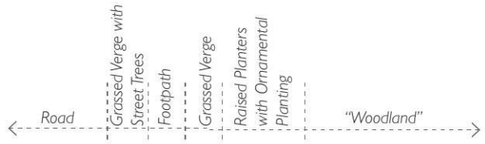
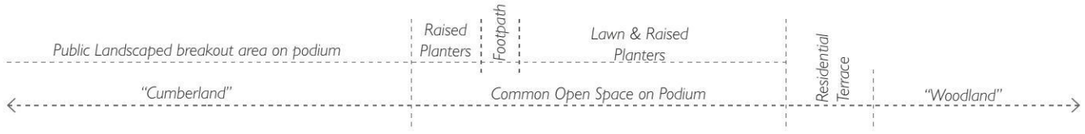
SECTION J-J



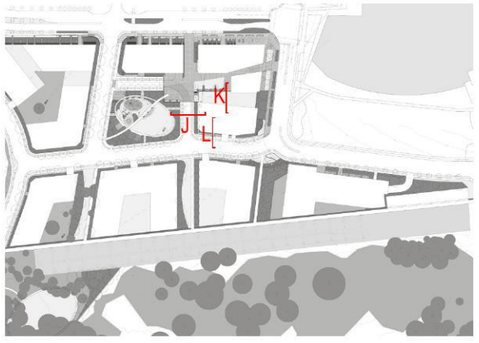


SECTION L-L





SECTION K-K



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1:250 @A3

0 2 4 6 8 10m

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S14-0080 S1-DA 20

WOODLANDS SECTIONS & VIEWS

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1:250 @A3

0 2 4 6 8 10m

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DILWYNIA WEST LANDSCAPE PLAN

S14-0080 S1-DA 21

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Version: 1, Version Date: 27/02/2015



LEGEND

1. Screen planting to the street
2. Turf verge with street trees. Consistent with the rest of Lakeside Parade.
3. Private terraces concrete unit pavers.
4. Deep soil planting in private courtyard
5. Common open space in deep soil
6. Screen planting to fences

O	BOLLARD	RS	RESIDENTIAL TIMBER BENCH SEAT
M	MAIL BOXES	S	GALLERIA BENCH SEAT
BR	BIKE RACKS	PSI	PICNIC SHELTER WITH 2X GALLERIA TABLE SETTINGS AND PARKSAPE BBQ
CS	INSITU OFF FORM CONCRETE BENCH SEAT		
B	WHEELIE BIN ENCLOSURE		

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1:250 @A3

0 2 4 6 8 10m

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S14-0080 S1-DA 22

DILWYNIA EAST LANDSCAPE PLAN

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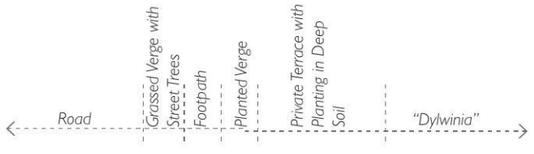
Version: 1, Version Date: 27/02/2015





SECTION M-M



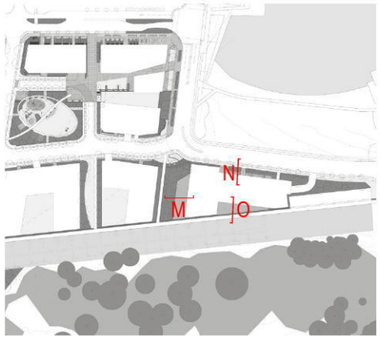


SECTION N-N





SECTION O-O





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1:250 @A3

0 2 4 6 8 10m

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DILWYNIA SECTIONS & VIEWS

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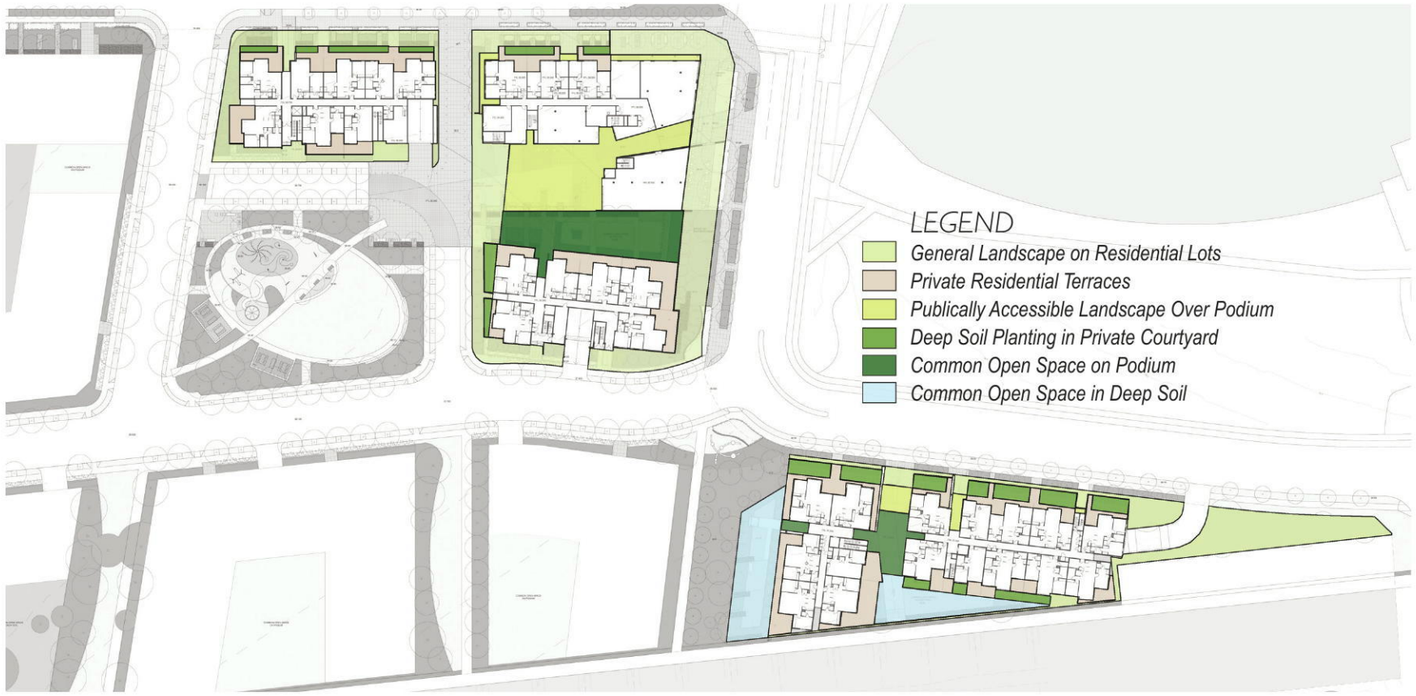


RESIDENTIAL AREAS

The landscape character for the Parklands Estate is in keeping with the bushland setting. Landscaping opportunities across the site have been maximised providing deep soil and large tree plantings where possible to enhance the visual amenity for the future residents and visitors. The key features of the private landscape areas include:

- Provide clear street addresses including hard and soft landscape treatments to assist in orientation and clearly defining entrances.
- Provide planting to the front of fencing and walls to soften the built form when seen from the street. High walls/ fences to the public domain have been avoided and where required are broken up through terracing or materials to reduce their visual impact.
- A mix of native and exotic planting is proposed be used however the overall character will remain native.
- Materials and finishes within the landscape will be in keeping with the character of those used within the public domain to maintain a strong and cohesive landscape character.
- Each building will be include naming signage and interpretation in keeping with the precinct plan.

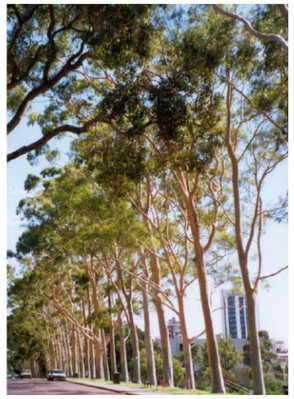
The locations of the various landscape types including communal open spaces provided for the apartment buildings are shown on the figure above. These spaces maximise soft landscape and where possible incorporate tree planting in areas of deep soil and in raised planters where the landscape is over the basement podium.

LANDSCAPE CHARACTER

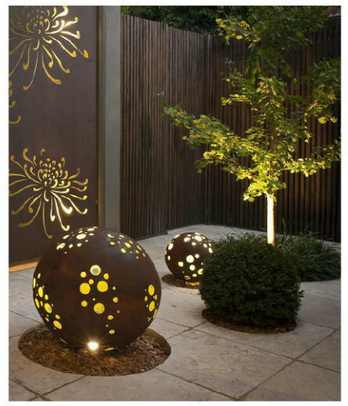


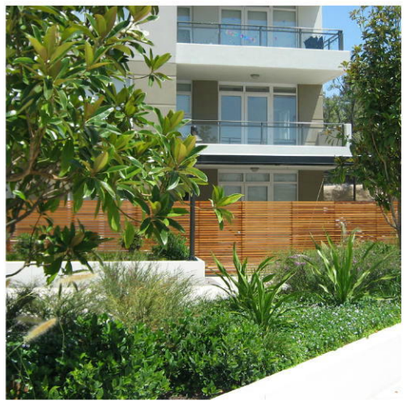


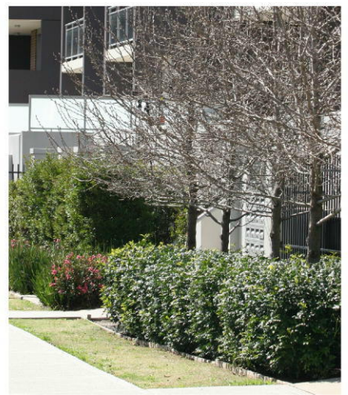


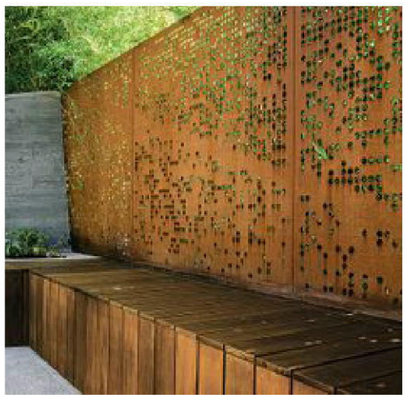












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1:1500 @A3

0 15 30 45 75m

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RESIDENTIAL APARTMENTS

S14-0080 S1-DA 24

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Version: 1, Version Date: 27/02/2015

Street Lighting

Artwork Lighting

Building Lighting

Wall Lighting

Feature Up-lighting

Shelter Lighting

Slide Tower Wash Lights

Pedestrian Path Lighting

LIGHTING STRATEGY

The lighting strategy for Stage 1 of Parklands Estate area aims to provide safe pedestrian and vehicular movement throughout the site including when people are likely to be commuting to and from work, exercising and walking dogs at dawn, dusk or after dark at some times of the year.

As such in addition to general street lighting pedestrian lighting is provided throughout the site along the path network to provide safe passage through and around the site. This includes the access path along the southern drainage channel as these areas are envisaged to be used for short walking loops.

The sites entries will incorporate lighting to the signage walls, artworks and up-lighting to the feature trees to highlight these areas. Feature lighting will also be provided in the central park as it is likely due to the surrounding density and street lighting spill that people will use this area after dark. In order to encourage positive after dark activities such as dinner BBQs and evening community evens (markets, movies, plays) to assist passive surveillance and discourage antisocial behaviour the park will be well lit including feature lighting of the playground.

Light fixtures will be consistent with those utilised across the Jordan Springs Estate and will comply with Council and RMS requirements..

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1:750 @A3

0 6 12 18 24 30m

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LIGHTING STRATEGY

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FURNITURE



SFA Galleria Seat



SFA Galleria Table Setting



SFA Wheelie Bin Enclosure



Modwood Bollard

PARK EQUIPMENT



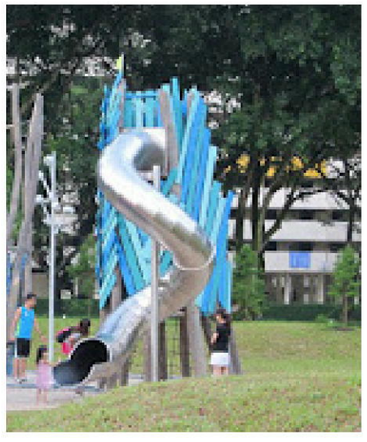
K&K Double Swing



K&K Hand Water Pump

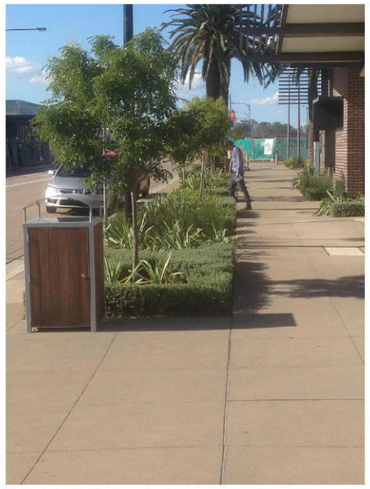


K&K Sand Digger



Atlantics Stainless Steel Tubular Slide

PAVING



Town Centre Paving - Insitu, saw cut, coloured concrete to match existing.



Footpaths - Broom Finished Natural Concrete



Natural Coloured Softfall to Play Areas



Bike Racks

WALLS





Formal Off Form Concrete Walls



Informal Sandstone Walls





Feature Paving identifying Apartment Building Entries

SHELTERS



Shelters in keeping with existing in Jordan Springs using Modwood elements to build on Parklands Character

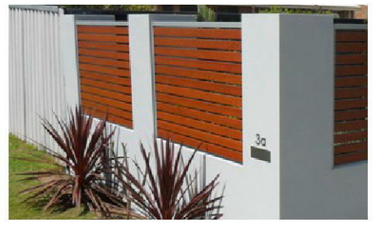


Christie Parksafe BBQ

SCREENS AND FENCES



Corten Feature Screens / Fences





Combined Timber and Masonary Fences

FEATURE ELEMENTS



Public Artworks



Wall Lighting

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S14-0080 S1-DA 26

MATERIALS AND FURNITURE PALETTE

Feb 13 2015
issue A

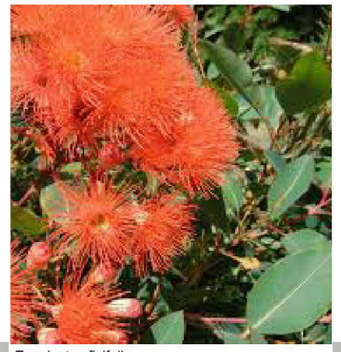
Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015


Angophora floribuna


Cupaniopsis anacardioides


Corymbia Citriodora

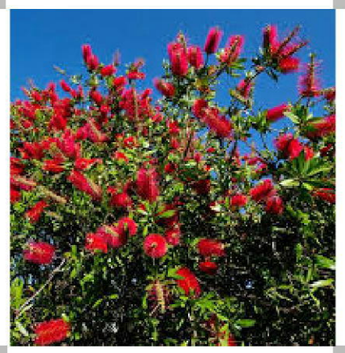

Pyrus ussuriensis


Eucalyptus ficifolia


Brachychiton acerifolius 'Illawarra Flame Tree'


Melaleuca nodosa


Melaleuca linariifolia


Callistemon 'Captain Cook'

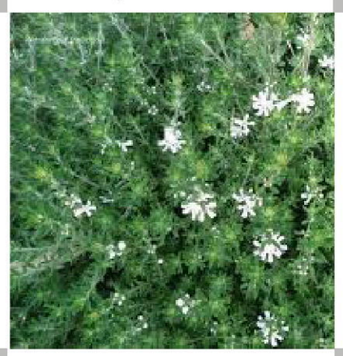

Banksia robur


Viburnum tinus


Grevillea x Superb


Doryanthes excelsa


Eryostemon myoporiodes


Westringia fuuctosa


Correa alba


Raphelolepsis indica 'Cosmic White'


Hardenbergia violacea

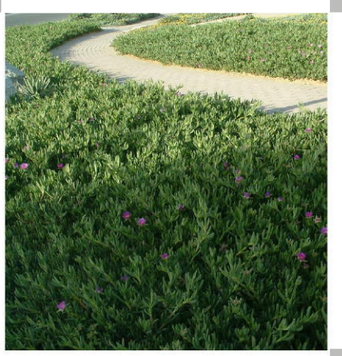

Capillipedium parviflorum


Lomandra longifolia 'Katrinus'


Poa labillardieri


Myoporum parvifolium


Convolvulus cneorum


carpobrotus glaucescens

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S14-0080 S1-DA 27

INDICATIVE PLANTING PALETTE

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Version: 1, Version Date: 27/02/2015

STREET & ENTRY TREES

Botanical Name	Common Name
Corymbia citriodora	Lemon Scented Gum
Corymbia punctata	Grey Gum
Eucalyptus crebra	Narrow Leafed Iron Bark
Fraxinus oxycarpa raywoodii	Claret Ash
Pyrus ussuriensis	Manchurian Pear
Tristaniopsis laurina 'Luscious'	Luscious Water Gum
Waterhousia floribunda	Weeping Lilly Pilly

PUBLIC DOMAIN TREES
(Central Park, Public Links & Urban Forecourts)

Botanical Name	Common Name
Angophora floribuna	Rough Barked Apple
Brachychiton acerifolius	Illawarra Flame Tree
Corymbia citriodora	Lemon Scented Gum
Cupaniopsis anacardioides	Tuckeroo
Fraxinus griffithii	Evergreen Ash
Pyrus calleryana 'Chanticleer'	Ornamnetal Pear
Ulmus parvifolia "Todd'	Chinese Elm

PRIVATE DOMAIN TREES
(Residential Surrounds, Common Open Space and Courtyards)

Botanical Name	Common Name
Acer x freemanii 'Autumn Blaze'	Red Maple
Eucalyptus ficifolia	Red Flowering Gum
Eucalyptus nicholii	Narrow Leafed Peppermint
Hymenosporum Flavum	Native Frangipani
Lagestromia Indica	Crepe Myrtle
Magnolia grandiflora 'MGTIG Greenback'	Greenback Magnolia
Prunus cerasifera 'Oakville Crimson Spire'	Ornamental Plum
Pyrus calleryana 'Chanticleer'	Ornamnetal Pear
Syzygium leuhmanii	Riberry
Ulmus parvifolia "Todd'	Chinese Elm

PUBLIC & PRIVATE DOMAIN SHRUBS, GRASSES & GROUND COVERS
(Non Irrigated)

Botanical Name	Common Name
Anigozanthos sp.	Kangaroo Paw
Banksia robur	Banksia
Callistemon viminalis 'Captain Cook'	Bottlebrush
Capillipedium parviflorum	Scented Top Grass
Carpobrotus glaucescens	Pig Face
Correa alba	White Correa
Correa reflexa	Native Fuchsia
Doryanthes excelsa	Gymea Lilly
Eryostemon myoporiodes	Wax Flower
Gazania sp.	Gazania
Grevillea x Superb	Superb Grevillea
Grevillea juniperina 'Moonlight'	Juniper-leaf grevillea
Hardenbergia violacea	False Sasaparilla
Leptospermum polygalifolium	Yellow Tea Tree
Lomandra longifolia 'Katrinus'	Lomandra 'Katrinus'
Melaleuca nodosa	Prickly Leafed Paper Bark
Melaleuca linariifolia	Snow in Summer
Myoporum parvifolium	Creeping Boobialla
Pimelea linifolia	Slender Rice Flower
Poa labillardieri	Common Tussock Grass
Raphelolepsis indica 'Cosmic White'	White Indian Hawthorn
Viburnum tinus	Laurustinus
Westringia fruticosa	Coast Rosemary

PRIVATE DOMAIN SHRUBS, GRASSES & GROUND COVERS
(Irrigated)

Botanical Name	Common Name
Asplinium australis	Birds Nest Fern
Abelia grandiflora	Glossy Abelia
Buxus sempervirens	Box
Convolvulus cneorum	Silver Bush
Camellia sasanqua	Sasanqua
Crinum pedunculatum	Swamp Lily
Dicksonia australis	Tree Fern
Gardenia augusta	Gardenia
Liriope 'Evergreen Giant'	Ever Green Giant
Murraya paniculata	Mock Orange
Philodendron Xanadu	Xanadu
Syzygium leuhmanii	Riberry
Viola hederacea	Native Violet

ASSET PROTECTION ZONES
(Low Bush Fire Risk Species)

Botanical Name	Common Name
Acmena smithii	Lilly Pilly
Casuarina glauca	Swamp Oak
Carpobrotus glaucescens	Pig Face
Dianella caerulea	Blue Flax-Lily
Einadia nutans	Climbing Saltbush
Grevillea 'Ivanhoe'	Grevillea Ivanhoe
Grevillea rosmarinifolia	Grevillea Rosmarinifolia
Grevillea'Bronze Rambler'	Prostrate Grevillea
Lomandra longifolia	Spiney Head Mat Rush
Pelargonium rodneyanum	Magenta Storksbill
Scaevola humilis	Purple Fusion
Syzigium australe	Brush Cherry
Tristaniopsis laurina 'Luscious'	Luscious Water Gum
Myoporum parvifolium	Creeping Boobialla

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Version: 1, Version Date: 27/02/2015



LANDSCAPE TYPE	Area (m2)
TOTAL STAGE 1 SITE AREA	19,800
Stage 1 Landscape Area	**9,670**
Central Park (Public Open Space)	2,400
Total Public Domain Landscape	**3,310**
Mass Planting	*1,790*
Turf	*1,320*
Sand Soft Fall	*200*
Total Private Domain Landscape	**2,775**
Turf in Deep Soil	*325*
Mass Planting in Deep Soil - Private Terraces	*280*
Mass Planting In Deep Soil	*1,655*
Turf on Podium	*265*
Mass Planting on Podium	*250*
Total Residential Common Open Space Area	**1,045**
Area of Common Open Space on Podium	*485*
Area of Common Open Space in Deep Soil	*560*
Landscape in Deep Soil %	28%
Permiable Landscape %	31%

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S14-0080 S1-DA 29

LANDSCAPE CALCULATIONS

Feb 13 2015
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Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

CLIENT

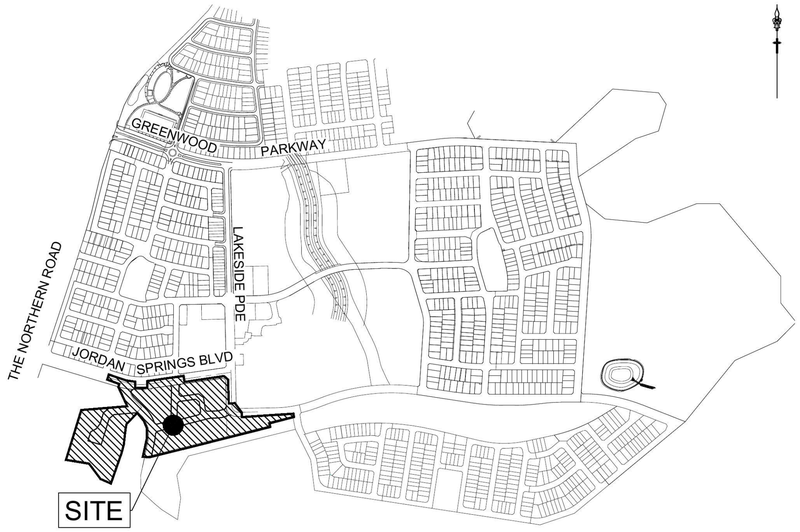
CID GROUP

PROJECT COORDINATOR

SYNERGY DEVELOPMENT GROUP

JORDAN SPRINGS - PARKLANDS ESTATE
DEVELOPMENT APPLICATION

PROPOSED SUBDIVISION AND ROADWORKS



LOCALITY SKETCH
PENRITH LGA

CIVIL PLAN INDEX		
PLAN NO.	PLAN NAME	REV
9776/DA00	COVER SHEET	A
9776/DA01	OVERALL SITE PLAN	A
9776/DA02	TYPICAL ROAD CROSS SECTIONS	A
9776/DA03	ROAD LAYOUT PLAN	A
9776/DA04	STORMWATER DRAINAGE PLAN	A
9776/DA05	CUT/FILL PLAN AND TREE REMOVAL	A
9776/DA06	ROAD LONGITUDINAL SECTIONS SHEET 1	A
9776/DA07	ROAD LONGITUDINAL SECTIONS SHEET 2	A
9776/DA08	SITE SECTIONS	A
9776/DA09	STAGE 1 DETAIL PLAN WITH LANDSCAPE OVERLAY	A
9776/DA10	STAGE 1 TEMPORARY SEDIMENT BASIN & SOIL & WATER MANAGEMENT PLAN	A
9776/DA11	GPT ACCESS PLAN	A

Prepared By:

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PLAN No. 9776/DA00 A
FILE No. 9776DA00

Plotted: February 12, 2015 File Name: J:\9776\DA - Development Application Approval Plans\9776DA00.dwg

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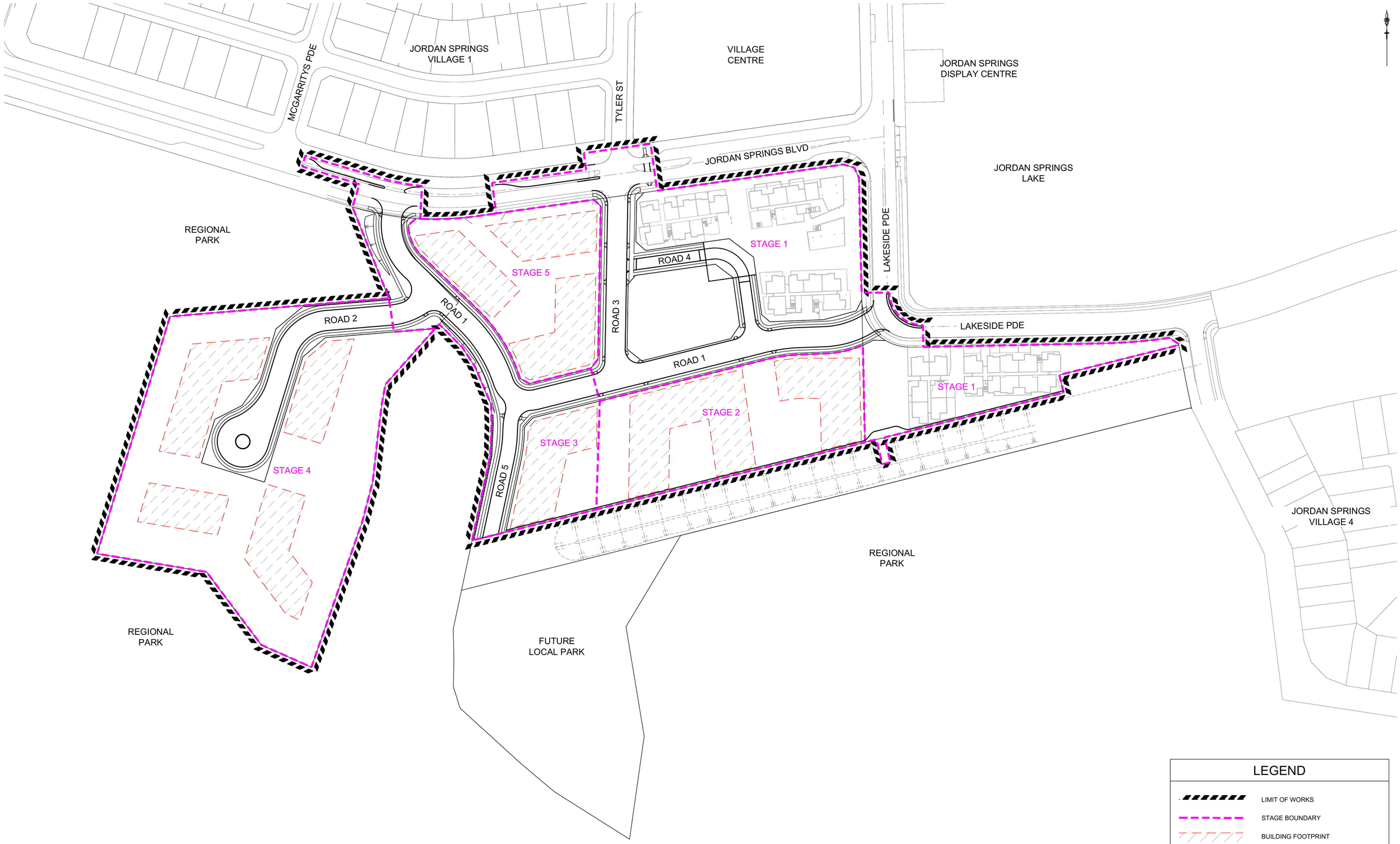
Version: 1, Version Date: 27/02/2015



LEGEND

- LIMIT OF WORKS
- STAGE BOUNDARY
- BUILDING FOOTPRINT

1:1000 (AT A1)

20 10 0 10 20 30 40 50 60 70 80 90 100

METRES

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AZIMUTH: AHD
DATUM: MGA
ORIGIN:

CLIENT: CID GROUP
PROJECT COORDINATOR: SYNERGY DEVELOPMENT GROUP

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JORDAN SPRINGS PARKLANDS ESTATE
OVERALL SITE PLAN

PLAN No: 9776/DA01 A
FILE No: 9776DA01
SHEET SIZE: A1 ORIGINAL

Plotted: 12 February , 2015 11:45:19 AM File Name: J:\9776\DA - Development Application Approval Plans\9776DA01.dwg

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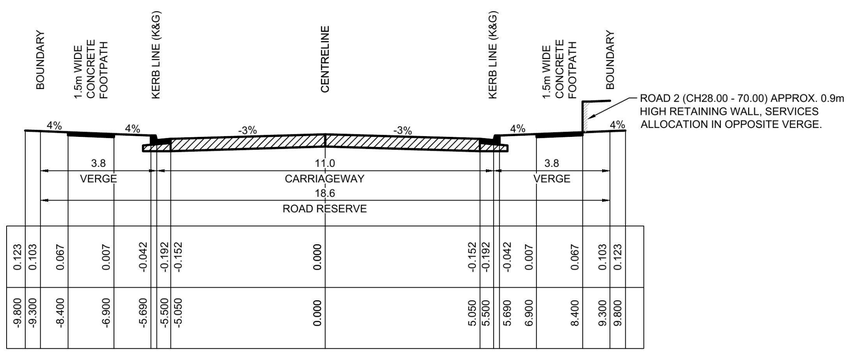
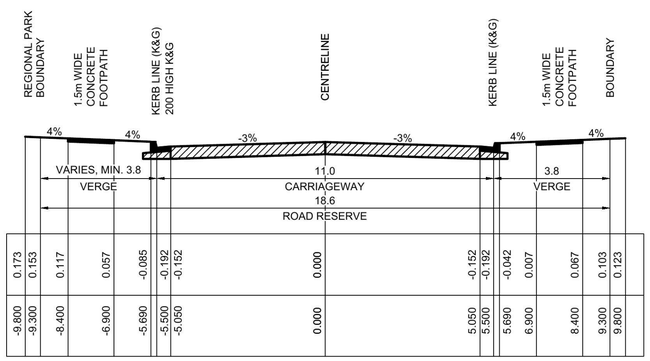


TYPICAL CROSS SECTION 1

ROAD 1 (CH0.00 - 80.51, 157.93 - 212.38) & ROAD 2

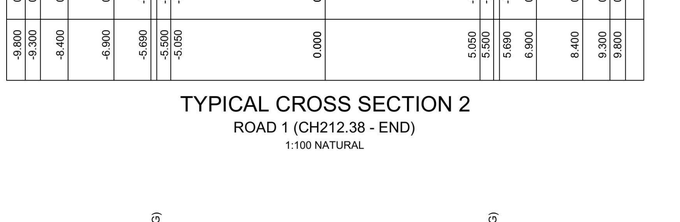
1:100 NATURAL



TYPICAL CROSS SECTION 2

ROAD 1 (CH212.38 - END)

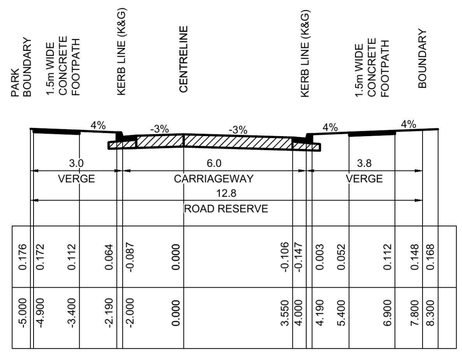
1:100 NATURAL



TYPICAL CROSS SECTION 3

ROAD 3 (CH60.81 - END)

1:100 NATURAL

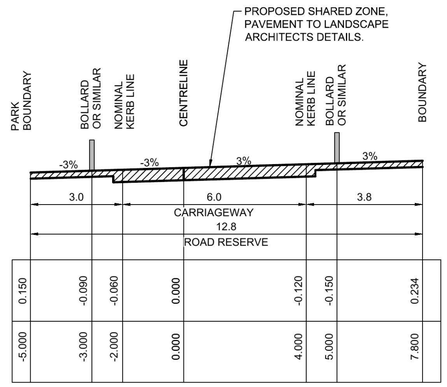


TYPICAL CROSS SECTION 4

ROAD 4 (CH0.00 - 38.15, 63.85 - END)

ONE WAY TRAFFIC

1:100 NATURAL

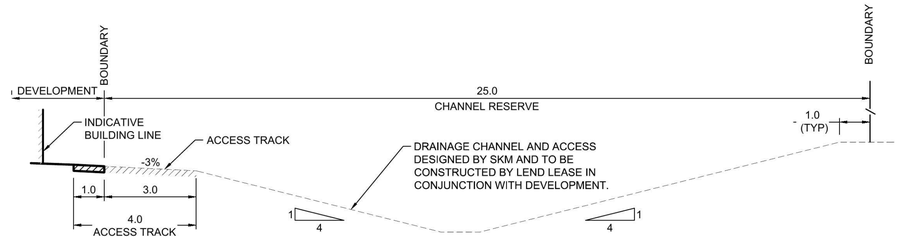


TYPICAL CROSS SECTION 5

ROAD 4 - SHARED ZONE (CH38.15 - 63.85)

ONE WAY TRAFFIC

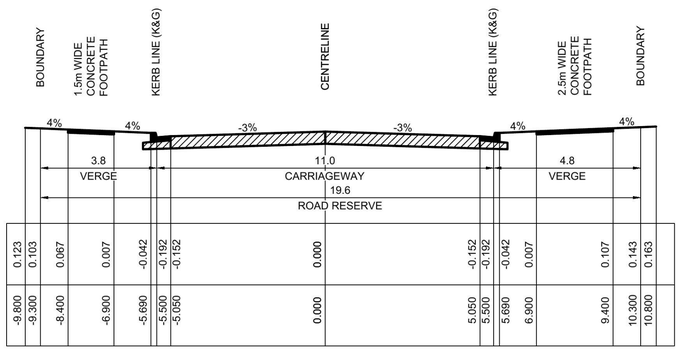
1:100 NATURAL



TYPICAL CROSS SECTION 8

DRAINAGE CHANNEL

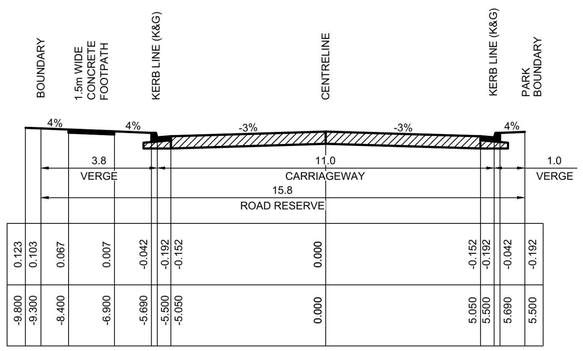
1:100 NATURAL



TYPICAL CROSS SECTION 3

ROAD 3 (CH60.81 - END)

1:100 NATURAL



TYPICAL CROSS SECTION 6

ROAD 1 (CH80.51 - 157.93) &
ROAD 3 (CH0.00 - 60.81)

1:100 NATURAL

1:100 (AT A1) 2 1 0 1 2 3 4 5 6 7 8 9 10 METRES

Plotted: 12 February , 2015 11:48:12 AM File Name: J:\9776D\DA - Development Application Approval Plans\9776DA02.dwg

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AZIMUTH: AHD
DATUM: MGA
ORIGIN:

CLIENT: CID GROUP
PROJECT COORDINATOR: SYNERGY DEVELOPMENT GROUP

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JORDAN SPRINGS
PARKLANDS ESTATE
TYPICAL ROAD CROSS SECTIONS

PLAN No: 9776/DA02 A
FILE No: 9776DA02
SHEET SIZE: A1 ORIGINAL

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

JORDAN SPRINGS VILLAGE 1

VILLAGE CENTRE

JORDAN SPRINGS DISPLAY CENTRE

JORDAN SPRINGS LAKE

MCGARRITYS PDE

TYLER ST

JORDAN SPRINGS BLVD

LAKESIDE PDE

ALTERATIONS TO EXISTING MEDIANS FOR CENTRAL INTERSECTION

ALTERATIONS TO EXISTING MEDIANS FOR WESTERN INTERSECTION

PROPOSED SHARED ZONE

PROPOSED MEDIAN FOR EASTERN INTERSECTION

REGIONAL PARK

RETAINING WALL MAX 0.9m HIGH

CATCH DRAIN

ROAD 1

ROAD 2

ROAD 3

ROAD 4

ROAD 5

ACCESS TRACK TO EXTEND TO VILLAGE 4 JORDAN SPRINGS.

4m WIDE ACCESS TRACK

POST CONSTRUCTION FLOWS ARE TO BE TREATED BY THE EAST LAKE.

ALL-WEATHER ACCESS TO GPT UNIT AND FIRE VEHICLE BAY - CONFIGURATION TO BE FINALISED IN CC DESIGN.

DRAINAGE CHANNEL AND ACCESS DESIGNED BY SKM AND TO BE CONSTRUCTED BY LEND LEASE IN CONJUNCTION WITH DEVELOPMENT.

RETAINING WALL MAX 0.9m HIGH

CONNECTION TO FUTURE LOCAL PARK.

FUTURE LOCKABLE GATE FOR DRAINAGE CHANNEL AND GPT ACCESS.

CATCH DRAIN, FINAL LOCATION TO BE COORDINATED WITH LANDSCAPE DESIGN

REGIONAL PARK

FUTURE LOCAL PARK

REGIONAL PARK

JORDAN SPRINGS VILLAGE 4

LEGEND

- LIMIT OF WORKS
- INDICATIVE BUILDING FOOTPRINT
- 29.0 DESIGN CONTOUR
- 35.0 EXISTING CONTOUR
- eS eS eS eS EXISTING SEWER AND STRUCTURE

1:1000 (AT A1)

20 10 0 10 20 30 40 50 60 70 80 90 100

METRES

A	ISSUED FOR DEVELOPMENT APPLICATION	AS	AS	DJH	MS	21/11/14
	AMENDMENT	DES	DRN	CKD	APR	DATE

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JORDAN SPRINGS PARKLANDS ESTATE

ROAD LAYOUT PLAN

PLAN No: 9776/DA03 A

FILE No: 9776DA03

SHEET SIZE: A1 ORIGINAL

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Version: 1, Version Date: 27/02/2015

JORDAN SPRINGS VILLAGE 1

VILLAGE CENTRE

JORDAN SPRINGS DISPLAY CENTRE

JORDAN SPRINGS LAKE

MCGARRITYS PDE

TYLER ST

JORDAN SPRINGS BLVD

LAKESIDE PDE

REGIONAL PARK

ROAD 1

ROAD 2

ROAD 3

ROAD 4

ROAD 5

CATCH DRAIN

CATCH DRAIN, FINAL LOCATION TO BE COORDINATED WITH LANDSCAPE DESIGN

4m WIDE ACCESS TRACK

ACCESS TRACK TO EXTEND TO VILLAGE 4 JORDAN SPRINGS AND LAKESIDE PDE.

POST CONSTRUCTION FLOWS ARE TO BE TREATED BY THE EAST LAKE.

EXISTING BASIN TO BE DECOMMISSIONED.

ALL-WEATHER ACCESS TO GPT UNIT AND FIRE VEHICLE BAY - CONFIGURATION TO BE FINALISED IN CC DESIGN.

DRAINAGE CHANNEL AND ACCESS DESIGNED BY SKM AND TO BE CONSTRUCTED BY LEND LEASE IN CONJUNCTION WITH DEVELOPMENT.

FUTURE LOCKABLE GATE FOR DRAINAGE CHANNEL AND GPT ACCESS.

FUTURE LOCAL PARK

JORDAN SPRINGS VILLAGE 4

LEGEND

- PROPOSED STORMWATER DRAINAGE LINE AND PIT
- GPT — GROSS POLLUTANT TRAP
- 1:100YR ARI FLOW PATH
- LIMIT OF WORKS
- 29.0 — DESIGN CONTOUR
- 35.0 — EXISTING CONTOUR
- CATCH DRAIN
- eS — eS — EXISTING SEWER AND STRUCTURE

1:1000 (AT A1)

20 10 0 10 20 30 40 50 60 70 80 90 100

METRES

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JORDAN SPRINGS PARKLANDS ESTATE
STORMWATER DRAINAGE PLAN

PLAN No: 9776/DA04 A

FILE No: 9776DA04

SHEET SIZE: A1 ORIGINAL

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Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015



1:1000 (AT A1)

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METRES

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JORDAN SPRINGS PARKLANDS ESTATE

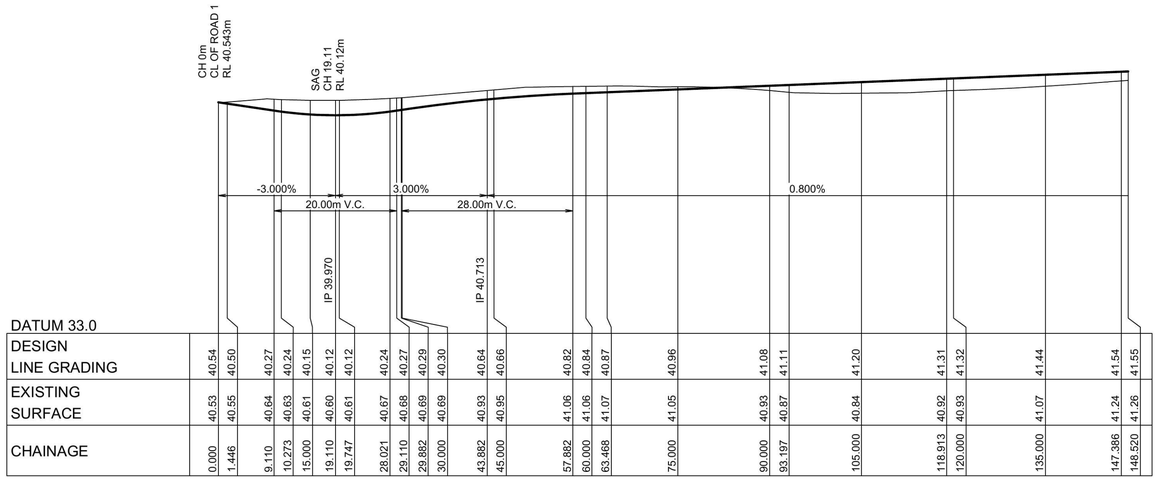
CUT/FILL PLAN AND TREE REMOVAL

PLAN No: 9776/DA05 A

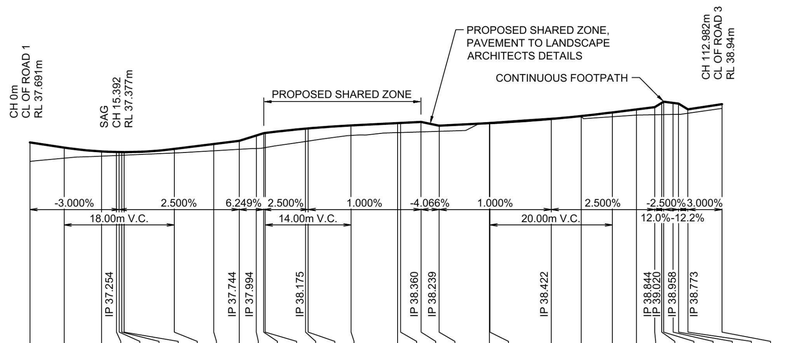
FILE No: 9776DA05

SHEET SIZE: A1 ORIGINAL

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

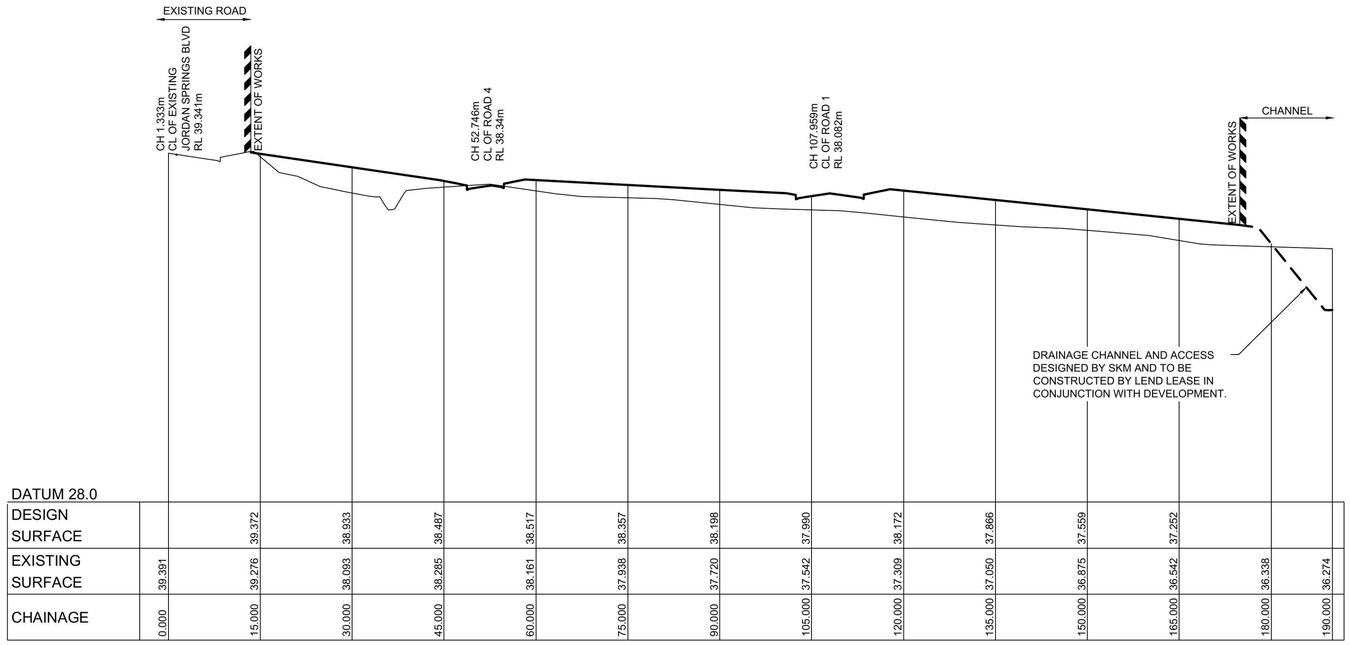

CH 0m
CL OF ROAD 1
RL 40.543m
SAG
CH 19.11
RL 40.12m
-3.000%
3.000%
0.800%
20.00m V.C.
28.00m V.C.
IP 39.970
IP 40.713

| | | |


CH 0m
CL OF ROAD 1
RL 37.691m
SAG
CH 15.392
RL 37.377m
PROPOSED SHARED ZONE
PROPOSED SHARED ZONE,
PAVEMENT TO LANDSCAPE
ARCHITECTS DETAILS
CONTINUOUS FOOTPATH
CH 112.982m
CL OF ROAD 3
RL 38.94m
-3.000%
2.500%
6.249%
2.500%
1.000%
-4.066%
1.000%
2.500%
-2.500%
3.000%
18.00m V.C.
14.00m V.C.
20.00m V.C.
12.0%
-12.2%
IP 37.254
IP 37.744
IP 37.994
IP 38.175
IP 38.360
IP 38.239
IP 38.422
IP 38.844
IP 39.020
IP 38.958
IP 38.773

DATUM 31.0

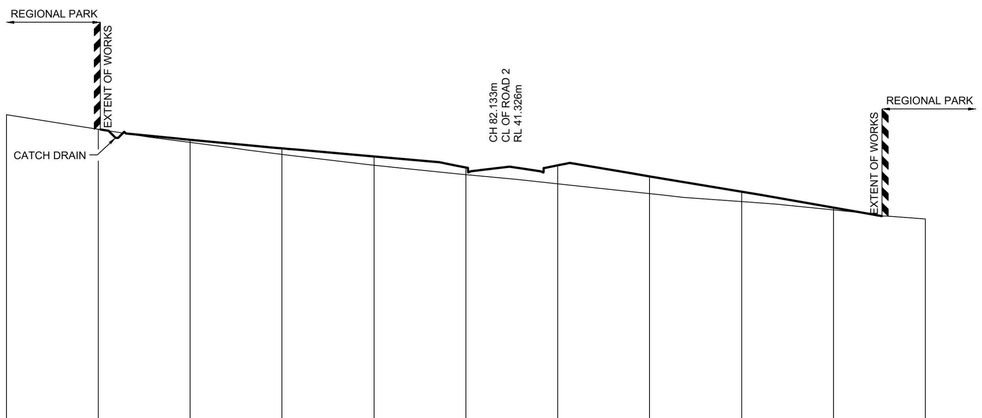
| | | |



DATUM 28.0

DESIGN SURFACE		39.372	38.933	38.487	38.517	38.357	38.198	37.990	38.172	37.866	37.559	37.252		
EXISTING SURFACE	39.391	39.276	38.093	38.285	38.161	37.938	37.720	37.542	37.309	37.050	36.875	36.542	36.338	36.274
CHAINAGE	0.000	15.000	30.000	45.000	60.000	75.000	90.000	105.000	120.000	135.000	150.000	165.000	180.000	190.000

SECTION 2 DA05
SCALE H 1:500
V 1:100



DATUM 33.0

DESIGN SURFACE			42.203	41.922	41.659	41.296	41.369	41.007	40.508	39.988	
EXISTING SURFACE	43.024	42.547	42.119	41.722	41.371	41.062	40.766	40.446	40.184	39.912	39.619
CHAINAGE	0.000	15.000	30.000	45.000	60.000	75.000	90.000	105.000	120.000	135.000	150.000

SECTION 1 DA05
SCALE H 1:500
V 1:100

V 1:100 (AT A1) 2 1 0 1 2 3 4 5 6 7 8 9 10 METRES

H 1:500 (AT A1) 10 0 10 20 30 40 50 METRES

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JORDAN SPRINGS
PARKLANDS ESTATE
SITE SECTIONS

PLAN No: 9776/DA08 A
FILE No: 9776DA08
SHEET SIZE: A1 ORIGINAL

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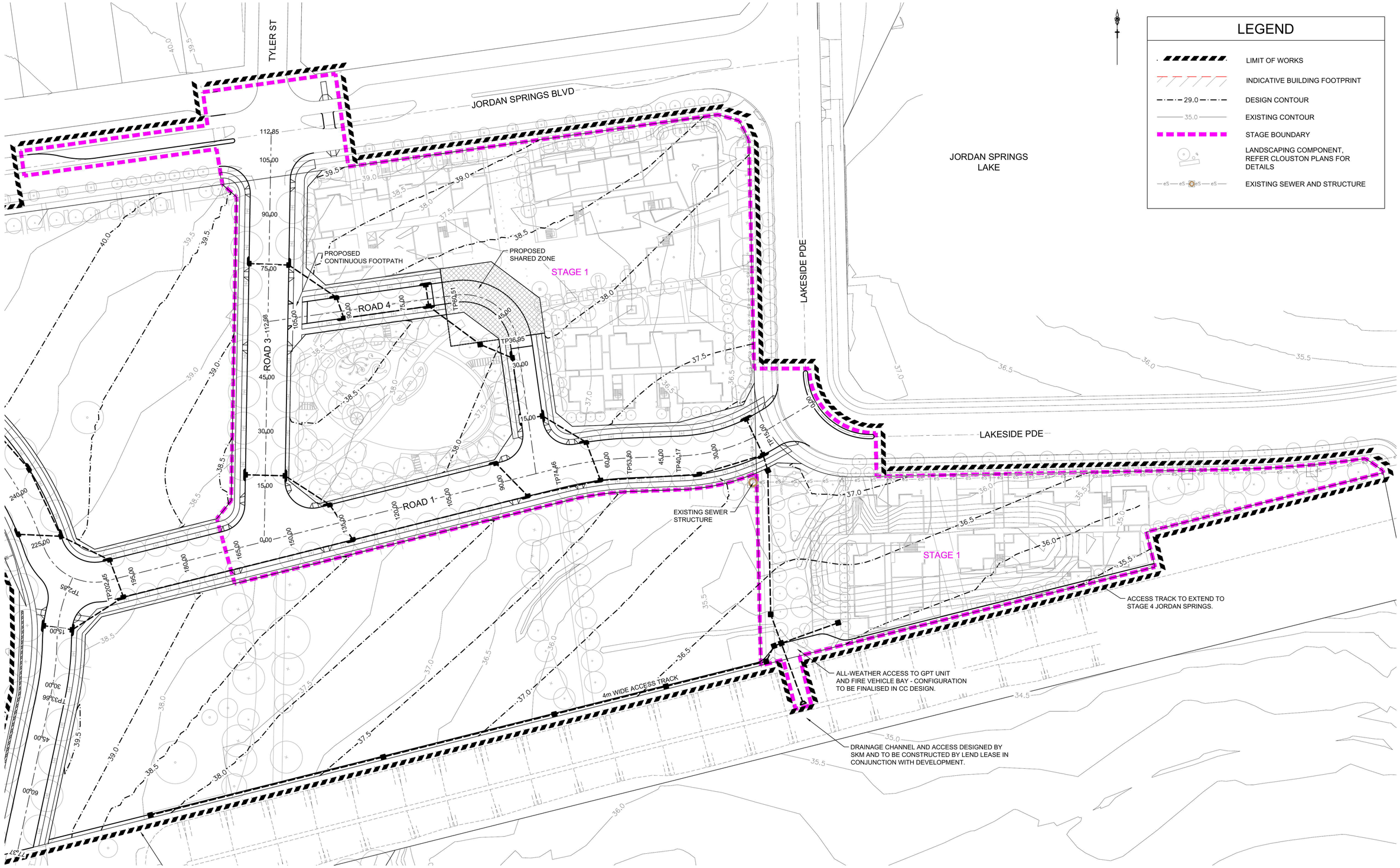

1:500 (AT A1)

10 0 10 20 30 40 50

METRES

Plotted: 12 February , 2015 11:51:11 AM File Name: J:\9776\DA - Development Application Approval Plans\9776DA09.dwg

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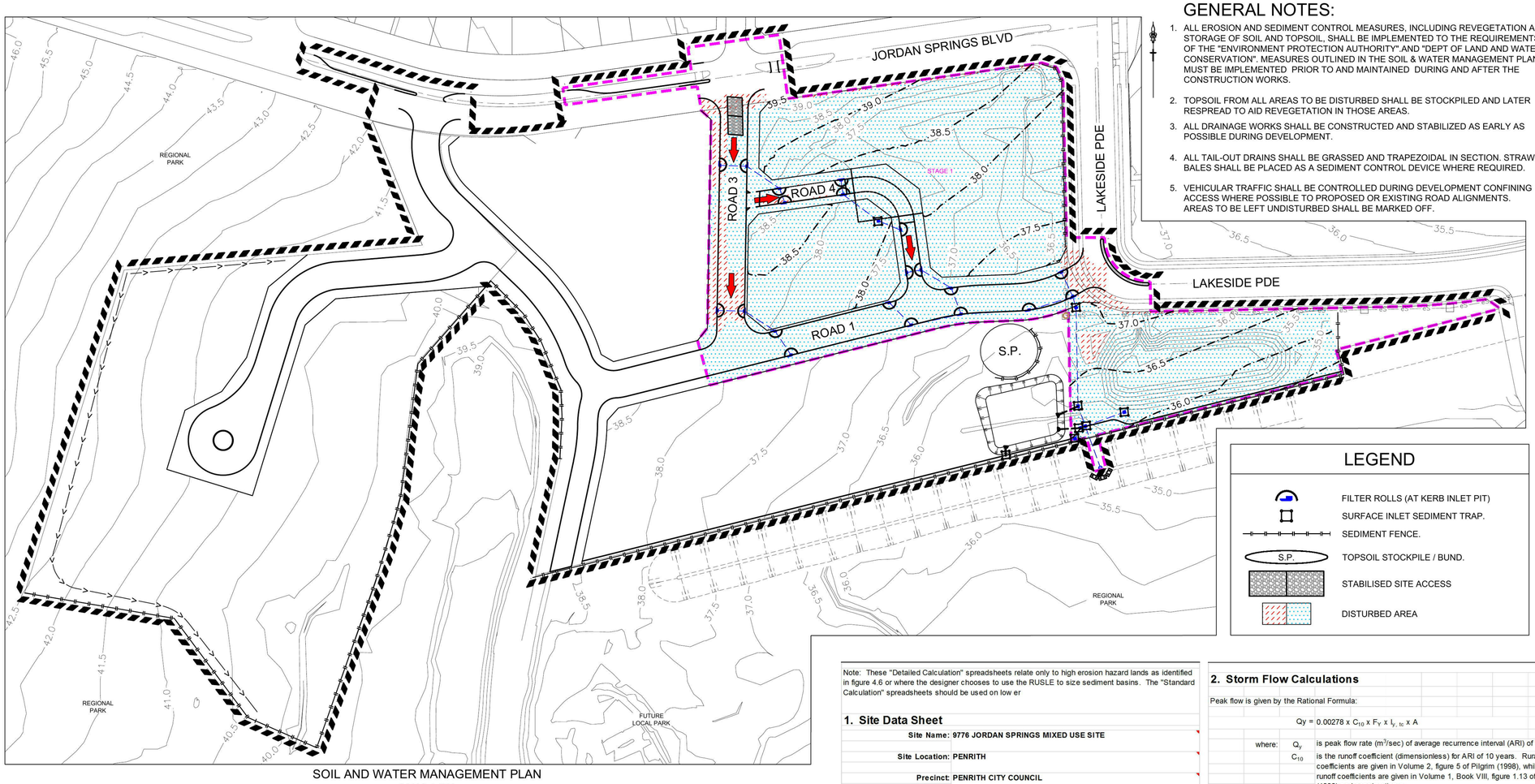
STAGE 1 DETAIL PLAN WITH LANDSCAPE OVERLAY

PLAN No: 9776/DA09 A

FILE No: 9776DA09

SHEET SIZE: A1 ORIGINAL

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015



SOIL AND WATER MANAGEMENT PLAN

SCALE 1:1000

GENERAL NOTES:

1. ALL EROSION AND SEDIMENT CONTROL MEASURES, INCLUDING REVEGETATION AND STORAGE OF SOIL AND TOPSOIL, SHALL BE IMPLEMENTED TO THE REQUIREMENTS OF THE "ENVIRONMENT PROTECTION AUTHORITY".AND "DEPT OF LAND AND WATER CONSERVATION". MEASURES OUTLINED IN THE SOIL & WATER MANAGEMENT PLAN MUST BE IMPLEMENTED PRIOR TO AND MAINTAINED DURING AND AFTER THE CONSTRUCTION WORKS.
2. TOPSOIL FROM ALL AREAS TO BE DISTURBED SHALL BE STOCKPILED AND LATER RESPREAD TO AID REVEGETATION IN THOSE AREAS.
3. ALL DRAINAGE WORKS SHALL BE CONSTRUCTED AND STABILIZED AS EARLY AS POSSIBLE DURING DEVELOPMENT.
4. ALL TAIL-OUT DRAINS SHALL BE GRASSED AND TRAPEZOIDAL IN SECTION. STRAW BALES SHALL BE PLACED AS A SEDIMENT CONTROL DEVICE WHERE REQUIRED.
5. VEHICULAR TRAFFIC SHALL BE CONTROLLED DURING DEVELOPMENT CONFINING ACCESS WHERE POSSIBLE TO PROPOSED OR EXISTING ROAD ALIGNMENTS. AREAS TO BE LEFT UNDISTURBED SHALL BE MARKED OFF.
6. DISTURBANCE OF VEGETATION SHALL BE LIMITED TO FILL AREAS, ROADWAYS AND DRAINAGE LINES. NO LOT GRADING SHALL BE CARRIED OUT IN UNDISTURBED AREAS WITHOUT CONSULTATION WITH COUNCIL'S ENGINEER.
7. ALL DISTURBED AREAS SHALL BE REVEGETATED WITHIN 14 WORKING DAYS FROM THE CONCLUSION OF LAND SHAPING.
8. MINIMISE DUST BY WATERING WHEN REQUIRED.

STOCKPILE NOTES:

9. SPOIL AND TOPSOIL STOCKPILES SHALL BE LOCATED AWAY FROM DRAINAGE LINES AND AREAS WHERE WATER MAY CONCENTRATE.
10. IF STOCKPILES ARE TO BE IN PLACE FOR LONGER THAN 14 DAYS THEN THEY SHALL BE STABILIZED BY COVERING WITH A MULCH OR WITH TEMPORARY VEGETATION.
11. FOLLOWING CONSTRUCTION, TOPSOIL SHALL BE RESPREAD TO A MINIMUM DEPTH OF 100mm ON THE BARE SOIL SURFACES AND REVEGETATE.
12. ALL STOCKPILES TO BE (MAX) 2m HIGH AND PROTECTED WITH SILT FENCE.

SPECIAL NOTES:

13. LOCATION AND EXTENT OF SOIL AND WATER MANAGEMENT DEVICES IS DIAGRAMMATIC ONLY AND THE ACTUAL REQUIREMENTS SHALL BE CONFIRMED ON SITE.
14. THIS PLAN IS TO BE READ IN CONJUNCTION WITH THE GUIDELINES SET OUT IN "MANAGING URBAN STORMWATER SOILS AND CONSTRUCTION " -4TH EDITION AND THE ACCOMPANYING ROAD AND DRAINAGE PLANS.
15. CONFORMITY WITH THIS PLAN SHALL IN NO WAY REDUCE THE RESPONSIBILITY OF THE CONTRACTOR TO PROTECT AGAINST WATER DAMAGE DURING THE COURSE OF THE CONTRACT.
16. MANAGEMENT DEVICES SHALL BE MAINTAINED ON A REGULAR BASIS. WHERE CLEANING IS REQUIRED, THE SEDIMENT SHALL BE REMOVED TO A POINT NOMINATED BY THE ENGINEER.
17. PRIOR TO THE COMMENCEMENT OF ANY EARTHWORKS, AND AFTER THE ROAD CENTRELINES HAVE BEEN PEGGED AND/OR PERMANENTLY MARKED, THE SITE MUST BE INSPECTED BY COUNCIL'S REPRESENTATIVE AND THE APPLICANT'S REPRESENTATIVE TO IDENTIFY AND APPROPRIATELY MARK:-
    a) THE TREES TO BE RETAINED.
    b) ALL TREES TO BE LEFT UNDISTURBED AND TO BE CORDONED OFF.
18. NO TREES SHALL BE REMOVED WITHOUT COUNCIL'S CLEARANCE.
19. MANAGEMENT DEVICES TO REMAIN UNTIL THE END OF THE MAINTENANCE PERIOD.

SEDIMENTATION CONTROL DEVICES:

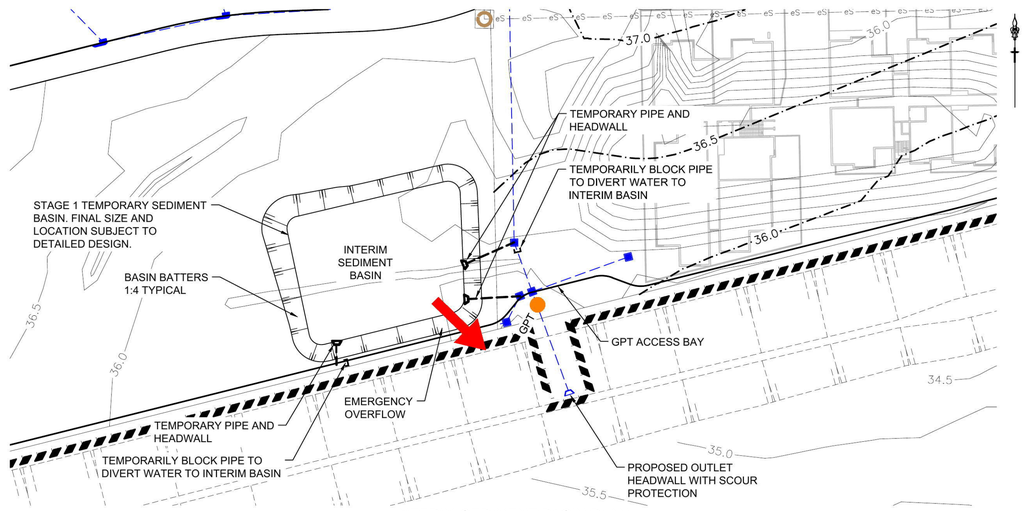
20. ALL STRAW BALES SHALL BE BOUND WITH WIRE. STRAW BALES SHALL BE PLACED END TO END IN A SINGLE ROW AND EMBEDDED INTO THE SOIL TO A DEPTH OF 100mm. EACH BALE SHALL BE SECURELY ANCHORED WITH TWO STEEL STAKES DRIVEN 450mm INTO THE GROUND AND LOCATED ON THE BALE CENTRE LINE.
21. SILT FENCES SHALL BE CONSTRUCTED BY STRETCHING A FILTER FABRIC (PROPEX OR SIMILAR) BETWEEN POSTS AT 2m (3m MAX) CENTRES. FABRIC SHALL BE BURIED 150mm ALONG ITS LOWER EDGE.

SEDIMENTATION POND NOTES:

22. SEDIMENT POND GEOMETRY SHOWN IS INDICATIVE ONLY AND IS SUBJECT TO FINAL DESIGN.

LEGEND

- FILTER ROLLS (AT KERB INLET PIT)
- SURFACE INLET SEDIMENT TRAP.
- SEDIMENT FENCE.
- S.P. — TOPSOIL STOCKPILE / BUND.
- STABILISED SITE ACCESS
- DISTURBED AREA



INTERIM SEDIMENT BASIN PLAN

SCALE 1:500

1:500 (AT A1) — 10 0 10 20 30 40 50 METRES

1:1000 (AT A1) — 20 10 0 10 20 30 40 50 60 70 80 90 100 METRES

Note: These "Detailed Calculation" spreadsheets relate only to high erosion hazard lands as identified in figure 4.6 or where the designer chooses to use the RUSLE to size sediment basins. The "Standard Calculation" spreadsheets should be used on low er

1. Site Data Sheet

Site Name: 9776 JORDAN SPRINGS MIXED USE SITE

Site Location: PENRITH

Precinct: PENRITH CITY COUNCIL

Description of Site: MIXED USE SITE

Site area	Sub-catchments 1						Remarks
Total catchment area (ha)	2.26						
Disturbed catchment area (ha)	2.26						

Soil analysis (enter sediment type if known, or laboratory particle size data)							
Sediment Type (C , F or D) if known:	D						From Appendix C
% sand (fraction 0.02 to 2.00 mm)	10						Soil texture should be assessed through
% silt (fraction 0.002 to 0.02 mm)	30						mechanical dispersion only. Dispersing
% clay (fraction finer than 0.002 mm)	60						agents (e.g. Calgon) should not be used
Dispersion percentage	50.0						E.g. enter 10 for dispersion of 10%
% of whole soil dispersible	37.5						See Section 6.3.3(e). Auto-calculated
Soil Texture Group	D						Automatic calculation from above

Rainfall data							
Design rainfall depth (days)	5						See Sections 6.3.4 (d) and (e)
Design rainfall depth (percentile)	75						See Sections 6.3.4 (f) and (g)
x-day, y-percentile rainfall event	21.8						See Section 6.3.4 (h)
Rainfall R-factor (if known)	2500						See Appendix B
IFD: 2-year, 6-hour storm (if known)	10.1						See IFD chart for the site

RUSLE Factors							
Rainfall erosivity (*R*-factor)	2500						Auto-filled from above
Soil erodibility (*K*-factor)	0.038						
Slope length (m)	160						
Slope gradient (%)	2						RUSLE LS factor calculated for a high rill/interrill ratio.
Length/gradient (*LS*-factor)	0.53						
Erosion control practice (*P*-factor)	1.3	1.3	1.3	1.3	1.3	1.3	
Ground cover (*C*-factor)	1	1	1	1	1	1	

Calculations							
Soil loss (t/ha/yr)	66						
Soil Loss Class	1						See Section 4.4.2(b)
Soil loss (m^3/ha/yr)	51						
Sediment basin storage volume, m^3	20						See Sections 6.3.4(i) and 6.3.5 (e)

2. Storm Flow Calculations

Peak flow is given by the Rational Formula:

$$Q_Y = 0.00278 \times C_{10} \times F_Y \times I_{Y,\,tc} \times A$$

where:
- Q_Y is peak flow rate (m^3/sec) of average recurrence interval (ARI) of "Y" year
- C_{10} is the runoff coefficient (dimensionless) for ARI of 10 years. Rural runoff coefficients are given in Volume 2, figure 5 of Pilgrim (1998), while urban runoff coefficients are given in Volume 1, Book VIII, figure 1.13 of Pilgrim (1998) and construction r
- F_Y is a frequency factor for "Y" years. Rural values are given in Volume 1, Book IV, Table 1.1 of Pilgrim (1998) while urban coefficients are given in Volume 1, Book VIII, Table 1.6 of Pilgrim (1998)
- A is the catchment area in hectares (ha)
- $I_{Y,\,tc}$ is the average rainfall intensity (mm/hr) for an ARI of "Y" years and a design duration of "tc" (minutes or hours)

Time of concentration (t_c) = 0.76 x (A/100)$^{0.38}$ hrs (Volume 1, Book IV of Pilgrim, 1998)

Note: For urban catchments the time of concentration should be determined by more precise calculations or reduced by a factor of 50 per cent.

To automatically halve the calculated time of concentration, place an "x" in this box: x

Peak flow calculations, 1

Site	A (ha)	tc (mins)	Rainfall intensity, I, mm/hr: 1 yr,tc	5 yr,tc	10 yr,tc	20 yr,tc	50 yr,tc	100 yr,tc	C_{10}
1	2.26	6	65.6	111.1	126.6	146.9	173.8	194.5	0.9
									0.9
									0.9

Peak flow calculations, 2

ARI (yrs)	Frequency factor (F_y)	Peak flows: 1 (m^3/s)	(m^3/s)	(m^3/s)	(m^3/s)	(m^3/s)	(m3/s)	Comment
1 yr,tc	0.8	0.297						
5 yr,tc	0.95	0.597						
10 yr,tc	1	0.716						
20 yr,tc	1.05	0.872						
50 yr,tc	1.15	1.130						
100 yr,tc	1.2	1.320						

4. Volume of Sediment Basins, *Type D* and *Type F* Soils

Basin volume = settling zone volume + sediment storage zone volume

Settling Zone Volume

The settling zone volume for *Type F* and *Type D* soils is calculated to provide capacity to contain all runoff expected from up to the y-percentile rainfall event. The volume of the basin's settling zone (V) can be determined as a function of the basin's s

$$V = 10 \times C_v \times A \times R_{x\text{-day},\ y\text{-}\%ile}\ (m^3)$$

where:

10 = a unit conversion factor

C_v = the volumetric runoff coefficient defined as that portion of rainfall that runs off as stormwater over the x-day period

$R_{x\text{-day},\ y\text{-}\%ile}$ = is the x-day total rainfall depth (mm) that is not exceeded in y percent of rainfall events. (See Sections 6.3.4(d), (e), (f), (g) and (h)).

A = total catchment area (ha)

Sediment Storage Zone Volume

In the detailed calculation on Soil Loss Classes 1 to 4 lands, the sediment storage zone can be taken as 50 percent of the settling zone capacity. Alternately designers can design the zone to store the 2-month soil loss as calculated by the RUSLE (Sectio

Place an "X" in the box below to show the sediment storage zone design parameters used here:

- [ ] 50% of settling zone capacity,
- [x] 2 months soil loss calculated by RUSLE

Total Basin Volume

Site	C_v	$R_{x\text{-day},\ y\text{-}\%ile}$	Total catchment area (ha)	Settling zone volume (m^3)	Sediment storage volume (m^3)	Total basin volume (m^3)
1	0.50	21.8	2.26	246.34	20	266.34

A	ISSUED FOR DEVELOPMENT APPLICATION	AS	AS	DJH	MS	21/11/14
	AMENDMENT	DES	DRN	CKD	APR	DATE

J. WYNDHAM PRINCE — CONSULTING CIVIL INFRASTRUCTURE ENGINEERS & PROJECT MANAGERS

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AZIMUTH: AHD
DATUM: MGA
ORIGIN:

CLIENT: CID GROUP

PROJECT COORDINATOR: SYNERGY DEVELOPMENT GROUP

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JORDAN SPRINGS
PARKLANDS ESTATE
STAGE 1 TEMPORARY SEDIMENT BASIN
& SOIL & WATER MANAGEMENT PLAN

PLAN No: 9776/DA10 A
FILE No: 9776DA10
SHEET SIZE: A1 ORIGINAL

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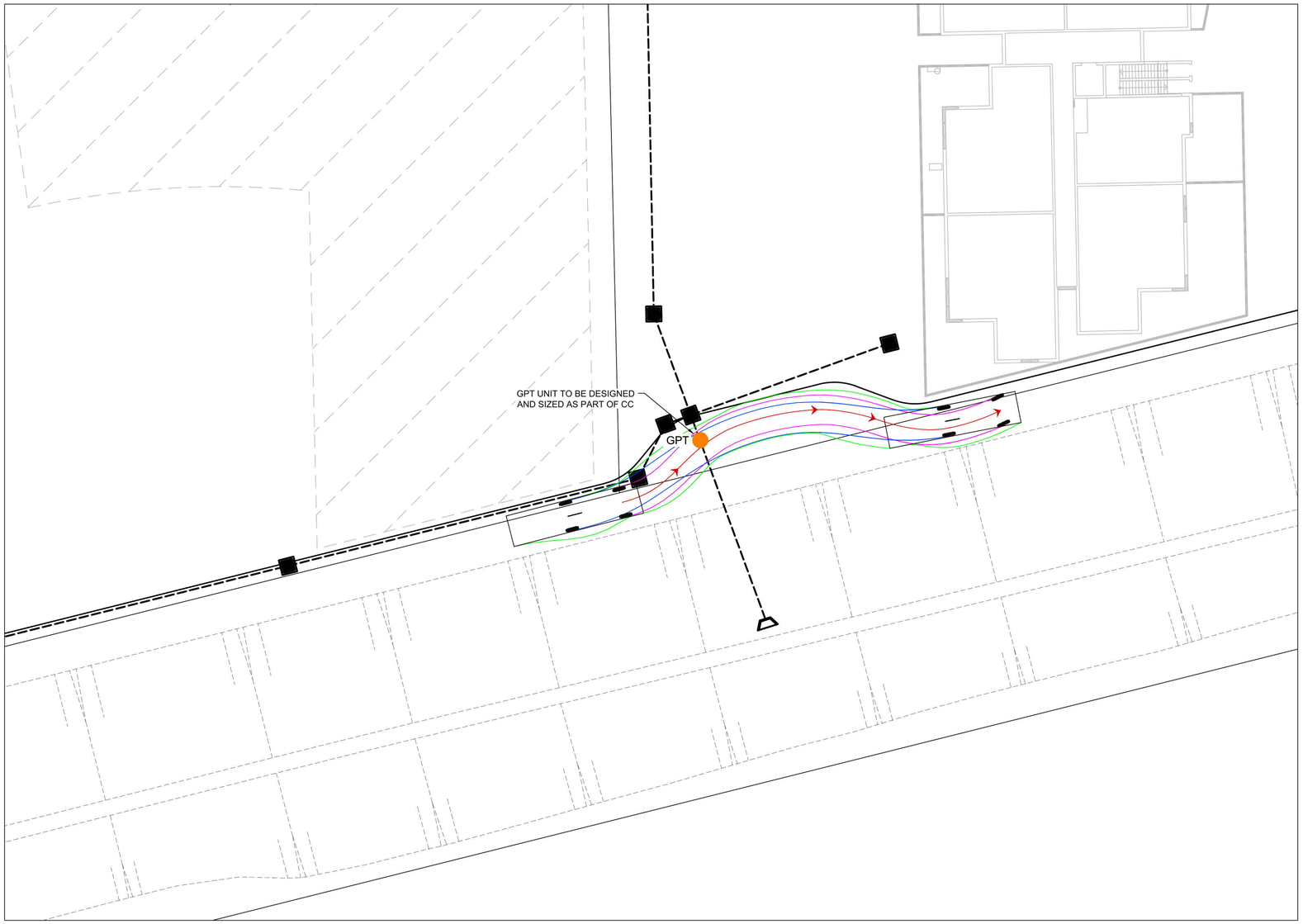

1:200 (AT A1)

4 2 0 4 8 12 16 20

METRES

A	ISSUED FOR DEVELOPMENT APPLICATION	AS	AS	DJH	MS	21/11/14
	AMENDMENT	DES	DRN	CKD	APR	DATE

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JORDAN SPRINGS
PARKLANDS ESTATE
GPT ACCESS PLAN

PLAN No: 9776/DA11 A

FILE No: 9776DA11

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GTAconsultants



Jordan Springs Parklands Estate Stage 1 Transport Impact Assessment

Client // C.I.D Group
Office // NSW
Reference // 14S1013100
Date // 12/02/15

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Jordan Springs Parklands Estate

Stage 1

Transport Impact Assessment

Issue: A 12/02/15

Client: C.I.D Group
Reference: 14S1013100
GTA Consultants Office: NSW

Quality Record

Issue	Date	Description	Prepared By	Checked By	Approved By	Signed
A	12/02/15	Final	Ashish Modessa	Wayne Johnson	Ken Hollyoak	

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Table of Contents

1.	**Introduction**	**1**
1.1	Background	1
1.2	Purpose of this Report	2
1.3	References	2
2.	**Jordan Springs Residential Subdivision**	**3**
2.1	Previous Studies and Assumptions	3
2.2	Road System	4
2.3	Traffic Flows and Assessment	6
2.4	Public Transport	8
2.5	Walking and Cycling	8
3.	**Development Proposal – Parklands Estate, Stage 1**	**10**
3.1	Development Schedule	10
3.2	Road Network	11
3.3	Pedestrian Facilities	11
3.4	Off-Street Parking Facilities	12
3.5	Bicycle Facilities	12
3.6	Loading Areas/ Refuse Collection	12
3.7	Cross Sectional Layout	13
4.	**Parking and Loading – PE, Stage 1**	**14**
4.1	Car Parking Provisions	14
4.2	Accessible Parking	15
4.3	Bicycle Parking	15
4.4	Car Parking and Loading Layout Review	15
5.	**Traffic Impact Assessment – PE, Stage 1**	**16**
5.1	Summary of Approved or Pending Approval Developments	16
5.2	Parklands Estate Stage 1 – Trip Generation	16
5.3	Trip Forecasting	17
5.4	Background Traffic	19
5.5	St Marys Central Precinct	20
5.6	Traffic Distribution and Assignment	20
5.7	Intersection Operation	21
5.8	The Northern Road Access - Road Capacity Check	23
6.	**Conclusion**	**25**

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Appendices

A: Signal Layouts for Jordan Springs Intersections

B: Western Precinct Traffic Forecasts

C: Parklands Estate, Stage 1 Site Layout Plans

Figures

Figure 1.1:	Context of Parklands Estate within Jordan Springs residential subdivision	1
Figure 2.1:	Context of Jordan Springs within St Marys Redevelopment Area	3
Figure 2.2:	Jordan Springs Framework Plan	5
Figure 2.3:	Jordan Springs Traffic Forecasts	7
Figure 2.4:	Local Bus Network	8
Figure 2.5:	Pedestrian and Cycle Network	9
Figure 3.1:	Parklands Estate Mixed Use Development – Stage 1 Layout	10
Figure 3.2:	Parklands Estate – Stage 1 Road Layout	11
Figure 5.1:	Anticipated 2016 Traffic Volumes (Weekday AM)	20
Figure 5.2:	Anticipated 2026 Traffic Volumes (Weekday AM)	20
Figure 5.3:	Anticipated 2016 Traffic Volumes (Weekday PM)	21
Figure 5.4:	Anticipated 2026 Traffic Volumes (Weekday PM)	21
Figure 5.5:	Anticipated 2016 Traffic Volumes (Saturday Midday)	21
Figure 5.6:	Anticipated 2026 Traffic Volumes (Saturday Midday)	21

Tables

Table 4.1:	Penrith DCP or DCS Off-street Car Parking Requirements	14
Table 4.2:	DCP or DCS On-street Accessible Car Parking Requirements	15
Table 5.1:	Estimated Development Traffic Generation – Weekday Peak Hour	17
Table 5.2:	Estimated Development Traffic Generation – Saturday Peak Hour	17
Table 5.3:	Jordan Springs Residential Development Trip Forecasting	18
Table 5.4:	2011 Surveyed Peak Hour Traffic Volumes	19
Table 5.5:	2014 Surveyed Peak Hour Traffic Volumes	19
Table 5.6:	SIDRA INTERSECTION Level of Service Criteria	22
Table 5.7:	2016 Traffic Analysis Results – AM, PM and Saturday Midday Peak	22
Table 5.8:	2026 Traffic Analysis Results – AM, PM and Saturday Midday Peak	23
Table 5.9:	Jordan Springs – Road Network Forecasted Traffic Volumes – including Parklands Estate	23

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

1. Introduction

1.1 Background

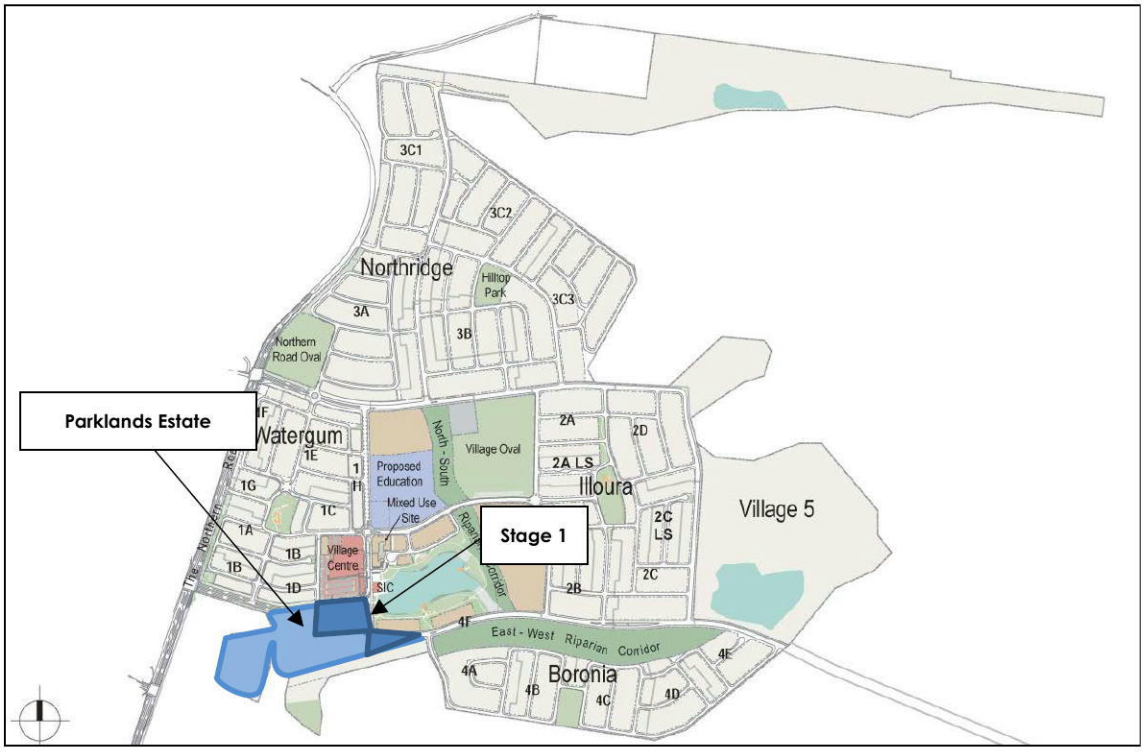
A development application is to be lodged with Penrith City Council for Stage 1 of the proposed Parklands Estate mixed use development (PE, Stage 1). Parklands Estate is located on the southern side of Jordan Springs Boulevard within the Jordan Springs residential subdivision. Jordan Springs is a part of a larger St Marys development site.

The Parklands Estate mixed use development consists of the 847 units and 614m^2 of commercial space. The breakdown on the development in the proposed stages is as follows:

- Stage 1 – 201 units, including three Live/ Work units, 614m^2 commercial space (four suites)
- Stage 2 – 231 units
- Stage 3 – 55 units
- Stage 4 – 241 units
- Stage 5 – 119 units.

The context of the proposed site within the Jordan Springs residential subdivision is shown in Figure 1.1.

Figure 1.1: Context of Parklands Estate within Jordan Springs residential subdivision



Basemap Source: Lend Lease

GTA Consultants was commissioned by C.I.D. Group in August 2014 to undertake a transport impact assessment for Stage 1 of the development, located towards the north-east and east side of Parklands Estate.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

In undertaking this study, consideration was given to previous planning works undertaken for the entire Jordan Springs residential subdivision as well as other precincts within the St Marys development site that produced an indicative development mix and road system for each of the precincts.

1.2 Purpose of this Report

This report sets out an assessment of the anticipated transport implications of the proposed development, including consideration of the following:

i existing traffic and parking conditions surrounding the site
ii suitability of the proposed parking in terms of supply (quantum) and layout
iii service vehicle requirements
iv pedestrian and bicycle requirements
v the traffic generating characteristics of the proposed development
vi suitability of the proposed access arrangements for the site
vii the transport impact of the development proposal on the surrounding road network.

1.3 References

In preparing this report, reference has been made to the following:

- Penrith Council Development Control Plan (DCP) 2010
- Western Precinct & Central Precinct St Marys Precinct Plans and Development Control Strategies, JBA, 2009
- Parklands Estate Master Plan Transport Impact Assessment, GTA Consultants, 2014
- plans for the proposed development prepared by Mosca Pserras Architects (mpa), Revision Preliminary for Consultants (P1), dated [26 11 2014]
- other documents and data as referenced in this report.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

2. Jordan Springs Residential Subdivision

The Jordan Springs residential subdivision has been the subject of numerous studies, which have defined the land use, assessed the traffic generation and its external implications, broadly defined the structure of the road system within the site, and developed a traffic management strategy for the Precinct.

2.1 Previous Studies and Assumptions

The regional traffic and transport implications of the St Marys development site have previously been considered for the site as a whole, including the Jordan Springs (Western Precinct), Central and Ropes Crossing (Eastern) Precincts.

Figure 2.1 shows Jordan Springs (shown as Western Precinct in the figure), Central Precinct, Dunheved and Eastern Precinct within the entire St Marys re-development.

Figure 2.1: Context of Jordan Springs within St Marys Redevelopment Area



Source: Western Precinct St Marys Precinct Plan and Development Control Strategy (JBA, 2009).

The Central Precinct of the St Marys re-development area has not been constructed. There is currently no direct road connection between the Eastern Precinct (Ropes Crossing) and Jordan Springs.

Studies of particular relevance to the Parklands Estate development are:

- *St Marys Development Revised Transport Management Plan Traffic Study (Sims Varley, 2004)*
- *St Marys Development Transport Management Study (SKM, 2007)*
- *St Marys Western Precinct Plan Traffic and Transport Report (SKM, 2009)*
- *St Marys Central Precinct Plan Traffic and Transport Report (SKM, 2009)*
- *Western Precinct St Marys Precinct Plan and Development Control Strategy (JBA, 2009)*
- *Parklands Estate Master Plan Transport Impact Assessment (GTA, 2014).*

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

The traffic planning management outlined in the previous traffic and transport reports and Precinct Plans are briefly reviewed below and form some of the background to the review of the Parklands Estate development.

2.1.1 Historical Jordan Springs Development Applications

Previous development applications have been submitted for the Jordan Springs residential subdivision. The documents, which describe the traffic impacts of these development applications, are listed below:

- *Western Precinct Villages 1A, 1B and 1C Traffic Assessment (Halcrow, 2009)*
- *Western Precinct Village 1D Builders Display Village Traffic Assessment (Halcrow, 2010)*
- *Western Precinct Villages 1E - 1G Traffic Assessment (Halcrow, 2010)*
- *Western Precinct Main Street Extension (Halcrow 2010)*
- *Western Precinct Village 2 Traffic Assessment (Halcrow, 2011)*
- *Western Precinct Village 3A Traffic Assessment (Halcrow, 2011)*
- *Western Precinct Village 3B Traffic Assessment (Halcrow, 2011)*
- *Jordan Springs – Relocation of the Builders Display Village Car Park Traffic Assessment (Halcrow, 2011)*
- *Jordan Springs Village 4 and Road 21 Traffic Assessment (GTA Consultants, 2012)*
- *Jordan Springs – Builders Display Village Car Park No. 2 Traffic Assessment (GTA Consultants, 2012)*
- *Jordan Springs – North Lake Access Road - Traffic Assessment (GTA Consultants, 2012)*
- *Jordan Springs Village 3C, Stage 1 – Traffic Assessment (GTA Consultants, June 2013)*
- *Jordan Springs Village 3C, Stage 2 – Traffic Assessment (GTA Consultants, August 2013)*
- *Jordan Springs Village 12 – Traffic Assessment (GTA Consultants, February 2014)*
- *Jordan Springs Village 3C, Stage 3 – Traffic Assessment (GTA Consultants, April 2014)*
- *Jordan Springs Village 5 – Traffic Assessment (GTA Consultants, July 2014)*
- *Jordan Springs Village 2 Residue Lots Traffic Assessment (GTA Consultants, October 2014).*

2.2 Road System

The main collector road system through Jordan Springs consists of a loop around the centre of the Precinct, with two roads (Jordan Springs Boulevard and Greenwood Parkway) leading off in a westerly direction to The Northern Road. The western (north-south orientated) road of the loop would be a "main street", also known as Lakeside Parade, providing access to the Village Centre. Figure 2.2 shows the Framework Plan.

The easterly connection through the Regional Park to the Central Precinct has changed slightly from the Framework Plan. Central Precinct will now connect with Lakeside Parade which is located south of the Village Centre as opposed to north of the Village Centre as indicated in the Framework Plan.

The road connections to The Northern Road for Jordan Springs include the following:

- Northern – Village 3C Stage 1 Road 1 (left-in/ left-out) access
- Central (north) – Greenwood Parkway/ Borrowdale Way (four-way signalised)
- Central (south) – Watkin Street (left-in/ left-out) access
- Southern – Jordan Springs Boulevard (three-way signalised).

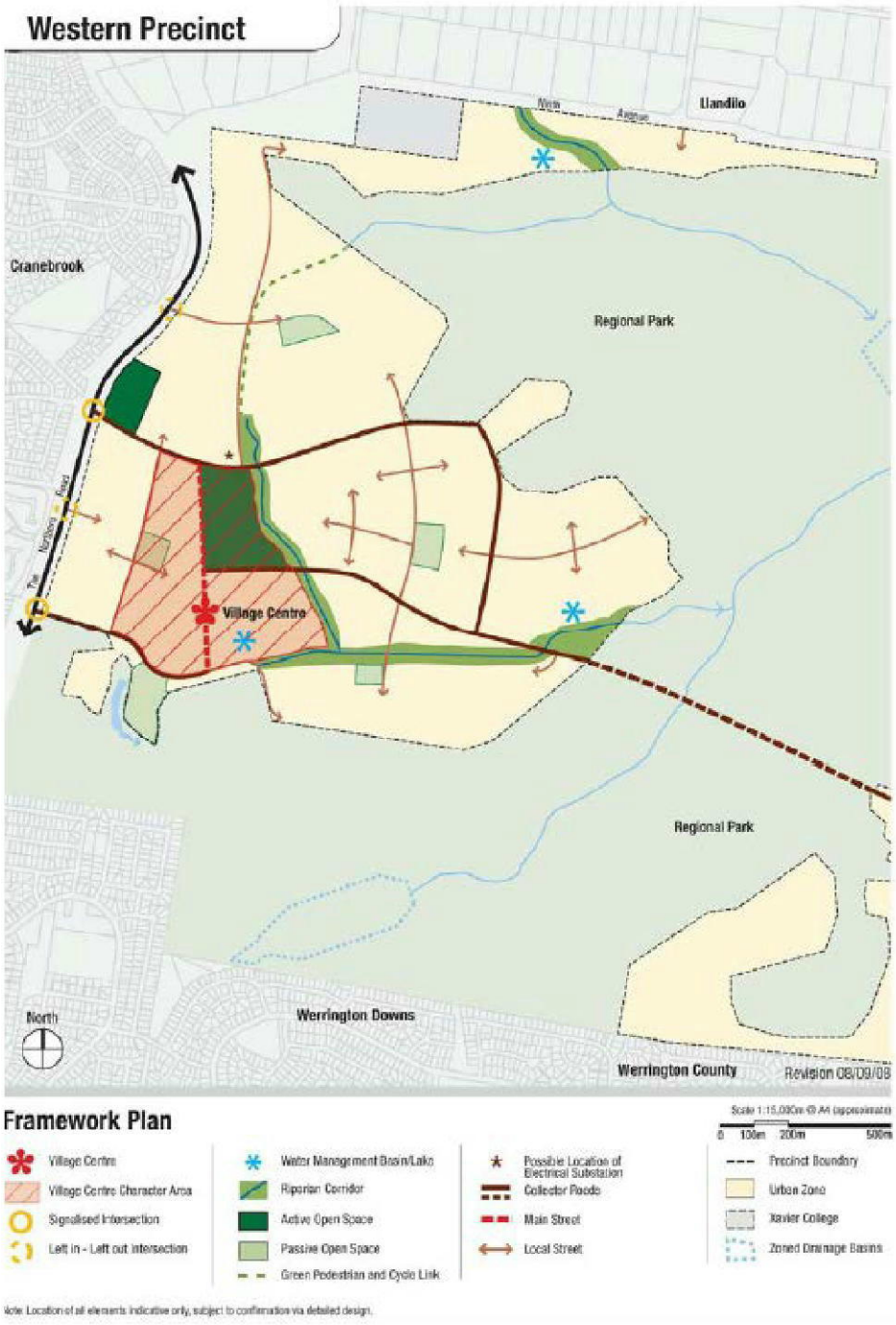
The Northern Road is currently being upgraded from Andrews Road to Borrowdale Road. The Northern Road will have two travel lanes in each direction, separated by a median.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

The Jordan Springs ultimate connections with The Northern Road are proposed to be completed by mid-2015 along with the upgrade of The Northern Road, except for the left-in/ left-out intersection at Village 3C Stage 1, which is to be constructed separately following The Northern Road upgrade.

The layout of the intersection of The Northern Road with Greenwood Parkway/ Borrowdale Way is shown in Appendix A.

Figure 2.2: Jordan Springs Framework Plan



Source: St Marys Western Precinct Plan Traffic and Transport Report, SKM, May 2009.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

2.3 Traffic Flows and Assessment

The SKM Western Precinct Plan Traffic and Transport report presents morning peak hour link flows at representative locations on the primary internal road network of the Jordan Springs (Western Precinct) as a whole. These were developed by dividing the area into twelve sub-areas and applying the assumptions used in the Sims Varley study (2004).

The estimated mid-block two way flows per hour are shown in Figure 2.3. Whilst the road layout for Jordan Springs Boulevard has altered since the preparation of this plan, the traffic volume estimates are still applicable.

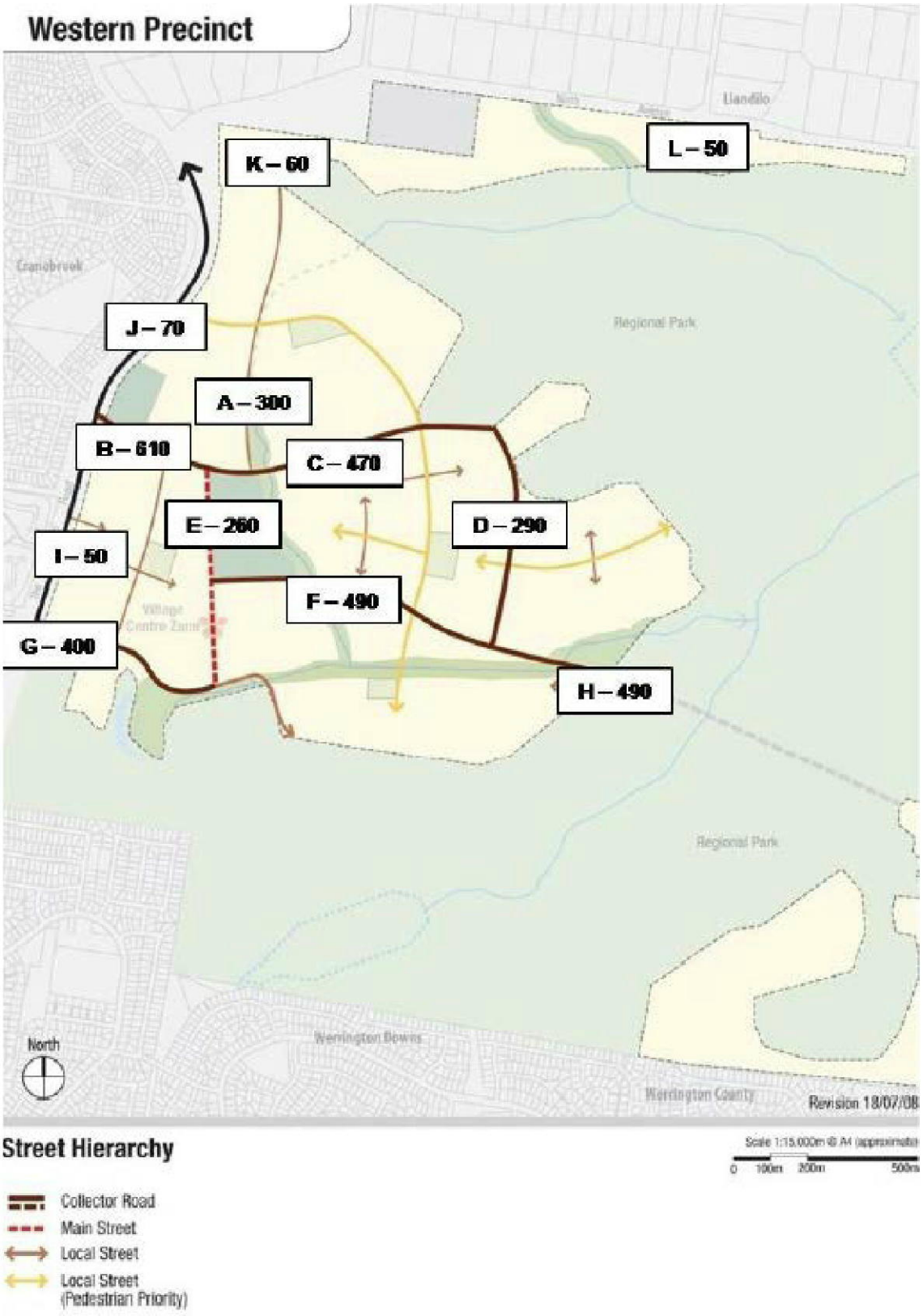
Halcrow Traffic Consultants prepared a traffic assessment for the entire Western Precinct in order to consider the traffic context of the proposals in the Western Precinct subdivision. The traffic assessment considered the initial findings of the SKM report and refined the traffic forecasts based on the proposed collector road layout.

The traffic assessment for the completed state of the entire Western Precinct including the Village Centre as provided in the previous reports is generally still applicable; however it does not include the proposed Parklands Estate Masterplan. A summary of the traffic assessment is contained in Appendix B.

The traffic assessment of the full Western Precinct development assumed indicative retail, community, commercial and educational land uses.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Figure 2.3: Jordan Springs Traffic Forecasts



Source: St Marys Western Precinct Plan Traffic and Transport Report, SKM, May 2009.

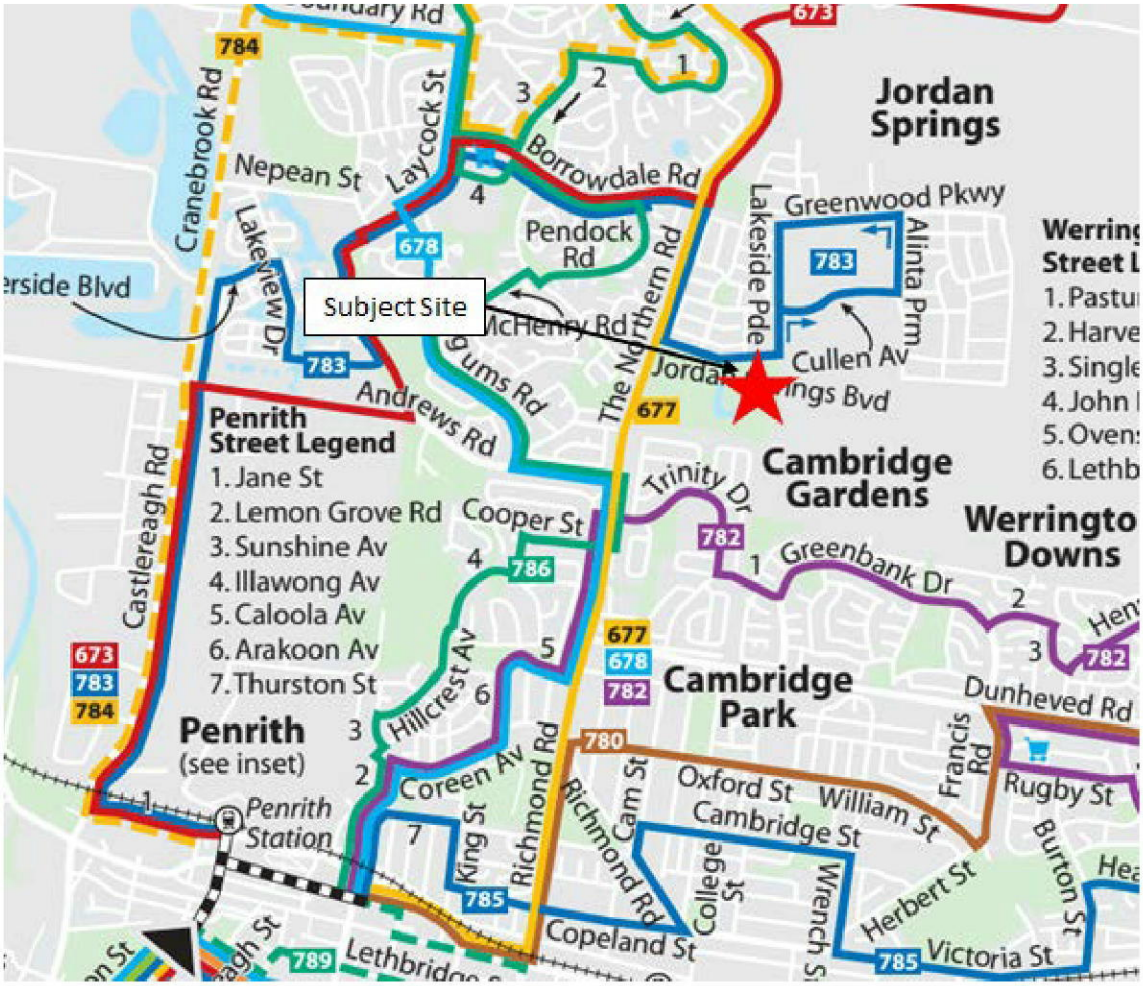
Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

2.4 Public Transport

Bus route 783 (Penrith and Jordan Springs Loop) operates within walking distance to the site. Services operate on approximately half hour intervals between 6:42am and 7:44pm on a typical weekday. Additionally, bus services 673, 677 and 786 are within walking distance to the site, these provide alternate access to Penrith Railway Station. Other limited bus services on routes 673 and 677 connect the site to Windsor and Richmond.

A network route is shown in Figure 2.4.

Figure 2.4: Local Bus Network



Source: Busways

2.5 Walking and Cycling

Pedestrian and cyclist facilities are included in the 'Western Precinct Development Control Strategy', noting that routes would be refined as the project proceeds. Local roads would carry low traffic volumes, and would be suitable for cyclists in mixed traffic conditions. Shared cycle and pedestrian paths are proposed along the major internal roads, as well as a network of pedestrian paths.

Figure 2.5 shows the pedestrian and bicycle network as defined in the Framework Plan.

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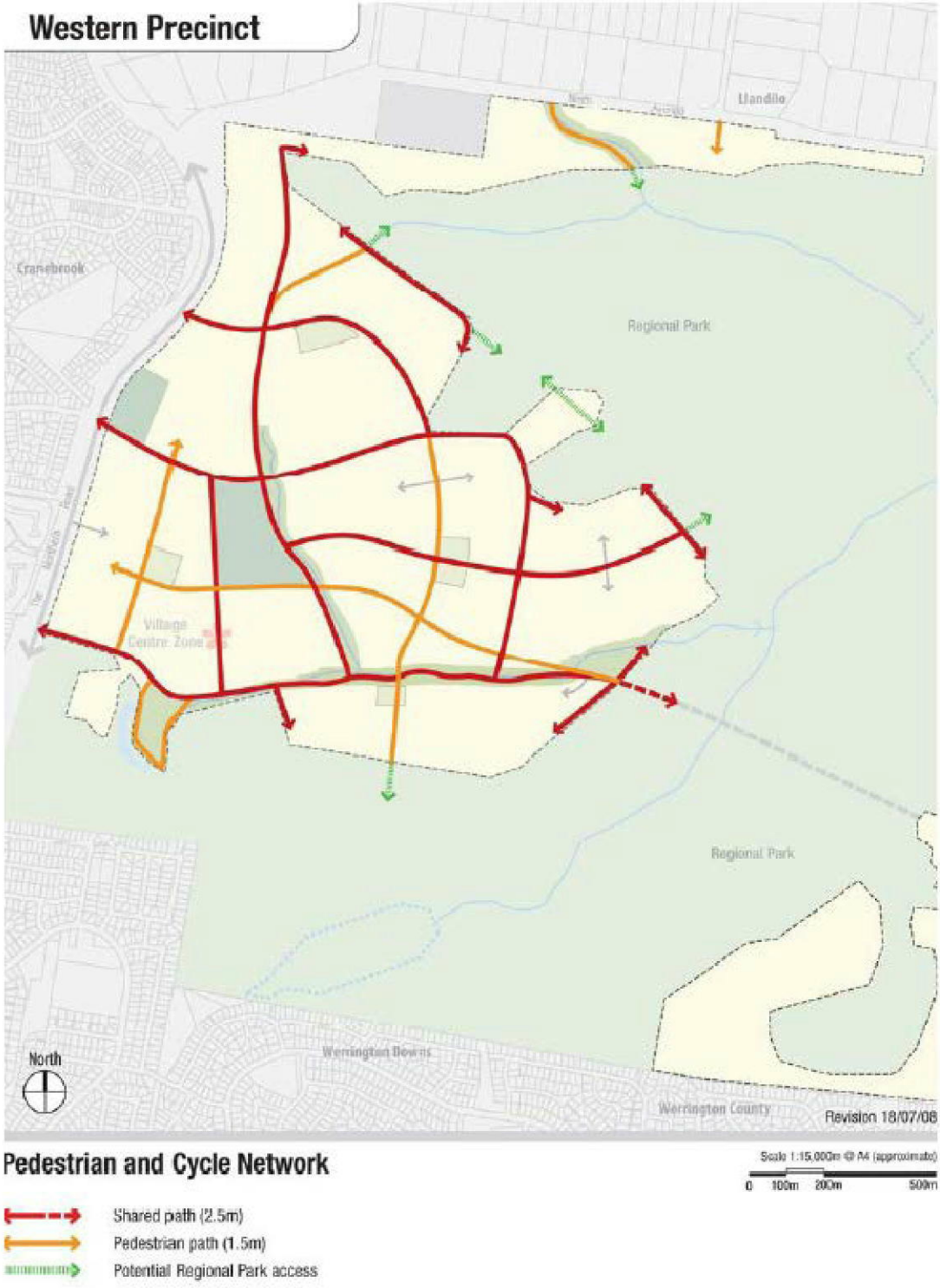
Version: 1, Version Date: 27/02/2015

Figure 2.5: Pedestrian and Cycle Network



Source: St Marys Western Precinct Plan Traffic and Transport Report, SKM, May 2009

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Version: 1, Version Date: 27/02/2015

3. Development Proposal – Parklands Estate, Stage 1

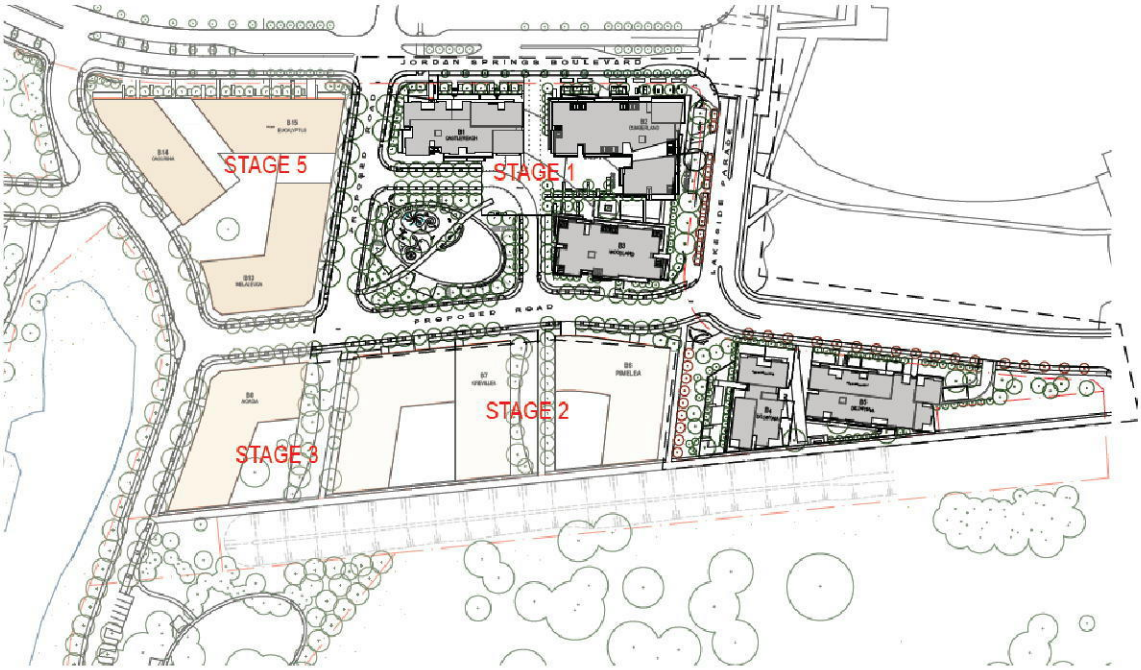
3.1 Development Schedule

The proposed Parklands Estate, Stage 1 mixed use development is located on the north-east and east side of Parklands East and consists of five buildings with the following land use mix:

- 27 one bedroom units
- 158 two bedroom units (including 3 live/ work units)
- 16 three bedroom units
- 614m^2 of commercial space (4 suites).

The layout of the Parkland Estate, Stage 1 development is shown below in Figure 3.1. The site layout plan and development schedule are provided in Appendix C.

Figure 3.1: Parklands Estate Mixed Use Development – Stage 1 Layout



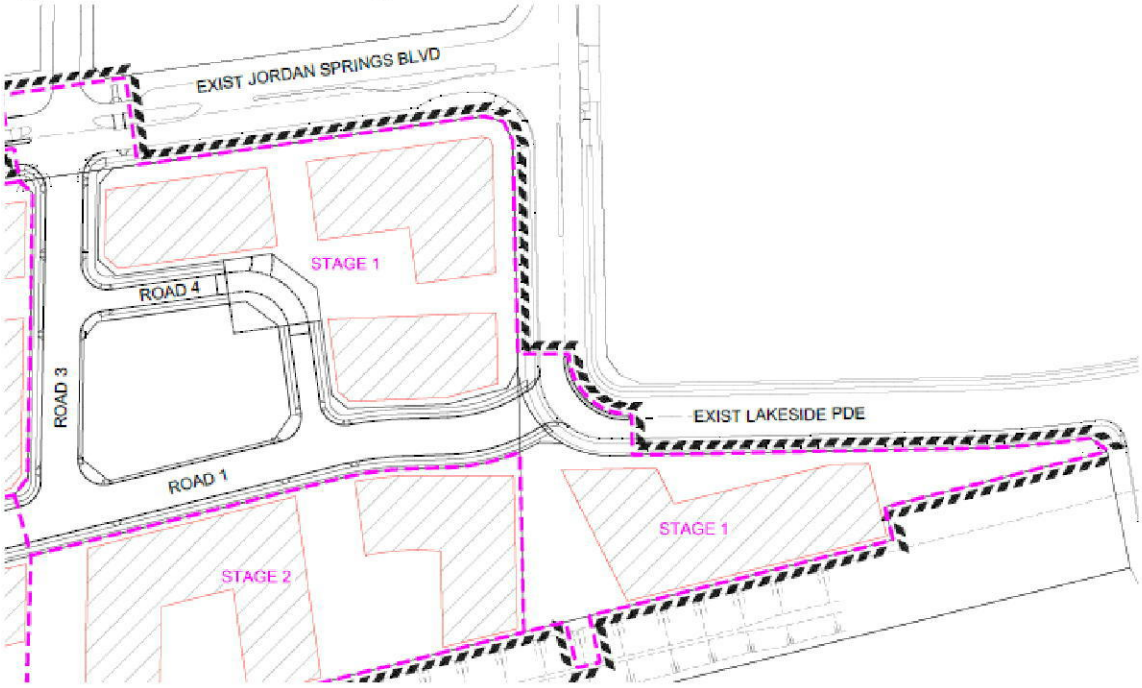
Background Image Source: Mosca Pserras Architects dated 17 December 2014

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

3.2 Road Network

The proposed road layout for Stage 1 of the proposed Parklands Estate development is shown below in Figure 3.2.

Figure 3.2: Parklands Estate – Stage 1 Road Layout



Background Image Source: JWP

There are two access points to be provided for Stage 1 of the Parklands Estate development. The access points would be located on roads internal to Jordan Springs. The proposed development access points include:

- Road 3 from Jordan Springs Boulevard to accommodate all turning movements. A 35m right turn bay will be constructed on Jordan Springs Boulevard for access into Road 3.
- Road 1 from Lakeside Parade to accommodate left in/ left out movements only.

Road 4 links Roads 1 and 3 around the northern and eastern perimeter of the proposed Park. Road 4 is proposed to include a raised perimeter treatment on approach to Roads 1 and 3. A raised threshold treatment is also proposed at the north-east corner of the Park.

The proposed intersections in Stage 1 and the access points from Jordan Springs Boulevard and Lakeside Parade are to be Give Way controlled. Notwithstanding, the safety of the intersection sight distance at the intersections would be assessed as part of the Detailed Design Road Safety Audit.

3.3 Pedestrian Facilities

A 1.5m wide pedestrian footpath is proposed on both sides of the roads within Stage 1, except on the western and southern side of the proposed Central Park.

A 2.5m wide shared path is proposed along the site frontage on Lakeside Parade and on the east side of Road 3 (between Jordan Springs Boulevard and Road 4).

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

3.4 Off-Street Parking Facilities

The development proposal comprises of five buildings (B1, B2, B3, B4 and B5). B1 provides two levels of basement car parking. B2 and B3 share two levels of basement parking. A shared two level basement car park is also provided for B4 and B5.

Access to the three basement car parks are provided via three vehicular crossovers that include:

- a 6m wide two-way driveway on Road 4 (Building 1 car park)
- a 6m wide two-way driveway on Road 1 (Building 2 & 3 car park)
- a 6m wide two-way driveway on Lakeside Parade (Building 4 & 5 carpark).

A total of 368 off-street car spaces are provided for Stage 1 across the three car parking facilities. The breakdown of the proposed car parking supply is as follows:

- Building 1 car park:
  - Residential – 48 spaces (including 3 accessible spaces)
  - Visitor – 7 spaces
  - Total – 55 spaces
- Building 2 & 3 car park:
  - Residential – 162 spaces (10 accessible spaces)
  - Visitor – 21 spaces
  - Commercial – 25 spaces (including 2 accessible spaces)
  - Total – 208 spaces
- Building 4 & 5 car park:
  - Residential – 95 spaces (including 12 accessible spaces)
  - Visitor – 13 spaces
  - Total – 108 spaces.

In addition, 3 motorcycle parking spaces are provided in the Building 1 car park and 7 in the Building 2 & 3 car park.

The suitability of the proposed access arrangement is discussed in Section 4 of this report.

3.5 Bicycle Facilities

The development proposal provides the following bicycle facilities in the basement car parks:

- Building 1 – 1 bicycle rack (5 bicycles)
- Building 2 & 3 – 7 bicycle racks (35 bicycles)
- Building 4 & 5 – 3 bicycles racks (15 bicycles).

3.6 Loading Areas/ Refuse Collection

A Shared Zone is proposed between Building 1 and Building 2 to service loading activities and refuse collection for the two buildings. The proposed Shared Zone connects Road 4 from the development with Jordan Springs Boulevard. A 4.5m one-way service egress driveway crossover is proposed from the Shared Zone on to Jordan Springs Boulevard.

Approval for the Shared Zone will be obtained from Penrith City Council and Roads and Maritime Services at a later stage.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

For Buildings 3 and 4/5, loading/unloading and refuse collection will occur from the road kerbside.

3.7 Cross Sectional Layout

The majority of roads within Stage 1 are proposed to be local streets with the following characteristics:

- 8.0 m or 11.0 m carriageways
- On-street parallel car parking on one or both sides of the road
- 1.5 m or 2.5 m wide footpaths and/ or shared paths on both sides of the road.

All local streets within the mixed use development have been designed as per the St Marys Western Precinct Plan.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

4. Parking and Loading – PE, Stage 1

4.1 Car Parking Provisions

The on-site parking provision requirements for various land uses are set out in the Development Control Strategy (DCS) in the Western Precinct Plan (WPP) for residential land uses and the Penrith City Council's Development Control Plan (DCP) 2010, Part C10 Transport, Access and Parking for all other land uses.

The DCS prevails the DCP for residential land uses and applies to the development site, an overall rate of 1 to 2 car spaces is required for apartments. There is a requirement for 1 visitor parking space for every 5 units under the DCS.

A review of the car parking rates for the proposed mixed use development and the proposed parking provisions are summarised in Table 4.1.

Table 4.1: Penrith DCP or DCS Off-street Car Parking Requirements

Building	Use	DCP or DCS Parking Rate	DCP or DCS Off-Street Parking Requirement	Parking Provision
Building 1	1 bedroom units (6)	1 space per unit	6	48
	2 bedroom units (26)	1.5 spaces per unit	39	
	3 bedroom units (1)	2 spaces per unit	2	
	Visitor parking	1 space per 5 dwellings	7 (6.6)	7
	Sub-Total		**54**	**55**
Building 2 & 3	1 bedroom units (8)	1 space per unit	8	162
	2 bedroom units (45)	1.5 spaces per unit	68	
	3 bedroom units (10)	2 spaces per unit	20	
	Visitor parking	1 space per 5 dwellings	13 (12.6)	21
	Commercial (614m^2)	1 space per 40m^2	15	25
	Sub-Total		**124**	**208**
	1 bedroom units (1)	1 space per unit	1	-
	2 bedroom units (35)	1.5 spaces per unit	53	
	3 bedroom units (5)	2 spaces per unit	10	
	Visitor parking	1 space per 5 dwellings	8 (8.2)	-
	Sub-Total		**72**	**-**
	Total (2 and 3)		**196**	**208**
Building 4 & 5	1 bedroom units (12)	1 space per unit	12	95
	2 bedroom units (52)	1.5 spaces per unit	78	
	Visitor parking	1 space per 5 dwellings	13 (12.8)	13
	Sub-Total		**103**	**108**
Total			**353**	**371**

Application of these parking rates results in the requirement of 353 off-street car spaces or:

- 54 car spaces for the Building 1 car park
- 196 car spaces for the Building 2 & 3 car park

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

- 103 car spaces for the Building 4 & 5 car park.

Based on the above and the proposed provision of 55 off-street car parking spaces for Building 1, 208 off-street parking spaces for Building 2 & 3 and 108 for Buildings 4 & 5, there is a sufficient car parking supply for each building.

4.2 Accessible Parking

Penrith City Council's DCP 2010 indicates that 1%-4% of total parking spaces should be allocated for accessible persons. Based on the DCP car parking requirements, the development proposal requirements for accessible spaces and proposed accessible parking provisions are summaries in Table 4.2.

Table 4.2: DCP or DCS On-street Accessible Car Parking Requirements

Building	Use	DCP Total parking Provisions	DCP Parking Requirement	Proposed Accessible Parking Provisions
Building 1 car park	Residential	54	1-3 spaces	3
Building 2 & 3 car park	Residential	181	2-8 spaces	10
Building 2 & 3 car park	Commercial	15	1 space	2
Building 4 & 5 car park	Residential	103	1-5 spaces	12

Based on the above, the proposed accessible parking provisions for the development proposal meet the DCP requirements.

4.3 Bicycle Parking

Penrith City Council's DCP 2010 does not provide a minimum bicycle parking provision. However, parking facilities for 55 bicycles are provided throughout the basement car parks.

4.4 Car Parking and Loading Layout Review

The car park layouts have been reviewed against the requirements of the Australian Standard for Off Street Car Parking (AS/NZS2890.1:2004). This assessment included a review of the following:

- bay and aisle width
- adjacent structures
- turnaround facilities
- circulation roads and ramps
- ramp grades
- height clearances
- internal and external queuing
- parking for persons with disabilities.

This review indicates that the proposed car parking layout is expected to operate satisfactorily.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

5. Traffic Impact Assessment – PE, Stage 1

A traffic analysis has been undertaken to ensure that the key intersections operate satisfactorily after completion of the proposed Parklands Estate Stage 1 and all other approved or pending approval developments within the Jordan Springs residential subdivision.

The analysis was undertaken for the design years 2016 (assumed development completion) and 2026 (10 years post development).

5.1 Summary of Approved or Pending Approval Developments

The following approved or pending approval developments within Jordan Springs were assessed in conjunction with the Parklands Estate development (approximate numbers only):

- Village One – 249 Residential Lots and 18 Display Homes
- Village Two – 407 Residential Lots and 22 Display Homes
- Village Three A & B – 277 Residential Lots
- Village Three C, Stage 1 – 210 Residential Lots
- Village Three C, Stage 2 – 166 Residential Lots
- Village Three C, Stage 3 – 203 Residential Lots
- Village Four – 291 Residential Lots
- Village Five – 271 Residential Lots
- Village Twelve – 91 Residential Lots
- Road 21 – 9 Residential Lots
- Road 21 – 20 Apartments
- Mixed Use Site – 100 Apartments
- Mixed Use Site – Retail 400m2
- Village Centre – Retail 4,000m2
- Village Centre – Medical Centre 2 Practitioners
- Village Centre – Child Care Centre – 120 Places
- Village Centre – Residential Lots (6,8,9) – 36 Residential Lots
- Village Centre – 28 Apartments.

Construction of Village 1, Village 2 (except for the 2B and 2C Residue lots), Village 3A, 3B, 3C Stage 1 and Village 4 and their roads and associated infrastructure have been completed.

The Village Centre, a mixed use site, Village 3C Stage 2 and Stage 3 and a number of roads have all been approved and are currently under construction.

Village 2B and 2C Residue lots and Village 5 are pending approval.

5.2 Parklands Estate Stage 1 – Trip Generation

Traffic generation estimates for the proposed Stage 1 development have been sourced from the *RMS Guide to Traffic Generating Developments* (2002).

The trip generation rates for the proposal are summarised in Table 5.1 and Table 5.2 for the weekday and Saturday peak hours.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table 5.1: Estimated Development Traffic Generation – Weekday Peak Hour

Use	Design Generation Rate (Peak Hour)	Traffic Generation Estimate	
		AM Peak Hour	PM Peak Hour
2 bedroom Live/ Work units (3)	0.4 – 0.5 per dwelling (0.5)	2	2
1 Bedroom Apartment (27)	0.4 – 0.5 per dwelling (0.4)	11	11
2 Bedroom Apartment (155)	0.4 – 0.5 per dwelling (0.5)	78	78
3 Bedroom Apartment (16)	0.5 – 0.65 per dwelling (0.65)	10	10
Commercial (614m^2 GFA)	2 per 100m^2	12	12
	Total	113 vehicle movements/ hour	113 vehicle movements/ hour

Table 5.1 shows that the proposed development is anticipated to generate 113 vehicle movements (two-way) during each weekday peak hour (AM, PM).

Table 5.2: Estimated Development Traffic Generation – Saturday Peak Hour

Use	Design Generation Rate (Peak Hour)	Traffic Generation Estimate (Peak Hour)
2 bedroom Live/ Work units (3)	0.45 per dwelling	1
1 Bedroom Apartment (27)	0.35 per dwelling	9
2 Bedroom Apartment (155)	0.45 per dwelling	70
3 Bedroom Apartment (16)	0.60 per dwelling	10
Commercial (614m^2 GFA)	-	-
	Total	90 vehicle movements/ hour

[1] Including Live/ Work units.

Table 5.2 shows that the proposed development is anticipated to generate 90 vehicle movements (two-way) during the Saturday peak hour.

5.3 Trip Forecasting

The trip rate calculations for all approved developments or are pending approval within Jordan Springs and the Parklands Estate are shown in Table 5.3.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table 5.3: Jordan Springs Residential Development Trip Forecasting

Development	Lot Type	Number/ GLFA	AM/PM Trip Rate	AM Peak Movements	PM Peak Movements	Saturday Trip Rate	Saturday Movements
Village 1A to 1C	Residential lots	109	0.75	82	82	0.68	74
Village 1D	Display Homes	18	1	18	18	2.66	48
Village 1E to 1G	Residential lots	140	0.75	105	105	0.68	95
Village 2A	Residential lots	75		56	56		51
	Display Homes	22	1	22	22	2.66	59
Village 2B	Residential lots	70	0.75	53	53	0.68	48
	Residue lots	24		18	18		16
Village 2C	Residential lots	111		83	83		75
	Residue lots	25		19	19		17
Village 2D	Residential lots	102		77	77		69
Village 3A	Residential lots	139		104	104		95
Village 3B	Residential lots	138		104	104		94
Village 3C1	Residential lots	210		158	158		143
Village 3C2	Residential lots	166		125	125		113
Village 3C3	Residential lots	204		153	153		139
Village 4	Residential lots	291		218	218		198
Village 5	Residential lots	271		203	203		184
Village 6	Residential lots	215		161	161		146
Village 12	Residential lots	91		68	68		62
Road 21 (Lakeside Parade)	Residential lots	9		7	7		6
	Apartments	20	0.50	10	10	0.45	9
Mixed Use Site	Apartments	100		50	50		45
	Retail	400	6 trips/100m^2	0	24	7.5 trips /100m^2	30
Village Centre	Retail	4,000		0	240		300
	Medical Centre	2 Practitioners	5.8 movements /practitioner	12	12	5.8 movements /practitioner	12
	Child Care Centre	120 Places	0.7 movements / child	84	84	-	0
	Residential lots (6,8,9)	36	0.75	27	27	0.68	24
	Apartment (7)	28	0.50	14	14	0.45	13
Parklands Estate, Stage 1	2 Bedroom Live/ Work units	3	0.5	2	2	0.45	1
	1 Bedroom Apartment	27	0.4	11	11	0.35	9
	2 Bedroom Apartment	155	0.5	78	78	0.45	70
	3 Bedroom Apartment	16	0.65	10	10	0.60	10
	Commercial	614	2 trips/100m^2	12	12	-	-
Total				**2144**	**2408**		**2255**

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

The total traffic generated from all of the approved or pending approval developments within Jordan Springs, and including Parklands Estate is estimated to be:

- 2,144 vehicle movements per hour during the weekday morning peak
- 2,408 vehicle movements per hour during the weekday afternoon peak
- 2,255 vehicle movements per hour during the weekend peak hour.

In reality, and as recognised in the SKM report, 25% of the residential trips will be contained within Jordan Springs. No containment reduction was provided for commercial trips, therefore 25% has been adopted for this assessment.

Based on the above, the total traffic generated from the approved or pending approval developments within Jordan Springs and including Parklands Estate that would access The Northern Road is estimated to be:

- 1,609 vehicle movements per hour during the weekday morning peak
- 1,741 vehicle movements per hour during the weekday afternoon peak
- 1,623 vehicle movements per hour during the weekend peak hour.

5.4 Background Traffic

Weekday and Saturday peak hour traffic and classification surveys were conducted at the intersection of The Northern Road and Borrowdale Way on Saturday 30 April 2011 and Monday 2 May 2011.

The surveyed traffic volumes along The Northern Road during the peak periods are shown in Table 5.4.

Table 5.4: 2011 Surveyed Peak Hour Traffic Volumes

Peak Hour	Traffic Volumes (per hour)		
	Northbound	Southbound	Total
Weekday AM	869	960	1,829
Weekday PM	913	831	1,744
Saturday Midday	785	694	1,479

More recently, traffic counts were undertaken at the intersection of The Northern Road and Ninth Avenue on Thursday 27 March 2014 and Saturday 5 April 2014. The peak hours are summarised in Table 5.5.

Table 5.5: 2014 Surveyed Peak Hour Traffic Volumes

Peak Hour	Traffic Volumes (per hour)		
	Northbound	Southbound	Total
Weekday AM	862	854	1,716
Weekday PM	798	918	1,716
Saturday Midday	674	725	1,399

Table 5.4 and Table 5.5 show that the traffic volumes on The Northern Road immediately south of Ninth Avenue have reduced by 6% and 2% during the weekday AM and PM peak hours respectively and 5% during the Saturday midday peak hour. It is thought that the reduction in traffic volumes along The Northern Road may be associated with the current construction work on The Northern Road and that traffic is using an alternative route to The Northern Road.

As a conservative approach, the traffic assessment was undertaken based on the 2011 traffic survey volumes. To determine the anticipated background traffic in 2016 and 2026, an annual

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

traffic growth rate of 2% and 4% has been applied to the 2011 surveyed local roads and The Northern Road traffic volumes respectively.

5.5 St Marys Central Precinct

For the purposes of this assessment, it was assumed that the St Marys Central Precinct would be completed by 2026, providing an additional road link for the Jordan Springs residential subdivision to the broader road network.

The Precinct Plans prepared for the St Marys Western (Jordan Springs) and Central Precincts forecasted that during the weekday morning peak, 490 two-way vehicles movements would be generated from Jordan Springs, and 490 two-way vehicle movements would be generated from the Central Precinct that would use the link road between the precincts. As such, there is not expected to be any significant change to traffic accessing The Northern Road.

In all likelihood, traffic from Jordan Springs may travel east towards Central Precinct however traffic from Central Precinct traveling west may visit the Jordan Springs Village Centre and may not continue towards The Northern Road. Therefore, traffic flow on approach to The Northern Road may decrease as a result of Central Precinct. GTA have conservatively not modelled this assumption as part of this traffic assessment.

5.6 Traffic Distribution and Assignment

The distribution and assignment of Jordan Springs residential subdivision traffic was undertaken based on the Halcrow Traffic Consultants traffic assessment, summarised in Appendix B, which considered the initial findings of the SKM report.

The Northern Road connection with the Jordan Springs Boulevard access would predominantly be used by residents of Parklands Estate.

The anticipated traffic volumes at the signalised intersections of The Northern Road and Jordan Springs Boulevard during the 2016 and 2026 weekday and Saturday surveyed peak periods are presented in Figure 5.1 to Figure 5.6.

Figure 5.1: Anticipated 2016 Traffic Volumes (Weekday AM)

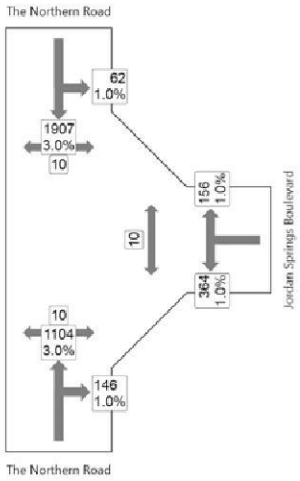
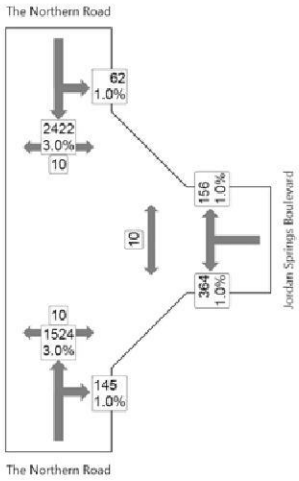


Figure 5.2: Anticipated 2026 Traffic Volumes (Weekday AM)



Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Figure 5.3: Anticipated 2016 Traffic Volumes (Weekday PM)

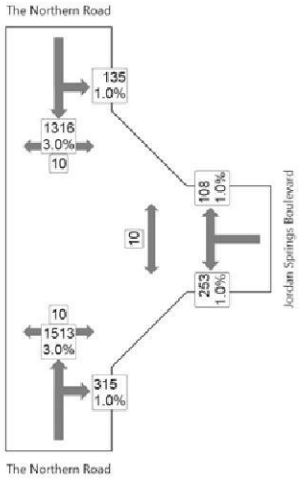


Figure 5.4: Anticipated 2026 Traffic Volumes (Weekday PM)

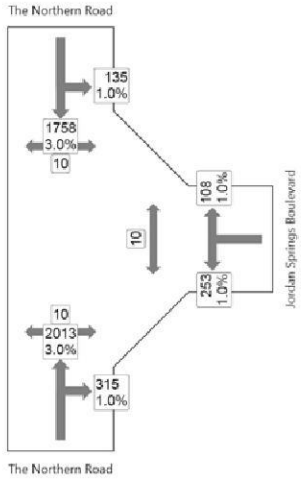


Figure 5.5: Anticipated 2016 Traffic Volumes (Saturday Midday)

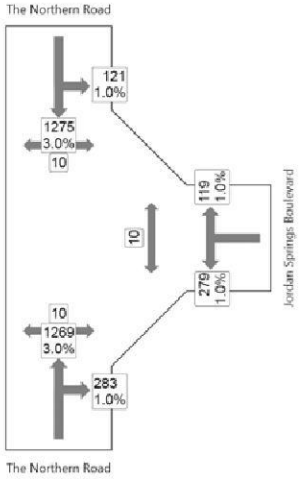
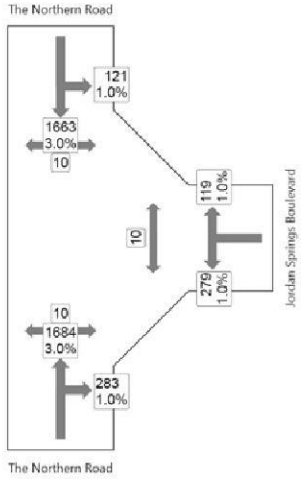


Figure 5.6: Anticipated 2026 Traffic Volumes (Saturday Midday)



5.7 Intersection Operation

The operation of the following intersections have been assessed using SIDRA INTERSECTION[1], a computer based modelling package which calculates intersection performance:

- The Northern Road and Jordan Springs Boulevard (three-way signalised)
- Jordan Springs Boulevard, Tyler Street and Road 3 access (four-way priority-controlled)
- Jordan Springs Boulevard and Lakeside Parade (three-way signalised)[2].

1 Program used under license from Akcelik & Associates Pty Ltd.

2 It is understood the intersection will be converted to signals prior to the anticipated completion of the Parklands Estate development. The layout of the proposed signal arrangement is shown in Appendix A.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

The commonly used measure of intersection performance, as defined by the Roads and Maritime Services, is vehicle delay. SIDRA INTERSECTION determines the average delay that vehicles encounter and provides a measure of the level of service.

Table 5.6 shows the criteria that SIDRA INTERSECTION adopts in assessing the level of service.

Table 5.6: SIDRA INTERSECTION Level of Service Criteria

Level of Service (LOS)	Average Delay per vehicle (secs/veh)	Traffic Signals, Roundabout	Give Way & Stop Sign
A	Less than 14	Good operation	Good operation
B	15 to 28	Good with acceptable delays and spare capacity	Acceptable delays and spare capacity
C	29 to 42	Satisfactory	Satisfactory, but accident study required
D	43 to 56	Near capacity	Near capacity, accident study required
E	57 to 70	At capacity, at signals incidents will cause excessive delays	At capacity, requires other control mode
F	Greater than 70	Extra capacity required	Extreme delay, major treatment required

Results of the SIDRA analysis at completion of the proposed development (2016), and assuming full occupy of all approved and pending approval developments as well as the Parklands Estate Stage 1 development, are shown below in Table 5.7.

Table 5.7: 2016 Traffic Analysis Results – AM, PM and Saturday Midday Peak

Intersection	Level of Service	Vehicle Delay (seconds)*	Level of Service	Vehicle Delay (seconds)*	Level of Service	Vehicle Delay (seconds)*
	Thursday AM		Thursday PM		Saturday Midday	
The Northern Road and Jordan Springs Boulevard	A	11	A	8	A	9
Jordan Springs Boulevard, Tyler Street and Road 3 access	A	11	A	12	A	12
Jordan Springs Boulevard and Lakeside Parade	B	18	B	18	B	22

* Reported delay is the average delay for signalised intersections and highest vehicle delay for roundabouts / priority intersections.

The results of the analysis indicate that the intersections would operate satisfactorily and accommodate the estimated traffic flows from all approved (and pending approval) developments within Jordan Springs, in conjunction with the estimated Parklands Estate mixed use development traffic.

The operation of The Northern Road and Jordan Springs Boulevard was also analysed using SIDRA for 10 year post development (2026). The results of the analysis, as shown in Table 5.8, illustrates that the intersection would continue to operate satisfactorily.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table 5.8: 2026 Traffic Analysis Results – AM, PM and Saturday Midday Peak

Intersection	Level of Service	Vehicle Delay (seconds)*	Level of Service	Vehicle Delay (seconds)*	Level of Service	Vehicle Delay (seconds)*
	Thursday AM		Thursday PM		Saturday Midday	
The Northern Road and Jordan Springs Boulevard	B	15	A	8	A	8

The results indicate that operation of The Northern Road and Jordan Springs Boulevard intersection will operate with acceptable delays in 2026.

To accommodate the increased traffic on The Northern Road, additional green time is likely to be allocated to the major movements, these being the through movements on The Northern Road and right turn movement from The Northern Road into Jordan Springs Boulevard. The allocation of phase times would be determined by Roads and Maritime Services' SCATS, a traffic management system that optimises traffic flow movement through an intersection.

5.8 The Northern Road Access - Road Capacity Check

The forecasted traffic generation of Parklands Estate would predominantly use Jordan Springs Boulevard.

Stage 1 of Parklands Estate is anticipated to generate 113 trips per hour during the weekday AM/ PM peak hours and 90 trips per hour during the Saturday peak hour. It is anticipated that 75% of these trips would access The Northern Road.

As such, the weekday AM, PM and Saturday peak hour trips from all developments within the Jordan Springs residential subdivision which have been approved or pending approval, including Parklands Estate, are shown in Table 5.9.

Table 5.9: Jordan Springs – Road Network Forecasted Traffic Volumes – including Parklands Estate

Access	Peak Period	Forecasted Trips Per Hour (Two-Way)	Jordan Springs Masterplan (Two-Way)
Northern Access (Stage 3C1 Road 1- Left-In/ Left-Out access)	Weekday AM	182	70
	Weekday PM	140	-
	Saturday Midday	136	-
Central Access (Greenwood Parkway)	Weekday AM	677	610
	Weekday PM	638	-
	Saturday Midday	649	-
Southern Access (Jordan Springs Boulevard)	Weekday AM	726	400
	Weekday PM	811	-
	Saturday Midday	803	-

The forecasted traffic volumes within Jordan Springs will be divided between Jordan Springs Boulevard, Watkins Street access (left-in/ left-out), Greenwood Parkway and the Stage 3C1 access (left-in/ left-out).

The forecasted weekday morning link traffic volumes at Greenwood Parkway are generally consistent with the estimated volumes of the SKM Masterplan.

At Stage 3C1 Road 1 and Jordan Springs Boulevard, the forecasted weekday morning traffic volumes exceed the estimate.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

The forecasted volumes on Jordan Springs Boulevard are higher than initially anticipated in the SKM Masterplan due to the realignment of Lakeside Parade and the increased density of land comprising Parklands Estate, a development not considered in the Western Precinct Plan prepared by JBA.

Nonetheless, Jordan Springs Boulevard has the operational capacity to satisfactorily accommodate the forecasted volumes, noting that a typical urban road could be expected to carry up to 900 vehicles per hour per lane. Furthermore, the capacity of Jordan Springs Boulevard increases to three lanes on approach to The Northern Road.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

6. Conclusion

Based on the analysis and discussions presented within this report, the following conclusions are made:

- A development application is to be lodged with Penrith City Council for Stage 1 of the proposed Parklands Estate mixed use development on the south side of Jordan Springs Boulevard. The development is located within the Jordan Springs residential subdivision. Stage 1 will consist of the following land uses:
  - 198 Apartments (16 - three bedroom, 27 – one bedroom, 155 – two bedroom)
  - 3 two bedroom Live/ Work units
  - 614m^2 of commercial space.
- Penrith City Council's Development Control Plan (DCP) 2010 parking requirement for the development site is 353 spaces or:
  - 54 car spaces for the Building 1 car park
  - 196 car spaces for the Building 2 & 3 car park
  - 103 car spaces for the Building 4 &5 car park.
- The proposed mixed use development will provide a total of 368 car parking spaces, the breakdown of the car parking spaces is as follows:
  - 55 off-street car spaces for Building 1, include 3 accessible spaces
  - 208 off-street car spaces for Building 2 & 3, include 12 accessible spaces
  - 108 off-street car spaces for Building 4, include 12 accessible spaces.
- The proposed car parking provisions in the development is considered appropriate and accords with the parking rates outlined within the Penrith City Council's Development Control Plan (DCP) 2010/ Western Precinct Plan.
- The development will provide 5 bicycle spaces within the Building 1 car park, 35 spaces in the Building 2 & 3 car park and 15 spaces in the Building 4 & 5 car park, which is satisfactory for a development of this nature.
- The forecasted traffic volume for the mixed use development during the weekday AM and PM peak hour is estimated to be 113 movements per hour whilst the Saturday peak hour traffic volume is estimated to be 90 movements per hour.
- The combined forecasted traffic volume for all of the approved Jordan Springs developments, including Stage 1 of the Parklands Estate Mixed Use development, during the weekday AM and PM peak hour is estimated to be 2,144 movements per hour and 2,408 movements per hour respectively, whilst the Saturday peak hour traffic volume is estimated to be 2,225 movements per hour.
- It is noted that 25% of the residential/ commercial trips and 50% of the retail trips will be contained within Jordan Springs. As such, the combined forecasted traffic volume for all of the approved Jordan Springs developments, including Stage 1 of the Parklands Estate Mixed Use development, which is forecasted to travel to/ from The Northern Road during the weekday AM and PM peak hour is estimated to be 1,609 movements per hour and 1,741 movements per hour respectively, whilst the Saturday peak hour traffic volume is estimated to be 1,623 movements per hour.
- Traffic modelling at Stage 1 development opening (2016) and 10-years post development (2026) indicates that the proposed signal arrangement at the intersection of The Northern Road and Jordan Springs Boulevard would operate satisfactorily and accommodate the estimated traffic flow for all approved (and pending approval)

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

developments within Jordan Springs, in conjunction with the estimated Parklands Estate mixed use development traffic. The St Marys Central Precinct was considered in the 2026 traffic modelling.

- Traffic modelling indicates that the proposed signal arrangement at the intersection of Jordan Springs Boulevard and Lakeside Parade would operate within capacity.
- The Stage 1 access points with Jordan Springs Boulevard and Lakeside Parade are also expected to operate well within capacity.
- The intersections within the Parklands Estate, Stage 1development are proposed to be all tee intersections.

Based on the above assessment, we conclude that the Parklands Estate, Stage 1 development would not have an adverse effect on the surrounding road network and its operations.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Appendix A

Signal Layouts for Jordan Springs Intersections

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Version: 1, Version Date: 27/02/2015

0154.358.VV.4396

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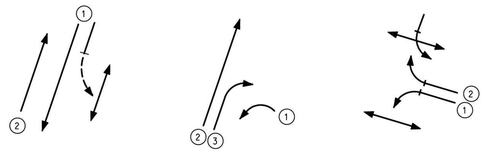
DO NOT AMEND MANUALLY



A PHASE | B & D PHASES (Z+ Introduces D Phase) | C PHASE

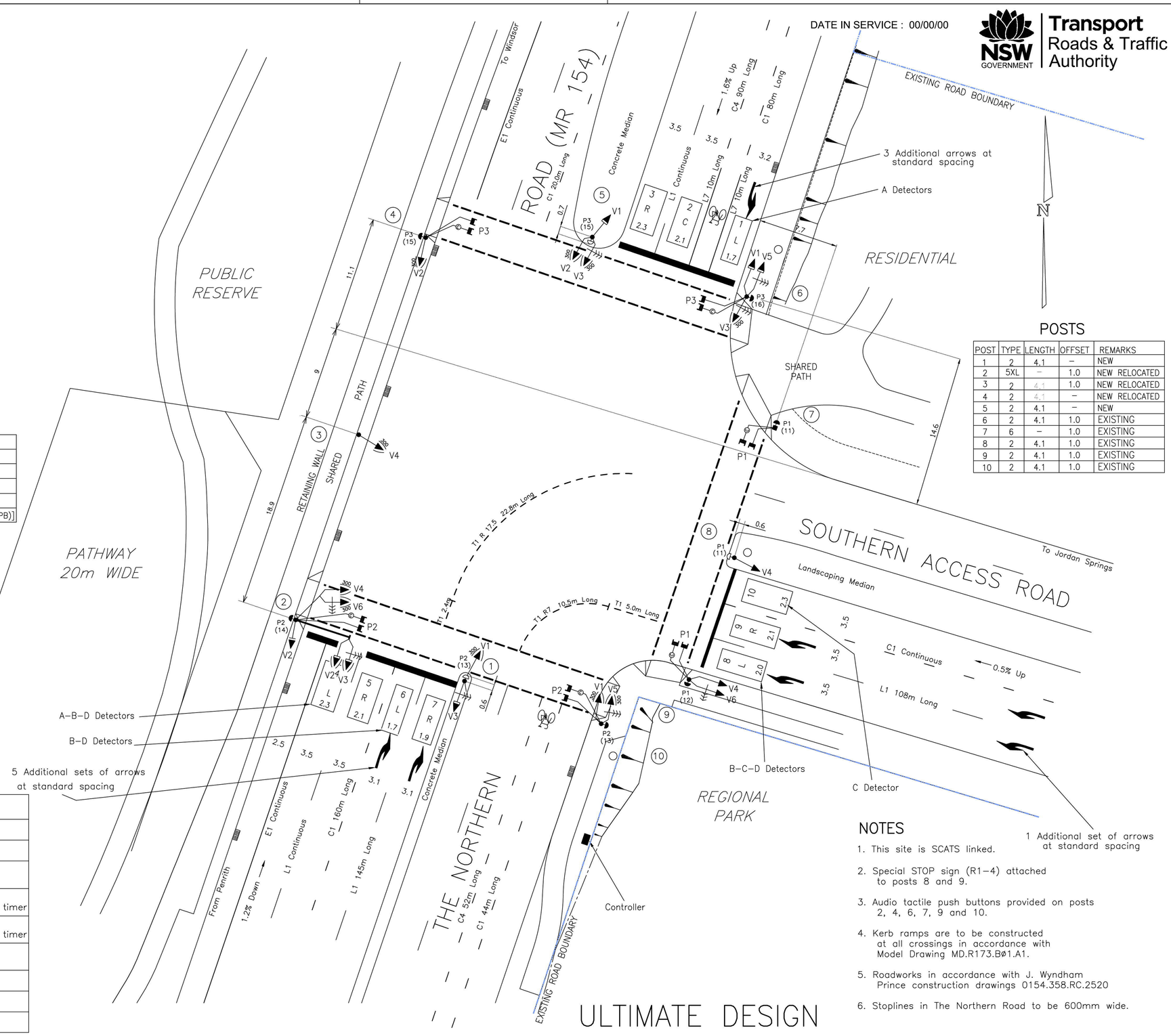
MOVEMENTS

DETECTOR SPECIFICATION

Detector		Specifications			
A	FN	A(L)	A(E1)		
	SG/PS	$\overline{A}$	A		
	DS	–	–		
A–B–D	FN	A(L)	A(E2)		
	SG/PS	$\overline{V2}$	A		
	DS	–	$\overline{B(NEXT)}.\overline{D(NEXT)}$		
cont. A–B–D	FN	B(E2)		D(E2)	
	SG/PS	B		D	
	DS	$\overline{A(NEXT)}.\overline{D(NEXT)}$		$\overline{A(NEXT)}.B(NEXT)$	
B–C–D	FN	B(PR)	B(CL)	D(PR)	D(CL)
	SG/PS	$\overline{B}.\overline{C}.\overline{D}$	C	$\overline{B}.\overline{C}.\overline{D}$	C
	DS	$\overline{C}$+P2(PB)	B–C–D(NG)	Z+.$\overline{C}$+P2(PB)	Z+.B–C–D(NG)
cont. B–C–D	FN	B(E1)		C(E1)	D(E1)
	SG/PS	B		C	D
	DS	$\overline{C(NEXT)}$+P2(PB)].$\overline{D(NEXT)}$		$\overline{B(NEXT)}.\overline{D(NEXT)}$	$\overline{B(NEXT)}.[\overline{C(NEXT)}$+P2(PB)]
B–D	FN	B(L)	D(L)	B(E3)	D(E3)
	SG/PS	$\overline{B}/\overline{D}$	$\overline{B}/\overline{D}$	B	D
	DS	–	Z+	$\overline{D(NEXT)}$	$\overline{B(NEXT)}$
C	FN	C(L)	C(E2)		
	SG/PS	$\overline{C}$	C		
	DS	–	–		
P1 P.B.	FN	A(PB)	C(L)		
	SG/PS	$\overline{P1(WALK)}$	A.$\overline{P1(WALK)}$		
	DS	–	$\overline{B}.\overline{C}.\overline{D}$		
P2 P.B.	FN	C(PB)	A(L)		
	SG/PS	$\overline{P2(WALK)}$	C.$\overline{P2(WALK)}$		
	DS	–	$\overline{A}.\overline{B}.\overline{D}$		
P3 P.B.	FN	C(PB)	A(L)		
	SG/PS	$\overline{P3(WALK)}$	C.$\overline{P3(WALK)}$		
	DS	–	$\overline{A}.\overline{B}.\overline{D}$		

SIGNAL GROUP/PHASE CHART

SIGNAL GROUP	PHASES WHEN GREEN A	B	C	D	STANDARD TABLE	REMARKS
V1	X				1	
V2	X	X		X	3	
V3		X		X	34	
V4			C		74	Timed Red protection for 'P3' ped. PB on Post 2 extends RA subject to timer
V5	C		C		79	Timed R.A. protection for 'P1' ped. PB on Post 5 extends RA subject to timer
V6		X	C	X	15	R.A. protection for 'P2' ped Walk & Clearance (Full Protection)
P1	X				2	
P2			X		2	
P3			X		2	



POSTS

POST	TYPE	LENGTH	OFFSET	REMARKS
1	2	4.1	–	NEW
2	5XL	–	1.0	NEW RELOCATED
3	2	4.1	1.0	NEW RELOCATED
4	2	4.1	–	NEW RELOCATED
5	2	4.1	–	NEW
6	2	4.1	1.0	EXISTING
7	6	–	1.0	EXISTING
8	2	4.1	1.0	EXISTING
9	2	4.1	1.0	EXISTING
10	2	4.1	1.0	EXISTING

NOTES

1. This site is SCATS linked.
2. Special STOP sign (R1–4) attached to posts 8 and 9.
3. Audio tactile push buttons provided on posts 2, 4, 6, 7, 9 and 10.
4. Kerb ramps are to be constructed at all crossings in accordance with Model Drawing MD.R173.B01.A1.
5. Roadworks in accordance with J. Wyndham Prince construction drawings 0154.358.RC.2520
6. Stoplines in The Northern Road to be 600mm wide.

ULTIMATE DESIGN

A ORIGINAL ISSUE

PUBLIC UTILITY LEGEND		REFERENCE PLANS	
HYDRANT	□	SYMBOLS/ABBS.	VD003-6
STOP VALVE	△	STD POSIT	VD001-5
GAS VALVE	#	PRES. DETECT	VC005-17
SEWER MANHOLE	⊗	VEH. GROUP OP	TS-TN-019
TELECOM PIT	◪	DET. LOGIC OP	TS-TN-020
ELECT LIGHT POLE	☌	PED. MOVEMNT OP	TS-TN-021
POWER POLE	○		
STAY POLE	⊘		
TELEPHONE BOX	⚿	SURVEYOR : Insight Surveying	
TELECOM PILLAR	⊘	DATE : 2010	

U.B.D. Ref. Map 144 D13
I.S.G. CO-ORDS E: 274 314 N: 1 266 866
DESIGNED : JS
CHECKED : CT
CT
SITE CHECKED
RW
RECOMMENDED

DESIGN APPROVAL	RTA ACCEPTANCE
APPROVED	RECOMMENDED
R. WEST	POSITION
POSITION DIRECTOR	DATE
DATE 15.9.11	ACCEPTED
DESIGN PREPARED BY	POSITION
TRANSPORT AND TRAFFIC PLANNING ASSOCIATES	DATE

ROADS AND TRAFFIC AUTHORITY OF NEW SOUTH WALES

PENRITH COUNCIL AREA
TRAFFIC SIGNALS AT THE INTERSECTION OF THE NORTHERN ROAD (MR 154) AND SOUTHERN ACCESS ROAD
CRANEBROOK

DESIGN LAYOUT TCS No 4396

EXISTING ☐ PROPOSED ☒
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SCALE 5 0 (1:200) 5 10
ISSUE A
FILE 358 TS 373
SUPERSEDES SHEET/ISSUE 1A
REGN. 0154.358.VV.4396
SHEET 1

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Version: 1, Version Date: 27/02/2015

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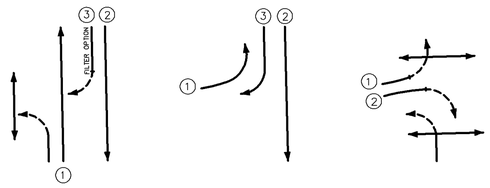
0000.358.VV.4443

DATE IN SERVICE : 00 / 00 / 0000

NSW GOVERNMENT Transport Roads & Maritime Services



MOVEMENTS

Z+ Introduces D Phase

NOTES

1. This site is SCATS linked.
2. Audio tactile push–buttons on Posts 1, 2, 3, 5, 6 and 7.
3. Special Regulatory Stop Sign placed on Post 1.
4. Kerb ramps in accordance with standard RMS model drawing No MD.R173.B01.A.1.
5. Existing service locations to be confirmed on–site prior to the commencement of any construction works.
6. Location of supply to be confirmed prior to construction by an accredited Level 2/3 service provider.
7. For associated civil works refer to plan number 8634/CC251–CC270 by J. Wyndham Prince

POSTS

POST	TYPE	LENGTH	OFFSET	REMARKS
1	2	4.1	1.0	NEW
2	2	4.1	1.0	NEW
3	2	4.1	1.0	NEW
4	2	4.1	1.0	NEW
5	2	4.1	1.0	NEW
6	5S	–	1.0	NEW
7	2	3.2	1.0	NEW

SIGNAL GROUP / PHASE CHART

SIGNAL GROUP	PHASES WHEN GREEN A	B	C	D	STANDARD TABLE	REMARKS
V1	X				1	
V2	X	X		X	3	
V3		X		X	81	Timed R.A. protection for P1 pedestrian. Z– filter option. Push button on Post 1 extends RA protection subject to timer
V4			C		74	Timed R.A. protection for P3 pedestrian. Push button on Post 6 extends RA protection subject to timer.
V5	C		C		89	Timed R.A. protection for P1 pedestrian. Push button on Post 1 extends RA protection subject to timer.
V6		X	C	X	77	Timed R.A. protection for P2 pedestrian. Push button on Post 3 extends RA protection subject to timer.
P1	X				2	
P2			X		2	
P3			X		2	

DETECTOR SPECIFICATION

Detector		Specifications				
A	FN	A(L)	A(E1)			
	SG/PS	$\overline{A}$	A			
	DS	–	–			
A-B-D1 Depart. & Approach	FN	B(PR)	D(PR)			
	SG/PS	A	A			
	DS	Z–	Z–.Z+			
A-B-D1 Approach	FN	A(L).B(L)	D(L)	B(L)	D(L)	
	SG/PS	A/B/D	$\overline{A/B/D}$	B/D	B/D	
	DS	Z–	Z–.Z+	$\overline{Z–}$	$\overline{Z–}$.Z+	
cont. A-B-D1 Approach	FN	A(E3)			B(E3)	D(E3)
	SG/PS	A			B	D
	DS	Z–.$\overline{A–B–D1(PR)}$.$\overline{B(NEXT)}$.$\overline{D(NEXT)}$			D(NEXT)	B(NEXT)
A-B-D2	FN	A(L)	A(E2)		B(E2)	
	SG/PS	$\overline{V2}$	A		B	
	DS	–	$\overline{B(NEXT)}$.$\overline{D(NEXT)}$		$\overline{A(NEXT)}$.$\overline{D(NEXT)}$	
cont. A-B-D2	FN	D(E2)				
	SG/PS	D				
	DS	$\overline{A(NEXT)}$.$\overline{B(NEXT)}$				
B-C-D	FN	B(PR)	D(PR)	B(E1)		
	SG/PS	$\overline{B.C.D}$	$\overline{B.C.D}$	B		
	DS	$\overline{C}$	Z+.$\overline{C}$	$\overline{C(NEXT)}$.$\overline{D(NEXT)}$		
cont. B-C-D	FN	C(E1)		D(E1)		
	SG/PS	C		D		
	DS	$\overline{B(NEXT)}$.$\overline{D(NEXT)}$		$\overline{B(NEXT)}$.C(NEXT)		
C	FN	C(PR)	C(E2)			
	SG/PS	$\overline{C}$	C			
	DS	–	–			
P1 P.B.	FN	A(PB)	C(L)			
	SG/PS	$\overline{P1(WALK)}$	A.P1(WALK)			
	DS	–	$\overline{B.C.D}$			
P2 P.B.	FN	C(PB)	A(L)			
	SG/PS	$\overline{P2(WALK)}$	C.$\overline{P2(WALK)}$			
	DS	–	$\overline{A.B.D}$			
P3 P.B.	FN	C(PB)	A(L)			
	SG/PS	$\overline{P3(WALK)}$	C.$\overline{P3(WALK)}$			
	DS	–	$\overline{A.B.D}$			

A ORIGINAL ISSUE

PUBLIC UTILITY LEGEND		REFERENCE PLANS	
HYDRANT	□	SYMBOLS/ABBS.	VD003-6
STOP VALVE	△	STD POSIT	VD001-5
GAS VALVE	#	PRES. DETECT	VC005-17
SEWER MANHOLE	⊗	VEH. GROUP OP	TS-TN-019
TELECOM PIT	▨	DET. LOGIC OP	TS-TN-020
ELECT LIGHT POLE	☌	PED. MOVEMNT OP	TS-TN-021
POWER POLE	○		
STAY POLE	⊘		
TELEPHONE BOX	T	SURVEYOR : PAUL HOMANN	
TELECOM PILLAR	•	DATE : N/A	

U.B.D. Ref. Map 144 D13
M.G.A. CO-ORDS E: 274 484 N: 1 266 522

DESIGNED LISA TULAU
CHECKED TERRY LAWRENCE
LISA TULAU
SITE CHECKED
TERRY LAWRENCE
RECOMMENDED

DESIGN APPROVAL
APPROVED
TERRY LAWRENCE
POSITION DIRECTOR
DATE 23.9.13
DESIGN PREPARED BY
TRANSPORT AND URBAN PLANNING PL

RMS ACCEPTANCE
RECOMMENDED
POSITION
DATE
ACCEPTED
POSITION
DATE

ROADS AND MARITIME SERVICES

PENRITH COUNCIL AREA
TRAFFIC SIGNALS AT
JORDAN SPRINGS BOULEVARDE
AND LAKESIDE PARADE
JORDAN SPRINGS

DESIGN LAYOUT TCS No 4443

EXISTING ☐ PROPOSED ☒
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SCALE 5 0 (1:200) 5 10
ISSUE A
FILE 358 TS 375
SUPERSEDES SHEET/ISSUE -
REGN. 0000.358.VV.4443
SHEET 1

$DATE$

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Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Appendix B

Western Precinct Traffic Forecasts

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Version: 1, Version Date: 27/02/2015

In order to assess the implications of the proposed subdivisions within the context of the Western Precinct, forecasts of evening peak hour traffic for the internal collector road system were developed for full development of the Western Precinct, based on the current dwelling yield plan and the current internal road system layout.

Land Use Mix for Western Precinct

Since the production of the SKM Precinct Plan, the land use mix in the Western Precinct has changed.

The SKM study assumed the following land use mix for the Western Precinct as a whole:

- 2,446 residential dwellings
- 3.4ha retail
- 4.9ha education.

The current land use mix for the Western Precinct as a whole includes:

- 2,490 residential dwellings
- 7,500m^2 retail GLFA
- 2,000 m^2 commercial GLFA
- 4.9ha education.

This assessment examines commercial land use as well as residential, retail and educational land use which were not previously examined in detail as part of the SKM Western Precinct Plan.

The SKM report also relied on a collector road layout which favoured movements to the northern collector road from the central precinct. A revised collector road layout directly connects the Central Precinct with Jordan Springs Boulevard.

Therefore the values calculated in this report vary from those contained in the Precinct Plan. The variance largely is reflected in higher traffic volumes along Jordan Springs Boulevard.

Traffic Assessment

Western Precinct was divided into Villages 1 to 6 according to the dwelling yield plan, with additional zones for retail/commercial and education/community facilities, and the following assumptions used for evening peak hour traffic conditions:

Land Use

- Western Precinct 2,446 dwellings
- Village Centre 7,500m^2 GLFA retail
- Village Centre 2,000m^2 commercial.

Traffic Generation

- Residential 0.75 trips per dwelling in evening peak
- Retail 6 trips per 100m^2 GLFA in evening peak
- Commercial 2 trips per 100m^2 GLFA evening peak.

Traffic Distribution

- Residential 75% inbound in evening peak
- 25% of retail trips are pass-by traffic
- 50% of retail trips are generated from within the Western Precinct
- 25% of residential trips are contained within the Western Precinct (to/from retail, education and community facilities)

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

- Directional distribution on the external road system based on the assumptions used by SKM regarding the design of the access intersections: 70% to/from the south, 20% to/from the north and 10% to/from the west.

It is expected that some traffic generated by the Central Precinct would use Western Precinct roads to access the external road system. Detailed analysis of the Central Precinct is beyond the scope of this study. The SKM Traffic and Transport Plan report (2009) indicates that the Central Precinct is estimated to generate some 983 vehicle movements per hour, and for the purpose of allowing for Central Precinct through traffic within Western Precinct, it was assumed that 50 per cent of the Central Precinct traffic would travel through the Western Precinct. This traffic was assumed to use both the southern and northern collector roads to travel between The Northern Road and the Central Precinct.

The evening peak hour was chosen as the retail activity is expected to be higher during the evening peak than the morning peak. This will result in a more robust assessment of future traffic volumes and their implications on road and intersection designs.

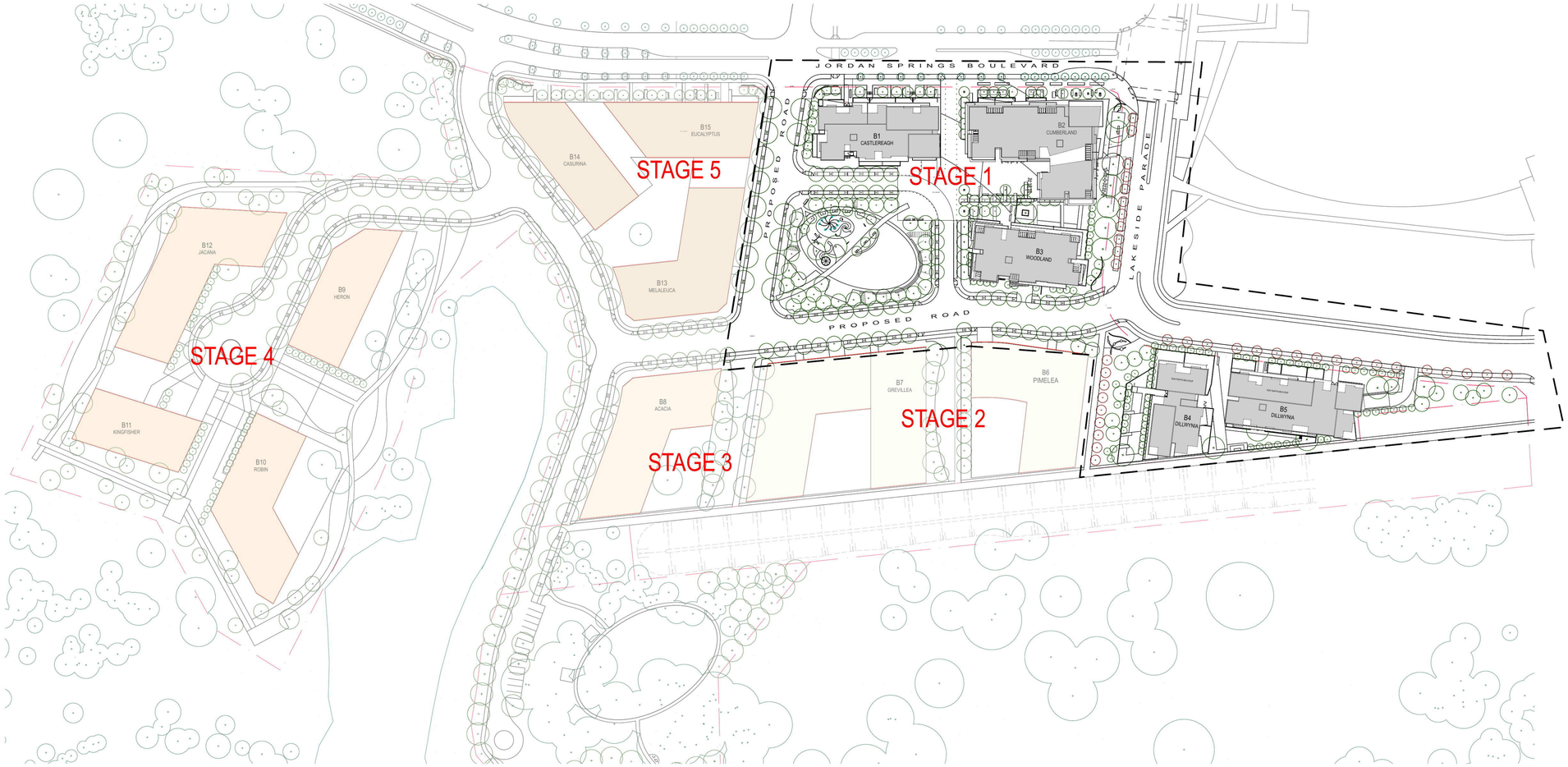
The results of the assessment found that the general layout of the intersections reflect those reported in the SKM report.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Appendix C

Parklands Estate, Stage 1 Site Layout Plans

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015



1 MASPTERPLAN
1:1000

- this drawing is copyright and the property of the author, and must not be retained, copied or used without the authority of mosca pserras architects.
- larger scale drawings and written dimensions take preference.
- do not scale from drawing
- all dimensions to be checked on site before commencement of work.
- all discrepancies to be brought to the attention of the author.

Notes

N

metres 0 1 5 10 1:250

CID GROUP

SYNERGY DEVELOPMENT GROUP

issue	details	by	date
P8	PRELIMINARY FOR CLIENT	SB	17.12.14
P7	PRELIMINARY FOR CONSULTANTS	SB	26.11.14
P6	PRELIMINARY FOR CONSULTANTS	SB	14.11.14
P5	PRELIMINARY FOR CONSULTANTS	SB	10.11.14
P4	PRELIMINARY FOR CONSULTANTS	SB	04.11.14
P3	PRELIMINARY FOR CONSULTANTS	SB	31.10.14

amendments

project
PARKLANDS ESTATE

location
Jordan Springs Boulevard
JORDAN SPRINGS

project co-ordinator
SYNERGY DEVELOPMENT GROUP

client
CID GROUP

drawing title
MASTER PLAN

date	checked	project arch.	drawn
30.09.14		SB	SB
scale	no		issue
	14016 AP02		P8

PRELIMINARY

mosca pserras architects

p 02 9601 3244 f 02 9601 6336

a po box 3353, liverpool westfield nsw 2170

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Jordan Springs Boulvard, JORDAN SPRINGS

DATE :16.12.14

	UNIT	APARTMENT TYPE				GFA	NSA				
		1 BED	2 BED	3 BED	NOTES		INTERNAL	TERRACE	MISC/ COMM	TOTAL	ADAPTABLE
	BUILDING ONE - CASTLERAGH										
	GROUND										
1	1G.01		2B				83	34		117	
2	1G.02		2B				83	39		122	
3	1G.03	1B					63	28		91	✓
4	1G.04		2B				83	39		122	
5	1G.05	1B					57	25		82	✓
6	1G.06		2B				83	37		120	
7	1G.07	1B					58	18		76	✓
8	1G.08		2B				80	27		107	
	SUBTOTAL	**3**	**5**	**0**		686					
	LEVEL 1										
9	11.01		2B				83	18		101	
10	11.02		2B				83	22		105	
11	11.03		2B				83	15		98	
12	11.04		2B				83	15		98	
13	11.05	1B					57	6		63	
14	11.06		2B				83	15		98	
15	11.07		2B				83	18		101	
16	11.08		2B				79	18		97	
17	11.09		2B				80	18		98	
	SUBTOTAL	**1**	**8**	**0**		808					
	LEVEL 2										
18	12.01		2B				83	18		101	
19	12.02		2B				83	22		105	
20	12.03		2B				83	15		98	
21	12.04		2B				83	15		98	
22	12.05	1B					57	6		63	
23	12.06		2B				83	15		98	
24	12.07		2B				83	18		101	
25	12.08		2B				79	18		97	
26	12.09		2B				80	18		98	
	SUBTOTAL	**1**	**8**	**0**		808					
	LEVEL 3										
27	13.01			3B			102	18		120	
28	13.02		2B				83	18		101	
29	13.03		2B				79	18		97	
30	13.04		2B				83	15		98	
31	13.05		2B				83	15		98	
32	13.06	1B					57	6		63	
33	13.07		2B				83	15		98	
	SUBTOTAL	**1**	**5**	**1**		645					

BUILDING ONE OVERALLS

	1 BED	2 BED	3 BED	TOTAL	GFA	INTERNAL	TERRACE	MISC	TOTAL	
TOTALS	**6**	**26**	**1**	**33**	**2947**	**2588**	**642**		**3230**	**3**

BUILDING TWO - CUMBERLAND

	GROUND										
34	2G.01		2B		LIVE/WORK		81	29		110	
35	2G.02		2B		LIVE/WORK		82	33		115	
36	2G.03		2B		LIVE/WORK		81	33		114	
	2G.04				COMMERCIAL				64	64	
	2G.05				COMMERCIAL				188	188	
	2G.06				COMMERCIAL				242	242	
	2G.07				COMMERCIAL				120	120	
	SUBTOTAL	**0**	**3**	**0**		975					
	LEVEL 1										
37	21.01			3B			105	17		122	
38	21.02		2B				83	19		102	
39	21.03		2B				83	18		101	
40	21.04		2B				83	17		100	
41	21.05		2B				83	15		98	
42	21.06		2B				83	15		98	
43	21.07	1B					61	8		69	✓
44	21.08			3B			104	11		115	
45	21.09		2B				82	15		97	
46	21.10		2B				83	20		103	
47	21.11		2B				83	17		100	
48	21.12		2B				83	15		98	
	SUBTOTAL	**1**	**9**	**2**		1170					
	LEVEL 2										
49	22.01			3B			105	17		122	
50	22.02		2B				83	19		102	
51	22.03		2B				83	18		101	
52	22.04		2B				83	26		109	
53	22.05		2B				83	18		101	
54	22.06		2B				83	15		98	
55	22.07	1B					61	8		69	✓
56	22.08			3B			104	11		115	
57	22.09		2B				82	23		105	
58	22.10		2B				83	18		101	
59	22.11		2B				83	14		97	
60	22.12		2B				83	15		98	
	SUBTOTAL	**1**	**9**	**2**		1170					
	LEVEL 3										
61	23.01			3B			105	17		122	
62	23.02		2B				83	19		102	
63	23.03		2B				82	18		100	
64	23.04		2B				83	26		109	
65	23.05		2B				83	18		101	
66	23.06		2B				83	15		98	
67	23.07	1B					61	8		69	✓
68	23.08			3B			104	11		115	
69	23.09		2B				82	23		105	
70	23.10		2B				83	18		101	
71	23.11		2B				83	14		97	
72	23.12		2B				83	15		98	
	SUBTOTAL	**1**	**9**	**2**		1170					
	LEVEL 4										
73	24.01			3B			105	17		122	
74	24.02		2B				81	21		102	
75	24.03		2B				82	18		100	
76	24.04		2B				81	18		99	
77	24.05		2B				81	17		98	
78	24.06		2B				81	16		97	
79	24.07	1B					61	7		68	✓
80	24.08			3B			103	11		114	
81	24.09		2B				80	18		98	
82	24.10		2B				81	17		98	
83	24.11		2B				81	19		100	
84	24.12		2B				82	15		97	
	SUBTOTAL	**1**	**9**	**2**		1170					

Jordan Springs Boulvard, JORDAN SPRINGS

DATE :16.12.14

	UNIT	APARTMENT TYPE				GFA	NSA				
		1 BED	2 BED	3 BED	NOTES		INTERNAL	TERRACE	MISC/ COMM	TOTAL	ADAPTABLE
	LEVEL 5										
85	25.01			3B			105	9		114	
86	25.02		2B				81	9		90	
87	25.03	1B					63	37		100	
88	25.04	1B					61	9		70	
89	25.05		2B				81	9		90	
90	25.06		2B				81	9		90	
91	25.07	1B					53	12		65	
92	25.08			3B			104	10		114	
93	25.09		2B				81	8		89	
94	25.10		2B				81	8		89	
95	25.11	1B					63	8		71	
96	25.12		2B				81	17		98	
	SUBTOTAL	**4**	**6**	**2**		1170					

BUILDING TWO OVERALLS

	1 BED	2 BED	3 BED	TOTAL	GFA	INTERNAL	TERRACE	MISC	TOTAL	ADAPTABLE
TOTALS	**8**	**45**	**10**	**63**	**6825**	**5225**	**1025**	**614**	**6864**	**4**

BUILDING THREE - WOODLAND

	GROUND										
111	3G.01		2B				82	26		108	
112	3G.02		2B				82	58		140	
113	3G.03	1B					63	21		84	✓
114	3G.04		2B				82	29		111	
115	3G.05		2B				82	67		149	
116	3G.06		2B				87	41		128	
	SUBTOTAL	**1**	**5**	**0**		574					
	LEVEL 1										
117	31.01		2B				82	18		100	
118	31.02		2B				82	32		114	
119	31.03		2B				82	14		96	✓
120	31.04		2B				82	19		101	
121	31.05		2B				82	31		113	
122	31.06			3B			118	17		135	
123	31.07		2B				81	15		96	
	SUBTOTAL	**0**	**6**	**1**		696					
	LEVEL 2										
124	32.01		2B				82	18		100	
125	32.02		2B				82	35		117	
126	32.03		2B				82	15		97	✓
127	32.04		2B				2	19		21	
128	32.05		2B				82	32		114	
129	32.06			3B			118	18		136	
130	32.07		2B				81	18		99	
	SUBTOTAL	**0**	**6**	**1**		696					
	LEVEL 3										
131	33.01		2B				82	18		100	
132	33.02		2B				82	34		116	
133	33.03		2B				82	14		96	✓
134	33.04		2B				82	19		101	
135	33.05		2B				82	31		113	
136	33.06			3B			118	18		136	
137	33.07		2B				81	18		99	
	SUBTOTAL	**0**	**6**	**1**		696					
	LEVEL 4										
138	34.01		2B				81	20		101	
139	34.02		2B				81	34		115	
140	34.03		2B				81	16		97	✓
141	34.04		2B				81	21		102	
142	34.05		2B				81	33		114	
143	34.06			3B			117	18		135	
144	34.07		2B				79	17		96	
	SUBTOTAL	**0**	**6**	**1**		696					
	LEVEL 5										
145	35.01		2B				81	7		88	
146	35.02		2B				81	8		89	
147	35.03		2B				81	8		89	✓
148	35.04		2B				81	8		89	
149	35.05		2B				81	9		90	
150	35.06			3B			104	7		111	
151	35.07		2B				81	7		88	
	SUBTOTAL	**0**	**6**	**1**		696					

BUILDING THREE OVERALLS

	1 BED	2 BED	3 BED	TOTAL	GFA	INTERNAL	TERRACE	MISC	TOTAL	ADAPTABLE
TOTALS	**1**	**35**	**5**	**41**	**4054**	**3416**	**908**	**0**	**4324**	**6**

BUILDING FOUR - DILLWYNIA

	GROUND										
152	4G.01		2B				88	73		161	
153	4G.02		2B				88	76		164	
154	4G.03		2B				81	28		109	✓
155	4G.04		2B				83	41		124	
156	4G.05		2B				83	67		150	
157	4G.06	1B					55	28		83	
	SUBTOTAL	**1**	**5**	**0**		542					
	LEVEL 1										
158	41.01		2B				88	17		105	
159	41.02		2B				88	18		106	
160	41.03		2B				81	18		99	✓
161	41.04		2B				83	27		110	
162	41.05		2B				83	28		111	
163	41.06	1B					55	11		66	
	SUBTOTAL	**1**	**5**	**0**		542					
	LEVEL 2										
164	42.01		2B				88	17		105	
165	42.02		2B				88	18		106	
166	42.03		2B				81	18		99	✓
167	42.04		2B				83	27		110	
168	42.05		2B				83	28		111	
169	42.06	1B					55	11		66	
	SUBTOTAL	**1**	**5**	**0**		542					
	LEVEL 3										
170	43.01		2B				88	17		105	
171	43.02		2B				88	18		106	
172	43.03		2B				81	18		99	✓
173	43.04		2B				83	27		110	
174	43.05		2B				83	28		111	
175	43.06	1B					55	11		66	
	SUBTOTAL	**1**	**5**	**0**		542					

BUILDING FOUR OVERALLS

	1 BED	2 BED	3 BED	TOTAL	GFA	INTERNAL	TERRACE	MISC	TOTAL	ADAPTABLE
TOTALS	**4**	**20**	**0**	**24**	**2168**	**1912**	**670**	**0**	**2582**	**4**

Jordan Springs Boulvard, JORDAN SPRINGS

DATE :16.12.14

	UNIT	APARTMENT TYPE				GFA	NSA				
		1 BED	2 BED	3 BED	NOTES		INTERNAL	TERRACE	MISC/ COMM	TOTAL	ADAPTABLE
	BUILDING FIVE - DILLWYNIA										
	GROUND										
176	5G.01		2B				83	48		131	
177	5G.02		2B				83	30		113	
178	5G.03	1B					51	19		70	
179	5G.04		2B				81	32		113	
180	5G.05		2B				80	23		103	
181	5G.06		2B				83	17		100	
182	5G.07		2B				83	53		136	
183	5G.08		2B				83	54		137	
184	5G.09		2B				83	52		135	
185	5G.10	1B					58	31		89	✓
	SUBTOTAL	**2**	**8**	**0**		867					
	LEVEL 1										
186	51.01		2B				83	15		98	
187	51.02		2B				83	15		98	
188	51.03	1B					51	6		57	
189	51.04		2B				81	20		101	
190	51.05		2B				80	15		95	
191	51.06		2B				83	19		102	
192	51.07		2B				83	19		102	
193	51.08		2B				83	15		98	
194	51.09		2B				83	14		97	
195	51.10	1B					58	6		64	✓
	SUBTOTAL	**2**	**8**	**0**		867					
	LEVEL 2										
196	52.01		2B				83	15		98	
197	52.02		2B				83	15		98	
198	52.03	1B					51	6		57	
199	52.04		2B				81	20		101	
200	52.05		2B				80	15		95	
201	52.06		2B				83	19		102	
202	52.07		2B				83	19		102	
203	52.08		2B				83	15		98	
204	52.09		2B				83	14		97	
205	52.10	1B					58	6		64	✓
	SUBTOTAL	**2**	**8**	**0**		867					
	LEVEL3										
206	53.01		2B				83	15		98	
207	53.02		2B				83	15		98	
208	53.03	1B					51	6		57	
209	53.04		2B				81	20		101	
210	53.05		2B				80	15		95	
211	53.06		2B				83	19		102	
212	53.07		2B				83	19		102	
213	53.08		2B				83	15		98	
214	53.09		2B				83	14		97	
215	53.10	1B					58	6		64	✓
	SUBTOTAL	**2**	**8**	**0**		867					

BUILDING FIVE OVERALLS

	1 BED	2 BED	3 BED	TOTAL	GFA	INTERNAL	TERRACE	MISC	TOTAL	ADAPTABLE
TOTALS	**8**	**32**	**0**	**40**	**3468**	**3072**	**791**	**0**	**3863**	**4**

STAGE ONE OVERALL TOTALS

	1 BED	2 BED	3 BED	TOTAL	GFA	INTERNAL	TERRACE	COMM	TOTAL	ADAPTABLE
	27	**158**	**16**	**201**	**19462**	**16213**	**4036**	**614**	**20863**	**21**
% MIX	13%	79%	8%							

CARPARKING

1Bed	@	1.0 space	27.0
2Bed	@	1.5 space	237.0
3Bed	@	2.0 space	32.0
Visitors	@	1.0 per 5 units	40.2
Commercial	@	1.0 per 25 m2	24.6
Total required			360.8
Total provided			371.0

BASIX NOTES

Construction general

Glazing	**Doors / windows:** Aluminium framed single glazed U-Value: 6.57 (equal to or lower than) SHGC: 0.74 (+ or – 10%) **Skylights:** Aluminium framed double glazed Given values are NFRC, total window values
Roof / ceiling insulation	**Roof:** Concrete slab roof – light colour (SA<0.475) **Ceiling:** Plasterboard R3.0 insulation to **units on Building A only** R2.5 insulation to all other units with balcony above & roof over. Note: insulation loss due to downlight penetrations have been modelled in accordance with relevant BCA Technical Notes and each downlight is assumed to be non vented.
Wall / floor insulation	**External Wall:** 180 mm concrete cast concrete wall – Default medium colour R1.0 insulation to **units on Building A: 201, 207, 210, 401, 410, 602, 702, 802, 902, 1002, 1008, 1202, 1208, 1402, 1408, 1502, 1508, 1602, 1608, 1702, 1708, 1802, 1808, 1902, 2002, 2102, 2202, 2302, 2402, 2502, 2602, 2702, 2801, 2807, Building B: 402, G03, 102, 202, 302, 403 and Building C: 103, 106, 208, 209, 502, 507, 702, 802, 902, 1002, 1102, 1202, 1302, 1402, 1502, 1602, 1702, 1802, 2002, 2102, 2202, 2302, 2402, 2502, 2602, 2702, 2802.** R2.0 insulation to **units on Building A: 209, 1907, 2007, 2107, 2207, 2307, 2407, 2507, 2607, 2707, 2807, Building B: 402 and Building C: 109, 2801.** No insulation to other units **Internal walls within units:** Plasterboard on studs - no insulation **Inter-tenancy walls:** Hebel wall and Dincel wall acoustic insulation (minimum of R2.0) to **units on Building A: 209, 1907, 2007, 2107, 2207, 2307, 2407, 2507, 2607, 2707 and 2807.** acoustic insulation (minimum of R1.7) to other units **Floors:** Concrete – carpet to bedrooms, studies, living areas & tiles to wet areas R0.6 insulation to **units on Building A: 401, 410 and Building C: 103.** R1.0 insulation to **unit on Building C: 109.** No insulation to other units

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- all discrepancies to be brought to the attention of the author.

Notes

N

metres 0 1 5 10 1:250

CID GROUP

SYNERGY DEVELOPMENT GROUP

issue	details	by	date
P3	PRELIMINARY FOR CONSULTANTS	SB	14.01.15
P2	PRELIMINARY FOR CLIENT	SB	17.12.14
P1	PRELIMINARY FOR CONSULTANTS	SB	26.11.14

amendments

project
PARKLANDS ESTATE

location
Jordan Springs Boulevard
JORDAN SPRINGS

project co-ordinator
SYNERGY DEVELOPMENT GROUP

client
CID GROUP

drawing title
DATA

date	checked	project arch.	drawn
30.09.14		SB	SB
scale	no		issue
	14016 AP03		P3

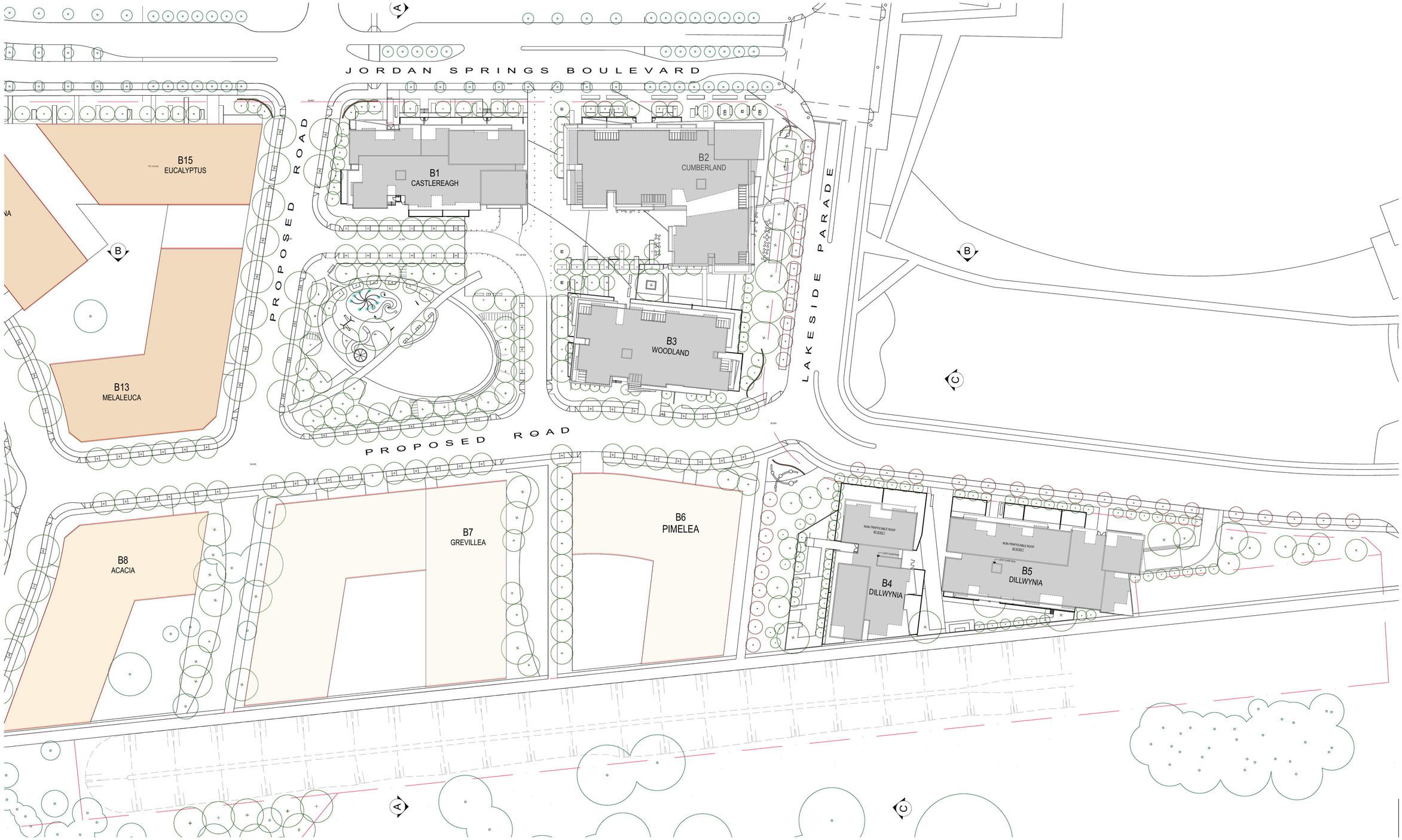
PRELIMINARY

mosca pserras architects

p 02 9601 3244 f 02 9601 6336

a po box 3353, liverpool westfield nsw 2170

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015



1 SITE PLAN
1:500

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SYNERGY DEVELOPMENT GROUP

issue	details	by	date
P5	PRELIMINARY FOR CONSULTANTS	SB	14.01.15
P4	PRELIMINARY FOR CLIENT	SB	17.12.14
P3	PRELIMINARY FOR CONSULTANTS	SB	26.11.14

amendments

project
PARKLANDS ESTATE

location
Jordan Springs Boulevard
JORDAN SPRINGS

project co-ordinator
SYNERGY DEVELOPMENT GROUP

client
CID GROUP

drawing title
SITE PLAN

date	checked	project arch.	drawn
30.09.14		SB	SB
scale	no		issue
	14016 AP04		P5

PRELIMINARY

mosca pserras architects

p 02 9601 3244 f 02 9601 6336

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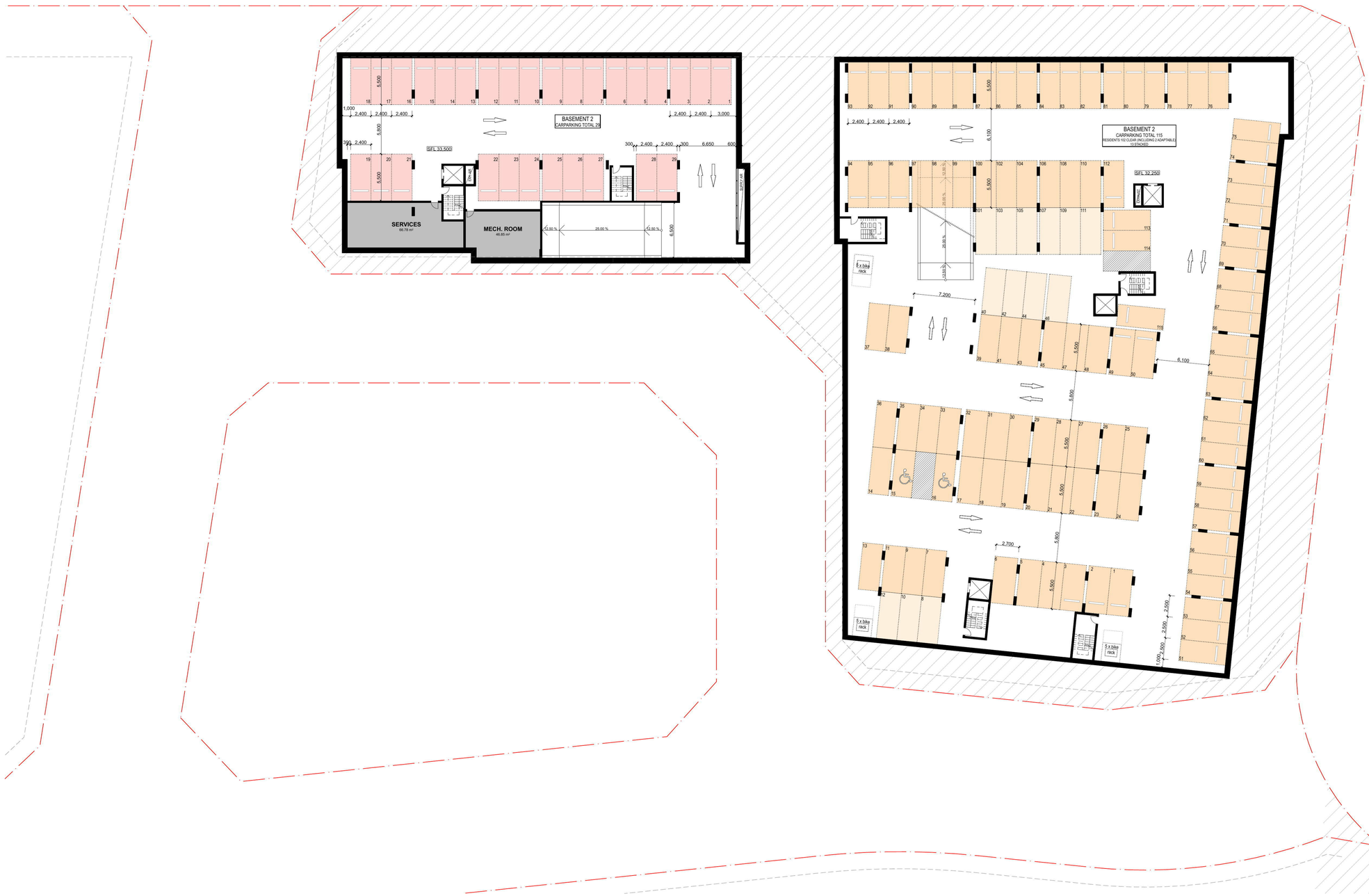
Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015



1 Basement 2
1:250

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Notes

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metres 0 1 5 10 1:250

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SYNERGY DEVELOPMENT GROUP

issue	details	by	date
P6	PRELIMINARY FOR CLIENT	SB	17.12.14
P5	PRELIMINARY FOR CONSULTANTS	SB	26.11.14
P4	PRELIMINARY FOR CONSULTANTS	SB	19.11.14
P3	PRELIMINARY FOR CONSULTANTS	SB	31.10.14
P2	PRELIMINARY FOR CONSULTANTS	SB	22.10.14
P1	PRELIMINARY FOR CLIENT	SB	08.10.14

amendments

project
PARKLANDS ESTATE

location
Jordan Springs Boulevard
JORDAN SPRINGS

project co-ordinator
SYNERGY DEVELOPMENT GROUP

client
CID GROUP

drawing title
Buildings 1,2 & 3-BASEMENT 2

date	checked	project arch.	drawn
30.09.14		SB	SB
scale	no		issue
	14016 AP05		P6

PRELIMINARY

mosca pserras architects

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1 Basement 1
1:250

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metres 0 1 5 10 1:250

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issue	details	by	date
P6	PRELIMINARY FOR CLIENT	SB	17.12.14
P5	PRELIMINARY FOR CONSULTANTS	SB	26.11.14
P4	PRELIMINARY FOR CONSULTANTS	SB	19.11.14
P3	PRELIMINARY FOR CONSULTANTS	SB	31.10.14
P2	PRELIMINARY FOR CONSULTANTS	SB	17.10.14
P1	PRELIMINARY FOR CLIENT	SB	08.10.14

amendments

project
PARKLANDS ESTATE

location
Jordan Springs Boulevard
JORDAN SPRINGS

project co-ordinator
SYNERGY DEVELOPMENT GROUP

client
CID GROUP

drawing title
Buildings 1,2 & 3-BASEMENT 1

date	checked	project arch.	drawn
30.09.14		SB	SB
scale	no		issue
	14016 AP06		P6

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p 02 9601 3244 f 02 9601 6336

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Document Set ID: 6445002
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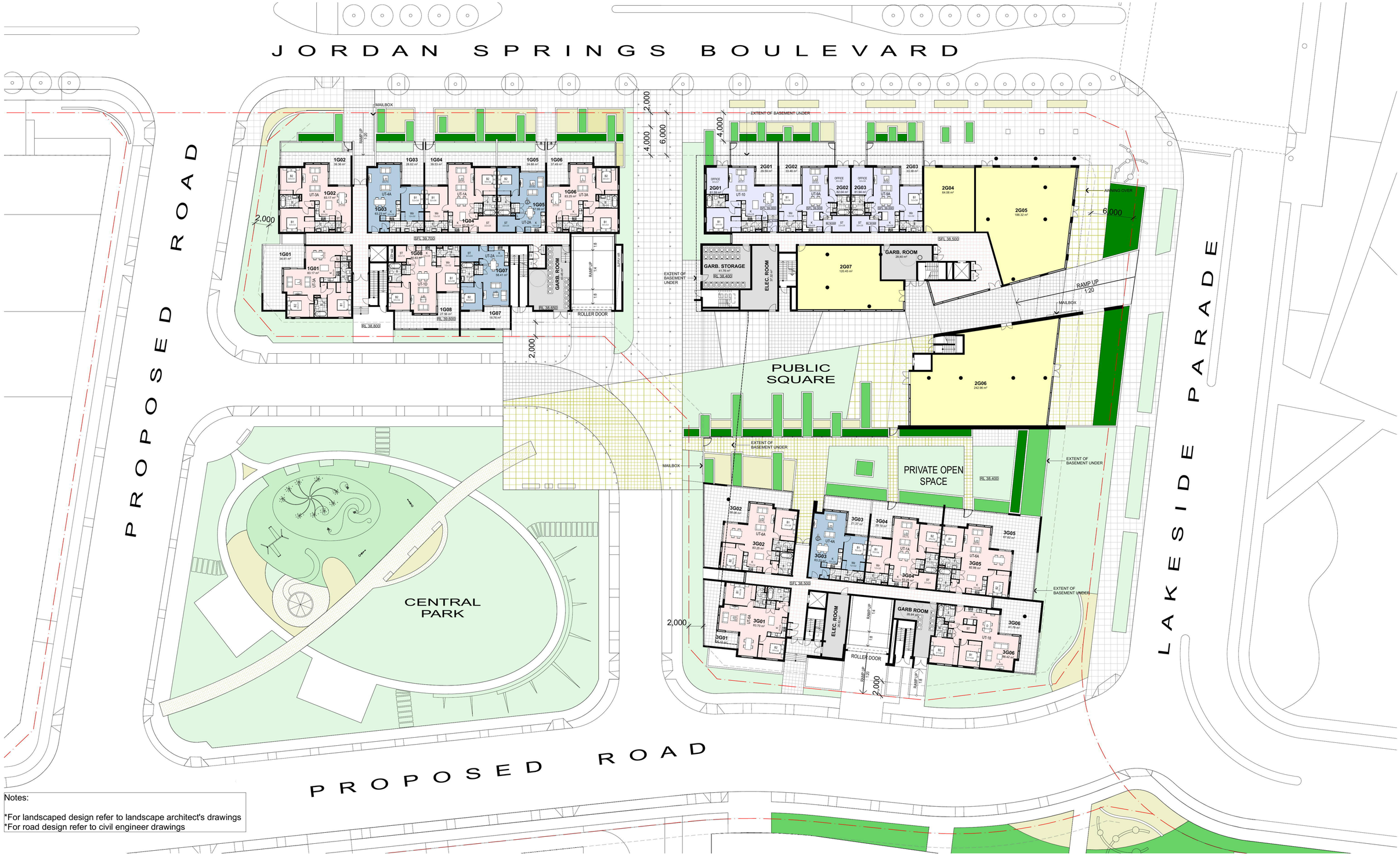

Notes:

*For landscaped design refer to landscape architect's drawings
*For road design refer to civil engineer drawings

1 Ground
1:250

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Notes

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metres 0 1 5 10 1:250

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issue	details	by	date
P7	PRELIMINARY FOR CONSULTANTS	SB	26.11.14
P6	PRELIMINARY FOR CONSULTANTS	SB	14.11.14
P5	PRELIMINARY FOR CONSULTANTS	SB	10.11.14
P4	PRELIMINARY FOR CONSULTANTS	SB	31.10.14
P3	PRELIMINARY FOR CONSULTANTS	SB	22.10.14
P2	PRELIMINARY FOR CONSULTANTS	SB	17.10.14
P1	PRELIMINARY FOR CLIENT	SB	08.10.14

amendments

project
PARKLANDS ESTATE

location
Jordan Springs Boulevard
JORDAN SPRINGS

project co-ordinator
SYNERGY DEVELOPMENT GROUP

client
CID GROUP

drawing title
Buildings 1,2 & 3-GROUND FLOOR

date	checked	project arch.	drawn
30.09.14		SB	SB
scale	no		issue
	14016 AP07		P7

PRELIMINARY

mosca pserras architects
p 02 9601 3244 f 02 9601 6336
a po box 3353, liverpool westfield nsw 2170

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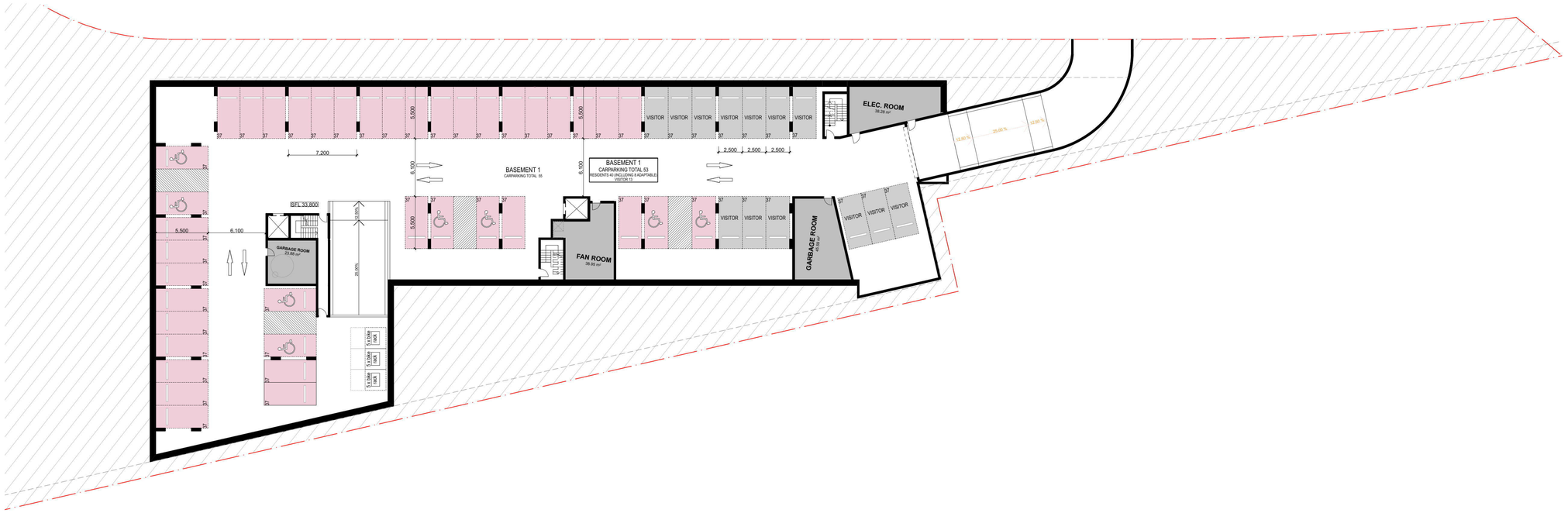
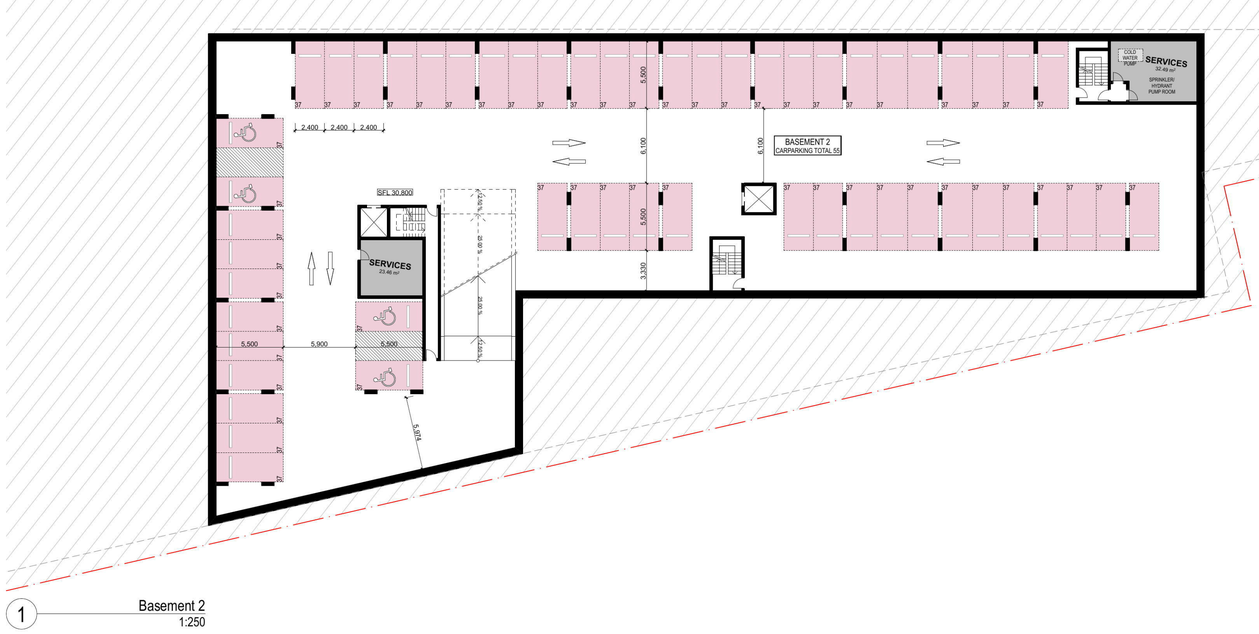
Version: 1, Version Date: 27/02/2015



1 Basement 1
1:250



1 Basement 2
1:250

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Notes

N

metres 0 1 5 10 1:250

CID GROUP

SYNERGY DEVELOPMENT GROUP

issue	details	by	date
P8	PRELIMINARY FOR CLIENT	SB	17.12.14
P7	PRELIMINARY FOR CONSULTANTS	SB	26.11.14
P6	PRELIMINARY FOR CONSULTANTS	SB	19.11.14
P5	PRELIMINARY FOR CONSULTANTS	SB	14.11.14
P4	PRELIMINARY FOR CONSULTANTS	SB	04.11.14
P3	PRELIMINARY FOR CONSULTANTS	SB	31.10.14
P2	PRELIMINARY FOR CONSULTANTS	SB	17.10.14
P1	PRELIMINARY FOR CLIENT	SB	08.10.14

amendments

project
PARKLANDS ESTATE

location
Jordan Springs Boulevard
JORDAN SPRINGS

project co-ordinator
SYNERGY DEVELOPMENT GROUP

client
CID GROUP

drawing title
Building 4-BESEMENT 1 & 2

date	checked	project arch.	drawn
30.09.14		SB	SB
scale	no		issue
	14016 AP14		P8

PRELIMINARY

mosca pserras architects
p 02 9601 3244 f 02 9601 6336
a po box 3353, liverpool westfield nsw 2170

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- larger scale drawings and written dimensions take preference.
- do not scale from drawing
- all dimensions to be checked on site before commencement of work.
- all discrepancies to be brought to the attention of the author.

Notes

N

metres 0 1 5 10 1:250

CID GROUP

SYNERGY DEVELOPMENT GROUP

amendments

issue	details	by	date
P8	PRELIMINARY FOR CONSULTANTS	SB	26.11.14
P7	PRELIMINARY FOR CONSULTANTS	SB	14.11.14
P6	PRELIMINARY FOR CONSULTANTS	SB	10.11.14
P5	PRELIMINARY FOR CONSULTANTS	SB	04.11.14
P4	PRELIMINARY FOR CONSULTANTS	SB	31.10.14
P3	PRELIMINARY FOR CONSULTANTS	SB	22.10.14
P2	PRELIMINARY FOR CONSULTANTS	SB	17.10.14
P1	PRELIMINARY FOR CLIENT	SB	08.10.14

project
PARKLANDS ESTATE

location
Jordan Springs Boulevard
JORDAN SPRINGS

project co-ordinator
SYNERGY DEVELOPMENT GROUP

client
CID GROUP

drawing title
Building 4-GROUND & LEVEL 1

date	checked	project arch.	drawn
30.09.14		SB	SB
scale	no		issue
	14016 AP17		P8

PRELIMINARY

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Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

WASTE MANAGEMENT PLAN
DEMOLITION, CONSTRUCTION AND USE OF PREMISES

If you need more space to give details, you are welcome to attach extra pages to this form.

PLEASE COMPLETE ALL PARTS OF THIS FORM THAT ARE RELEVANT TO YOUR DEVELOPMENT APPLICATION (DA).

IF YOU NEED MORE SPACE TO GIVE DETAILS, YOU ARE WELCOME TO ATTACH EXTRA PAGES TO THIS FORM.

Council will assess the information you provide on this form along with your attached plans. We will take into account the types and volumes of waste that could be produced as a result of your proposed development, and how you are planning to:

- minimise the amount of waste produced
- maximise re-use and recycling
- store, transport and dispose of waste safely and thoughtfully.

APPLICANT DETAILS

First name

Surname

Postal Address

Street No.

Street name

Suburb

Post code

Contact phone number

Email address

DETAILS OF YOUR PROPOSED DEVELOPMENT

Lots 3989, 3990, 3991 DP1190132

Street No.

Street name: JORDAN SPRINGS BOULEVARD

Suburb: JORDAN SPRINGS.

Post code

What buildings and other structures are currently on the site?

NIL.

Briefly describe your proposed development

MIXED USE RESIDENTAIL DEVELOPMENT COMPRISING OF 5 BUILDINGS AND ASSOCIATED BASEMENT CARPARKING.

Applicant Signature

Date

PENRITH CITY COUNCIL

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Version: 1, Version Date: 27/02/2015

SECTION 1: DEMOLITION

*Please include details on the plans you submit with this form, for example location of on-site storage areas/ containers, vehicle access point/s.

Materials		Destination		
		Re-use and recycling		Disposal
Material	Estimated volume (m^2 or m^3)	ON-SITE* Specify proposed re-use or on-site recycling	OFF-SITE Specify contractor and recycling facility	Specify contractor and landfill site
Excavation (eg soil, rock)				
Green waste				
Bricks				
Concrete				
Timber (Please specify type/s)				
Plasterboard				
Metals (Please specify type/s)				
Other				

NOT APPLICABLE
NO DEMOLITION REQUIRED.

PENRITH CITY COUNCIL

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Version: 1, Version Date: 27/02/2015

SECTION 2: CONSTRUCTION

*Please include details on the plans you submit with this form, for example location of on-site storage areas/ containers, vehicle access point/s.

Materials		Destination		
		Re-use and recycling		Disposal
Material	Estimated volume (m^2 or m^3)	ON-SITE* Specify proposed re-use or on-site recycling	OFF-SITE Specify contractor and recycling facility	Specify contractor and landfill site
Excavation (eg soil, rock)	29 700 m^2			TO APPROPRIATE FACILITY.
Green waste	10 m^3		TO LOCAL RECYCLE FACILITY	
Bricks	8 m^3		"	
Concrete	10 m^3		"	
Timber (Please specify type/s)	NIL			
Plasterboard	6 m^3			SITA ENVIROMENT 13 13 35
Metals (Please specify type/s)	5 m^3			"
Other				

PENRITH CITY COUNCIL

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Version: 1, Version Date: 27/02/2015

SECTION 3: WASTE FROM ON-GOING USE OF PREMISES

If relevant, please list the type/s of waste that may be generated by on-going use of the premises after the development is finished.	Expected volume (average per week)
RESIDENTIAL: GARBAGE @ 80L/UNIT/W RECYCLING @ 40L/UNIT/W	16 080 L 8 040 L
COMMERCIAL: GARBAGE @ 60L/100M²/D	2520 L
RECYCLING @ 25L/100M²/D	1050 L

SECTION 4: ON-GOING MANAGEMENT OF PREMISES

If relevant, please give details of how you intend to manage waste on-site after the development is finished, for example through lease conditions for tenants or an on-site caretaker/manager. Describe any proposed on-site storage and treatment facilities. Please attach plans showing the location of waste storage and collection areas, and access routes for tenants and collection vehicles.

Residents are to transport garbage waste & recyclables to garbage chutes & recycle bins located on each floor of every building.
The garbage chute system discharges into garbage store rooms located generally on the ground floor.
Here a site caretaker is responcible to transport the full garbage & recycle bins to an arranged collection point on the nominated days and times.
Commercial waste is to be collected by a private contractor.

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Version: 1, Version Date: 27/02/2015

DATE PLOTTED: 3 February 2015 8:45 AM BY : SGC_MAC3

A1

PARKLANDS ESTATE
JORDAN SPRINGS BOULEVARD, JORDAN SPRINGS

STORMWATER CONCEPT DESIGN

sgc



LOCALITY PLAN

SITE

DRAWING REGISTER		
No.	TITLE	REV
SW01	COVER SHEET	A
SW02	SITE PLAN	A
SW03	STORMWATER CONCEPT DESIGN - BUILDINGS 1,2,3 GROUND FLOOR - 1 OF 4	A
SW04	STORMWATER CONCEPT DESIGN - BUILDINGS 1,2,3 GROUND FLOOR - 2 OF 4	A
SW05	STORMWATER CONCEPT DESIGN - BUILDINGS 1,2,3 GROUND FLOOR - 3 OF 4	A
SW06	STORMWATER CONCEPT DESIGN - BUILDINGS 1,2,3 GROUND FLOOR - 4 OF 4	A
SW07	STORMWATER CONCEPT DESIGN - BUILDINGS 1,2,3 BASEMENT 2 - SHEET 1	A
SW08	STORMWATER CONCEPT DESIGN - BUILDINGS 1,2,3 BASEMENT 2 - SHEET 2	A
SW09	STORMWATER CONCEPT DESIGN - BUILDINGS 1,2,3 BASEMENT 2 - SHEET 3	A
SW10	STORMWATER CONCEPT DESIGN - BUILDINGS 1,2,3 ROOF PLAN	A
SW11	STORMWATER CONCEPT DESIGN - BUILDINGS 4 & 5 GROUND FLOOR - 1 OF 2	A
SW12	STORMWATER CONCEPT DESIGN - BUILDINGS 4 & 5 GROUND FLOOR - 2 OF 2	A
SW13	STORMWATER CONCEPT DESIGN - BUILDINGS 4 & 5 BASEMENT 2 - 1 OF 2	A
SW14	STORMWATER CONCEPT DESIGN - BUILDINGS 4 & 5 BASEMENT 2 AND DETAILS - 2 OF 2	A
SW15	STORMWATER CONCEPT DESIGN - BUILDINGS 4 & 5 ROOF PLAN	A

Drawing Title

COVER SHEET

Project Number	Drawing Number	Revision Number
20140381	SW01	A

Sheet 1 of 15 | Issue FOR APPROVAL

PLOT By: P.P
DRAWING FILE: C:\Production\2014\20140381 Jordan Springs Boulevard, Jordan Springs - Parklands Estate - Stage 1\Civil\Cad\SW01.dwg

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Version: 1, Version Date: 27/02/2015

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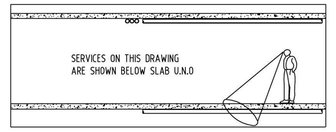
A1



JORDAN SPRINGS BOULEVARD

SW03

SW04

BUILDING B1

B1
CASTLEREAGH

BUILDING B2

B2

SW05

SW06

PROPOSED ROAD

CENTRAL PARK

BUILDING B3

B3
WOODLAND

LAKESIDE PARADE

PROPOSED ROAD

B15
EUCALYPTUS

B13
MELALEUCA

B8
ACACIA

B7
GREVILLEA

B6
PIMELEA

SW11

SW12

NON-TRAFFICABLE ROOF

BUILDING B4

B4
DILLWYNIA

NON-TRAFFICABLE ROOF

BUILDING B5

B5
DILLWYNIA

Reference Coordination Drawing

Discipline	Drawing Title and Number	Date	Rev.
ARCH	14016 AP02	17.12.14	P8
ARCH			
STRUCT			
MECH			
ELEC			
HYD			
FIRE			
LANDS			
CIVIL			
SURVEY			

Issue	Last revision title	by	Date	Status
A	SUBMISSION TO COUNCIL	SH	18.12.2014	2

Issuer internal sequence and revision history

1-preliminary 2-development application 3-construction certificate
4-tender 5-construction 6-other

ENGINEERS AUSTRALIA
Chartered Professional Engineer
MEMBER

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DRAWN	DATE
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Scales

0m 5 10 15 20 25
SCALE 1500 ON ORIGINAL SIZE

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ARCHITECT
MOSCA PSERRAS
ARCHITECTS

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PROJECT
PARKLANDS ESTATE

JORDAN SPRINGS BOULEVARD
JORDAN SPRINGS

Grid	Datum	Sheet	Scale (at original size)
-	A.H.D.	2 of 15	1500 @ A1

Drawing Status: FOR APPROVAL
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Drawing Title
STORMWATER CONCEPT DESIGN
SITE PLAN

Project No	Drawing No	Revision No
20140381	SW02	A

DATE PLOTTED: 3 February 2015 8:44 AM BY: SGCE_MAC3
FILE: Z:\Production\2014\20140381 Jordan Springs - Parklands Estate - Stage 1\Civil\cad\SW02.dwg

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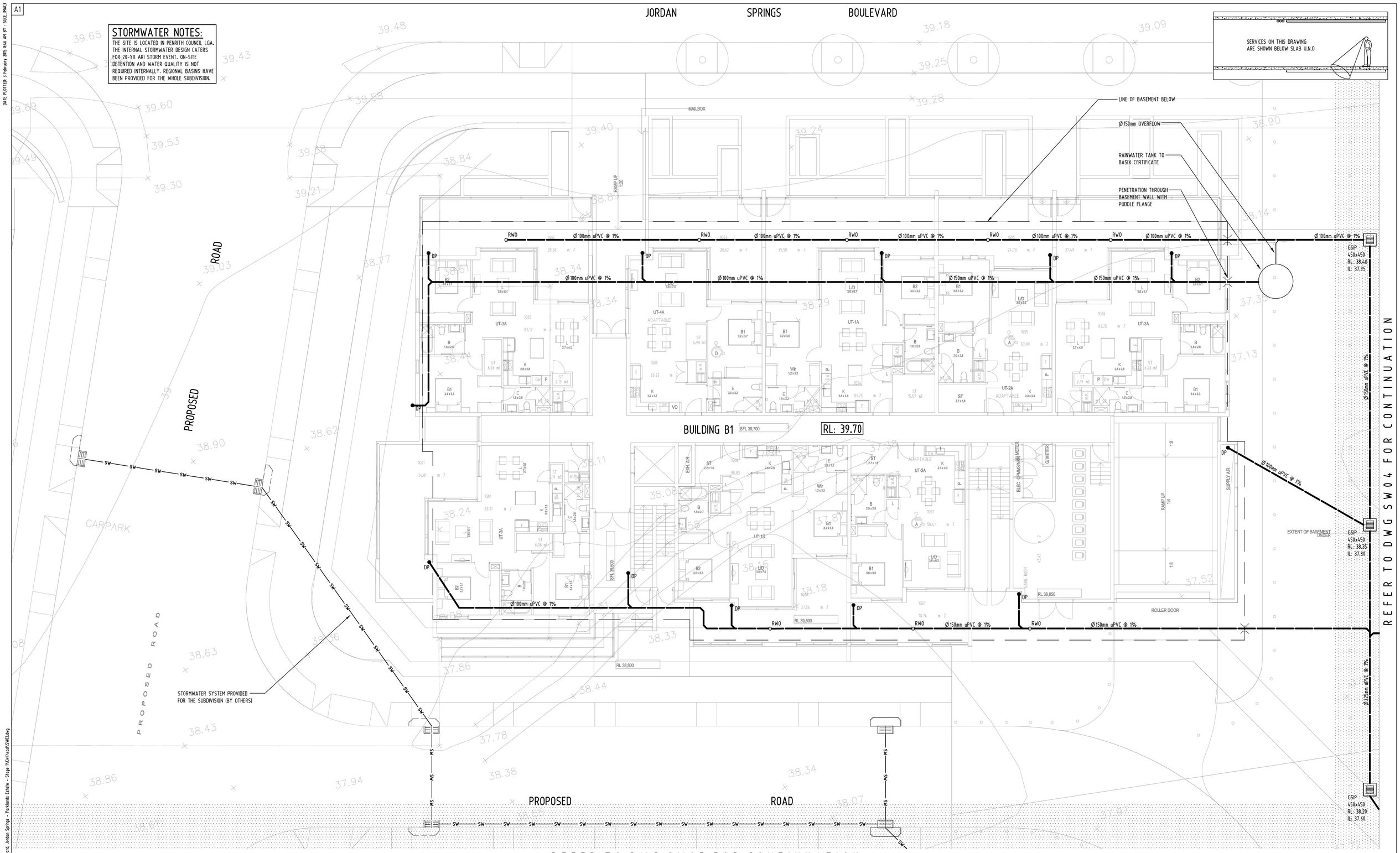

Issue	Last revision title	by	Date	Status
A	SUBMISSION TO COUNCIL	SH	02.02.15	2

Issuer internal sequence and revision history

1-preliminary 2-development application 3-construction certificate
4-tender 5-construction 6-other

Reference Coordination Drawing

Discipline	Drawing Title and Number	Date	Rev.
ARCH	14016 AP07	17.12.14	P8
ARCH			
STRUCT			
MECH			
ELEC			
HYD			
FIRE			
LANDS			
CIVIL			
SURVEY	9776DA SURVEY	27.11.14	#

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Scales

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PROJECT
PARKLANDS ESTATE

JORDAN SPRINGS BOULEVARD
JORDAN SPRINGS

Grid	Datum	Sheet	Scale (at original size)
-	A.H.D.	3 of 15	1:100 @ A1

Drawing Status
FOR APPROVAL
NOT TO BE USED FOR CONSTRUCTION PURPOSES

Drawing Title
STORMWATER CONCEPT DESIGN
BUILDINGS 1, 2 AND 3 GROUND FLOOR
SHEET 1 OF 4

Project No	Drawing No	Revision No
20140381	SW03	A

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

A1

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JORDAN SPRINGS BOULEVARD

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STORMWATER NOTES:

THE SITE IS LOCATED IN PENRITH COUNCIL LGA. THE INTERNAL STORMWATER DESIGN CATERS FOR 20-YR ARI STORM EVENT. ON-SITE DETENTION AND WATER QUALITY IS NOT REQUIRED INTERNALLY. REGIONAL BASINS HAVE BEEN PROVIDED FOR THE WHOLE SUBDIVISION.

EXTENT OF BASEMENT UNDER

BUILDING B2 RL: 38.50

PUBLIC SQUARE

PARADE

LAKESIDE

Ø100mm uPVC @ 1%

Ø150mm uPVC @ 1%

Ø225mm uPVC @ 1%

RWO

DP

GSIP 450x450 RL: 38.40 IL: 37.95

GSIP 450x450 RL: 38.40 IL: 37.90

GSIP 450x450 RL: 38.35 IL: 37.80

GSIP 450x450 RL: 38.35 IL: 37.75

GSIP 450x450 RL: 38.20 IL: 37.60

ROOFWATER ONLY

Ø150mm OVERFLOW

RAINWATER TANK TO BASIX CERTIFICATE

FIRST FLUSH DEVICE

AWNING OVER

MAILBOX

GARB. STORAGE

GARB. ROOM

ELEC. ROOM

SUBSTATION

ELEC

COMMS/NBN

W METER

G METER

OFFICE

UT-10

UT-9A

SFL 39.000

SFL 38.500

SFL 38.400

RL 38.400

REFER TO DWG SW03 FOR CONTINUATION

REFER TO DWG SW06 FOR CONTINUATION

A	SUBMISSION TO COUNCIL	SH	02.02.15	2
Issue	Last revision title	by	Date	Status

Issuer internal sequence and revision history

1-preliminary 2-development application 3-construction certificate 4-tender 5-construction 6-other

Reference Coordination Drawing

Discipline	Drawing Title and Number	Date	Rev.
ARCH	1408 AP07	17.12.14	P8
ARCH			
STRUCT			
MECH			
ELEC			
HYD			
FIRE			
LANDS			
CIVIL			
SURVEY	97760A SURVEY	27.11.14	#

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Scales

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SCALE 1:100 ON ORIGINAL SIZE

CLIENT
CID GROUP

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MOSCA PSERRAS ARCHITECTS

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PROJECT
PARKLANDS ESTATE
JORDAN SPRINGS BOULEVARD
JORDAN SPRINGS

Grid	Datum	Sheet	Scale (at original size)
-	A.H.D.	4 of 15	1:100 @ A1

Drawing Status: FOR APPROVAL
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Drawing Title
STORMWATER CONCEPT DESIGN
BUILDINGS 1, 2 AND 3 GROUND FLOOR
SHEET 2 OF 4

Project No	Drawing No	Revision No
20140381	SW04	A

PLOT BY: Z:\Production\2014\20140381 Jordan Springs Boulevard, Jordan Springs - Parklands Estate - Stage 1\Civil\cad\SW04.dwg

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A1

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REFER TO DWG SW03 FOR CONTINUATION

PROPOSED ROAD

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STORMWATER NOTES:

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GSIP 450x450 RL: 38.70 IL: 38.20

GSIP 450x450 RL: 38.50 IL: 37.90

GSIP 450x450 RL: 38.40 IL: 37.80

GSIP 450x450 RL: 38.40 IL: 37.90

GSIP 450x450 RL: 38.40 IL: 37.90

GSIP 450x450 RL: 38.25 IL: 37.70

GSIP 450x450 RL: 37.90 IL: 37.30

GSIP 450x450 RL: 38.15 IL: 37.60

GSIP 450x450 RL: 37.80 IL: 37.10

Ø150mm uPVC @ 1%

Ø225mm uPVC @ 1%

Ø300mm uPVC @ 1%

STORMWATER SYSTEM PROVIDED FOR THE SUBDIVISION (BY OTHERS)

CATCH DRAIN (TYP.)

CATCH DRAIN AT BOTTOM OF BANK

CENTRAL PARK

ROAD

PROPOSED

MAILBOX

REFER TO DWG SW06 FOR CONTINUATION

Issue	Last revision title	by	Date	Status
A	SUBMISSION TO COUNCIL	SH	02.02.15	2

Issuer internal sequence and revision history

1-preliminary 2-development application 3-construction certificate 4-tender 5-construction 6-other

Reference Coordination Drawing

Discipline	Drawing Title and Number	Date	Rev.
ARCH	1406 AP07	17.12.14	P8
ARCH			
STRUCT			
MECH			
ELEC			
HYD			
FIRE			
LANDS			
CIVIL			
SURVEY	97760A SURVEY	27.11.14	#

ENGINEERS AUSTRALIA Chartered Professional Engineer MEMBER

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APPROVED	DATE

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Scales

0m 1 2 3 4 5

SCALE 1:100 ON ORIGINAL SIZE

CLIENT
CID GROUP

ARCHITECT
MOSCA PSERRAS ARCHITECTS

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Web: www.sgce.com.au

PROJECT
PARKLANDS ESTATE

JORDAN SPRINGS BOULEVARD
JORDAN SPRINGS

Grid	Datum	Sheet	Scale (at original size)
-	A.H.D.	5 of 15	1:100 @ A1

Drawing Status: FOR APPROVAL
NOT TO BE USED FOR CONSTRUCTION PURPOSES

Drawing Title
STORMWATER CONCEPT DESIGN
BUILDINGS 1, 2 AND 3 GROUND FLOOR
SHEET 3 OF 4

Project No	Drawing No	Revision No
20140381	SW05	A

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Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

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REFER TO DWG SW05 FOR CONTINUATION

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GSIP 450x450 RL: 38.20 IL: 37.60

GSIP 450x450 RL: 38.15 IL: 37.55

GSIP 600x600 RL: 38.30 IL: 37.65

GSIP 600x600 RL: 38.25 IL: 37.45

GSIP 450x450 RL: 37.70 IL: 37.20

GSIP 450x450 RL: 37.70 IL: 37.20

Ø225mm uPVC @ 1%

Ø100mm uPVC @ 1%

Ø150mm uPVC @ 1%

RWO

DP

EXTENT OF BASEMENT UNDER

PRIVATE OPEN SPACE

RL: 38.40

RL: 38.50

BUILDING B3

SFL 38.500

ROOFWATER ONLY

FIRST FLUSH DEVICE

RAINWATER TANK TO BASIX CERTIFICATE

Ø150mm OVERFLOW PIPE

OF

CONNECT TO STORMWATER INFRASTRUCTURE PROVIDED FOR SUBDIVISION; REFER J. WYNDHAM PRINCE DESIGN DRAWINGS (TYP.)

SW

ROLLER DOOR

RAMP UP 1:8

RAMP UP 1:4

RAMP UP 1:20

MAILBOX

PARADE

LAKESIDE

PROPOSED ROAD

A	SUBMISSION TO COUNCIL	SH	02.02.15	2
Issue	Last revision title	by	Date	Status

Issuer internal sequence and revision history

1-preliminary 2-development application 3-construction certificate 4-tender 5-construction 6-other

Reference Coordination Drawing

Discipline	Drawing Title and Number	Date	Rev.
ARCH	14016 AP07	17.12.14	P8
ARCH			
STRUCT			
MECH			
ELEC			
HYD			
FIRE			
LANDS			
CIVIL			
SURVEY	97760A SURVEY	27.11.14	#

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PROJECT
PARKLANDS ESTATE
JORDAN SPRINGS BOULEVARD
JORDAN SPRINGS

Grid	Datum	Sheet	Scale (at original size)
-	A.H.D.	6 of 15	1:100 @ A1

Drawing Status: FOR APPROVAL
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Drawing Title
STORMWATER CONCEPT DESIGN
BUILDINGS 1, 2 AND 3 GROUND FLOOR
SHEET 4 OF 4

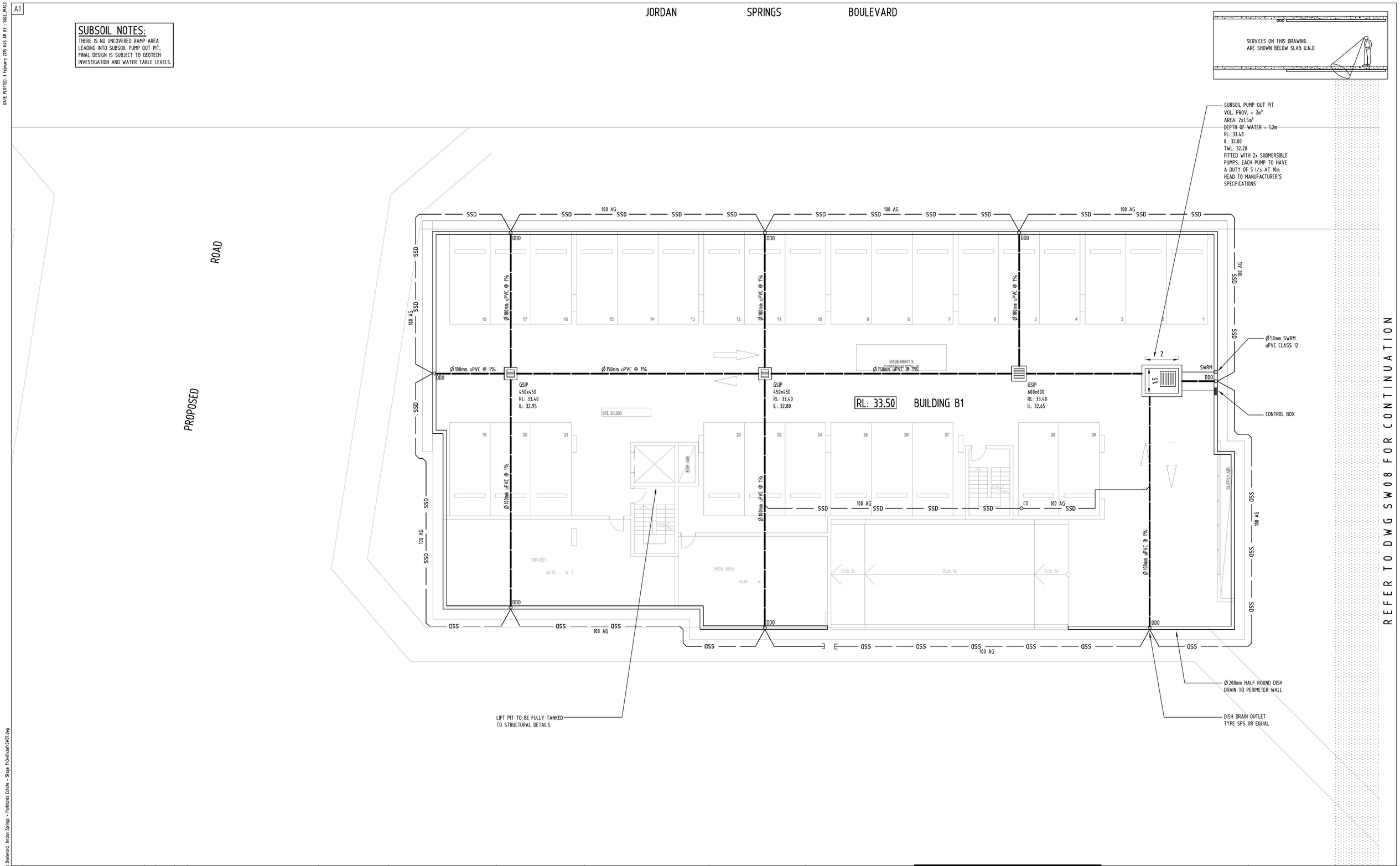
Project No	Drawing No	Revision No
20140381	SW06	A

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

A1

SUBSOIL NOTES:

THERE IS NO UNCOVERED RAMP AREA LEADING INTO SUBSOIL PUMP OUT PIT. FINAL DESIGN IS SUBJECT TO GEOTECH INVESTIGATION AND WATER TABLE LEVELS.



Issue	Last revision title	by	Date	Status
A	SUBMISSION TO COUNCIL	SH	02.02.15	2

Issuer internal sequence and revision history

1-preliminary 2-development application 3-construction certificate 4-tender 5-construction 6-other

Reference Coordination Drawing

Discipline	Drawing Title and Number	Date	Rev.
ARCH	14016 AP05	17.12.14	P6
ARCH			
STRUCT			
MECH			
ELEC			
HYD			
FIRE			
LANDS			
CIVIL			
SURVEY			

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PROJECT
PARKLANDS ESTATE

JORDAN SPRINGS BOULEVARD
JORDAN SPRINGS

Grid	Datum	Sheet	Scale (at original size)
-	A.H.D.	7 of 15	1:100 @ A1

Drawing Status: FOR APPROVAL
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Drawing Title
STORMWATER CONCEPT DESIGN
BUILDINGS 1, 2 AND 3
BASEMENT 2 - SHEET 1

Project No	Drawing No	Revision No
20140381	SW07	A

DATE PLOTTED: 3 February 2015 8:45 AM BY : SGCE_MAC3

XREFs: 2-Production\2014\20140381 Jordan Springs Boulevard, Jordan Springs - Parklands Estate - Stage 1\Civil\cad\SW07.dwg

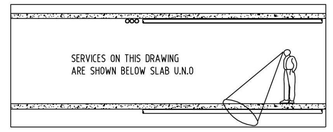
DATE PLOTTED: 3 February 2015 8:44 AM BY: SGCL_MAC3

A1

JORDAN SPRINGS BOULEVARD

SUBSOIL NOTES:

THERE IS NO UNCOVERED RAMP AREA LEADING INTO SUBSOIL PUMP OUT PIT. FINAL DESIGN IS SUBJECT TO GEOTECH INVESTIGATION AND WATER TABLE LEVELS.





REFER TO DWG SW07 FOR CONTINUATION

REFER TO DWG SW09 FOR CONTINUATION

Issue	Last revision title	by	Date	Status
A	SUBMISSION TO COUNCIL	SH	02.02.15	2

Issuer internal sequence and revision history

1-preliminary 2-development application 3-construction certificate 4-tender 5-construction 6-other

Reference Coordination Drawing

Discipline	Drawing Title and Number	Date	Rev.
ARCH	14016 AP05	17.12.14	P6
ARCH			
STRUCT			
MECH			
ELEC			
HYD			
FIRE			
LANDS			
CIVIL			
SURVEY			

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SCALE 1:100 ON ORIGINAL SIZE

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PROJECT
PARKLANDS ESTATE
JORDAN SPRINGS BOULEVARD
JORDAN SPRINGS

Grid	Datum	Sheet	Scale (at original size)
-	A.H.D.	8 of 15	1:100 @ A1

Drawing Status: FOR APPROVAL
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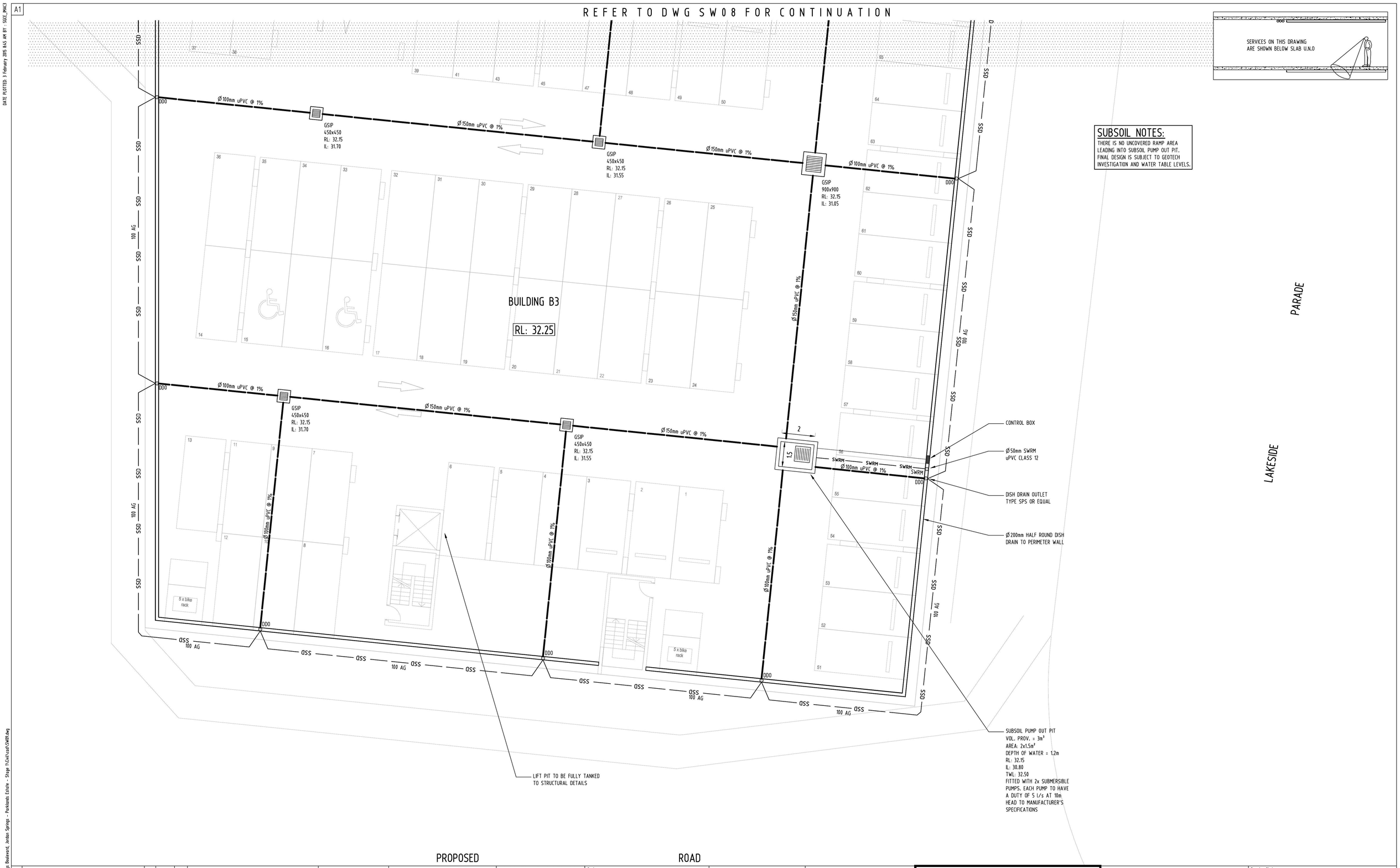
Drawing Title
STORMWATER CONCEPT DESIGN
BUILDINGS 1, 2 AND 3
BASEMENT 2 - SHEET 2

Project No	Drawing No	Revision No
20140381	SW08	A

XREF: P:\Projects\2014\20140381 Jordan Springs Boulevard, Jordan Springs - Parklands Estate - Stage 1\Civil\cad\SW08.dwg

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015



Issue	Last revision title	by	Date	Status
A	SUBMISSION TO COUNCIL	SH	02.02.15	2

Issuer internal sequence and revision history

1-preliminary 2-development application 3-construction certificate 4-tender 5-construction 6-other

Reference Coordination Drawing

Discipline	Drawing Title and Number	Date	Rev.
ARCH	14016 AP05	17.12.14	P6
ARCH			
STRUCT			
MECH			
ELEC			
HYD			
FIRE			
LANDS			
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SURVEY			

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PROJECT
PARKLANDS ESTATE
JORDAN SPRINGS BOULEVARD
JORDAN SPRINGS

Grid	Datum	Sheet	Scale (at original size)
-	A.H.D.	9 of 15	1:100 @ A1

Drawing Status
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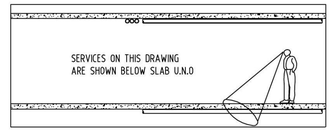
Drawing Title
STORMWATER CONCEPT DESIGN
BUILDINGS 1, 2 AND 3
BASEMENT 2 - SHEET 3

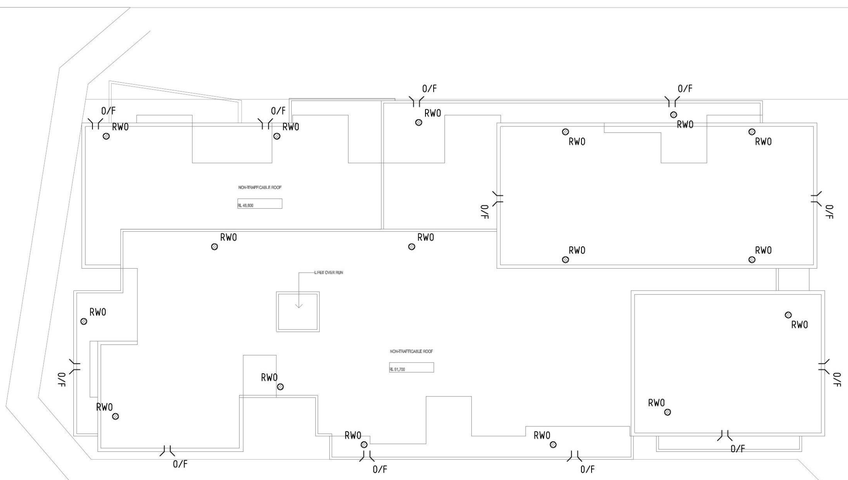
Project No	Drawing No	Revision No
20140381	SW09	A

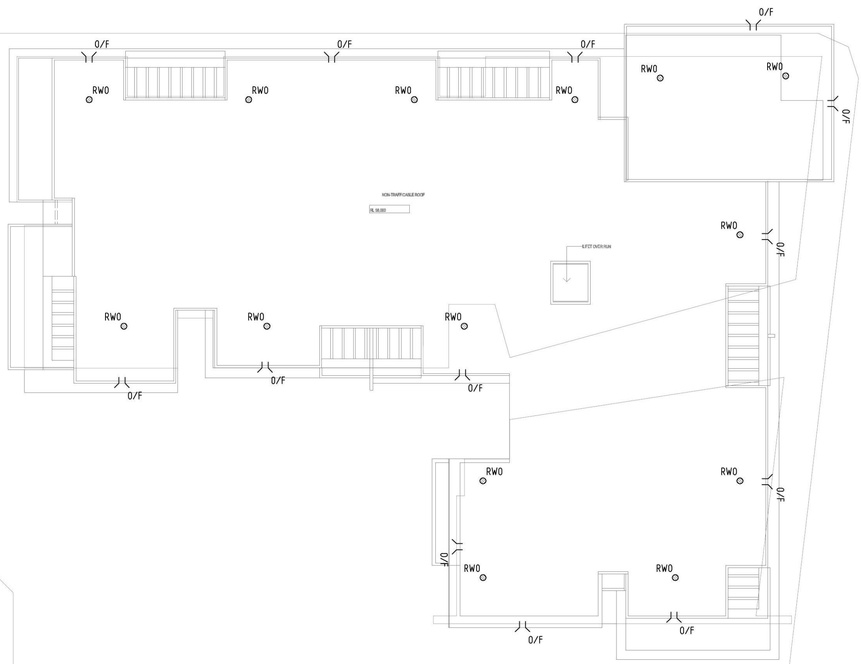
Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

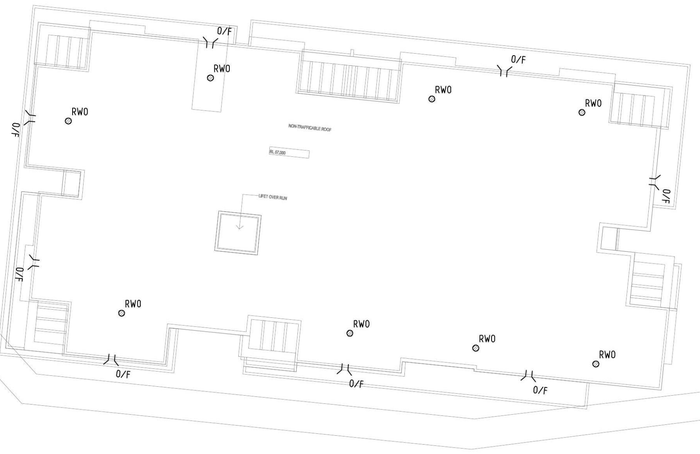
DATE PLOTTED: 3 February 2015 8:44 AM BY: SGCE_MAC3

A1









A	SUBMISSION TO COUNCIL	SH	02.02.15	2
Issue	Last revision title	by	Date	Status

Issuer internal sequence and revision history

1-preliminary 2-development application 3-construction certificate
4-tender 5-construction 6-other

Reference Coordination Drawing

Discipline	Drawing Title and Number	Date	Rev.
ARCH	14016 AP13	14.01.15	P8
ARCH			
STRUCT			
MECH			
ELEC			
HYD			
FIRE			
LANDS			
CIVIL			
SURVEY			

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PROJECT
PARKLANDS ESTATE

JORDAN SPRINGS BOULEVARD
JORDAN SPRINGS

Grid	Datum	Sheet	Scale (at original size)
-	A.H.D.	10 of 15	1:100 @ A1

Drawing Status: FOR APPROVAL
NOT TO BE USED FOR CONSTRUCTION PURPOSES

Drawing Title
STORMWATER CONCEPT DESIGN
BUILDINGS 1, 2 AND 3
ROOF PLAN

Project No	Drawing No	Revision No
20140381	SW10	A

XREF: P:\Projects\2014\20140381 Jordan Springs Boulevard, Jordan Springs - Parklands Estate - Stage 1\Civil\cad\SW10.dwg

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

DATE PLOTTED: 3 February 2015 8:48 AM BY: SGCL_MAC3

A1

REFER TO DWG SW06 FOR CONTINUATION

PENETRATION THROUGH BASEMENT WALL WITH PUDDLE FLANGE (TYP.)

STORMWATER SYSTEM PROVIDED FOR SUBDIVISION (BY OTHERS)

STORMWATER NOTES:

THE SITE IS LOCATED IN PENRITH COUNCIL LGA. THE INTERNAL STORMWATER DESIGN CATERS FOR 20-YR ARI STORM EVENT. ON-SITE DETENTION AND WATER QUALITY IS NOT REQUIRED INTERNALLY. REGIONAL BASINS HAVE BEEN PROVIDED FOR THE WHOLE SUBDIVISION.

GSIP 900x900 RL: 37.10 IL: 35.75

GSIP 900x900 RL: 37.10 IL: 35.90

GSIP 900x900 RL: 37.10 IL: 36.10

GSIP 600x600 RL: 37.10 IL: 36.25

GSIP 600x600 RL: 37.10 IL: 36.30

GSIP 900x900 RL: 37.00 IL: 35.65

GSIP 900x900 RL: 36.90 IL: 35.45

GSIP 600x600 RL: 36.80 IL: 36.00

GSIP 600x600 RL: 37.00 IL: 36.30

Ø 225mm uPVC @ 1%

Ø 300mm uPVC @ 1%

Ø 150mm uPVC @ 1%

Ø 100mm uPVC @ 1%

RL: 37.30 BUILDING B4

RL: 37.30 BUILDING B5

SFL 37.200

SFL 37.300

MAILBOX

RAMP UP 1:20

1500 SILL

1800 FEATURE WALL

PRIVATE OPEN SPACE

CONNECT TO EXISTING STORMWATER LINE BY J. WYNDHAM PRINCE PROVIDED FOR THE SUBDIVISION

ROOFWATER ONLY

FIRST FLUSH DEVICE

RAINWATER TANK TO BASIX CERTIFICATE

Ø 150mm OVERFLOW

LINE OF BASEMENT BELOW

REFER TO DWG SW12 FOR CONTINUATION

Issue	Last revision title	by	Date	Status
A	SUBMISSION TO COUNCIL	SH	02.02.15	2

Issuer internal sequence and revision history

1-preliminary 2-development application 3-construction certificate 4-tender 5-construction 6-other

Reference Coordination Drawing

Discipline	Drawing Title and Number	Date	Rev.
ARCH	1406 AP15	17.12.14	P9
ARCH			
STRUCT			
MECH			
ELEC			
HYD			
FIRE			
LANDS			
CIVIL			
SURVEY			

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PROJECT
PARKLANDS ESTATE

JORDAN SPRINGS BOULEVARD
JORDAN SPRINGS

Grid	Datum	Sheet	Scale (at original size)
-	A.H.D.	11 of 15	1:100 @ A1

Drawing Status: FOR APPROVAL
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Drawing Title
STORMWATER CONCEPT DESIGN
BUILDING 4 & 5
GROUND FLOOR - SHEET 1 OF 2

Project No	Drawing No	Revision No
20140381	SW11	A

XREFs: C:\Productions\2014\20140381 Jordan Springs Boulevard, Jordan Springs - Parklands Estate - Stage 1\Civil\Xcad\SWT1.dwg

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Version: 1, Version Date: 27/02/2015

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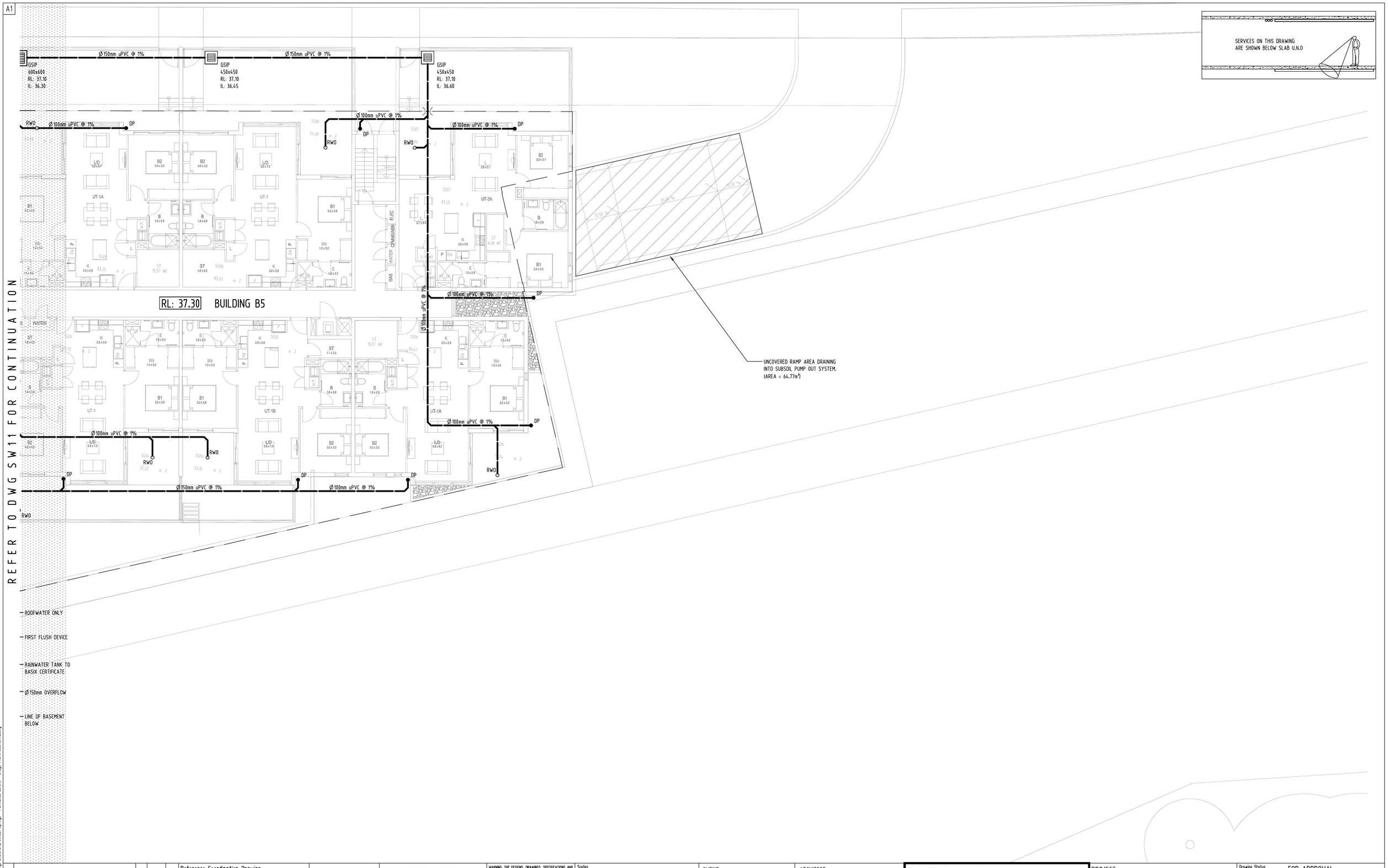
A1



A	SUBMISSION TO COUNCIL	SH	02.02.15	2
Issue	Last revision title	by	Date	Status

Issuer internal sequence and revision history

1-preliminary 2-development application 3-construction certificate
4-tender 5-construction 6-other

Reference Coordination Drawing

Discipline	Drawing Title and Number	Date	Rev.
ARCH	14.016 AP15	17.12.14	P9
ARCH			
STRUCT			
MECH			
ELEC			
HYD			
FIRE			
LANDS			
CIVIL			
SURVEY			

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PROJECT
PARKLANDS ESTATE

JORDAN SPRINGS BOULEVARD
JORDAN SPRINGS

Grid	Datum	Sheet	Scale (at original size)
-	A.H.D.	12 of 15	1:100 @ A1

Drawing Status: FOR APPROVAL
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Drawing Title
STORMWATER CONCEPT DESIGN
BUILDING 4 & 5
GROUND FLOOR - SHEET 2 OF 2

Project No	Drawing No	Revision No
20140381	SW12	A

DATE PLOTTED: 3 February 2015 8:47 AM BY: SGCE_MAC3
C:\Production\2014\20140381 Jordan Springs - Parklands Estate - Stage 1\Cad\cad\SW12.dwg

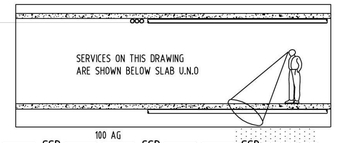
Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

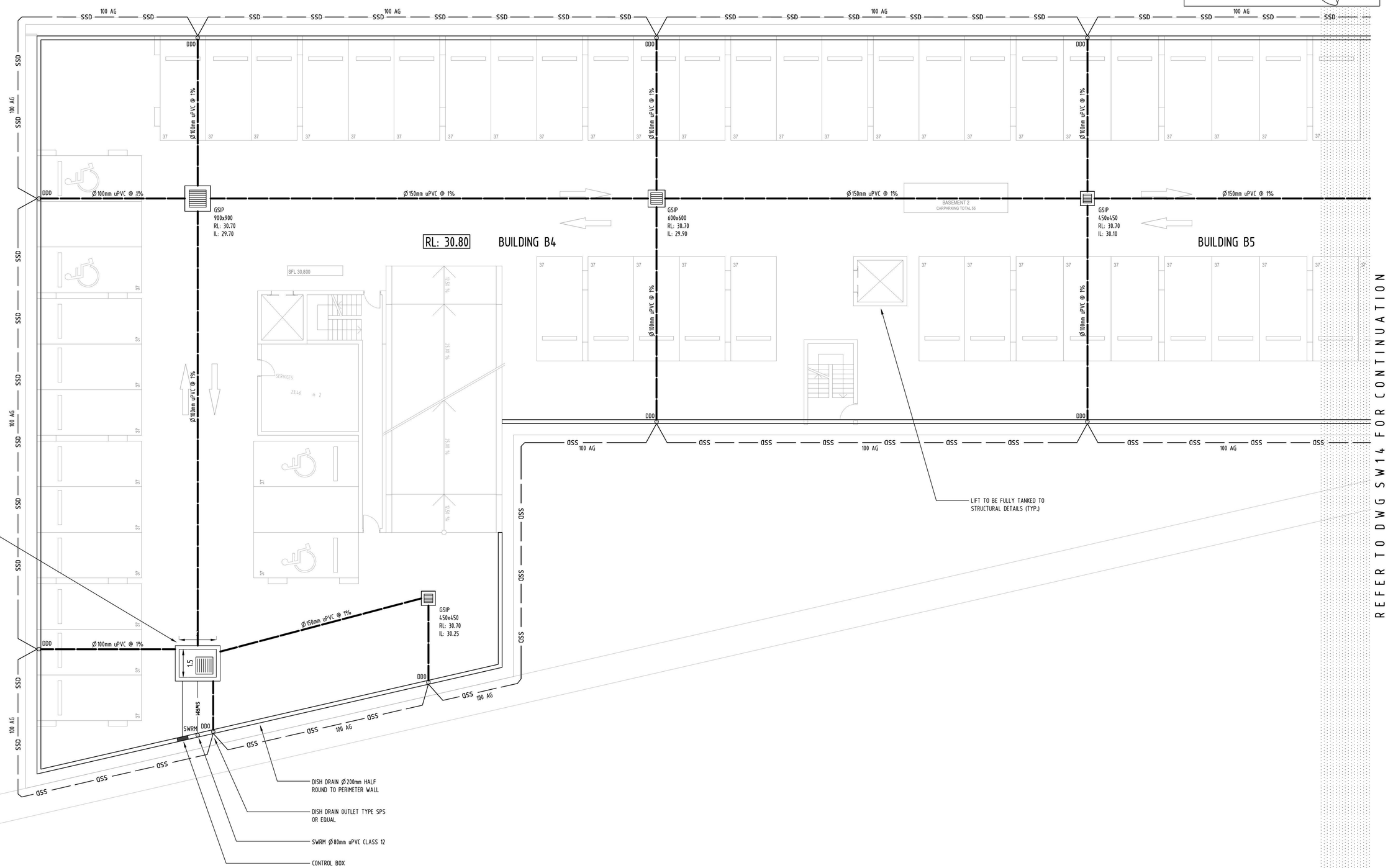
DATE PLOTTED: 3 February 2015 8:47 AM BY: SGCE_MAC3

A1

NOTES:

FINAL SUBSOIL DESIGN IS SUBJECT TO GEOTECHNICAL REPORT AND DEPTH OF WATER TABLE. UNCOVERED RAMP AREA DRAINING INTO SUBSOIL PUMP OUT
AREA =
SUBSOIL PUMP OUT IS SIZED IN ACCORDANCE WITH AS3500
VOL. REQ. = 3m³
PUMP RATE = 10 l/s @ 8m HEAD





REFER TO DWG SW14 FOR CONTINUATION

Issue	Last revision title	by	Date	Status
A	SUBMISSION TO COUNCIL	SH	02.02.15	2

Issuer internal sequence and revision history
1-preliminary 2-development application 3-construction certificate
4-tender 5-construction 6-other

Reference Coordination Drawing

Discipline	Drawing Title and Number	Date	Rev.
ARCH	14.016 AP14	17.12.14	P8
ARCH			
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MECH			
ELEC			
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SURVEY			

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PROJECT
PARKLANDS ESTATE
JORDAN SPRINGS BOULEVARD
JORDAN SPRINGS

Grid	Datum	Sheet	Scale (at original size)
-	A.H.D.	13 of 15	1:100 @ A1

Drawing Status: FOR APPROVAL
NOT TO BE USED FOR CONSTRUCTION PURPOSES

Drawing Title
STORMWATER CONCEPT DESIGN
BUILDING 4 & 5
BASEMENT 2 - SHEET 1 OF 2

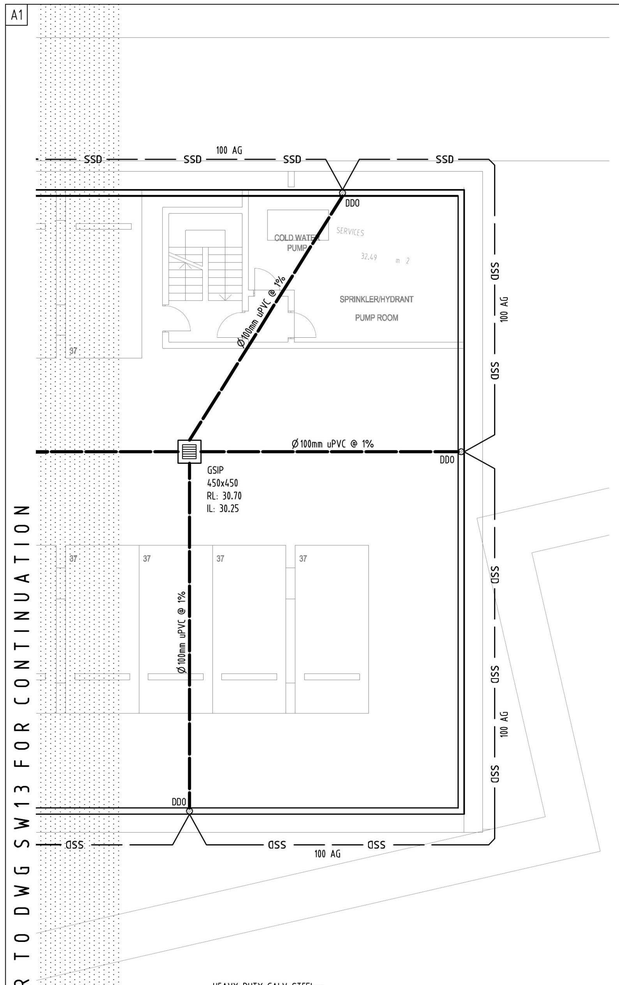
Project No	Drawing No	Revision No
20140381	SW13	A

XREF: P:\Projects\2014\20140381 Jordan Springs Boulevard, Jordan Springs - Parklands Estate - Stage 1\Civil\Cad\SW13.dwg

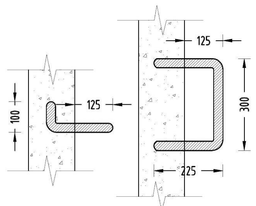
Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

DATE PLOTTED: 3 February 2015 8:47 AM BY: SGCE_MAC3

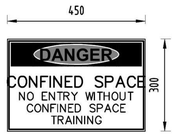
A1



REFER TO DWG SW13 FOR CONTINUATION



1 DETAIL
STEP IRONS
SCALE 1:10

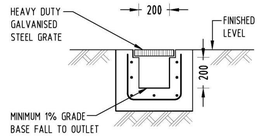


2 DETAIL
CONFINED SPACE SIGN
SCALE 1:10

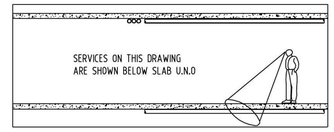


LEGEND:
BACKGROUND IS YELLOW
TEXT IS WHITE ON BLACK BACKGROUND

3 DETAIL
RAINWATER SIGN
SCALE 1:20

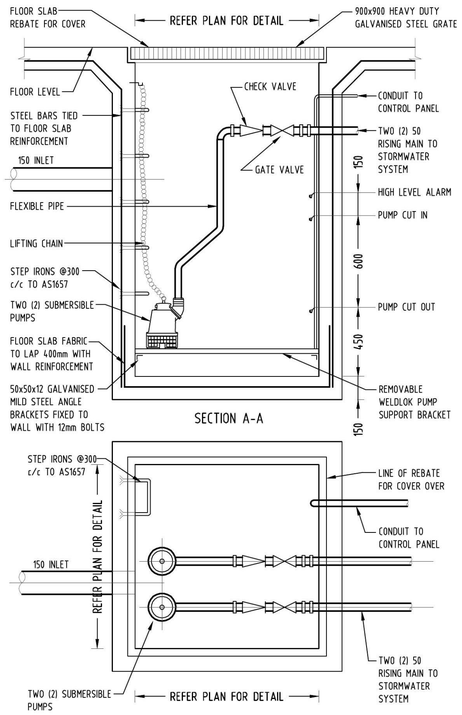


4 DETAIL
GRATED TRENCH DRAIN
SCALE 1:20



LEGEND:

- STORMWATER LINE
- SSD — SUBSOIL LINE
- SWRM — SWRM — STORMWATER RISING MAIN
- OF — OF — OVERFLOW LINE
- e — EXISTING STORMWATER LINE
- SW — SW — AUTHORITY STORMWATER LINE
- S — AUTHORITY SEWER LINE
- W — AUTHORITY WATER LINE
- G — G — AUTHORITY GAS LINE
- E — AUTHORITY ELECTRICITY LINE
- UE — AUTHORITY UNDERGROUND ELECTRICITY LINE
- TEL — AUTHORITY COMMS LINE
- GRATED SURFACE INLET PIT WITH ENVIROPOD INSERT
- GRATED SURFACE INLET PIT
- JUNCTION PIT
- EXISTING GULLY PIT
- OFP — OVERLAND FLOW PATH
- CO — CLEAR OUT POINT
- CAP
- DROP
- DP — DOWNPIPE



7 DETAIL
SUBSOIL PUMP OUT PIT
SCALE 1:20

DRAINAGE NOTES:

ALL PIPES TO BE LAID ON 75mm SAND BED WITH THE BARRELS FULLY SUPPORTED

100mm AND 150mm DIAMETER PIPES TO BE LAID ON MINIMUM 1% GRADE

MINIMUM DEPTH OF COVER FOR PIPES NOT SUBJECT TO VEHICULAR LOADING TO BE 300mm

ALL DRAINAGE PIPES LAID UNDER PAVEMENT SHALL BE REINFORCED CONCRETE WITH RUBBER RING JOINTS

BACKFILL TRENCHES WITH COMPACTED SAND OR APPROVED AGGREGATE MATERIAL

HEAVY DUTY GRATES AND COVERS ARE TO BE PROVIDED IN TRAFFICABLE AREAS

PIT GRATE TO BE TYPE WELDLOK OR APPROVED EQUIVALENT

ALL PITS SHALL BE PROVIDED WITH A LOCKING CLIP

ALL PITS SHALL BE MAINTAINED REGULARLY

TOP OF BENCHING SHALL BE TO THE HALF OF THE OUTLET PIPE DIAMETER

Ø 100mm SUBSOIL DRAINAGE PIPE 3000mm LONG WRAPPED IN FABRIC SOCK TO BE PROVIDED ADJACENT TO INLET PIPES

COMPRESSIVE STRENGTH f'_c FOR CAST IN SITU CONCRETE TO BE A MINIMUM OF 20MPa AT 28 DAYS

PROVIDE CLEANING EYES TO ALL DOWNPIPES NOT DIRECTLY CONNECTED TO PITS

ISOLATED JOINTS TO BE PROVIDED TO ISOLATE CONCRETE PAVEMENTS FROM PITS

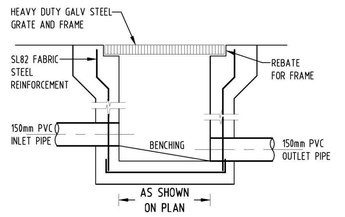
ALL TRENCH GRATES PROVIDED SHALL HAVE A MINIMUM CLEAR WIDTH OF 200mm

STORMWATER DRAINAGE CONNECTIONS TO THE MAIN SYSTEM SHALL BE TO THE REQUIREMENTS AND THE SATISFACTION OF LOCAL COUNCIL

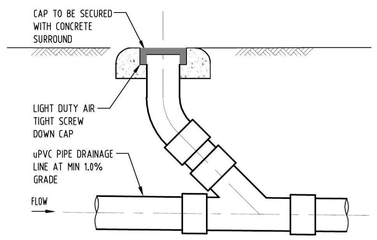
SERVICES SHOWN ON PLAN ARE INDICATIVE, EXACT DEPTH AND LOCATION TO BE CONFIRMED ONSITE. CONTRACTOR TO CARRY OUT DIAL BEFORE YOU DIG APPLICATION AND ENGAGE A REGISTERED SURVEYOR TO PEG OUT ALL EXISTING SERVICES PRIOR TO ANY WORK COMMENCING ONSITE.

ABBREVIATIONS:

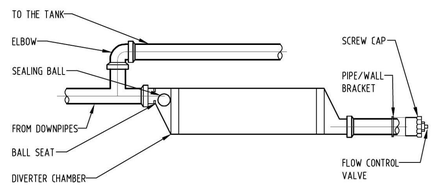
Ø or DIA	DIAMETER
CO	CLEAR OUT
DDO	DISH DRAIN OUTLET
DP	DOWNPIPE
e	EXISTING
FFL	FINISHED FLOOR LEVEL
GTD	GRATED TRENCH DRAIN
GSIP	GRATED SURFACE INLET PIT
IL	INVERT LEVEL
KIP	KERB INLET PIT
NGL	NATURAL GROUND LEVEL
OFP	OVERLAND FLOWPATH
OSD	ON-SITE DETENTION
RCP	REINFORCED CONCRETE PIPE
RL	REDUCED LEVEL
RWT	RAINWATER TANK
SW	STORMWATER
SWP	STORMWATER PIT
SWRM	STORMWATER RISING MAIN
SWS	STORMWATER SUMP
TOK	TOP OF KERB
TOW	TOP OF WALL
UPVC	UNPLASTICISED POLYVINYL CHLORIDE



5 DETAIL
STORMWATER PIT
SCALE 1:20



6 DETAIL
CLEANING EYE
SCALE 1:10



8 DETAIL
IN-GROUND FIRST FLUSH DIVERTER
SCALE 1:20

Reference Coordination Drawing

Discipline	Drawing Title and Number	Date	Rev.
ARCH	14.01% AP14	17.12.14	P8
ARCH			
STRUCT			
MECH			
ELEC			
HYD			
FIRE			
LANDS			
CIVIL			
SURVEY			

#	ADD DETAILED DESCRIPTION	XX	ADD DATE	#
Issue	Last revision title	by	Date	Status

Issuer internal sequence and revision history
1-preliminary 2-development application 3-construction certificate
4-tender 5-construction 6-other

ENGINEERS AUSTRALIA Chartered Professional Engineer MEMBER

DIMENSIONS NOT SHOWN TO BE CHECKED ON SITE. DO NOT SCALE OF THIS DRAWING. POSITIONS OF AUTHORITIES MAINS AND/OR EXISTING SERVICES ARE TO BE CHECKED PRIOR TO COMMENCEMENT OF WORK. REPORT ANY DISCREPANCIES TO THE CONSULTING ENGINEER FOR DECISION/CLARIFICATION BEFORE PROCEEDING WITH THE WORK. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE SPECIFICATIONS AND OTHER CONSULTANTS' DRAWINGS.

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DRAWN	DATE
CHECKED	DATE
DESIGNED	DATE
VERIFIED	DATE
APPROVED	DATE

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Scales
0m 1 2 3 4 5
SCALE 1:100 ON ORIGINAL SIZE

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CID GROUP

ARCHITECT
MOSCA PSERRAS ARCHITECTS

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PROJECT
PARKLANDS ESTATE
JORDAN SPRINGS BOULEVARD
JORDAN SPRINGS

Drawing Status: FOR APPROVAL
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Drawing Title
STORMWATER CONCEPT DESIGN
BUILDING 4 & 5
BASEMENT 2 - SHEET 2 OF 2

Grid	Datum	Sheet	Scale (at original size)
-	A.H.D.	14 of 15	1:100 @ A1

Project No	Drawing No	Revision No
20140381	SW14	A

DATE PLOTTED: 3 February 2015 8:47 AM BY: SGCE_MAC3
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Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

DATE PLOTTED: 3 February 2015 8:47 AM BY: SGCE_MAC3

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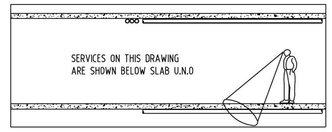

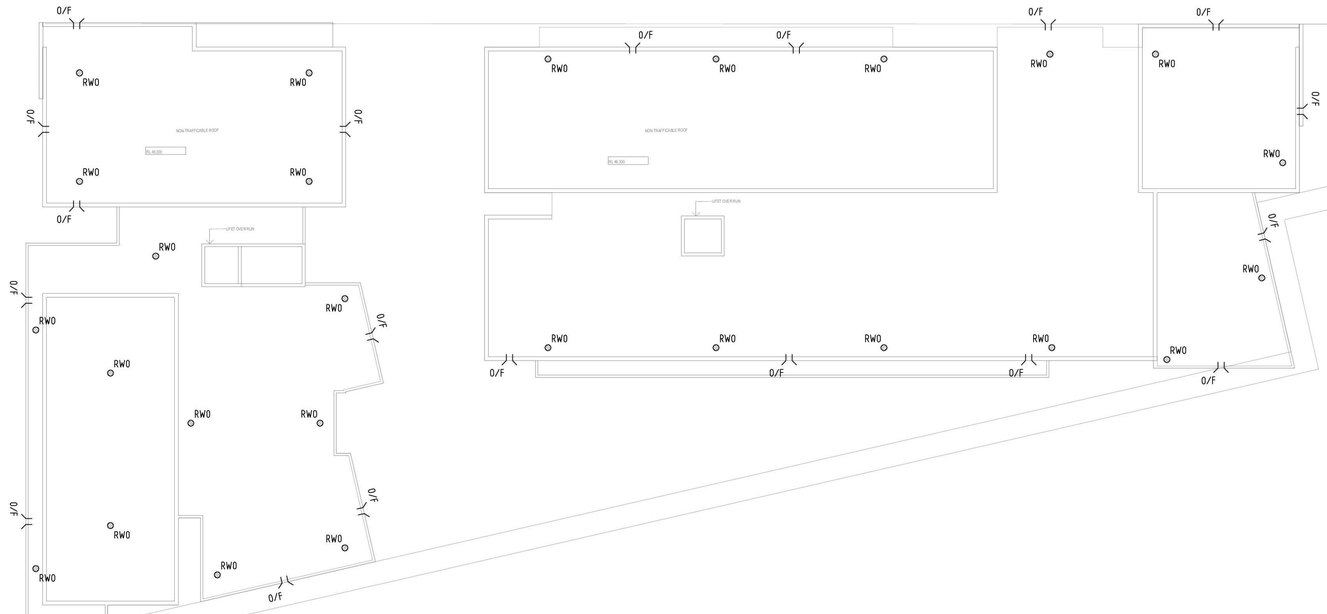

A	SUBMISSION TO COUNCIL	SH	02.02.15	2	
Issue	Last revision title	by	Date	Status	

Issuer internal sequence and revision history

1-preliminary 2-development application 3-construction certificate 4-tender 5-construction 6-other

Reference Coordination Drawing

Discipline	Drawing Title and Number	Date	Rev.
ARCH	14.016 AP17	17.12.14	P3
ARCH			
STRUCT			
MECH			
ELEC			
HYD			
FIRE			
LANDS			
CIVIL			
SURVEY			

ENGINEERS AUSTRALIA Chartered Professional Engineer MEMBER

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Scales

0m 2 4 6 8 10

SCALE 1:200 ON ORIGINAL SIZE

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PROJECT
PARKLANDS ESTATE

JORDAN SPRINGS BOULEVARD
JORDAN SPRINGS

Grid	Datum	Sheet	Scale (at original size)
-	A.H.D.	15 of 15	1:100 @ A1

Drawing Status
FOR APPROVAL
NOT TO BE USED FOR CONSTRUCTION PURPOSES

Drawing Title
STORMWATER CONCEPT DESIGN
BUILDING 4 & 5
ROOF PLAN

Project No	Drawing No	Revision No
20140381	SW15	A

PLOT BY: Z:\Production\2014\20140381 Jordan Springs Boulevard, Jordan Springs - Parklands Estate - Stage 1\Civil\cad\SW15.dwg

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Western Precinct Plan - Development Control Strategy

Section	Comment/Response	Consistency
5A Urban Structure and Subdivision		
5.2 Street Types		
A permeable grid pattern and legible street network should be achieved for the western precinct, generally consistent with **Figure 11** of the Western Precinct Plan.	Figure 11 identifies major collector roads through the western precinct, including Jordan Springs Boulevard to the north and Lakeside Parade to the east. While it is envisaged that a broader street network will be constructed at later stages of the development within the Parklands Estate, stage 1 will include the construction of a part of the street network that is generally consistent with a grid pattern supporting high levels of connectivity and permeability.	Yes.
Local Street		
Street Type L3: ▪ 6 metre wide travel lanes; ▪ 5 metre parking allowance (2.5m+2.5m)	Detailed street design has been undertaken by J. Wyndham Prince and is provided at **Appendix F.**	Yes
5.3 Public Domain		
5.3.1 Landscape Character		
Public Open Spaces shall be designed to reflect one of the five (5) landscape character schemes, that include:	Several of the adopted landscape characters are reflected in the public open space design of the proposal. A urban plaza and square is proposed to connect the site with the Town Centre, ground level retail and	Yes, refer to section 5.8.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

• Bushland character • Parklands character • Woodland character; • Open space water; • Urban Plazas	commercial uses are proposed to activate the corner of Lakeside Parade and Jordan Springs Boulevard. Pedestrians will be led through the plaza to central park that adopts a parkland character incorporating passive and active play areas, with equipment and open grass area. This parkland character is carried on through stage 1 and used in the treatment of verges and private open space to create a sense of continuity.	
5.3.2 Landscape presentation The landscape presentation will reflect the level of embellishment	The landscape presentation of stage 1 will integrate both urban and suburban aspects. The urban plaza connecting the Town Centre with the central park with have an urban presentation consistent with the high density residential development and street level retail and commercial premises and integrate with the suburban presentation of the central park that is capable of supporting formal play areas, social gatherings and family use. Central park is a pocket park intended to serve the immediate residents of the Parklands Estate but has been designed to meet a range of needs for residents throughout the WP.	Yes.
5.3.3 Public Domain Materials and Treatments		
• Provide street furniture items and lighting of suitable design, colour and durability; • Signage, street furniture should reinforce identity, be coordinated and located to minimise visual clutter and obstruction. • Footpaths and cycle paths should be hard waring and durable;	A comprehensive and detailed landscape design package for stage 1 has been developed by Clouston Associates.	Yes. Refer to **Appendix E**.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

• Identify opportunities to integrate public art into the public domain.		
5.3.4 Street Tree Planting	Details provided in the detailed landscape design package for stage 1 developed by Clouston Associates.	Refer to **Appendix E**
5.3.5 Lighting	Details provided in the detailed landscape design package for stage 1 developed by Clouston Associates..	Refer to **Appendix E**
5.4 Character Areas		
Planning and Design Principles for the **Village Centre Character Area** include: ▪ Urban scale, high density, and diverse built form resulting from pattern use; ▪ Predominant land use to reflect mixed use with residential, commercial, retail, community and education uses; ▪ Variable built forms and typologies are permitted including 2 – 4 storey shop top housing and residential flat buildings. ▪ Building frontages to address public space and active streets. ▪ Regional Park is the focal point of the main street axis, local parks within 5 minutes' walk; ▪ 5 minute walking distance to public transport.	The proposed development is generally consistent with the desired future character of the village centre. In particular the following: ▪ The development reflects an urban scale of 4 – 6 storey residential flat buildings and a mixed use building; ▪ Delivery of 614m² of non-residential floor space, over four (4) tenancies with varied and flexible floor plans to allow for a range of potential retail, commercial and office uses; ▪ Provision for purpose built live/work apartments orientated to and with direct street access from Jordan Springs Boulevard; ▪ A mix of soft landscaping and appropriate scale fencing is used to delineate public and private space; ▪ The sites location within the village centre and with direct road frontage to Jordan Springs Boulevard provides access to future public transport routes as identified in the WPP; ▪ The proposed street layout will retain and enhance the vista along	Yes, refer to section 5 of the SEE.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

	Lakeside Parade to the Winnamatt Park.	
5B Built Form Housing		
The proposed development will incorporate the following built forms: ▪ Apartments; ▪ Shop top housing; ▪ Live work	Land to which stage 1 applies is zoned urban and located within the Village Centre Character area, wherein the proposed forms of residential accommodation are permitted. Six (6) storey building elements are proposed on a prominent corner location, the intersection of Jordan Spring Boulevard and Lakeside Parade and provide positive reinforcement of the street edge an optimises the outlook over the village lake.	Generally compliant, refer to **Appendix L**.
5.7 General Housing Siting and Design Controls		
5.7.1 External Build Form and Materials – Private Domain		
Facades to incorporate a mix of materials and colours consistent with the design guidelines issued by the developer.	The proposed buildings use a mix of colours and materials that harmonise the parkland backdrop. A detailed outline is provided in section 3 of the SEE and detailed on the architectural plans in **Appendix C**. Lend Lease as the developer has signed general agreement to the submission of the development application and acknowledge their concurrence to both the design, materials and colour palette.	Yes.
5.7.2 Landscaping		
Tree plantings located in front of higher density forms of residential accommodation shall ensure the maintenance of casual/passive surveillance.	Street trees proposed will be consistent with existing plantings along Jordan Springs Boulevard and Lakeside Parade. All trees selected are detail in the landscape design package prepared by Clouston Associates and are provided at **Appendix E.**	Yes.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

A detailed landscape plan is to accompany development applications, detailing the following: ▪ Existing trees to be retained/removed; ▪ Proposed tree and vegetative plantings.	A site survey and tree removal plan are provided at **Appendix B** and **F.**	Yes.
5.7.3 Visual and Acoustic Privacy ▪ Avoid direct overlooking between habitable and active indoor and outdoor spaces; ▪ Use of screens or distance separation shall be used where appropriate to protect privacy of residents; ▪ Design elements such as offset windows, screening, highlight windows or glazing to be used as suitable to achieve additional visual privacy; ▪ Noise sensitive areas to be located away from noise sources; and ▪ Living areas of one dwelling to be located away from service equipment of others.	As the proposed development is for residential flat buildings of 3 or more storeys the provisions of SEPP 65 apply requiring suitable separation distances between each of the buildings and their active and passive living spaces. An assessment of the proposal against the provisions of SEPP 65, including separation is provided in **Appendix M** prepared by Mosca Pserras Architects. This statement concludes that the minimum separation requirements have been met or where necessary suitable alternative design measures used to achieve privacy, acoustic and visual.	Yes.
5.7.4 Fences and Walls		
▪ Front fences no higher than 1.5 metres;	Fencing will be no more than 1.5 metres in height	Refer to **Appendices C & E**.
▪ Design and materials of front fences to be consistent with the proposed building forms;	Refer to Landscape Design Package, drawing reference SI-DA Issue A	
▪ Walls shall be sympathetic to natural landform changes;	Noted. Refer to maximum height details and relevant design packages.	
▪ Fences shall provide visual privacy whilst maintain views, sunlight and air movement.	Refer to landscape detail, fences are constructed using timber battens and are visually permeable where possible.	

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

5.7.5 Garage		
Garages shall not dominate dwelling facades	All parking is located within basement level parking that has been suitably integrated into the building design so as to not be visually intrusive.	Yes.
5.7.6 Safety		
▪ Dwellings to overlook the street and other public/communal spaces;	Each of the proposed residential buildings and mixed use building have dwellings orientated to the street fronts and the central park common open space	Yes.
▪ All developments are to incorporate the principles the CPTED;	A crime risk assessment has been undertaken and is provided at Section 5.12.1.1 of the SEE.	Yes.
▪ Design and layout of developments to avoid the opportunity for concealment or blank walls facing the street.	The potential for concealment, street level activation and defensible space has been considered in the crime risk assessment.	Yes.
5.7.7 Solar Access		
▪ Private Open Space areas to receive a minimum of 3 hours sunlight on 22 June between 9am and 3pm; and	The proposed development complies with the requirement of SEPP 65 that 70 per cent of new apartments receive a minimum of 3 hours solar access. Refer to SEPP 65, Rule of Thumb Assessment provided at **Appendix M.**	Yes.
▪ Dwellings to be designed to avoid over shadowing of adjacent properties.	The proposed development will not reduce the availability of sunlight to adjacent residential development located to the north of the site beyond Jordan Springs Boulevard.	Yes

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

5.7.8 Energy and Water Efficiency		
Dwellings to be designed to maximise passive solar heating and cooling opportunities.	These provisions are override by SEPP BASIX. A BASIX Certificate has been issued for the development, demonstrating that when complete the proposal is capable of meeting the State Governments energy, water and heating reduction targets.	Yes.
5.7.9 Servicing		
▪ Development to demonstrate that consideration has been given waste storage, management and collection.	Detailed consideration of the waste and servicing arrangements is outlined in Sections 3 and 5 of the SEE. Each building is provided with designated waste storage rooms capable of managing the potential waste generated by each until collection by Council. In this regard, it is envisaged that kerb side collection would be undertaken and each building has been designed to allow for bins to moved easily from the buildings to the street edge.	Yes.
5.7.10 Adaptability		
Residential dwellings may be designed to achieve the following key features:		
▪ Direct access;	Each building is capable of complying with the accessibility requirements of AS4299. A detailed BCA report has been undertaken and is provided at **Appendix D.**	
▪ Accessible parking;	Accessible resident, visitor and customer parking has been provided within basement level car parking, close to lift entries.	Yes
▪ Adequate access and circulation widths; and	Provision has been made for the delivery of adaptable housing within each	Yes

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

	building. Pre and post adaptation plans are provided in the architectural design package provided at **Appendix D.**	
▪ Main facilities at ground level.	The proposal involves construction of multi-storey residential flat and mixed use buildings. Features include lift access at all levels, graded entries and suitable circulation spaces in all common areas of the building.	Yes.
5C Non Residential Built Form		
Shall observe the following general urban design principles		
Mix of Uses ▪ Incorporate a range of uses;	This application does not seek consent for use of the ground floor non-residential uses.	
▪ Vertical mixed use shall provide retail or commercial at ground level, so as to maximise street activation with residential uses located above;	The development provides 614m² of non-residential floor space across four (4) tenancies designed to have flexible floor plan layouts to encourage a wide range of uses.	
▪ Conflict between uses to be overcome through suitable design and siting of uses;		
Street Frontages/Entrances		
▪ Non-residential uses to be located at street level	Building 2 delivers non-residential floor area at ground level, with entries orientated to the main street or pedestrian walkways, including the proposed public square.	Yes.
▪ Primary entrances to be located off main streets;	Where residential buildings have a main street frontage, pedestrian entries have been orientated to the respective street front.	Yes.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

▪ Access points to be compatible with overall façade and be clearly definable;	Access points are integrated into the overall building design and will be clearly defined by lighting, use of numbers and directional signage where necessary.	Yes
▪ Vehicle entries to be located away from main streets;	Vehicle entries to buildings are provided off local streets proposed as part of the development. Garage entries are recessed in accordance with the DCS requirements for residential development.	Yes.
Building Form		
▪ Buildings to face the street;	All buildings have been designed to have a street facing façade.	Yes.
▪ Attention to be paid to the relationship of the rear façade of buildings to adjacent public domain;	Where buildings are connected to public open space and domain areas, care has been taken to provide visual interest whilst ensuring privacy of residents.	
▪ Avoid blank walls;	The proposed design, as far as practicable, has sought to avoid blank walls. The majority of elevations have a combination of variable balcony dimensions and window openings, promoting casual surveillance along most points and reducing visual bulk and mass.	
▪ Material and physical articulation to be used to break up building bulk and mass;	The proposed design effectively integrates built and material articulation to effectively manage and overcome the potential for bulk and mass. Furthermore, the provision of ground floor garden apartments to the street has increased the street level setback of buildings further reducing the potential for bulk and mass at the street edge.	
▪ Facades of large buildings to be articulated to reflect the scale of the existing development;	Buildings are where desired vertically and horizontally articulated. Graduated heights stepping up from 4 storeys where opposite residential urban character areas to 6 storeys in the town centre core, reflects a site	

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

	and context sensitive urban design response. Individual buildings are use strong horizontal, balcony elements, to break the building mass, the recessed building façade setback between 1 metre and 3 metres from the balcony edge creating staggered and broken facades further ameliorates the potential for visual bulk. The use of overhanging balconies work to create human scale at the ground floor and their staggered dimensions and angled alignments avoid the potential for the building to present as bulky or dominant.
Building Depth ▪ Adequate to allow natural light, ventilation and permit optimum circulation and layout.	As demonstrated by the SEPP 65 statement completed by Mosca Pserras Architects, provided at **Appendix M**, the development achieves:

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Residential Development Controls

Control	Comment/Response	Consistency
Shop Top Development (Building 2 –6 Storey Mixed Use Development, with Ground Floor Commercial Premises and Shop top housing above)		
Site Area – 120m²+	6.5 hectares	Yes
Typical Frontage – 6 m (min)	203 metres	Yes
Typical Depth – 20 metres	67 metres	Yes
Setbacks		
Primary		
▪ Frontage: nil (0 metres)	7.5 metres at ground level;	Yes
▪ Garage: 0.5 metres	Shared basement with adjacent Building 3.	Not applicable.
▪ Articulation setback: -1.5 metres (i.e. 1.5 metres setback from the façade)	6 metres at Level 1	No. Refer to section 5.2.1 of the SEE.
Secondary		
▪ Frontage: nil (0 metres)	Ground Level: 7.5 metres at ground level; Level 1 – 6: Setback from Lakeside Parade is generally 6 metres with minor variables of 1.5 to 2.5 metres stepping away from the street edge	
▪ Garage: 0.5 metres	Shared basement with adjacent Building 3.	Not applicable.
▪ Articulation setback: -nil (0 metres)		

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Side		
▪ Internal – nil (0 metres)	▪ Southern wall of Building 2 and northern facing balcony of Building 3 are separated by a minimum distance of 10.8 metres; ▪ Eastern facing windows of Building 4 and western facing windows of Building 5 are separated by a distance of 9 metres; and ▪ Eastern facing windows and Building 1 and western facing windows of Building 2 are separated by a distance of 12 metres. Where separation ("setbacks") internal to the site are below the requirements of SEPP65, where necessary amenity devices such as privacy screens and highlight windows have been used to provide privacy.	No, but acceptable refer to SEE.
Rear		
▪ Garage Rear loaded – 0.5 metres	Basement level parking accessed through Building 3, refer to assessment below.	Not applicable
Open space		
Private – 10 per cent	Private open space for each apartment within Building 2 has been provided by way of individual balconies. Each balcony has a depth of 2 meters and area equal to a minimum of 10m².	No, but acceptable.
Min Width – 2.5 metres	As noted above each balcony has a depth of 2 metres in accordance with the provisions of the Residential Flat Design Code (RFDC) adopted under SEPP 65 which overrides the provisions of the DCS.	No, but consistent with SEPP 65 so acceptable.
Parking		
1 bed = 1/dwelling 2 bed = 1.5/dwelling	An assessment of parking is provided in Section 5.5 of the SEE and addressed in detail in the traffic and parking impact prepared by GTA	Yes.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

3 bed = 2/dwelling	Traffic Planning provided at **Appendix G.** The report generally resolves that the development has adequate resident visitor parking to meet the demand as determined by the DCS.	
Typical Character Area – Village Centre Area	The proposed forms of residential accommodation are consistent with the village character centre and relevant objectives.	Yes.
Apartments (Buildings 1, 3, 4 & 5) **Building 1 – Part 3, part 4 storey residential flat building** **Building 3 – 6 Story residential flat building; and** **Buildings 4 and 5 – 4 storey residential flay building.**		
Typical Depth		
▪ 55m² for 1 bed	1 bedroom apartments internal floor area 57m² - 63m²	No, consistent with SEPP 65 so acceptable.
▪ 80m² for 2 bed	2 bedroom apartments have a minimum internal floor area of 80m²	Yes.
▪ 100m² for 3 bed	3 bedroom apartments have an internal floor of 102m² – 118m²	Yes.
Setbacks		
Primary		
▪ Frontage: 2 metres		
	Building 1: 7.5 metres from Jordan Springs Boulevard	Yes.
	Building: 3: 4 metres widening to 6 metres from Lakeside Parade	Yes.
	Buildings 4 and 5: 4.2 metres from proposed Road 3	Yes.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

▪ Garage: 2.5 metres	**Building 4 & 5** (shared basement carpark) is parallel to the Road 1 via a curved driveway entry due to the triangular shape of the block. The garage entry is generally obscured from the adjacent road frontage.	Yes.
▪ Articulation setback: 1.0 metre		
	Building 1: + 1 metre (i.e. steps 1 metre toward JSB) with a street setback of 6 metres (with minor balcony projections at the western end) for Levels 1 and 2. At Level , building 1 becomes part 3, part 4 storey the setback at this level is predominantly 6 metres with a minor indentation of 0.7 metres for a extent of 6.5 metres between 1307 and 1306	No.
	Building 3: Nil, building form has a consistent vertical line along all facades.	No.
	Buildings 4 & 5: nil constant 4 metre setback to balcony edge ground level to level 4. Front façade of the proposed building is staggered and stepped horizontally to provide balconies of suitable depths.	No.
Secondary		
▪ Frontage: 2.0 metres	Building 3: setback from proposed Road 1 is a maximum of 2.5 metres to the balcony edge. Dwelling facades step horizontally, between 1m and 3 metres, to allow for varying depth within balconies.	Yes.
▪ Garage: 2.5 metre	Building 1 – 3.4 metre setback from proposed Road 4; Building 3 – setback 5.8 metres from proposed Road 1	Yes
▪ Articulation zone: 1 metre		

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Side		
▪ Internal – 0.9 metre	▪ Southern wall of Building 2 and northern facing balcony of Building 3 are separated by a minimum distance of 10.8 metres; ▪ Eastern facing windows of Building 4 and western facing windows of Building 5 are separated by a distance of 9 metres; and ▪ Eastern facing windows and Building 1 and western facing windows of Building 2 are separated by a distance of 12 metres. Where separation ("setbacks") internal to the site are below the requirements of SEPP65, where necessary amenity devices such as privacy screens and highlight windows have been used to provide privacy.	Refer to SEPP 65 statements provided at **Appendix M**.
Rear		
▪ Building – 0.9 metres	**Buildings 4 & 5:** Adjoins the southern boundary adjacent to the regional park and has a continuous 2 metre setback.	Yes.
▪ Garage Rear loaded – 0.5 metres	Basement level parking for Buildings 1 and 3 are provided of new internal access roads (i.e. Roads 3 and 4) away from main street frontages. As outlined above the entries are recessed from the street edge by a minimum of 3.4 metres.	Yes.
Open space		
Private – 10m² balcony	Private open space has been provided in accordance with the provisions of the RFDC and SEPP 65 to include: ▪ 25m² courtyards for ground level apartments; ▪ Balconies for apartments located above ground with an area generally exceeding 10m²	Yes.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Min Width – 2.5 metres	Balconies have variable dimensions to provide visual and physical articulation to the building forms. As such the depth of balconies range from 1 metre to 4metres. This configuration results in all apartments having balconies excess of 10m².	Yes
Height – 4 storeys, provision for 6 storeys on key "landmark" sites	4 – 6 storeys. 6 Storey elements are located at the corner of Lakeside Parade and Jordan Springs Boulevard and define the corner edge and optimise resident view out towards the lake. The graduated and stepped heights allow for a visual transition and crescendo at the main street junction that provides a visual statement for visitors entering the town centre.	Yes.
Parking		
1 bed = 1/dwelling 2 bed = 1.5/dwelling 3 bed = 2/dwelling	An assessment of parking is provided in Section 5.6 of the SEE and addressed in detail in the traffic and parking impact prepared by GTA Traffic Planning provided at **Appendix G.** The report generally resolves that the development has adequate resident visitor parking to meet the demand as determined by the DCS.	No, but consistent with SEPP 65. Considered acceptable.
Typical Character Area – Village Centre Area	The proposed forms of residential accommodation are consistent with the village character centre and relevant objectives.	Yes.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

COMPLIANCE TABLE – SEPP 65 DESIGN QUALITY OF RESIDENTIAL FLAT DEVELOPMENT
PARKLANDS ESTATE, Jordan Springs Boulevard, Jordan Springs

		COMMENT	COMPLIES
Principle 1: Context	*Good design responds and contributes to its context. Context can be defined as the key natural and built features of an area.* *Responding to context involves identifying the desirable elements of a location's current character or, in the case of precincts undergoing a transition, the desired future character as stated in planning and design policies. New buildings will thereby contribute to the quality and identity of the area.*	Following a rigorous process of site analysis, urban design and explorative concept design analysis. We propose a contemporary response to this site. A perimeter block style of development was employed to reinforce site structure and establish relationships between varying surrounding context. A graduation of heights and massing from 3 storey next to the low density residential lots, to 6 storey near the anticipated Town Centre, back down to 4 storey reflecting the natural bushland tree canopy heights of the Regional Park. Low Density Residential to the Northwest: Building One (3/4 storey) addresses the intersection of Jordan Springs Boulevard and Tyler Street. Establishes a street edge on the opposite corner to the residential lots. Slab type building form, which starts the transition in height and scale. Town Centre to the Northwest: Buildings Two & Three (6 storey) addresses the intersection of Jordan Springs Boulevard and Lakeside Parade. Mixed use building with commercial and live/work apartments on ground level. Maintains the street edge around the corner. Strong focus on the corner with an urban forecourt. Reflects the anticipated village Town Centre character. Courtyard type building form, maintaining height and scale around this active corner. Bushland Regional Park setting to the South: Buildings Four & Five (4 storey) addresses Lakeside Parade. Establishes a street edge while maintaining views/vistas to the Regional Park. Building height kept to a minimum so not to exceed tree canopy. Slab type building forms, orientated differently to each	✓

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

		COMMENT	COMPLIES
		other to end the transition in height and scale. These Urban design principles and the concept of human scale have created a rhythm and grain that will be reflected throughout this precinct. The development is intended not to replicate, but to complement and positively contribute to its future surrounding context.	
Principle 2: Scale	*Good design provides an appropriate scale in terms of the bulk and height that suits the scale of the street and the surrounding buildings.* *Establishing an appropriate scale requires a considered response to the scale of existing development. In precincts undergoing a transition, proposed bulk and height needs to achieve the scale identified for the desired future character of the area.*	Existing and proposed street widths within the site structure inform us of a natural hierarchical order. Street widths within the site are narrower than the major existing feeder roads and relate to the buildings they serve. Street setbacks are varied to suit bulk, scale and massing. Larger street setbacks are employed on Jordan Springs Boulevard and Lakeside Parade. Smaller street setbacks are used within the site street network. Street wall heights of buildings are stepped back. Jordan Springs Boulevard street wall height starts at 3 storey then steps back before increasing to 4 storey. These concepts all work together to moderate bulk, scale and massing. Coupled with sensible street tree planting, once matured aid in reducing this bulk, scale and mass. These concepts ensure consistency with this principle.	✓

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

COMPLIANCE TABLE – SEPP 65 DESIGN QUALITY OF RESIDENTIAL FLAT DEVELOPMENT
PARKLANDS ESTATE, Jordan Springs Boulevard, Jordan Springs

		COMMENT	COMPLIES
Principle 3: Built Form	*Good design achieves an appropriate built form for a site and the building's purpose, in terms of building alignments, proportions, building type and the manipulation of building elements.* *Appropriate built form defines the public domain, contributes to the character of streetscapes and parks, including their views and vistas, and provides internal amenity and outlook.*	All buildings have been aligned and orientated to address existing and proposed street network. This aids in defining public and private space. Landscaping has been carefully manipulation and used as a tool to further refine these spaces. An Architectural language of highlighting elements on the façade which identifies a base, middle and upper is coupled with landscaping provide a character to the precinct. The site structure and position of buildings provides for a wide variety of apartments to experience a range of views to the Central Park, Regional Park and the Lake. These design concepts ensure consistency with this principle.	✓
Principle 4: Density	*Good design has a density appropriate for a site and its context, in terms of floor space yields (or number of units or residents).* *Appropriate densities are sustainable and consistent with the existing density in an area or, in precincts undergoing a transition, are consistent with the stated desired future density. Sustainable densities respond to the regional context, availability of infrastructure, public transport, community facilities and environmental quality.*	The development is well suited within its context and will be reflective of future precinct development. There is a mix of apartment types: 27 -1 Bedroom 158 -2 Bedroom (of which 3 are live/work apartments) 16 -3 Bedroom A total of 201 apartments are proposed with 21 able to be converted into adaptable apartments. This mix contributes to housing and social diversity and is consistent with the vision for development in this area. The proposed density is appropriate based on the sites attributes such as accessibility to transport, local and nearby facilities. The development is therefore consistent with this principle.	✓

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

COMPLIANCE TABLE – SEPP 65 DESIGN QUALITY OF RESIDENTIAL FLAT DEVELOPMENT
PARKLANDS ESTATE, Jordan Springs Boulevard, Jordan Springs

		COMMENT	COMPLIES
Principle 5: Resource, water and energy efficiency	*Good design makes efficient use of natural resources, energy and water throughout its full life cycle, including construction.* *Sustainability is integral to the design process. Aspects include demolition of existing structures, recycling of materials, selection of appropriate and sustainable materials, adaptability and reuse of buildings, layouts and built form, passive solar design principles, efficient appliances and mechanical services, soil zones for vegetation and reuse of water.*	Environmental Sustainable Design principles have not only been adopted in the design but also carried through in the construction phase. The development meets the provisions under SEPP and BASIX which seeks to achieve energy, water efficiency and improved thermal performance. As part of the compliance water efficient fixtures, energy saving devices and rainwater retention for irrigation of courtyards have been adopted. Residential components have been designed to achieve a high level of cross flow ventilation and good solar access consistent with the provisions contained within the Residential Flat Design Code. These design principles ensure consistency with this principle.	✓
Principle 6: Landscape	*Good design recognises that together landscape and buildings operate as an integrated and sustainable system, resulting in greater aesthetic quality and amenity for both occupants and the adjoining public domain.* *Landscape design builds on the existing site's natural and cultural features in responsible and creative ways. It enhances the development's natural environmental performance by co-ordinating water and soil management, solar access, micro-climate, tree canopy and habitat values. It contributes to the positive image and contextual fit of development through respect for streetscape and neighbourhood character, or desired future character. Landscape design should optimise useability, privacy and social opportunity, equitable access and respect for neighbours' amenity, and provide for practical establishment and long term management.*	To establish the Parkland character of the estate a connection between the Town Centre and Regional park needs to be reinforced. An Urban forecourt, located to the northwest corner of the site and a Central Park, located within the middle of the development are key elements in achieving this connection. Connecting a series of landscape spaces has created a series of visual and physical links. Integrating setbacks, road verges, private and common open spaces all combine within the site structure to provide view corridors and vistas. There will be active and passive landscaped areas that greatly add to the amenity of the overall development. These design principles ensure consistency with this principle.	✓

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

COMPLIANCE TABLE – SEPP 65 DESIGN QUALITY OF RESIDENTIAL FLAT DEVELOPMENT
PARKLANDS ESTATE, Jordan Springs Boulevard, Jordan Springs

		COMMENT	COMPLIES
Principle 7: Amenity	*Good design provides amenity through the physical, spatial and environmental quality of a development.* *Optimising amenity requires appropriate room dimensions and shapes, access to sunlight, natural ventilation, visual and acoustic privacy, storage, indoor and outdoor space, efficient layouts and service areas, outlook and ease of access for all age groups and degrees of mobility.*	The design provides adequate levels of internal amenity for future occupants. All apartments within the residential component of the development will have good sunlight and solar access, natural ventilation and have suitable visual and acoustic privacy. This is consistent with the provisions contained under the RFDC. The apartments will have appropriate storage and effective floor plan layouts with private open space in the form of a balcony. Common open space provide areas of outdoor recreation for all residents. The development will be required to comply with the requirements contained under the Building Code of Australia (BCA) which defines minimum acceptable construction outcomes to minimise noise transfer between units and provide for natural ventilation and daylight.	✓
Principle 8: Safety and security	*Good design optimises safety and security, both internal to the development and for the public domain. This is achieved by maximising overlooking of public and communal spaces while maintaining internal privacy, avoiding dark and non-visible areas, maximising activity on streets, providing clear, safe access points, providing quality public spaces that cater for desired recreational uses, providing lighting appropriate to the location and desired activities, and clear definition between public and private spaces.*	The proposal provides good passive surveillance with sight lines across the site and to the adjacent streets. The ground floor component of the development will provide active usage, which in turn will have the positive outcome in lengthened surveillance during the day by patronage and in the evening/ night by residents within the complex. This is encouraged as a design element under the Crime Prevention Through Environmental Design Principles (CPTED). Suitable street and ground level lighting will be provided to maximise surveillance opportunities at night and to reduce concealed areas. The basement car park will have security doors restricting access to resident parking and suitable lighting will be provided within the basement. As demonstrated within the accompanying plans the development is consistent with the principles contained within CPTED.	✓

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

COMPLIANCE TABLE – SEPP 65 DESIGN QUALITY OF RESIDENTIAL FLAT DEVELOPMENT
PARKLANDS ESTATE, Jordan Springs Boulevard, Jordan Springs

		COMMENT	COMPLIES
Principle 9: Social Dimensions	*Good design responds to the social context and needs of the local community in terms of lifestyles, affordability, and access to social facilities.* *New developments should optimise the provision of housing to suit the social mix and needs in the neighbourhood or, in the case of precincts undergoing transition, provide for the desired future community.* *New developments should address housing affordability by optimising the provision of economic housing choices and providing a mix of housing types to cater for different budgets and housing needs.*	The proposal will provide for a wide variety of apartment layouts and sizes which will compliment the type of housing within the available area. Communal open space areas provide for and allow opportunities for social interaction and recreation. Affordability has been a key driver in the design of the apartments. The site is highly sustainable in terms of its location to transport, leisure and infrastructure. These design principles ensure consistency with this principle.	✓
Principle 10: Aesthetics	*Quality aesthetics require the appropriate composition of building elements, textures, materials and colours and reflect the use, internal design and structure of the development. Aesthetics should respond to the environment and context, particularly to desirable elements of the existing streetscape or, in precincts undergoing transition, contribute to the desired future character of the area.*	The 'Parklands Estate' as the name suggests will adopt a natural material and colour palette. A selection of three different bricks of varying colours and tones will be highlighted with sandstone features. Paint colours are reflective of the colours found within the Regional Park bushland setting. These elements combined with an architectural language used on all the facades it will add to the visual interest and present as a well articulated development. The aesthetic of the architectural design is therefore consistent with the objectives of this principle.	✓

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

COMPLIANCE TABLE – SEPP 65 DESIGN QUALITY OF RESIDENTIAL FLAT DEVELOPMENT
PARKLANDS ESTATE, Jordan Springs Boulevard, Jordan Springs

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

mosca pserras architects

18th February 2015

Senior Development Assessment Officer
Penrith City Council
601 High Street,
PENRITH, NSW, 2751

PARKLANDS ESTATE, JORDAN SPRINGS BOULEVARD, JORDAN SPRINGS
DESIGN VERIFICATION STATEMENT

In accordance with Clause 50(1A) of the *Environmental Planning and Assessment Regulation 2000*, I Frank Mosca am a qualified architect for the purposes of State Environmental Planning Policy No. 65 – Design Quality of Residential Flat Development (SEPP 65).

I verify that the residential flat development, as shown in Architectural Drawings 14016/AP01 through to 14016/AP22, issue A, dated 13/02/2015 was designed under my direction with regard to the design quality principles set out in Part 2 of SEPP 65.

Yours sincerely

Frank Mosca
Registered Architect
NSW ARB no. 5000

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Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

SEPP 65 Numerical Compliance table for: PARKLANDS ESTATE Jordan Springs

Ex	ITEM	PART/ PAGE	RULES OF THUMB	BETTER DESIGN PRACTIC E	NOTES	complies
	PART 1 LOCAL CONTEXT					
1	**PRIMARY DEVELOPMENT CONTROLS**					
1.1	**BUILDING HEIGHT**	1-24				
	Where there is an existing FSR, test height controls against it to ensure a good fit			√		√
	Test height against the number of storeys and minimum ceiling heights required for the desired building use			√		√
1.2	**BUILDING DEPTH**	1-26				
	Apartment building depths of 10-18mm are appropriate			√		√
1.3	**BUILDING SEPARATION**					
	Building Separation is proportionate to building height to facilitate better urban form and improved residential amenity			√	A 12m separation is established between Building 1 (4 storey) and Building 2 (6 storey). The separation between Building 2 (6 storey) and building 3 (6 storey) varies between 11.7m and 12.6m from wall to wall. B3 terraces face north for amenity. B2 south facing bedroom windows will be screened for privacy.	√
1.4	**STREET SETBACKS**	1-30				
	Identify desired streetscape character, the common setback of building in the street, the accommodation of street planting and height of buildings and daylight access controls			√		√
1.5	**SIDE & REAR SETBACKS**	1-33				
	Relate side and rear setbacks to existing streetscape patterns			√		√
1.6	**FLOOR SPACE RATIO**	1-35				
	Test built form outcome with floor space ratio			√		√
	PART 2 SITE DESIGN					
2	**SITE CONFIGURATION**					
2.1	**DEEP SOIL ZONES**	2-44				

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

SEPP 65 Numerical Compliance table for: PARKLANDS ESTATE Jordan Springs

Ex	ITEM	PART/ PAGE	RULES OF THUMB	BETTER DESIGN PRACTIC E	NOTES	complies
	A minimum of 25 percent of the open space area of a site should be a deep soil zone: more is desirable. Exceptions may be made in urban areas where sites are built out and there is no capacity for water filtration. In these instances, stormwater treatment measures must be integrated with the design of the residential flat design.		√		Approximately 28 per cent of the landscaped area provided is deep soil (excludes 2,400m² of deep soil provided as public open space)	√
2.2	**FENCES & WALLS**	2-45				
	Delineate the private and public domain without compromising safety and security			√		√
2.3	**LANDSCAPE DESIGN**	2-46				
	Improve amenity of open space with landscape design			√		√
2.4	**OPEN SPACE**	2-48		√		
	The area of communal open space required should generally be at least between 25 and 30% of the site area. Larger sites and Brownfield sites may have potential for more than 30%.		√		Common Open Space provided is 1,045m2 refer to Landscape Consultant Dwgs.	x
	Where recommended area is unachievable demonstrate that residential amenity is provided in the form of increased private open space &/or contribution to public open space.		√		Central Park (Public Open Space) provided is 2,400m2 refer to Landscape Consultant Dwgs.	√
	The minimum recommended area of private open space for each apartment at ground level or similar space on a structure, such as on a podium or carpark, is 25 m2 ; the minimum preferred dimension in one direction is 4 m.		√		30 apartments on the ground floor have courtyards ranging between 25m2 to 68m2. One apartment has 21 m2.	x
2.5	**ORIENTATION**	2-50				
	Plan the site to optimise solar access.			√		√
	Select building types which respond to the streetscape whilst optimising solar access			√		√
	Optimise solar access to living spaces and associated private open spaces by orientating them north			√		√
	Detail buildings elements to modify environmental conditions			√		√
2.6	**PLANTING ON STRUCTURES**					
	Minimum soil depth for planting		√		Refer to Landscape Consultants Dwgs.	√
2.7	**STORMWATER MANAGEMENT**					
	On dense urban sites seek measures			√		√

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

SEPP 65 Numerical Compliance table for: PARKLANDS ESTATE Jordan Springs

Ex	ITEM	PART/ PAGE	RULES OF THUMB	BETTER DESIGN PRACTIC E	NOTES	complies
	such as on site detention					
3	**SITE AMENITY**					
3.1	**SAFETY**	2-56				
	Separate residential parking from other building use and control access from public and common areas			√		√
	Provide direct access from car park to apartment lobbies for residents			√		√
	Provide separate access for residents in mixed –use buildings			√		n/a
	Provide audio or video intercom for visitor entry			√		√
	Provide key card access for residents			√		X
3.2	**VISUAL PRIVACY**	2-58				
	Locate and orient development to maximise visual privacy			√		√
	Design building layouts to minimise direct overlooking of rooms and private open spaces			√		√
4	**SITE ACCESS**					
4.1	**BUILDING ENTRY**	2-60				
	Provide as direct a physical and visual connection as possible between street and entry			√	Clearly defined feature entry to all Lift Lobbies.	√
	Achieve clear lines of transition between public street, the shared private, circulation spaces and apartment unit			√		√
	Generally provide separate entries from the street for pedestrians and cars and different uses			√	Clearly defined and separate pedestrian and vehicle entry points.	√
4.2	**PARKING**	2-62				
	Give preference to underground carparking			√		√
	Provide bicycle parking which is easily accessible from ground level and from apartments			√		√
4.3	**PEDESTRIAN ACCESS**	2-64				
	Follow accessibility standard AS 1428 (Pt. 1 & 2) as a minimum		√			√
	Provide barrier free access to at least 20 percent of dwellings in the development		√			√
4.4	**VEHICLE ACCESS**	2-65				
	Generally limit the width of driveways to a max of 6m		√		Complies with the minimum standards.	√

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

SEPP 65 Numerical Compliance table for: PARKLANDS ESTATE Jordan Springs

Ex	ITEM	PART/ PAGE	RULES OF THUMB	BETTER DESIGN PRACTIC E	NOTES	complies
	Locate vehicle entries away from main pedestrian entries and on secondary frontages		√			√
	PART 3 BUILDING DESIGN					
5	**BUILDING CONFIGURATION**					
5.1	**APARTMENT LAYOUT**	3-67				
	Determine appropriate apartment sizes in relation to: – Geographic location and market demands. – The spatial configuration of an apartment. – Affordability and range of apartment sizes provides more choice for more people			√		√
	Ensure apartment layouts are resilient over time. Design issues to address may include: – Accommodating a variety of furniture arrangements – Providing for a range of activities and privacy levels between different spaces within the apartment – Utilising flexible room sizes and proportions or open plans – Ensuring circulation by stairs, corridors and through rooms is planned as efficiently as possible thereby increasing the amount of floor space in rooms.			√		√
	Design apartment layouts, which respond to the natural and built environments and optimise site opportunities by: – Providing private open space in the form of a balcony, a terrace , a courtyard or a garden for every apartment – Orientating main living spaces toward the primary outlook and aspect away from neighbouring noise sources or windows. – Locating main living spaces adjacent to main private open space. – Locating habitable rooms, and			√		√

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

SEPP 65 Numerical Compliance table for: PARKLANDS ESTATE Jordan Springs

Ex	ITEM	PART/ PAGE	RULES OF THUMB	BETTER DESIGN PRACTIC E	NOTES	complies
	where possible kitchens and bathrooms, on the external face of the buildings thereby maximises the number of rooms with windows. – Maximising opportunities to facilitate natural ventilation and to capitalise on natural daylight – Avoid locating kitchen as part of main circulation spaces, such as hallway or entry space					
	Ensure apartment layouts and dimensions facilitate furniture removal and placement			√		√
	Single-aspect apartments should be limited in depth to 8m from a window.	3-69	√		Complies, habitable rooms within single aspect apartments do not have a depth greater than 8.0m from a window.	√
	The back of a kitchen should be no more than 8m from a window.	3-69	√		Complies, no kitchen is located greater than 8.0m from a window.	√
	The width of cross over or cross through apartments over 15m deep should be 4m or greater to avoid deep narrow apartment layouts	3-69	√			√
	Buildings not meeting minimum standards listed above must demonstrate how satisfactory daylight and ventilation can be achieved	3-69	√			n/a
	If council chooses to standardise apartment sizes, a range of sizes that do not exclude affordable housing should be used. As a guide, the Affordable Housing Service suggest the following minimum apartment sizes, which can contribute to housing affordability: – 1 bedroom apartment 50m2 – 2 bedroom apartment 70m2 – 3 bedroom apartment 95m2	3-69	√		Complies, Apartments sizes range from: 1Bed: 55 to 63m2 2Bed: 79 to 88m2 3bed: 103 to 118m2	√
5.2	**APARTMENT MIX**					
	Provide a variety of apartment types	3-70				
	Refine the appropriate apartment mix for a location by: – Considering population trends in the future as well as present market demands – Noting the apartment's location			√	Apartment mix provided: 1Bed: 13% 2Bed: 79% 3Bed: 8% of which three are	√

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

SEPP 65 Numerical Compliance table for: PARKLANDS ESTATE Jordan Springs

Ex	ITEM	PART/ PAGE	RULES OF THUMB	BETTER DESIGN PRACTIC E	NOTES	complies
	in relation to public transport, public facilities, employment areas, schools and universities and retail centres.				live/work apartments.	
	Locate mix of one and three bedroom apartments on the ground level where accessibility is more easily achieved for disabled, elderly people or families with children			√	A mix of 1 , 2 bedroom and Live/Work apartments have been provided on the ground floor.	√
	Optimise the number of accessible and adaptable apartments to cater for a wider range of occupants. Australian Standards are only a minimum.			√		√
	Investigate the possibility of flexible apartment configuration, which support change in the future.			√		√
5.3	**BALCONIES**	3-71				
	Provide primary balconies for all apartments with a minimum depth of 2m	3-72	√		Balconies vary between 2.0m to 4.8m in depth.	√
	Require scale plans of balcony with furniture layout to confirm adequate, useable space when an alternate balcony depth is proposed		√			n/a
5.4	**CEILING HEIGHTS**	3-73				
	Recommended minimum FFL-FCL heights:					
	Mixed use 3.3m ground & first floor to promote future use flexibility		√		3.3m provided to ground floor only.	X
	Residential building in mixed use area 3.3m for ground floor to promote future use flexibility.		√			√
	In residential flats or other residential floor of mixed use buildings					
	2.7m habitable rooms, 2.4 non habitable preferred, 2.25 permitted		√		All apartments achieve 2.7m.	√
	Two storey units 2.4m min. for second storey if 50% or more of the apartment has 2.7m min heights		√			n/a
	Two storey units with two storey void space, 2.4m min ceiling heights		√			n/a
	Attic spaces 1.5m min height at edge of room with 30 degree min. ceiling slope.		√			n/a
	Developments which seek to vary the recommended ceiling heights must demonstrate that apartments will receive satisfactory daylight		√			n/a
5.5	**FLEXIBILITY**	3-75				
	Provide robust building configurations, which utilise multiple entries and			√		√

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

SEPP 65 Numerical Compliance table for: PARKLANDS ESTATE Jordan Springs

Ex	ITEM	PART/ PAGE	RULES OF THUMB	BETTER DESIGN PRACTIC E	NOTES	complies
	circulation cores, especially in larger buildings over 15m long. – Thin building cross sections, which are suitable for residential or commercial uses. – A mix of apartment types – Higher ceilings in particular on the ground floor and first floor – Separate entries for the ground floor level, and the upper levels – Sliding and/or moveable wall systems					
	Provide apartment layouts, which accommodate the changing use of rooms			√		√
	Utilise structural systems, which support a degree of furniture change in building use or configuration			√		√
	Promote accessibility	3-76				
5.6	**GROUND FLOOR APARTMENTS**	3-77				
	Optimise the number of ground floor apartments with separate entries and consider requiring an appropriate percentage of accessible units. This relates to the desired streetscape and topography of the site		√		Complies, most ground floor apartments when feasible have separate entries.	√
	Provide ground floor apartments with access to private open space, preferably as a terrace or garden		√			√
5.7	**INTERNAL CIRCULATION**	3-79				
	In general where units are located off a double loaded corridor the number of units accessible from a single corridor should be limited to 8		√		Corridors serve between 2 to 8 apartments. Natural light and ventilation is optimised through the use of floor to ceiling windows where possible and supplemented by suitable artificial lighting and ventilation.	√
5.8	**MIXED USE**	3-80				
	Choose a mix of uses that compliment and reinforce the character, economics and function of the local area			√		√
	Choose compatible mix of uses			√		√
	Consider building depth and form in relation to each uses requirements for servicing and amenity			√		√

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

SEPP 65 Numerical Compliance table for: PARKLANDS ESTATE Jordan Springs

Ex	ITEM	PART/ PAGE	RULES OF THUMB	BETTER DESIGN PRACTIC E	NOTES	complies
	Design legible circulation systems, which ensure safety of users			√		√
	Ensure building positively contributes to public domain			√		√
	Design for acoustic privacy from the beginning of the project to ensure that future services, such as air conditioning, do not cause acoustic problems late			√		√
	Recognising the ownership/lease patterns and separating requirements for purposes of BCA for considerations			√		√
5.9	**STORAGE**	3-82				
	In addition to kitchen cupboards and bedroom wardrobes, provide accessible storage facilities at the following rates – Studio apartments 6m3 – One bedroom apartments 6m3 – Two bedroom apartments 8m3 – Three plus bedroom apartments 10m3		√		Complies, storage is provided within all apartments achieving 6m3 for 1bedroom 8m3 for 2bedroom 10m3 for 3bedroom.	√
6	**BUILDING AMENITY**					
6.1	**ACOUSTIC PRIVACY**	3-83				
	Arrange apartments within development to minimise noise transition between flats			√		√
	Design the internal apartment layout to separate noisier spaces from quieter spaces			√		√
6.2	**DAYLIGHT ACCESS**	3-84				
	Living rooms and private open spaces for at least 70% of apartments in a development should receive a min. 3 hours direct sunlight between 9am and 3pm in mid-winter. In dense urban areas min 2 hours may be acceptable		√		Complies, apartments receiving the required sunlight equates to 78% ie: 156 apartments 3hrs 70% ie: 140 apartments 2hrs 8% ie: 16 apartments	√
	Limit the number of single aspect apartments with a southerly aspect to a maximum of 10% of total units		√		Complies, single aspect apartments equate to 4% ie 8 apartments	√
6.3	**NATURAL VENTILATION**	3-86				
	Building depths which support natural ventilation typically range from 10-18m		√		Complies, Apartment depths range from 8.5 m to 14.2 m in depth	√
	60% of residential units should be		√		Complies, naturally	√

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

SEPP 65 Numerical Compliance table for: PARKLANDS ESTATE Jordan Springs

Ex	ITEM	PART/ PAGE	RULES OF THUMB	BETTER DESIGN PRACTIC E	NOTES	complies
	naturally cross ventilated				cross ventilated apartments equate to 66% ie: 133 apartments.	
	25% of kitchens should have access to natural ventilation		√		Complies, kitchens are well positioned within a cross ventilated living space equate to 46% ie 93 apartments.	√
7	**BUILDING FORM**					
7.1	**AWNINGS & SIGNAGE**	3-88				
	Awnings encourage pedestrian activity on streets			√		√
	Signage should be carefully considered and integrated into the development			√		√
7.2	**FACADES**	3-89				
	Compose facades with appropriate scale, rhythm and proportion, which respond to building uses and contextual character			√		√
	Design facades to reflect the orientation of the site using elements such as sun shading, depending on orientation			√		√
7.3	**ROOF DESIGN**	3-91				
	Relate roof design to the desired built form			√		√
	Design the roof to relate to the size and scale of the building			√		√
8	**BUILDING PERFORMANCE**					
8.1	**ENERGY EFFICIENCY**	3-93				
	Incorporate passive solar design techniques to optimise heat storage in winter and heat transfer in summer by:					
	Maximising thermal mass in floor & walls in northern rooms			√		√
	Hard floor finishes instead of carpet			√		√
	Insulating roof/ceiling to R2.0, external walls to R1.0 and floor including separation from basement parking to R1.0			√		√
	Improve control of mechanical space heating & cooling by:					
	Designing apartments so that entries open into lobbies or vestibules and are isolated from living areas by doorways			√		√

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

SEPP 65 Numerical Compliance table for: PARKLANDS ESTATE Jordan Springs

Ex	ITEM	PART/ PAGE	RULES OF THUMB	BETTER DESIGN PRACTIC E	NOTES	complies
	Provide or plan for future installation of photo voltaic panels			√	Roof design can facilitate future installation.	√
	Improve efficiency of hot water systems			√		√
	Reduce reliance on artificial lighting			√		√
	Maximise the efficiency of household appliances			√		√
8.2	**MAINTENANCE**	3-95				
	Select manually operated systems such as blinds, sunshades and curtains in preference to mechanical systems			√		√
	Select durable materials which can be easily cleaned and graffiti resistant			√		√
8.3	**WASTE MANAGEMENT**	3-96				
	Provide every dwelling with a waste cupboard or temporary storage area of sufficient size to hold a single days waste and enable source separation			√		√
	Supply waste management plan with DA		√		Complies, refer to Waste Management Plan.	√
8.4	**WATER CONSERVATION**	3-97				
	Collect ,store and use rainwater on site for car washing, garden, toilet flushing, laundry and clothes washing			√		√
	Rainwater is not to be collected from roofs coated with lead or bitumen based paints.		√			√

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

MEDIUM DENSITY HOUSING DEVELOPMENT WITHIN THE PARKLANDS ESTATE AREA OF JORDAN SPRINGS IN THE WESTERN PRECINCT, ST MARY'S PROPERTY

Species Impact Statement

For:

Synergy Development Group

February 2015

Final

CUMBERLAND ECOLOGY

PO Box 2474, Carlingford Court 2118
www.cumberlandecology.com.au

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Report No. 13092RP2

The preparation of this report has been in accordance with the brief provided by the Client and has relied upon the data and results collected at or under the times and conditions specified in the report. All findings, conclusions or recommendations contained within the report are based only on the aforementioned circumstances. The report has been prepared for use by the Client and no responsibility for its use by other parties is accepted by Cumberland Ecology.

Revision	Date Issued	Reviewed by	Approved by	Date Approved	Revision Type
1	4/12/2014	GK	GK	4/12/2014	Final Draft
2	12/02/2015	VO/GK	DR	11/02/2015	Final

Approved by: David Robertson

Position: Director

Signed: David Robertson

Date: *12 February, 2015*

I, Amen Zoabi of Synergy Development Group, PO Box 314, Casula NSW 2170, being the applicant for the development consent for proposed development of Lots 3989, 3990 and 3991 in DP1190132, St. Mary's Western Precinct Penrith LGA have read and understood this Species Impact Statement. I understand the implications of the recommendations made in the statement and accept that they may be placed as conditions of consent or concurrence for the proposal.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table of Contents

EXECUTIVE SUMMARY

1 INTRODUCTION

1.1 Purpose *1.1*

1.2 Approvals and Licences *1.2*

1.2.1 State Government Instruments *1.2*

1.2.2 Local Government Policies *1.4*

1.2.3 Australian Heritage Commission Register of National Estate *1.4*

1.3 DGR Matters Which Have Been Limited or Modified *1.4*

2 CONTEXTUAL INFORMATION

2.1 Background *2.1*

2.1.1 St Marys Property *2.1*

2.1.2 Western Precinct *2.5*

2.2 Description of the Proposal *2.7*

2.2.1 Nature *2.7*

2.2.2 Extent *2.9*

2.2.3 Location *2.9*

2.2.4 Timing *2.9*

2.2.5 Layout *2.10*

2.2.6 Future Development of the Western Precinct *2.10*

2.3 Land Tenure Information *2.10*

2.4 Vegetation *2.11*

2.4.1 Cumberland Plain Woodland - Shale Plain Woodland *2.12*

2.4.2 Shale Gravel Transition Forest *2.12*

2.4.3 Alluvial Woodland *2.13*

2.4.4 Freshwater Wetlands on Coastal Floodplains *2.13*

2.4.5 Cumberland Plain Woodland - Shale Hills Woodland *2.14*

2.4.6 Agnes Banks Woodland *2.14*

2.4.7 Castlereagh Swamp Woodland *2.15*

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table of Contents *(Cont'd)*

2.4.8 Cooks River/Castlereagh Ironbark Forest 2.15
2.4.9 Moist Shale Woodland 2.16
2.4.10 Riparian Forest 2.16
2.4.11 Shale Sandstone Transition Forest 2.17
2.4.12 Castlereagh Scribbly Gum Woodland 2.17
2.4.13 Riparian Scrub 2.18
2.4.14 Upper Georges River Sandstone Woodland 2.18
2.4.15 Western Sandstone Gully Forest 2.18
2.4.16 Endangered Ecological Communities of the Cumberland Plain 2.19
2.5 Plans and Maps 2.19

3 INITIAL ASSESSMENT

3.1 Endangered and Critically Endangered Ecological Communities 3.1
3.2 Threatened Species and Populations Records 3.1
3.2.1 Database Records 3.1
3.2.2 Literature Review 3.2
3.2.3 Habitat Assessment 3.2

4 SURVEY

4.1 Survey Background 4.1
4.1.1 Historical Surveys 4.1
4.1.2 Recent Surveys 4.2
4.2 Survey Methods 4.3
4.2.1 Terrestrial Survey 4.3
4.2.2 Statistical Analyses 4.13
4.2.3 Weather Conditions for Surveys by Cumberland Ecology 4.13
4.2.4 Survey Limitations 4.14
4.3 Survey Results 4.15
4.3.1 Vegetation Communities of the Study Area 4.15
4.3.2 Statistical outcomes of vegetation composition 4.28

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table of Contents *(Cont'd)*

comparisons

4.3.3 Threatened Flora Species 4.31

4.3.4 Fauna Habitats within Study Area 4.35

4.3.5 Fauna Species within the Subject Land 4.36

4.3.6 Fauna Species 4.38

4.4 Habitat Corridors 4.46

4.5 Determining Affected (C)EECs/Species 4.46

4.5.1 Major Affected (C)EECs/species 4.47

4.5.2 Minor Affected (C)EECs/species 4.47

4.5.3 (C)EECs/Species that are not affected 4.48

5 IMPACT ASSESSMENT

5.1 Assessment of Likely Impacts 5.1

5.1.1 Direct Impacts of Development 5.1

5.1.2 Indirect Impacts 5.3

5.1.3 Cumulative Impact of Development in the Western Precinct 5.3

5.2 Assessment of Critically Endangered and Endangered Ecological Communities and Species Likely to be Affected 5.4

5.2.1 Cumberland Plain Woodland 5.5

5.2.2 River-flat Eucalypt Forest 5.5

5.2.3 Freshwater Wetlands 5.5

5.2.4 Cumberland Plain Land Snail 5.5

5.3 Description of Habitat 5.6

5.3.1 Cumberland Plain Woodland 5.6

5.3.2 River-flat Eucalypt Forest 5.9

5.3.3 Freshwater Wetlands 5.12

5.4 Past Disturbance History of the Western Precinct 5.13

5.4.1 Assessment of Ability of Affected (C)EECs/Species to Recover to Pre-Disturbance Condition 5.14

5.5 Description of Conservation Status 5.14

5.5.1 Cumberland Plain Woodland 5.14

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table of Contents *(Cont'd)*

	5.5.2	River-flat Eucalypt Forest	*5.15*
	5.5.3	Freshwater Wetlands	*5.15*
5.6		Discussion of Likely Effects of the Proposed development	*5.16*
	5.6.1	Extent of Habitat Removal	*5.16*
	5.6.2	Significance within the Local Context	*5.18*
	5.6.3	Discussion of Connectivity	*5.21*
	5.6.4	Consideration of Threatening Processes	*5.22*
5.7		Description of Feasible Alternatives	*5.24*
6		**CONSISTENCY OF THE PROPOSAL WITH THE OBJECTIVES OF THE CUMBERLAND PLAIN RECOVERY PLAN**	
6.1		Introduction	*6.1*
6.2		Species, Populations and Ecological Communities	*6.1*
6.3		Compliance of the Proposed Development with the Objectives and Actions of the Final Recovery Plan for the Cumberland Plain	*6.4*
	6.3.1	Objectives	*6.5*
	6.3.2	Actions	*6.5*
	6.3.3	Guidelines	*6.6*
	6.3.4	Management Plans Regulating Development of the SMP	*6.8*
	6.3.5	Assessment of Threatened Species, Populations and Ecological Communities within this SIS	*6.9*
6.4		Application of Recovery Plan to Proposal	*6.11*
7		**AMELIORATIVE MEASURES**	
7.1		Introduction	*7.1*
	7.1.1	SMP/Regional Park	*7.1*
	7.1.2	Western Precinct	*7.2*
7.2		Long Term Management Strategies	*7.2*
	7.2.1	The Landscape Masterplan	*7.2*
	7.2.2	Weed Management Plan	*7.4*
	7.2.3	Feral and Domestic Animal Management Strategy	*7.4*
	7.2.4	Bushfire Management Plan	*7.5*

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table of Contents *(Cont'd)*

7.2.5 Macrofauna Management Plan *7.5*

7.2.6 Habitat Enhancement within Subject Land *7.5*

7.3 Compensatory Measures *7.6*

7.3.1 Regional Park Plan of Management *7.6*

7.3.2 Macrofauna Management Plan *7.7*

7.3.3 Principles for Offsetting *7.7*

7.3.4 Alternative Compensatory Measures *7.8*

7.4 Monitoring *7.8*

7.4.1 Weed Management Plan *7.9*

7.4.2 The St Marys Macrofauna Management Plan *7.9*

8 ASSESSMENTS OF SIGNIFICANCE

8.1 Critically Endangered Ecological Community *8.1*

8.1.1 Cumberland Plain Woodland *8.1*

8.1.2 River-flat Eucalypt Forest *8.5*

8.1.3 Freshwater Wetlands *8.7*

8.2 Fauna *8.10*

8.2.1 Cumberland Plain Land Snail *8.10*

8.2.2 Woodland Birds *8.13*

8.2.3 Microchiropteran Bats *8.15*

8.2.4 Grey-headed Flying-fox *8.19*

9 ADDITIONAL INFORMATION

9.1 Qualifications and Experience *9.1*

9.1.1 Other Approvals Required for the Development or Activity *9.1*

9.1.2 Licence Matters *9.1*

9.1.3 Section 110 (5) Reports *9.2*

10 CONCLUSION

REFERENCES

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table of Appendices

A. DIRECTOR GENERAL'S REQUIREMENTS

B. SURVEY EFFORT

C. FLORA AND FAUNA SPECIES LISTS

D. FLORA AND FAUNA DATA ANALYSIS

E. ACTIONS PRESCRIBED BY THE FINAL RECOVERY PLAN FOR THE CUMBERLAND PLAIN

F. STAFF CVS

G. APPROVAL PROCESS FLOWCHART (JBA 2011)

List of Tables

S.1	Vegetation Communities of the Subject Land	10
3.1	Threatened Flora recorded in the Locality and the Assessment of the Likelihood of Occurrence	3.5
3.2	Threatened Fauna recorded in the Locality and the Assessment of the Likelihood of Occurrence	3.10
4.1	Dates of Field Surveys	4.3
4.2	Modified Braun-Blanquet scores used in Quadrat surveys	4.5
4.3	Fauna Survey Methods and Effort (Cumberland Ecology 2011)	4.8
4.4	Tree Hollow Size Class	4.12
4.5	Summary of Weather Conditions during 2011 survey period	4.13
4.6	Locations of Grevillea juniperina ssp juniperina populations in the Study Area	4.32

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

List of Tables

4.7	Locations of Pultenaea parviflora in the Subject Land	4.33
4.8	Population estimates for Pultenaea parviflora and Grevillea juniperina ssp juniperina within the St Marys Regional Park	4.34
4.9	Bat survey results	4.41
4.10	Bat survey definitions	4.41
5.1	Vegetation Communities of the Subject Land	5.1
5.2	Vegetation communities conserved in the Study Area and Regional Park	5.4
6.1	Threatened Biodiversity addressed in the Recovery Plan	6.1
6.2	Threatened Biodiversity identified in the Recovery Plan that have been addressed in this SIS	6.10
A.1	DGR Compliance table	A.1
B.1	History of survey effort on the SMP relevant to the Western Precinct	B.1
B.2	Detailed Methods and Records of Survey for Threatened Flora species on the SMP	B.8
B.3	Detailed Methods and Records of Survey for Threatened Fauna species on the SMP	B.64
C.1	Flora species recorded in the Study Area	C.1
C.2	Fauna species recorded in the Study Area and SMP	C.21
D.1	Snail survey records for the Study Area - CE 2011	D.1
D.2	Habitat Assessment results in the Study Area	D.2
D.3	Results of Group Similarity Analyses (SIMPER) of Flora data by habitat and primary species contributing to Similarity	D.4
D.4	Statistical comparison of Cumberland Plain Land Snail numbers between different sections of the Study Area	D.7
E.1	Compliance with Cumberland Plain Recovery Plan	E.1

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

List of Figures

1.1	Aerial Photograph of the St Marys Property	1.6
1.2	Zoning of the St Marys Property (SREP 30 Amendment 2)	1.7
2.1	Plan of the Subject Site identifying the Proposal	2.21
2.2	Aerial view of the Subject Site, Subject Land and Study Area	2.22
2.3	Vegetation Communities in the Locality	2.23
2.4	Topography of the Locality identifying land uses	2.24
2.5	Aerial Photograph of the Locality identifying areas of native vegetation	2.25
3.1	OEH Threatened Flora records within the Locality	3.3
3.2	OEH Threatened Fauna records within the Locality	3.4
4.1	Flora survey locations	4.7
4.2	Fauna survey locations	4.10
4.3	Comparison of exotic and native plant composition in the Subject Sites (Area A), regenerating Regional Park Woodland (Area B) and Mature Regional Park Woodland (Area C)	4.28
4.4	Similarity Dendrogram of all flora species among quadrats	4.30
4.5	Comparative abundance of Cumberland Plain Land Snail within the Subject Land (Area A), regenerating Regional Park woodland (Area B) and Mature Regional Park woodland (Area C)..	4.45
4.6	Threatened Flora and Fauna recorded in the Study Area	4.50
4.7	Vegetation of the Study Area	4.51

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

List of Photographs

2.1	Aerial photograph of St Marys Property, 1947	2.2
2.2	Aerial photograph of St Marys Property, 1955	2.2
2.3	Aerial photograph of St Marys Property, 1965	2.3
2.4	Aerial photograph of St Marys Property, 1978	2.3
4.1	Mature CPW in the Regional Park	4.17
4.2	Regenerating CPW on the subject site	4.18
4.3	Intact Derived Native Grassland in the north of the Western Precinct	4.20
4.4	Low diversity Derived Native Grassland on the subject land	4.20
4.5	River-flat Eucalypt Forest in the south-eastern part of the study area	4.23
4.6	Sedgeland in the subject land (Village 2)	4.24
4.7	Sedgeland in the subject land (Village 4)	4.25
4.8	Freshwater Wetland in the study area	4.26
4.9	Wetland dam vegetation in Regional Park areas adjacent to the subject site	4.27

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Glossary of Terms

Abundance: means a quantification of the population of the species or community.

Affected (C)EECs/species: means subject species, populations and communities likely to be affected by the approved components of the project.

CEEC: Critically Endangered Ecological Community

Conservation status: is an indicator of how likely it is to remain alive at present or in the near future. Many factors are used to assess a species' conservation status, including: the number remaining, the overall increase or decrease in the population over time, breeding success rates and known threats.

Development: as defined in the EP&A Act means:

(a) the use of land, and

(b) the subdivision of land, and

(c) the erection of a building, and

(d) the carrying out of a work, and

(e) the demolition of a building or work, and

(f) any other matter or thing referred to in section 26 that is controlled by an environmental planning instrument, but does not include any development of a class or description prescribed by the regulations for the purposes of this definition.

Director-General: means the Director-General of the Department of Premier and Cabinet.

EEC: Endangered Ecological Community

Jordan Springs: *The suburb of Jordan Springs, also referred to as the Western Precinct*

LGA: Local Government Area;

Locality: means the area within a 10km^2 radius of the centre of the subject site.

OEH: means the NSW Office of Environment and Heritage (formerly the NSW Department of Environment, Climate Change and Water or DECCW). The OEH is a division of the NSW Department of Premier and Cabinet

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Proposed Development: is the development, activity or action proposed.

Region: as defined in the TSC Act, means for the purposes of the provision in which it is used, a bioregion defined in a national system of bioregionalisation that is determined (by the Director-General under subsection (4)) to be appropriate for those purposes. In this case, the Bioregion refers to the Sydney Basin Bioregion.

Significant species: means species not listed in the TSC Act but considered to be of regional or local significance.

Study area: means the subject site, subject land and any additional areas that are likely to be affected by the proposal, either directly or indirectly. For the purposes of this SIS, the study area includes proximate areas of the proposed St Marys Regional Park

Subject land: means the entire Western Precinct, as defined under the Regional Environmental Plan for St Marys (SREP 30).

Subject site: means the area encompassing the total development footprint of the Parklands Estate area within the Jordan Springs development. This includes Lots 3989, 3990 and 3991 in DP1190132

Subject species: means those threatened species that are known or considered likely to occur in the study area.

SEE: Statement of Environmental Effects

SREP 30: Sydney Regional Environment Plan 30, Amendment No. 2, as shown in Figure 1.2;

State Deed: The St Marys State Development Agreement

St Marys EPS: St Marys Environmental Planning Strategy 2000;

St Marys Property (SMP): encompassing land marked in Figures 1.1 and 1.2;

Western Precinct: encompassing the land identified as such in Figure 1.2.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Executive Summary

S1 PURPOSE

This document is a Species Impact Statement (SIS) that has been prepared to assess the impacts of the future development of Village Centre 2 (VC2), Village Centre 3 (VC3) and Village Centre 10 (VC10) (Lots 3989, 3990 and 3991 in DP1190132), within the Western Precinct (now the suburb of Jordan Springs) of the St Marys Property (SMP) in western Sydney.

The development of VC2, VC3 and VC10 is collectively referred to as the 'Parklands Estate' and is proposed to be implemented in five stages. This SIS has been prepared to support all development applications (DAs) related to the development of the Parklands Estate area, including a proposed Masterplan DA and individual DAs for each stage of the proposed development.

The purpose of the SIS is to:

- Identify threatened species issues and identify and provide appropriate amelioration strategies to minimise adverse impacts resulting from the proposal;
- Assist consent and determining authorities in the assessment of the development applications under Part 4 or request for Part 5 approval under the Environmental Planning and Assessment Act 1979 (EP&A Act);
- Assist the Director-General of the Office of Environment and Heritage (OEH, formerly DECCW) in deciding whether or not concurrence should be granted for the purposes of Parts 4 or 5 of the EP&A Act;
- Assist the Director-General of the OEH when consulted for the purposes of Parts 4 or 5 of the EP&A Act; and
- Assist the Director-General of the OEH in the assessment of Section 91 License applications lodged under the Threatened Species Conservation Act 1995 (TSC Act).

As described in the Precinct Plan for the Western Precinct (JBA, 2009), approval under Commonwealth environmental law was granted to the development of the SMP (in accordance with the Sydney Regional Environmental Plan No. 30 – St Marys (SREP 30)) under the *Environment Protection (Impact of Proposals) Act 1974* (EPIP Act) prior to the gazettal of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Clarification of all related actions necessary for the carrying out of the approved development was thereafter granted by the Commonwealth under the Environmental Reform

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

(Consequential Provisions) Act 1999 (ERCP Act). As such, following the commencement of the EPBC Act, the Commonwealth confirmed that the EPIP Act approval and ERCP Act certification completed the Commonwealth environmental assessment and held that "***no further approvals***" [our emphasis] were required provided development was consistent with the established planning framework provided by the SREP 30. This SIS therefore does not address species, populations and communities listed under the EPBC Act, except where those species of relevance are also listed under the TSC Act.

This SIS is a detailed assessment of the collective extent of works contained within Lots 3989, 3990 and 3991 in DP1190132,of the Parklands Estate area of the Western Precinct (now the suburb of Jordan Springs) of the SMP. However, it also assesses the impacts of development across the Western Precinct as a whole, as detailed in the approved Precinct Plan. It contains specific assessment of threatened species, populations and ecological communities listed in the schedules of the TSC Act.

S2 BACKGROUND

The former Australian Defence Industries (ADI) site at St Marys was endorsed by the NSW Government for inclusion on the Urban Development Program (UDP) in 1993. The site presented an opportunity to provide housing for Sydney's growing population within an environmentally sustainable framework.

Given that the site straddles the boundary between two local government areas (Blacktown and Penrith) the NSW Government decided that a regional environmental plan should be prepared for the site. Technical investigations into the environmental values and development capability of the land were commenced in 1994, and the Regional Environmental Plan for St Marys (SREP 30) was gazetted in January, 2001. It zoned the land into "urban", "employment", "regional open space", and "Regional Park" uses (Refer to Figure 1.2).

In view of the original scale of the residential and employment uses, a package of documents was prepared to guide and control development. These comprised SREP 30 (maps and written instrument) (DUAP, 2001b), and an Environmental Planning Strategy (EPS) (DUAP, 2001a) which sets out performance objectives and strategies to address key aspects associated with the site, including: conservation, cultural heritage, water and soils, transport, urban form, energy and waste, human services, employment, and land contamination.

In addition, a State Development Agreement (State Deed) was entered into between the landowner and developers of the land (a Joint Venture comprising ComLand and Lend Lease Development), and the NSW Government. The State Deed specifies a series of obligations to be provided during development of the SMP. These obligations include, amongst other things, the following relevant contributions:

- the staged transfer and dedication 900ha of land to the NPWS as a Regional Park for the sum of $3 (three dollars);

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

- staged monetary contributions (c$6m) towards capital improvements within the 900ha Regional Park;
- monetary contributions towards a Plan of Management for the 900ha Regional Park; and
- the erection of stock proof fencing in stages along the boundaries of the 900ha Regional Park.

The State Deed was executed in December 2002. It provides legal certainty for the delivery of obligations at specific milestones. Together with the SREP 30 and the EPS, the State Deed provides the broader framework for the facilitation of future development of SMP on an agreed basis.

Under SREP 30 development areas are referred to as "precincts" and the SMP is subdivided into Eastern Precinct, Ropes Creek Precinct, Central Precinct, Western Precinct, Dunheved Precinct and Regional Park, Regional Open Space, Drainage Land and Roads. A Precinct Plan was prepared for the each development precinct.

To date the Precinct Plans for the Eastern Precinct, Ropes Creek Precinct, Dunheved Precincts, Central Precinct, Western Precinct have been prepared, exhibited and adopted by the relevant Councils and development is being progressed on a staged basis. As a result, the SMP is one of the largest single Greenfield Release Areas in the Metropolitan Development Program and critical to the delivery of housing numbers for Metropolitan Sydney.

Western Precinct Plan

A Precinct Plan was prepared for the Western Precinct and was approved by Penrith City Council in 2009. The Precinct Plan contained assessments of biodiversity, a plan for the management of weeds, and a strategy for management of domestic and feral animals. The Biodiversity Assessment for the Western Precinct predicted that development of the Precinct was not likely to have a significant negative impact upon threatened flora and fauna within the SMP in the long-term due to the major conservation outcome provided by the creation of the 900ha Regional Park in the SMP.

The development applications for Stage 1 of the Western Precinct development, referred to as the suburb of Jordan Springs, were submitted to Penrith City Council by Lend Lease Pty Ltd in August 2009. Subsequent DA's for Stages 2, 3A and 3B were submitted by Lend Lease in May 2011, for Stage 4 in August 2012, Stage 3C1 in June 2013, Stage 3C2 in August 2013, Village Centre Site 12 in February 2014, Stage 3C3 in April 2014 and Village 5 in July 2014.. All applications were in accordance with the Precinct Plan and the broader statutory framework provided by the SREP 30, EPS and the State Deed.

Parklands Estate Area Development Applications

Synergy Development Group is preparing a Staged DA, on behalf of CID group for submission to Penrith City Council (Council) for the proposed Parklands Estate (hereafter

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

referred to as the 'subject site') development within the Western Precinct (Jordan Springs). The proposed development of the subject site is to take place in five stages and will also include a Masterplan DA. As part of the Council's and the Joint Regional Planning Panel's consideration of the subject development applications, further clarification has been sought on the assessment of Cumberland Plain Woodland (CPW) since its listing as a Critically Endangered Ecologically Community (CEEC) under the TSC Act (NSW Scientific Committee, 2009). CPW is also listed as a Critically Endangered Ecological Community under the EPBC Act (as Cumberland Plain Woodland and Shale Gravel Transition Forest).

The vegetation present in the subject site consists of a mix of mature CPW woodland, young, CPW woodland in various stages of regeneration and low diversity native grassland derived from CPW. Although the development of the subject site will further fragment representatives of the CPW community from the Regional Park and will remove an area of CEEC, the removal of the small area of CPW proposed, is not considered to constitute a significant impact within the meaning of Section 5A of the EP&A Act (7 Part Test). A large area of high quality CPW will still be conserved in the Regional Park, regardless of the proposed DAs.

However, on a precautionary basis, it has been agreed with Council that all DAs for the Western Precinct/Jordan Springs development area, that will involve the removal of TSC Act listed species and communities, will be accompanied by a SIS. For this reason, although the collective impacts of the proposed DAs for the development of the subject site are not generally considered to be significant, a SIS has nonetheless been prepared. This SIS report has been prepared as an overarching assessment of the entire subject site (the Masterplan area) and encompasses the collective impacts of each of the proposed development stages.

S3 PROPOSAL

The proposed development of the subject site involves seeking development consent via a Staged DA (including a Masterplan DA) for a mixed residential development comprising five development blocks, new streets, landscaped open space including central square, vehicular access and car parking within the subject site.

Physical works proposed for the subject site include:

- Construction of buildings and roads;
- Bulk earthworks in grading of the lot and road;
- Provision of associated infrastructure;
- Provision of landscaping; and
- Associated tree removal.

The development of the subject site is to be implemented in five stages. The location of the subject site (encompassing all five stages) is mapped in the SIS (refer to Figure 2.1) and will be set out in detail in the relevant Statement of Environmental Effects (SEE). Additional

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

ancillary works will be located within the area shown as the subject site and include the creation of interim sediment and detention basins and culverts with relation to road infrastructure works.

S4 VEGETATION OF THE STUDY AREA

Historically, the Western Precinct was used for ammunition storage bunkers and large numbers of concrete bunkers existed across the area until the 1990s. The Western Precinct was intensively mown and heavily grazed by kangaroos while it was used as a Defence site. However, with a change of ownership the storage bunkers were removed and mowing has been reduced to areas of the perimeter of the Regional Park and the boundaries of the SMP. Under the provisions of SREP 30 the kangaroos have been subject to management and progressively reduced in numbers via implementation of a Macrofauna Management Plan (Cumberland Ecology, 2004b). These land management changes since the late 1990s have allowed for regeneration of CPW across various parts of the SMP. Whereas large areas were mown and heavily grazed and open in the early 1990s, there has been a greater level of regeneration in recent times: by way of example, within the Regional Park there are broad areas of young sapling regrowth of CPW trees and shrubs, creating additional habitat on site for various plants and animals. Such regrowth of habitat has only occurred due to land management practices prescribed and implemented by the proponent since the gazettal of SREP 30.

Consequently, the vegetation of the study area can now be separated into various sub-units of the following vegetation types:

Cumberland Plain Woodland

The vegetation of the Western Precinct contains Cumberland Plain Woodland (CPW) and grassland derived from the clearing of CPW ("derived native grassland"). CPW in the study area is described in various conditions / forms below:

Mature CPW

The CPW in the central portions of the Regional Park (which have been included in the eastern extent of the study area for the purposes of this SIS) generally contains mature CPW and other woodland types (Refer to Figure 4.7). The mature CPW contains a higher diversity of native species and is generally more structurally intact than the CPW within the rest of the Western Precinct. The mature areas of CPW contain a shrub layer, mostly of *Bursaria spinosa* (Blackthorn) and *Dillwynia sieberi* (Parrot-pea), characteristic species of CPW. A patch of mature CPW is present along the south to south-western parts of the subject site and extends southwards into the adjacent Regional Park.

Regenerating CPW

The CPW present in the Western Precinct is considered to be occurring in a more simplified regenerating form of the community, compared with the regeneration taking place in the Regional Park, possibly because of the historically higher levels of disturbance. There is a visually obvious and statistical difference between the condition (measured by abundance

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

cover of exotic species in each stratum) and the diversity of species present in the CPW of the Western Precinct and that of the Regional Park. This includes woodland of a similar age of regeneration (the sampling area referred to as Area B in this SIS) as shown in the statistical analysis provided in Section 4.3.2. This observation is further supported by previous resilience assessment data collected by Ian Perkins in 1999 that resulted in modifications to the Regional Park boundary (as at the time of the surveys) to include Area B, which was historically cleared (prior to 1940) and maintained as open grassland with scattered mature trees through heavy kangaroo grazing and slashing until 2000 as with the land within the approved Western Precinct limits (the subject land). The regenerating CPW on the subject site occurs mainly in the central areas (Refer to Figure 4.7).

Derived Native Grassland

The vegetation of the Western Precinct contains grassland derived from the clearing of CPW ("derived native grassland"). This grassland has been extensively surveyed, and can be further characterised by a large zone dominated by exotic grasses (predominately *Axonopus fissifolius*) and few native herbs and shrubs. Smaller zones in the neighbouring Regional Park are dominated by native grasses and the inclusion of a higher diversity of native herbs and shrubs. Although both forms of grassland are considered to be derived from the past clearing of CPW, the latter category is likely to have a higher resilience and is associated with the historically less disturbed portions of the SMP.

Shale Gravel Transition Forest

As its name suggests, Shale Gravel Transition Forest (SGTF) is a transitional plant community which grades into CPW where the influence of gravel soil declines, and grades into Cooks River/Castlereagh Ironbark Forest or Castlereagh Scribbly Gum Woodland where gravel deposits are thicker. There is a natural continuum of soil in this spectrum, and it can be difficult to separate out these communities, at the middle of the shale-gravel spectrum. In a new CEEC listing under the EPBC Act, a single community called *Cumberland Plain Woodland and Shale-gravel Transition Forest* is described.

The NSW Scientific Committee description for SGTF includes a slightly different species composition to CPW, based on the local presence of lateritic gravel in the soil (NSW Scientific Committee, 2002c). The community is dominated by *Eucalyptus fibrosa* with *E. moluccana* also occurring less frequently. Shrub species are similar to those found in CPW but more commonly include shrubs from the pea family, including threatened species such as Parrot pea, and has also been observed to contain high numbers of *Grevillea juniperina* subsp. *juniperina*.

Large areas of SGTF occur in the eastern portions of the SMP, mostly to the east of the current study area extent. This community has been previously mapped in the Western Precinct. The floristics surveyed during the preparation of this SIS suggest that the vegetation patches are not substantially different across the subject land, and therefore it has all been considered to be CPW in this SIS, which is of higher conservation status under the TSC Act.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

River-flat Eucalypt Forest

River-flat Eucalypt Forest (RFEF) has a limited occurrence in the Western Precinct, in simplified regenerating form in the south east of the Precinct as a 10m wide band either side of the drainage line. Although it has a limited distribution within the precinct (only 0.7ha), it adjoins more extensive areas of Alluvial Woodland in the Regional Park along the tributary to South Creek.

The vegetation is patchy, with the eastern extent being more intact and exhibiting more of the indicative species of this community, while the western extent is more closely related to CPW. The canopy is mostly dominated by *Eucalyptus tereticornis* (Forest Red Gum) but also includes *Angophora floribunda* (Rough-barked Apple), *Casuarina glauca* (Swamp Oak) and *Eucalyptus amplifolia* (Cabbage Gum). In the more intact sections, a small tree layer occurs with *Melaleuca linariifolia* and *Acacia floribunda* being present.

This community does not occur on the subject site but is present within the subject land.

Freshwater Wetlands

Sedgeland, a form of Freshwater Wetlands, occurs in very small local patches throughout the precinct, generally artificially created by a small scraping of the soil that results in a small depression. These areas usually are too small to warrant mapping, being only a few square metres in area and have therefore been included in the grassland mosaic. Three areas of Freshwater Wetlands have been mapped: the area surrounding the dam in the south western corner of the precinct, largely included in the Regional Park, a small soak in the centre of the subject land, and also an area along a drainage line near the western section of the precinct.

This community does not occur on the subject site but is present within the parts of the Regional Park adjacent to the subject site.

Planted Trees

There are also areas of planted, non-indigenous trees. These mainly consist of rows of Spotted Gum (*Corymbia maculata*) or Lemon-scented Gum (*Corymbia citriodora*) on the western boundary, along the Northern Road. A patch of *C. maculata* was planted (in approximately 1990) as a scientific trial (Ian Doyle, Lend Lease, *pers comm*. 2011). This patch occurs in the south east of the subject land.

S5 SUBJECT SITE, SUBJECT LAND AND AFFECTED FLORA AND FAUNA

For the purposes of this SIS, the land directly affected by the proposals for the development of the Parklands Estate area of the Western Precinct is defined as the "**subject site**" (refer to Figure 2.1).

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

The subject site sits wholly within the "**subject land**", which corresponds to the area covered by the Western Precinct (refer to Figures 2.1 and 2.2).

The "**study area**" comprises the subject site, the subject land and adjacent areas that could be directly or indirectly impacted by the proposed development. This includes proximate areas of the Western Precinct, the Regional Park, and land adjoining the SMP (Refer to Figure 2.2).

The "**locality**" is defined as the area within a 10km radius of the centre of the subject site, as determined by the DGRs (refer to Figure 2.3).

This SIS evaluates subject flora and fauna, known or considered likely to occur in the locality ("subject (C)EECs/species"), and then determines those which are most likely to be affected by the proposed development ("affected (C)EECs/species"). Affected (C)EECs/species means those threatened species, populations and ecological communities that are likely to experience impacts from the proposal.

The SIS distinguishes between "major" and "minor" affected (C)EECs/species (this includes populations and communities). Major affected (C)EECs/species are those that will definitely experience a measureable loss of habitat as a result of the proposed development. Minor affected (C)EECs/species are those species that occur (or are considered likely to occur) in the study area and which may experience small or very minor impacts to habitat, either directly or indirectly.

S5.1 Major Affected (C)EECs/species

In summary, the major affected (C)EECs/species that are considered in detail in this SIS are:

- Cumberland Plain Woodland; and
- Cumberland Plain Land Snail (*Meridolum corneovirens*).

All of these (C)EECs/species occur on the subject site and will have habitat removed as a result of the development.

S5.2 Minor Affected (C)EECs/species

The minor affected (C)EECs/species include:

Endangered ecological communities

- River-flat Eucalypt Forest;
- Freshwater Wetlands; and
- Shale Gravel Transition Forest.

These EECs occur in the study area but will not be removed on the subject site.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Flora population

- *Marsdenia viridiflora* subsp. *Viridiflora* in the Bankstown, Blacktown, Camden, Campbelltown, Fairfield, Holroyd, Liverpool and Penrith local government areas: This species has been recorded in low numbers in the Regional Park and study area but has not been recorded on the subject land.

Flora species

- *Grevillea juniperina subsp juniperina*;
- *Pultenaea parviflora* (Bush Pea); and
- *Pimelea spicata* (Spiked Rice-flower).

These flora species have been recorded in the study area and the subject land, but not from within or adjoining the subject site.

Fauna species

Microchiropteran Bats: East-coast Freetail Bat (*Mormopterus norfolkensis)*, Large-eared Pied Bat (*Chalinolobus dwyeri)*, Eastern False Pipistrelle (*Falsistrellus tasmaniensis*), Eastern Bentwing Bat (*Miniopterus orianae oceanensis (formerly M. schreibersii oceanensis))*, Southern Myotis (*Myotis macropus*) and Greater Broad-nosed Bat (*Scoteanax rueppellii)*: These microbats have all been recorded on the SMP, and mostly within the study area. The habitats present on the subject land do not provide significant habitat for these species due to a lack of roosting habitat. However, they will experience a loss of foraging habitat to a relatively minor degree. For this reason, these microbats are considered to be minor affected (C)EECs/species.

Flying Fox: Grey-headed Flying-fox (*Pteropus poliocephalus*): As with the microbats, the subject land provides a relatively small area of foraging habitat for this species, No flying-fox camps are known to occur on or adjoining the study area.

Birds: Speckled Warbler (*Pyrrholaemus sagittata*), Varied Sittella (*Daphoenositta chrysoptera*), Diamond Firetail (*Emblema guttata*), Hooded Robin (*Melanodryas cucullata*): These small woodland birds have been recorded on the SMP and within the study area, although all within the Regional Park.

S6 IMPACTS OF THE PROPOSED DEVELOPMENT

The proposal will result in direct impacts, indirect impacts and will contribute to cumulative impacts of development of the Western Precinct as described below:

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

S6.1 Direct Impacts

S6.1.1 Vegetation communities

The proposed development will occur within a landscape that has been extensively altered since European settlement. The subject site is vegetated by patches of mature and regenerating CPW as well as low diversity Derived Native Grassland (DNG) which collectively conforms to the critically endangered listing of CPW under the TSC Act (and EPBC Act), as shown in **Table S.1**. A conservative approach has been taken for this SIS and it is assumed that all vegetation within the subject site will be removed for the purposes of the proposed development.

Table S.1 Vegetation Communities of the Subject Land

Vegetation Communities Occurring within the Subject Land	Vegetation to be removed from the Subject Site (ha)	Vegetation removed from approved portions of the Subject Land (ha)	Vegetation remaining in undeveloped portions of Subject land (excludes subject site)
Cumberland Plain Woodland (CEEC)	1.75	5.81	15.71
Regenerating CPW (CEEC)	1.26	31.48	21.63
CPW Derived Native Grassland (CEEC)	0.00	2.29	0.09
CPW Low diversity Derived Native Grassland (CEEC)	1.86	69.31	31.99
River-flat Eucalypt Forest (EEC)	0.00	2.04	0.75
Regenerating River-flat Eucalypt Forest (EEC)	0.00	2.96	1.21
Freshwater Wetland (EEC)	0.00	0.22	0.29
Plantings	0.00	0.60	0.03
TOTAL VEGETATION	*4.87*	*114.70*	*71.69*

S6.2 Threatened species

The clearing of vegetation within the subject site will directly remove habitat for threatened species such as the Cumberland Plain Land Snail (*Meridolum corneovirens*). The Cumberland Plain Land Snail was recorded within CPW to the east of the subject site during surveys and has a high potential to occur within the mature and regenerating CPW patches within the subject site. Several individuals are likely to be removed given that CPW habitat is to be cleared. No other threatened flora or fauna species have been recorded within or immediately adjacent to the subject site. Some highly mobile fauna species, such as microbats, and some small woodland birds that are known from the study area may experience minor habitat loss. Notwithstanding this, none are expected to be impacted by

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

the proposed DA. The subject site and Western Precinct as a whole, generally lack important habitat features, such as hollow-bearing trees. This paucity of habitat features suggests that it would be unlikely for these species to be dependent on the habitats present. The Regional Park provides substantial habitat for these species.

Extensive mitigation measures will be implemented across the Western Precinct to minimise the impacts from development. Foremost amongst these is the 900 hectare Regional Park, which will conserve substantial habitat for all known species of threatened flora and fauna that have been recorded previously on the SMP. Areas of CPW within the Regional Park, that are disturbed for minor drainage works associated with the current subject site will be rehabilitated following the construction of these works.

S6.3 Indirect Impacts

The subject site includes additional areas for works within the DA boundaries. This includes areas for ancillary works and other disturbance such as battering. There is also the chance of indirect effects, such as the spread of weeds, to impact on native vegetation in this area.

Most of the regenerating CPW on the subject site occurs mainly in the central area. The mature CPW occurs along the south to south-west sections of the subject site and extends into the adjoining Regional Park, to the south.

The quality of the vegetation areas greatly improves in the Regional Park. This conclusion is based on the identification of less disturbed parts of the SMP, which have greater significance. The removal of the degraded edges of these patches of CPW also has the potential to indirectly impact on CPW through the increase of edge effects and weed invasion on the adjoining Regional Park. These indirect impacts also have the potential to affect the wetlands present in areas of the Regional Park adjacent to the subject site. However, such potential indirect impacts can be minimised through the implementation of comprehensive mitigation measures, as described in Section 4.5 and detailed in the Western Precinct Biodiversity Assessment (Cumberland Ecology, 2009a).

Site specific mitigation measures for the protection of (C)EEC vegetation should include the continued mowing of a buffered edge between the residential development area and the Regional Park. The mowing itself appears to favour the establishment of native grass and herb species (as was found on the northern boundary, where native grassland occurs in the mown APZ) and removes woody weeds. Trees should be retained wherever practicable and the use of fertilisers avoided at the perimeter of the Regional Park. In combination with the comprehensive mitigation measures for the SMP, it is considered that minimal indirect impacts are likely to occur as a result of the proposed development.

S6.4 Cumulative Impact of Development in the Western Precinct

As detailed in the approved Western Precinct Plan (JBA 2009), the remainder of the Western Precinct is zoned “Urban” and is proposed for development as residential and commercial land. This will result in the removal of habitat for C/EECs and threatened species of relevance to the current proposal, consistent with the “balanced” outcome for the SMP site as a whole completed under SREP 30. This indirect impact will further fragment habitats in

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

the study area to some degree, although the vegetation patches are already fragmented and the Western Precinct is at the western edge of the SMP and already bounded by residential and rural-residential land holdings. A summary of the area of vegetation removed as part of approved DAs within the Western Precinct is presented in Table S.1 and is referred to further in the detailed impact assessments presented below.

S7 MITIGATION MEASURES

The foremost mitigation measure associated with the proposed development instituted under the established statutory planning framework provided by SREP 30, the EPS and the State Deed is the dedication of land for the creation of the 900 hectare Regional Park. This is supplemented by the provision of funding under the State Deed for the ongoing conservation, enhancement, management and rehabilitation of this land, which, together with proposed open space areas, will total over 900 hectares of retained and improved habitat. As described within the approved Western Precinct Plan, this area will contain representative and viable occurrences of all known threatened species that occur in the SMP.

This is further supported by the following three documents prepared by the NSW Government:

- Draft Strategic Assessment Report for the Sydney Growth Centres Program (DoP, 2010);
- Report on the methodology for identifying priority conservation lands on the Cumberland Plain (DECCW, 2010); and
- Cumberland Plain Recovery Plan (DECCW, 2011);

Importantly, the latter two of the listed studies above identify the SMP Regional Park as a Priority Area/Priority Conservation Lands for the management and recovery of the Cumberland Plain.

As described within the Western Precinct Plan, there are a suite of management plans currently being implemented for weeds, domestic and feral animals, and macrofauna. Each of these plans contains multiple measures aimed at safeguarding the areas proposed for conservation within the 900ha Regional Park and open space areas of the SMP.

Such mitigation measures are also considered as part of the offset package for the Western Precinct development. Such measures go beyond those generally provided by traditional offsets, which usually require a more simplified level of contribution, dedication or management. The additional measures at SMP include significant financial investment measures, including the funding of the Macrofauna Management Plan (MMP). The MMP manages the kangaroo and emu population through fertility control measures. This has greatly reduced the severity of grazing impacts on the regeneration of CPW and other (C)EECs within the SMP. Trials for kangaroo exclusion and grassy woodland recovery have also been funded by the proponent prior to the transfer of ownership to OEH.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

The above mitigation measures are explained in further detail within this SIS.

S8 CONCLUSION

The proposed development of the subject site and subject land will remove a relatively small area of habitat for CPW. However, and with due consideration of the distribution of this CEEC in the region, the proposed development is not likely to have a significant impact on CPW such that the large and viable representatives in the Regional Park would be placed at risk of extinction. The large and continuous remnants present in the Regional Park will be protected and enhanced through a range of mitigation measures identified and retained in perpetuity in public ownership.

The major affected (C)EECs/species impacted by the proposed development includes the Cumberland Plain Land Snail. The mature and young regenerating CPW, and to a lesser degree the low diversity DNG, on the subject site provide an area of about 4.87 ha of potential habitat for the Cumberland Plain Land Snail as well as some potential foraging habitat for wide ranging threatened fauna species. However, when directly compared with the habitats of the Regional Park, these areas of habitat are considered to be degraded and of a lesser significance due to the increased level of disturbance, sparse nature and comparatively small size. Therefore, the loss of this habitat on the subject site is not considered to be significant.

The impact of the proposed development will be more than balanced by the major conservation outcome resulting from of the creation of the 900ha Regional Park. The Regional Park comprises CPW of quality and scale in a consolidated land holding, to be transferred into public ownership and subject to a fully funded Plan of Management.

When weighed against the conservation benefits, both direct and indirect, that will be derived from the 900ha Regional Park, together with the various mitigation measures afforded by the management strategies for weeds, feral and domestic animals and macrofauna, the relatively small areas of natural and semi-natural vegetation to be cleared as a result of the proposed development are considered to be of minor consequence. This SIS concludes that the proposed development of the subject site will not result in any local populations of threatened species or occurrences of ecological communities becoming extinct. Known occurrences of threatened flora and fauna within the SMP are predicted to be secure in the long term as a result of the creation of the 900ha Regional Park and numerous supporting mitigation measures that are enshrined in a legal, statutory planning framework.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Chapter 1

Introduction

1.1 Purpose

This document is a Species Impact Statement (SIS) that has been prepared to assess the impacts of the future development of Village Centre 2 (VC2), Village Centre 3 (VC3) and Village Centre 10 (VC10) (Lots 3989, 3990 and 3991 in DP1190132), within the Western Precinct (now the suburb of Jordan Springs) of the St Marys Property (SMP) in western Sydney.

The development of VC2, VC3 and VC10 is collectively referred to as the 'Parklands Estate' and is proposed to be implemented in five stages. This SIS has been prepared to support all development applications (DAs) related to the development of the Parklands Estate area (hereafter referred to as the 'subject site'), including a proposed Masterplan DA and individual DAs for each stage of the proposed development.

The SIS has been prepared in accordance with Section 109 and 110 of the *Threatened Species Conservation Act 1995* (TSC Act) and with the requirements of the Director General of the Office of Environment and Heritage (OEH), copies of which are provided in Appendix A.

The main objectives of this SIS are to:

- Identify threatened species issues and provide appropriate amelioration strategies to minimise adverse impacts resulting from the proposal;
- Provide an appropriate level of background information and assessment to facilitate determinations and licensing processes;
- Assist consent and determining authorities in the assessment of the development application under Part 4 or request for Part 5 approval under the Environmental Planning and Assessment Act 1979 (EP&A Act);
- Assist the Director-General of the OEH in deciding whether or not concurrence should be granted for the purposes of Parts 4 or 5 of the EP&A Act;
- Assist the Director-General of the OEH or the Minister for the Environment when consulted for the purposes of Parts 4 or 5 of the EP&A Act; and

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

- Assist the Director-General of the OEH in the assessment of Section 91 Licence applications lodged under the TSC Act.

Throughout the SIS the section order and heading titles are replicated from the DGRs. In order to demonstrate how each SIS section complies with statutory requirements a comprehensive compliance table is included in Appendix A.

1.2 Approvals and Licences

This SIS has been prepared in accordance with Sections 109 and 110 of the TSC Act, which describes the form and content of a SIS, with the exception of those matters limited or modified in the DGRs as listed in Section 1.4 below. The requirements of the Director-General of the OEH were sought pursuant to Section 111 of the TSC Act.

As described in the Precinct Plan for the Western Precinct (JBA, 2009), approval under Commonwealth environmental law was granted to the development of the SMP (in accordance with the Sydney Regional Environmental Plan No. 30 – St Marys (SREP 30)) under the *Environment Protection (Impact of Proposals) Act 1974* (EPIP Act) prior to the gazettal of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Clarification of all related actions necessary for the carrying out of the approved development was thereafter granted by the Commonwealth under the Environmental Reform (Consequential Provisions) Act 1999 (ERCP Act). As such, following the commencement of the EPBC Act, the Commonwealth confirmed that the EPIP Act approval and ERCP Act certification completed the Commonwealth environmental assessment and held that "***no further approvals***" [our emphasis] were required provided development was consistent with the established planning framework provided by the SREP 30. This SIS therefore does not address species, populations and communities listed under the EPBC Act, except where those species of relevance are also listed under the TSC Act.

1.2.1 State Government Instruments

Planning instruments that relate to the development of the Western Precinct include:

- Sydney Regional Environmental Plan 30 (SREP 30) (DUAP, 2001b); and
- St Marys Environmental Planning Strategy 2000 (EPS 2000) (DUAP, 2001a); and
- St Marys State Development Agreement December 2002.

i. SREP 30

Sydney Regional Environmental Plan No. 30 – St Marys provides a framework for sustainable development and management of land to which SREP 30 applies, including the Western Precinct. SREP 30 addresses proposals for a Regional Park, regional open space, urban and employment lands and establishes town planning, urban design and environmental conservation principles to guide the long-term development and conservation of the SMP.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Under SREP 30, a draft Precinct Plan is to include proposals for and information about:

"*management of the potential impacts of development on the existing physical and environmental characteristics of the land, including significant native flora and fauna habitat and soil characteristics. The information is to include specific details of those characteristics and to explain how development should be planned and configured to minimise adverse impacts on areas of significance for biodiversity*."

Part 5 of SREP 30 outlines performance objectives for the development of the SMP. Those outlined for conservation are:

(1) *A representative and significant proportion of the natural values of the land are to be conserved within a regional park in order to protect the variety of Western Sydney vegetation communities, native flora and fauna species and fauna habitat;*

(2) *Urban design and site planning in the Employment and Urban zones are to have regard to significant stands of trees and, where practicable, retain those trees;*

(3) *Adverse impacts on the vegetation and fauna habitats within the Regional Park and Regional Open Space zones resulting from the development of areas zoned Employment or Urban are to be minimised;*

(4) *Infrastructure is to be designed and located to minimise potential adverse impacts on the conservation values of the land; and*

(5) *Infrastructure and recreational facilities within the regional park are to be sited and constructed to minimise adverse impacts on the park's natural values.*

ii. EPS 2000

The EPS 2000 (DUAP, 2001a) supports SREP 30 and outlines the strategies required to achieve the objectives outlined in SREP 30.

Iii State Deed

The State Deed requires the delivery of a series of obligations during implementation of the SMP. These obligations include the staged transfer and dedication of 900ha of land to the NPWS as a Regional Park, monetary contributions towards capital improvements and a Plan of Management and the erection of stock proof fencing.

The State Deed provides legal certainty for the delivery of obligations at specific milestones. Together with the SREP 30 and the EPS, the State Deed provides the broader statutory framework for the facilitation of future development of SMP on an agreed basis.

At this point in time – partway through the development - the first element of the Regional Park has already been dedicated (Wianamatta Regional Park), relevant monetary contributions made, Plan of Management adopted and initial stock proof fencing erected.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

1.2.2 Local Government Policies

The Western Precinct is located within the Penrith LGA. However, under the terms of the SREP 30, no Penrith LEP or DCP apply to the SMP. Penrith City Council (Council) has produced a document entitled *Sustainability Blueprint for Urban Release Areas* (PCC, 2005). Whilst not an environmental planning instrument, this document outlines the key aims of Council in relation to ensuring the sustainability of future urban development. The objective of this document, as it relates to biodiversity, is "*to retain and conserve indigenous vegetation and wildlife habitat and corridors*" (PCC, 2005). This requires areas of high conservation value to be identified within urban development areas and to be excluded from development; biodiversity corridors to be established that link corridors of regional significance; and requires the submission of a Flora and Fauna Strategy which outlines how indigenous vegetation and wildlife habitat will be retained and conserved. The objectives of the PCC document are addressed in the Western Precinct Plan and achieved across the SMP site as a whole.

1.2.3 Australian Heritage Commission Register of National Estate

The majority of the 900ha Regional Park is listed on the Australian Heritage Commission Register of National Estate (Australian Heritage Commission, 1999). The vegetation within this area is referred to in the National Estate as an important remnant of the vegetation communities that were once widespread on the Cumberland Plain and include Cumberland Plain Woodland and Castlereagh Woodland. The Register of National Estate place description also makes reference to significant flora and fauna, including threatened plants and examples of the Cumberland Plain Woodland bird assemblage. The developments proposed for the Western Precinct will adjoin Regional Park land along the eastern boundary.

1.3 DGR Matters Which Have Been Limited or Modified

The following Section 110 Matters need not be addressed by this SIS

- Section 110(2)(g) and 110(3)(d). The matters raised in this section of the TSC Act have been clarified by the requirements below.

The following Section 110 matters need only be addressed where relevant:

- Threat abatement plans

At this time, no threat abatement plans have been approved that are relevant to this proposal.

- Recovery plans:
  - Bush Stone Curlew Recovery Plan
  - Cumberland Plain Recovery Plan

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

- *Persoonia nutans* Recovery Plan
- *Pimelea spicata* Recovery Plan

Of these recovery plans, only the Cumberland Plain Recovery Plan and the *Pimelea spicata* recovery plan are of relevance to the current proposal, due the presence, or potential presence of the species/communities on the subject site. Although *Pimelea spicata* has not been recorded on, or adjoining the subject site, there is potential for this species to occur, given the marginally suitable habitat present within the subject land, and the difficulty in detecting this cryptic herb. Therefore consideration of the recovery plan has been included in this SIS.

- Key Threatening Processes:
  - Clearing of native vegetation
  - High frequency fire
  - Loss of vegetation structure and composition
  - Loss of hollow-bearing trees
- Critical habitat

At this time, no areas of declared critical habitat are relevant to this proposal.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Coordinate System: MGA Zone 56 (GDA 94)



Legend

- St Marys Property Boundary
- Precinct Boundary
- Regional Park

Grid North

Image Source:
Image © SIX Maps
(dated 4-1-2014)

CUMBERLAND ECOLOGY

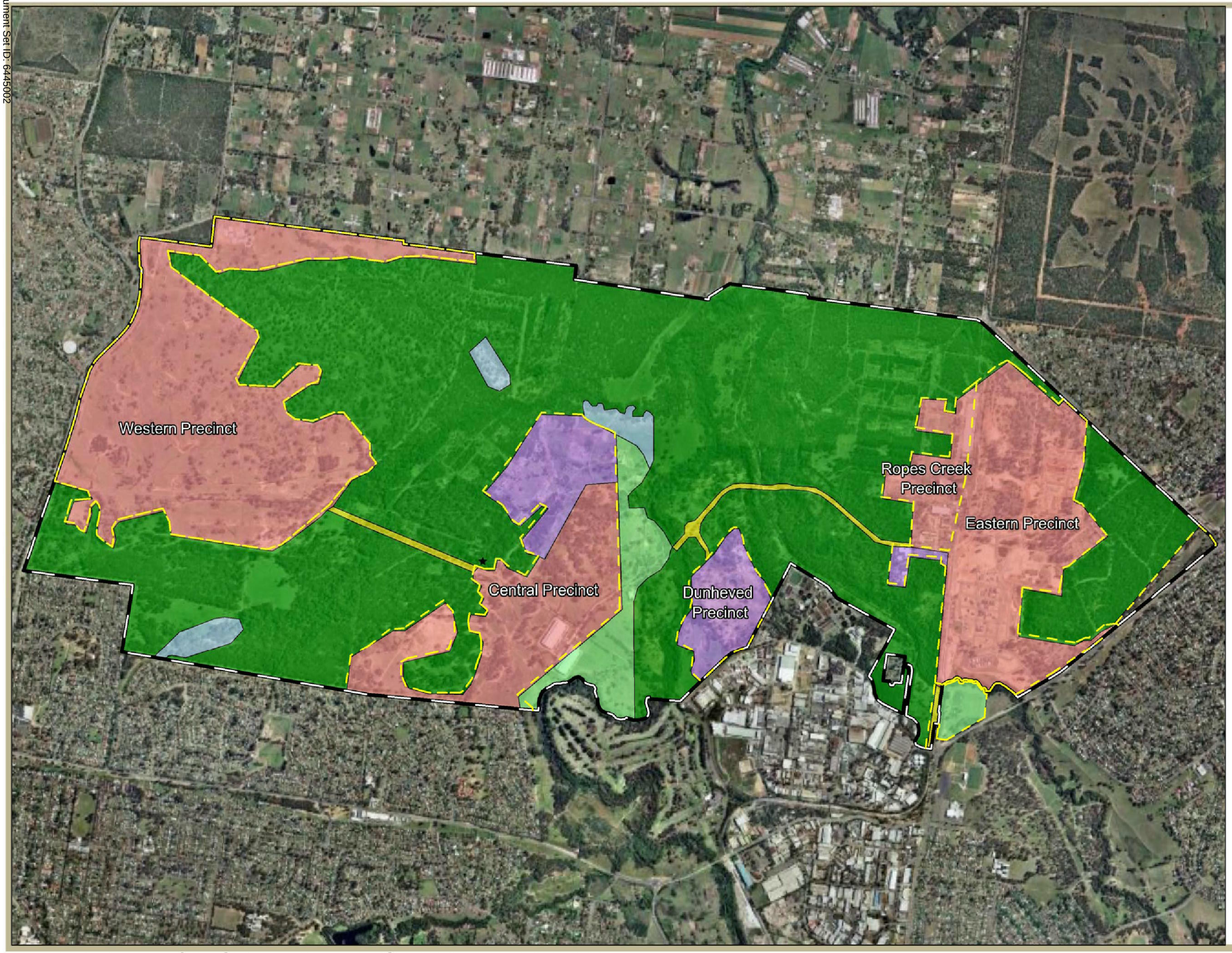
I:\...\13092\Figures\RP2_SIS\20141202\Figure 1.1.

Figure 1.1. Aerial photograph of the St Marys Property

500 0 500 1000 1500 2000 m

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Coordinate System: MGA Zone 56 (GDA 94)



Legend

- St Marys Property Boundary
- Precinct Boundary

Zone

- Employment
- Road and Road Widening
- Drainage
- Regional Park
- Urban
- Regional Open Space

Grid North

Image: ©2011 Sinclair Knight Merz & Fugro

CUMBERLAND ECOLOGY

I:\...\8143\Figures\Village 6 SIS\20130530\Figure 1.2. Zoning

Figure 1.2. Zoning of the St Marys Property (SREP 30 Ammendment 2)

500 0 500 1000 1500 2000 m

Contextual Information

2.1 Background

2.1.1 St Marys Property

The SMP comprises 1,545 ha of land which is situated north of St Marys and north-east of Penrith on the Cumberland Plain in Western Sydney. The SMP incorporates areas of cleared agricultural land, developed areas and areas of regenerating Western Sydney Woodland vegetation (ERM, 2000). The site is adjoined on three sides by urban development and to the north by lands used for agricultural purposes.

Historically, there is evidence that the site was occupied continuously by Aborigines prior to European settlement. From 1803 the site was surveyed, settled, cleared and used for farming purposes by Governor King's family.

Generally, farming in the St Marys area centred on cattle with the nearby St Marys saleyards being the second largest in rural New South Wales during the 60 years of its operation from the 1880s. Within the SMP, the ruins of the former Beacroft Butchery and slaughter yard are to be found.

In 1924, the lands generally comprising the SMP were consolidated into one parcel by a grazier, Mr JW Fisher. Following the outbreak of World War II, the Australian Government established an explosives and munitions filling factory on these lands, which had by then been resumed from various farmers, including JW Fisher. These manufacturing operations were established in two major waves during World War II and later during the 1950's. Extensive works were undertaken on the site involving the construction of more than 800 buildings, a transport network including roads and railway lines, as well as major services infrastructure and telecommunications facilities. The site was segregated into small areas by security fencing for both safety and security reasons. This complex of munitions factories operated until production ceased in 1994. The site has subsequently been decontaminated, and the great majority of the buildings and other infrastructure demolished and removed.

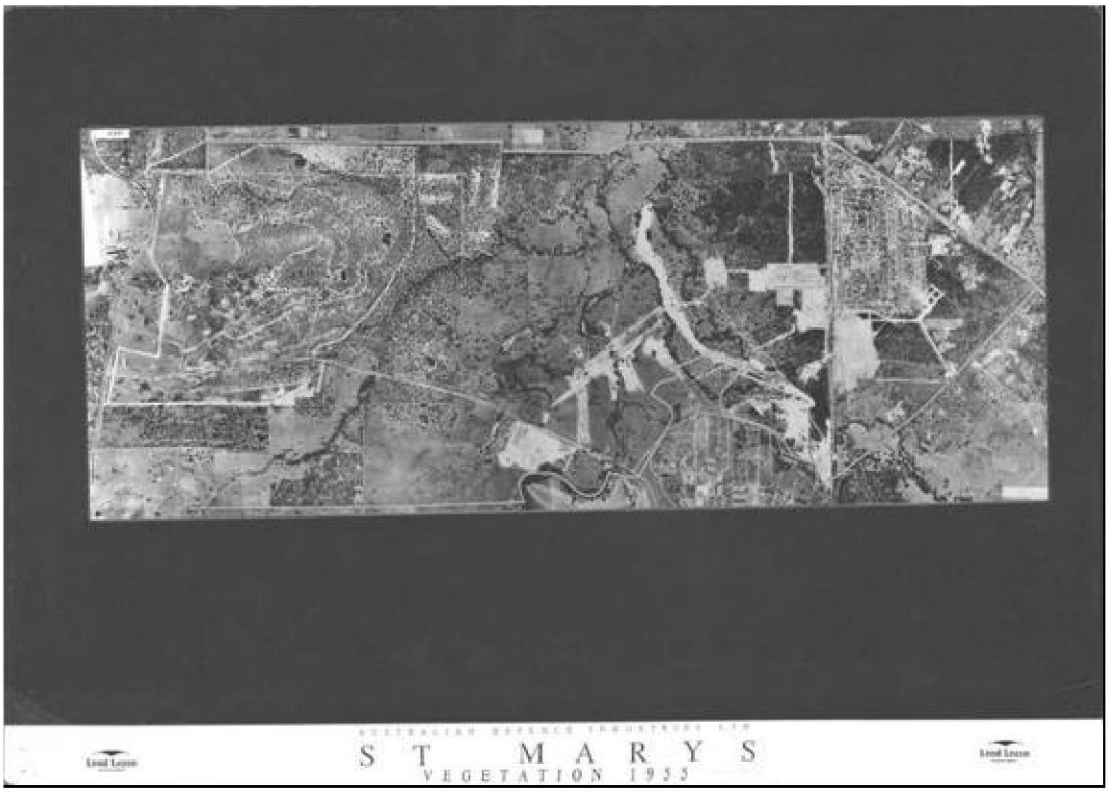
The flora and fauna of the SMP have been extensively surveyed and analysed over the last 28 years (Gunninah, 1991; Gunninah, 1995; Kinhill, 1995; ERM, 1997; Gunninah, 1997; ERM, 1998; ERM, 2000; Cumberland Ecology, 2004c; Cumberland Ecology, 2005; Cumberland Ecology, 2009b; Cumberland Ecology, 2009a). The native vegetation within the St Marys Property has survived decades of use and clearing since European settlement. The entire property experienced tree clearance and pastoral activities prior to the 1940s

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

(ERM, 2000). Most of the native vegetation is regenerating from earlier episodes of clearing (Gunninah, 1995; Gunninah, 1997; NSW NPWS, 2000). Photographs 1.1 – 1.4 depict these transitions. Despite being shaped by these previous management actions, the remnant Cumberland Plain Woodland and other vegetation communities present on the site support flora and fauna species of acknowledged significant conservation value.

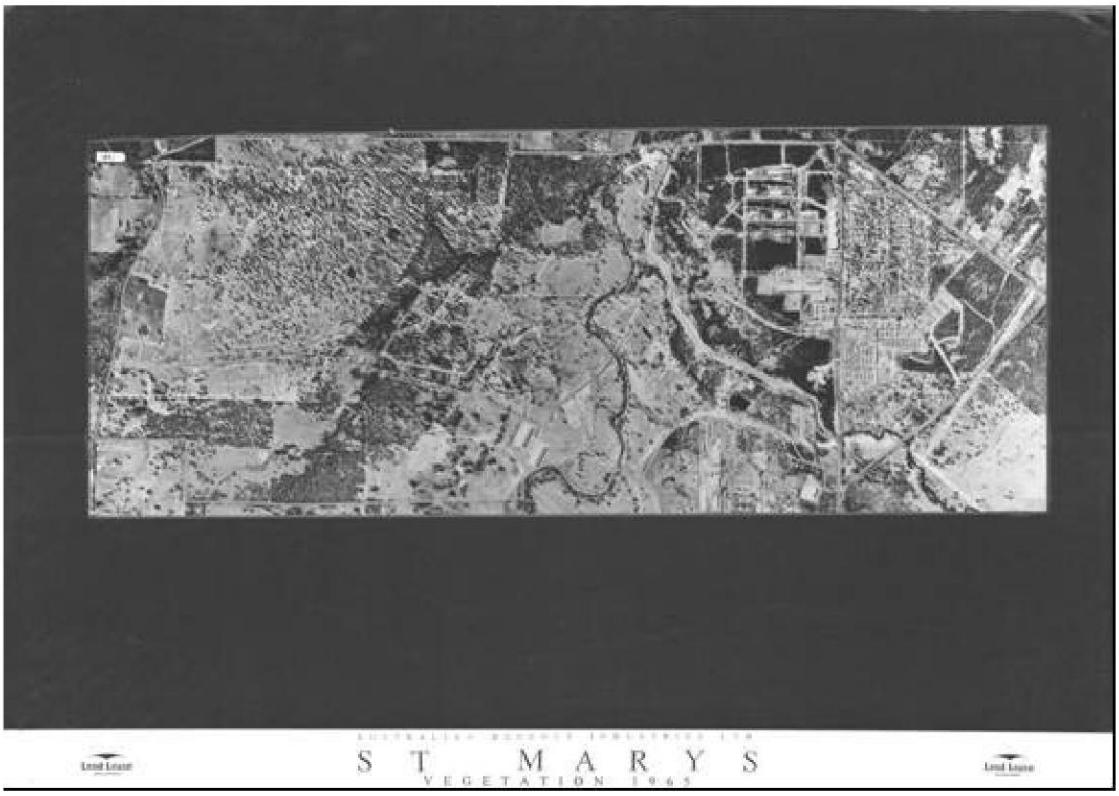


Photograph 2.1 Aerial photograph of St Marys Property, 1947

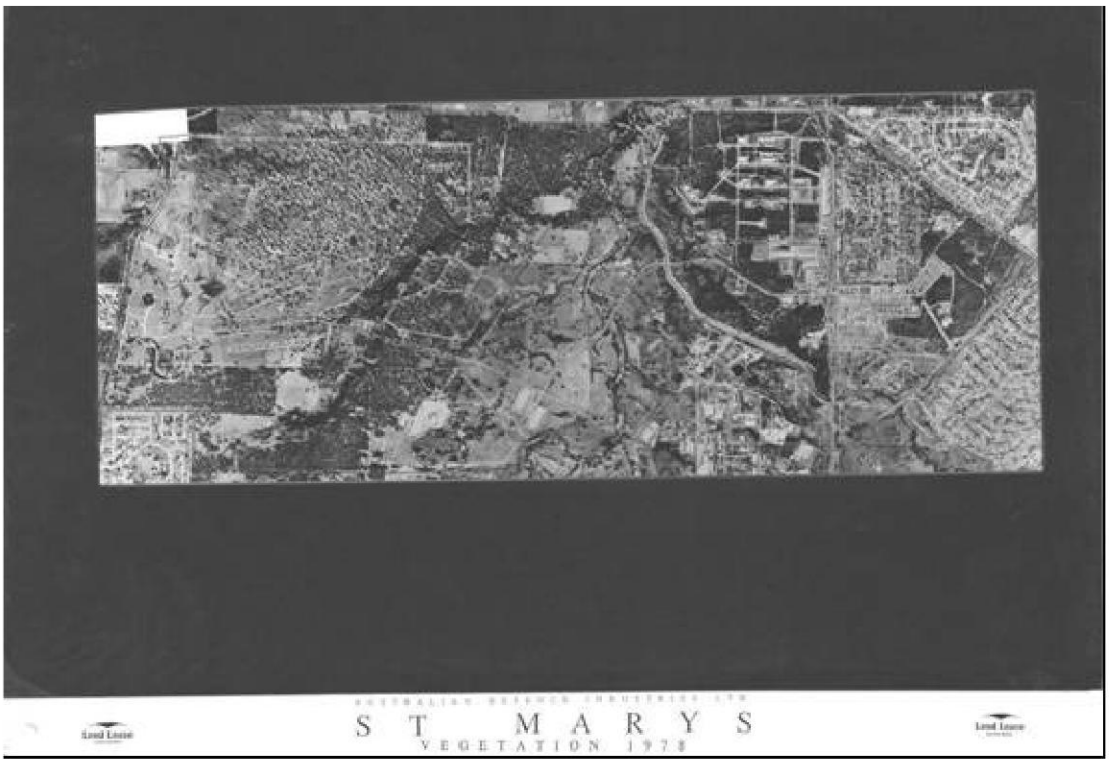


Photograph 2.2 Aerial photograph of St Marys Property, 1955

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015



Photograph 2.3 Aerial photograph of St Marys Property, 1965



Photograph 2.4 Aerial photograph of St Marys Property, 1978

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

The former Australian Defence Industries (ADI) site at St Marys was endorsed by the NSW Government for inclusion on the Urban Development Program (UDP) in 1993. The site was seen to present an opportunity to provide housing for Sydney's growing population within an environmentally sustainable framework.

Given that the site straddles the boundary between two local government areas (Blacktown and Penrith); the Government decided that a regional environmental plan should be prepared for the site. Technical investigations into the environmental values and development capability of the land were commenced in 1994, and the Regional Environmental Plan for St Marys (SREP 30) (DUAP, 2001b) was gazetted in January, 2001. It zoned the land into "urban", "employment", "regional open space", and "regional park" uses (Refer to Figure 1.2). Appendix F includes a flowchart of the chronology of the statutory process.

In view of the original scale of the residential and employment uses, a package of documents was prepared to guide and control development. It comprised SREP 30 (maps and written instrument) (DUAP, 2001b), and an Environmental Planning Strategy (EPS) (DUAP, 2001a) which sets out performance objectives and strategies to address key aspects associated with the site, including: conservation, cultural heritage, water and soils, transport, urban form, energy and waste, human services, employment, and land contamination.

The State Development Agreement (State Deed) was entered into between the landowner and developers of the land (a Joint Venture comprising ComLand and Lend Lease Development), and the NSW Government in December 2001. The State Deed sets out the specific obligations and responsibilities in providing, amongst other things, services, infrastructure, monitory contributions and land in support of the SMP. These obligations include, amongst other things, the following relevant contributions:

- The staged transfer and dedication 900ha of land to the NPWS as a Regional Park for the sum of $3 (three dollars);
- Staged monetary contributions (c$6m) towards capital improvements within the 900ha Regional Park;
- Monetary contributions towards a Plan of Management for the 900ha Regional Park; and
- The erection of stock proof fencing in stages along the boundaries of the 900ha Regional Park.

The State Deed provides legal certainty for the delivery of obligations at specific milestones. Together with the SREP 30 and the EPS, the State Deed provides the broader framework for the facilitation of future development of SMP on an agreed basis.

SREP 30 (DUAP, 2001b) identified 6 development "precincts" (known as the Western Precinct, Central Precinct, North and South Dunheved Precincts, Ropes Creek Precinct and Eastern Precinct) and requires a precinct plan be adopted by the relevant council prior to any development taking place.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

To date the Precinct Plans for the Eastern Precinct, Ropes Creek Precinct, Dunheved Precincts, Central Precinct, Western Precinct have been prepared, exhibited and adopted by the relevant Councils and development is being progressed on a staged basis. As a result, the SMP is one of the largest single Greenfield Release Area in the Metropolitan Development Program and critical to the delivery of housing numbers for Metropolitan Sydney.

Planning for any precinct is to address all of the issues in SREP 30 and the EPS, including preparation of management plans for a range of key issues such as weed management, feral and domestic animal management and bushfire management.

A Macrofauna Management Plan for the entire site needed to be submitted before or at the same time as lodgement of the first Precinct Plan (Eastern Precinct), under section 4.4 (15) of the EPS. The plan is required to account for displacement of macrofauna through the loss of habitat that would occur as a result of development of the SMP.

In March 2002, the Commonwealth Government advised that those areas of the site listed on the Register of the National Estate should be excluded from urban development. This had the effect of changing the boundaries of the areas to be set aside for conservation. The precincts for development are shown in Figure 1.1.

The Minister for Planning has declared the Eastern Precinct, North and South Dunheved Precincts, Ropes Creek, Central and Western Precinct as Release Areas for development. All Precinct Plans have been prepared, exhibited and adopted by the relevant Council. Development is currently underway in the Eastern Precinct and Ropes Creek Precinct and has recently commenced in the Western Precinct, Since the endorsement of the Macrofauna Management Plan in 2004, 27 permanent kangaroo grazing monitoring plots have been surveyed annually in the Regional Park. These include grazing-excluded and open plots in CPW. The plots have been surveyed five times by Cumberland Ecology, resulting in a comprehensive species list for the community on the SMP, as well as an indication of the condition of CPW in the Regional Park. Four out of the six locations of plots are in sections of the Regional Park surrounding the Western Precinct.

A compilation of survey methods and results from the reports available to Cumberland Ecology is found in Chapter 4.

2.1.2 Western Precinct

Following surveys completed for the EPS Environmental Planning Strategy and SREP 30 that covered the entire SMP, the key surveys in the Western Precinct include those completed for the additions to the land on the Register of National Estate:

- ERM (1998) Addendum to Objection to Interim Listing of ADI St Marys Site in the Register of the National Estate Submission to the Australian Heritage Commission. Environmental Resources Management Australia, Sydney (ERM, 1998).
- Perkins, I. (1999) Flora Assessment of the Disputed Areas of Western Sydney Shale Woodlands Ian Perkins Consultancy Services, Sydney (Perkins, 1999).

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

The main purpose of these assessments was to determine if any land in the western portion of the SMP should be included in the listing of National Estate. The land on the Register of National Estate on the SMP has formed the land zoned as Regional Park.

Perkins completed a resilience survey over the SMP that included analysis of canopy regeneration, proportion of native ground cover species and soil disturbance to determine viability of land that had been used for grazing. The majority of the western portion of the SMP had been cleared and grazed by sheep and kangaroos. Some areas at the time of assessment contained a scattering of large, old trees and the area of the denser coverage of trees was included on the Register of National Estate. This area was included as one large patch and did not include smaller scattered, isolated patches containing only a few trees.

The land on the Register of National Estate at SMP lies wholly within the land zoned "Regional Park" in the SREP 30 (confirmed via SREP 30 Amendment 1). The remaining area not included on the Register of National Estate formed the Western Precinct (zoned "Urban" in the SREP 30).

ERM commenced surveys for the development of the Western Precinct in 2000 with Dr David Robertson as Senior Ecologist. Original plans for the development of the SMP were focussed on developing the Western Precinct first but then the focus was changed to development of the Eastern Precinct first. Meanwhile, the surveys conducted by ERM were never published in a report but Dr Robertson retains a general knowledge of the findings of the surveys.

Since sheep grazing was removed approximately 10 years ago from the Western Precinct and the western portion of the Regional Park, listed on the Register of National Estate, there has been prolific eucalypt regeneration surrounding the old remnant trees, filling in the spaces between the older trees. However, much of the Western Precinct is still heavily influenced by the history of sheep grazing, including a high proportion of exotic pasture grass coverage and evidence of sheep camps where herbaceous weeds form thick coverage around the bases of large, old trees.

i. Western Precinct Plan

Further to the surveys undertaken from 1995 to 2001, Cumberland Ecology undertook vegetation surveys in 2007 and a condition assessment in 2008 as part of the Biodiversity Assessment prepared as part of the Western Precinct Plan (Cumberland Ecology, 2009a). It should be noted that the Biodiversity Assessment took into account transect and condition assessment data to 2008. The final modifications to the Biodiversity Assessment were made in 2009 to take into account the preliminary determination of CPW as a critically endangered ecological community.

The Western Precinct Plan was adopted in March 2009. This relates to a total of approximately 200ha of land, zoned "Urban" in SREP 30 (Amendment No. 2).

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

ii. Stage 1, 2, 3, 4 and 5 Development Applications

The development application for Stage 1, of the Western Precinct development, now referred to as the suburb of Jordan Springs, was submitted by Lend Lease Pty Ltd (Lend Lease) to Penrith City Council in August 2009. Subsequent DAs for Stages 2, 3A and 3B were submitted by Lend Lease in May 2011, for Stage 4 in August 2012, Stage 3C1 in June 2013, Stage 3C2 in August 2013, Village Centre site 12 in February 2014, Stage 3C3 in April 2014, and Village 5 in July 2014.. Stages 1, 2, 3A, 3B, 3C1, 3C2, 3C3, 4 and VC Site 12 were approved under Part 4 of the EP&A Act, in accordance with the Western Precinct Plan.

iii. The Parklands Estate Area Development Applications

Synergy Development Group is preparing a Staged DA, on behalf of CID group for submission to Penrith City Council (Council) for the proposed Parkland Estate development of the subject site. The proposed development of medium density housing and associated infrastructure within the subject site is to take place in five stages and will also include a Masterplan DA.

The subject site is bounded by the Regional Park to the west and south and current development and developed areas to the north and east.

The CPW vegetation present in the subject site consists of a mix of mature woodland, young, woodland in various stages of regeneration and low diversity derived native grassland. Although, the development of the subject site will further fragment representatives of the CPW community from the Regional Park and will remove an area of CEEC, the small area of CPW to be removed is not considered to constitute a significant impact in terms of Section 5A of the EP&A Act (the 7 Part Test) because of the large area and high quality of the CPW conserved in the Regional Park.

However, on a precautionary basis, it has been agreed with Penrith City Council that all DAs for the Western Precinct development area that involve the removal of TSC Act listed species and communities will be accompanied by a SIS. For this reason, although the impacts of the current DA are not generally considered to be significant, a SIS has nonetheless been prepared. This SIS report has been prepared as an overarching assessment of the entire subject site (or the Masterplan area) and encompasses the collective impacts of each of the proposed development stages.

2.2 Description of the Proposal

2.2.1 Nature

Future Development of the subject site involves the development of a mixed residential development comprising approximately 15 buildings, new streets, landscaped open space, vehicular access and car parking. The development of the subject site will take place in five stages and specifics for each stage will be detailed in the relevant DA documentation for each stage.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

To date, details are available only for the Stage 1 DA, which comprises the creation of five apartment buildings, new streets, landscaped open space including Central Square, vehicular access and car parking and associated civil construction works. Further details for subsequent stages will be provided with subsequent DAs for each future stage and an overarching vision of the future development of the subject site will be provided in the Masterplan DA.

The subject site is located towards the south-western part of the Western Precinct and is bounded to the south and west by the Regional Park the areas known as Village 1 to the north and parts of the Riparian Corridor and Village 4 to the east.

The locations of the subject land and subject site are shown in Figure 2.1 and Figure 2.2. Additional ancillary works will be located within the area shown as the subject site and include drainage works, the creation of interim sediment and detention basins and culverts with relation to road infrastructure works.

i. Buildings and other structures

Future development of the subject site will include land subdivision, ancillary works and construction of approximately 15 buildings along with new streets, landscaped open space, vehicular access and car parking and other associated infrastructure.

Details of the buildings and structures for each stage of the development will be provided in the relevant architectural diagrams and Statement of Environmental Effects (SEE) for each DA.

ii. Installation and maintenance of utilities

All necessary utilities required to service a residential development will be installed and maintained in the appropriate manner, in accordance with accepted standards. Details will be provided in the relevant SEE for each DA.

iii. Access routes

No new access routes are to be created. Relevant access route plans for each stage will be provided in the relevant SEE for each DA.

iv. Waste and Water Management

Waste management during construction will be conducted in accordance with all relevant Council regulations and will be specified in the relevant SEE for each DA. Specific waste and water management plans, including requirements for the establishment of interim stormwater and sediment detention basins will be prepared for each stage of the proposed development. and will be detailed in the relevant SEE for each DA.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

v. Changes in surface water flows

As a result of the transformation of the subject site and wider subject land from former defence uses / redundant land into a master planned residential community there will be changes to surface water flows across the site. These changes are set out in detail in the approved Western Precinct Plan - Water, Soils and Infrastructure report.

vi. Fire protection zones

Asset Protection Zones (APZs) are required for all urban areas within 100 metres of a high or medium bushfire hazard and 30 metres of a low bushfire hazard. In accordance with the "Planning for Bushfire Protection 2006" guidelines and in agreement with the NSW Rural Fire Services (RFS), it is proposed to construct temporary APZs between the areas of proposed works and the areas of hazard. The temporary APZs will be managed by the landowner, in accordance with the NSW RFS guidelines until such time as permanent APZs have been put in place. The permanent APZs will be established through future stages of subdivision in accordance with the provisions of the RFS.

A specific Bushfire Protection Assessment will be conducted for each stage and will be provided as supporting documentation for the relevant SEE for each DA.

vii. Landscaping

Landscaping will include street tree planting and the creation of a Village Park, as detailed in the approved Western Precinct Plan. All species used in planting are selected in accordance with Council requirements and avoid the use of species that may invade bushland. Please refer to the relevant SEE or the approved Western Precinct Plan.

2.2.2 Extent

As described above, this SIS has been prepared as an overarching assessment of the entire subject site (or the Masterplan area) and encompasses the collective impacts of each of the proposed development stages. Therefore, for the purposes of this SIS, the proposed development includes all land within the Parklands Estate area of the Western Precinct. The total area of the subject site comprises approximately 5 hectares.

2.2.3 Location

The proposed development is within Jordan Springs in the St Marys Development project, Western Precinct, St Marys NSW 2760.

2.2.4 Timing

Anticipated start- of- works to implement the initial stages of the proposed development is forecast for 2015. This timing is subject to planning consent being issued.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

2.2.5 Layout

The layout of the proposed development area, identifying the subject site is shown on the attached plan (refer Figure 2.1). The layout conforms to the objectives, principles, and requirements of the strategic statutory framework (as set out in SREP 30, the EPS and the State Deed) and the local environmental planning instrument for the site (as set out in the, the Western Precinct Plan and Development Control Strategy (JBA 2009)) submitted to Penrith City Council in 2009.

2.2.6 Future Development of the Western Precinct

Upon gazettal of SREP 30 Amendment No. 2 of State Regional Environmental Plan No. 30 – St Marys (SREP 30) in February 2009, the Western Precinct was wholly zoned Urban. Land zoned Urban is intended to primarily accommodate residential uses, with some limited non-residential development, such as local retail and commercial uses. The Western Precinct Plan (WPP) and accompanying Development Control Strategy (DCS) have been prepared and were adopted by Penrith City the Council at its ordinary meeting on 23 March 2009. These documents are to guide the future development of Jordan Springs.

The approved WPP illustrates the manner in which the Western Precinct (Jordan Springs) is to be developed. A copy of the overall Framework Plan which sets the direction for the development of the precinct is provided in the Precinct Plan (JBA 2009).

As illustrated in the Framework Plan, the proposed development of Jordan Springs entails:

- A Village Centre, comprising a mix of retail, commercial, community, open space and residential uses, in the southern part of the precinct;
- Predominantly residential development in the remainder of the precinct;
- Construction of roads, including external connections to The Northern Road and Ninth Avenue and east to the Central Precinct; and
- Provision of local open space, riparian corridors and stormwater basins.

It is anticipated that once fully developed Jordan Springs will accommodate approximately 2,450 dwellings with a residential population in the order of 6,400.

2.3 Land Tenure Information

The registered proprietor of the subject site is CID group Pty Ltd while that for the remainder of the subject land is St Marys Land Limited. The 900ha Regional Park will be owned by the NSW Government and managed by the Office of Environment and Heritage, National Parks Division (formerly NPWS). Initial transfer has already taken place (Wianamatta Regional Park).

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

2.4 Vegetation

The vegetation communities of the Cumberland Plain have been mapped by the Office of Environment and Heritage (OEH) (then the Department of Environment, Climate Change and Water (DECCW) (Tozer, 2003; DECCW, 2007), including several updated versions based on more recent aerial photography, showing types and extent of canopy disturbance of vegetation communities, as shown in Figure 2.3. The DECCW map units have been verified and refined in parts of the study area by ground-truthing vegetation communities in the SMP (refer to Figure 4.7).

The following Critically Endangered and Endangered Ecological Communities are known to occur within the study area:

- Cumberland Plain Woodland (in the form of Shale Plains Woodland, as mapped by DECCW 2007);
- River–flat Eucalypt Forest (in the form of Alluvial Woodland, as mapped by DECCW 2007);
- Shale-Gravel Transition Forest; and
- Freshwater Wetlands on Coastal Floodplains.

Within the locality, a much broader range of communities, as mapped by DECCW 2007, are known to occur. These include:

- Shale Hills Woodland (CPW – CEEC);
- Agnes Banks Woodland (EEC);
- Castlereagh Swamp Woodland (EEC);
- Cooks River/Castlereagh Ironbark Forest (EEC);
- Moist Shale Woodland (EEC);
- Riparian Forest (RFEF – EEC);
- Shale Sandstone Transition Forest (High Influence and Low influence variants – EEC);
- Castlereagh Scribbly Gum Woodland;
- Riparian Scrub;
- Upper Georges River Sandstone Woodland; and
- Western Sandstone Gully Forest.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

The distribution of these communities in the locality is shown in Figure 2.3. The distribution of these communities in the locality is shown in Figure 2.3.

As specified in the DGRs, the vegetation communities present within the locality have been described with reference to the Cumberland Plain vegetation mapping (NPWS, 2002a; NPWS, 2002b) and relevant Scientific Committee determinations for Endangered Ecological Communities. All vegetation communities mapped by NPWS (2002a;b) were described by Tozer (2003), some of which were subsequently updated in Tozer et al. (2010), which have also been consulted during the preparation of the relevant ecological community descriptions, below.

2.4.1 Cumberland Plain Woodland - Shale Plain Woodland

The Native Vegetation of the Cumberland Plain mapping (NPWS 2002a;b) and descriptions by Tozer (2003) for Map Unit 10: Shale Plains Woodland along with descriptions by Tozer et al (2010) for Map Unit GW p29 corresponds to the CEEC listing for Cumberland Plain Woodland in the Sydney Basin Bioregion (CPW) (NSW Scientific Committee, 2009).

Cumberland Plain Woodland – Shale Plain Woodland is described as a eucalypt woodland community with an open shrub layer and grassy groundcover, restricted to the Cumberland Plain, western Sydney. It occurs on clay-loam soils derived from Wianamatta shale at altitudes from 50-300m (Tozer et al 2010).

The dominant canopy species are; Grey Box and Forest Red Gum, in association with *Eucalyptus crebra* (Narrow-leaved Ironbark) and *Acacia implexa* (Hickory Wattle). Mid-storey dominants include; *Bursaria spinosa* (Blackthorn), *Rubus parvifolius* (Native Raspberry) and *Clematis glycinoides* (Headache Vine). The groundcover is dominated by *Dichondra repens* (Kidney Weed), *Brunoniella australis* (Blue Trumpet), Desmodium *varians* (Slender Tick Trefoil), *Aristida ramosa* (Purple Wiregrass) *Microlaena stipoides* (Weeping Meadow Grass), *Carex inversa*, *Themeda australis* (Kangaroo Grass), *Cyperus gracilis* (Slender Flat-sedge), *Dichelachne* micrantha (Shorthair Plumegrass) , *Asperula conferta* (Common Woodruff), *Oxalis perennans,* Cheilanthes *sieberi subsp. sieberi* (Poison Rock Fern), and *Desmodium brachypodum* (Large Tick Trefoil).

It is estimated that over 90% of the original extent of this community has been cleared since European settlement. Threats to CPW include continued clearing, degradation, weed invasion and high fire frequency.

2.4.2 Shale Gravel Transition Forest

The Native Vegetation of the Cumberland Plain mapping (NPWS 2002a;b) and descriptions by Tozer (2003) for Map Unit 103: Shale Plains Woodland along with descriptions by Tozer et al (2010) for Map Unit DSF p502 corresponds to the EEC listing for Shale Gravel Transition Forest in the Sydney Basin Bioregion (SGTF) (NSW Scientific Committee, 2002c).

Shale Gravel Transition Forest is described as an eucalypt woodland with an open layer of sclerophyll shrubs and grassy groundcover, restricted to the Cumberland Plain, western Sydney. It occurs on clay soils with a high concentration of iron-indurated gravel, derived

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

mainly from Tertiary Alluvium in areas where average annual rainfall varies from 750 – 950 mm (Tozer et al 2010).

It has a dominant canopy species of *Eucalyptus fibrosa* (Broad-leaved Ironbark) but *E. moluccana* (Grey Box) and *E. tereticornis* (Forest Red Gum) may also occur. *Melaleuca decora* (Paperbark) dominates the understorey, with *Bursaria spinosa, Daviesia ulicifolia* (Gorse Bitter Pea) and *Lissanthe strigosa* (Peach Heath) occurring in the shrub layer. Grasses and herbs occur in the ground layer. Shale-Gravel Transition Forest shares a number of species with Cumberland Shale Plains Woodland.

It is estimated that about 75% of the original extent of this community has been cleared since European settlement. Threats to SGTF include clearing, mining for gravel and weed invasion.

2.4.3 Alluvial Woodland

The Native Vegetation of the Cumberland Plain mapping (NPWS 2002a;b) and descriptions by Tozer (2003) for Map Unit 11: Alluvial Woodland along with descriptions by Tozer et al (2010) for Map Unit FoW p33 corresponds to the EEC listing for River-Flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions (RFEF) (NSW Scientific Committee, 2004k).

This community occurs on stream banks and alluvial flats on the Cumberland Plain and is restricted to the Hawkesbury-Nepean and Georges River systems on alluvial soils derived from Wianamatta Shale. The community occurs as woodland with an open shrub layer and a continuous groundcover of grasses and forbs.

The dominant canopy species are; *E. tereticornis*, *Angophora floribunda* (Rough-barked Apple), *Eucalyptus amplifolia* (Cabbage Gum), associated with; *Eucalyptus eugenioides* (Thin-leaved Stringybark) and *Eucalyptus elata* (River Peppermint). Dominant mid-storey species include; *Acacia parramattensis* (Parramatta Wattle), *Bursaria spinosa* and *Sigesbeckia orientalis*. Dominant groundcover species are; *Microlaena stipoides*, *Oplismenus aemulus*(Basket Grass), *Dichondra repens*, *Entolasia marginata*(Bordered Panic), *Solanum prinophyllum*(Forest Nightshade), *Pratia purpurascens* (Whiteroot), *Echinopogon ovatus* (Forest Hedgehog Grass), *Desmodium varians*, *Commelina cyanea*(Native Wandering Jew) and *Veronica* plebeian (Trailing Speedwell) (Tozer et al. 2010).

It is estimated that 95% of the original extent of this community has been cleared since European settlement. Remnants of this community are threatened by land clearing, weed invasion, rubbish dumping and other processes of degradation.

2.4.4 Freshwater Wetlands on Coastal Floodplains

Freshwater wetlands on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions occurs on low-lying parts of floodplains, alluvial flats, depressions, drainage lines, back swamps, lagoons and lakes. It is dominated by

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

herbaceous plants including sedges, emergent plants, floating and submerged plants (NSW Scientific Committee, 2004e).

This community is not described by any mapping projects of the Cumberland Plain.

2.4.5 Cumberland Plain Woodland - Shale Hills Woodland

The Native Vegetation of the Cumberland Plain mapping (NPWS 2002a;b) and descriptions by Tozer (2003) for Map Unit 9: Shale Hills Woodland along with descriptions by Tozer et al (2010) for Map Unit p28 correspond to the CEEC listing for Cumberland Plain Woodland in the Sydney Basin Bioregion (CPW) (NSW Scientific Committee, 2009).

Cumberland Plain Woodland – Shale Hills Woodland is closely related to Cumberland Shale Plains Woodland but typically occurs on steeper and more undulating terrain. It is found from 50 – 350m ASL in areas receiving 750 – 900mm mean annual rainfall occurs on clay/loam soils derived from Wianamatta Shale ridges in the area of north-east Sydney and is described as woodland with an open shrub layer and a grassy groundcover (Tozer et al 2010).

The canopy is dominated by *E.* and *E. tereticornis* and is associated with *E. crebra* and *E. eugenioides*). The mid-storey is dominated by *Bursaria spinosa*. The groundcover dominants are *Dichondra repens*, *Cheilanthes sieberi*, *Aristida vagans* (Threeawned Speargrass), *Microlaena stipoides*, *Themeda australis*, *Brunoniella australis*, *Desmodium gunnii, Opercularia diphylla*, *Wahlenbergia gracilis* (Sprawling Bluebell), *Dichelachne micrantha* (Shorthair Plumegrass)*, Paspalidium distans*, *Eragrostis leptostachya* (Paddock Lovegrass) and *Lomandra filiformis* (Wattle Mat-rush) (Tozer et al. 2006).

It is estimated that 95% of the original extent of this community has been cleared since European settlement.

2.4.6 Agnes Banks Woodland

The Native Vegetation of the Cumberland Plain mapping (NPWS 2002a;b) and descriptions by Tozer (2003) for Map Unit 8: Agnes Banks Woodland along with descriptions by Tozer et al (2010) for Map Unit DSF p239 correspond to the EEC listing for Agnes Banks Woodland in the Sydney Basin Bioregion (NSW Scientific Committee, 2000a).

Agnes Banks Woodland has been described as a low eucalypt woodland with a sclerophyll shrub stratum and a groundcover dominated by sedges and forbs. The community is restricted to small areas of old podsolised sand deposits overlying Tertiary clays and gravels at Agnes Banks on the east bank of the Hawkesbury River (Tozer et al 2010).

The canopy is dominated by species such as *Angophora bakeri* (Narrow-leaved Apple) and *E. sclerophylla* (Hard-leaved Scribbly Gum) with an underlying shrub layer consisting of *Banksia oblongifolia* (Fern-leaved Banksia), *Dillwynia sericea* (Showy Parrot-pea), *Leptospermum trinervium* (Slender Tea-tree) and *Pimelea linifolia* (Slender Rice Flower). Groundcover species include *Lepidosperma urophorum, Stylidium graminifolium* (Grass Trigger-plant) and *Trachymene incisa*.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Agnes Banks Woodland has a highly restricted distribution and this community is continues to be threatened by sand mining and rural residential development.

2.4.7 Castlereagh Swamp Woodland

The Native Vegetation of the Cumberland Plain mapping (NPWS 2002a;b) and descriptions by Tozer (2003) for Map Unit 4: Castlereagh Swamp Woodland along with descriptions by Tozer et al (2010) for Map Unit DSF p4 correspond to the EEC listing for Castlereagh Swamp Woodland Community (NSW Scientific Committee, 1999).

Castlereagh Swamp Woodland is a low woodland community that occurs in poorly drained depressions along intermittent watercourses between Castlereagh and Holsworthy on the Cumberland Plain, western Sydney.

The canopy is dominated by species such as *Melaleuca decora, E. parramattensis* (Parramatta Red Gum), and *Melaleuca linariifolia* (Budjur). The groundcover is dominated by species that can tolerate waterlogged conditions such as *Goodenia paniculata* (Branched Goodenia)*, Centella asiatica* (Indian Pennywort) and *Juncus usitatus*. Other common ground cover species include: *Cheilanthes sieberi, Opercularia diphylla, Pratia purpurascens, Themeda australis, Hydrocotyle peduncularis, Hypericum gramineum* (Small St Johns Wort)*, Paspalidium distans, Eragrostis brownii* (Brown's Lovegrass) *and Fimbristylis dichotoma* (Common Fringe-sedge).

Castlereagh Swamp Woodland has a highly restricted distribution and remnant areas are all less than 100 hectares in size. This community is threatened by weed invasion related to nutrient enrichment from surrounding urban and rural areas as well as from direct destruction for hobby farm, rural and residential development.

2.4.8 Cooks River/Castlereagh Ironbark Forest

The Native Vegetation of the Cumberland Plain mapping (NPWS 2002a;b) and descriptions by Tozer (2003) for Map Unit 3: Cooks River/Castlereagh Ironbark Forest along with descriptions by Tozer et al (2010) for Map Unit DSF p1 Castlereagh Ironbark Forest correspond to the EEC listing for Cooks River/Castlereagh Ironbark Forest in the Sydney Basin Bioregion (NSW Scientific Committee, 2002a).

Cooks River/Castlereagh Ironbark Forest (CRCIF) occurs in the Holsworthy and Castlereagh areas, and in the eastern section of the Cumberland Plain on alluvial soils and can intergrade with Shale-Gravel Transition Forest.

The dominant canopy species are *E. fibrosa* and *Melaleuca decora*. The understorey is typically dense and contains *Melaleuca. Nodosa* (Prickly-leaved Paperbark), *Lissanthe strigosa, Dillwynia tenuifolia, Pultenaea villosa* (Hairy Bush-pea) and *Daviesia ulicifolia.* The ground layer consists of grasses and herbs.

The community is under threat from weed invasion, clearing, rubbish dumping and damage by vehicle access.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

2.4.9 Moist Shale Woodland

The Native Vegetation of the Cumberland Plain mapping (NPWS 2002a;b) and descriptions by Tozer (2003) for Map Unit 14: Moist Shale Woodland along with descriptions by Tozer et al (2010) for Map Unit GW p514 Cumberland Moist Shale Woodland correspond to the EEC listing for Moist Shale Woodland in the Sydney Basin Bioregion (NSW Scientific Committee, 2002b).

This community is described as an eucalypt woodland with a sparse semi-mesic shrub layer and grassy groundcover, restricted to rugged areas with soils derived from Wianamatta Shale at higher elevations in the southern half of the Cumberland Plain

The dominant canopy species are *E. tereticornis* and *E. moluccana* with a shrub layer consisting of *Breynia oblongifolia* (Coffee Bush), *Clerodendrum tomentosum* (Hairy Clerodendrum), *Sigesbeckia orientalis, Olearia viscidula* (Wallaby Weed) and *Bursaria spinosa*. Groundcover species include *Cayratia clematidea* (Native Grape), *Desmodium gunnii, Cyperus gracilis* (Slender Flat-sedge), *Brunoniella australis, Desmodium brachypodum* (Large Tick Trefoil), *Glycine clandestina Solanum prinophyllum, Microlaena stipoides, Einadia hastata* (Berry Saltbush), *Nyssanthes diffusa* (Barbwire Weed), *Plectranthus parviflorus* (Cockspur Flower) and *Rumex brownii* (Swamp Dock).

The community is under threat from rural-residential development, weed invasion, high frequency fire and grazing.

2.4.10 Riparian Forest

The Native Vegetation of the Cumberland Plain mapping (NPWS 2002a;b) and descriptions by Tozer (2003) for Map Unit 12: Riparian Forest corresponds to the EEC listing for River-Flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions (RFEF) (NSW Scientific Committee, 2004k).

This community is not widely distributed, being limited to banks of the Hawkesbury-Nepean River or on the terraces immediately adjacent to the river.

Canopy species include: *E. botryoides* (Bangalay), *E. elata, Angophora subvelutina* (Broad-leaved Apple) and *Angophora floribunda*. The understory often contains a small tree stratum consisting of species of Acacia, such as *A. Binervia* (Coastal Myall), *A. Floribunda* (White Sally Wattle) *and A. Mearnsii* (Black Wattle). Common groundcover species include *Oplismenus aemulus* (Australian Basket Grass), *Pteridium esculentum* (Bracken Fern), *Microlaena stipoides var. Stipoides* (Weeping Grass), *Stipa ramosissima* (Stout Bamboo Grass) and *Echinopogon ovatus*.

As part of the RFEF community, is estimated that 95% of the original extent of this community has been cleared since European settlement.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

2.4.11 Shale Sandstone Transition Forest

The Native Vegetation of the Cumberland Plain mapping (NPWS 2002a;b) and descriptions by Tozer (2003) for Map Units 1 and 2: Shale Sandstone Transition Forest (Low Sandstone and High Sandstone influence) along correspond to the EEC listing for Shale/Sandstone Transition Forest in the Sydney Basin Bioregion (NSW Scientific Committee, 1998).

This community occurs on transitional shale-sandstone soils around the edge of the Cumberland Plain at altitudes up to 350m and is described as woodland with an open shrub layer and a grassy groundcover. Shale Sandstone Transition Forest (Low Sandstone Influence) occurs around the margins of the Cumberland Plain on soils derived from Wianamatta Shale while Shale Sandstone Transition Forest (High Sandstone Influence) occurs on the margins of the Cumberland Plain in close proximity to the sandstone/shale boundary

The dominant canopy species are; *E. crebra*, *Eucalyptus fibrosa* and *E. punctata* (Grey Gum), generally also in association with; *E. globoidea* (White Stringybark) and *E. eugenioides*). Dominant understorey species include; *Allocasuarina littoralis* (Black She-Oak), *Persoonia linearis* (Narrow-leaved Geebung), *Bursaria spinosa* subsp. *spinosa*, *Ozothamnus diosmifolius* (White Dogwood) and *Hibbertia aspera* (Rough Guinea Flower). Dominant groundcover species include; *Lepidosperma laterale*, *Cheilanthes sieberi* subsp. *Sieberi, Aristida vagans*, *Pratia purpurascens*, *Microlaena stipoides var. stipoides*, *Entolasia stricta* (Wiry Panic), *Lomandra multiflora* (Many-flowered Mat-rush), *Themeda australis*, *Panicum simile* (Two-colour Panic), *Echinopogon caespitosus* (Hedgehog Grass), *Pomax umbellata*, *Dichondra repens*, *Glycine clandestina*, *Billardiera scandens* (Hairy Apple Berry) and *Opercularia diphylla* (Tozer et al. 2006).

An estimate of the area of this vegetation type which has been cleared from its original extent is 80% since European settlement.

2.4.12 Castlereagh Scribbly Gum Woodland

The Native Vegetation of the Cumberland Plain mapping (NPWS 2002a;b) and descriptions by Tozer (2003) for Map Unit 6: Castlereagh Scribbly Gum Woodland correspond to the Vulnerable Ecological Community (VEC) listing for Castlereagh Scribbly Gum Woodland in the Sydney Basin Bioregion (NSW Scientific Committee, 2010).

The canopy is dominated by *E. parramattensis, subsp. parramattensis, Angophora bakeri* and *E. sclerophylla* along with an occasional small tree stratum of *Melaleuca decora*. The shrub stratum is well developed and consists of species such as *Banksia spinulosa subsp spinulosa* (Hairpin Banksia), *Melaleuca nodosa, Hakea sericea* and *Hakea dactyloides* (Finger Hakea). The ground stratum contains a diverse range of forbs including *Themeda australis, Entolasia stricta, Cyathochaeta diandra, Dianella revoluta subsp revoluta* (Blueberry Lilly), *Stylidium graminifolium, Platysace ericoides, Laxmannia gracilis* (Slender Wire Lilly) and *Aristida warburgii*.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

2.4.13 Riparian Scrub

The Native Vegetation of the Cumberland Plain mapping (NPWS 2002a;b) and Tozer (2003) have described Map Unit 35: Riparian Scrub as a community that occurs along banks of small streams on soils derived from Hawkesbury Sandstone. This community does not correspond to a State or Commonwealth listed threatened ecological community

Riparian Scrub is dominated by *Ceratopetalum apetalum* (Coachwood) and *Tristaniopsis laurina* (Water Gum) although trees such as *Angophora costata* (Smooth-barked Apple) and *E. pilularis* (Stringybark) may occasionally occur. Common shrub species include *Lomatia myricoides* (River Lomatia), *Acacia obtusifolia*, *Leptospermum morrisonii* and *Grevillea oleoides* (Red Spider Flower) The ground stratum is variable and can include water plants such as *Triglochin procerum* (Water Ribbons) as well terrestrial herbs such as *Schoenus melanostachys* (Black Bog-rush)*, Sticherus flabellatus* (Shiny Fan-fern) and *Todea barbara* (King Fern) along the banks.

2.4.14 Upper Georges River Sandstone Woodland

The Native Vegetation of the Cumberland Plain mapping (NPWS 2002a;b) and Tozer (2003) have described Map Unit 32: Upper Georges River Sandstone Woodland as occurring predominantly on the Mittagong Formations and typically found on upper slopes and ridges. This community does not correspond to a State or Commonwealth listed threatened ecological community.

The canopy is dominated by *E. punctata* and *E. gummifera (*Red Bloodwood), with *E. sparsifolia* and *Allocasuarina littoralis*. Shrub species include *Acacia ulicifolia* (Prickly Moses), *Acacia terminalis* (Sunshine Wattle), *Acacia linifolia* (Narrow-leaved Wattle), *Persoonia linearis, Leptospermum trinervium* and *Exocarpos strictus* (Dwarf Cherry). The ground stratum is often dominated by grass species such as *Entolasia stricta* , *Themeda australis*, *Austrostipa pubescens, Aristida vagans* and *Austrodanthonia fluva*.

2.4.15 Western Sandstone Gully Forest

The Native Vegetation of the Cumberland Plain mapping (NPWS 2002a;b) and Tozer (2003) have described Map Unit 33: Western Sandstone Gully Forest as occurring on the lower slopes of sandstone gullies on Hawkesbury Sandstone and Mittagong Formations. This community does not correspond to a State or Commonwealth listed threatened ecological community.

The canopy is dominated by *Angophora costata, Corymbia gummifera* and *E. pilularis*, with occasional occurrences of *E. punctata*. A sparse layer of smaller trees is dominated by *Ceratopetalum gummiferum* (Christmas Bush) and *Allocasuarina littoralis*. Shrub species include *Acacia terminalis*, *Leptospermum trinervium, Persoonia linearis* and *Banksia spinulosa*. In the ground stratum, the fern species *Pteridium esculentum* is invariably present, along with the climber *Smilax glyciphylla* (Sweet Sarsaparilla).

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

2.4.16 Endangered Ecological Communities of the Cumberland Plain

Several EECs that are known to occur on the Cumberland Plain are absent from the study area and the wider locality. These include:

- Blue Gum High Forest in the Sydney Basin Bioregion (CEEC)
- Elderslie Banksia Scrub Forest Community (EEC)
- Sydney Turpentine Ironbark Forest (EEC)
- Western Sydney Dry Rainforest (WSDR) in the Sydney Basin Bioregion (EEC)

These (C)EECs have not been described further in this SIS as they do not occur within the locality of the study site.

2.5 Plans and Maps

The following maps are provided at the end of each chapter:

Chapter 1:

- Aerial photograph of the St Marys Property (Figure 1.1);
- Zoning of the St Marys Property (SREP 30 Amendment 2) (Figure 1.2).

Chapter 2:

- Plan of the subject site identifying the proposal (Figure 2.1);
- Aerial view of the subject site, subject land and study area (Figure 2.2);
- Vegetation communities in the locality (DECCW 2007) (Figure 2.3);
- Topography of the locality identifying land uses (Figure 2.4); and
- Aerial photograph of the locality identifying areas of native vegetation (Figure 2.5).

Chapter 3:

- OEH (2012) threatened flora species records (Figure 3.1); and
- OEH (2012) threatened fauna species records (Figure 3.2).

Chapter 4;

- Flora survey locations (Figure 4.1);
- Fauna survey locations (Figure 4.2);

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

- Threatened flora and fauna recorded in the study area (Figure 4.6); and
- Vegetation of the study area (Figure 4.7).

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Document Set ID: 6445602
Version: 1, Version Date: 27/02/2015

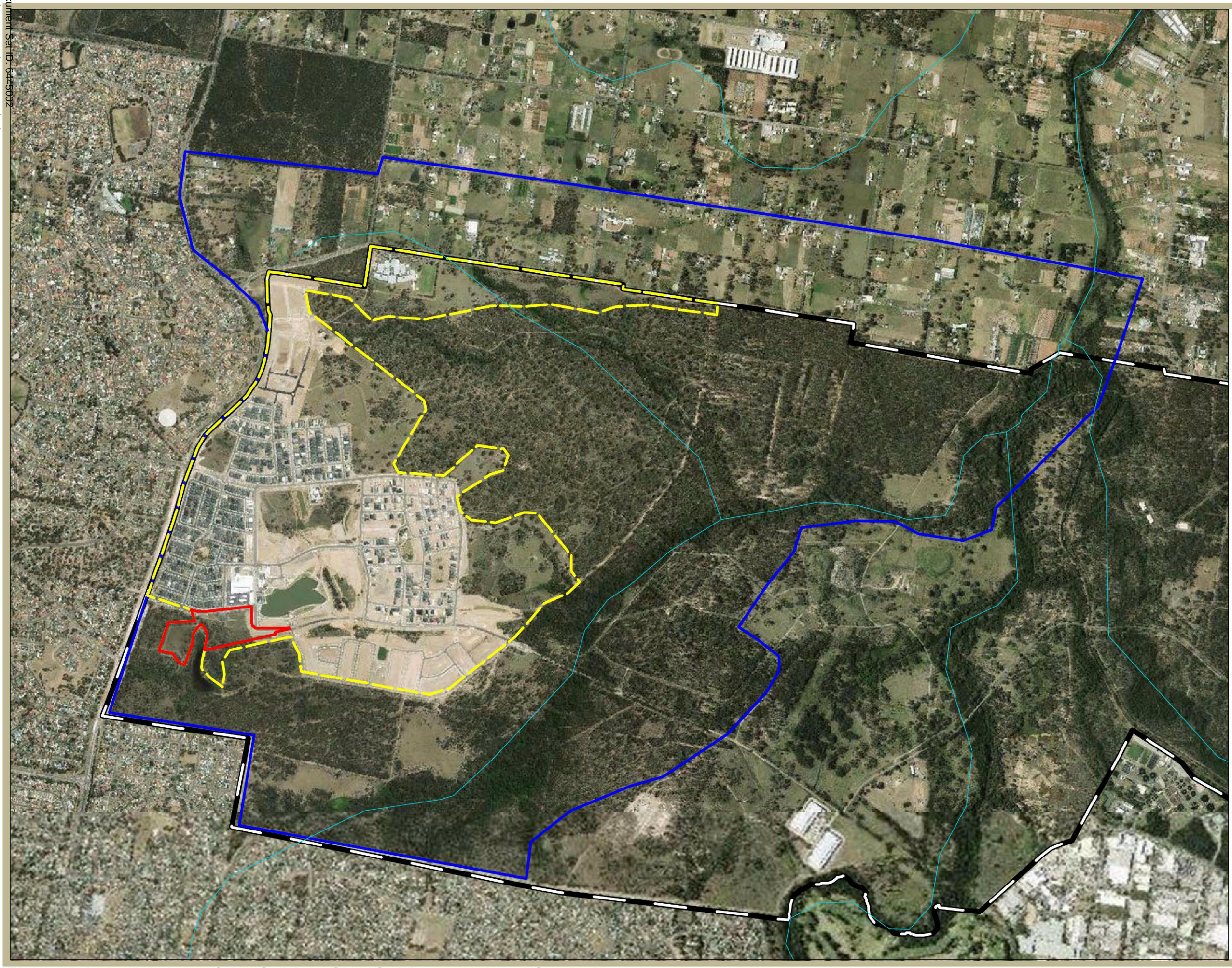
Coordinate System: MGA Zone 56 (GDA 94)



Figure 2.1. Plan of the Subject Site identifying the Proposal

Document Set ID: 6445602
Version: 1, Version Date: 27/02/2015

Coordinate System: MGA Zone 56 (GDA 94)



Legend

- St Marys Property Boundary
- Subject Site
- Subject Land (Western Precinct)
- Study Area
- Waterway

Grid North

Image Source:
Image © SIX Maps
(dated 17-1-2014)

CUMBERLAND ECOLOGY

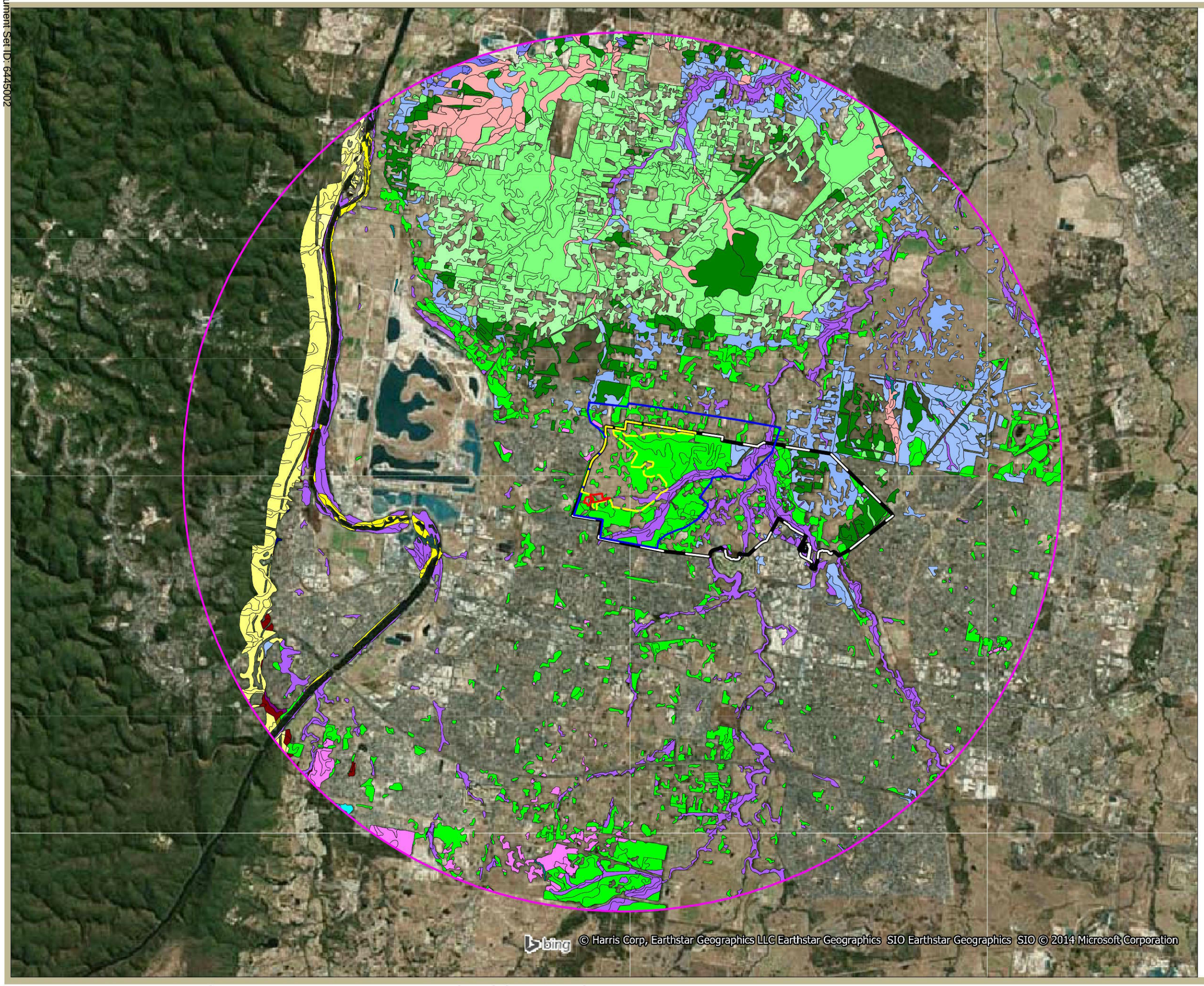
I:\...\13092\Figures\RP2_SIS\20141202\Figure 2.2

Figure 2.2. Aerial view of the Subject Site, Subject Land and Study Area

250 0 250 500 750 1000 m

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Coordinate System: MGA Zone 56 (GDA 94)



N
Grid North

Legend

- St Marys Property Boundary
- Subject Site
- Subject Land
- Study Area
- Locality

Vegetation Community

- Shale Plains Woodland (CPW) (CEEC)
- Shale Hills Woodland (CPW) (CEEC)
- Alluvial Woodland (RFEF) (EEC)
- Riparian Forest (RFEF) (EEC)
- Shale/Gravel Transition Forest (EEC)
- Shale Sandstone Transition Forest (Low Influence) (EEC)
- Shale Sandstone Transition Forest (High Influence) (EEC)
- Freshwater Wetlands (EEC)
- Moist Shale Woodland (EEC)
- Cooks River Castlereagh Ironbark Forest (EEC)
- Castlereagh Swamp Woodland (EEC)
- Agnes Banks Woodland (EEC)
- Castlereagh Scribbly Gum Woodland (VEC)
- Upper Georges River Sandstone Woodland
- Western Sandstone Gully Forest
- Riparian Scrub
- Unclassified Vegetation

Data Source: Change in the distribution of Cumberland Plain Woodland 2007 (DECCW, 2007)

CUMBERLAND ECOLOGY

I:\...\13092\Figures\RP2_SIS\20141202\Figure 2.3

Figure 2.3. Vegetation Communities in the Locality (DECCW, 2007)

1 0 1 2 3 4 km

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Coordinate System: MGA Zone 56 (GDA 94)

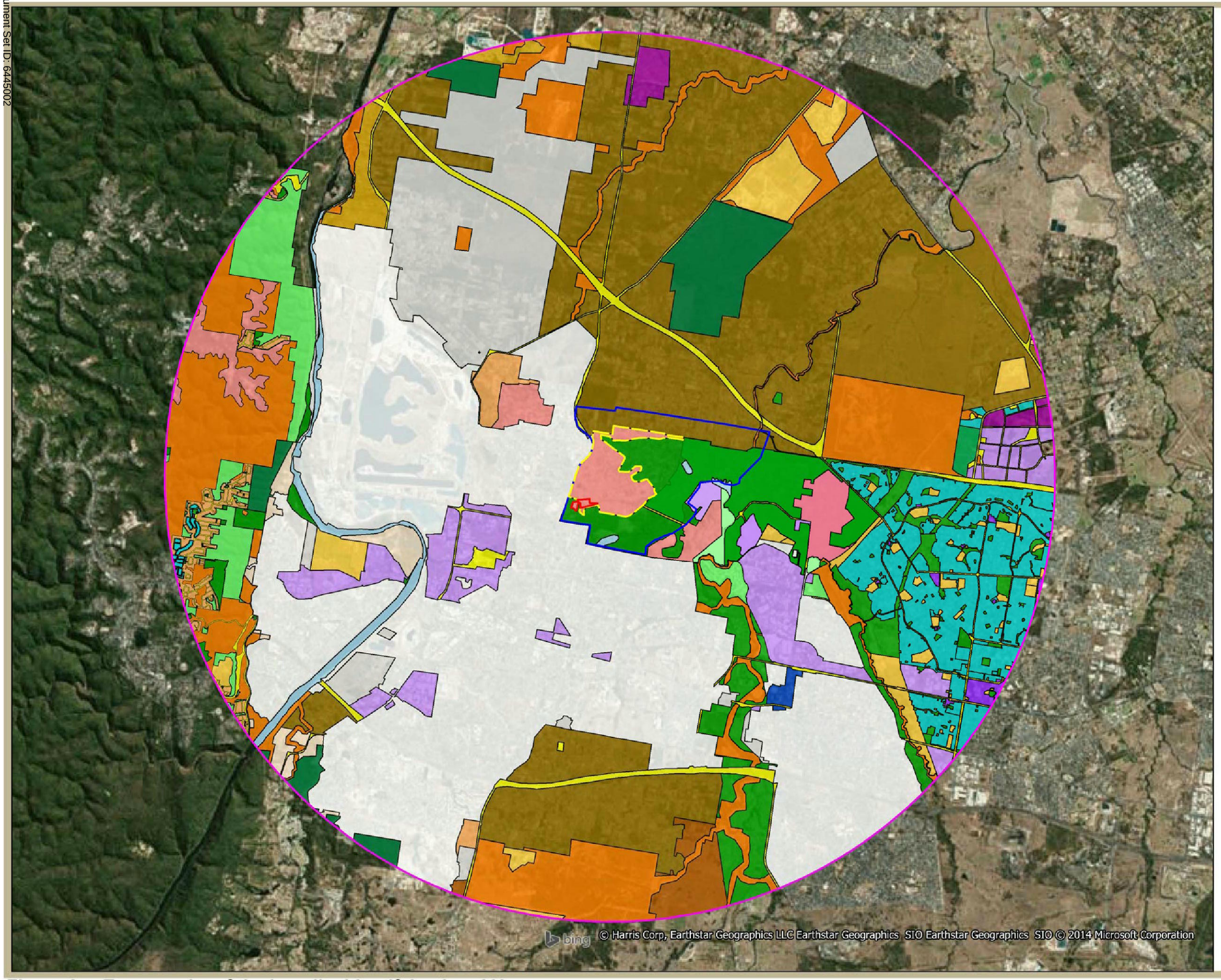
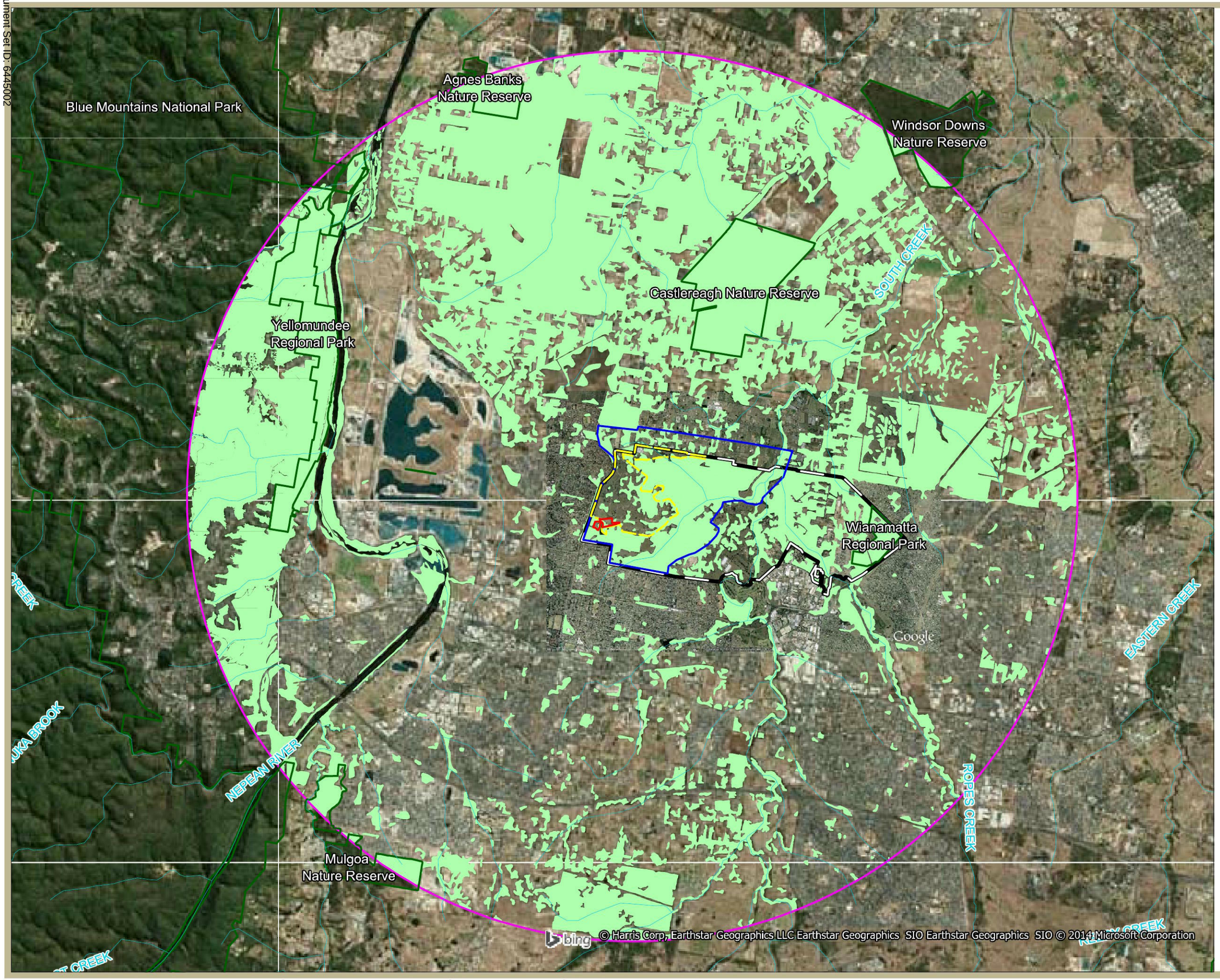


Figure 2.4. Topography of the Locality identifying Land Uses

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Coordinate System: MGA Zone 56 (GDA 94)



Legend

- St Marys Property Boundary
- Subject Site
- Subject Land (Western Precinct)
- Study Area
- Locality
- Native Vegetation
- National Parks and Reserves

N
Grid North

Data Source:
Vegetation mapping: Blue_Mountains_ LGA_VISmap_2239; Change in the distribution of Cumberland Plain Woodland 2008;
© Copyright Commonwealth of Australia (Geoscience Australia) 2006
NPWS Estate 2012

CUMBERLAND ECOLOGY

I:\...\13092\Figures\RP2_SIS\20141202\Figure 2.5

Figure 2.5. Aerial photograph of the Locality identifying areas of Native vegetation

1 0 1 2 3 4 km

Chapter 3

Initial Assessment

This initial assessment provides a general description of the threatened species or populations known or likely to be present in the area that is the subject of the action and in any area that is likely to be affected by the action. Based on habitat assessment and records from the locality and study area within the south eastern portion of the SMP, this chapter determines the "subject species" and those species likely to be affected by the proposal ("affected (C)EECs/species"). Affected (C)EECs/species defines those threatened species, populations and ecological communities that are likely to experience impacts from the proposal.

3.1 Endangered and Critically Endangered Ecological Communities

The following endangered and critically endangered ecological communities (referred to collectively as (C)EEC's) are known to occur within the subject land:

- Cumberland Plain Woodland (CPW);
- River –flat Eucalypt Forest (RFEF);
- Shale-Gravel Transition Forest (SGTF); and
- Freshwater Wetlands on Coastal Floodplains (FWCF).

This SIS considers these (C)EECs as subject communities. Of these four communities, only CPW is considered to occur within the subject site. The floristics of SGTF surveyed during the groundtruthing surveys within the subject land suggests that the vegetation patches are not substantially different from those of CPW across the subject land. This vegetation community is therefore considered to be CPW in this SIS, which is of higher conservation status under the TSC Act.

3.2 Threatened Species and Populations Records

3.2.1 Database Records

Threatened species, populations and ecological community records from within the locality were obtained from databases, including the Atlas of NSW Wildlife (OEH, 2014a), Bird Data

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

(Birds Australia, 2011) and the Biobanking Credit Calculator Tool (DECC, 2009) (DECC, 2009). The search area was defined as within a 10km radius of the subject site. A 10 km radius search area was adopted for the Birds Australia database. These records are shown in **Figure 3.1** and **Figure 3.2**.

The number and age of records of threatened species recorded within a 10 km radius of the Western Precinct provided a picture of the distribution for relevant species within the locality and was useful supplementary information when assessing the likelihood of occurrence of threatened species within the Western Precinct.

3.2.2 Literature Review

The Western Precinct, including the current study area, has been subject to a series of flora and fauna investigations from the early 1990s until the present date. These have involved literature reviews, database assessments, vegetation mapping, a general census of flora and fauna and targeted surveys for threatened species. A synthesis of the information from the relevant reports has been carried out as part of the Western Precinct Biodiversity Assessment (Cumberland Ecology, 2009a) to determine the flora and fauna species which may be affected by any activity within the Western Precinct. A summary of the results of these surveys is shown in Chapter 4. Further details are provided in the Supplementary Report prepared by Cumberland Ecology for the Western Precinct Stage 1 DAs (Cumberland Ecology, 2009b).

A summary of more recent surveys conducted specifically for the Western Precinct Biodiversity Assessment and Flora and Fauna Assessments for development applications in the Western Precinct and this SIS is provided in Chapter 4.

Table 3.1 provides an initial assessment of the exhaustive list provided by the databases and literature review process. **Table 3.1** also identifies the “subject species”, as described below.

3.2.3 Habitat Assessment

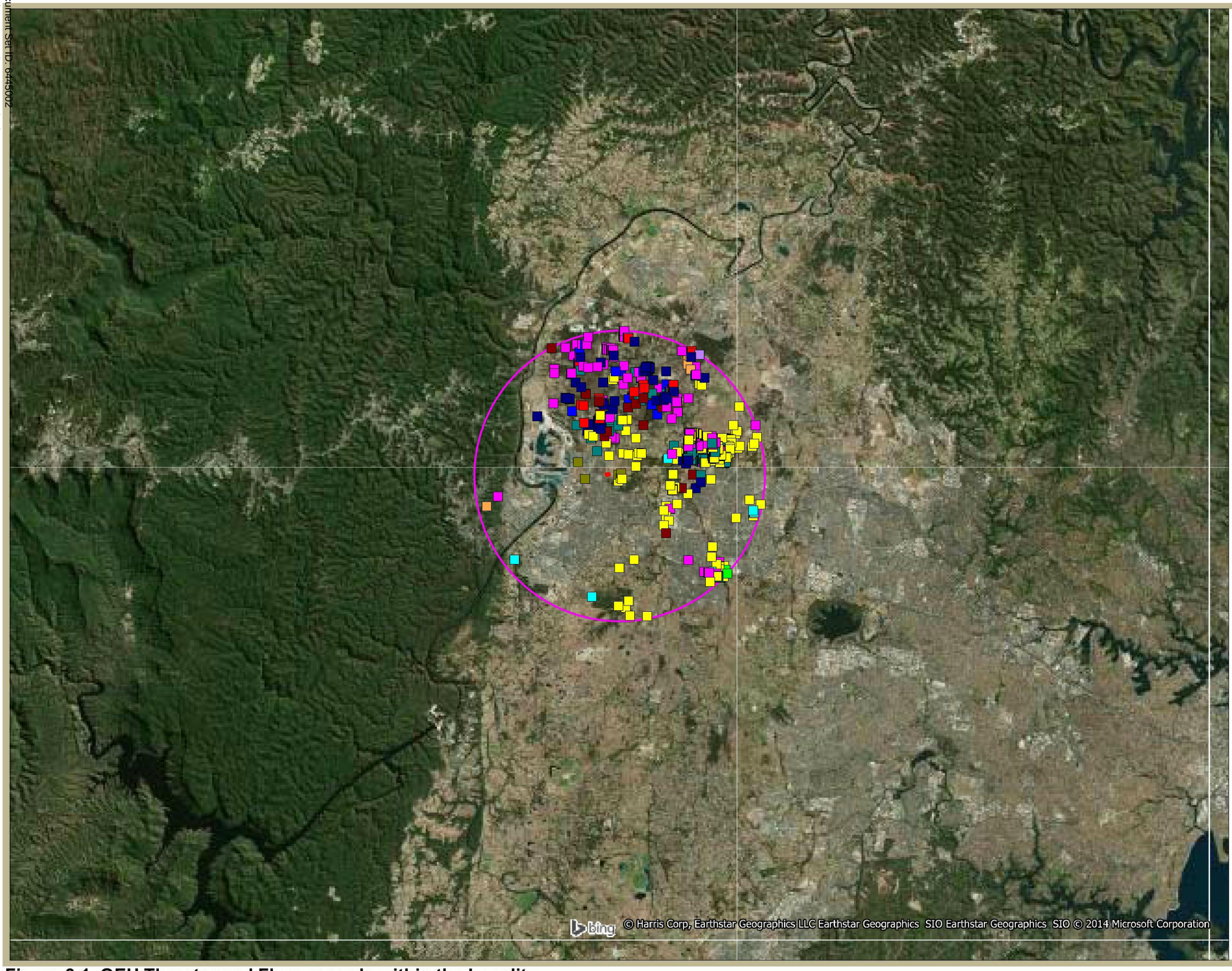
Habitat assessment and field surveys of the study area were used to determine the threatened species likely to occur, or occurring on the subject site. The results of this assessment are found in Chapter 4.

Based on this habitat assessment, and consideration of the species records for the study area, the threatened species or populations that occur or have potential to occur in the study area were identified (the “subject species”).

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Coordinate System: MGA Zone 56 (GDA 94)



Legend

- Subject Site
- Locality

Threatened Flora

- Acacia bynoeana
- Acacia pubescens
- Allocasuarina glareicola
- Dillwynia tenuifolia
- Grevillea juniperina subsp. juniperina
- Marsdenia viridiflora subsp. viridiflora
- Micromyrtus minutiflora
- Persoonia hirsuta
- Persoonia nutans
- Pimelea curviflora var. curviflora
- Pimelea spicata
- Pultenaea parviflora

N
Grid North

Data Source:
OEH Atlas data: 03/12/2014
Map Scale: 1:250,000

CUMBERLAND ECOLOGY

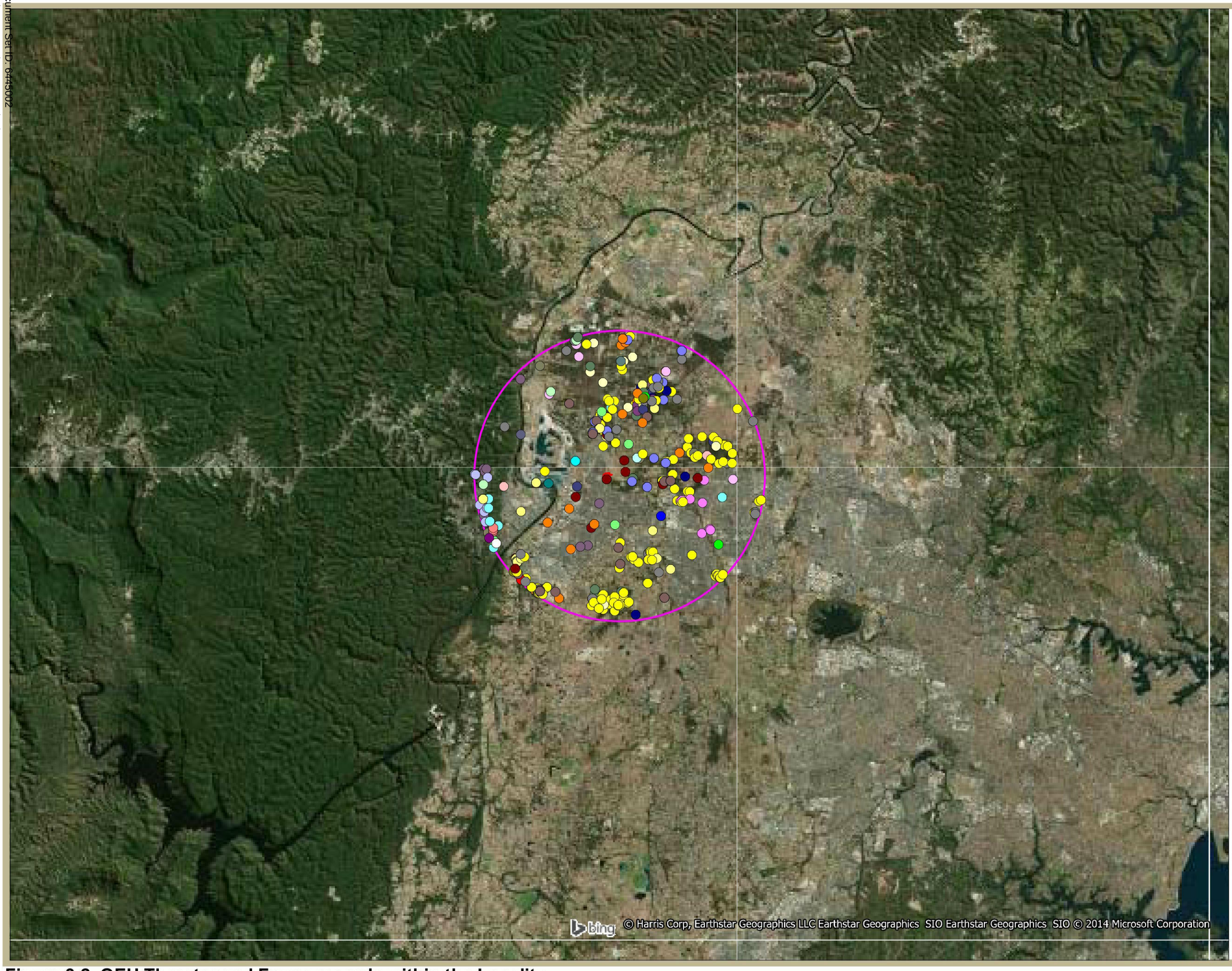
5 0 5 10 15 20 km

I:\...\13092\Figures\RP2_SIS\20141203\Figure 3.1

Figure 3.1. OEH Threatenend Flora records within the Locality

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Coordinate System: MGA Zone 56 (GDA 94)



Grid North

Legend

Subject Site

Locality

Threatened Fauna

- Australasian Bittern
- Black-chinned Honeyeater (eastern subspecies)
- Black-necked Stork
- Bush Stone-curlew
- Cumberland Plain Land Snail
- Diamond Firetail
- Eastern Bentwing-bat
- Eastern False Pipistrelle
- Eastern Freetail-bat
- Eastern Pygmy-possum
- Flame Robin
- Freckled Duck
- Gang-gang Cockatoo
- Glossy Black-Cockatoo
- Greater Broad-nosed Bat
- Green and Golden Bell Frog
- Grey-headed Flying-fox
- Koala
- Large-eared Pied Bat
- Little Bentwing-bat
- Little Eagle
- Little Lorikeet
- Masked Owl
- Painted Honeyeater
- Powerful Owl
- Rainbow Bee-eater
- Red-crowned Toadlet
- Regent Honeyeater
- Scarlet Robin
- Sooty Owl
- Southern Myotis
- Speckled Warbler
- Spotted Harrier
- Spotted-tailed Quoll
- Square-tailed Kite
- Squirrel Glider
- Swift Parrot
- Varied Sittella
- Yellow-bellied Glider
- Yellow-bellied Sheathtail-bat

Data Source:
OEH Atlas Data: 03/12/2014
Map Scale 1:250,000

CUMBERLAND ECOLOGY

I:\...\13092\Figures\RP2_SIS\20141203\Figure 3.2

Figure 3.2. OEH Threatenend Fauna records within the Locality

5 0 5 10 15 20 km

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table 3.1 Threatened Flora recorded in the Locality and the Assessment of the Likelihood of Occurrence

Scientific Name	Common Name	Status		Habitat	Likelihood of occurrence	Subject Species?
		TSC Act	EPBC Act			
Acacia bynoeana	Bynoe's Wattle	E1	V	Found in heath and woodland on sandy soils. Scattered from coast to mountains, uncommon. Associated overstorey species include Corymbia gummifera (Red Bloodwood), Scribbly Gum (Eucalyptus haemastoma), Parramatta Red Gum (Eucalyptus parramattensis), Banksia serrata and Angophora bakeri.	Unlikely to occur. The study area does not contain sandy soils and the typical overstorey species are absent.	No
Acacia pubescens	Downy Wattle	V	V	Occur in open woodland and forest, including Cooks River/Castlereagh Ironbark Forest, Shale/Gravel Transition Forest and Cumberland Plain Woodland	Potential to occur. Suitable habitat is present in study area	Yes
Allocasuarina glareicola		E1	E	Castlereagh Woodlands on lateritic soils. Found in open woodland with Eucalyptus parramattensis, Eucalyptus fibrosa, Angophora bakeri, Eucalyptus sclerophylla and Melaleuca decora. Primarily restricted to the Richmond (NW Cumberland Plain) district, but with an outlier population found at Voyager Point, Liverpool.	Unlikely to occur. Open woodland habitat does not occur and the characteristic overstorey associated with this species are absent.	No
Asterolasia elegans			E	Found in sheltered forests on mid- to lower slopes and valleys, e.g. in or adjacent to gullies which support sheltered forest	Unlikely to occur. Suitable habitat does not occur in study area	No
Cynanchum elegans			E	Climber or twiner found on the edge of dry rainforest communities. Also associated with littoral rainforest and Coastal Tea-tree - Coastal Banksia scrub.	Unlikely to occur. No suitable habitat present in study area	No

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table 3.1 Threatened Flora recorded in the Locality and the Assessment of the Likelihood of Occurrence

Scientific Name	Common Name	Status		Habitat	Likelihood of occurrence	Subject Species?
		TSC Act	EPBC Act			
Dillwynia tenuifolia		V	V	It has a core distribution within the Cumberland Plain, where it may be locally abundant within scrubby, dry heath areas within Castlereagh Ironbark Forest and Shale/Gravel Transition Forest on tertiary alluvium or laterised clays. May also be common in the ecotone between these areas and Castlereagh Scribbly Gum Woodland.	Likely to occur. This species has not been recorded on the subject site or subject land. This species has been widely recorded on the SMP and suitable habitat is present in the study area.	Yes
Eucalyptus benthamii	Camden White Gum	V	V	Occurs in open forest and requires a combination of deep alluvial and a flooding regime that permits seedling establishment	Unlikely to occur. Lack of necessary flooding regime	No
Grevillea juniperina subsp. juniperina	Juniper-leaved Grevillea	V		Restricted to red sandy to clay soils – often lateritic on Wianamatta Shale and Tertiary alluvium in Cumberland Plain Woodland and Castlereagh Woodland	This species has been recorded from the subject site in small numbers, as well as the subject land and study area in moderately high numbers. Tens of thousands of this species are estimated to occur in the Regional Park.	Yes
Grevillea parviflora subsp. parviflora	Small Flower Grevillea	V	V	Occurs on sandy clay loam soils, often with lateritic ironstone gravels. Soils are mostly derived from Tertiary sands or alluvium and from the Mittagong Formation with alternating bands of shale and fine-grained sandstones. Soil landscapes include Lucas Heights and Berkshire Park. Often occurs in	Potential to occur. Suitable habitat for this species is present in the study area.	Yes

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table 3.1 Threatened Flora recorded in the Locality and the Assessment of the Likelihood of Occurrence

Scientific Name	Common Name	Status		Habitat	Likelihood of occurrence	Subject Species?
		TSC Act	EPBC Act			
				open, slightly disturbed sites such as along tracks		
Hypsela sessiliflora		E1	X	Known to grow in damp places on Cumberland Plain, including freshwater wetland, grassland/alluvial woodland and an alluvial woodland/shale plains woodland (Cumberland Plain woodland	Suitable habitat available but Unlikely to occur due to rarity of species	No
Marsdenia viridiflora subsp. viridiflora		E2		Recent records are from Prospect, Bankstown, Smithfield, Cabramatta Creek and St Marys. Previously known north from Razorback Range. Grows in vine thickets and open shale woodland	Likely to occur. This species has not been recorded on the subject land, although it is known from the study area.	Yes
Melaleuca deanei	Deane's Paperbark	V	V	Grows in heath on sandstone	Unlikely to occur. The study area is not located on sandstone geology and therefore does not provide suitable habitat	No
Micromyrtus minutiflora		E1	V	Restricted to the general area between Richmond and Penrith, western Sydney. Grows in Castlereagh Scribbly Gum Woodland, Ironbark Forest, Shale/Gravel Transition Forest, open forest on tertiary alluvium and consolidated river sediments.	Likely to occur. This species has not been recorded on the subject land although it has been widely recorded on the SMP and suitable habitat is present in the study area.	Yes

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table 3.1 Threatened Flora recorded in the Locality and the Assessment of the Likelihood of Occurrence

Scientific Name	Common Name	Status		Habitat	Likelihood of occurrence	Subject Species?
		TSC Act	EPBC Act			
Persoonia nutans	Nodding Geebung	E1	E	Associated with dry woodland, Castlereagh Scribbly Gum Woodland, Agnes Banks Woodland and sandy soils associated with tertiary alluvium, occasionally poorly drained. Also occurs in Shale Gravel Transition Forest and Castlereagh Ironbark Forest. Endemic to Western Sydney.	Likely to occur. This species has not been recorded on the subject land, although it is known from the study area.	Yes
Pimelea curviflora var. curviflora		V	V	Occurs on shaley/lateritic soils over sandstone and shale/sandstone transition soils on ridgetops and upper slopes amongst woodlands	Unlikely to occur. The study area is not located on sandstone geology and therefore does not provide suitable habitat	No
Pimelea spicata	Spiked Rice-flower	E1	E	In western Sydney, it occurs on an undulating topography of well structured clay soils, derived from Wianamatta shale. It is associated with Cumberland Plain Woodland (CPW), in open woodland and grassland often in moist depressions or near creek lines. Has been located in disturbed areas that would have previously supported CPW	This species has been recorded from the study area and subject land in very small numbers. The study area provides suitable habitat for this species.	Yes
Pomaderris brunnea			V	Shrub that grows in moist woodland or forest on clay and alluvial soils of flood plains and creek lines in association with Eucalyptus amplifolia, Angophora floribunda, Acacia parramattensis, Bursaria spinosa and Kunzea ambigua. Flowers Sept-Oct.	Unlikely to occur due to restricted distribution within NSW	No
Pterostylis			E	Found in open forest or woodland, on flat or gently sloping	Unlikely to occur due to lack of	No

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table 3.1 Threatened Flora recorded in the Locality and the Assessment of the Likelihood of Occurrence

Scientific Name	Common Name	Status		Habitat	Likelihood of occurrence	Subject Species?
		TSC Act	EPBC Act			
gibbosa				land with poor drainage.	suitable habitat and restricted distribution within NSW	
Pterostylis saxicola	Sydney Plains Greenhood	E1		Most commonly found growing in small pockets of shallow soil in depressions on sandstone rock shelves above cliff lines. The vegetation communities above the shelves where it occurs are sclerophyll forest or woodland on shale/sandstone transition soils or shale soils	Unlikely to occur. No suitable habitat components such as sandstone rock shelves occur in the study area	No
Pultenaea parviflora		E1	V	May be locally abundant, particularly within scrubby/dry heath areas within Castlereagh Ironbark Forest and Shale Gravel Transition Forest on tertiary alluvium or laterised clays. May also be common in ecotone between these communities and Castlereagh Scribbly Gum Woodland.	This species has been recorded from the study area, subject land and has also been widely recorded throughout the SMP	Yes
Rhizanthella slateri			E	The species grows in eucalypt forest but no informative assessment of the likely preferred habitat for the species is available	Unlikely to occur due to limited distribution within NSW	No
Syzygium paniculatum	Magenta Lilly Pilly	E1	V	Occurs on grey soils over sandstone, restricted mainly to remnant stands of littoral (coastal) rainforests or on gravels, sands, silts and clays in riverside gallery rainforests	Unlikely to occur. Habitat requirements such as sandstone and rainforest not present in study area	No

Key: E/E1 = Endangered, E2 = Endangered population, V = Vulnerable, X – Extinct

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table 3.2 Threatened Fauna recorded in the Locality and the Assessment of the Likelihood of Occurrence

Scientific Name	Common Name	Status		Habitat Requirements	Likelihood of occurrence	Subject Species?
		TSC Act	EPBC Act			
Invertebrates						
Meridolum corneovirens	Cumberland Plain Land Snail	E1		Primarily inhabits Cumberland Plain Woodland. This community is a grassy, open woodland with occasional dense patches of shrubs.	Potential to occur. This species has been recorded from the SMP and potential habitat is present in the study area.	Yes
Amphibians						
Litoria aurea	Green and Golden Bell Frog	E1	V	Large permanent freshwater wetlands, with dense stands of reeds	Potential suitable habitat including permanent freshwater wetlands are present in the study area. However, this species is thought to be extinct in Western Sydney and is therefore highly unlikely to occur.	No
Heleioporus australiacus	Giant Burrowing Frog	E1	V	Found in heath, woodland and open dry sclerophyll forest on a variety of soil types except those that are clay based. Breeding habitat is generally soaks or pools within first or second order streams. During non-breeding periods, it burrows below the soil surface or in the leaf litter.	Unlikely to occur. Some potential habitat occurs in the study area, only 1 record exists for this species.	No

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table 3.2 Threatened Fauna recorded in the Locality and the Assessment of the Likelihood of Occurrence

Scientific Name	Common Name	Status		Habitat Requirements	Likelihood of occurrence	Subject Species?
		TSC Act	EPBC Act			
Aves						
Actitis hypoleucos	Common Sandpiper		C, J, K	Abundant in mangrove inlets but also present in rocky shores and margins of coastal and inland wetlands	Unlikely to occur. Suitable habitat not present in study area	No
Anthochaera phrygia	Regent Honeyeater	E4A	E, M	Dry open forests, woodlands, especially red ironbark, yellow box, yellow gum	Potential to occur. Woodland habitat is present in the study area.	Yes
Apus pacificus	Fork-tailed Swift		C, J, K	Highly mobile whilst in Australia and almost exclusively aerial to 300m. Mostly found over dry or open habitats, including riparian woodland and tea-tree swamps, low scrub, heathland or saltmarsh of inland plains	Unlikely to occur. Individuals may fly over area while migrating to more suitable habitats	No
Ardea ibis	Cattle Egret		C, J	Inhabit shallow water and wetland habitats (such as inland and coastal, freshwater and saline, permanent and ephemeral, open and vegetated, large and small, natural and artificial.	Unlikely to occur. Favours marine/estuarine habitats which do not occur within the study area	No
Botaurus poiciloptilus	Australasian Bittern	E1		Favours permanent freshwater wetlands with tall, dense vegetation, particularly bullrushes (Typha spp.) and spikerushes	Potential suitable habitat including permanent freshwater wetlands are present in the study area. Only 1 record for the area so Unlikely to occur	No

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table 3.2 Threatened Fauna recorded in the Locality and the Assessment of the Likelihood of Occurrence

Scientific Name	Common Name	Status		Habitat Requirements	Likelihood of occurrence	Subject Species?
		TSC Act	EPBC Act			
Burhinus grallarius	Bush Stone-curlew	E1		Well wooded floodplain forests, amongst fallen timber	Unlikely to occur. No suitable floodplain forest habitat for this species is present in the study area	No
Callocephalon fimbriatum	Gang-gang Cockatoo	V		Wetter forests, and woodlands, from sea level to 2000m on divide. From timbered foothills and valleys to suburban gardens. Nests in large tree hollows.	Potential to occur. Potential foraging habitat for this species is present in the study area, although limited nesting habitat is present due to the lack of large hollow bearing trees.	Yes
Calyptorhynchus lathami	Glossy Black-Cockatoo	V		Eucalypt forests and woodlands and forage in Allocasuarina. Nest in large tree hollows	Potential to occur. This species has been recorded from near the SMP according to the Atlas of NSW Wildlife (DECCW 2010). However, the SMP lacks suitable foraging habitat and large tall hollow-bearing trees for nesting, therefore is not likely to be a significant area of habitat.	Yes

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table 3.2 Threatened Fauna recorded in the Locality and the Assessment of the Likelihood of Occurrence

Scientific Name	Common Name	Status		Habitat Requirements	Likelihood of occurrence	Subject Species?
		TSC Act	EPBC Act			
Circus assimilis	Spotted Harrier	V		Grassy open woodland including acacia and mallee remnants, inland riparian woodland, grassland and shrub steppe (e.g. chenopods). It is found mostly commonly in native grassland, but also occurs in agricultural land, foraging over open habitats including edges of inland wetlands.	Potential to occur. Suitable foraging habitat is present in the study area.	Yes
Daphoenositta chrysoptera	Varied Sittella	V		Eucalypt forests and woodlands, especially those containing rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland.	Potential to occur. Eucalypt woodland habitat is present in the study area.	Yes
Ephippiorhynchus asiaticus	Black-necked Stork	E1		Associated with tropical and warm temperate terrestrial wetlands, estuarine and littoral habitats, and occasionally woodlands and grasslands, floodplains. Forages in fresh or saline waters up to 0.5m deep, mainly in open fresh waters, extensive sheets of shallow water over grasslands or sedgeland, mangroves, mudflats, shallow swamps with short emergent vegetation and permanent billabongs and pools on floodplains.	Potential to occur. Some wetland habitat is present in the study area.	Yes

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table 3.2 Threatened Fauna recorded in the Locality and the Assessment of the Likelihood of Occurrence

Scientific Name	Common Name	Status		Habitat Requirements	Likelihood of occurrence	Subject Species?
		TSC Act	EPBC Act			
Gallianago hardwickii	Latham's Snipe		C, J, K	In Australia, inhabit permanent and ephemeral open, freshwater wetlands with low, dense vegetation up to 2000 m above sea-level. Forage in areas of mud (either exposed or beneath a very shallow covering of water) and some form of cover (e.g. low, dense vegetation).	Potential suitable habitat including permanent freshwater wetlands are present in the study area. May pass though the area so Potential to occur	No
Glossopsitta pusilla	Little Lorikeet	V		Mostly occurs in dry, open eucalypt forests and woodlands. They have been recorded from both old-growth and logged forests in the eastern part of their range, and in remnant woodland patches and roadside vegetation. Isolated flowering trees in open country, e.g. paddocks, roadside remnants and urban trees are also used.	Potential to occur. Potential woodland habitat is present in the study area.	Yes
Grantiella picta	Painted Honeyeater	V		A nomadic species that typically inhabits Boree, Brigalow and Box-Gum Woodlands and Box-Ironbark Forests with abundant mistletoe. It is a specialist feeder on the fruits of mistletoes growing on woodland eucalypts and acacias, preferring Amyema sp (mistletoe).	Potential to occur. Eucalypt woodland habitat is present in the study area.	Yes

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table 3.2 Threatened Fauna recorded in the Locality and the Assessment of the Likelihood of Occurrence

Scientific Name	Common Name	Status		Habitat Requirements	Likelihood of occurrence	Subject Species?
		TSC Act	EPBC Act			
Haliaeetus leucogaster	White-bellied Sea-Eagle		C	Australian distribution along the coastline and some larger inland waterways. Generally forage over large expanses of open water, in-shore waters and open terrestrial habitats.	Unlikely to occur. Favoured habitats not present in study area	No
Hieraaetus morphnoides	Little Eagle	V		The Little Eagle occupies habitats rich in prey within open eucalypt forest, woodland or open woodland. Sheoak or acacia woodlands and riparian woodlands of interior NSW are also used. For nest sites it requires a tall living tree within a remnant patch.	Potential to occur. Eucalypt woodland habitat is present in the study area.	Yes
Hirundapus caudacutus	White-throated Needletail		C, J, K	Almost exclusively aerial, from heights of less than 1 m up to more than 1000 m above the ground. Occur over most types of habitat, particularly above wooded areas including open forest and rainforest, between trees or in clearings and below the canopy.	Unlikely to occur. Favoured habitats are not present in study area	No
Ixobrychus flavicollis	Black Bittern	V		Boggy marsh, wetland margins	Potential to occur. Wetland habitat is present in the study area.	Yes
Lathamus discolor	Swift Parrot	E1	E	Forests, woodlands, plantations, banksias, street trees and gardens	Potential to occur. Woodland habitat is present in the study area.	Yes

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table 3.2 Threatened Fauna recorded in the Locality and the Assessment of the Likelihood of Occurrence

Scientific Name	Common Name	Status		Habitat Requirements	Likelihood of occurrence	Subject Species?
		TSC Act	EPBC Act			
Limosa limosa	Black-tailed Godwit	V	C, J,K,	Primarily a coastal species, found in sheltered bays, estuaries and lagoons with large intertidal mudflats and/or sandflats.	Unlikely to occur. No suitable mudflat/ sandflat habitat present	No
Lophoictinia isura	Square-tailed Kite	V		Diverse habitats from dry woodlands and open forests. Shows a particular preference to timbered watercourses	Potential to occur. Woodland foraging habitat is present in the study area and it may forage over the study area as part of a larger range	Yes
Melanodryas cucullata cucullata	Hooded Robin (south-eastern form)	V		Prefers lightly wooded country, usually open eucalypt woodland, acacia scrub and mallee, often in or near clearings or open areas. Requires structurally diverse habitats featuring mature eucalypts, saplings, some small shrubs and a ground layer of moderately tall native grasses.	Potential to occur. Suitable habitat such as native grassland and woodland is present in the study area.	Yes
Melithreptus gularis gularis	Black-chinned Honeyeater (eastern subspecies)	V		Drier eucalypt forests, woodlands, timber on water courses, often no understorey, scrubs. Favours ironbark woodlands on western slopes.	Potential to occur. Woodland habitat is present in the study area.	Yes

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table 3.2 Threatened Fauna recorded in the Locality and the Assessment of the Likelihood of Occurrence

Scientific Name	Common Name	Status		Habitat Requirements	Likelihood of occurrence	Subject Species?
		TSC Act	EPBC Act			
Merops ornatus	Rainbow Bee-eater		J	Inhabit heathland, open forests and woodlands, shrublands, and various cleared or semi-cleared habitats, including farmland and areas of human habitation. Often occur in open, cleared or lightly-timbered areas located in close proximity to permanent water.	Potential to occur. This species occurs in a wide range of habitats and suitable habitat such as open areas, woodland and permanent water is present in the study area.	No
Neophema pulchella	Turquoise Parrot	V		Steep rocky ridges and gullies, rolling hills, valleys and river flats and the plains of the Great Dividing Range. It is associated with coastal scrubland, open forest and timbered grassland, especially low shrub ecotones between dry hardwood forests and grasslands with high proportion of native grasses and forbs.	Potential to occur. This species occurs in a wide range of habitats and suitable habitat such as native grassland and woodland is present in the study area.	No
Ninox connivens	Barking Owl	V		Inhabits woodland and open forest, including fragmented remnants and partly cleared farmland. Is flexible in its habitat use and hunting can extend in to closed forest and more open areas. Requires very large permanent territories.	Unlikely to occur. Habitat and prey species present but territorial requirements may exceed availability, especially as potential breeding habitat (large tree hollows) is minimal.	No

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table 3.2 Threatened Fauna recorded in the Locality and the Assessment of the Likelihood of Occurrence

Scientific Name	Common Name	Status		Habitat Requirements	Likelihood of occurrence	Subject Species?
		TSC Act	EPBC Act			
Ninox strenua	Powerful Owl	V		Habitat for this species is widespread and is primarily tall moist eucalypt forest of the eastern tableland edge and the mosaic of wet and dry sclerophyll forests occurring on undulating gentle terrain nearer the coast. Optimal habitat includes a tall shrub layer and abundant hollows supporting high densities of arboreal marsupials. Pairs occupy large, probably permanent home and nest in large hollows.	Unlikely to occur. Moist tall eucalypt forest is not present in the study area. Potential breeding habitat is minimal as no large tree hollows are present.	No
Oxyura australis	Blue-billed Duck	V		Prefers deep water in large permanent wetlands and swamps with dense aquatic vegetation. The species is completely aquatic, swimming low in the water along the edge of dense cover. It will fly if disturbed, but prefers to dive if approached	Potential to occur. Wetland habitat is present in the study area.	Yes

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table 3.2 Threatened Fauna recorded in the Locality and the Assessment of the Likelihood of Occurrence

Scientific Name	Common Name	Status		Habitat Requirements	Likelihood of occurrence	Subject Species?
		TSC Act	EPBC Act			
Petroica boodang	Scarlet Robin	V		The Scarlet Robin breeds in drier eucalypt forests and temperate woodlands, often on ridges and slopes, within an open understorey of shrubs and grasses and sometimes in open areas. Abundant logs and coarse woody debris are important structural components of its habitat. In autumn and winter it migrates to more open habitats such as grassy open woodland or paddocks with scattered trees. It forages from low perches, feeding on invertebrates taken from the ground, tree trunks, logs and other coarse woody debris.	Potential to occur. Woodland habitat is present in the study area and logs and woody debris are present.	Yes
Petroica phoenicea	Flame Robin	V		In NSW it breeds in upland moist eucalypt forests and woodlands, often on ridges and slopes, in areas of open understorey. It migrates in winter to more open lowland habitats such as grassland with scattered trees and open woodland on the inland slopes and plains	Potential to occur, particularly in winter when the species migrates to more open habitats	Yes

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table 3.2 Threatened Fauna recorded in the Locality and the Assessment of the Likelihood of Occurrence

Scientific Name	Common Name	Status		Habitat Requirements	Likelihood of occurrence	Subject Species?
		TSC Act	EPBC Act			
Pyrrholaemus sagittatus (Chthonicola sagittata)	Speckled Warbler	V		Lives in a wide range of eucalypt dominated communities that have a grassy understorey, often on rocky ridges or in gullies. Typical habitat would include scattered native tussock grasses, a sparse shrub layer, some eucalypt regrowth and an open canopy.	Potential to occur. This species has been recorded from the SMP and suitable habitat occurs in the study area	Yes
Rostratula australis	Australian Painted Snipe	E1	V	Inhabits fringes of shallow inland wetlands, swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber.	Potential to occur. Wetland habitat is present in study area	Yes
Stagonopleura guttata	Diamond Firetail	V		Found in grassy eucalypt woodlands, including Box-Gum Woodlands and Snow Gum Eucalyptus pauciflora Woodlands	Potential to occur. Suitable habitat is present in the study area.	Yes
Stictonetta naevosa	Freckled Duck	V		Associated with a variety of plankton-rich wetlands, such as heavily vegetated, large open lakes and their shores, creeks, farm dams, sewerage ponds and floodwaters	Potential to occur. Wetland habitat is present in the study area.	Yes
Tringa glareola	Wood Sandpiper		C, J, K	Uses well-vegetated, shallow, freshwater wetlands, such as swamps, billabongs, lakes, pools and waterholes	Potential habitat does occur in study area. Species favours Western Australia so Unlikely to occur	Yes

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table 3.2 Threatened Fauna recorded in the Locality and the Assessment of the Likelihood of Occurrence

Scientific Name	Common Name	Status		Habitat Requirements	Likelihood of occurrence	Subject Species?
		TSC Act	EPBC Act			
Tringa nebularia	Common Greenshank		C, J, K	Occurs in sheltered coastal habitats, typically with large mudflats and saltmarsh, mangroves or seagrass	Unlikely to occur. Favoured habitat is not present in study area	No
Tyto novaehollandiae	Masked Owl	V		Occurs mainly in large areas of forests. Roosts in large hollow	Unlikely to occur. Dense forest habitat is not readily available in Western Sydney and there is a lack of records in the locality. Very limited breeding habitat is available due to the lack of large trees with hollows.	No
Tyto tenebricosa	Sooty Owl	V		Sooty Owls are associated with tall wet old growth forest on fertile soil with a dense understorey and emergent tall Eucalyptus species. Pairs roost in the daytime amongst dense vegetation, in tree hollows and sometimes in caves. Typically associated with an abundant and diverse supply of prey items and a selection of large tree hollows	Unlikely to occur. No suitable habitat such as wet old growth forest is present in the study area, and no large trees with hollows are present.	No
Mammals						

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table 3.2 Threatened Fauna recorded in the Locality and the Assessment of the Likelihood of Occurrence

Scientific Name	Common Name	Status		Habitat Requirements	Likelihood of occurrence	Subject Species?
		TSC Act	EPBC Act			
Chalinolobus dwyeri	Large-eared Pied Bat	V	V	Frequents low to mid-elevation dry open forest and woodland close to caves (near their entrances), crevices in cliffs, old mine workings and in the disused, bottle-shaped mud nests of the Fairy Martin (Hirundo ariel). Probably forages for small, flying insects below the forest canopy	Potential to occur. May forage over the study area however no suitable roosting habitat such as caves, cliffs or mines are present in the study area.	Yes
Dasyurus maculatus	Spotted-tailed Quoll	V	E	Occurs in wide variety of habitats in large remnants. Dens in tree hollows, hollow logs or rock crevices	Potential to occur. Woodland habitat is present in the study area as are habitat resources such as hollow logs.	Yes
Falsistrellus tasmaniensis	Eastern False Pipistrelle	V		Usually roosts in tree hollows in the higher rainfall forests within its range.	Potential to occur. May forage over the study area however no suitable roosting habitat is present in the study area.	Yes
Miniopterus orianae (formerly schreibersii) oceanensis	Eastern Bentwing-bat	V		Forages above the canopy and eats mostly moths. Roosts in caves, old mines, road culverts	Potential to occur. May forage over the study area however no suitable roosting habitat such as caves or mines are present in the study area.	Yes
Mormopterus norfolkensis	East-coast Freetail-bat	V		Inhabits dry and wet sclerophyll forests, coastal woodland. Roosts in tree hollows and buildings. Have been found roosting under the bark of trees.	Potential to occur. May forage over the study area and suitable roosting habitat is present in the study area.	Yes

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table 3.2 Threatened Fauna recorded in the Locality and the Assessment of the Likelihood of Occurrence

Scientific Name	Common Name	Status		Habitat Requirements	Likelihood of occurrence	Subject Species?
		TSC Act	EPBC Act			
Myotis macropus	Southern Myotis	V		Known from a range of habitats close to water from lakes, small creeks to large lakes and mangrove lined estuaries	Potential to occur. Aquatic foraging habitat is present in the study area.	Yes
Petaurus australis	Yellow-bellied Glider	V		Patchily distributed in wet sclerophyll forest	Unlikely to occur. No wet sclerophyll forest is present in the study area.	No
Petaurus norfolcensis	Squirrel Glider	V		Associated with dry hardwood forest and woodlands. Habitats typically include gum barked and high nectar producing species, including winter flower species. The presence of hollow bearing eucalypts is a critical habitat value	Potential to occur. Woodland habitat is present in the study area.	Yes
Petrogale penicillata	Brush-tailed Rock-Wallaby	E1	V	Inhabit rocky escarpments, outcrops and cliffs with a preference for complex structures with fissures, caves and ledges facing north.	Unlikely to occur. No suitable habitat present on site	No
Phascolarctos cinereus	Koala	V		Widespread in sclerophyll forest and woodlands. Requires relatively large home ranges.	Potential to occur. Potential habitat occurs in the study area however this species has not been recorded. The habitat on the study area is relatively isolated and it is not likely to form part of a home range of a koala.	Yes

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table 3.2 Threatened Fauna recorded in the Locality and the Assessment of the Likelihood of Occurrence

Scientific Name	Common Name	Status		Habitat Requirements	Likelihood of occurrence	Subject Species?
		TSC Act	EPBC Act			
Potorous tridactylus tridactylus	Long-nosed Potoroo	V	V	Inhabits dry/wet sclerophyll forests or coastal heaths with dense understorey and occasional open areas	Unlikely to occur. No wet sclerophyll forest or coastal heath present in the study area	
Pseudomys novaehollandiae	New Holland Mouse		V	Inhabit open heathland, open woodland and vegetated sand dunes in coastal areas and up to 100 km inland on sandstone country up to 900m altitude.	Unlikely to occur. Has very specific habitat requirements that do not occur in the study area	No
Pteropus poliocephalus	Grey-headed Flying-fox	V	V	Roosts in large camps and disperses nightly up to 20km to feed in flowering eucalypts	Potential to occur. No roosting camps are present in the study area however potential foraging habitat is present in the study area.	Yes
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	V		Roosts in tree hollows and buildings; utilises mammal burrows in treeless areas. Forages in most habitats across its very wide range, with and without trees; appears to defend an aerial territory	Potential to occur. May forage over the study area and some roosting habitat is available.	Yes
Scoteanax rueppellii	Greater Broad-nosed Bat	V		Usually in tall wet forest, extending into drier forest along gullies. Forages along forest edges. Roosts in tree hollows	Has been recorded, despite the lack of optimal wet forest habitat present in the study area.	Yes

Key: E/E1 = Endangered, E2 = Endangered population, E4A = Critically Endangered, V = Vulnerable, C - China-Australia Migratory Bird Agreement (CAMBA), J - Japan-Australia Migratory Bird Agreement (JAMBA), K - Republic of Korea - Australia Migratory Bird Agreement (ROKAMBA), M = Migratory species.

Survey

This chapter presents the background of ecological studies in the subject area, details of the procedures for the current surveys undertaken for the purposes of this SIS and the results of past and current surveys in relation to flora and fauna, vegetation communities and mapping and the occurrence of any threatened species, in accordance with DGRs 4.1; *Requirement to Survey* and 4.2; *Documentation.*

4.1 Survey Background

4.1.1 Historical Surveys

The Former ADI Site and its surrounds have been subject to detailed flora and fauna studies since the area was rezoned in 1993. There has been considerable ecological survey effort within the locality of the Western Precinct in recent times for baseline data by Government and Industry. The contemporary studies completed within the Western Precinct and within the locality were reviewed, including unpublished reports prepared for OEH on the flora and fauna of both the Western Precinct and adjacent Regional Park. The reports utilised to inform this SIS include:

1 ERM (2000) Assessment of the Implications of Development for Land Registered on the National Estate at St Marys NSW Report to ComLand Limited Environmental Resources Management Australia, Sydney.

2. Gunninah (1991) **Australian Defence Industries (ADI) Site, St Marys, Fauna Survey** Gunninah Environmental Consultants, Sydney.

3. Gunninah (1995) **Australian Defence Industries St Marys Planning Study: Flora and Fauna Issues** Gunninah Environmental Consultants, Sydney.

4. Cumberland Ecology (2004a) **St Mary's Eastern Precinct: Fauna and Fauna Assessment for Proposed Lot 2 and Lot 5 Development Applications** Cumberland Ecology, Sydney.

5. Cumberland Ecology (2004c) **Stage 1 Subdivision, St Mary's Eastern Precinct: Part Lot 2 DP 1038166 Species Impact Statement** Cumberland Ecology, Sydney.

6. Cumberland Ecology (2005) **St Marys North and South Dunheved Precincts Plan: Biodiversity Assessment** Cumberland Ecology, Epping.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

7. NPWS (2000a) **The Native Vegetation of the Cumberland Plain, Western Sydney: Technical Report** NSW National Parks and Wildlife Service, Hurstville.

8. DUAP (2001) **Sydney Regional Environmental Plan No. 30: St Marys** Department of Urban Affairs and Planning, Sydney.

9. DUAP (2001) **St Marys Environmental Planning Strategy 2000** Department of Urban Affairs and Planning, Sydney.

10. Perkins, I. (1999) **Flora Assessment of the Disputed Areas of Western Sydney Shale Woodlands** Ian Perkins Consultancy Services, Sydney.

11. Cumberland Ecology (2009c) **St Marys Property - Western Precinct: Biodiversity Assessment** Cumberland Ecology, Epping.

12. Cumberland Ecology (2004 – 2014) **Analysis of the Response of Cumberland Plain Woodland to Grazing by Macrofauna on the SMP: Floristic and Structural Changes (one – nine) years after grazing exclosure**. Cumberland Ecology, Epping.

13. Cumberland Ecology (2012b) **Village 4 development of Jordan Springs in the Western Precinct, St Marys Property: Species Impact Statement**. Cumberland Ecology, Epping.

14. Cumberland Ecology (2012a) Riparian Corridor Development of Jordan Springs in the Western Precinct, St Marys Property: Species Impact Statement. Cumberland Ecology, Epping.

4.1.2 Recent Surveys

The contemporary ecological study was initially intended to update existing knowledge of the biodiversity values within the Western Precinct in line with legislative changes, current survey guidelines and new protected species listings. Detailed surveys were completed in 2011 to provide baseline flora and fauna data for the Western Precinct in compliance with the OEH guidelines for flora and fauna survey (DEC (NSW), 2004). Additional flora surveys were conducted in 2012 to supplement data collected in the previous year.

i. Vegetation Surveys

Vegetation mapping has previously occurred within the Western Precinct and across the whole St Mary's Property. However the increasing importance placed by government agencies on the conservation of CEECs and in particular the up-listing of Cumberland Plain Woodland from endangered to critically endangered under the TSC Act and EPBC Act (although the EPBC Act status is not applicable for the SMP) directed the need for current floristic surveys.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

ii. Targeted threatened species surveys

Based on the identification of subject species from assessment of species records and the habitats present (Chapter 3), targeted surveys were conducted for the following threatened species groups:

- Shrubs and herbs associated with Cumberland Plain Woodland (in particular *Pimelea spicata* and *Grevillea juniperina subsp juniperina*);
- Cumberland Plain Land Snail;
- Microchiropteran bats; and
- Diurnal birds.

4.2 Survey Methods

4.2.1 Terrestrial Survey

i. Dates of Survey

The most recent surveys built upon an existing database of flora and fauna information that included data from the 1990s and 2000s. Recent surveys are also available from nearby areas of the Western Precinct, being those undertaken to inform flora and fauna assessments in the Eastern Precinct. A summary of earlier surveys is provided within **Appendix B**.

The detailed field surveys within the study area took place over the 2011 Autumn period and are summarised in **Table 4.1**. Both floristic and faunal surveys were conducted throughout this survey period. Additional flora surveys and threatened species searches were conducted within the study area on 22 – 23 February, 15 March 2012 and 29 April 2013 to supplement data collected in the previous years. Additional surveys within the subject site were conducted on 8 August 2013.

Further targeted flora surveys and fauna habitat assessments were also conducted along a road easement within the Regional Park, between the Central and Western Precincts on 2 August 2012.

Table 4.1 Dates of Field Surveys

Dates of Survey	Tasks completed
April 14, 2011	Flora Quadrats, targeted threatened flora searches
April 22, 2011	Flora Quadrats, targeted threatened flora searches

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table 4.1 Dates of Field Surveys

Dates of Survey	Tasks completed
April 27-29, 2011	Diurnal bird surveys, snail searches, targeted threatened flora searches
May 2, 2011	Flora Quadrats, targeted threatened flora searches
February 22-23, 2012	Flora Quadrats, targeted threatened flora searches.
March 15, 2012	Flora Quadrats, targeted threatened flora searches.
August 2, 2012	Targeted threatened flora searches, fauna habitat assessment
April 29 2013	Flora quadrats
August 8 2013	Flora quadrats, threatened flora searches

ii. Flora Survey

a. Vegetation Mapping of the Western Precinct

Vegetation maps provided by DECC in the Mapping of the Cumberland Plain (2007) and ground-truthing that was undertaken by Cumberland Ecology in 2007-2008 to inform the Western Precinct Biodiversity Assessment (Cumberland Ecology, 2009c) were used in the first instance to map the vegetation of the St Marys Property. This survey data formed a basis of the current investigation, although the survey methods used varied from those used in previous and current surveys.

Preliminary quadrat data in relation to Flora and Fauna assessments was collected in 2009 – 2010. Extensive flora surveys were conducted specifically for the purposes of SIS reports for development applications within the subject land, through Quadrat sampling (20m x 20m) between 27 April and 2 May 2011. Additional sampling was conducted using the same methods, in other parts of the subject land on 22 – 23 February, 15 March 2012, 29 April 2013 and 8 August 2013. The quadrats were located within all classes of the vegetation communities present in the study area both to supplement previous survey data and to compare data collected in the same survey season and using the same methodology. Analysis of the data was used to characterise vegetation map units by their species composition and community structure.

The resultant information was synthesised using Geographical Information Systems (GIS) to create a spatial database that was used to interpret and interpolate the data to produce a vegetation map of the Western Precinct. Mapping was completed using MapInfo Version 11.0.4 (Pitney Bowes Software Inc., 2010) on a Windows 7 platform.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

b. Floristic Census and Targeted Surveys

The flora assemblage within the Western Precinct was recorded by quadrat sampling and through targeted searches for threatened species. The Subject Site and adjacent areas were traversed extensively during the 2011 and 2012 surveys. Nonetheless, an additional survey of the subject site was conducted on 8 August 2013 to determine current conditions of vegetation within the subject site in light of recent development in adjacent areas.

The locations of all threatened species detected within the traverses during the 2011 - 2013 surveys were recorded, with estimates of the population size made. All vascular plants recorded or collected were identified using keys and nomenclature provided in Harden (1990-1993). Additionally, Richardson *et al (2006)* (2006) was used to assist identification of selected plant taxa. Where known, taxonomic and nomenclatural changes have been incorporated into the results, as derived from *PlantNET (Botanic Gardens Trust, 2014)*. Any specimens that were not readily identifiable were lodged for identification with the National Herbarium of NSW at the Royal Botanic Gardens, Sydney.

c. Quadrat Sampling

A total of 59 quadrats were sampled across the 2009 - 2013 survey periods in 20 x 20 metre plots. The locations of these quadrats were chosen so that sampling was conducted in areas most representative of the condition and composition of the vegetation patch. The quadrat locations are shown in **Figure 4.1**. Flora quadrat data is provided in Appendix C. In each quadrat, the following information was recorded as a minimum:

- All vascular flora species present within the plot or directly adjacent to the plot;
- The stratum in which each species occurred;
- The relative frequency of occurrence of each plant species;
- Vegetation structural data (i.e. height and percentage cover of each stratum);
- A waypoint to mark the location of the quadrat, using a handheld GPS; and
- Photographs of the quadrat.

The relative abundance and cover of each species within the quadrat was approximated using a scoring system based on the Braun-Blanquet scoring system (Braun-Blanquet, 1927). The scores used are provided in **Table 4.2**.

Table 4.2 Modified Braun-Blanquet scores used in Quadrat surveys

Class	Cover-abundance	Notes
+	Rare (less than 1 % cover)	Herbs, sedges and grasses: within 4 m2 Shrubs and small trees: less than 5 individuals.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

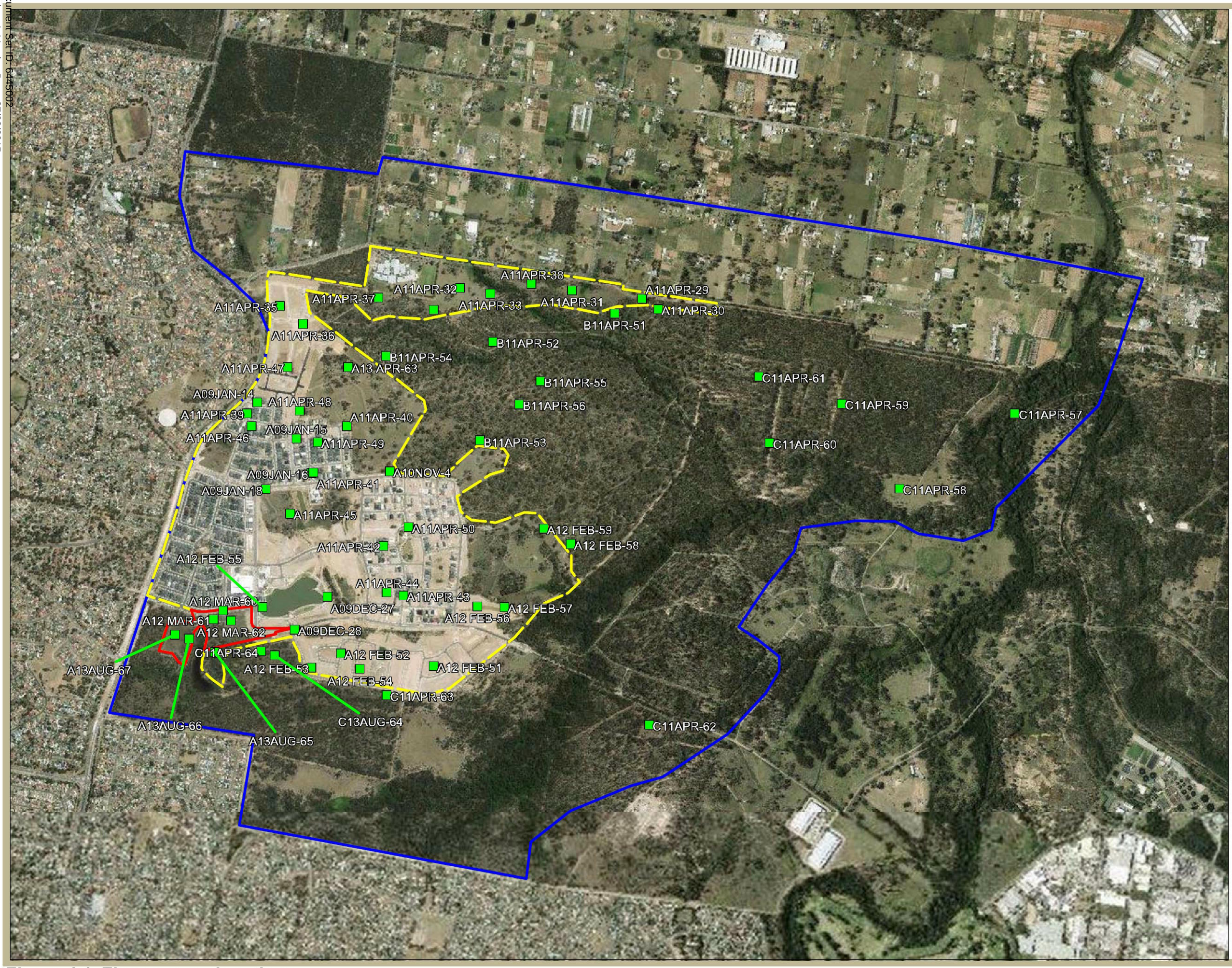
Table 4.2 Modified Braun-Blanquet scores used in Quadrat surveys

Class	Cover-abundance	Notes
1	Few Individuals (less than 5 % cover)	Herbs, sedges and grasses: within 20 m2 Shrubs and small trees: 5 or more individuals Medium - large overhanging tree.
2	5 - less than 25 % cover	-
3	25 - less than 50 % cover	-
4	50 - less than 75 % cover	-
5	75 - 100 % cover	-

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Document Set ID: 6445602
Version: 1, Version Date: 27/02/2015

Coordinate System: MGA Zone 56 (GDA 94)



Legend

- Subject Site
- Subject Land
- Study Area
- Quadrat Location

Grid North

Image Source:
Image © SIX Maps
(dated 17-1-2014)

CUMBERLAND ECOLOGY

I:\...\13092\Figures\RP2_SIS\20141202\Figure 4.1

Figure 4.1. Flora survey locations

250 0 250 500 750 1000 m

iii. Fauna survey

Fauna surveys were conducted during the 2011 survey period, where possible, in accordance with OEH guidelines for ecological assessment (DEC (NSW), 2004). Due to the extensive nature of these surveys, further surveys in 2012 and 2013 were deemed unnecessary and further fauna assessments in 2012 – 2013 were limited to verifying current conditions from previous habitat assessments.

As OEH survey guidelines are based upon stratification units, the Western Precinct was stratified using vegetation units as a surrogate for fauna habitat and survey effort was allocated accordingly. This was determined to constitute the following units:

- Sparse regenerating woodland and grassland (referred to as area A, being the subject land);
- Regenerating woodland (continuous) (referred to as area B, being the regrowth woodland added to the Regional Park since 1990); and
- Mature Woodland (referred to area C, being the established mature woodland of the Regional Park).

A summary of sampling method and effort used are provided in **Table 4.3**. Fauna survey locations are shown in **Figure 4.2**.

Table 4.3 Fauna Survey Methods and Effort (Cumberland Ecology 2011)

Survey Method	CE Survey Effort in Western Precinct
Amphibians	
Opportunistic call detection	Throughout survey period
Reptiles	
Opportunistic sightings	Throughout survey period
Diurnal Birds	
Walking transects	9 Hours (3 hours at 3 sites)
Opportunistic sightings	Throughout survey period
Nocturnal Birds	
Day habitat search	Throughout survey period
Non-flying Mammals	
Search for scats and signs	5 hours

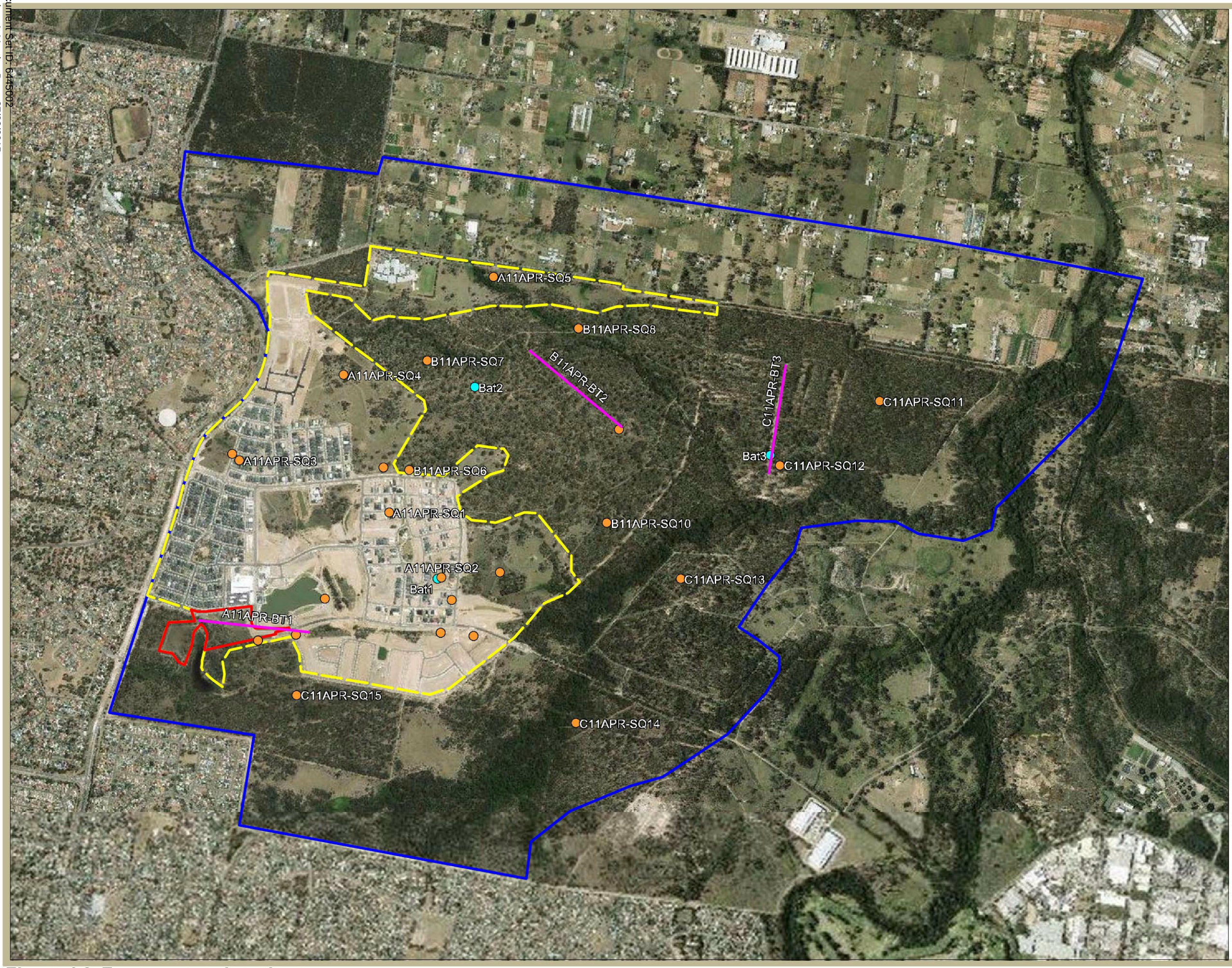
Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table 4.3 Fauna Survey Methods and Effort (Cumberland Ecology 2011)	
Survey Method	**CE Survey Effort in Western Precinct**
Bats	
Ultrasonic call recording	6 nights
Snails	
Active habitat searches (spot assessment method)	300 sites

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Document Set ID: 6445602
Version: 1, Version Date: 27/02/2015

Coordinate System: MGA Zone 56 (GDA 94)



Legend

- Subject Site
- Subject Land
- Study Area

Survey Locations

- Cumberland Plain Land Snail
- Search Centre Point
- Anabat
- Bird Transect

Grid North

Image Source:
Image © SIX Maps
(dated 17-1-2014)

CUMBERLAND ECOLOGY

I:\...\13092\Figures\RP2_SIS\20141204\Figure 4.2

Figure 4.2. Fauna survey locations

250 0 250 500 750 1000 m

a. Bat Surveys

Microchiropteran bats (microbats) were surveyed through the use of Anabat Z-caim units to record ultrasonic bat recordings.

Anabat Z-caim units were employed during the survey to record calls of microbats and were left at each survey location for two nights. Anabats were set before dusk each evening and set to automatically switch off after dawn. Calls recorded on each anabat were analysed to determine which species were present within the Study area.

b. Diurnal Bird Surveys

Visual observation and call identification of diurnal birds was carried out during each survey period. Dawn surveys were conducted at several points throughout the Western Precinct, and in the adjacent Regional Park, through the use of 500m walking transects over a 1 hour time period. Stops were made throughout the transects to positively identify birds, and detect cryptic species in the vegetation adjacent to the transect. Diurnal birds were also identified and recorded as they were encountered throughout the Western Precinct during the survey periods. GPS readings were taken near sightings of any threatened bird species.

c. Incidental Observations

Any incidental vertebrate fauna species that were heard calling, observed or otherwise detected on the basis of tracks or signs during 2011 fauna surveys and the August 2012 traverses were recorded and listed in the total species list for the subject site. Incidental records of threatened flora and fauna from areas adjacent to the study area have also been included.

d. Cumberland Plain Land Snail Assessment –Spot Assessment Technique

A survey of Cumberland Plain Land Snail activity was conducted based on an adaption of the methodology known as the Regularised Grid-Based Spot Assessment Technique (RGB-SAT) protocol developed by Biolink (Biolink, 2008), generally used to detect Koala scats. The spot assessment technique did not adhere strictly to a grid based protocol, but rather sampled five representative sites within each zone, at approximately equal spacing's from each site.

A total of 15 sampling points were taken, with five occurring in the Western Precinct, five occurring within the 'Perkins Peninsula' and five occurring within the Regional Park. Searches of five minutes in duration were made within the one metre of each of 20 trees for either live snails, or snail shells. Where there was no suitable habitat present, an appropriate habitat tree within a 100m radius of the sampling point was chosen. Trees that were targeted were those which provided suitable habitat for the species, predominantly those with a DBH of over 10cm and having a layer of bark around their base Typical species included *Eucalyptus moluccana* (Grey Box) and to a lesser extent *Eucalyptus tereticornis* (Forest Red Gum).

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

iv. Habitat Assessment

The characteristic attributes of different types of fauna habitat generally influences the assemblage of fauna species that can be found within each habitat and also affects the general value of the habitat for fauna. The Western Precinct contains three broad habitat types that vary in their value for fauna. These are:

- Remnant woodland and open forest;
- Riparian vegetation associated with minor tributaries and drainage lines;
- Young regenerating woodland; and
- Grassland.

Habitat condition was assessed during the 2011 surveys and the August 2012 surveys by noting ground and canopy cover, number and size of hollows present, habitat features such as bush rock and fallen trees, and signs of fauna usage such as scats and scratches.

Fauna habitat assessments also included consideration of important indicators of habitat condition and complexity including the occurrence of microhabitats such as tree hollows, fallen logs, bush rock and wetland areas such as creeks and soaks. An assessment of the structural complexity of vegetation, the age structure of the forest and the nature and extent of human disturbance throughout the Western Precinct was undertaken and considered.

a. Hollow Assessment

Hollows are used as a general indication of habitat quality for arboreal fauna, and hollow-dependent birds and bats. Hollows observed during surveys were recorded and the general vegetation condition and tree maturity were used to predict whether trees on site are likely to contain hollows. Indirect indicators of fauna use of the site such as droppings, diggings, footprints, scratches, nests, burrows, paths and runways were also noted.

A regularised hollow assessment was also conducted at each of the 15 sampling points used for the above Cumberland Plain Land Snail assessment described above. At each sampling point, searches for hollow-bearing trees were made within a 20m x 20m quadrat. For each quadrat the number of hollows and size class of hollows were recorded. Hollow size classes are defined in Table 2.5 below. Data obtained was used to give an indication of the availability of habitat for arboreal fauna, and hollow-dependent birds and bats.

Table 4.4 Tree Hollow Size Class

Class	Diameter (cm)
Small	<10
Medium	10>-<30
Large	>30

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

4.2.2 Statistical Analyses

Percentage composition of native and exotic flora species in the different study areas from current and previous surveys were calculated and plotted in Microsoft Excel. Flora data was further analysed using the statistical program PRIMER Version 6 (Clarke and Gorley, 2006). Similarity matrix dendograms were produced (CLUSTER) and analysed using SIMPER (Similarity percentages) tests to determine levels of similarity between different groups of quadrats. Separate CLUSTER and SIMPER analyses were conducted for the native and exotic species data sets in addition to the analyses for the complete set of flora data. This information was used as part of the analysis to separate out various condition classes of vegetation.

Differences in Cumberland Plain Land Snail numbers between the different areas were analysed using the Statistical software package, MyStat. Data was tested for normality and homogeneity of variance and then analysed using either Analysis of Variance (ANOVA) or Kruskal-Wallis (K-W) tests in the event that ANOVA requirements were not met even after data transformations. Mann-Whitney U-tests were used for post-hoc pair wise comparisons between areas for the K-W tests. As U-tests are not typical post-hoc tests, a Bonferroni adjustment was applied to the level of significance to avoid Type I errors. As three comparisons were run, this reduced the standard 0.05 level of significance to 0.017 (0.05/3).

4.2.3 Weather Conditions for Surveys by Cumberland Ecology

This report draws upon information collected by numerous ecologists over many years, including studies done across the 900ha Regional Park and both the Western and other Precincts. Surveys have therefore been conducted in all seasons and in a wide variety of weather conditions. This means that the resultant database of ecological information is detailed and reliable.

Weather conditions during surveys by Cumberland Ecology were generally appropriate for detection of a wide variety of flora and fauna, and due to high rainfall in Autumn 2011, were generally very good for flora survey.

A summary of weather conditions in the locality of the Western Precinct during the 2011 surveys is provided in Table 4.5. Weather conditions during the survey period stayed predominantly cool to mild, with the daily maximum temperature varying from 18.3°C to 25.7°C. Two days saw rainfall, with most other days being overcast but remaining dry.

Conditions leading up to and during the survey period (14 April- 2 May, 2011) were generally warm, with some isolated rainfall. This rainfall created boggy conditions within the drainage lines across the Western Precinct.

Table 4.5 Summary of Weather Conditions during 2011 survey period

Date	°C min	°C max	Rain (mm)
14/04/2011	9.9	24.1	0

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table 4.5 Summary of Weather Conditions during 2011 survey period

Date	°C min	°C max	Rain (mm)
22/04/2011	12	25.7	0
27/04/2011	14.5	18.9	5.4
28/04/2011	14.1	20.1	0.4
29/04/2011	13.9	20.8	2.8
02/05/2011	9.9	18.3	0

4.2.4 Survey Limitations

Adequate ecological data exists for the assessment of the ecological impacts for the Project. There are no significant limitations to the data available.

The flora and fauna of the study area, the SMP and immediate surrounds have been subject to a series of surveys over many years. Consequently, the ecology of the Western Precinct and indeed the flora and fauna of the locality is well known. There is an excellent baseline of flora and fauna data, including vegetation mapping, and information about individual species.

The SMP and its surrounds have been subject to detailed flora and fauna studies since the area was rezoned in 1993. There has been considerable ecological survey effort within the locality of the Western Precinct in recent times for baseline data by Government and Industry. The contemporary studies completed within the Western Precinct and within the locality were reviewed, including unpublished reports prepared for OEH on the flora and fauna of both the Western Precinct and adjacent Regional Park. These included vegetation community mapping, targeted threatened species surveys listed in Section 4.1.1 above.

At the time of 2011, 2012 and 2013 surveys by Cumberland Ecology, and in the months before, the weather conditions had been favourable for plant growth and reproduction. Features such as flowers and fruits required for identification of most plants to species level was available. Grasses, herbs and creepers were readily identifiable in most instances.

A range of threatened flora species are known to occur in the locality, and the SMP. The majority of these threatened flora were not detected in the subject land or study area during the surveys to date. However, the habitats that are present in the subject land and study area have the potential to support the species. For this reason, where potential habitats were present, it was assumed that minor or negligible impacts to the species could occur, despite negative survey results. Species that have been recorded on the subject land are considered as major affected species in this SIS, and are assessed as such.

The comprehensive fauna surveys previously conducted on the SMP were generally undertaken according to OEH guidelines (DEC (NSW), 2004) (despite a number of the historic surveys being prior to this publication date). Targeted fauna surveys conducted for this SIS were not intended as baseline fauna surveys, due to this extensive prior survey data, but were conducted to supplement previous surveys and provide updated data for

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

specific threatened species. The data produced by the surveys is intended to be indicative of the types of species that could occur and not an absolute census of all flora and fauna species of the study area.

4.3 Survey Results

This section presents the results of recent surveys and describes the flora and fauna of the study area of the Western Precinct, taking into account information obtained from previous surveys and surveys undertaken specifically for this Western Precinct Biodiversity Assessment. Particular emphasis has been placed on threatened flora and vegetation communities that have been recorded from the SMP or that could potentially occur.

This addresses the DGRs 4.2; *Documentation* and subsections 4.2.3 *Description and mapping of results of vegetation, flora and fauna surveys*.

Detailed descriptions of each of the communities listed above are provided in the following sections.

4.3.1 Vegetation Communities of the Study Area

Cumberland Plain Woodland (CPW) is the dominant vegetation community occurring in the study area. Across much of the study area, its occurrence ranges from sparse open woodland interspersed with large patches of grassland to more intact, large areas of woodland.

The CPW present in the subject land is dominated by a low quality variant of the community known as CPW Low diversity Derived Native Grassland. The other variants of CPW within the subject land include patches of regenerating and mature CPW. All three variants of CPW are present within the subject site. Detailed descriptions of each of the communities listed above are provided in the following sections.

For the purposes of this SIS, three sampling areas were identified:

- Area A: The subject land, including the more sparse occurrences of CPW present in the study area. The current subject site is included within this area;
- Area B: The Regional Park; including areas of regenerating CPW that are of a similar age to Area A. This area was identified during very early surveys by Perkins as being of higher quality than CPW in Area A, and consequently the woodland was added to the larger 900ha Regional Park; and
- Area C: The Regional Park; including predominantly mature CPW and also RFEF and some patches of grassland that historically experienced higher levels of disturbance than other parts of the Regional Park.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

i. Cumberland Plain Woodland

a. Mature CPW in the Regional Park

The CPW in the central portions of the Regional Park, which has been included in the eastern extent of the study area for the purposes of this SIS, generally contained mature CPW and other woodland types. Quadrats conducted within this variation of CPW in the Regional Park were located within the mature and structurally complex woodland shown as Area C (or Quadrats labelled with C in Figure 4.1). A small number of plots within Areas A and B also conformed to this mature class of CPW. However, not all quadrats in area C conformed to this definition, as open-structured regenerating plots and some grassland plots were also surveyed for comparison with the subject land. .

The canopy of the CPW was open and almost exclusively dominated by *E. moluccana* with soma areas also containing *E. fibrosa* (Broad-leaved Ironbark) and *E. tereticornis* with an average Projective Foliage Cover (PFC) of 10-40%. The Midstorey was also dominated by sparse small trees of *E. moluccana*, *Acacia parramattensis* (Parramatta Wattle) with some areas including *E. tereticornis* with a slightly variable PFC of between 1-5% and occasionally up to 20%. A very sparse to moderate shrub layer was present in most quadrats, dominated by *Bursaria spinosa* (Blackthorn) and *Dillwynia sieberi* (Parrot-pea). The groundcover was dominated by native herbs and twiners typical of CPW; *Brunoniella australis* (Blue Trumpet), *Glossocardia bidens* (Cobbler's Tick), *Phyllanthus virgatus* (a spurge), *Hypochaeris radicata* (Flatweed), *Oxalis perennans*, *Dichondra repens* (Kidney Weed) and *Glycine tabacina* (Love Creeper) and a few exotic herbs also dominant; *Sida rhombifolia* (Paddy's Lucerne) and *Richardia stellaris*. Native grasses were abundant and included: Aristida vagans (Three-awned Spear Grass), *Bothriochloa decipiens/macra* (Pitted Bluegrass/Red Leg Grass), *Chloris ventricosa* (Windmill Grass), *Sporobolus creber* (Slender Rat's Tail Grass) and *Paspalidium distans*.

Exotic groundcover abundance within quadrats was estimated to be approximately 1-20%. Mature CPW with a shrub layer of *Bursaria spinosa* is shown in Photograph 4.1.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015



Photograph 4.1 Mature CPW in the Regional Park

b. Regenerating CPW

Regenerating CPW occurs throughout a large portion of the study area. This variation of the community refers to both the regeneration (often prolific) of sapling and juvenile Grey Box and also the generally reduced diversity of native ground cover species that typify CPW, being a grassy open woodland community, as shown in Photograph 4.2.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015



Photograph 4.2 Regenerating CPW on the subject site

Area B – Regional Park

Quadrats conducted within this variation of CPW that occurs in the Regional Park were located within the dense regenerating woodland shown as Area B (or Quadrats labelled with B) in Figure 4.1. The canopy was very sparse and almost exclusively dominated by *E. moluccana* with an overall Projective Foliage Cover (PFC) of 5-10%. The Midstorey was also dominated by *E. moluccana* with some areas including *E. tereticornis* with a highly variable PFC of between 5-50%. A very sparse shrub layer was present in most quadrats, dominated by *E. moluccana* saplings and occasionally *B. spinosa*. The groundcover was similar to that of mature CPW, described above, although the diversity of native groundcover species was slightly reduced, with several native herbs absent, including; P. *virgatus and O. perennans.*

Several of the herbs and grasses that were recorded to be present, but not dominant, in the Mature CPW were not present in this variation, including the characteristic species; *Lomandra filiformis* ssp. *filiformis* (Wattle Mat-rush), *Plantago debilis* and *Hypochaeris radicata* and some native grasses such as *Sporobolus creber* (Slender Rat's Tail Grass).

This variant of regenerating CPW was estimated to have an exotic ground cover of mostly between 5-10%.

Area A – Subject land

Quadrats conducted within this variation of CPW in the Western Precinct were located within the sparse regenerating woodland shown as Area A (or Quadrats labelled with A) in Figure 4.1. This variant is similar to that described above, although the canopy is generally more

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

open, with a PFC of 5-10% and a native shrub layer is often absent. The species were as above, although the diversity of native groundcover species was reduced, with several of the dominant native herbs absent, including; P. *virgatus, O. perennans.* Several of the herbs and grasses that were recorded to be present, but not dominant, in the Mature CPW were not present in this variation, including characteristic species; *Lomandra filiformis* ssp. *filiformis* (Wattle Mat-rush), *Plantago debilis* and *Hypochaeris radicata* and some native grasses such as *Sporobolus creber* (Slender Rat's Tail Grass).

c. Derived Native Grasslands

Two main forms of grassland are recognised: areas supporting native herbs and some native grasses and areas supporting a far higher concentration of exotic species. Although both forms of grassland are considered to be derived from the past clearing of CPW, the former category is likely to have a higher resilience and is associated with the historically less disturbed portions of the SMP. The photographs below (**Photo 4.3 and Photo 4.4**) indicate the two categories of derived native grassland.

Native dominated DNG

The canopy, midstorey and shrub layers were absent. The native herb layer was similar to that of CPW, although native herbs were less frequent. Dominant native species included herbs and grasses such as *Gnaphalium sp., Wahlenbergia gracilis* (Native Bluebell), *Fimbristylis dichotoma* (Common Fringe-sedge), *Bothriochloa decipens/macra, Sporobolus creber, Eragrostis brownii, Cymbopogon refractus, Aristida ramosa* and *Aristida vagans*. Other dominant species included exotic grasses such as *Setaria parviflora*, *Eragrostis curvula* (African Lovegrass), and *Axonopus fissifolius* (Carpet Grass), as well as exotic herbs such as *Senecio madagascariensis* (Fireweed) and *Conyza bonariensis* (Flaxleaf Fleabane).

Low diversity DNG

The majority of this grassland is within Area A and supports a far higher concentration of weeds than the native dominated sub-category, being dominated by few species of exotic grasses; mainly *Axonopus fissifolius, Paspalum dilatatum, Setaria parviflora and Eragrostis curvula* and also *Cynodon dactylon* (Couch Grass). Exotic herbs were also common and included; *Senecio madagascariensis* and *Hypochaeris radicata*. Native species present include *Fimbristylis dichotoma, Eragrostis brownii, Themeda australis* (Kangaroo Grass) and *Wahlenbergia gracilis*.

Drainage depressions formed from historic soil scraping and the creation of contour banks within the subject land, are generally considered to be part of the grassland category. Due to the high concentration of exotic species, these areas were not considered separately from the more exotic, low diversity variant of CPW derived native grassland described above.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015



Photograph 4.3 **Intact Derived Native Grassland in the north of the Western Precinct**



Photograph 4.4 **Low diversity Derived Native Grassland on the subject land**

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

ii. Shale Gravel Transition Forest

This community occurs predominantly in Area C in the Regional Park, but fragmented patches were found in the subject land.

As the name suggests, this is a transitional plant community which grades into Cumberland Plain Woodland where the influence of gravel soil declines, and grades into Cooks River/Castlereagh Ironbark Forest or Castlereagh Scribbly Gum Woodland where gravel deposits are thick. There is a natural continuum of soil is this spectrum, and it can be difficult to distinguish these communities, towards the centre of the shale-gravel spectrum. In a new critically endangered listing under the EPBC Act, a single community called *Cumberland Plain Woodland and Shale-gravel Transition Forest* is described.

The NSW Scientific Committee description for SGTF includes a slightly different species composition from CPW, based on the local presence of lateritic gravel in the soil (NSW Scientific Committee, 2002c). The community is dominated by *Eucalyptus fibrosa* with *E. moluccana* also occurring less frequently. Shrub species are similar to those found in CPW but more commonly include shrubs from the pea family, including threatened species such as Parrot pea, and has also been observed to contain high numbers of *Grevillea juniperina* subsp. *juniperina*.

Large areas of SGTF occur in the eastern portions of the SMP, mostly to the east of the current study area extent. This community has previously been mapped in the Western Precinct. While floristic data from one quadrat, collated for the preparation of this SIS was strongly consistent with this community, most vegetation patches in the current study site are considered to conform more to the definition of CPW. For the purposes of this SIS, the few patches of SGTF occurring within the subject land have therefore been incorporated within CPW, which is of higher conservation status under the TSC Act.

The SGTF community is therefore considered unlikely to experience significant habitat loss.

iii. River-flat Eucalypt Forest

River-flat Eucalypt Forest (RFEF) has a limited occurrence in the Western Precinct, occurring in a simplified regenerating form in the south east of the Precinct as a 10m wide band either side of a drainage line. Although RFEF has a limited distribution within the precinct, it adjoins more extensive areas of Alluvial Woodland in the Regional Park along the tributary to South Creek.

The subject site and Western Precinct generally does not form part of a natural floodplain, as indicated by ground levels present and the soil scrapes and dug out channels that have been historically formed to direct water flow. Although vegetation in the south of the subject site exhibits some riparian characteristics, the majority of this vegetation is unvaried in composition from the surrounding woodland. Within the study area as a whole, most of the limited native vegetation associated with any drainage channels is more indicative of CPW than a riparian community.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

The occurrence of RFEF vegetation is somewhat fragmented, with the eastern extent being more intact and exhibiting more of the species the indicative of this community. The western extent however, is more closely related to CPW.

Previous quadrat and transect data was used to describe this community in the Western Precinct. The data indicated that the canopy was mostly dominated either by *Eucalyptus tereticornis* (Forest Red Gum) or *Angophora floribunda* (Rough-barked Apple) but also includes *Casuarina glauca* (Swamp Oak) and *Eucalyptus amplifolia* (Cabbage Gum). In the more intact sections, a small tree layer occurs with *Melaleuca linariifolia* and *Acacia floribunda* being present.

The midcanopy was sparse and absent in some areas, but dominated by juvenile *E. moluccana* and *E. tereticornis* trees, *Allocasuarina littoralis* (Black She-oak), *Casuarina glauca* and *Acacia parramattensis* (Parramatta Wattle).

The shrub layer was dense in parts and dominated by saplings of the canopy and midcanopy species including, *Bursaria spinosa*, *Daviesia ulicifolia* and *Grevillea juniperina spp juniperina* and exotic species such as *Phoenix canariensis* (Canary Island Date Palm) and *Ligustrum lucidum* (Large-leaved Privet).

The groundcover was dominated by native grasses, mainly *Aristida ramosa, Chloris ventricosa, Bothriochloa decipiens, Cymbopogon refractus* and *Themeda australis* with exotics *Axonopus affinis, Cynodon dactylon*, and *Chloris gayana* (Rhodes Grass). Herbs were infrequent, but dominated by *Pratia purpurascens* (White Root), *Asperula conferta* (Common Woodruff), *Cyperus gracilis, L. filiformis* ssp *filiformis* (Wattle Mat-rush) and the vine *Desmodium varians* (Tick-trefoil) and exotics *Richardia stellaria*, *Sida rhombifolia* (Paddys Lucerne) and *Verbena officinalis* (Small-flowered Purpletop).

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015



Photograph 4.5 River-flat Eucalypt Forest in the south-eastern part of the study area

As identified by the final determination (NSW Scientific Committee, 2004j), this community typically tends to form mosaics with other floodplain forest communities and treeless wetlands. River-flat Eucalypt Forest, in the form of Alluvial Woodland, is present on the SMP, in association with South Creek and Ropes Creek. The drainage channels present in the study area are currently in a modified and degraded condition, but in the future, their connection with tributaries of South Creek will be enhanced. The regeneration of River-flat Eucalypt Forest and wetland habitats will form part of the Riparian Corridor development, and will therefore increase the current extent of this EEC.

iv. Freshwater Wetlands

a. Sedgeland

Sedgeland, a form of Freshwater Wetlands, occurs in very small localised patches throughout the precinct, generally artificially created by a small scraping of the soil that has resulted in a small depression. These areas usually are too small to warrant mapping, being only a few square metres in area and have been included in the grassland mosaic.

These areas of sedgeland have been created by ponding next to a contour bank, which was similar to the other areas of ephemeral ponding, aside from the dominance of native rather than exotic species. The man-made landform is not likely to exist on a natural floodplain and is not mapped as being within the 1:100 year flood zone.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

The identification guidelines for Freshwater Wetlands on Coastal Floodplains, an EEC listed under the TSC Act state that the wetland must be on a natural coastal floodplain that is inundated at least every 100 years (DECC (NSW), 2008). The majority of the subject land is not within the 100 year flood extent. However, based on the species present, it is considered that the EEC is present in a degraded / simplistic form.

An area of sedgeland with an open area of water has been mapped in the centre of the area known as Village 2, as shown in Photograph 4.6. A small ephemeral, wetland area, artificially formed above a contour bank was present at the southern end of the area known as Village 4 as shown in Photograph 4.7. Both of these wetlands occur in areas which are now the subject of approved DAs.



Photograph 4.6 Sedgeland in the subject land (Village 2)

The sedgeland within Village 2 is mostly dominated by *Carex appressa, Juncus* sp. and *Persicaria decipiens*. *Triglochin procera* and *Ludwigia peploides* ssp. *montevidensis* occurred within the water. Occasional *Ranunculus inundatus, Philydrum lanuginosum, Ottelia ovalifolia, Paspalum distichum, Cyperus eragrostis, Centella asiatica, Typha orientalis* and *Alternanthera denticulata* also occur. The vegetation within the Village 4 wetland area was dominated by *Cyperus sp., Axonopus fissifolius* and *Eragrostis brownii*. *Goodenia paniculata, Alternanthera denticulata* and *Juncus sp*. occurred occasionally along with rare occurrences of *Melaleuca stypheloides* and *Potamogeton sp.* This can be seen in Photograph 4.7.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015



Photograph 4.7 Sedgeland in the subject land (Village 4)

The smaller areas of sedgeland in the Western Precinct formed in scrapes in the soil have minimal conservation value. They provide small areas of habitat to common frog species and water resources for other animals, as well as local provenance plants.

b. Wetland/dam

A large dam occurs in the study area, just to the south of subject site. The dam comprises an arc shaped body of water that follows the local contours and a series of borrow pits from which soil was taken to construct the dam wall. Wetland species occur in the dam as well as the low lying borrow pits but would have only colonised the area since the dam was flooded. The area covered by the current extent of Freshwater Wetlands would have comprised Cumberland Plain Woodland and River-flat Eucalypt Forest prior to construction of the dam. An area at the north-eastern extent of the wetland contains vegetation that could be described as wet meadow.

Sections of this Freshwater Wetland can be seen in Photographs 4.8 and 4.9.

Wetland vegetation in the dam was concentrated at the northern end and mainly comprised *Eleocharis sphacelata* and *Marsilea hirsuta* (Nardoo). *Philydrum lanuginosum* (Frogsmouth)

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

was common, and *Juncus* sp formed a band around the margin and on the dam wall at the overflow zone.

The borrow pit vegetation varied from a small pond with dense *Eleocharis sphacelata* and sparse *Philydrum lanuginosum* and *Potamogeton tricarinarus*, to seepage zones with *Juncus* sp, *Ranunculus inundatus*, *Ludwigia peploides* and *Lythrum hyssopifolia*. Seepage zone vegetation occurred in many of the borrow pits and the south eastern end of the dam wall, that acted as a spillway.

Remnants of the original vegetation communities had regenerated on the slightly higher ground between borrow pit wetland zones. This was largely composed of large *Eucalyptus tereticornis* with *Angophora floribunda* and *Allocasuarina littoralis* (Black She-oak) understorey, and *Bursaria spinosa* shrub stratum with native grass ground cover.

The wet meadow zone was a low lying area that received periodic inundation, but apparently at a frequency less than required for most wetland plant species. It comprised *Microlaena stipoides* grassland with *Juncus* sp., *Persicaria decipiens*, *Centella asiatica* and *Lythrum hyssopifolia* being co-dominant. Common species included: *Ranunculus inundatus*, *Eclipta platyglossa* and exotic Asteraceae. Juveniles of the noxious *Xanthium* sp were recorded in significant numbers in this area. *Cynodon dactylon* was locally dominant, especially at the dry margins except along the northern side. Overall, exotic species ranged from 5-70% of the projective foliage cover of the ground cover in the wet meadow and borrow pit zones.



Photograph 4.8 Freshwater Wetland in the study area

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015



Photograph 4.9 Wetland dam vegetation in Regional Park areas adjacent to the subject site

Large wetlands are uncommon in and around the SMP and are considered to have moderate to high conservation significance. Where wetland species have colonised artificially created habitats, the area is still considered to be a degraded variant of the EEC.

Wetlands have conservation value if they form part of a habitat corridor, provide habitat for aquatic species and resources for birds and mammals, provide habitat for threatened aquatic plants or maintain a seed bank of local provenance plants.

The larger dam and wetland habitat is of high conservation value as it provides potential habitat for native frog species, foraging habitat for wetland bird (local and migratory) species, covers a relatively large area compared with sedgeland formed in scrapes and is connected to other types of habitat through the Regional Park. Some sedgelands and wet meadows that occur around the dam near the precinct also have high conservation value because of the connectivity to the Regional Park habitats.

v. Planted Trees

Areas of planted, non-indigenous trees also occur within the subject land. These mainly consist of rows of *Corymbia maculata* (Spotted Gum) or *Corymbia citriodora* (Lemon-scented Gum) on the western boundary, along the Northern Road. A patch of Spotted Gums was also planted (in approximately 1990) in the south east of the subject land as a scientific trial ((Ian Doyle, Lend Lease, pers comm. 2011). These planted tree areas support an

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

understorey that is consistent with CPW, and therefore have been included in the area of EEC, despite the non-indigenous canopy cover.

4.3.2 Statistical outcomes of vegetation composition comparisons

Statistical analyses of the data found that the subject land (Area A) had a higher exotic species composition (33.96%) than the Regenerating woodland (Area B: 19.92%) or Mature woodland (Area C: 28.13%) areas. These figures provide support to the decision to include the regenerating woodland (Area B) into the Regional Park as the lower exotic species composition is indicative of its higher conservation value. The following figure (Fig 4.3) shows the relative proportions of native and exotic plant species in the different sampling areas.

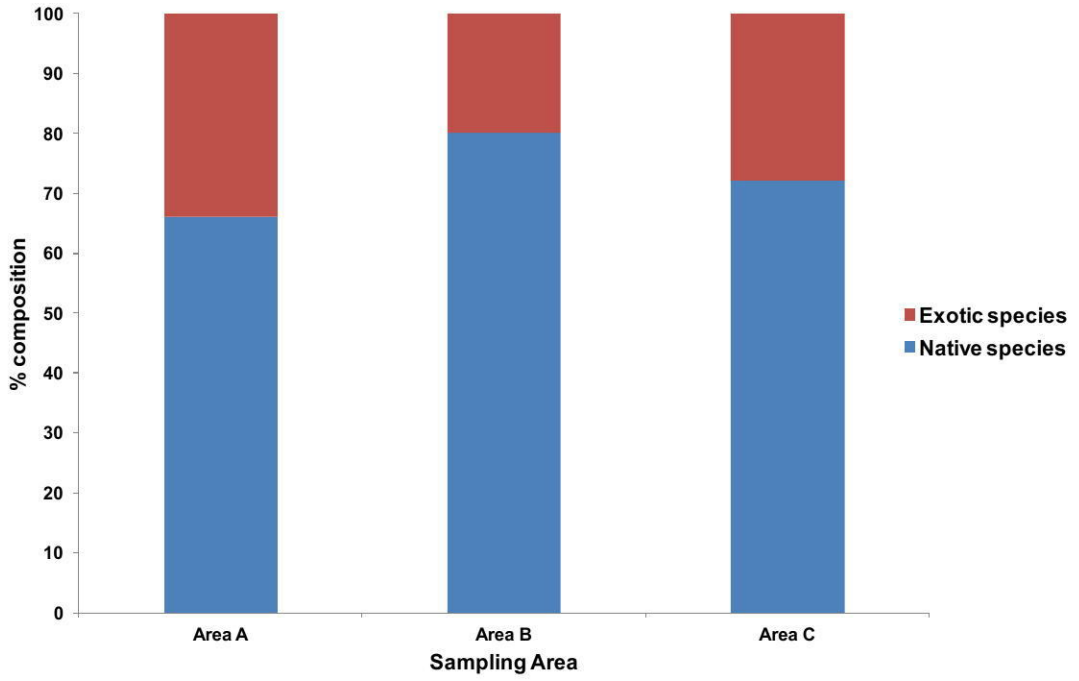


Figure 4.3 Comparison of exotic and native plant composition in the Subject Sites (Area A), regenerating Regional Park Woodland (Area B) and Mature Regional Park Woodland (Area C)

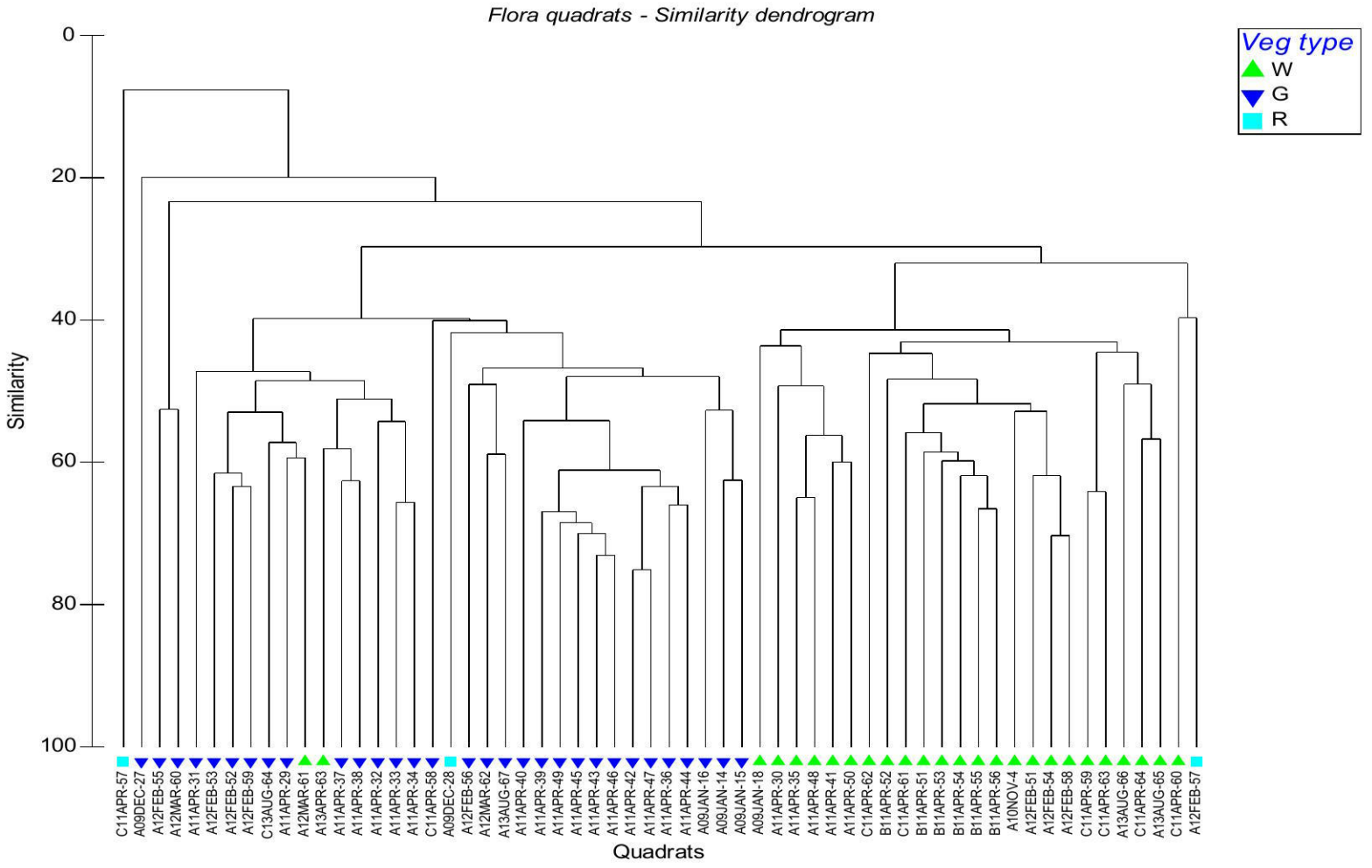
The following similarity dendrogram (**Figure 4.4**) shows that the different quadrats start segregating into groups or clusters at similarity levels of ~10-20%, indicating that plant composition differs between quadrats/habitats. Although all three sampling areas recorded a higher percentage of native than exotic flora species, SIMPER (Similarity Percentage) analyses found that species contribution to the vegetation composition differed between the different sampling areas and between habitat types. Details of similarity levels among similarly classified quadrats and the three primary species contributing to this similarity is provided in **Appendix D**.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Overall Areas A and B showed a 65.18% dissimilarity in their species composition, Areas A and C had a dissimilarity of 72.89% while Areas B and C differed by 60.65%. Grassland and Woodland habitats across the entire study area had a dissimilarity of 71.83%. Riparian habitats had a dissimilarity of 75.15% and 76.85% with grassland and woodland habitats respectively.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015



Key: R = Riparian Vegetation; W = Woodland, G = Grassland,

Figure 4.4 Similarity Dendrogram of all flora species among quadrats

4.3.3 Threatened Flora Species

Numerous flora surveys have recorded a wide diversity of plants from the SMP, including several threatened species. These are *Grevillea juniperina* ssp *juniperina, Pultenaea parviflora, Pimelea spicata, Dillwynia tenuifolia, Micromyrtus minutiflora, Marsdenia viridiflora* ssp *viridiflora* (endangered population), and *Persoonia nutans*. The majority of these species are found in Shale-gravel Transition Forest (SGTF) and Cooks River/Castlereagh Ironbark Forest (CRCIF) in the east of the current study area, where the soil is characterised by large amounts of lateritic gravel. *Pimelea spicata, Marsdenia viridiflora* ssp *viridiflora* are also found in Cumberland Plain Woodland and *Grevillea juniperina* ssp *juniperina* can be found in Cumberland Plain Woodland or grassland areas where there is a gravel influence. The soil type in the Western Precinct is different however, and contains less lateritic gravel, although localised areas contain high proportions of gravel also. Consequently, there is limited habitat for most of the threatened species recorded from the east, except in pockets of similar soil type.

i. Recent surveys of the study area

Two threatened plant species; *Grevillea juniperina* ssp *juniperina,* and *Pultenaea parviflora* have been recorded during the 2011 and 2012 surveys of the Western Precinct. Additionally, several individuals of *Pimelea spicata* have been detected in the past, however the species was not detected within the 2011 and 2012 surveys despite searches in the locations of previous records.

These records are summarised below.

a. *Grevillea juniperina* subsp *juniperina*

Grevillea juniperina subsp. *juniperina* is listed as Vulnerable under the TSC Act. It is a dense shrub, 0.5-1.5m tall, found only in Western Sydney, between St Mary's, Londonderry and Prospect (Robinson, 1991).

No individuals of *Grevillea juniperina* subsp. *juniperina* were recorded within the current subject site. Within the study area, occurrences of *Grevillea juniperina* subsp. *juniperina* were recorded from the northern and southern margins of the precinct, and it is estimated that approximately 700 individuals occur within the precinct. Local population sizes varied from individuals to an estimated 410 plants (Table 4.6). Large areas of habitat for this species are contained within the Regional Park, where over 250,000 *Grevillea juniperina* subsp *juniperina* specimens are estimated to be located (Cumberland Ecology, 2004a) with numerous sub-populations and individuals of the species being detected in the 2011 survey period.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table 4.6 Locations of Grevillea juniperina ssp juniperina populations in the Study Area

Location – AGD 66	Number of plants (estimated)
56 290647 6267154	Over 30
56 289573 6267156	Over 30
56 289340 6266924	Approximately 20
56 290357 6265591	single plant
56 290389 6265714	single plant
56 290388 6265684	approximately 55
56 290276 6267251	less than 10 plants
56 290147 6265572 (and immediate surrounds)	42 (within or directly adjoining the subject site)
56 290344 6265574 (and immediate surrounds)	125 (within or directly adjoining the subject site)
56 289909 6265136	60
56 290064 6265381	40
56 290165 6265290	410
56 289234 6266875	23
56 290181 6267063	50
56 290553 6266991	120
56 290118 6265420	Single plant
56 290435 6265697	Single plant
Total estimated to occur	**1017**

Previous surveys have indicated medium-high densities of this species found in the Regional Park (averaging up to 1300 plants/ha in less fragmented areas, and 750 plants/ha in fragmented areas, and lower densities (200 plants/ha) in development area, as discussed further below and shown in Appendix B.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

b. *Pultenaea parviflora*

Only one occurrence of *Pultenaea parviflora* has been recorded within the Western Precinct. The individual plant was identified in the 2011 survey, and occurred in an area of grassland which is the subject of an approved Development Application. Large areas of habitat for this species are contained within the Regional Park, with numerous populations and individuals of the species being detected in the 2011 survey period.

Table 4.7 Locations of Pultenaea parviflora in the Subject Land

Location – AGD 66	Number of plants (estimated)
56 289601 6266220	single plant

ii. Historic surveys of the study area and SMP

Gunninah Consultants (Gunninah, 1995) and ERM (ERM, 2003) have previously counted threatened plants within quadrats of various sizes that have allowed for extrapolations or counts of threatened plants within the SMP. This has been possible for – *Pultenaea parviflora*, and *Grevillea juniperina* subspecies *juniperina*. The Biodiversity Assessment of the Eastern Precinct (ERM, 2003) of the SMP provided estimates of populations of these species based upon such counts. For the purposes of this SIS, Cumberland Ecology also counted plants on the subject site and within the eastern tip of the Regional Park.

The various counts of threatened plants were done at different times under differing seasonal conditions by different people. The densities of plants counted by Gunninah Consultants were generally the highest (although they did not count *Grevillea*) and it is possible that additional seedlings were present during these counts to inflate the population estimates.

Due to the variation in numbers of plants between the different estimates, this SIS relies upon the lowest most conservative estimates of plant numbers within the Regional Park. The numbers should be interpreted as indicative only and reflect the scale and variability of the populations.

The table below shows the assumed areas of habitat and habitat types for each of the threatened plants in the Regional Park. The table on the following page shows the various population estimates for each of the threatened plant.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table 4.8 Population estimates for Pultenaea parviflora and Grevillea juniperina ssp juniperina within the St Marys Regional Park

Estimated Numbers of P. parviflora and G. juniperina in Regional Park	Surveyors:	Gunninah 1995	ERM 2001/02	ERM 2003	Cumberland Ecology 2004	Max Pop in Reg Pk	Min Pop in Reg Pk
	Plot size in metre square:	200	1000	10	10		
	Plot number:	32	4	91	35		
Pultenaea parviflora	Mean per hectare	436	1,162	1,933	1,371	260,955	58,860
	Standard Error	106	770	325	296	43,875	14,310
Grevillea juniperina subspecies juniperina	Mean per hectare	not counted	467	2,822	714	987,700	249,900
	Standard Error		401	361	156	126,350	214,582

Gunninah 1995 = Gunninah Environmental Consultants report for Pyro Park; ERM 2001/02 = Biodiversity Assessment for Eastern Precinct; ERM 2003 = estimates from Remediation Works Assessment; Cumberland Ecology 2004 = surveys for the Eastern Precinct SIS

iii. Pimelea spicata

Pimelea spicata is listed as Endangered under both the TSC Act and the EPBC Act. It is a summer flowering shrub that grows to 50 cm tall, is erect or somewhat prostrate in habit (NSW NPWS, 2004). *Pimelea spicata* has white, pink-tinged tubular flowers to 10mm long, with four spreading petals (OEH, 2013b). The leaves are opposite and elliptical to 20mm long by 8mm wide. This species was once widespread on the Cumberland Plain, however now it only occurs in two disjunct areas, the Cumberland Plain and the Illawarra. Threats to this species include: loss of habitat to urban development; high frequency fire; and habitat modification such as mowing, grazing and weed invasion. A draft recovery plan has been prepared for this species which identifies the following objectives (DEC (NSW), 2006):

- Conserve *P. spicata* using land use and conservation planning mechanisms;
- Identify and minimise the operation of threats at sites where *P. spicata* occurs;
- Implement a survey and monitoring program that will provide information on the extent and viability of *P. spicata*;
- Provide the community with information that assists in conserving the species;
- Raise awareness of the species and involve the community in the recovery program; and
- Promote research questions that will assist future management decisions.

One population consisting of two individuals of *Pimelea spicata* was historically recorded south of the main east-west road within the Western Precinct. These individuals were not detected during the 2011-2012 surveys. Another population has been historically recorded in the Regional Park, although this population was also not confirmed during the 2011 field surveys.

4.3.4 Fauna Habitats within Study Area

i. Woodland Habitat

The dominant fauna habitat in the Study area is woodland, and this occurs throughout the southern and eastern portions of the study area. The woodland falls within the regional park, and occurs in two distinct growth forms.

- Mature woodland; and
- Regenerating woodland.

All vegetation on the SMP is regenerated vegetation, however the core area of the Regional Park is considered to be mature (regenerated) woodland. The core area has not been cleared within the last 50 years, and therefore has a higher degree of structural complexity than areas of woodland found within the younger regenerating woodland within the Regional Park, or that found within the subject land (refer to Section 4.3.3). The stands of mature trees

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

provide sheltering, foraging, nesting and breeding habitat for most fauna that may occur within the SMP.

The remainder of the Regional Park consists of regenerating woodland. This area occurs to the west of the central portion of the Regional Park, and is sometimes referred to as the "Perkins Peninsula", due to the fact that the area was identified as regenerating Cumberland Plain Woodland by Ian Perkins in his submission to the Australian Heritage Commission (Perkins, 1999). This area has been cleared more recently than other parts of the Regional Park, and therefore consists of less mature woodland, with a greater number of eucalypt saplings occurring within the mid stratum than in the Mature Woodland. This woodland currently provides some feed and shelter habitat, and will, in the future, form a large area of mature woodland.

ii. Grassland Habitats

Grassland areas occur within the study area but represent little value to native fauna, as there is little structural complexity that is necessary to provide roosting or nesting habitat for most species. The grassland areas within the study area may, in the future, regenerate to form additional woodland. Species that commonly occur in the grassland habitats are those that are generally abundant in agricultural areas where the native vegetation has been significantly modified or removed, or they are species that typically favour foraging in grassland. Such species include birds such as the Australian Raven (*Corvus coronoides*), Crested Pigeon (*Geophaps lophotes*), Galah (*Cacatua roseicapilla*), and mammals such as the Eastern Grey Kangaroo (*Macropus giganteus*).

iii. Riparian Habitats

Significant riparian habitat occurs within the wider study area and Regional Park. A tributary of South Creek runs from west to east through the southern end of the subject land and drains into South Creek within the Regional Park. As discussed previously, this drainage line contains some water at most times of the year and therefore provides a water source for native fauna. The wetland in the Regional Park is likely to provide a significant amount of habitat for common native species as it is a permanent source of water and supports significant amounts of fringing vegetation that provides habitat for wetland birds and amphibians.

Smaller areas of ephemeral wetlands occur throughout the Regional Park in low depressions often resulting from a scrape formed in the topsoil. These support common frog species including the Common Eastern Froglet (*Crinia signifera*) and Striped Marsh Frog (*Limnodynastes peronii*).

4.3.5 Fauna Species within the Subject Land

Habitats of value to native fauna in the Western Precinct are generally associated with the largely regrowth woodland that occurs in the east along the border with the Regional Park and as isolated groups of trees across the precinct. However, the value of this vegetation to hollow-dwelling native fauna is limited as the trees are mostly immature and offer limited

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

roosting or nesting habitat. The majority of the woodland habitat that occurs on the SMP will be conserved within the Regional Park.

The extent of disturbance and land management activities has significantly limited the suitability of the Western Precinct to provide habitat for native species. Disturbed habitats generally support populations of native and exotic species that are common in urban/rural environments. Therefore the patches of remnant vegetation in the Western Precinct are not likely to support a wide range of species compared with the Regional Park which contains larger areas not subject to ongoing disturbance.

i. Grassland Habitats

The dominant fauna habitat in the Western Precinct is grassland, and this occurs throughout most of the Western Precinct. Grassland areas are of little value to native fauna, as there is little structural complexity that would provide roosting or nesting habitat for most species. Species that commonly occur in these habitats are those that are generally abundant in agricultural areas where the native vegetation has been significantly modified or removed, or they are species that typically favour foraging in grassland. Such species include birds such as the Australian Raven (*Corvus coronoides*), Crested Pigeon (*Geophaps lophotes*), Galah (*Cacatua roseicapilla*), and mammals such as the Eastern Grey Kangaroo (*Macropus giganteus*).

ii. Woodland Habitats

The woodland communities in the Western Precinct are very limited, and are restricted to remnants occurring along the common border with the Regional Park and patches of regrowth in the middle of the precinct. These areas typically have very little understorey vegetation remaining, and consist mostly of juvenile canopy species. Despite this, flowering eucalypts, paperbarks and smaller shrubs on the subject site are likely to provide some foraging resources for nectivorous mammals and birds. The Sugar Glider (*Petaurus breviceps*) will feed on nectar and pollen when available (Suckling, 1995) and the Common Ring-tail Possum (*Pseudocheirus peregrinus*) will also feed on flowers (McKay and Ong, 1995). Birds such as honeyeaters, would also feed on the nectar resources and several bat species may also forage over or through the canopy (Churchill, 1998).

The woodlands within the Western Precinct consist of predominantly regrowth vegetation and therefore are relatively immature. Few trees are older than approximately 50 years, and as such, show little signs of senescence and generally lack hollows. This significantly limits the nesting habitat available for hollow-dependent fauna such as Sulphur-crested Cockatoos, Galahs and Brushtail Possums. The majority of trees with potential to support hollows are located external to the Western Precinct within the Regional Park.

Extensive areas of woodland habitat occur throughout most of the Regional Park and provide sheltering, foraging, nesting and breeding habitat for most fauna that may occur within the Western Precinct. These habitats are extensive within the SMP and facilitate fauna movement within the property and between external areas of habitat. These habitats will be protected in the long term within the Regional Park.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

iii. Riparian and Wetland Habitats

Riparian habitats are limited in the Western Precinct; however a man-made drainage line runs from west to east near the southern end of the precinct and drains into a tributary of South Creek in the Regional Park. This drainage line contains some water at most times of the year and therefore provides a water source for native fauna. It provides only limited direct habitat for aquatic species however, as it is lined with concrete and has steep sides. Furthermore it lacks aquatic and fringing vegetation that is a prerequisite for most aquatic species' occurrence.

The riparian and wetland habitats in the Regional Park on the other hand are likely to provide a significant amount of habitat for native species. The wetland dam present in the Regional Park near the southern boundary of the Western Precinct is a permanent source of water and contains significant amounts of vegetation on the edges that provide potential habitat for common wading birds and amphibians.

As described for the Study Area, smaller areas of ephemeral wetlands occur in low depressions often resulting from a scrape formed in the topsoil. These support common frog species including the Common Eastern Froglet (*Crinia signifera*) and Striped Marsh Frog (*Limnodynastes peronii*) but have limited connectivity to habitat in the Regional Park.

4.3.6 Fauna Species

A wide variety of fauna species have been recorded from the SMP, and the Western Precinct, including several threatened species. A complete fauna species list for the study area is provided in Appendix C.

i. Non-Flying Mammals

The most common and conspicuous mammals across the SMP, are the Eastern Grey Kangaroo (*Macropus giganteus*) and Red Kangaroo (*Macropus rufus)*. The animals within the SMP are not a naturally occurring population as they were introduced into the area by humans. Population numbers are dynamic but were estimated to be 2,185 animals in May 2007 across the entire SMP (Cumberland Ecology, 2007). A large number of kangaroos occur in the Western Precinct as it provides ideal habitat. These animals are subject to a Macrofauna Management Plan (Cumberland Ecology, 2004b), which is currently being implemented across the SMP and the population has been substantially reduced or retained in particular areas since implementation of the Plan in 2005.

Three arboreal mammals have been recorded within the SMP; the Common Brush-tail Possum (*Trichosurus vulpecula*), the Common Ring-tail Possum (*Pseudocheirus peregrinus*), and the Sugar Glider (*Petaurus breviceps*). The Common Brush-tail Possum and Sugar Glider generally occur in low numbers on the SMP which is likely to be a reflection of the lack of hollow-bearing trees. The Common Ring-tail Possum is more abundant, which is most likely due to its ability to build nests in tree foliage. One native terrestrial mammal has been recorded from the SMP; the Echidna (*Tachyglossus aculeatus*). These species are likely to be found predominantly in the Regional Park where large areas of intact woodland are present.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Several threatened mammals have been recorded within the locality (see Figure 4.2) or have potential habitat within the locality including the Spotted-tailed Quoll *(Dasyurus maculatus maculatus*), Koala (*Phascolarctos cinereus*) and Squirrel Glider (*Petaurus norfolcensis*). No recent, confirmed records for these species have been obtained for the SMP, and it is unlikely that these species occur in the Western Precinct due to the limited availability of habitat.

No koalas were detected in the Western Precinct during recent field investigations, nor were any traces of Koalas found such as scats or scratches on trees. According to members of staff who have worked on the site for many years, including Senior Development Managers Graham Duncan and Bill Mitchell of Delfin Lend Lease, there have been no formal or verified reports of Koalas made within the site. This is consistent with the findings of earlier fauna surveys by Gunninah Consultants and ERM (Gunninah, 1991, ERM, 2003).

Several introduced species have been recorded from the SMP including the European fox (*Vulpes vulpes*), cat (*Felis catus*), dog (*Canis familiaris*), rabbit (*Oryctolagus cuniculus*), Brown hare (*Lepus capensis*), Black rat (*Rattus rattus*) and House mouse (*Mus musculus*). The introduced species are the subject of a Feral and Domestic Animal Management Strategy for the Western Precinct, which includes recommendations for their control.

ii. Bats

Numerous bat surveys have been conducted on the SMP and the species detected during these surveys are indicated in Table 4.10 below. Of the species recorded, several are listed as threatened under the TSC Act and/or the EPBC Act including; the Grey-headed Flying-fox (*Pteropus poliocephalus*), Large Footed Myotis (*Myotis adversus*), Eastern Bentwing Bat (*Miniopterus orianae (formerly schreibersii) oceanensis*), Eastern False Pipistrelle (*Falsistrellus tasmaniensis*), Greater Broad-nosed Bat (*Scoteanax rueppellii*) and East-coast Freetail Bat (*Mormopterus norfolkensis*).

The Western Precinct does not provide suitable habitat for the Southern Myotis (or Large Footed Myotis), as this species forages over open water for fish and insects, using its feet (DEC (NSW), 2005i)(OEH, 2012h). However, the dam and wetland area in the south western section of the Regional Park may provide suitable habitat for this species as it contains a relatively large area of open water where it may forage. This area will be protected for conservation in the long term as it is located in the Regional Park, although some impacts to it may occur due to its close proximity to the Western Precinct.

The Greater Broad-nosed Bat, Eastern False Pipstrelle and East-coast Freetail Bat may have some limited potential roosting habitat on the Western Precinct as they are known to roost in tree hollows (OEH, 2012e; OEH, 2012d; OEH, 2012c). This kind of habitat is limited in the Western Precinct however, as the vegetation is predominantly immature regrowth. A greater number of mature trees are conserved within adjacent areas of the Regional Park. The Greater Broad-nosed Bat has also been known to roost in buildings, and there are several derelict buildings within the study area that may provide habitat for this species.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

The Greater Broad-nosed Bat has only had a possible detection within the regional park, and the East-coast Freetail Bat has been detected within the regional park, but not within the subject land during current surveys. In addition, the Eastern False Pipistrelle has only had a single possible detection within the subject land within the current surveys. These species may forage across the Western Precinct but are not expected to rely upon the vegetation in the precinct.

The Eastern Bentwing Bat has been detected during current surveys, and occurs both within the subject land and the study area. The species utilises caves as its primary roost habitat, and has occasionally been known to utilise man-made structures (OEH, 2012b). Within the subject land, all historical man-made structures have been removed, therefore there in no suitable roost habitat within the subject land, however the species may still utilise the area as a foraging resource.

The Grey-headed Flying-fox (*Pteropus poliocephalus*) is listed as Vulnerable under both the TSC Act and the EPBC Act (OEH, 2012f). This species is the largest Australian bat, and forages on the nectar, fruits and pollen of native trees, and roosts in large aggregations. The Grey-headed Flying-fox has been recorded from the locality and has the potential to forage on the SMP; however no roosting camps are present on the site. There is limited habitat present in the Western Precinct for this species due to the relatively low amounts of native vegetation that is present. The species was not recorded during the current survey period.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table 4.9 Bat survey results

Unit	Date	T. au	M. no	M. sp	C. go	C. mo	F. ta	M. sc	N. sp.	S. ru	S. or	V. re	V. vu	Total Passes
1	27-Apr	C			C	C	Po	C	Po		Po		C	130
2	27-Apr	C	C	Po		C		C	P				C	46
2	28-Apr	P	C	Po	C	Po		C						62
3	27-Apr	C	C	Po	C			C				P		143
3	28-Apr	C	P	Po	C			C		Po	Po			124

Note *Bat Specialist; Glenn Hoye, who has identified the calls recorded on Anabat by Cumberland Ecology, has assigned a confidence level to each species record, depending on call quality and the ease of recognition between subspecies etc. As such,* ***C = Confident, P = Probable and Po = Possible.*** *Abbreviations of species names are defined in Table 4.10. Unit locations are shown in Figure 4.1.*

Table 4.10 Bat survey definitions

Abbreviation	Common	Scientific	Status
T. au	White-striped Mastiff Bat	*Austronomus* (formerly *Tadarida) australis*	P
M. no	East-coast Freetail Bat	*Mormopterus norfolkensis*	V
M. sp	Eastern Freetail Bat	*Mormopterus ridei (formerly sp. 2)*	P
C. go	Gould's Wattled Bat	*Chalinolobus gouldii*	P
C. mo	Chocolate Wattled Bat	*Chalinolobus morio*	P

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table 4.10 Bat survey definitions

Abbreviation	Common	Scientific	Status
F. ta	Eastern False Pipistrelle	*Falsistrellus tasmaniensis*	V
M. sc	Eastern Bent-wing Bat	*Miniopterus orianae (formerly schreibersii) oceanensis*	V
N. sp.	Unidentified Long-eared Bat	*Nyctophilus sp.*	P
S. ru	Greater Broad-nosed Bat	*Scoteanax rueppelli*	V
S. or	Eastern Broad-nosed Bat	*Scotorepens orion*	P
V. re	Southern Forest Bat	*Vespadelus regulus*	P
V. vu	Little Forest Bat	*Vespadelus vulturnus*	P

As indicated by the results in Table 4.10 above, the entire study area is likely to provide habitat for the majority of bat species, including the subject site.

iii. Birds

Within the Western Precinct, the main habitats most suitable for birds are those associated with remnant and regrowth vegetation. However, these areas of regrowth are generally immature and structural diversity is low, thereby limiting the diversity of birds. These kinds of habitats are also rare in the Western Precinct, the main habitat type being open grassland which supports a low diversity of bird species. Within the disturbed grasslands and open woodland, common bird species include the Australian Magpie-lark (*Grallina cyanoleuca*), Australian Raven (*Corvus coronoides*), Eastern Rosella (*Platycercus eximius*), Rainbow Lorikeet (*Trichoglossus haematodus*) and the Noisy Miner (*Manorina melanocephala*). These species are common in urban and rural environments and often out-compete smaller forest birds at the interface with woodland habitats. Emus (*Dromaius novaehollandiae*) are also present in the precinct within the grassland and open woodland areas. Although there are limited habitat areas for small birds, several common birds were recorded in woodland areas including the Weebill (*Smicrornis brevirostris*), Superb Fairy Wren (*Malurus cyaneus*), and the Spotted Pardalote (*Pardalotus punctatus*).

A number of bird species listed under the TSC Act and/or the EPBC Act, including migratory and non-migratory species, have been recorded from the SMP and may utilise habitats within the Western Precinct.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Migratory species that may visit the site to forage include the Swift Parrot (*Lathamus discolour*). The Swift Parrot is listed under both the TSC Act and the EPBC Act as Endangered (OEH, 2014d) and has been recorded from within the locality, although it has not been recorded from the SMP or the Western Precinct. This species may visit the locality as part of a broad foraging area during some years of migration, however, it is far more likely to utilise the Regional Park, which includes a greater diversity of blossoming species.

Lathams Snipe is listed as Migratory under the EPBC Act and was recorded during the 2007 field survey in the dam wetland area, directly adjacent to the Western Precinct in the Regional Park. The wetland areas could potentially provide foraging habitat for this species but this is likely to be limited. As this species is not listed as threatened, further assessments have not been conducted for this species as EPBC Act approval is not required for this proposal.

The Speckled Warbler (*Pyrrholaemus sagittata*) is listed as Vulnerable under the TSC Act and has been recorded at the SMP in 1991 (Gunninah, 1991), and most recently in 2006 by Cumberland Ecology when it was recorded in the western area of the Regional Park. This species forages on the ground in grassy woodlands, and requires large undisturbed remnants in order to persist (OEH, 2012i). The Western Precinct consists predominantly of degraded regrowth woodland that has been highly disturbed. The precinct may constitute some limited potential habitat for this species, although this species is most likely to occur within parts of the Regional Park where there is sufficient shelter in the grass and shrub layers.

The Varied Sittella (*Daphoenositta chrysoptera*) is listed as Vulnerable under the TSC Act and has been recorded at the SMP, specifically in the Regional Park, in August 2012 by Cumberland Ecology. This species inhabits eucalypt forests and woodlands, especially those containing rough-barked species and mature smooth-barked gums with dead branches, mallee and *Acacia* woodland (OEH, 2012j). The Western Precinct consists predominantly of degraded regrowth woodland that has been highly disturbed. The precinct may constitute some limited potential habitat for this species. However, this species is sedentary and is most likely to occur within parts of the Regional Park where there are sufficient mature trees and mallee habitat.

The Diamond Firetail (*Emblema guttata*) is listed as Vulnerable under the TSC Act and was recorded on the SMP in 1991 (Gunninah, 1991), however no subsequent records have been documented. The Diamond Firetail inhabits grassy eucalypt-dominated woodlands, nests in trees and bushes, and forages on the ground (OEH, 2012a). The Western Precinct consists predominantly of degraded regrowth woodland with few areas of shrubs and provides little habitat for this species. Consequently it is considered unlikely that the Diamond Firetail is present in the Western Precinct.

The Black Bittern is listed as Vulnerable under the TSC Act and may have been recorded close to the SMP in 1985 in South Creek near the southern boundary of the SMP (pers comm. Bill Mitchell of Delfin Lend Lease). The Black Bittern is found in wetland areas with permanent water and dense vegetation (OEH, 2014b). There is no suitable habitat for this

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

species within the Western Precinct, although it could potentially occur in permanently wet areas in the adjacent Regional Park including areas of South Creek and Ropes Creek.

Other threatened aquatic birds including the endangered Black-necked Stork (*Ephippiorhynchus asiaticus*), which has been recorded in the locality (see **Figure 3.2**) but not on the SMP, could potentially use the wetland associated with the dam in the south of the study area as it holds permanent water. This area will be protected for conservation in the long-term as it is located within the Regional Park.

Threatened forest and woodland bird species recorded from the locality but not the SMP include: the Regent Honeyeater (*Anthochaera phrygia*), listed as Critically Endangered under the TSC Act (and Endangered under the EPBC Act); Painted Honeyeater (*Grantiella picta*), Square-tailed Kite (*Lophoictinia isura*) and the Glossy Black Cockatoo (*Calyptorhynchus lathami*), all listed as Vulnerable under the TSC Act. These species may forage in the study area from time to time, although this would be likely part of a much bigger foraging range, including the large reserves to the north of the study area. The SMP generally does not contain *Allocasaurina* tree species, and therefore is not likely to be suitable habitat for the Glossy Black Cockatoo.

These species are considered potentially to occur in the Western Precinct on the basis of either previous records in the locality or the occurrence of suitable habitat. If these species do occur on the SMP however, they are considered unlikely to utilise the poor quality habitats of the subject land and would be more likely to occur within the Regional Park which supports large areas of intact native vegetation. This vegetation is to be preserved.

iv. Reptiles and Amphibians

Reptiles that have been recorded at the SMP and that may occur within the Western Precinct include the Red-bellied Black-snake (*Pseudechis porphyriacus*), Eastern Brown Snake (*Pseudonaja textilis*), Bearded Dragon (*Amphibolurus barbatus*) and the Delicate Garden Skink (*Lampropholis delicata*). These species are generally common in open grassland/open woodland habitats.

No threatened reptiles have been recorded on the SMP. The Broad-headed Snake (*Hoplocephalus bungaroides*), listed as Endangered under the TSC Act and Vulnerable under the EPBC Act has been recorded from the locality, however it has not been recorded on the SMP, and is unlikely to occur due to lack of suitable habitat. This species inhabits sandstone escarpments and none are present on the SMP.

One amphibian listed as Endangered under the TSC Act and Vulnerable under the EPBC Act that has been recorded in the locality more than 20 years ago is the Green and Golden Bell Frog (*Litoria aurea*). However, the Western Precinct contains limited areas of wetland that do not contain permanent water and this species is therefore not expected to occur in this precinct. An area of wetland occurs in the south west of the Regional Park, directly adjacent to the Western Precinct and provides potential habitat for the Green and Golden Bell Frog. However, established populations of Mosquito Fish (*Gambusia holbrooki*) are also present in this wetland, which are a known predator of Green and Golden Bell Frog eggs

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

and tadpoles (DEC (NSW), 2005a). Mosquito Fish have been linked to declines in Green and Golden Bell Frog distribution and are likely to limit the suitability of the wetlands to provide habitat for this species. Furthermore, extensive past targeted surveys for this species have failed to detect it and no recent records occur in the locality. The Green and Golden Bell Frog is, therefore, not expected to occur on the SMP.

v. Invertebrates

One invertebrate species listed as Endangered under the TSC Act has been recorded on the SMP, the Cumberland Plain Land Snail (*Meridolum corneovirens*). The Cumberland Plain Land Snail has been found in many areas of Cumberland Plain Woodland on the SMP and many records of the species exist in the surrounding locality. The Cumberland Plain Land Snail was recorded in the Western Precinct during targeted surveys to inform this Species Impact Statement. The following figure shows the relative abundance of the Cumberland Plain Land Snail within the Subject Land and the broader Study Area.

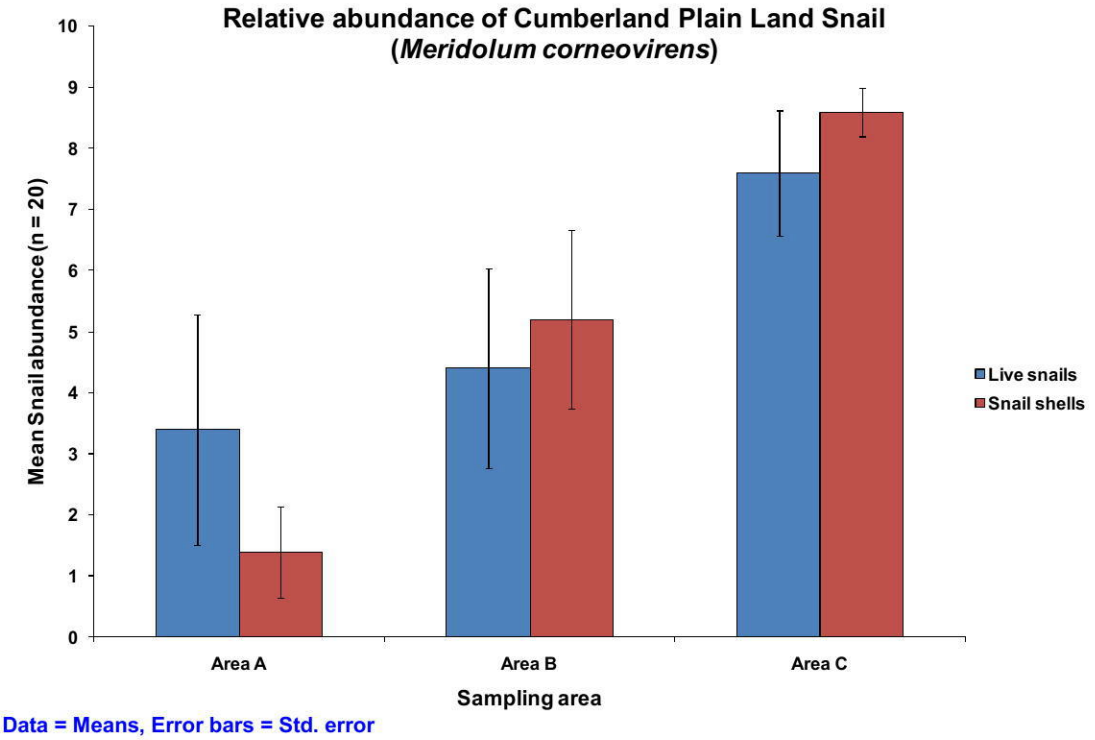


Figure 4.5 Comparative abundance of Cumberland Plain Land Snail within the Subject Land (Area A), regenerating Regional Park woodland (Area B) and Mature Regional Park woodland (Area C)..

The graph shows that there is a relatively lower abundance of the Cumberland Plain Land Snail within the Subject Land (Area A) than the other parts of the broader Study Area (Areas B and C). Statistical analyses confirmed that these differences in total snail numbers (live snails and snail shells) were significant (Kruskal Wallis: H = 6.517, p = 0.012). The Mature woodland area (Area C) had significantly higher numbers of snails than the subject land

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

(Area A) (p = 0.008). No significant differences in snail numbers were found between the Regenerating Woodland area (Area B) and either of the other two areas. Details of the statistical tests conducted are provided in Appendix D.

The significantly higher snail numbers in Area C shows that the species is well conserved within the mature core of the Regional Park, with strong supporting numbers in the adjoining regenerating portion of the Regional Park. The habitat occurring within the Subject Land is highly fragmented, and consists predominantly of few large remnant trees surrounded by new re-growth, and therefore it is felt that the habitat within the Subject Land does not constitute core or high value habitat for the species.

Threatened species recorded in the locality are listed in **Table 3.1**. Records of recent surveys are shown in **Figure 4.6**.

4.4 Habitat Corridors

The study area forms part of a broad local corridor that extends to the north of the site, and to a lesser extent to the south via South Creek riparian corridor, as shown in Figure 2.5. The vegetation on the subject land is connected to vegetation in the Regional Park to the east, but to the west beyond the Northern Road is urban development. Development of the subject land will not sever connectivity between areas of existing native vegetation. To the north of the study area beyond Ninth Avenue, there are rural residential blocks and several patches of remnant vegetation.

4.5 Determining Affected (C)EECs/Species

Affected (C)EECs/species means those threatened species, populations and ecological communities that are likely to experience impacts from the proposal.

The SIS distinguishes between “major” and “minor” affected (C)EECs/species. Major affected (C)EECs/species are those that will definitely experience a measureable loss of habitat. Minor affected (C)EECs/species are those species that occur (or are considered likely to occur) in the study area and which may experience small or very minor impacts to habitat, either directly or indirectly.

The primary impact of the proposal in terms of flora and fauna is the reduction in potential habitat in the study area from native vegetation clearance. The following threatened species includes those that may be affected by the proposal and are therefore assessed in subsequent sections of this chapter.

This list of species has been refined from the list of subject species (see Chapter 3) based on their listing in the DGRs, their known occurrence in the study area or their likelihood of occurrence. The remaining subject species listed in Chapter 3 are not analysed further as they are not considered likely to occur in the study area (based on general species distribution information) and/or are not known to utilise the habitat types of the subject area.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

4.5.1 Major Affected (C)EECs/species

Relatively few of the subject species are considered likely to be affected by the proposed development. The major affected (C)EECs/species include those known from the subject site that will experience a loss of individuals from the population on the SMP and are assessed in detail by the SIS.

In summary, the major affected (C)EECs/species that are considered in detail within the following impact assessment chapter are:

- Cumberland Plain Woodland; and
- Cumberland Plain Land Snail.

All of these (C)EECS/species occur on the subject site and will have habitat removed as a result of the development.

Cumberland Plain Woodland (CPW)

CPW on the subject site consists of a mix of mature woodland, young woodland in various stages of regeneration and grassland.. Scattered patches of regenerating CPW occur mainly in the central areas of the subject site. A patch of mature CPW occurs along the south to south-western section of the subject site and extends southward into the Regional Park.

Cumberland Plain Land Snail

This species has been recorded within mature and regenerating CPW across the entire study area. Individuals were detected within patches of CPW to the east of the subject site and there is a high likelihood of occurrence within other patches across the subject site.

4.5.2 Minor Affected (C)EECs/species

The minor affected (C)EECs/species include:

Endangered ecological communities

River-flat Eucalypt Forest, Freshwater Wetlands and Shale Gravel Transition Forest: These EECs occur in the Subject Land but not within the subject site.

The minor affected EECs, River-flat Eucalypt Forest and Freshwater Wetlands, could experience very minor habitat loss or potential indirect impacts and is also considered in the following chapter.

The floristics surveyed during the preparation of this SIS suggests that the vegetation patches for Shale Gravel Transition Forest do not differ substantially from those of Cumberland Plain Woodland. This EEC is therefore considered to be CPW in this SIS, which is of higher conservation status under the TSC Act.

Flora population

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

- *Marsdenia viridiflora* subsp. *viridiflora*: This species has been recorded in low numbers in the Regional Park but has not been recorded on the Subject Land.

Flora species

- *Grevillea juniperina* subsp *juniperina*
- *Pultenaea parviflora* ; and
- *Pimelea spicata.*

These flora species have been recorded in the study area and the subject land, but not from with or adjoining the subject site.

Fauna species

Microchiropteran Bats: East-coast Freetail Bat, Large-eared Pied Bat, Eastern False Pipistrelle, Eastern Bent-wing Bat, Southern Myotis and Greater Broad-nosed Bat: These microbats have all been recorded on the SMP, and mostly within the study area. The habitats present on the subject land do not provide significant habitat for these species due to a lack of roosting habitat. However, they will experience a loss of foraging habitat to a relatively minor degree. For this reason, these microbats are considered to be minor affected (C)EECs/species.

Flying Fox: Grey-headed Flying-fox: As with the microbats, the subject land provides a relatively small area of foraging habitat for this species, No flying-fox camps are known to occur on or adjoining the study area.

Birds: Speckled Warbler, Varied Sittella, Diamond Firetail and Hooded Robin.

4.5.3 (C)EECs/Species that are not affected

Habitat analysis and targeted surveys have indicated that several of these species do not appear to occur in the study area. The plants *Dillwynia tenuifolia*, *Persoonia nutans* and *Micromytus minutiflora* have not been located in the study area. For this reason, these plant species are not considered as affected (C)EECs/species.

Very few of the birds listed as the subject species have ever been detected on the SMP, and none were detected on the site during the current surveys of the study area. The majority of birds are therefore not considered as affected (C)EECs/species, however, small grassy woodland associated species that are known from the SMP are included as affected (C)EECs/species.

Additionally, Koalas, Spotted-tailed Quolls, Squirrel Gliders and Green and Golden Bell Frogs have not been found on the SMP, though some marginal potential habitat occurs, and the species are not considered as affected (C)EECs/species. Furthermore, the Green and

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Golden Bell Frog is considered likely to be extinct in this part of Western Sydney (DEC (NSW), 2005a).

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

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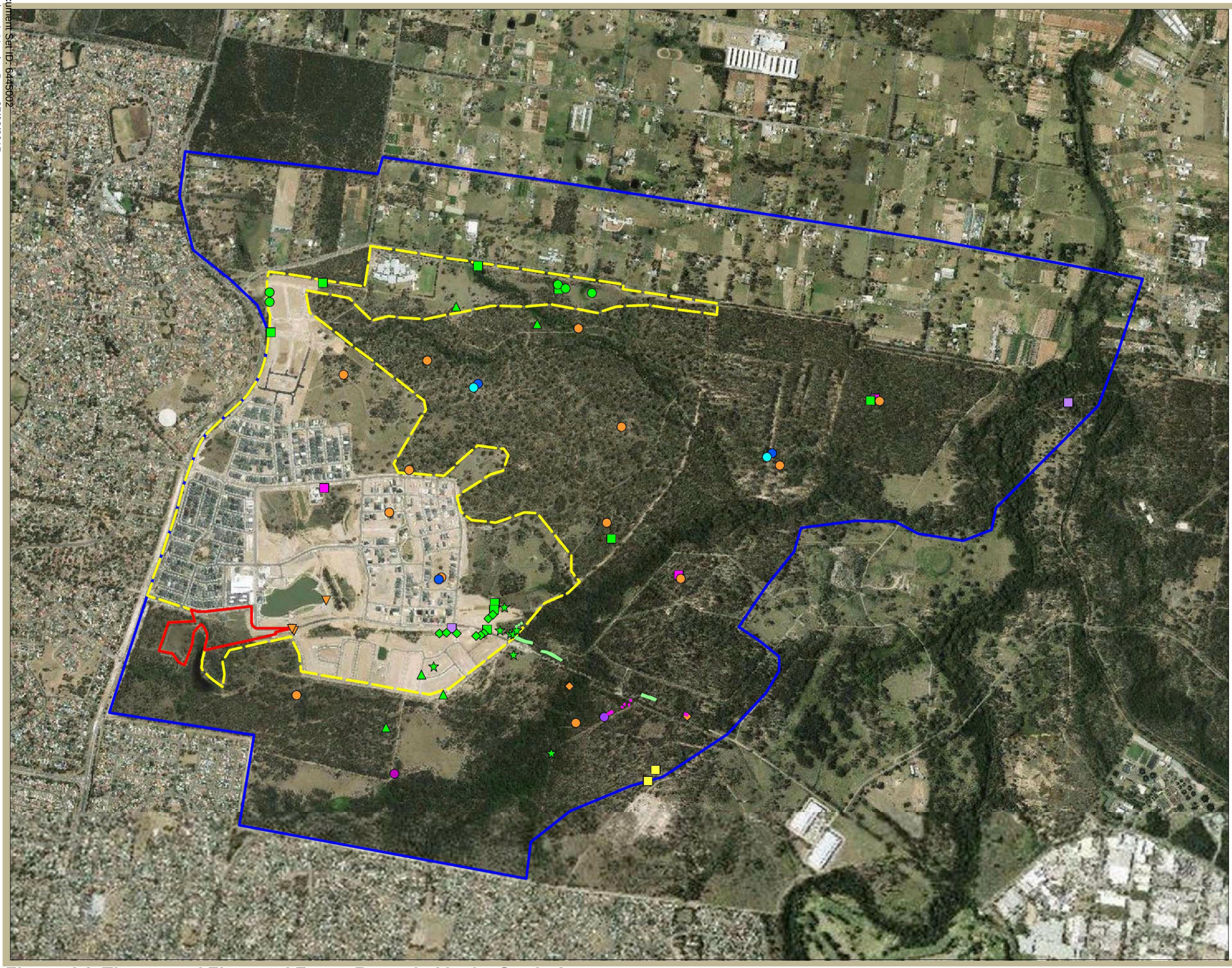
Version: 1, Version Date: 27/02/2015

Coordinate System: MGA Zone 56 (GDA 94)



Grid North

Legend

- Subject Site
- Subject Land
- Study Area

Threatened Flora

2013 Records
- Grevillea juniperina ssp juniperina

2012 Records
- Grevillea juniperina ssp juniperina
- Grevillea juniperina subsp. juniperina
- Pultenea parviflora

2011 Records
- Grevillea juniperina ssp juniperina
- Pultenaea parviflora

2010 Records
- Grevillea juniperina subsp juniperina cluste

2009 Records
- Grevillea juniperina ssp juniperina

2008 Incidental Records
- Marsdenia viridiflola

2004 Incidental Records
- Pimelea spicata

Threatened Fauna

2012 Records
- Cumberland Plain Land Snail Shell
- Varied Sittella

2011 Records
- Cumberland Plain Land Snail
- Eastern Bentwing-bat
- Eastern Freetail-bat

2010 Records
- Cumberland Plain Land Snail

2008 Indicative Record
- Speckled Warbler

Image Source:
Image © SIX Maps
(dated 17-1-2014)

CUMBERLAND ECOLOGY

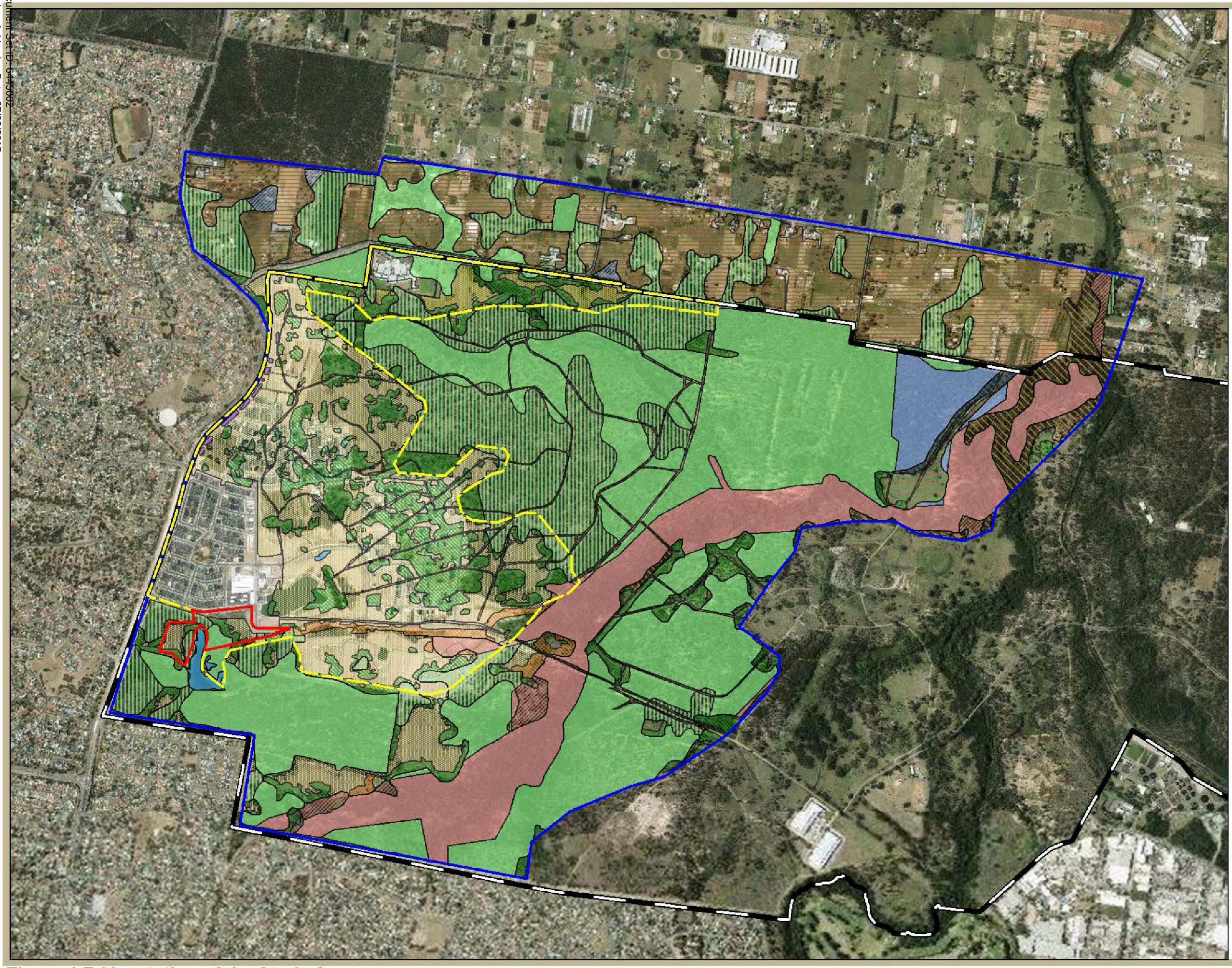
I:\...\13092\Figures\RP2_SIS\20141204\Figure 4.6

Figure 4.6. Threatened Flora and Fauna Recorded in the Study Area

250 0 250 500 750 1000 m

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Coordinate System: MGA Zone 56 (GDA 94)



Legend

- St Marys Property Boundary
- Subject Site
- Subject Land (Western Precinct)
- Study Area

Vegetation Community (CE, 2011)

- Cumberland Plain Woodland (CEEC)
- Regenerating Cumberland Plain Woodland (CEEC)
- River Flat Eucalypt Forest (EEC)
- Regenerating River-flat Eucalypt Forest (EEC)
- Shale Gravel Transition Forest (>10% Canopy Cover)
- Derived Native Grassland (CEEC)
- Low Diversity Derived Native Grassland (CEEC)
- Plantings
- Rural / Undetermined
- Freshwater Wetland

Vegetation Communities (DECCW, 2008)

- Shale Plains Woodland (CEEC) (Cumberland Plain Woodland) (>10% Canopy Cover)
- 10 - Shale Plains Woodland
- Alluvial Woodland (EEC) (River Flat Eucalypt Forest) (>10% Canopy Cover)
- 11 - Alluvial Woodland
- Shale/Gravel Transition Forest (EEC) (>10% Canopy Cover)
- Shale/Gravel Transition Forest (EEC) (5-10% Canopy Cover)

Image Source:
Image © SIX Maps
(dated 17-1-2014)

N
Grid North

CUMBERLAND ECOLOGY

I:\...\13092\Figures\RP2_SIS\20141204\Figure 4.7

Figure 4.7. Vegetation of the Study Area

250 0 250 500 750 1000 m

Chapter 5

Impact Assessment

This chapter addresses the impacts to species, populations and C/EECs in order to address DGR Sections 5 and Section 6. The following summary of impact provides an indication of general impacts of the proposal and future proposals within the subject site and Western Precinct development area.

5.1 Assessment of Likely Impacts

5.1.1 Direct Impacts of Development

i. Vegetation communities

The proposed development will occur within a landscape that has been extensively altered since European settlement took place. The CPW vegetation on the subject site consists of a mix of mature woodland, young, woodland in various stages of regeneration and derived native grassland which collectively conforms to the critically endangered listing under the TSC Act. A conservative approach has been taken for this SIS and it is assumed that all vegetation within the subject site will be removed for the purposes of the proposed development.

The development of the subject site and the development of the Western Precinct will result in the clearance of this vegetation, as shown in **Table 5.1.**

Table 5.1 Vegetation Communities of the Subject Land

Vegetation Communities Occurring within the Subject Land	Vegetation to be removed from the Subject Site (ha)	Vegetation removed from approved portions of the Subject Land (ha)	Vegetation remaining in undeveloped portions of Subject land (excludes subject site)
Cumberland Plain Woodland (CEEC)	1.75	5.81	15.71
Regenerating CPW (CEEC)	1.26	31.48	21.63
CPW Derived Native Grassland (CEEC)	0.00	2.29	0.09
CPW Low diversity Derived Native	1.86	69.31	31.99

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table 5.1 Vegetation Communities of the Subject Land

Vegetation Communities Occurring within the Subject Land	Vegetation to be removed from the Subject Site (ha)	Vegetation removed from approved portions of the Subject Land (ha)	Vegetation remaining in undeveloped portions of Subject land (excludes subject site)
Grassland (CEEC)			
River-flat Eucalypt Forest (EEC)	0.00	2.04	0.75
Regenerating River-flat Eucalypt Forest (EEC)	0.00	2.96	1.21
Freshwater Wetland (EEC)	0.00	0.22	0.29
Plantings	0.00	0.60	0.03
TOTAL VEGETATION	*4.87*	*114.70*	*71.69*

ii. Threatened species

The clearing of vegetation mentioned within the subject site will directly remove habitat for threatened species such the Cumberland Plain Land Snail (*Meridolum corneovirens*). The Cumberland Plain Land Snail was recorded within CPW in the central area of the subject site and has a high potential to occur within other scattered patches within the subject site. Several individuals are likely to be removed given that CPW habitat is to be cleared.

Some highly mobile fauna species such as microbats, and some small woodland birds that are known from the study area may experience minor habitat loss, however, the subject site, and Western Precinct as a whole, generally lack important habitat features, such as hollow-bearing trees. This paucity of habitat features suggests that it would be unlikely for these species to be dependent on the habitats present. The Regional Park also provides substantial habitat for these species.

Extensive mitigation measures will be implemented across the Western Precinct to minimise the impacts from development. Foremost amongst these is the 900 hectare Regional Park, which will conserve substantial habitat for all known species of threatened flora and fauna that have been recorded previously on the SMP. Areas of CPW within the Regional Park, that are disturbed for minor drainage works associated with the current Subject Site will be rehabilitated following the construction of these works. Such mitigation measures are discussed further in Chapter 7.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

5.1.2 Indirect Impacts

i. Subject site

The current proposal includes additional areas for works within the subject site boundary. This includes areas for ancillary works and other disturbance such as the creation of interim sediment and detention basins, and battering and retaining walls associated with roads and drainage works. There is also the chance of indirect effects, such as the spread of weeds, to impact on native vegetation in this area.

The regenerating CPW on the subject site occurs mainly in the central area. The mature CPW is present along the south to south-west sections of the subject site and extends southwards into the neighbouring Regional Park.

The quality of CPW vegetation greatly improves in the Regional Park and the removal of vegetation from the subject site has the potential to indirectly impact on CPW as well as wetland areas in the Regional Park via increases in edge effects and sedimentation or increases in the number of feral species. However, comprehensive mitigation measures, as described in Section 4.5 and detailed in the Western Precinct Biodiversity Assessment (Cumberland Ecology, 2009c) will be implemented to minimise potential impacts..

Site specific mitigation measures for the protection of (C)EEC vegetation should include the continued mowing of a buffered edge between the residential development area and the Regional Park. The mowing itself appears to favour the establishment of native grass and herb species (as was found on the northern boundary, where native grassland occurs in the mown APZ) and removes woody weeds. Trees should be retained wherever possible and fertilisers avoided at the perimeter of the Regional Park. Erosion and sediment control measures also need to be implemented to prevent surface run-off into the adjacent wetland areas in the Regional Park. In combination with the comprehensive mitigation measures for the SMP, minimal indirect impacts are likely to occur as a result of the proposed development.

5.1.3 Cumulative Impact of Development in the Western Precinct

As detailed in the approved Precinct Plan (JBA 2009), the remainder of the Western Precinct is zoned “Urban” and is proposed for residential and commercial development. This will result in the removal of a large area of habitat for C/EECs and threatened species of relevance to the current proposal. This indirect impact will further fragment habitats in the study area to some degree, although the vegetation patches are already fragmented and the Western Precinct is at the western edge of the SMP, which is bounded by existing residential and rural-residential land holdings. A summary of the area of vegetation removed from areas approved for development also presented in **Table 5.1** and is referred to further in the detailed impact assessments presented below.

The total area of vegetation conserved outside the subject land is also present in Table 5.2.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table 5.2 Vegetation communities conserved in the Study Area and Regional Park

Vegetation Community	Study Area (Ha)	Regional Park (Ha)
Cumberland Plain Woodland	252	408
Regenerating Cumberland Plain Woodland	158	27
CPW Derived Native Grassland	11	23
Shale Gravel Transition Forest (>10% canopy cover)	17	55.8
Shale/Gravel Transition Forest (5-10% cc)	2	
River Flat Eucalypt Forest	105	217
Regenerating River-flat Eucalypt Forest	10	265
Freshwater Wetland	2	2
Rural / Undetermined	118	
TOTAL	**691**	**998**

5.2 Assessment of Critically Endangered and Endangered Ecological Communities and Species Likely to be Affected

Major affected (C)EECs/species are those that will experience a measureable loss of habitat as a result of the development. Relatively few of the subject (C)EECs/species are considered likely to be affected by the proposed development. The major affected (C)EECs/species include those known from the subject site that will experience a loss of individuals from the population on the SMP and are assessed in detail in the sections below. These are:

- Cumberland Plain Woodland; and
- Cumberland Plain Land Snail (*Meridolum corneovirens*).

Minor affected EECs/species are those that occur (or are considered likely to occur) in the study area and which may experience small or very minor impacts to habitat, as identified in Chapter 4. The minor affected EECs, Freshwater Wetlands and River-flat Eucalypt Forest, are considered in more detail in the following sections, due to the potential for indirect effects, despite the small area of habitat present on the subject land. The EEC Shale-Gravel Transition Forest, is considered to be a minor affected EEC but is not considered in detail as the community has been incorporated into the assessments for CPW.

Minor affected species are not considered in detail in the following sections. Habitat descriptions are provided for these species in Table 3.1 and impacts to these species are considered more in terms of impacts to their habitats/potential habitats.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

5.2.1 Cumberland Plain Woodland

The NSW Scientific Committee made a final determination on the 18th December 2009 to list Cumberland Plain Woodland as 'critically endangered' under the TSC Act. The state listing includes derived native grasslands where they contain characteristic native non-woody species (NSW Scientific Committee, 2009). It does not state minimum condition thresholds, patch size or project foliage cover requirements for Cumberland Plain Woodland or derived native grasslands.

Most of this community had been heavily cleared on the SMP and is in various stages of regeneration in the study area. Cumberland Plain Woodland would have covered the study area prior to historical clearing for grazing, based on the soils and ground cover species present.

Although no strict definition of derived native grasslands is provided in the final determination, generally this term refers to areas of native vegetation where the tree and shrub layers have been removed, leaving a herbaceous ground cover layer.

5.2.2 River-flat Eucalypt Forest

River-flat Eucalypt Forest on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions is an EEC listed under the TSC Act (NSW Scientific Committee, 2004k). In the Sydney Basin bioregion this community replaces the former EEC Sydney Coastal River-flat Forest.

The patch of this community in the Western Precinct is regenerating after previous disturbances and although dominated by native species in each stratum and in viable condition, it contains some significant weed development.

5.2.3 Freshwater Wetlands

Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions is an EEC listed under the TSC Act (NSW Scientific Committee, 2004e). In the Western Precinct, it is predominately known from parts of the Regional Park adjacent to the southern extent and will not be removed as part of the proposal.

5.2.4 Cumberland Plain Land Snail

The Cumberland Plain Land Snail is superficially similar to the exotic Garden Snail. The shell is between 25 mm and 30 mm in size and while it may be almost any shade of brown, it is always uniform in colour. The Cumberland Plain Land Snail has a more flattened shell that is very thin and fragile, compared with the thick shell of the Garden Snail. It primarily occurs in Cumberland Plain Woodland, which is a grassy open woodland with occasional dense patches of shrubs (OEH, 2013a).

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

This species has been recorded on the subject land and is estimated to occur in a low density in the Western Precinct, likely due to the regenerating form of CPW present which generally lacks significant leaf litter and debris due to the young age of most trees present.

5.3 Description of Habitat

5.3.1 Cumberland Plain Woodland

i. The assessment of habitat for Cumberland Plain Woodland (CPW) also provides an assessment for affected (C)EECs/species occurring within CPW on the subject site, which includes the Cumberland Plain Land Snail.

Threatened birds known from the study area, in particular small woodland birds including Speckled Warbler, Diamond Firetail, Hooded Robin and Varied Sittella utilise this open woodland habitat type, are known from the SMP and are likely to occur in the study area. However, these species generally require large undisturbed remnants in order to persist. Therefore the sparse and fragmented woodland patches present in the Western Precinct are not likely to represent suitable habitat and these species are more likely to be associated with the intact CPW in the Regional Park, where the records are from.

Likewise with microbats and the Grey-headed Flying-fox, the CPW present on the subject land provides some foraging resources, although only as part of a larger habitat matrix including the Regional Park. Roosting habitat is not readily available for microbats in the study area, as hollow-bearing trees are very uncommon and few buildings remain for cave/building roosting bats. No Flying-fox camps are known from the study area, with the closest being at Cabramatta Creek.

ii. Habitat in the study area

a. Type

In the study area CPW occurs in the Shale Plains Woodland form, as referred to in Chapter 2. Its habitat is in gently undulating areas of the Cumberland Plain, in the driest areas of Sydney, receiving less than 800mm of rain a year (Benson and Howell, 1990). It occurs on Wianamatta shales, some Holocene alluvium and occasionally Mittagong formation, Tertiary alluvium, Hawkesbury sandstone and Aeolian deposits (Tozer, 2003).

Within the study area, the habitat for CPW and associated fauna species exists as larger tracts of mature woodland, which provides more connective habitat and structured woodland.

b. Size

The total area of CPW within the subject site includes 1.75 ha of mature CPW, 1.26 ha of regenerating CPW and 1.86 ha of low diversity Derived Native Grassland (DNG). A total of approximately 69.41 ha of these three CPW variants occurs in the undeveloped portions of the Western Precinct. This compares with a total of 756.2ha of core and support for core habitat throughout the SMP, including CPW in the Regional Park, within areas listed on the

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Register of the National Estate (Australian Heritage Commission, 1999) and in open space areas. Throughout Western Sydney, 6745 (±968)ha of CPW in the form of Shale Plains Woodland existed in 1997 (Tozer, 2003).

The study area was determined as including the adjoining areas of the Regional Park and connective woodland beyond the SMP to the north in order to comprehensively address any potential indirect impacts to proximate habitat. This includes a large portion of the Regional Park and surrounds included in the study area and totals approximately 410ha of CPW.

c. Condition

Previous assessments of the Western Precinct have classified grasslands with greater than 50% native groundcover abundance as being CPW derived native grassland whereas areas with less than 50% native cover abundance (or greater than 50% exotic cover abundance) were not classified as being part of the CEEC. The survey and detailed assessment of floristic data prepared specifically for this SIS has involved the comparison of quadrats at both ends of the spectrum of native and low diversity grassland using statistical analysis.

The analysis indicates that although the low diversity grasslands of the Western Precinct are unlikely to regenerate to woodland naturally, due to the historical disturbance experienced, they exhibit many of the native herb and grass species characteristic of CPW. Areas supporting grasslands in the north of the Western Precinct, close to the Regional Park boundary, were observed to contain a higher diversity of native herbs and grasses, which correlated with the area of the Precinct where disturbance was historically less. These areas would be more likely to regenerate to woodland over time. This can be seen in the lower dissimilarity levels between Areas B & C which supports the fact that Area B has the potential to regenerate to a condition similar to that of Area C. In contrast, this is not observed in the statistical analysis for grasslands of Area A.

Visual observations further support this, as very limited areas of woodland have regenerated throughout much of the Western Precinct, despite the removal of grazing and several years of high rainfall, and generally good conditions for plant growth.

Mature CPW within the Regional Park was identified as being in much better condition than the CPW in the Western Precinct and on the subject site. Despite the presence of some dominant weeds, namely Paddys Lucerne and Fireweed, a higher diversity of native groundcover species, particularly herbs and grasses were consistently recorded within the Regional Park. The overall condition of CPW in the study area was determined to be high.

iii. Habitat in the locality

Mature and regenerating CPW occurs throughout much of the locality as the SMP is well within the natural extent of this community, and not at the edge of its distribution. The majority of habitat is sparsely distributed and dissected by rural/residential developed across western, south western and parts of northern Sydney. In the study area, similar regenerating CPW occurs between rural lands to the north and links with a very large block of habitat in the Air Services Australian Defence land. The Air Services site exists as a very large block of

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

high quality mature CPW and forms part of a major corridor of CPW habitat to the north linking with several National Parks and Nature Reserves.

iv. Distribution of similar habitats in the region

Known areas of CPW within the region occur at Scheyville National Park, Windsor Downs Nature Reserve, Leacock Regional Park and Mulgoa Nature Reserve (NSW NPWS, 2001a) and also at Nelsons Ridge and Prospect Reservoir. In proximate sites to the study area, it is represented in Shanes Park and in other bushland remnants of Penrith and adjoining Blacktown Local Government Area, such as Prospect Reservoir, Nurragingy Reserve and intergrading with Sydney Coastal River Flat Forest at Bells and Eastern Creek (NSW NPWS, 1997a).

The Cumberland Plain Land Snail has been found within the region at Scheyville National Park, Agnes Banks Nature Reserve, Castlereagh Nature Reserve, Windsor Downs Nature Reserve and in Gulguer Nature Reserve. Most occurrences, however, are not from conserved areas (NSW NPWS, 2000). The species occurs in CPW and in Castlereagh Woodlands in Western Sydney and therefore is likely to occur at Shanes Park, to the north east of the SMP, Prospect Reservoir, Marsden Park, Nurragingy Reserve, the Regional Park on the SMP and in other smaller bushland remnants throughout the region (NSW NPWS, 1997a).

This is further supported by the following three documents prepared by the NSW Government:

- Draft Strategic Assessment Report for the Sydney Growth Centres Program (DoP, 2010); and
- Report on the methodology for identifying priority conservation lands on the Cumberland Plain (DECCW, 2010); and
- Cumberland Plain Recovery Plan (DECCW, 2011).

Importantly, the latter two of the studies listed above identify the SMP Regional Park as a Priority Area/Priority Conservation Lands for the management and recovery of the Cumberland Plain.

v. Condition of similar habitat in the region

Condition of similar habitat within the region is likely to vary with disturbance history and human accessibility.

Castlereagh Nature Reserve, Windsor Downs Nature Reserve and Scheyville National Park all contain CPW and are assumed to be managed to provide good condition habitat for CPW and for the Cumberland Plain Land Snail.

Prospect Reservoir contains a large area of regrowth CPW. The area was grazed prior to becoming a reservoir and grazing was continued but increasingly restricted until the 1970s.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Much of the vegetation has only regenerated since grazing ceased (NSW NPWS, 1997a)(NSW NPWS, 1997a).

Shanes Park, adjacent to the corner of the north and north eastern boundaries of the SMP, contains the second largest intact remnant of CPW (NSW NPWS, 1997a). This remnant is a central area of core habitat in Blacktown LGA, with the potential to form corridors to other bushland remnants throughout the LGA.

Nurragingy Reserve contains some CPW of varying condition. Better condition CPW is contained in areas of the reserve only used for passive recreation (NSW NPWS, 1997a).

vi. National distribution

Cumberland Plain Woodland is only found on the Cumberland Plain of Western Sydney, in the LGAs of Auburn, Bankstown, Baulkham Hills, Blacktown, Camden, Campbelltown, Fairfield, Hawkesbury, Holroyd, Liverpool, Parramatta, Penrith and Wollondilly (NSW Scientific Committee, 2009).

5.3.2 River-flat Eucalypt Forest

Part of a patch of RFEF that surrounds an existing drainage channel occurs close to the southern end of the study area. The vegetation is in moderate condition and continues to the east through the Regional Park.

This riparian community represents foraging habitat for microbats, particularly for the fishing bat; Southern Myotis. This community may also provide habitat for Black Bittern, although this is likely to be restricted to the dense and connective riparian habitats of the study area. Small woodland birds may use this woodland for shelter as part of a matrix of woodland and forest habitats in the study area.

i. Habitat in the study area

a. Type

River-flat Eucalypt Forest (RFEF) is found on coastal floodplains and has a tall canopy of eucalypts. The most widespread canopy trees include *Eucalyptus tereticornis, E. amplifolia, Angophora floribunda* and *A. subvelutina*. It may have a layer of small trees and a scattering of shrubs. The ground cover consists of abundant forbs, scramblers and grasses. RFEF occurs on alluvial soils on river-flats of the NSW North Coast, Sydney Basin and South East Corner bioregions.

Within the study area, the habitat for RFEF and associated fauna species exists as larger tracts of mature woodland, which provides more connective habitat and structured woodland.

b. Size

No RFEF occurs on the subject site. A very small area, totalling approximately 1.96 ha of mature and regenerating RFEF occurs within the undeveloped portions of the subject land

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

as a narrow strip along a drainage channel towards the southern boundary of the subject land, which is a man-made tributary of South Creek. This compares with a total of 265.3ha of core and support for core habitat throughout the SMP, including 217.7ha of RFEF included in the Regional Park, within areas listed on the Register of the National Estate (Australian Heritage Commission, 1999) and in open space areas. Throughout Western Sydney, 4698 (±903)ha of Alluvial Woodland existed in 1997 (Tozer, 2003).

The study area was determined as including the adjoining areas of the Regional Park and connective woodland beyond the SMP to the north in order to comprehensively address any potential indirect impacts to proximate habitat. This includes a large portion of the Regional Park and totals approximately 215ha of RFEF.

c. Condition

The narrow band of RFEF in the subject land is highly degraded due to severe stream erosion which has incised the banks of the channel in the south of the subject site. The canopy exhibits past disturbance and although it is currently dominated by *Angophora floribunda*, it also contains *Casuarina glauca* and may have once fitted into the definition of the Swamp Oak Floodplain Forest EEC. One *E. amplifolia* (Cabbage Gum) specimen adjoins the community in cleared grassland, an indicator that the community is more similar to RFEF. The canopy height is 15-20m and projective foliage cover (PFC) 50% which is very open for this forest community.

Weeds are present, including *Ligustrum sinense* (Small-leaved Privet) and thickets of *Rubus fruticosus* (Blackberry) although they do not dominate the understorey.

ii. Habitat in the locality

Major watercourses in the study area and locality contain RFEF, including Ropes Creek and South Creek as shown in Figure 5.1. These first order streams are well vegetated in parts of their range, although significant weed invasion is present throughout. This community grades into several floodplain EECs including Swamp Oak Floodplain Forest, which is known to be present in the locality.

iii. Distribution of similar habitats in the region

Larger corridors of Alluvial Woodland occur within the study area and the SMP. Most of these areas will be conserved within the Regional Park. Small areas of RFEF occur at Cattai National Park, Dharug National Park, Georges River National Park, Scheyville National Park, Gulguer Nature Reserve, Mulgoa Nature Reserve and Marramarra National Park (NSW Scientific Committee, 2004l). In proximate sites to the study area, it is represented in the SMP Regional Park, RAAF land at Orchard Hills, Rickabys Creek, Mulgoa Creek, South Creek, Prospect Reservoir, Nurragingy Reserve and at Bells Creek, near Townson Rd (NSW NPWS, 1997b; NSW NPWS, 1997a).

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

iv. Condition of similar habitat in the region

Condition of similar habitat within the region is likely to vary with disturbance history and human accessibility.

Cattai National Park, Dharug National Park, Georges River National Park, Scheyville National Park, Gulguer Nature Reserve, Mulgoa Nature Reserve and Marramarra National Park all contain RFEF (NSW Scientific Committee, 2004k). It is assumed that these Nature Reserves and National Parks are managed to provide and maintain RFEF in good condition.

Prospect Reservoir contains an area of regrowth RFEF. The area was grazed prior to becoming a reservoir and grazing was continued but increasingly restricted until the 1970s. Much of the vegetation has only regenerated since grazing ceased. Riparian habitats for RFEF are degraded due to weed invasion (NSW NPWS, 1997a).

Nurragingy Reserve contains some RFEF of varying condition. RFEF is degraded in areas of unlimited pedestrian access. Weed invasion has also led to the degradation of this RFEF (NSW NPWS, 1997a).

RAAF land at Orchard Hills contains good condition riparian areas of RFEF but this is under Defence ownership (NSW NPWS, 1997b).

RFEF along Rickabys Creek has been impacted by clearing for development and has been degraded by rubbish dumping and use of trail bikes in the area. Road construction has also damaged this bushland remnant (NSW NPWS, 1997b).

RFEF along Mulgoa Creek has been subject to poor land management and the negative effects of agriculture in the area. It has also been degraded by weed invasion (NSW NPWS, 1997b).

The corridor of RFEF along South Creek varies in condition; with good condition RFEF occurring in the central section of the Regional Park. Southern sections of this creek have been affected by clearing for agriculture and weed invasion (NSW NPWS, 1997b).

An area of RFEF along Bells Creek, near Townson Rd is currently threatened by grazing and has been subject to weed invasion (NSW NPWS, 1997a).

v. National distribution

RFEF is known from parts of the Local Government Areas of Port Stephens, Maitland, Singleton, Cessnock, Lake Macquarie, Wyong, Gosford, Hawkesbury, Baulkham Hills, Blacktown, Parramatta, Penrith, Blue Mountains, Fairfield, Holroyd, Liverpool, Bankstown, Wollondilly, Camden, Campbelltown, Sutherland, Wollongong, Shellharbour, Kiama, Shoalhaven, Palerang, Eurobodalla and Bega Valley but may occur elsewhere in these bioregions (NSW Scientific Committee, 2004k).

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

5.3.3 Freshwater Wetlands

Small areas of Freshwater Wetland are present on the subject land as small depressions with a low diversity of native and exotic wetland species, in areas that are the subject of approved DAs. A larger area of this habitat is present to the south of the subject site and subject land, contained within the Regional Park.

This wetland community represents foraging habitat for microbats, particularly for the fishing bat; Southern Myotis as well as potential foraging habitat for passing migratory wetland birds.

i. Habitat in the study area

a. Type

Sedgeland, a form of Freshwater Wetlands, occurs in very small local patches throughout the precinct, generally artificially created by a small scraping of the soil that results in a small depression. These areas usually are too small to warrant mapping, being only a few square metres in area and have been included in the grassland mosaic. A larger area of Freshwater Wetlands has been mapped within the study area: an area surrounding the dam in the south western corner of the precinct, largely included in the Regional Park.

This kind of wetland is uncommon in and around the SMP and is considered to have moderate to high conservation significance. Where wetland species have colonised artificially created habitats, the area is still considered to be a degraded variant of the EEC. Degraded wetlands have conservation value if they form part of a habitat corridor, provide habitat for aquatic species and resources for birds and mammals, provide habitat for threatened aquatic plants or maintain a seed bank of local provenance plants.

The smaller areas of sedgeland in the Western Precinct formed in scrapes in the soil have minimal conservation value. They provide small areas of habitat to common frog species and water resources for other animals, as well as local provenance plants. The wetland associated with the dam in the south west of the Regional Park near the south-western corner of the Western Precinct is of high conservation value as it provides potential habitat for local and migratory species including Lathams Snipe (listed under the EPBC Act only), covers a relatively large area compared with sedgeland formed in scrapes and is connected to other types of habitat through the Regional Park. Some sedgelands and wet meadows that occur around the dam near the precinct also have high conservation value because of the connectivity to the Regional Park habitats.

b. Size

No natural or artificial Freshwater Wetland occurs on the subject site The wetland in the south of the precinct will not be removed, and totals approximately 2ha.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

c. Condition

Overall, exotic species ranged from 5-70% of the projective foliage cover of the ground cover in the wet meadow and borrow pit zones.

ii. Habitat in the locality

No significant occurrences of this EEC are known to occur in the locality. However, farm dams and other similar man-made wetlands are frequent throughout the locality, and are also likely to conform to a variant of Freshwater Wetlands, if only in a very simplified form, as with the study area.

iii. Distribution of similar habitats in the region

Few good examples of this community are reserved in the region. This community is known to occur in Hexham Swamp and Pitt Town Nature Reserves and Scheyville National Park in the Region (NSW Scientific Committee, 2004e).

iv. Condition of similar habitat in the region

Condition of similar habitat within the region is likely to vary with disturbance history and human accessibility. There is likely to be other similar man-made habitats for this EEC in the locality and region that occur in a similar state to the study area habitat.

v. National distribution

Although Freshwater Wetland is known from along the majority of the NSW coast, it is distinct in the Sydney Basin where it is associated with sandplains. As a habitat, it has been extensively cleared and modified. In the 1990s the extent remaining was: 3% in the NSW North Coast bioregion, 66% in the lower Hunter – Central coast region, 40% on the Cumberland Plain, 70% in the Sydney – South Coast region, and 30% in the Eden region.

5.4 Past Disturbance History of the Western Precinct

Land parcels were granted for pastoralism on the Cumberland Plain in the early 1800s. Parts of the SMP were included in these grants. Timber-getting took place in the South Creek area of the SMP, in the 1860s, for sleepers and general construction associated with the extension of the western railway line (Kinhill, 1995).

The SMP was acquired by the Commonwealth in the 1940s for the manufacture and storage of munitions. Grazing continued on much of the SMP in order to keep ground layer fuel levels low (Kinhill, 1995).

The SMP underwent demolition of most buildings and decontamination, including soil remediation works, in the 1990s (Kinhill, 1995).

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Much of the vegetation currently on the property has regenerated since the cessation of grazing and clearing from the mid 1940s onwards (ERM, 2003). Such vegetation is now predominantly within the Regional Park.

Most of the subject site was subject to remediation works in the mid 1990s with the result that much of the soils have either been removed or highly disturbed. This has greatly degraded the condition of any native vegetation remaining in the area.

5.4.1 Assessment of Ability of Affected (C)EECs/Species to Recover to Pre-Disturbance Condition

Resilience, or the ability of native vegetation to recover to a pre-disturbance condition is assessed using the *In Situ Resilience and Anticipated Recovery Capacity Assessment* (Perkins, 2002)(Perkins, 2002). Refer to Figure 4.7 mapping of vegetation communities for an indication of canopy cover and regeneration age of the forest, woodland and grassland in the study area.

All woodland and forest habitat types exhibit high resilience, evident from the regeneration of all community types. However, in the Western Precinct, where past disturbance was significant, all communities were recorded to contain a lower diversity of native species than in the Regional Park. The woodland cover is more sparse and has less structure than the representatives in the Regional Park, however, it is likely that over time, these communities could have the potential to regenerate to a state similar to pre-disturbance.

The grasslands are however considered to be a more degraded form of the community from which they are derived, as no regeneration of midstorey and canopy layers are evident. This is not to say that areas of grassland are not in reasonable condition, as they contain a number of native groundcover species indicative of the original woodland. Overall, a reduced abundance of native species occurs in the Western Precinct, which is likely as a result of the past disturbance.

The consistency of the Proposal with the objectives of the Recovery Plan for the Cumberland Plain (DECCW 2011) is discussed in detail in Chapter 6.

5.5 Description of Conservation Status

5.5.1 Cumberland Plain Woodland

Cumberland Plain Woodland has been up-listed to critically endangered on both the TSC Act and EPBC Act and is therefore not considered likely to be well reserved. As previously discussed however, CPW may be comparatively well reserved in the locality, as demonstrated by the high proportion of the study area that includes CPW. Further discussion of the state and regional conservation of this community is provided in Section 6.3. This CEEC is not at the limit of its known distribution in the study area.

The principal threat to the biodiversity of the Cumberland Plain is the further loss and fragmentation of habitat and the resulting indirect impacts (such as weed invasion) that occur

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

as a result of this. The proposed development will contribute to this threat, however, the retention of expansive areas of the high quality habitat in the Regional Park and the management of this vegetation are likely to significantly reduce the effect of the threat to this community in the locality.

Cumberland Plain Land Snail is at threat from the modification to CPW. The bulk of the known populations are small, isolated and vulnerable to impacts from clearing and habitat modification such as weed invasion, inappropriate fire management and removal of ground cover, as this removes shelter, breeding habitat and sources of food (OEH, 2013a).

5.5.2 River-flat Eucalypt Forest

RFEF is listed as endangered under the TSC Act. It is likely to be well represented in the locality and is distributed throughout the region, and other parts of NSW. Further discussion of the state and regional conservation of this community is provided in Section 6.3.

The community has experienced a reduction in the area of habitat and the remaining area is likely to represent much less than 30% of its original range. Recently recorded, major occurrences include: about 2,000 ha in the lower Hunter region; less than 10,000 ha on the NSW south coast from Sydney to Moruya, of which up to about three-quarters occurred on the Cumberland Plain in 1998 (NSW Scientific Committee, 2004k).

The principles threats to this EEC of relevance to the study area include:

- Flood mitigation and drainage works;
- Landfilling and earthworks associated with urban and industrial development;
- Changes in water quality, particularly increased nutrients and sedimentation; and
- Weed invasion.

The proposed development of the Western Precinct has the potential to exacerbate the impact of threats to this community due to proposed drainage upgrade works. However, the occurrence of such works is only of relevance to the sparse areas of RFEF that occur in association with the artificial drainage channel in the south of the precinct. Mature trees will be retained wherever possible on the banks of the channel and regeneration of the riparian corridor after structural works are completed will include extensive planting of RFEF species.

5.5.3 Freshwater Wetlands

Freshwater wetlands on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions occurs on low-lying parts of floodplains, alluvial flats, depressions, drainage lines, back swamps, lagoons and lakes. It is dominated by herbaceous plants including sedges, emergent plants, floating and submerged plants (NSW Scientific Committee, 2004e).

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

The community is threatened by land clearing, fragmentation, flood mitigation, land-filling, pollution from runoff, weed invasion, damage from livestock and feral animals, acid sulphate soils, rubbish dumping and climate change (NSW Scientific Committee, 2004e).

The development of the subject site and continued development of the Western Precinct will not greatly exacerbate the effects of this threat to the larger examples of this EEC. The small localised depressions with characteristics of Freshwater Wetlands that will be removed on the subject land are not likely to constitute significant habitat as they are already subject to substantial weed invasion and are isolated from the natural floodplain.

5.6 Discussion of Likely Effects of the Proposed development

5.6.1 Extent of Habitat Removal

The subject site is proposed for development via a single development application (DA). Table 5.1 outlines the extent of the developable area for this DA within the study site. Other precincts will be progressively developed within the SMP as outlined within SREP 30.

Most of these areas are currently cleared, although more vegetation will be modified or removed as a result of this proposed development and subsequent developments. Although there is scope for retention of canopy species and some under storey species in open space areas, the open space areas will be highly modified as a result of the proposal and subsequent DAs. The vegetation community lining South Creek and tributaries in the study area will not be cleared. In fact, a significant riparian zone along the southern edge of precinct will be established, allowing the area to regenerate.

As detailed in **Table 5.1**, the proposed development of the subject site and Western Precinct will remove habitat for the C/EECs and species described in this chapter. Of greatest significance is the direct removal of CPW which is described further below. Other species and EEC will experience habitat loss or modification to a lesser extent.

i. CPW

The proposed development for the subject site will clear a total of 4.87 ha of CPW consisting of 1.81 ha of mature CPW, 1.26 ha of regenerating CPW and 1.86 ha of low diversity DNG.

This represents a small area of habitat for the Cumberland Plain Land Snail. However, a significantly greater density of snails is known to occur in the Regional Park, particularly within the mature woodland in the central sections of the park. The discrete subpopulations of this species present in the Western Precinct are likely to be permanently removed by the removal and modification of CPW proposed. However, the extent of such habitat removal for this species in the Western Precinct is not considered likely to cause the extinction of the local population centred on the Regional Park as sizable numbers occur within a secure and connective tract of woodland habitat.

The removal of this woodland type also represents foraging habitat for threatened bats and birds, although as previously discussed, such habitat is likely to form marginal support areas

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

as part of a large habitat matrix centred on the Regional Park and proximate reserves. It is therefore expected that this habitat removal is a minor area of habitat for these highly mobile species.

ii. RFEF

The proposed development for the subject site will not clear any RFEF. The RFEF to be removed, modified or isolated as a result of the other developments within the subject land is not important to the long-term survival of the community within the locality. River-flat Eucalypt Forest of high conservation significance will be conserved within the Regional Park and managed for conservation. The vegetation within the Regional Park is considered to be more important than that within the Western Precinct as it is in better condition and is more intact.

As with CPW, this community provides some habitat for threatened bats and birds known to occur in the study area. This habitat will not be greatly modified for these species.

iii. Freshwater Wetlands

The proposed development for the subject site will not clear any Freshwater Wetlands. While there is potential for indirect impacts to the wetland in the adjacent Regional Park, these can be mitigated via appropriate control measures. The Freshwater Wetlands to be removed, modified or isolated as a result of the other developments within the subject land are not important to the long-term survival of the community within the locality. Freshwater Wetlands of high conservation significance will be conserved within the Regional Park and managed for conservation. The vegetation within the Regional Park is considered to be more important than that within the Western Precinct as it is in better condition and is more intact.

This community provides some habitat for threatened bats and birds known to occur in the study area. This habitat will not be greatly modified for these species.

iv. Plant species

Approximately 700 specimens of *Grevillea juniperina spp. juniperina* were recorded in the Western Precinct during the field surveys. These are located at the northern and southern margins of the precinct. No individuals are present within the subject site.

It has been estimated that at least 249,000 (minimum) specimens of *G. juniperina* subsp *juniperina* occur within the Regional Park, where extensive habitat has been conserved (ERM, 2003). These specimens will not be affected by development within the Western Precinct and will be protected in perpetuity.

A single *Pultenaea parviflora* plant was recorded in the subject land during the 2011 surveys in an area that is subject to an approved DA and has been cleared. This plant had not been previously recorded in the Western Precinct, and no other specimens were found. This is not considered to be a significant part of the population which is centred on the Regional Park, where it is estimated that at least 50,000 of this species occur.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Approximately 2 specimens of *Pimelea spicata* have previously been recorded from the Western Precinct but were not detected during 2011 or 2012 surveys. These specimens are located in the south eastern portion of the precinct, in a drainage depression. A larger patch with more specimens is located within the Regional Park (although outside of the current study area) and the development is not considered likely to threaten the survival of this species in the locality.

The table provided in Section 4.3.2 provides an estimate of the approximate number of the affected plant species to be removed from the subject site and the Western Precinct as a whole and those conserved in the Regional Park study area.

5.6.2 Significance within the Local Context

i. Cumberland Plain Woodland

The geography, soils, topography and associated species of CPW are specific to Western Sydney, although dominant canopy species are found elsewhere in NSW and Australia. Remnants are often small (<10ha) and vulnerable to disturbance and degeneration by humans (NSW NPWS, 1997c). According to the JANIS report (Joint ANZECC / MCFFA National Forest Policy Statement Implementation Sub-committee, 1997), 15% of the pre-1750 distribution of any vegetation community should be conserved within the Comprehensive, Adequate and Representative (CAR) reserve system. As such, only 7.7(±1.1)% of the Pre-European extent of Shale Plains Woodland existed in 2003 (Tozer, 2003). Of this, significant areas are conserved within Windsor Downs Nature Reserve (NSW NPWS, 1997c), Scheyville National Park, Leacock Regional Park and Mulgoa Nature Reserve (NSW Scientific Committee, 2009).

Within the Region, there are core CPW remnants at Kemps Creek, Prospect Reservoir, Shanes Park, Orchard Hills RAAF base, the 900ha Regional Park on the SMP, Hawkesbury Reserve, Lansdowne Park, Boral-Lower Canal (Prospect) and on the Wonderland site at Eastern Creek (NSW NPWS, 1997c).

The long-term security of CPW in the SMP, within the study area, will be assured with its inclusion in the Regional Park. The area of CPW to be included within the Regional Park is 531.8ha of core and support for core habitat. This includes core habitat CPW within the study area. The 900ha Regional Park will be transferred to State Government ownership and managed by the NSW National Parks and Wildlife Service (ERM, 2003).

CPW occurring on the subject site occurs as sparse regenerating woodland patches and is moderately disturbed. Many small patches of CPW, such as those on the subject site, occur throughout the Cumberland Plain. The area of CPW to be conserved within the Regional Park is of much greater size and quality and is one of the largest areas of CPW remaining.

There is no long-term security for patches of CPW in the Western Precinct, as they occur in the area of the future development. There is scope for the retention of individual trees within open space areas, although the viability of the under storey and shrub layer is dependent on landscaping plans and management.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

ii. River-flat Eucalypt Forest

The geography, soils, topography and associated species of RFEF are specific to Western Sydney, although dominant canopy species are found elsewhere in NSW and Australia. Much of the pre-European distribution of this community has been cleared for agriculture, as it occurs on fertile alluvial soils. According to the JANIS report (Joint ANZECC / MCFFA National Forest Policy Statement Implementation Sub-committee, 1997), 15% of the pre-1750 distribution of any vegetation community should be conserved within the Comprehensive, Adequate and Representative (CAR) reserve system. As such, only 13(±2.5)% of the Pre-European extent of Alluvial Woodland existed in 2003 (Tozer, 2003). Of this, good representations of RFEF are conserved within Bents Basin State Recreation Area, Mulgoa Nature Reserve and Western Sydney Regional Park (NSW NPWS, 2001b), and small areas are conserved within Cattai National Park, Dharug National Park, Georges River National Park, Scheyville National Park, Gulguer Nature Reserve and Marramarra National Park (NSW Scientific Committee, 2004k).

Within the region, there are core RFEF remnants at Prospect Reservoir, Orchard Hills RAAF base, the SMP Regional Park, Rickabys Creek, Mulgoa Creek, South Creek, Nurragingy Reserve and along Bells Creek near Townson Road (NSW NPWS, 1997b; NSW NPWS, 1997a)

The long-term security of RFEF in the SMP, within the study area, will be assured with its inclusion in the Regional Park. The area of RFEF to be included within the Regional Park is 217.7ha of core and support for core habitat. This includes core habitat RFEF within the study area. The Regional Park will be transferred to State Government ownership and managed by the NSW National Parks and Wildlife Service (ERM, 2003).

The area of RFEF within the edge of the subject site and adjacent to the subject site is of little local significance. This representative occurs as a very simplified form of the community and is very sparse in a narrow band surrounding an incised drainage channel. Larger areas of much higher quality exist in the locality and a large area will be conserved within the Regional Park. Notwithstanding this, the RFEF will not be significantly cleared but will be conserved and rehabilitated as part of the future riparian corridor for the Western Precinct.

Although the proposed Riparian Corridor construction will involve some vegetation removal for the creation of the new channel and other bank stabilisation works, the landscaping of the entire Riparian Corridor will include the retention of the majority of the trees and also the larger patches of woodland, particularly in areas of higher sensitivity, such as the locations containing Grevillea juniperina ssp juniperina. Significant areas of future plantings will include CPW, RFEF, wetland and other riparian associated species.

There is long-term security for the corridor of RFEF adjacent to the subject site, as it occurs in the riparian zone adjacent to the proposed development. The corridor will be rehabilitated and widened as a result of management requirements for the riparian zone.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

iii. Freshwater Wetlands

Freshwater wetlands on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions occurs on low-lying parts of floodplains, alluvial flats, depressions, drainage lines, back swamps, lagoons and lakes. It is dominated by herbaceous plants including sedges, emergent plants, floating and submerged plants (NSW Scientific Committee, 2004e).

The community is threatened by land clearing, fragmentation, flood mitigation, land-filling, pollution from runoff, weed invasion, damage from livestock and feral animals, acid sulphate soils, rubbish dumping and climate change (NSW Scientific Committee, 2004e).

There is long-term security for the large wetland in the south of the study area as it occurs in the riparian zone adjacent to the proposed development. The wetland and riparian corridor will be rehabilitated and widened as a result of management requirements for the riparian zone.

iv. Plant species

The three subject plant species are all shrubs endemic to the Cumberland Plain. *Pultenaea parviflora* and *Pimelea spicata* are TSC listed as endangered plants, *G. juniperina* subsp. *juniperina* are vulnerable plants, with relatively narrow total ranges. The Regional Park contains some of the largest known populations of these species, if not the largest known population of *P. parviflora* in existence.

The long-term security of these shrubs in the study area is assured with the dedication of large areas of habitat to the Regional Park, in particular, the eastern section of the Regional Park. The conservation of these shrubs within the Regional Park is important for its long-term security because of the large size of the populations of the species.

Within the region, *P. parviflora* is also conserved within Scheyville National Park, Windsor Downs Nature Reserve and Castlereagh Nature Reserve (NSW NPWS, 2002). *G. juniperina* subsp. *juniperina* is conserved within Castlereagh Nature Reserve (NSW Scientific Committee, 2000). Pimelea spicata is not known to have secure habitat in the region, although suitable secure habitat occurs in the nearby Regional Park as well as the Castlereagh Nature Reserve, the Agnes Bank Nature Reserve, and the Windsor Downs Nature Reserve. Although other bushland remnants contain populations of these affected (C)EECs/species, the gazetted National Parks and Nature Reserves referred to provide a higher level of protection as they are dedicated to the long-term security of the species.

v. Cumberland Plain Land Snail

The Cumberland Plain Land Snail only occurs on the Cumberland Plain. It is known from over 100 locations in Western Sydney. The area of habitat for the Cumberland Plain Land Snail coincides with occurrences of CPW on the subject site. As referred to above, the area of CPW on the subject site is very small and not high quality habitat, compared with CPW occurrences in the Regional Park and other parks and reserves within the locality. This area

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

of habitat within the subject site is not ensured of long-term security, as the activity of vegetation clearance has been proposed for the subject site.

vi. Bats and birds

Woodland habitat on the subject land is fragmented for the wide ranging, minor affected fauna species. In the context of the locality, and the Regional Park, it is not considered likely that the subject site or the subject land would form a significant area of habitat for local populations of these species. Wetland habitats within the subject land are also considered unlikely to form a significant area of habitat for local populations of bird and bat species due to their relatively small size.

As the potential habitat on the subject site and subject land represents only a small portion of the area available to the species in the locality and the species are highly mobile, the habitat present is not considered to be critical to their survival, and hence is not significant in the local context.

5.6.3 Discussion of Connectivity

i. C/EECs and flora species

The study area forms part of a broad local corridor that extends to the north of the site, and to a lesser extent to the south via South Creek riparian corridor. The vegetation on the subject land is connected to vegetation in the Regional Park to the east, but to the west beyond the Northern Road is urban development. Development of the subject land will not sever connectivity between areas of existing native vegetation. To the north of the study area beyond Ninth Avenue, there are rural residential blocks and several patches of remnant vegetation.

The cumulative impacts of the development of the Western Precinct is not expected to greatly limit gene flow of plant species between the north western parts of the Regional Park and the proximate areas of CPW to the north and north west. These areas of habitat are already fragmented and pollination between these areas of habitat is therefore slightly reduced from that of continuous woodland. Further fragmentation is not likely to reduce the viability of CPW, RFEF and Freshwater Wetlands and the subject plant species in the locality.

ii. Bats and birds

Woodland habitat on the subject land is already fragmented for the affected fauna species. The sparse patches do however provide additional connection to the intact habitats in the Regional Park. The development of the Western Precinct is not likely to greatly reduce this connection, as it occurs at the western extent of the core area of habitat for these species and will not sever a significant connection that exists in the Regional Park.

As the potential habitat on the subject site and subject land represents only a small portion of the area available to the species in the locality and the species are highly mobile, the proposed development is not likely to decrease the movement of individuals and gene flow

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

between areas of potential habitat throughout the locality or within or between local populations.

iii. Cumberland Plain Land Snail

The Cumberland Plain Land Snail is not a mobile species and therefore does not depend on extensive movement of individuals to maintain a viable population. The species occurs in isolated populations throughout its highly restricted distribution. Therefore the lack of connectivity present on the study area is not expected to affect the survival potential of the species, and the proposed development is not expected to decrease the connectivity relative to existing levels. A viable local population is expected to persist in the Regional Park.

5.6.4 Consideration of Threatening Processes

The following Key Threatening Processes, listed under the TSC Act have been considered with respect to C/EECs and the affected (C)EECs/species:

- Clearing of native vegetation;
  - Native vegetation will definitely be cleared (see above section) and the most significant impacts on CPW and the affected (C)EECs/species will arise from vegetation clearance.
- Invasion of native plant communities by exotic perennial grasses;
  - There is potential for exotic perennial grasses to invade bushland in the Regional Park, particularly if there is runoff from the subject site to the Regional Park, or dumping of grass propagules in the Regional Park, from residential areas, on completion of the proposed development. Exotic grasses are currently in existence on the subject site, particularly dominating the grassland, and invading other habitats. Active management of the Regional Park will reduce the effect of exotic grasses and minimise invasion into the Regional Park.
- Competition from Feral Honeybees;
  - Honeybees are established in the vegetation of the SMP at present and are an ongoing threat. Honeybees can compete with native arboreal fauna and native bees for tree hollows. They can also compete with native pollinators for floral resources (NSW Scientific Committee, 2004a).
- Infection of native plants by *Phytophthora cinnamomi*;
  - There is a potential threat to the vegetation to be conserved within the Regional Park. However, no dieback of the type caused by this plant pathogen has been observed within the SMP and it is not generally regarded

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

as a threat within Western Sydney vegetation (NSW Scientific Committee, 2004h).

- Importation of red imported fire ants into NSW;
  - Fire ants, if established would be a major threat to terrestrial ecosystems. The proposed development is not likely to increase the risk of establishment of these ants.
- Introduction of the large earth bumblebee *Bombus terrestris*;
  - The large earth bumblebee, if established would be a major threat to terrestrial ecosystems. The proposed development is not likely to significantly increase the establishment of this species.
- Removal of dead wood and dead trees;
  - The proposed development will remove some dead wood and a small number of dead trees. However, most of the vegetation in the subject site is regrowth and so contains little dead wood. There is also potential for new human residents of the subject site to gather wood from the Regional Park. This threat must be managed by the OEH via the management plan for the Regional Park.
- Competition and grazing by the feral European rabbit;
  - Rabbits are established across the SMP. The proposed development will not increase the threat from rabbits. Moreover, the Western Precinct Plan has a Domestic and Feral Animal Management Strategy (Cumberland Ecology, 2008a) that includes rabbit control measures. Such measures are currently being implemented in the SMP.
- Ecological consequences of high frequency fires;
  - The SMP has had a relatively high fire frequency in the past due to arson. This will need to be managed via the Regional Park Plan of Management. The proposed development of the Western Precinct is unlikely to significantly increase the frequency of fire, but fire frequencies will need to be monitored.
- Predation by Plague Minnow (Gambusia holbrooki)
  - The Plague Minnow preys upon tadpoles and is a threat to a number of frog species. It occurs within South Creek and the smaller drainage-lines in the study area. The proposals for the Western Precinct as a whole entail construction of biofiltration and wetland detention basins. The permanent wetland detention basins have potential to be colonised by the Plague Minnow, but the ephemeral biofiltration areas have potential to create

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

additional habitat for frogs that is free of Plague Minnow. Such artificial wetlands will provide additional foraging areas for bats, frogs and birds within the study area.

Measures to minimise the impacts of the proposed development on threatened species and communities are discussed further in Chapter 7.

5.7 Description of Feasible Alternatives

The proposed residential subdivision and subsequent development of the SMP Western Precinct complies with the land use zoning as set out in SREP30 (DUAP, 2001b). SREP30 was prepared, and land use zones identified, following significant investigations over many years into the biophysical, economic, social and ESD considerations of development via Section 22 and Joint Steering Committee processes. Alternatives to the proposal were considered in the Section 22 Advisory Committee Report (Department of Urban Affairs and Planning, 1997). A conservation outcome was determined, and conservation areas to be included in the Regional Park (now 900ha in area) and Regional open space areas were determined before the developable area was defined. The following points were considered in order to determine the area for conservation:

- The relative size or area of habitat patches;
- Representation of a vegetation community on a regional scale;
- The presence of threatened flora and fauna species;
- Species diversity in habitat patches;
- The relative naturalness of the habitat patch;
- Connectivity of habitat patches;
- Fragmentation of habitat patches;
- The ease of management of habitat patches, including amount of active management, feasibility and cost; and
- The strategic importance of the SMP for biodiversity management within the locality.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Chapter 6

Consistency of the Proposal with the Objectives of the Cumberland Plain Recovery Plan

6.1 Introduction

A Final Recovery Plan (the Recovery Plan) for the communities and associated threatened species and populations of the Cumberland Plain has been prepared and adopted by the OEH in January 2011 (DECCW, 2011). The Draft Recovery Plan (DECCW (NSW), 2009) was in force between 2009 and 2011. The purpose of this chapter is to examine the consistency of the proposed development with the objectives and actions of the Recovery Plan for the purpose of considering whether there is likely to be a significant impact on threatened species. This analysis is undertaken under section 5A of the EP&A Act.

When considering whether to approve the proposed development under section 79C of the *Environmental Planning and Assessment Act* 1979 Council is not required to act in a manner consistent with the objectives and actions in the Recovery Plan, but should take those objectives and actions into account when determining the development applications.

6.2 Species, Populations and Ecological Communities

The Recovery Plan (DECCW 2011) addresses the following threatened species, populations and ecological communities that are found on the Cumberland Plain, as shown in **Table A.1**.

Table 6.1 Threatened Biodiversity addressed in the Recovery Plan

Threatened Biodiversity	TSC Act Status	EPBC Act Status
Flora Species		
Allocasuarina glareicola	Endangered	Endangered
Dillwynia tenuifolia	Vulnerable	Vulnerable
Juniper-leaved Grevillea (*Grevillea juniperina* subsp. *juniperina*)	Vulnerable	-
Micromyrtus minutiflora	Endangered	Vulnerable
Sydney Plains Greenhood (*Pterostylis saxicola*)	Endangered	Endangered

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table 6.1 Threatened Biodiversity addressed in the Recovery Plan

Threatened Biodiversity	TSC Act Status	EPBC Act Status
Pultenaea parviflora	Endangered	Vulnerable
Fauna Species		
Cumberland Plain Land Snail (*Meridolum corneovirens*)	Endangered	-
Populations		
Dillwynia tenuifolia population in the Baulkham Hills LGA	Endangered	-
Dillwynia tenuifolia population at Kemps Creek	Endangered	-
Marsdenia viridiflora R. Br subsp. *viridiflora* population in the Bankstown, Blacktown, Camden, Fairfield, Holroyd, Liverpool and Penrith LGAs	Endangered	-
Pomaderris prunifolia (a shrub) population in the Parramatta, Auburn, Strathfield and Bankstown LGAs	Endangered	-
Ecological Communities		
Agnes Banks Woodland	Endangered	-
Castlereagh Swamp Woodland	Endangered	-
Cooks River/Castlereagh Ironbark Forest	Endangered	-
Cumberland Plain Woodland (listed on EPBC Act as Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest)	Critically Endangered	Critically Endangered
Moist Shale Woodland	Endangered	-
Shale Gravel Transition Forest (listed on EPBC Act as Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest)	Endangered	Critically Endangered
Shale Sandstone Transition Forest	Endangered	Endangered
River-flat Eucalypt Forest (previously Sydney Coastal River Flat Forest)	Endangered	-
Western Sydney Dry Rainforest	Endangered	-

The management and recovery objectives for the flora and fauna species, populations and ecological communities listed above are addressed as part of the overall objectives for the communities of the Cumberland Plain as it is recognised that the recovery of the vegetation will facilitate the recovery of the associated flora and fauna species.

In addition to those listed above, the following threatened species and populations are found on the Cumberland Plain but are not specifically addressed in the Recovery Plan, as only a small proportion of their distribution occurs within the Cumberland Plain or a recovery plan already exists:

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

- *Acacia pubescens* (Downy Wattle);
- *Hibbertia superans;*
- *Pultenaea pedunculata* (Matted Bush-pea);
- *Persoonia nutans* (Nodding Geebung);
- *Pimelea curviflora* var. *curviflora*; and
- *Pimelea spicata* (Spiked Rice-flower).

Of the species listed above, only one; *Pimelea spicata* occurs on the subject land. Although not covered by the Recovery Plan, this species is addressed in a species specific recovery plan (DEC (NSW), 2006). This species is dealt with at Section 4.3.2iii of this SIS.

The Recovery Plan also identifies a number of additional fauna species, including threatened microbats and birds that are likely to benefit from the implementation of the prescribed management actions. The SIS has dealt with these in Section 4.3.5ii.

The subject land, including the subject site development area at Jordan Springs, contains some ecological communities and threatened species, or habitat for such species, of relevance to the plan, including;

- Cumberland Plain Woodland;
- River-flat Eucalypt Forest;
- *Grevillea juniperina* subsp *juniperina*;
- *Pultenaea parviflora*; and
- Cumberland Plain Land Snail

The primary focus of the Recovery Plan is the preservation of threatened species, populations and communities in priority conservation lands. Priority conservation lands are identified in Figure 1 of the Recovery Plan and are said to represent the best remaining opportunities in the region to maximise biodiversity benefits. DECCW considers these lands to be the highest priority for future efforts to conserve the threatened biodiversity in the region. The 900 ha proposed Regional Park is identified in the Recovery Plan as priority conservation land.

While the subject site is not priority conservation lands, the Recovery Plan nevertheless identifies as a responsibility of, in this case, Council, the promotion and adoption of best practice standards for bushland management on private land outside the identified priority conservation lands. These best practices standards are set out in Appendix 2 to the Recovery Plan and are considered in Section 6.3 below and Appendix E. In relation to private land, the Recovery Plan contemplates the preparation of site action or management plans which address the management of threatened biodiversity in accordance with the

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Recovery Plan. The action and management plans addressing the management of threatened biodiversity for the subject land are also discussed in Section 6.3 below.

Chapter 5 considers the impacts of the proposed development on threatened species, populations and ecological communities, including those listed in the Recovery Plan. The clearing of vegetation within the subject site will directly remove habitat for a small number of threatened species including; the Cumberland Plain Land Snail. *Marsdenia viridiflora* has been recorded in the study area, but not within the subject land. Notwithstanding this, the potential impacts of the proposed development on this species have been considered.

Further to this, a total area of 4.87 ha of CPW, consisting of 1.75 ha of mature CPW, 1.26 ha of regenerating CPW and 1.86 ha of low diversity DNG will be removed as part of the proposed development. The removal of this vegetation will remove the habitat of the Cumberland Plain Land Snail on the subject site. Significant and higher quality habitat for the threatened species will remain in the proposed Regional Park. Such impacts have been assessed in detail in Chapter 5 and Chapter 8 of this SIS.

The Recovery Plan identifies the proposed Regional Park; now named the Wianamatta Regional Park, as priority conservation lands. The Regional Park adjoins the subject site to the east. Partial transfer of Wianamatta Regional Park ownership to the National Parks and Wildlife Division of the OEH has been gazetted, this being the Eastern portion, fronting Forrester Road and Palmyra Avenue. The balance of the land zoned Regional Park is still owned by St Marys Land Limited a Lend Lease Company. The Wianamatta Regional Park Plan of Management was adopted by the Minister for Climate Change and the Environment on 15th February 2011. The Regional Park forms the primary mitigation measure for the development of the SMP and the subject site, consistently with the planning framework which has regulated the development of the SMP for over two decades.

6.3 Compliance of the Proposed Development with the Objectives and Actions of the Final Recovery Plan for the Cumberland Plain

The Recovery Plan identifies the principal threat to the biodiversity of the Cumberland Plain as being the further loss and fragmentation of habitat. Clearing for rural and residential developments, industry, and agricultural land uses has led to increasingly isolated small remnants which are more susceptible to degradation, provide less habitat values and support fewer species.

The Recovery Plan makes clear that there are other areas of local conservation significance, including areas which provide buffers, corridors and ecological linkages for the priority conservation lands, which must be the subject of best practice management (p11). Likewise, (p12) the Recovery Plan notes that the significance of remnant vegetation outside the priority conservation lands should not be underrated, and that best practice management should be implemented on other areas of local conservation significance. It is clear, therefore, that actions to be taken do not relate exclusively to priority conservation lands.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

6.3.1 Objectives

The objectives of the Final Recovery Plan are to improve the conservation of the communities of the Cumberland Plain and protect significant remnants in the long-term. The objectives are as follows:

- Recovery Objective 1: To build a protected area network, comprising public and private lands focused on the priority conservation lands (PCL);
- Recovery Objective 2: To deliver best practice management for threatened biodiversity across Cumberland Plain, with a specific focus on the priority conservation lands and public lands where the primary management objectives are compatible with biodiversity conservation;
- Recovery Objective 3: To develop an understanding and enhanced awareness in the community of the Cumberland Plain's threatened biodiversity, the best practice standards for its management, and the recovery program; and
- Recovery Objective 4: To increase knowledge of the threats to the survival of the Cumberland Plain's threatened biodiversity, and thereby improve capacity to manage these in a strategic and effective manner.

The responsibility for the implementation of these objectives is with OEH (Formerly DECCW). However, the proposed development of the subject site and the Western Precinct in general is consistent with these objectives. The proposed Wianamatta Regional Park has been designated as priority conservation lands and will therefore address Objectives 1 and 2.

The community awareness of the Cumberland Plain's threatened biodiversity is enhanced through the creation of the Regional Park. This will assist in achieving Recovery Objective 3.

The Regional Park also allows for the continued increase of knowledge of threats to the threatened biodiversity of the Cumberland Plain, and therefore assists in the implementation of Recovery Objective 4.

6.3.2 Actions

The responsibilities imposed upon the Council in the implementation of the Recovery Plan require the following:

- Action 1.4 requires the Council to have regard to Priority Conservation Lands in identifying areas for inclusion into environment protection and regional open space zones. This has been achieved by Council through the making of SREP 30 by the Minister for Planning and the reservation of the proposed Regional Park, as discussed above and in Chapter 7;
- Action 1.5 is directed to "*circumstances where impacts on the threatened biodiversity listed in Table 1 (of the Recovery Plan) are unavoidable, as part of any*

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

consent, approval or license that is issued, ensure that offset measures are undertaken within the priority conservation lands where practicable ..." It is noted that Council is not listed as a responsible authority for this action. However, the above action has been included for completeness. In any event, any loss of ecological communities on the subject site is overcome by the offset measures proposed by the proposed Regional Park, as discussed in detail in Chapter 7 of this SIS;

- Action 2.2 requires that Council support and promote the adoption of best practice standards for bushland management and restoration (as specified in Appendix 2) on public and private lands within the Cumberland Plain. The best practice standards are set out in Appendix 2 of the Recovery Plan.

6.3.3 Guidelines

Appendix 2 of the Recovery Plan includes guidelines for the best practice standards for bushland management. The guidelines relate to 3 types of bushland reserved within the Cumberland Plain:

- Bushland on public lands within or outside of priority conservation lands which have conservation as a primary management objective;
- Bushland on public lands outside the priority conservation lands where conservation is not a primary management objective but is compatible with the primary objective; and
- Bushland on private lands

The Wianamatta Regional Park falls under both the categories of "bushland on public lands within priority conservation lands where conservation is the primary management objective" and "bushland on private lands within priority conservation lands where conservation is the primary management objective". The management of this land is governed by the Wianamatta Plan of Management (DEC (NSW), 2007), the implementation of which is the responsibility of OEH and Lend Lease. Regional Park ownership will be transferred to OEH progressively through the life of the development of the SMP.

Only small areas of land within the subject site or Western Precinct will conform to the description of the second point: "bushland on public lands outside of the priority conservation lands", where parklands are created and bushland retained in the development areas. However, presently, any bushland retained in the Western Precinct conforms to "bushland on private lands".

Within the subject site and Western Precinct as a whole, some areas of bushland will be retained after residential development is complete. These areas will predominantly include Asset Protection Zones (APZ), and open space, including some pocket parks. Opens Space & pocket parks will be dedicated to Penrith Council as Public Reserve.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

According to Appendix 2, bushland on public lands outside the priority conservation lands where conservation is not a primary management objective but is compatible with the primary management objective requires an adopted management system or policy (or similar planning document) which addresses:

- *management of threatened biodiversity and is consistent with the recovery plan;*
- *the land to be managed such that the objectives of the management system or policy are met;*
- *monitoring to be undertaken periodically to determine the status of threatened entities, or to assess the effectiveness of threat abatement measures being implemented (for guidance see the Monitoring manual for bitou bush control and native plant recovery (Hughes et al. 2009) at www.environment.nsw.gov.au/bitouTAP/monitoring.htm);* and
- *management is consistent with the following documents, and any additional best practice* documents that DECCW may promote at a later date:
  - *Recovering bushland on the Cumberland Plain – Best practice guidelines for the management and restoration of bushland (DEC 2005a);*
  - *the recommended fire regimes in the Appendix 3; and*
  - *a landscape-scale response to African Olive invasion on the Cumberland Plain (as per completion of action 2.6).*

For bushland on private lands to meet best practice standards for management, Appendix 2 indicates the following measures:

- *a site action or management plan to be prepared which addresses the management of threatened biodiversity and is consistent with the recovery plan;*
- *the land to be managed in accordance with the site action or management plan; and*
- *management to be consistent with the following documents, and any other best practice documents that DECCW may promote at a later date:*
  - *Recovering bushland on the Cumberland Plain – Best practice guidelines for the management and restoration of bushland; and*
  - *The recommended fire regimes in Appendix 3.*

The document *Recovering Bushland on the Cumberland Plain - Best Practice Guidelines for the Management and Restoration of Bushland* (DEC (NSW), 2005b) ("the DEC Guidelines") is referred to in Appendix 2, which requires management to be consistent with the DEC Guidelines in order to reach "best practice standards for management" of bushland on private lands. Relevantly, the DEC guidelines include the following provisions:

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

- " ... protect any retained native vegetation from further degradation by fencing it so it can be managed as a separate unit..." (p 16);
- "...actively manage all retained and protected native vegetation ..." (p 16); and
- "It is extremely important that [remnants of native vegetation] are retained and effort is made to link them across the landscape" (p 17) (emphasis in original).

Page 24 of the DEC Guidelines is headed "Checklist: Ten simple guidelines for making your land fauna friendly". It relevantly includes the following principles:

- Local native vegetation should cover at least 30 per cent of the total area;
- Exclude high impact land uses from at least 30 per cent of the area;
- Maintain native grasses... for grassy woodland areas, it has been recommended that at least half the area contain native grass and herb species ...;
- Native vegetation cover ideally should be in patches of at least 5 to 10 hectares and linked by strips at least 25-50 metres wide;
- Manage at least 10 per cent of the area for wildlife. Of the 30 per cent of the area that is local native vegetation, one third (10 per cent) should be managed primarily for wildlife; and
- Maintain understorey cover over at least a third of the area within a patch of trees. Ensure that approximately one-third of the area managed for wildlife has a high diversity of locally occurring understorey species (herbs, grasses and shrubs) (emphasis in original).

These provisions have been collectively satisfied by the management plans described in the following section, 6.3.4.

6.3.4 Management Plans Regulating Development of the SMP

Several management plans have been approved and adopted for the bushland across the SMP and of specific relevance to this SIS, within the Western Precinct. These areas are already being managed in accordance with these management plans to the extent required. These management plans are consistent with the objectives and requirements of the Recovery Plan, as outlined above.

In addition to the Wianamatta Regional Park Plan of Management, the management plans include the following which have been approved and adopted by Council as part of the statutory planning framework:

- Weed Management Plan (WMP) (Cumberland Ecology, 2008b);
- Feral and Domestic Animal Management Strategy (FDAMS) (Cumberland Ecology, 2008a);

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

- Bushfire Hazard Reduction Plan (BES, 2008);
- Landscape Management Plan (Riparian Restoration) (Environmental Partnership, 2008); and
- A Plan of Management for Eastern Grey Kangaroos, Red Kangaroos and Emus (Referred to as a Macrofauna Management Plan - *MMP*) (Cumberland Ecology, 2004b).

The MMP relates to the entire SMP, including the proposed Wianamatta Regional Park, and was approved by DEC (2005) and stipulates the humane management of macrofauna across the SMP.

The other management plans listed above were prepared as part of the Western Precinct Plan and were adopted by Council in April 2009. The plans are consistent with relevant best practice guidelines for the management of bushland and were prepared in consultation with relevant government departments. Despite the differing publication dates, a review of the purpose and objectives of these guidelines demonstrates that the principles established are collectively satisfied by the management plans.

The recommended fire regimes in Appendix 3 of the Recovery Plan are not considered relevant to bushland in the Western Precinct, as the remnants of bushland are not suitable for this kind of management.

Table **E.1** in **Appendix E** provides a summary of the best practice standards for bushland management, as stated in Appendix 2 of the Recovery Plan and indicates the applicable management plan and section that addresses each point.

6.3.5 Assessment of Threatened Species, Populations and Ecological Communities within this SIS

Several threatened species, populations and ecological communities recorded from the subject site and subject land are covered in the Recovery Plan. These species and populations have been considered in the SIS, and impacts from the proposed development on these species and populations have been assessed. **Table 6.2** indicates the relevant sections in the SIS where these species have been addressed.

The management and recovery objectives for the flora and fauna species, populations and ecological communities listed in **Table 6.2** are addressed as part of the overall objectives for the ecological communities of the Cumberland Plain as it is recognised that the recovery of the vegetation will facilitate the recovery of the associated flora and fauna species.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table 6.2 Threatened Biodiversity identified in the Recovery Plan that have been addressed in this SIS

Threatened Biodiversity listed in the Recovery Plan	Addressed in SIS
Cumberland Plain Woodland	Identified as a Subject and Affected Communities in Section 4.5 of the SIS. Impacts to this community are assessed in Sections 5.2, 5.3 and 5.6
River-flat Eucalypt Forest	Identified as a Subject and Affected Species in Section 4.5 of the SIS. Impacts to this species are assessed in Sections 5.2, 5.3 and 5.6
Grevillea juniperina subsp *juniperina*	Identified as a Subject and Affected Species in Section 4.5 of the SIS. Impacts to this species are assessed in Sections 5.2, 5.3 and 5.6
Pultenaea parviflora	Identified as a Subject and Affected Species in Section 4.5 of the SIS. Impacts to this species are assessed in Sections 5.2, 5.3 and 5.6
Marsdenia viridiflora R. Br subsp. *viridiflora* population in the Bankstown, Blacktown, Camden, Fairfield, Holroyd, Liverpool and Penrith LGAs	Identified as a Subject Species in Section 4.5 of the SIS. Impacts to this species are not assessed in detail, due to the lack of records in the subject site and subject land.
Cumberland Plain Land Snail (*Meridolum corneovirens*)	Identified as a Subject and Affected Species in Section 4.5 of the SIS. Impacts to this species are assessed in Sections 5.2, 5.3 and 5.6

As discussed in detail within Chapter 8 of this SIS, the proposed Regional Park. The main actions proposed in the Recovery Plan include:

- Building the protected area network;
- Delivering best practice management;
- Promoting awareness, education and engagement; and
- Enhancing information, monitoring and enforcement.

The proposed development is consistent with these actions because the largest and best areas of high quality biodiversity in the SMP will be conserved within the proposed Regional Park, adding to the protected area network with opportunity to deliver best practice management. The area of habitat for threatened biodiversity proposed to be cleared is comparatively small and is of lower biodiversity value compared to that of the Regional Park.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

6.4 Application of Recovery Plan to Proposal

As discussed briefly above, when considering whether to grant development consent to the proposed development, Council is not required to act in a manner consistent with the objectives and actions in the Recovery Plan. Those objectives and actions should however be taken into account, as follows:

- Under sections 5A and 79C of the Environmental Planning and Assessment Act 1979, Council is required to take into account whether the Proposal is consistent with the objectives and aims of the Recovery Plan. Under section 79C Council retains the discretion to approve or refuse the Proposal so long as mandatory matters have been taken into account. Under section 69 of the Threatened Species Conservation Act 1995 Council is not required to strictly apply each action for which it is said to be responsible in the Recovery Plan when determining a development application.

- The main actions proposed in the Recovery Plan include:

    - Building the protected area network;
    - Delivering best practice management;
    - Promoting awareness, education and engagement; and
    - Enhancing information, monitoring and enforcement.

The Proposed development is consistent with these actions because:

1. The largest and best areas of high quality biodiversity in the SMP will be conserved within the proposed Regional Park, adding to the protected area network with opportunity to deliver best practice management;

2. The area of habitat for threatened biodiversity proposed to be cleared is comparatively small and is of lower biodiversity value compared to that of the Regional Park; and

3. Management plans regulating the development of the SMP have been approved and adopted that are consistent with the objectives and requirements of the Recovery Plan.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Chapter 7

Ameliorative Measures

7.1 Introduction

Measures have been put in place to mitigate adverse affects on the species, populations and ecological communities that exist or may occur in the study area during and after the construction of the Western Precinct. Long term management strategies, compensatory management strategies and monitoring plans have been developed in order to minimise the impacts of the proposed development on the flora and fauna of the subject site, including affected (C)EECs/species and ecological communities. These management strategies and plans will minimise and control the key threatening processes outlined in Chapter 5.

This chapter provides a summary of the mitigation measures proposed and the extent of implementation that has occurred to date.

The mitigation measures will cover the SMP including the Western Precinct and the Regional Park. Long term management strategies and plans include:

7.1.1 SMP/Regional Park

- The statutory planning framework established for the SMP provides the foundation for the sustainable development and management of the SMP:

  - The SREP30 (DUAP, 2001b) zones 900ha of land for the purpose of a Regional Park to conserve a representative and significant proportion of the natural values of the SMP in order to protect the variety of Western Sydney vegetation communities, native flora and fauna species and fauna habitat. Clause 37(1)(b) of SREP 30 provides a relevant objective of this zoning is to "conserve and enhance the range and variety of ecological communities...within the area". Development for the purpose of any land use authorised under the National Parks and Wildlife Act (NPW Act) is permissible without consent, and any other land use is prohibited: cl 37(2) ;

  - The EPS2000 establishes amongst other things the environmental conservation principles to guide the long term development and conservation of the SMP. Section 4.2 provides that the Regional Park will provide for the conservation of EECs including CPW. Section 4.3 provides performance objectives amongst which is the objective of minimising

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

adverse impacts on the vegetation habitats within the Regional Park resulting from the development of areas zoned "Urban"; and

- The State Deed provides for the transfer of land to NPWS, provision of funding and the obligation to gazette land as Regional Park under the NPW Act.

➢ The Regional Park Plan of Management, adopted under S.75A of the NPW Act.

- The approved St Marys Macrofauna Management Plan (Cumberland Ecology, 2004b);

7.1.2 Western Precinct

➢ The Western Precinct Weed Management Plan (Cumberland Ecology, 2008b);

➢ The Western Precinct Feral and Domestic Animal Management Strategy (Cumberland Ecology, 2008a);

➢ The Western Precinct Landscape Concept Plan (Environmental Partnership, 2009); and

➢ Vegetation Management Plan for Riparian Corridors (Environmental Partnership, 2008)

7.2 Long Term Management Strategies

Long-term management strategies to protect the high quality habitats of the study area from impacts prior to, during and post construction of developments in the Western Precinct, as detailed in the Precinct Plan (JBA 2009). Such measures include the implementation of the following plans:

7.2.1 The Landscape Masterplan

A number of principles have been adopted in relation to the Landscape Masterplan for the Western Precinct (Environmental Partnership, 2009) including;

➢ Maximising natural functioning of the watercourses, incorporating bed and bank stability;

➢ Maximising corridor functions for native fauna and flora of the riparian areas;

➢ Maximise water quality functions;

➢ Maximising biological functions within riparian areas;

➢ Minimising movement of undesirable flora within the riparian areas; and

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

- Minimising future salinity impacts for the whole site.

i. Seed collection

The seed from local native plants will be collected for use in the revegetation plans for riparian zone and open space areas. This will ensure preservation of the local genetic material of the flora.

ii. Retention of significant trees

Street trees are an important element of the streetscape and open space system. Street trees assist in reinforcing the biodiversity values of the St Marys Development. The following strategies are to be used wherever possible in the subsequent planning phases to respond to retain individual trees and stands of existing trees through the site. Moreover

- Existing significant trees shall be incorporated into the planting design at key locations within parks and streetscapes; and

- Street trees are predominantly native trees indigenous to Western Sydney.

iii. Environmental Considerations

The environmental values of both the subject site and the Western Precinct will be reinforced through appropriate revegetation from local seed stock and protection of natural features. The natural features that will be protected in the Western Precinct include watercourses, mature trees, fire cycle maintenance, and the soil seed bank.

The revegetation of the riparian zone will incorporate indigenous plant species predominantly propagated from seed stock collected from the site and from local seed stock collected by other organisations. This will ensure that the creek and environmental corridors are revegetated with genetically appropriate plant species to maintain genetic integrity of the local biodiversity. The maintenance of naturally functioning watercourses increases the environmental value of the site by increasing creek bank stability and water quality. Moreover, naturally functioning watercourses protects from future degradation of the site from invasive weeds and high salinity.

All open spaces will be designed to ensure that the maintenance of local flora is sustainable. The design and maintenance standards will be defined by the quality, size, location and use of each individual open space area. Existing significant trees shall be incorporated into the planting design at key locations within parks and streetscapes. These mature trees will strengthen the biodiversity values of the subject site by providing shelter, habitat and corridors for native fauna. Moreover, the mature trees will provide shade and aesthetic values for the residents of SMP. Any trees that are removed will be harvested for landscape mulch and furniture items to minimise wastage and in up keeping with sustainability values. Furthermore the onsite topsoil will be stripped, stored, ameliorated and reused within streetscape and parks. This will ensure that local seed bank in the soil is preserved for the biodiversity value of the Western Precinct.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

A well-defined asset protection zone and appropriate interface and edge treatments along the Regional Park boundary will assist in the ongoing management of the park. The maintenance of the natural fire cycles in the Regional Park is important for the preservation of floral diversity in the Regional Park, however regular burn offs of ground litter in the Regional Park will safeguard the residents of SMP from the threat of bush fire. The asset protection zone will enhance this safeguard.

7.2.2 Weed Management Plan

A Weed Management Plan has been developed and adopted by Penrith City for the Western Precinct in order to provide for the following objectives:

- Identification and management of weeds during and after construction on the Western Precinct to prevent the spread of weeds into the Regional Park;
- Specify control measures for noxious weeds of significance in the SMP specifically identified in the EPS, Noxious Weeds Act 1993 and Weeds of National Significance;
- Set out requirements for revegetation after disturbance or construction to reduce the potential spread and establishment of weeds;
- Prepare prescriptions for the control of significant weed species within the Western Precinct development area during and after construction;
- Detail a weed control program for the Western Precinct development area;
- Make provision for weed control guidelines for building and landscaping and education material for future residents;
- Outline strategies to ensure that the relevant objectives outlined in SREP 30 and St Marys EPS Environmental Planning Strategy and State Deed are met; and
- The WMP will be implemented and enforced via conditions of consent on DAs.

7.2.3 Feral and Domestic Animal Management Strategy

A Feral and Domestic Animal Management Strategy has been developed and adopted by PCC for the Western Precinct in order to provide for the following objectives:

- To ensure that development of the Western Precinct does not directly increase populations of, or improve habitats for, feral/exotic pest animals and over-abundant native species;
- To ensure that development of Western Precinct does not indirectly increase populations of feral animals such as European Red Foxes and Feral Cats by creating abundant prey;

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

- To ensure that development of Western Precinct does not exacerbate any Key Threatening Process;
- To minimise the potential for domestic animals within Western Precinct to impact on native flora and fauna values at the SMP;
- To minimise the potential for feral/exotic pests, over-abundant native and domestic animals to impinge on the conservation values of the adjoining Regional Park; and
- This strategy will be implemented and enforced via conditions of consent on DAs.

7.2.4 Bushfire Management Plan

The Bushfire Management Plan is being implemented progressively in the Western Precinct to reduce the bushfire hazard to life and property within the precinct and reduce the adverse effects of frequent bushfires on the Regional Park.

7.2.5 Macrofauna Management Plan

The St Marys Macrofauna Management Plan (for kangaroos and emus) for the entire SMP has been endorsed by NPWS and is now being implemented, which will ultimately result in a decrease in grazing pressure in the Regional Park and exclusion of macrofauna from the Western Precinct.

The key objectives of the MMP include:

- Minimisation of risks to macrofauna from human activities and from macrofauna to humans on the SMP;
- Provision of a protocol for the treatment of sick or injured macrofauna on the SMP;
- Justification of management options for the macrofauna population;
- Provision of short term prescriptions for management of macrofauna in relation to proposed developments within the development precincts of the SMP;
- Provision of medium term and long term prescriptions for management of macrofauna within the Regional Park and open space areas of the SMP; and
- Provision of appropriate mechanisms for monitoring, review and revision of the MMP as required for adaptive management of the macrofauna populations.

7.2.6 Habitat Enhancement within Subject Land

Some existing trees and understorey within the Western Precinct will be retained and incorporated into the landscape design of the precinct plan. These may be retained around future dwellings or in proposed riparian corridors and areas of open space where possible.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Planting of riparian corridors as part of water management will also form part of onsite mitigation.

7.3 Compensatory Measures

Compensatory strategies have been put in place to minimise impacts on threatened species and (C)EECs.

The foremost mitigation measure for threatened species and ecological communities is the establishment of the 900ha Regional Park, to be managed by OEH. The Regional Park will conserve extensive, viable tracts of forest and woodland, and habitats of threatened and regionally significant species. The Regional Park comprises the best representative parts of the (C)EECs in the SMP.

In addition to the reservation of this land, regeneration (assisted if required) of endangered ecological communities and threatened flora will occur within degraded parts of the Regional Park using local seed stock (this has been addressed within the Regional Park Plan of Management). The establishment of the Regional Park is further supported by the extensive plans of management of relevance to the long-term management of this large conservation area. The following plans have been implemented for the Regional Park:

7.3.1 Regional Park Plan of Management

- A Plan of Management for the 900ha Regional Park (DEC (NSW), 2007) has been prepared and recently endorsed by OEH. The Regional Park will be managed to maintain the remnant vegetation communities and associated biodiversity and will include the protection of significant cultural and scenic values. Visitor and research opportunities will be provided that are consistent with the conservation values of the Park. The key objectives of this plan include:

- Protection and enhancement of the natural heritage of the Park, particularly the endangered ecological communities and the threatened flora and fauna species through the management of fire, disturbed areas, drainage, introduced species, access and visitor use;

- Protection of the catchment values of South and Ropes Creeks through managing any disturbances, particularly those associated with fire, access and drainage;

- Provision of recreational facilities that are appropriate in a regional context and are designed, located and managed to protect the natural and cultural heritage and visual values of the Park;

- Provision of interpretive and educational opportunities through signage, park brochures and activities to assist visitor understanding and enjoyment of the Park; and

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

- Improving knowledge of natural and cultural heritage, corresponding threats and the evaluation of management programs through research and monitoring. Working with local government, other agencies and authorities, the community and commercial interests to maximise community interest and involvement in the conservation of the Park, and the implementation of sympathetic conservation measures in the neighbouring environment.

7.3.2 Macrofauna Management Plan

Significant financial investment has been made by the proponent to contribute to the overall compensatory "package". The population management of kangaroo and emu populations in the 900ha Regional Park (and other areas of the SMP) has allowed for the regeneration of CPW and other woodland types due to the significant reduction in grazing animals present. There has also been investment in the monitoring of impacts from grazing over a number of years, as described in Section 7.4 below.

7.3.3 Principles for Offsetting

The compensatory measures against state-wide standards in offsetting utilised for the development of the SMP is specified by OEH in '*Guidelines for Biodiversity Certification of Environmental Planning Instruments Working Draft – Department of Environment and Climate Change, October 2007' (DECC, 2007).* The Principles for offsetting (DECC 2007) require that offsets be underpinned by sound ecological principles and must:

- Include the consideration of structure, function and compositional elements of biodiversity, including threatened species;
- Enhance biodiversity at a range of scales;
- Consider the conservation status of ecological communities; and
- Ensure the long-term viability and functionality of biodiversity.

Offsets should be targeted according to biodiversity priorities in the area, based on the conservation status of the ecological community, the presence of threatened species or their habitat, connectivity and the potential to enhance condition by management actions and the removal of threats. Only ecological communities that are equal or greater in conservation status to the type of ecological community lost can be used for offsets. One type of environmental benefit cannot be traded for another: for example, biodiversity offsets may also result in improvements in water quality or salinity but these benefits do not reduce the biodiversity offset requirements.

The dedication of 900ha of land to create Regional Park, monetary contributions towards capital costs of the Regional Park, fencing and additional measures, such as the implementation of management plans described above, satisfies these principles.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

7.3.4 Alternative Compensatory Measures

The options for the SMP have been considered over many years and they range from the "complete conservation option", which would involve designating the entire SMP as a conservation reserve, through to options that would see the majority of the site developed and used for urban development.

The "complete conservation option" has not been considered feasible due to the extensive disturbance of the former industrial portions of the subject site and the high costs (and impracticalities) of restoration of such land. More extensive development of the SMP is also not warranted as this would likely require clearing of at least some relatively undisturbed woodland and forest and impact upon areas listed on the Register of National Estate.

The conservation outcome for the SMP provided for under SREP 30 was determined by the detailed deliberations of a statutory committee convened by the NSW Minister for Planning under Section 22 of the NSW EP&A Act (1979) (Department of Urban Affairs and Planning, 1997). This outcome was added to in more recent years by the inclusion of all areas of National Estate into an expanded Regional Park. Due to the high conservation values of portions of the site, conservation outcomes were considered in detail and provided for as the first priority for planning the future of the property.

The major alternatives to the development of the property would be more conservation/less development or more development/less conservation. However, currently SREP 30 and the subsequent amendments to expand the Regional Park provide for conservation of approximately 900 hectares of the 1545 hectare site and include the vast majority of the high and medium conservation value lands.

In the context of the SMP, and the study area, the subject site is a highly disturbed area. While the subject site could in theory be added to the conservation reserve for the SMP, this is not a practical alternative to the current proposed development owing to the high level of disturbance to the site. Such an alternative would also substantially reduce the developable area of the subject site without adding substantially to the conservation of threatened flora and fauna.

7.4 Monitoring

The effectiveness of the mitigation measures is determined by ongoing monitoring. The objective of the ongoing monitoring of the affected (C)EECs/species will be to ascertain whether the predicted impacts on the species occur. Monitoring will also detect other unexpected impacts and where necessary, measures to prevent further impacts can be implemented. The method of monitoring, reporting framework, duration and frequency is outlined in detail. The effectiveness of mitigation measures is generally proven by experimental design allowing adaptive management and appropriate monitoring. Details of the monitoring for all flora and fauna within the SMP, including macrofauna, weeds, feral animals and threatened species, will be provided within a Monitoring Plan prepared in conjunction with the Regional Park Plan of Management.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

7.4.1 Weed Management Plan

A vital component of weed control strategy is follow-up work and monitoring. The review and monitoring of weed control is outlined in this plan. Short term monitoring will be undertaken as a follow-up to weed control operations, ensuring that weed control has been successful. The long-term monitoring program is to provide sufficient feedback on the success of the overall weed control strategies including suppression and prevention of weed spread and establishment. Detailed short-term and long-term monitoring objectives and methods are outlined in the plan. An annual review of the plan will be undertaken to assess the effectiveness of the plan, during the first three years. The detailed reporting framework is also outlined in the plan.

7.4.2 The St Marys Macrofauna Management Plan

The Macrofauna Management Plan (MMP) is based upon an adaptive management approach and regular monitoring and review. This will ensure that the kangaroo and emu populations are managed in an optimal way that ensures animals are removed from development areas and where retained, they are maintained in a healthy humane condition at densities that do not unsustainably impact upon the condition and use of the Regional Park. Kangaroos and emus will be counted on a quarterly basis for the first five years of the MMP. The counts of kangaroos and emus will, where possible, be related to data from fox baiting programs conducted on the SMP. Detailed short-term and long-term monitoring objectives and methods are outlined in the MMP. The findings of monitoring work for the MMP and results of various adaptive management procedures will be summarised within an annual report, submitted to NPWS. This annual report will be used as the basis for the annual revision of the MMP.

It is a condition of the MMP that vegetation will be monitored in these plots annually in autumn for the life of the MMP. Baseline flora surveys of these plots were completed between March and July 2005. Vegetation within the plots was then re-surveyed between March and July from 2008 - 2014. Reports have been completed, analysing the floristic and structural changes within the first (Cumberland Ecology, 2006), and all other subsequent years up to 2014 after grazing exclosure. This research is considered to assist in the conservation efforts for CPW by OEH.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Chapter 8

Assessments of Significance

8.1 Critically Endangered Ecological Community

8.1.1 Cumberland Plain Woodland

Cumberland Plain Woodland (CPW) occurs in two forms; Shale Hills Woodland and Shale Plains Woodland. Shale Hills Woodland occurs in the south of the Cumberland Plain in more elevated areas. Shale Plains Woodland is more widely distributed, occurring throughout the drier areas of the Cumberland Plain (NSW NPWS, 2000). Dominant canopy species include *Eucalyptus moluccana*, *E. tereticornis*, *E. crebra*, *Corymbia maculata* and *E. eugenoides*. The shrub layer is dominated by *Bursaria spinosa*. Grasses dominate the ground layer (Benson and Howell, 1990).

The community is well adapted to fire and drought but is now under threat from disturbance triggering weed invasion, increased soil nutrients, rubbish dumping and altered fire regimes.

In December 2009, the NSW Scientific Committee released a final determination for the listing of Cumberland Plain Woodland as a critically endangered ecological community (NSW Scientific Committee, 2009). The definition of the community in this final determination includes areas of derived native grasslands, referring to areas where trees and shrubs have been cleared but a native understorey typical of Cumberland Plain Woodland still exists.

CPW within the subject site consists of a mix of mature woodland, young, degraded woodland in various stages of regeneration and low diversity derived native grassland. CPW within the subject site totals an area of 4.87 ha (1.75 ha of mature CPW, 1.26 ha of regenerating CPW and 1.86 ha of low diversity DNG) of vegetation and is similar to other representatives in the greater Western Precinct, particularly the western side, and the Village 1, 2, 3, 4 and 5 localities. Larger patches and more intact tracts of CPW occur on the SMP, with the largest and best quality areas conserved within the Regional Park.

a) in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction

Not applicable.

b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

endangered population such that a viable local population of the species is likely to be placed at risk of extinction

Not applicable.

c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction

The proposed development of the subject site will collectively remove an area of approximately 4.87 ha of CPW consisting of 1.75 ha of mature CPW, 1.26 ha of regenerating CPW and 1.86 ha of low diversity DNG.

Additionally, cumulative impacts of the Western Precinct development (currently undeveloped portions only) are likely to remove or modify a total of 15 ha of mature CPW, 21 ha of regenerating CPW, 0.09 ha of DNG and 31.99 ha of low diversity DNG. This is not likely to have an adverse effect on the extent of the community such that its local occurrence is likely to be placed at risk of extinction because the community is well-represented within the adjacent Regional Park where it has a higher conservation value and is in better condition.

There is a possibility that the composition of CPW may be modified in the adjoining areas of the Regional Park due to an increase in edge effects from the future residential areas. However, a suite of mitigation measures will be implemented to reduce impacts from the proposed development within the Western Precinct and adjoining Regional Park including fencing and comprehensive drainage and waste management strategies. Any edge-effects that may occur are expected to be localised, and would not be expected to adversely modify composition to place the local occurrence at risk of extinction.

d) in relation to the habitat of a threatened species, population or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

It is assumed that all CPW within the subject site will be removed or substantially modified for the proposed development. The proposed development of the subject site will collectively remove an area of approximately .1.26 ha of regenerating CPW. 1.75 ha of mature CPW and 1.86 ha of low diversity DNG.

Additionally, cumulative impacts of the Western Precinct development (currently undeveloped portions only) are likely to remove or modify a total of 15 ha of mature CPW, 21.63 ha of regenerating CPW, 0.09 ha of DNG and 31.99 ha of low diversity DNG. This is compared with the large areas of intact CPW/Cumberland Plain Vegetation Communities totalling more than 411ha/746ha respectively (DEC (NSW), 2007) conserved in perpetuity in the 900ha Regional Park as an offset to development of the SMP development precincts.

The CPW of the study area occurs at the eastern edge of the Western Precinct development area and will not isolate any patches of woodland that occur outside of the development areas. The sparse regenerating woodland on the subject site occurs at the outer edge of a continuous patch that extends into the Regional Park. The proposed development of the Western Precinct will however contribute to the increasing fragmentation of habitat within the Western Precinct and links to the Regional Park.

The CPW to be removed or modified as a result of the proposed development is not likely to be of great importance to the long-term survival of the community within the locality. Cumberland Plain Woodland of high conservation significance will be conserved within the Regional Park and managed for conservation. The vegetation within the Regional Park is considered to be more important than that within the subject site as it has higher resilience, is more structurally intact and has higher species diversity.

e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly)

No critical habitat for this endangered ecological community has currently been identified by the Director-General of the OEH.

f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

The Draft Recovery Plan for the Cumberland Plain has been placed on public exhibition. The main actions proposed in the Recovery Plan include:

- Building the protected area network;
- Delivering best practice management;
- Promoting awareness, education and engagement; and
- Enhancing information, monitoring and enforcement.

The proposed development is consistent with these actions because the largest and best quality areas of CPW in the SMP will be conserved within the Regional Park, adding to the

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

protected area network with opportunity to deliver best practice management. The patches and sparse patches of CPW in the study area are comparatively small and degraded compared to the representation in the Regional Park and will not greatly add to the viability of the community if retained, once the study area is developed for urban purposes.

There are no threat abatement plans relevant to CPW.

g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

The proposed development will result in the threatening process 'Clearing of native vegetation'. However, the vegetation to be cleared consists predominantly of degraded and sparsely regenerating CPW and higher quality examples of the community will be conserved within the Regional Park.

Other key threatening processes that may be increased as a result of the proposed development include:

- Competition and grazing by the Feral European Rabbit;
- Ecological consequence of high frequency fires; and
- Invasion of native plant communities by exotic perennial grasses.

The Feral and Domestic Animal Management Strategy will be implemented in the Western Precinct to ensure that the effects of rabbits are not exacerbated by the proposed development and to decrease the impacts from rabbits as they currently exist on the SMP.

The Bushfire Management Plan has been designed to mitigate factors that could lead to high frequency fires. The plan of management for the Regional Park will also ensure that this process is not exacerbated.

The Weed Management Plan will be implemented to reduce the impacts of exotic perennial grasses.

Conclusion

The development of the subject site and subject land will remove a relatively small area of habitat for this community based and recent assessments of derived native grassland on the subject land and with due consideration of the restricted distribution of this CEEC in the region. However, the proposed development is not likely to have a significant impact on Cumberland Plain Woodland such that the large and viable representatives in the Regional Park would be placed at risk of extinction. The large and continuous remnants present in the Regional Park will be protected through a range of mitigation measures and retained in perpetuity in public ownership.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

8.1.2 River-flat Eucalypt Forest

River-flat Eucalypt Forest (RFEF) is found on coastal floodplains and has a tall canopy of eucalypts. The most widespread canopy trees include *Eucalyptus tereticornis, E. amplifolia, Angophora floribunda* and *A. subvelutina*. It may have a layer of small trees and a scattering of shrubs. The ground cover consists of abundant forbs, scramblers and grasses. RFEF occurs on alluvial soils on river-flats of the NSW North Coast, Sydney Basin and South East Corner bioregions (NSW Scientific Committee, 2004k).

No RFEF is present on the subject site. A small patch of RFEF in moderate condition occurs in the south east of the subject land. It is connected to a larger area of RFEF (a form of Alluvial Woodland) in the Regional Park. It is connected to a larger area of RFEF (a form of Alluvial Woodland) in the Regional Park.

a) *In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,*

Not applicable.

b) *In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,*

Not applicable.

c) *In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:*

   (i) *is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*

   (ii) *is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.*

The RFEF in the Western Precinct occurs in a small area connected to a larger section of RFEF in the Regional Park. The proposed development will not remove an area of RFEF and is not likely to have an adverse effect on the extent of the community such that its local occurrence is likely to be placed at risk of extinction. The community is well-represented within the adjacent Regional Park where it has a higher conservation value and is in better condition.

The composition may be modified in parts of the Western Precinct where representations of the community are retained such as significant trees or patches of understorey. Although patches of vegetation are not likely to be retained with structural complexity or composition

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

resembling RFEF, this will not adversely modify composition to place the local occurrence at risk of extinction because of the retention of RFEF in the Regional Park.

d) In relation to the habitat of a threatened species, population or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.

No RFEF will be removed on the subject site. However a total of 6.95 ha of mature and regenerating RFEF will be modified as part of future works on the subject land. However, such works will occur in the future riparian corridor, which will include regeneration of this community.

Intact RFEF will remain connected to other areas of native vegetation through the Regional Park around the southern and eastern sides of the precinct. Any significant trees or patches of understorey that are retained within the precinct will become isolated as a result of the proposed development.

The RFEF to be removed, modified or isolated as a result of the proposed development is not important to the long-term survival of the community within the locality. River-flat Eucalypt Forest of high conservation significance will be conserved within the Regional Park and managed for conservation. The vegetation within the Regional Park is considered to be more important than that within the Western Precinct as it is in better condition and is more intact.

e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

No critical habitat for this endangered ecological community has currently been identified by the Director-General of the OEH.

f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plans,

The DECC is currently preparing a draft recovery plan for the endangered ecological communities of the Cumberland Plain, though it is yet to be finalised. There are no threat abatement plans relevant to RFEF.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

g) Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

The proposed development will result in Clearing of native vegetation. However, the vegetation to be cleared consists of degraded RFEF and higher quality examples of the community will be conserved within the Regional Park. Other key threatening processes that may be increased as a result of the proposed development include:

- Competition and grazing by the feral European rabbit;
- Ecological consequence of high frequency fires; and
- Invasion of native plant communities by exotic perennial grasses.

The Feral and Domestic Animal Management Strategy will be implemented in the Western Precinct to ensure that the effects of rabbits are not exacerbated by the proposed development and to decrease the impacts from rabbits as they currently exist on the SMP.

The Bushfire Management Plan has been designed to mitigate factors that could lead to high frequency fires. The Plan of Management for the Regional Park will also ensure that this process is not exacerbated.

The Weed Management Plan will be implemented to reduce the impacts of exotic perennial grasses.

Conclusion

The proposed development is not likely to have a significant impact on River-flat Eucalypt Forest.

8.1.3 Freshwater Wetlands

Freshwater wetlands on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions occurs on low-lying parts of floodplains, alluvial flats, depressions, drainage lines, back swamps, lagoons and lakes. It is dominated by herbaceous plants including sedges, emergent plants, floating and submerged plants (NSW Scientific Committee, 2004e).

The community is threatened by land clearing, fragmentation, flood mitigation, land-filling, pollution from runoff, weed invasion, damage from livestock and feral animals, acid sulphate soils, rubbish dumping and climate change.

No areas of Freshwater Wetlands occur on the subject site, although small patches occur in nearby parts of the subject land in low-lying areas. Other areas of Freshwater Wetlands are conserved within the Regional Park.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

a) In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,

Not applicable.

b) In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,

Not applicable.

c) In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

The Freshwater Wetlands in the Western Precinct and surrounding areas of the Regional Park occur in very small localised depressions. The proposed development will not remove any areas of Freshwater Wetlands and therefore will not have an adverse effect on the extent of the community such that its local occurrence is likely to be placed at risk of extinction. Furthermore, the community is well-represented within the adjacent Regional Park where it has a higher conservation value and is in better condition.

There is a possibility that wetlands in the adjacent areas of the Regional Park may be modified through indirect impacts from clearing of vegetation and ancillary works. However, a suite of mitigation measures will be implemented to reduce impacts from the proposed development within the Western Precinct and adjoining Regional Park including fencing and comprehensive drainage and waste management strategies. Any edge-effects that may occur are expected to be localised, and would not be expected to adversely modify composition to place the local occurrence at risk of extinction.

The composition may be modified in parts of the Western Precinct where representations of the community are retained such as within riparian corridors. This will not adversely modify composition to place the local occurrence at risk of extinction because of the retention of Freshwater Wetlands in the Regional Park.

d) In relation to the habitat of a threatened species, population or ecological community:

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.

It is assumed that some of the Freshwater Wetlands within the precinct will be removed or substantially modified for the proposed development while some areas may be retained within riparian corridors.

Intact Freshwater Wetlands will remain connected to other areas of native vegetation as the community intergrades with CPW, through the Regional Park around the southern and eastern sides of the precinct. Any areas that are retained within riparian corridors in the precinct are likely to be connected to the Regional Park.

The Freshwater Wetlands to be removed, modified or isolated as a result of the proposed development are not important to the long-term survival of the community within the locality. Freshwater Wetlands of high conservation significance will be conserved within the Regional Park and managed for conservation. The vegetation within the Regional Park is considered to be more important than that within the Western Precinct as it is in better condition and is more intact.

e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

No critical habitat for this endangered ecological community has currently been identified by the Director-General of the DECC.

f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plans,

The DECC is currently preparing a draft recovery plan for the endangered ecological communities of the Cumberland Plain, though it is yet to be finalised. There are no threat abatement plans relevant to Freshwater Wetlands.

g) Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

The proposed development will result in Clearing of native vegetation. However, the vegetation to be cleared consists of degraded Freshwater Wetlands and higher quality examples of the community will be conserved within the Regional Park. Other key threatening processes that may be increased as a result of the proposed development include:

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

- Competition and grazing by the feral European rabbit;
- Ecological consequence of high frequency fires; and
- Invasion of native plant communities by exotic perennial grasses.

The Feral and Domestic Animal Management Strategy will be implemented in the Western Precinct to ensure that the effects of rabbits are not exacerbated by the proposed development and to decrease the impacts from rabbits as they currently exist on the SMP.

The Bushfire Management Plan has been designed to mitigate factors that could lead to high frequency fires. The plan of management for the Regional Park will also ensure that this process is not exacerbated.

The Weed Management Plan will be implemented to reduce the impacts of exotic perennial grasses.

Conclusion

The proposed development will not have a significant impact on Freshwater Wetlands.

8.2 Fauna

8.2.1 Cumberland Plain Land Snail

The Cumberland Plain Land Snail inhabits a very small area on the Cumberland Plain west of Sydney from Richmond and Windsor south to Picton and from Liverpool west to the Hawkesbury and Nepean Rivers at the base of the Blue Mountains (OEH, 2013a). It primarily occurs in Cumberland Plain Woodland which is a grassy open woodland with occasional dense patches of shrubs. It lives under litter or bark, leaves and logs or shelters in loose soil around grass clumps (OEH, 2013a). The Cumberland Plain Land Snail is listed as Endangered under the TSC Act (NSW Scientific Committee, 1997).

a) *In the case of a threatened species, whether the lifecycle of the species is likely to be disrupted such that a viable local population of the species is likely to be placed at risk of extinction.*

Little is known about the range of the Cumberland Plain Land Snail and the area required for a viable population, but it is thought that the remaining total population on the Cumberland Plain consists of several disjunct populations (NSW Scientific Committee, 1997). The SMP is likely to support one large population or subpopulation of this species. The Cumberland Plain Land Snail is present within most or all of the larger patches of CPW on the SMP and is represented within the Regional Park which contains more than 400ha of potential habitat.

Cumberland Plain Land Snail's were recorded on the subject land, although not from within the subject site. As an indication of relative abundance, surveys of comparative CPW in the Regional Park indicate a significantly higher number of snails in mature CPW. The habitat on the subject land is sparse and suitable CPW patches are small and infrequent. Based on

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

the assessments in the Regional Park, it can be assumed that approximately 400ha of habitat occurs, which would suggest potentially hundreds of thousands of snails.

Because the CPW on the subject site is isolated from other patches, it is questionable as to whether the subpopulation would be viable in the long term as it may not survive stochastic events such as a long drought period or disease. The conservation of large, intact areas of habitat for the species in the Regional Park is considered an adequate conservation measure for the long term viability of the species on the SMP.

b) *In the case of an endangered population, whether the lifecycle of the species that constitutes the endangered population is likely to be disrupted such that the viability of the population is likely to be significantly compromised,*

There are no populations of this species listed as endangered under the TSC Act.

c) *In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:*

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

Not applicable.

d) *In relation to the habitat of a threatened species, population or ecological community:*

(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.

A total of 3.01 ha of marginal potential habitat (in the form of mature and regenerating CPW) will be removed on the subject site. Additionally, the development of the remainder of the subject land will remove up to 74 ha of potential habitat in the form of mature and regenerating CPW. It can therefore be assumed that all of the potential habitat for this species on the subject site will be removed or substantially modified as a result of the proposed development.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

The potential habitat for this species occurs in patches fragmented from larger occurrences in the Regional Park. Any significant trees or patches of understorey that are retained within the subject site will remain isolated from the Regional Park.

The habitat to be removed, modified or isolated as a result of the proposed development may be important to the long-term survival of the species within the locality. However, areas of known high quality habitat occur within the Regional Park and will be conserved within the Regional Park and managed for conservation.

e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).

No critical habitat for this species has currently been identified by the Director-General of the OEH.

f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

A recovery plan has not been prepared for this species. No threat abatement plans are relevant to this species.

The Cumberland Plain Recovery Plan (DECCW 2011) focuses primarily on vegetation that constitutes habitat for this species.

g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of a key threatening process.

Clearing of native vegetation resulting in the loss of habitat is a listed threatening process under the TSC Act. Small, degraded patches of potential habitat will be cleared for the proposed development. However, over 400ha of known habitat for the species will be contained within the Regional Park, which will be managed to improve fauna habitat on the SMP.

No other key threatening process that may be exacerbated by the proposed action will affect this species.

Conclusion

The proposed development is not likely to have a significant impact on the Cumberland Plain Land Snail. The development of the subject site and the subject land will remove an area of habitat for this species. However, the proposed development is not likely to have a significant impact on Cumberland Plain Land Snail such that the large and viable representatives in the Regional Park would be placed at risk of extinction. The large and continuous remnants present in the Regional Park will be protected through a range of mitigation measures and retained in perpetuity.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

8.2.2 Woodland Birds

The following vulnerable listed woodland bird species have been recorded in the study area, and have similar habitat requirements, are assessed in the Assessment of Significance below:

- Speckled Warbler (*Pyrrholaemus sagittata*);
- Diamond Firetail (*Stagonopleura guttata*);
- Varied Sittella (*Daphoenositta chrysoptera*); and
- Hooded Robin (*Melanodryas cucullata cucullata*).

The Speckled Warbler has a patchy distribution throughout south-eastern Queensland, the eastern half of NSW and into Victoria, as far west as the Grampians. The species is most frequently reported from the hills and tablelands of the Great Dividing Range, and rarely from the coast. The Speckled Warbler lives in a wide range of *Eucalyptus* dominated communities that have a grassy understorey, often on rocky ridges or in gullies (OEH, 2012i). The Speckled Warbler is listed as Vulnerable on Schedule 2 of the TSC Act (NSW Scientific Committee , 2004k).

The Diamond Firetail occurs in Eucalypt woodlands including Box-Gum and Snow Gum woodlands. It also occurs in open forest, mallee, natural temperate grasslands and derived grasslands, often in riparian areas (OEH, 2012a). It is widely distributed across NSW. The Diamond Firetail is threatened by habitat loss through clearing, invasion of weeds and firewood collection, and predation of eggs and nestlings by the Pied Currawong. The Diamond Firetail is listed as Vulnerable on Schedule 2 of the TSC Act.

The Varied Sittella is sedentary and inhabits most of mainland Australia except the treeless deserts and open grasslands. Its distribution in NSW is nearly continuous from the coast to the far west (OEH, 2012j). The Varied Sittella's population size in NSW is uncertain but is believed to have undergone a moderate reduction over the past several decades.

The Hooded Robin is found across Australia, except for the driest deserts and the wetter coastal areas - northern and eastern coastal Queensland and Tasmania. The south-eastern form (subspecies cucullata) is found from Brisbane to Adelaide and throughout much of inland NSW. The species prefers lightly wooded country, usually open eucalypt woodland, acacia scrub and mallee, often in or near clearings or open areas and requires structurally diverse habitats featuring mature eucalypts, saplings, some small shrubs and a ground layer of moderately tall native grasses (OEH, 2014c).

(a) *In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,*

Development of the subject site may impact on some potential habitat for these small woodland bird species that have been recorded in the study area (or similar habitats on the

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

SMP) during past surveys. Although none have been recorded in the Western Precinct and areas of better quality habitat occur within the Regional Park. The proposed development is not likely to place a local population of the species at risk of extinction.

(b) *In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,*

There are no populations of the species that are listed as endangered under the TSC Act.

(c) *In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:*

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction

Not applicable.

(d) *In relation to the habitat of a threatened species, population or ecological community:*

(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.

All of the known and potential habitat for the species on the subject site, and consequently across the subject land, will be removed or substantially modified as a result of the proposed development. This is a small area in comparison to that of the adjoining Regional Park.

The potential habitat for the species in the study area occurs in sparse patches that are fragmented from larger occurrences in the Regional Park. The proposed development will however increase the effects of existing fragmentation. Any significant trees or patches of understorey that are retained within the subject site will remain isolated from the Regional Park.

The habitat to be removed, modified or isolated as a result of the proposed development is not important to the long-term survival of the species within the locality. Areas of high quality

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

habitat occur within the Regional Park and will be conserved within the Regional Park and managed for conservation.

(e) *Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).*

No critical habitat for this species has currently been identified by the Director-General of the OEH.

(f) *Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,*

The Red Fox threat abatement plan is relevant to this species, although the birds are not a priority species listed in the plan. The proposed development is consistent with the objectives of the plan.

No recovery plan has been prepared for the species.

(g) *Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.*

The proposed development will result in Clearing of native vegetation. However, the vegetation to be cleared consists of degraded habitat for the species. Larger areas of better quality habitat will be conserved within the Regional Park.

Other key threatening processes that may be increased as a result of the proposed development include:

- Predation by the European Red Fox; and
- Predation by the Feral Cat.

The Feral and Domestic Animal Management Strategy will be implemented in the Western Precinct to ensure that the effects of foxes and cats are not exacerbated by the proposed development.

Conclusion

The proposed development will not have significant impact on the woodland bird species such that a local population would be placed at risk of extinction.

8.2.3 Microchiropteran Bats

The following Assessments of Significance demonstrates apply to the following species of microchiropteran bats known to occur in the locality:

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

- Eastern Bentwing-bat (*Miniopterus orianae oceanensis (formerly M. schreibersii oceanensis*);
- Eastern False Pipistrelle (*Falsistrellus tasmaniensis*);
- East-coast Freetail-bat (*Mormopterus norfolkensis*);
- Greater Broad-nosed Bat (*Scoteanax rueppellii*);
- Large-eared Pied Bat (*Chalinolobus dwyeri*);
- Southern Myotis (*Myotis macropus*); and
- Yellow-bellied Sheathtail-bat (*Saccolaimus flaviventris*).

The Eastern Bentwing Bat occurs along the east and north-west coasts of Australia. It roosts in caves, derelict mines, stormwater tunnels, buildings and other man-made structures. It forages above the canopy in forested areas. The Eastern Bentwing Bat forms maternity colonies in caves and populations usually centre on such caves (OEH, 2012b). The Eastern Bentwing Bat is listed as Vulnerable on Schedule 2 of the TSC Act (NSW Scientific Committee, 2004b).

The Eastern False Pipistrelle is found on the south eastern coast and ranges of Australia from southern Queensland to Victoria and Tasmania (OEH, 2012c). It prefers moist habitats and generally roosts in eucalypt hollows, but has been found under loose bar on trees or in buildings. The Eastern False Pipistrelle is listed as Vulnerable on Schedule 2 of the TSC Act (NSW Scientific Committee, 2004c).

The East-coast Freetail Bat (also known as the Eastern Freetail Bat) occurs from southern Queensland to southern NSW, in dry sclerophyll forest and woodland (Churchill, 2008). It roosts in tree hollows and sometimes under bark or in man-made structures (OEH, 2012d). The East-coast Freetail Bat is listed as Vulnerable on Schedule 2 of the TSC Act (NSW Scientific Committee, 2004d) (NSW Scientific Committee, 2004d).

The Large-eared Pied Bat is found mainly in areas with extensive cliffs and caves, from Rockhampton in Queensland south to Bungonia in the NSW Southern Highlands. It is generally rare with a very patchy distribution in NSW (OEH, 2012g). This species roosts in caves, crevices in cliffs, old mine workings and in the disused, bottle-shaped mud nests of the Fairy Martin (*Hirundo ariel*), frequenting low to mid-elevation dry open forest and woodland close to these features. This species is found in well-timbered areas containing gullies. The Large-eared Pied Bat is listed as Vulnerable on Schedule 2 of the TSC Act and Vulnerable under the EPBC Act (NSW Scientific Committee, 2004i).

The Southern Myotis occurs in coastal areas from north western Australia to south western Victoria (OEH, 2012h). It roosts close to water in caves, mine shafts, tree hollows, stormwater channels, buildings, under bridges and in dense foliage. It forages over streams and pools by raking its feet across the surface for insects and small fish. The Southern

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Myotis is listed as Vulnerable (as Large-footed Myotis) on Schedule 2 of the TSC Act (NSW Scientific Committee, 2004j).

The Greater Broad-nosed Bat occurs from the Atherton Tableland to north eastern Victoria in gullies and river systems that drain the Great Dividing Range. It roosts in tree hollows and sometimes in buildings. It occurs in woodland to moist and dry eucalypt forest and rainforest but is most common in tall wet forest (OEH, 2012e). The Greater Broad-nosed Bat is listed as Vulnerable on Schedule 2 of the TSC Act (NSW Scientific Committee, 2004f)

The Yellow-bellied Sheathtail Bat is a large species of microchiropteran bat that is characterised by rich shiny black fur on the back and contrasting bright white or yellow fur on the belly (Churchill, 2008). It occurs across northern and eastern Australia but it is a rare visitor in the southern parts of this range, including Victoria, south western NSW and eastern South Australia. It roosts in tree hollows and buildings and forages in most habitats. The Yellow-bellied Sheathtail Bat is listed as Vulnerable on Schedule 2 of the TSC Act (NSW Scientific Committee, 2004l).

a) *In the case of a threatened species, whether the lifecycle of the species is likely to be disrupted such that a viable local population of the species is likely to be placed at risk of extinction.*

There is very limited potential roosting habitat for the hollow-dwelling species of these microchiropteran bats in the study area and no potential roosting habitat for cave-dwelling species. These species are likely to primarily utilise the study area as foraging habitat as part of a larger range. Potential habitat will be retained in the Regional Park, where extensive areas of roosting and foraging habitat are located. As 900ha of potential roosting and foraging habitat will be conserved within the Regional Park, it is not likely that the proposed development will affect the life cycle of these species such that a viable local population is placed at risk of extinction.

b) *In the case of an endangered population, whether the lifecycle of the species that constitutes the endangered population is likely to be disrupted such that the viability of the population is likely to be significantly compromised,*

There are no populations of these species listed as endangered under the TSC Act.

c) *In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:*

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

Not applicable.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

d) *In relation to the habitat of a threatened species, population or ecological community:*

(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.

All of the known and potential habitat for these species on the subject site will be removed or substantially modified as a result of the proposed development.

The potential habitat for these species in the study area occurs in patches isolated from larger occurrences in the Regional Park. Any significant trees or patches of understorey that are retained within the subject site will remain isolated from the Regional Park.

The habitat to be removed, modified or isolated as a result of the proposed development is not important to the long-term survival of these species within the locality. Areas of high quality habitat occur within the Regional Park and will be conserved within the Regional Park and managed for conservation.

e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).

No critical habitat for these species has currently been identified by the Director-General of the OEH.

f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

No recovery plans have been prepared for these species. No threat abatement plans are relevant to these species.

g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of a key threatening process.

Clearing of native vegetation and Loss of hollow-bearing trees are listed key threatening processes under the TSC Act. No old-growth trees with hollows were recorded and limited mature trees occur on the subject site, which would provide foraging and potential roosting habitat, may be removed for the proposed development. However 900 ha of vegetation, including hollow bearing trees, will be conserved within the Regional Park. Future management of the Regional Park will also be designed to protect fauna habitats. The extent of clearing proposed is therefore not considered to be a threat to microchiropteran bat species in the precinct.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

No other key threatening process that may be exacerbated by the proposed action will affect these species.

Conclusion

The proposed development will not have a significant impact on threatened microchiropteran bats.

8.2.4 Grey-headed Flying-fox

The Grey-headed Flying-fox is found along the east coast of Australia from Bundaberg to Melbourne. It occurs in subtropical and temperate rainforests, tall sclerophyll forest and woodlands, heaths, swamps, gardens and orchards. The species roosts in camps with high site fidelity. The Grey-headed Flying-fox is threatened by loss of foraging habitat, disturbance to camps, unregulated shooting and electrocution on power lines (OEH, 2012f). It is listed as vulnerable under the TSC Act and the EPBC Act (NSW Scientific Committee, 2004g).

a) *In the case of a threatened species, whether the lifecycle of the species is likely to be disrupted such that a viable local population of the species is likely to be placed at risk of extinction.*

The study area consists only of potential foraging habitat for the Grey-headed Flying-fox as this species roosts in camps, the locations of which are well-known in the Sydney region. No camps occur on the SMP. The proposed development is unlikely to place a local population of the species at risk of extinction as it will result in the removal of a small area of low quality foraging habitat.

b) *In the case of an endangered population, whether the lifecycle of the species that constitutes the endangered population is likely to be disrupted such that the viability of the population is likely to be significantly compromised,*

There are no populations of this species listed as endangered under the TSC Act.

c) *In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:*

   (i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

   (ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

Not applicable.

d) *In relation to the habitat of a threatened species, population or ecological community:*

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.

All of the known and potential habitat for this species on the subject site will be removed or substantially modified as a result of the proposed development.

The potential habitat for this species in the study area occurs in patches isolated from larger occurrences in the Regional Park. Any significant trees or patches of understorey that are retained within the subject site will remain isolated from the Regional Park.

The habitat to be removed, modified or isolated as a result of the proposed development is not important to the long-term survival of the species within the locality. Areas of high quality habitat occur within the Regional Park and will be conserved within the Regional Park and managed for conservation.

e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).

No critical habitat for this species has currently been identified by the Director-General of the OEH.

f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

No recovery plan has been prepared for this species. No threat abatement plans are relevant to the species.

g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of a key threatening process.

Clearing of native vegetation is a listed key threatening process under the TSC Act. A relatively small number of mature eucalypt trees occur on the subject site, which provide potential foraging habitat, will be removed for the proposed development. However 900 ha of vegetation, will be conserved within the Regional Park. Future management of the Regional Park will also be designed to protect fauna habitats. The extent of clearing proposed is therefore not considered to be a threat to the Grey-headed Flying-fox in the precinct.

No other key threatening process that may be exacerbated by the proposed action will affect this species.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Conclusion

The proposed development will not have a significant impact on the Grey-headed Flying-fox.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Additional Information

9.1 Qualifications and Experience

The Cumberland Ecology staff involved with the compilation of this SIS have many years of experience in ecology, flora and fauna assessments and threatened species legislation. The sub-consultants are specialist in their area of expertise. The details of the qualifications of key Cumberland Ecology staff involved in the preparation of this SIS, and relevant sub-consultants, are provided in Appendix F.

9.1.1 Other Approvals Required for the Development or Activity

The proposed development will be assessed under Part 4 of the Environmental Planning and Assessment Act 1979. Penrith City Council will be the consent authority for the proposed development. The development application will be lodged concurrently with this SIS.

The development of the SMP has been assessed by the Commonwealth under the provisions of the Environment Protection (Impacts of Proposals) Act 1974. Associated certification of related actions under the Environmental Reform (Consequential Provisions) Act 1999 has also been granted.

9.1.2 Licence Matters

The actions necessitate the clearing of land and the removal of threatened plant species. These actions are permitted with the approval of licence applications under State and Commonwealth legislation. The following licence applications are to be submitted concurrently with this SIS:

- EPBC Permit (Section 201) – Licence to kill, injure, take, trade, keep or move a listed threatened species or ecological community.

Cumberland Ecology currently holds the following licences:

- Scientific licence (Section 132 C) (National Parks and Wildlife Act 1974)

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

9.1.3 Section 110 (5) Reports

Impact assessment was conducted after due consideration for the Environmental Impact Assessment Guidelines for relevant threatened species and the condition of potential habitats in the study area. Section 110 (5) reports utilised in preparation of this SIS are included in the References section below.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Conclusion

The proposed development of the subject site will remove a total area of 4.87 ha of CPW in the form of 1.86 ha low diversity Derived Native Grassland, 1.26 ha of regenerating CPW and 1.75 ha of mature CPW. However, and with due consideration of the restricted distribution of this CEEC in the region, the proposed development is not likely to have a significant impact on CPW such that the large and viable representatives in the Regional Park would be placed at risk of extinction. The large and continuous remnants present in the Regional Park will be protected and enhanced through a range of mitigation measures identified and retained in perpetuity. Areas of affected CPW within the Regional Park are proposed to be revegetated following completion of drainage works.

The major affected (C)EECs/species impacted by the proposed development includes the Cumberland Plain Land Snail. The mature and regenerating CPW and to a lesser extent, the low diversity Derived Native Grassland, on the subject site provide an area of habitat for the threatened plants, animals and communities mentioned above. However, when directly compared with the habitats of the Regional Park, this area of habitat is considered to be degraded and of a lesser importance due to the increased level of disturbance, sparse nature and its comparatively small in size. Therefore, the loss of this habitat in the subject site and subject land is not considered to be significant.

The impact of the proposed development will be more than balanced by the major conservation outcome resulting from of the creation of the 900ha Regional Park. The Regional Park comprises CPW of quality and scale in a consolidated land holding, to be transferred into public ownership and subject to a Plan of Management.

When weighed against the conservation benefits, both direct and indirect, that will be derived from the 900ha Regional Park, together with the various mitigation measures afforded by the management strategies for weeds, feral and domestic animals and macrofauna, the relatively small areas of natural and semi-natural vegetation to be cleared as a result of the proposed development are considered to be of minor consequence. The proposed development is unlikely to result in any threatened species or ecological community becoming extinct. Known occurrences of threatened flora and fauna within the SMP are predicted to be secure in the long term as a result of the creation of the 900ha Regional Park and numerous supporting mitigation measures that are enshrined in the legal, statutory planning framework.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

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Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

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Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

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Version: 1, Version Date: 27/02/2015

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Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

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Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Appendix A

Director General's Requirements

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

CUMBERLAND ECOLOGY

Table A.1 DGR Compliance table

Main Heading	Subsections	Our Response
1 FORM OF THE SPECIES IMPACT STATEMENT		
	1.1 A species impact statement must be in writing (Section 109 (1))	The SIS is written
	1.2 A species impact statement must be signed by the principal author of the statement and by:	Refer to page i
	a. the applicant for the licence, or	
	b. if the species impact statement is prepared for the purposes of the Environmental Planning and Assessment Act 1979, the applicant for development consent or the proponent of the activity proposed to be carried out (as the case requires) Section 109(2)).	
	The applicant or proponent must sign the following declaration: "I…[insert name], of ..[address], being the applicant for the development consent…[insert DA number, Lot & DP numbers, street, suburb and LGA names] have read and understood this species impact statement. I understand the implications of the recommendations made in the statement and accept that they may be placed as conditions of consent or concurrence for the proposal."	
2. CONTEXTUAL INFORMATION		
The description must include information of the following forms or types:	2.1 Description of proposal, subject site and study area The following are further requirements related to your obligation under Section 110(1) to address the following: *A species impact statement must include a full description of the action proposed, including its nature, extent, location, timing and layout*	Ref to Section 2.2.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table A.1 DGR Compliance table

Main Heading	Subsections	Our Response
	A comprehensive description of the nature, extent and timing of all components and associated or consequent actions of the proposal must be provided, including actions that have effects both on and off the subject land as a result of the proposal. These actions detailed must include, but are not to be restricted to construction or ongoing use and maintenance of proposed: • buildings or other structures • utilities such as for sewage, electricity, gas or water • access routes; • dams/ponds, pipes/channels or other infrastructure for drainage, waste water/effluent management or erosion control • any structure or activity that may change surface or subterranean water movements • wastewater disposal • bush fire hazard reduction and protection measures, such inner and outer protection areas of asset protection zones (APZs), etc. • landscaping.	
	2.2 Land tenure information A legal description of the land (lot and deposited plan numbers) and information about the land tenure across the study area must be provided.	Ref to Section 2.3.
	2.3 Vegetation Vegetation present within the locality must be mapped and described. The descriptions should refer to: • Scientific Committee determinations (http://www.environment.nsw.gov.au/	Ref to Section 2.4.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table A.1 DGR Compliance table

Main Heading	Subsections	Our Response
	committee/ListOfScientificCommitteeDeterminations.htm; • The OEH Vegetation Types Database (http://www.environment.nsw.gov.au/biobanking/vegtypedatabase.htm); and. • The Cumberland Plain vegetation mapping. (http://www.environment.nsw.gov.au/surveys/CumberlandPlainVegetationMappingProject.htm;	
	2.4 Plans and maps An aerial photograph or reproduction of such a photograph (preferably colour), of the locality, indicating scale and clearly delineating the subject site must be provided. A map or maps must be provided, showing:	Ref to page 2.16 for a list of Figures in each chapter of this SIS.
	i. in the locality, • any locally significant areas for threatened biodiversity. • the locations and types of vegetation and cleared areas (with reference to the description required in section 2.3).	
	ii. in the study area, • the location, size and dimensions of the study area. • the full extent of the proposed works as described in section 2.1 at a scale of not less than 1:1000. • the locations and types of vegetation and cleared areas (with reference to the description required in section 2.3). • the current activities/usage of this land.	

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table A.1 DGR Compliance table

Main Heading	Subsections	Our Response
	All maps must indicate scale and have an explanatory legend of any symbols used.	
	2.5 Threatened Species A list of all the threatened species or populations found in the database searches referred to in Section 3.1.1.	Refer to table 3.1 and Figures 3.1 and 3.2.
3 INITIAL ASSESSMENT	The following are further requirements related to your obligation under Section 110(2)(a) to address the following: *a general description of the threatened species or populations known or likely to be present in the area that is the subject of the action and in any area that is likely to be affected by the action.* and the requirements under Section 110(3)(a) to address the following: *a general description of the ecological community present in the area that is the subject of the action and in any area that is likely to be affected by the action*	
	3.1 Identifying subject threatened species, populations and ecological communities ('subject species')	Refer to Chapter 3.
	3.1.1 Assessment of available information In determining the species, populations and ecological communities likely to be present (the subject species) consideration must be given to the records and known distribution of species and to habitat types present within the study area. OEH recommends that a comprehensive habitat assessment across the whole site, identifying key habitat features for both flora and fauna, should first be conducted, following the guidelines at www.environment.nsw.gov.au/threatenedspecies/surveymethodsfauna.htm be used. Additionally, the OEH threatened species profiles, any available recovery plans and or	Ref to Chapter 3.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table A.1 DGR Compliance table

Main Heading	Subsections	Our Response
	draft recovery plans, and vegetation assessment and mapping by State or local government agencies must be consulted. Specific fauna information regarding bushland that encompasses the site may be found in OEH's Rapid Fauna Habitat Assessment of the Sydney Metropolitan CMA Area (DECC 2008, www.sydney.cma.nsw.gov.au/component/option,com_remository/Itemid,116/func,select/id,40). For obtaining known records flora and fauna databases such as the OEH Atlas of NSW Wildlife, as well as those held by local governments, the Australian Museum, CSIRO, Forests NSW and the Botanic Gardens Trust Sydney should be consulted to assist in compiling the list. Note that the OEH Atlas only holds records for which OEH is the custodian and does not include records held in other databases, and the conditions of data licences or data exchange agreements prevent OEH from distributing such information. In many cases, OEH Atlas may only contain a small subset of available data. Hence, other databases must also be consulted to make an adequate determination of subject species. Additionally, the OEH web site version of the Atlas does not provide all held records and does not provide all records with accurate location information. Use of the BioBanking Credit Calculator (www.environment.nsw.gov.au/biobanking/calculator.htm) is also recommended to supplement the list of threatened species that possibly occur on the site (see guidelines at www.environment.nsw.gov.au/threatenedspecies/ surveymethodsfauna.htm#4). In determining the subject species, any available recovery plans or draft recovery plans, and vegetation assessment and mapping by State or local government agencies must be consulted. The following vulnerable, endangered or critically endangered species should be considered as a subject species:	

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table A.1 DGR Compliance table

Main Heading	Subsections	Our Response
Species Lists		
	These lists are not exhaustive. One of the roles of the SIS is to determine which species may be utilising the study area given the limitations of existing databases. Also be aware that additional species, populations, and ecological communities could be added to the schedules of the TSC Act between the issue of these requirements and the granting of consent. If this occurs, these additional entities will need to be addressed in the SIS and considered by the consent, determining, or concurrence authority. This requirement does not apply to the listing of a vulnerable ecological community (s5D EP&A Act). This requirement does not apply to the new listing of a vulnerable species unless the development application has not been determined by the consent authority within the period of 12 months after the date the application was made (s.105A EP&A Act).	
4 SURVEY		
	4.1 Requirement to survey Targeted surveys for subject species and their habitats must be undertaken • within the study area to provide information on distribution, population/sub-population sizes and density, and area of habitat (known and potential), noting variations across the study area. • within the locality to provide information on distribution, population/sub-population sizes, and area of habitat (known and potential). This data is necessary to support the impact assessment requirements of section 5 and factors (a) and (d) of the assessment of significance. The techniques and timing of these surveys should be commensurate with the biology/ecology of these species and ecological communities in order to maximise the	Ref to Chapter 4, Sections 4.1 – 4.2.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table A.1 DGR Compliance table

Main Heading	Subsections	Our Response
	likelihood and accuracy of detection. Survey requirements for certain species are identified in section 4.3. Guidance on appropriate methodologies and level and timing of survey efforts for some other species can be obtained from OEH's Threatened Species Survey and Assessment Guidelines (www.environment.nsw.gov.au/threatenedspecies/surveyassessmentgdlns.htm), environmental impact assessment guidelines (see section 9.4), draft or approved recovery plans (see section 9.4), scientific or environmental management journals, biodiversity surveys and other sources. The information required to identify the type of impacts and assess their significance on threatened species is the key determinant for the level of survey effort required. Specific survey requirements for certain species, populations and ecological communities are identified in section 4.3. Any modifications to the recommended or required survey methods or levels of survey effort require justification of their adequacy. This justification should be scientifically valid and refer to relevant scientific literature. Previous surveys (yours or others) can contribute to fulfilling the requirements of section 4, but only if they have been conducted and documented in accordance with the provisions specified in that section, e.g. with respect to the type, location, duration, spacing/density, appropriate season and weather conditions, etc. of the surveys. Documentation and mapping of these attributes, as required by section 4.2, applies equally to any previous surveys used. The currency of any previous surveys used to fulfil these requirements is a matter that will need to be considered by the consent authority in determining the adequacy of the SIS. Species of taxonomic uncertainty must have their identification confirmed by a recognised authority such as the Australian Museum or National Herbarium at the Royal Botanic	

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table A.1 DGR Compliance table

Main Heading	Subsections	Our Response
	Gardens, Sydney.	
	4.2 Documentation	
	4.2.1 Description of survey techniques and survey locations Survey technique(s) must be described and, where possible, a reference supporting the survey technique employed is to be provided. The size, orientation and dimensions of plots, transects or other sampling units should be clearly documented for each type of survey technique undertaken. Full AMG grid references for the survey site(s) should be noted. Survey site(s) should be shown on a map or maps, at a scale of not less than 1:2000, which indicate scale and have an explanatory legend of all information shown and symbols used.	Refer to Section 4.2.
	4.2.2 Documenting survey effort and results Each and every survey must be documented. Name(s) of surveyor(s) and other personnel must be recorded. Other persons who identified records (e.g., by analysis of Anabat recordings, hair tubes, scats) should also be named. The date and time and environmental conditions experienced during each survey must be documented. Survey proformas for a range of standard fauna survey techniques can be provided separately by email from the nominated contact officer upon request. These forms have provision for the types of information required to be documented. These or equivalent forms must be used by field staff when undertaking fauna surveys. Completed data sheets are to be included as an appendix to the SIS.	Ref to Section 4.3-4.5.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table A.1 DGR Compliance table

Main Heading	Subsections	Our Response
	Additionally, the time invested in applying each different survey technique – e.g. number of person hours/transect, duration of call playback, number of nights traps set – must be summarised in the SIS. It is not sufficient to document only the aggregate time spent on all survey techniques combined. Any limitations (e.g. denied access to private land) to sampling across the study area are to be documented.	
	4.2.3 Description and mapping of results of vegetation, flora and fauna surveys The locations of any newly recorded threatened species or endangered populations resulting from additional surveys must be mapped and described. The mapping of vegetation required under section 2.3 must reflect any new information resulting from additional surveys.	Refer to Section 4.3 and Figures 4.3 and 4.4.
5 ASSESSMENT OF LIKELY IMPACTS ON THREATENED SPECIES AND POPULATIONS	Assessment of impacts must consider the nature, extent and timing of the proposal and all associated actions, including but not restricted to construction, provision and ongoing maintenance of approved or proposed: buildings or other structures; utilities such as for sewage, electricity, gas or water; routes for access and egress; dams and associated infrastructure; pipelines; drainage infrastructure and changes made to surface water flows; bush fire hazard reduction and protection measures; landscaping; and ongoing maintenance	Refer to Chapter 5.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table A.1 DGR Compliance table

Main Heading	Subsections	Our Response
	Assessment must include the direct and indirect impacts of these activities which may occur both on or off the subject land. To assess the impacts from the provision bushfire protection (e.g. if there will be a requirement to provide fuel free and/or fuel reduced zones in retained bushland), proponents should consider recommendations in 'Planning for Bushfire Protection' (NSW Rural Fire Service 2006) and consider the use of situating required access roads around the roads as an option to meet those requirements but reduce impacts on retained bushland.	
	5.1 Assessment of species likely to be affected The following are further requirements related to your obligation under Section 110(2)(b) to address the following: *an assessment of which threatened species or population known or likely to be present in the area are likely to be affected by the action.* This requires you to refine the list of subject threatened species and populations (given the outcome of survey and analysis of likely impacts) in order to identify which threatened species or endangered populations may be affected directly or indirectly (including cumulatively), by the proposal. This is to be done taking account of the requirements outlined previously in section 4 of these requirements and information in any relevant Scientific Committee determinations, OEH threatened species profiles, recovery plans or draft recovery plans, and vegetation assessment and mapping. Detailed rationale should be provided to demonstrate how the list was derived. If adequate surveys/studies have been undertaken to categorically demonstrate the species does not occur in the study area, or if not resident, will not utilise habitats on site on occasion, or if off-site, be	Refer to Sections 4.5 and 5.2.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table A.1 DGR Compliance table

Main Heading	Subsections	Our Response
	influenced by off-site impacts of the activity, that species does not have to be considered further. Otherwise all species/populations likely to occur in the study area (based on general species distribution information), and known to utilise those habitat types, should be assessed as if they are present. The requirements in the remainder of this section need only be addressed for those species that are likely to be affected by the proposal. Subsequently this information should be used in an Assessment of Significance (as required in section 8) for each of those species or populations.	
	5.2 Discussion of local and regional abundance and distribution The following are further requirements related to your obligation under Section 110(2)(d) to address the following: *an estimate for the local and regional abundance of those species or populations*	Refer to Section 5.3.
	5.2.1 Discussion of other known local populations A discussion of other known populations in the locality must be provided. An estimate of the numbers of individuals of each threatened species or population utilising the area and the relative significance of the population(s) in the study area to the populations in the locality must be included.	Refer to Section 5.3.
	5.3 Assessment of habitat The following are further requirements related to your obligation under Section 110(2)(f) to address the following: *a full description of the type, location, size and condition of the habitat (including critical habitat) of those species and populations and details of the distribution and condition of similar habitats in the region (Section 110 (2)(f)).*	Refer to Section 5.3.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table A.1 DGR Compliance table

Main Heading	Subsections	Our Response
	5.3.1 Description of habitat values Specific habitat features must be described (e.g. frequency and location of stags, hollow bearing trees, culverts, rock shelters, rock outcrops, crevices, caves, drainage lines, soaks etc) and the density of understorey vegetation and groundcover. The condition of the habitat within the study area must be discussed, including the prevalence of introduced species, species of weeds present and an estimate of the total weed cover as a percentage of each vegetation community, whether trampling or grazing is apparent, effects of erosion, prevalence of rubbish dumping, history of resource extraction or logging and proximity to roads. Details of the subject site's fire history (eg frequency, time since last fire, intensity) and the source of fire history (eg observation, local records), must be provided. OEH's Rapid Fauna Habitat Assessment of the Sydney Metropolitan CMA Area (DECC 2008, www.sydney.cma.nsw.gov.au/component/option,com_remository/Itemid,116/func,select/id,40) is a source of information that should be referred to in meeting this requirement.	Refer to Sections 4.3 and 5.3.
	5.3.2 Discussion of habitat utilisation A discussion of how individuals use the area (eg residents, transients, adults, juveniles, nesting, foraging) and discussion of the significance of the habitat of the study area to the viability of the threatened species or endangered population in the locality must be included.	
	5.4 Discussion of conservation status The following are further requirements related to your obligation under Section 110(2)(c) to address the following:	Refer to Section 5.5.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table A.1 DGR Compliance table

Main Heading	Subsections	Our Response
	for each species or population likely to be affected, details of its local, regional and State-wide conservation status, the key threatening processes generally affecting it, its habitat requirements and any recovery plan or threat abatement plan applying to it and to your obligation under Section 110(2)(e) to address the following: *an assessment of whether those species or populations are adequately represented in conservation reserves (or other similar protected areas) in the region* and to your obligation under Section 110(2)(e1) to address the following: *an assessment of whether any of those species or populations is at the limit of its known distribution* The relative significance of the subject site for threatened species or endangered populations in the locality must be discussed. In particular, discussion of other known populations must be provided. Such an assessment must consider and compare the differences in the type, condition, and tenure and long-term security of other areas of known habitats in the locality with those in the study area. The discussion must also relate to the threatening processes (see section 6.4.4) that affect the conservation status of the ecological community. Known occurrences in the locality and region of the extinction or degradation of local populations of each affected threatened species or population and of fragmentation, decrease in extent or degradation of its habitat should be documented.	
	5.5 Discussion of the likely effect of the proposal at local and regional scales	Refer to Section 5.6.
	5.5.1 Significance within a local context The significance of impacts in the study area for conservation of affected threatened	Refer to Section 5.6.2.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table A.1 DGR Compliance table

Main Heading	Subsections	Our Response
	species or endangered populations in the locality must be discussed. An assessment of the significance of such impacts must compare and take into account the differences in the type, condition, and the tenure and long-term security, of other areas of known habitats in the locality with those in the study area.	
	5.5.2 Discussion of connectivity The potential of the proposal to increase fragmentation of the habitat or decrease the ability for movement of individuals and/or gene flow between habitats or populations of a threatened species or population must be appraised.	Refer to Section 5.6.
	5.5.3 Consideration of threatening processes Assessment of effects must not be limited only to threats that are recognised as key threatening processes, but must include other threatening processes that are generally accepted by the scientific community as affecting the species or population and are likely to be caused or exacerbated by the proposal. Assessment should also include consideration of information in the Priorities Action Statement and any approved or draft recovery plans or threat abatement plans which may be relevant to the proposal.	Refer to Section 5.6.4.
	Description of feasible alternatives The following are further requirements related to your obligation under Section 110(2)(h) to address the following: *a description of any feasible alternatives to the action that are likely to be of lesser effect and the reasons justifying the carrying out of the action in the manner proposed, having regard to the biophysical, economic and social considerations and the principles of ecologically sustainable development.* Where a Statement of Environmental Effects, Environmental Impact Statement or Review	

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table A.1 DGR Compliance table

Main Heading	Subsections	Our Response
	of Environmental Factors deals with these matters, the SIS may refer to the relevant section of the SEE, EIS or REF as long as the document referred to is provided with the SIS. The SIS must include details of the condition and use of other parts of the subject area and why these can or cannot be considered as feasible alternatives.	
6 ASSESSMENT OF LIKELY IMPACTS ON THREATENED ECOLOGICAL COMMUNITIES	Assessment of impacts must consider the nature, extent and timing of the proposal and all associated actions, including but not restricted to construction, provision and ongoing maintenance of approved or proposed: buildings or other structures; utilities such as for sewage, electricity, gas or water; routes for access and egress; dams and associated infrastructure; pipelines; drainage infrastructure and changes made to surface water flows; bush fire hazard reduction and protection measures; landscaping; and ongoing maintenance Assessment must include the direct and indirect impacts of these activities which may occur both on or off the subject land. To assess the impacts from the provision bushfire protection (e.g. if there will be a requirement to provide fuel free and/or fuel reduced zones in retained bushland), proponents should consider recommendations in 'Planning for Bushfire Protection' (NSW	Refer to Section 5.1.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table A.1 DGR Compliance table

Main Heading	Subsections	Our Response
	Rural Fire Service 2006) and consider the use of situating required access roads around the roads as an option to meet those requirements but reduce impacts on retained bushland.	
	6.1 Assessment of critically endangered or endangered ecological communities likely to be affected The following are further requirements related to your obligation under Section 110(3)(a) to address the following: *a general description of the ecological community present in the area that is the subject of the action and in any area that is likely to be affected by the action.* This requires you to refine the list of subject ecological communities (given the outcome of survey and analysis of likely impacts) in order to identify which critically endangered or endangered ecological communities (C/EECs) may be affected, directly or indirectly (including cumulatively), by the proposal. This must include reference to the ecological community as described by the NSW Scientific Committee, and to the requirements outlined previously in section 4 of these requirements, and take into account information any relevant C/EEC profile, recovery plan or draft recovery plan, and vegetation assessment and mapping. Adequate rationale should be provided to demonstrate how the list was derived. If adequate surveys/studies have been undertaken to categorically demonstrate the C/EEC does not occur in the study area, or will not utilise habitats on site, or if off-site, be influenced by off-site impacts of the activity, that C/EEC does not have to be considered further. Otherwise all C/EECs likely to occur in the study area (based on general distribution information), and known to occupy those habitat types, should be assessed as if present.	Refer to Section 5.2.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table A.1 DGR Compliance table

Main Heading	Subsections	Our Response
	The requirements in the remainder of this section need only be addressed for those C/EECs that are likely to be affected by the proposal.	
	6.2 Description of habitat The following are further requirements related to your obligation under Section 110(3)(c) to address the following: *a full description of the type, location, size and condition of the habitat of the ecological community and details of the distribution and condition of similar habitats in the region.*	Refer to Section 5.3.
	6.2.1 Study area An assessment of habitat the study area is required to include: a description of each C/EEC, including: • a description those areas where the community may only be represented by soil stored seed with no or few above-ground components, and • description of disturbance history and recovery capacity. If the site shows signs of disturbance, details should be provided of the site's disturbance history. An assessment should be made of the ability of the ecological community to recover to a state representative of its pre-disturbance condition. This assessment will include consideration of the site's in-situ and migratory resilience and will be accompanied by a map of the recovery capacity of the ecological community across the site. Consideration should be given to the results (preliminary or otherwise) of restoration projects being undertaken at other sites that contain the ecological community when assessing its recovery capacity. comparison of the affected community with the C/EEC as determined by the NSW Scientific Committee.	Refer to Section 5.4.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table A.1 DGR Compliance table

Main Heading	Subsections	Our Response
	reference to any relevant available recovery plans or draft recovery plans and vegetation assessment and mapping. maps, consistent with the descriptions provided, showing of the extent and condition of the C/EEC.	
	6.2.2 Locality A discussion of other occurrences of each C/EEC populations in the locality must be provided. This must include: a comparison of other known occurrences and their habitats with those of the study area in terms of remnant sizes, connectivity, species diversity and abundances, quality and condition (including levels of disturbances, weed diversity and abundances). the tenure and long-term security of other occurrences and its habitat. the relative significance of the subject site for each C/EEC in the locality and region.	Refer to Section 5.3.
	6.3 Discussion of conservation status The following are further requirements related to your obligation under Section 110(3)(b) to address the following: *for each ecological community present, details of its local, regional and State-wide conservation status, the key threatening processes generally affecting it, its habitat requirements and any recovery plan or any threat abatement plan applying to it* The following are further requirements related to your obligation under Section 110(3)(b1) to address the following: *an assessment of whether those ecological communities are adequately represented in conservation reserves (or other similar protected areas) in the region*	Refer to Section 5.5.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table A.1 DGR Compliance table

Main Heading	Subsections	Our Response
	The following are further requirements related to your obligation under Section 110(3)(b2) to address the following: *an assessment of whether any of those ecological communities is at the limit of its known distribution* The relative significance of the subject site for each C/EEC in the locality must be discussed. In particular, discussion of other known occurrences of each affected C/EEC must be provided. Such an assessment must consider and compare the differences in remnant sizes, connectivity, species diversity and abundances, quality and condition (including levels of disturbances, weed diversity and abundances), tenure and long-term security of other known occurrences and habitats in the locality with those in the study area. The discussion must also relate to the threatening processes (see section 6.4.4) that affect the conservation status of the ecological community. Known occurrences in the locality and region of fragmentation, decrease in extent or degradation of each C/EEC or its habitat should be documented.	
	6.4 Discussion of the likely effect of the proposal at local and regional scales	Refer to Section 5.3.
	6.4.1 Significance within a local context The significance of impacts in the study area for conservation of affected C/EEC in the locality must be discussed. An assessment of the significance of such impacts must compare and take into account the differences in remnant sizes, connectivity, species diversity and abundances, quality and condition (including levels of disturbances, weed diversity and abundances), tenure and long-term security of other known occurrences and habitats in the locality with those in the study area.	Refer to Section 5.3.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table A.1 DGR Compliance table

Main Heading	Subsections	Our Response
	6.4.2 Extent of habitat removal or modification The location, nature and extent of habitat removal or modification which may result from the proposed action including the cumulative loss of habitat from the study area (including all proposed DAs and those areas in the subject area already with development consent or identified for development) and the impacts of this on the viability of the C/EEC in the locality. This must include an assessment of the proportion of the C/EEC to be affected by the proposal, in relation to the total extent of the C/EEC, and the impact of this on the viability of the endangered ecological community at the local level.	Refer to Section 5.6.
	6.4.3 Discussion of connectivity The potential of the proposal to increase fragmentation of each C/EEC, its relation to adjoining vegetation and to exacerbate edge effects or to decrease the ability for movement of individuals and/or gene flow between habitats must be discussed. The impact on habitats in the proximate reserved lands, must be discussed. If connectivity between adjacent remnants of C/EECs is likely to be affected, the impact of the proposal on connectivity must also be discussed.	Refer to Section 5.6.
	6.4.4 Consideration of threatening processes Assessment of effects must not be limited to threats that are determined to be key threatening processes', but must also include threatening processes that are generally accepted by the scientific community as affecting the species or population and are likely to be caused or exacerbated by the proposal. Assessment should also include consideration of information in the Priorities Action Statement and any approved or draft recovery plans or threat abatement plans which may be relevant to the proposal.	Refer to Section 5.6.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table A.1 DGR Compliance table

Main Heading	Subsections	Our Response
	6.4 Description of feasible alternatives The following are further requirements related to your obligation under Section 110(3)(e) to address the following: *a description of any feasible alternatives to the action that are likely to be of lesser effect and the reasons justifying the carrying out of the action in the manner proposed having regard to the biophysical, economic and social considerations and the principles of ecologically sustainable development.* Where a Statement of Environmental Effects, Environmental Impact Statement or Review of Environmental Factors deals with these matters, the SIS may refer to the relevant section of the SEE, EIS or REF. The SIS must include details of the condition and use of other parts of the subject area and why these can or cannot be considered as feasible alternatives.	Refer to Section 5.7.
7 AMELIORATIVE AND COMPENSATORY MEASURES		
	7.1 Description of ameliorative measures The following are further requirements related to your obligation under Sections 110(2)(i) and 110(3)(f) to address the following: *a full description and justification of the measures proposed to mitigate any adverse effect of the action on the species and populations [s.110(2)(i)] [or] ecological community [s.110(3)(f)] including a compilation (in a single section of the statement) of those measures.* OEH strongly supports the view that development proposals should, in order of	Refer to Chapter 6.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table A.1 DGR Compliance table

Main Heading	Subsections	Our Response
	preference: i. Avoid any impacts; ii. Minimise on- and off-site impacts such that a significant impact is not likely. Measures proposed to avoid, reduce or ameliorate impacts should only be proposed where it can be clearly demonstrated that they have been successfully applied elsewhere. The likely efficacy of such measures with respect to the current proposal should be assessed in detail.	
	7.1.1 Long term management strategies Consideration must be given to developing long term management strategies to protect areas within the study area which are of particular importance for the threatened species or endangered populations likely to be affected. This may include proposals to restore or improve habitat on site where possible.	Refer to Section 6.3.
	7.1.2 Compensatory strategies Where the proposal will still result in loss to threatened species or habitats, strategies to compensate (offset) for the loss(es) should be considered. These may include other off-site or local area proposals that contribute to long term conservation of the threatened species. Any offsetting measures should be developed in accordance and be consistent with the "Principles for the Use of Biodiversity Offsets in NSW" (www.environment.nsw.gov.au/biocertification/offsets.htm). OEH advocates us of the Biobanking Assessment Method (www.environment.nsw.gov.au/biobanking/assessmethodology.htm) which affords a transparent, consistent and scientifically-based method to inform the calculation of	Refer to Section 6.3.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table A.1 DGR Compliance table

Main Heading	Subsections	Our Response
	sufficient offset areas and appropriate management actions to ensure maintenance or improvement of threatened biota. Where such proposals involve other lands, or where the involvement of community groups is envisaged in such proposals, such groups are to be consulted and proposals should contain evidence of support from these stakeholders and from relevant land managers. Compensatory benefits likely to result from such measures proposed for alternative sites are to be discussed and evaluated along with a discussion of mechanisms of how they might best occur.	
	7.1.3 Translocation OEH does not consider the translocation of threatened species, populations or ecological communities to be an ameliorative measure for the purposes of considering impacts of a particular development/activity and translocation is usually only supported by OEH in specific conservation programs (e.g. recovery planning), but only as a last resort after in-situ conservation options have been exhausted. Translocation should only be considered following extensive investigation of alternative options to avoid and mitigate the impacts of the development and a demonstrated long term financial commitment by the applicant.	Translocation is not considered in this SIS or as part of the proposal.
	7.1.4 Ongoing monitoring Any proposed pre- or post-development monitoring plans of the effectiveness of the mitigation or compensatory measures must be outlined in detail, including the objectives of the monitoring program, method of monitoring, reporting framework, duration and frequency. Generally, ameliorative strategies which have not been proved effective	Refer to Section 6.4.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table A.1 DGR Compliance table

Main Heading	Subsections	Our Response
	should be undertaken under experimental design conditions and appropriately monitored.	
8. ASSESSMENT OF SIGNIFICANCE OF LIKELY EFFECT OF PROPOSED ACTION	Based on the detailed assessment and consideration of alternatives and/or ameliorative measures proposed in the SIS, a re-assessment of the significance of impact (section 5A EP&A Act) is to be carried out for each of the entities (threatened species, population or ecological community) identified in the SIS as being likely to be affected. This assessment must be carried out in accordance with the Threatened species assessment of significance guidelines (DECC 2007) (www.environment.nsw.gov.au/threatenedspecies/tsaguide.htm) and must incorporate the relevant information from sections 5.1 to 7 of these SIS requirements. For each entity an overall conclusion must be drawn as to whether the proposal is still considered likely to have a significant effect.	Refer to Chapter 7.
9 ADDITIONAL INFORMATION		
	9.1 Qualifications and experience The following is your obligation under Sections 110(4) to address the following: *a species impact statement must include details of the qualifications and experience in threatened species conservation of the person preparing the statement and of any other person who has conducted research or investigations relied on in preparing the statement*	Refer to Chapter 8, Section 8.1
	9.2 Other approvals required for the development or activity The following are further requirements related to your obligation under Sections 110(2)(j) and 110(3)(g)) to address the following: *a list of any approvals that must be obtained under any other Act or law before the action may be lawfully carried out, including details of the conditions of any existing approvals that are relevant to the species or population or ecological community*	Refer to Section 8.1

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table A.1 DGR Compliance table

Main Heading	Subsections	Our Response
	Other approvals under NSW law In providing a list of other approvals the following must be included: • Where a consent is required under Part 4 of the Environmental Planning and Assessment Act 1979, the name of the consent authority and the timing of the development application should be included; or • Where an approval(s) is required under Part 5 of the Environmental Planning and Assessment Act 1979, the name of the determining authority(ies), the basis for the approval and when these approvals are proposed to be obtained should be included.	
	Approval under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) A development or action will require referral to, and may require the approval of, the Federal Minister for the Environment (in addition to any local or state government consent or approval) if that action will have, or is likely to have, a significant impact on the environment or on a matter of national environmental significance (NES matter). Threatened species and communities listed in the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) are considered to be matters of national environmental significance, as are migratory species and a number of other matters. It is the responsibility of the proponent to assess whether the development is likely to have a significant impact on an NES matter. Information regarding matters of national environmental significance and guidelines to assist whether to refer the action can be obtained from the Commonwealth Government Department of Sustainability, Environment, Water, Population and Communities (DSEWPC) at www.environment.gov.au/epbc/protect/index.html or by contacting DSEWPC on (02) 6274	

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table A.1 DGR Compliance table

Main Heading	Subsections	Our Response
	1111. A proponent can also make a referral if they are unsure whether approval is needed under the Act or if it needs certainty. To minimise delays in getting approvals under the Commonwealth and State processes, it is best, and in the interest of the proponent, if the development is referred early to DSEWPC's Environment Assessment Branch to obtain a decision on whether it is a controlled action before the SIS is exhibited under the EP&A Act.	
	Further information regarding the operation of the EPBC Act in NSW can be found in the NSW Department of Planning and Infrastructure's website at www.planning.nsw.gov.au/SettingtheDirection/GovernmentAgreementsandForums/BilateralAgreementwiththeCommonwealth/tabid/283/language/en-AU/Default.aspx and on the DEWHA website at www.environment.gov.au/epbc/assessments/bilateral/nsw.html. Further information regarding the operation of the EPBC Act in NSW can be found in the NSW Dept of Planning and Infrastructure's website at EPBC Act Guide to Implementation in NSW (available at www.planning.nsw.gov.au/environmentalassessment/comm.asp) and on the DSEWPC website at www.environment.gov.au/epbc/assessments/bilateral/index.html.	
	9.3 Licensing matters relating to conducting surveys Persons conducting flora and fauna surveys must have appropriate licences or approvals under relevant legislation. The relevant legislation and associated licences and approvals that may be required are listed below: *National Parks and Wildlife Act 1974:* • General Licence (Section 120) to harm or obtain protected fauna (this may include threatened fauna).	Refer to Section 8.1.2.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table A.1 DGR Compliance table

Main Heading	Subsections	Our Response
	• Licence to pick protected native plants (Section 131). • Scientific Licence (Section 132C) to authorise the carrying out of actions for scientific, educational or conservation purposes. *Threatened Species Conservation Act 1995:* • Licence to harm threatened animal species, and/or pick threatened plants and/or damage the habitat of a threatened species (Section 91). *Animal Research Act 1985:* • Animal Research Authority to undertake fauna surveys.	
	9.4 Section 110 (5) reports Section 110(5) of the Threatened Species Conservation Act 1995 has the effect of requiring OEH to provide that information it has regarding the State-wide conservation status of the subject species is made available, in order to satisfy ss.110(2) & (3) of the Act. To this end, OEH provide this information via www.threatenedspecies.environment.nsw.gov.au). Detailed species profiles and environmental impact assessment guidelines for threatened species, populations and ecological communities are available via this website. Proponents and consultants should note that OEH has no further published information available to satisfy s.110(5) of the Act and that purchase or receipt and use of the above profiles can be taken to have satisfied the requirements of ss.110(2) & (3) in relation to the State-wide conservation status of the listed species, populations and ecological communities.	Refer to Section 8.1.3 and References Section.

Appendix B

Survey Effort

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table B.1 History of survey effort on the SMP relevant to the Western Precinct

Date	Author	Report	Location*	Flora Methods	Flora Effort	Fauna Methods	Fauna Effort
Oct-93	James, T.A.	Vegetation Survey - Australian Defence Industries St Mary's Facility	Regional Park (eastern section)	Inspected to identify plant communities and to compile a plant species list. Both native and the more significant exotic plant species were recorded.	Inspected on 3 occasions during August and September.	n/a	n/a
Jun-91	Gunninah Consultants	Fauna Survey - Australian Defence Industries (ADI) Site, St Mary's	Across the SMP (including Regional Park and Western Precinct)	n/a	n/a	Daytime searches for native animals in all vegetation communities. Record kept of all native bird species sighted, searches for cryptic species such as frogs and reptiles, and for indirect evidence of all native animals (diggings, footprints, burrows, scats, bones, scratchings etc) and recording sightings of	200 person hours of field survey over 8 days. Elliotts: 1200 trap nights, Harps: 26 trap nights, Pitfalls: 60 trap nights

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table B.1 History of survey effort on the SMP relevant to the Western Precinct

Date	Author	Report	Location*	Flora Methods	Flora Effort	Fauna Methods	Fauna Effort
						animals. Elliott A trapping, live pitfall traps, harp-type bat traps, spotlight surveys.	
Aug-94	Gunninah Consultants	Environmental Review - Australian Defence Industries (ADI) Site, St Mary's					
Apr-95	Gunninah Consultants	Distribution of Endangered Flora: Pyro Park - Australian Defence Industries (ADI) Site, St Mary's Facility	Regional Park (eastern section)	A fixed, marked grid based on transect lines placed at 50m centres were surveyed for threatened flora species. Tagging was conducted until it was deemed not to be feasible. Transect surveys undertaken after this point.		n/a	n/a
Apr-95	Gunninah Consultants	Flora Survey: Bomb and North Bomb Sectors - Australian Defence Industries (ADI) Site, St Mary's Facility	Regional Park (central section)	Detailed walked surveys throughout the Bomb and North Bomb sites, describing and mapping the vegetation communities present,	Over a period of three days.	n/a	n/a

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table B.1 History of survey effort on the SMP relevant to the Western Precinct

Date	Author	Report	Location*	Flora Methods	Flora Effort	Fauna Methods	Fauna Effort
				establishing a flora species inventory, and identifying plant species of conservation concern or interest.			
Aug-95	Gunninah Consultants	Fauna and Flora Issues - Australian Defence Industries (ADI) Site, St Mary's - Planning Study	Across the SMP (including Regional Park and Western Precinct)	Supplementary flora field surveys to provide more detailed vegetation community descriptions, to locate endangered plant species, and confirm the accuracy and consistency of available information. Quadrats surveyed.		n/a	n/a
Jan-96	Gunninah Environmental Consultants	Flora Survey: Ropes Creek Area - Australian Defence Industries (ADI) Site, St Mary's Facility	Regional Park (Ropes Creek Area)	Detailed walked surveys throughout the Ropes Creek Area, describing and mapping the vegetation communities present, establishing a flora species inventory, searching for and identifying plant species of		n/a	n/a

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table B.1 History of survey effort on the SMP relevant to the Western Precinct

Date	Author	Report	Location*	Flora Methods	Flora Effort	Fauna Methods	Fauna Effort
				conservation concern or interest.			
Nov-96	Gunninah Environmental Consultants	Vegetation Communities - Australian Defence Industries (ADI) Site, St Mary's Facility	Across the SMP (including Regional Park and Western Precinct)	Quadrats (20m x 20m) were defined within each study area and were placed at 1ha intervals, except from those areas in which the community/floristic group varied within the range of 1ha. Dominant species from each stratum were recorded. Species of conservations significance recorded		n/a	n/a
Jan-97	Gunninah Environmental Consultants	Flora Survey: Northern Sector - Australian Defence Industries (ADI) Site, St Mary's Facility	Regional Park (Northern Sector)	Walked surveys throughout the Northern Sector describing and mapping the vegetation communities present. A flora species inventory was also established and plant species of conservation concern or	Surveyed for one day to compile a flora inventory identifying endangered plant species, native and exotic species.		

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table B.1 History of survey effort on the SMP relevant to the Western Precinct

Date	Author	Report	Location*	Flora Methods	Flora Effort	Fauna Methods	Fauna Effort
				interest were identified and located.			
Feb-99	Ian Perkins	Flora Assessment of the Disputed Areas of the Western Sydney Shale Woodlands	Regional Park (North western section and Western Precinct)	15 Quadrats (20x20m) in the north western section and western sections of the Regional Park, and in the Western Precinct. A flora species list was made for each quadrat.	15 quadrats surveyed over 5 days.	n/a	n/a
May-09	Cumberland Ecology	St Marys Property Western Precinct Stage 1A Development Application Flora and Fauna Assessment	Western Precinct	Transects with spot assessments to determine vegetation community type and vegetation condition	83 5x5m quadrats between 2007 and 2008	Bird transects, fauna habitat assessments, incidental fauna records throughout site	16 person hours targeted bird surveys
Apr-11	Cumberland Ecology	St. Marys Western Precinct SIS	Western Precinct and Regional Park	Quadrats (20m x 20m) placed within the subject site, subject land and study area. Targeted searches throughout subject site, subject land and study area.	35 Quadrats, Targeted searches	Daytime searches for native animals in all vegetation communities. Record kept of all native bird species sighted and for indirect evidence of all native animals	9 Person Hours Targeted Bird Transects, 6 nights Anabat survey, 300 trees with potential snail habitat.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table B.1 History of survey effort on the SMP relevant to the Western Precinct

Date	Author	Report	Location*	Flora Methods	Flora Effort	Fauna Methods	Fauna Effort
						(diggings, footprints, burrows, scats, bones, scratchings etc) and recording sightings of animals. 500m Bird transects within subject site, subject land and study area. Targeted snail searches at 15 sites, 5 within the Subject Land, each containing 20 sample trees. Anabat detectors within subject site, subject land and study area.	
Feb- 12	Cumberland Ecology	St. Marys Western Precinct SIS	Western Precinct - Village 4	Quadrats (20m x 20m) and Targeted searches across subject site (Village 4).	4 Quadrats, 2km of targeted searches	n/a	n/a
Mar–12	Cumberland Ecology	St. Marys Western	Western	Quadrats (20m x 20m)	3 Quadrats	n/a	n/a

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table B.1 History of survey effort on the SMP relevant to the Western Precinct

Date	Author	Report	Location*	Flora Methods	Flora Effort	Fauna Methods	Fauna Effort
		Precinct SIS	Precinct – North Lakes Access Road	and vegetation condition assessment of the subject site			
Aug- 12	Cumberland Ecology	Jordan Springs Trunk Sewer	St Marys Western Precinct eastern border and Regional Park	n/a	n/a	Threatened species searches	
Mar- 13	Cumberland Ecology	St. Marys Western Precinct SIS	Western Precinct – Stage 3C(1) and Stage 3C(2)	Quadrats (20m x 20m) and vegetation condition assessment of the subject site	1 Quadrat		

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table B.2 Detailed Methods and Records of Survey for Threatened Flora species on the SMP

Year	Author	Title	Scientific name	Location*	Numbers	Method
1994	Gunninah Consultants	Australian Defence Industries St Marys Facility Western Sydney - Environmental Review	*Dillwynia tenuifolia*	Eastern section of RP. Common throughout eastern end of the ADI site, particularly in open sites within the Ironbark forest communities and along tracks.	Common	Wide-ranging walked inspections of the Pyro Park area recording all species encountered.
1995	Gunninah Consultants	Australian Defence Industries St Marys Facility - Distribution of Endangered Flora, Pyro Park	*Dillwynia tenuifolia*	Eastern section of RP. Was found more widely over the eastern RP study area, and its occurrence appears to be highly correlated with sites of disturbance.	249 in 0.64ha of Section 3. Across all Pyro Park: approx range 1803 - 6075.	Two approaches. The first was to tag each individual specimen, however this approach was abandoned. The second approach was a transect-based survey of the specimens using the grid lines to be surveyed through the Pyro Park area. This involved botanists surveying transects and recording the densities of the

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table B.2 Detailed Methods and Records of Survey for Threatened Flora species on the SMP

Year	Author	Title	Scientific name	Location*	Numbers	Method
						specimens. Four transects (100m long, spaced 25m apart- later to 50m). Plants were surveys at specified survey points (10m diameter: 78.5m2 area) at 10m intervals along each transect, and the density of specimens was noted at a scale of 1-6 (1: 91-100, 2 = 50-90, 3=21-50, 4=5-20, 5=5-3, 6=2-1 plants per survey point).
1996	Gunninah Environmental Consultants	Australian Defence Industries St Marys Facility - Flora Survey Ropes Creek	*Dillwynia tenuifolia*	Ropes Creek - Study area A, B and E (eastern portion, northern portion).	Infrequent in area B. Considerable numbers in cleared areas in area E (eastern portion). Patchily	Detailed walked surveys throughout the Ropes Creek study area. Involved establishing a flora species inventory and

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table B.2 Detailed Methods and Records of Survey for Threatened Flora species on the SMP

Year	Author	Title	Scientific name	Location*	Numbers	Method
		Area			distributed in area E (northern portion). Few specimens along dirt track, and in greater numbers along main road.	searching for and identifying plant species of conservation concern or interest.
1996	Gunninah Environmental Consultants	Australian Defence Industries St Marys - Vegetation Communities	*Dillwynia tenuifolia*	Unavailable		Quadrats (20m x 20m) were defined within each study area and were placed at 1ha intervals, except from those areas in which the community/floristic group varied within the range of 1ha. Quadrats were assessed and plant species recorded.
1997	Gunninah Environmental Consultants	Australian Defence Industries St Marys Facility -	*Dillwynia tenuifolia*	Northern Sector of RP		Walked surveys throughout the 'Northern Sector' establishing a flora

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table B.2 Detailed Methods and Records of Survey for Threatened Flora species on the SMP

Year	Author	Title	Scientific name	Location*	Numbers	Method
		'Northern Sector' Flora Survey				species inventory and identifying plant species of conservation concern or interest. The study sites were surveyed on one day. Survey quadrats were 20m in diameter.
2003	ERM	St Marys Eastern Precinct Plan - Biodiversity Assessment	*Dillwynia tenuifolia*	Eastern Precinct	Population in study area = 140,295; development area = 30,754. High densities found in Regional Park (averaging up to 790 plants/ha in less fragmented areas), while lower densities found in the fragmented areas	In order to obtain data on the abundance of threatened plants within the SMP, quadrat sampling for threatened plant species was undertaken. 45 survey locations were haphazardly marked on a map, 14 of these were in the study area. An additional 20m by 50m quadrat was also

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table B.2 Detailed Methods and Records of Survey for Threatened Flora species on the SMP

Year	Author	Title	Scientific name	Location*	Numbers	Method
					of the Regional Park and the development area (190 plants/ha and 165 plants/ha respectively).	surveyed. The number of all threatened plant species within this quadrat. An additional 10 20m by 50m quadrats were surveyed. Quadrat sampling was supplemented by traversing the study area and noting the distribution of plants that were not included in quadrats.
2004	Cumberland Ecology	St Marys Eastern Precinct - Flora and Fauna Assessment for Proposed Lot 2 and Lot 5 Development Applications	*Dillwynia tenuifolia*	Eastern Precinct	The population within the study area is estimated to be 140,295 plants. Of this, approximately 30,754 plants (~22% of the total population) are	

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table B.2 Detailed Methods and Records of Survey for Threatened Flora species on the SMP

Year	Author	Title	Scientific name	Location*	Numbers	Method
					estimated to be in the proposed development area. High densities of this species are found in the less fragmented portions of the Regional Park (averaging 790 plants/ha) while low densities are found in the fragmented portions of the Regional Park and proposed development area (290 and 165 plants/ha respectively).	

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table B.2 Detailed Methods and Records of Survey for Threatened Flora species on the SMP

Year	Author	Title	Scientific name	Location*	Numbers	Method
2004	Cumberland Ecology	Stage 1 Subdivision, St Marys Eastern Precinct: Part Lot 2 DP 1038166 - Species Impact Statement	*Dillwynia tenuifolia*	Southern section Eastern precinct	3229 per hectare (796 standard error). Area B - 4 plants/400 square metres. Area C - 8 specimens.	Targeted survey for threatened species that were known to be present or considered a possibility to be present.
2005	Cumberland Ecology	St Marys Property - Eastern Precinct - Flora and Fauna Risk Assessment for the demolition of buildings, removal of existing roads and stockpiling material	*Dillwynia tenuifolia*	Eastern Precinct.	Stockpile 3 = 17, Stockpile 4 = 27, Stockpile 5 = 135, Stockpile 6 = 330 (part estimated), Stockpile 7 = 11, Stockpile 8 = 2, Stockpile 9 = 8. Total = 761.	The entire area of each proposed stockpile location was inspected for threatened flora species by walking parallel transects across each area, and all individual plants of all maturities were counted. A variation in this methodology was required for Stockpile Number 6. Estimates of plant numbers were undertaken in this

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table B.2 Detailed Methods and Records of Survey for Threatened Flora species on the SMP

Year	Author	Title	Scientific name	Location*	Numbers	Method
						stockpile owing to the dense occurrences in certain sections.
2005	Cumberland Ecology	St Marys Project Site - Eastern Precinct - Flora and Fauna Assessment of Proposed Subdivision and Construction Works for a Village Centre.	*Dillwynia tenuifolia*	Eastern Precinct. Land within the proposed re-subdivision of proposed Lot 3 in the subdivision of Lot 4 in DP 1079444 (ref DA 05-2323 and DA 05-2960).	Less than 30 plants on subject site.	Inspected the subject site to assess the vegetation condition and identify areas where threatened flora occurred and estimated population numbers of these species.
2005	Cumberland Ecology	St Marys Property - Eastern Sector Blacktown LGA - Eight part test assessment of the impacts of long term macrofauna fencing upon	*Dillwynia tenuifolia*	Fenceline between Eastern and Ropes Creek Precincts, and Regional Park		The survey was based on information recorded along a series of transects along the proposed route of the macrofauna fence.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table B.2 Detailed Methods and Records of Survey for Threatened Flora species on the SMP

Year	Author	Title	Scientific name	Location*	Numbers	Method
		threatened flora and fauna				
2005	Cumberland Ecology	Eastern Precinct, St Marys Property - Flora and Fauna Assessment for a Residential Subdivision within Lot 4 in DP107944 (in DA 04-1669)	*Dillwynia tenuifolia*	Lot 4 in DP107944 Eastern Precinct	In CRCIF: 167/ha (SE 17.08), estimated 1503. In Remediated Areas: 657/ha (SE 460.76), estimated 10512. Abundance in each quadrat - Q1:4; Q2:1; Q3:1; Q4:3; Q5:2.	Quadrats were placed to sample the vegetation communities present. Three 20 m x 20 m quadrats were randomly placed in woodland and three quadrats were placed in disturbed/open areas and traversed.
2005	Cumberland Ecology	Letter: Zone Substation Flora and Fauna Assessment; Ropes Creek Precinct, SMP.	*Dillwynia tenuifolia*	Zone Substation, Ropes Creek.	1	Inspected the area covered by the Zone Substation, Ropes Creek, identifying any additional threatened species issues.
2006	Cumberland Ecology	Flora and fauna assessment for future learning and community	*Dillwynia tenuifolia*	Eastern Precinct, proposed residual lots 17, 18, 20 and 21.	Exotic grassland = 6, Woodland = 8. Total = 14.	Surveyed proposed Residue Lots 17, 18, 20, 21 of the future Learning and

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table B.2 Detailed Methods and Records of Survey for Threatened Flora species on the SMP

Year	Author	Title	Scientific name	Location*	Numbers	Method
		uses in the Eastern Precinct				Community sites, for the presence of threatened shrub species. Plants were counted in this area.
2006	Cumberland Ecology	St Marys Project Site - Eastern Precinct - Flora and Fauna Assessment for a Private School in the Eastern Precinct	*Dillwynia tenuifolia*	Village North development area Eastern Precinct.	Approximately 200 to be removed.	A threatened species search was made concurrently with the general flora survey.
2006	Cumberland Ecology	St Marys Project Site - Eastern Precinct - Flora and Fauna Assessment for Level 1 Park Earthworks in the Eastern Precinct.	*Dillwynia tenuifolia*	Eastern Precinct. Residue Lots 19, 20 and 21 and the surrounding Learning and Community sites.	Approximately 200 on subject site.	A botanist surveyed Residue Lots 19, 20 and 21 and the surrounding Learning and Community sites, for the presence of threatened shrub species which are known to occur in large numbers in the

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table B.2 Detailed Methods and Records of Survey for Threatened Flora species on the SMP

Year	Author	Title	Scientific name	Location*	Numbers	Method
						Eastern Precinct and throughout the Regional Park
2006	Cumberland Ecology	Ropes Creek Precinct - Biodiversity Assessment	*Dillwynia tenuifolia*	Ropes Creek Precinct.	Estimated that no more than 500 individuals	A targeted threatened flora survey was conducted within the precinct.
2007	Cumberland Ecology	Proposed Subdivision of Stage 2G Eastern Precinct SMP - Flora and Fauna Assessment	*Dillwynia tenuifolia*	Eastern Precinct, northern section.	Approximately 25 on subject site.	
2008	Cumberland Ecology	Eastern Precinct Development Application - Flora and Fauna Assessment	*Dillwynia tenuifolia*	Lands located adjacent to Palmyra Avenue in the north-east of the Eastern Precinct of the SMP.	Only small numbers were recorded; approximately 900 specimens occur within areas proposed for subdivision.	During the field survey an estimate made of the numbers of threatened flora recorded from the SMP occurring within the subject site.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table B.2 Detailed Methods and Records of Survey for Threatened Flora species on the SMP

Year	Author	Title	Scientific name	Location*	Numbers	Method
			Dillwynia tenuifolia			
1994	Gunninah Consultants	Australian Defence Industries St Marys Facility Western Sydney - Environmental Review	*Grevillea juniperina* subsp *juniperina*	Eastern section RP		Wide-ranging walked inspections of the Pyro Park area recording all species encountered.
1995	Gunninah Consultants	Australian Defence Industries St Marys Facility - Flora Survey Bomb & North Bomb Sectors	*Grevillea juniperina* subsp *juniperina*	Central section RP		Walked surveys throughout the Bomb and North Bomb sites establishing a flora species inventory and identifying plant species of conservation concern or interest. The study sites were surveyed over a period of three days.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table B.2 Detailed Methods and Records of Survey for Threatened Flora species on the SMP

Year	Author	Title	Scientific name	Location*	Numbers	Method
1996	Gunninah Environmental Consultants	Australian Defence Industries St Marys Facility - Flora Survey Ropes Creek Area	*Grevillea juniperina* subsp *juniperina*	Ropes Creek	Infrequent in area B. Commonly represented in area E (eastern portion)	Detailed walked surveys throughout the Ropes Creek study area. Involved establishing a flora species inventory and searching for and identifying plant species of conservation concern or interest.
1997	Gunninah Environmental Consultants	Australian Defence Industries St Marys Facility - 'Northern Sector' Flora Survey	*Grevillea juniperina* subsp *juniperina*	Northern Sector, western section, eastern section, central section RP		Walked surveys throughout the 'Northern Sector' establishing a flora species inventory and identifying plant species of conservation concern or interest. The study sites were surveyed on one day. Survey

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table B.2 Detailed Methods and Records of Survey for Threatened Flora species on the SMP

Year	Author	Title	Scientific name	Location*	Numbers	Method
						quadrats were 20m in diameter.
2003	ERM	St Marys Eastern Precinct Plan - Biodiversity Assessment	*Grevillea juniperina* subsp *juniperina*	Eastern Precinct	Population in study area = 494,611; development area = 37, 326. Medium-high densities found in Regional Park (averaging up to 1300 plants/ha in less fragmented areas, and 750 plants/ha in fragmented areas, and lower densities (200 plants/ha) in development area.	In order to obtain data on the abundance of threatened plants within the SMP, quadrat sampling for threatened plant species was undertaken. 45 survey locations were haphazardly marked on a map, 14 of these were in the study area. An additional 20m by 50m quadrat was also surveyed. The number of all threatened plant species within this quadrat. An additional 10 20m by 50m quadrats were surveyed. Quadrat

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table B.2 Detailed Methods and Records of Survey for Threatened Flora species on the SMP

Year	Author	Title	Scientific name	Location*	Numbers	Method
						sampling was supplemented by traversing the study area and noting the distribution of plants that were not included in quadrats.
2004	Cumberland Ecology	St Marys Eastern Precinct - Flora and Fauna Assessment for Proposed Lot 2 and Lot 5 Development Applications	*Grevillea juniperina* subsp *juniperina*	Eastern Precinct	The population within the study area is estimated to 494,611 plants with approximately 37,326 within the proposed development area (~7.5%). Medium to high densities are found throughout the Regional Park (averaging up to 1,300 plants/ha in less fragmented	

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table B.2 Detailed Methods and Records of Survey for Threatened Flora species on the SMP

Year	Author	Title	Scientific name	Location*	Numbers	Method
					areas, and 750 plants/ha in fragmented areas) and lower densities (200 plants/ha) in the proposed development area and other disturbed habitats.	
2004	Cumberland Ecology	Stage 1 Subdivision, St Marys Eastern Precinct: Part Lot 2 DP 1038166 - Species Impact Statement	*Grevillea juniperina* subsp *juniperina*	Southern section Eastern precinct	714 per hectare (156 standard error). Area A - few. Area B - 1 plant/400 square metres. Area C - 130 specimens. Area E - 2 specimens. 1 specimens east of Area E.	Targeted survey for threatened species that were known to be present or considered a possibility to be present.
2005	Cumberland Ecology	St Marys Property -	*Grevillea juniperina*	Eastern Precinct.	Stockpile 3 = 1, Stockpile 5 = 16,	The entire area of each proposed

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table B.2 Detailed Methods and Records of Survey for Threatened Flora species on the SMP

Year	Author	Title	Scientific name	Location*	Numbers	Method
		Eastern Precinct - Flora and Fauna Risk Assessment for the demolition of buildings, removal of existing roads and stockpiling material	subsp *juniperina*		Stockpile 8 = 24, Stockpile 9 = 102. Total = 143.	stockpile location was inspected for threatened flora species by walking parallel transects across each area, and all individual plants of all maturities were counted. A variation in this methodology was required for Stockpile Number 6. Estimates of plant numbers were undertaken in this stockpile owing to the dense occurrences in certain sections.
2005	Cumberland Ecology	St Marys North and South Dunheved Precincts Plan - Biodiversity Assessment	*Grevillea juniperina* subsp *juniperina*	North and South Dunheved Precincts. Found predominantly in the Cumberland Plain Woodland in the northern tip of Dunheved but plants were also found along the eastern edge.		Targeted searches for threatened species.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table B.2 Detailed Methods and Records of Survey for Threatened Flora species on the SMP

Year	Author	Title	Scientific name	Location*	Numbers	Method
2005	Cumberland Ecology	St Marys Project Site - Eastern Precinct - Flora and Fauna Assessment of Proposed Subdivision and Construction Works for a Village Centre.	*Grevillea juniperina* subsp *juniperina*	Eastern Precinct.	30-60 plants on subject site.	Inspected the subject site to assess the vegetation condition and identify areas where threatened flora occurred and estimated population numbers of these species.
2005	Cumberland Ecology	St Marys Property - Eastern Sector Blacktown LGA - Eight part test assessment of the impacts of long term macrofauna fencing upon threatened flora and fauna	*Grevillea juniperina* subsp *juniperina*	Fenceline between Eastern and Ropes Creek Precincts, and Regional Park		The survey was based on information recorded along a series of transects along the proposed route of the macrofauna fence.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table B.2 Detailed Methods and Records of Survey for Threatened Flora species on the SMP

Year	Author	Title	Scientific name	Location*	Numbers	Method
2005	Cumberland Ecology	Eastern Precinct, St Marys Property - Flora and Fauna Assessment for a Residential Subdivision within Lot 4 in DP107944 (in DA 04-1669)	*Grevillea juniperina* subsp *juniperina*	Eastern Precinct	In CRCIF: 83/ha (SE 64.55), estimated 747. In Remediated Areas: 308/ha (SE 169.12), estimated 4928. Abundance in each quadrat - Q2:1; Q4:4.	Quadrats were placed to sample the vegetation communities present. Three 20 m x 20 m quadrats were randomly placed in woodland and three quadrats were placed in disturbed/open areas and traversed.
2005	Cumberland Ecology	Letter: Eastern Precinct - Proposed subdivision DA - Stage 1(E) - Flora and fauna assessment. 9/6/05. To Rob Bennett.	*Grevillea juniperina* subsp *juniperina*	Located in Stage 1(e), Eastern Precinct.		Inspected the area covered by Stage 1(e) identifying any additional threatened species issues.
2005	Cumberland Ecology	Letter: Eastern Precinct - Proposed	*Grevillea juniperina* subsp	Located in Stage 1(f), Eastern Precinct.		Inspected the area covered by Stage 1(f) identifying any

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table B.2 Detailed Methods and Records of Survey for Threatened Flora species on the SMP

Year	Author	Title	Scientific name	Location*	Numbers	Method
		subdivision DA - Stage 1(F) - Flora and fauna assessment. 9/6/05. To Rob Bennett.	*juniperina*			additional threatened species issues.
2005	Cumberland Ecology	Letter: Zone Substation Flora and Fauna Assessment; Ropes Creek Precinct, SMP.	*Grevillea juniperina* subsp *juniperina*	Zone Substation, Ropes Creek.	Less than 10 plants.	Inspected the area covered by the Zone Substation, Ropes Creek, identifying any additional threatened species issues.
2006	Cumberland Ecology	Flora and fauna assessment for future learning and community uses in the Eastern Precinct	*Grevillea juniperina* subsp *juniperina*	Eastern Precinct, proposed residual lots 17, 18, 20 and 21.	Exotic grassland = 57, Woodland = 78. Total = 135.	Surveyed proposed Residue Lots 17, 18, 20, 21 of the future Learning and Community sites, for the presence of threatened shrub species. Plants were counted in this area.
2006	Cumberland Ecology	St Marys Project Site - Eastern	*Grevillea juniperina*	Village North development area Eastern Precinct.	Approximately 100 to be removed.	A threatened species search was made

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table B.2 Detailed Methods and Records of Survey for Threatened Flora species on the SMP

Year	Author	Title	Scientific name	Location*	Numbers	Method
		Precinct - Flora and Fauna Assessment for a Private School in the Eastern Precinct	subsp *juniperina*			concurrently with the general flora survey.
2006	Cumberland Ecology	St Marys Project Site - Eastern Precinct - Flora and Fauna Assessment for Level 1 Park Earthworks in the Eastern Precinct.	*Grevillea juniperina* subsp *juniperina*	Eastern Precinct.	Approximately 200 on subject site.	A botanist surveyed Residue Lots 19, 20 and 21 and the surrounding Learning and Community sites, for the presence of threatened shrub species which are known to occur in large numbers in the Eastern Precinct and throughout the Regional Park
2006	Cumberland Ecology	Proposed Concrete Recycling Facility	*Grevillea juniperina* subsp	Central Precinct stockpile.	Several specimens.	A threatened species search was made concurrently with the

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table B.2 Detailed Methods and Records of Survey for Threatened Flora species on the SMP

Year	Author	Title	Scientific name	Location*	Numbers	Method
		- Flora and Fauna Assessment	*juniperina*			general flora survey.
2006	Cumberland Ecology	Ropes Creek Precinct - Biodiversity Assessment	*Grevillea juniperina* subsp *juniperina*	Ropes Creek Precinct.	Estimated that no more than 500 individuals	A targeted threatened flora survey was conducted within the precinct.
2006	Cumberland Ecology	St Marys Property - Penrith Local Government Area - Assessments of Significance of the impacts of long term macrofauna fencing upon threatened flora and fauna	*Grevillea juniperina* subsp *juniperina*	Fenceline between Central and Western Precinct, and Regional Park	34	The survey was based on information recorded along a series of transects along the proposed route of the macrofauna fence.
2007	Cumberland Ecology	Proposed Subdivision of Stage 2G Eastern Precinct SMP -	*Grevillea juniperina* subsp *juniperina*	Eastern Precinct northern section.	Approximately 80 on subject site.	

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table B.2 Detailed Methods and Records of Survey for Threatened Flora species on the SMP

Year	Author	Title	Scientific name	Location*	Numbers	Method
		Flora and Fauna Assessment				
2008	Cumberland Ecology	St Mary Property - Western Precinct Biodiversity Assessment	*Grevillea juniperina* subsp *juniperina*	Western Precinct. Northern and southern margins of the Precinct. (See report for GPS locations)	Approximately 700. Populations of 60, 40, 410, 23, 50 and 120.	A targeted threatened flora survey was conducted within the precinct during the flora survey.
2008	Cumberland Ecology	St Marys Property Proposed Regional Park Boundary Changes - Ecological Assessment for Sydney Regional Environmental Plan 30 and Environment Protection and Biodiversity Conservation Act 1999	*Grevillea juniperina* subsp *juniperina*	Western Precinct northern section	Approximately 150.	A field survey of each area.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table B.2 Detailed Methods and Records of Survey for Threatened Flora species on the SMP

Year	Author	Title	Scientific name	Location*	Numbers	Method
2008	Cumberland Ecology	St Marys Property Proposed Regional Park Boundary Changes - Ecological Assessment for Sydney Regional Environmental Plan 30 and Environment Protection and Biodiversity Conservation Act 1999	*Grevillea juniperina* subsp *juniperina*	Western Precinct northern section	Rarely in this section.	A field survey of each area.
2008	Cumberland Ecology	St Marys Property Proposed Regional Park Boundary Changes - Ecological	*Grevillea juniperina* subsp *juniperina*	Western Precinct northern section	Approximately 50.	A field survey of each area.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table B.2 Detailed Methods and Records of Survey for Threatened Flora species on the SMP

Year	Author	Title	Scientific name	Location*	Numbers	Method
		Assessment for Sydney Regional Environmental Plan 30 and Environment Protection and Biodiversity Conservation Act 1999				
2008	Cumberland Ecology	St Marys Property Proposed Regional Park Boundary Changes - Ecological Assessment for Sydney Regional Environmental Plan 30 and Environment Protection and Biodiversity	*Grevillea juniperina* subsp *juniperina*	Central Precinct.	Approximately 1000.	A field survey of each area.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table B.2 Detailed Methods and Records of Survey for Threatened Flora species on the SMP

Year	Author	Title	Scientific name	Location*	Numbers	Method
		Conservation Act 1999				
2008	Cumberland Ecology	St Marys Property Proposed Regional Park Boundary Changes - Ecological Assessment for Sydney Regional Environmental Plan 30 and Environment Protection and Biodiversity Conservation Act 1999	*Grevillea juniperina* subsp *juniperina*	Central Precinct	Over 100.	A field survey of each area.
2008	Cumberland Ecology	St Marys Property Proposed Regional Park Boundary	*Grevillea juniperina* subsp *juniperina*	Central Precinct.	Several specimens.	A field survey of each area.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table B.2 Detailed Methods and Records of Survey for Threatened Flora species on the SMP

Year	Author	Title	Scientific name	Location*	Numbers	Method
		Changes - Ecological Assessment for Sydney Regional Environmental Plan 30 and Environment Protection and Biodiversity Conservation Act 1999				
2008	Cumberland Ecology	St Marys Property Proposed Regional Park Boundary Changes - Ecological Assessment for Sydney Regional Environmental Plan 30 and Environment	*Grevillea juniperina* subsp *juniperina*	Northern boundary of the Ropes Creek Precinct.	Few specimens	A field survey of each area.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table B.2 Detailed Methods and Records of Survey for Threatened Flora species on the SMP

Year	Author	Title	Scientific name	Location*	Numbers	Method
		Protection and Biodiversity Conservation Act 1999				
2008	Cumberland Ecology	St Marys Property Proposed Regional Park Boundary Changes - Ecological Assessment for Sydney Regional Environmental Plan 30 and Environment Protection and Biodiversity Conservation Act 1999	*Grevillea juniperina* subsp *juniperina*	Ropes Creek Precinct.	Approximately 200.	A field survey of each area.
2008	Cumberland Ecology	St Marys Property Proposed	*Grevillea juniperina* subsp	Regional Park (near Ropes Creek Precinct).	Approximately 1000.	A field survey of each area.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table B.2 Detailed Methods and Records of Survey for Threatened Flora species on the SMP

Year	Author	Title	Scientific name	Location*	Numbers	Method
		Regional Park Boundary Changes - Ecological Assessment for Sydney Regional Environmental Plan 30 and Environment Protection and Biodiversity Conservation Act 1999	*juniperina*			
2008	Cumberland Ecology	St Marys Property - Central Precinct Biodiversity Assessment	*Grevillea juniperina* subsp *juniperina*	Central Precinct. 3 locations (see report for GPS)	Approximately 530. Populations of 150, 380 and 2.	A targeted threatened flora survey was conducted within the precinct during the flora survey.
2008	Cumberland Ecology	Eastern Precinct Development Application - Flora and Fauna Assessment	*Grevillea juniperina* subsp *juniperina*	Eastern Precinct northern section.	Common throughout most of the study area and approximately 2,500 specimens	During the field survey an estimate made of the numbers of threatened flora recorded from the

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table B.2 Detailed Methods and Records of Survey for Threatened Flora species on the SMP

Year	Author	Title	Scientific name	Location*	Numbers	Method
					are estimated to occur within areas proposed for subdivision.	SMP occurring within the subject site.
2003	ERM	Remediation Action Plan for the Eastern Sector of the St Marys Property - Flora & Fauna Assessment	*Grevillea juniperina* subsp *juniperina*	Eastern section RP		
2011	Cumberland Ecology	St Marys Western Precinct Species Impact Statement	*Grevillea juniperina* subsp *juniperina*	cluster along north-western boundary of SMP	Over 30	Targeted survey for threatened species that were known to be present or considered a possibility to be present.
2011	Cumberland Ecology	St Marys Western Precinct Species Impact Statement	*Grevillea juniperina* subsp *juniperina*	cluster along north-western boundary of SMP	Over 30	Targeted survey for threatened species that were known to be present or considered a possibility to be present.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table B.2 Detailed Methods and Records of Survey for Threatened Flora species on the SMP

Year	Author	Title	Scientific name	Location*	Numbers	Method
2011	Cumberland Ecology	St Marys Western Precinct Species Impact Statement	*Grevillea juniperina* subsp *juniperina*	along fence line on western side of Western Precinct	Approximately 20	Targeted survey for threatened species that were known to be present or considered a possibility to be present.
2011	Cumberland Ecology	St Marys Western Precinct Species Impact Statement	*Grevillea juniperina* subsp *juniperina*	Adjacent to creekline in Western Precinct	single plant	Targeted survey for threatened species that were known to be present or considered a possibility to be present.
2011	Cumberland Ecology	St Marys Western Precinct Species Impact Statement	*Grevillea juniperina* subsp *juniperina*	Adjacent to creekline and exclosure fencing in Western Precinct	single plant	Targeted survey for threatened species that were known to be present or considered a possibility to be present.
2011	Cumberland Ecology	St Marys Western Precinct Species Impact Statement	*Grevillea juniperina* subsp	Adjacent to creekline and exclosure fencing in Western Precinct	single plant	Targeted survey for threatened species that were known to be

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table B.2 Detailed Methods and Records of Survey for Threatened Flora species on the SMP

Year	Author	Title	Scientific name	Location*	Numbers	Method
			juniperina			present or considered a possibility to be present.
2011	Cumberland Ecology	St Marys Western Precinct Species Impact Statement	*Grevillea juniperina* subsp *juniperina*	Adjacent to creekline and exclosure fencing in Western Precinct	approximately 55	Targeted survey for threatened species that were known to be present or considered a possibility to be present.
2011	Cumberland Ecology	St Marys Western Precinct Species Impact Statement	*Grevillea juniperina* subsp *juniperina*	Directly to the East of the drainage line, in the north west of the western precinct	Less than 10 plants	Targeted survey for threatened species that were known to be present or considered a possibility to be present.
2011	Cumberland Ecology	St Marys Western Precinct Species Impact Statement	*Grevillea juniperina* subsp *juniperina*	Within regional park, adjacent to track	25 Pultenaea, 44 Grevillea	Targeted survey for threatened species that were known to be present or considered a possibility to be present.
2011	Cumberland Ecology	St Marys Western Precinct Species	*Grevillea juniperina*	Within regional park	approximately 10 plants	Targeted survey for threatened species

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table B.2 Detailed Methods and Records of Survey for Threatened Flora species on the SMP

Year	Author	Title	Scientific name	Location*	Numbers	Method
		Impact Statement	subsp *juniperina*			that were known to be present or considered a possibility to be present.
2005	Cumberland Ecology	Letter: New records of *Marsdenia viridiflora* subsp *viridiflora:* Eastern Precinct, SMP. 15/5/05. To David Aynsley.	*Marsdenia viridiflora* subsp *viridiflora*	Located in the most southern corner of Stage 1(e). The exact location of these plants was in the centre of a drainage reserve, which forms part of a secondary open space corridor. The two groups were located approximately 10 metres apart.	12 plants/suckers. 2 groups of 6.	During work on the Vegetation Rehabilitation Plan (VRP) specimens were detected.
2006	Cumberland Ecology	Analysis of the responses of Cumberland Plain Woodland to grazing by macrofauna at St Marys - Floristic and structural changes 1 year after grazing exclosure	*Marsdenia viridiflora* subsp *viridiflora*	Exclosure plot		Exclosure plot methodology.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table B.2 Detailed Methods and Records of Survey for Threatened Flora species on the SMP

Year	Author	Title	Scientific name	Location*	Numbers	Method
2006	Cumberland Ecology	St Marys Property - Penrith Local Government Area - Assessments of Significance of the impacts of long term macrofauna fencing upon threatened flora and fauna	*Marsdenia viridiflora* subsp *viridiflora*	Fenceline between Central and Western Precinct, and Regional Park	<30 on fenceline, >100 in Regional Park in immediate vicinity of fence.	The survey was based on information recorded along a series of transects along the proposed route of the macrofauna fence.
2007	Cumberland Ecology	Analysis of the responses of Cumberland Plain Woodland to grazing by macrofauna at St Marys - 2006-2007 Floristic and structural changes two	*Marsdenia viridiflora* subsp *viridiflora*	Exclosure plot 6Do and 6Eo.	Approximately 5 plants	Exclosure plot methodology.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table B.2 Detailed Methods and Records of Survey for Threatened Flora species on the SMP

Year	Author	Title	Scientific name	Location*	Numbers	Method
		years after grazing exclosure				
2008	Cumberland Ecology	St Marys Property Proposed Regional Park Boundary Changes - Ecological Assessment for Sydney Regional Environmental Plan 30 and Environment Protection and Biodiversity Conservation Act 1999	*Marsdenia viridiflora* subsp *viridiflora*	Central Precinct.		A field survey of each area.
1994	Gunninah Consultants	Australian Defence Industries St Marys Facility Western Sydney -	*Micromyrtus minutiflora*	Eastern section RP		Wide-ranging walked inspections of the Pyro Park area recording all species encountered.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table B.2 Detailed Methods and Records of Survey for Threatened Flora species on the SMP

Year	Author	Title	Scientific name	Location*	Numbers	Method
		Environmental Review				
1995	Gunninah Consultants	Australian Defence Industries St Marys Facility - Distribution of Endangered Flora, Pyro Park	*Micromyrtus minutiflora*	Eastern section RP	265 in 0.64ha of Section 3. Across all Pyro Park: approx range 604-1810.	Two approaches. The first was to tag each individual specimen, however this approach was abandoned. The second approach was a transect-based survey of the specimens using the grid lines to be surveyed through the Pyro Park area. This involved botanists surveying transects and recording the densities of the specimens. Four transects (100m long, spaced 25m apart- later to 50m). Plants were surveys at

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table B.2 Detailed Methods and Records of Survey for Threatened Flora species on the SMP

Year	Author	Title	Scientific name	Location*	Numbers	Method
						specified survey points (10m diameter: 78.5m2 area) at 10m intervals along each transect, and the density of specimens was noted at a scale of 1-6 (1: 91-100, 2 = 50-90, 3=21-50, 4=5-20, 5=5-3, 6=2-1 plants per survey point).
1996	Gunninah Environmental Consultants	Australian Defence Industries St Marys Facility - Flora Survey Ropes Creek Area	*Micromyrtus minutiflora*	Ropes Creek	Patchily distributed.	Detailed walked surveys throughout the Ropes Creek study area. Involved establishing a flora species inventory and searching for and identifying plant species of conservation concern or interest.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table B.2 Detailed Methods and Records of Survey for Threatened Flora species on the SMP

Year	Author	Title	Scientific name	Location*	Numbers	Method
1996	Gunninah Environmental Consultants	Australian Defence Industries St Marys - Vegetation Communities	*Micromyrtus minutiflora*			
1997	Gunninah Environmental Consultants	Australian Defence Industries St Marys Facility - 'Northern Sector' Flora Survey	*Micromyrtus minutiflora*	Northern Sector RP		Walked surveys throughout the 'Northern Sector' establishing a flora species inventory and identifying plant species of conservation concern or interest. The study sites were surveyed on one day. Survey quadrats were 20m in diameter.
2003	ERM	St Marys Eastern Precinct Plan - Biodiversity	*Micromyrtus minutiflora*	Eastern Precinct	Population in study area = 1340;	In order to obtain data on the abundance of threatened plants

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table B.2 Detailed Methods and Records of Survey for Threatened Flora species on the SMP

Year	Author	Title	Scientific name	Location*	Numbers	Method
		Assessment			development area = 150.	within the SMP, quadrat sampling for threatened plant species was undertaken. 45 survey locations were haphazardly marked on a map, 14 of these were in the study area. An additional 20m by 50m quadrat was also surveyed. The number of all threatened plant species within this quadrat. An additional 10 20m by 50m quadrats were surveyed. Quadrat sampling was supplemented by traversing the study area and noting the distribution of plants

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table B.2 Detailed Methods and Records of Survey for Threatened Flora species on the SMP

Year	Author	Title	Scientific name	Location*	Numbers	Method
						that were not included in quadrats.
2004	Cumberland Ecology	St Marys Eastern Precinct - Flora and Fauna Assessment for Proposed Lot 2 and Lot 5 Development Applications	*Micromyrtus minutiflora*	Eastern Precinct.	The population within the study area is estimated to be approximately 1340 plants with approximately 150 plants (11% of the total population) occurring within the proposed development area.	
2004	Cumberland Ecology	Stage 1 Subdivision, St Marys Eastern Precinct: Part Lot 2 DP 1038166 - Species Impact Statement	*Micromyrtus minutiflora*	Eastern Precinct southern section	41 per hectare (29 standard error)	Targeted survey for threatened species that were known to be present or considered a possibility to be present.
2005	Cumberland Ecology	St Marys Property -	*Micromyrtus minutiflora*	Fenceline between Central and Western Precinct, and Regional Park	4	The survey was based on information

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table B.2 Detailed Methods and Records of Survey for Threatened Flora species on the SMP

Year	Author	Title	Scientific name	Location*	Numbers	Method
		Eastern Sector Blacktown LGA - Eight part test assessment of the impacts of long term macrofauna fencing upon threatened flora and fauna				recorded along a series of transects along the proposed route of the macrofauna fence.
2006	Cumberland Ecology	Flora and fauna assessment for future learning and community uses in the Eastern Precinct	*Micromyrtus minutiflora*	Eastern Precinct, proposed residual lots 17, 18, 20 and 21.	Exotic grassland = 5, Woodland = 48. Total = 53.	Surveyed proposed Residue Lots 17, 18, 20, 21 of the future Learning and Community sites, for the presence of threatened shrub species. Plants were counted in this area.
2008	Cumberland Ecology	Eastern Precinct Development Application - Flora and Fauna	*Micromyrtus minutiflora*	Eastern Precinct northern section.	A single localised population was recorded near the western end of the	During the field survey an estimate made of the numbers of threatened flora

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table B.2 Detailed Methods and Records of Survey for Threatened Flora species on the SMP

Year	Author	Title	Scientific name	Location*	Numbers	Method
		Assessment			subject site, and the population was estimated to comprise approximately 200 plants.	recorded from the SMP occurring within the subject site.
1994	Gunninah Consultants	Australian Defence Industries St Marys Facility Western Sydney - Environmental Review	*Persoonia nutans*	Eastern section RP	2 specimens	Wide-ranging walked inspections of the Pyro Park area recording all species encountered.
1995	Gunninah Consultants	Australian Defence Industries St Marys Facility - Distribution of Endangered Flora, Pyro Park	*Persoonia nutans*	Eastern section RP	2	Not available
1996	Gunninah Environmental Consultants	Australian Defence Industries St	*Persoonia nutans*	Not available	Not available	Not available

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table B.2 Detailed Methods and Records of Survey for Threatened Flora species on the SMP

Year	Author	Title	Scientific name	Location*	Numbers	Method
		Marys - Vegetation Communities				
1997	Gunninah Environmental Consultants	Australian Defence Industries St Marys Facility - 'Northern Sector' Flora Survey	*Persoonia nutans*	Northern Sector RP	Not available	Walked surveys throughout the 'Northern Sector' establishing a flora species inventory and identifying plant species of conservation concern or interest. The study sites were surveyed on one day. Survey quadrats were 20m in diameter.
2004	Cumberland Ecology	St Marys Eastern Precinct - Flora and Fauna Assessment for Proposed Lot 2 and Lot 5	*Persoonia nutans*	Eastern section RP	Persoonia nutans has been recorded at 3 locations in the study area.	

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table B.2 Detailed Methods and Records of Survey for Threatened Flora species on the SMP

Year	Author	Title	Scientific name	Location*	Numbers	Method
		Development Applications				
2012	Cumberland Ecology	St Marys Western Precinct Species Impact Statement	*Pimelea spicata*	Along slope adjacent to creek towards Southern edge of Village 4.	None recorded	Targeted survey for threatened species that were known to be present or considered a possibility to be present.
1994	Gunninah Consultants	Australian Defence Industries St Marys Facility Western Sydney - Environmental Review	*Pultenaea parviflora*	Eastern section RP	Common	Wide-ranging walked inspections of the Pyro Park area recording all species encountered.
1995	Gunninah Consultants	Australian Defence Industries St Marys Facility - Distribution of Endangered Flora, Pyro Park	*Pultenaea parviflora*	Eastern section RP	284 in 0.64ha of Section 3. Across all Pryo Park: approx range 3370 - 11080.	Two approaches. The first was to tag each individual specimen, however this approach was abandoned. The second approach was a transect-based survey of the

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table B.2 Detailed Methods and Records of Survey for Threatened Flora species on the SMP

Year	Author	Title	Scientific name	Location*	Numbers	Method
						specimens using the grid lines to be surveyed through the Pyro Park area. This involved botanists surveying transects and recording the densities of the specimens. Four transects (100m long, spaced 25m apart- later to 50m). Plants were surveys at specified survey points (10m diameter: 78.5m2 area) at 10m intervals along each transect, and the density of specimens was noted at a scale of 1-6 (1: 91-100, 2 = 50-90, 3=21-50, 4=5-20, 5=5-3, 6=2-1

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table B.2 Detailed Methods and Records of Survey for Threatened Flora species on the SMP

Year	Author	Title	Scientific name	Location*	Numbers	Method
						plants per survey point).
1996	Gunninah Environmental Consultants	Australian Defence Industries St Marys Facility - Flora Survey Ropes Creek Area	*Pultenaea parviflora*	Ropes Creek	Infrequent in area B. Considerable numbers in cleared areas in area E (eastern portion). Patchily distributed in area E (northern portion). Few specimens along dirk track, and in greater numbers along main road.	Detailed walked surveys throughout the Ropes Creek study area. Involved establishing a flora species inventory and searching for and identifying plant species of conservation concern or interest.
1996	Gunninah Environmental Consultants	Australian Defence Industries St Marys - Vegetation Communities	*Pultenaea parviflora*	Unavailable		Quadrats (20m x 20m) were defined within each study area and were placed at 1ha intervals, except from those areas in which the community/floristic group varied within the

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table B.2 Detailed Methods and Records of Survey for Threatened Flora species on the SMP

Year	Author	Title	Scientific name	Location*	Numbers	Method
						range of 1ha. Quadrats were assessed and plant species recorded.
1997	Gunninah Environmental Consultants	Australian Defence Industries St Marys Facility - 'Northern Sector' Flora Survey	*Pultenaea parviflora*	Northern Sector RP		Walked surveys throughout the 'Northern Sector' establishing a flora species inventory and identifying plant species of conservation concern or interest. The study sites were surveyed on one day. Survey quadrats were 20m in diameter.
2003	ERM	St Marys Eastern Precinct Plan - Biodiversity Assessment	*Pultenaea parviflora*	Eastern Precinct	Population in study area = 112,183; development area = 29,966. High densities found in	In order to obtain data on the abundance of threatened plants within the SMP, quadrat sampling for threatened plant

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table B.2 Detailed Methods and Records of Survey for Threatened Flora species on the SMP

Year	Author	Title	Scientific name	Location*	Numbers	Method
					Regional Park (averaging up to 665 plants/ha in less fragmented areas), while lower densities found in the fragmented areas of the Regional Park and the development area (115 plants/ha and 160 plants/ha respectively).	species was undertaken. 45 survey locations were haphazardly marked on a map, 14 of these were in the study area. An additional 20m by 50m quadrat was also surveyed. The number of all threatened plant species within this quadrat. An additional 10 20m by 50m quadrats were surveyed. Quadrat sampling was supplemented by traversing the study area and noting the distribution of plants that were not included in quadrats.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table B.2 Detailed Methods and Records of Survey for Threatened Flora species on the SMP

Year	Author	Title	Scientific name	Location*	Numbers	Method
2004	Cumberland Ecology	St Marys Eastern Precinct - Flora and Fauna Assessment for Proposed Lot 2 and Lot 5 Development Applications	*Pultenaea parviflora*	Eastern Precinct.	The population within the study area is estimated to be 112,183 plants. Of this, approximately 29,966 plants (~27% of the total population) are estimated to be in the proposed development area. High densities of this species are found in the less fragmented portions of the Regional Park (averaging 665 plants/ha), while low densities are found in the fragmented	

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table B.2 Detailed Methods and Records of Survey for Threatened Flora species on the SMP

Year	Author	Title	Scientific name	Location*	Numbers	Method
					portions of the Regional Park and proposed development area (115 and 160 plants/ha respectively).	
2004	Cumberland Ecology	Stage 1 Subdivision, St Marys Eastern Precinct: Part Lot 2 DP 1038166 - Species Impact Statement	*Pultenaea parviflora*	Eastern Precinct	1371 per hectare (296 standard error). Area A - 1 plant/400 square metres. Area B - 160 plants/400 square metres. Area C - 32 specimens. Area D - 8 specimens. Area E - 30 specimens. 14 specimens east of Area E.	Targeted survey for threatened species that were known to be present or considered a possibility to be present.
2005	Cumberland Ecology	St Marys Property -	*Pultenaea parviflora*	Eastern Precinct.	Stockpile 3 = 186, Stockpile 4 = 48,	The entire area of each proposed

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table B.2 Detailed Methods and Records of Survey for Threatened Flora species on the SMP

Year	Author	Title	Scientific name	Location*	Numbers	Method
		Eastern Precinct - Flora and Fauna Risk Assessment for the demolition of buildings, removal of existing roads and stockpiling material			Stockpile 5 = 17, Stockpile 6 = 435 (part estimated), Stockpile 7 = 22, Stockpile 8 = 42, Stockpile 9 = 11. Total = 761	stockpile location was inspected for threatened flora species by walking parallel transects across each area, and all individual plants of all maturities were counted. A variation in this methodology was required for Stockpile Number 6. Estimates of plant numbers were undertaken in this stockpile owing to the dense occurrences in certain sections.
2005	Cumberland Ecology	St Marys North and South Dunheved Precincts Plan - Biodiversity Assessment	*Pultenaea parviflora*	North and South Dunheved Precincts. Recorded on site, along the eastern edge of the development area.	One individual plant	Targeted searches for threatened species.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table B.2 Detailed Methods and Records of Survey for Threatened Flora species on the SMP

Year	Author	Title	Scientific name	Location*	Numbers	Method
2005	Cumberland Ecology	St Marys Project Site - Eastern Precinct - Flora and Fauna Assessment of Proposed Subdivision and Construction Works for a Village Centre.	*Pultenaea parviflora*	Eastern Precinct.	Less than 30 plants on subject site.	Inspected the subject site to assess the vegetation condition and identify areas where threatened flora occurred and estimated population numbers of these species.
2005	Cumberland Ecology	St Marys Property - Eastern Sector Blacktown LGA - Eight part test assessment of the impacts of long term macrofauna fencing upon threatened flora and fauna	*Pultenaea parviflora*	Fenceline between Eastern and Ropes Creek Precincts, and Regional Park		The survey was based on information recorded along a series of transects along the proposed route of the macrofauna fence.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table B.2 Detailed Methods and Records of Survey for Threatened Flora species on the SMP

Year	Author	Title	Scientific name	Location*	Numbers	Method
2005	Cumberland Ecology	Eastern Precinct, St Marys Property - Flora and Fauna Assessment for a Residential Subdivision within Lot 4 in DP107944 (in DA 04-1669)	*Pultenaea parviflora*	Eastern Precinct	In CRCIF: 25/ha (SE 11.16), estimated 225. In Remediated Areas: 290/ha (SE 133.21), estimated 4640. Abundance in each quadrat - Q1:2; Q2:1; Q3:3; Q4:4.	Quadrats were placed to sample the vegetation communities present. Three 20 m x 20 m quadrats were randomly placed in woodland and three quadrats were placed in disturbed/open areas and traversed.
2006	Cumberland Ecology	Flora and fauna assessment for future learning and community uses in the Eastern Precinct	*Pultenaea parviflora*	Eastern Precinct	Exotic grassland = 400, Woodland = 153. Total = 553.	Surveyed proposed Residue Lots 17, 18, 20, 21 of the future Learning and Community sites, for the presence of threatened shrub species. Plants were counted in this area.
2006	Cumberland Ecology	St Marys Project Site - Eastern Precinct - Flora	*Pultenaea parviflora*	Eastern Precinct northern section.	Approximately 50 to be removed.	A threatened species search was made concurrently with the

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table B.2 Detailed Methods and Records of Survey for Threatened Flora species on the SMP

Year	Author	Title	Scientific name	Location*	Numbers	Method
		and Fauna Assessment for a Private School in the Eastern Precinct				general flora survey.
2006	Cumberland Ecology	St Marys Project Site - Eastern Precinct - Flora and Fauna Assessment for Level 1 Park Earthworks in the Eastern Precinct.	*Pultenaea parviflora*	Eastern Precinct.	Approximately 900 on subject site.	A botanist surveyed Residue Lots 19, 20 and 21 and the surrounding Learning and Community sites, for the presence of threatened shrub species which are known to occur in large numbers in the Eastern Precinct and throughout the Regional Park
2006	Cumberland Ecology	Ropes Creek Precinct - Biodiversity Assessment	*Pultenaea parviflora*	Ropes Creek Precinct.	Estimated that no more than 500 individuals	A targeted threatened flora survey was conducted within the precinct.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table B.2 Detailed Methods and Records of Survey for Threatened Flora species on the SMP

Year	Author	Title	Scientific name	Location*	Numbers	Method
2007	Cumberland Ecology	Proposed Subdivision of Stage 2G Eastern Precinct SMP - Flora and Fauna Assessment	*Pultenaea parviflora*	Eastern Precinct northern section.	Approximately 80 on subject site.	
2008	Cumberland Ecology	Eastern Precinct Development Application - Flora and Fauna Assessment	*Pultenaea parviflora*	Eastern Precinct northern section.	Occurs variably through the study area, with approximately 1,400 specimens estimated to occur within areas proposed for subdivision.	During the field survey an estimate made of the numbers of threatened flora recorded from the SMP occurring within the subject site.
2011	Cumberland Ecology	St Marys Western Precinct Species Impact Statement	*Pultenaea parviflora*	Located in grassland in centre of Western Precinct	single plant	Targeted survey for threatened species that were known to be present or considered a possibility to be present.
2011	Cumberland Ecology	St Marys Western Precinct Species	*Pultenaea parviflora/*	Located in regional park in an area surrounded by large earth mounds, adjacent to road	>100 individuals of both species	Targeted survey for threatened species

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table B.2 Detailed Methods and Records of Survey for Threatened Flora species on the SMP

Year	Author	Title	Scientific name	Location*	Numbers	Method
		Impact Statement	*Grevillea juniperina subsp juniperina*		present	that were known to be present or considered a possibility to be present.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table B.3 Detailed Methods and Records of Survey for Threatened Fauna species on the SMP

Year	Author	Title	Scientific name	Common name	Location	Numbers	Method
1991	Gunninah Consultants	Australian Defence Industries (ADI) site, St Marys - Fauna Survey	Scoteanax rueppellii	Greater Broad-nosed Bat			Harp-type bat traps (approximately 2m x 2m), ranging from 0-3 nights of survey for 16 survey sites.
1991	Gunninah Consultants	Australian Defence Industries (ADI) site, St Marys - Fauna Survey	Sericornis sagittatus	Speckled Warbler	Site 10 (Woodland - vegetation community 2A). Site 15 (Woodland - vegetation community 2A)		Daytime searches for native animals were conducted in all vegetation communities. A record of all bird species sited was kept.
1991	Gunninah Consultants	Australian Defence Industries (ADI) site, St Marys - Fauna Survey		Diamond Firetail	During investigation on SMP, or incidental by staff.		Daytime searches for native animals were conducted in all vegetation communities. A record of all bird species sited was kept.
2005	Cumberland Ecology	St Marys North and South Dunheved Precincts Plan -		Cumberland Plain Land Snail	North and South Dunheved Precincts. Found in patches of Cumberland Plain	Thirteen individual shells were recorded.	Searches were made for live snails around the bases of trees within Cumberland Plain

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table B.3 Detailed Methods and Records of Survey for Threatened Fauna species on the SMP

Year	Author	Title	Scientific name	Common name	Location	Numbers	Method
		Biodiversity Assessment			Woodland in the northern part of Dunheved Section.		Woodland and within Sydney Coastal River Flat. The searches were conducted by two people for nearly two hours, giving 3.5 hours of search time. During this time, leaf litter, logs and other woodland floor debris were searched around the base of approximately 20 trees, including Grey Box (*Eucalyptus moluccana*).
2005	Cumberland Ecology	St Marys North and South Dunheved Precincts Plan - Biodiversity Assessment	Mormopterus sp	Unidentified freetail bat	Ropes Creek, Eastern Precinct.	1 Probable, 1 Possible	Surveys were made for microchiropteran bats using ZCAIM bat detector units. Two units were set each night for four nights, for 12 hours of recording time each night between the 19th and 23rd of April 2004. The two units were placed at different

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table B.3 Detailed Methods and Records of Survey for Threatened Fauna species on the SMP

Year	Author	Title	Scientific name	Common name	Location	Numbers	Method
							locations and sampled each of the major forest types on the subject site as follows: Sydney Coastal River Flat Forest along St Marys sewage outflow, South Dunheved Precincts – 4 ZCAIM nights; and Sydney Coastal River Flat Forest along Ropes Creek, Eastern Precinct – 4 ZCAIM nights.
2005	Cumberland Ecology	St Marys North and South Dunheved Precincts Plan - Biodiversity Assessment	Nyctophilus species and/or Myotis adversus	Unidentified longeared bat; and/or southern large-footed myotis	Sewage works outflow, Dunheved Precinct.	43 Probable	Surveys were made for microchiropteran bats using ZCAIM bat detector units. Two units were set each night for four nights, for 12 hours of recording time each night between the 19th and 23rd of April 2004. The two units were placed at different

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table B.3 Detailed Methods and Records of Survey for Threatened Fauna species on the SMP

Year	Author	Title	Scientific name	Common name	Location	Numbers	Method
							locations and sampled each of the major forest types on the subject site as follows: Sydney Coastal River Flat Forest along St Marys sewage outflow, South Dunheved Precincts – 4 ZCAIM nights; and Sydney Coastal River Flat Forest along Ropes Creek, Eastern Precinct – 4 ZCAIM nights.
2005	Cumberland Ecology	St Marys North and South Dunheved Precincts Plan - Biodiversity Assessment	Miniopterus shreibersii and/or Vespadelus regulus	Common Bentwing Bat and/or Southern Forest Bat	Ropes Creek, Eastern Precinct and sewage works outflow, Dunheved Precinct.	6 Probable in Ropes Creek, Eastern Precinct. 7 Probable in Sewage works outflow, Dunheved Precinct.	Surveys were made for microchiropteran bats using ZCAIM bat detector units. Two units were set each night for four nights, for 12 hours of recording time each night between the 19th and 23rd of April 2004. The two units were placed at different

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table B.3 Detailed Methods and Records of Survey for Threatened Fauna species on the SMP

Year	Author	Title	Scientific name	Common name	Location	Numbers	Method
							locations and sampled each of the major forest types on the subject site as follows: Sydney Coastal River Flat Forest along St Marys sewage outflow, South Dunheved Precincts – 4 ZCAIM nights; and Sydney Coastal River Flat Forest along Ropes Creek, Eastern Precinct – 4 ZCAIM nights.
2004	Cumberland Ecology	St Marys Eastern Precinct - Flora and Fauna Assessment for Proposed Lot 2 and Lot 5 Development Applications	Mormopterus sp	Unidentified freetail bat	Ropes Creek, Eastern Precinct.	1 Probable, 1 Possible	Surveys were made for microchiropteran bats using ZCAIM bat detector units. Two units were set each night for four nights, for 12 hours of recording time each night between the 19th and 23rd of April 2004. The two units were placed at different

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table B.3 Detailed Methods and Records of Survey for Threatened Fauna species on the SMP

Year	Author	Title	Scientific name	Common name	Location	Numbers	Method
							locations and sampled each of the major forest types on the subject site as follows: Sydney Coastal River Flat Forest along St Marys sewage outflow, South Dunheved Precincts – 4 ZCAIM nights; and Sydney Coastal River Flat Forest along Ropes Creek, Eastern Precinct – 4 ZCAIM nights.
2004	Cumberland Ecology	St Marys Eastern Precinct - Flora and Fauna Assessment for Proposed Lot 2 and Lot 5 Development Applications	Nyctophilus species and/or Myotis adversus	Unidentified longeared bat; and/or southern large-footed myotis	Sewage works outflow, Dunheved Precinct.	43 Probable	Surveys were made for microchiropteran bats using ZCAIM bat detector units. Two units were set each night for four nights, for 12 hours of recording time each night between the 19th and 23rd of April 2004. The two units were placed at different

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table B.3 Detailed Methods and Records of Survey for Threatened Fauna species on the SMP

Year	Author	Title	Scientific name	Common name	Location	Numbers	Method
							locations and sampled each of the major forest types on the subject site as follows: Sydney Coastal River Flat Forest along St Marys sewage outflow, South Dunheved Precincts – 4 ZCAIM nights; and Sydney Coastal River Flat Forest along Ropes Creek, Eastern Precinct – 4 ZCAIM nights.
2004	Cumberland Ecology	St Marys Eastern Precinct - Flora and Fauna Assessment for Proposed Lot 2 and Lot 5 Development Applications	Miniopterus shreibersii and/or Vespadelus regulus	Common Bentwing Bat and/or Southern Forest Bat	Ropes Creek, Eastern Precinct and sewage works outflow, Dunheved Precinct.	6 Probable in Ropes Creek, Eastern Precinct. 7 Probable in Sewage works outflow, Dunheved Precinct.	Surveys were made for microchiropteran bats using ZCAIM bat detector units. Two units were set each night for four nights, for 12 hours of recording time each night between the 19th and 23rd of April 2004. The two units were placed at different

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table B.3 Detailed Methods and Records of Survey for Threatened Fauna species on the SMP

Year	Author	Title	Scientific name	Common name	Location	Numbers	Method
							locations and sampled each of the major forest types on the subject site as follows: Sydney Coastal River Flat Forest along St Marys sewage outflow, South Dunheved Precincts – 4 ZCAIM nights; and Sydney Coastal River Flat Forest along Ropes Creek, Eastern Precinct – 4 ZCAIM nights.
2004	Cumberland Ecology	St Marys Eastern Precinct - Flora and Fauna Assessment for Proposed Lot 2 and Lot 5 Development Applications		Cumberland Plain Land Snail			
2005	Cumberland Ecology	St Marys Property -		Cumberland Plain Land	Along fence.	3 shells under 1 tree	The survey was based on information recorded

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table B.3 Detailed Methods and Records of Survey for Threatened Fauna species on the SMP

Year	Author	Title	Scientific name	Common name	Location	Numbers	Method
		Eastern Sector Blacktown LGA - Eight part test assessment of the impacts of long term macrofauna fencing upon threatened flora and fauna		Snail			along a series of transects along the proposed route of the macrofauna fence.
2004	Cumberland Ecology	Stage 1 Subdivision, St Marys Eastern Precinct: Part Lot 2 DP 1038166 - Species Impact Statement	Mormopterus sp	Unidentified freetail bat	Ropes Creek, Eastern Precinct.	1 Probable, 1 Possible	Surveys were made for microchiropteran bats using ZCAIM bat detector units. Two units were set each night for four nights, for 12 hours of recording time each night between the 19th and 23rd of April 2004. The two units were placed at different locations and sampled each of the major forest types on the subject site

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table B.3 Detailed Methods and Records of Survey for Threatened Fauna species on the SMP

Year	Author	Title	Scientific name	Common name	Location	Numbers	Method
							as follows: Sydney Coastal River Flat Forest along St Marys sewage outflow, South Dunheved Precincts – 4 ZCAIM nights; and Sydney Coastal River Flat Forest along Ropes Creek, Eastern Precinct – 4 ZCAIM nights.
2004	Cumberland Ecology	Stage 1 Subdivision, St Marys Eastern Precinct: Part Lot 2 DP 1038166 - Species Impact Statement	Nyctophilus species and/or Myotis adversus	Unidentified longeared bat; and/or southern large-footed myotis	Sewage works outflow, Dunheved Precinct.	43 Probable	Surveys were made for microchiropteran bats using ZCAIM bat detector units. Two units were set each night for four nights, for 12 hours of recording time each night between the 19th and 23rd of April 2004. The two units were placed at different locations and sampled each of the major forest types on the subject site

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table B.3 Detailed Methods and Records of Survey for Threatened Fauna species on the SMP

Year	Author	Title	Scientific name	Common name	Location	Numbers	Method
							as follows: Sydney Coastal River Flat Forest along St Marys sewage outflow, South Dunheved Precincts – 4 ZCAIM nights; and Sydney Coastal River Flat Forest along Ropes Creek, Eastern Precinct – 4 ZCAIM nights.
2004	Cumberland Ecology	Stage 1 Subdivision, St Marys Eastern Precinct: Part Lot 2 DP 1038166 - Species Impact Statement	Miniopterus shreibersii and/or Vespadelus regulus	Common Bentwing Bat and/or Southern Forest Bat	Ropes Creek, Eastern Precinct and sewage works outflow, Dunheved Precinct.	6 Probable in Ropes Creek, Eastern Precinct. 7 Probable in Sewage works outflow, Dunheved Precinct.	Surveys were made for microchiropteran bats using ZCAIM bat detector units. Two units were set each night for four nights, for 12 hours of recording time each night between the 19th and 23rd of April 2004. The two units were placed at different locations and sampled each of the major forest types on the subject site

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table B.3 Detailed Methods and Records of Survey for Threatened Fauna species on the SMP

Year	Author	Title	Scientific name	Common name	Location	Numbers	Method
							as follows: Sydney Coastal River Flat Forest along St Marys sewage outflow, South Dunheved Precincts – 4 ZCAIM nights; and Sydney Coastal River Flat Forest along Ropes Creek, Eastern Precinct – 4 ZCAIM nights.
2004	Cumberland Ecology	Stage 1 Subdivision, St Marys Eastern Precinct: Part Lot 2 DP 1038166 - Species Impact Statement		Cumberland Plain Land Snail	See figure in report	3 shells	Searches were made for live snails and shells around the bases of trees within Cumberland Plain Woodland and within Sydney Coastal River Flat Forest.
2001	ERM	???	Miniopterus shreibersii oceanensis	Eastern Bentwing-bat	Western Precinct (Regional Park - riparian habitats; Western Village - dam/riparian habitats)	RP riparian habitats - 9 calls. WV dam/riparian habitats - 6 calls	Anabat surveys.
2001	ERM	???	Mormopterus norfolkensis	Eastern Freetail-bat	Western Precinct (Regional Park - riparian	RP riparian habitats - 2 calls, woodland/forest	Anabat surveys.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table B.3 Detailed Methods and Records of Survey for Threatened Fauna species on the SMP

Year	Author	Title	Scientific name	Common name	Location	Numbers	Method
					habitats and woodland/forest habitats; Western Village - dam/riparian habitats and grassland/woodland habitats)	habitats - 1 call. WV dam/riparian habitats - 13 calls, grassland/woodland habitats 12 calls.	
2001	ERM	???	Scoteanax rueppellii	Greater Broad-nosed Bat	Western Precinct (Western Village - dam/riparian habitats)	WV dam/riparian habitats - 2 calls.	Anabat surveys.
2011	Cumberland Ecology	St Marys Western Precinct Species Impact Statement	Meridolum corneovirens	Cumberland Plain Land Snail	3 sites within the Western Precinct, 9 sites within the Regional Park.	17 live snails and 7 snail shells within Western Precinct, 60 live snails and 69 snail shells within the Regional Park	Surveys were conducted at 5 locations within the Western Precinct, and 10 locations within the Regional Park. 20 trees per site with suitable snail habitat (fallen bark around base) were searched for 5 minutes per tree, or until a live snail or shell was detected.

Appendix C

Flora and Fauna Species Lists

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table C.1 Flora species recorded in the Study Area

Scientific Name	Common Name	Regen CPW - Subject Land	Regen CPW - Regional Park	Mature CPW - Regional Park	DNG	Low diversity DNG	Exotic grassland	Riparian	Wetland (Incidental Records)
Acacia decurrens (seedling)	Black Wattle (seedling)	+	-	-	-	-	-	-	-
Acacia parramattensis	Parramatta Wattle	-	-	-	-	-	-	-	-
Acacia parramattensis (juvenile)	Parramatta Wattle (juvenile)	+	-	+	+	+	+	+	-
Acacia parramattensis (seedling)	Parramatta Wattle (seedling)	-	-	-	-	-	-	-	-
Acacia parramattensis (small tree)	Parramatta Wattle (small tree)	-	-	+	+	-	-	+	-
Agrostis sp.	Blown Grass	-	-	-	-	-	-	-	-
Ajuga australis	Austral Bugle	-	+	+	-	-	-	-	-
Alternanthera denticulata	Lesser Joyweed	+	-	+	-	-	+	-	+
Alternanthera nana	Hairy Joyweed	-	+	+	-	-	-	-	-
Alternanthera nodiflora	Common Joyweed	+	+	+	-	+	-	-	-
Alternanthera sp.		-	-	-	-	-	-	-	-
Amaranthus sp.		-	-	-	-	-	+	-	-
Amaranthus viridus		-	-	-	-	-	+	-	-
Amyema miquelii	Mistletoe	-	-	+	-	-	-	-	-
Anagallis arvensis	Scarlet Pimpernel	+	-	+	-	+	+	-	-
Angophora floribunda	Rough-barked Apple	-	-	-	-	-	-	+	-

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

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Scientific Name	Common Name	Regen CPW - Subject Land	Regen CPW - Regional Park	Mature CPW - Regional Park	DNG	Low diversity DNG	Exotic grassland	Riparian	Wetland (Incidental Records)
Angophora floribunda (juvenile)	Rough-barked Apple (juvenile)	-	-	-	-	+	-	+	-
Angophora floribunda (seedling)	Rough-barked Apple (seedling)	-	-	-	-	-	-	+	-
Angophora floribunda (small tree)	Rough-barked Apple (small tree)	-	-	-	-	+	-	+	-
Araujia sericifera	Moth Vine	+	-	+	-	-	-	+	-
Aristida ramosa	a Three-awned Grass	+	-	-	+	+	-	+	-
Aristida vagans	Three-awned Spear Grass	+	+	+	+	+	-	+	-
Aristida warburgii		-	-	+	-	-	-	+	-
Arthropodium milleflorum	Pale Vanilla-lily	-	+	+	-	-	-	-	-
Arthropodium sp.		+	-	-	+	-	-	-	-
Asparagus aethiopicus	Asparagus Fern	-	-	-	-	-	-	-	-
Asparagus asparagoides	Bridal Creeper	-	-	+	-	-	-	-	-
Asperula conferta	Common Woodruff	+	+	+	+	+	-	-	-
Aster subulatus	Wild Aster	-	-	+	-	-	+	-	-
Astroloma humifusum	Native Cranberry	+	-	+	+	+	-	+	-
Astroloma humifusum (juvenile)	Native Cranberry (juvenile)	-	-	+	-	-	-	-	-
Austrodanthonia fulva	Wallaby Grass	+	-	-	-	-	-	-	-
Austrodanthonia sp.	a Wallaby Grass	+	-	+	-	-	-	-	-

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

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Austrodanthonia tenuior		+	-	-	-	-	-	-	-
Austrostipa verticillata	Slender Bamboo Grass	-	-	-	-	-	-	-	-
Axonopus fissifolius	Carpet Grass	+	+	+	+	+	+	+	+
Bidens pilosa	Farmer's Friend	+	+	+	+	+	+	+	-
Bidens subalternans	Greater Beggar's Ticks	+	-	+	+	+	-	+	-
Bossiaea buxifolia		-	-	+	-	-	-	-	-
Bothriochloa decipiens/macra	Pitted Bluegrass/Red Leg Grass	+	+	+	+	+	-	+	-
Brachychiton populneus ssp. populneus (juvenile)	Kurrajong (juvenile)	-	-	-	-	-	-	-	-
Brassica fruticulosa	Twiggy Turnip	-	-	-	-	-	+	-	-
Brassica sp.		+	-	-	-	-	-	+	-
Briza minor	Shivery Grass	-	-	-	+	-	-	-	-
Briza subaristata		-	-	-	+	+	+	+	-
Bromus catharticus	Prarie Grass	-	-	-	-	-	-	-	-
Brunoniella australis	Blue Trumpet	+	+	+	-	-	-	-	-
Bursaria spinosa	Blackthorn	+	-	-	+	+	-	-	-
Bursaria spinosa (seedling)	Blackthorn (seedling)	-	-	-	-	-	-	+	-
Bursaria spinosa ssp. spinosa	Blackthorn	+	-	+	+	+	-	-	-

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

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Bursaria spinosa ssp. spinosa (seedling)	Blackthorn (seedling)	+	-	+	-	-	-	-	-
Calotis cuneifolia	Blue Burr-daisy	+	+	+	+	+	+	+	-
Calotis lappulacea	Yellow Burr-daisy	+	+	+	+	+	-	-	-
Cardamine paucijuga		-	-	-	-	-	-	-	-
Carex appressa									+
Carex breviculmis		-	-	-	-	+	-	-	-
Carex inversa		+	-	-	+	+	-	-	-
Cassinia sp.		+	-	-	-	-	-	-	-
Casuarina glauca	Swamp Oak	-	-	-	+	-	-	-	-
Centaurium erythraea	Common Century	+	-	-	+	+	+	-	-
Centaurium sp.		+	-	-	+	+	+	-	-
Centella asiatica	Pennywort	+	+	+	+	+	+	+	+
Cestrum parqui (juvenile)	Green Cestrum (juvenile)	-	-	-	-	-	-	+	-
Chamaesyce drummondii	Caustic Weed	+	-	-	-	+	-	-	-
Chamaesyce sp.		-	+	+	-	-	+	-	-
Cheilanthes sieberi	Poison Rock Fern	+	+	+	+	+	-	+	-
Chenopodium album	Fat Hen	-	-	-	-	-	+	-	-

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

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Scientific Name	Common Name	Regen CPW - Subject Land	Regen CPW - Regional Park	Mature CPW - Regional Park	DNG	Low diversity DNG	Exotic grassland	Riparian	Wetland (Incidental Records)
Chloris divaricata	Slender Chloris	-	-	-	+	-	-	-	-
Chloris gayana	Rhodes Grass	-	-	-	-	-	-	-	-
Chloris truncata	Windmill Grass	+	+	-	-	-	-	-	-
Chloris ventricosa	Windmill Grass	+	+	+	-	-	-	-	-
Chorizema parviflorum	Eastern Flame Pea	-	-	+	-	-	-	-	-
Chorizema parviflorum (juvenile)	Eastern Flame Pea (juvenile)	-	-	-	-	-	-	+	-
Cirsium vulgare	Spear Thistle	+	+	+	-	+	+	-	-
Clematis glycinoides	Headache Vine	-	-	-	-	-	-	+	-
Commelina cyanea	Blue Wandering Jew	+	+	+	-	+	-	+	-
Conyza bonariensis	Flaxleaf Fleabane	+	+	+	+	+	+	+	-
Conyza sp.	Fleabane	-	-	-	-	+	-	-	-
Crepis foetida	Stinking Hawksbeard	-	-	-	-	-	-	-	-
Cupressus sp.	a Cypress Pine	-	-	-	-	-	-	+	-
Cupressus sp. (juvenile)	a Cypress Pine (juvenile)	-	-	-	-	-	-	-	-
Cyclospermum leptophyllum	Slender Celery	+	-	-	+	+	-	-	-
Cymbonotus lawsonianus	Bear's Ears	-	+	+	-	-	-	-	-
Cymbopogon refractus	Barbed Wire Grass	+	+	+	+	+	-	+	-

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

CUMBERLAND ECOLOGY

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Cynodon dactylon	Couch Grass	+	-	+	+	+	+	+	+
CYPERACEAE		-	-	-	-	-	-	+	-
Cyperus ?exaltatus		-	-	-	-	-	-	-	-
Cyperus brevifolius	Mullumbimbi Couch	+	-	-	+	+	+	-	-
Cyperus difformis		+	-	-	-	+	-	-	-
Cyperus eragrostis		-	-	+	-	+	+	+	+
Cyperus gracilis	Slender Flat-sedge	+	+	-	-	+	-	-	-
Cyperus imbecillus		-	-	-	-	-	-	-	-
Cyperus laevis		-	-	-	+	-	-	-	-
Cyperus sp.	a Sedge	-	-	-	-	+	-	-	+
Daucus glochidiatus	Native Carrot	+	-	-	-	-	-	-	-
Daviesia ulicifolia	Gorse Bitter Pea	-	-	+	-	-	-	+	-
Desmodium varians	Tick Trefoil	+	+	+	+	+	-	+	-
Dianella longifolia	Blue Flax Lily	+	-	+	-	-	-	-	-
Dianella revoluta	Flax Lily	-	-	-	-	-	-	-	-
Dichanthium sericeum	Queensland Bluegrass	-	+	+	-	-	-	-	-
Dichelachne micrantha	Short-haired Plume Grass	+	+	-	+	+	+	+	-

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

CUMBERLAND ECOLOGY

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Dichelachne parva		-	-	-	-	+	-	-	-
Dichelachne rara		-	-	-	-	+	-	-	-
Dichelachne sp.	Plume Grass	-	-	-	-	-	-	-	-
Dichondra repens	Kidney Weed	+	+	+	+	-	-	+	-
Dichopogon fimbriatus	Nodding Chocolate Lily	-	-	-	+	-	-	-	-
Dichopogon sp.		-	-	-	-	-	-	-	-
Digitaria sp.		-	-	-	-	-	+	-	-
Dillwynia sieberi	a Parrot-pea	+	+	+	-	+	-	+	-
Dillwynia sieberi (juvenile)	a Parrot-pea (juvenile)	-	-	-	+	-	-	-	-
Dodonaea viscosa subsp. cuneata		-	-	-	-	+	-	-	-
Doodia caudata var. caudata	Small Rasp Fern	-	-	-	-	-	-	+	-
Drosera peltata		-	-	-	-	-	-	+	-
Drosera sp.	a Sundew	-	-	-	+	-	-	-	-
Echinochloa crus-galli	Barnyard Grass	-	-	-	-	-	+	-	-
Echinochloa sp.		-	-	-	-	-	+	-	-
Echinopogon caespitosus	Hedgehog Grass	+	+	+	-	+	-	+	-
Echinopogon ovatus	Tufted Hedgehog Grass	+	-	+	-	-	-	-	-

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

CUMBERLAND ECOLOGY

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Eclipta platyglossa									+
Einadia hastata	Berry Saltbush	+	-	-	-	-	-	-	-
Einadia nutans	Climbing Saltbush	+	-	-	-	-	-	-	-
Einadia polygonoides		+	+	+	-	+	+	-	-
Einadia trigonos	Fishweed	+	-	-	-	-	-	-	-
Eleocharis sphacelata									+
Eleusine indica	Crowsfoot Grass	-	-	-	-	-	+	-	-
Elymus scaber	Common Wheatgrass	-	-	-	-	-	-	-	-
Enchylaena tomentosa	Ruby Saltbush	+	-	-	-	-	-	-	-
Enteropogon acicularis		-	-	-	-	-	-	-	-
Entolasia stricta	Wiry Panic	-	-	-	-	-	-	+	-
Epaltes australis	Spreading Nut-heads	-	-	+	-	-	-	-	-
Epaltes minor	Not listed on PlantNet - checked Genus name with DT	-	-	-	-	-	+	+	-
Epilobium billardierianum		-	-	-	-	-	-	-	-
Eragrostis brownii	Brown's Love-grass	+	+	+	+	+	+	+	+
Eragrostis curvula	African Love-grass	+	-	+	+	+	+	+	-
Eragrostis leptostachya	Paddock Love-grass	+	+	+	+	+	-	+	-

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

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Eremophila deblis	Winter Apple	+	+	+	-	-	-	-	-
Eriochloa pseudoacrotricha	Early Spring Grass	+	+	+	+	-	-	+	-
Eucalyptus amplifolia	Cabbage Gum	-	-	-	-	-	-	+	-
Eucalyptus crebra	Narrow-leaved Ironbark	+	-	-	-	-	-	-	-
Eucalyptus crebra (juvenile)	Narrow-leaved Ironbark (juvenile)	+	-	+	+	-	-	-	-
Eucalyptus crebra (seedling)	Narrow-leaved Ironbark (seedling)	-	-	-	+	-	-	-	-
Eucalyptus crebra (small tree)	Narrow-leaved Ironbark (small tree)	+	-	+	-	-	-	+	-
Eucalyptus eugenioides (juvenile)	Thin-leaved Stringybark (juvenile)	-	-	-	-	-	-	+	-
Eucalyptus fibrosa	Red Ironbark	-	+	+	-	-	-	-	-
Eucalyptus moloccana	Grey Box	+	+	+	-	-	-	-	-
Eucalyptus moloccana (small tree)	Grey Box (small tree)	+	+	+	-	-	+	+	-
Eucalyptus molucanna (juvenile)	Grey Box (juvenile)	+	+	+	+	+	-	-	-
Eucalyptus moluccana (seedling)	Grey Box (seedling)	+	+	+	+	-	-	-	-
Eucalyptus tereticornis	Forest Red Gum	+	+	+	-	-	-	+	-
Eucalyptus tereticornis (juvenile)	Forest Red Gum (juvenile)	+	+	+	+	-	-	+	-
Eucalyptus tereticornis (seedling)	Forest Red Gum (seedling)	+	-	+	+	-	-	-	-
Eucalyptus tereticornis (small tree)	Forest Red Gum (small tree)	+	+	+	+	-	+	+	-

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

CUMBERLAND ECOLOGY

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Euchiton sphaericus		-	+	-	-	+	-	-	-
Facelis retusa		-	-	-	-	-	-	-	-
Fimbristylis dichotoma	Common Fringe-sedge	+	+	+	+	+	+	+	-
Gamochaeta americana	Cudweed	-	-	-	-	+	+	-	-
Gamochaeta purpurea		-	-	-	-	-	-	-	-
Geranium ?solanderi	Native Geranium	+	+	-	-	-	-	-	-
Glossocardia bidens	Cobbler's Tick	+	+	+	+	+	-	-	-
Glycine clandestina		-	-	+	-	-	-	+	-
Glycine microphylla	Small-leaf Glycine	+	+	+	+	-	-	+	-
Glycine tabacina	Love Creeper	+	+	+	+	+	+	-	-
Gnaphalium sp.		+	+	+	+	+	-	+	-
Gomphocarpus fruticosus	Narrow-leaved Cotton Bush	+	-	+	-	-	-	-	-
Gomphrena celosioides	Gomphrena Weed	+	-	-	-	-	-	-	-
Goodenia ?gracilis		+	-	+	-	-	-	-	-
Goodenia bellidifolia		+	-	-	-	-	-	-	-
Goodenia hederacea	Forest Goodenia	-	+	+	-	-	-	-	-
Goodenia paniculata	Branched Goodenia	-	-	-	-	-	-	-	+

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

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Grevillea juniperina ssp juniperina		-	-	-	-	-	-	+	-
Grevillea robusta (juvenile)	Silky Oak (juvenile)	+	-	-	-	-	-	-	-
Haloragis heterophylla	Rough Raspwort	-	-	-	+	-	-	-	-
Hardenbergia violacea	False Sasparilla	-	-	+	-	-	-	-	-
Heliotropium amplexicaule	Blue Heliotrope	+	+	+	-	+	-	-	-
Hibbertia diffusa	Wedge Guinea Flower	+	-	+	-	-	-	+	-
Hydrocotyle laxiflora	Stinking Pennywort	-	-	-	+	-	-	-	-
Hypericum gramineum	Small St. John's Wort	-	+	+	+	+	+	+	-
Hypericum perforatum	St. John's Wort	-	-	+	+	+	-	+	-
Hypochaeris glabra	Smooth Catsear	-	-	-	-	-	-	-	-
Hypochaeris microcephala	White Flatweed	+	-	-	-	-	-	-	-
Hypochaeris microcephala var. albiflora	White Flatweed	+	-	+	-	-	+	-	-
Hypochaeris radicata	Flatweed	+	+	+	+	+	-	+	-
Hypoxis hygrometrica hygrometrica	Golden Weather-grass	+	-	-	-	-	-	-	-
Hypoxis sp.		-	-	-	+	+	-	-	-
Juncus sp.		-	-	+	-	+	-	-	+
Juncus usitatus		-	-	-	-	+	-	+	-

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

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Kunzea ambigua	Tick Bush	-	-	-	-	-	-	+	-
Lachnagrostis filliformis	Blown Grass	-	-	-	-	+	-	-	-
Lachnagrostis sp		-	-	-	-	-	+	-	-
Lactuca saligna	Willow-leaved Lettuce	-	-	-	-	+	-	-	-
Lagenophora? sp.		-	-	+	-	-	-	-	-
Lantana camara	Lantana	-	-	-	-	-	-	-	-
Laxmannia gracilis	Slender Wire Lily	-	+	-	-	-	-	-	-
Lepidium bonariense	Argentine Peppercress	-	-	-	-	-	-	-	-
Ligustrum lucidum (juvenile)	Large-leaved Privett (juvenile)	-	-	+	-	-	-	+	-
Ligustrum sinense	Small-leaved Privett	-	-	-	-	-	-	+	-
Ligustrum vulgare	European Privet	-	-	-	-	-	-	-	-
Linum marginale	Native Flax	-	-	-	+	-	-	-	-
Linum trigynum	French Flax	-	-	-	-	+	+	-	-
Lomandra filiformis ssp. filiformis	Wattle Mat-rush	+	+	+	-	-	-	-	-
Lomandra longifolia	Spiny-headed Mat-rush	-	-	-	-	-	-	+	-
Lomandra multiflora ssp. multiflora	Many-flowered Mat-rush	-	-	-	-	-	-	-	-
Ludwigia peploides ssp. montevidensis									+

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table C.1 Flora species recorded in the Study Area

Scientific Name	Common Name	Regen CPW - Subject Land	Regen CPW - Regional Park	Mature CPW - Regional Park	DNG	Low diversity DNG	Exotic grassland	Riparian	Wetland (Incidental Records)
Lycium ferocissimum	African Boxthorn	+	-	-	-	-	-	-	-
Lythrum hyssopifolia	Hyssop Loosestrife	-	-	+	-	-	-	-	+
Maclura pomifera (small tree)	Osage Orange (small tree)	-	-	-	-	-	-	+	-
Marsilea hirsuta	Nardoo	-	-	-	-	-	-	-	+
Medicago polymorpha	Burr Medic	-	+	-	-	-	-	-	-
Melaleuca styphelioides	Prickly-leaved Paperbark	-	+	-	-	-	-	-	+
Melia azedarach	White Cedar	-	-	+	-	-	-	-	-
Melinis repens	Red Natal Grass	-	-	-	-	+	-	-	-
Mentha satureoides	Creeping Mint	-	+	+	+	-	-	-	-
Microlaena stipoides	Weeping Meadow Grass	+	-	-	-	-	-	+	+
Microlaena stipoides var. stipoides	Weeping Meadow Grass	+	+	+	+	+	-	+	-
Microtis sp.	an Orchid	-	-	-	-	-	-	-	-
Modiola caroliniana	Red-flowered Mallow	-	+	+	-	+	+	-	-
Morus alba	White Mulberry	-	-	-	-	-	-	-	-
Olea europaea ssp. cuspidata	African Olive	+	-	+	-	-	-	-	-
Opercularia diphylla	Stinkweed	-	+	+	-	-	-	-	-
Opercularia varia	Variable Stinkweed	-	-	-	+	-	-	-	-

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table C.1 Flora species recorded in the Study Area

Scientific Name	Common Name	Regen CPW - Subject Land	Regen CPW - Regional Park	Mature CPW - Regional Park	DNG	Low diversity DNG	Exotic grassland	Riparian	Wetland (Incidental Records)
Oplismenus aemulus	Basket Grass	-	-	+	-	-	-	+	-
Opuntia aurantiaca	Tiger Pear	-	-	+	-	-	-	-	-
Ottelia ovalifolia									+
Oxalis exilis	a Wood Sorrel	+	-	-	+	+	-	-	-
Oxalis perennans		+	+	+	+	+	-	-	-
Oxalis perennans?		+	-	-	+	-	-	-	-
Oxalis sp.		-	-	-	-	+	-	-	-
Ozothamnus diosmifolius	White Dogwood	-	-	+	-	+	-	-	-
Panicum effusum	Hairy Panic	-	-	-	-	-	-	+	-
Paronychia brasiliana	Brazilian Whitlow	-	-	-	-	-	-	-	-
Parsonsia straminea	Common Silkpod	+	-	-	-	-	-	-	-
Paspalidium distans		+	+	+	+	+	+	+	-
Paspalum dilatatum	Paspalum	+	+	-	+	+	+	+	-
Paspalum distichum	Water Couch	-	-	-	-	-	+	-	+
Passiflora caerulea	Blue Passionflower	+	-	-	-	-	-	-	-
Pennisetum clandestinum	Kikuyu	-	-	-	-	-	+	-	-
Persicaria decipiens	Slender Knotweed	-	-	-	-	-	+	-	+

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table C.1 Flora species recorded in the Study Area

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Persicaria hydropiper	Water Pepper	-	-	-	-	-	-	-	+
Persicaria sp.		-	-	-	-	-	-	+	-
Philydrum lanuginosum									+
Phoenix canariensis (juvenile)	Canary Island Date Palm (juvenile)	-	-	-	-	-	-	-	-
Phyllanthus virgatus	a spurge	+	+	+	+	+	-	+	-
Phyllanthus virgatus		+	-	+	-	+	-	-	-
Pimelea curviflora ssp. subglabrata	Rice Flower	-	-	-	-	-	-	-	-
Pimelea curviflora var. subglabrata		-	+	-	-	-	-	-	-
Pimelea sp.		-	-	+	-	-	-	-	-
Pimelea sp. 1 (unknown - collected)		-	-	-	-	+	-	-	-
Plantago debilis		+	+	+	-	-	-	-	-
Plantago gaudichaudii	Narrow Plantain	-	+	-	-	-	-	-	-
Plantago lanceolata	Lamb's Tongues	-	-	-	-	+	-	-	-
Plantago myosuros		-	-	-	-	-	-	-	-
Poa labillardieri	Tussock Grass	+	-	-	-	-	-	-	-
Pomax umbellata		-	-	+	-	-	-	-	-
Poranthera microphylla		-	-	-	-	-	-	-	-

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table C.1 Flora species recorded in the Study Area

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Poranthera microphylla		-	-	-	-	-	-	-	-
Portulaca oleracea	Pigweed	-	-	+	-	-	+	-	-
Potamogeton tricarinatus									+
Potamogeton sp.									+
Potentilla reptans		-	-	-	-	-	-	-	-
Pratia purpurascens	Whiteroot	+	+	+	+	+	-	-	-
Pteridium esculentum	Bracken	-	-	-	-	-	-	-	-
Ranunculus inundatus									+
Ranunculus lappaceus	Common Buttercup	-	-	-	-	-	-	+	-
Richardia stellaris		+	+	+	+	+	+	+	-
Romulea rosea	Onion Grass	-	-	-	-	+	-	-	-
Rubus fruticosus	Blackberry	-	-	-	-	-	-	-	-
Rumex brownii	Swamp Dock	-	-	-	-	-	-	+	-
Rumex conglommeratus	Clustered Dock	-	-	-	-	-	-	-	-
Rumex crispus	Curled Dock	-	-	-	-	+	-	-	-
Salvia sp.		-	-	-	-	-	+	-	-
Schoenus apogon	Common Bog-rush	-	-	-	-	+	-	-	-

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

CUMBERLAND ECOLOGY

Table C.1 Flora species recorded in the Study Area

Scientific Name	Common Name	Regen CPW - Subject Land	Regen CPW - Regional Park	Mature CPW - Regional Park	DNG	Low diversity DNG	Exotic grassland	Riparian	Wetland (Incidental Records)
Scleria mackaviensis		+	-	-	-	-	-	-	-
Senecio diaschides		+	-	-	-	-	-	-	-
Senecio madagascariensis	Fireweed	+	+	+	+	+	+	+	-
Setaria italica	Foxtail Millet	-	-	-	-	-	-	-	-
Setaria parviflora	Slender Pigeon Grass	+	+	+	+	+	+	+	-
Sida corrugata	Corrugated Sida	+	-	+	-	-	-	-	-
Sida rhombifolia	Paddy's Lucerne	+	+	+	+	+	+	+	-
Sigesbeckia orientalis		-	+	-	-	-	-	-	-
Solanum nigrum	Blackberry Nightshade	-	-	-	-	-	+	-	-
Solanum prinophyllum	Forest Nightshade	+	-	-	-	-	-	-	-
Solanum prinophyllum (juvenile)	Forest Nightshade (juvenile)	+	+	+	-	-	-	-	-
Solanum pseudocapsicum	Jerusalem Cherry	+	-	-	-	-	-	-	-
Solanum pseudocapsicum (juvenile)	Jerusalem Cherry (juvenile)	+	+	+	-	-	-	+	-
Solanum seaforthianum	Climbing Nightshade	-	-	-	-	-	-	-	-
Solenogyne bellioides		-	+	+	+	+	-	-	-
Sonchus oleraceus	Sow Thistle	+	-	+	-	-	+	-	-

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table C.1 Flora species recorded in the Study Area

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Sorghum leiocladum	Wild Sorghum	-	-	-	-	+	-	-	-
Spergularia sp.		-	+	+	-	-	-	-	-
Sporobolus africanus	Parramatta Grass	-	-	-	-	+	-	-	-
Sporobolus creber	Slender Rat's Tail Grass	+	+	+	+	+	-	+	-
Sporobolus elongatus	Slender Rat's Tail Grass	-	-	+	+	+	-	+	-
Stackhousia viminea	Slender Stackhousia	+	+	-	+	-	-	-	-
Stenotaphrum secundatum	Buffalo Grass	-	-	-	-	+	-	-	-
Tagetes minuta	Stinking Roger	-	-	+	-	-	-	-	-
Taraxacum officianale	Dandelion	+	-	-	-	-	-	-	-
Thelymitra sp.	an Orchid	-	-	-	-	-	-	-	-
Themeda australis	Kangaroo Grass	+	+	-	+	+	-	+	-
Tradescantia fluminensis	Wandering Jew	-	-	-	-	-	-	+	-
Trema tomentosa var. aspera	Native Peach	-	-	+	-	-	-	-	-
Tricoryne elatior	Yellow Autumn-lily	-	-	-	+	+	-	-	-
Tricoryne simplex		+	-	-	+	+	-	+	-
Tricoryne sp.		-	-	-	-	+	-	-	-
Trifolium dubium	Yellow Suckling Clover	-	+	+	+	-	+	-	-

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table C.1 Flora species recorded in the Study Area

Scientific Name	Common Name	Regen CPW - Subject Land	Regen CPW - Regional Park	Mature CPW - Regional Park	DNG	Low diversity DNG	Exotic grassland	Riparian	Wetland (Incidental Records)
Trifolium repens	White Clover	-	-	-	-	-	+	-	-
Trifolium sp.	Clover	-	-	-	-	-	+	-	-
Triglochin procera									+
Typha orientalis	Broadleaf Cumbungi	-	-	-	-	-	-	-	+
Unknown sp. 1	Persecaria like	-	-	-	-	+	-	-	-
Unknown sp. 2	rush	-	-	-	-	+	-	-	-
Unknown sp. 3	grass - Briza subaristida?	-	-	-	-	+	-	-	-
Unknown sp. 4	Herb - opp linear leaves, square stem + branches	-	-	-	-	+	-	-	-
Verbena bonariensis	Purpletop	-	-	-	+	+	-	-	-
Verbena brasiliensis		-	-	-	-	-	-	-	-
Verbena officinalis	Common Verbena	-	+	+	+	+	+	-	-
Verbena rigida	Veined Verbena	-	-	-	+	+	-	-	-
Vernonia cinerea		-	+	+	-	-	-	-	-
Veronica ?calycina	Hairy Speedwell	-	+	-	-	-	-	-	-
Veronica plebia	Trailing Speedwell	+	-	-	-	-	-	-	-
Vicia sativa	Common Vetch	-	-	-	-	-	-	-	-
Vittadinia cuneata	Fuzzweed	+	-	-	-	-	-	-	-

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table C.1 Flora species recorded in the Study Area

Scientific Name	Common Name	Regen CPW - Subject Land	Regen CPW - Regional Park	Mature CPW - Regional Park	DNG	Low diversity DNG	Exotic grassland	Riparian	Wetland (Incidental Records)
Vittadinia hispidula		-	-	-	-	+	-	-	-
Vittadinia spp.		+	+	+	+	-	-	-	-
Wahlenbergia communis	Tufted Bluebell	+	+	+	+	+	-	-	-
Wahlenbergia gracilis	Native Bluebell	+	+	+	+	+	-	-	-
Wurmbea dioica	Early Nancy	-	-	-	-	-	-	-	-
Xanthium occidentale	Noogoora Burr	-	-	-	+	-	-	-	-
Xanthium sp.		+	-	+	-	-	-	-	+
Zornia dictiocarpa	Zornia	+	+	+	+	+	-	+	-

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

CUMBERLAND ECOLOGY

Table C.2 Fauna species recorded in the Study Area and SMP

Family	Scientific Name	Common Name	Legal Status	Gunninah 1991	ERM 2003	CE 2004-2006	CE 2007-2008	CE 2009	Cumberland Ecology 2011		
									Subject Land	Study Area - Regrowth CPW	Study Area - Mature CPW
Acanthizidae	*Acanthiza chrysorrhoa*	Yellow-rumped Thornbill	P	X		X	X				
Acanthizidae	*Acanthiza lineata*	Striated Thornbill	P	X		X					
Acanthizidae	*Acanthiza nana*	Yellow Thornbill	P	X	X	X	X		X	X	X
Acanthizidae	*Acanthiza pusilla*	Brown Thornbill	P	X	X					X	
Acanthizidae	*Acanthiza reguloides*	Buff-rumped Thornbill	P			X					
Acanthizidae	*Gerygone olivacea*	White-throated Gerygone	P				X				
Acanthizidae	*Pyrrholaemus saggitatus*	Speckled Warbler	V	X							
Acanthizidae	*Sericornis frontalis*	White-browed Scrubwren	P			X					
Acanthizidae	*Smicrornis brevirostris*	Weebill	P			X	X		X	X	X
Accipitridae	*Accipiter cirrocephalus*	Collared Sparrowhawk	P	X		X					
Accipitridae	*Accipiter fasciatus*	Brown Goshawk	P			X					X
Accipitridae	*Accipiter*	Grey Goshawk	P					X			

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table C.2 Fauna species recorded in the Study Area and SMP

Family	Scientific Name	Common Name	Legal Status	Gunninah 1991	ERM 2003	CE 2004-2006	CE 2007-2008	CE 2009	Cumberland Ecology 2011		
									Subject Land	Study Area - Regrowth CPW	Study Area - Mature CPW
	novaehollandiae										
Accipitridae	*Aquila audax*	Wedge-tailed Eagle	P		X		X				
Accipitridae	*Aviceda subcristata*	Pacific Baza	P							X	
Accipitridae	*Elanus axillaris*	Black-shouldered Kite	P	X	X						
Accipitridae	*Haliastur sphenurus*	Whistling Kite	P	X							
Aegothelidae	*Aegotheles cristatus*	Australian Owlet-nightjar	P	X							
Agamidae	*Pogona barbata*	Bearded Dragon	P	X	X						
Alcedinidae	*Ceyx azureus*	Azure Kingfisher	P	X							
Alcedinidae	*Dacelo novaeguineae*	Laughing Kookaburra	P	X	X	X	X			X	
Anatidae	*Anas castanea*	Chestnut Teal	P			X					
Anatidae	*Anas gracilis*	Grey Teal	P			X	X				
Anatidae	*Anas superciliosa*	Pacific Black Duck	P	X		X	X				
Anatidae	*Aythya australis*	Hardhead	P				X				
Anatidae	*Biziura lobata*	Musk Duck	P	X							
Anatidae	*Chenonetta jubata*	Australian Wood Duck	P	X		X	X				

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table C.2 Fauna species recorded in the Study Area and SMP

Family	Scientific Name	Common Name	Legal Status	Gunninah 1991	ERM 2003	CE 2004-2006	CE 2007-2008	CE 2009	Cumberland Ecology 2011		
									Subject Land	Study Area - Regrowth CPW	Study Area - Mature CPW
Anatidae	*Cygnus atratus*	Black Swan	P	X							
Ardeidae	*Ardea alba*	Great Egret	P	X							
Ardeidae	*Ardea intermedia*	Intermediate Egret	P	X							
Ardeidae	*Bubulcus ibis*	Cattle Egret	P	X							
Ardeidae	*Egretta novaehollandiae*	White-faced Heron	P	X		X	X				
Artamidae	*Artamus cyanopterus*	Dusky Woodswallow	P			X					X
Artamidae	*Cracticus torquatus*	Grey Butcherbird	P	X	X	X			X	X	X
Artamidae	*Gymnorhina tibicen*	Australian Magpie	P	X	X	X	X	X		X	X
Artamidae	*Strepera graculina*	Pied Currawong	P	X	X	X	X				
Cacatuidae	*Cacatua galerita*	Sulphur-crested Cockatoo	P	X	X	X	X				
Cacatuidae	*Cacatua sanguinea*	Little Corella	P	X		X					
Cacatuidae	*Calyptorhynchus funereus*	Yellow-tailed Black-Cockatoo	P	X	X	X					
Cacatuidae	*Eolophus roseicapillus*	Galah	P	X	X	X	X				

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

CUMBERLAND ECOLOGY

Table C.2 Fauna species recorded in the Study Area and SMP

Family	Scientific Name	Common Name	Legal Status	Gunninah 1991	ERM 2003	CE 2004-2006	CE 2007-2008	CE 2009	Cumberland Ecology 2011		
									Subject Land	Study Area - Regrowth CPW	Study Area - Mature CPW
Camaenidae	*Meridolum corneovirens*	Cumberland Plain Land Snail	E1			X			X	X	X
Campephagidae	*Coracina novaehollandiae*	Black-faced Cuckoo-shrike	P	X	X	X	X		X		
Campephagidae	*Lalage tricolor*	White-winged Triller	P				X				
Canidae	*Canis lupus familiaris**	Dog	U		X				X		
Canidae	*Vulpes vulpes**	Fox	U	X	X				X		
Casuariidae	*Dromaius novaehollandiae*	Emu	P	X	X	X	X	X		X	
Charadriidae	*Elseyornis melanops*	Black-fronted Dotterel	P	X							
Charadriidae	*Vanellus miles*	Masked Lapwing	P	X	X	X		X			
Climacteridae	*Cormobates leucophaea*	White-throated Treecreeper	P			X					
Columbidae	*Columba livia**	Rock Dove	U	X	X						
Columbidae	*Geopelia placida*	Peaceful Dove	P	X							
Columbidae	*Ocyphaps lophotes*	Crested Pigeon	P	X		X	X				

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

CUMBERLAND ECOLOGY

Table C.2 Fauna species recorded in the Study Area and SMP

Family	Scientific Name	Common Name	Legal Status	Gunninah 1991	ERM 2003	CE 2004-2006	CE 2007-2008	CE 2009	Cumberland Ecology 2011		
									Subject Land	Study Area - Regrowth CPW	Study Area - Mature CPW
Columbidae	*Phaps chalcoptera*	Common Bronzewing	P			X	X			X	
Columbidae	*Streptopelia chinensis**	Spotted Turtle-Dove	U	X	X	X	X	X		X	
Coraciidae	*Eurystomus orientalis*	Dollarbird	P	X							
Corcoracidae	*Corcorax melanorhamphos*	White-winged Chough	P	X	X	X	X			X	
Corcoracidae	*Struthidea cinerea*	Apostlebird	P				X				
Corvidae	*Corvus coronoides*	Australian Raven	P	X	X	X	X	X	X	X	X
Cuculidae	*Cacomantis flabelliformis*	Fan-tailed Cuckoo	P	X	X						
Cuculidae	*Chalcites lucidus*	Shining Bronze-Cuckoo	P	X		X					
Cuculidae	*Cuculus pallidus*	Pallid Cuckoo	P				X				
Dicaeidae	*Dicaeum hirundinaceum*	Mistletoebird	P			X					
Dicruridae	*Grallina cyanoleuca*	Magpie-lark	P	X	X	X	X		X	X	X
Dicruridae	*Myiagra inquieta*	Restless Flycatcher	P			X					
Dicruridae	*Rhipidura albiscapa*	Grey Fantail	P	X	X	X	X		X	X	X

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

CUMBERLAND ECOLOGY

Table C.2 Fauna species recorded in the Study Area and SMP

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									Subject Land	Study Area - Regrowth CPW	Study Area - Mature CPW
Dicruridae	*Rhipidura leucophrys*	Willie Wagtail	P	X	X	X	X		X		X
Dicruridae	*Rhipidura rufifrons*	Rufous Fantail	P	X							
Elapidae	*Pseudechis porphyriacus*	Red-bellied Black Snake	P	X	X				X		
Elapidae	*Pseudonaja textilis*	Eastern Brown Snake	P	X	X						
Estrildidae	*Lonchura castaneothorax*	Chestnut-breasted Mannikin	P	X							
Estrildidae	*Neochmia temporalis*	Red-browed Finch	P	X	X	X	X				
Estrildidae	*Stagonopleura guttata*	Diamond Firetail	V	X							
Estrildidae	*Taeniopygia bichenovii*	Double-barred Finch	P	X		X	X		X		
Estrildidae	*Taeniopygia guttata*	Zebra Finch	P	X							
Falconidae	*Falco cenchroides*	Nankeen Kestrel	P	X							
Falconidae	*Falco longipennis*	Australian Hobby	P			X					
Felidae	*Felis catus**	Cat	U	X		X					
Hirundinidae	*Hirundo neoxena*	Welcome Swallow	P	X		X	X		X		X
Hirundinidae	*Petrochelidon ariel*	Fairy Martin	P	X							

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

CUMBERLAND ECOLOGY

Table C.2 Fauna species recorded in the Study Area and SMP

Family	Scientific Name	Common Name	Legal Status	Gunninah 1991	ERM 2003	CE 2004-2006	CE 2007-2008	CE 2009	Cumberland Ecology 2011		
									Subject Land	Study Area - Regrowth CPW	Study Area - Mature CPW
Hirundinidae	*Petrochelidon nigricans*	Tree Martin	P	X							
Hylidae	*Litoria dentata*	Bleating Tree Frog	P			X					
Hylidae	*Litoria peronii*	Peron's Tree Frog	P		X						
Hylidae	*Litoria verreauxii*	Verreaux's Frog	P		X						
Leporidae	*Lepus capensis**	Brown Hare	U	X	X	X					
Leporidae	*Oryctolagus cuniculus**	Rabbit	U	X	X	X			X		
Macropodidae	*Macropus giganteus*	Eastern Grey Kangaroo	P	X	X	X		X		X	X
Macropodidae	*Macropus robustus*	Common Wallaroo	P								X
Macropodidae	*Macropus rufus*	Red Kangaroo	P	X	X	X					
Maluridae	*Malurus cyaneus*	Superb Fairy-wren	P	X	X	X	X		X	X	X
Meliphagidae	*Acanthorhynchus tenuirostris*	Eastern Spinebill	P	X	X	X					
Meliphagidae	*Anthochaera carunculata*	Red Wattlebird	P			X	X				
Meliphagidae	*Anthochaera*	Little Wattlebird	P		X						

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table C.2 Fauna species recorded in the Study Area and SMP

Family	Scientific Name	Common Name	Legal Status	Gunninah 1991	ERM 2003	CE 2004-2006	CE 2007-2008	CE 2009	Cumberland Ecology 2011		
									Subject Land	Study Area - Regrowth CPW	Study Area - Mature CPW
	chrysoptera										
Meliphagidae	*Lichenostomus chrysops*	Yellow-faced Honeyeater	P	X	X	X				X	X
Meliphagidae	*Lichenostomus penicillatus*	White-plumed Honeyeater	P	X		X					
Meliphagidae	*Manorina melanocephala*	Noisy Miner	P	X	X	X	X	X	X	X	
Meliphagidae	*Melithreptus brevirostris*	Brown-headed Honeyeater	P			X	X				
Meliphagidae	*Melithreptus lunatus*	White-naped Honeyeater	P	X		X					
Meliphagidae	*Myzomela sanguinolenta*	Scarlet Honeyeater	P	X		X					
Meliphagidae	*Philemon corniculatus*	Noisy Friarbird	P	X		X	X				
Molossidae	*Mormopterus ridei (formerly "Species 2")*	Eastern Freetail Bat	P			X					
Molossidae	*Mormopterus*	East-coast Freetail-bat	V		X						

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table C.2 Fauna species recorded in the Study Area and SMP

Family	Scientific Name	Common Name	Legal Status	Gunninah 1991	ERM 2003	CE 2004-2006	CE 2007-2008	CE 2009	Cumberland Ecology 2011		
									Subject Land	Study Area - Regrowth CPW	Study Area - Mature CPW
	norfolkensis										
Molossidae	*Mormopterus sp.?*	A Freetail-bat	P		X						
Molossidae	*Tadarida australis*	White-striped Freetail-bat	P		X						
Motacillidae	*Anthus australis*	Australian Pipit	P	X							
Muridae	*Mus musculus**	House Mouse	U	X							
Muridae	*Rattus rattus**	Black Rat	U	X							
Myobatrachidae	*Crinia signifera*	Common Eastern Froglet	P		X	X			X		X
Myobatrachidae	*Limnodynastes ornatus*	Ornate Burrowing Frog	P	X							
Myobatrachidae	*Limnodynastes peronii*	Brown-striped Frog	P			X					
Myobatrachidae	*Limnodynastes tasmaniensis*	Spotted Grass Frog	P			X					
Neosittidae	*Daphoenositta chrysoptera*	Varied Sittella	V	X	X	X					

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table C.2 Fauna species recorded in the Study Area and SMP

Family	Scientific Name	Common Name	Legal Status	Gunninah 1991	ERM 2003	CE 2004-2006	CE 2007-2008	CE 2009	Cumberland Ecology 2011		
									Subject Land	Study Area - Regrowth CPW	Study Area - Mature CPW
Oriolidae	*Oriolus sagittatus*	Olive-backed Oriole	P	X		X					
Pachycephalidae	*Colluricincla harmonica*	Grey Shrike-thrush	P	X	X	X				X	
Pachycephalidae	*Falcunculus frontatus*	Eastern Shrike-tit	P	X	X	X					
Pachycephalidae	*Monarcha melanopsis*	Black-faced Monarch	P	X							
Pachycephalidae	*Pachycephala pectoralis*	Golden Whistler	P	X	X	X	X		X	X	X
Pachycephalidae	*Pachycephala rufiventris*	Rufous Whistler	P				X				
Pardalotidae	*Pardalotus punctatus*	Spotted Pardalote	P	X	X	X	X		X		
Pardalotidae	*Pardalotus striatus*	Striated Pardalote	P			X	X				
Petauridae	*Petaurus breviceps*	Sugar Glider	P	X							
Petroicidae	*Eopsaltria australis*	Eastern Yellow Robin	P	X	X	X					
Petroicidae	*Melanodryas cucullata*	Hooded Robin	V		X	X	X				
Petroicidae	*Microeca fascinans*	Jacky Winter	P			X					X
Petroicidae	*Petroica rosea*	Rose Robin	P	X		X				X	X

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table C.2 Fauna species recorded in the Study Area and SMP

Family	Scientific Name	Common Name	Legal Status	Gunninah 1991	ERM 2003	CE 2004-2006	CE 2007-2008	CE 2009	Cumberland Ecology 2011		
									Subject Land	Study Area - Regrowth CPW	Study Area - Mature CPW
Phalacrocoracidae	*Phalacrocorax melanoleucos*	Little Pied Cormorant	P	X		X	X				
Phalangeridae	*Trichosurus vulpecula*	Common Brushtail Possum	P	X		X		X			
Phasianidae	*Coturnix ypsilophora*	Brown Quail	P	X							
Podargidae	*Podargus strigoides*	Tawny Frogmouth	P	X							
Podicipedidae	*Tachybaptus novaehollandiae*	Australasian Grebe	P	X		X	X				
Pseudocheiridae	*Pseudocheirus peregrinus*	Common Ringtail Possum	P	X	X						
Psittacidae	*Glossopsitta concinna*	Musk Lorikeet	P							X	
Psittacidae	*Platycercus adscitus eximius*	Eastern Rosella	P	X	X	X	X	X		X	
Psittacidae	*Platycercus elegans*	Crimson Rosella	P	X	X	X					
Psittacidae	*Psephotus haematonotus*	Red-rumped Parrot	P	X		X	X				

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

CUMBERLAND ECOLOGY

Table C.2 Fauna species recorded in the Study Area and SMP

Family	Scientific Name	Common Name	Legal Status	Gunninah 1991	ERM 2003	CE 2004-2006	CE 2007-2008	CE 2009	Cumberland Ecology 2011		
									Subject Land	Study Area - Regrowth CPW	Study Area - Mature CPW
Psittacidae	*Trichoglossus chlorolepidotus*	Scaly-breasted Lorikeet	P	X							
Psittacidae	*Trichoglossus haematodus*	Rainbow Lorikeet	P	X		X	X	X			
Ptilonorhynchidae	*Ptilonorhynchus violaceus*	Satin Bowerbird	P				X				
Pycnonotidae	*Pycnonotus jocosus**	Red-whiskered Bulbul	U	X		X					
Rallidae	*Fulica atra*	Eurasian Coot	P	X		X	X				
Rallidae	*Gallinula tenebrosa*	Dusky Moorhen	P	X		X	X				
Rallidae	*Porphyrio porphyrio*	Purple Swamphen	P	X		X	X				
Scincidae	*Lampropholis guichenoti*	Pale-flecked Garden Sunskink	P	X	X						
Scincidae	*Tiliqua scincoides*	Eastern Blue-tongue	P	X					X		
Scolopacidae	*Gallinago hardwickii*	Latham's Snipe	P				X				
Strigidae	*Ninox boobook*	Southern Boobook	P	X							
Sturnidae	*Acridotheres tristis**	Common Myna	U	X		X	X	X			

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

CUMBERLAND ECOLOGY

Table C.2 Fauna species recorded in the Study Area and SMP

Family	Scientific Name	Common Name	Legal Status	Gunninah 1991	ERM 2003	CE 2004-2006	CE 2007-2008	CE 2009	Cumberland Ecology 2011		
									Subject Land	Study Area - Regrowth CPW	Study Area - Mature CPW
Sturnidae	*Sturnus vulgaris**	Common Starling	U	X		X	X				
Tachyglossidae	*Tachyglossus aculeatus*	Short-beaked Echidna	P	X							
Threskiornithidae	*Platalea flavipes*	Yellow-billed Spoonbill	P	X		X					
Threskiornithidae	*Platalea regia*	Royal Spoonbill	P	X							
Threskiornithidae	*Threskiornis spinicollis*	Straw-necked Ibis	P	X							
Vespertilionidae	*Chalinolobus gouldii*	Gould's Wattled Bat	P		X	X		X			
Vespertilionidae	*Chalinolobus morio*	Chocolate Wattled Bat	P	X	X						
Vespertilionidae	*Miniopterus orianae (formerly schreibersii) oceanensis*	Eastern Bentwing-bat	V	X	X	X		X			
Vespertilionidae	*Myotis macropus*	Large-footed Myotis	V			X					
Vespertilionidae	*Nyctophilus geoffroyi*	Lesser Long-eared Bat	P	X	X						
Vespertilionidae	*Nyctophilus sp.*	long-eared bat	P		X	X					
Vespertilionidae	*Scoteanax rueppellii*	Greater Broad-nosed Bat	V	X	X						

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table C.2 Fauna species recorded in the Study Area and SMP

Family	Scientific Name	Common Name	Legal Status	Gunninah 1991	ERM 2003	CE 2004-2006	CE 2007-2008	CE 2009	Cumberland Ecology 2011		
									Subject Land	Study Area - Regrowth CPW	Study Area - Mature CPW
Vespertilionidae	*Scotorepens orion*	Eastern Broad-nosed Bat	P		X						
Vespertilionidae	*Vespadelus darlingtoni*	Large Forest Bat	P		X						
Vespertilionidae	*Vespadelus regulus*	Southern Forest Bat	P		X	X					
Vespertilionidae	*Vespadelus vulturnus*	Little Forest Bat	P	X	X						
Zosteropidae	*Zosterops lateralis*	Silvereye	P	X	X	X			X		

Appendix D

Flora and Fauna Data Analysis

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

CUMBERLAND ECOLOGY

Table D.1 Snail survey records for the Study Area - CE 2011

	Area A – Regenerating CPW- Subject Land					Area B - Regenerating CPW- Regional Park					Area C-Mature CPW- Regional Park				
	A-SQ1	A-SQ2	A-SQ3	SQ4	SQ5	B-SQ6	B-SQ7	B-SQ8	B-SQ9	B-SQ10	C-SQ11	C-SQ12	C-SQ13	C-SQ14	C-SQ15
Total trees	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Live snails	8	8	0	1	0	4	5	3	0	10	9	11	6	6	6
Snail Shells	2	4	0	1	0	1	9	4	8	4	10	9	8	8	8
Total Snails	10	12	0	2	0	5	14	7	8	14	19	20	14	14	14
Ave for Area	4.8					9.6					16.2				
St Dev	5.76194					4.15933					3.03315				
St Err	2.57682					1.86011					1.35647				

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

CUMBERLAND ECOLOGY

Table D.2 Habitat Assessment results in the Study Area

	Habitat Features	Area A-Regenerating CPW - study area					Area B - Regenerating CPW- Regional Park					Area C - Mature CPW - Regional Park				
		SQ1	SQ2	SQ3	SQ4	SQ5	SQ6	SQ7	SQ8	SQ9	SQ10	SQ11	SQ12	SQ13	SQ14	SQ15
Projective Cover (total % cover = 100%)	Vegetation	95	92	80	85	20	95	83	85	80	70	70	40	80	65	70
	Logs	0	0	1	0	1	1	2	0	5	2	1	5	2	0	1
	Rock	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Litter	1	5	9	12	55	2	4	10	5	15	15	25	10	15	12
	Soil	2	1	0	0	5	0	4	0	3	3	2	10	0	5	2
	Bark	2	2	10	3	19	2	7	5	7	10	12	20	8	15	15
Hollows	Small	0	4	3	2	1	1	5	3	2	2	1	3	3	2	3
	Medium	1	1	0	0	0	0	1	0	1	1	0	0	1	0	0
	Large	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Main Tree Species	*E.molucanna*	X	X	X	X		X		X	X	X	X	X	X	X	X
	E. teretecornis		X			X		X	X	X						
	E. fibrosa				X											
Main Understory Species	Native Grasses	X	X	X	X	X		X	X	X	X		X	X		
	Exotic Grasses			X												
	Native Shrubs					X						X			X	X
	Native Herbs						X				X	X			X	X

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

CUMBERLAND ECOLOGY

Table D.2 Habitat Assessment results in the Study Area

	Habitat Features	Area A-Regenerating CPW - study area					Area B - Regenerating CPW- Regional Park					Area C - Mature CPW - Regional Park				
		SQ1	SQ2	SQ3	SQ4	SQ5	SQ6	SQ7	SQ8	SQ9	SQ10	SQ11	SQ12	SQ13	SQ14	SQ15
	Regenerating Eucalypts															
	Exotic Herbs															
Flowering Tree		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Signs of fauna activity		Nil	Macropod scats	Macropod scats	Nil	Macropod scats	Nil	Macropod scats,	Macropod scats	Macropod scats, Emu scats	Macropod scats	Nil	Macropod scats	Macropod scats	Nil	Macropod scats, Emu scats

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table D.3 Results of Group Similarity Analyses (SIMPER) of Flora data by habitat and primary species contributing to Similarity

Data type	Habitat	Group similarity (%)	Main contributing species	% contribution to similarity
All Quadrats – flora abundance data	Grassland	42.86	*Axonopus fissifolius*	9.79
			Senecio madagacariensis	7.94
			Setaria parviflora	7.34
	Woodland	44.52	*Aristida vagans*	6.48
			Sida rhombifolia	5.45
			Brunoniella australis	4.98
	Riparian	15.55	*Microlaena stipoides*	18.59
			Sida rhombifolia	8.59
			Angrophora floribunda	8.40
All Quadrats – Native flora abundance data	Grassland	36.37	*Cynodon dactylon*	14.51
			Fimbristylis dichotoma	13.95
			Centella asiatica	12.20
	Woodland	44.43	*Aristida vagans*	8.23
			Brunoniella australis	6.32
			Cymbopogon refractus	6.20
	Riparian	14.09	*Microlaena stipoides*	30.21
			Angophora floribunda	13.02
			Dichelachne micrantha	8.32
All Quadrats – Exotic	Grassland	50.73	*Axonopus fissifolius*	18.89

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table D.3 Results of Group Similarity Analyses (SIMPER) of Flora data by habitat and primary species contributing to Similarity

Data type	Habitat	Group similarity (%)	Main contributing species	% contribution to similarity
species abundance data			*Senecio madagascariensis*	15.63
			Setaria parviflora	14.49
	Woodland	44.19	*Sida rhombifolia*	27.48
			Senecio madagascariensis	20.38
			Richardia stellaris	14.97
	Riparian	19.85	*Axonopus fissifolius*	24.65
			Eragrostis curvula	20.13
			Sida rhombifolia	16.54
All Quadrats – flora abundance data	A	36.64	*Senecio madagacariensis*	7.77
			Setaria parviflora	6.84
			Axonopus fissifolius	6.36
	B	56.43	*Aristida vagans*	7.19
			Cymbopogon refractus	5.21
			Glossocardia bidens	4.88
	C	30.79	*Aristida vagans*	6.97
			Sida rhombifolia	5.23
			Senecio madagascariensis	5.02
All Quadrats – Native	A	32.36	*Cymbopogon refractus*	10.36

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table D.3 Results of Group Similarity Analyses (SIMPER) of Flora data by habitat and primary species contributing to Similarity

Data type	Habitat	Group similarity (%)	Main contributing species	% contribution to similarity
flora abundance data			*Fimbristylis dichotoma*	10.09
			Cynodon dactylon	8.69
	B	56.02	*Aristida vagans*	8.93
			Cymbopogon refractus	6.46
			Glossocardia bidens	6.07
	C	28.60	*Aristida vagans*	10.21
			Cymbopogon refractus	6.53
			Bothriochloa decipiens/macra	6.06
All Quadrats – Exotic flora abundance data	A	42.81	*Senecio madagascariensis*	19.51
			Setaria parviflora	17.03
			Axonopus fissifolius	13.65
	B	57.62	*Richardia stellaria*	25.94
			Sida rhombifolia	24.85
			Senecio madagascariensis	17.57
	C	34.81	*Sida rhombifolia*	17.82
			Senecio madagascariensis	16.79
			Richardia stellaria	14.65

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table D.4 Statistical comparison of Cumberland Plain Land Snail numbers between different sections of the Study Area

Data type	Normality test (Shapiro – Wilks test)	Homogeneity of Variances test (Levene's test)	Comparative test utilised	Test statistic	Test statistic p-value	Post Hoc tests					
						A & B		A & C		B & C	
						U	p	U	p	U	p
Live	✓	✓	ANOVA	1.984	0.180	n/a	n/a	n/a	n/a	n/a	n/a
Shells	✓	×	Kruskal – Wallis	8.916	***0.012***	3.50	0.055	0.00	***0.008***	5.00	0.104
Totals	✓	×	Kruskal - Wallis	8.873	***0.012***	6.00	0.172	0.00	***0.008***	3.00	0.034

Appendix E

Actions prescribed by the Final Recovery Plan for the Cumberland Plain

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table E.1 Compliance with Cumberland Plain Recovery Plan

Topics to address	*CPW recovery plan objectives*	*Relevant sections*	*Required action*	*Objective addressed in Cumberland Ecology management plan*	*Relevant Cumberland Ecology Management plan/section*
Building the protected area network	Page 14 - Recovery Objective 1: To build a protected area network, comprising public and private lands, focused on the priority conservation lands (PCL)	Recovery objective subdivided into several actions. 1.1, 1.2. 1.3 and 1.6 not applicable to management plan as they are responsibility of OEH (listed as DECCW in CPW plan). Actions 1.4 and 1.5 potentially applicable to management plans as they refer to acquisition of lands for inclusion into protection and assurance of offsets where impacts are unavoidable respectively	Possible statement in management plan acknowledging that appropriate local council/govt dept will be contacted in the event of future rezonation/change of development plans	Feral and Domestic Animal Management Stragety (FDAMS) - No	FDAMS not really applicable as area covered by plan is not a PCL. Only potential relevance may be Action 1.5 - offsets where impacts are unavoidable - which has a note on offsets in Growth Centres. May need to state in sections 3.1.3 (Pg 3.2) and 3.1.6 (Pg 3.4) that planting of native shurbs is in accordance with the Growth Centres Biodiversity Certification Order as well as Asset Protection Zone

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table E.1 Compliance with Cumberland Plain Recovery Plan

Topics to address	*CPW recovery plan objectives*	*Relevant sections*	*Required action*	*Objective addressed in Cumberland Ecology management plan*	*Relevant Cumberland Ecology Management plan/section*
					requirements?
				Weed Management Plan (WMP) - No	WMP not really applicable as area covered by plan is not a PCL. Action 1.5 may have some relevance as clearing for development will remove native vegetation as well as the weeds. Could make statement in Section 4.2.3 (Pg 4.4) and/or 4.3.1 (pg 4.5) that loss/disturbance of native vegetation within development site does not affect local long-term survival of native species as adjacent Regional Park

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table E.1 Compliance with Cumberland Plain Recovery Plan

Topics to address	*CPW recovery plan objectives*	*Relevant sections*	*Required action*	*Objective addressed in Cumberland Ecology management plan*	*Relevant Cumberland Ecology Management plan/section*
					has sustainable populations (refer to 2009 WP Biodiversity assessment)
				Macrofauna Management Plant (MFMP) - Yes	MFMP indirectly addresses Action 1.4 as Chapter 1, Section 1.3.1 (pg 1.9) states that St Mary's Property has been zoned into urban development and regional park areas, thus lands for inclusion into protection are acquired. Action 1.5 (offsets) not relevant as plan deals with fauna. Presence of park indicates offset area for flora

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table E.1 Compliance with Cumberland Plain Recovery Plan

Topics to address	*CPW recovery plan objectives*	*Relevant sections*	*Required action*	*Objective addressed in Cumberland Ecology management plan*	*Relevant Cumberland Ecology Management plan/section*
Delivery of best practise management strategies	Page 16: Recovery Objective 2: To deliver best practice management for threatened biodiversity across Cumberland Plain, with a specific focus on the priority conservation lands and public lands where the primary management objectives are compatible with biodiversity conservation	Recovery objective subdivided into several actions. 2.1, 2.4, 2.6, 2.7 not applicable to management plan as they are govt dept responsibilities or refer to Priority Conservation lands. Actions 2.2, 2.3 and 2.5 all refer to best management practices outlined in Appendix 2 which has relevant sections detailed below. Actions 2.3 and 2.5 not directly relevant as they refer to local, state and Australian govenment lands. Action 2.2 highly relevant as it refers to public and private lands	Responses to relevant sections of Appendix 2 required. Point 2 is relevant as it refers to public lands compatible with primary management objective. Point 3 also relevant as it deals with private land.	FDAMS - Yes WPS - Yes MFMP - Yes	Detailed in following points

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table E.1 Compliance with Cumberland Plain Recovery Plan

Topics to address	*CPW recovery plan objectives*	*Relevant sections*	*Required action*	*Objective addressed in Cumberland Ecology management plan*	*Relevant Cumberland Ecology Management plan/section*
Appendix 2 - Best practice standards for bushland management	Page 31: Appendix 2, Point 2: Bushland on public lands compatible with primary management objective	Requirement 1: a site action or management plan to be prepared which addresses the management of threatened biodiversity and is consistent with the recovery plan	Development of management plan consistent with recovery plan	FDAMS - Yes	FDAMS: Chapter 3, Section 3.1.1 (Pg 3.1) and 3.2 (Pg 3.6) Overall management strategy acknowledges that threatened flora, fauna and EECs have to be protected from feral/stray and domestic animals
				WMP - Yes	WMP: Chapter 4, Section 4.1 (Pg 4.1) acknowledges the different threats weeds pose to native vegetation and habitats
				MFMP - yes	Chapters 4 and 5 cover issues that necessitate fauna population management. While

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table E.1 Compliance with Cumberland Plain Recovery Plan

Topics to address	*CPW recovery plan objectives*	*Relevant sections*	*Required action*	*Objective addressed in Cumberland Ecology management plan*	*Relevant Cumberland Ecology Management plan/section*
					they deal with macrofauna, these comply with recovery plan as they indirectly aid in protecting/regeneration of the CEEC.
	Page 31: Appendix 2, Point 2: Bushland on public lands compatible with primary management objective	Requirement 2: the land to be managed in accordance with the site action or management plan	Procedures/Strategies to execute management plan	FDAMS - Yes	FDAMS - Chapter 3, Sections 3.1.2 - 3.1.8 and Section 3.2 outline procedures for MP execution to prevent feral/domestic animals effects on native flora/fauna and prevent/reduce access to adjacent PCL.
				WMP - Yes	WMP - Chapter 4, Sections 4.2, 4.3 and Appendix C provide details on procedures

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table E.1 Compliance with Cumberland Plain Recovery Plan

Topics to address	*CPW recovery plan objectives*	*Relevant sections*	*Required action*	*Objective addressed in Cumberland Ecology management plan*	*Relevant Cumberland Ecology Management plan/section*
					to remove/reduce spread of weeds. Explicit mention of protecting adjacent Regional Park by preventing weed infestations mentioned on pg 4.3.
				MFMP - yes	Chapters 7 - 12 outline various protocols/stategies for implementing management issues identified in Chapters 4-5.
	Page 31: Appendix 2, Point 2: Bushland on public lands compatible with primary	Requirement 3: Monitoring to be undertaken periodically to determine the status of threatened entities, or to assess the effectiveness of threat abatement measures being implemented (for guidance see the Monitoring manual for bitou bush control and native plant recovery (Hughes et al. 2009) at	Periodic monitoring using monitoring methods listed in Hughes article	FDAMS - No	No mention of ongoing monitoring of feral population numbers or of corresponding responses of native flora/fauna species.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table E.1 Compliance with Cumberland Plain Recovery Plan

Topics to address	*CPW recovery plan objectives*	*Relevant sections*	*Required action*	*Objective addressed in Cumberland Ecology management plan*	*Relevant Cumberland Ecology Management plan/section*
	management objective	www.environment.nsw.gov.au/bitouTAP/monitoring.htm)			Hughes article not really applicable as it deals with methods for monitoring flora not fauna
				WMP - Yes	Monitoring of weed populations along with ongoing review of strategy outlined in Chapter 5 with timeline for procedures outlined in Appendix E. Methodolgy for Long term Monitoring (Section 5.2) not specificially mentioned but it is stated that methods used in this WMP (transects - which is one of the methods listed in

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table E.1 Compliance with Cumberland Plain Recovery Plan

Topics to address	*CPW recovery plan objectives*	*Relevant sections*	*Required action*	*Objective addressed in Cumberland Ecology management plan*	*Relevant Cumberland Ecology Management plan/section*
					Hughes 2009) be used. No methods/reference link for methods mentioned for Short term monitoring (Section 5.1)
				MFMP - yes	Methods for ongoing monitoring for macrofauna as well as flora outlined in Sections 13.1.1 - 13.1.4
	Page 31: Appendix 2, Point 2: Bushland on public lands compatible with primary management objective	Requirement 4: Management to be consistent with the following documents [Recovering bushland on the Cumberland Plain – Best practice guidelines for the management and restoration of bushland (DEC 2005a); recommended fire regimes in Appendix 3] , and any other best practice documents that OEH (DECCW) may promote at a later date. A landscape-scale response to African Olive invasion on the Cumberland Plain (as per	Appropriate references have to be incorporated/references in management plan	FDAMS - No	FDAMS - N/A as fire regimen not included in MP. May need to reference the DEC document with regard to planting of native shrubs? Action 2.6 is responsibility of OEH

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table E.1 Compliance with Cumberland Plain Recovery Plan

Topics to address	*CPW recovery plan objectives*	*Relevant sections*	*Required action*	*Objective addressed in Cumberland Ecology management plan*	*Relevant Cumberland Ecology Management plan/section*
		completion of action 2.6)			(DECCW) and is not applicable to this MP as the focus is on fauna
				WMP - Yes	WMP - Fire regimes N/A as it is not used as a weed control method. Action 2.6 is responsibility of OEH (DECCW) but plan is in compliance as control and removal of African Olive is covered (Appendix C, Section C.3) Recovering Bushland document not referenced. Important/Relevant sections of Recovering Bushland document are chapter 2 (pg 16,

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table E.1 Compliance with Cumberland Plain Recovery Plan

Topics to address	*CPW recovery plan objectives*	*Relevant sections*	*Required action*	*Objective addressed in Cumberland Ecology management plan*	*Relevant Cumberland Ecology Management plan/section*
					pg 21, pg 25?) and Chapter 4 (pg 38,)
				MFMP - yes	Recovering bushland documents highlights need to reduce overgrazing (and it's side effects like erosion). Reducing of grazing pressure is explicitly stated in Chapter 12, Section 12.3 as an outcome of controlling Macrofauna populations. However previous section does state that some weed species may increase (pg 12.3, dot point 4) which may be contradictory. Fire regimen and African

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table E.1 Compliance with Cumberland Plain Recovery Plan

Topics to address	*CPW recovery plan objectives*	*Relevant sections*	*Required action*	*Objective addressed in Cumberland Ecology management plan*	*Relevant Cumberland Ecology Management plan/section*
					Olive invasion N/A as plan is focussed on macrofauna
Appendix 2 - Best practice standards for bushland management	Page 31: Appendix 2, Point 3: Bushland on private lands	Requirement 1: a site action or management plan to be prepared which addresses the management of threatened biodiversity and is consistent with the recovery plan	Development of management plan consistent with recovery plan	FDAMS - Yes	FDAMS: Chapter 3, Section 3.1.1 (Pg 3.1) and 3.2 (Pg 3.6) Overall management strategy acknowledges that threatened flora, fauna and EECs have to be protected from feral/stray and domestic animals
				WMP - Yes	WMP: Chapter 4, Section 4.1 (Pg 4.1) acknowledges the different threats weeds pose to native vegetation and habitats
				MFMP - yes	Chapters 4 and 5

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table E.1 Compliance with Cumberland Plain Recovery Plan

Topics to address	*CPW recovery plan objectives*	*Relevant sections*	*Required action*	*Objective addressed in Cumberland Ecology management plan*	*Relevant Cumberland Ecology Management plan/section*
					cover issues that necessitate fauna population management. While they deal with macrofauna, these comply with recovery plan as they indirectly aid in protecting/regeneration of the CEEC.
	Page 31: Appendix 2, Point 3: Bushland on private lands	Requirement 2: the land to be managed in accordance with the site action or management plan	Procedures/Strategies to execute management plan	FDAMS - Yes	FDAMS - Chapter 3, Sections 3.1.2 - 3.1.8 and Section 3.2 outline procedures for MP execution to prevent feral/domestic animals effects on native flora/fauna and prevent/reduce access to adjacent PCL.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table E.1 Compliance with Cumberland Plain Recovery Plan

Topics to address	*CPW recovery plan objectives*	*Relevant sections*	*Required action*	*Objective addressed in Cumberland Ecology management plan*	*Relevant Cumberland Ecology Management plan/section*
				WMP - Yes	WMP - Chapter 4, Sections 4.2, 4.3 and Appendix C provide details on procedures to remove/reduce spread of weeds. Explicit mention of protecting adjacent Regional Park by preventing weed infestations mentioned on pg 4.3.
				MFMP - yes	Chapters 7 - 12 outline various protocols/stategies for implementing management issues identified in Chapters 4-5.
	Page 31: Appendix 2, Point	Requirement 3: Management to be consistent with the following documents [Recovering bushland on the	Appropriate references have to be	FDAMS - Yes	FDAMS - N/A as fire regimen not included in

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table E.1 Compliance with Cumberland Plain Recovery Plan

Topics to address	*CPW recovery plan objectives*	*Relevant sections*	*Required action*	*Objective addressed in Cumberland Ecology management plan*	*Relevant Cumberland Ecology Management plan/section*
	3: Bushland on private lands	Cumberland Plain – Best practice guidelines for the management and restoration of bushland (DEC 2005a); recommended fire regimes in Appendix 3] , and any other best practice documents that OEH (DECCW) may promote at a later date	incorporated/references in management plan		MP. May need to reference the DEC document with regard to planting of native shrubs?
				WMP - Yes	WMP - Fire regimes N/A as it is not used as a weed control method. Recovering Bushland document not referenced. Important/Relevant sections of Recovering Bushland document are chapter 2 (pg 16, pg 21, pg 25?) and Chapter 4 (pg 38,)
				MFMP - yes	Recovering bushland documents highlights need to reduce overgrazing (and it's

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table E.1 Compliance with Cumberland Plain Recovery Plan

Topics to address	*CPW recovery plan objectives*	*Relevant sections*	*Required action*	*Objective addressed in Cumberland Ecology management plan*	*Relevant Cumberland Ecology Management plan/section*
					side effects like erosion). Reducing of grazing pressure is explicitly stated in Chapter 12, Section 12.3 as an outcome of controlling Macrofauna populations. However previous section does state that some weed species may increase (pg 12.3, dot point 4) which may be contradictory. Fire regimen N/A as plan is focussed on macrofauna
Community awareness	Page 17: Recovery Objective 3: To develop an	Recovery objective subdivided into several actions. Actions 3.1, 3.2, 3.3, 3.6 and 3.7 not relevant as they are council or OEH responsibilities. Actions 3.4 and 3.5 may have some relevance as they refer to OEH and	Statement in management plan communication section addressing potential methods for raising	FDAMS - Yes	FDAMS: Section 2.2 (Pg 2.8); Section 3.1.1 (pg 3.1); Section 3.2 (Pg 3.6) and Section

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table E.1 Compliance with Cumberland Plain Recovery Plan

Topics to address	*CPW recovery plan objectives*	*Relevant sections*	*Required action*	*Objective addressed in Cumberland Ecology management plan*	*Relevant Cumberland Ecology Management plan/section*
	understanding and enhanced awareness in the community of the Cumberland Plain's threatened biodiversity, the best practice standards for its management, and the recovery program	local councils working collaboratively with landowners and other organisations to increase awareness of best practice standards and opportunities for further involvement/participation in the recovery program	awareness of issues in recovery plan if necessary		3.3 (Pg 3.7)
				WMP - Yes	WMP: Chapter 4, Section 4.2.4 (Pg 4.5). Could potentially be expanded to have more regular updates/awareness programs on importance of weed control.
				MFMP - yes	Initiation of a environmental education program explicitly mentioned in Chapter 7, section 7.10. However this is not clearly divided into separate programs for the Park area and the development area

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table E.1 Compliance with Cumberland Plain Recovery Plan

Topics to address	*CPW recovery plan objectives*	*Relevant sections*	*Required action*	*Objective addressed in Cumberland Ecology management plan*	*Relevant Cumberland Ecology Management plan/section*
Continued research/monitoring and data updates	Page 19: Recovery Objective 4: To increase knowledge of the threats to the survival of the Cumberland Plain's threatened biodiversity, and thereby improve capacity to manage these in a strategic and effective manner	Recovery objective subdivided into several actions. Actions 4.1, 4.2 and 4.6 not relevant as they are council or OEH responsibilities. Action 4.4 not directly relevant but deals with compliance and enforcement programs dealing with unauthorised clearing of bushland. Local councils and OEH responsible for carrying out Actions 4.3 and 4.5 respectively, which deal with reviewing biodiversity strategies and establishing development notification frameworks. But these may be relevant as they include areas around the priority conservation lands	Make a statement in management plan that all required permits for clearing were acquired thus removing any potential issues with regard to Action 4.4. Actions 4.3 and 4.5 can be addressed via statements indicating ongoing development of management plans and proper communication within legal channels of any future changes in development plans.	FDAMS - No	FDAMS - N/A as all actions are to be carried out by government bodies. However could add statement in Conclusion that MP strategy will be reviewed and revised according to feral animal responses
				WMP - Yes	WMP - Chapter 5 and Appendix E specify ongoing monitoring, annual reviews and adaptive management timeframes for weed control which will ultimately aid in protecting adjacent Park

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

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Topics to address	*CPW recovery plan objectives*	*Relevant sections*	*Required action*	*Objective addressed in Cumberland Ecology management plan*	*Relevant Cumberland Ecology Management plan/section*
				MFMP - yes	MFMP has been developed as an adaptive management plan and Chapter 13 covers multiple issues that will contribute to ongoing development and improvement of management plan (including liasions and reviews) thus indirectly complying with requirement of improving management capacity/strategy

Appendix F

Staff CVs

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Dr David Robertson

Director

Dr David Robertson's ecological career has spanned 29 years since completion of his PhD at Melbourne University in 1985. He is a specialist ecologist with expertise in both botany and zoology and has worked as an ecological consultant since 1993.

During part of his career, David has also been a lecturer in plant taxonomy, plant ecology and freshwater ecology at Charles Sturt University and Austalian Catholic University. This has developed his capability to work in both aquatic and terrestrial flora and fauna inventory, management of threatened species, ecological risk assessment, wetland rehabilitation and management, and ecological research for environmental impact assessment.

Throughout his career, David has worked on a wide variety of ecological projects. This includes ecological projects across Australia, including New South Wales, Queensland, ACT, Victoria, Tasmania and Western Australia. He has also gained international experience as the senior ecologist involved with consultancies in Hong Kong, Sri Lanka and the Philippines.

Since the inception of Cumberland Ecology Pty Ltd in 2003, David and his team of ecologists at Cumberland Ecology have worked on ecological investigations throughout NSW, averaging over 80 projects per year. They have worked extensively within the Hunter Valley, Gunnedah Basin, Sydney Region, on coastal projects and in the Western Blue Mountains.

David has had, and continues to have, direct involvement in many large-scale vegetation mapping and flora and fauna impact assessment projects. David has worked on many projects that entail the preparation of ecological offsets and Cumberland Ecology has been engaged to monitor such offsets. Cumberland Ecology has helped to formulate offsets for many mining projects in NSW, and also for mines in north Queensland and in Mindanao (Philippines). Under David's direction, an array of monitoring work has been and is being conducted at sites in the Hunter Valley, Gunnedah, Coffs Harbour and Western Sydney.

Education

Bachelor of Science (Honours), Ecology, University of Melbourne, 1980.

Doctor of Philosophy, Ecology, University of Melbourne, 1986.

David undertook his tertiary education at Melbourne University, completing a Bachelor of Science majoring in botany and zoology. This included a thesis submitted as part of the requirements for the B.Sc. Honours Degree at The University of Melbourne School of Botany:

Aspects of the Ecology of Eucalyptus sideroxylon (A. Cunn, ex W. Wool) at Point Addis, Victoria (November 1980).

He completed his Doctor of Philosophy in 1985 at the School of Botany, which was entitled:

Interrelationships between Kangaroos, Fire and Vegetation Dynamic at Gellibrand Hill Park, Victoria (August 1985).

Professional Memberships and Affiliations

Ecological Society of Australia

He is also an accredited BioBanking Assessor.

Employment History

David has lectured in ecology and aquatic biology at Charles Sturt University. Consultancy employment includes as a senior ecologist with the Australian Museum, senior ecologist in charge of the Ecological Services Practice for ERM Australia, and Director of Cumberland Ecology (current).

2003- 2013 - Cumberland Ecology: Director

1997-2003 - ERM: Senior Ecologist

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

1998-1999 - Australian Catholic University: Lecturer (part time)

1995-1996 - Australian Museum: Senior Ecological Consultant

1987-1994 - Charles Sturt University: Lecturer

1986-1987 - University of Melbourne: Research Fellow

Experience

David has been involved in the development of biodiversity offset packages for a number of projects, which have included strategic assessments of land as compensatory habitats and involvement in the development of indirect offsets such as threatened species recovery plans. As part of the development of suitable offsets, David is regularly involved in negotiations with clients and regulators about the level of mitigation measures required for flora and fauna impacts.

Recent examples of projects requiring significant offsets work entailing the selection of suitable remnant vegetation for enduring protection and habitat for threatened species listed under the EPBC Act and TSC Act include the:

- Mt Pleasant Project Modification: involved in the selection and subsequent ecological investigations of candidate offset lands, resulting in a substantial offsets package of over 12,000 ha. Further involvement in the development of an Offset Management Plan designed to effectively manage and monitor the offsets for conservation and ecological gains.

- Maules Creek Coal Project is a large-scale flora and fauna baseline study of 2,700 hectares of forest and woodland in the locality of Narrabri, New South Wales. The purpose of the study, which has been ongoing since 2008, was to assess the potential impacts of proposed open cut mining on biodiversity. Key biodiversity values of the Project Area include a number of threatened bird and bat species as well as threatened ecological communities such as the critically endangered Box Gum Woodland.

- Warkworth Mine Extension Project: assistance in the development of an approved offset package. Involved in fauna surveys of the offsets to provide baseline data on their ecological value, particularly for threatened species, and which fulfil a component of the Project's conditions of consent.

- Drayton South Coal Project: involved in the strategic selection and survey, including vegetation mapping, flora and fauna investigations, of suitable offsets.

- Shenhua Watermark Coal Project; presents a complex suite of ecological issues including Critically Endangered and Endangered Ecological Communities (including areas of Box Gum Grassy Woodland), threatened flora and fauna. In particular Koalas, an iconic species for which the area is well known, are present within the proposed Watermark Project Boundary. This has resulted in extensive surveying and mapping of suitable offsets.

- Bengalla Mine Project involves the preparation of an EIA to support a State Significant Development application. The Project impacts include clearing of Box Gum Woodland and Derived Native Grassland, as well the removal of habitat for a range of threatened species and an endangered population. This has involved negotiations with State and Federal Government Authorities to develop appropriate offsets for the Project impacts. This includes participation in the Upper Hunter Strategic Assessment. Cumberland Ecology is currently preparing an Assessment Report for submission as part of the UHSA, including summary of the results of extensive flora and fauna survey and calculations using the Biodiversity Certification Assessment Methodology (BCAM).

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Dr Gitanjali Katrak

Senior Project Manager / Ecologist

Gitanjali Katrak is a Project Manager/Ecologist at Cumberland Ecology, based in Sydney. She has a Bachelor of Sciences (Biological Sciences) with Honours and a PhD in intertidal wetland ecology.

Gitanjali has has been involved in terrestrial and aquatic surveys, impact assessments, ecological monitoring and statistical analyses. She has also managed State Significant Developments and Section 5A assessments with endangered ecological community and threatened species issues. Gitanjali has also been involved in the preparaton of Statements of Evidence for the NSW Land and Environment Court.

Recent consultancy work has included:

- Flora and fauna impact assessments for State Significant Developments, Part 3A projects and Part 5 projects;
- Vegetation mapping, aquatic surveys and targeted threatened species habitat assessment and surveys;
- Impact assessment and offsetting for mining projects; and
- Statisical analyses for ongoing monitoring programmes.

Fields of Competence

- *Commonwealth Environment Protection and Biodiversity Conservation Act 1999;*
- NSW *Threatened Species Conservation Act 1995*;
- Terrestrial and aquatic ecological surveys, particularly aquatic invertebrate identification and assessment of threatened species and ecological communities; and
- Statistical analyses.

Key Sectors

- Urban development; and
- Mining and Extraction industries.

Education

- Bachelor of Science (Honours) in Biological Sciences, La Trobe University, VIC. 2002
- Doctor of Philosophy, Intertidal Wetland Ecology. Flinders University, SA. 2011

Key Projects

Wallarah 2 Coal Project

Gitanjali is currently managing the Ecological Impact Assessments and Offset Strategy for the Development Application of the State Significant Wallarah 2 Coal Project.

St. Mary's Development – Lend Lease

Gitanjali is involved with the progressive development of the former ADI site at St Marys, Western Sydney. Assessments have included the preparation of large scale Species Impact Statements for the Development Precinct DA's and ongoing monitoring within the Regional Park.

Land and Envrionment Court cases

Gitanjali has been involved in court proceedings for several Land and Environment court cases dealing with a variety of issues, including aquatic pollution, groundwater dependent ecosystems, threatened species issues and offset strategies.

Flora and fauna surveys

Gitanjali has been involved in ecological assessments including Species Impact Statements and Flora and Fauna Assessments as part of development applications for a variety of projects in the greater Sydney Metropolitan area.

Statistical analysis

Gitanjali has experience conducting statistical analyses, using programmes such as SPSS and PRIMER, to determine biological patterns and community structure.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Vanessa Orsborn

Project Manager / Ecologist

Vanessa Orsborn has over eight years experience in ecology and project management. She primarily manages flora and fauna assessments and related assessments under the EP&A Act and the EPBC Act.

Recent consultancy experience has included:

- Preparation of offset calculations and reporting for future mining in the Upper Hunter using the Biocertification Assessment Methodology (BCAM);
- Provision of strategic advice for legal privilege;
- Impact Assessments for urban development; and
- Preparation of management plans for offset lands.

Fields of Competence

- Accredited BioBanking and BioCertification Assessor;
- Commonwealth and State environmental approvals;
- Ecological survey and monitoring, particularly assessment of threatened species and ecological communities; and
- Report writing and liaison with stakeholders.

Key Industry Sectors

- Urban development;
- Natural resource management; and
- Power and renewable energies.

Education

BEnvSci. Australian Catholic University, 2004.

Key Projects

Upper Hunter Strategic Assessment

Vanessa has been involved in the development of the Upper Hunter Strategic Assessment, which is a combined offsetting scheme for future mining projects in the Upper Hunter Valley. BCAM is used to dictate offset contributions for future mine projects, to be paid to an Offsets Fund managed by the NSW Office of Environment and Heritage. Vanessa has prepared BCAM reports for Coal and Allied and RioTinto owned mines.

Coal Mine Consent Modification Projects

Since 2010, Vanessa has managed the ecological assessments for several Major Project applications for various coal mines in the Upper Hunter Valley, including Muswellbrook Coal, Bengalla Mine and Mount Pleasant projects. Assessments have included consideration of offset requirements, particularly in relation to Box Gum Woodland and other vegetation communities listed under the TSC Act and EPBC Act.

Ecological Management Projects

Vanessa has prepared numerous ecological management plans; for vegetation management, pest species management and also over-abundant native species management. These have primarily included projects in the Sydney Basin as well as the Hunter Valley and South Coast of NSW. Recent projects have included preparation of a detailed Offset Area Management Programme (OAMP) report for the implementation of biodiversity conservation and restoration works within four offset properties, as part of the Ravensworth Mine Complex approval conditions.

M2 Upgrade – Leighton Contractors

Vanessa prepared extensive documentation to satisfy approval conditions including mitigation and offset strategies for the M2 Upgrade Project. During construction works, she led a team of ecologists to ensure the safe handling of fauna disturbed during clearing.

St Marys Development – Delfin Lend Lease

Vanessa has been involved with the progression of the former ADI site at St Marys, mainly in the preparation of impact assessments and also annual macropod population impact monitoring. Recent assessments have included the preparation of a large scale Species Impact Assessment for the Western Precinct development proposals.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Emily Cave

Research Assistant / Ecologist

Emily Cave is a Research Assistant/Ecologist at Cumberland Ecology, based in Sydney. She has a Bachelor of Science (Honours) in Biology.

Emily has been involved in a wide range of flora and fauna surveys, particularly for residential and mining projects in NSW. She has extensive experience in vertebrate fauna survey, particularly ornithological census. Emily has experience in data analysis, data entry, habitat mapping, pre-clearing assessment, and clearing supervision. Recently, she has been involved with the North West Growth Centre project, supervising vegetation clearance.

Consultancy work includes:

- Mount Pleasant Project Biodiversity Management Area baseline surveys;
- Bird surveys for prospective offset areas within the Hunter Valley; and
- Pre-clearing assessment and clearing supervision for linear infrastructure projects in western Sydney.

Fields of Competence

- Commonwealth *Environment Protection and Biodiversity Conservation Act 1999;*
- NSW *Threatened Species Conservation Act 1995*;
- Ecological surveys, particularly ornithological surveys and habitat assessment; and
- Data analysis, storage and preparation of reports.

Key Industry Sectors

- Urban development; and
- Mining industries.

Education

Bachelor of Science (Honours) in Biology
Macquarie University, NSW (2012)

Key Projects

North West Growth Centre – Lend Lease

Emily has been a key member of the ecology team undertaking pre-clearance surveys and vegetation clearance supervision for the construction of a pipeline for Sydney Water in the Vineyard / Rouse Hill / Kellyville area. This involved flora identification, fauna identification and relocation, and dam dewatering procedures. Dam dewatering procedures involved monitoring the water source during pumping and ensuring that any fauna are caught and relocated to new suitable habitat.

Watermark Coal Project – Shenhua Watermark Coal

Emily has assisted with flora and fauna surveys within Biodiversity Offset areas for the Watermark Coal Project (an open cut coal mining operation) within the Gunnedah Local Government Area. Surveys have included BioBanking assessments, habitat assessments, bird surveys and targeted koala searches.

Bengalla Mine – Hansen Bailey

Flora and fauna surveys within Biodiversity Offset areas for the Bengalla Continuation of Mining Project within the Upper Hunter Local Government Area. Surveys included setting up camera traps and Anabat units, undertaking habitat assessments and fauna surveys. Emily was the leader of a birding team for one of the survey weeks.

Flora and fauna surveys

Various projects mainly as part of development applications in the Greater Sydney Metropolitan area.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Resume - David Thomas

Address 9 Miriam Road, Denistone NSW 2114

Phone (02) 9858 4360

Email address booyong@tpg.com.au

Member of Ecological Consultants Association

Areas of Expertise

- vegetation survey, assessment & mapping
- preparation of management plans for natural areas
- bushland reconstruction & rehabilitation planning

Employment History

Environmental Consultant (1994 to present)

Areas of Vegetation Surveys & Assessments (as at October, 2010):
I have had extensive experience in most vegetation and habitat types in the Sydney Basin Bioregion, including endangered ecological community survey and assessment of condition and viability of bushland. A smaller proportion of my work has been done in the North Coast, Central Western Slopes and South Coast regions.

Western Sydney
Agnes Banks, Airds, Auburn LGA, Austral, Badgerys Ck, Bankstown Airport, Berkshire Park, Blacktown, Bringelly, Castlereagh, Casula, Cattai, Chullora, Doonside, Eastern Creek, Fairfield, Granville, Green Valley, Grose Vale, Hoxton Park, Kellyville, Kemps Creek, Kingswood, Kurrajong, Kurmond, Leacock Regional Park, Lidcombe, Macquarie Fields, Marayong, Maroota, Marsden Park, Milperra, Mt Druitt, Newington, Nth Parramatta, Prestons, Prospect Reservoir, Quakers Hill, Riverstone, Rooty Hill, Ropes Ck, Rouse Hill development area, Rydalmere, St. Marys, Scheyville NP, Schofields, Seven Hills, Villawood, Warragamba, Wedderburn, Werrington

Northern Sydney
Bayview, Beacon Hill, Beecroft, Belrose, Buffalo Creek, Castle Cove, Castle Hill, Cheltenham, Church Point, Cowan, Cromer, Denistone, Duffys Forest, Dural, Eastwood,

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Epping, Glenorie, Gordon, Hornsby, Killara, North Epping, North Rocks, Palm Beach, Pymble, Ryde, St. Ives, Shrimptons Creek, Brush Farm Park), Sydney Harbour NP, Terrey Hills, The Spit, Turramurra, Warriewood, West Pennant Hills, Willoughby

Southern & Eastern Sydney
Alfords Point, Bondi Junction, Calsil Dune & Kurnell, Cooks Cove, Cronulla, Gymea, Holsworthy, LaPerouse, Lilli Pilli, Little Bay, Lucas Heights, Matraville, Menai, Menangle, Narellan, Oyster Bay, Smiths Creek, Sutherland, Sylvania, Tamarama, Towra Point, Voyager Point, Vaucluse, Wedderburn, Woronora

Illawarra
American Creek, Avon Water Catchment Area, Bellambi Colliery (Woronora Water Catchment Area), Berkeley, Blue Angle Creek (Gerroa), Bulli Pass, Cataract Water Catchment Area, Coaldale, Cordeaux Heights, Dunmore, Farmborough Heights, Minnamurra, Royal NP, Mt. Keira, Mt. Kembla, Sandon Point, Spring Creek (Kiama), Stanwell Tops, Toolijooa, West Dapto, Wilton

Blue Mountains
Bell, Glenbrook-Blackheath, Lapstone, Lawson-Nth Katoomba, Lithgow, Megalong Valley, Narrowneck, Springwood, Wentworth Falls, Wolgan Valley, Woodford

Country NSW
Awaba, Bargo, Brisbane Water NP, Cambewarra, Dunmore, Eden, Forbes-Harden, Glen Innes, Gosford-Port Stephens, Green Point (Lake Macquarie), Gulgong-Wellington, HMAS Albatross (Nowra), Hunter Valley (Pokolbin-Scone), Iluka, Kandos, Kincumber, Lake Munmorah, Menangle Park, Merriwa, Mt Penang, Morrisett, Murray Valley, Muswellbrook, Nattai, Joorilands, Pacific Palms, Patonga, Picton, Portland, Port Stephens, Raymond Terrace, Singleton, Tahmoor, Taree, Tea Gardens, Terrigal, Tuncurry, Wamberal, Werriberri/The Oaks/Oakdale, Wolgan Valley, Woy Woy, Yuragir NP

Vegetation Mapping has been done in many of the above surveys and has included plant community, &/or bushland condition mapping.

Larger mapping projects have been done in:
Prospect Reservoir; Singleton Army Training Area; Taree LGA (eastern half); Sydney Harbour NP; Voyager Point/Pleasure Point, Kemps Ck and Bonds Ck (in Liverpool LGA); Carlton Stud, Picton; Werriberri & Nattai Water Catchment Areas.

Management Plans *(including site and impact assessment)*
Camden Airport; Denistone Catchment; Duffys Forest; Flat Rock Ck, Willoughby; Hoxton Park Airport; Kemps Ck; Prestons; Rooty Hill; Stonequarry Ck, Picton; Wilton sandstone quarry, *Pimelea spicata* population at Hoxton Park.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Bushland Rehabilitation Planning and related work

- Eastern Suburbs Banksia Scrub at Bondi Junction
- Chullora railway yards bushland corridor
- Farmers Creek, City of Lithgow
- Blue Mountains sewage treatment plants rehabilitation
- Eastwood; planning & supervision of rehabilitation of railway embankment for City-Rail, and worksites in Brush Farm Park
- Bush regeneration at Royal National Park and Dee Why
- Leader of LEAP (Land Care & Environmental Action Program) team (bush regeneration training component) at Ryde Hospital bushland & Prospect Reservoir
- Plant selection for rehabilitation work for M2 motorway, quarry at Cattai, Lambert - Park, Eastwood and part of Olympic site, Homebush Bay
- Nth Ryde – Epping: identification of soil conditions/types for topsoil storage (for later rehabilitation) during M2 road construction
- Smalls Creek, Kellyville

Other Work

Assessment of potential offsets for proposed coal mines at Mt Pleasant in Hunter Valley and Awaba; and proposed residential development at former ADI site at St Marys

Contract botanical survey for NPWS for: Bargo, Blue Mountains, Gosford-Port Stephens-Upper Hunter, Illawarra, Sydney Metropolitan, Singleton, Warragamba and Western Sydney mapping surveys

Member of Flora Team, Western Sydney Biodiversity Survey, NPWS (1996)

Preparation of Species Impact Statements for sites at Prestons, Bondi Junction, Belrose and Green Valley

Tree surveys for proposed residential developments at Beecroft, Berowra, Caringbar, Carlingford, Cheltenham, Coogee, Eastwood, East Ryde, Epping, Epping West, Nth Epping, Glenhaven, Hornsby, Killara, Pacific Palms, Tuggerah, Turramurra, Waitara, West Pennant Hills

Royal National Park - investigation of possible effect of vegetation on road accident

Peer review of vegetation surveys near Murwillumbah and at Darling Mills Ck, Baulkham Hills; Voyager Point, Liverpool; Upper Blue Mountains

Expert witness in Land & Environment Court

Environmental Officer, Sydney Water (1989-1994)

Vegetation surveys throughout corporation's area of operations

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Plant community mapping and description of Katoomba & Blackheath Water Catchment Areas, & Prospect Reservoir

Planning & supervision of revegetation plan and bush regeneration at Prospect Reservoir
Supervision of fieldwork for 96 students involved in six month environmental training program (LEAP) in western Sydney.

Selection, project management and monitoring of bushland restoration projects (Sydney, Illawarra, & Blue Mountains)

Environmental assessment of potential impact of proposed construction works on bushland - including preparation of reviews of environmental factors

Advice on construction site management & restoration

Preparation of environmental management plan for Prospect Reservoir (1989) & later update: *Prospect Reservoir Landuse & Environmental Management Plan* (1993)

Publication: *Rainforest Conservation Status in the Metropolitan and Woronora Catchment Areas*. 1990. Water Board - Sydney, Blue Mountains, Illawarra.

An original member of the Ethics Committee of the Ecological Consultants Association.

***Previous work in engineering*:**

- Pumping Engineer (Water Board, 1979-1989)
- Technical Inspector (Dept. Labour & Industry, 1977-1978)
- Refrigeration/Air Conditioning Mechanic (Royal North Shore Hospital, 1976)
- Marine Engineer (Australian & overseas shipping companies, 1969-1976, 1978)

Qualifications & Training

- Uncompleted BSc. (University of New England)
- Bush Regeneration Certificate TAFE, 1994
- First Class Certificate of Competency for Steam & Motor Ships - Ministry of Shipping & Transport, 1974, 1977
- Marine Engineering Technology Certificate, TAFE, 1969
- Fitting & Machining Apprenticeship, Associated Steamships P/L, 1966-8
- NSW Leaving Certificate (Matriculation), 1965

Personal Data

Date of Birth: May, 1948
Citizenship: Australian
Interests: Family, steam machinery, gardening, bushwalking
BushCare volunteer City of Ryde

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Appendix G

Approval Process Flowchart (JBA 2011)

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Biodiversity Conservation, Western Precinct, St Marys

Technical investigations
Technical investigations into the environmental values and developmental capacity of the land commenced 1994, including Regional Environmental Study

NPWS letter dated 21/6/00 confirming:
"…the planning process for the ADI site has been proceeding for several years and the conservation values of the site have been comprehensively assessed…the NPWS has independently considered the results of the various assessments…(and) is satisfied that the proposed park captures the areas of highest conservation significance…the conservation outcome currently proposed at ADI….is robust." (Attachment A)

Sydney Regional Environmental Plan No.30 - St Marys
The statutory planning framework for the St Marys site. Includes zoning, zone objectives, special provisions + provides the process for land release and for the approval of Precinct Plans

St Marys Environmental Planning Strategy 2000
The comprehensive plan for developers, consent authorities and members of the community to manage development and conservation on the St Marys site. Identifies performance objectives and corresponding strategies that MUST be considered in the preparation of Precinct Plans and DAs. EPS to be used to assist those responsible for assessing development and approving, permitting or authorizing a use, activity or development

Performance objectives (conservation)
- A representative and significant proportion of the natural values of the land are to be conserved within a Regional Park
- Urban design & site planning to have regard to significant stands of trees and retain where practicable
- Impacts on vegetation and fauna habitats within Regional Park to be minimized

Planning approach & performance objectives (conservation)
- Enable significant natural & cultural values to be conserved primarily through the establishment of a Regional Park
- Natural environment within development areas to be conserved as far as practicable: Urban design & site planning to have regard to significant stands of trees and retain where practicable
- Impacts on vegetation and fauna habitats within Regional Park to be minimized
- DAs considered under TSCA 1995

NPWS letter dated 18/09/02 stating:
"…establishment of the area as a reserve under the National Parks + Wildlife Act, 1974 will provide the highest level of legal protection." (Attachment B)

St Marys Development Agreement
- Requires transfer of Regional Park + Regional Open Space to State Government
- Ensures preparation of a Plan of Management and the long term management of Regional Park in accordance with the *National Parks & Wildlife Act*, 1974 including the preservation, protection and rehabilitation of biodiversity values
- Ensures funding for ongoing management of Regional Park

Strategies (conservation)
- Transfer ownership of Regional Park and Regional Open Space to State Government via Development Agreement
- Developer to fund establishment of Regional Park & Open Space + preparation of Plans of Management for uses, facilities & recreation management via Development Agreement
- Prepare Regional Park Fire Management Plan + Bush Regeneration Plan
- Develop remaining land for urban uses as distributed under SREP 30

The Hon Frank Sator MP letter dated 4/10/06 stating:
"…during the consultation process a number of issues were raised by agencies. In particular, the Department of Environment and Conservation...raised issues which been been discussed with you in detail. The declaration is conditional upon these particular matters being progressed to my satisfaction prior to specifc stages in the planning process." (Attachment C)

Land Release of Western Precinct (29 September 2006)
By Ministerial declaration following consultation with DEC and other public agencies

Development controls (conservation)
Precinct Plans to:
- Include tree surveys
- Protect significant stands of trees where practicable
- Include a weed management plan
- Include strategies for managing domestic and feral animals
- Incorporate fire management elements
- Identify vegetation links to Regional Park
- Include strategies for the management of Regional Park boundaries

NPWS letter dated 21/03/01 identifying the appropriate level of biodiversity assessment for preparation of a Precinct Plan. NPWS advice: *"It should be acknowledged that 8 part tests, and possibly one or several SISs, may be required at the DA stage to meet statutory requirements. However, the assessments undertaken at the Precinct Plan stage should assist to stream-line the consideration of threatened species issues at the DA stage and minimize the need to undertake new or replicate existing survey information & assessment"* (Attachment D)

Supporting Precinct Plan technical studies (conservation)
- Tree survey locating all trees within the Western Precinct (200mm+ diameter)
- Biodiversity Assessment mapping & describing all vegetation communities, fauna habitats + flora & fauna species within the Western Precinct and the surrounding areas of woodland within the Regional Park; assessing impact of proposal; and identifying scope of likely work, including any additional survey, required at DA stage

DEC letter (undated) providing comments on Draft Precinct Plan (Attachment E)

Western Precinct Plan adopted by Council 23 March 2009
Forms part of the regulatory planning framework of Penrith City Council and a basis on which to assess & make decisions about the development of the Western Precinct as a whole. Illustrates the pattern of development and provides benchmarks, principles + provisions relating to environmental conservation.

Strategies (conservation)
- Locate open space around significant (good quality) stands of existing trees outside the Regional Park boundaries
- Establish riparian corridors along existing drainage lines for drainage and vegetation conservation purposes
- Design upgrading of drainage paths to conserve existing trees as practicable and vegetate so that they approximate a natural state and provide canopy connectivity
- Retain proportion of native tree canopy within the open space, road and drainage networks

+

Western Precinct Framework Plan
- Establishes the structure and key principles for the planning and future development of the Western Precinct
- Provides habitat links through the Precinct along rehabilitated drinage lines, connecting through to the Regional Park
- Establishes riparian corridors (integrated with other open space areas) along three drinage lines
- Estahlishes two water management basins/lakes
- Establishes a Bushfire APZ to the Regional Park

+

Management Plans (conservation)
Provide management framework for potential impacts of development on physical + environmental characteristics of land:
- Landscape and Open Space Masterplan
- Landscape and Open Space Handover and Maintenance Plan
- Water Cycle Management Plan
- Landscape Strategy
- Weed Management Plan
- Feral and Domestic Animals Management Plan
- Fire Management Plan
- Macro Fauna Management Plan

Western Precinct 1st Stage Subdivision Development Applications
First Development Applications lodged with Penrith City Council for Stage 1 of development of the Western Precinct in November 2009. Proposals in accordance with SREP 30, the EPS, Western Precinct Plan, and the St Marys Development Agreement

Flora and Fauna Impact Assessment
Prepared for each development application

'7 Part Tests'
Prepared for all threatened ecological communities + flora & fauna species

Species Impact Statements
- DGRs requested from DECCW to prepare a precautionary SIS for Village 2 DAs.
- Responds to queries from Council/JRPP and change in status of CPW to CEEC.
- Individual SISs likely to be required to accompany future DAs within the Western Precinct.

Development Assessment
Penrith City Council have to date granted development consent for 267 residential lots within Stage 1.

DA **MUST** be consistent with SREP 30 performance objectives, zone objectives + other requirements

Council **MUST** consider the development control strategies contained within the St Marys EPS

Council **MUST** take the Precinct Plan

Council **MUST** consider the consistency of the DA with the terms of the Development Agreement

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Mixed Use Development at Jordan Springs Boulevard

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Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

DOCUMENT CONTROL REGISTER

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Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

TABLE OF CONTENTS

1 INTRODUCTION 4
2 PROJECT DESCRIPTION 5
3 EXISTING BACKGROUND NOISE LEVELS 7
3.1 MEASUREMENT LOCATIONS 7
3.2 EQUIPMENT USED 7
3.3 MEASUREMENT TIME PERIOD 7
3.4 MEASURED RATING BACKGROUND NOISE LEVEL 7
4 NOISE ASSESSMENT 8
4.1 PENRITH CITY COUNCIL DEVELOPMENT CONTROL PLAN 2010 8
4.2 REQUIREMENTS BY NSW INFRASTRUCTURE SEPP 8
4.3 REQUIREMENTS BY AUSTRALIAN STANDARDS 9
4.4 TRAFFIC NOISE INTRUSION ASSESSMENT 9
4.4.1 Noise Descriptors 9
4.4.2 Existing Roads - Traffic Noise Measurements 10
4.4.2.1 Measurement Period, Location and Equipment 10
4.4.2.2 Long Term Monitoring 10
4.4.2.3 Manned Measurements 10
4.4.2.4 Measured Noise Levels 10
4.4.3 Future Roads' Noise Emissions 11
4.4.3.1 Estimated Traffic Volumes 11
4.4.3.2 Predicted Future Traffic Noise Levels 12
4.4.4 Evaluation of Noise Intrusion 12
4.5 PLANT NOISE EMISSIONS 13
4.5.1 Plant Noise Emission Criteria 13
4.5.1.1 Intrusiveness Criterion 13
4.5.1.2 Amenity Criterion 13
4.5.1.3 Sleep Arousal 14
4.5.1.4 Summary of Assessment Criteria 14
5 RECOMMENDATIONS 15
5.1 GLAZING 15
5.2 ROOF /CEIING STRUCTURE 16
5.2.1 Concrete Roof 16
5.3 EXTERNAL WALLS 16
5.4 DWELLING VENTILATION 17
5.5 PLANT 17
6 CONCLUSION 18
APPENDIX 1 – UNATTENDED TRAFFIC NOISE MONITORING DATA ALONG THE NORTHERN ROAD 19
APPENDIX 2 – UNATTENDED BACKGROUND NOISE MONITORING DATA 20

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

1 INTRODUCTION

This report presents an environmental noise assessment conducted for stage 1 of the proposed mixed use development located at Jordan Springs Boulevard, Jordan Springs. The assessment is based on the following architectural drawings:

Table 1 – Drawings for Assessment

Architect	Project Number	Drawing Number	Revision
Mosca Pserras Architects	14016	AP02	P8
		AP04	P5
		AP05	P6
		AP06	P6
		AP07	P8
		AP08	P7
		AP09	P7
		AP10	P7
		AP11	P7
		AP12	P8
		AP13	P8
		AP14	P8
		AP15	P9
		AP16	P6
		AP17	P3
		AP18	P8
		AP19	P7
		AP20	P2

Potential noise impacts related to the proposal have been assessed at existing and future occupants on and surrounding the site. Recommendations have been made to fully ameliorate any identified impacts, and ensure the future occupants will be provided with an acceptable level of amenity.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

2 PROJECT DESCRIPTION

Project site is located on the corner of Jordan Springs Blvd and Lakeside Parade, Jordan Springs. The overview of the project is:

- 5 multi-level residential flat buildings.
- Office spaces on the ground floor of Building 2.

The noise sources and potential impacts relevant to the proposed development are:

- Traffic noise intrusion into the residential dwellings from traffic movements on local roads.
- Noise emissions from the operation of mechanical services (typically air-conditioning and car park fans) associated with the development.

These potential impacts have been assessed in accordance with Penrith Council guidelines and recommendations made to ameliorate any impacts if required.

Refer to Figure 1 for an aerial photograph of the project site.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

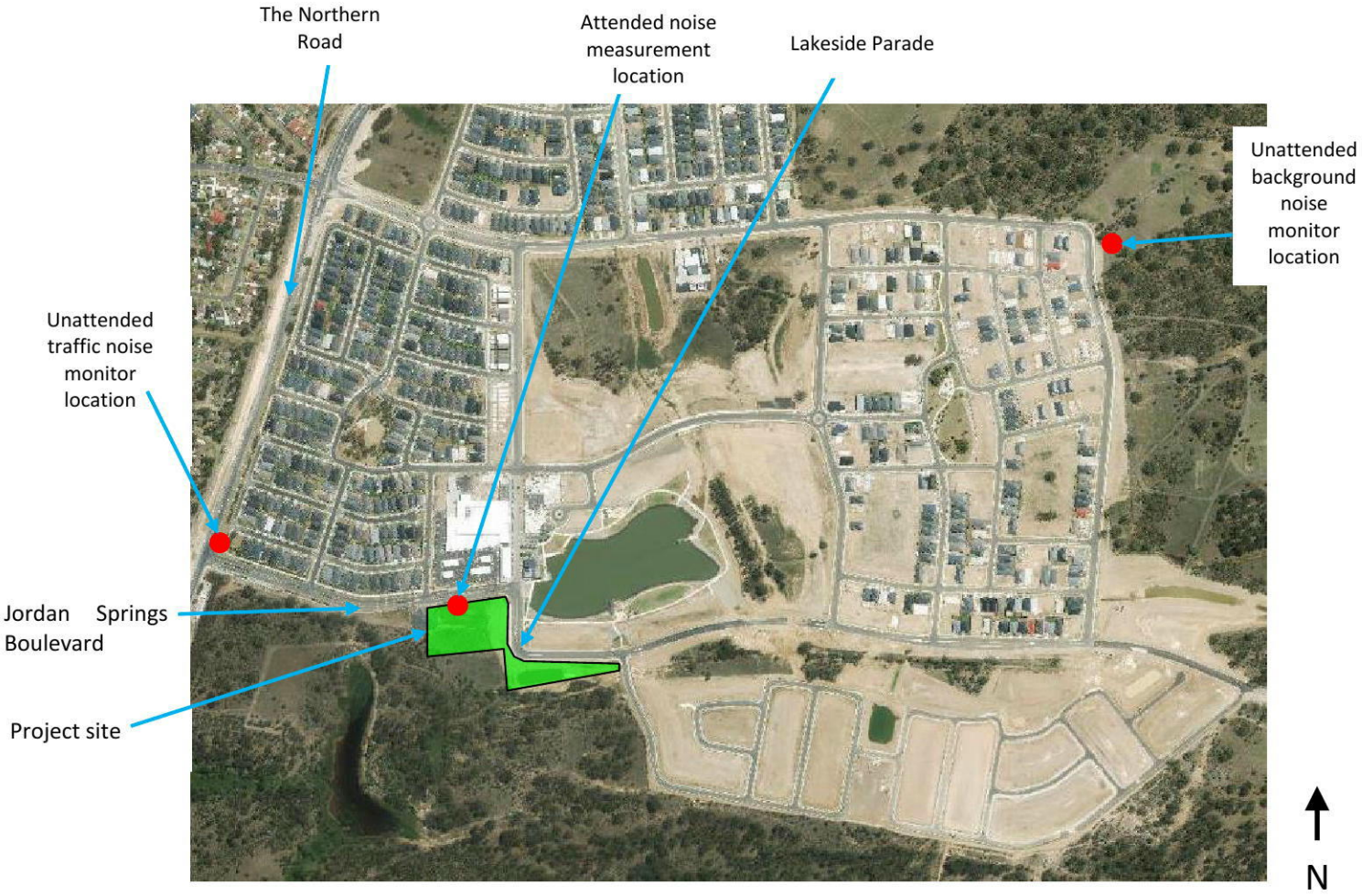


Figure 1 – Site Map and Noise Monitor Locations

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

3 EXISTING BACKGROUND NOISE LEVELS

Long term background noise monitoring was undertaken to establish noise emission criteria in accordance with guidelines within the NSW EPA Industrial Noise Policy.

3.1 MEASUREMENT LOCATIONS

The unattended monitor measurement locations are indicated in Figure 1. The monitor east of the site was used to assess background noise levels. This location was selected to avoid noise created by existing construction activities near the project site.

3.2 EQUIPMENT USED

Background noise was recorded using an Acoustic Research Laboratories Pty Ltd noise logger. The logger was programmed to store 15-minute statistical noise levels throughout the unmanned monitoring period. The equipment was calibrated at the beginning and the end of the measurement using a Rion NC-73 calibrator; no significant drift was detected. All measurements were taken on A-weighted fast response mode.

3.3 MEASUREMENT TIME PERIOD

Unattended measurements were conducted between 13th and 19th November 2013.

3.4 MEASURED RATING BACKGROUND NOISE LEVEL

The measured background noise levels (dB(A) L_{90}) for day, evening and night time periods are shown in the table below.

- Day is defined as the period from 7am to 6pm Monday to Saturday and 8am to 6pm Sundays and Public Holidays;
- Evening is defined as the period from 6pm to 10pm; and
- Night is defined as the period from 10pm to 7am Monday to Saturday and 10pm to 8am Sundays and Public Holidays.

The rating background noise levels calculated in accordance with the guidelines contained in the EPA Industrial Noise Policy are summarised in Table 2.

Table 2 – Rating Background Noise Levels

Location	Time	L_{90} dB(A)
Unattended noise monitor east of the site	Day	39
	Evening	39* (42)
	Night	39

* The recorded level was 42 however in accordance with EPA guidelines the lower, "daytime" level has been adopted for assessment purposes.

It is noted that the measured background noise levels in the vicinity are likely to increase over time once the locality undergoes development. Therefore, use of these background noise levels provide a conservative impact assessment over the long term.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

4 NOISE ASSESSMENT

The following noise assessments have been carried out:

- Traffic noise intrusion into the project site from vehicles on surrounding roads. The main external noise sources are The Northern Road, and noise from future movements on Jordan Springs Boulevard and Lakeside Parade.

4.1 PENRITH CITY COUNCIL DEVELOPMENT CONTROL PLAN 2010

Part C12 of the Penrith DCP 2010 states the following:

*"**12.1 Road Traffic Noise***

C. Controls

Noise Impact Statements - specific requirements

d) Where a site is likely to be affected by unacceptable levels of road traffic noise, the applicant is required to provide a Noise Impact Statement prepared by a qualified acoustic consultant in accordance with the requirements set out in Appendix F3 of this DCP.

e) The Noise Impact Statement should demonstrate acoustic protection measures necessary to achieve an indoor environment meeting residential standards, in accordance with DECCW and State Road Authority criteria, as well as relevant Australian Standards."

The EPA RNP states: Land use developments must meet inernal noise goals in the infrastructure SEPP (Department of Planning NSW 2007) for sensitive developments near busy roads.

4.2 REQUIREMENTS BY NSW INFRASTRUCTURE SEPP

Section 3.5 of the NSW Department of Planning's 'Development Near Rail Corridors and Busy Roads (Interim Guideline)' states:

"The following provides an overall summary of the assessment procedure to meet the requirements of clauses 87 and 102 of the Infrastructure SEPP. The procedure covers noise at developments for both Road and Rail.

- *If the development is for the purpose of a building for residential use, the consent authority must be satisfied that appropriate measures will be taken to ensure that the following LAeq levels are not exceeded:*
  - *in any bedroom in the building: 35dB(A) at any time 10pm-7am*
  - *anywhere else in the building (other than a garage, kitchen, bathroom or hallway): 40dB(A) at any time."*

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

4.3 REQUIREMENTS BY AUSTRALIAN STANDARDS

In accordance with the DCP the relevant Australian standards for the assessment of traffic noise intrusion into the project are Australia Standard AS2107-2000 and AS 3671. The applicable noise level requirements from these standards are detailed below.

Table 3 - Internal Noise Criteria

Space	Noise Criteria L_{eq}
Bedroom	Night- 35 dB(A) (10pm to 7am)
Living Room	Day - 40 dB(A) (7am to 10pm)
Private Offices	40 dB(A) (7am to 10pm)

4.4 TRAFFIC NOISE INTRUSION ASSESSMENT

4.4.1 Noise Descriptors

Traffic noise constantly varies in level, due to fluctuations in traffic speed, vehicle types, road conditions and traffic densities. Accordingly, it is not possible to accurately determine prevailing traffic noise conditions by measuring a single, instantaneous noise level. To accurately determine the effects of traffic noise a 15-20 minute measurement interval is utilised. Over this period, noise levels are monitored on a continuous basis and statistical and integrating techniques are used to determine noise description parameters. These parameters are used to measure how much annoyance would be caused by a particular noise source.

In the case of environmental noise three principle measurement parameters are used, namely L_{10}, L_{90} and L_{eq}.

The L_{10} and L_{90} measurement parameters are statistical levels that represent the average maximum and average minimum noise levels respectively, over the measurement intervals.

The L_{10} parameter is commonly used to measure noise produced by a particular intrusive noise source since it represents the average of the loudest noise levels produced at the source.

Conversely, the L_{10} level (which is commonly referred to as the background noise level) represents the noise level heard in the quieter periods during a measurement interval. The L_{90} parameter is used to set the allowable noise level for new, potentially intrusive noise sources since the disturbance caused by the new source will depend on how audible it is above the pre-existing noise environment, particularly during quiet periods, as represented by the L_{90} level.

The L_{eq} parameter represents the average noise energy during a measurement period. This parameter is derived by integrating the noise levels measured over the measurement period. L_{eq} is important in the assessment of traffic noise impact as it closely corresponds with human perception of a changing noise environment; such is the character of traffic noise.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

4.4.2 Existing Roads - Traffic Noise Measurements

The nearest major existing traffic noise source is The Northern Road, located approximately 350m west of the project site.

The project site is bound to the north by Jordan Springs Boulevard and to the east by Lakeside Parade, both of which are local roads.

4.4.2.1 Measurement Period, Location and Equipment

Traffic noise measurements were taken using a long term, unmanned noise monitor, and supplemented using a hand held measurement. The unattended noise measurements were carried out at 8m from kerb with the microphone having an unobstructed 180 degree view of the road. Refer Figure 1.

Measurements were performed generally in accordance with the Australian Standard AS1055 – Description and Measurement of Environmental Noise – General Procedures.

4.4.2.2 Long Term Monitoring

Measurements of traffic noise along The Northern Rd were recorded using an Acoustic Research Laboratories Pty Ltd noise logger. The logger was programmed to store 15-minute statistical noise levels throughout the unmanned monitoring period. The equipment was calibrated at the beginning and the end of the measurement using a Rion NC-73 calibrator; no significant drift was detected. All measurements were taken on A-weighted fast response mode. Unmanned measurements were conducted between 13th and 19th November 2013. Figure 1 details the measurement position.

4.4.2.3 Manned Measurements

Manned measurements were taken during morning peak on 19th November 2013. Noise measurements were obtained using a Norsonic type SA140 Sound Analyser. The analyser was set to fast response and calibrated before and after the measurements using a Norsonics Sound Calibrator type 1251. No significant drift was noted.

4.4.2.4 Measured Noise Levels

Representative traffic noise levels were determined from the logging data and manned measurements, and are presented below. Long term monitoring data are attached at the end of this report.

Table 4 - Measured Noise Levels

Location	Existing Traffic Noise Level dB(A)L_{eq}	
	Daytime (7am-10pm)	Night time (10pm-7am)*
@ 8m distance from Kerb of The Northern Rd	61dB(A)Leq	58dB(A)Leq

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

When assessing noise impacts at the proposed development the measured level is adjusted for distance, barrier attenuation and orientation. A 3 dB(A) increase in existing noise levels has also been used to allow for traffic growth for a 10 year period, assuming 7% pa compounding traffic growth.

4.4.3 Future Roads' Noise Emissions

4.4.3.1 Estimated Traffic Volumes

Traffic noise emitted from future roads has been predicted based on expected traffic movements. Traffic volumes used in the assessment are based on information provided by GTA Consultants. The data are summarised in the following table.

Table 5 – Traffic Volumes on Future Roads

Road	Vehicles per Hour	
	AM Peak	PM Peak
Jordan Springs Boulevard – west of Lakeside Parade	929	902
Lakeside Parade – south of Jordan Springs Boulevard	597	547

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

4.4.3.2 Predicted Future Traffic Noise Levels

Traffic noise predictions have been carried out by CORTN programme and predicted traffic volume above. The predicted traffic noise levels during peak traffic hours are been presented below:

Table 6 –Predicted Traffic Noise Levels

Location	Predicted Mean Traffic Noise Level During Peak Hour (day time period)
Jordan Springs Boulevard north of the project site – 5m distance from kerb	67 dB(A) L_{eq}
Lakeside Parade east of the project site - 5m distance from kerb	66 dB(A) L_{eq}

The assessment criteria use noise level descriptors based on the 7am and 10 pm (day) and 10pm and 7am (night) periods, not the peak hour noise levels. The day and night noise level descriptors have been estimated from the peak data based on a minus 2 dB(A) correction for daytime (meaning the average traffic volume is 2/3 of the peak) and 7 dB(A) for night time (meaning the average traffic volume is 1/5 of the peak).

4.4.4 Evaluation of Noise Intrusion

Internal noise levels will primarily be as a result of noise transfer through the windows, doors and roofs, as these are relatively light building elements that offer less resistance to the transmission of sound. Similarly, sound transmission through light-weight wall constructions on facades facing roads should also be assessed. External walls that are proposed to be masonry elements will not require assessment as they will adequately prevent sound transmission.

Noise transmission through windows, doors and roofs has been predicted based on the predicted external levels incident on the façade, the spectral characteristics of the external noise, the area of building elements exposed to traffic noise, the absorption characteristics of the rooms and the noise reduction performance of the building elements.

The glazing required to comply with the recommended criteria are summarised in Section 5.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

4.5 PLANT NOISE EMISSIONS

A detailed mechanical design is unavailable at this stage. Therefore, noise emission limits for plant serving the project site will be established. These will be the basis for future assessments of plant noise during detailed design of the buildings and associated plant treatments. The criteria apply to the cumulative effect of all noise sources on the subject site.

4.5.1 Plant Noise Emission Criteria

Environmental noise emissions from the plant serving the project site should comply with the requirements of NSW EPA Industrial Noise Policy which has been detailed below.

The EPA Industrial Noise Policy provides guidelines for assessing noise impacts from industrial developments. The recommended assessment objectives vary depending on the potentially affected receivers, the time of day, and the type of noise source. The EPA Industrial Noise Policy has two requirements which both have to be complied with, namely an amenity criterion and an intrusiveness criterion. In addition, the EPA in its Environmental Noise Control Manual states that noise controls should be applied with the general intent to protect residences from sleep arousal.

4.5.1.1 Intrusiveness Criterion

The guideline is intended to limit the audibility of noise emissions at residential receivers and requires that noise emissions measured using the L_{eq} descriptor not exceed the background noise level by more than 5 dB(A). Where applicable, the intrusive noise level should be penalised (increased) to account for any annoying characteristics such as tonality.

4.5.1.2 Amenity Criterion

The guideline is intended to limit the absolute noise level from all industrial noise sources to a level that is consistent with the general environment.

The EPA's Industrial noise policy sets out acceptable noise levels for various localities. Table 2.1 on page 16 of the policy indicates 4 categories to distinguish different residential areas. They are rural, suburban, urban and urban/industrial interface.

Table below provides the recommended ambient noise levels for the urban residential receivers for the day, evening and night periods.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

For the purposes of this condition:

- Day is defined as the period from 7am to 6pm Monday to Saturday and 8am to 6pm Sundays and Public Holidays;
- Evening is defined as the period from 6pm to 10pm; and
- Night is defined as the period from 10pm to 7am Monday to Saturday and 10pm to 8am Sundays and Public Holidays.

Table 7 – EPA Recommended Amenity Industrial Noise Levels - External

Type of Receiver	Time of Day	Recommended Acceptable Noise Level dB(A) L_{eq}
Residential	Day	60
	Evening	50
	Night	45

4.5.1.3 Sleep Arousal

To minimise the potential for sleep arousal the $L_{1\ (1\ minute)}$ noise level of any specific noise source does not exceed the background noise level (L_{90}) by more than 15 dB(A) outside a resident's bedroom window between the hours of 10pm and 7am. The L_1 noise level is the level exceeded for 1 per cent of the time and approximates the typical maximum noise level from a particular source. Where the typical repeatable existing L_1 levels exceed the above requirement then the existing L_1 levels form the basis for sleep disturbance criteria.

4.5.1.4 Summary of Assessment Criteria

EPA Industry Policy requirements will be used as acoustic assessment criteria for this project. The intrusiveness, amenity and sleep arousal criteria for this project have been determined using these guidelines and the noise monitoring results. These are summarised below. We note that the formulation of the assessment criteria has been based on the lowest background noise levels determined from all monitoring data.

The table below provides a summary of the criteria applicable to the proposed development based on the information documented above.

Table 8 – Noise Objectives for Residential Receivers Near Proposed Development

Daytime Noise Objective dB(A) L_{eq}	Evening Noise Objective dB(A) L_{eq}	Night Noise Objective dB(A) L_{eq}	Night Noise Objective dB(A) $L_{1(1min)}$
44	44	44	54

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

5 RECOMMENDATIONS

The following acoustic treatments are recommended for the proposed development to comply with the recommended noise criteria and prevent adverse noise impacts to occupants on the subject site and on surrounding sites.

5.1 GLAZING

The worst case glazing thickness of the facades of the proposed development (applying to the lower levels) have been recommended to ensure that traffic and patron noise levels comply with all internal noise criteria.

Table 9 – Worst-Case Glazing Recommendations

Building	Façade	Room Type	Glazing Thickness	Minimum STC/Rw Rating
1	North	All	6.38mm laminated	31
	West/East	All	6mm float	29
	South	Bedrooms	6mm float	29
		Living Rooms	5mm float	28
2	North/East	All	6.38mm laminated	31
	West	All	6mm float	29
	South	Bedrooms	6mm float	29
		Living Rooms	5mm float	28
	All	Offices	6.38mm laminated	31
3	East	All	6.38mm Lam	31
	Remaining	Bedrooms	6mm float	29
		Living Rooms	5mm float	28
4	North/West	All	6.38mm laminated	31
	Remaining	Bedrooms	6mm float	29
		Living Rooms	5mm float	28
5	North	All	6.38mm laminated	31
	Remaining	Bedrooms	6mm float	29
		Living Rooms	5mm float	28

The opening sashes should be fitted with acoustic seals for the recommended glazing system above.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

5.2 ROOF /CEIING STRUCTURE

5.2.1 Concrete Roof

The proposed concrete roof for the development will be acoustically acceptable will not require any additional treatment.

Penetrations in ceilings (such as for light fittings etc.) must be sealed gap free with a flexible sealant. Any ventilation openings in the ceilings would need to be acoustically treated to maintain the acoustic performance of the ceiling construction

5.3 EXTERNAL WALLS

External walls that are of a masonry or concrete construction will be acoustically acceptable and will not require any additional treatment.

Any proposed use of lightweight external walls should be analysed by ALC prior to CC stage.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

5.4 DWELLING VENTILATION

Where traffic noise levels transmitted through the façade under a naturally ventilated (windows open) condition exceed the internal criteria by more than 10 dB(A) in habitable spaces then an alternative ventilation system or air conditioning should be provided to those rooms.

Indicatively, the following facades would require alternative ventilation or air conditioning to habitable rooms:

- The northern, eastern and western facades of Building 1;
- The northern, eastern and western facades of Building 2 (habitable rooms with glazing facing west into the public square only will **not** require alternative ventilation or air conditioning);
- The eastern façade of Building 3;
- The northern and western façades of Building 4;
- The northern façade of Building 5.

The exact extent should be assessed at construction certificate based on final configuration of layouts and façade designs.

5.5 PLANT

- Plant noise emission criteria are provided in this report. A detailed mechanical noise assessment should be carried out at CC stage to assess the treatment to be applied to the plant to comply with the criteria.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

6 CONCLUSION

An environmental noise assessment for the proposed mixed use development at Jordan Springs Boulevard, Jordan Springs has been carried out. The following noise sources have been assessed:

- Traffic noise impacts on the dwellings within the proposed development.
- Noise emissions from plant on the dwellings within the proposed development and on surrounding properties.

Recommendations are made in Section 5 of the report based on the assessment outcomes. The implementation of these recommendations will ensure there would be no adverse noise impacts.

We trust this information is satisfactory. Please contact us should you have any further queries.

Yours faithfully,

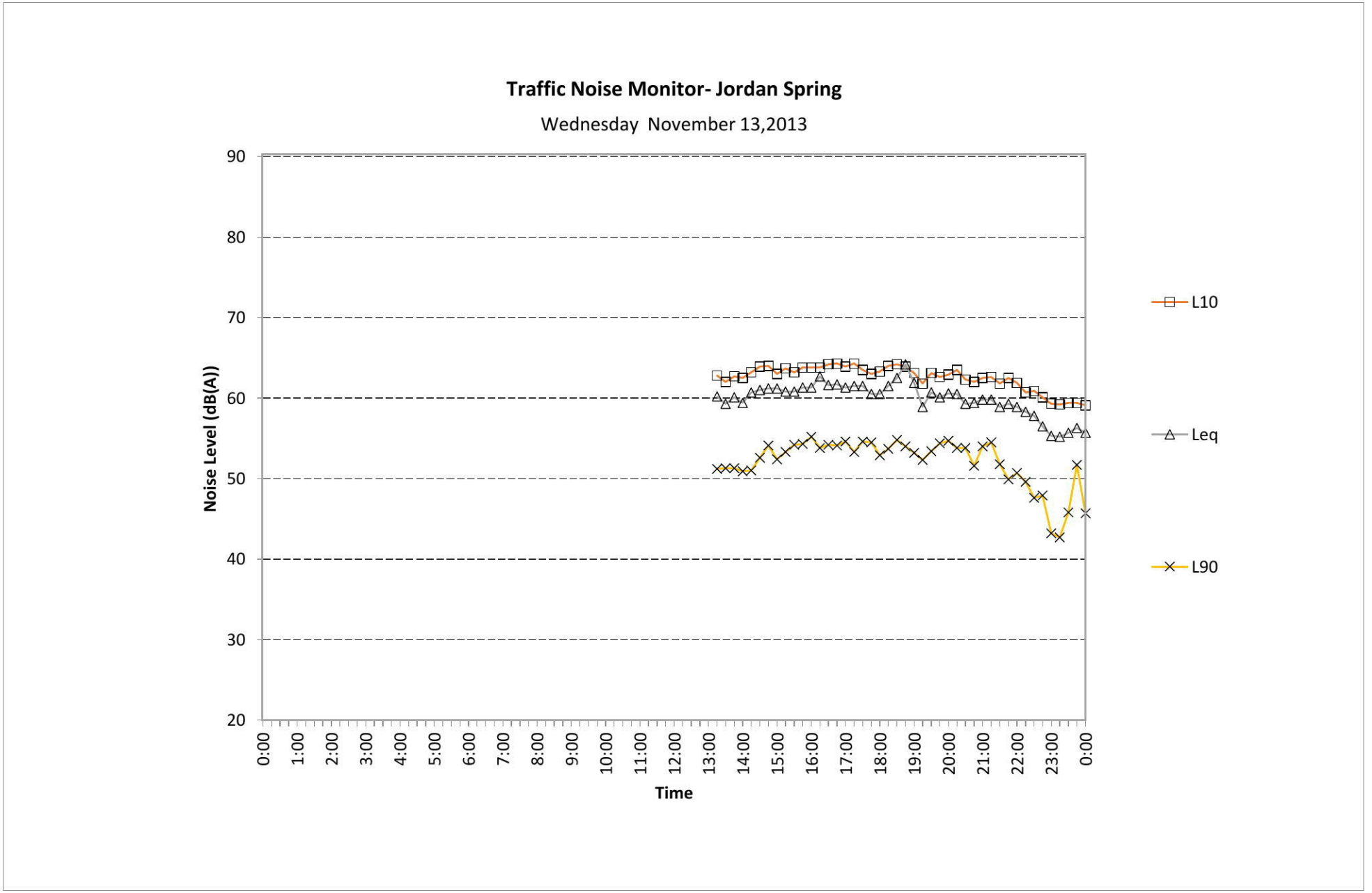


Acoustic Logic Consultancy Pty Ltd
Justin Leong

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

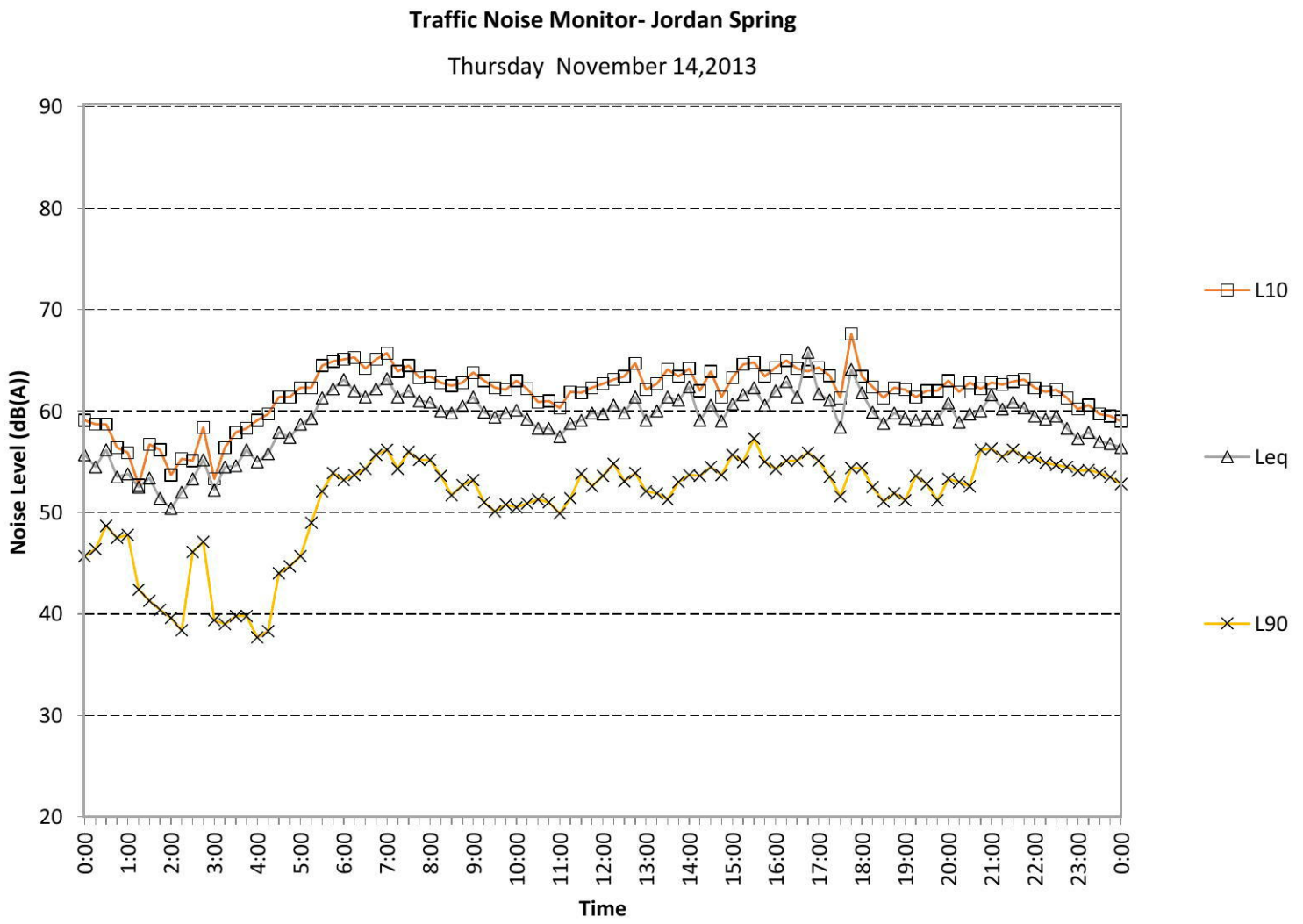
APPENDIX 1 – UNATTENDED TRAFFIC NOISE MONITORING DATA ALONG THE NORTHERN ROAD

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015



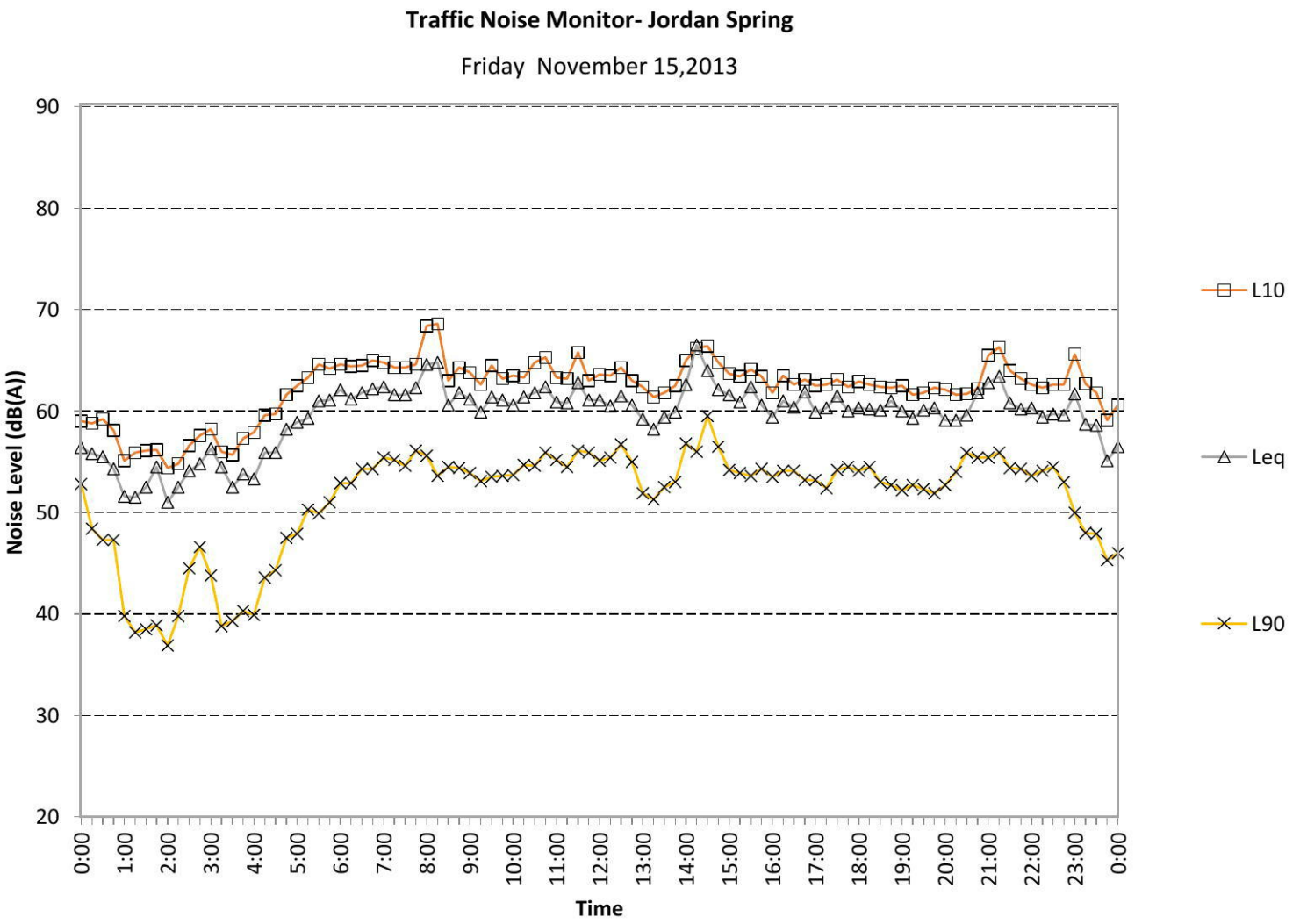
Traffic Noise Northern Road_graph

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015



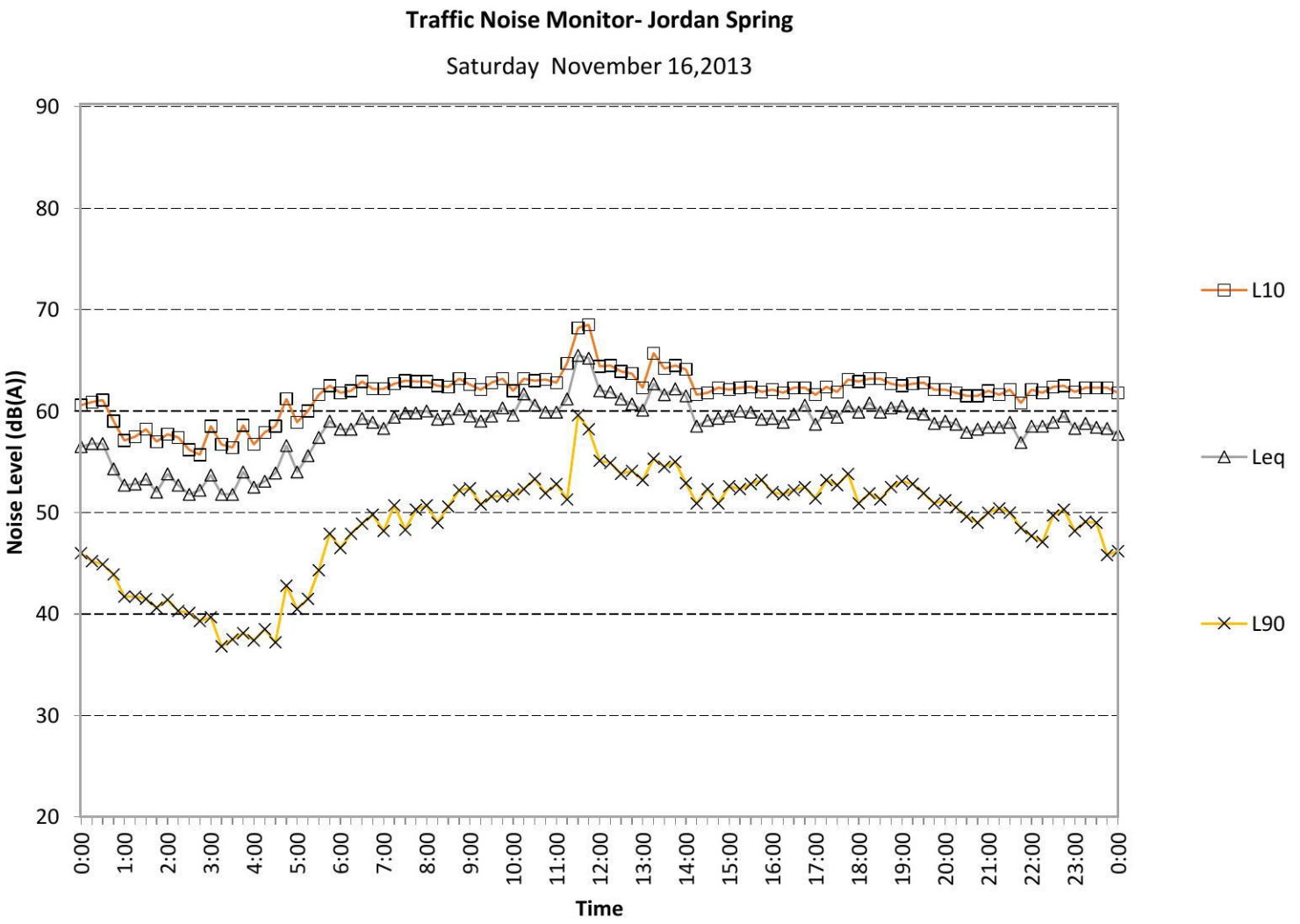
Traffic Noise Northern Road_graph

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015



Traffic Noise Northern Road_graph

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015


Traffic Noise Monitor- Jordan Spring
Saturday November 16,2013
Noise Level (dB(A))
90
80
70
60
50
40
30
20
0:00
1:00
2:00
3:00
4:00
5:00
6:00
7:00
8:00
9:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
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20:00
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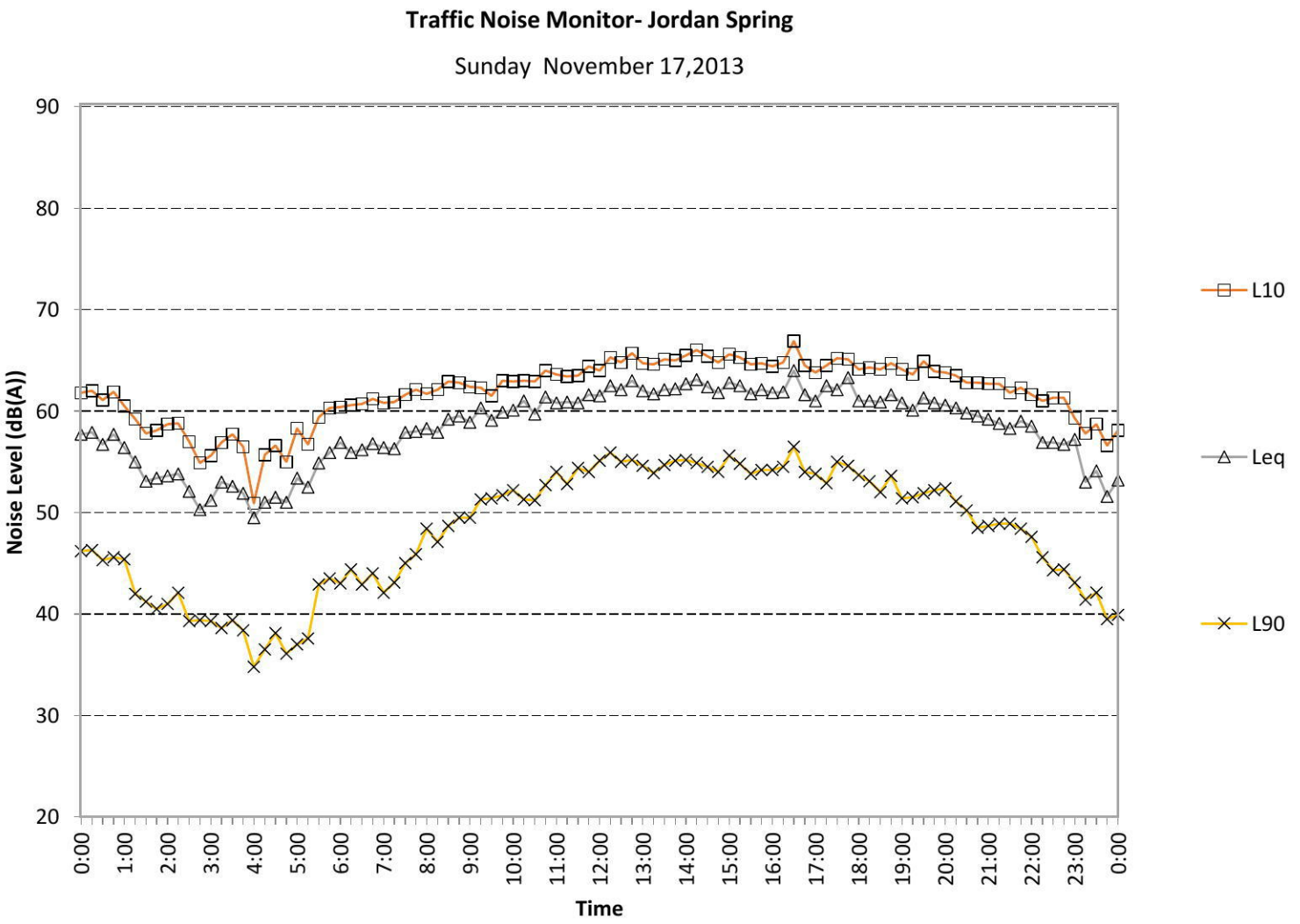
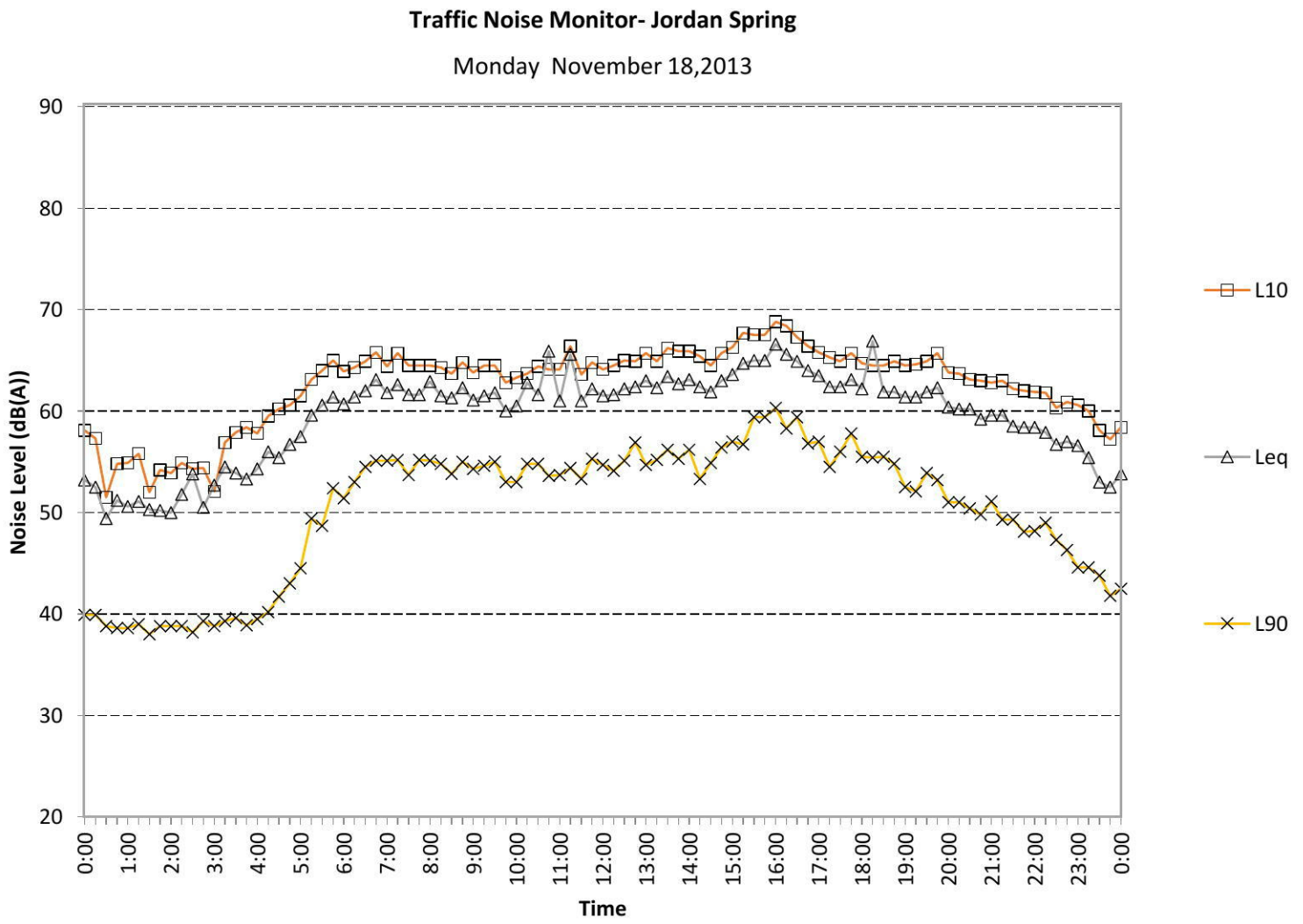
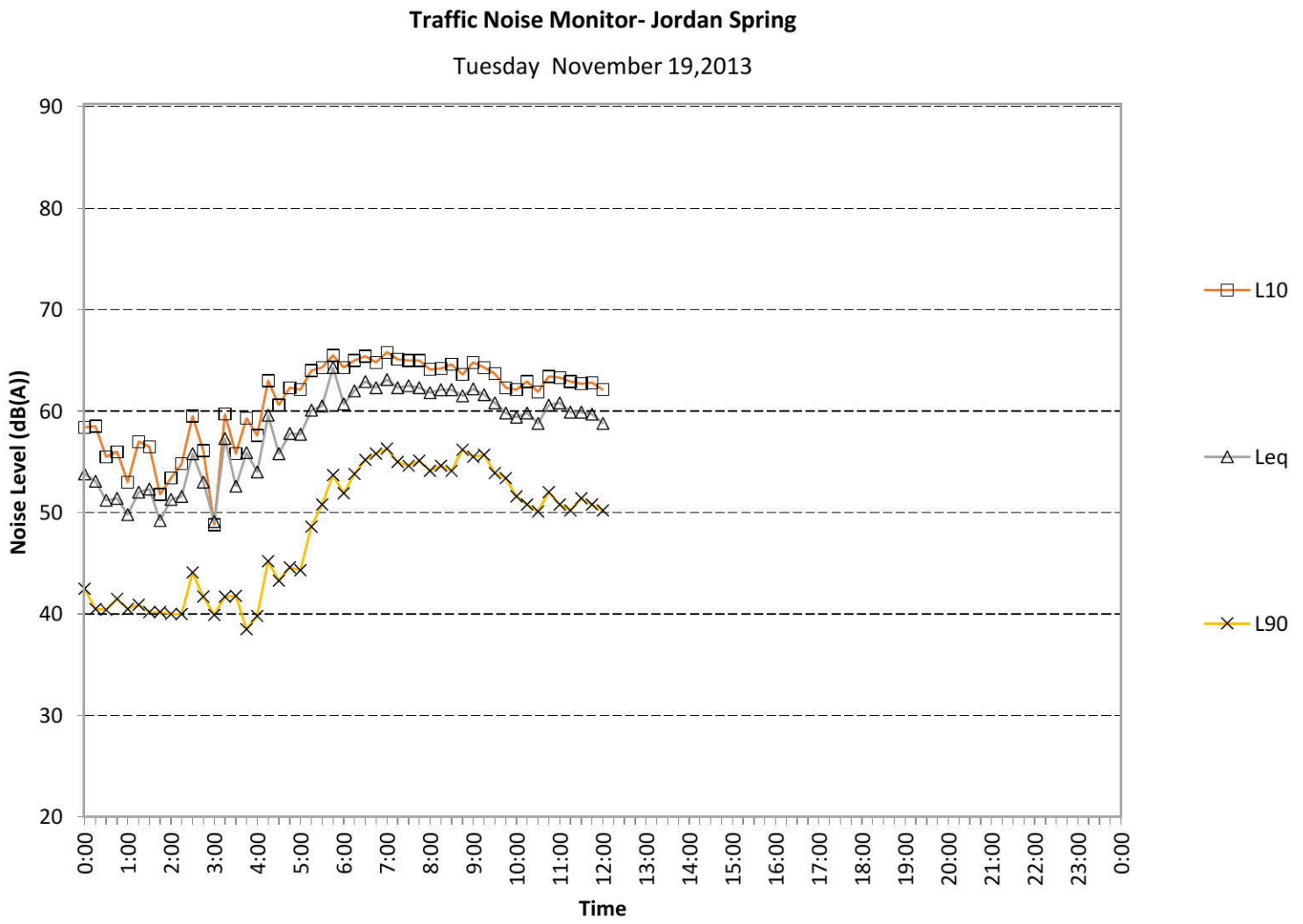
22:00
23:00
0:00
Time
L10
Leq
L90



Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

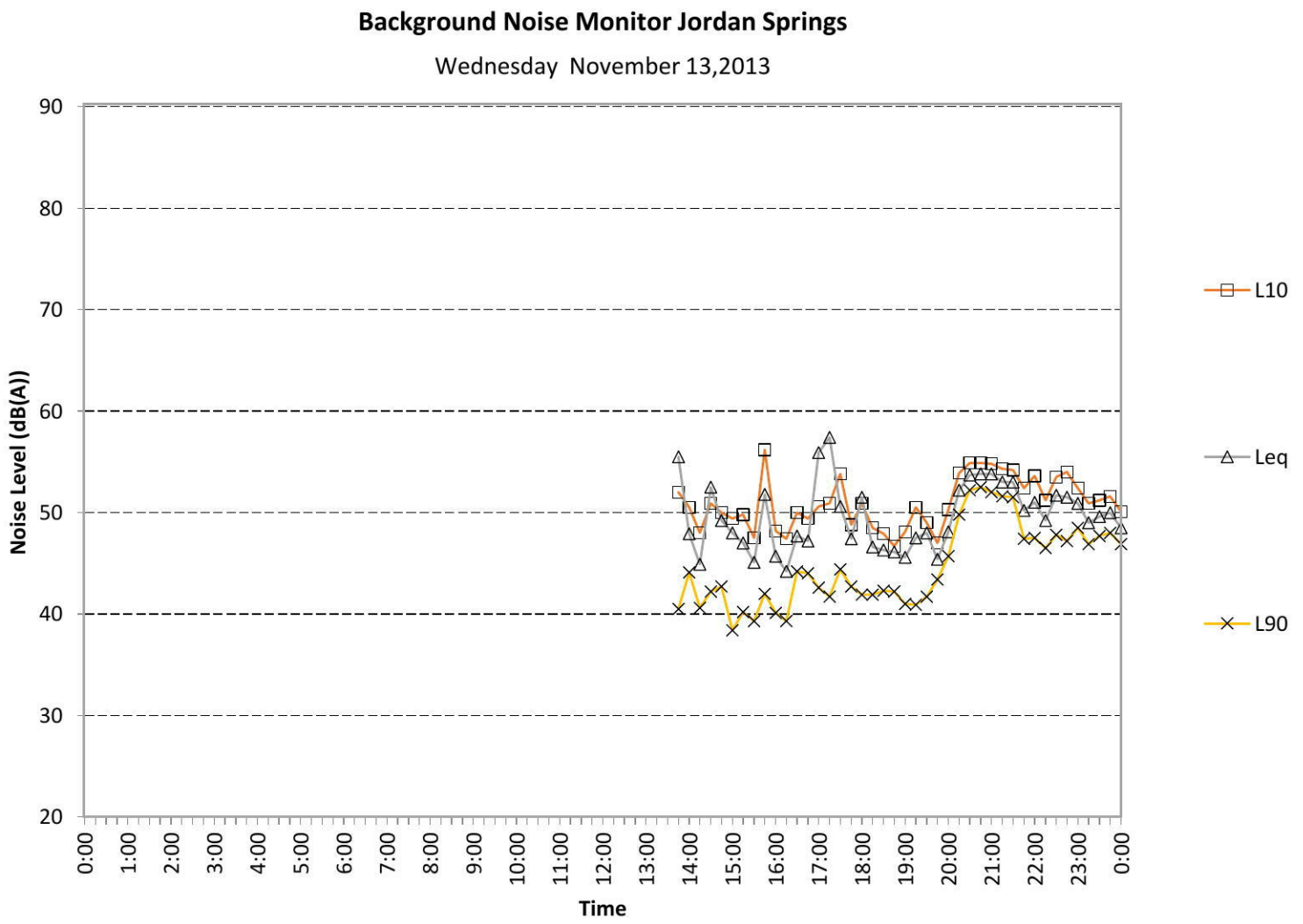


Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

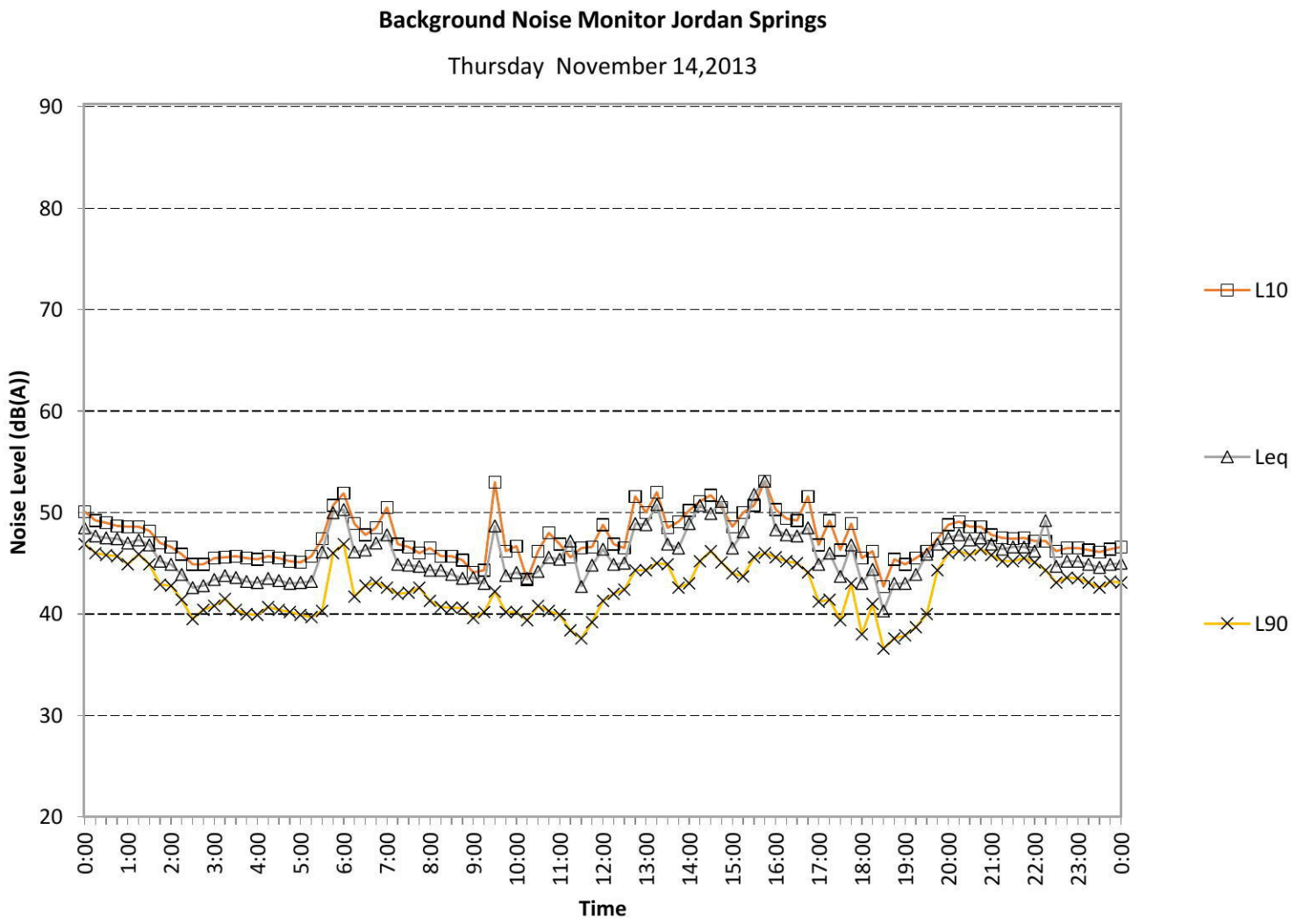

Traffic Noise Monitor- Jordan Spring
Tuesday November 19,2013
Noise Level (dB(A))
90
80
70
60
50
40
30
20
0:00
1:00
2:00
3:00
4:00
5:00
6:00
7:00
8:00
9:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
0:00
Time
L10
Leq
L90

APPENDIX 2 – UNATTENDED BACKGROUND NOISE MONITORING DATA

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015



Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015



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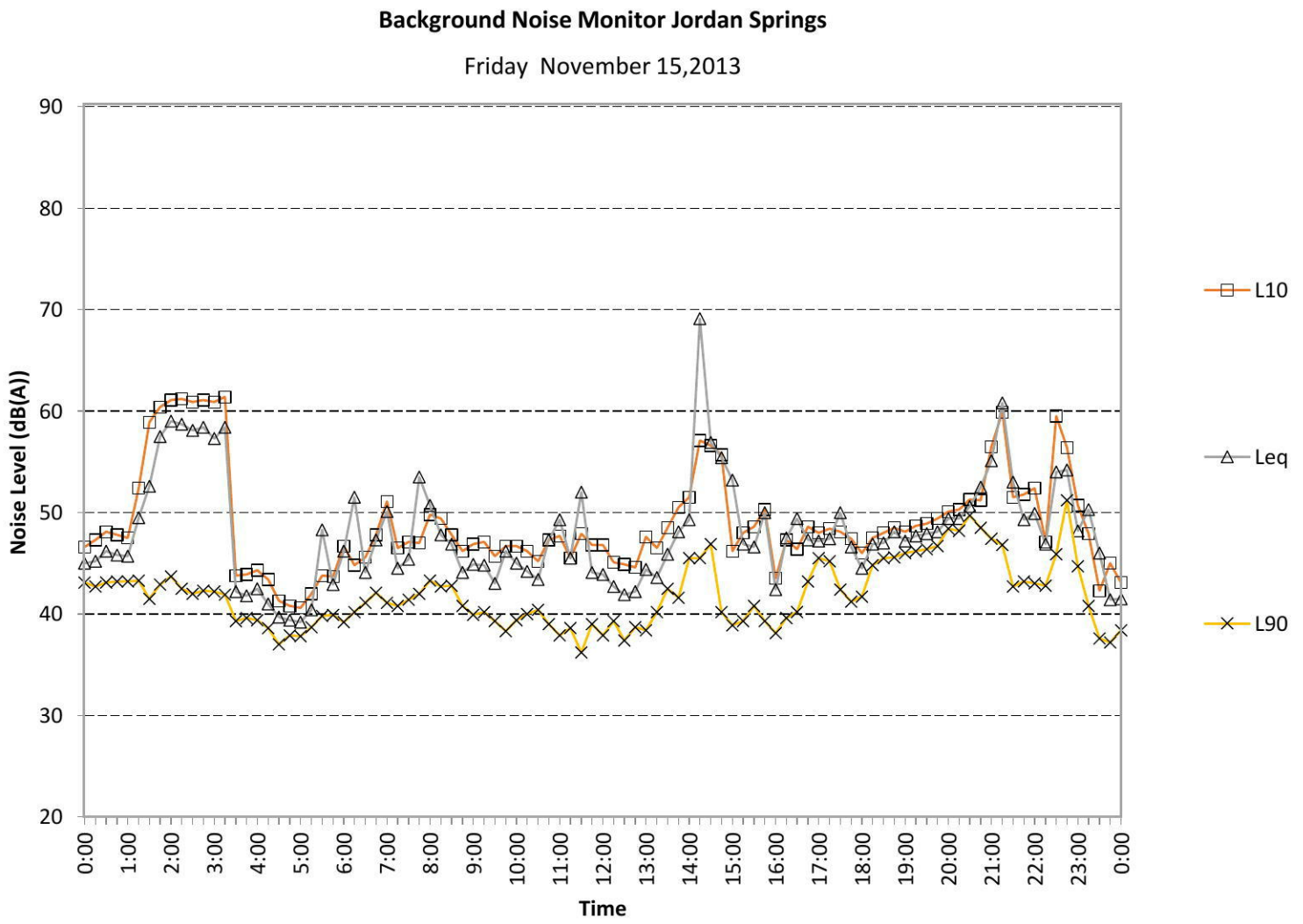

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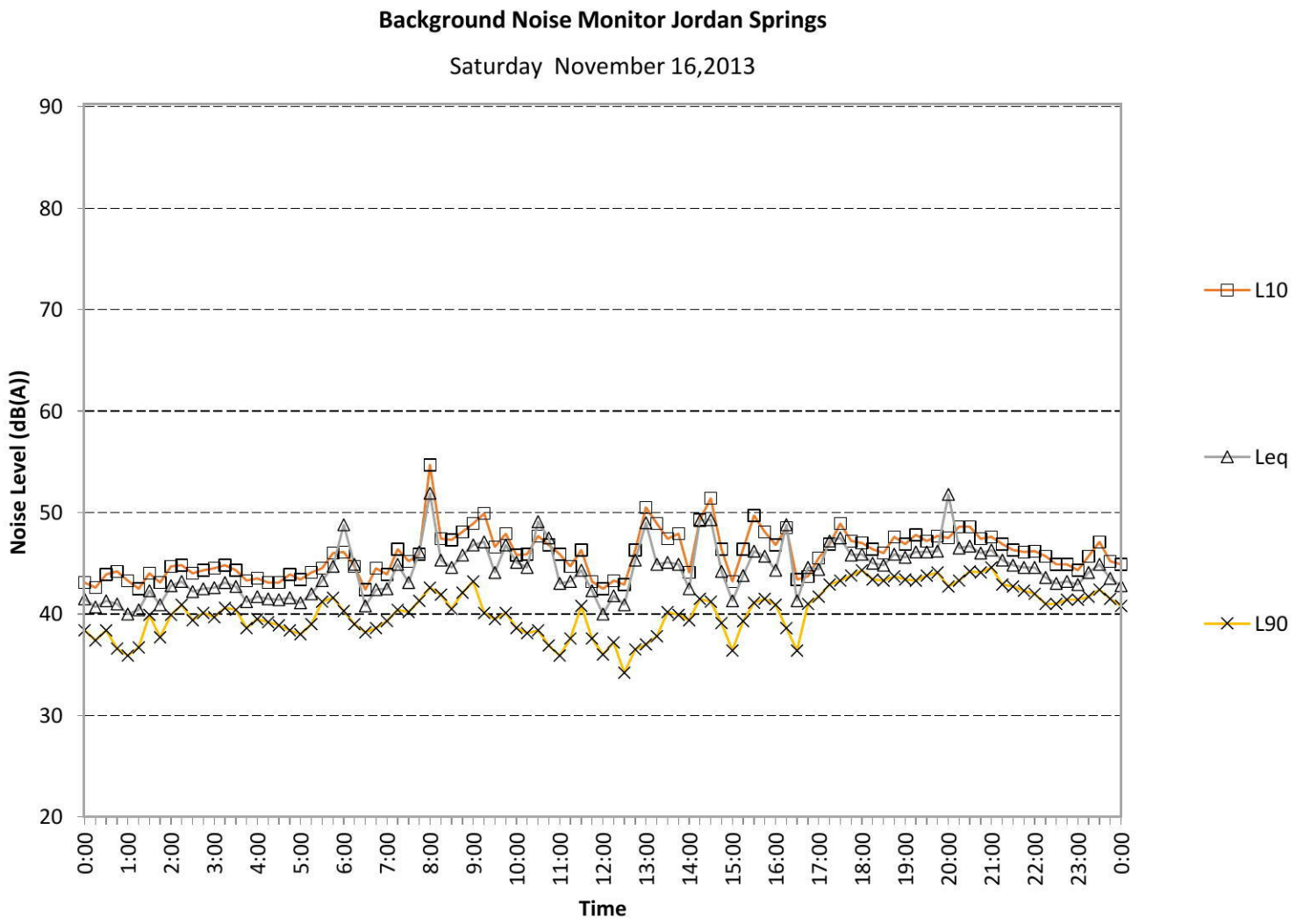

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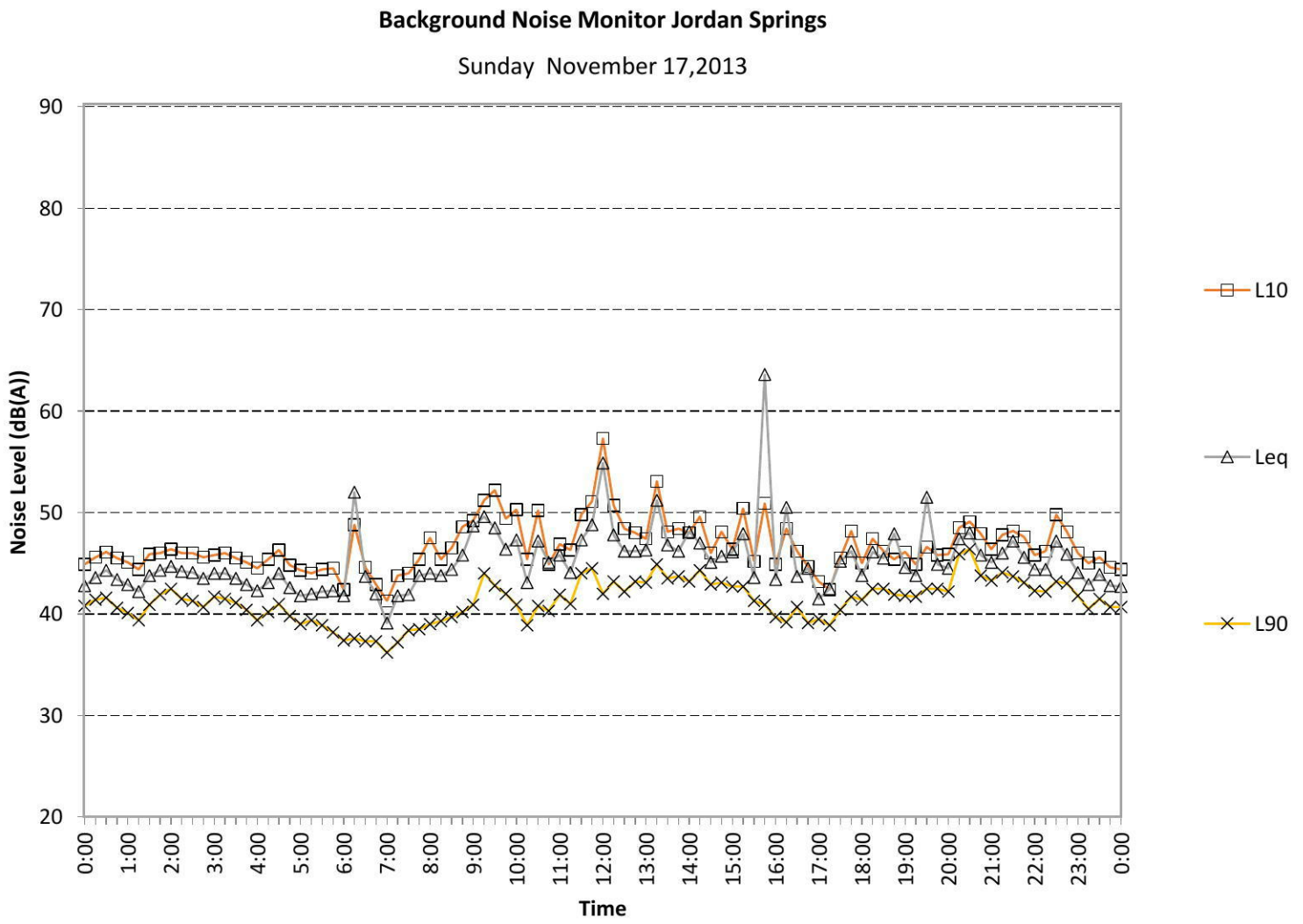
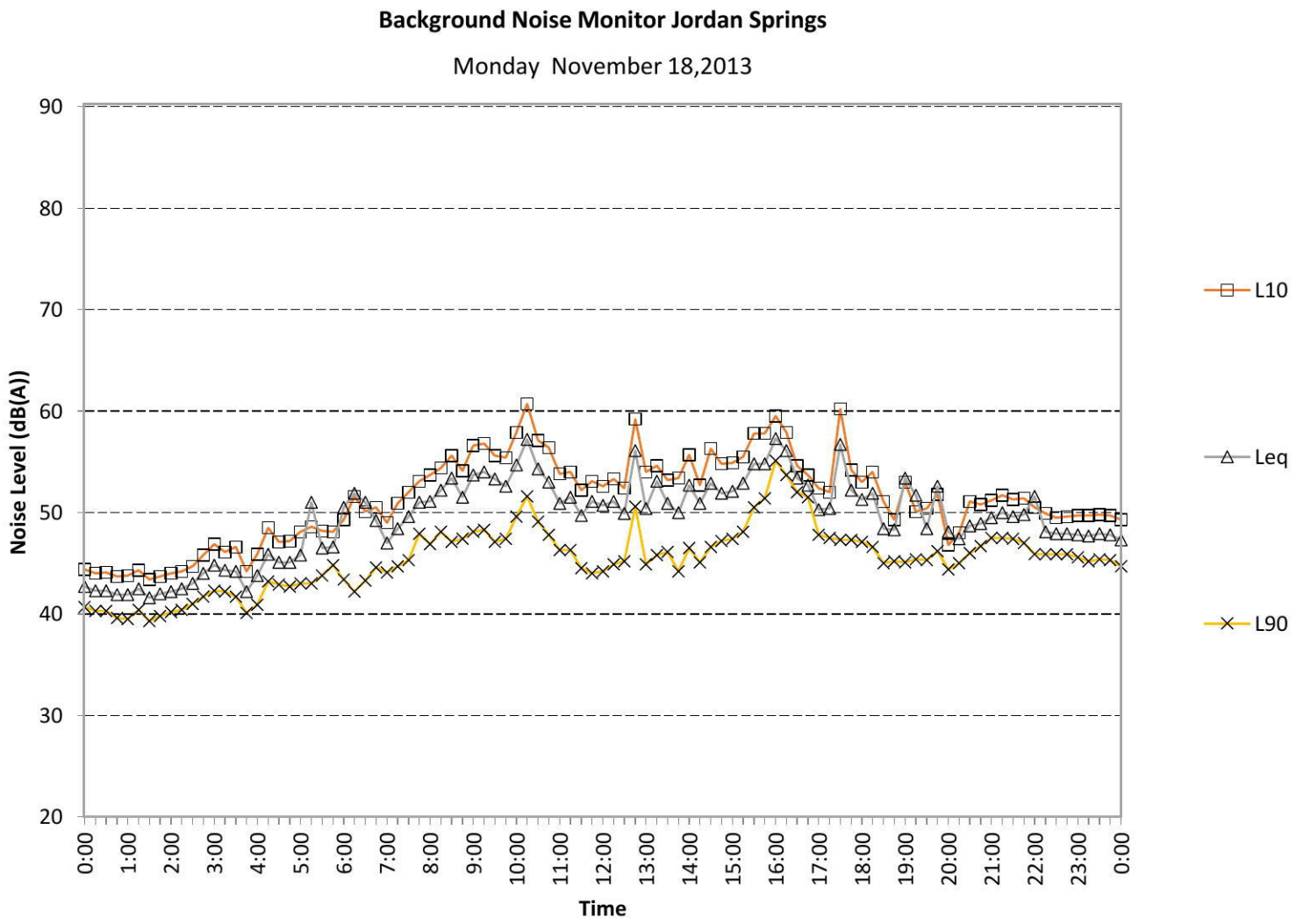
Version: 1, Version Date: 27/02/2015



Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015



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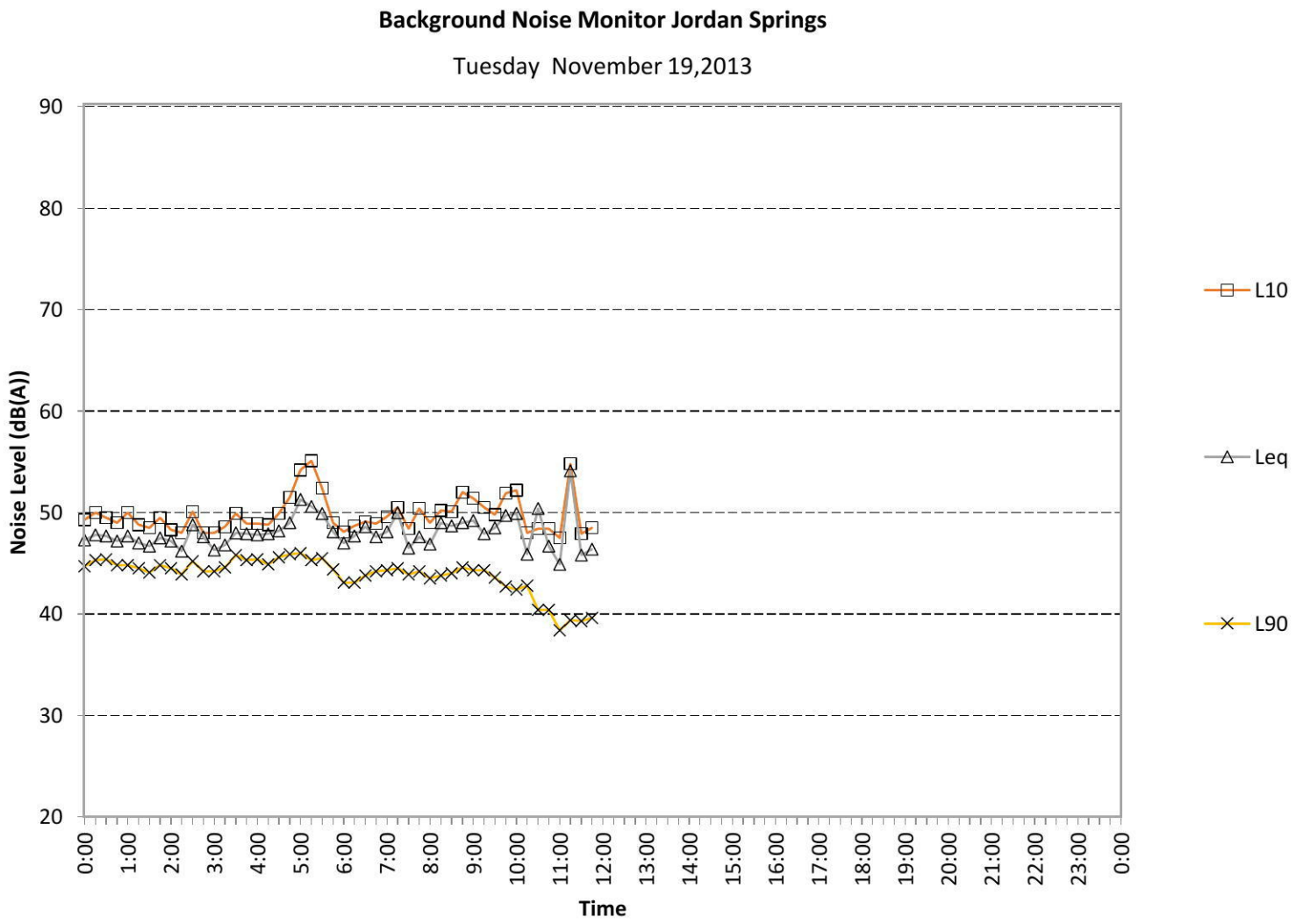

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

BASIX® Certificate

Building Sustainability Index www.basix.nsw.gov.au

Multi Dwelling

Certificate number: 535429M_02

This certificate confirms that the proposed development will meet the NSW government's requirements for sustainability, if it is built in accordance with the commitments set out below. Terms used in this certificate, or in the commitments, have the meaning given by the document entitled "BASIX Definitions" dated 18/09/2014 published by Planning & Infrastructure. This document is available at www.basix.nsw.gov.au

Director-General
Date of issue: Thursday, 19 February 2015
To be valid, this certificate must be lodged within 3 months of the date of issue.

NSW GOVERNMENT Planning & Infrastructure

Project summary	
Project name	Building 2_02
Street address	NA Jordan Springs Boulevard JORDAN SPRINGS 2747
Local Government Area	Penrith City Council
Plan type and plan number	deposited -
Lot no.	-
Section no.	-
No. of residential flat buildings	1
No. of units in residential flat buildings	63
No. of multi-dwelling houses	0
No. of single dwelling houses	0

Project score		
Water	✔ 41	Target 40
Thermal Comfort	✔ Pass	Target Pass
Energy	✔ 34	Target 20

Certificate Prepared by
Name / Company Name: Aminga Holdings Pty Ltd
ABN (if applicable): 41003542425

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Description of project

Project address	
Project name	Building 2_02
Street address	NA Jordan Springs Boulevard JORDAN SPRINGS 2747
Local Government Area	Penrith City Council
Plan type and plan number	deposited -
Lot no.	-
Section no.	-
Project type	
No. of residential flat buildings	1
No. of units in residential flat buildings	63
No. of multi-dwelling houses	0
No. of single dwelling houses	0
Site details	
Site area (m²)	2430
Roof area (m²)	1440
Non-residential floor area (m²)	615.8
Residential car spaces	65
Non-residential car spaces	5

Common area landscape		
Common area lawn (m²)	0	
Common area garden (m²)	930	
Area of indigenous or low water use species (m²)	0	
Assessor details		
Assessor number	BDAV/13/1525	
Certificate number	15250013	
Climate zone	28	
Project score		
Water	✔ 41	Target 40
Thermal Comfort	✔ Pass	Target Pass
Energy	✔ 34	Target 20

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Description of project

The tables below describe the dwellings and common areas within the project

Residential flat buildings - Building 2, 63 dwellings, 6 storeys above ground

Dwelling no.	No. of bedrooms	Conditioned floor area (m²)	Unconditioned floor area (m²)	Area of garden & lawn (m²)	Indigenous species (min area m²)
2101	3	105.0	0.0	0	0
2105	2	83.0	0.0	0	0
2109	2	83.0	0.0	0	0
2201	3	105.0	0.0	0	0
2205	2	83.0	0.0	0	0
2209	2	90.0	0.0	0	0
2301	3	105.0	0.0	0	0
2305	2	83.0	0.0	0	0
2309	2	83.0	0.0	0	0
2401	3	105.0	0.0	0	0
2405	2	830.0	0.0	0	0
2409	2	83.0	0.0	0	0
2501	3	105.0	0.0	0	0
2505	2	83.0	0.0	0	0
2509	2	83.0	0.0	0	0
2G01	2	81.0	0.0	15	0

Dwelling no.	No. of bedrooms	Conditioned floor area (m²)	Unconditioned floor area (m²)	Area of garden & lawn (m²)	Indigenous species (min area m²)
2102	2	83.0	0.0	0	0
2106	2	83.0	0.0	0	0
2110	2	83.0	0.0	0	0
2202	2	83.0	0.0	0	0
2206	2	83.0	0.0	0	0
2210	2	83.0	0.0	0	0
2302	2	83.0	0.0	0	0
2306	2	83.0	0.0	0	0
2310	2	83.0	0.0	0	0
2402	2	83.0	0.0	0	0
2406	2	83.0	0.0	0	0
2410	2	83.0	0.0	0	0
2502	2	90.0	0.0	0	0
2506	2	83.0	0.0	0	0
2510	2	83.0	0.0	0	0
2G02	2	82.0	0.0	15	0

Dwelling no.	No. of bedrooms	Conditioned floor area (m²)	Unconditioned floor area (m²)	Area of garden & lawn (m²)	Indigenous species (min area m²)
2103	2	92.0	0.0	0	0
2107	1	61.0	0.0	0	0
2111	2	83.0	0.0	0	0
2203	2	92.0	0.0	0	0
2207	1	61.0	0.0	0	0
2211	2	83.0	0.0	0	0
2303	2	92.0	0.0	0	0
2307	1	61.0	0.0	0	0
2311	2	83.0	0.0	0	0
2403	2	92.0	0.0	0	0
2407	1	61.0	0.0	0	0
2411	2	83.0	0.0	0	0
2503	2	83.0	0.0	0	0
2507	1	83.0	0.0	0	0
2511	2	83.0	0.0	0	0
2G03	2	81.0	0.0	15	0

Dwelling no.	No. of bedrooms	Conditioned floor area (m²)	Unconditioned floor area (m²)	Area of garden & lawn (m²)	Indigenous species (min area m²)
2104	2	83.0	0.0	0	0
2108	2	104.0	0.0	0	0
2112	2	83.0	0.0	0	0
2204	2	83.0	0.0	0	0
2208	3	104.0	0.0	0	0
2212	2	83.0	0.0	0	0
2304	2	83.0	0.0	0	0
2308	3	104.0	0.0	0	0
2312	2	83.0	0.0	0	0
2404	2	83.0	0.0	0	0
2408	3	104.0	0.0	0	0
2412	2	83.0	0.0	0	0
2504	2	83.0	0.0	0	0
2508	3	104.0	0.0	0	0
2512	2	83.0	0.0	0	0

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Description of project

The tables below describe the dwellings and common areas within the project

Common areas of unit building - Building 2

Common area	Floor area (m²)
Car park area (No. 1)	1720

Common area	Floor area (m²)
Lift car (No. 1)	-

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Schedule of BASIX commitments

1. Commitments for Residential flat buildings - Building 2
    (a) Dwellings
        (i) Water
        (ii) Energy
        (iii) Thermal Comfort
    (b) Common areas and central systems/facilities
        (i) Water
        (ii) Energy

2. Commitments for multi-dwelling houses

3. Commitments for single dwelling houses

4. Commitments for common areas and central systems/facilities for the development (non-building specific)
        (i) Water
        (ii) Energy

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Schedule of BASIX commitments

The commitments set out below regulate how the proposed development is to be carried out. It is a condition of any development consent granted, or complying development certificate issued, for the proposed development, that BASIX commitments be complied with.

1. Commitments for Residential flat buildings - Building 2

(a) Dwellings

(i) Water	Show on DA plans	Show on CC/CDC plans & specs	Certifier check
(a) The applicant must comply with the commitments listed below in carrying out the development of a dwelling listed in a table below.			
(b) The applicant must plant indigenous or low water use species of vegetation throughout the area of land specified for the dwelling in the "Indigenous species" column of the table below, as private landscaping for that dwelling. (This area of indigenous vegetation is to be contained within the "Area of garden and lawn" for the dwelling specified in the "Description of Project" table).	✔	✔	
(c) If a rating is specified in the table below for a fixture or appliance to be installed in the dwelling, the applicant must ensure that each such fixture and appliance meets the rating specified for it.		✔	✔
(d) The applicant must install an on demand hot water recirculation system which regulates all hot water use throughout the dwelling, where indicated for a dwelling in the "HW recirculation or diversion" column of the table below.		✔	✔
(e) The applicant must install: (aa) a hot water diversion system to all showers, kitchen sinks and all basins in the dwelling, where indicated for a dwelling in the "HW recirculation or diversion" column of the table below; and (bb) a separate diversion tank (or tanks) connected to the hot water diversion systems of at least 100 litres. The applicant must connect the hot water diversion tank to all toilets in the dwelling.		✔ ✔	✔ ✔
(e) The applicant must not install a private swimming pool or spa for the dwelling, with a volume exceeding that specified for it in the table below.	✔	✔	
(f) If specified in the table, that pool or spa (or both) must have a pool cover or shading (or both).		✔	
(g) The pool or spa must be located as specified in the table.	✔	✔	
(h) The applicant must install, for the dwelling, each alternative water supply system, with the specified size, listed for that dwelling in the table below. Each system must be configured to collect run-off from the areas specified (excluding any area which supplies any other alternative water supply system), and to divert overflow as specified. Each system must be connected as specified.	✔	✔	✔

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

	Fixtures					Appliances		Individual pool				Individual spa		
Dwelling no.	All shower-heads	All toilet flushing systems	All kitchen taps	All bathroom taps	HW recirculation or diversion	All clothes washers	All dish-washers	Volume (max volume)	Pool cover	Pool location	Pool shaded	Volume (max volume)	Spa cover	Spa shaded
All dwellings	3 star (> 4.5 but <= 6 L/min)	4 star	5 star	5 star	-	-	-	-	-	-	-	-	-	-

	Alternative water source							
Dwelling no.	Alternative water supply systems	Size	Configuration	Landscape connection	Toilet connection (s)	Laundry connection	Pool top-up	Spa top-up
None	-	-	-	-	-	-	-	-

(ii) Energy	Show on DA plans	Show on CC/CDC plans & specs	Certifier check
(a) The applicant must comply with the commitments listed below in carrying out the development of a dwelling listed in a table below.			
(b) The applicant must install each hot water system specified for the dwelling in the table below, so that the dwelling's hot water is supplied by that system. If the table specifies a central hot water system for the dwelling, then the applicant must connect that central system to the dwelling, so that the dwelling's hot water is supplied by that central system.	✔	✔	✔
(c) The applicant must install, in each bathroom, kitchen and laundry of the dwelling, the ventilation system specified for that room in the table below. Each such ventilation system must have the operation control specified for it in the table.		✔	✔
(d) The applicant must install the cooling and heating system/s specified for the dwelling under the "Living areas" and "Bedroom areas" headings of the "Cooling" and "Heating" columns in the table below, in/for at least 1 living/bedroom area of the dwelling. If no cooling or heating system is specified in the table for "Living areas" or "Bedroom areas", then no systems may be installed in any such areas. If the term "zoned" is specified beside an air conditioning system, then the system must provide for day/night zoning between living areas and bedrooms.		✔	✔
(e) This commitment applies to each room or area of the dwelling which is referred to in a heading to the "Artificial lighting" column of the table below (but only to the extent specified for that room or area). The applicant must ensure that the "primary type of artificial lighting" for each such room in the dwelling is fluorescent lighting or light emitting diode (LED) lighting. If the term "dedicated" is specified for a particular room or area, then the light fittings in that room or area must only be capable of being used for fluorescent lighting or light emitting diode (LED) lighting.		✔	✔

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

(ii) Energy	Show on DA plans	Show on CC/CDC plans & specs	Certifier check
(f) This commitment applies to each room or area of the dwelling which is referred to in a heading to the "Natural lighting" column of the table below (but only to the extent specified for that room or area). The applicant must ensure that each such room or area is fitted with a window and/or skylight.	✔	✔	✔
(g) This commitment applies if the applicant installs a water heating system for the dwelling's pool or spa. The applicant must:			
(aa) install the system specified for the pool in the "Individual Pool" column of the table below (or alternatively must not install any system for the pool). If specified, the applicant must install a timer, to control the pool's pump; and		✔	
(bb) install the system specified for the spa in the "Individual Spa" column of the table below (or alternatively must not install any system for the spa). If specified, the applicant must install a timer to control the spa's pump.		✔	
(h) The applicant must install in the dwelling:			
(aa) the kitchen cook-top and oven specified for that dwelling in the "Appliances & other efficiency measures" column of the table below;		✔	
(bb) each appliance for which a rating is specified for that dwelling in the "Appliances & other efficiency measures" column of the table, and ensure that the appliance has that minimum rating; and		✔	✔
(cc) any clothes drying line specified for the dwelling in the "Appliances & other efficiency measures" column of the table.		✔	
(i) If specified in the table, the applicant must carry out the development so that each refrigerator space in the dwelling is "well ventilated".		✔	

	Hot water	Bathroom ventilation system		Kitchen ventilation system		Laundry ventilation system	
Dwelling no.	Hot water system	Each bathroom	Operation control	Each kitchen	Operation control	Each laundry	Operation control
All dwellings	gas instantaneous 3 star	individual fan, ducted to façade or roof	interlocked to light	individual fan, ducted to façade or roof	manual switch on/off	individual fan, ducted to façade or roof	interlocked to light

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

	Cooling		Heating		Artificial lighting						Natural lighting	
Dwelling no.	living areas	bedroom areas	living areas	bedroom areas	No. of bedrooms &/or study	No. of living &/or dining rooms	Each kitchen	All bathrooms/ toilets	Each laundry	All hallways	No. of bathrooms &/or toilets	Main kitchen
2107, 2207, 2307, 2407, 2507	1-phase airconditioning 3.5 Star (new rating)	ceiling fans + 1-phase airconditioning 3.5 Star (new rating)	1-phase airconditioning 3.5 Star (new rating)	1-phase airconditioning 3.5 Star (new rating)	1 (dedicated)	1 (dedicated)	yes (dedicated)	yes (dedicated)	yes (dedicated)	yes (dedicated)	0	no

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

	Cooling		Heating		Artificial lighting						Natural lighting	
Dwelling no.	living areas	bedroom areas	living areas	bedroom areas	No. of bedrooms &/or study	No. of living &/or dining rooms	Each kitchen	All bathrooms/ toilets	Each laundry	All hallways	No. of bathrooms &/or toilets	Main kitchen
2101, 2102, 2103, 2104, 2105, 2106, 2108, 2109, 2110, 2111, 2112, 2201, 2202, 2203, 2204, 2205, 2206, 2208, 2209, 2210, 2211, 2212, 2301, 2302, 2303, 2304, 2305, 2306, 2308, 2309, 2310, 2311, 2312, 2401, 2402, 2403, 2404, 2405, 2406,	1-phase airconditioning 3.5 Star (new rating)	ceiling fans + 1-phase airconditioning 3.5 Star (new rating)	1-phase airconditioning 3.5 Star (new rating)	1-phase airconditioning 3.5 Star (new rating)	2 (dedicated)	1 (dedicated)	yes (dedicated)	yes (dedicated)	yes (dedicated)	yes (dedicated)	0	no

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

	Cooling		Heating		Artificial lighting						Natural lighting	
Dwelling no.	living areas	bedroom areas	living areas	bedroom areas	No. of bedrooms &/or study	No. of living &/or dining rooms	Each kitchen	All bathrooms/ toilets	Each laundry	All hallways	No. of bathrooms &/or toilets	Main kitchen
2408, 2409, 2410, 2411, 2412, 2501, 2502, 2503, 2504, 2505, 2506, 2508, 2509, 2510, 2511, 2512, 2G01, 2G02, 2G03												

	Individual pool		Individual spa		Appliances & other efficiency measures							
Dwelling no.	Pool heating system	Timer	Spa heating system	Timer	Kitchen cooktop/oven	Refrigerator	Well ventilated fridge space	Dishwasher	Clothes washer	Clothes dryer	Indoor or sheltered clothes drying line	Private outdoor or unsheltered clothes drying line
All dwellings	-	-	-	-	gas cooktop & electric oven	-	yes	-	-	-	-	-

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

(iii) Thermal Comfort	Show on DA plans	Show on CC/CDC plans & specs	Certifier check
(a) The applicant must attach the certificate referred to under "Assessor details" on the front page of this BASIX certificate (the "Assessor Certificate") to the development application and construction certificate application for the proposed development (or, if the applicant is applying for a complying development certificate for the proposed development, to that application). The applicant must also attach the Assessor Certificate to the application for a final occupation certificate for the proposed development.			
(b) The Assessor Certificate must have been issued by an Accredited Assessor in accordance with the Thermal Comfort Protocol.			
(c) The details of the proposed development on the Assessor Certificate must be consistent with the details shown in this BASIX Certificate, including the details shown in the "Thermal Loads" table below.			
(d) The applicant must show on the plans accompanying the development application for the proposed development, all matters which the Thermal Comfort Protocol requires to be shown on those plans. Those plans must bear a stamp of endorsement from the Accredited Assessor, to certify that this is the case.			
(e) The applicant must show on the plans accompanying the application for a construction certificate (or complying development certificate, if applicable), all thermal performance specifications set out in the Assessor Certificate, and all aspects of the proposed development which were used to calculate those specifications.			
(f) The applicant must construct the development in accordance with all thermal performance specifications set out in the Assessor Certificate, and in accordance with those aspects of the development application or application for a complying development certificate which were used to calculate those specifications.		✔	✔
(g) Where there is an in-slab heating or cooling system, the applicant must: (aa) Install insulation with an R-value of not less than 1.0 around the vertical edges of the perimeter of the slab; or (bb) On a suspended floor, install insulation with an R-value of not less than 1.0 underneath the slab and around the vertical edges of the perimeter of the slab.	✔	✔	✔
(h) The applicant must construct the floors and walls of the development in accordance with the specifications listed in the table below.	✔	✔	✔

	Thermal loads	
Dwelling no.	Area adjusted heating load (in mJ/m²/yr)	Area adjusted cooling load (in mJ/m²/yr)
2112, 2212, 2312, 2412, 2512	32.0	25.3
2101, 2102, 2103, 2201, 2202, 2203, 2301, 2302, 2303, 2401, 2402, 2403, 2501, 2502, 2503	32.9	25.3

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

	Thermal loads	
Dwelling no.	Area adjusted heating load (in mJ/m²/yr)	Area adjusted cooling load (in mJ/m²/yr)
2108, 2109, 2110, 2111, 2208, 2209, 2210, 2211, 2308, 2309, 2310, 2311, 2408, 2409, 2410, 2411, 2508, 2509, 2510, 2511	30.4	23.4
All other dwellings	17.9	23.5

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

(b) Common areas and central systems/facilities

(i) Water	Show on DA plans	Show on CC/CDC plans & specs	Certifier check
(a) If, in carrying out the development, the applicant installs a showerhead, toilet, tap or clothes washer into a common area, then that item must meet the specifications listed for it in the table.		✔	✔
(b) The applicant must install (or ensure that the development is serviced by) the alternative water supply system(s) specified in the "Central systems" column of the table below. In each case, the system must be sized, be configured, and be connected, as specified in the table.	✔	✔	✔
(c) A swimming pool or spa listed in the table must not have a volume (in kLs) greater than that specified for the pool or spa in the table.	✔	✔	
(d) A pool or spa listed in the table must have a cover or shading if specified for the pool or spa in the table.		✔	
(e) The applicant must install each fire sprinkler system listed in the table so that the system is configured as specified in the table.		✔	✔
(f) The applicant must ensure that the central cooling system for a cooling tower is configured as specified in the table.		✔	✔

Common area	Showerheads rating	Toilets rating	Taps rating	Clothes washers rating
All common areas	no common facility	no common facility	3 star	no common laundry facility

Central systems	Size	Configuration	Connection (to allow for...)
Central water tank - rainwater or stormwater (No. 1)	10000	To collect run-off from at least: - 1440 square metres of roof area of buildings in the development - 0 square metres of impervious area in the development - 0 square metres of garden/lawn area in the development - 0 square metres of planter box area in the development (excluding, in each case, any area which drains to, or supplies, any other alternative water supply system).	- irrigation of 930 square metres of common landscaped area on the site - car washing in 0 car washing bays on the site

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

(ii) Energy	Show on DA plans	Show on CC/CDC plans & specs	Certifier check
(a) If, in carrying out the development, the applicant installs a ventilation system to service a common area specified in the table below, then that ventilation system must be of the type specified for that common area, and must meet the efficiency measure specified.		✔	✔
(b) In carrying out the development, the applicant must install, as the "primary type of artificial lighting" for each common area specified in the table below, the lighting specified for that common area. This lighting must meet the efficiency measure specified. The applicant must also install a centralised lighting control system or Building Management System (BMS) for the common area, where specified.		✔	✔
(c) The applicant must install the systems and fixtures specified in the "Central energy systems" column of the table below. In each case, the system or fixture must be of the type, and meet the specifications, listed for it in the table.	✔	✔	✔

	Common area ventilation system		Common area lighting		
Common area	Ventilation system type	Ventilation efficiency measure	Primary type of artificial lighting	Lighting efficiency measure	Lighting control system/BMS
Car park area (No. 1)	ventilation (supply + exhaust)	carbon monoxide monitor + 2-speed fan	fluorescent	motion sensors	No
Lift car (No. 1)	-	-	light-emitting diode	connected to lift call button	No

Central energy systems	Type	Specification
Lift (No. 1)	gearless traction with V V V F motor	Number of levels (including basement): 7

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

4. Commitments for common areas and central systems/facilities for the development (non-building specific)

(b) Common areas and central systems/facilities

(i) Water	Show on DA plans	Show on CC/CDC plans & specs	Certifier check
(a) If, in carrying out the development, the applicant installs a showerhead, toilet, tap or clothes washer into a common area, then that item must meet the specifications listed for it in the table.		✔	✔
(b) The applicant must install (or ensure that the development is serviced by) the alternative water supply system(s) specified in the "Central systems" column of the table below. In each case, the system must be sized, be configured, and be connected, as specified in the table.	✔	✔	✔
(c) A swimming pool or spa listed in the table must not have a volume (in kLs) greater than that specified for the pool or spa in the table.	✔	✔	
(d) A pool or spa listed in the table must have a cover or shading if specified for the pool or spa in the table.		✔	
(e) The applicant must install each fire sprinkler system listed in the table so that the system is configured as specified in the table.		✔	✔
(f) The applicant must ensure that the central cooling system for a cooling tower is configured as specified in the table.		✔	✔

Common area	Showerheads rating	Toilets rating	Taps rating	Clothes washers rating
All common areas	no common facility	no common facility	3 star	no common laundry facility

(ii) Energy	Show on DA plans	Show on CC/CDC plans & specs	Certifier check
(a) If, in carrying out the development, the applicant installs a ventilation system to service a common area specified in the table below, then that ventilation system must be of the type specified for that common area, and must meet the efficiency measure specified.		✔	✔
(b) In carrying out the development, the applicant must install, as the "primary type of artificial lighting" for each common area specified in the table below, the lighting specified for that common area. This lighting must meet the efficiency measure specified. The applicant must also install a centralised lighting control system or Building Management System (BMS) for the common area, where specified.		✔	✔
(c) The applicant must install the systems and fixtures specified in the "Central energy systems" column of the table below. In each case, the system or fixture must be of the type, and meet the specifications, listed for it in the table.	✔	✔	✔

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Notes

1. In these commitments, "applicant" means the person carrying out the development.
2. The applicant must identify each dwelling, building and common area listed in this certificate, on the plans accompanying any development application, and on the plans and specifications accompanying the application for a construction certificate / complying development certificate, for the proposed development, using the same identifying letter or reference as is given to that dwelling, building or common area in this certificate.
3. This note applies if the proposed development involves the erection of a building for both residential and non-residential purposes (or the change of use of a building for both residential and non-residential purposes). Commitments in this certificate which are specified to apply to a "common area" of a building or the development, apply only to that part of the building or development to be used for residential purposes.
4. If this certificate lists a central system as a commitment for a dwelling or building, and that system will also service any other dwelling or building within the development, then that system need only be installed once (even if it is separately listed as a commitment for that other dwelling or building).
5. If a star or other rating is specified in a commitment, this is a minimum rating.
6. All alternative water systems to be installed under these commitments (if any), must be installed in accordance with the requirements of all applicable regulatory authorities. NOTE: NSW Health does not recommend that stormwater, recycled water or private dam water be used to irrigate edible plants which are consumed raw, or that rainwater be used for human consumption in areas with potable water supply.

Legend

1. Commitments identified with a "✔" in the "Show on DA plans" column must be shown on the plans accompanying the development application for the proposed development (if a development application is to be lodged for the proposed development).
2. Commitments identified with a "✔" in the "Show on CC/CDC plans and specs" column must be shown in the plans and specifications accompanying the application for a construction certificate / complying development certificate for the proposed development.
3. Commitments identified with a "✔" in the "Certifier check" column must be certified by a certifying authority as having been fulfilled. (Note: a certifying authority must not issue an occupation certificate (either interim or final) for a building listed in this certificate, or for any part of such a building, unless it is satisfied that each of the commitments whose fulfilment it is required to monitor in relation to the building or part, has been fulfilled).

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

BASIX® Certificate

Building Sustainability Index www.basix.nsw.gov.au

Multi Dwelling

Certificate number: 593848M_02

This certificate confirms that the proposed development will meet the NSW government's requirements for sustainability, if it is built in accordance with the commitments set out below. Terms used in this certificate, or in the commitments, have the meaning given by the document entitled "BASIX Definitions" dated 18/09/2014 published by Planning & Infrastructure. This document is available at www.basix.nsw.gov.au

Director-General
Date of issue: Thursday, 19 February 2015
To be valid, this certificate must be lodged within 3 months of the date of issue.

NSW GOVERNMENT Planning & Infrastructure

Project summary	
Project name	Buildings 1 and 3_02
Street address	NA Jordan Springs Boulevard JORDAN SPRINGS 2747
Local Government Area	Penrith City Council
Plan type and plan number	deposited -
Lot no.	-
Section no.	-
No. of residential flat buildings	1
No. of units in residential flat buildings	74
No. of multi-dwelling houses	0
No. of single dwelling houses	0

Project score		
Water	✔ 41	Target 40
Thermal Comfort	✔ Pass	Target Pass
Energy	✔ 33	Target 20

Certificate Prepared by
Name / Company Name: Aminga Holdings Pty Ltd
ABN (if applicable): 41003542425

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Description of project

Project address	
Project name	Buildings 1 and 3_02
Street address	NA Jordan Springs Boulevard JORDAN SPRINGS 2747
Local Government Area	Penrith City Council
Plan type and plan number	deposited -
Lot no.	-
Section no.	-
Project type	
No. of residential flat buildings	1
No. of units in residential flat buildings	74
No. of multi-dwelling houses	0
No. of single dwelling houses	0
Site details	
Site area (m²)	4150
Roof area (m²)	1958
Non-residential floor area (m²)	0
Residential car spaces	74
Non-residential car spaces	5

Common area landscape		
Common area lawn (m²)	0	
Common area garden (m²)	930	
Area of indigenous or low water use species (m²)	0	
Assessor details		
Assessor number	BDAV/13/1525	
Certificate number	15250013	
Climate zone	28	
Project score		
Water	✔ 41	Target 40
Thermal Comfort	✔ Pass	Target Pass
Energy	✔ 33	Target 20

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Description of project

The tables below describe the dwellings and common areas within the project

Residential flat buildings - Building 1and 3, 74 dwellings, 6 storeys above ground

Dwelling no.	No. of bedrooms	Conditioned floor area (m²)	Unconditioned floor area (m²)	Area of garden & lawn (m²)	Indigenous species (min area m²)
1101	2	83.0	0.0	0	0
1105	1	57.0	0.0	0	0
1109	2	80.0	0.0	0	0
1204	2	83.0	0.0	0	0
1208	2	79.0	0.0	0	0
1303	2	79.0	0.0	0	0
1307	2	83.0	0.0	0	0
1G04	2	83.0	0.0	15	0
1G08	2	80.0	0.0	0	0
3104	2	83.0	0.0	0	0
3201	2	83.0	0.0	0	0
3205	2	83.0	0.0	0	0
3302	2	83.0	0.0	0	0
3306	3	117.0	0.0	0	0
3403	2	83.0	0.0	0	0
3407	2	83.0	0.0	0	0
3504	2	83.0	0.0	0	0
3G01	2	83.0	0.0	15	0

Dwelling no.	No. of bedrooms	Conditioned floor area (m²)	Unconditioned floor area (m²)	Area of garden & lawn (m²)	Indigenous species (min area m²)
1102	2	83.0	0.0	0	0
1106	2	83.0	0.0	0	0
1201	2	83.0	0.0	0	0
1205	1	57.0	0.0	0	0
1209	2	80.0	0.0	0	0
1304	2	83.0	0.0	0	0
1G01	2	83.0	0.0	15	0
1G05	1	57.0	0.0	15	0
3101	2	83.0	0.0	0	0
3105	2	83.0	0.0	0	0
3202	2	83.0	0.0	0	0
3206	3	117.0	0.0	0	0
3303	2	83.0	0.0	0	0
3307	2	83.0	0.0	0	0
3404	2	83.0	0.0	0	0
3501	2	83.0	0.0	0	0
3505	2	83.0	0.0	0	0
3G02	2	83.0	0.0	15	0

Dwelling no.	No. of bedrooms	Conditioned floor area (m²)	Unconditioned floor area (m²)	Area of garden & lawn (m²)	Indigenous species (min area m²)
1103	2	83.0	0.0	0	0
1107	2	83.0	0.0	0	0
1202	2	83.0	0.0	0	0
1206	2	83.0	0.0	0	0
1301	2	102.0	0.0	0	0
1305	2	83.0	0.0	0	0
1G02	2	83.0	0.0	15	0
1G06	2	83.0	0.0	15	0
3102	2	83.0	0.0	0	0
3106	3	117.0	0.0	0	0
3203	2	83.0	0.0	0	0
3207	2	83.0	0.0	0	0
3304	2	83.0	0.0	0	0
3401	2	83.0	0.0	0	0
3405	2	83.0	0.0	0	0
3502	2	83.0	0.0	0	0
3506	3	103.0	0.0	0	0
3G03	1	63.0	0.0	20	0

Dwelling no.	No. of bedrooms	Conditioned floor area (m²)	Unconditioned floor area (m²)	Area of garden & lawn (m²)	Indigenous species (min area m²)
1104	2	83.0	0.0	0	0
1108	2	79.0	0.0	0	0
1203	2	83.0	0.0	0	0
1207	2	83.0	0.0	0	0
1302	2	83.0	0.0	0	0
1306	1	57.0	0.0	0	0
1G03	1	63.0	0.0	15	0
1G07	1	58.0	0.0	0	0
3103	2	83.0	0.0	0	0
3107	2	83.0	0.0	0	0
3204	2	83.0	0.0	0	0
3301	2	83.0	0.0	0	0
3305	2	83.0	0.0	0	0
3402	2	83.0	0.0	0	0
3406	3	117.0	0.0	0	0
3503	2	83.0	0.0	0	0
3507	2	83.0	0.0	0	0
3G04	2	83.0	0.0	20	0

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Dwelling no.	No. of bedrooms	Conditioned floor area (m²)	Unconditioned floor area (m²)	Area of garden & lawn (m²)	Indigenous species (min area m²)
3G05	2	82.0	0.0	20	0

Dwelling no.	No. of bedrooms	Conditioned floor area (m²)	Unconditioned floor area (m²)	Area of garden & lawn (m²)	Indigenous species (min area m²)
3G06	2	83.0	0.0	0	0

Dwelling no.	No. of bedrooms	Conditioned floor area (m²)	Unconditioned floor area (m²)	Area of garden & lawn (m²)	Indigenous species (min area m²)

Dwelling no.	No. of bedrooms	Conditioned floor area (m²)	Unconditioned floor area (m²)	Area of garden & lawn (m²)	Indigenous species (min area m²)

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Description of project

The tables below describe the dwellings and common areas within the project

Common areas of unit building - Building 1and 3

Common area	Floor area (m²)
Car park area Bldg 1	1063

Common area	Floor area (m²)
Car park area Blds 3	1720

Common areas of the development (non-building specific)

Common area	Floor area (m²)
Lift car (No. 1)	-

Common area	Floor area (m²)
Lift car (No. 2)	-

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Schedule of BASIX commitments

1. Commitments for Residential flat buildings - Building 1and 3
    (a) Dwellings
        (i) Water
        (ii) Energy
        (iii) Thermal Comfort
    (b) Common areas and central systems/facilities
        (i) Water
        (ii) Energy

2. Commitments for multi-dwelling houses

3. Commitments for single dwelling houses

4. Commitments for common areas and central systems/facilities for the development (non-building specific)
        (i) Water
        (ii) Energy

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Schedule of BASIX commitments

The commitments set out below regulate how the proposed development is to be carried out. It is a condition of any development consent granted, or complying development certificate issued, for the proposed development, that BASIX commitments be complied with.

1. Commitments for Residential flat buildings - Building 1and 3

(a) Dwellings

(i) Water	Show on DA plans	Show on CC/CDC plans & specs	Certifier check
(a) The applicant must comply with the commitments listed below in carrying out the development of a dwelling listed in a table below.			
(b) The applicant must plant indigenous or low water use species of vegetation throughout the area of land specified for the dwelling in the "Indigenous species" column of the table below, as private landscaping for that dwelling. (This area of indigenous vegetation is to be contained within the "Area of garden and lawn" for the dwelling specified in the "Description of Project" table).	✔	✔	
(c) If a rating is specified in the table below for a fixture or appliance to be installed in the dwelling, the applicant must ensure that each such fixture and appliance meets the rating specified for it.		✔	✔
(d) The applicant must install an on demand hot water recirculation system which regulates all hot water use throughout the dwelling, where indicated for a dwelling in the "HW recirculation or diversion" column of the table below.		✔	✔
(e) The applicant must install: (aa) a hot water diversion system to all showers, kitchen sinks and all basins in the dwelling, where indicated for a dwelling in the "HW recirculation or diversion" column of the table below; and (bb) a separate diversion tank (or tanks) connected to the hot water diversion systems of at least 100 litres. The applicant must connect the hot water diversion tank to all toilets in the dwelling.		✔ ✔	✔ ✔
(e) The applicant must not install a private swimming pool or spa for the dwelling, with a volume exceeding that specified for it in the table below.	✔	✔	
(f) If specified in the table, that pool or spa (or both) must have a pool cover or shading (or both).		✔	
(g) The pool or spa must be located as specified in the table.	✔	✔	
(h) The applicant must install, for the dwelling, each alternative water supply system, with the specified size, listed for that dwelling in the table below. Each system must be configured to collect run-off from the areas specified (excluding any area which supplies any other alternative water supply system), and to divert overflow as specified. Each system must be connected as specified.	✔	✔	✔

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

	Fixtures					Appliances		Individual pool				Individual spa		
Dwelling no.	All shower-heads	All toilet flushing systems	All kitchen taps	All bathroom taps	HW recirculation or diversion	All clothes washers	All dish-washers	Volume (max volume)	Pool cover	Pool location	Pool shaded	Volume (max volume)	Spa cover	Spa shaded
All dwellings	3 star (> 4.5 but <= 6 L/min)	4 star	5 star	5 star	-	-	-	-	-	-	-	-	-	-

	Alternative water source							
Dwelling no.	Alternative water supply systems	Size	Configuration	Landscape connection	Toilet connection (s)	Laundry connection	Pool top-up	Spa top-up
None	-	-	-	-	-	-	-	-

(ii) Energy	Show on DA plans	Show on CC/CDC plans & specs	Certifier check
(a) The applicant must comply with the commitments listed below in carrying out the development of a dwelling listed in a table below.			
(b) The applicant must install each hot water system specified for the dwelling in the table below, so that the dwelling's hot water is supplied by that system. If the table specifies a central hot water system for the dwelling, then the applicant must connect that central system to the dwelling, so that the dwelling's hot water is supplied by that central system.	✔	✔	✔
(c) The applicant must install, in each bathroom, kitchen and laundry of the dwelling, the ventilation system specified for that room in the table below. Each such ventilation system must have the operation control specified for it in the table.		✔	✔
(d) The applicant must install the cooling and heating system/s specified for the dwelling under the "Living areas" and "Bedroom areas" headings of the "Cooling" and "Heating" columns in the table below, in/for at least 1 living/bedroom area of the dwelling. If no cooling or heating system is specified in the table for "Living areas" or "Bedroom areas", then no systems may be installed in any such areas. If the term "zoned" is specified beside an air conditioning system, then the system must provide for day/night zoning between living areas and bedrooms.		✔	✔
(e) This commitment applies to each room or area of the dwelling which is referred to in a heading to the "Artificial lighting" column of the table below (but only to the extent specified for that room or area). The applicant must ensure that the "primary type of artificial lighting" for each such room in the dwelling is fluorescent lighting or light emitting diode (LED) lighting. If the term "dedicated" is specified for a particular room or area, then the light fittings in that room or area must only be capable of being used for fluorescent lighting or light emitting diode (LED) lighting.		✔	✔

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

(ii) Energy	Show on DA plans	Show on CC/CDC plans & specs	Certifier check
(f) This commitment applies to each room or area of the dwelling which is referred to in a heading to the "Natural lighting" column of the table below (but only to the extent specified for that room or area). The applicant must ensure that each such room or area is fitted with a window and/or skylight.	✔	✔	✔
(g) This commitment applies if the applicant installs a water heating system for the dwelling's pool or spa. The applicant must:			
(aa) install the system specified for the pool in the "Individual Pool" column of the table below (or alternatively must not install any system for the pool). If specified, the applicant must install a timer, to control the pool's pump; and		✔	
(bb) install the system specified for the spa in the "Individual Spa" column of the table below (or alternatively must not install any system for the spa). If specified, the applicant must install a timer to control the spa's pump.		✔	
(h) The applicant must install in the dwelling:			
(aa) the kitchen cook-top and oven specified for that dwelling in the "Appliances & other efficiency measures" column of the table below;		✔	
(bb) each appliance for which a rating is specified for that dwelling in the "Appliances & other efficiency measures" column of the table, and ensure that the appliance has that minimum rating; and		✔	✔
(cc) any clothes drying line specified for the dwelling in the "Appliances & other efficiency measures" column of the table.		✔	
(i) If specified in the table, the applicant must carry out the development so that each refrigerator space in the dwelling is "well ventilated".		✔	

	Hot water	Bathroom ventilation system		Kitchen ventilation system		Laundry ventilation system	
Dwelling no.	Hot water system	Each bathroom	Operation control	Each kitchen	Operation control	Each laundry	Operation control
All dwellings	gas instantaneous 3 star	individual fan, ducted to façade or roof	interlocked to light	individual fan, ducted to façade or roof	manual switch on/off	individual fan, ducted to façade or roof	manual switch on/off

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

	Cooling		Heating		Artificial lighting						Natural lighting	
Dwelling no.	living areas	bedroom areas	living areas	bedroom areas	No. of bedrooms &/or study	No. of living &/or dining rooms	Each kitchen	All bathrooms/ toilets	Each laundry	All hallways	No. of bathrooms &/or toilets	Main kitchen
1105, 1205, 1306, 1G03, 1G05, 1G07, 3G03	1-phase airconditioning 3.5 Star (new rating)	1-phase airconditioning 3.5 Star (new rating)	1-phase airconditioning 3.5 Star (new rating)	1-phase airconditioning 3.5 Star (new rating)	1 (dedicated)	1	yes (dedicated)	yes (dedicated)	yes (dedicated)	yes (dedicated)	0	no

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

	Cooling		Heating		Artificial lighting						Natural lighting	
Dwelling no.	living areas	bedroom areas	living areas	bedroom areas	No. of bedrooms &/or study	No. of living &/or dining rooms	Each kitchen	All bathrooms/ toilets	Each laundry	All hallways	No. of bathrooms &/or toilets	Main kitchen
1101, 1102, 1103, 1104, 1106, 1107, 1108, 1109, 1201, 1202, 1203, 1204, 1206, 1207, 1208, 1209, 1301, 1302, 1303, 1304, 1305, 1307, 1G01, 1G02, 1G04, 1G06, 1G08, 3101, 3102, 3103, 3104, 3105, 3106, 3107, 3201, 3202, 3203, 3204, 3205,	1-phase airconditioning 3.5 Star (new rating)	1-phase airconditioning 3.5 Star (new rating)	1-phase airconditioning 3.5 Star (new rating)	1-phase airconditioning 3.5 Star (new rating)	2 (dedicated)	1	yes (dedicated)	yes (dedicated)	yes (dedicated)	yes (dedicated)	0	no

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

	Cooling		Heating		Artificial lighting						Natural lighting	
Dwelling no.	living areas	bedroom areas	living areas	bedroom areas	No. of bedrooms &/or study	No. of living &/or dining rooms	Each kitchen	All bathrooms/ toilets	Each laundry	All hallways	No. of bathrooms &/or toilets	Main kitchen
3206, 3207, 3301, 3302, 3303, 3304, 3305, 3306, 3307, 3401, 3402, 3403, 3404, 3405, 3406, 3407, 3501, 3502, 3503, 3504, 3505, 3506, 3507, 3G01, 3G02, 3G04, 3G05, 3G06												

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

	Individual pool		Individual spa		Appliances & other efficiency measures							
Dwelling no.	Pool heating system	Timer	Spa heating system	Timer	Kitchen cooktop/oven	Refrigerator	Well ventilated fridge space	Dishwasher	Clothes washer	Clothes dryer	Indoor or sheltered clothes drying line	Private outdoor or unsheltered clothes drying line
All dwellings	-	-	-	-	gas cooktop & electric oven	-	yes	-	-	-	-	-

(iii) Thermal Comfort	Show on DA plans	Show on CC/CDC plans & specs	Certifier check
(a) The applicant must attach the certificate referred to under "Assessor details" on the front page of this BASIX certificate (the "Assessor Certificate") to the development application and construction certificate application for the proposed development (or, if the applicant is applying for a complying development certificate for the proposed development, to that application). The applicant must also attach the Assessor Certificate to the application for a final occupation certificate for the proposed development.			
(b) The Assessor Certificate must have been issued by an Accredited Assessor in accordance with the Thermal Comfort Protocol.			
(c) The details of the proposed development on the Assessor Certificate must be consistent with the details shown in this BASIX Certificate, including the details shown in the "Thermal Loads" table below.			
(d) The applicant must show on the plans accompanying the development application for the proposed development, all matters which the Thermal Comfort Protocol requires to be shown on those plans. Those plans must bear a stamp of endorsement from the Accredited Assessor, to certify that this is the case.			
(e) The applicant must show on the plans accompanying the application for a construction certificate (or complying development certificate, if applicable), all thermal performance specifications set out in the Assessor Certificate, and all aspects of the proposed development which were used to calculate those specifications.			
(f) The applicant must construct the development in accordance with all thermal performance specifications set out in the Assessor Certificate, and in accordance with those aspects of the development application or application for a complying development certificate which were used to calculate those specifications.		✔	✔
(g) Where there is an in-slab heating or cooling system, the applicant must: (aa) Install insulation with an R-value of not less than 1.0 around the vertical edges of the perimeter of the slab; or (bb) On a suspended floor, install insulation with an R-value of not less than 1.0 underneath the slab and around the vertical edges of the perimeter of the slab.	✔	✔	✔
(h) The applicant must construct the floors and walls of the development in accordance with the specifications listed in the table below.	✔	✔	✔

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

	Thermal loads	
Dwelling no.	Area adjusted heating load (in mJ/m²/yr)	Area adjusted cooling load (in mJ/m²/yr)
1G02, 1G03, 1G04, 1G05, 1G06	17.9	25.5
1101, 1107, 1108, 1109, 1201, 1207, 1208, 1209, 1301, 1302, 1303, 1304, 1G01, 1G07, 1G08, 3101, 3106, 3107, 3201, 3206, 3207, 3301, 3306, 3307, 3401, 3406, 3407, 3501, 3506, 3507, 3G01, 3G06	32.9	25.5
All other dwellings	17.9	23.5

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

(b) Common areas and central systems/facilities

(i) Water	Show on DA plans	Show on CC/CDC plans & specs	Certifier check
(a) If, in carrying out the development, the applicant installs a showerhead, toilet, tap or clothes washer into a common area, then that item must meet the specifications listed for it in the table.		✔	✔
(b) The applicant must install (or ensure that the development is serviced by) the alternative water supply system(s) specified in the "Central systems" column of the table below. In each case, the system must be sized, be configured, and be connected, as specified in the table.	✔	✔	✔
(c) A swimming pool or spa listed in the table must not have a volume (in kLs) greater than that specified for the pool or spa in the table.	✔	✔	
(d) A pool or spa listed in the table must have a cover or shading if specified for the pool or spa in the table.		✔	
(e) The applicant must install each fire sprinkler system listed in the table so that the system is configured as specified in the table.		✔	✔
(f) The applicant must ensure that the central cooling system for a cooling tower is configured as specified in the table.		✔	✔

Common area	Showerheads rating	Toilets rating	Taps rating	Clothes washers rating
All common areas	no common facility	no common facility	3 star	no common laundry facility

(ii) Energy	Show on DA plans	Show on CC/CDC plans & specs	Certifier check
(a) If, in carrying out the development, the applicant installs a ventilation system to service a common area specified in the table below, then that ventilation system must be of the type specified for that common area, and must meet the efficiency measure specified.		✔	✔
(b) In carrying out the development, the applicant must install, as the "primary type of artificial lighting" for each common area specified in the table below, the lighting specified for that common area. This lighting must meet the efficiency measure specified. The applicant must also install a centralised lighting control system or Building Management System (BMS) for the common area, where specified.		✔	✔
(c) The applicant must install the systems and fixtures specified in the "Central energy systems" column of the table below. In each case, the system or fixture must be of the type, and meet the specifications, listed for it in the table.	✔	✔	✔

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

	Common area ventilation system		Common area lighting		
Common area	Ventilation system type	Ventilation efficiency measure	Primary type of artificial lighting	Lighting efficiency measure	Lighting control system/BMS
Car park area Bldg 1	ventilation (supply + exhaust)	carbon monoxide monitor + 2-speed fan	compact fluorescent	motion sensors	No
Car park area Blds 3	ventilation (supply + exhaust)	carbon monoxide monitor + 2-speed fan	compact fluorescent	motion sensors	No

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

4. Commitments for common areas and central systems/facilities for the development (non-building specific)

(b) Common areas and central systems/facilities

(i) Water	Show on DA plans	Show on CC/CDC plans & specs	Certifier check
(a) If, in carrying out the development, the applicant installs a showerhead, toilet, tap or clothes washer into a common area, then that item must meet the specifications listed for it in the table.		✔	✔
(b) The applicant must install (or ensure that the development is serviced by) the alternative water supply system(s) specified in the "Central systems" column of the table below. In each case, the system must be sized, be configured, and be connected, as specified in the table.	✔	✔	✔
(c) A swimming pool or spa listed in the table must not have a volume (in kLs) greater than that specified for the pool or spa in the table.	✔	✔	
(d) A pool or spa listed in the table must have a cover or shading if specified for the pool or spa in the table.		✔	
(e) The applicant must install each fire sprinkler system listed in the table so that the system is configured as specified in the table.		✔	✔
(f) The applicant must ensure that the central cooling system for a cooling tower is configured as specified in the table.		✔	✔

Common area	Showerheads rating	Toilets rating	Taps rating	Clothes washers rating
All common areas	no common facility	no common facility	3 star	no common laundry facility

Central systems	Size	Configuration	Connection (to allow for...)
Central water tank - rainwater or stormwater (No. 1)	12000	To collect run-off from at least: - 1950 square metres of roof area of buildings in the development - 0 square metres of impervious area in the development - 0 square metres of garden/lawn area in the development - 0 square metres of planter box area in the development (excluding, in each case, any area which drains to, or supplies, any other alternative water supply system).	- irrigation of 930 square metres of common landscaped area on the site - car washing in 0 car washing bays on the site

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

(ii) Energy	Show on DA plans	Show on CC/CDC plans & specs	Certifier check
(a) If, in carrying out the development, the applicant installs a ventilation system to service a common area specified in the table below, then that ventilation system must be of the type specified for that common area, and must meet the efficiency measure specified.		✔	✔
(b) In carrying out the development, the applicant must install, as the "primary type of artificial lighting" for each common area specified in the table below, the lighting specified for that common area. This lighting must meet the efficiency measure specified. The applicant must also install a centralised lighting control system or Building Management System (BMS) for the common area, where specified.		✔	✔
(c) The applicant must install the systems and fixtures specified in the "Central energy systems" column of the table below. In each case, the system or fixture must be of the type, and meet the specifications, listed for it in the table.	✔	✔	✔

	Common area ventilation system		Common area lighting		
Common area	Ventilation system type	Ventilation efficiency measure	Primary type of artificial lighting	Lighting efficiency measure	Lighting control system/BMS
Lift car (No. 1)	-	-	light-emitting diode	connected to lift call button	No
Lift car (No. 2)	-	-	light-emitting diode	connected to lift call button	No

Central energy systems	Type	Specification
Lift (No. 1)	gearless traction with V V V F motor	Number of levels (including basement): 4
Lift (No. 2)	gearless traction with V V V F motor	Number of levels (including basement): 4

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Notes

1. In these commitments, "applicant" means the person carrying out the development.
2. The applicant must identify each dwelling, building and common area listed in this certificate, on the plans accompanying any development application, and on the plans and specifications accompanying the application for a construction certificate / complying development certificate, for the proposed development, using the same identifying letter or reference as is given to that dwelling, building or common area in this certificate.
3. This note applies if the proposed development involves the erection of a building for both residential and non-residential purposes (or the change of use of a building for both residential and non-residential purposes). Commitments in this certificate which are specified to apply to a "common area" of a building or the development, apply only to that part of the building or development to be used for residential purposes.
4. If this certificate lists a central system as a commitment for a dwelling or building, and that system will also service any other dwelling or building within the development, then that system need only be installed once (even if it is separately listed as a commitment for that other dwelling or building).
5. If a star or other rating is specified in a commitment, this is a minimum rating.
6. All alternative water systems to be installed under these commitments (if any), must be installed in accordance with the requirements of all applicable regulatory authorities. NOTE: NSW Health does not recommend that stormwater, recycled water or private dam water be used to irrigate edible plants which are consumed raw, or that rainwater be used for human consumption in areas with potable water supply.

Legend

1. Commitments identified with a "✔" in the "Show on DA plans" column must be shown on the plans accompanying the development application for the proposed development (if a development application is to be lodged for the proposed development).
2. Commitments identified with a "✔" in the "Show on CC/CDC plans and specs" column must be shown in the plans and specifications accompanying the application for a construction certificate / complying development certificate for the proposed development.
3. Commitments identified with a "✔" in the "Certifier check" column must be certified by a certifying authority as having been fulfilled. (Note: a certifying authority must not issue an occupation certificate (either interim or final) for a building listed in this certificate, or for any part of such a building, unless it is satisfied that each of the commitments whose fulfilment it is required to monitor in relation to the building or part, has been fulfilled).

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

BASIX® Certificate

Building Sustainability Index www.basix.nsw.gov.au

Multi Dwelling

Certificate number: 593849M_02

This certificate confirms that the proposed development will meet the NSW government's requirements for sustainability, if it is built in accordance with the commitments set out below. Terms used in this certificate, or in the commitments, have the meaning given by the document entitled "BASIX Definitions" dated 18/09/2014 published by Planning & Infrastructure. This document is available at www.basix.nsw.gov.au

Director-General
Date of issue: Thursday, 19 February 2015
To be valid, this certificate must be lodged within 3 months of the date of issue.

NSW GOVERNMENT Planning & Infrastructure

Project summary	
Project name	Buildings 4 and 5_02
Street address	NA Jordan Springs Boulevard JORDAN SPRINGS 2747
Local Government Area	Penrith City Council
Plan type and plan number	deposited -
Lot no.	-
Section no.	-
No. of residential flat buildings	1
No. of units in residential flat buildings	64
No. of multi-dwelling houses	0
No. of single dwelling houses	0

Project score		
Water	✔ 40	Target 40
Thermal Comfort	✔ Pass	Target Pass
Energy	✔ 31	Target 30

Certificate Prepared by
Name / Company Name: Aminga Holdings Pty Ltd
ABN (if applicable): 41003542425

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Description of project

Project address	
Project name	Buildings 4 and 5_02
Street address	NA Jordan Springs Boulevard JORDAN SPRINGS 2747
Local Government Area	Penrith City Council
Plan type and plan number	deposited -
Lot no.	-
Section no.	-
Project type	
No. of residential flat buildings	1
No. of units in residential flat buildings	64
No. of multi-dwelling houses	0
No. of single dwelling houses	0
Site details	
Site area (m²)	4454
Roof area (m²)	1921
Non-residential floor area (m²)	0
Residential car spaces	64
Non-residential car spaces	5

Common area landscape		
Common area lawn (m²)	0	
Common area garden (m²)	930	
Area of indigenous or low water use species (m²)	0	
Assessor details		
Assessor number	BDAV/13/1525	
Certificate number	15250013	
Climate zone	28	
Project score		
Water	✔ 40	Target 40
Thermal Comfort	✔ Pass	Target Pass
Energy	✔ 31	Target 30

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Description of project

The tables below describe the dwellings and common areas within the project

Residential flat buildings - Buildings 4 and 5, 64 dwellings, 4 storeys above ground

Dwelling no.	No. of bedrooms	Conditioned floor area (m²)	Unconditioned floor area (m²)	Area of garden & lawn (m²)	Indigenous species (min area m²)
4101	2	88.0	0.0	0	0
4105	2	83.0	0.0	0	0
4203	2	81.0	0.0	0	0
4301	2	88.0	0.0	0	0
4305	2	83.0	0.0	0	0
4G03	2	81.0	0.0	40	0
5101	2	83.0	0.0	0	0
5105	2	80.0	0.0	0	0
5109	2	83.0	0.0	0	0
5203	1	51.0	0.0	0	0
5207	2	83.0	0.0	0	0
5301	2	83.0	0.0	0	0
5305	2	80.0	0.0	0	0
5309	2	83.0	0.0	0	0
5G03	1	51.0	0.0	15	0
5G07	2	83.0	0.0	15	0

Dwelling no.	No. of bedrooms	Conditioned floor area (m²)	Unconditioned floor area (m²)	Area of garden & lawn (m²)	Indigenous species (min area m²)
4102	2	88.0	0.0	0	0
4106	1	55.0	0.0	0	0
4204	2	83.0	0.0	0	0
4302	2	88.0	0.0	0	0
4306	1	55.0	0.0	0	0
4G04	2	83.0	0.0	40	0
5102	2	83.0	0.0	0	0
5106	2	83.0	0.0	0	0
5110	1	58.0	0.0	0	0
5204	2	81.0	0.0	0	0
5208	2	83.0	0.0	0	0
5302	2	83.0	0.0	0	0
5306	2	83.0	0.0	0	0
5310	1	58.0	0.0	0	0
5G04	2	81.0	0.0	15	0
5G08	2	83.0	0.0	15	0

Dwelling no.	No. of bedrooms	Conditioned floor area (m²)	Unconditioned floor area (m²)	Area of garden & lawn (m²)	Indigenous species (min area m²)
4103	2	81.0	0.0	0	0
4201	2	88.0	0.0	0	0
4205	2	83.0	0.0	0	0
4303	2	81.0	0.0	0	0
4G01	2	88.0	0.0	15	0
4G05	2	55.0	0.0	0	0
5103	1	51.0	0.0	0	0
5107	2	83.0	0.0	0	0
5201	2	83.0	0.0	0	0
5205	2	80.0	0.0	0	0
5209	2	83.0	0.0	0	0
5303	1	51.0	0.0	0	0
5307	2	83.0	0.0	0	0
5G01	2	83.0	0.0	15	0
5G05	2	80.0	0.0	15	0
5G09	2	83.0	0.0	15	0

Dwelling no.	No. of bedrooms	Conditioned floor area (m²)	Unconditioned floor area (m²)	Area of garden & lawn (m²)	Indigenous species (min area m²)
4104	2	83.0	0.0	0	0
4202	2	88.0	0.0	0	0
4206	1	55.0	0.0	0	0
4304	2	83.0	0.0	0	0
4G02	2	88.0	0.0	15	0
4G06	1	83.0	0.0	0	0
5104	2	81.0	0.0	0	0
5108	2	83.0	0.0	0	0
5202	2	83.0	0.0	0	0
5206	2	83.0	0.0	0	0
5210	1	58.0	0.0	0	0
5304	2	81.0	0.0	0	0
5308	2	83.0	0.0	0	0
5G02	2	83.0	0.0	15	0
5G06	2	83.0	0.0	15	0
5G10	1	58.0	0.0	15	0

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Description of project

The tables below describe the dwellings and common areas within the project

Common areas of unit building - Buildings 4 and 5

Common area	Floor area (m²)
B1 carpark	2100
Lift car (No. 2)	-

Common area	Floor area (m²)
B2 carpark	2100

Common area	Floor area (m²)
Lift car (No. 1)	-

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Schedule of BASIX commitments

1. Commitments for Residential flat buildings - Buildings 4 and 5
    - (a) Dwellings
        - (i) Water
        - (ii) Energy
        - (iii) Thermal Comfort
    - (b) Common areas and central systems/facilities
        - (i) Water
        - (ii) Energy

2. Commitments for multi-dwelling houses

3. Commitments for single dwelling houses

4. Commitments for common areas and central systems/facilities for the development (non-building specific)
    - (i) Water
    - (ii) Energy

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Schedule of BASIX commitments

The commitments set out below regulate how the proposed development is to be carried out. It is a condition of any development consent granted, or complying development certificate issued, for the proposed development, that BASIX commitments be complied with.

1. Commitments for Residential flat buildings - Buildings 4 and 5

(a) Dwellings

(i) Water	Show on DA plans	Show on CC/CDC plans & specs	Certifier check
(a) The applicant must comply with the commitments listed below in carrying out the development of a dwelling listed in a table below.			
(b) The applicant must plant indigenous or low water use species of vegetation throughout the area of land specified for the dwelling in the "Indigenous species" column of the table below, as private landscaping for that dwelling. (This area of indigenous vegetation is to be contained within the "Area of garden and lawn" for the dwelling specified in the "Description of Project" table).	✔	✔	
(c) If a rating is specified in the table below for a fixture or appliance to be installed in the dwelling, the applicant must ensure that each such fixture and appliance meets the rating specified for it.		✔	✔
(d) The applicant must install an on demand hot water recirculation system which regulates all hot water use throughout the dwelling, where indicated for a dwelling in the "HW recirculation or diversion" column of the table below.		✔	✔
(e) The applicant must install: (aa) a hot water diversion system to all showers, kitchen sinks and all basins in the dwelling, where indicated for a dwelling in the "HW recirculation or diversion" column of the table below; and (bb) a separate diversion tank (or tanks) connected to the hot water diversion systems of at least 100 litres. The applicant must connect the hot water diversion tank to all toilets in the dwelling.		✔ ✔	✔ ✔
(e) The applicant must not install a private swimming pool or spa for the dwelling, with a volume exceeding that specified for it in the table below.	✔	✔	
(f) If specified in the table, that pool or spa (or both) must have a pool cover or shading (or both).		✔	
(g) The pool or spa must be located as specified in the table.	✔	✔	
(h) The applicant must install, for the dwelling, each alternative water supply system, with the specified size, listed for that dwelling in the table below. Each system must be configured to collect run-off from the areas specified (excluding any area which supplies any other alternative water supply system), and to divert overflow as specified. Each system must be connected as specified.	✔	✔	✔

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

	Fixtures					Appliances		Individual pool				Individual spa		
Dwelling no.	All shower-heads	All toilet flushing systems	All kitchen taps	All bathroom taps	HW recirculation or diversion	All clothes washers	All dish-washers	Volume (max volume)	Pool cover	Pool location	Pool shaded	Volume (max volume)	Spa cover	Spa shaded
All dwellings	3 star (> 4.5 but <= 6 L/min)	4 star	5 star	5 star	-	-	-	-	-	-	-	-	-	-

	Alternative water source							
Dwelling no.	Alternative water supply systems	Size	Configuration	Landscape connection	Toilet connection (s)	Laundry connection	Pool top-up	Spa top-up
None	-	-	-	-	-	-	-	-

(ii) Energy	Show on DA plans	Show on CC/CDC plans & specs	Certifier check
(a) The applicant must comply with the commitments listed below in carrying out the development of a dwelling listed in a table below.			
(b) The applicant must install each hot water system specified for the dwelling in the table below, so that the dwelling's hot water is supplied by that system. If the table specifies a central hot water system for the dwelling, then the applicant must connect that central system to the dwelling, so that the dwelling's hot water is supplied by that central system.	✔	✔	✔
(c) The applicant must install, in each bathroom, kitchen and laundry of the dwelling, the ventilation system specified for that room in the table below. Each such ventilation system must have the operation control specified for it in the table.		✔	✔
(d) The applicant must install the cooling and heating system/s specified for the dwelling under the "Living areas" and "Bedroom areas" headings of the "Cooling" and "Heating" columns in the table below, in/for at least 1 living/bedroom area of the dwelling. If no cooling or heating system is specified in the table for "Living areas" or "Bedroom areas", then no systems may be installed in any such areas. If the term "zoned" is specified beside an air conditioning system, then the system must provide for day/night zoning between living areas and bedrooms.		✔	✔
(e) This commitment applies to each room or area of the dwelling which is referred to in a heading to the "Artificial lighting" column of the table below (but only to the extent specified for that room or area). The applicant must ensure that the "primary type of artificial lighting" for each such room in the dwelling is fluorescent lighting or light emitting diode (LED) lighting. If the term "dedicated" is specified for a particular room or area, then the light fittings in that room or area must only be capable of being used for fluorescent lighting or light emitting diode (LED) lighting.		✔	✔

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

(ii) Energy	Show on DA plans	Show on CC/CDC plans & specs	Certifier check
(f) This commitment applies to each room or area of the dwelling which is referred to in a heading to the "Natural lighting" column of the table below (but only to the extent specified for that room or area). The applicant must ensure that each such room or area is fitted with a window and/or skylight.	✔	✔	✔
(g) This commitment applies if the applicant installs a water heating system for the dwelling's pool or spa. The applicant must:			
(aa) install the system specified for the pool in the "Individual Pool" column of the table below (or alternatively must not install any system for the pool). If specified, the applicant must install a timer, to control the pool's pump; and		✔	
(bb) install the system specified for the spa in the "Individual Spa" column of the table below (or alternatively must not install any system for the spa). If specified, the applicant must install a timer to control the spa's pump.		✔	
(h) The applicant must install in the dwelling:			
(aa) the kitchen cook-top and oven specified for that dwelling in the "Appliances & other efficiency measures" column of the table below;		✔	
(bb) each appliance for which a rating is specified for that dwelling in the "Appliances & other efficiency measures" column of the table, and ensure that the appliance has that minimum rating; and		✔	✔
(cc) any clothes drying line specified for the dwelling in the "Appliances & other efficiency measures" column of the table.		✔	
(i) If specified in the table, the applicant must carry out the development so that each refrigerator space in the dwelling is "well ventilated".		✔	

	Hot water	Bathroom ventilation system		Kitchen ventilation system		Laundry ventilation system	
Dwelling no.	Hot water system	Each bathroom	Operation control	Each kitchen	Operation control	Each laundry	Operation control
4G01, 4G02	gas instantaneous 5.5 star	individual fan, ducted to façade or roof	interlocked to light	individual fan, ducted to façade or roof	interlocked to light	individual fan, ducted to façade or roof	interlocked to light

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

	Hot water	Bathroom ventilation system		Kitchen ventilation system		Laundry ventilation system	
Dwelling no.	Hot water system	Each bathroom	Operation control	Each kitchen	Operation control	Each laundry	Operation control
4101, 4102, 4103, 4104, 4105, 4106, 4201, 4202, 4203, 4204, 4205, 4206, 4301, 4302, 4303, 4304, 4305, 4306, 4G03, 4G04, 4G05, 4G06, 5101, 5102, 5103, 5104, 5105, 5106, 5107, 5108, 5109, 5110, 5201, 5202, 5203, 5204, 5205, 5206, 5207, 5208, 5209,	gas instantaneous 5.5 star	individual fan, ducted to façade or roof	interlocked to light	individual fan, ducted to façade or roof	manual switch on/off	individual fan, ducted to façade or roof	interlocked to light

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

	Hot water	Bathroom ventilation system		Kitchen ventilation system		Laundry ventilation system	
Dwelling no.	Hot water system	Each bathroom	Operation control	Each kitchen	Operation control	Each laundry	Operation control
5210, 5301, 5302, 5303, 5304, 5305, 5306, 5307, 5308, 5309, 5310, 5G01, 5G02, 5G03, 5G04, 5G05, 5G06, 5G07, 5G08, 5G09, 5G10							

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

	Cooling		Heating		Artificial lighting						Natural lighting	
Dwelling no.	living areas	bedroom areas	living areas	bedroom areas	No. of bedrooms &/or study	No. of living &/or dining rooms	Each kitchen	All bathrooms/ toilets	Each laundry	All hallways	No. of bathrooms &/or toilets	Main kitchen
4106, 4206, 4306, 4G06, 5103, 5110, 5203, 5210, 5303, 5310, 5G03, 5G10	1-phase airconditioning 5.5 Star (new rating)	1-phase airconditioning 5.5 Star (new rating)	1-phase airconditioning 5.5 Star (new rating)	1-phase airconditioning 5.5 Star (new rating)	1 (dedicated)	1 (dedicated)	yes (dedicated)	yes (dedicated)	yes (dedicated)	yes (dedicated)	0	no

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

	Cooling		Heating		Artificial lighting						Natural lighting	
Dwelling no.	living areas	bedroom areas	living areas	bedroom areas	No. of bedrooms &/or study	No. of living &/or dining rooms	Each kitchen	All bathrooms/ toilets	Each laundry	All hallways	No. of bathrooms &/or toilets	Main kitchen
4101, 4102, 4103, 4104, 4105, 4201, 4202, 4203, 4204, 4205, 4301, 4302, 4303, 4304, 4305, 4G01, 4G02, 4G03, 4G04, 4G05, 5101, 5102, 5104, 5105, 5106, 5107, 5108, 5109, 5201, 5202, 5204, 5205, 5206, 5207, 5208, 5209, 5301, 5302, 5304,	1-phase airconditioning 5.5 Star (new rating)	1-phase airconditioning 5.5 Star (new rating)	1-phase airconditioning 5.5 Star (new rating)	1-phase airconditioning 5.5 Star (new rating)	2 (dedicated)	1 (dedicated)	yes (dedicated)	yes (dedicated)	yes (dedicated)	yes (dedicated)	0	no

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

	Cooling		Heating		Artificial lighting						Natural lighting	
Dwelling no.	living areas	bedroom areas	living areas	bedroom areas	No. of bedrooms &/or study	No. of living &/or dining rooms	Each kitchen	All bathrooms/ toilets	Each laundry	All hallways	No. of bathrooms &/or toilets	Main kitchen
5305, 5306, 5307, 5308, 5309, 5G01, 5G02, 5G04, 5G05, 5G06, 5G07, 5G08, 5G09												

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

	Individual pool		Individual spa		Appliances & other efficiency measures							
Dwelling no.	Pool heating system	Timer	Spa heating system	Timer	Kitchen cooktop/oven	Refrigerator	Well ventilated fridge space	Dishwasher	Clothes washer	Clothes dryer	Indoor or sheltered clothes drying line	Private outdoor or unsheltered clothes drying line
4G01, 4G02, 4G03, 4G04, 4G05, 4G06, 5G01, 5G02, 5G03, 5G04, 5G05, 5G06, 5G07, 5G08, 5G09, 5G10	-	-	-	-	gas cooktop & electric oven	-	yes	-	-	-	yes	yes

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

	Individual pool		Individual spa		Appliances & other efficiency measures							
Dwelling no.	Pool heating system	Timer	Spa heating system	Timer	Kitchen cooktop/oven	Refrigerator	Well ventilated fridge space	Dishwasher	Clothes washer	Clothes dryer	Indoor or sheltered clothes drying line	Private outdoor or unsheltered clothes drying line
4101, 4102, 4103, 4104, 4105, 4106, 4201, 4202, 4203, 4204, 4205, 4206, 4301, 4302, 4303, 4304, 4305, 4306, 5101, 5102, 5103, 5104, 5105, 5106, 5107, 5108, 5109, 5110, 5201, 5202, 5203, 5204, 5205, 5206, 5207, 5208, 5209, 5210,	-	-	-	-	gas cooktop & electric oven	-	yes	-	-	-	yes	-

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

	Individual pool		Individual spa		Appliances & other efficiency measures							
Dwelling no.	Pool heating system	Timer	Spa heating system	Timer	Kitchen cooktop/oven	Refrigerator	Well ventilated fridge space	Dishwasher	Clothes washer	Clothes dryer	Indoor or sheltered clothes drying line	Private outdoor or unsheltered clothes drying line
5301, 5302, 5303, 5304, 5305, 5306, 5307, 5308, 5309, 5310												

(iii) Thermal Comfort	Show on DA plans	Show on CC/CDC plans & specs	Certifier check
(a) The applicant must attach the certificate referred to under "Assessor details" on the front page of this BASIX certificate (the "Assessor Certificate") to the development application and construction certificate application for the proposed development (or, if the applicant is applying for a complying development certificate for the proposed development, to that application). The applicant must also attach the Assessor Certificate to the application for a final occupation certificate for the proposed development.			
(b) The Assessor Certificate must have been issued by an Accredited Assessor in accordance with the Thermal Comfort Protocol.			
(c) The details of the proposed development on the Assessor Certificate must be consistent with the details shown in this BASIX Certificate, including the details shown in the "Thermal Loads" table below.			
(d) The applicant must show on the plans accompanying the development application for the proposed development, all matters which the Thermal Comfort Protocol requires to be shown on those plans. Those plans must bear a stamp of endorsement from the Accredited Assessor, to certify that this is the case.			
(e) The applicant must show on the plans accompanying the application for a construction certificate (or complying development certificate, if applicable), all thermal performance specifications set out in the Assessor Certificate, and all aspects of the proposed development which were used to calculate those specifications.			
(f) The applicant must construct the development in accordance with all thermal performance specifications set out in the Assessor Certificate, and in accordance with those aspects of the development application or application for a complying development certificate which were used to calculate those specifications.		✔	✔
(g) Where there is an in-slab heating or cooling system, the applicant must:	✔	✔	✔

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

(iii) Thermal Comfort	Show on DA plans	Show on CC/CDC plans & specs	Certifier check
(aa) Install insulation with an R-value of not less than 1.0 around the vertical edges of the perimeter of the slab; or (bb) On a suspended floor, install insulation with an R-value of not less than 1.0 underneath the slab and around the vertical edges of the perimeter of the slab.			
(h) The applicant must construct the floors and walls of the development in accordance with the specifications listed in the table below.	✔	✔	✔

	Thermal loads	
Dwelling no.	**Area adjusted heating load (in mJ/m²/yr)**	**Area adjusted cooling load (in mJ/m²/yr)**
4103, 4104, 4203, 4204, 4303, 4304, 4G03, 4G04	32.0	25.3
4105, 4106, 4205, 4206, 4305, 4306, 4G05, 4G06	30.4	23.4
5102, 5103, 5104, 5105, 5106, 5202, 5203, 5204, 5205, 5206, 5302, 5303, 5304, 5305, 5306, 5G02, 5G03, 5G04, 5G05, 5G06	32.9	25.5
All other dwellings	17.9	23.5

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

(b) Common areas and central systems/facilities

(i) Water	Show on DA plans	Show on CC/CDC plans & specs	Certifier check
(a) If, in carrying out the development, the applicant installs a showerhead, toilet, tap or clothes washer into a common area, then that item must meet the specifications listed for it in the table.		✔	✔
(b) The applicant must install (or ensure that the development is serviced by) the alternative water supply system(s) specified in the "Central systems" column of the table below. In each case, the system must be sized, be configured, and be connected, as specified in the table.	✔	✔	✔
(c) A swimming pool or spa listed in the table must not have a volume (in kLs) greater than that specified for the pool or spa in the table.	✔	✔	
(d) A pool or spa listed in the table must have a cover or shading if specified for the pool or spa in the table.		✔	
(e) The applicant must install each fire sprinkler system listed in the table so that the system is configured as specified in the table.		✔	✔
(f) The applicant must ensure that the central cooling system for a cooling tower is configured as specified in the table.		✔	✔

Common area	Showerheads rating	Toilets rating	Taps rating	Clothes washers rating
All common areas	no common facility	no common facility	3 star	no common laundry facility

Central systems	Size	Configuration	Connection (to allow for...)
Central water tank - rainwater or stormwater (No. 1)	10000	To collect run-off from at least: - 1900 square metres of roof area of buildings in the development - 0 square metres of impervious area in the development - 0 square metres of garden/lawn area in the development - 0 square metres of planter box area in the development (excluding, in each case, any area which drains to, or supplies, any other alternative water supply system).	- irrigation of 930 square metres of common landscaped area on the site - car washing in 0 car washing bays on the site

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

(ii) Energy	Show on DA plans	Show on CC/CDC plans & specs	Certifier check
(a) If, in carrying out the development, the applicant installs a ventilation system to service a common area specified in the table below, then that ventilation system must be of the type specified for that common area, and must meet the efficiency measure specified.		✔	✔
(b) In carrying out the development, the applicant must install, as the "primary type of artificial lighting" for each common area specified in the table below, the lighting specified for that common area. This lighting must meet the efficiency measure specified. The applicant must also install a centralised lighting control system or Building Management System (BMS) for the common area, where specified.		✔	✔
(c) The applicant must install the systems and fixtures specified in the "Central energy systems" column of the table below. In each case, the system or fixture must be of the type, and meet the specifications, listed for it in the table.	✔	✔	✔

	Common area ventilation system		Common area lighting		
Common area	Ventilation system type	Ventilation efficiency measure	Primary type of artificial lighting	Lighting efficiency measure	Lighting control system/BMS
B1 carpark	ventilation (supply + exhaust)	carbon monoxide monitor + 2-speed fan	fluorescent	motion sensors	No
B2 carpark	ventilation (supply + exhaust)	carbon monoxide monitor + 2-speed fan	fluorescent	motion sensors	No
Lift car (No. 1)	-	-	light-emitting diode	connected to lift call button	No
Lift car (No. 2)	-	-	light-emitting diode	connected to lift call button	No

Central energy systems	Type	Specification
Lift (No. 1)	gearless traction with V V V F motor	Number of levels (including basement): 5
Lift (No. 2)	gearless traction with V V V F motor	Number of levels (including basement): 5

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

4. Commitments for common areas and central systems/facilities for the development (non-building specific)

(b) Common areas and central systems/facilities

(i) Water	Show on DA plans	Show on CC/CDC plans & specs	Certifier check
(a) If, in carrying out the development, the applicant installs a showerhead, toilet, tap or clothes washer into a common area, then that item must meet the specifications listed for it in the table.		✔	✔
(b) The applicant must install (or ensure that the development is serviced by) the alternative water supply system(s) specified in the "Central systems" column of the table below. In each case, the system must be sized, be configured, and be connected, as specified in the table.	✔	✔	✔
(c) A swimming pool or spa listed in the table must not have a volume (in kLs) greater than that specified for the pool or spa in the table.	✔	✔	
(d) A pool or spa listed in the table must have a cover or shading if specified for the pool or spa in the table.		✔	
(e) The applicant must install each fire sprinkler system listed in the table so that the system is configured as specified in the table.		✔	✔
(f) The applicant must ensure that the central cooling system for a cooling tower is configured as specified in the table.		✔	✔

Common area	Showerheads rating	Toilets rating	Taps rating	Clothes washers rating
All common areas	no common facility	no common facility	3 star	no common laundry facility

(ii) Energy	Show on DA plans	Show on CC/CDC plans & specs	Certifier check
(a) If, in carrying out the development, the applicant installs a ventilation system to service a common area specified in the table below, then that ventilation system must be of the type specified for that common area, and must meet the efficiency measure specified.		✔	✔
(b) In carrying out the development, the applicant must install, as the "primary type of artificial lighting" for each common area specified in the table below, the lighting specified for that common area. This lighting must meet the efficiency measure specified. The applicant must also install a centralised lighting control system or Building Management System (BMS) for the common area, where specified.		✔	✔
(c) The applicant must install the systems and fixtures specified in the "Central energy systems" column of the table below. In each case, the system or fixture must be of the type, and meet the specifications, listed for it in the table.	✔	✔	✔

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Notes

1. In these commitments, "applicant" means the person carrying out the development.
2. The applicant must identify each dwelling, building and common area listed in this certificate, on the plans accompanying any development application, and on the plans and specifications accompanying the application for a construction certificate / complying development certificate, for the proposed development, using the same identifying letter or reference as is given to that dwelling, building or common area in this certificate.
3. This note applies if the proposed development involves the erection of a building for both residential and non-residential purposes (or the change of use of a building for both residential and non-residential purposes). Commitments in this certificate which are specified to apply to a "common area" of a building or the development, apply only to that part of the building or development to be used for residential purposes.
4. If this certificate lists a central system as a commitment for a dwelling or building, and that system will also service any other dwelling or building within the development, then that system need only be installed once (even if it is separately listed as a commitment for that other dwelling or building).
5. If a star or other rating is specified in a commitment, this is a minimum rating.
6. All alternative water systems to be installed under these commitments (if any), must be installed in accordance with the requirements of all applicable regulatory authorities. NOTE: NSW Health does not recommend that stormwater, recycled water or private dam water be used to irrigate edible plants which are consumed raw, or that rainwater be used for human consumption in areas with potable water supply.

Legend

1. Commitments identified with a "✔" in the "Show on DA plans" column must be shown on the plans accompanying the development application for the proposed development (if a development application is to be lodged for the proposed development).
2. Commitments identified with a "✔" in the "Show on CC/CDC plans and specs" column must be shown in the plans and specifications accompanying the application for a construction certificate / complying development certificate for the proposed development.
3. Commitments identified with a "✔" in the "Certifier check" column must be certified by a certifying authority as having been fulfilled. (Note: a certifying authority must not issue an occupation certificate (either interim or final) for a building listed in this certificate, or for any part of such a building, unless it is satisfied that each of the commitments whose fulfilment it is required to monitor in relation to the building or part, has been fulfilled).

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Bushfire Protection Assessment

Proposed Residential Development: Jordan Springs – Parkland Estates – Stage 1

Prepared for
Synergy Development Group

3 February 2015







Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

DOCUMENT TRACKING

Item	Detail
Project Name	Bushfire Protection Assessment, Proposed Residential Development, Jordan Springs – Parkland Estates – Stage 1
Project Number	14GOSBUS-0143
Prepared by	Josh Calandra
Approved by	David Peterson
Status	FINAL
Version Number	2
Last saved on	3 February 2015

ACKNOWLEDGEMENTS

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Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Contents

1 Property and proposal 1
1.1 Introduction 1
1.2 Location and description of subject land 1
1.3 Description of proposal 1

2 Bushfire threat assessment 6
2.1 Assessment requirements 6
2.2 Vegetation types and slopes 6

3 Bushfire protection measures 7

4 APZ maintenance plan 8

5 Construction standard 8

6 Water supply 9

7 Gas and electrical supplies 9

8 Access and egress 9

9 Fire trails 11

10 Assessment of environmental issues 13

11 Bushfire maintenance plans and fire emergency procedures 13

12 Recommendations and conclusion 14
12.1 Recommendations 14
12.2 Conclusion 15

References 16

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Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

List of Figures

Figure 1: Location Plan for Parkland Estates Stage 1 2

Figure 2: Development layout for Parkland Estates Stage 1 3

Figure 3: Bushfire Hazard Assessment and APZs for Parkland Estates Stage 1 4

Figure 4: BALs for Parkland Estates Stage 1 5

List of Tables

Table 1: APZ calculation 7

Table 2: Performance criteria for proposed public roads*[1] 10

Table 3: Performance criteria for fire trails*2 12

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Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

1 Property and proposal

Name:	Synergy Development Group		
Street or property Name:	Jordan Springs – Parklands Estate – Stage 1		
Suburb, town or locality:	Jordan Springs	**Postcode:**	2747
Lot/DP no:	Lots 3989 & 3991 DP 1190132		
Local Government Area:	Penrith City Council		
Type of development:	Residential development (apartment blocks)		

1.1 Introduction

Synergy Development Group, on behalf of their client CID Group, commissioned Eco Logical Australia Pty Ltd (ELA) to prepare a bushfire protection assessment (BPA) for the proposed Stage 1 of the Parkland Estates residential development. This extends over the east portion of Village Centre 2 (VC2) and all of Village Centre 3 (VC3) in the form of 5 medium density apartment blocks within Lots 3989 & 3991 DP 1190132 of Jordan Springs (hereafter referred to as the subject land).

This assessment has been prepared by the ELA Bushfire Consultant Josh Calandra (FPAA BPAD-D Certified Practitioner No. BPD-PD-23276). Josh is recognised by the NSW Rural Fire Service as a suitably qualified consultant in bushfire risk assessment.

The bushfire protection requirements for residential subdivision throughout Jordan Springs (formerly known as the Western Precinct) have been previously determined and approved at the Precinct Plan stage as described within the report '*Bushfire Protection Assessment – St Marys Western and Central Precincts*' prepared by BES (2009). This assessment follows and builds upon the findings of the initial bushfire report.

1.2 Location and description of subject land

The Parklands Estate is located approximately 3.4 kilometres east of the Nepean River and 2.9 kilometres north east of the Penrith CBD. The site is bounded to the north and east by land that is in varying stages of development for the Jordan Springs residential community. It is bounded in all other directions by Wianamatta Regional Park frontages. The subject land is located in the Local Government Area of Penrith City Council and has a Fire Danger Index (FDI) of 100.

The location is shown in **Figure 1**.

1.3 Description of proposal

The proposal for Stage 1 of Parklands Estate is to establish 5 apartment blocks ranging in height from 4-8 stories across the east of VC2 and all of VC3 with associated infrastructure and public open space. The proposed apartment blocks are B1 Castlereagh 4 stories, B2 Cumberland 8 stories, B3 Woodland 6 stories and B4 & B5 Dillwynia 4 stories.

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Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

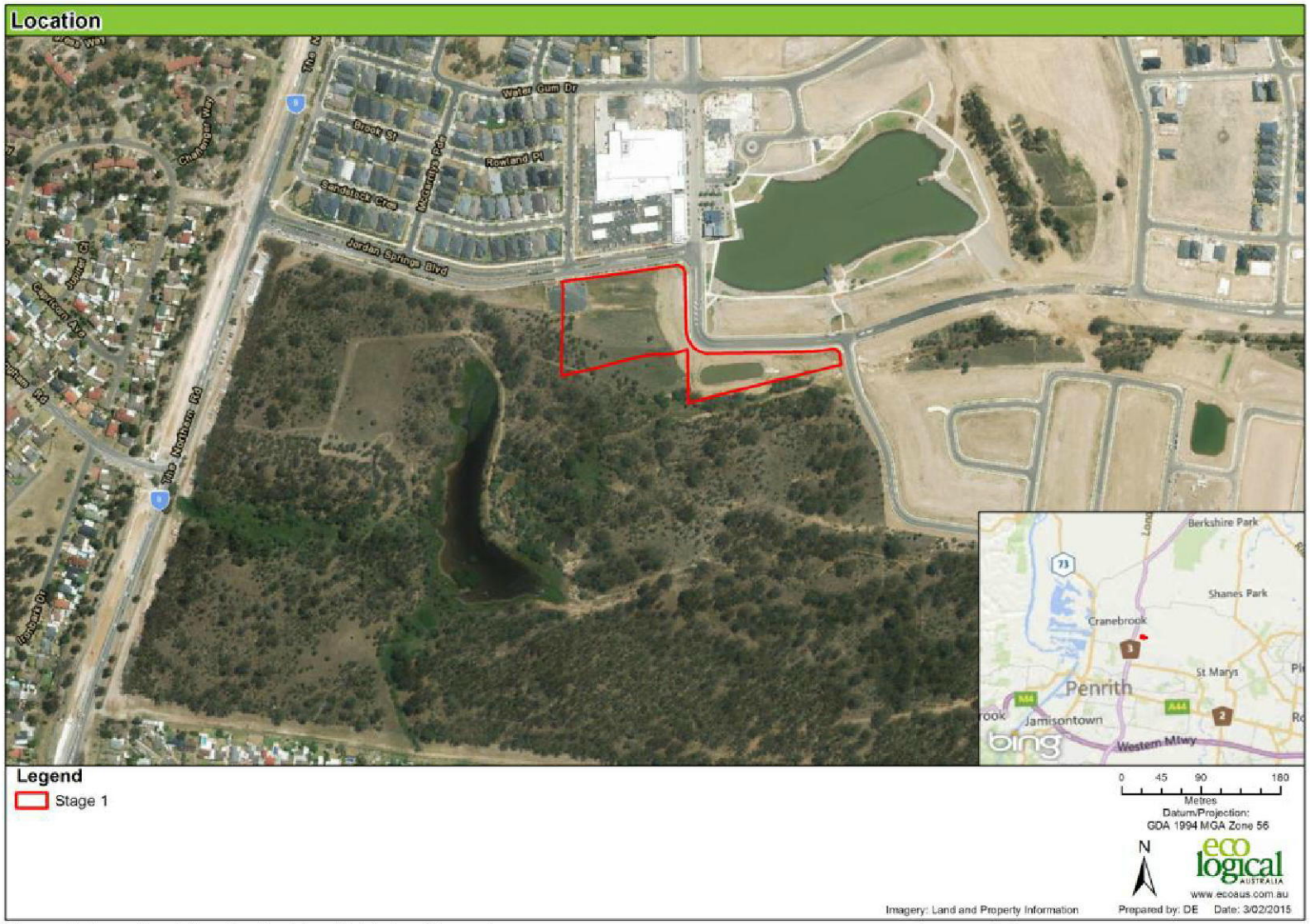

Figure 1: Location Plan for Parkland Estates Stage 1

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Version: 1, Version Date: 27/02/2015



Figure 2: Development layout for Parkland Estates Stage 1

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Version: 1, Version Date: 27/02/2015

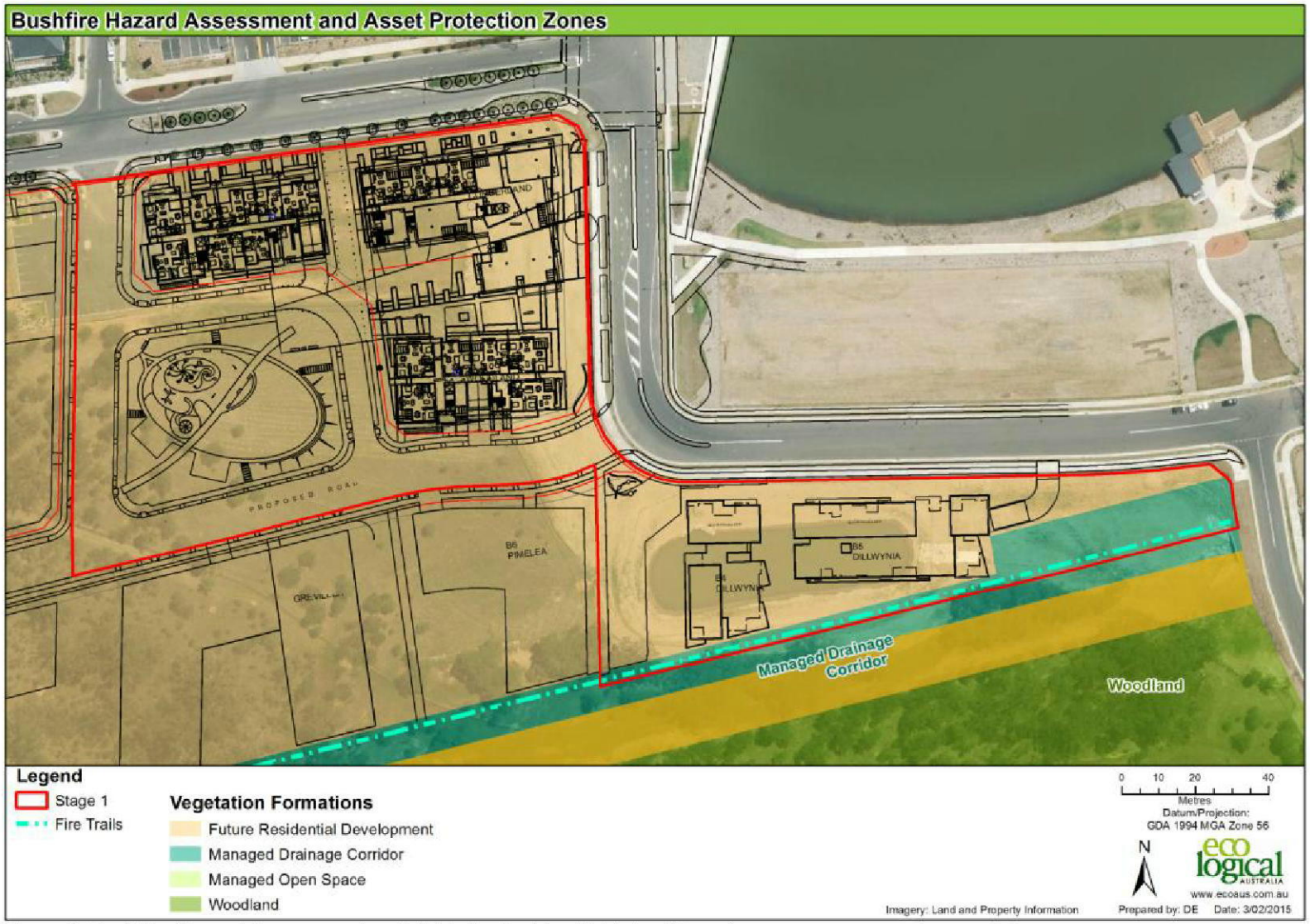

Figure 3: Bushfire Hazard Assessment and APZs for Parkland Estates Stage 1

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Version: 1, Version Date: 27/02/2015

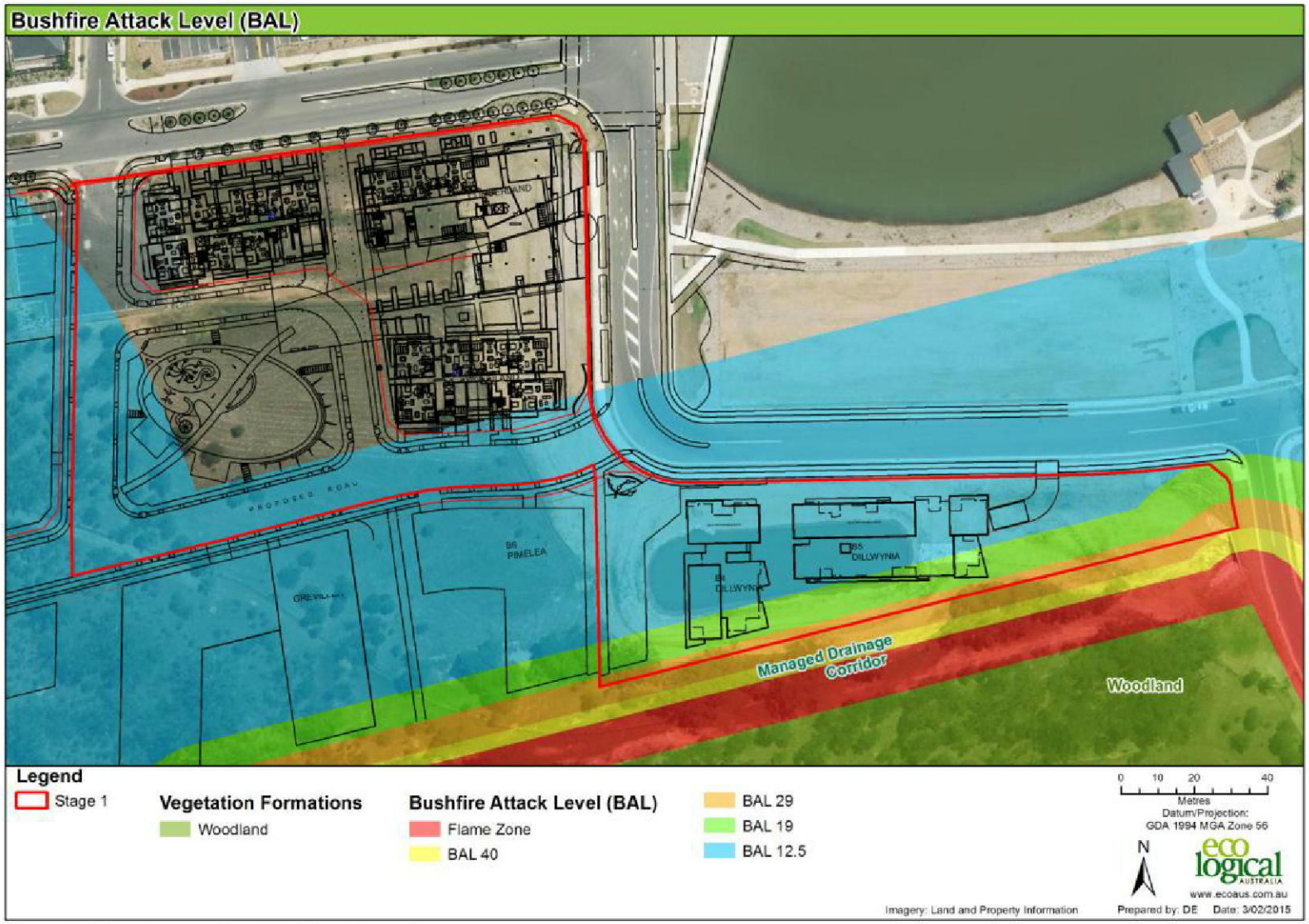

Figure 4: BALs for Parkland Estates Stage 1

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Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

2 Bushfire threat assessment

2.1 Assessment requirements

The Parkland Estates is identified as Bush Fire Prone Land by Penrith City Council. The following assessment is prepared in accordance with Section 100B of the *Rural Fires Act 1997*, Clause 44 of the *Rural Fires Regulation 2008*, and '*Planning for Bush Fire Protection* 2006' (RFS 2006) herein referred to as PBP.

The assessment also adopts the recommendations approved within the Precinct Plan relating to bushfire protection described within the report '*Bushfire Protection Assessment – St Marys Western and Central Precincts*' prepared by BES (2009). This assessment follows and builds upon the findings of the initial bushfire report.

2.2 Vegetation types and slopes

The vegetation and slope have been assessed in all directions from the proposed development. In accord with PBP the predominant vegetation class has been calculated for a distance of at least 140 metres out from the boundary of the subject land and the slope class *"most significantly affecting fire behaviour having regard for vegetation found [on it]"* determined for a distance of at least 100 metres in all directions. The predominant vegetation and effective slope assessments are shown in **Table 1**.

The land to the north is managed as part of the existing Jordan Springs residential development. The land to the east has been cleared and is under construction for Village 4.

To the south of VC2 and VC3 there is a proposed managed drainage corridor and beyond this within Lot 3993 is an area of Open Space (managed lands) that has been designated for community use. These areas are suitable for use as Asset Protection Zones (APZs) to provide separation from the hazard areas within the adjoining Regional Park. The drainage corridor has been designed to comply with an APZ through the mass planting of native grasses and sparse tree planting. The future plan of management for the drainage corridor will stipulate the management regime to keep the grasses consistent with acceptable APZ fuel loads.

The vegetation to the northwest is vegetation classified under PBP as 'Woodland' occurring within the Wianamatta Regional Park and is a significant bushfire hazard. The vegetation to the west is a remnant dam which is currently either not vegetated or has highly disturbed vegetation that is classified under PBP as 'Freshwater Wetland' which is considered to have the same fuel loads as 'Scrub' for BAL assessment purposes. Both of these hazards are occurring greater than 100 metres from the proposed development at Stage 1.

The vegetation classifications provided above are consistent with the bushfire assessment (BES 2009) approved as part of the Precinct Plan.

The hazards to the south and west fall within the PBP slope classification of 'Downslope of 0-5 degrees'. The hazard to the northwest falls within the PBP slope classification of 'All upslopes and flat lands'.

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Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

3 Bushfire protection measures

Table A2.4 of PBP and Table 2.4.2 of *AS 3959-2009 Construction of buildings in bushfire-prone areas* (AS 3959) have been used to determine the width of Asset Protection Zones (APZ) for the proposed development. **Table 1** below shows the APZ calculation and the locations of APZs are shown in **Figure 3**.

All APZs meet or exceed the Acceptable Solution APZ dimension required by PBP for residential subdivision and ensure that no residential dwelling will be exposed to greater than BAL-29 under AS 3959.

Table 1: APZ calculation

Direction	Slope[1]	Vegetation[2]	PBP APZ[3]	Proposed APZ	Comment
South	Downslope >0-5º	Woodland	15 m	> 25 m	A minimum 25 metre drainage corridor and minimum 4 metre wide fire trail provide an adequate APZ
Northwest	Upslope	Woodland	10 m	> 100 m	The road reserve and land cleared for residential development provides an adequate APZ
West	Downslope >0-5º	Freshwater Wetland	10 m	> 100 m	

All other directions are existing or proposed infrastructure and residential developments

[1] Slope most significantly influencing the fire behaviour of the site having regard to vegetation found. Slope classes are according to PBP.

[2] Predominant vegetation is identified, according to PBP and *"Where a mix of vegetation types exist the type providing the greater hazard is said to be predominate".*

[3] Assessment according to PBP.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

4 APZ maintenance plan

The proposed APZ area is to be managed as follows:

- No tree or tree canopy is to occur within 2 metres of future buildings;
- The presence of a few shrubs or trees in the APZ is acceptable provided that they:
    - are well spread out and do not form a continuous canopy;
    - are not species that retain dead material or deposit excessive quantities of ground fuel in a short period or in a danger period; and
    - are located far enough away from future buildings so that they will not ignite the buildings by direct flame contact or radiant heat emission.
- Any landscaping or plantings should preferably be local endemic mesic species or other low flammability species;
- A minimal ground fuel is to be maintained to include less than 4 tonnes per hectare of fine fuel (*fine fuel* means ANY dead or living vegetation of <6 mm in diameter *e.g.* twigs less than a pencil in thickness. 4 t/ha is equivalent to a 1 cm thick layer of leaf litter); and
- Any structures storing combustible materials such as firewood (*e.g.* sheds) must be sealed to prevent entry of burning debris.

5 Construction standard

The building construction standard is based on the determination of the Bushfire Attack Level (BAL) in accordance with Method 1 of AS 3959-2009 'Construction of Buildings in Bushfire Prone Areas'. The BAL is based on known vegetation type, effective slope and managed separation distance between the development and the bushfire hazard.

The BALs that are relevant to this development are shown in **Figure 4** with the apartment blocks B1 Castlereagh and B2 Cumberland having BAL-LOW construction requirements, apartment block B3 Woodland exposed to a maximum of BAL-12.5 construction requirements and the apartment blocks B4 & B5 Dillwynia being exposed to a maximum of BAL-19 to BAL-12.5 construction requirements.

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Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

6 Water supply

The subject land is to be serviced by reticulated water. The furthest point from any future buildings to a hydrant is to be less than 90 metres. The reticulated water supply is to comply with the following acceptable solutions within Section 4.1.3 of PBP:

- Reticulated water supply to urban subdivisions uses a ring main system for areas with perimeter roads;
- Fire hydrant spacing, sizing and pressures comply with AS 2419.1 – 2005. Where this cannot be met, the RFS will require a test report of the water pressures anticipated by the relevant water supply authority. In such cases, the location, number and sizing of hydrants shall be determined using fire engineering principles;
- Hydrants are not located within any road carriageway;
- All above ground water and gas service pipes external to the building are metal, including and up to any taps; and
- The [PBP] provisions of parking on public roads are met.

7 Gas and electrical supplies

In accordance with PBP, electricity should be underground wherever practicable. Where overhead electrical transmission lines are installed:

- Lines are to be installed with short pole spacing, unless crossing gullies, and
- No part of a tree should be closer to a powerline than the distance specified in "*Guideline for managing vegetation near power lines*" issued by Department of Energy, Utilities and Sustainability (ISSC 3, December 2005).

Any gas services are to be installed and maintained in accordance with AS/NZS 1596:2008 (Standards Australia 2008).

8 Access and egress

The stage 1 of Parklands Estate is accessed via Jordan Springs Boulevard to the north and Lakeside Drive to the east. The proposed public road layout within the subdivision and its linkages to existing and future surrounding roads complies with PBP as listed within **Table 2** on the following page.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table 2: Performance criteria for proposed public roads*[1]

Performance Criteria	Acceptable Solutions
The intent may be achieved where:	
• firefighters are provided with safe all weather access to structures (thus allowing more efficient use of firefighting resources)	• public roads are two-wheel drive, all weather roads
• public road widths and design that allows safe access for firefighters while residents are evacuating an area	• urban perimeter roads are two-way, that is, at least two traffic lane widths (carriageway 8 metres minimum kerb to kerb), allowing traffic to pass in opposite directions. Non perimeter roads comply with Table 4.1 – Road widths for Category 1 Tanker (Medium Rigid Vehicle) requiring a minimum 6.5 m trafficable width. • the perimeter road is linked to the internal road system at an interval of no greater than 500 metres in urban areas • traffic management devices are constructed to facilitate access by emergency services vehicles • public roads have a cross fall not exceeding 3 degrees • public roads are through roads. Dead end roads are not recommended, but if unavoidable, dead ends are not more than 200 metres in length, incorporate a minimum 12 metres outer radius turning circle, and are clearly sign posted as a dead end and direct traffic away from the hazard • curves of roads (other than perimeter roads) are a minimum inner radius of six metres • maximum grades for sealed roads do not exceed 15 degrees and an average grade of not more than 10 degrees or other gradient specified by road design standards, whichever is the lesser gradient • there is a minimum vertical clearance to a height of four metres above the road at all times
• the capacity of road surfaces and bridges is sufficient to carry fully loaded firefighting vehicles	• the capacity of road surfaces and bridges is sufficient to carry fully loaded firefighting vehicles (approximately 15 tonnes for areas with reticulated water, 28 tonnes or 9 tonnes per axle for all other areas). Bridges clearly indicated load rating
• roads that are clearly sign posted (with easy distinguishable names) and buildings / properties that are clearly numbered	• public roads greater than 6.5 metres wide to locate hydrants outside of parking reserves to ensure accessibility to reticulated water for fire suppression • public roads between 6.5 metres and 8 metres wide are No Parking on one side with the services (hydrants) located on this side to ensure accessibility to reticulated water for fire suppression
• there is clear access to reticulated water supply	• public roads up to 6.5 metres wide provide parking within parking bays and located services outside of the parking bays to ensure accessibility to reticulated water for fire suppression • one way only public access roads are no less than 3.5 metres wide and provide parking within parking bays and located services outside of the parking bays to ensure accessibility to reticulated water for fire suppression
• parking does not obstruct the minimum paved width	• parking bays are a minimum of 2.6 metres wide from kerb to kerb edge to road pavement. No services or hydrants are located within the parking bays • public roads directly interfacing the bush fire hazard vegetation provide roll top kerbing to the hazard side of the road

*[1] PBP page 21

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

9 Fire trails

There is a proposed maintenance access way between the drainage corridor and the southern boundary of the development. The access way will comply with the PBP deemed-to-satisfy approach for fire trails as listed in **Table 3** below, the fire trail location is shown in **Table 3**.

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Version: 1, Version Date: 27/02/2015

Table 3: Performance criteria for fire trails*2

Performance Criteria	Acceptable Solutions
The intent may be achieved where:	
▪ the width and design of the fire trails enables safe and ready access for firefighting vehicles	▪ a minimum carriageway width of four metres with an additional one metre wide strip on each side of the trail (clear of bushes and long grass is provided ▪ the trail is a maximum grade of 15 degrees if sealed and not more than 10 degrees if unsealed ▪ a minimum vertical clearance of four metres to any overhanging obstructions, including tree branches is provided ▪ the crossfall of the trail is not more than 10 degrees ▪ the trail has the capacity for passing by: - reversing bays using the access to properties to reverse fire tankers, which are six metres wide and eight metres deep to any gates, with an inner minimum turning radius of six metres and outer minimum radius of 12 metres; and / or - a passing bay every 200 metres, 20 metres long by three metres wide, making a minimum trafficable width of seven metres at the passing bay ▪ *Note: Some short construction in the access may be accepted where they are not less than the minimum (3.5m) and extend for no more than 30m and where obstruction cannot be reasonably avoided or removed*
▪ fire trails are trafficable under all weather conditions. Where the fire trail joins a public road, access shall be controlled to prevent use by non-authorised persons	▪ the fire service is accessible to firefighters and maintained in a serviceable condition by the owner of the land ▪ appropriate drainage and erosion controls are provided ▪ the fire trail system is connected to the property access road and / or to the through road system at frequent intervals of 200 metres or less ▪ fire trails do not traverse a wetlands or other land potentially subject to periodic inundation (other than a flood or storm surge) ▪ gates for fire trails are provided and locked with a key / lock system authorized by the local RFS
▪ fire trails designed to prevent weed infestation, soil erosion and other land degradation	▪ fire trail does not adversely impact on natural hydrological flows ▪ fire trail design acts as an effective barrier to the spread of weeds and nutrients ▪ fire trail construction does not expose acid-sulphate soils

*[2] PBP page 25

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

10 Assessment of environmental issues

PBP requires that known significant environmental features, threatened species or Aboriginal relics identified under the *Threatened Species Conservation Act 1995* or the *National Parks Act 1974* that will affect or be affected by the development be addressed in this report.

A Species Impact Statement for the Parklands Estate development encompassing Stage 1 prepared by Cumberland Ecology and dated 2014 has determined the following:

"*The proposed development of the subject site will remove a total of 5.07 ha of Cumberland Plain Woodland (CPW) in the form of mature CPW (1.81 ha), regenerating CPW (1.30 ha) and low diversity Derived Native Grassland (1.96 ha). However, and with due consideration of the restricted distribution of this Critically Endangered Ecological Community (CEEC) in the region, the proposed development is not likely to have a significant impact on CPW such that the large and viable representatives in the Regional Park would be placed at risk of extinction.*

The mature and regenerating CPW and to a lesser extent, the low diversity Derived Native Grassland, to be cleared for the proposed development provide an area of potential habitat for threatened plants and animals, primarily the Cumberland Plain Land Snail. However, when directly compared with the habitats of the Regional Park, this area of habitat is considered to be degraded and of a lesser importance due to the increased level of disturbance, sparse nature and its comparatively small size. Therefore, the loss of this habitat within the proposed development area is not considered to be significant.

The impact of the proposal will be more than balanced by the major conservation outcome resulting from of the creation of the 900ha Regional Park. The Regional Park comprises CPW of quality and scale in a consolidated land holding, to be transferred into public ownership and subject to a Plan of Management. When weighed against the conservation benefits, both direct and indirect, that will be derived from the 900ha Regional Park, together with the various mitigation measures afforded by the management strategies for weeds, feral and domestic animals and macrofauna, the relatively small areas of vegetation to be cleared as a result of the proposal are considered to be of minor consequence. The proposal is unlikely to result in any threatened species or ecological community becoming extinct."

Penrith City Council is the determining authority for this infill development; they will assess more thoroughly any potential environmental and heritage issues.

11 Bushfire maintenance plans and fire emergency procedures

The areas determined to provide the required separation distances (APZ's) from the hazard are to be maintained in perpetuity for the life of the subdivision following the fuel management guide listed in Section 4.

The future occupants of apartments will be responsible for their own emergency management strategies.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

12 Recommendations and conclusion

12.1 Recommendations

The following recommendations have been made within this report to ensure the proposed development is compliant with Section 100B of the *Rural Fires Act 1997*, Clause 44 of the *Rural Fires Regulation 2008*, and '*Planning for Bush Fire Protection 2006'* (RFS 2006):

Recommendation 1- Asset protection zones are to be provided to the proposed development as listed in **Table 1** and shown in **Figure 3**;

Recommendation 2- Asset protection zone landscaping is to comply with the NSW Rural Fire Service document '*Planning for Bush Fire Protection 2006'* inner protection area requirements as listed in Appendix 2 Section A2.2 of PBP and guided by the fuel management principles listed in Section 4 of this report;

Recommendation 3- Landscaping across the subdivision is to comply with the principles listed in Appendix 5 of the NSW Rural Fire Service document *'Planning for Bush Fire Protection 2006'*;

Recommendation 4- The BALs that are relevant to this development are shown in **Figure 4** with the apartment blocks B1 Castlereagh and B2 Cumberland having BAL-LOW construction requirements, apartment block B3 Woodland exposed to a maximum of BAL-12.5 construction requirements and the apartment blocks B4 & B5 Dillwynia being exposed to a maximum of BAL-19 to BAL-12.5 construction requirements;

Recommendation 5- A hydrant water supply should be installed in accordance with Australian Standard AS 2419.1 where it can be within 90 metres of the entire building envelope;

Recommendation 6- Electrical services should be underground and if overhead lines are used, overhanging branches should be trimmed according to "*Guideline for managing vegetation near power lines*" issued by Department of Energy, Utilities and Sustainability (ISSC 3, December 2005);

Recommendation 7 Gas services are to be installed and maintained in accordance with AS/NZS 1596:2008 (Standards Australia 2008); and

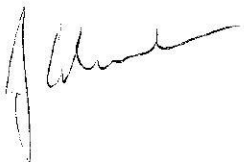
Recommendation 8- Public roads are to comply with the NSW Rural Fire Service document '*Planning for Bush Fire Protection 2006*' as listed in **Table 2** of this report; and

Recommendation 9- The access way between the drainage corridor and the development is to comply with the PBP fire trail standards as listed in **Table 3** of this report.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

12.2 Conclusion

In the author's professional opinion the bushfire protection requirements listed in this assessment provide an adequate standard of bushfire protection for the proposed development. The proposal is consistent with the intent of '*Planning for Bush Fire Protection'* (RFS 2006) and appropriate for the issue of a Bush Fire Safety Authority.



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Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

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Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Appendix A

Elemental Cost Estimate Summary

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Elemental Summary

Jordan Springs Boulevard, Jordan Springs

Code	Item	%	Cost ($) / m2	Total Cost ($)
PR	Preliminaries	12.95	188	6,795,258
AR	Demolition - Vacant	0.00	0	-
XP	Site Preparation	0.04	1	22,616
SB	Substructure (Shoring, Excavation & Basement structure)	19.51	284	10,239,251
CL	Columns	1.57	23	821,721
UF	Upper floors	8.26	120	4,334,765
SC	Staircases	1.58	23	829,259
RF	Roof	1.67	24	873,681
EW	External Walls	10.06	146	5,277,066
WW	Windows	2.25	33	1,182,727
ED	External Doors	0.81	12	424,328
NW	Internal Walls	3.43	50	1,799,402
NS	Internal Screens	0.51	7	268,381
ND	Internal Doors	1.38	20	722,644
WF	Wall Finishes	3.35	49	1,760,112
FF	Floor Finishes	2.62	38	1,372,827
CF	Ceiling Finishes	1.61	23	842,531
FT	Fitments	5.14	75	2,699,431
PB	Hydraulic Services (incl. External Services)	5.73	83	3,008,209
AC	Mechanical Services (Basement and wet areas Ventilation, Air Conditioning if applicable)	1.96	29	1,030,856
FP	Fire Services	1.67	24	873,896
LP	Electrical Services	3.44	50	1,805,575
TS	Transportation Services (Lifts, Escalators and the like)	1.22	18	640,791
SS	Special Services (Rubbish Chute, Compactor and the like)	0.20	3	105,542
XR/XN	Siteworks (Boundary walls, Fencing and Gates, etc.)	0.27	4	143,236
XL	Landscaping and Improvements	0.44	6	229,931
BM	Builder's Margin	6.31	92	3,312,943
	Total Construction Cost (excl. GST)			**51,416,981**
	Add Consultants Fees	2.01	29	1,055,495
	Sub-total (excl. GST)	100.00	1,453	52,472,476
	Add Internal Road Allowance			3,000,000
	Total Development Cost (excl. GST)			**55,472,476**
	Add GST			5,547,248
	Total Development Cost (incl. GST)			61,019,724

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Appendix B

Council Schedule

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Appendix C

Schedule of Finishes

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Proposed Mixed Use Development

Parkland Estate

At Jordan Springs Boulevard, Jordan Springs

ASSUMED SCHEDULE OF FINISHES

RESIDENTIAL FIXTURES AND FINISHES

Kitchen Appliances	
Cabinet and Cook top	Gas cook top
Wall Oven	Electric multi-function
Rangehood	Re-circulating
Dishwasher	Free-standing
Sink/ Mixer tap	Stainless Steel 1& ½ bowl
Laundry Fittings	
Clothes Dryer	3.5kg basic
Laundry Tub	45 Liter tub / cabinet
Tapware	
Kitchen	Single Lever Mixer / chrome
Vanity Units	Chrome
Bath	Chrome
Shower	Chrome
Bathroom Fittings	
Main Bathroom	Standard
Ensuite	Standard
Shower Screens	Powdercoated aluminum frame / safety glass
Mirror	Wall mounted mirror above each vanity unit
Bathroom Sanitary ware	
Bath	Stylus acrylic bath
WC Suites	Vitreous China Suite with 6/3 dual flush
Vanity Unit	Laminated top with Semi-recessed basin
Internal finishes and Fittings	
Cornices	Standard Cove
Internal Doors	Hollow core - plain
Front Doors	Basic feature
Door Handles	Lockset to entry doors
	Metal lever to internal doors
Kitchen	Stone benchtop and laminated doors
Wardrobes	Mirrored doors
Walls	Plasterboard / painted
Ceilings	Plasterboard / painted
Blinds	Excluded

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Floor Finishes

Living / Dining	Carpet
Bedrooms	Carpet
Kitchen	Ceramic tiles
Laundry	Ceramic tiles
Bathroom / Ensuite	Ceramic tiles
Balcony	Ceramic tiles

Fixtures

Hot water unit	Gas
Intercom	Audio intercom
Air conditioning	Split system / 1 per unit
Transportation	Lifts

COMMERCIAL / RETAIL FINISHES

Floors	Concrete slab
Internal Walls	Face masonry
Ceiling / light fittings	Excluded
Shop front / Glazing	Powdercoated aluminum frame / commercial grade
Air conditioning	Excluded

BUILDING EXTERIOR

External walls	Refer to Architectural Drawings
Windows and sliding doors	Powdercoat / aluminum framed
Handrails / balustrades	Powdercoated metal / glass infills
Roof	Refer to architectural drawings
Main garage door	Overhead / automatic
Driveway / paths	Concrete Paving
Letterboxes	Powdercoated classic

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Appendix D

Indicative Area Schedule

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Indicative Area Analysis

Jordan Springs Boulevard, Jordan Springs
Basement for Buildings 1, 2 & 3 + Building 1

Building Level	Description	No	F.E.C.A* (m2)	U.C.A** (m2)	G.F.A*** Total (m2)
Basement 2	Parking	144	4,413		4,413
Basement 1	Parking	119	4,413		4,413
GF	Units	8	590		590
GF	Common Area		171	23	194
L1	Units	9	714	145	859
L1	Common Area		120		120
L2	Units	9	714	145	859
L2	Common Area		120		120
L3	Units	7	570	108	678
L3	Common Area		106		106
Total		**33**	**11,932**	**421**	**12,352**

*F.E.C.A (Fully Enclosed Covered Area): The sum of all such areas at all building floor levels, including basements (except unexcavated portions), floored roof spaces and attics, garages, penthouses, enclosed porches and attached enclosed covered ways alongside building, equipment rooms, lift shafts, vertical ducts, staircases and any other fully enclosed spaces and useable areas of the building, computed by measuring from the normal inside face of exterior walls but ignoring any projections such as plinths, columns, piers and the like which project from the normal inside face of exterior walls. It shall not include open courts, light wells, connecting or isolated covered ways and net open areas of upper portions of rooms, lobbies, halls interstitial spaces and the like which extend through the storey being computed.

**U.C.A (Unenclosed Covered Area): The sum of all such areas at all building floor levels, including roofed balconies, open verandahs, porches and porticos, attached open covered ways alongside buildings, undercrofts and useable space under buildings, unenclosed access galleries (including ground floor) and any other trafficable covered areas of the building which are not totally enclosed by full height walls, computed by measuring the area between the enclosing walls or balustrade (ie. from the inside face of the UCA excluding the wall or balustrade thickness). When the covering element (ie. roof or upper floor) is supported by columns, is cantilevered or is suspended, or any combination of these, the measurements shall be taken to the edge of the paving or to the edge of the cover, whichever is the lesser. UCA shall not include eaves overhangs, sun shading, awnings and the like where these do not relate to clearly defined trafficable covered areas, nor shall it include connecting or isolated covered ways.

*** G.F.A (Gross Floor Area): The sum of the 'Fully Enclosed Covered Area' and 'Unenclosed Covered Area' as defined.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Indicative Area Analysis

Jordan Springs Boulevard, Jordan Springs

Building 2

Building Level	Description	No	F.E.C.A* (m2)	U.C.A** (m2)	G.F.A*** Total (m2)
GF	Commercial	4	616		616
GF	Units	3	244	48	292
GF	Common Area		267	108	375
L1	Units	12	1,016	202	1,218
L1	Common Area		163		163
L2	Units	12	1,016	202	1,218
L2	Common Area		163		163
L3	Units	12	1,016	202	1,218
L3	Common Area		163		163
L4	Units	12	999	194	1,193
L4	Common Area		163		163
L5	Units	12	935	145	1,080
L5	Common Area		163		163
Total		**63**	**6,925**	**1,101**	**8,026**

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Indicative Area Analysis

Jordan Springs Boulevard, Jordan Springs

Building 3

Building Level	Description	No	F.E.C.A* (m2)	U.C.A** (m2)	G.F.A*** Total (m2)
GF	Units	6	478	109	587
GF	Common Area		172	27	199
L1	Units	7	609	117	726
L1	Common Area		109		109
L2	Units	7	609	117	726
L2	Common Area		109		109
L3	Units	7	609	117	726
L3	Common Area		109		109
L4	Units	7	601	119	720
L4	Common Area		109		109
L5	Units	7	592	76	668
L5	Common Area		109		109
Total		**41**	**4,217**	**682**	**4,899**

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Indicative Area Analysis

Jordan Springs Boulevard, Jordan Springs

Basement for Buildings 4 & 5 + Building 4

Building Level	Description	No	F.E.C.A* (m2)	U.C.A** (m2)	G.F.A*** Total (m2)
Basement 2	Parking	55	1,998		1,998
Basement 1	Parking	53	2,023		2,023
GF	Units	6	478	110	588
GF	Common Area		81	9	90
L1	Units	6	478	97	575
L1	Common Area		75		75
L2	Units	6	478	97	575
L2	Common Area		75		75
L3	Units	6	478	97	575
L3	Common Area		75		75
Total		**24**	**6,239**	**409**	**6,648**

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Indicative Area Analysis

Jordan Springs Boulevard, Jordan Springs

Building 5

Building Level	Description	No	F.E.C.A* (m2)	U.C.A** (m2)	G.F.A*** Total (m2)
GF	Units	10	768	162	930
GF	Common Area		118	15	133
L1	Units	10	768	144	912
L1	Common Area		127		127
L2	Units	10	768	144	912
L2	Common Area		127		127
L2	Units	10	768	144	912
L2	Common Area		127		127
Total		**40**	**3,570**	**608**	**4,178**

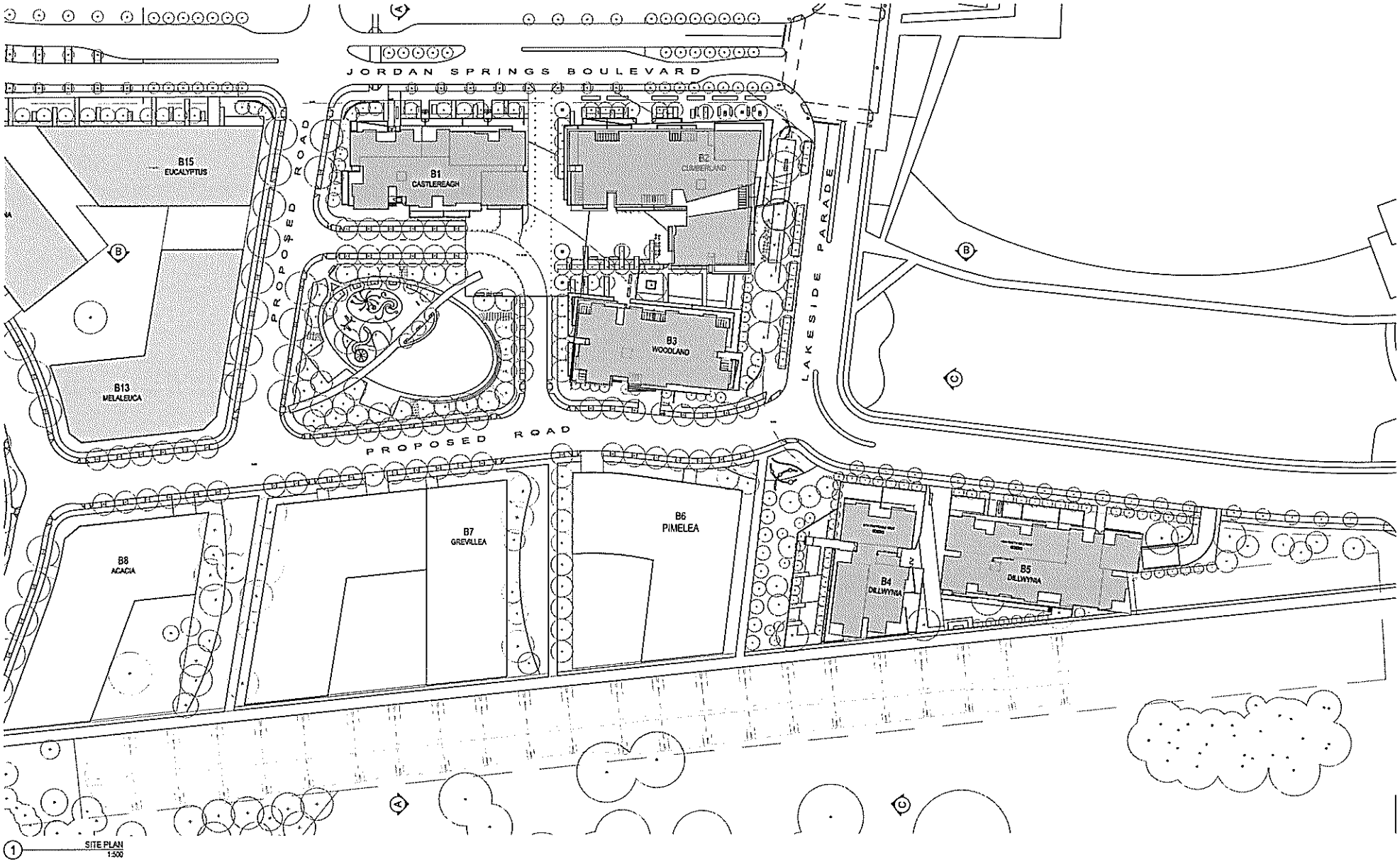
Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Appendix E

Reduced Architectural Drawings

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015



1 SITE PLAN
1:500

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- larger scale drawings and written dimensions have preference
- do not scale from drawing
- all dimensions to be checked on site before commencement of work
- all discrepancies to be brought to the attention of the author

Notes

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CID GROUP

SYNERGY DEVELOPMENT GROUP

issue	details	by	date
A	DEVELOPMENT APPLICATION STAGE 1	SB	13.02.15

amendments

project
PARKLANDS ESTATE

location
Jordan Springs Boulevard
JORDAN SPRINGS

project co-ordinator
SYNERGY DEVELOPMENT GROUP
client
CID GROUP
drawing title
SITE PLAN

date	checked	project arch	drawn
30.09.14		SB	SB
scale	no		issue
	14016 AP04		A

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p 02 9601 3244 f 02 9601 6336
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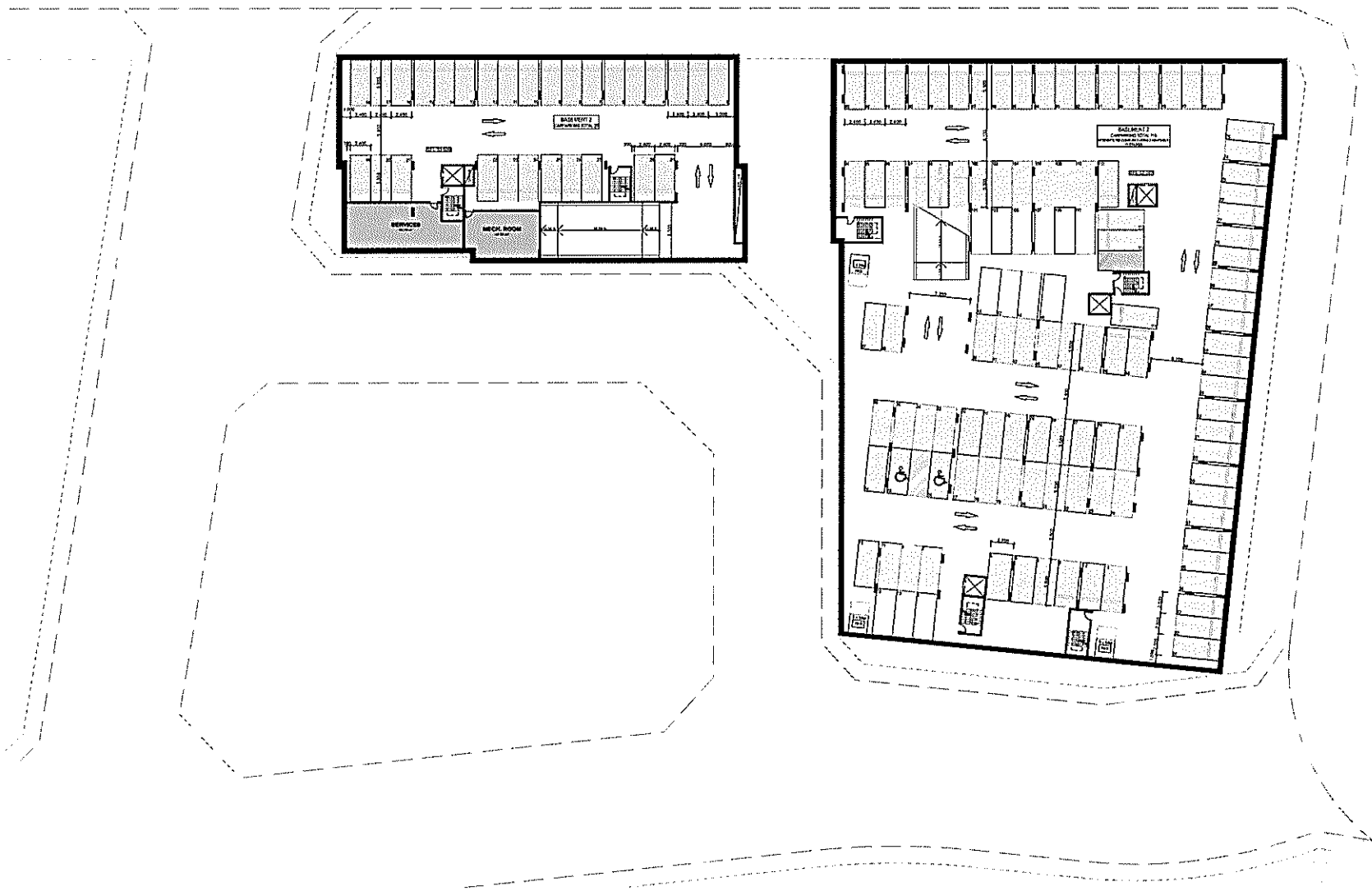

1 Basement 2
1:250

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- all discrepancies to be brought to the attention of the author

Notes

N

metres 0 1 5 10 1:250

CID GROUP

SYNERGY DEVELOPMENT GROUP

issue	details	by	date
A	DEVELOPMENT APPLICATION STAGE 1	SB	13.02.15

amendments

project
PARKLANDS ESTATE

location
Jordan Springs Boulevard
JORDAN SPRINGS

project co-ordinator
SYNERGY DEVELOPMENT GROUP
client
CID GROUP
drawing title
Buildings 1,2 & 3-BASEMENT 2

date	checked	project arch	drawn
30.09.14		SB	SB
scale	no		issue
	14016 AP05		A

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1 Basement 1
1:250

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Notes

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CID GROUP

SYNERGY DEVELOPMENT GROUP

issue	details	by	date
A	DEVELOPMENT APPLICATION STAGE 1	SB	13.02.15

amendments

project
PARKLANDS ESTATE

location
Jordan Springs Boulevard
JORDAN SPRINGS

project co-ordinator
SYNERGY DEVELOPMENT GROUP
client
CID GROUP
drawing title
Buildings 1,2 & 3-BASEMENT 1

date	checked	project arch	drawn
30.09.14		SB	SB
scale	no		issue
	14016 AP06		A

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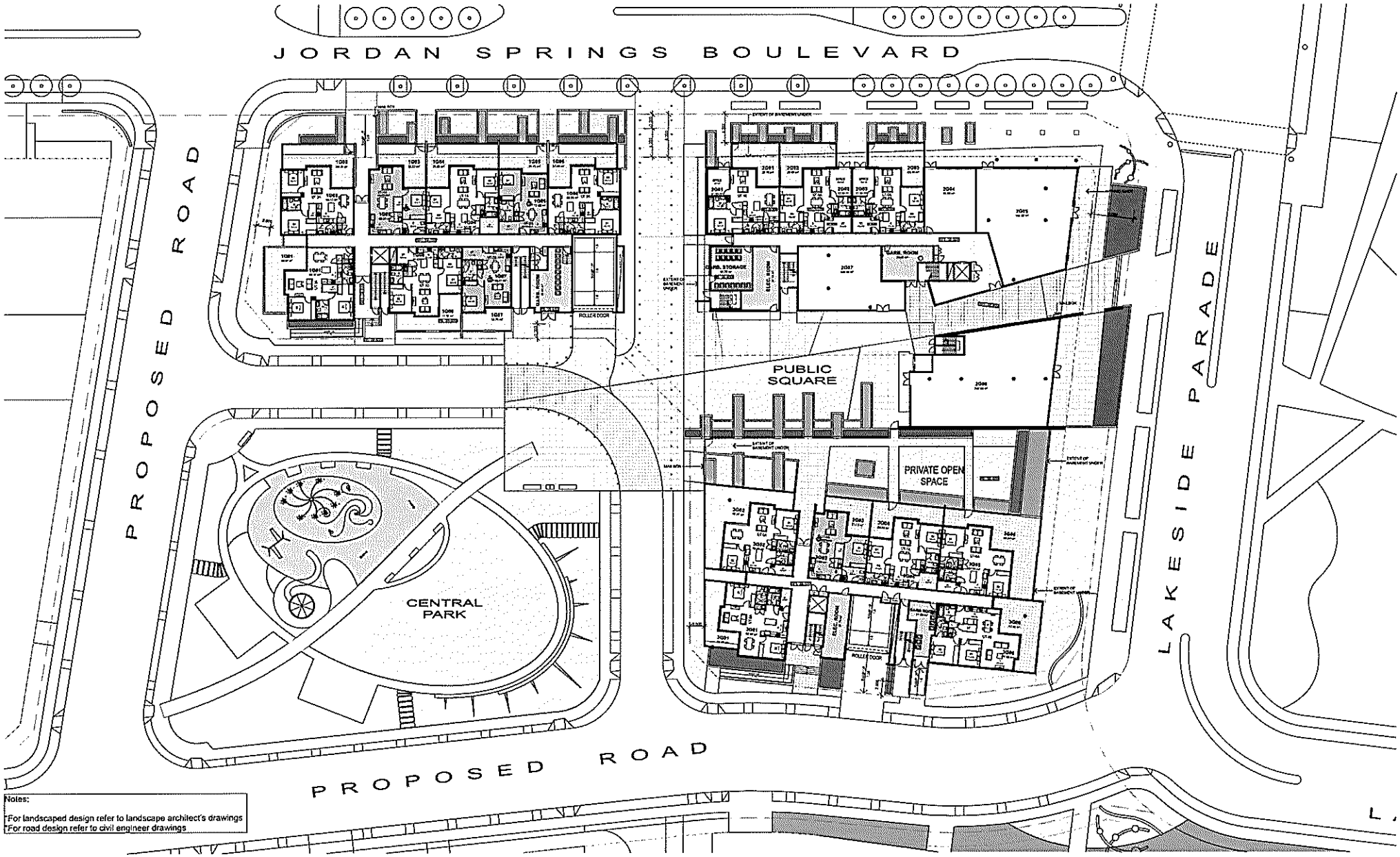

Notes:
*For landscaped design refer to landscape architect's drawings
*For road design refer to civil engineer drawings

1 Ground 1:250

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Notes

N

CID GROUP

SYNERGY DEVELOPMENT GROUP

issue	details	by	date
A	DEVELOPMENT APPLICATION STAGE 1	SB	13.02.15

amendments

project
PARKLANDS ESTATE

location
Jordan Springs Boulevard
JORDAN SPRINGS

project co-ordinator
SYNERGY DEVELOPMENT GROUP
client
CID GROUP
drawing title
Buildings 1,2 & 3-GROUND FLOOR

date	checked	project arch.	drawn
30.09.14		SB	SB
scale	no		issue
	14016 AP07		A

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1 Level 1
1:250

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Notes

N

metres 0 1 5 0 1:250

CID GROUP

SYNERGY DEVELOPMENT GROUP

issue	details	by	date
A	DEVELOPMENT APPLICATION STAGE 1	SB	17.02.15

amendments

project
PARKLANDS ESTATE

location
Jordan Springs Boulevard
JORDAN SPRINGS

project co-ordinator
SYNERGY DEVELOPMENT GROUP

client
CID GROUP

drawing title
Buildings 1,2 & 3-LEVEL 1

date	checked	project arch	drawn
30.09.14		SB	SB
scale	no		issue
	14016 AP08		A

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1 Level 2
1:250

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all discrepancies to be brought to the attention of the author

Notes

N

metres 0 1 5 10 1:250

CID GROUP

SYNERGY DEVELOPMENT GROUP

issue	details	by	date
A	DEVELOPMENT APPLICATION STAGE 1	SB	13.02.15

amendments

project
PARKLANDS ESTATE

location
Jordan Springs Boulevard
JORDAN SPRINGS

project co-ordinator
SYNERGY DEVELOPMENT GROUP
client
CID GROUP
drawing title
Buildings 1,2 & 3-LEVEL 2

date	checked	project arch	drawn
30.09.14		SB	SB
scale	no		issue
	14016 AP09		A

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1 Level 3
1:250

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Notes

N

metres 0 5 10 1:250

CID GROUP

SYNERGY DEVELOPMENT GROUP

issue	details	by	date
A	DEVELOPMENT APPLICATION STAGE 1	SB	13.02.15

amendments

project
PARKLANDS ESTATE

location
Jordan Springs Boulevard
JORDAN SPRINGS

project co-ordinator
SYNERGY DEVELOPMENT GROUP
client
CID GROUP
drawing title
Buildings 1,2 & 3-LEVEL 3

date	checked	project arch.	drawn
30.09.14		SB	SB
scale	no		issue
	14016 AP10		A

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mosca pserras architects
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1 Level 4
1:250

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Notes

N

metres 0 5 10 1:250

CID GROUP

SYNERGY DEVELOPMENT GROUP

issue	details	by	date
A	DEVELOPMENT APPLICATION STAGE 1	SB	13.02.15

amendments

project
PARKLANDS ESTATE

location
Jordan Springs Boulevard
JORDAN SPRINGS

project co-ordinator
SYNERGY DEVELOPMENT GROUP
client
CID GROUP
drawing title
Buildings 1,2 & 3-LEVEL 4

date	checked	project arch.	drawn
30.09.14		SB	SB
scale	no		issue
	14016 AP11		A

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1 Level 5
1:250

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Notes

N

metres 0 5 10 1:250

CID GROUP

SYNERGY DEVELOPMENT GROUP

issue	details	by	date
A	DEVELOPMENT APPLICATION STAGE 1	SB	13.02.15

amendments

project
PARKLANDS ESTATE

location
Jordan Springs Boulevard
JORDAN SPRINGS

project co-ordinator
SYNERGY DEVELOPMENT GROUP

client
CID GROUP

drawing title
Buildings 1,2 & 3-LEVEL 5

date	checked	project arch	drawn
30.08.14		SB	SS
scale	no		issue
	14016 AP12		A

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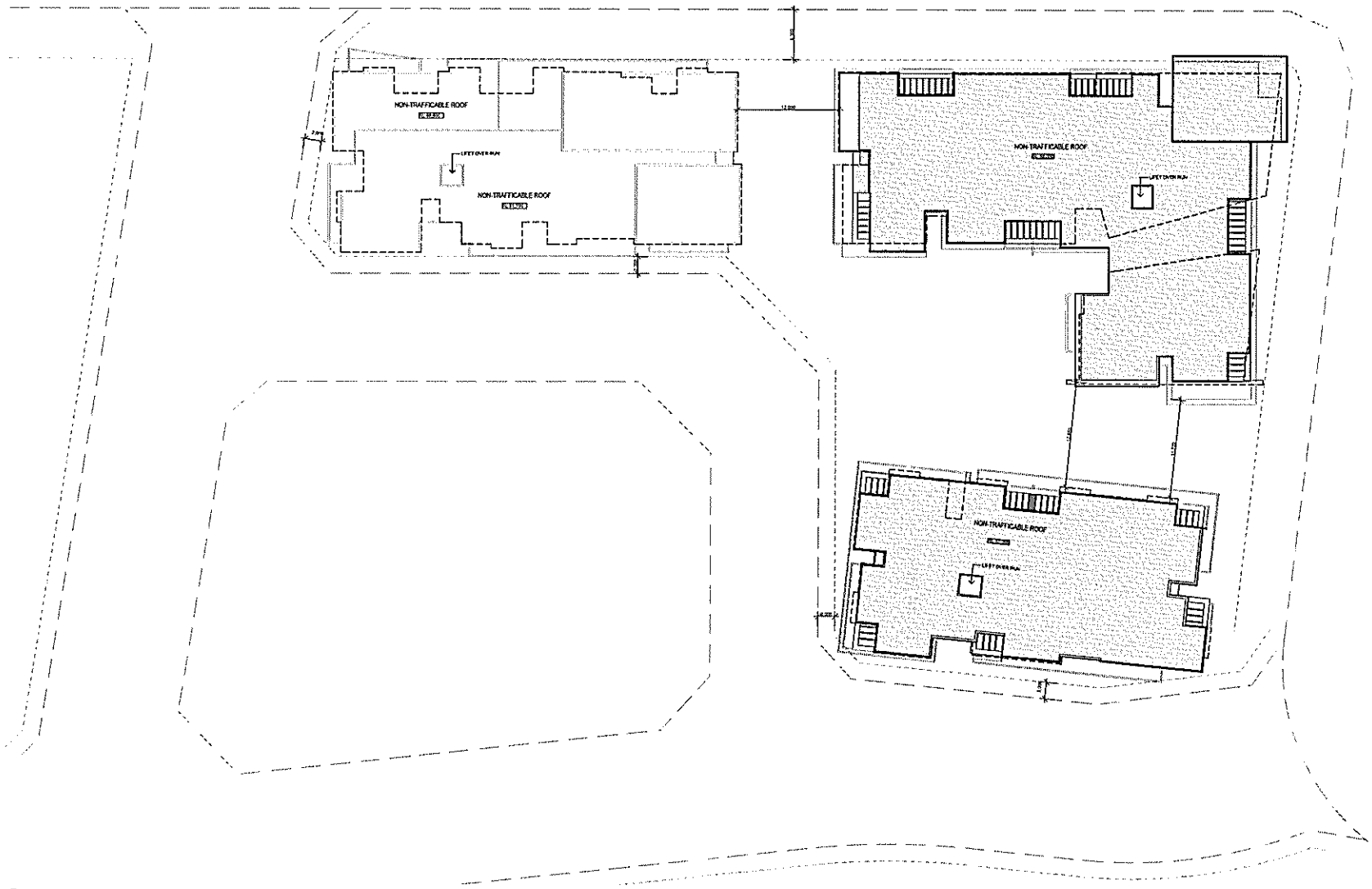
Version: 1, Version Date: 27/02/2015



1 Roof
1:250

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- all discrepancies to be brought to the attention of the author

Notes

N

metres 0 5 10 1:250

CID GROUP

SYNERGY DEVELOPMENT GROUP

issue	details	by	date
A	DEVELOPMENT APPLICATION STAGE 1	SB	13.02.15

amendments

project
PARKLANDS ESTATE

location
Jordan Springs Boulevard
JORDAN SPRINGS

project co-ordinator
SYNERGY DEVELOPMENT GROUP
client
CID GROUP
drawing title
Buildings 1,2 & 3-ROOF

date	checked	project arch	drawn
30.09.14		SB	SR
scale	no		issue
	14016 AP13		A

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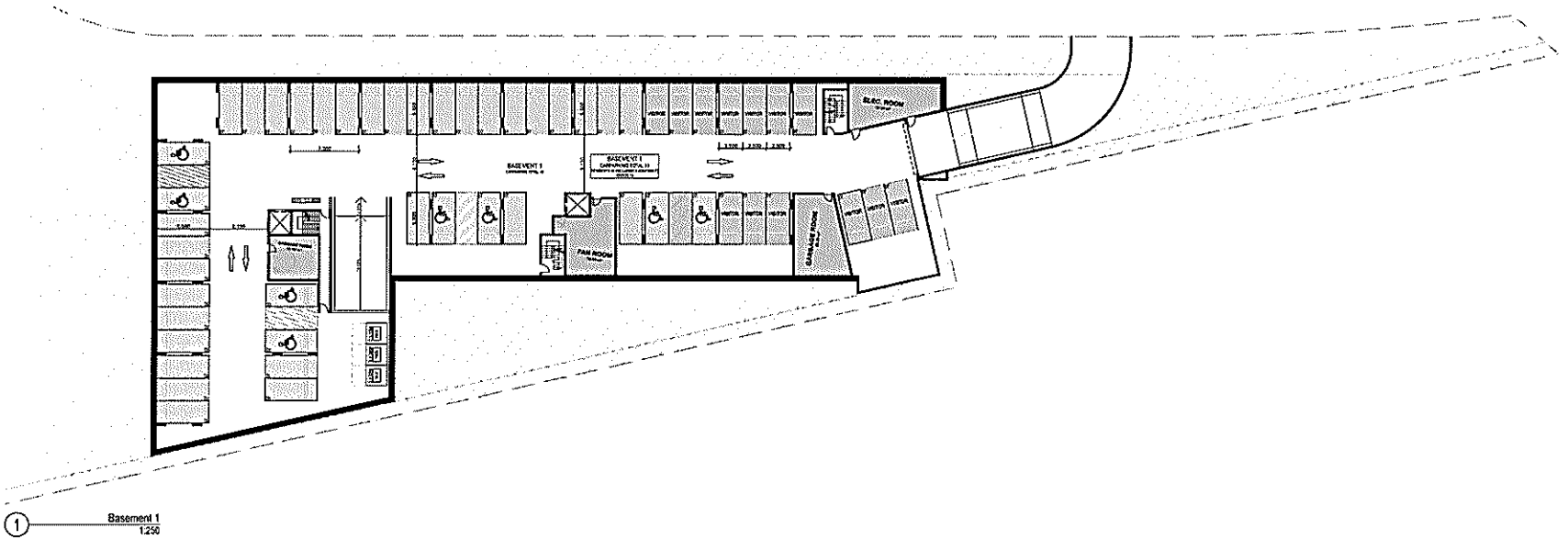
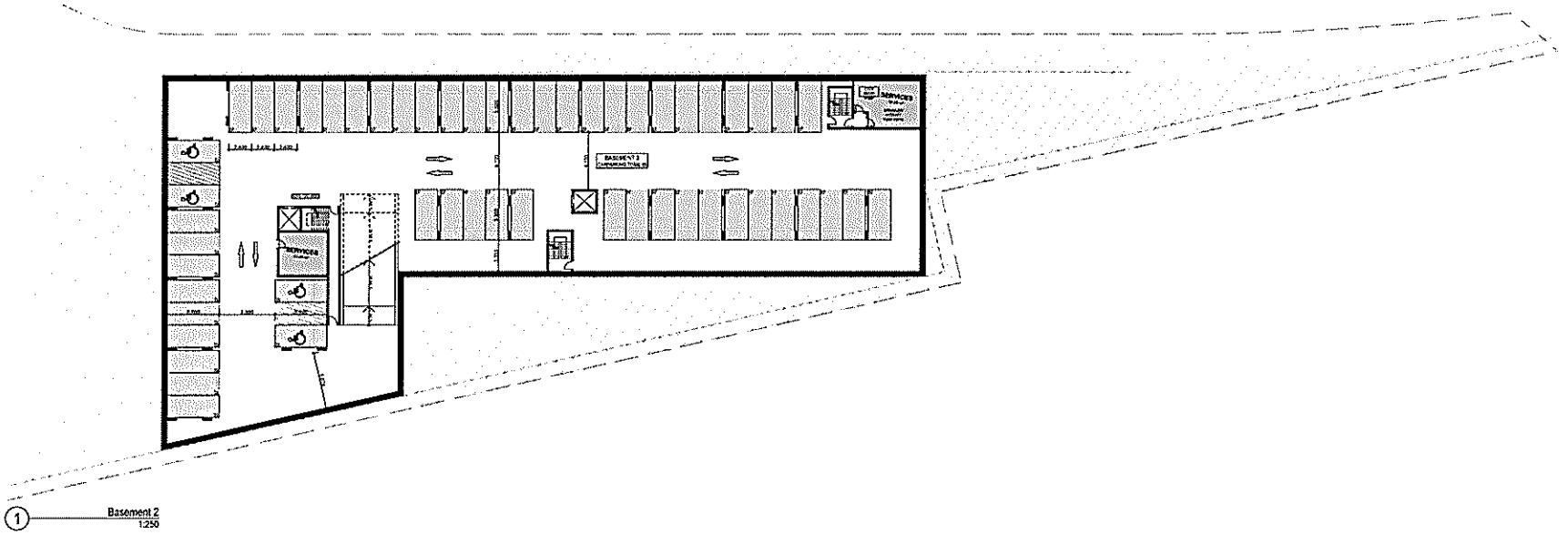


1 Basement 1
1:250



1 Basement 2
1:250

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N

metres 0 5 10 1:250

CID GROUP

SYNERGY DEVELOPMENT GROUP

issue	details	by	date
A	DEVELOPMENT APPLICATION STAGE 1	SB	13.02.15

amendments

project
PARKLANDS ESTATE

location
Jordan Springs Boulevard
JORDAN SPRINGS

project co-ordinator
SYNERGY DEVELOPMENT GROUP
client
CID GROUP
drawing title
Building 4-BESEMENT 1 & 2

date	checked	project arch	drawn
30.09.14		SB	SB
scale	no		issue
	14016 AP14		A

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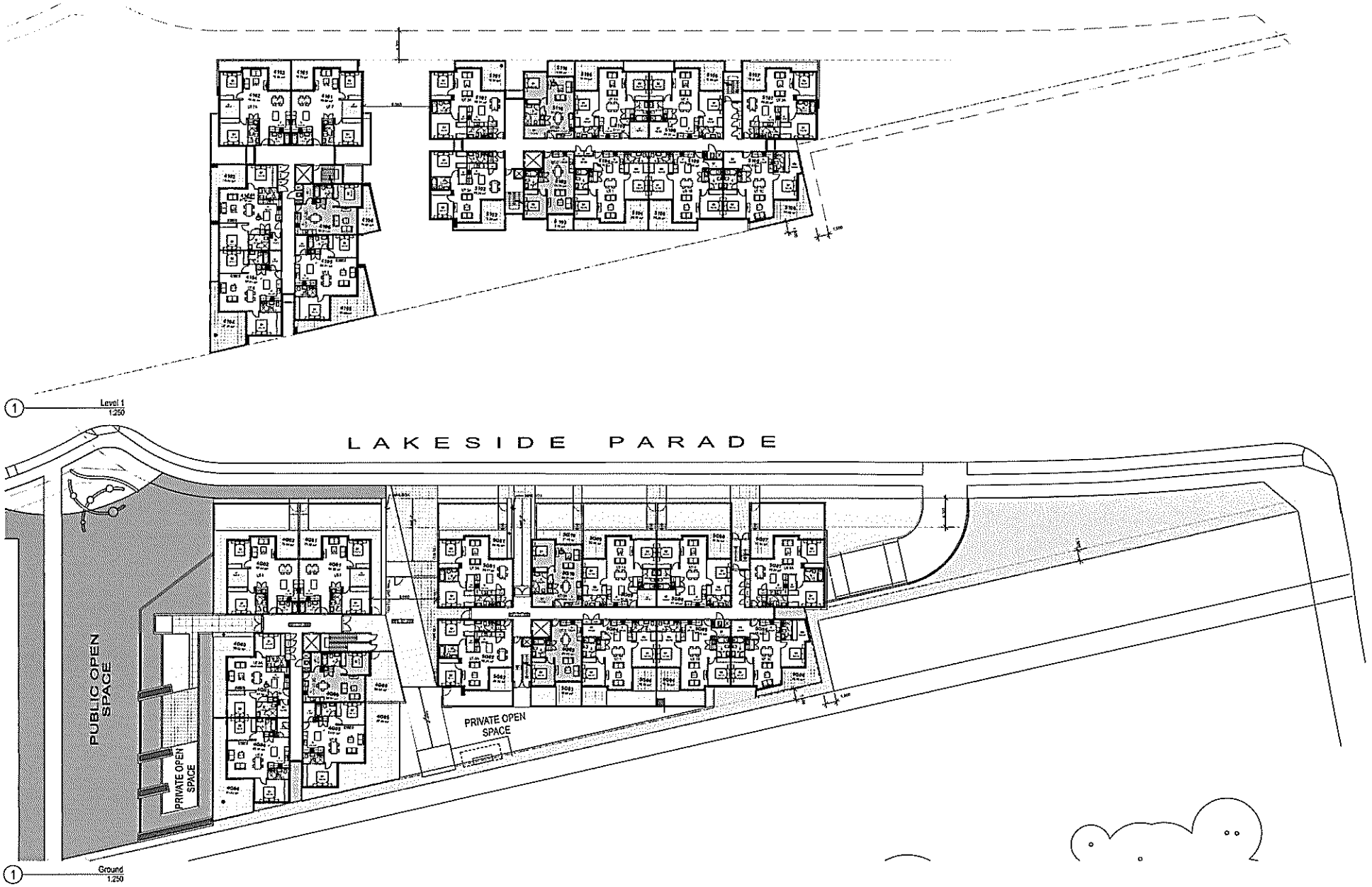

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do not scale from drawing
all dimensions to be checked on site before commencement of work.
all discrepancies to be brought to the attention of the author

Notes

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metres 0 5 10 1:250

CID GROUP

SYNERGY DEVELOPMENT GROUP

issue	details	by	date
A	DEVELOPMENT APPLICATION STAGE 1	SB	11.02.15

amendments

project
PARKLANDS ESTATE

location
Jordan Springs Boulevard
JORDAN SPRINGS

project coordinator
SYNERGY DEVELOPMENT GROUP
client
CID GROUP
drawing title
Building 4-GROUND & LEVEL 1

date	checked	project arch.	drawn
30.09.14		SB	SB
scale	no		issue
	14016 AP15		A

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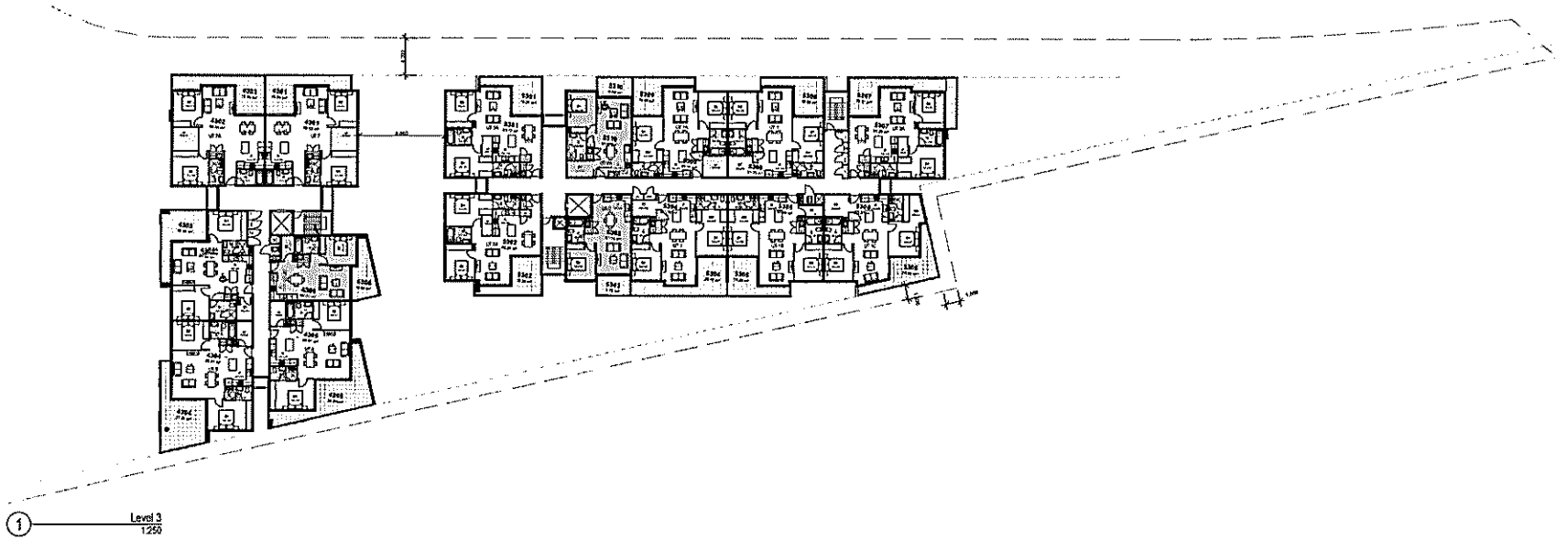
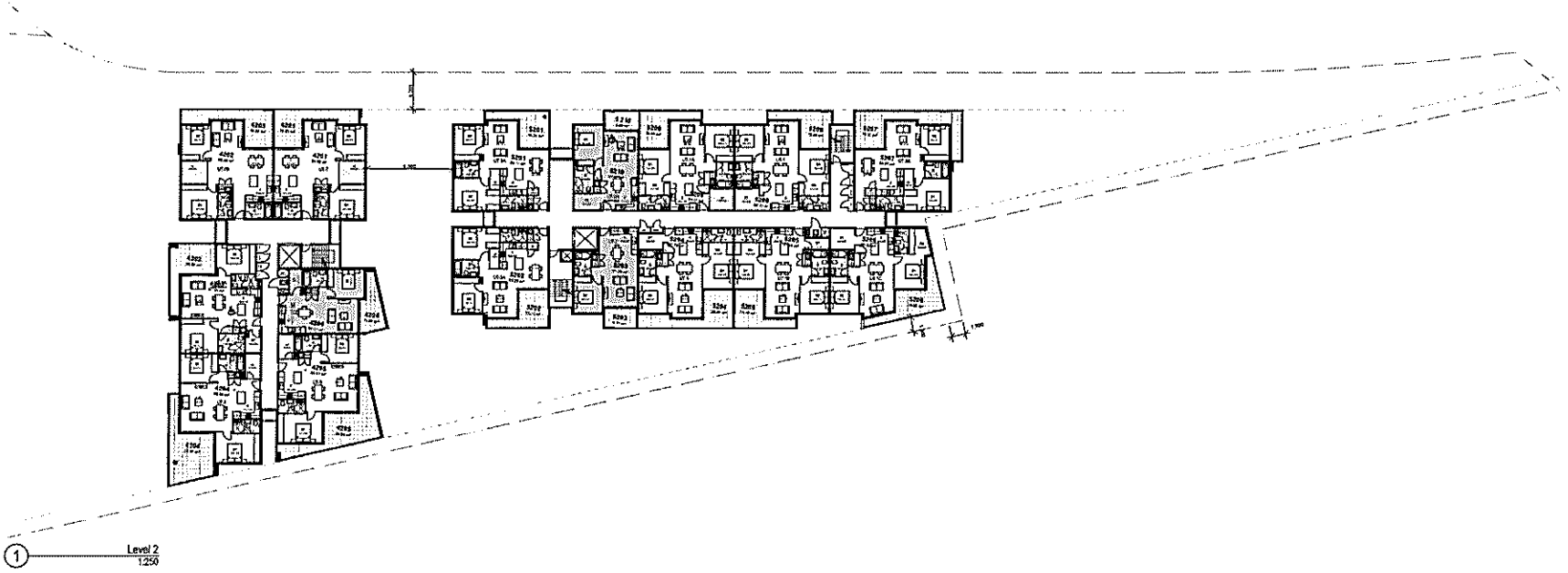
Version: 1, Version Date: 27/02/2015



1 Level 3
1:250



1 Level 2
1:250

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Notes

N

metres 0 5 10 1:250

CID GROUP

SYNERGY DEVELOPMENT GROUP

issue	details	by	date
A	DEVELOPMENT APPLICATION-STAGE 1	RB	11.02.15

amendments

project
PARKLANDS ESTATE

location
Jordan Springs Boulevard
JORDAN SPRINGS

project co-ordinator
SYNERGY DEVELOPMENT GROUP

client
CID GROUP

drawing title
Builidng 4-LEVELS 2 & 3

date	checked	project arch	drawn
30.09.14		SB	SB
scale	no		issue
	14016 AP16		A

mpa
mosca pserras architects
p 02 9601 3244 f 02 9601 6336
a po box 3353, liverpool westfield nsw 2170

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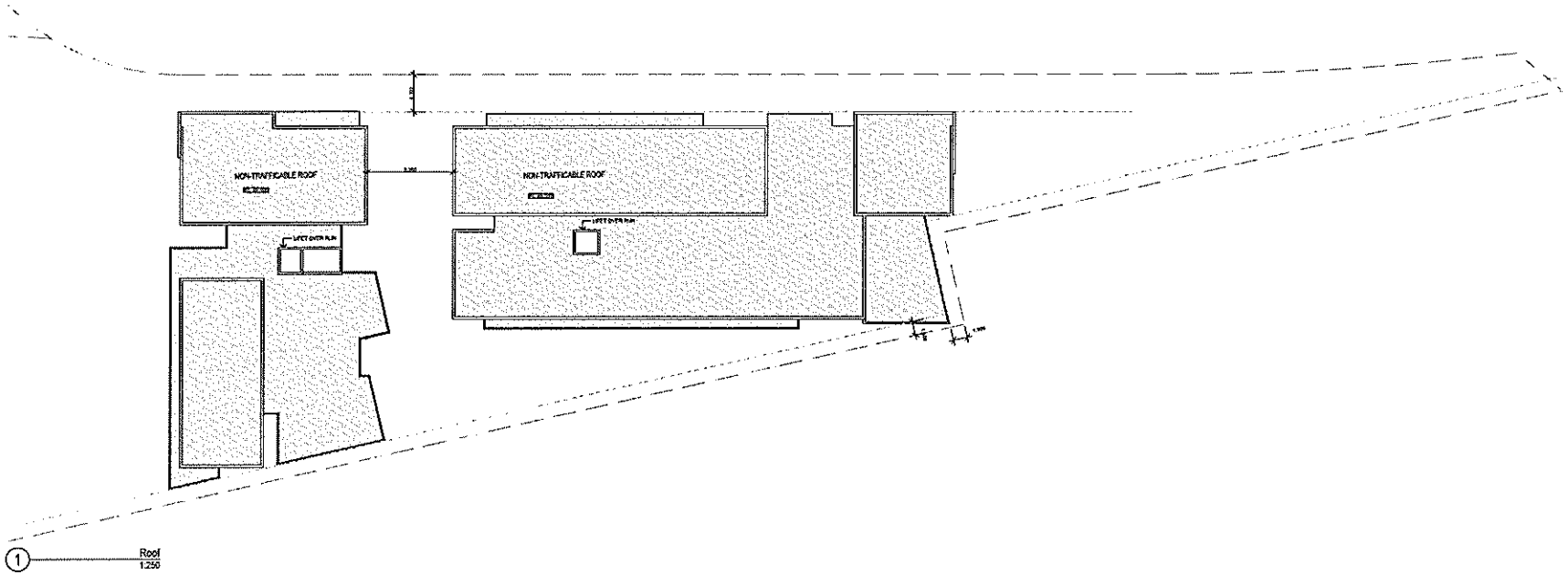

1 Roof
1:250

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Notes

N

metres 0 5 10 1:250

CID GROUP

SYNERGY DEVELOPMENT GROUP

issue	details	by	date
A	DEVELOPMENT APPLICATION STAGE 1	SB	13.02.15

amendments

project
PARKLANDS ESTATE

location
Jordan Springs Boulevard
JORDAN SPRINGS

project co-ordinator
SYNERGY DEVELOPMENT GROUP
client
CID GROUP
drawing title
Building 4-ROOF

date	checked	project arch	drawn
30.09.14		SB	SB
scale	job		issue
	14016 AP17		A

mpa
mosca pserras architects
p 02 9601 3244 f 02 9601 6336
a po box 3353, liverpool westfield nsw 2170

CONSTRUCTION CONSULTANTS

QUANTITY SURVEYORS ■ CONSTRUCTION ECONOMISTS ■ PROJECT MANAGERS

Sydney
Suite 5 / 101 George Street, Parramatta NSW
Ph: (02) 9633 9233

Melbourne
Suite 19 / 47 Bourke Street, Melbourne VIC
Ph: (03) 9660 2933

E: michael@mmdcc.com.au
www.mmdcc.com.au

CAPITAL INVESTMENT VALUE REPORT



Source: Google Maps

Project: **Proposed Mixed Use Development – Parkland Estate At Jordan Springs Boulevard, Jordan Springs**

Applicant: **Synergy Development Group Pty Ltd**

Builder: **Developer Managed**

Report Date: 17 February 2015

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Table of Contents

1. Instruction 3
2. Location 3
3. Brief Development Description 3
4. Quality of Finishes 4
5. Construction Cost Estimate – Capital Investment Value 4
6. Construction Cost Estimate – Section 94A Levy 4
7. Areas 5
8. Exclusions 5
9. Documentation 5
10. Design Assumptions / Parameters 5
11. Disclaimer 6

Appendix A *Elemental Cost Estimate Summary*
Appendix B *Council Schedule*
Appendix C *Assumed Schedule of Finishes*
Appendix D *Indicative Area Schedule*
Appendix E *Reduced Architectural Drawings*

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

1. Instruction

We have undertaken a study of the initial Architectural Drawings and other information provided, with the aim of deriving the probable cost of construction for the above Project and providing a **Capital Investment Value Report**.

2. Location

The subject development is situated to the south of Jordan Springs Boulevard and is bounded by The Wianamatta Regional Park to the south and east and the Village Lake across Lakeside Drive to the west. The location of the Subject Property is depicted on cover page.

3. Brief Development Description

The proposal comprises the construction of a mixed use development comprises five (5) buildings ranging from four (4) to six (6) storeys with associated basement car parking.

The proposed Development consists of:

- 263 x car parking spaces within two (2) basement levels to serve Buildings 1, 2 & 3;
- 108 x car parking spaces within two (2) basement levels to serve Buildings 4 & 5;
- Building 1:
    - 33 x residential units within 4 storeys (Ground Floor to Level 3).
- A total of 201 residential units and 4 commercial spaces:
    - Building 2:
        - 4 x commercial spaces on Ground Level;
        - 63 x residential units within 6 storeys (Ground Level to Level 5).
    - Building 3:
        - 41 x residential units within 6 storeys (Ground Level to Level 5).
    - Building 4:
        - 24 x residential units within 4 storeys (Ground Floor to Level 3).
    - Building 5:
        - 40 x residential units within 4 storeys (Ground Floor to Level 3).

Typically, each residential unit (excl. one bedroom units) comprises of a bathroom, ensuite, laundry, living/dining, bedrooms, kitchen and balcony.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

4. Quality of Finishes

The proposed finishes of the residential portion of the Development may be considered of standard quality, as described in the attached Schedule of Finishes (*Appendix C*), prepared by MMDCC and based on information supplied by the Developer. The quality of finishes proposed, are appropriate to the type, scale and location of this project.

The commercial/retail areas do not include any wall, floor nor ceiling fixtures and finishes. The fit-out (incl. loose furniture) of this area shall be completed by others, subject to individual tenancy requirements.

5. Construction Cost Estimate – Capital Investment Value

The estimated cost of construction may be achieved in the vicinity of the following:

Description	**Amount ($)**
Building Cost (Capital Investment Value)	**55,472,476**

Please refer to *Appendix A* for an Elemental Cost Estimate Summary prepared in general compliance with the criteria outlined by the NSW Government Department of Planning (Part 3A).

This indicative Capital Investment Value includes all costs necessary to establish and operate the development including the design and construction of buildings, structures, associated infrastructure and fixed or mobile plant and equipment (**but excluding land costs and GST**).

6. Construction Cost Estimate – Section 94A Levy

Description	**Amount ($)**
Total Construction Cost (excl. GST)	**51,416,981**
Add Consultants Fees	1,055,495
Add Internal Road Allowance	3,000,000
Total Development Cost (excl. GST)	55,472,476
Add GST	5,547,248
Total Development Cost (incl. GST)	61,019,724

The required Council Schedule, titled "Registered Quantity Surveyor's Detailed Cost Report" is attached in *Appendix B*. Our Construction Cost Estimate is prepared in accordance with the Environmental Planning and Assessment Regulation 2000 (Reg 25J) - Section 94A Levy - Determination of proposed cost of Development.

Our Construction Cost Estimate may be considered at mid-range of recent costs, based on the proposed level of finishes and in the absence of structural and services drawings, Contract Documents and DA Conditions.

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

7. Areas

According to the architectural drawings, the proposed approximate Floor Areas may be presented as outlined in *Appendix D*.

8. Exclusions

Our Cost Estimate does not include the following:

- Land Acquisition;
- Marketing and financing;
- Legal costs;
- Project Management;
- Building insurance costs;
- Major services diversions, external connections and /or improvement;
- Amplification / amendment to existing services;
- Underpinning of existing structure;
- Amendments to plans, incomplete documentation;
- Taxes, levies and charges;
- Disabled access;
- Energy and water efficiency;
- Decontamination works (Asbestos Removal, etc);
- Rock excavation;
- Authorities Fees (S94 Contribution and the like);
- Contingency allowance.

9. Documentation

Our Cost Estimate was based on Architectural Drawings supplied by *Mosca Pserras Architects*, Job No. 14016, AP01 to AP22, Issue A, dated 13/02/2015. Please refer to *Appendix E* for a reduced copy of part of these drawings.

10. Design Assumptions / Parameters

In the absence of engineering drawings, the structure of the proposed buildings was assumed of conventional nature, comprising the following:

- Reinforced concrete soldier piles / shotcrete to basement shoring;
- Reinforced concrete strip / pad footings;
- Reinforced concrete columns and floor slabs (framed structure).

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Our Indicative Cost Estimate was based on the assumption that the whole development will be constructed in a single stage (i.e. not a staged development). If the building is to be completed in stages, the cost of preliminaries and Building services may increase.

This Cost Estimate may provide no more than a rough guide to the probable cost of the proposed development. Costs may vary considerably, due to a range of variables:

- Further Geotechnical investigation;
- Structural and services documentation;
- Contract conditions;
- Final PC Items and Provisional Allowances;
- Variations in the proposed fixtures and finishes;
- DA Conditions.

11. Disclaimer

This Certificate has been prepared for the sole purpose of providing a Cost Estimate for an indicative Capital Investment Value Report and DA Council Submission only. This Quantity Survey Certificate is not to be used for any other purpose. This Report is confidential to the developer. The Writer does not accept any contractual, tortuous or other form of liability for any consequences, loss or damage which may arise as a result of any other person acting upon or using this report.

Report and estimate prepared by



Michael M. Dakhoul *B. Build (Hons. 1) AAIQS MAIB MCIOB ICECA*
AAIQS Reg. No. 3618

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

Lend Lease

JORDANSPRINGS

13th February 2015

CID Group
C/- Synergy Development Group
PO Box 314
CASULA NSW 2170

Dear Amen,

The design plans for your 'Parklands Estate' development, Stage 1 that your are building on the following unregistered lots in the Plan of Proposed Subdivision of Lot 3389 & Lot 3391 DP: 1190132, Jordan Springs Boulevard, Jordan Springs are now approved and ready to be submitted to Penrith Council for approval. We wish you every success with the construction.

We note that we have endorsed the following documents which include Buildings 1,2,3,4 & 5 in Stage 1 only:

Drawing No:	Description	Issue	Lend Lease Endorsement
AP01	Cover Sheet	A	13th February 2015
AP02	Masterplan	A	13th February 2015
AP03	Data	A	13th February 2015
AP04	Site Plan	A	13th February 2015
AP05	Buildings 1,2 & 3 – Basement 2	A	13th February 2015
AP06	Buildings 1,2 & 3 – Basement 1	A	13th February 2015
AP07	Buildings 1,2 & 3 – Ground Floor	A	13th February 2015
AP08	Buildings 1,2 & 3 – Level 1	A	13th February 2015
AP09	Buildings 1,2 & 3 – Level 2	A	13th February 2015
AP10	Buildings 1,2 & 3 – Level 3	A	13th February 2015
AP11	Buildings 1,2 & 3 – Level 4	A	13th February 2015
AP12	Buildings 1,2 & 3 – Level 5	A	13th February 2015
AP13	Buildings 1,2 & 3 – Roof	A	13th February 2015
AP14	Building 4 – Basement 1 & 2	A	13th February 2015
AP15	Building 4 – Ground & Level 1	A	13th February 2015
AP16	Building 4 – Levels 2 & 3	A	13th February 2015
AP17	Building 4 - Roof	A	13th February 2015
AP18	Buildings 1,2 & 3 – Elevations	A	13th February 2015
AP19	Buildings 1,3,4 & 5 – Elevations	A	13th February 2015
AP20	Buildings 1,2,3 & 4 – Sections	A	13th February 2015
AP21	Buildings 1,2,3 & 4 – Adaptable Units	A	13th February 2015
AP22	Shadow Diagrams	A	13th February 2015

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CID Approval JS

Document Set ID: 6445002
Version: 1, Version Date: 27/02/2015

It is CID's responsibility to ensure that all additional documents required for compliance with Penrith Council and the appropriate SEPP controls are submitted with these documents. Council will make the ultimate determination.

The endorsed development, including the proposed brick and colour palette and landscaping treatment, must be constructed strictly as per the approved documents. Should any amendments be proposed following the date of this endorsement, then a revised set of documents is required to be submitted to Lend Lease for approval.

Please note: Jordan Springs is a Fibre Connected Community and arrangements for connections and related costs will be required. Please visit http://www.opticomm.net.au for further information.

We look forward to the opportunity of welcoming your future buyers to their new community and to working with you when you choose to build again at Jordan Springs. However, in the meantime, remember we are here to help with any questions or concerns you may have, so please don't hesitate to contact us.

Yours sincerely,

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