



**BLACKETT
MAGUIRE+
GOLDSMITH**

BCA ASSESSMENT REPORT

**DA1 - THORNTON CENTRAL
LORD SHEFFIELD CIRCUIT, THORNTON PENRITH**

Revision 1

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Project No.: 140195

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REPORT STATUS				
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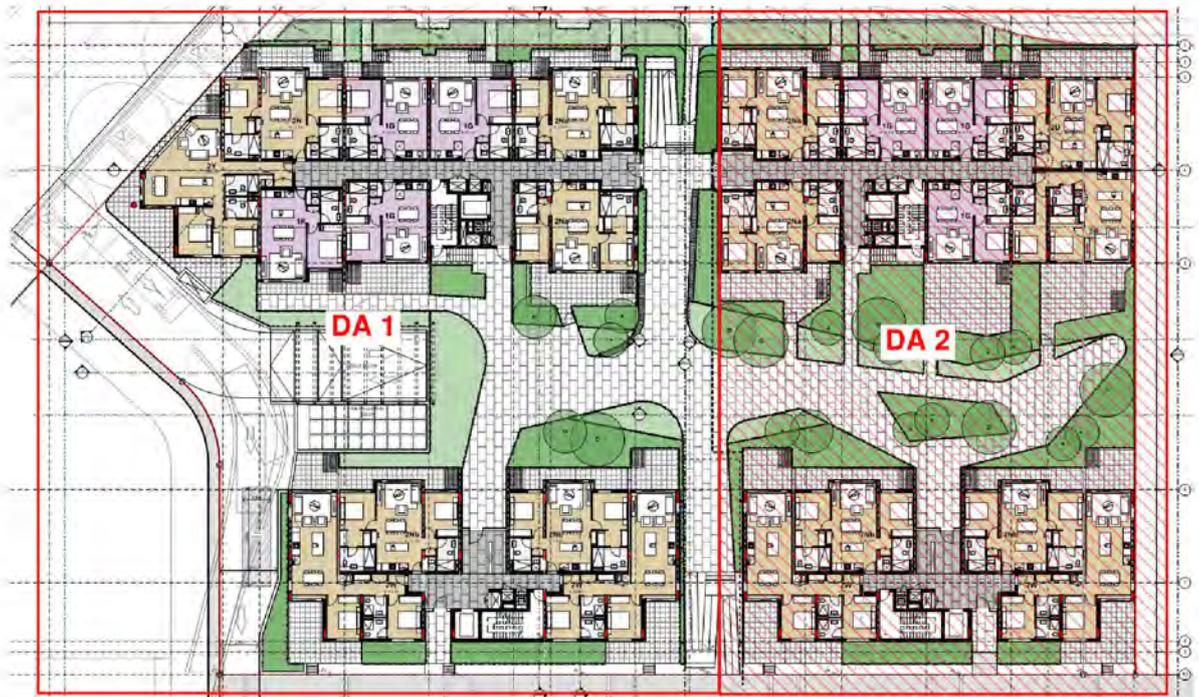


A. INTRODUCTION

A.1 BACKGROUND / PROPOSAL

Blackett Maguire + Goldsmith Pty Ltd (BM+G) have been commissioned by Thornton North Penrith Pty Ltd to undertake a Building Code of Australia (BCA) 2014 assessment for the proposed residential development located at Lord Sheffield Circuit, Thornton, , pursuant to the provisions of clause 145 of the *Environmental Planning & Assessment Regulation 2000* and clause 18 of the *Building Professionals Regulation 2007*..

It is understood that the Development Application will be submitted as 2 separate proposals. This report will relate to DA 1 ONLY (see below):



It is important to note that the proposed basement carpark for the development will interconnect all buildings on the site at the basement levels. Therefore, for the purposes of our BCA Assessment, all four residential towers are to be one United Building and in turn the requirements of each building apply to all buildings due to this designation.

A.2 AIM

The aim of this report is to:

- + Undertake an assessment of the proposed residential/commercial building against the Deemed-to-Satisfy (DtS) Provisions of the BCA 2014.
- + Identify any BCA compliance issues that require resolution/attention for the proposed development.

A.3 PROJECT TEAM

The following BM+G team members have contributed to this report:

- + Dean Goldsmith (Director)
- + Tony Heaslip (Director)



A.4 DOCUMENTATION

The following documentation has been reviewed, referenced and/or relied upon in the preparation of this report:

- + BCA 2014
- | Guide to the BCA 2014.
- | Architectural plans prepared by dKO Architecture (NSW) Pty Ltd;

Drawing No.	Revision	Date	Drawing No.	Revision	Date
DA01-0001	A		DA01-0008	A	
DA01-0002	A		DA01-0009	A	
DA01-0003	A		DA01-0010	A	
DA01-0004	A		DA01-0011	A	
DA01-0005	A		DA01-0012	A	
DA01-0006	A		DA01-0013	A	
DA01-0007	A		DA01-0014	A	

A.5 REGULATORY FRAMEWORK

Pursuant to clause 145 of the Environmental Planning and Assessment (EPA) Regulation 2000 all new building work must comply with the current BCA however the existing features of an existing building need not comply with the BCA unless upgrade is required by other clauses of the legislation.

Clause 143(3) of the EPA Regulation 2000 prevents a certifying authority from issuing a construction certificate if the proposed new work will result in a reduction to the fire protection and structural capacity of the building.

A.6 LIMITATIONS & EXCLUSIONS

The limitations and exclusions of this report are as follows:

- | The following assessment is based upon a review of the architectural documentation.
- + No assessment has been undertaken with respect to the Disability Discrimination Act (DDA) 1992. The building owner needs be satisfied that their obligations under the DDA have been addressed.

Please note that whilst the BCA specifies a minimum standard of compliance with AS1428 (Parts 1-3) and Part D3 of the BCA for access and facilities for people with disabilities, compliance with such requirements may not necessarily preclude the possibility of a future complaint made under the DDA 1992. The DDA is a complaint based legislation and is presently not identified by the State Building Codes and Regulations. In this regard the building owner should be satisfied that their obligations under the DDA have been addressed.

- + The Report does not address matters in relation to the following:
 - i. Local Government Act and Regulations.
 - ii. NSW Public Health Act 1991 and Regulations.
 - iii. Occupational Health and Safety (OH&S) Act and Regulations.
 - iv. Work Cover Authority requirements.
 - v. Water, drainage, gas, telecommunications and electricity supply authority requirements.
 - vi. DDA 1992.



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A.7 TERMINOLOGY

Alternative Solution

A Building Solution which complies with the Performance Requirements other than by reason of satisfying the DtS Provisions.

Building Code of Australia (BCA)

Document published on behalf of the Australian Building Codes Board. The BCA is a uniform set of technical provisions for the design and construction of buildings and other structures throughout Australia and is adopted in New South Wales (NSW) under the provisions of the EPA Act and Regulation. Building regulatory legislation stipulates that compliance with the BCA Performance Requirements must be attained and hence this reveals BCA's performance based format.

Construction Certificate

Building Approval issued by the Certifying Authority pursuant to Part 4A of the EP&A Act 1979.

Construction Type

The construction type is a measure of a buildings ability to resist a fire. The minimum type of fire-resisting construction of a building must be that specified in Table C1.1 and Specification C1.1, except as allowed for—

- (i) certain Class 2, 3 or 9c buildings in C1.5; and
- (ii) a Class 4 part of a building located on the top storey in C1.3(b); and
- (iii) open spectator stands and indoor sports stadiums in C1.7.

Note: Type A construction is the most fire-resistant and Type C the least fire-resistant of the types of construction.

Climatic Zone

Is an area defined in BCA Figure A1.1 and in Table A1.1 for specific locations, having energy efficiency provisions based on a range of similar climatic characteristics.

Deemed to Satisfy Provisions (DtS)

Provisions which are deemed to satisfy the Performance Requirements.

Effective Height

The height to the floor of the topmost storey (excluding the topmost storey if it contains only heating, ventilating, lift or other equipment, water tanks or similar service units) from the floor of the lowest storey providing direct egress to a road or open space.

Fire Resistance Level (FRL)

The grading periods in minutes for the following criteria-

- (a) structural adequacy; and
 - (b) integrity; and
 - (c) insulation,
- and expressed in that order.



Fire Source Feature (FSF)

The far boundary of a road which adjoins the allotment; or a side or rear boundary of the allotment; or an external wall of another building on the allotment which is not a Class 10 building.

National Construction Code Series (NCC)

The NCC was introduced 01 May 2011 by the Council of Australian Governments. The BCA Volume One (Class 2 to 9 Buildings) is now referenced as the National Construction Code Series Volume One – BCA.

Occupation Certificate

Building Occupation Approval issued by the Principal Certifying Authority pursuant to Part 4A of the EPA Act 1979.

Open Space

A space on the allotment, or a roof or other part of the building suitably protected from fire, open to the sky and connected directly with a public road.

Performance Requirements of the BCA

A Building Solution will comply with the BCA if it satisfies the Performance Requirements. A Performance requirement states the level of performance that a Building Solution must meet.

Compliance with the Performance Requirements can only be achieved by-

- (a) complying with the DtS Provisions; or
- (b) formulating an Alternative Solution which-
 - (i) complies with the Performance Requirements; or
 - (ii) is shown to be at least equivalent to the DtS Provisions; or
- (c) a combination of (a) and (b).

Sole Occupancy Unit (SOU)

A room or other part of a building for occupation by one or joint owner, lessee, tenant, or other occupier to the exclusion of any other owner, lessee, tenant, or other occupier and includes a dwelling.



B. BUILDING CHARACTERISTICS

B.1 BUILDING CLASSIFICATION

The following table presents a summary of relevant building classification items of the proposed mixed use residential and commercial building:

▪ BCA Classification:	Class 2 (Residential) Class 7a (Carpark)
▪ Rise in Storeys:	The building has a rise in storeys of Eight (8).
▪ Effective Height:	The building has an effective height of 22.9m (< 25m)
▪ Type of Construction:	Type A Construction
▪ Climate Zone:	Zone 6

B.2 FIRE SOURCE FEATURE

The distances from the nearest Fire Source Features are:

BOUNDARY	DISTANCE TO FIRE SOURCE FEATURE
North-Western Boundary	>3m
South-Western Boundary	>3m
North-Eastern Boundary	<3m – see C1.1 & C3.2 below
South-Eastern Boundary	<3m – see C1.1 & C3.2 below (DA2 Buildings)

BCA ASSESSMENT

C.1 BCA DEEMED-TO-SATISFY COMPLIANCE ISSUES:

The following comments have been made in relation to the relevant BCA provisions relating to the compliance issues associated with the proposed located at 1-3 Wharf Road Gladsville.

Note: The following is a précis of the provisions and should be read in conjunction with the BCA. As stated above the four residential towers forming this development are deemed to be a single United Building due to the inter-connecting basement carpark.

SECTION B - STRUCTURE

1. Part B1 – Structural Provisions

Structural engineering details prepared by an appropriately qualified structural engineer to be provided to demonstrate compliance with Part B1 in relation to the new structural elements of the building.



Comments: Details are to be provided confirming that the design achieves compliance with the following is required at the time of application for Construction Certificate, inclusive of reference to the following Australian Standards (where relevant):

1. AS 1170.0 – 2002 General Principles
2. AS 1170.1 – 2002, including certification for balustrading (dead and live loads)
3. AS 1170.2 – 2002, Wind loads
4. AS 1170.4 – 2007, Earthquake loads
5. AS 3700 – 2001, Masonry code
6. AS 3600 – 2009, Concrete code
7. AS 4100 – 1998, Steel Structures and/or
8. AS 4600 – 2005, Cold formed steel.
9. AS 2047 – 1999, Windows in buildings.
10. AS 1288 – 2006, Glass in buildings.

In addition, details pertaining to the method of addressing attack from subterranean termites are to be provided with the application for construction certificate.

SECTION C – FIRE RESISTANCE

FIRE RESISTANCE AND STABILITY

2. Clause C1.1 – Type of Construction Required

The minimum type of fire-resisting construction of a building must be that specified in Table C1.1 and Specification C1.1 except as allowed for in this clause.

The minimum type of fire-resisting construction of a building must be that specified in Table C1.1 and Specification C1.1 except as allowed for in this

Comments: Type A construction applies to this building as it has a rise in storeys of more than 3. Refer to comments under Spec. C1.1 below and Appendix 1.

3. Clause C1.10 – Fire Hazard Properties

The fire hazard properties of the following linings, materials and assemblies in a Class 2 to 9 building must comply with **Specification C1.10** and the additional requirements of the **NSW Provisions** of the Code.

Comments: Architect to note. Details for compliance can be sought at the Occupation Certificate stage.

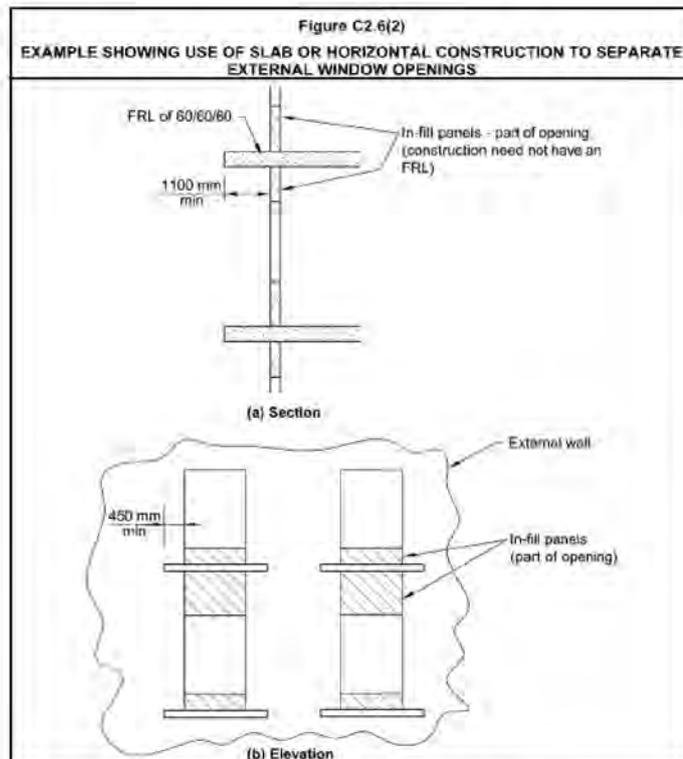
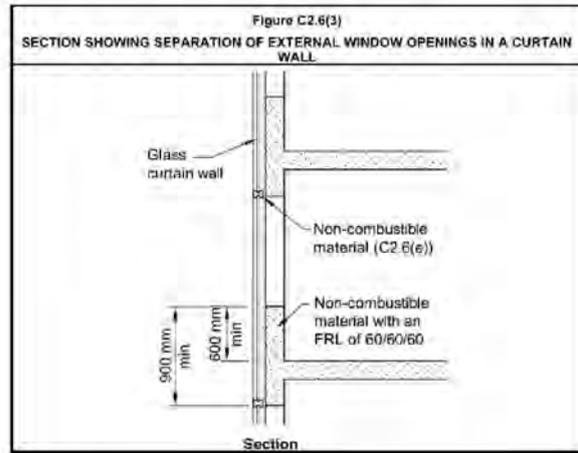
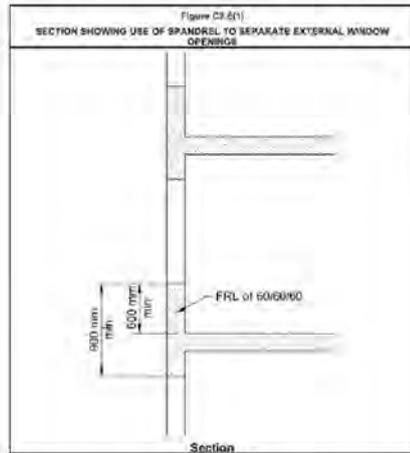
Part C2 Compartmentation and Separation

4. Clause C2.6 – Vertical Separation of Openings in External Walls

If in a building of Type A construction, any part of a window or other opening in an external wall is above another opening in the storey next below and its vertical projection falls no further than 450 mm outside the lower opening (measured horizontally), the openings must be separated by and horizontal or vertical spandrel with an FRL of 60/60/60, and for the purposes of C2.6, window or other opening means that part of the external wall of a building that does not have an FRL of 60/60/60 or greater.



Comments: Spandrel protection is required throughout the building in accordance with this Clause (and the diagrams from the Guide to the BCA below). The detailing of the spandrel separation is to be provided for review at CC stage. It is noted that the design appears capable of complying with the spandrel requirements, and it is assumed that where full height glazing is provided over multiple levels, a fire rated spandrel panel will be provided behind the glazing. Similarly, where the full height glazing is adjacent a corner of the building, the fire rated infill panel will be provided behind the glazing also to achieve the spandrel requirements (or the fire rating will need to extend 450mm to the side of the opening and 1100mm out from the opening) as detailed in the diagrams below. Further details are required to be provided with the construction certificate documentation.



Note: In this regard, consideration should be given to the above ground portions of the basement if mechanical vents/grills are proposed in relation to the protection of the ground floor units above.



5. Clause C2.9 - Separation of Classification in Different Storeys

This clause specifies the required separation between parts of a building which are of a different classification, situated one above another, to minimise the risk of a fire in one classification causing the failure of building elements in another classification in a different storey.

Comments: The floor above the carpark is to achieve an FRL of 120/120/120.

6. Clause C2.10 - Separation of Lift Shafts

Applies to all classes of buildings and specifies the protection requirements for openings for lift shafts and lift landing doors. The requirements are set out in sub-clauses (a), (b) (c) & (d) which relate to openings in Type A, B and C construction. Also note the Deemed to Satisfy Provisions of Part C3.

Comments: The lift in each tower is required to be enclosed in a fire rated shaft achieving an FRL in accordance with Table 3 of Specification C1.1. The current design is compliant with the requirements of Spec. C1.1. Details to be submitted with the CC application documents.

7. Clause C2.12 - Separation of Equipment

Equipment as listed below must be separated from the remainder of the building with construction that achieves an FRL of 120/120/120 and doorways being self-closing -/120/30 fire doors:

- + Lift motors and lift control panels; or
- + Emergency generators used to sustain emergency equipment operating in the emergency mode; or
- + Central smoke control plant; or
- + Boilers; or
- + A battery or batteries installed in the building that have a voltage exceeding 24 volts and a capacity exceeding 10 ampere hours.

Separation of on-site fire pumps must comply with the requirements of AS 2419.1.

Comments: Architect to note. Details are to be provided at CC application stage

8. Clause C2.13 - Electricity Supply System

To ensure certain types of electrical equipment to operate during an emergency the requirements of sub-clauses (a), (b) (c), (d) & (e) must be complied with relating to substations, sub-mains and main switchboards.

- (a) An electricity substation located within a building must –
 - (i) Be separated from any other part of the building by construction having an FRL of not less than 120/120/120; and
 - (ii) Having any doorway in that construction protected with a self-closing fire door having an FRL of not less than -/120/30
 - (b) A main switchboard located within the building which sustains emergency equipment operating in the emergency mode must –
 - (i) Be separated from any other part of the building by construction having an FRL of not less than -/120/30.
 - (ii) Have any doorway in that construction protected with a self-closing fire door having an FRL of not less than -/120/30.
 - (c) Electrical conductors located within a building that supply –
 - (i) A substation located within the building which supplies a main switchboard covered by (b); or
 - (ii) A main switchboard covered by (b),
- Must –
- (iii) Have a classification in accordance with AS/NZS 3013 of not less than –



- (A) If located in a position that could be straight to damage by motor vehicles – WS53W; or
 - (B) Otherwise – WS52W; or
- (iv) Be enclosed or otherwise protected by construction having an FRL of not less than 120/120/120

Comments: Confirmation is to be provided for the respective fire ratings on the CC plans, and also for the design of the required electrical services with the construction certificate documentation.

PART C3: PROTECTION OF OPENINGS

9. Clause C3.2 – Protection of Openings in External Walls

Openings in external walls that are required to have an FRL, which are to be exposed to a fire-source feature, are required to be protected in accordance with C3.2(a) & C3.2(b).

Openings in an external wall that is required to have an FRL must –

- (a) If the distance between the opening and the fire-source feature to which it is exposed is less than –
 - (i) 3 m from a side or rear boundary of the allotment; or
 - (ii) 6 m from the far boundary of a road, river, lake or the like adjoining the allotment, if not located in a storey at or near ground level; or
 - (iii) 6 m from another building on the allotment that is not a Class 10, be protected in accordance with C3.4 and if wall-wetting sprinklers are used, they are located externally; and
- (b) If the required to be protected under (a), not occupy more than 1/3 of the area of the external wall of the storey in which it is located unless they are in a Class 9b building used as an open spectator stand.

Comments: There are openings within 3m of a fire source feature in both the south-eastern and north-eastern facades, and as such the provisions of C3.2 & C3.4 apply to the openings within 3m of the allotment boundary. It is noted that this non-compliance is proposed to be addressed as an alternative solution by the Fire Engineer to demonstrate compliance with Performance Requirement CP2.

10. Clause C3.8 – Openings in Fire-isolated Exits

Specifies that the doorways that open into fire-isolated exits must be protected by -/60/30 fire doors that are self-closing or automatic. This clause also details the deemed-to-satisfy methods of activation. This does not apply to doors opening to a road or open space.

A window in the external walls of fire-isolated exits must be protected in accordance with C3.4 if it is within 6m of and exposed to a window or other opening in a wall of the same building other than in the same fire-isolated enclosure.

Comments: The door schedule provided with the application for the construction certificate shall detail compliance with the requirements of this clause.

11. Clause C3.9 – Service Penetrations in Fire-isolated Exits

Fire isolated exits must not be penetrated by any services other than electrical wiring as permitted by D2.7(e), ducting associated with a pressurisation system or water supply pipes for fire services.

Comments: Architect/Services Consultants to note and ensure compliance with regards to restriction of services penetrating the fire isolated stairs and passageway.

12. Clause C3.10 – Openings in Fire-isolated Lift Shafts

If lift shafts are required to be fire-isolated an entrance doorway must be protected by -/60- fire doors and the lift indicator panels must backed by construction having an FRL of not less than -/60/60 if it exceeds 35,000mm²



Comments: Certification from the lift consultant to confirm compliance is to be provided for the construction certificate application.

13. Clause C3.11 – Bounding Construction: Class 2, 3 & 4 Buildings

Protection is required to the bounding walls of sole-occupancy units or public corridors in Class 2 & 3 buildings and Class 4 portions of buildings of Types A, B & C Construction. Namely:

- + Doorways must be protected if providing access from an SOU to a:
 - o Public corridor;
 - o A room not within an SOU; or
 - o The landing of an internal non-fire isolated stairway that serves a required exit; or
 - o Another SOU
- + A doorway must be protected if it provides access from a room not within an SOU to a public corridor or the like; or to the landing on a non-fire isolated stairway that serves as a required exit.
- + Protection of the doorway must be -/60/30 self-closing fire door in Type A Construction, and a self-closing tight fitting solid core door in Type B or Type C Construction.

Comments: Compliance is to be demonstrated with the construction certificate documentation.

14. Clause C3.12 – Openings in Floors & Ceilings for Services

This clause applies to the floors and ceilings in buildings of Types A, B & C Construction and sets out the methods required to limit the spread of fire through openings in these building elements, required to resist the spread of fire.

Comments: Certification will be required at OC application stage.

15. Clause C3.13 – Openings in Shafts

This clause specifies that in buildings of Type A Construction, openings in shafts must be protected (generally with 1 hour fire rated shafts and doors).

Comments: Compliance is to be demonstrated with the construction certificate documentation.

16. Clause C3.15 – Openings for Service Installations

The clause details the requirements for protection of service openings in building elements that have an FRL, to prevent the spread of fire. C3.15 only applies only to an element required to have an FRL with respect to integrity or insulation.

Specification C3.15 prescribes materials and methods of installation for services that penetrate walls, floors and ceilings required to have an FRL. Where the mechanical ventilation system penetrates floors or walls that require an FRL the installation is to comply with AS/NZS 1668.1.

Comments: Compliance is to be demonstrated with the construction certificate documentation.

SPECIFICATIONS.

17. Specification C1.1 – Fire Resisting Construction

The new building works are required to comply with the requirements detailed under Table 3 of Specification C1.1 for Type A Construction. (See Appendix 1)

Comments: Compliance is readily achievable for the requirements of Type A construction. (See Appendix 1 at the end of the report for the required FRL's applicable to the building).



SECTION D – ACCESS & EGRESS

PART D1 PROVISION FOR ESCAPE

18. Clause D1.2 – Number of Exits Required

This clause requires the provision of sufficient exits to enable safe egress in case of an emergency. D1.2 provides that all buildings must have at least one exit from each storey and sets out circumstances in which more than one exit may be required (particularly in relation to Class 9 buildings).

Note: Not less than 2 exits must be provided from each storey if the building has an effective height of more than 25m.

Note: Not less than 2 exits must be provided from any storey that involves a vertical rise within the building of more than 1.5m unless the floor area of the storey is not more than 50m² and the distance of travel from any point on the floor to a single exit is not more than 20m.

Comments: *The current exit configuration is compliant with the requirements of this clause.*

19. Clause D1.3 – When Fire-isolated Stairways & Ramps are Required

This clause indicates when fire isolated stairways and ramps are required to enable safe egress from a building in the case of a fire, setting out the limits to which non-fire isolated exits can be used in Class 2, 3, 5, 6, 7, 8 and 9 buildings. Particular exceptions apply to Class 9a patient care and also class 9c aged care buildings.

Class 2 – an exit stair must be fire isolated when it connects or passes by more than 3 consecutive stories. An extra storey of any classification can be included if it is only for the accommodation of motor vehicles, etc; the building has a sprinkler system throughout; or if the stair is not providing access from or egress to the additional storey, and is separated by construction achieving an FRL of 60/60/60, and is smoke proof.

Class 7a – every stairway must be fire isolated if it connects more than 2 consecutive storeys. Concessions apply to inclusion of an additional storey, or sprinklers, as per the above.

Comments: *The exit stairs from the building are required to be fire isolated as they connect more than 3 levels in the residential levels.*

20. Clause D1.4 – Exit Travel Distances

This clause specifies the permitted travel distances allowable from Class 2 to Class 9 buildings, specifying the maximum distances to be taken into account for the various uses in each Class of building.

The following applies:

- + In a Class 2 or 3 building
 - The entrance of any SOU must be not more than:
 - 6m from an exit or from a point which travel in 2 different directions to 2 exits is available; or
 - 20m from a single exit serving the storey at the level of egress to a road or open space.
 - No point on the floor of a room which is not within a SOU must be more than 20m to an exit, or a point from which travel in different directions to 2 exits is available.
- + In a Class 5, 6 and 7a building:
 - No point on the floor must be more than 20m to an exit, or a point from which travel in different directions to 2 exits is available, in which case the maximum distance to one of those exits must not exceed 40m;
 - For the Class 5 and 6, the distance to a single exit serving a storey at the level of access to a road or open space may be increased to 30m.



Comments: Exit Travel distances do not comply on the Class 2 residential levels in both Towers with the worst case being 12m to an exit. This non-compliance will need to be addressed via a performance solution from an accredited Fire Engineer addressing Performance Requirement DP4 and EP2.2.

21. Clause D1.5 - Distances Between Alternative Exits

This clause specifies the minimum and maximum permitted distances between alternative exits. Class 5, 7a and 9b and 9c allows a maximum 60m between alternative exits when measured back through the designated point of choice (and to be no closer than 9m apart, and not converge so as to be less than 6m apart).

Exits required as alternative exits must be -

- (a) distributed as uniformly as practicable within or around the storey served and in positions where unobstructed access to at least 2 exits is readily available from all points on the floor including lift lobby areas; and
 - i. not less than 9m apart; and
 - ii. not more than -
 - in a Class 2 or 3 building - 45m apart; or
 - In a Class 9a health-care building, if such required exit serves a patient care area - 45m apart; or
 - In all other cases, i.e. the non-patient care areas - 60m apart.
- (b) Located so that the alternative paths of travel do not converge such that they become less than 6m apart.

Comments: The travel distances between the alternative exits within the building comply with the requirements of this clause.

22. Clause D1.6 - Dimensions of Exits

This clause specifies the minimum dimensions such as height and width of paths of travel from Class 2 to 9 buildings. It also specifies the minimum dimensions of doorways from the various compartments and the width of exit doors from buildings depending on the uses and functions carried out within them.

Comments: Exit corridors and stairs and other paths of travel are to be a minimum 1m in width and 2m in height clear of any obstructions. The unobstructed height of any doorway may be reduced to not less than 1980mm.

Note: See items further into the report in relation to the minimum ceiling heights for habitable and non-habitable spaces.

23. Clause D1.7 - Travel via Fire Isolated Exits

Sets out the requirements for safe discharge from various compartments and areas within a building, into a fire isolated stairway or passageway or ramp.

Note: a ramp for changes of level in a fire isolated passageway is required in a Class 9 building.

Where a path of travel from the point of discharge of a fire isolated exit necessitates passing within 6m of any part of an external wall of the same building, measured horizontally at right angles to the path of travel, that part of the wall must have -

- + an FRL of not less than 60/60/60; and
- + Any openings protected internally in accordance with BCA Clause C3.4,
- + For a distance of 3m above or below, as appropriate, the level of the path of travel, or for the height of the wall, whichever is the lesser.

Comments: From the plans it is unclear if the discharge from the fire stair in the northern or southern DA1 towers will necessitate passing within 6m of the external wall of the building to reach the road. If this is the case, the part of the external wall of the building required to be



passed within 6m to reach the road must achieve an FRL of not less than 60/60/60 for a minimum height of 3m above the egress path. Further details are required to be provided with the construction certificate documentation.

24. Clause D1.10 – Discharge From Exits

This clause requires that an exit must not be blocked at the point of discharge. Barriers such as bollards must be installed to prevent vehicles from blocking the discharge from exits.

This clause also provides the methods of construction, location and separation, at exit discharge points for all building Classes.

Comments: The pathways from exit discharges points around the site to the public road are to be detailed to comply with the requirements of this clause on the Construction Certificate plans. Noting where a change in level is present, compliant stairways or ramps not steeper than 1:8 are required.

25. Clause D1.17 – Access to Lift Pits

This clause provides the requirements for access to lift pits not more than 3m deep and the requirements of construction of access for lift pits that are more than 3m deep. The requirement for signage to lift pits is also set out.

Comments: Lift Contractor to note, Details are to be provided with the construction certificate documentation.

PART D2 CONSTRUCTION OF EXITS

26. Clause D2.2 – Fire-isolated Stairways & Ramps

A stairway or ramp, including landings that are required to be within a fire-resisting shaft must be constructed of non-combustible materials to protect the structural integrity of the shaft.

Comments: Certification will be required at CC application stage.

27. Clause D2.4 – Separation of Rising & Descending Stair Flights

If a stairway serving as an exit is required to be fire-isolated there must be no direct connection between the rising and descending flights of stairs at the level from which egress is obtained. This clause also prescribes the level of construction required.

Comments: The current plans are non-compliant with the requirements of this clause as there is no separation from the rising stairs from basement levels and the descending stairs from residential levels. It is understood that an alternative solution is to be proposed by the Fire Engineer to address Performance Requirements DP4 & DP5 in this regard.

28. Clause D2.7 – Installations in Exits & Paths of Travel

This clause restricts the installation of certain services in fire-isolated exits, non-fire-isolated exits and certain paths of travel to exits. It prescribes which services shall not be installed as well as the circumstances in which certain services may be installed in fire-isolated and non-fire-isolated exits.

If installed in a path of travel to an exit, electrical distribution boards, communication cupboards and the like containing motors, etc are to be enclosed with non-combustible construction, and doors are to be provided with smoke seals to the perimeter.

Comments: Architect to note. Details are to be provided with the construction certificate documentation.

29. Clause D2.10 – Pedestrian Ramps

A fire-isolated ramp may be substituted for a fire-isolated stairway if the construction enclosing the ramp and the dimensions comply with the requirements for a fire-isolated stairway. The ramp must also comply with the access requirements of D3 and AS1428.1, not have a gradient steeper than 1:8 and have a non-slip finish.



Comments: Details of slip resistance for the ramp finish to be provided with the occupation certificate documentation.

30. Clause D2.13 – Goings & Risers

This clause sets out the detailed requirements for the construction and geometry of the goings and risers in required stairways. These details are set out in sub-clauses (a) to (c) and Table D2.13 Riser and Going Dimensions.

Comments: All stairs are to have solid risers, and are to have contrasting nosings, slip resistant surfaces throughout in accordance with clause 11 of AS2419.1-2009. (See diagram in Part D3 below). Refer to the slip resistance requirements for stairs below under Clause D2.14.

Riser and Going Dimensions (mm)			
	Riser (R)	Going (G)	Quantity (2R + G)
Maximum	190	355	700
Minimum	115	250	550

31. Clause D2.14 – Landings

The dimensions and gradients of landings in stairways are set out in this clause; the configuration will depend on the proposed use of a building.

Landing surfaces must be slip resistant surfaces OR slip resistant nosing not less than listed in Table D2.14 when tested in accordance with AS4586.

Table D2.14 SLIP-RESISTANCE CLASSIFICATION

Application	Surface conditions	
	Dry	Wet
Ramp steeper than 1:14	P4 or R11	P5 or R12
Ramp steeper than 1:20 but not steeper than 1:14	P3 or R10	P4 or R11
Tread or landing surface	P3 or R10	P4 or R11
Nosing or landing edge strip	P3	P4

Comments: Details to be confirmed with the occupation certificate documentation.

32. Clause D2.15 – Thresholds

The threshold of a doorway must not incorporate a step or ramp at any point closer to the doorway than the width of the door leaf unless –

- (a) In patient care areas in a class 9a health-care building, the door sill is not more than 25mm above the finished floor level to which the doorway opens: or
- (b) In a Class 9c aged care building, a ramp is provided with a maximum gradient of 1:8 for a maximum height of 25mm over the threshold.

Comments: There are no steps or ramps proposed within the door thresholds.

Note: this provision relates primarily to door openings from the exit stairs, given the requirements for accessibility throughout other areas of the building.

33. Clause D2.16 – Balustrades or Other Barriers

This clause details where balustrades are required to be provided and sets out in specific detail the construction requirements for different building uses.



This clause details where balustrades are required to be provided and sets out in specific detail the construction requirements. Typically the following will apply to this class of building:

- + Balustrades are required where the fall to the level below is more than 1m in height. The minimum height of a balustrade is 1m above the floor of the landing, walkway or the like; and 865mm above the floor of a stairway or a ramp.
- + For a fall of more than 4m to the surface level below, a window sill must be a minimum of 865mm in height above the height of the floor surface.
- + Where the floor is more than 4m above the surface beneath the balustrade any horizontal or near horizontal members between 150mm and 760mm above the floor must not could facilitate climbing.
- + Balustrades must be constructed so as to not permit a sphere of 125mm diameter to pass through. The exception to this is within fire isolated exits within the building, or within a class 7 or 8 building, where the rails can be positioned a maximum of 460mm apart, so long as a bottom rail is located so a sphere of 150mm cannot pass through the opening between the nosing of the stair treads and the rail or between the floor of the landing, balcony or the like.

Comments: Details of the proposed balustrades are to be provided with the application for the construction certificate for assessment detailing the above.

34. Clause D2.17 – Handrails

This Clause sets out the requirements regarding the location, spacing and extent of handrails required to be installed in buildings. Handrails are required both sides of a public corridor in a Class 9c building.

This Clause sets out the requirements regarding the location, spacing and extent of handrails required to be installed in buildings. A Class 9a building must be provided along at least one side of every passageway or corridor used by patients and must be:

- + Fixed not less than 50mm clear of the wall; and
- + Where practicable, continuous for their full length.

Comments: Details of the proposed handrails are to be provided for assessment with the application for the construction certificate. It is noted that no stairs are proposed within the SOU. See also see parts of this report relating to Part D3 for additional requirements for handrails.

35. Clause D2.20 – Swinging Doors

A swinging door in a required exit or forming part of a required exit must swing in the direction of egress and must not otherwise impede egress. In addition, the door must not encroach at any part of its swing by more than 500mm on the required width of the exit (with the exception of airlocks and sanitary compartments, and with the exception of buildings or building parts that are less than 200m²).

Comments: Current configuration is non-compliant with the requirements of this clause as the eastern door of the northern building swings inwards; as do both exit doors in the southern building.

36. Clause D2.21 – Operation of Latch

A door in a required exit or forming part of a required exit and in a path of travel to a required exit must be readily openable without a key from the side that faces a person seeking egress, by a single downward action or pushing action on a single device which is located between 900mm & 1100mm from the floor. This clause prohibits the use of devices such as deadlocks and knobs (rather, lever latches are required). D2.21 also sets out exceptions in relation to buildings where special security arrangements are required in relation to the uses carried out.

Where fitted with a fail-safe device which automatically unlocks the door upon the activation of a sprinkler system or detection system, the above need not apply.

Comments: Architect to note. Compliance must be demonstrated at OC application stage.



37. Clause D2.23 - Signs on Doors

This clause requires the use of signs to alert persons that the operation of certain doors, that are required for evacuation in an emergency, must not be impaired and must be installed where they can be readily seen.

Sub-clauses (a) & (b) provide the requirements for the installation of such signs, the detail contained in them.

Doors of a fire-isolated exit must not be locked from the inside in a Class 9a health-care building, a Class 9c aged care building and in a fire-isolated exit serving a storey above 25m effective height, throughout the exit.

This clause details the exceptions to the above requirements if the doors are fitted with an automatic failsafe device or where sub-clauses (i) & (ii) apply

Comments: Certification will be required at OC application stage.

Any new self-closing fire and/or smoke doors leading into the fire stair or forming part of a Horizontal Exit or smoke compartment are to be provided with signage as follows:

FIRE SAFETY DOOR
DO NOT OBSTRUCT
DO NOT KEEP OPEN

Any new automatic closing fire and/or smoke doors which are held on hold open devices that leads into the fire stair or forming part of a Horizontal Exit or smoke compartment are to be provided with signage as follows:

FIRE SAFETY DOOR
DO NOT OBSTRUCT

In addition to the above, the doors which provide access to the fire isolated exits and also the Horizontal Exits must have signage provided adjacent to the entry doorway which states the following (ref Clause 183 of EP&A Reg 2000):

**OFFENCES
RELATING TO
FIRE EXITS**

By virtue of the regulations under the Environmental Planning and Assessment Act 1979 it is an offence:

(a) to obstruct anything in this bill that may impede the free passage of persons, or

(b) to interfere with or hinder observation or inspection by the operations of the Council providing access to fire exits or

(c) to remove, damage or otherwise render inoperative any sign.

38. Clause D2.24 - Protection of Openable Window

This clause relates to the protection of openable windows in a class 9b early childhood centre, or openable windows in a bedroom in a class 2 or 3 building or a class 4 part of a building, where the floor level is more than 2m above the surface level beneath. The intent of this clause is to limit the risk of a person (especially a young child) falling through an openable window, however it does not apply to such a window where the lowest level of its window opening is less than 1.7m above the floor. Details for protection include the following:

- + Openable portion of the window must have a device to restrict the window opening; or
- + Be fitted with a screen with secure fittings;
- + Not permit a sphere of 125mm to pass through;
- + Resist outward horizontal action of 250N;
- + Have a child resistant release mechanism if the screen or device is able to be removed, unlocked or overridden.



In addition to the above, and for floors that are more than 4m above the surface level below, a barrier with a height not less than 865mm above the floor is required for all openable windows. The barrier must permit a sphere of 125mm to pass through, and must not have any horizontal or near horizontal elements between 150mm and 760mm above the floor that facilitate climbing.

Comments: Details are to be provided with the construction certificate documentation.

ACCESS FOR PEOPLE WITH A DISABILITY

39. Clause D3.1 – General Building Access Requirements.

The extent of access required depends on the classification of the building. Buildings and parts of buildings must be accessible as set out in Table D3.1 unless exempted by Clause D3.4.

Residential parts: In a building required to be accessible, access for persons with disabilities must be provided from a pedestrian entrance required to be accessible to a minimum of 1 floor and to the entrance doorway of each SOU on that level and any other common room used by the residents. Notwithstanding, where a passenger lift is installed, access must be provided to every level served by the lift. However, we note that access is not required to the ancillary carpark part of the residential building (i.e. this being a class 7a, which is not required in Table D3.5 to be accessible as it is ancillary to a class 2).

All door handles and related hardware to new doorways required to be accessible shall be of a type that allows the door to be unlocked and opened with one hand in accordance with AS1428.1-2009. Clause 13.5.2 requires that a type 'D' handle be installed to all swinging doors.

Comments: Compliance is readily achievable. The passenger lift serves all levels of the building and access is provided to the residential lobbies from the street level.

40. Clause D3.2 – General Building Access Requirements for People with Disabilities

This part requires accessways to be provided to accessible buildings from the main points of pedestrian entry at the allotment boundary and any accessible car parking space or accessible associated buildings connected by a pedestrian link.

Access must be provided to and within all areas normally used by occupants (as required by Clause D3.1) within this building from the main points of pedestrian entry at the allotment boundary; from another accessible building connected by a pedestrian link; and any accessible car parking space.

Accessways are to be provided to accessible buildings from the main points of pedestrian entry at the allotment boundary and any accessible car parking space or accessible associated buildings connected by a pedestrian link.

Access must be provided through the principal pedestrian entrance and through not less than 50% of all pedestrian entrances (including the principal pedestrian entry).

In addition, as the building is greater than 500m², the non-accessible entrance must not be greater than 50m from an accessible entrance.

The minimum width of an accessible doorway must have a clear opening width of not less than 850mm in accordance with AS1428.1.

Comments: The current plans show compliance is achieved. Details to be provided at CC application stage.

41. Clause D3.3 – Parts of the Building to be Accessible

This part specifies the requirements for accessways within buildings which must be accessible.

In accordance with Clause D3.3; the non-fire-isolated stairways must comply with Clause 11 of AS 1428.1-2009 and the passenger lift must comply with Clause E3.6.



Clause D3.3(g) and (h) requires that the pile height or pile thickness shall not exceed 11mm and the carpet backing thickness shall not exceed 4mm. Moreover, the carpet pile height or pile thickness dimension shall not exceed 11mm, the carpet backing thickness dimension shall not exceed 4mm and their combined dimension shall not exceed 15mm.

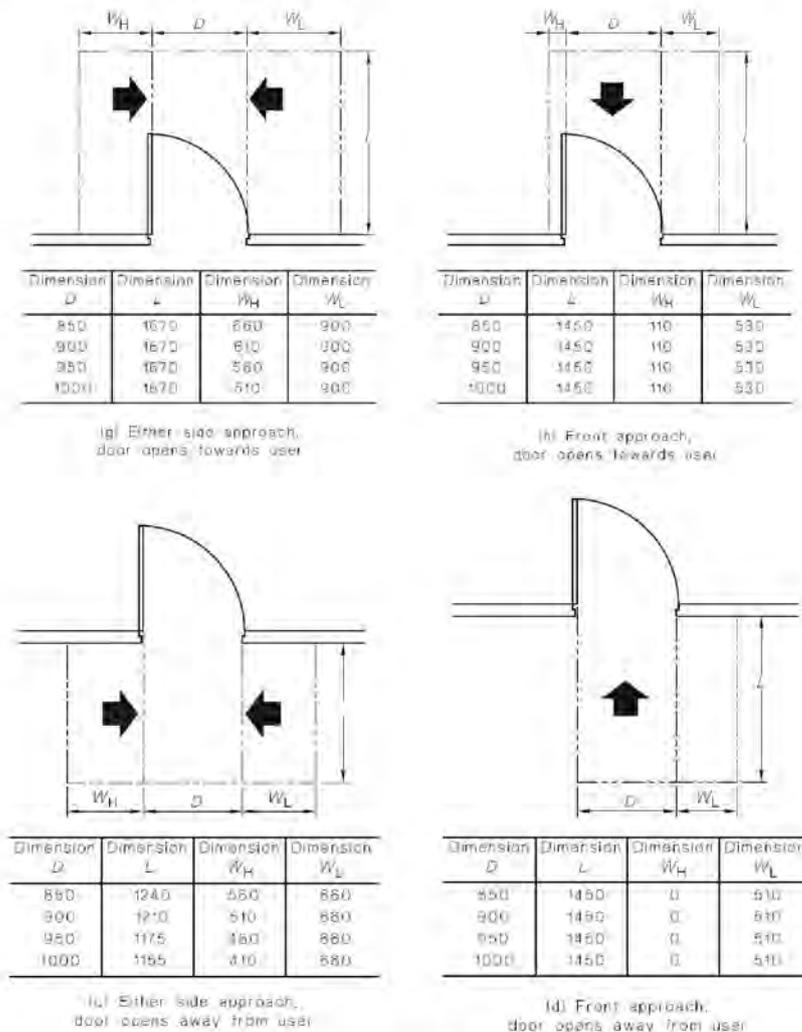
Comments: The following is a summary of some of the key matters which need to be considered:

Access for persons with disabilities must be provided, at a minimum, to and within all areas normally used by the occupants. This includes to and within all common areas.

The minimum width of an accessible doorway must have a clear opening width of not less than 850mm in accordance with AS1428.1.

All doorways on a continuous path of travel (i.e. throughout the common areas of the class 2 parts) shall have a minimum luminance contrast of 30% provided between: door leaf and door jamb; or door leaf and adjacent wall; or architrave and wall; or door leaf and architrave; or door jamb and adjacent wall. The minimum width of the area of luminance contrast shall be 50mm.

Circulation space to the new doorways that are required to be accessible are to comply with Section 13 of AS1428.1-2009, including as follows:



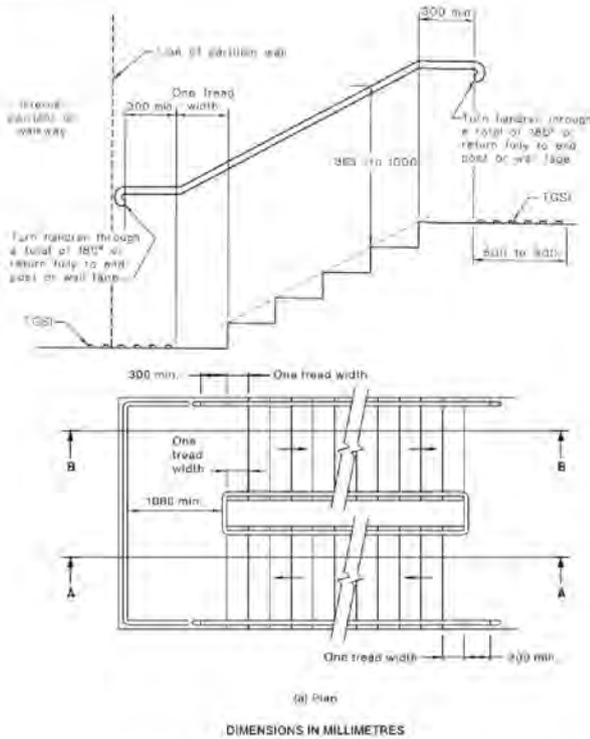
Circulation space requirements at doorways

Turning Spaces and Passing Spaces in Common Corridors are required to be provided on each residential level of both Towers in accordance with Clauses 6.4 & 6.5 of AS 1428.1-2009.



Stairways

+ Every common area stairway must be constructed in accordance with Clause 11 of AS1428.1, except if they are within a fire isolated exit. Note: The main stair within the class 2 portions of the building are to be used as a circulation stair as well as the fire stair. As such, the stairways must be designed to comply with the accessibility requirements of Clause 11 of AS1428.1-2009 and details will need to be confirmed on the plans for CC. This should be reviewed prior to submission.



Stairway and handrail requirements

- + Stairs shall have opaque risers (i.e. Solid)
- + Stair nosing's shall comply with the following diagram, which achieve a colour contrast luminance of 30% to the background (tread):

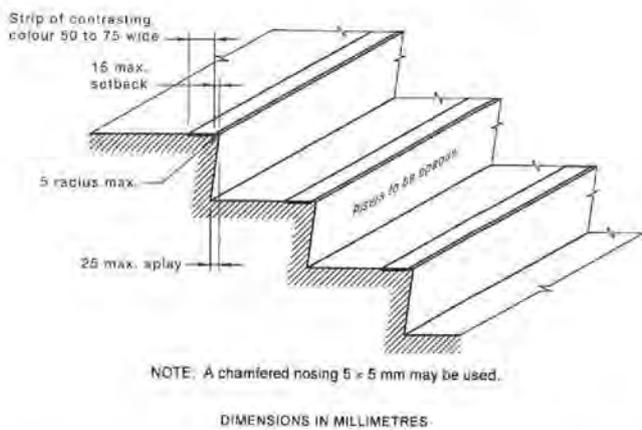


FIGURE 27(A) A TYPICAL STAIR NOSING PROFILE WITH NOSING STRIP

Stairway nosing requirements



- + Stairways are to be served by Tactile Ground Surface Indicators in accordance with AS1428.4.1, except if they are within a fire isolated exit.

Handrails

- + Handrails shall be installed along stairways as follows:
 - o Shall be continuous through the flight and where practicable, around landings and have no obstruction on or above up to a height of 600mm,
 - o Installed along both sides of the stairway (giving consideration also to 1m unobstructed width),

Note: If the stair in the southern building are proposed to be used as a circulation stair, the provisions of AS1428.1 must be applied.

42. Clause D3.8 - Tactile Indicators

This clause provides for the installation of tactile indicators in buildings required to be accessible and must be provided to warn people who are blind or have a vision impairment that they are approaching a stairway, escalator, passenger conveyor, ramp, overhead obstruction or an accessway meeting a vehicular way, except for areas exempted by D3.4.

Comments: Stairways and ramps serving the building will need to be provided with Tactile Ground Surface Indicators in accordance with AS1428.4. Details to be shown on the plans for Construction Certificate.

43. Clause D3.12 - Glazing on an Accessway

This part requires the provision of a contrasting strip, chair rail, handrail or transom across all frameless or fully glazed doorways and surrounding glazing capable of being mistaken for an opening.

Comments: Design details to note requirements for full height glazing.

SECTION E - SERVICES AND EQUIPMENT

PART E1 FIRE FIGHTING EQUIPMENT

44. Clause E1.3 - Fire Hydrants

A fire hydrant system must be provided to serve a building having a total floor area greater than 500m² and where a fire brigade is available to attend a building fire, installed in accordance with the provisions of AS2419.

The hydrant booster assembly and any external fire hydrants are required to be located greater than 10 metres from an external wall of the building, or affixed to the external wall and protected by a radiant heat shield that has an FRL of 90/90/90 located 2 metres either side and 3 metres above the outlets.

Any gas meter must be located a minimum of 10 metres from the hydrant booster outlet.

A required fire services pump room is required to be accessible directly from the road or open space, or from a door opening from a fire isolated exit.

Comments: Detailed plans showing the location of the hydrants (and booster assembly) providing coverage to all areas of the building and a design certificate to AS2419.1-2005 is to be provided with the application for a construction certificate. Hydrant booster assemblies are required to be located within sight of the main entry of the building. Due to the nature of the site the location of the booster assembly may need to be addressed as a performance solution from an Accredited Fire Safety Engineer addressing Performance Requirement EP1.3 or an exemption sought from the Fire Brigades under Cl. 188 of the EP&A Regulations.

45. Clause E1.4 - Fire Hose Reels

A fire hose reel system must be provided to serve a building where one or more internal fire hydrants are installed or in a building with a floor area greater than 500m².



Fire Hose Reels are to be located within 4m of an exit, or located adjacent to an internal hydrant (other than one within a fire isolated exit). Where system coverage is not achieved by the above, additional FHR may be located in paths of travel to an exit.

We note that BCA 2014 does not require the installation of Fire Hose Reels to service the Class 2 or Class 3 parts of the building subject to compliance with the requirements of Clause E1.6 relating to the installation of portable fire extinguishers.

A fire hose reel system must be provided to serve a building where one or more internal fire hydrants are installed or in a building with a floor area greater than 500m² and for the purposes of this clause, a sole-occupancy unit in a Class 2, 3 building or a Class 4 part is considered to be a fire compartment.

Comments: A plan shall be provided with the construction certificate documentation together with a design certificate to AS2441-2005 that details the coverage provided by the fire hose reels.

46. Clause E1.5 - Sprinklers

A sprinkler system must be installed in a building or part of a building when required by Table E1.5 and comply with Specification E1.5.

Sprinkler alarm valves must be located in a secure room or enclosure which has direct egress to a road or open space.

Table E1.5 sets out which types of building occupancies and Classes which require having sprinkler systems installed in them.

Comments: The carpark is noted as containing >40 vehicles and as such, is required to be provided with a sprinkler system.

PART E2 SMOKE HAZARD MANAGEMENT

47. Clause E2.2 - General Requirements

Class 2 to 9 buildings must comply with the provisions of this Clause to remove smoke during a fire, to control the operation of air handling systems and to prevent the spread of smoke between compartments.

Buildings must comply with the provisions of **Table E2.2a**, as applicable to Class 2 to 9 buildings and **Table E2.2b** as applicable to Class 6 and 9b buildings. It deals with the design and construction of air handling systems that are part of a smoke hazard management system and air handling system that are not part of a smoke hazard management system.

The details relating to the installation and operation of the systems are set out in **Specifications E2.2a, E2.2b and E2.2c**.

Comments: A smoke detection and alarm system is required to be provided throughout the building in accordance with Table E2.2a. It is to be connected to a building occupant warning system.

The mechanical ventilation in the carpark must comply with the above mentioned requirements.

Design certification shall be provided with the documentation submitted with the construction certificate application.

PART E3 LIFT INSTALLATIONS

48. Clause E3.2 - Stretcher Facility in Lifts

Stretcher facilities, complying with this clause, must be provided in lifts in at least one emergency lift as required by E3.4 or in a storey above an effective height of 12m.

A stretcher facility must accommodate a raised stretcher with a patient lying on it horizontally by providing a clear space not less than 600mm wide x 2000mm long x 1400mm high above the floor level.



Comments: The lift within the northern building serves storeys above an effective height of 12m and as such is required to be provided to accommodate a stretcher in accordance with the requirements of the clause above. A design certificate from the lift supplier shall be provided with the documentation submitted with the construction certificate application.

49. Clause E3.3 - Warning Against use of Lifts in Fire

Warning signs required be provided must be displayed where they can be readily seen and must comply with the details and dimensions of **Figure 3.3**.

Comments: Compliance is readily achievable. Details to be confirmed with the documentation provided with the construction certificate application.

50. Clause E3.5 - Landings

E3.5(a) The provisions of clause 12.2 - "Access" of AS 1735.2 do not apply.

E3.5(b) The provisions of Clause A3.2 - "Access to landings" of Appendix A of AS 1735.1 do not apply.

E3.5(c) Access and egress to and from lift well landings must comply with the Deemed-to-Satisfy Provisions of Part D.

Comments: Design certification from the lift supplier shall be provided with the documentation submitted with the construction certificate application.

51. Clause E3.6 - Passenger Lifts

In an accessible building, every passenger lift must be one of the types identified in **Table E3.6a**, have accessible features in accordance with **Table E3.6b** and not rely on a constant pressure device for its operation if the lift car is fully enclosed.

Comments: The passenger lifts are required to be designed to comply with AS1735.2 and AS1735.12. Design documentation shall be provided with the application for the construction certificate.

52. Clause E3.7 - Fire Service Controls

In passenger lifts designed in accordance with AS 1735 Parts 1 and 2, all lift cars serving any storey above an effective height of 12m must be provided with fire service controls.

Comments: Design certification from the lift supplier shall be provided with the documentation submitted with the construction certificate application.

53. Clause E3.9 - Fire Service Recall Operations Switch

Each group of lifts must be provided with one fire service control switch (required by Clause E3.7 above) that activates the fire service recall operation. This clause details the switch, the labelling, the key and operation procedures for a fire service recall operation.

Comments: Design certification from the lift supplier shall be provided with the documentation submitted with the construction certificate application.

54. Clause E3.10 - Lift Car Fire Service Drive Control Switch

The lift car fire service drive control switch required by E3.7 must be activated from within the lift car. This clause details the switch, the initiation, the labelling and operation for the fire service drive control switch.

Comments: Design certification from the lift supplier shall be provided with the documentation submitted with the construction certificate application.



EMERGENCY LIGHTING, EXIT SIGNS AND WARNING SYSTEMS

55. Clause E4.2 - Emergency Lighting Requirements

This clause details when emergency lighting must be installed in Class 2 to 9 buildings. The requirements for buildings and parts of buildings are detailed in sub-clauses (a) to (i) and each sub-clause must be considered as more than one may apply to any single building

Comments: Design details shall be provided with the documentation provided with the occupation certificate application.

56. Clause E4.5 - Exit Signs

An exit sign must be clearly visible to persons approaching the exit and must be installed on, above or adjacent to each door providing egress from a building. Sub-clauses (a) to (d) set out the situations where exit signs are required to be installed.

Comments: Design details shall be provided with the documentation provided with the occupation certificate application.

57. Clause E4.6 - Direction Signs

If an exit is not readily apparent to persons occupying or visiting the building then exit signs must be installed in appropriate positions in corridors, hallways, lobbies, and the like, indicating the direction to a required exit.

Comments: Design details shall be provided with the documentation provided with the occupation certificate application.

58. Clause E4.8 - Design & Operation of Exit Signs

Every required exit sign must comply with AS/NZS 2293.1 and be clearly visible at all times when the building is occupied by any person having the legal right of entry into the building.

Comments: Design details shall be provided with the documentation provided with the occupation certificate application.

SECTION F - HEALTH & AMENITY

PART F1 DAMP AND WEATHERPROOFING.

59. Clause F1.1 - Stormwater drainage

Stormwater drainage must comply with AS/NZ 3500.3.

Comments: Design statements to be provided with the construction certificate application.

60. Clause F1.7 - Waterproofing of Wet Areas

This clause requires that wet areas in Class 2 to 9 buildings must be waterproofed. It prescribes the standards to which the work must be carried on the construction of rooms containing urinals and their installation.

Comments: Details to be provided with the application for the construction certificate.

61. Clause F1.11 - Provision of Floor Wastes

In a Class 2 or 3 building or Class 4 part of a building, the floor of each bathroom and laundry located above a sole-occupancy unit or public space must be graded to permit drainage to a floor waste.

Comments: Details to be provided with the application for the construction certificate.



PART F2 SANITARY AND OTHER FACILITIES

62. Clause F2.1 – Facilities in Residential Buildings

Sanitary and other facilities for Class 2 and 3 buildings and Class 9c aged care buildings and for Class 4 parts of buildings must be provided in accordance with **Table F2.1**. This Table details the facilities required to be provided in residential buildings.

Comments: Current provisions are compliant with the requirements of this clause. Details will be required to be submitted at CC Application Stage.

63. Clause F2.5 – Construction of Sanitary Compartments

Other than in an early childhood centre, sanitary compartments must have doors and partitions that separate adjacent compartments and extend –

- + from floor level to the ceiling in the case of a unisex facility; or
- + a height of not less than 1.5m above the floor if primary school children are the principal users; or
- + 1.8m above the floor in all other cases.

The door to a fully enclosed sanitary compartment must open outwards; or slide; or be readily removable from the outside of the sanitary compartment, unless there is a clear space of at least 1.2m, measured in accordance with Figure F2.5 between the closet pan within the sanitary compartment and the doorway.

Comments: The current configuration is compliant. Details to be provided at CC application stage.

PART F3 ROOM HEIGHTS

64. Clause F3.1 Height of Rooms and other spaces

The ceiling heights in Class 2 to 9 buildings must not be less than required in sub-clauses (a) to (f) of this clause.

The ceiling heights are prescribed and should be checked for all classes and parts during assessment or the design process.

The ceiling minimum heights for a Class 2 or 3 building are as follows:

- + Kitchen, laundry or the like – 2.1m;
- + Corridor, passageway or the like – 2.1m
- + Habitable rooms excluding the kitchen – 2.4m.

Comments: Architect to ensure compliance with SEPP 65 as applicable (or outline in the DA submission any shortcomings)

Note: The basement carpark will require careful consideration, particularly with regard to the ceiling height required for accessible spaces, where services may impact on the required clearances and should be given early attention to ensure compliance. Discuss requirements with the access consultant.

Ceiling heights to be reviewed at the CC stage with the detailed section drawings.

PART F4 LIGHT AND VENTILATION

65. Clause F4.1 – Provision of natural Light

Natural lighting must be provided in:

- + Class 2 buildings and Class 4 parts of buildings – to all habitable rooms.
- + Class 3 buildings – all bedrooms and dormitories.

Comments: Detailed plans to be reviewed with the construction certificate application and certification provided.



66. Clause F4.2 - Methods & Extent of Natural Lighting

Sub-clauses (a), (b) & (c) set out the requirement that natural light must be provided by windows and the size and location of such windows. Natural light can also be provided by the use of rooflights in accordance with the provisions of this Clause.

Note: the Guide to the BCA, as part of the commentary under **F4.2**, contains an example for determining proportional combination of windows and rooflights. **Figure F4.2(1)** in the Guide to the BCA contains an elevation showing method of measuring distance of window from boundary. **Figure F4.2(2)** contains an illustration of window sill in aged care building.

Comments: Detailed plans to be reviewed with the construction certificate application and certification is to be provided at CC application stage.

67. Clause F4.4 - Artificial Lighting

Artificial lighting is required where it is necessary to minimise the hazard to occupants during an emergency evacuation. Sub-clauses (a), (b) & (c) sets out the places where artificial lighting is always required in all classes of buildings and the standard to which it must be installed.

Comments: Compliance is readily achievable. Design documentation shall be provided with the construction certificate application.

68. Clause F4.5 - Ventilation of Rooms

A habitable room, office, shop, factory, workroom, sanitary compartment, bathroom, shower room, laundry and any other room occupied by a person for any purpose must have natural ventilation complying with F4.6 **or** a mechanical or air-conditioning system complying with AS1668.2 and AS/NZS 3666.1.

Comments: Detailed review of any window openings to be undertaken with the application for the construction certificate. Design documentation shall be provided from the mechanical consultant for all ventilation to the building with the construction certificate documentation.

69. Clause F4.6 - Natural Ventilation

Natural ventilation provided in accordance with F4.5(a) must consist of permanent openings, windows, doors or other devices which can be opened in accordance with sub-clauses (a), (b) & (c).

Comments: Detailed review of any window openings to be undertaken with the application for the construction certificate. Design documentation shall be provided from the mechanical consultant for all ventilation to the building with the construction certificate documentation.

70. Clause F4.11 - Carparks

Every storey of a carpark except an open-deck carpark must have-

- (a) A system of ventilation complying with AS 1668.2; or
- (b) An adequate system of permanent natural ventilation.

Comments: Details of the mechanical ventilation system and design certificate is to be provided with the application for the construction certificate.

PART F5 SOUND TRANSMISSION AND INSULATION

71. Clause F5.4 - Sound Insulation Rating of Floors

The sound rating of floors in a Class 2 or 3 building must be calculated in accordance with the requirements of sub-clause (a) and the floors in a Class 9c aged care building must be calculated in accordance with sub-clause (b). The deemed-to-satisfy construction requirements are set out in **Specification F5.2. Table 3A** of the Specification prescribes Acceptable Forms of Construction for Floors.



Comments: Details to be provided with the construction certificate documentation. It is recommended that an Acoustic Consultant be engaged to confirm compliance with the requirement of this clause have been achieved.

72. Clause F5.5 - Sound Insulation Rating of Walls

The sound rating required for walls in Class 2 and 3 buildings and Class 9c aged care buildings is set out in sub-clauses (a) to (f). The deemed-to-satisfy construction requirements are set out in **Specification F5.2. Table 2A** of the Specification prescribes Acceptable Forms of Construction for Walls.

Comments: Details to be provided with the construction certificate documentation. It is recommended that an Acoustic Consultant be engaged to confirm compliance with the requirement of this clause have been achieved.

73. Clause F5.6 - Sound Insulation Rating of Services

This clause details the separation requirements for services. The requirements only apply to services which pass through more than one sole-occupancy unit or are located in a wall or floor cavity which separates sole-occupancy units. F5.6 does not apply if the pipe is only located in a single unit or any part of a Class 2, 3 or 9c building which is not part of a sole-occupancy unit.

Comments: Details to be provided with the construction certificate documentation. It is recommended that an Acoustic Consultant be engaged to confirm compliance with the requirement of this clause have been achieved.

74. Clause F5.7 - Sound Isolation of Pumps

A flexible coupling must be used at the point of connection between the service pipes in a building and any circulating or other pump.

Comments: Details to be provided with the construction certificate documentation. It is recommended that an Acoustic Consultant be engaged to confirm compliance with the requirement of this clause have been achieved.

SECTION J - ENERGY EFFICIENCY

75. Section J - Energy Efficiency

Despite the provision of BASIX, the following NSW Sec. J requirements still apply to the residential portion:

Class 2 - NSW Part J (A)1 - Building Fabric - This part only applies where the development consent or an environmental planning instrument specifies that insulation is to be provided as part of the development consent.

Class 2 - NSW Part J (A)2 - Building Sealing - The following national provisions are applicable:

- + Clause J3.3 - Roof lights (we note that no roof details are currently provided).
- | Clause J3.4 - External windows and doors
- + Clause J3.5 - Exhaust fans
- + Clause J3.6 - Construction of roofs, walls and floors
- | Clause J3.7 - Evaporative coolers

Class 2 - NSW Part J (A)3 - Air Conditioning and Ventilating Systems - The following national provisions are applicable:

- + Clause J5.2 - Air-conditioning and ventilating systems
- + Clause J5.3 - Time switch



- | Clause J5.4 - Heating and cooling systems
- + Clause J5.5 - Ancillary exhaust systems

Class 2 - NSW Part J (A)4 – Hot Water Supply

- + Clause J7.2 - Hot water supply

Class 2- NSW Part J (A)5 – Access for Maintenance

Details and design certification are required

Details are to be provided from the design consultants for their respective disciplines for the proposed new glazing, building fabric, ventilation, electrical and hydraulic systems that compliance with the requirements of Section J has been achieved in association with the BASIX Certificate.



C. CONCLUSION

This report contains an assessment of the referenced architectural documentation for the proposed residential building at Lord Sheffield Circuit, Thornton against the Deemed-to-Satisfy Provisions of the BCA 2014. Arising from the review, it is considered that the proposed development can readily achieve compliance with the relevant provisions of the BCA with minor amendments to the plans. Where compliance matters are proposed to comply with the performance requirements (rather than DTS Provisions), the development of an Alternative Solution Report will be required prior to the issue of the Construction Certificate.

The following fire safety measures are required within building:

Essential Fire and Other Safety Measures	Standard of Performance
Access Panels, Doors & Hoppers	BCA Clause C3.13 & AS 1530.4 - 2005
Alarm Signaling Equipment	AS1670.3 - 2004
Automatic Fire Detection & Alarm System	BCA Spec. E2.2a & AS 1670.1 - 2004.
Building Occupant Warning System activated by the Fire Detection and Alarm System	BCA Clause Spec E2.2a Clause 6 & Clause 3.22 of AS 1670.1 - 2004
Emergency Lighting	BCA Clause E4.4 & AS 2293.1 - 2005
Exit Signs	BCA Clauses E4.5, E4.6 & E4.8 and AS 2293.1 - 2005
Fire Dampers	BCA Clause C3.15, AS 1668.1 - 1998 & AS 1682.1 & 2 - 1990
Fire Doors	BCA Clause C2.12, C2.13, C3.2, C3.4, C3.5, C3.6 & C3.7, C3.8, C3.11 and AS 1905.1 - 2005
Fire Hose Reels	BCA Clause E1.4 & AS 2441 - 2005
Fire Hydrant Systems	Clause E1.3 & AS 2419.1 - 2005
Fire Seals	BCA Clause C3.15 & AS 1530.4 - 2005 & AS 4072.1 - 2005
Fire Shutters (TBC)	BCA Spec. C3.4 & AS 1905.2 - 2005
Fire Windows (TBC)	BCA Spec. C3.4
Lightweight Construction	BCA Clause C1.8 & AS 1530.3 - 1999
Mechanical Air Handling Systems (in carpark)	BCA Clause E2.2, AS/NZS 1668.1 - 1998 & AS 1668.2 - 1991
Paths of Travel	EP & A Regulation Clause 186
Portable Fire Extinguishers	BCA Clause E1.6 & AS 2444 - 2001
Smoke and/or Heat Alarm Systems	BCA Spec. E2.2a & AS 3786 - 1993
Wall wetting sprinklers (TBC)	BCA Clause C3.4 & AS 2118.2 - 1995
Warning & Operational signs	Section 183 of the EP & A Regulations 2000, AS 1905.1 - 2005, BCA Clause C3.6, D2.23, E3.3

Notes:

The measures included and the standards of performances nominated above may vary as a result of any proposed fire engineered alternative solutions.



D. APPENDIX 1

TABLE 3 TYPE A CONSTRUCTION: FRL OF BUILDING ELEMENTS

Building element	Class of building – FRL: (in minutes)		
	<i>Structural adequacy/ Integrity/ Insulation</i>		
	2, 3 or 4 part	5, 7a	6
EXTERNAL WALL (including any column and other building element incorporated therein) or other external building element, where the distance from any <i>fire-source feature</i> to which it is exposed is—			
For <i>loadbearing</i> parts—			
less than 1.5 m	90/ 90/ 90	120/120/120	180/180/180
1.5 to less than 3 m	90/ 60/ 60	120/ 90/ 90	180/180/120
3 m or more	90/ 60/ 30	120/ 60/ 30	180/120/ 90
For non- <i>loadbearing</i> parts—			
less than 1.5 m	-/ 90/ 90	-/120/120	-/180/180
1.5 to less than 3 m	-/ 60/ 60	-/ 90/ 90	-/180/120
3 m or more	-/-/-	-/-/-	-/-/-
EXTERNAL COLUMN not incorporated in an <i>external wall</i> , where the distance from any <i>fire-source feature</i> to which it is exposed is—			
less than 3 m	90/-/-	120/-/-	180/-/-
3 m or more	-/-/-	-/-/-	-/-/-
COMMON WALLS and FIRE WALLS—	90/ 90/ 90	120/120/120	180/180/180
INTERNAL WALLS—			
<i>Fire-resisting</i> lift and stair <i>shafts</i> —			
<i>Loadbearing</i>	90/ 90/ 90	120/120/120	180/120/120
Non- <i>loadbearing</i>	-/ 90/ 90	-/120/120	-/120/120
Bounding <i>public corridors</i> , public lobbies and the like—			



Building element	Class of building – FRL: (in minutes)		
	<u>Structural adequacy/ Integrity/ Insulation</u>		
	2, 3 or 4 part	5, 7a	6
<u>Loadbearing</u>	90/ 90/ 90	120/--	180/--
Non- <u>loadbearing</u>	-/ 60/ 60	--/--	--/--
Between or bounding <u>sole-occupancy units</u> —			
<u>Loadbearing</u>	90/ 90/ 90	120/--	180/--
Non- <u>loadbearing</u>	-/ 60/ 60	--/--	--/--
Ventilating, pipe, garbage, and like <u>shafts</u> not used for the discharge of hot products of combustion—			
<u>Loadbearing</u>	90/ 90/ 90	120/ 90/ 90	180/120/120
Non- <u>loadbearing</u>	-/ 90/ 90	-/ 90/ 90	-/120/120
OTHER LOADBEARING INTERNAL WALLS, INTERNAL BEAMS, TRUSSES			
and COLUMNS—	90/--	120/--	180/--
FLOORS	90/ 90/ 90	120/120/120	180/180/180
ROOFS	90/ 60/ 30	120/ 60/ 30	180/ 60/ 30

St Hilliers Pty Limited

Thornton Central Development Lot 3007 - DA01

Traffic and Parking Report

12 September 2014



**PARSONS
BRINCKERHOFF**

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1. Introduction

This Traffic and Parking report has been prepared in support of a Development Application (DA) for part of Lot 3007 of the Thornton Central Development, North Penrith. This DA, known as DA01 covers the building of the first half of the Lot. An associated DA (DA02) covers the second and final part. The location of DA01 and DA02 is shown in Figure 1.1. The proposed multi-storey residential buildings were envisaged within a Part 3A Concept approved by the Minister for Planning and Infrastructure on 9 November 2011 (in accordance with Part 3A of the EPA Act 1979).



Base image source: DKO Architects, 2014

Figure 1.1 Study site location

This report summarises the impact of the development and assesses the consistency with the approved transport and access arrangements. It also contains a preliminary Construction Traffic Management Plan (CTMP) for these works.

1.1 Background

The North Penrith project site abuts directly onto State rail land north of Penrith Station. It was previously used as an army base for the Royal Australian Engineers until 1994. It retains one building on the Commonwealth Heritage List, Thornton Hall, in the eastern part of the site. Plans are for it to be retained, renovated and used as a single dwelling. Adjoining land uses include an army depot, a museum, industrial uses, a rail line and residences.

An approved Concept Plan for the Thornton site provides for a transit-oriented mixed uses development to accommodate 900–1,000 dwellings, employment generating uses, open space and associated infrastructure and facilities. The development was divided into stages. These Stages have all been approved and development has already commenced in some (some dwellings already occupied). Stage 3A, in which Lot 3007 is located was approved on 7 May 2014.

A Transport Management and Accessibility Plan (TMAP) was prepared for the site on behalf of Landcom (now known as UrbanGrowth NSW) and lodged in support of the Part 3A application. Since the approval of the Concept Plan, the ownership of Stage 3A has changed from UrbanGrowth NSW to St Hilliers Pty Limited. Since the approval of the Concept Plan, there have been some minor changes to the yields within each stage. The combined impacts of these changes are assessed within this report.

The adjoining Penrith Training Depot, on an area of land retained by the Department of Defence will continue its current activity. A new 1,000 space multi-level commuter car park, constructed by Penrith City Council was opened on 3 August 2012. These activities are not associated with the Thornton development, although their access is maintained and where appropriate enhanced, through the future access network.

1.1 Site location

The study site, shown in Figure 1.2 is located immediately north of the Penrith CBD, in western Sydney, approximately 50-kilometres from Sydney CBD. The present Penrith CBD is a short walk away on the southern side of the Western Rail Line. The Thornton development is located alongside a commuter car park, and the Penrith Training Depot.



Base image source: Landcom, 2010

Figure 1.2 Study site location

1.2 Scope of this report

This report is structured as follows:

- Section 2 provides an overview of existing transport conditions in the area around the development
- Section 3 details the proposed development
- Section 4 analyses the trip generation of the proposed development as well as the impact of the Project on the surrounding road network and on public transport, pedestrians and cyclists
- Section 5 assesses the site access and parking within the site
- Section 6 outlines the anticipated construction details and assesses the impact
- Section 7 presents the conclusions of the assessment and lists the recommendations.

2. Existing conditions

The Thornton Central development site has excellent access to rail services, with walking distance access to frequent, express train services, Penrith Interchange buses and the Penrith CBD. Connection to the cycle network and pedestrian access across the Western Rail Line mean the site is less reliant on car-based travel and therefore less affected by congestion on the road network at Castlereagh Street and Parker Street.

2.1 Rail

Penrith Station is served by the Western Line and the Blue Mountains Line providing direct links to Sydney CBD in the east (the Western Line continues north to Berowra as the North Shore Line and to Lithgow in the west. Table 2.1 shows that on average, there is a combined eastbound rail service every 4 to 5 minutes in the peak direction during the morning and afternoon weekday peak hours.

Table 2.1 Current train services at Penrith Station

Line	Direction	AM peak hour services	PM peak hour services	Weekday services	First/last train
Western	Eastbound	10	6	74	3:09 to 23:20 (later on Fridays)
	Westbound	4 (2 terminate)	8 (5 terminate)	76	5:23 to 1:06 (later on Fridays)
Blue Mountains	Eastbound	4	2	33	4:14 to 23:37
	Westbound	2	4	33	5:09 to 1:06

Source: Sydney Trains timetables, June 2014 and 20 October 2013

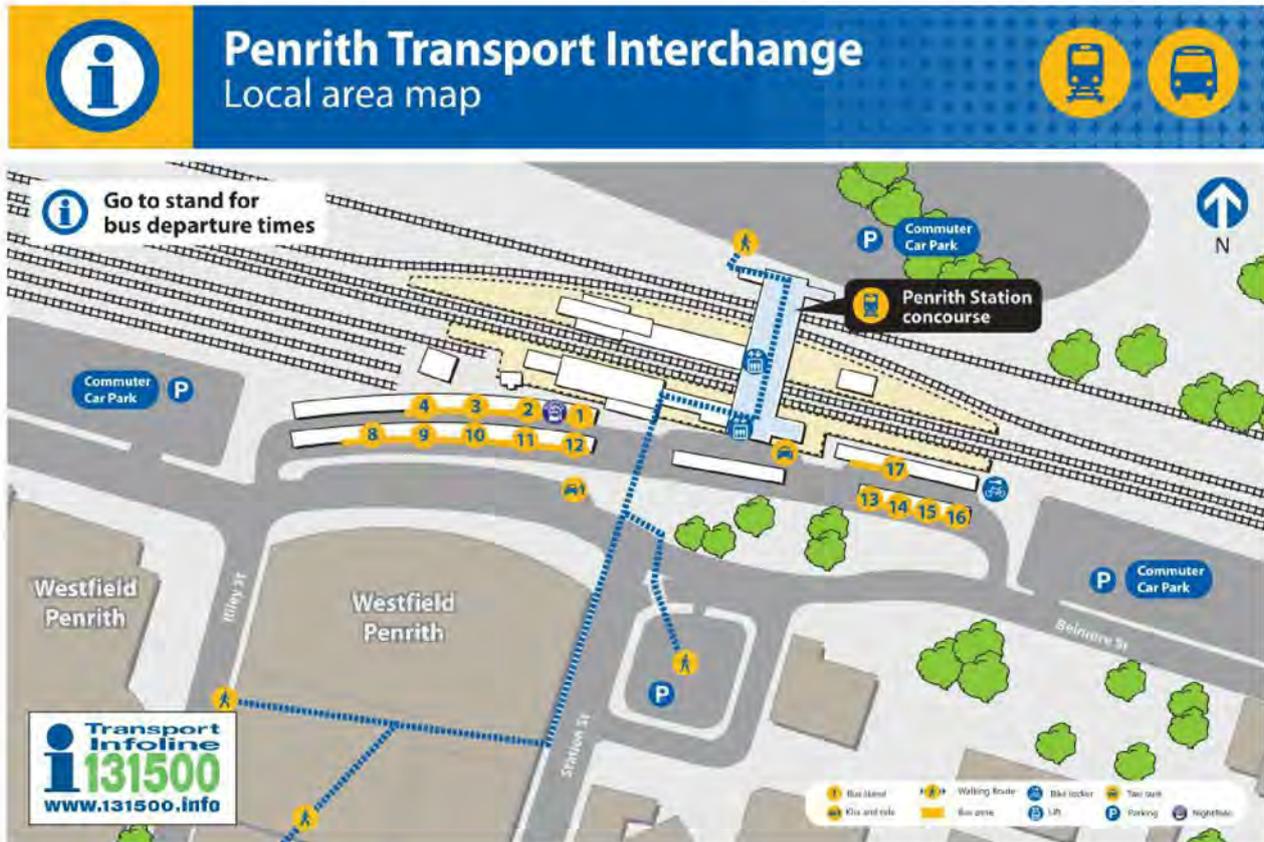
The Thornton development site is within an 800 m walking catchment of Penrith Station. Penrith Station received an Easy Access upgrade in 2000 so a wider range of commuters with mobility restrictions could access the station. It included the installation of four lifts, a new overhead concourse, and other safety and security measures.

The surrounds of the station have commuter parking for approximately 1,800 vehicles:

- RailCorp car park on the north side of Jane Street – 320 vehicles.
- Penrith Council car park on the north side of Belmore Street – 348 vehicles.
- Penrith Council commuter car parking is provided at Sloper Place, an off-street car park on the south side of Belmore Street – 124 vehicles.
- North Penrith commuter car park – 1,000 vehicles.

2.2 Penrith Interchange

Penrith Interchange, on the southern and northern sides of Penrith Station, includes bus stands, taxi ranks, kiss-and-ride space, and bicycle facilities including racks and lockers. The interchange is within walking distance from the Thornton Central site, giving future residents and employees access to a wide range of transport options. The layout of the Penrith Interchange is shown in Figure 2.1.



Source: www.131500.info

Figure 2.1 Penrith Station interchange layout

2.3 Bus

Penrith is within Region 1 of the Sydney bus network. The local bus network consists of 23 local routes and five Blue Mountains Bus company routes. Added to these regular public services are special school bus trips. Many of these bus routes serve the areas south and West of Penrith. The buses that travel north from Penrith include:

- north-east services – 678, 782, 785, 786 plus school services
- northern services – 673, 783, 784 plus school services.

Many of these travel within the vicinity of the North Penrith site. The Region 1 bus network is shown in Figure 2.2. The Blue Mountains Bus company services travel west from Penrith CBD. The focus of the Penrith bus network is the interchange on the southern side of Penrith Station. However, the Concept Plan for the Thornton development includes the provision for a future bus corridor through the site and under the rail line via a new bus-only underpass.



Source: Region 1 Bus Network Map Effective 18 May 2014

Figure 2.2 Penrith Bus Network

2.4 Road network

Regional road access to the study area is primarily provided by Coreen Avenue to the north, Parker Street/Richmond Road in the east and Castlereagh Road in the west. A description of the roads in the study area and their characteristics is shown in Table 2.2.

Table 2.2 Description of key roads in the local network

Road name	Classification	Carriageway	Speed limit	Role in network
Castlereagh Road	Arterial	Divided two lanes in each direction	60 km/h	Provides access to the north from the western side of Penrith.
Parker Street	Arterial	Divided, three lanes in each direction south of Copeland Street Divided, two lanes in each direction north of Copeland Street	70 km/h, school speed limit at Copeland Street	Connects the eastern side of Penrith to the M4 Motorway.
Richmond Road	Arterial	Divided, two lanes in each direction	70 km/h	Part of The Northern Road/Parker Street corridor.
Coreen Avenue	Collector	Undivided, one lane each way with parking on both sides	60 km/h from Castlereagh Road to Coombes Drive (east) and 50 km/h to Parker Street	Connects Castlereagh Road in the west and Parker Street in the east.
Lemongrove Road/ Macquarie Avenue, Evan Street	Collector	Undivided, one lane each way with parking on both sides (except Evan Street Bridge)	50 km/h	Alternative crossing of the Western Rail Line, provides local access to Penrith CBD.
The Crescent/ Cox Street	Local	Undivided, one lane each way with parking on both sides	50 km/h	Provides access to the southern edge of the Lemongrove residential precinct.
Peachtree Road	Local	Undivided, one lane each way with parking on both sides	50 km/h	Connects the Thornton development to Castlereagh Road

2.5 Pedestrians and cycles

The Thornton development is planned with footpaths provided on both sides of the street, as well as pedestrian connections across the waterway and a pedestrian plaza leading to the Penrith Station (northern) forecourt. Penrith Station includes unrestricted (unpaid) pedestrian access across the Western Rail Line with lift access.

There are limited pedestrian facilities provided along Coreen Avenue fronting the site. However, some sections of Coreen Avenue between Parker Street and Coombes Drive have concrete footpaths. A pedestrian refuge is located on Coreen Avenue, east of Hughes Avenue.

An off-road cycle path has been constructed by Penrith City Council along Castlereagh Street. When the Peachtree Road and Coombewood Avenue road network is complete, this cycle path will be connected to Penrith Station. The plans for the Thornton development include improvements to cycle infrastructure to improve access.

A cycle lane is provided at the newly upgraded intersection of Lemongrove Road and Coreen Avenue. Cycling can also occur in shared parking lanes on Coreen Avenue between Castlereagh Road and Parker Street. There is also a cycle track between Coombes Drive and Andrews Road, through Hickeys Park.

3. Proposed development

The development of Lot 3007 (within Thornton Central) is divided into two separate, but associated DAs:

- **DA01** (the subject of this report) covers two of the four buildings proposed for Lot 3007. It also included half of the basement car park including the entry/exit and ramp.
- **DA02** covers the remaining two of four buildings and the remainder of the basement car park level(s).

The DA covers the construction of residential apartment buildings, and does not include non-residential land use. Any departure from the approved non-residential floor space approved under the Concept Plan would need to be assessed as part of future applications. This assessment is therefore confined to the number of residential dwellings currently proposed based on the lots created.

3.1 Changes in the development

Parsons Brinckerhoff prepared the North Penrith Development Transport Mobility and Accessibility Plan (TMAP) (Parsons Brinckerhoff, October 2010) submitted in support of the Part 3A Concept Plan DA. Since submission of the approved Concept Plan there have been some changes to the North Penrith Development. From a traffic, transport and access perspective, the major changes include:

- a re-ordering of the development staging
- changes to development yield and mix
- changes to the local street network in other stages.

3.2 This development

The number of dwellings in each DA is listed in Table 3.1.

Table 3.1 Dwelling number and type by DA (construction stage)

Dwelling type	DA01 (This DA)	DA02	Lot 3007 (DA01 plus DA02)
1 bedroom	38	27	65
2 bedroom	39	41	80
3 bedroom	6	0	6
Total	83	68	151

The combined DA01 and DA02 development also comprises:

- Potential for 157 parking spaces, with the potential to increase this by 40 spaces to 197 spaces.
- One garbage truck parking space adjacent to the waste storage collection point.
- No visitor parking spaces – all visitor parking on-street.
- 10% disabled parking spaces to match 10% universal access apartments.

Relevant street level and basement parking plans are provided in Appendix A.

Parking

Two parking options are proposed (applying to both DA01 and DA02):

1. Parking rates as per those given in the *North Penrith Design Guidelines¹* and *Penrith Development Control Plan 2010*.
2. An option of increasing the parking rate for two bedroom apartments from 1.0 per dwelling to 1.5 per dwelling.

In physical terms, the choice of parking option approved/built would influence the number of basement parking levels constructed.

- If the higher parking rate option is approved, **both Basement 1 and Basement 2** levels would be constructed.
- If the additional parking is not approved or if the additional parking level is not built due to commercial reasons, **only Basement 1** would be built.

3.3 Comparison to approved Concept Plan

The approved Concept Plan included 274 dwellings within the village centre, now referred to as Stage 3A. The Development Application lodged to create the superlots and infrastructure associated with Stage 3A flagged an increase to 330 dwellings along with a 100 unit seniors living/aged care facility. Overall the total yield for the Thornton development was still within the 900–1,000 dwelling total.

The 83 apartments in DA01 (and combined 151 apartments with DA02) are within the 330 dwelling sub-total for Stage 3A. It is noted that there may be changes in the dwelling numbers associated with other lots within Stage 3A. Any increases above the cumulative total of 1,000 dwellings in the remaining buildings within Stage 3A would be assessed as part of subsequent development applications.

3.4 Access arrangements

Four access points connect the development to the road network, including:

1. a new access to Coreen Avenue, west of Coombes Drive (eastern intersection), already constructed as part of Stage 1, called Sydney Smith Drive
2. the existing commuter car park access road, renamed as Combewood Avenue, to be connected to as part of Stage 2B
3. a connection through to the Castlereagh Road/Peachtree Road intersection, renamed as Thornton Drive, to be connected to as part of Stage 2B
4. a connection to The Crescent near the current entrance to the Penrith Training Depot, called Mountain View Crescent, constructed as part of Stage 2A.

The TMAP analysis concluded that these four access points would provide sufficient capacity to accommodate all movements into and out of the site. All four access points and connecting internal streets will be constructed before work commences on the development. The only link not available by the end of Stage 3A will be Lord Sheffield Circuit between Combewood Avenue and Dunshea Street. In the interim, an alternative route for village centre traffic will be available via Lord Sheffield Circuit and Thornton Drive.

¹ North Penrith Design Guidelines 2013 (version 19 March 2013, Landcom)

4. Transport impact

There have been changes in the development yield since the approval of the Concept Plan in November 2011. This section investigates the implications of these changes on the anticipated amount of traffic generated by the development, and considers the impact of changed traffic generation on the road network.

4.1 Traffic generation and impact

The TMAP assessed a total yield including a range of between 900 and 1,000 residential dwellings. Traffic generation and impact was assessed based on the upper limit. Given that the number of dwellings proposed does not exceed the number assessed for stage 3A in the TMAP, the traffic generation (with the lower parking total) is within the trip numbers already assessed for the TMAP. If the number of dwellings in subsequent lots within Stage 3A causes the 1,000 dwelling total to be exceeded, the impact of this change in the overall development yield would need to be assessed as part of subsequent development applications.

Considering that the proposed residential development is within the amount previously assessed for the approved Concept Plan, the impact is considered to be consistent with that of the approved Concept Plan. The impact of changes in other land uses has not been assessed. These would be the subject of future development applications.

4.2 Impact of additional parking option

The DA seeks residential development with an amount of parking that complies with the *North Penrith Design Guidelines*, with an option to increase this by 20 spaces allocated to 50% of the two bedroom units for DA01 (40 additional spaces for the combined DA01 and DA02). It is noted that the proposed parking rate of 1.5 spaces per two bedroom unit is in excess of the 1 space per two bedroom unit (maximum) allowed in the *North Penrith Design Guidelines*² and *Penrith Development Control Plan 2010*. The additional 0.5 parking spaces per two bedroom unit is proposed as an option to make this size of unit compatible with potential buyers in the local market. This Traffic and Parking Report assesses the potential impact of the additional 20 (and 40 combined) spaces. The proposed parking for the one bedroom and three bedroom units comply with the maximum number of spaces allowed in the *North Penrith Design Guidelines* and *Penrith Development Control Plan 2010*.

The additional car spaces for 50% of the two bedroom units will create second car spaces for these units. While numerically, this is a doubling of the potential traffic generation, a second car is typically used less frequently, for example if only one person in a couple works full-time, and may only be used during midday hours or on weekends. It is therefore likely that these second car spaces will not affect the critical morning and afternoon peak periods as much as the first car space (already included in the traffic generation).

RMS has released more up-to-date information on traffic generation rates – *TD13/04a Guide to Traffic Generating Developments Updated traffic surveys (RMS, August 2013)*. This guide provides a traffic generation rate per parking space for high-density development of:

- Sydney average:
 - ▶ 0.15 vehicle trips per car space during the AM peak
 - ▶ 0.12 vehicle trips per car space during the PM peak.

² North Penrith Design Guidelines 2013 (version 19 March 2013, Landcom)

- Sydney low range:
 - ▶ 0.09 vehicle trips per car space during the AM peak
 - ▶ 0.05 vehicle trips per car space during the PM peak.

It is recommended that the low-range figure is appropriate for the second car spaces proposed. However, the average rate is also reported to provide an indication of the upper range.

Table 4.1 Potential total traffic generation from additional parking for two bedroom units

	Sydney low range	Sydney average per car space
DA01 only		
AM peak period	1.8	3.8
PM peak period	1.0	2.4
Combined DA01 and DA02		
AM peak period	3.6	7.6
PM peak period	2.0	4.8

This number of additional trips during the peak period is considered low in absolute terms. These small numbers are reduced further when they are distributed onto the road network. Table 4.2 indicates the in/out splits and origin-destination split adopted for the TMAP.

Table 4.2 In/out split for residential traffic during the morning and afternoon peak periods

	Percentage of trips in	Percentage of trips out
AM peak period	10%	90%
PM peak period	80%	20%

Table 4.3 Breakdown of direction of travel to/from the site

Origin-Destination	Percentage of trips from the site in the AM peak ¹	Percentage of trips to the site in the AM peak ¹
Internal	4%	4%
Penrith CBD	3%	12%
Great Western Highway (east)	11%	11%
Great Western Highway (west)	17%	7%
Parker Street South	11%	17%
Dunheved Road	10%	7%
Castlereagh Road	7%	7%
Mulgoa Road	22%	31%
The Northern Road (north)	14%	3%
Total	100%	100%

(1) Opposite in the PM peak

Source: Analysis of 2006 Journey to Work Data (Bureau of Transport Statistics) presented in North Penrith Transport Management and Accessibility Plan (Parsons Brinckerhoff, 2010)

After applying the in/out split, dividing the trips up by direction and assigning them to the road network, the largest impact on any of the external roads used for access to the site (Coreen Avenue, Peachtree Road, Castlereagh Road, Lemongrove Street bridge or Parker Street) would be approximately 1.3 vehicles during the peak hour for DA01 only, or less than three (3) vehicles during the peak hour for the combined DA01 and DA02. This level of increase would be imperceptible above regular traffic volumes and is within normal daily fluctuations in traffic flow.

Implications for the remainder of the high-density within Thornton Central

The development application includes the proposed increase in parking for two bedroom units for this building only. However, if this higher rate were applied to the remainder of the high density dwellings proposed within the Thornton Central development, there would be an additional 3 to 12 vehicle trips during the peaks. In combination with the increase of the additional 40 spaces for Lot 3007 (DA01 plus DA02), the largest increase would be 7 vehicles per hour. This equates approximately to an additional trip every nine minutes, which would also be imperceptible above regular traffic volumes.

4.3 Sustainable transport measures

The travel plan for the project is being implemented as per the details provided in the TMAP. This includes the provision of 'welcome packs' given to residents, which will include information on public transport, walking and cycling, including:

- welcome letter (including direction to the 131 500 travel information line and website)
- train network map
- train timetables for Penrith Station
- bus map
- bus timetables for all bus routes serving the Penrith Interchange
- leaflet: Using the bus for the first time
- Penrith City Council cycle map
- site cycle and footpath map (including cycle locker locations)
- leaflet: How to use cycle lockers
- leaflet: Fares/Travel passes
- Information on the Opal Card.

5. Parking and access

Access to the site is consistent with the approved Concept Plan. However, some changes to the parking arrangements are proposed to accommodate the needs of the site. This section outlines the parking and assesses arrangements of the proposed layout.

5.1 Access

Access is proposed via a laneway from Lord Sheffield Circuit (south) that connects through to the parking street perpendicular to Aviators Way. The laneway will be two-way for vehicles at Lord Sheffield Circuit and one-way exit for vehicles at the parking street.

This access is consistent with the requirements of the *North Penrith Design Guidelines* as shown in Figure 5.1.



Source: Figure 23, North Penrith Design Guidelines 2013 (version 19 March 2013, Landcom)

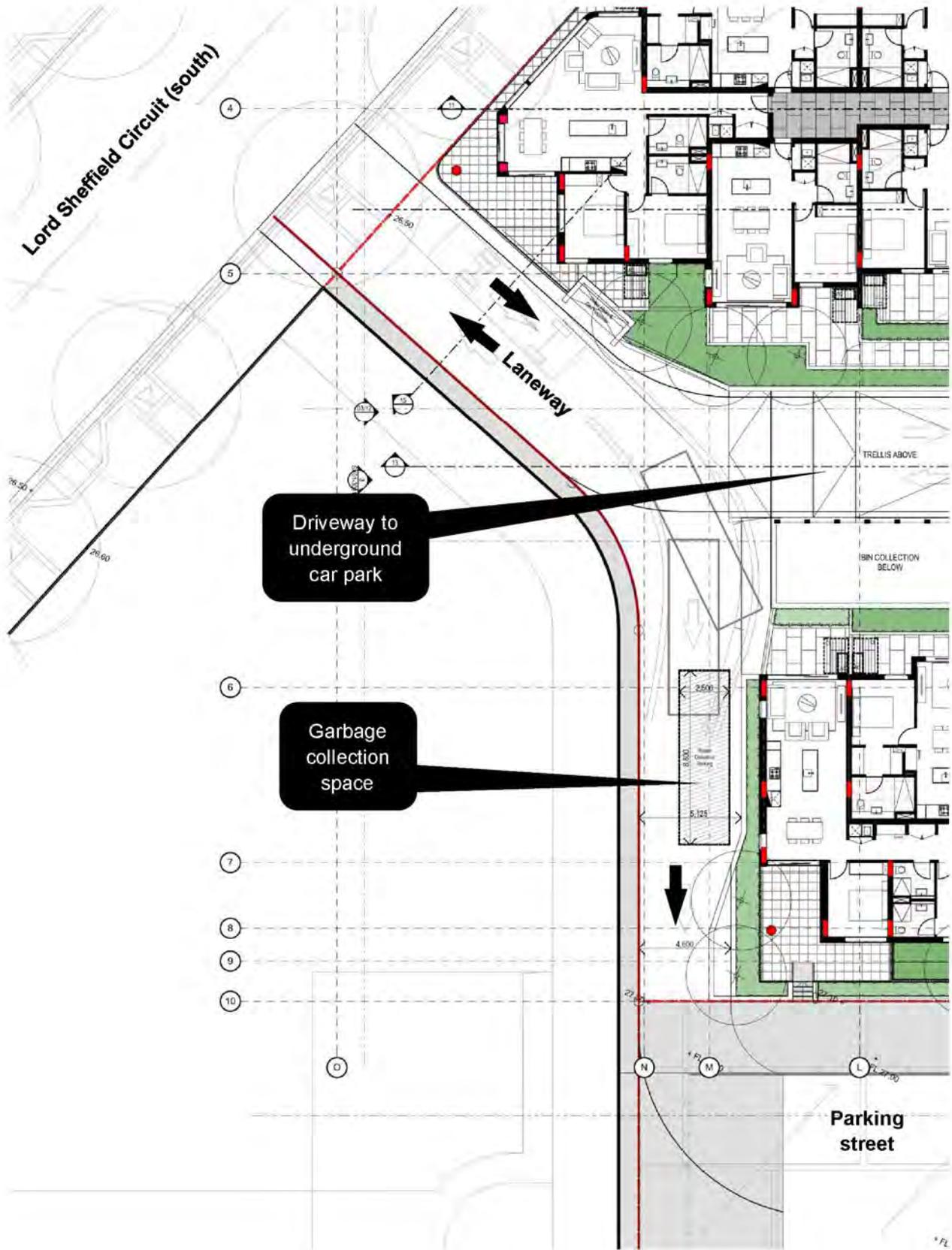
Figure 5.1 Vehicle access location

The proposed design of the laneway includes:

- Entry/exit to the car park for Lot 3007 via a driveway on the northern side.
- A space for garbage collection on the northern side.
- A footpath on the southern side for pedestrians.

The width of the laneway would be 6.17 m at Lord Sheffield Circuit, 5.125 m alongside the garbage collection space and 3.5 m at the one-lane exit. The footpath would be 1.0 m wide.

The proposed access arrangements are shown in Figure 5.2.



Base image source: DKO Architects, 2014

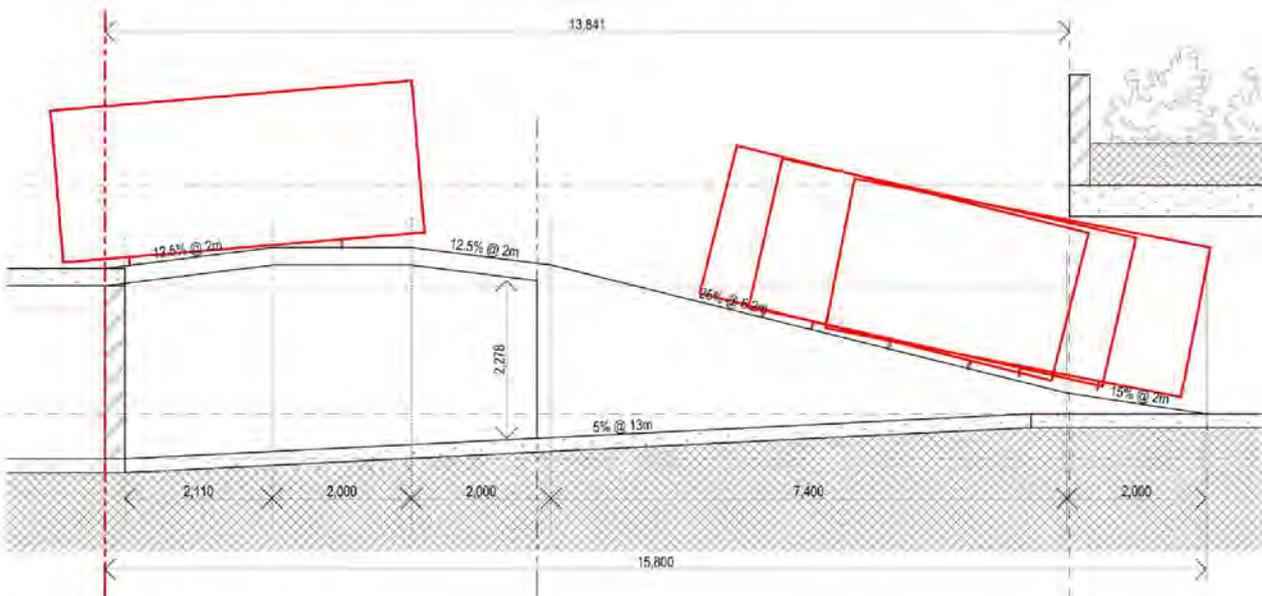
Figure 5.2 Vehicle access arrangement

The access to the underground car park has been reviewed and found to be designed in accordance with Australian Standard *AS2890.1-2004 Parking Facilities Part 1 Off-street car parking*.

- The width of the driveway is 6.4 metres to provide two-way flow.
- The car park is designed for use by cars only.
- The garbage collection space in the laneway will be jointly used by removalist and delivery vans, due to the infrequency of garbage collection.

Access to the car park would be for residents only. A remote control door is proposed, as all visitor parking will be on-street (as per the North Penrith Design Guidelines). Therefore a car reader/intercom is not required in the middle of the driveway for access.

The entry ramp gradient would be 25% (1 in 4) with appropriate transitions at either end. An area 6 m long would be relatively flat, providing sufficient space for a vehicle to wait, if required, before proceeding. As the laneway provides only local access, cars leaving the car park would only need to give way to garbage trucks and removalist vans, and hence queuing at the top of the ramp is unlikely.



Source: DKO Architects, 2014

Figure 5.3 Car park ramp long-section

The footpath is proposed on the southern side of the laneway, reducing the potential for vehicle/pedestrian conflict. Planting on the northern side of the laneway adjacent to the waste collection area would exclude pedestrians from the northern boundary, improving sight distance for drivers of pedestrians.

5.2 Parking spaces

The development proposes two parking regimes:

1. Parking rates as per those given in the *North Penrith Design Guidelines*³ and *Penrith Development Control Plan 2010*.
2. An option of increasing the parking rate for two bedroom apartments from 1.0 per dwelling to 1.5 per dwelling.

³ North Penrith Design Guidelines 2013 (version 19 March 2013, Landcom)

Tables 5.1 and 5.2 calculate the theoretical number of parking spaces under each regime. They also indicate the proposed number to be delivered under each option.

- If the higher parking rate option is approved, **both Basement 1 and Basement 2** levels would be constructed.
- If the additional parking is not approved or if the additional parking level is not built due to commercial reasons, **only Basement 1** would be built, with six additional spaces provided in the space where the ramp between levels would have been provided.

Table 5.1 Parking rates - complying

	Rate per dwelling	DA01 (This DA)	DA02	Lot 3007 (DA01 plus DA02)
Required (maximum)				
1 bedroom	1	38	27	65
2 bedroom	1	39	41	80
3 bedroom	2	12	0	12
Total (maximum)		89	68	157
Parking provided				
Regular spaces		68	56	123
Disabled spaces		4	10	14 (10%)
Total spaces		72 (-17)	66 (-2)	137 (-20)

Table 5.1 shows that if only Basement 1 were built, for DA01 the parking provided would be 17 spaces less than the maximum allowed by the *Guidelines* and *DCP*. The deficit in spaces is likely to result in some one bedroom apartments not being provided with a parking space (effectively 0.5 spaces per one bedroom apartment).

Table 5.2 Parking rates – with additional space for 50% of two bedroom apartments

	Rate per dwelling	DA01 (This DA)	DA02	Lot 3007 (DA01 plus DA02)
Required (maximum)				
1 bedroom	1	38	27	65
2 bedroom	1.5	58.5	61.5	120
3 bedroom	2	12	0	12
Total (maximum)		108.5	88.5	197
Parking provided				
Regular spaces		85	87	172
Disabled spaces		5	14	19 (10%)
Total spaces		90 (-18.5)	101 (+12.5)	191 (-6)

Table 5.2 shows that if both basements were built, for DA01 the parking provided would be some 19 spaces less than the maximum allowed by the *Guidelines* and *DCP*. The deficit in spaces is likely to result in only one out of 39 two-bedroom apartments being offered with an additional parking space.

However, a surplus in DA02 would mean that a greater number of two bedroom units could be offered with a second space. Overall, the construction of both basement levels would ensure that all one bedroom apartments would receive a parking space and that all three bedroom apartments would receive two spaces. 34 out of the 80 two bedroom units would receive two spaces (1.43 spaces per dwelling).

While the provision of disabled spaces between DA01 and DA02 is not even, the delivery of accessible apartments would match the amount of accessible parking provided. The number of disabled spaces provided is 10% in both parking options, matching the percentage of accessible dwellings.

No car wash bays are proposed. However, given that the *North Penrith Design Guidelines* indicates a maximum provision for car wash space numbers, the provision of no spaces is compliant with the *Guidelines*.

5.3 Car park design

The underground car park has been designed to comply with the requirements of *Australian Standard AS2890.1-2004 Parking Facilities Part 1 Off-street car parking*, *Australian Standard AS2890.6-2009 Parking Facilities Part 6 Off-street car parking for people with disabilities* and the *North Penrith Design Guidelines*. Plans for the two basement levels are provided in Appendix A. Features include:

- 90 degree parking spaces are 2.4 m wide by 5.4 m long
- parallel spaces are 3.2 m wide and 7.8 m long
- two-way aisles are generally 5.8 m wide
- one-way aisles are between 4.6 m and 4.8 m wide
- the internal ramp is 6.4 m wide with a similar long-section to the entry ramp from the laneway.

Circulation within the car park vehicles would enter down the central aisle then split north or south before looping back to the exit ramp. Indicative paths for both car park levels are shown in Figure 5.4. Note that it is assumed that the entire Basement 1 and Basement 2 space would be constructed in one stage. Parking spaces within DA02 would not be available in DA01, but the circulation aisles would be open and available for use.

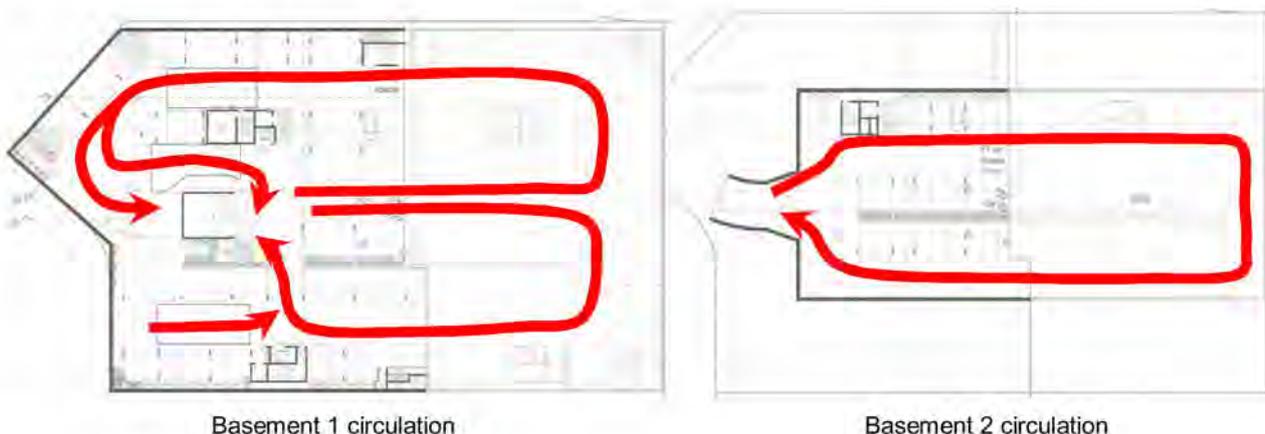


Figure 5.4 Car park circulation

A swept path analysis, using Autodesk Vehicle Tracking software, has been undertaken for a car making various critical movements around the car park. The results of this analysis are provided in Appendix B. The turns for which analysis has been undertaken are shown on Figure 5.5.

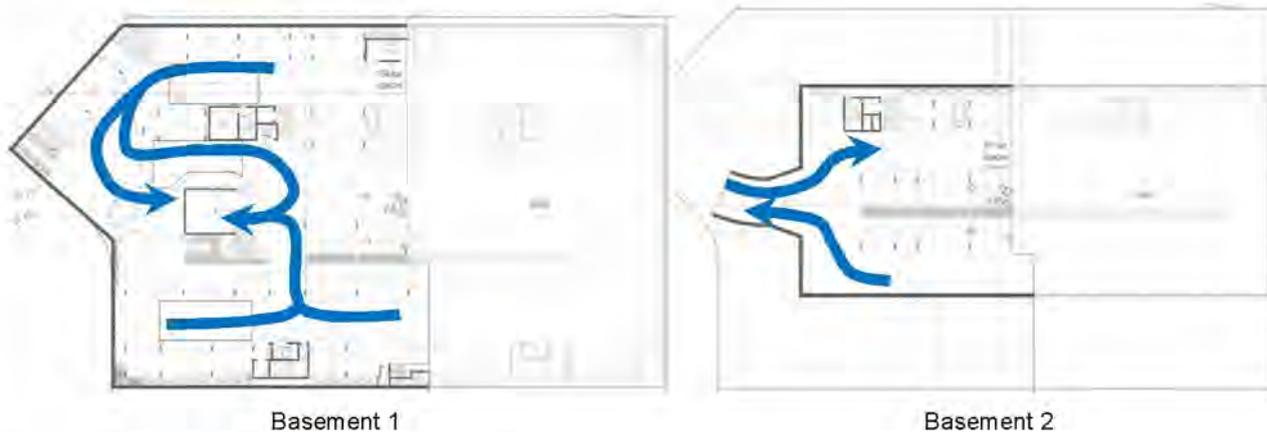


Figure 5.5 Car park swept path analysis

One blind aisle is proposed, with suitable extension at the end to assist manoeuvring into and out of the end spaces. This blind aisle would have a gradient of 5% to maintain suitable headroom.

Headroom within the basement levels is generally 2.5 m. However, at the entry to the blind aisle, this reduces to 2.2 m. Both these values comply with the requirements of AS2890.1-2004. No disabled spaces are proposed on the blind aisle.

800 mm deep columns are proposed either between 750 mm and 1,550 mm from the entry to the space, or within 800 mm of the end of the space, enabling door opening and complying with the design envelope of AS2890.1-2004.

Disabled parking has been provided through the car park, to match the percentage of accessible dwellings within the development. Spaces are located close to lifts. Shared areas are provided at one end and alongside each disabled space. Some shared areas overlap with circulation aisles. Shared areas provided out of circulation aisles would be protected by a bollard to prevent another car from parking in the space. All disabled spaces are located in areas with 2.6 m headroom.

5.4 Servicing and garbage collection

As mentioned previously, a garbage collection space is proposed within the laneway, in close proximity to the bin storage/collection area. A swept path analysis, using Autodesk Vehicle Tracking software, has been undertaken for a garbage truck or removalist truck to enter the laneway from Lord Sheffield Circuit and exit via the parking street (in a forward movement). The analysis assumed a 10.7 m long rear-loaded garbage truck and a 12.5 m removalist truck. The analysis indicating that the truck can be accommodated within the widths provided. The results of this analysis are provided in Appendix B.

The proposed space for removalist and delivery vans is the same space as for garbage collection, i.e. on the northern side of the laneway between the car park entry and the parking street. This does not comply with the *North Penrith Design Guidelines*. However, it is believed that the intention of the requirement for loading/unloading to be separate from waste collection was mainly intended to apply to commercial and retail development, where the frequency of garbage collection and deliveries would be significantly higher. Given that the proposed development is residential only, the frequency and volume of garbage to be collected would be low, increasing the time that this space would be available for use by deliveries/removal vans.

The Guidelines also require this space to be away from the circulation space of other vehicles. Whilst the laneway does provide a connection to the parking street, the space between the car park entry and the parking street is proposed mainly for waste collection and deliveries. Other routes will exist between Lord Sheffield Circuit and the parking street. Cars accessing the car park can enter and exit freely while the waste collection space is occupied.

6. Construction

This section describes the following aspects of the construction of the infrastructure works:

- construction details
- the traffic generating activities
- construction affecting public transport and pedestrians.

As a construction contractor has not been appointed, the exact methodology of construction is not yet known. A complete construction traffic management plan will be submitted for approval before the commencement of construction, once the required detail is known.

The construction of DA01 and DA02 would run consecutively, with stages overlapping. For example, fit-out of DA01 will conceivably occur during the construction of DA02. For the purposes of this assessment, the construction of DA01 and DA02 has been treated as one exercise.

6.1 Construction details

The following typical construction work hours have been assumed:

- Monday to Friday 7.00 am to 6.00 pm
- Saturday 8.00 am to 3.00 pm
- no work will be undertaken on Sundays and public holidays.

Out of hours construction on weekends and at night may be required, but would be subject to a separate application.

Construction is expected to last for a total of 15 months.

Types of vehicles

The types of construction vehicles likely to be used during the stages of construction include:

- Site Establishment - utilities and small delivery trucks.
- Site Works & Demolition - tipper trucks, various delivery trucks.
- Excavation and Bulk Site Filling - tipper trucks, low loader float for excavator.
- Concrete Floor Slabs - concrete agitator trucks & pump.
- Framing - timber delivery semi-trailer, crane.
- Roofing - semi delivery truck, crane.
- Brickwork - concrete agitator trucks & pump.
- Glazing and Lock-Up - utilities and small delivery trucks.
- Finishing & Fit-Out Trades - utilities and small delivery trucks.

It is anticipated that the use of low loaders and vehicles carrying wide loads will be required for the delivery and collection of some equipment and material. It will be the responsibility of the contractor to arrange for Road Occupancy Licences (ROL) for these movements.

6.2 Construction site and access

The access to the site would be via Lord Sheffield Circuit. Access to the road network would be via the intersection of Coreen Avenue and Sydney Smith Drive.

The proposed truck routes for the development would take the quickest path onto the arterial road network and would avoid Coreen Avenue between Coombes Drive (eastern intersection) and Parker Street due to the 5 tonne load restriction. The proposed truck route is shown on Figure 6.1. All movements into and out of the site will be in a forward direction. When a connection is completed between Castlereagh Road and Lord Sheffield Circuit (via Thornton Drive, trucks exiting the site to the south will be able to avoid impacting Coreen Avenue.



Figure 6.1 Proposed construction truck route

The source of fill used on the site is not currently known. It is likely that construction truck access would be required to the M4 Motorway and potentially to Castlereagh Road.

Pedestrians walking between the commuter car park and Penrith Station would not be affected during construction. Cyclists would continue to be able to use the public streets, unless specific situations temporarily arose where road closures affecting all traffic were required.

There may be situations where additional temporary lane closures may be required, such as during the erection of cranes. Further details of these would be submitted to the relevant authorities with the construction management plan when further details of the construction process were known. This includes details affecting pedestrian and bicycle movements.

Site Traffic Management Plans (STMP's) will be developed for specific areas of work outside the site that may impact in some way on local traffic. STMP's describe the extent of the expected traffic impact, and the management and responsibility measures to be implemented.

Traffic control measures will be planned and used such as temporary signage, traffic barriers and placement, traffic control crew, delineation devices, road occupancy licence (ROL) applications, temporary speed zones, etc. which must be in place for the duration of the activity or work area impact. It will be the responsibility of the D&C contractor to prepare and gain approval for the STMP and ROLs.

6.3 Construction traffic generation and impact

Traffic generation during construction of the supporting infrastructure works is likely to comprise traffic associated with construction personnel and construction vehicles travelling to and from the site. The level of construction activity, and therefore traffic generation, will vary throughout the construction process. The following estimates are provided for a typical upper limit of activity.

Construction staff movement

It is estimated that the construction workforce on site at any one time would peak at approximately 150 persons. This peak would be reached approximately half-way through the construction works. Construction staff would be provided information on and encouraged to take advantage of train services at Penrith Station and buses to Penrith Interchange, as well as cycling and walking.

However, to estimate potential traffic generation, a conservatively high assumption is made that all construction personnel will arrive and depart at the site using light vehicles, and that the vehicle occupancy rate would be 1.2 persons per vehicle. During a typical working day, up to 125 vehicles would arrive before the morning peak and depart after the morning peak to minimise the impact on the peak traffic flow.

Construction staff parking

It is assumed that the construction personnel would park their vehicles in the street with 90 degree parking until the basement car park has been constructed, and then within the underground parking thereafter.

During infrastructure servicing works, tradesman utility vehicles, water carts, delivery trucks and heavy vehicles such as lifting cranes are expected. Typically, each civil contractor or trade will complete their section of work prior to the next trade arriving on site ensuring smooth running of the project and safety on site, and thus minimising the number of daily vehicle movements.

Truck movement

The number of truck movements per day will vary depending on the type of construction work being undertaken. It is expected that the largest numbers of truck movements in and out of the site will be generated during the bulk excavation stage, occurring within the first three months of construction. During this stage, approximately 1,100 truck movements are estimated within the three month period. This equates to approximately 34 truck trips per day (two-way) or 2.2 truck movements per hour in and 2.2 truck movements out of the site (assuming an even spread of truck movements across an 8 hour work day and each truck returning empty for its next trip).

Traffic impacts

The peak truck generating period (during excavation) and the peak construction staff time (approximately mid-way during construction) are unlikely to coincide. The four to five truck movements (two-way) per hour is anticipated to have a low impact, even during the peak traffic times.

Due to the staged construction of the Thornton Central site, the development is currently not operating at its full traffic-generating potential. The highest trip generating land use – the commercial/office space has not been built yet. The upper limit of construction worker traffic is lower than the ultimate number of office worker car trips, and hence the impact will be less. Also, due to the typically early work hours for construction, workers are likely to arrive before the morning traffic peak and leave before the afternoon traffic peak.

Pedestrians and cyclists

Pedestrians would be accommodated by hoardings, if required, to safely protect the footpath area during construction. Cyclists would continue to be able to use the public streets, unless specific situations temporarily arose where road closures affecting all traffic were required. Where possible, cyclists would be allowed to continue.

7. Conclusion and recommendations

Parsons Brinckerhoff has undertaken a traffic and parking assessment to support a development application for the proposed residential development within Lot 3007 of the Thornton Central development. The development in this site has been divided into two stages, known as DA01 and DA02. This assessment has included a review of the development proposal for consistency with the transport issues covered in the 2010 TMAP, the North Penrith Design Guidelines, the DCP and Australian Standards for car parking. The assessment for DA01 has included a review of proposed changes to development yield, development type, traffic generation, traffic impact, access, parking and construction impact. A separate assessment has been prepared for DA02.

7.1 Development changes

Changes to the development site since the approval of the concept Plan include:

- Changed development yield:
 - ▶ The number of dwellings proposed within the site does not exceed the number of dwellings assessed for Stage 3A for the TMAP. Any increase beyond the Stage 3A total resulting from development in other lots would be the subject of a separate development application and transport assessment.
- A re-ordering of the development staging:
 - ▶ The highest relative trip generating land use is unlikely to have been built by the time Lot 3007 is developed, meaning that traffic generated during construction is likely to be lower than the ultimate traffic generation.
- Changes to the local street network in other stages:
 - ▶ These changes have been approved as part of previous assessments. No further changes are proposed as part of this DA.

Guideline non-conformances

Three non-conformances have been identified within the proposed development. The details and the assessment of their impact include:

- Proposed parking option for 1.5 spaces per dwelling for two bedroom apartments (opposed to 1.0 spaces per dwelling for two bedroom apartments)
 - ▶ An analysis of the potential traffic impact indicates that the potential increase in vehicle trips from the additional spaces would be less than three vehicles during the peak hour, which is considered imperceptible above regular traffic volumes and within normal daily fluctuation in traffic.
- Shared use of the waste collection space in the proposed laneway with delivery and removalist vehicles.
 - ▶ This is considered acceptable given the relatively infrequent use by garbage trucks and small frequency of deliveries/removal van use due to the residential development type
- Waste collection space to be located away from the circulation space of other vehicles.
 - ▶ The section of laneway for the waste collection space is proposed mainly for waste collection and deliveries, with no blockage of the car park entry/exit.

These non-conformances are considered acceptable given that they do not affect safety and result in a small overall impact.

7.2 Conclusions

The conclusions of this Traffic and Parking study

- Traffic Generation: As the total number of dwellings within DA01 does not exceed the total for Stage 3A, the impact of the development is within the traffic impacts assessed for the 2010 TMAP.
- Sustainable transport measures: A 'welcome pack' of transport information would be given to new residents.
- Access to the basement car park is provided in accordance with the *North Penrith Design Guidelines*.
- The basement car park has been designed in accordance with:
 - ▶ Australian Standard AS2890.1-2004 Parking Facilities Part 1 Off-street car parking; and
 - ▶ Australian Standard AS2890.6-2009 Parking Facilities Part 6 Off-street car parking for people with disabilities.
- Parking spaces have been proposed under two options:
 - ▶ Complying option: the 72 spaces provided within the first basement level is 17 spaces less than the maximum allowable.
 - ▶ Higher two bedroom parking: the 90 spaces proposed within the first and second basement levels equates to approximately 1.43 spaces per two bedroom apartment parking in addition to one space per one bedroom apartment and two spaces per three bedroom apartment. This is higher than the maximum provision in the *North Penrith Design Guidelines*.
 - ▶ 10% of spaces are designed for people with disabilities under both options to match the 10% universal access apartments within the development.
- Swept path analysis has indicated that:
 - ▶ The waste collection space proposed within the laneway is suitable for a 10.7 m garbage truck and a 12.5 m removalist van to enter and leave in a forward direction.
 - ▶ Cars can make the required manoeuvres within the basement levels.
- Construction arrangements:
 - ▶ Truck routes are proposed to minimise the impact of truck movements on residents.
 - ▶ The volume of traffic movement associated with construction workers arriving at/leaving the site is likely to be lower than the ultimate traffic generation at ultimate development, and is likely to have a lower impact as it will typically occur outside peak traffic times.
 - ▶ All construction staff parking is expected to be contained on site.
 - ▶ As a construction contractor has not been appointed, the exact methodology of construction is not yet known. A complete CTMP will be submitted for approval before the commencement of construction, but once the required detail is known.
 - ▶ The volume of truck movements per hour is low and is anticipated to have a low impact, even during the peak traffic times.

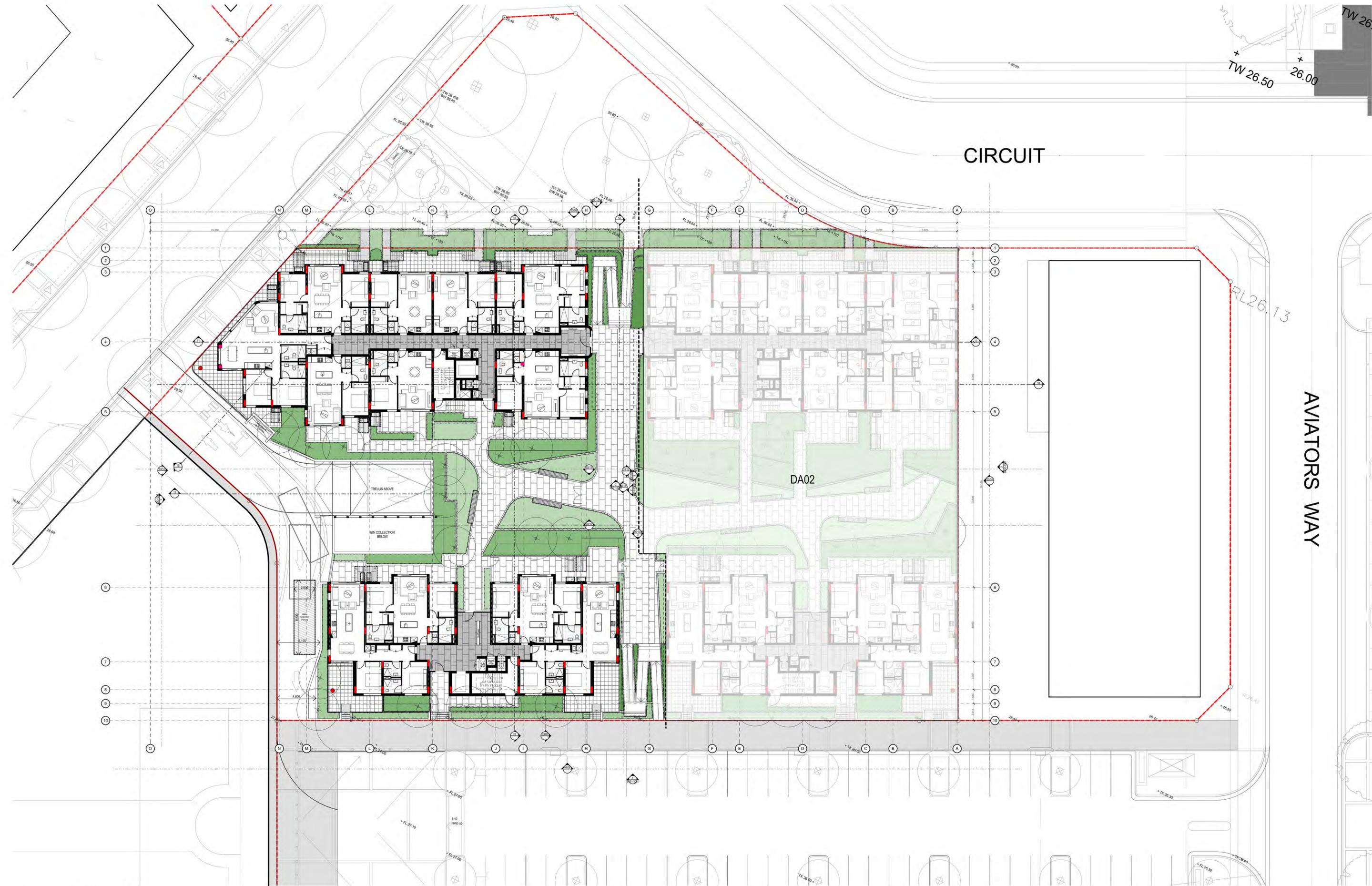
Appendix A

Development plans



Plans provided include:

- Ground Floor Plan
- Car park Basement 1 Plan
- Car park Basement 2 Plan



1 Ground Floor
1:200

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 David Richardson 3542 (NSW)
 Ross de Klerk 5787 (NSW)
 GENERAL NOTES
 Builder/Contractor shall verify job dimensions before any job commences.
 Figure dimensions take precedence over drawings and job dimensions. All shop drawings shall be submitted to the Architect/Consultant and manufacture shall not commence prior to return of inspected shop drawings by the Architect/Consultant.

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C	DRAFT Revised - For Information Only	JF	12/09/2014
B	DRAFT Revised - For Information Only	JF	09/09/2014
A	DRAFT - For Information Only	JF	05/09/2014

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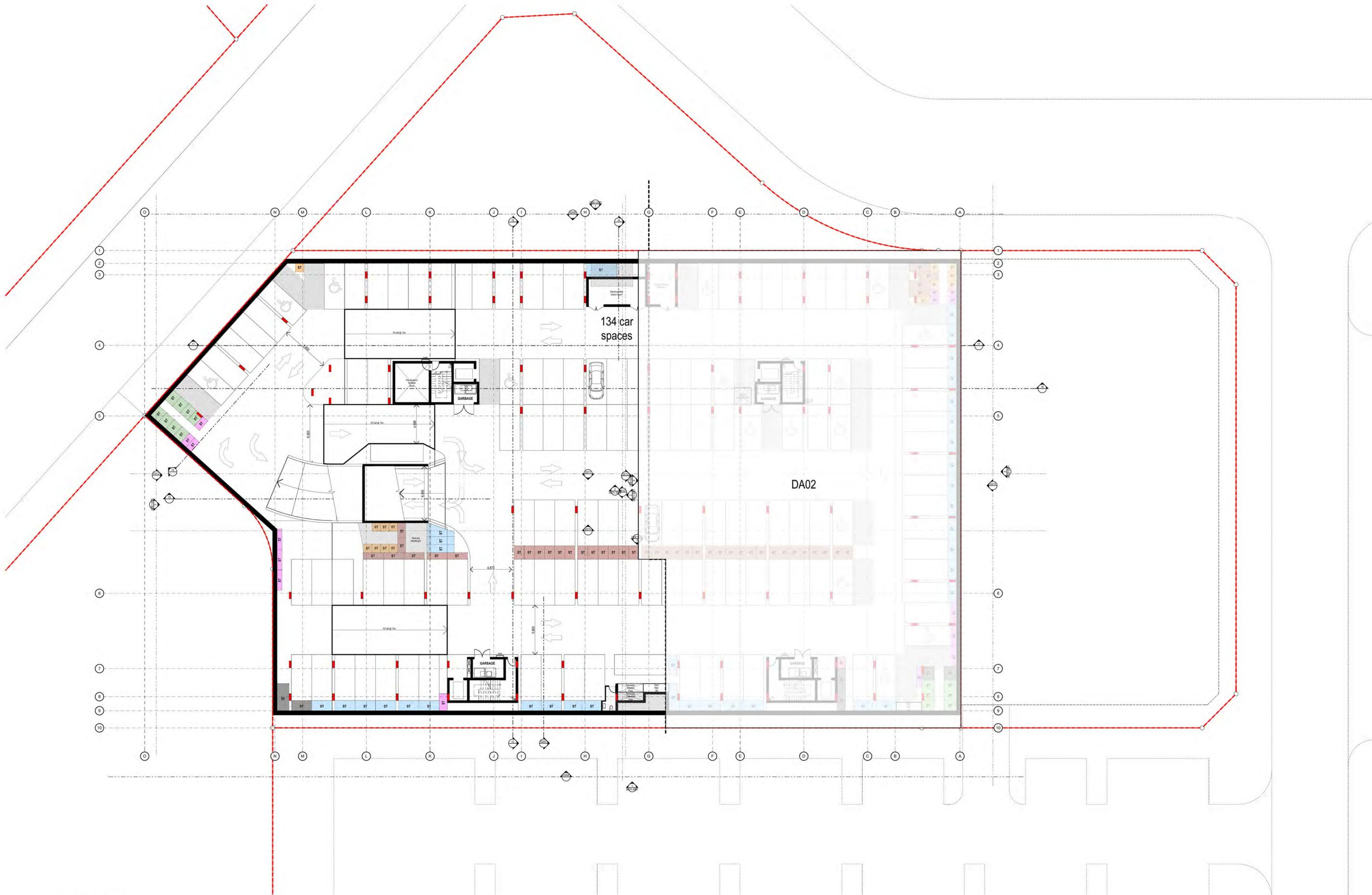
Client Details
**St Hillers
 First Point**

Project
**Lord Sheffield Circuit
 Apartments - DA01**
 Project Address
 Lord Sheffield Circuit,
 Thornton, Penrith, Australia

Project Number
00010935

Drawing
Ground Floor Plan
 Scale: 1:200
 Date: 12/09/2014
 Revision

Drawing Number
SK01-2100



1 Basement 1
1:200

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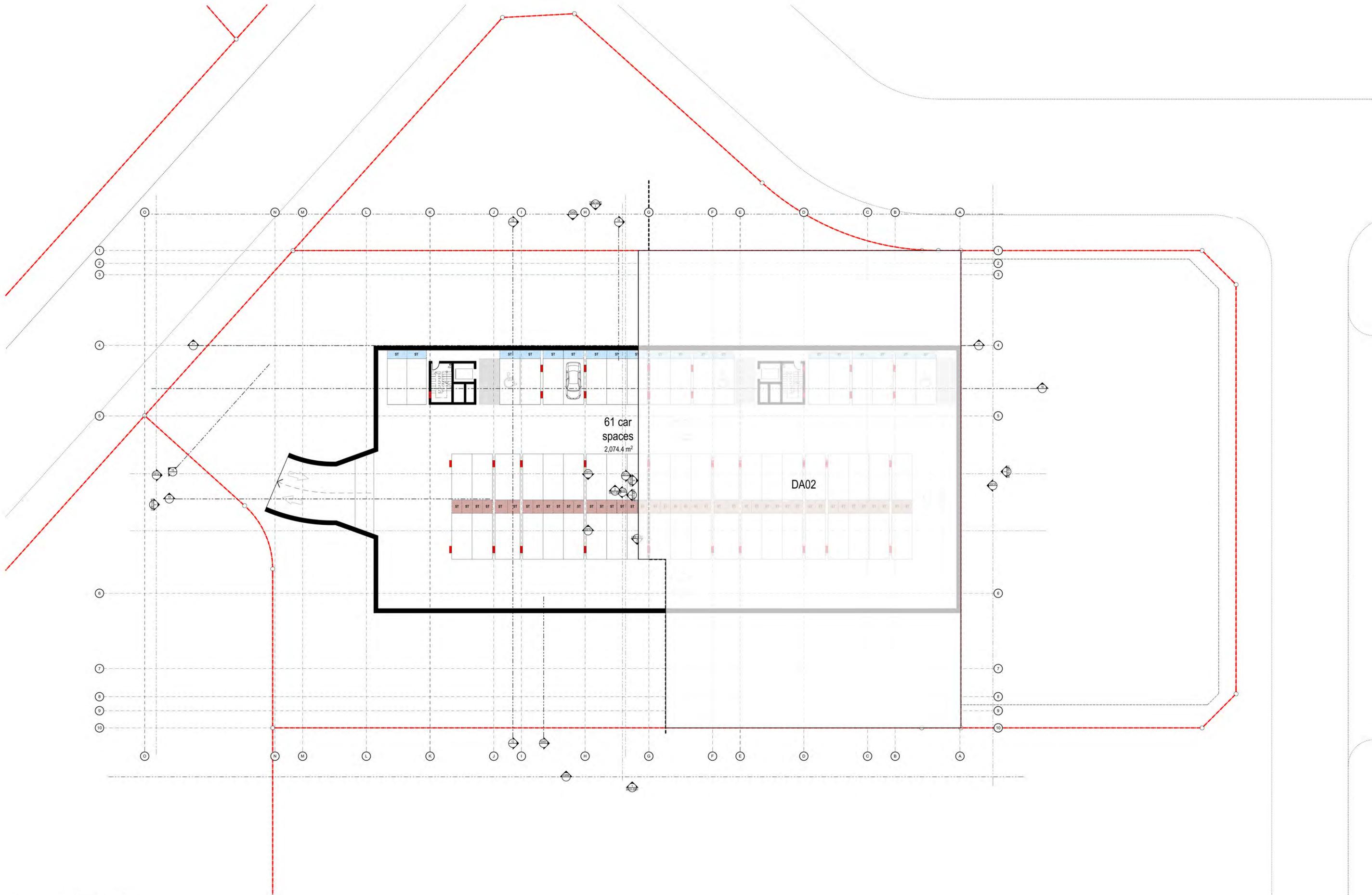
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Client Details
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Project
**Lord Sheffield Circuit
 Apartments - DA01**
 Project Address
 Lord Sheffield Circuit,
 Thornton, Penrith, Australia

Project Number
00010935

Drawing
Basement 1 Floor Plan
 Scale: 1:200
 Date: 12/09/2014
 Drawing Number
SK01-2110
 Revision
 C



1 Basement 2
1:200

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Client Details
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 First Point**

Project
**Lord Sheffield Circuit
 Apartments - DA01**
 Project Address
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 Thornton, Penrith, Australia

Project Number
00010935

Drawing
Basement 2 Floor Plan
 Scale: 1:200
 Date: 12/09/2014

Drawing Number
SK01-2111
 Revision
 C

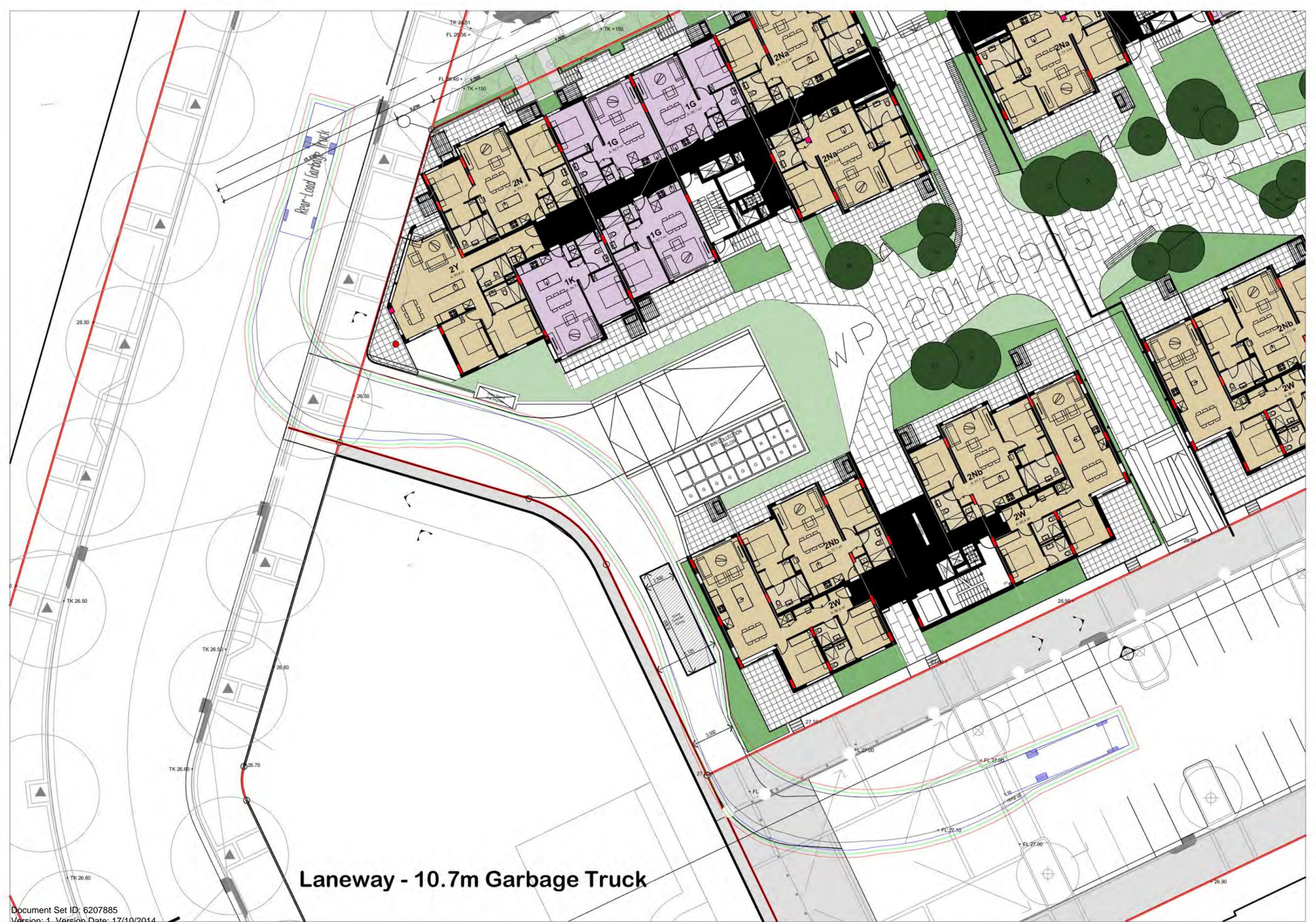
Appendix B

Truck swept path diagrams



Swept path analysis provided includes:

- Laneway – 10.7 m Garbage truck
- Laneway – 12.5 m Removalist truck
- Basement 1 – Car turning from northern aisle to exit ramp
- Basement 1 – Car turning from southern aisle to exit ramp
- Basement 1 – Car turning from blind aisle to exit ramp
- Basement 1 – Car entering ramp to Basement 2
- Basement 2 – Car entering ramp and leaving



Laneway - 10.7m Garbage Truck



Laneway - 12.5m Removalist Truck



Basement 1 - Car turning from northern aisle to exit ramp



Basement 1 - Car turning from southern aisle to exit ramp



133 car spaces

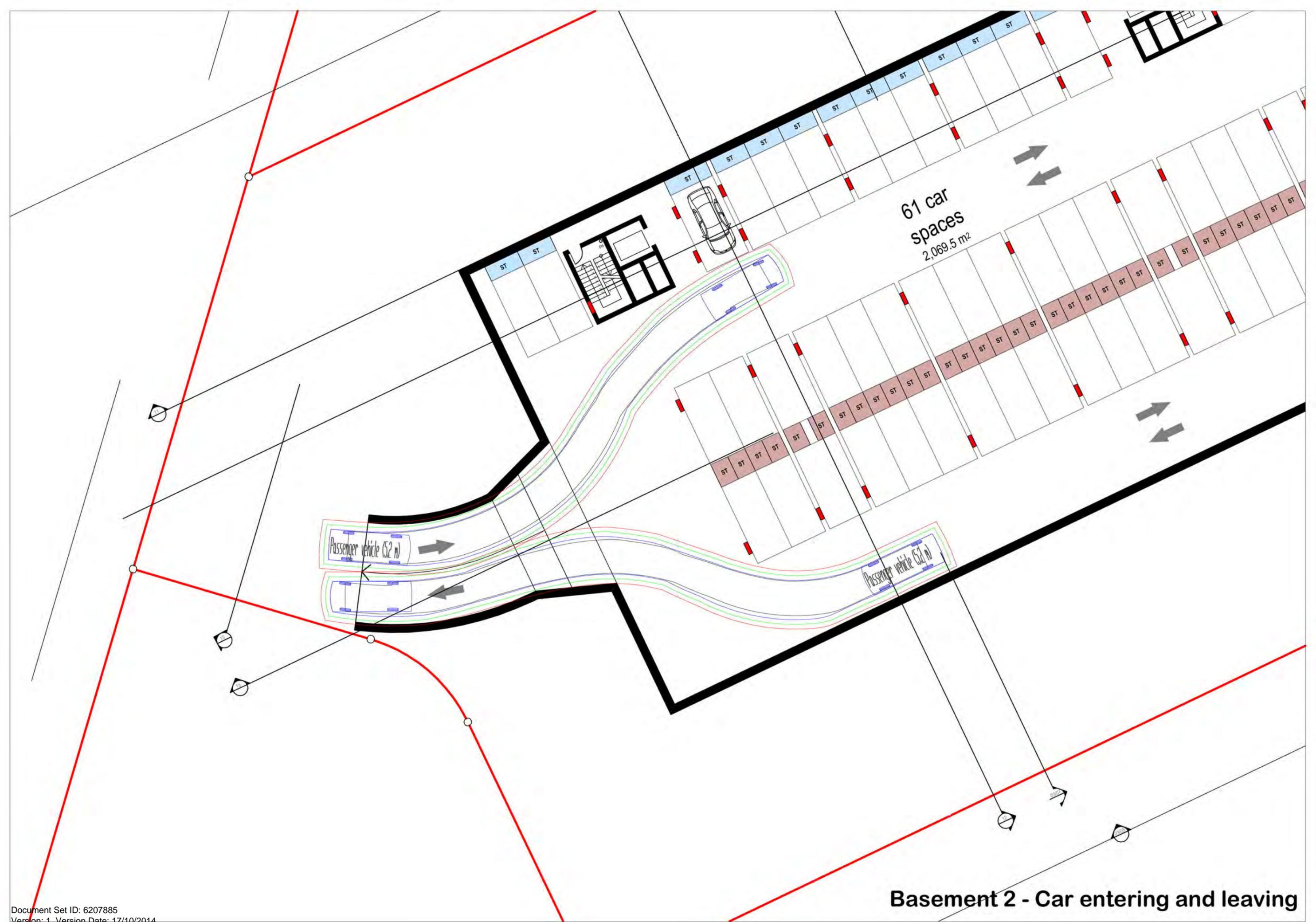
Passenger vehicle (5.2 x 2.0 m)

G R
GARBAGE

G R
GARBAGE

GARBAGE R
3.823

Basement 1 - Car entering ramp to Basement 2



61 car spaces
2,069.5 m²

Passenger vehicle (5.2 m)

Passenger vehicle (5.2 m)

Basement 2 - Car entering and leaving

BASIX[®] Certificate

Building Sustainability Index www.basix.nsw.gov.au

Multi Dwelling

Certificate number: 573449M

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 29/06/2009 published by Planning & Infrastructure. This document is available at www.basix.nsw.gov.au

Director-General

Date of issue: Sunday, 14 September 2014

To be valid, this certificate must be lodged within 3 months of the date of issue.



Project summary		
Project name	STH001 DA01 Thornton Central	
Street address	- Lord Sheffield Circuit PENRITH 2750	
Local Government Area	Penrith City Council	
Plan type and plan number	deposited 1171491	
Lot no.	3007	
Section no.	-	
No. of residential flat buildings	2	
No. of units in residential flat buildings	83	
No. of multi-dwelling houses	0	
No. of single dwelling houses	0	
Project score		
Water	✓ 41	Target 40
Thermal Comfort	✓ Pass	Target Pass
Energy	✓ 30	Target 30

Certificate Prepared by

Name / Company Name: Thermal Performance

ABN (if applicable): 64 137 428 767

Description of project

Project address	
Project name	STH001 DA01 Thornton Central
Street address	- Lord Sheffield Circuit PENRITH 2750
Local Government Area	Penrith City Council
Plan type and plan number	deposited 1171491
Lot no.	3007
Section no.	-
Project type	
No. of residential flat buildings	2
No. of units in residential flat buildings	83
No. of multi-dwelling houses	0
No. of single dwelling houses	0
Site details	
Site area (m ²)	2620
Roof area (m ²)	1262
Non-residential floor area (m ²)	0
Residential car spaces	92
Non-residential car spaces	0

Common area landscape	
Common area lawn (m ²)	150
Common area garden (m ²)	352
Area of indigenous or low water use species (m ²)	150
Assessor details	
Assessor number	20731
Certificate number	1006831307
Climate zone	28
Project score	
Water	 41 Target 40
Thermal Comfort	 Pass Target Pass
Energy	 30 Target 30

Description of project

The tables below describe the dwellings and common areas within the project

Residential flat buildings - Building A, 64 dwellings, 8 storeys above ground

Dwelling no.	No. of bedrooms	Conditioned floor area (m ²)	Unconditioned floor area (m ²)	Area of garden & lawn (m ²)	Indigenous species (min area m ²)
A1	2	92.0	0.0	0	0
A5	2	77.2	0.0	0	0
A9	2	92.0	0.0	0	0
A13	2	80.1	0.0	0	0
A17	3	103.8	0.0	0	0
A21	2	80.1	0.0	0	0
A25	3	103.8	0.0	0	0
A29	2	80.1	0.0	0	0
A33	3	103.8	0.0	0	0
A37	2	80.1	0.0	0	0
A41	3	103.8	0.0	0	0
A45	2	80.1	0.0	0	0
A49	3	103.8	0.0	0	0
A53	2	80.1	0.0	0	0
A57	3	103.8	0.0	0	0
A61	2	80.1	0.0	0	0
Dwelling no.	No. of bedrooms	Conditioned floor area (m ²)	Unconditioned floor area (m ²)	Area of garden & lawn (m ²)	Indigenous species (min area m ²)
A2	2	77.0	0.0	0	0
A6	2	77.2	0.0	0	0
A10	2	77.0	0.0	0	0
A14	2	78.9	0.0	0	0
A18	2	77.0	0.0	0	0
A22	2	78.9	0.0	0	0
A26	2	77.0	0.0	0	0
A30	2	78.9	0.0	0	0
A34	2	77.0	0.0	0	0
A38	2	78.9	0.0	0	0
A42	2	77.0	0.0	0	0
A46	2	78.9	0.0	0	0
A50	2	77.0	0.0	0	0
A54	2	78.9	0.0	0	0
A58	2	77.0	0.0	0	0
A62	2	78.9	0.0	0	0
Dwelling no.	No. of bedrooms	Conditioned floor area (m ²)	Unconditioned floor area (m ²)	Area of garden & lawn (m ²)	Indigenous species (min area m ²)
A3	1	50.4	0.0	0	0
A7	1	50.4	0.0	0	0
A11	1	50.4	0.0	0	0
A15	1	50.4	0.0	0	0
A19	1	50.4	0.0	0	0
A23	1	50.4	0.0	0	0
A27	1	50.4	0.0	0	0
A31	1	50.4	0.0	0	0
A35	1	50.4	0.0	0	0
A39	1	50.4	0.0	0	0
A43	1	50.4	0.0	0	0
A47	1	50.4	0.0	0	0
A51	1	50.4	0.0	0	0
A55	1	50.4	0.0	0	0
A59	1	50.4	0.0	0	0
A63	1	50.4	0.0	0	0
Dwelling no.	No. of bedrooms	Conditioned floor area (m ²)	Unconditioned floor area (m ²)	Area of garden & lawn (m ²)	Indigenous species (min area m ²)
A4	1	50.4	0.0	0	0
A8	1	54.4	0.0	0	0
A12	1	50.4	0.0	0	0
A16	1	54.4	0.0	0	0
A20	1	50.4	0.0	0	0
A24	1	54.4	0.0	0	0
A28	1	50.4	0.0	0	0
A32	1	54.4	0.0	0	0
A36	1	50.4	0.0	0	0
A40	1	54.4	0.0	0	0
A44	1	50.4	0.0	0	0
A48	1	54.4	0.0	0	0
A52	1	50.4	0.0	0	0
A56	1	54.4	0.0	0	0
A60	1	50.4	0.0	0	0
A64	1	54.4	0.0	0	0

Residential flat buildings - Building D, 19 dwellings, 4 storeys above ground

Dwelling no.	No. of bedrooms	Conditioned floor area (m ²)	Unconditioned floor area (m ²)	Area of garden & lawn (m ²)	Indigenous species (min area m ²)
D1	2	80.9	0.0	0	0
D5	2	80.9	0.0	0	0
D9	2	80.9	0.0	0	0
D13	1	50.4	0.0	0	0
D17	2	76.0	0.0	0	0

Dwelling no.	No. of bedrooms	Conditioned floor area (m ²)	Unconditioned floor area (m ²)	Area of garden & lawn (m ²)	Indigenous species (min area m ²)
D2	2	76.0	0.0	0	0
D6	1	50.4	0.0	0	0
D10	2	80.9	0.0	0	0
D14	2	80.9	0.0	0	0
D18	1	50.4	0.0	0	0

Dwelling no.	No. of bedrooms	Conditioned floor area (m ²)	Unconditioned floor area (m ²)	Area of garden & lawn (m ²)	Indigenous species (min area m ²)
D3	2	76.0	0.0	0	0
D7	2	76.0	0.0	0	0
D11	1	50.4	0.0	0	0
D15	2	80.9	0.0	0	0
D19	2	80.9	0.0	0	0

Dwelling no.	No. of bedrooms	Conditioned floor area (m ²)	Unconditioned floor area (m ²)	Area of garden & lawn (m ²)	Indigenous species (min area m ²)
D4	2	80.9	0.0	0	0
D8	1	50.4	0.0	0	0
D12	2	76.0	0.0	0	0
D16	1	50.4	0.0	0	0

Description of project

The tables below describe the dwellings and common areas within the project

Common areas of unit building - Building A

Common area	Floor area (m ²)
Lift car (No. 1)	-
Hallway/lobby type (No. 1)	65
Hallway/lobby type (No. 4)	65
Hallway/lobby type (No. 7)	65

Common area	Floor area (m ²)
Lift motor room (No. 1)	6
Hallway/lobby type (No. 2)	65
Hallway/lobby type (No. 5)	65

Common area	Floor area (m ²)
Ground floor lobby type (No. 1)	102
Hallway/lobby type (No. 3)	65
Hallway/lobby type (No. 6)	65

Common areas of unit building - Building D

Common area	Floor area (m ²)
Lift car (No. 2)	-
Hallway/lobby type (No. 8)	55

Common area	Floor area (m ²)
Lift motor room (No. 2)	6
Hallway/lobby type (No. 9)	55

Common area	Floor area (m ²)
Ground floor lobby type (No. 2)	58
Hallway/lobby type (No. 10)	55

Common areas of the development (non-building specific)

Common area	Floor area (m ²)
Car park area (No. 1)	3408
Garbage room (No. 1)	10

Common area	Floor area (m ²)
Switch room (No. 1)	12
Garbage room (No. 2)	10

Common area	Floor area (m ²)
Switch room (No. 2)	20
Plant or service room (No. 1)	10

Schedule of BASIX commitments

1. Commitments for Residential flat buildings - Building A

(a) Dwellings

- (i) Water
- (ii) Energy
- (iii) Thermal Comfort

(b) Common areas and central systems/facilities

- (i) Water
- (ii) Energy

2. Commitments for Residential flat buildings - Building D

(a) Dwellings

- (i) Water
- (ii) Energy
- (iii) Thermal Comfort

(b) Common areas and central systems/facilities

- (i) Water
- (ii) Energy

3. Commitments for multi-dwelling houses

4. Commitments for single dwelling houses

5. Commitments for common areas and central systems/facilities for the development (non-building specific)

- (i) Water
- (ii) Energy

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 A

(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: <ul style="list-style-type: none"> (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.	✓	✓	✓

Dwelling no.	Fixtures					Appliances		Individual pool				Individual spa		
	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
A1, A2, A3, A4, A5, A6, A7, A8, A9, A10	3 star (> 4.5 but <= 6 L/min)	4 star	3 star	5 star	no	-	-	-	-	-	-	-	-	-

Dwelling no.	Fixtures					Appliances		Individual pool			Individual spa			
	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
A11, A12, A13, A14, A15, A16, A17, A18, A19, A20, A21, A22, A23, A24, A25, A26, A27, A28, A29, A30, A31, A32, A33, A34, A35, A36, A37, A38, A39, A40, A41, A42, A43, A44, A45, A46, A47, A48, A49, A50,	3 star (> 4.5 but <= 6 L/min)	4 star	3 star	5 star	no	-	-	-	-	-	-	-	-	-

Dwelling no.	Fixtures					Appliances		Individual pool				Individual spa		
	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
A51, A52, A53, A54, A55, A56, A57, A58, A59, A60, A61, A62, A63, A64														

Alternative water source								
Dwelling no.	Alternative water supply systems	Size	Configuration	Landscape connection	Toilet connection (s)	Laundry connection	Pool top-up	Spa top-up

(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.		✓	✓

(ii) Energy	Show on DA plans	Show on CC/CDC plans & specs	Certifier check
(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.		✓	✓
(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	central hot water system 1	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

Dwelling no.	Cooling		Heating		Artificial lighting						Natural lighting	
	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
A17, A25, A33, A41, A49, A57	1-phase airconditioning EER 3.0 - 3.5 (zoned)	1-phase airconditioning EER 3.0 - 3.5 (zoned)	1-phase airconditioning EER 3.5 - 4.0 (zoned)	1-phase airconditioning EER 3.5 - 4.0 (zoned)	3 (dedicated)	2 (dedicated)	yes (dedicated)	yes (dedicated)	yes (dedicated)	yes (dedicated)	0	no
A1, A2, A5, A6, A9, A10, A13, A14, A18, A21, A22, A26, A29, A30, A34, A37, A38, A42, A45, A46, A50, A53, A54, A58, A61, A62	1-phase airconditioning EER 3.0 - 3.5 (zoned)	1-phase airconditioning EER 3.0 - 3.5 (zoned)	1-phase airconditioning EER 3.5 - 4.0 (zoned)	1-phase airconditioning EER 3.5 - 4.0 (zoned)	2 (dedicated)	2 (dedicated)	yes (dedicated)	yes (dedicated)	yes (dedicated)	yes (dedicated)	0	no

Dwelling no.	Cooling		Heating		Artificial lighting						Natural lighting	
	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
A3, A4, A7, A8, A11, A12, A15, A16, A19, A20, A23, A24, A27, A28, A31, A32, A35, A36, A39, A40, A43, A44, A47, A48, A51, A52, A55, A56, A59, A60, A63, A64	1-phase airconditioning EER 3.0 - 3.5 (zoned)	1-phase airconditioning EER 3.0 - 3.5 (zoned)	1-phase airconditioning EER 3.5 - 4.0 (zoned)	1-phase airconditioning EER 3.5 - 4.0 (zoned)	1 (dedicated)	2 (dedicated)	yes (dedicated)	yes (dedicated)	yes (dedicated)	yes (dedicated)	0	no

Dwelling no.	Individual pool		Individual spa		Appliances & other efficiency measures							
	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	-	no	-	-	1.5 star	yes	no

(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.	✓	✓	✓

Dwelling no.	Thermal loads	
	Area adjusted heating load (in mJ/m ² /yr)	Area adjusted cooling load (in mJ/m ² /yr)
A1	85.7	46.6
A2	31.7	30.9
A3	34.3	28.9
A4	34.4	28.8
A5	28	32.7
A6	71	35
A7	84.5	23.7
A8	82.5	20.7
A9	85.8	48.4
A13	20.6	30.1
A16	65.9	23.6
A17	73.4	49.6
A21	22.5	29.8
A24	65.1	23.6
A25	73.3	49.6
A29	25.8	29.1
A30	73.8	30.3
A31	81.5	28.2
A32	62.1	25.6
A33	79	40.2
A34	30.8	29.4
A35	41	28
A36	31.1	26.7
A37	18.7	31.3
A38	78.2	28.2
A39	84.4	27
A40	64.4	25.3

Dwelling no.	Thermal loads	
	Area adjusted heating load (in mJ/m ² /yr)	Area adjusted cooling load (in mJ/m ² /yr)
A41	79.5	40.2
A42	31.2	29.2
A43	41.4	28.1
A44	31.5	27
A45	18.4	31.8
A46	78.3	28.5
A47	84.8	26.7
A48	64.8	24.9
A49	79.8	39.8
A50	31.4	29.2
A51	41.5	28.2
A52	31.8	26.9
A53	18	31.8
A54	75.7	29.7
A55	85.2	26.7
A56	65.1	24.7
A57	76.7	39.5
A58	30.8	30.7
A59	39.9	29.8
A60	31.3	27.5
A61	18.5	32
A62	63.1	32.3
A63	82.3	27
A64	66	23.9
A14, A22	74.8	30.1
A15, A23	84.5	26.1
A10, A18, A26	27	32.9

Dwelling no.	Thermal loads	
	Area adjusted heating load (in mJ/m ² /yr)	Area adjusted cooling load (in mJ/m ² /yr)
A11, A19, A27	36.5	33.1
All other dwellings	27.4	31.5

(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	4 star	5 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.	✓	✓	✓

Common area	Common area ventilation system		Common area lighting		
	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 motor room (No. 1)	ventilation exhaust only	none ie. continuous	fluorescent	manual on / manual off	No
Ground floor lobby type (No. 1)	no mechanical ventilation	-	compact fluorescent	daylight sensor and motion sensor	No
Hallway/lobby type (No. 1)	no mechanical ventilation	-	compact fluorescent	motion sensors	No
Hallway/lobby type (No. 2)	no mechanical ventilation	-	compact fluorescent	motion sensors	No
Hallway/lobby type (No. 3)	no mechanical ventilation	-	compact fluorescent	motion sensors	No
Hallway/lobby type (No. 4)	no mechanical ventilation	-	compact fluorescent	motion sensors	No
Hallway/lobby type (No. 5)	no mechanical ventilation	-	compact fluorescent	motion sensors	No
Hallway/lobby type (No. 6)	no mechanical ventilation	-	compact fluorescent	motion sensors	No
Hallway/lobby type (No. 7)	no mechanical ventilation	-	compact fluorescent	motion sensors	No

Central energy systems	Type	Specification
Central hot water system (No. 1)	gas instantaneous	Piping insulation (ringmain & supply risers): (a) Piping external to building: R1.0 (~38 mm); (b) Piping internal to building: R1.0 (~38 mm)
Lift (No. 1)	gearless traction with V V V F motor	Number of levels (including basement): 10

2. Commitments for Residential flat buildings - Building D

(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: <ul style="list-style-type: none"> <li>(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 <li>(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.	✓	✓	✓

Dwelling no.	Fixtures					Appliances		Individual pool				Individual spa		
	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	3 star	5 star	no	-	-	-	-	-	-	-	-	-

Dwelling no.	Alternative water source							
	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.		✓	✓

(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	central hot water system 2	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

Dwelling no.	Cooling		Heating		Artificial lighting						Natural lighting	
	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
D6, D8, D11, D13, D16, D18	1-phase airconditioning EER 3.0 - 3.5 (zoned)	1-phase airconditioning EER 3.0 - 3.5 (zoned)	1-phase airconditioning EER 3.5 - 4.0 (zoned)	1-phase airconditioning EER 3.5 - 4.0 (zoned)	1 (dedicated)	2 (dedicated)	yes (dedicated)	yes (dedicated)	yes (dedicated)	yes (dedicated)	0	no
D1, D2, D3, D4, D5, D7, D9, D10, D12, D14, D15, D17, D19	1-phase airconditioning EER 3.0 - 3.5 (zoned)	1-phase airconditioning EER 3.0 - 3.5 (zoned)	1-phase airconditioning EER 3.5 - 4.0 (zoned)	1-phase airconditioning EER 3.5 - 4.0 (zoned)	2 (dedicated)	2 (dedicated)	yes (dedicated)	yes (dedicated)	yes (dedicated)	yes (dedicated)	0	no

Dwelling no.	Individual pool		Individual spa		Appliances & other efficiency measures							
	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	-	no	-	-	1.5 star	yes	no

(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/m ² /yr)	Area adjusted cooling load (in mJ/m ² /yr)
D1	83.9	19.6
D2	65.4	28.2
D3	60	29.2
D4	86.8	22.1
D5	75.8	33.1

Dwelling no.	Thermal loads	
	Area adjusted heating load (in mJ/m ² /yr)	Area adjusted cooling load (in mJ/m ² /yr)
D6	54.3	31
D7	61.6	30.2
D8	48.4	31.7
D9	77.5	27
D10	74.6	33.4
D11	53.5	31
D12	60.6	30.3
D13	46.7	31.8
D14	75	29.5
D15	81.4	45
D16	45.3	34.3
D17	51.5	34.6
D18	41.1	34.7
All other dwellings	73.1	43.5

(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	4 star	5 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.	✓	✓	✓

Common area	Common area ventilation system		Common area lighting		
	Ventilation system type	Ventilation efficiency measure	Primary type of artificial lighting	Lighting efficiency measure	Lighting control system/BMS
Lift car (No. 2)	-	-	light-emitting diode	connected to lift call button	No
Lift motor room (No. 2)	ventilation exhaust only	none ie. continuous	fluorescent	manual on / manual off	No
Ground floor lobby type (No. 2)	no mechanical ventilation	-	compact fluorescent	daylight sensor and motion sensor	No
Hallway/lobby type (No. 8)	no mechanical ventilation	-	compact fluorescent	motion sensors	No
Hallway/lobby type (No. 9)	no mechanical ventilation	-	compact fluorescent	motion sensors	No
Hallway/lobby type (No. 10)	no mechanical ventilation	-	compact fluorescent	motion sensors	No

Central energy systems	Type	Specification
Central hot water system (No. 2)	gas instantaneous	Piping insulation (ringmain & supply risers): (a) Piping external to building: R1.0 (~38 mm); (b) Piping internal to building: R1.0 (~38 mm)
Lift (No. 2)	gearless traction with V V V F motor	Number of levels (including basement): 5

5. 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	4 star	5 star	no common laundry facility

Central systems	Size	Configuration	Connection (to allow for...)
Central water tank - rainwater or stormwater (No. 1)	5000	To collect run-off from at least: - 1262 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 502 square metres of common landscaped area on the site - car washing in 0 car washing bays on the site

Central systems	Size	Configuration	Connection (to allow for...)
Fire sprinkler system (No. 1)	-	So that fire sprinkler test water is contained within the fire sprinkler system for re-use, rather than disposed.	-

(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	Common area ventilation system		Common area lighting		
	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 + VSD fan	fluorescent	time clock and motion sensors	No
Switch room (No. 1)	ventilation exhaust only	none ie. continuous	fluorescent	manual on / manual off	No
Switch room (No. 2)	ventilation exhaust only	none ie. continuous	fluorescent	manual on / manual off	No
Garbage room (No. 1)	ventilation exhaust only	-	fluorescent	motion sensors	No
Garbage room (No. 2)	ventilation exhaust only	-	fluorescent	motion sensors	No
Plant or service room (No. 1)	ventilation exhaust only	none ie. continuous	fluorescent	manual on / manual off	No

Central energy systems	Type	Specification
Alternative energy supply	Photovoltaic system	Rated electrical output (min): 2.5 peak kW

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).



REPORT
TO
THORNTON NORTH PENRITH PTY LTD
ON
PRELIMINARY GEOTECHNICAL INVESTIGATION
FOR
PROPOSED RESIDENTIAL DEVELOPMENT
AT
LOT 3007 THORTON DEVELOPMENT, LORD
SHEFFIELD CIRCUIT, PENRITH, NSW

16 September 2014
Ref: 27694ZNrpt Rev1



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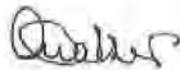
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Date: 16 September 2014
Report No: 27694ZNRpt
Revision No: 1

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STS TABLE A: POINT LOAD STRENGTH INDEX TEST REPORT

BOREHOLE LOGS 1 TO 5 INCLUSIVE, INCLUDING COLOUR CORE PHOTOGRAPH

FIGURE 1: BOREHOLE LOCATION PLAN

FIGURE 2: GRAPHICAL BOREHOLE SUMMARY

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APPENDIX A: ENVIROLAB SERVICES CERTIFICATE OF ANALYSIS NO: 115736



1 INTRODUCTION

This report presents the results of a preliminary geotechnical investigation for the proposed residential development at Lot 3007, Thornton Development, Lord Sheffield Circuit, Penrith, NSW. The investigation was commissioned by Mr Frank Katsanevas of St Hilliers on behalf of Thornton North Penrith Pty Ltd by email dated 22 August 2014. The investigation was completed generally in accordance with our proposal Ref: 'P39186ZN' dated 21 August 2014, our subsequent email dated 3 September 2014, and our further discussion on 4 September 2014.

This report confirms and amplifies the preliminary information provided by email dated 11 September 2014.

From the email from Mr Robert Facioni of Structural Design Solutions (NSW) [SDS] dated 21 August 2014, we understand the proposed development will comprise a 9 storey residential apartment building over a single level of basement carparking, however, consideration is being given to 2 levels of basement carparking. The proposed basement will extend to, or close to, the site boundaries. Maximum column loads on the order of 6,000kN have been estimated by SDS.

The purpose of the investigation was to obtain geotechnical information on subsurface conditions as a basis for preliminary comments and recommendations on excavation conditions, hydrogeological conditions, retention options, lateral earth pressures, footings, on-grade floor slabs and additional geotechnical work required.

2 INVESTIGATION PROCEDURE

Prior to any drilling commencing, the borehole locations were electromagnetically scanned for buried services by a specialist subcontractor.

Initially, four boreholes, BH1 to BH4, were drilled to refusal at depths between 5.8m (BH3) and 7.4m (BH1) using spiral augering and rotary washboring techniques with our truck mounted JK500 drill rig. One additional borehole, BH5, was initially drilled to a depth of 12.78m using spiral augering and 'tubex' down hole hammering techniques using our truck mounted JK500 drill rig. BH5 was subsequently extended to a depth of 15.65m using rotary diamond coring techniques with water flush.



The strength of the alluvial silts and clays and relative density of the alluvial sands and gravels were assessed from the results of Standard Penetration tests (SPTs) and SPT Solid Cone tests completed in the boreholes along with hand penetrometer tests on recovered cohesive soil samples. The strength of the bedrock was assessed from tactile examination of recovered rock core and subsequent laboratory point load strength index ($I_{s(50)}$) tests. The results of the point load strength index tests are presented on the attached Soil Test Services Pty Ltd (STS) Table A and are plotted on the borehole logs. A colour core photograph is also attached with the borehole logs.

50mm diameter PVC standpipe piezometers were installed in BH1, BH3 and BH5 to allow for the ongoing measurement of groundwater levels and these were monitoring whilst we were on site. No longer term groundwater monitoring was completed.

The borehole locations, as shown on the attached Borehole Location Plan (Figure 1) were set out by taped measurements from inferred site boundaries.

Our geotechnical engineer, David Schwarzer, was on site full time during the fieldwork and set out the borehole locations, directed the electromagnetic scanning, nominated the sampling and testing, and prepared logs of the encountered subsurface profile. The borehole logs are attached to this report along with a set of Report Explanation Notes which describe the investigation techniques adopted and define the logging terms and symbols used.

Selected samples were submitted to Envirolab Services Pty Ltd, a NATA registered laboratory, for aggressivity testing (soil pH, sulfate content, chloride content, electrical conductivity and resistivity). The results of the testing are summarised in the attached Envirolab Certificate of Analysis No. 115736, attached as Appendix A of this report. Contamination testing was outside the scope of our investigation.

3 RESULTS OF INVESTIGATION

3.1 Site Description

The site is located in relatively level topography and the site itself was near level.

The proposed Lord Sheffield Circuit formed the north-western site boundary and northern corner of the site, and had been boxed out at the time of our investigation.



At the time of the fieldwork, the site was vacant with a number of small stockpiles scattered across the site. The stockpiles were a maximum of about 2m high.

Vacant sites, including that for a proposed road, were located to the north-west, south-east and south-west of the site. An at-grade asphaltic concrete surfaced carpark was located to the north-east of the site.

3.2 Subsurface Conditions

The 1:100,000 Geological Map of Penrith indicates the site is underlain by Quaternary alluvial soils of the Cranebrook Formation.

The boreholes disclosed a subsurface profile comprising surficial fill over alluvial sands, silts and clays, then alluvial gravels, with interbedded sandstone and shale bedrock at depth. For details of the encountered subsurface profile, reference should be made to the attached borehole logs. A summary of the encountered conditions is presented below. Figure 2 presents a Graphical Borehole Summary.

Fill, comprising silty clay and silty gravelly clay of low to medium plasticity was encountered in all 5 boreholes to depths between 0.05m (BH3 and BH4) and 0.5m (BH2 and BH5).

Alluvial Sands, Silts and Clays were encountered from immediately beneath the fill and extended to depths between 5.0m (BH3) and 6.45m (BH1) below existing levels. The clays ranged from low to high plasticity and were of very stiff to hard strength. The silts were of low plasticity and of hard strength. The sands were medium dense, with the basal 0.5m of the sand profile in some boreholes were interbedded with alluvial gravels.

Alluvial Gravels were encountered beneath the alluvial sands, silts and clays in all 5 boreholes. The alluvial gravels were assessed as being medium dense or dense, and borehole refusal occurred within the gravel profile in all but one of the boreholes after only limited penetration. BH1 to BH4 inclusive were terminated at depths between 5.8m (BH3) and 7.4m (BH1). In BH5, the alluvial gravel profile extended to a depth of 12.5m.

Interbedded Shale and Sandstone Bedrock was encountered from immediately beneath the alluvial gravel profile in BH5 and extended to the 15.65m borehole termination depth. The interbedded shale and sandstone was initially of low strength, increasing to high strength with depth. A number of defects were encountered over the upper portion of the bedrock profile, with

no defects below 15m depth. The core loss zones likely represent thicker extremely weathered or clay seams within the better quality bedrock profile.

Groundwater: Boreholes BH1 to BH4 were 'dry' during and on completion of augering and BH3 remained 'dry' 6 days after the completion of drilling. On completion of washboring, standing water was measured in BH1 at 4.2m depth, falling to 5.4m after 18 hours then to 6.6m after 7 days.

In BH5, groundwater seepage was encountered at a depth of 8m during drilling. On completion of down hole hammer drilling, standing water was measured at a depth of 9.9m in BH5 and on completion of coring, standing water was measured at a depth of 6.5m in BH1. We note that water is injected into the borehole during rotary washboring and coring and groundwater levels had likely not stabilised in the limited observation period in BH5.

3.3 Laboratory Test Results

The point load strength index tests on the recovered core generally correlated well with our field assessment of the bedrock strength. The estimated Unconfined Compressive Strength (UCS) of the bedrock ranged from 12MPa to 104MPa.

The results of the soil aggressivity are summarised in the table below:

	BH1 (1.5m to 1.95m depth)	BH1 (4.5m to 4.95m depth)	BH3 (1.5m to 1.8m depth)	BH3 (4.5m to 4.95m depth)
Strata	Silty Clay	Silty Sand	Silty Clay	Sandy Silt
pH	4.4	7.9	5.1	7.4
Sulfate content (mg/kg)	<10	<10	<10	10
Chloride content (mg/kg)	1,200	200	600	300
Electrical Conductivity (μ S/cm)	710	150	390	230
Resistivity (ohm/m)	14	68	26	43



4 COMMENTS AND RECOMMENDATIONS

The following sections of the report have been prepared on the basis that the development will have only a single level of basement carparking. If a second basement level is proposed, then the comments and recommendations below should be reviewed and amended as required.

4.1 Excavation

4.1.1 Excavation Conditions

The proposed basement is expected to require excavation to a maximum depth of about 3m below existing levels, with locally deeper excavation required for services and lift overrun pits. Such excavation is expected to encounter the alluvial sands, clays and silts only.

Excavation of such materials is expected to be readily completed using conventional techniques such as the buckets of hydraulic excavators.

4.1.2 Seepage

Groundwater, where encountered, was at least 2m below anticipated bulk excavation levels and is not expected to be encountered.

We recommend that monitoring be continued in the installed standpipes to assess groundwater fluctuation with time.

4.2 Retention

4.2.3 Retention Options

Where space permits, temporary batters in the alluvial sands, clays and silts, above the groundwater table of 1 Vertical (V) to 1.5 Horizontal (H) are deemed appropriate and should remain stable in the short term, provided no surcharge loads are placed at the crest of the excavation. Steeper temporary batters of 1V to 1H may also be adopted for areas where only alluvial clays are present.

However, we understand that the proposed basement excavation will extend to, or close to, the site boundaries, and that it will most likely not be feasible to accommodate such temporary batter slopes within the site. We therefore recommend that the excavation be supported by an engineered retention system.



Given the subsurface conditions encountered, a conventional soldier pile wall with shotcrete infill panels could be considered for the majority of the excavation perimeter, however, in any areas where the alluvial sands extend above bulk excavation level, e.g. at BH2, such a system would not be feasible due to the collapsing nature of the sands and a contiguous pile wall would be required. If a soldier pile wall is to be adopted, we strongly recommend that additional spiral auger drilled boreholes be completed down to say 0.5m below bulk excavation level to confirm the subsurface profile around the perimeter of the proposed basement, and hence, the areas where a contiguous pile wall is necessary. Alternatively, as there appears to be no vibration sensitive structures within at least 30m of the site boundaries, consideration could be given to adopting a steel sheet pile wall for the entire excavation perimeter.

For a soldier pile wall, the shotcrete would need to be placed progressively as the excavation proceeds and regardless of what wall type is adopted, anchors would be required to limit deflections of the wall. We assume that permanent support of the retention system would be provided by the building structure.

We also note that for a soldier pile or contiguous pile wall, conventional bored piles would not be suitable due to the collapsing nature of the sandy soils and continuous flight auger CFA piling techniques would be required. We also note that using either CFA piling or sheet piling techniques it will most likely not be feasible to penetrate into the alluvial gravel profile. Therefore, the retention system will need to generate sufficient passive resistance within the alluvial soils above the gravels.

4.2.4 Retaining Wall Design Parameters

The major consideration in the selection of earth pressures for the design of the retaining walls is the need to limit deformations occurring outside the excavations. The following characteristic earth pressure coefficients and subsoil parameters may be adopted if a static design of temporary or permanent retention systems is to be carried out.

- For anchored or propped walls, where minor movements can be tolerated, provided there are no buried movement sensitive services present within the road reserve, we recommend the use of rectangular lateral earth pressure distribution of $6H$ (kPa) for the soil profile, where H is the retained height in metres.
- For anchored or propped walls, supporting areas which are relatively sensitive to movement, e.g. if there are movement sensitive services present (at the time of construction



or proposed in the future), a rectangular lateral earth pressure distribution of $8H$ (kPa) should be adopted for the soil profile.

- Any surcharge affecting the walls (e.g. road traffic loading, construction loads, etc.) should be allowed in the design using an 'at rest' earth pressure coefficient, K_o , of 0.55.
- The retaining walls should be designed as drained and measures taken to induce complete and permanent drainage of the ground behind the wall. Strip drains incorporating a geofabric to act as a filter against subsoil erosion would be appropriate for soldier pile walls. For a contiguous pile wall or sheet pile wall, drainage should comprise say 40mm diameter PVC pipes pushed through holes drilled through the wall say 0.2m above the basement finished floor level at say 2m horizontal centres with the inserted end of the PVC wrapped in geofabric to act as a filter against subsoil erosion. The hole surrounding the PVC pipe should be grouted up subsequent to installation of the pipe.
- Lateral toe restraint may be achieved by embedding the footing to sufficient depth below bulk excavation level, and any service excavations within 5m in front of the wall. A triangular lateral earth pressure coefficient should be adopted for embedment depth design with a "passive" earth pressure coefficient, K_p , of 3.0, assuming horizontal ground in front of the wall. We note that significant deflection is required in order to mobilise the full passive resistance of a soil and therefore a Factor of Safety of at least 2 should be adopted. We note that the upper 0.3m below bulk excavation level and any service excavations should be ignore due to potential disturbance effects. For soldier piles, soil arching to 3 times the actual pile diameter (assuming the piles are spaced at greater than 3 pile diameter centres) can be adopted to assess the passive resistance of the piles.
- If anchors are to run below adjoining properties, then permission of the owners must be obtained before installation.
- Anchors bonded into alluvial sands or gravels above the groundwater table can be designed based on an effective friction angle of 30° on the grout soil interface subject to the following conditions:
 - Anchor bond length of at least 3m behind the 'active' zone of the excavation (taken as a 45° zone above the base of the excavation).
 - Overall stability, including anchor group interaction, is satisfied.
 - All anchors are proof loaded to at least 1.3 times the design working load before being locked off at working load. We strongly recommend that such proof loading be inspected by an experience geotechnical engineer.



We recommend that consideration be given to carrying out computer modelling (e.g. WALLAP) of the proposed retaining wall system to analyse loads on the retention system and potential movements of the retention system. We can complete such modelling if commissioned to do so.

4.3 Footings

On the completion of excavation, alluvial soils are expected to be uniformly exposed across the basement excavation. Given the column loads advised (6,000kN), we anticipate that pad footings within the soil profile will not be feasible.

For the proposed development, we consider driven piles, e.g. precast concrete or timber piles, founded within the alluvial gravel profile, will be the most suitable footing type. Push in piles could also be considered, adopting the same design criteria as for driven piles. The advantage of push in piles is that they are effectively 'self-proving' with the push in system providing a short term static load test for each pile.

For driven piles founded on the alluvial gravels at a depth of 3m below bulk excavation level, and with a minimum embedment of 4 pile diameters below bulk excavation level, an allowable end bearing pressure of 2,000kPa could be provisionally adopted. However, higher bearing pressures could be feasible pending the driving of test piles.

We note that driven piles are typically installed on a design and construct basis by piling contractors with the contractor also certifying the piles. However, we would be able to review proposed pile designs prepared by piling contractors if requested to do so.

The building may also be supported on piles founded in the underlying bedrock profile. However, drilling of piles through the alluvial gravel profile will likely be problematic and may not be achievable in practice. If piles to the bedrock profile are proposed, comment on the feasibility of these should be sought from specialist piling contractors. For piles socketed a nominal 0.3m into bedrock of at least high strength, an allowable end bearing pressure of 3MPa can be adopted, based on serviceability criteria. For sockets longer than the nominal 0.3m above, an allowable shaft adhesion of 300kPa in compression and 150kPa in tension can be adopted. If piles to the bedrock profile are to be adopted, we strongly recommend that consideration be given to the drilling of additional cored borehole to confirm the depth to and quality of the bedrock profile across the site. If conventional bordered piles, or cased bored piles are adopted, the initial stages of pile drilling should be inspected by a geotechnical engineer to confirm the appropriate foundation material has been achieved.



The proposed piling contractor(s) should be provided with a full copy of this report so they are able to make their own assessment of installation and founding conditions.

4.4 Basement On-Grade Floor Slab

The soil subgrade at basement level must be proof rolled with at least 8 passes of a minimum 10 tonne deadweight smooth drum roller. The final pass of proof rolling should be carried out under the direction of an experienced geotechnical engineer for the detection of unstable or soft areas. The purpose of the proof rolling is to assist in the detection of any soft or unstable areas where replacement or improvement of the existing subgrade is required. If any soft or unstable areas are detected, advice on replacement/improvement would be provided during the inspection. Allowance should be made for possible replacement excavations in the design of the basement retaining walls.

The basement level on-grade floor slab should be provided with underfloor drainage. The underfloor drainage should comprise a strong, durable, single-sized washed aggregate (such as 'blue metal' gravel), which can also act as the subbase. The underfloor drainage should connect with the retaining wall drains (if applicable) and direct groundwater seepage to a sump for pumped disposal to the stormwater system.

Concrete on-grade floor slabs and pavements should be provided with effective shear connection at joints by using dowels or keys. The concrete on-grade floor slabs should be structurally isolated from all columns and footings, i.e. designed as a 'floating' slab.

4.5 Soil Aggressivity

Based on the results of the aggressivity testing, a 'Moderate' exposure classification is applicable for concrete piles in accordance with Table 6.4.2(C) of 'AS2159-2009: Piling – Design and Installation'.

In accordance with Table 6.5.2(C) of 'AS2159-2009', a 'Severe' exposure classification is applicable for steel piles.

4.6 Additional Geotechnical Work Required

The following summarises the further geotechnical input which is required and which has been detailed in the preceding sections of this report:

- Additional boreholes around the site perimeter to confirm subsurface conditions for shoring design.
- Additional cored boreholes if piles to bedrock are proposed.
- Additional groundwater monitoring to assess groundwater level fluctuations.
- Review of piling contractors designs.
- Witnessing of proof testing of temporary anchors.
- Geotechnical inspection of the initial stages of bored pile drilling, if appropriate.
- Proof rolling of exposed subgrade.

5 GENERAL COMMENTS

The recommendations presented in this report include specific issues to be addressed during the construction phase of the project. As an example, special treatment of soft spots may be required as a result of their discovery during proof-rolling, etc. In the event that any of the construction phase recommendations presented in this report are not implemented, the general recommendations may become inapplicable and JK Geotechnics accept no responsibility whatsoever for the performance of the structure where recommendations are not implemented in full and properly tested, inspected and documented.

Occasionally, the subsurface conditions between the completed boreholes may be found to be different (or may be interpreted to be different) from those expected. Variation can also occur with groundwater conditions, especially after climatic changes. If such differences appear to exist, we recommend that you immediately contact this office.

This report provides advice on geotechnical aspects for the proposed civil and structural design. As part of the documentation stage of this project, Contract Documents and Specifications may be prepared based on our report. However, there may be design features we are not aware of or have not commented on for a variety of reasons. The designers should satisfy themselves that all the necessary advice has been obtained. If required, we could be commissioned to review the geotechnical aspects of contract documents to confirm the intent of our recommendations has been correctly implemented.



A waste classification will need to be assigned to any soil excavated from the site prior to offsite disposal. Subject to the appropriate testing, material can be classified as Virgin Excavated Natural Material (VENM), General Solid, Restricted Solid or Hazardous Waste. If the natural soil has been stockpiled, classification of this soil as Excavated Natural Material (ENM) can also be undertaken, if requested. However, the criteria for ENM are more stringent and the cost associated with attempting to meet these criteria may be significant. Analysis takes seven to 10 working days to complete, therefore, an adequate allowance should be included in the construction program unless testing is completed prior to construction. If contamination is encountered, then substantial further testing (and associated delays) should be expected. We strongly recommend that this issue is addressed prior to the commencement of excavation on site.

This report has been prepared for the particular project described and no responsibility is accepted for the use of any part of this report in any other context or for any other purpose. If there is any change in the proposed development described in this report then all recommendations should be reviewed. Copyright in this report is the property of JK Geotechnics. We have used a degree of care, skill and diligence normally exercised by consulting engineers in similar circumstances and locality. No other warranty expressed or implied is made or intended. Subject to payment of all fees due for the investigation, the client alone shall have a licence to use this report. The report shall not be reproduced except in full.

TABLE A
POINT LOAD STRENGTH INDEX TEST REPORT

Client:	JK Geotechnics	Ref No:	27694ZN
Project:	Proposed Residential Development	Report:	A
Location:	Lot 3007 Thornton Development, Lord Sheffield Circuit, Penrith, NSW	Report Date:	15/09/2014

Page 1 of 1

BOREHOLE NUMBER	DEPTH m	$I_{S(50)}$ MPa	ESTIMATED UNCONFINED COMPRESSIVE STRENGTH (MPa)
5	12.89-12.93	0.6	12
	13.24-13.28	0.7	14
	13.53-13.56	5.2	104
	14.06-14.09	0.6	12
	14.57-14.60	2.6	52
	15.17-15.21	1.2	24
	15.46-15.49	1.0	20

NOTES:

1. In the above table testing was completed in the Axial direction.
2. The above strength tests were completed at the 'as received' moisture content.
3. Test Method: RMS T223.
4. For reporting purposes, the $I_{S(50)}$ has been rounded to the nearest 0.1MPa, or to one significant figure if less than 0.1MPa
5. The Estimated Unconfined Compressive Strength was calculated from the point load Strength Index by the following approximate relationship and rounded off to the nearest whole number :
$$U.C.S. = 20 I_{S(50)}$$



Borehole No.

1

1/2

BOREHOLE LOG

Client: ST HILLIERS
Project: PROPOSED RESIDENTIAL DEVELOPMENT
Location: LOT 3007, THORNTON DEVELOPMENT, LORD SHEFFIELD CIRCUIT, PENRITH, NSW

Job No. 27694ZN **Method:** SPIRAL AUGER/ROTARY WASHBORE JK500 **R.L. Surface:** N/A
Date: 2-9-14 **Datum:**

Logged/Checked by: D.S./N.E.S. *(Signature)*

Groundwater Record	SAMPLES				Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	FS	U30	DB	DS									
						0		CH	FILL: Silty clay topsoil, low plasticity, brown, with fine to medium grained ironstone, shale and igneous gravel. SILTY CLAY: high plasticity, brown.	MC<PL	H		ALLUVIAL
				N = 12 8,6,6		1			as above, but light grey mottled orange brown.			>600 >600 >600	
				N = 17 4,8,9		2		CL	SILTY CLAY: low plasticity, light grey and red brown, trace of fine grained sand.			>600 >600 >600	
						3						>600 >600 >600	
						4		SM	SILTY SAND: fine grained, orange brown, with clay fines.	D	MD		
						5							
						6		SG	SILTY GRAVELLY SAND: fine grained, orange brown, medium to coarse alluvial gravel.	M			COMMENCE WASHBORING
						6		GM	SILTY GRAVEL: medium to coarse grained, alluvial, with alluvial cobbles.				
						7							

ON COMPLETION OF WASHBORING

AFTER 18 HRS

ON 9/9/14

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BOREHOLE LOG

Borehole No.

1

2/2

Client: ST HILLIERS
Project: PROPOSED RESIDENTIAL DEVELOPMENT
Location: LOT 3007, THORNTON DEVELOPMENT, LORD SHEFFIELD CIRCUIT, PENRITH, NSW

Job No. 27694ZN **Method:** SPIRAL AUGER/ROTARY WASHBORE JK500 **R.L. Surface:** N/A
Date: 2-9-14 **Datum:**
Logged/Checked by: D.S./N.E.S. 

Groundwater Record	SAMPLES				Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	ES	U50	DB	DS									
					N _c 12 52 REF				SILTY GRAVEL: medium to coarse grained, alluvial, with alluvial cobbles.	W	MD		
						8 9 10 11 12 13 14			END OF BOREHOLE AT 7.4m				REFUSAL CLASS 18 uPVC STANDPIPE INSTALLED TO 7.4m, MACHINE SLOTTED BETWEEN 1.4m AND 7.4m, CASING FROM 1.4m TO SURFACE, BACKFILLED WITH 2mm SAND FILTER SAND BETWEEN 1.4m AND 7.4m, BENTONITE SEAL BETWEEN 1m AND 1.4m, BACKFILLED WITH DRILL SPOIL TO SURFACE

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Borehole No.
2
 1/1

BOREHOLE LOG

Client: ST HILLIERS
Project: PROPOSED RESIDENTIAL DEVELOPMENT
Location: LOT 3007, THORNTON DEVELOPMENT, LORD SHEFFIELD CIRCUIT, PENRITH, NSW

Job No. 27694ZN **Method:** SPIRAL AUGER JK500 **R.L. Surface:** N/A
Date: 3-9-14 **Datum:**

Logged/Checked by: D.S./N.E.S.

Groundwater Record	SAMPLES				Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	FS	U50	DB	DS									
DRY ON COMPLETION & AFTER 3.5 HRS						0			FILL: Silty clay topsoil, low plasticity, brown, with fine to coarse grained sandstone, shale and igneous gravel, trace of fine to medium grained sand and root fibres.	MC>PL			GRASS COVER
					N = 22 7,10,12	1		CH	SILTY CLAY: high plasticity, brown.	MC<PL	H	>600 >600 >600	ALLUVIAL
					N = 30 6,14,16	2		CL	SILTY SANDY CLAY: low plasticity, brown, orange brown and light grey, fine to medium grained sand.			>600 >600 >600	
					N = 20 6,10,10	3		SC	SILTY CLAYEY SAND: fine to medium grained, brown, orange brown and light grey.	D	MD		
					N = 13 8,6,7	4		SM	SILTY SAND: fine grained, brown.				
						5			as above, but with medium to coarse grained alluvial gravel and alluvial cobbles.				
				Nc= 12/50 REF.	6		GP	GRAVEL: medium to coarse grained, alluvial, blue grey, with fine to medium grained sand, silt fines and alluvial cobbles.		(MD)			'TC' BIT REFUSAL
					7			END OF BOREHOLE AT 5.85m					

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Borehole No.
3
 1/1

BOREHOLE LOG

Client: ST HILLIERS
Project: PROPOSED RESIDENTIAL DEVELOPMENT
Location: LOT 3007, THORNTON DEVELOPMENT, LORD SHEFFIELD CIRCUIT, PENRITH, NSW

Job No. 27694ZN **Method:** SPIRAL AUGER JK500 **R.L. Surface:** N/A
Date: 3-9-14 **Datum:**
Logged/Checked by: D.S./N.E.S. *[Signature]*

Groundwater Record	SAMPLES			Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	ES	USO	DB DS									
DRY ON COMPLETION AND ON 9/9/14					0		CH	FILL: Silty gravelly clay, low plasticity, dark brown, fine to medium grained shale, sandstone and igneous gravel trace of root fibres. SILTY CLAY: high plasticity, light brown mottled light grey.	MC>PL / MC>PL	VSt	300 310 320	GRASS COVER ALLUVIAL
				N = 9 3,4,5	1			as above, but light grey.	MC<PL	H	>600 >600 >600	
				N = 24 3,6,18	2		CL	SILTY CLAY: low plasticity, light grey and orange brown, with fine to medium grained sand.			>600 >600 >600	
					3		SM	SILTY SAND: fine grained, light grey and orange brown.	D	MD		TOO FRIABLE FOR HP TESTING
				N = 16 5,7,9	4		ML	SANDY SILT: low plasticity, brown, fine grained sand.	MC<PL	(VSt-H)		CLASS 18 uPVC STANDPIPE INSTALLED TO 5.8m DEPTH, MACHINE SLOTTED BETWEEN 5.8m AND 1m, CASING FROM 1m TO SURFACE, BACKFILLED WITH 2mm SAND FILTER SAND BETWEEN 5.8m AND 1m, BENTONITE SEAL BETWEEN 1m AND 0.5m, BACKFILLED WITH DRILL SPOIL TO SURFACE
				N = 18 5,9,9	5		SG	SANDY SILTY GRAVEL: medium to coarse grained, alluvial, blue grey, with alluvial cobbles.	D	MD		
			Nc= 10/ 100mm REF	6			END OF BOREHOLE AT 5.8m					'TC' BIT REFUSAL
				7								

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Borehole No.

4

1/1

BOREHOLE LOG

Client: ST HILLIERS
Project: PROPOSED RESIDENTIAL DEVELOPMENT
Location: LOT 3007, THORNTON DEVELOPMENT, LORD SHEFFIELD CIRCUIT, PENRITH, NSW

Job No. 27694ZN **Method:** SPIRAL AUGER JK500 **R.L. Surface:** N/A
Date: 3-9-14 **Datum:**

Logged/Checked by: D.S./N.E.S.

Groundwater Record	SAMPLES			Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	ES	U50	DB									
DRY ON COMPLETION					0		CL	FILL: Silty gravelly clay, low plasticity, brown, fine to coarse grained igneous gravel, trace of root fibres. SILTY CLAY: medium plasticity, light grey, trace of ash.	MC>PL MC>PL	St		GRASS COVER ALLUVIAL
				N = 7 2,3,4	1			SILTY CLAY: medium plasticity, light grey and orange brown, trace of fine grained sand.		VSt	180 180 180	
				N = 11 3,4,7	2			SILTY SANDY CLAY: low plasticity, light grey mottled dark grey and orange brown.	MC~PL	H		
				N = 20 7,10,10	3						>600 540 >600	
				N = 22 6,10,12	4		SC	SILTY CLAYEY SAND: fine to medium grained, light grey and orange brown.	D	MD		
					5		SM	SILTY SAND: fine to medium grained, orange brown.				
				SPT 11/150mm REFUSAL Nc=15 REF	6		GP	SILTY SANDY GRAVEL: medium to coarse grained, alluvial, blue grey, with alluvial cobbles. END OF BOREHOLE AT 6.45m				
				7								

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BOREHOLE LOG

Client: ST HILLIERS
Project: PROPOSED RESIDENTIAL DEVELOPMENT
Location: LOT 3007, THORNTON DEVELOPMENT, LORD SHEFFIELD CIRCUIT, PENRITH, NSW

Job No. 27694ZN **Method:** SPIRAL AUGER AND TUBEX **R.L. Surface:** N/A
Date: 9-9-14 JK305 **Datum:**

Logged/Checked by: D.S./N.E.S. *[Signature]*

Groundwater Record	SAMPLES				Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	ES	U50	DB	DS									
						0			FILL: Silty clay, medium plasticity, brown, with fine to coarse grained igneous and shale gravel.	MC<PL			
						1		CH	SILTY CLAY: high plasticity, light grey mottled brown, trace of ash.	MC<PL	H	>600 >600 >600	ALLUVIAL HAND PENETROMETER TESTING ON REMOULDED SAMPLES
						2			SILTY CLAY: high plasticity, light brown.	MC>PL	VSt-H	350 380 400	
						3		CL	SILTY CLAY: medium plasticity, orange brown mottled light grey, trace of fine grained sand.	MC<PL	H	>600 >600 >600	
						4		CL	SILTY SANDY CLAY: low plasticity, orange brown and light grey, fine grained sand.				
						5		SM	SILTY SAND: fine to medium grained, orange brown, with clay fines.	D			TOO FRIABLE FOR HAND PENETROMETER TESTING
						6							
						7		GS	SILTY SANDY GRAVEL: medium to coarse grained, alluvial, blue grey, fine to medium grained sand, with alluvial cobbles.	D	(MD)		COMMENCE TUBEX DRILLING

ON COMPLETION OF CORING

COPYRIGHT



Borehole No.
5
 2/3

BOREHOLE LOG

Client: ST HILLIERS
Project: PROPOSED RESIDENTIAL DEVELOPMENT
Location: LOT 3007, THORNTON DEVELOPMENT, LORD SHEFFIELD CIRCUIT, PENRITH, NSW

Job No. 27694ZN **Method:** SPIRAL AUGER AND TUBEX JK305 **R.L. Surface:** N/A
Date: 9-9-14 **Datum:**
Logged/Checked by: D.S./N.E.S.

Groundwater Record	SAMPLES				Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	FS	USO	DB	DS									
						8		GS GP	SANDY GRAVEL: medium to coarse grained, alluvial, blue grey, with alluvial cobbles. GRAVEL: medium to coarse grained, alluvial, blue grey, with fine to medium grained sand, and alluvial cobbles.	D	(MD)		
						9							
						10							
						11							
						12							
						12.5		-	INTERBEDDED SANDSTONE AND SHALE: fine grained, light grey and dark grey.	DW	(L)		
						13			REFER TO CORED BOREHOLE LOG				
						14							

ON COMPLETION OF HAMMER DRILLING

CLASS 18 uPVC STAND PIPE INSTALLED TO 15.65m DEPTH. MACHINE SLOTTED BETWEEN 3.65m DEPTH TO 15.65m DEPTH. CASING BETWEEN 3.65m DEPTH AND SURFACE. BACK FILLED WITH 2mm FILTER SAND BETWEEN 15.65m DEPTH AND 1m DEPTH. BENTONITE SEAL BETWEEN 0.5m TO 1m DEPTH. BACK FILLED WITH SOIL TO SURFACE.

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CORED BOREHOLE LOG

Client: ST HILLIERS
Project: PROPOSED RESIDENTIAL DEVELOPMENT
Location: LOT 3007, THORNTON DEVELOPMENT, LORD SHEFFIELD CIRCUIT, PENRITH, NSW

Job No. 27694ZN **Core Size:** NMLC **R.L. Surface:** N/A
Date: 9-9-14 **Inclination:** VERTICAL **Datum:**
Drill Type: JK305 **Bearing:** - **Logged/Checked by:** D.S./N.E.S.

Water Loss/Level	Barrel Lift	Depth (m)	Graphic Log	CORE DESCRIPTION Rock Type, grain characteristics, colour, structure, minor components.	Weathering	Strength	POINT LOAD STRENGTH INDEX I _s (50)	DEFECT DETAILS									
								DEFECT SPACING (mm)					DESCRIPTION				
								EL	VL	L	M	H	VH	EH	500	300	100
		12		START CORING AT 12.78m													
		13		SANDSTONE: fine grained, light grey.	DW	M	.										- CS, 0°, 2mm.t - CS, 0°, 2mm.t
NO RET- URN				CORE LOSS 0.12m	DW	M	.										- J, 0°, IS - J, 0°, IS - CS, 0°, 20mm.t - Be, 0°, P, S, 10mm.t, CLAY INFILL - CS, 0°, 5mm.t
		14		INTERBEDDED SANDSTONE AND SHALE: fine grained, light grey and dark grey, bedded @ 0°-10°, with VH strength bands.			.										- CS, 0°, 3mm.t - CS, 10°, 10mm.t - XWS, 0°, 10mm.t - XWS, 0°, Un, 3mm.t
				CORE LOSS 0.12m			.										- Be, 0°, P, S
		15		INTERBEDDED SANDSTONE AND SHALE: fine grained, light grey and dark grey, bedded at 0°-10°.	DW	H	.										- NUMEROUS BEDDING, 0°-10°, P, S, SPACED ≈ 20mm APART
				END OF BOREHOLE AT 15.65m													
		16															
		17															
		18															

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JK Geotechnics



JOB No. 276942N BH5 START CORING AT 12.78m

12

13

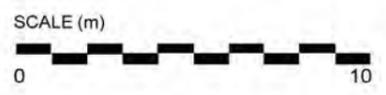
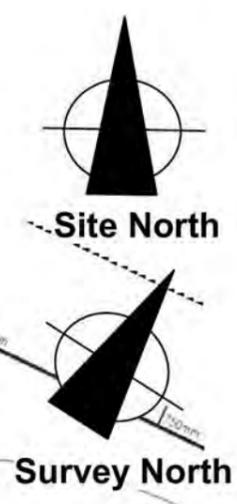
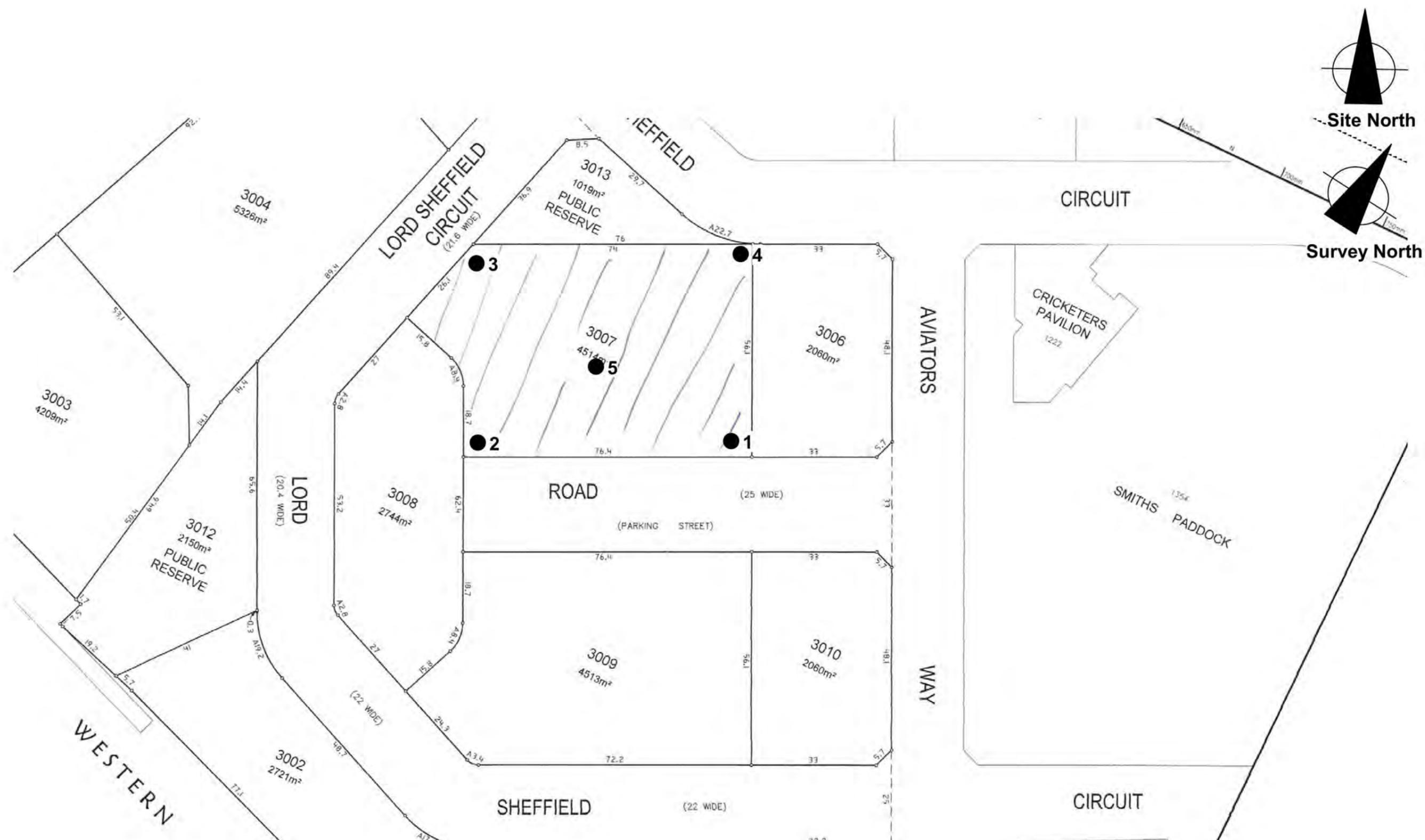
CORE
LOSS
0.12m

14

CORE
LOSS 0.12m

15

END BH AT 15.65m

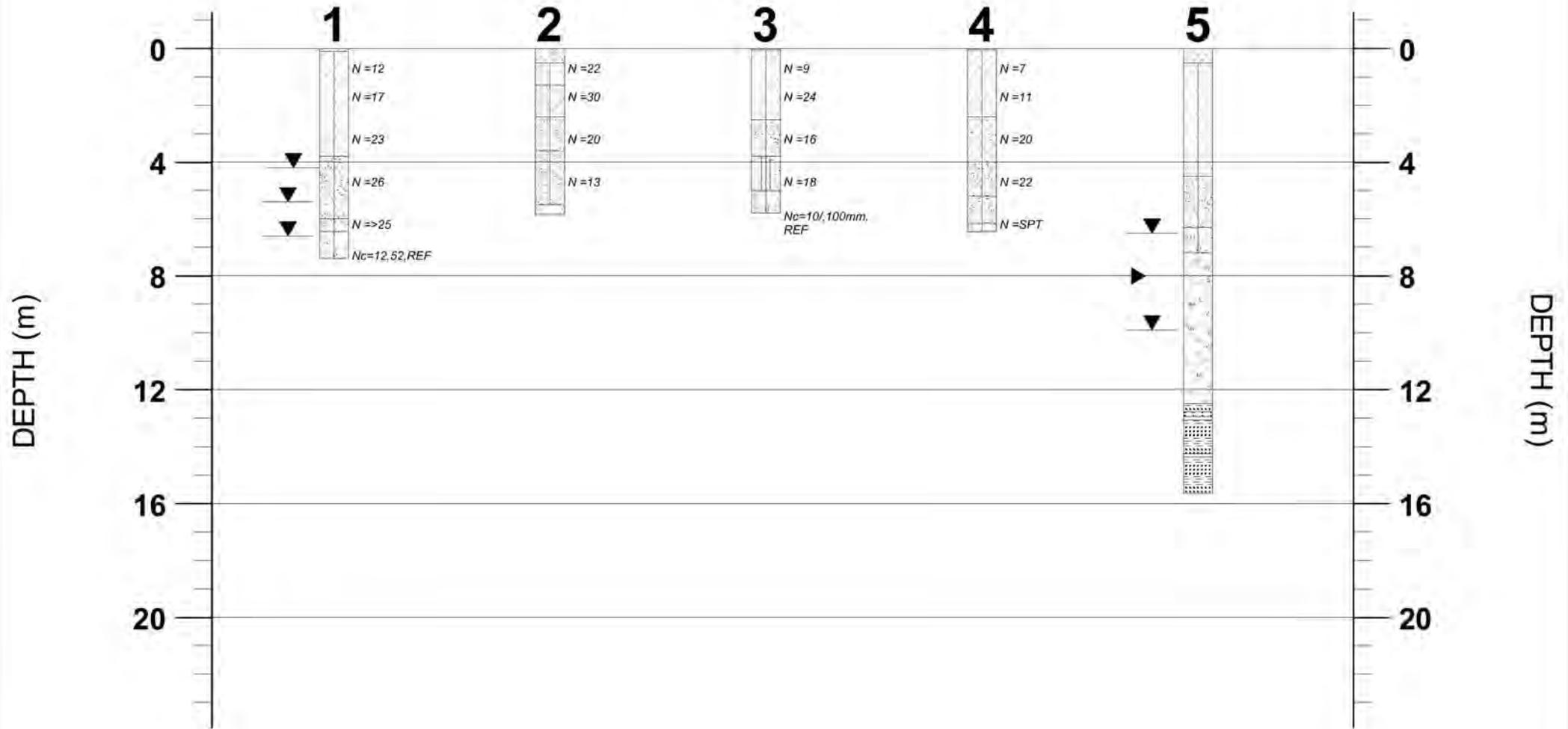


BOREHOLE LOCATION PLAN

JK Geotechnics
 GEOTECHNICAL & ENVIRONMENTAL ENGINEERS
 Report No. 27694ZN Figure No. 1



GRAPHICAL BOREHOLE SUMMARY



	Fill		Silty Gravelly Sand		Clayey Silty Sand		Silty Clayey Gravel		Interbedded Sandstone and shale	N	SPT "N" VALUE
	Silty Clay		Silty Gravel		Gravel		Sandstone/Greywacke		Observed water level	Nc	SOLID CONE BLOW COUNTS PER 150mm
	Silty Sand		Sandy Silty Clay		Sandy silt		Core Loss/Empty		Groundwater seepage level		

NOTE: REFER TO BOREHOLE LOGS

Scale: 1 : 200 (vert) ; NTS (horiz)

JK Geotechnics

Job No.: 27694ZN

Figure No.: 2





REPORT EXPLANATION NOTES

INTRODUCTION

These notes have been provided to amplify the geotechnical report in regard to classification methods, field procedures and certain matters relating to the Comments and Recommendations section. Not all notes are necessarily relevant to all reports.

The ground is a product of continuing natural and man-made processes and therefore exhibits a variety of characteristics and properties which vary from place to place and can change with time. Geotechnical engineering involves gathering and assimilating limited facts about these characteristics and properties in order to understand or predict the behaviour of the ground on a particular site under certain conditions. This report may contain such facts obtained by inspection, excavation, probing, sampling, testing or other means of investigation. If so, they are directly relevant only to the ground at the place where and time when the investigation was carried out.

DESCRIPTION AND CLASSIFICATION METHODS

The methods of description and classification of soils and rocks used in this report are based on Australian Standard 1726, the SAA Site Investigation Code. In general, descriptions cover the following properties – soil or rock type, colour, structure, strength or density, and inclusions. Identification and classification of soil and rock involves judgement and the Company infers accuracy only to the extent that is common in current geotechnical practice.

Soil types are described according to the predominating particle size and behaviour as set out in the attached Unified Soil Classification Table qualified by the grading of other particles present (e.g. sandy clay) as set out below:

Soil Classification	Particle Size
Clay	less than 0.002mm
Silt	0.002 to 0.075mm
Sand	0.075 to 2mm
Gravel	2 to 60mm

Non-cohesive soils are classified on the basis of relative density, generally from the results of Standard Penetration Test (SPT) as below:

Relative Density	SPT 'N' Value (blows/300mm)
Very loose	less than 4
Loose	4 – 10
Medium dense	10 – 30
Dense	30 – 50
Very Dense	greater than 50

Cohesive soils are classified on the basis of strength (consistency) either by use of hand penetrometer, laboratory testing or engineering examination. The strength terms are defined as follows.

Classification	Unconfined Compressive Strength kPa
Very Soft	less than 25
Soft	25 – 50
Firm	50 – 100
Stiff	100 – 200
Very Stiff	200 – 400
Hard	Greater than 400
Friable	Strength not attainable – soil crumbles

Rock types are classified by their geological names, together with descriptive terms regarding weathering, strength, defects, etc. Where relevant, further information regarding rock classification is given in the text of the report. In the Sydney Basin, 'Shale' is used to describe thinly bedded to laminated siltstone.

SAMPLING

Sampling is carried out during drilling or from other excavations to allow engineering examination (and laboratory testing where required) of the soil or rock.

Disturbed samples taken during drilling provide information on plasticity, grain size, colour, moisture content, minor constituents and, depending upon the degree of disturbance, some information on strength and structure. Bulk samples are similar but of greater volume required for some test procedures.

Undisturbed samples are taken by pushing a thin-walled sample tube, usually 50mm diameter (known as a U50), into the soil and withdrawing it with a sample of the soil contained in a relatively undisturbed state. Such samples yield information on structure and strength, and are necessary for laboratory determination of shear strength and compressibility. Undisturbed sampling is generally effective only in cohesive soils.

Details of the type and method of sampling used are given on the attached logs.

INVESTIGATION METHODS

The following is a brief summary of investigation methods currently adopted by the Company and some comments on their use and application. All except test pits, hand auger drilling and portable dynamic cone penetrometers require the use of a mechanical drilling rig which is commonly mounted on a truck chassis.

Test Pits: These are normally excavated with a backhoe or a tracked excavator, allowing close examination of the insitu soils if it is safe to descend into the pit. The depth of penetration is limited to about 3m for a backhoe and up to 6m for an excavator. Limitations of test pits are the problems associated with disturbance and difficulty of reinstatement and the consequent effects on close-by structures. Care must be taken if construction is to be carried out near test pit locations to either properly recompact the backfill during construction or to design and construct the structure so as not to be adversely affected by poorly compacted backfill at the test pit location.

Hand Auger Drilling: A borehole of 50mm to 100mm diameter is advanced by manually operated equipment. Premature refusal of the hand augers can occur on a variety of materials such as hard clay, gravel or ironstone, and does not necessarily indicate rock level.

Continuous Spiral Flight Augers: The borehole is advanced using 75mm to 115mm diameter continuous spiral flight augers, which are withdrawn at intervals to allow sampling and insitu testing. This is a relatively economical means of drilling in clays and in sands above the water table. Samples are returned to the surface by the flights or may be collected after withdrawal of the auger flights, but they can be very disturbed and layers may become mixed. Information from the auger sampling (as distinct from specific sampling by SPTs or undisturbed samples) is of relatively lower reliability due to mixing or softening of samples by groundwater, or uncertainties as to the original depth of the samples. Augering below the groundwater table is of even lesser reliability than augering above the water table.

Rock Augering: Use can be made of a Tungsten Carbide (TC) bit for auger drilling into rock to indicate rock quality and continuity by variation in drilling resistance and from examination of recovered rock fragments. This method of investigation is quick and relatively inexpensive but provides only an indication of the likely rock strength and predicted values may be in error by a strength order. Where rock strengths may have a significant impact on construction feasibility or costs, then further investigation by means of cored boreholes may be warranted.

Wash Boring: The borehole is usually advanced by a rotary bit, with water being pumped down the drill rods and returned up the annulus, carrying the drill cuttings. Only major changes in stratification can be determined from the cuttings, together with some information from "feel" and rate of penetration.

Mud Stabilised Drilling: Either Wash Boring or Continuous Core Drilling can use drilling mud as a circulating fluid to stabilise the borehole. The term 'mud' encompasses a range of products ranging from bentonite to polymers such as Revert or Biogel. The mud tends to mask the cuttings and reliable identification is only possible from intermittent intact sampling (eg from SPT and U50 samples) or from rock coring, etc.

Continuous Core Drilling: A continuous core sample is obtained using a diamond tipped core barrel. Provided full core recovery is achieved (which is not always possible in very low strength rocks and granular soils), this technique provides a very reliable (but relatively expensive) method of investigation. In rocks, an NMLC triple tube core barrel, which gives a core of about 50mm diameter, is usually used with water flush. The length of core recovered is compared to the length drilled and any length not recovered is shown as CORE LOSS. The location of losses are determined on site by the supervising engineer; where the location is uncertain, the loss is placed at the top end of the drill run.

Standard Penetration Tests: Standard Penetration Tests (SPT) are used mainly in non-cohesive soils, but can also be used in cohesive soils as a means of indicating density or strength and also of obtaining a relatively undisturbed sample. The test procedure is described in Australian Standard 1289, "Methods of Testing Soils for Engineering Purposes" – Test F3.1.

The test is carried out in a borehole by driving a 50mm diameter split sample tube with a tapered shoe, under the impact of a 63kg hammer with a free fall of 760mm. It is normal for the tube to be driven in three successive 150mm increments and the 'N' value is taken as the number of blows for the last 300mm. In dense sands, very hard clays or weak rock, the full 450mm penetration may not be practicable and the test is discontinued.

The test results are reported in the following form:

- In the case where full penetration is obtained with successive blow counts for each 150mm of, say, 4, 6 and 7 blows, as
N = 13
4, 6, 7
- In a case where the test is discontinued short of full penetration, say after 15 blows for the first 150mm and 30 blows for the next 40mm, as
N > 30
15, 30/40mm

The results of the test can be related empirically to the engineering properties of the soil.

Occasionally, the drop hammer is used to drive 50mm diameter thin walled sample tubes (U50) in clays. In such circumstances, the test results are shown on the borehole logs in brackets.

A modification to the SPT test is where the same driving system is used with a solid 60° tipped steel cone of the same diameter as the SPT hollow sampler. The solid cone can be continuously driven for some distance in soft clays or loose sands, or may be used where damage would otherwise occur to the SPT. The results of this Solid Cone Penetration Test (SCPT) are shown as "N_c" on the borehole logs, together with the number of blows per 150mm penetration.

Static Cone Penetrometer Testing and Interpretation:

Cone penetrometer testing (sometimes referred to as a Dutch Cone) described in this report has been carried out using an Electronic Friction Cone Penetrometer (EFCP). The test is described in Australian Standard 1289, Test F5.1.

In the tests, a 35mm diameter rod with a conical tip is pushed continuously into the soil, the reaction being provided by a specially designed truck or rig which is fitted with an hydraulic ram system. Measurements are made of the end bearing resistance on the cone and the frictional resistance on a separate 134mm long sleeve, immediately behind the cone. Transducers in the tip of the assembly are electrically connected by wires passing through the centre of the push rods to an amplifier and recorder unit mounted on the control truck.

As penetration occurs (at a rate of approximately 20mm per second) the information is output as incremental digital records every 10mm. The results given in this report have been plotted from the digital data.

The information provided on the charts comprise:

- Cone resistance – the actual end bearing force divided by the cross sectional area of the cone – expressed in MPa.
- Sleeve friction – the frictional force on the sleeve divided by the surface area – expressed in kPa.
- Friction ratio – the ratio of sleeve friction to cone resistance, expressed as a percentage.

The ratios of the sleeve resistance to cone resistance will vary with the type of soil encountered, with higher relative friction in clays than in sands. Friction ratios of 1% to 2% are commonly encountered in sands and occasionally very soft clays, rising to 4% to 10% in stiff clays and peats. Soil descriptions based on cone resistance and friction ratios are only inferred and must not be considered as exact.

Correlations between EFCP and SPT values can be developed for both sands and clays but may be site specific.

Interpretation of EFCP values can be made to empirically derive modulus or compressibility values to allow calculation of foundation settlements.

Stratification can be inferred from the cone and friction traces and from experience and information from nearby boreholes etc. Where shown, this information is presented for general guidance, but must be regarded as interpretive. The test method provides a continuous profile of engineering properties but, where precise information on soil classification is required, direct drilling and sampling may be preferable.

Portable Dynamic Cone Penetrometers: Portable Dynamic Cone Penetrometer (DCP) tests are carried out by driving a rod into the ground with a sliding hammer and counting the blows for successive 100mm increments of penetration.

Two relatively similar tests are used:

- Cone penetrometer (commonly known as the Scala Penetrometer) – a 16mm rod with a 20mm diameter cone end is driven with a 9kg hammer dropping 510mm (AS1289, Test F3.2). The test was developed initially for pavement subgrade investigations, and correlations of the test results with California Bearing Ratio have been published by various Road Authorities.
- Perth sand penetrometer – a 16mm diameter flat ended rod is driven with a 9kg hammer, dropping 600mm (AS1289, Test F3.3). This test was developed for testing the density of sands (originating in Perth) and is mainly used in granular soils and filling.

LOGS

The borehole or test pit logs presented herein are an engineering and/or geological interpretation of the sub-surface conditions, and their reliability will depend to some extent on the frequency of sampling and the method of drilling or excavation. Ideally, continuous undisturbed sampling or core drilling will enable the most reliable assessment, but is not always practicable or possible to justify on economic grounds. In any case, the boreholes or test pits represent only a very small sample of the total subsurface conditions.

The attached explanatory notes define the terms and symbols used in preparation of the logs.

Interpretation of the information shown on the logs, and its application to design and construction, should therefore take into account the spacing of boreholes or test pits, the method of drilling or excavation, the frequency of sampling and testing and the possibility of other than "straight line" variations between the boreholes or test pits. Subsurface conditions between boreholes or test pits may vary significantly from conditions encountered at the borehole or test pit locations.

GROUNDWATER

Where groundwater levels are measured in boreholes, there are several potential problems:

- Although groundwater may be present, in low permeability soils it may enter the hole slowly or perhaps not at all during the time it is left open.
- A localised perched water table may lead to an erroneous indication of the true water table.
- Water table levels will vary from time to time with seasons or recent weather changes and may not be the same at the time of construction.
- The use of water or mud as a drilling fluid will mask any groundwater inflow. Water has to be blown out of the hole and drilling mud must be washed out of the hole or 'reverted' chemically if water observations are to be made.

More reliable measurements can be made by installing standpipes which are read after stabilising at intervals ranging from several days to perhaps weeks for low permeability soils. Piezometers, sealed in a particular stratum, may be advisable in low permeability soils or where there may be interference from perched water tables or surface water.

FILL

The presence of fill materials can often be determined only by the inclusion of foreign objects (eg bricks, steel etc) or by distinctly unusual colour, texture or fabric. Identification of the extent of fill materials will also depend on investigation methods and frequency. Where natural soils similar to those at the site are used for fill, it may be difficult with limited testing and sampling to reliably determine the extent of the fill.

The presence of fill materials is usually regarded with caution as the possible variation in density, strength and material type is much greater than with natural soil deposits. Consequently, there is an increased risk of adverse engineering characteristics or behaviour. If the volume and quality of fill is of importance to a project, then frequent test pit excavations are preferable to boreholes.

LABORATORY TESTING

Laboratory testing is normally carried out in accordance with Australian Standard 1289 'Methods of Testing Soil for Engineering Purposes'. Details of the test procedure used are given on the individual report forms.

ENGINEERING REPORTS

Engineering reports are prepared by qualified personnel and are based on the information obtained and on current engineering standards of interpretation and analysis. Where the report has been prepared for a specific design proposal (eg. a three storey building) the information and interpretation may not be relevant if the design proposal is changed (eg to a twenty storey building). If this happens, the company will be pleased to review the report and the sufficiency of the investigation work.

Every care is taken with the report as it relates to interpretation of subsurface conditions, discussion of geotechnical aspects and recommendations or suggestions for design and construction. However, the Company cannot always anticipate or assume responsibility for:

- Unexpected variations in ground conditions – the potential for this will be partially dependent on borehole spacing and sampling frequency as well as investigation technique.
- Changes in policy or interpretation of policy by statutory authorities.
- The actions of persons or contractors responding to commercial pressures.

If these occur, the company will be pleased to assist with investigation or advice to resolve any problems occurring.

SITE ANOMALIES

In the event that conditions encountered on site during construction appear to vary from those which were expected from the information contained in the report, the company requests that it immediately be notified. Most problems are much more readily resolved when conditions are exposed that at some later stage, well after the event.

REPRODUCTION OF INFORMATION FOR CONTRACTUAL PURPOSES

Attention is drawn to the document 'Guidelines for the Provision of Geotechnical Information in Tender Documents', published by the Institution of Engineers, Australia. Where information obtained from this investigation is provided for tendering purposes, it is recommended that all information, including the written report and discussion, be made available. In circumstances where the discussion or comments section is not relevant to the contractual situation, it may be appropriate to prepare a specially edited document. The company would be pleased to assist in this regard and/or to make additional report copies available for contract purposes at a nominal charge.

Copyright in all documents (such as drawings, borehole or test pit logs, reports and specifications) provided by the Company shall remain the property of Jeffery and Katauskas Pty Ltd. Subject to the payment of all fees due, the Client alone shall have a licence to use the documents provided for the sole purpose of completing the project to which they relate. License to use the documents may be revoked without notice if the Client is in breach of any objection to make a payment to us.

REVIEW OF DESIGN

Where major civil or structural developments are proposed or where only a limited investigation has been completed or where the geotechnical conditions/ constraints are quite complex, it is prudent to have a joint design review which involves a senior geotechnical engineer.

SITE INSPECTION

The company will always be pleased to provide engineering inspection services for geotechnical aspects of work to which this report is related.

Requirements could range from:

- i) a site visit to confirm that conditions exposed are no worse than those interpreted, to
- ii) a visit to assist the contractor or other site personnel in identifying various soil/rock types such as appropriate footing or pier founding depths, or
- iii) full time engineering presence on site.



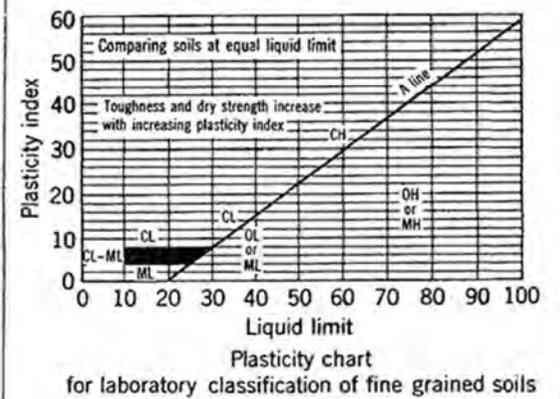
GRAPHIC LOG SYMBOLS FOR SOILS AND ROCKS

SOIL		ROCK		DEFECTS AND INCLUSIONS	
	FILL		CONGLOMERATE		CLAY SEAM
	TOPSOIL		SANDSTONE		SHEARED OR CRUSHED SEAM
	CLAY (CL, CH)		SHALE		BRECCIATED OR SHATTERED SEAM/ZONE
	SILT (ML, MH)		SILTSTONE, MUDSTONE, CLAYSTONE		IRONSTONE GRAVEL
	SAND (SP, SW)		LIMESTONE		ORGANIC MATERIAL
	GRAVEL (GP, GW)		PHYLLITE, SCHIST	OTHER MATERIALS	
	SANDY CLAY (CL, CH)		TUFF		CONCRETE
	SILTY CLAY (CL, CH)		GRANITE, GABBRO		BITUMINOUS CONCRETE, COAL
	CLAYEY SAND (SC)		DOLERITE, DIORITE		COLLUVIUM
	SILTY SAND (SM)		BASALT, ANDESITE		
	GRAVELLY CLAY (CL, CH)		QUARTZITE		
	CLAYEY GRAVEL (GC)				
	SANDY SILT (ML)				
	PEAT AND ORGANIC SOILS				



UNIFIED SOIL CLASSIFICATION TABLE

Field Identification Procedures (Excluding particles larger than 75 μm and basing fractions on estimated weights)				Group Symbols ^a	Typical Names	Information Required for Describing Soils	Laboratory Classification Criteria					
Coarse-grained soils More than half of material is larger than 75 μm sieve size ^b (The 75 μm sieve size is about the smallest particle visible to naked eye)	Gravels More than half of coarse fraction is larger than 4 mm sieve size	Clean gravels (little or no fines)	Wide range in grain size and substantial amounts of all intermediate particle sizes	<i>GW</i>	Well graded gravels, gravel-sand mixtures, little or no fines	Give typical name; indicate approximate percentages of sand and gravel; maximum size; angularity, surface condition, and hardness of the coarse grains; local or geologic name and other pertinent descriptive information; and symbols in parentheses For undisturbed soils add information on stratification, degree of compactness, cementation, moisture conditions and drainage characteristics Example: <i>Silty sand, gravelly</i> : about 20% hard, angular gravel particles 12 mm maximum size; rounded and subangular sand grains coarse to fine, about 15% non-plastic fines with low dry strength; well compacted and moist in place; alluvial sand; (<i>SM</i>)	Determine percentages of gravel and sand from grain size curve Depending on percentage of fines (fraction smaller than 75 μm sieve size) coarse grained soils are classified as follows: Less than 5% <i>GW, GP, SW, SP</i> More than 5% to 12% <i>GM, GC, SM, SC</i> Borderline cases requiring use of dual symbols	$C_U = \frac{D_{60}}{D_{10}}$ Greater than 4 $C_C = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ Between 1 and 3				
		Gravels with fines (appreciable amount of fines)	Predominantly one size or a range of sizes with some intermediate sizes missing	<i>GP</i>	Poorly graded gravels, gravel-sand mixtures, little or no fines			Not meeting all gradation requirements for <i>GW</i>				
		Sands More than half of coarse fraction is smaller than 4 mm sieve size	Clean sands (little or no fines)	Wide range in grain sizes and substantial amounts of all intermediate particle sizes	<i>SW</i>			Well graded sands, gravelly sands, little or no fines	Atterberg limits below "A" line, or <i>PI</i> less than 4 Atterberg limits above "A" line, with <i>PI</i> greater than 7	Atterberg limits below "A" line or <i>PI</i> less than 5 Atterberg limits below "A" line with <i>PI</i> greater than 7		
			Sands with fines (appreciable amount of fines)	Predominantly one size or a range of sizes with some intermediate sizes missing	<i>SP</i>			Poorly graded sands, gravelly sands, little or no fines				
			Identification Procedures on Fraction Smaller than 380 μm Sieve Size	Silts and clays liquid limit less than 50	None to slight			Quick to slow			None	<i>ML</i>
	Medium to high				None to very slow			Medium			<i>CL</i>	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
	Slight to medium				Slow			Slight			<i>OL</i>	Organic silts and organic silts-clays of low plasticity
	Silts and clays liquid limit greater than 50	Slight to medium	Slow to none	Slight to medium	<i>MH</i>			Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts			For undisturbed soils add information on structure, stratification, consistency in undisturbed and remoulded states, moisture and drainage conditions Example: <i>Clayey silt, brown</i> ; slightly plastic; small percentage of fine sand; numerous vertical root holes; firm and dry in place; loess; (<i>ML</i>)	
		High to very high	None	High	<i>CH</i>			Inorganic clays of high plasticity, fat clays				
		Medium to high	None to very slow	Slight to medium	<i>OH</i>			Organic clays of medium to high plasticity				
Highly Organic Soils		Readily identified by colour, odour, spongy feel and frequently by fibrous texture		<i>Pt</i>	Peat and other highly organic soils							



Note: 1 Soils possessing characteristics of two groups are designated by combinations of group symbols (eg. GW-GC, well graded gravel-sand mixture with clay fines).
 2 Soils with liquid limits of the order of 35 to 50 may be visually classified as being of medium plasticity.



LOG SYMBOLS

LOG COLUMN	SYMBOL	DEFINITION	
Groundwater Record		Standing water level. Time delay following completion of drilling may be shown.	
		Extent of borehole collapse shortly after drilling.	
		Groundwater seepage into borehole or excavation noted during drilling or excavation.	
Samples	ES	Soil sample taken over depth indicated, for environmental analysis.	
	U50	Undisturbed 50mm diameter tube sample taken over depth indicated.	
	DB	Bulk disturbed sample taken over depth indicated.	
	DS	Small disturbed bag sample taken over depth indicated.	
	ASB	Soil sample taken over depth indicated, for asbestos screening.	
	ASS	Soil sample taken over depth indicated, for acid sulfate soil analysis.	
Field Tests	N = 17 4, 7, 10	Standard Penetration Test (SPT) performed between depths indicated by lines. Individual figures show blows per 150mm penetration. 'R' as noted below.	
	N _c =	5	Solid Cone Penetration Test (SCPT) performed between depths indicated by lines. Individual figures show blows per 150mm penetration for 60 degree solid cone driven by SPT hammer. 'R' refers to apparent hammer refusal within the corresponding 150mm depth increment.
		7	
		3R	
VNS = 25	Vane shear reading in kPa of Undrained Shear Strength.		
PID = 100	Photoionisation detector reading in ppm (Soil sample headspace test).		
Moisture Condition (Cohesive Soils) (Cohesionless Soils)	MC>PL	Moisture content estimated to be greater than plastic limit.	
	MC≈PL	Moisture content estimated to be approximately equal to plastic limit.	
	MC<PL	Moisture content estimated to be less than plastic limit.	
	D	DRY – Runs freely through fingers.	
	M	MOIST – Does not run freely but no free water visible on soil surface.	
	W	WET – Free water visible on soil surface.	
Strength (Consistency) Cohesive Soils	VS	VERY SOFT – Unconfined compressive strength less than 25kPa	
	S	SOFT – Unconfined compressive strength 25-50kPa	
	F	FIRM – Unconfined compressive strength 50-100kPa	
	St	STIFF – Unconfined compressive strength 100-200kPa	
	VSt	VERY STIFF – Unconfined compressive strength 200-400kPa	
	H	HARD – Unconfined compressive strength greater than 400kPa	
	()	Bracketed symbol indicates estimated consistency based on tactile examination or other tests.	
Density Index/ Relative Density (Cohesionless Soils)		Density Index (I_d) Range (%)	
	VL	Very Loose <15	
	L	Loose 15-35	
	MD	Medium Dense 35-65	
	D	Dense 65-85	
	VD	Very Dense >85	
()	Bracketed symbol indicates estimated density based on ease of drilling or other tests.		
Hand Penetrometer Readings	300	Numbers indicate individual test results in kPa on representative undisturbed material unless noted otherwise.	
	250		
Remarks	'V' bit	Hardened steel 'V' shaped bit.	
	'TC' bit	Tungsten carbide wing bit.	
		Penetration of auger string in mm under static load of rig applied by drill head hydraulics without rotation of augers.	

LOG SYMBOLS continued

ROCK MATERIAL WEATHERING CLASSIFICATION

TERM	SYMBOL	DEFINITION
Residual Soil	RS	Soil developed on extremely weathered rock; the mass structure and substance fabric are no longer evident; there is a large change in volume but the soil has not been significantly transported.
Extremely weathered rock	XW	Rock is weathered to such an extent that it has "soil" properties, ie it either disintegrates or can be remoulded, in water.
Distinctly weathered rock	DW	Rock strength usually changed by weathering. The rock may be highly discoloured, usually by ironstaining. Porosity may be increased by leaching, or may be decreased due to deposition of weathering products in pores.
Slightly weathered rock	SW	Rock is slightly discoloured but shows little or no change of strength from fresh rock.
Fresh rock	FR	Rock shows no sign of decomposition or staining.

ROCK STRENGTH

Rock strength is defined by the Point Load Strength Index ($I_s 50$) and refers to the strength of the rock substance in the direction normal to the bedding. The test procedure is described by the International Journal of Rock Mechanics, Mining, Science and Geomechanics, Abstract Volume 22, No 2, 1985.

TERM	SYMBOL	$I_s (50)$ MPa	FIELD GUIDE
Extremely Low:	EL	0.03	Easily remoulded by hand to a material with soil properties.
Very Low:	VL	0.1	May be crumbled in the hand. Sandstone is "sugary" and friable.
Low:	L	0.3	A piece of core 150mm long x 50mm dia. may be broken by hand and easily scored with a knife. Sharp edges of core may be friable and break during handling.
Medium Strength:	M	1	A piece of core 150mm long x 50mm dia. can be broken by hand with difficulty. Readily scored with knife.
High:	H	3	A piece of core 150mm long x 50mm dia. core cannot be broken by hand, can be slightly scratched or scored with knife; rock rings under hammer.
Very High:	VH	10	A piece of core 150mm long x 50mm dia. may be broken with hand-held pick after more than one blow. Cannot be scratched with pen knife; rock rings under hammer.
Extremely High:	EH		A piece of core 150mm long x 50mm dia. is very difficult to break with hand-held hammer. Rings when struck with a hammer.

ABBREVIATIONS USED IN DEFECT DESCRIPTION

ABBREVIATION	DESCRIPTION	NOTES
Be	Bedding Plane Parting	Defect orientations measured relative to the normal to the long core axis (ie relative to horizontal for vertical holes)
CS	Clay Seam	
J	Joint	
P	Planar	
Un	Undulating	
S	Smooth	
R	Rough	
IS	Ironstained	
XWS	Extremely Weathered Seam	
Cr	Crushed Seam	
60t	Thickness of defect in millimetres	

APPENDIX A

CERTIFICATE OF ANALYSIS

115736

Client:

JK Geotechnics
PO Box 976
North Ryde BC
NSW 1670

Attention: David Schwarzer

Sample log in details:

Your Reference:

27694ZN, Lord Sheffield Circuit

No. of samples:

4 Soils

Date samples received / completed instructions received

05/09/2014 / 05/09/2014

Analysis Details:

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Please refer to the last page of this report for any comments relating to the results.

Report Details:

Date results requested by: / Issue Date:

12/09/14 / 12/09/14

Date of Preliminary Report:

Not Issued

NATA accreditation number 2901. This document shall not be reproduced except in full.

Accredited for compliance with ISO/IEC 17025.

Tests not covered by NATA are denoted with *.

Results Approved By:


Jacinta Hurst
Laboratory Manager

Envirolab Reference: 115736
Revision No: R 00



Miscellaneous Inorg - soil					
Our Reference:	UNITS	115736-1	115736-2	115736-3	115736-4
Your Reference	-----	1	1	3	3
Depth	-----	1.5-1.95	4.5-4.95	1.5-1.8	4.5-4.95
Date Sampled		2/09/2014	2/09/2014	3/09/2014	3/09/2014
Type of sample		Soil	Soil	Soil	Soil
Date prepared	-	08/09/2014	08/09/2014	08/09/2014	08/09/2014
Date analysed	-	09/09/2014	09/09/2014	09/09/2014	09/09/2014
pH 1:5 soil:water	pH Units	4.4	7.9	5.1	7.4
Sulphate, SO4 1:5 soil:water	mg/kg	<10	<10	<10	10
Chloride, Cl 1:5 soil:water	mg/kg	1,200	200	600	300
Electrical Conductivity 1:5 soil:water	µS/cm	710	150	390	230
Resistivity in soil*	ohm m	14	68	26	43

Client Reference: 27694ZN, Lord Sheffield Circuit

MethodID	Methodology Summary
Inorg-001	pH - Measured using pH meter and electrode in accordance with APHA latest edition, 4500-H+. Please note that the results for water analyses are indicative only, as analysis outside of the APHA storage times.
Inorg-081	Anions - a range of Anions are determined by Ion Chromatography, in accordance with APHA latest edition, 4110-B.
Inorg-002	Conductivity and Salinity - measured using a conductivity cell at 25oC in accordance with APHA latest edition 2510 and Rayment & Lyons.
Inorg-002	Conductivity and Salinity - measured using a conductivity cell at 25oC in accordance with APHA 22nd ED 2510 and Rayment & Lyons. Resistivity is calculated from Conductivity.

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Client Reference: 27694ZN, Lord Sheffield Circuit

QUALITY CONTROL	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results	Spike Sm#	Spike % Recovery
Miscellaneous Inorg - soil						Base Duplicate %RPD		
Date prepared	-			08/09/2014	115736-1	08/09/2014 08/09/2014	LCS-1	08/09/2014
Date analysed	-			09/09/2014	115736-1	09/09/2014 09/09/2014	LCS-1	09/09/2014
pH 1:5 soil:water	pH Units		Inorg-001	[NT]	115736-1	4.4 4.2 RPD: 5	LCS-1	102%
Sulphate, SO4 1:5 soil:water	mg/kg	10	Inorg-081	<10	115736-1	<10 <10	LCS-1	105%
Chloride, Cl 1:5 soil:water	mg/kg	10	Inorg-081	<10	115736-1	1200 1000 RPD: 18	LCS-1	90%
Electrical Conductivity 1:5 soil:water	µS/cm	1	Inorg-002	<1	115736-1	710 840 RPD: 17	LCS-1	101%
Resistivity in soil*	ohm m	1	Inorg-002	<1.0	115736-1	14 12 RPD: 15	LCS-1	101%
QUALITY CONTROL	UNITS	Dup. Sm#		Duplicate		Spike Sm#	Spike % Recovery	
Miscellaneous Inorg - soil				Base + Duplicate + %RPD				
Date prepared	-	[NT]		[NT]		115736-2	08/09/2014	
Date analysed	-	[NT]		[NT]		115736-2	09/09/2014	
pH 1:5 soil:water	pH Units	[NT]		[NT]		[NR]	[NR]	
Sulphate, SO4 1:5 soil:water	mg/kg	[NT]		[NT]		115736-2	99%	
Chloride, Cl 1:5 soil:water	mg/kg	[NT]		[NT]		115736-2	72%	
Electrical Conductivity 1:5 soil:water	µS/cm	[NT]		[NT]		[NR]	[NR]	
Resistivity in soil*	ohm m	[NT]		[NT]		[NR]	[NR]	

Envirolab Reference: 115736
Revision No: R 00

Report Comments:

Asbestos ID was analysed by Approved Identifier:
Asbestos ID was authorised by Approved Signatory:

Not applicable for this job
Not applicable for this job

INS: Insufficient sample for this test
NA: Test not required
<: Less than

PQL: Practical Quantitation Limit
RPD: Relative Percent Difference
>: Greater than

NT: Not tested
NA: Test not required
LCS: Laboratory Control Sample

Quality Control Definitions

Blank: This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.

Duplicate: This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.

Matrix Spike : A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.

LCS (Laboratory Control Sample) : This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.

Surrogate Spike: Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: <5xPQL - any RPD is acceptable; >5xPQL - 0-50% RPD is acceptable.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals; 60-140% for organics and 10-140% for SVOC and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

NORTH PENRITH: PLANNING COMPLIANCE TABLE DA01

North Penrith Design Guidelines

MATTER	STANDARD	PROPOSAL	COMPLIANCE
3.0 RESIDENTIAL DEVELOPMENT			
3.3 Building Envelopes	(1) The maximum number of storeys for residential development on the site is six storeys	The proposal presents two buildings of 8 storeys and four storeys. Refer to Section 6.1 of the SEE for appropriate justification.	✓
	(2) For all residential development (excluding residential flat buildings), the floor area of the third storey is to be no more than 60% of the second storey.	Residential flat buildings are proposed. Therefore this does not apply to the proposal.	✓
	(3) The location and siting of the third storey is to ensure adequate solar access and privacy for the lot and adjacent residential lots.	Appropriate solar access and privacy is provided, refer to Section 6.2 of the SEE for additional detail.	✓
	(4) Development adjacent to a laneway (ie ancillary dwelling) is to be no more than 2 storeys.	NA	NA
	(5) A minimum floor to ceiling height of 2,700mm is to be provided for all ground floor living spaces.	Proposal complies. 3.1 metre floor to ceilings are proposed.	✓
3.5 Private Open Space and Landscaping	5) The majority of dwellings within any given Development Block should receive at least 2 hrs of sunlight between 9am and 3pm at winter solstice (June 21).	Proposal complies. Refer to SEPP 65/RFDC review attached at Appendix F .	✓
3.8 Visual and Acoustic Amenity	1) Direct overlooking of main habitable areas and private open spaces or adjacent dwellings should be minimised through building layout, window and balcony location and	The proposed design has been carefully designed to protect residential amenity of adjacent sites. Comprehensive landscaping has been provided.	✓

MATTER	STANDARD	PROPOSAL	COMPLIANCE
	design, and the use of screening devices, including landscaping.	Refer to the Architectural Design Statement and the Landscape Plans attached at Appendix B and D for detail of the design and proposed landscaping.	
3.11 Specific Provisions – Residential Flat Buildings	Residential flat development is to be generally consistent with the guidelines and 'rules of thumb' set out within the NSW Residential Flat Design Code and the development controls in the table below. If there is any inconsistency, the development controls below prevail.	The proposal is generally consistent with the rule of thumb standards of the NSW Residential Flat Design Code. Refer to the Design Verification at Appendix F for details.	✓
Min. lot size -	650m2	The proposed lot size is greater than 650sqm.	✓
Max. building height	Maximum 6 storeys, except for Block C3 which is 3 storeys	To provide the Council with strategic context and an overview of how the apartment and town centre precinct may develop over the coming years, the applicant has prepared an indicative masterplan which provides guidance for potential height, massing and public domain improvements. This does not seek to replace the North Penrith Design Guidelines, but rather provides Council with an overview of the applicant's more detailed evaluation of the site conditions, constraints and opportunities based on a more thorough review of the precinct. As a prelude to prepared and lodging this DA (as well as DA02), this indicative masterplan was	

MATTER	STANDARD	PROPOSAL	COMPLIANCE
		<p>presented to and endorsed by Council's Design Review Panel and elected Council.</p> <p>With regard to the first development applications (i.e. DA01 and DA02) in the apartment precinct, the proposed design has focused on providing two apartment building typologies within each application. Firstly, a taller apartment building (of 8 storeys) to the north to optimise solar access, views and amenity and a garden apartment building (of 4 storeys) which provides a more pedestrian scale to the boulevard type streetscape to the south</p> <p>Refer to Section 6.1 of the SEE for further detail</p>	
<p>Max car parking rates</p>	<p>Studio 0.5 space / dwelling</p> <p>1-2 bedroom 1 space / dwelling</p> <p>3+ bedroom 2 spaces / dwelling</p> <p>Visitor parking on street</p>	<p>Parking spaces have been proposed under two options. The complying option proposes 72 spaces provided within the first basement level which is 17 spaces less than the maximum allowable. The higher two bedroom parking option proposes 90 spaces within the first and second basement levels which equates to approximately 1.43 spaces per two bedroom apartment parking in addition to one space per one bedroom apartment and two spaces per three bedroom apartment. This is higher than the maximum provision in the <i>North Penrith Design Guidelines</i></p>	

MATTER	STANDARD	PROPOSAL	COMPLIANCE
		<p>but is supportable with regard to traffic generation in the local area. 10% of spaces are designed for people with disabilities under both options to match the 10% universal access apartments within the development.</p> <p>Refer to Section 6.2.1 of the SEE and Appendix E for justification.</p>	
Car parking location and design	<p>At grade or within basement levels.</p> <p>At grade / undercroft parking is to be visually attractive, easily accessible to the dwelling entry and incorporate passive surveillance</p>	<p>No above ground parking is proposed as part of this application.</p>	<p>✓</p>
Universal dwellings	<p>Maximum site cover 100% - for Blocks A1, A2 and T1 - T5 50% - for Block C3</p> <p>Minimum deep soil zone 0% for Blocks A1, A2 and T1 - T5 15% for Block C3</p>	<p>The site is located within T5. The proposal is below Council's maximum site coverage control</p> <p>A large landscaped area is proposed which provides opportunities for mature plant growth.</p>	<p>✓</p> <p>✓</p>
	<p>Minimum communal open space 0% for Blocks A1, A2 and T1 - T5, 20% for Block C3.</p>	<p>Communal open space is provided and as such the proposal exceeds Council's minimum standard.</p>	<p>✓</p>

MATTER	STANDARD	PROPOSAL	COMPLIANCE
<p>(2) Development on the residential flat development sites nominated at Figure 15 is to achieve the desired outcomes specified below.</p> <p>Note: Residential flat buildings may occur on sites other than those nominated.</p>	 <p>LEGEND Apartment Sites</p>	<p>The proposal site is identified as T5 which specifies that apartments are a preferred use. Accordingly the proposal responds to this objective.</p>	<p>✓</p>
<p>Blocks T3-T5</p>	<p>Residential uses at ground floor should be designed as 'live/ work' spaces.</p> <p>The residential component is to be consistent with relevant controls in Section 4.0.</p>	<p>The proposed design is flexible and provides the potential for live/work spaces as identified in the guidelines.</p>	<p>✓</p>

MATTER	STANDARD	PROPOSAL	COMPLIANCE
<h2>4.0 THE VILLAGE CENTRE</h2>			
<p>4.1 Built form Controls</p>	<p>(1) The location of preferred land uses within the Village Centre is to be generally consistent with the Figure 18. The nominated 'Opportunity Site' may be developed for commercial, educational uses and the like should the demand arise.</p>	<p>The site is identified as High Density Residential. Proposed design is consistent with this land use.</p>	<p>✓</p>
	<p>(2) Building heights with the Village Centre are to be a minimum of 2 storeys, excluding the supermarket, and a maximum of 6 storeys.</p>	<p>To provide the Council with strategic context and an overview of how the apartment and town centre precinct may develop over the coming years, the applicant has prepared an indicative masterplan which provides guidance for potential height, massing and public domain improvements. This does not seek to replace the North Penrith Design Guidelines, but rather provides Council with an overview of the applicant's more detailed evaluation of the site conditions, constraints and opportunities based on a more thorough review of the precinct. As a prelude to prepared and lodging this DA (as well as DA02), this indicative masterplan was presented to and endorsed by Council's Design Review Panel and elected Council.</p> <p>With regard to the first development applications (i.e. DA01 and DA02) in the apartment precinct, the proposed design has focused on providing two apartment building typologies within each application. Firstly, a taller apartment building (of</p>	

MATTER	STANDARD	PROPOSAL	COMPLIANCE
		<p>8 storeys) to the north to optimise solar access, views and amenity and a garden apartment building (of 4 storeys) which provides a more pedestrian scale to the boulevard type streetscape to the south</p> <p>Refer to Section 6.1 of the SEE for further detail</p>	
	<p>(3) The ground floor of all mixed-use buildings is to have a minimum floor to ceiling height of 3.6m in order to provide for flexibility of future use. Above ground level, minimum floor to ceiling heights are 3.3m for commercial office, 3.6m for active public uses, such as retail and restaurants, and 2.7m for residential.</p>	<p>3.1 floor to ceiling heights are proposed</p>	<p>✓</p>
	<p>(4) Building setbacks / build-to lines within the Village Centre are to be consistent with Figure 19.</p> <p>Buildings are generally to be built to the street / square alignment. No upper level setbacks are required.</p>	<p>Building setbacks are consistent with Councils control.</p>	<p>✓</p>
	<p>(5) Building frontage types within the Village Centre are to be generally consistent with Figures 20-21 and the table below.</p>	<p>Building frontages are consistent with the design guidelines.</p>	<p>✓</p>
	<p>(6) Street frontages are required at ground level of buildings as shown at Figure 22 and the table below.</p>	<p>Proposed is consistent with this control.</p>	<p>✓</p>

MATTER	STANDARD	PROPOSAL	COMPLIANCE
	<p>(7) Main building entry points should be clearly visible from primary street frontages and enhanced as appropriate with awnings, building signage or high quality architectural features that improve clarity of building address and contribute to visitor and occupant amenity.</p>	<p>Main entry points are provided to both buildings via the central courtyard, entrances are clearly visible. The proposal complies.</p>	<p>✓</p>
	<p>(8) Mixed use buildings within the Village Centre are to:</p> <ul style="list-style-type: none"> ▪ provide direct 'front door' access from ground floor residential units, ▪ provide clearly separate and distinguishable commercial and residential entries and vertical circulation, and ▪ provide multiple entrances for large developments including an entrance on each street frontage. 	<p>NA</p>	<p>NA</p>
	<p>(9) To facilitate the future conversion of ground floor residential uses to non-residential uses, the s88B instrument is to include a provision stating that the body corporate is not to unreasonably restrict or limit the ability for such a conversion to occur.</p>	<p>Proposed ground floor uses are for residential purposes</p>	<p>NA</p>
	<p>(10) The design and provision of facilities for persons with a disability including car parking must comply with Australian Standard AS 1428 Pt 1 and 2 (or as amended) and the Commonwealth Disability Discrimination Act 1992 (as amended). A report from an accredited access consultant is to be submitted with a development application (where relevant), indicating the proposal's</p>	<p>An accessibility report has been prepared and attached at Appendix M, demonstrating the proposed access provisions are appropriate for the site. Refer to Section 6.2.5 of the SEE for detail.</p>	<p>✓</p>

MATTER	STANDARD	PROPOSAL	COMPLIANCE
	compliance.		
	(12) The design of roof plant rooms and lift overruns is to be integrated into the overall architecture of the building, and in residential buildings may be screened by roof pergolas.	Lift overruns and roof plants are integrated into the architectural design and do not create an unreasonable visual impacts.	✓
	(15) All dwellings, including those dwellings in a mixed-use building and serviced apartments which are intended to be or are capable of being strata titled, are to demonstrate compliance with the State Environmental Planning Policy (Building Sustainability Index: BASIX) 2004.	A BASIX assessment has been undertaken, refer to Appendix H . The proposal complies.	✓
4.2 Access, Parking and Servicing	<p>Maximum parking rates are to be in accordance with the table below. The preferred location of and access to car parking within the Village Centre is shown at Figure 23.</p> <p>Development Type Maximum Car Parking Rate</p> <p><u>Residential</u></p> <ul style="list-style-type: none"> - Studio (0.5 space / dwelling) - 1-2 Bedroom (1 space / dwelling) - 3+ bedroom (2 spaces / dwelling) - Visitors (On-street only) - Car wash bay (1 space for car washing for every 50 units, up to a maximum 4 spaces per building) 	<p>Parking spaces have been proposed under two options. The complying option proposes 72 spaces provided within the first basement level which is 17 spaces less than the maximum allowable. The higher two bedroom parking option proposes 90 spaces within the first and second basement levels which equates to approximately 1.43 spaces per two bedroom apartment parking in addition to one space per one bedroom apartment and two spaces per three bedroom apartment. This is higher than the maximum provision in the <i>North Penrith Design Guidelines</i> but is supportable with regard to traffic generation in the local area. 10% of spaces are designed for people with disabilities under both options to match the 10% universal access apartments</p>	

MATTER	STANDARD	PROPOSAL	COMPLIANCE
	Other uses - As per Section Part 2 2.11 of Penrith DCP 2006	within the development.	
	<p>(4) Where above ground parking is proposed, the location of the parking area must:</p> <ul style="list-style-type: none"> ▪ be located on the side or rear of the site, and not be visible from the street and street frontage; ▪ be landscaped or screened so that cars parked in the parking area are not visible from adjoining buildings or the street/street frontage; and ▪ allow safe and direct access to the building's entry points. 	Refer to Section 6.2.1 of the SEE and Appendix E for justification.	✓
	<p>(5) Where possible, natural ventilation is to be provided to underground parking areas with ventilation grilles and structures that are:</p> <ul style="list-style-type: none"> ▪ integrated into the overall façade and landscape design of the development, ▪ Located away from the primary street facade, and oriented away from windows of habitable rooms and private open space areas. 	The proposed residential flat buildings receive natural cross ventilation. Refer to the SEPP 65 assessment attached at Appendix F .	
	<p>(6) Car parking above ground level is to have a minimum floor to ceiling height of 2.8m so it may be adapted to another use in the future.</p>	No parking is proposed above ground level.	✓

MATTER	STANDARD	PROPOSAL	COMPLIANCE
	<p>(7) All parking provided on site is to meet AS 2890 and where, appropriate AS 1428.</p>	<p>Refer to the Traffic Assessment attached at Appendix E</p>	<p>✓</p>
	<p>(8) All loading and unloading areas are to be: North Penrith Design Guidelines 2013 40</p> <ul style="list-style-type: none"> ▪ integrated into the design of developments, ▪ separated from car parking and waste storage and collection areas, ▪ located away from the circulation path of other vehicles, ▪ provided separately for commercial/retail and residential uses, where part of a mixed use development, and ▪ designed for commercial vehicle circulation and access complying with AS 2890.2. 	<p>No loading facilities are incorporated into this DA given the proposed uses are residential.</p>	<p>✓</p>
	<p>(9) Vehicular access to the loading / unloading area(s) is preferred off rear lanes, side streets and right of ways. Where appropriate, consider a single vehicular access point for the loading/unloading area(s) and waste collection area(s).</p>	<p>Vehicular access to the site is proposed in accordance with the direction provided by the design guidelines.</p>	<p>✓</p>

Penrith DCP 2006

MATTER	STANDARD	PROPOSAL	COMPLIANCE
2.2 Crime Prevention Through Environmental Design	<p>DA's should follow the four CPTED principles to minimise the opportunity for crime:</p> <ol style="list-style-type: none"> 1) Surveillance 2) Access control 3) Territorial reinforcement 4) Space management 	The proposal incorporates a design which provides passive surveillance of the surrounding area including the provision of an internal courtyard. Effective lighting and landscaping has been provided which enhances the safety of public places.	✓
6.22 North Penrith			
2.1 ESD	<p>- Remediation must be undertaken in accordance with the detailed terms and provisions of:</p> <ul style="list-style-type: none"> • The Remediation Action Plan (RAP) prepared by consultants CMPS&F, which has been environmentally audited by Dames and Moore and endorsed by Penrith Council • Penrith Council's draft Contaminated Lands Policy 	<p>The proposed site has previously been remediated as detailed in the SEE.</p> <p>Appropriate ESD measures have been incorporated into the proposed design. Please refer to Section 6.2.3 of the SEE.</p>	✓
2.3 Urban Development	- Adopt effective urban design strategies in order to maximise densities of employment and residential development	The proposal is of a higher density in accordance with specific objectives of the design guidelines. The proposal does not result in unreasonable amenity impacts.	✓



WASTE MANAGEMENT PLAN

PREPARED FOR
THORNTON NORTH PENRITH PTY LTD

ON BEHALF OF
DKO ARCHITECTURE

RESIDENTIAL DEVELOPMENT
LORD SHEFIELD CIRCUIT
THORNTON
PENRITH NSW

ISSUED SEPTEMBER 2014

EDDY SAIDI
1800 025 073

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ABOUT ELEPHANTS FOOT

Elephants Foot Recycling Solutions is a family owned Australian company whose philosophy is providing quality recycling and waste solutions through product innovation. We are Australia's leading supplier of garbage, recycling and laundry chute systems.

Our team of experts has been proudly assisting architects, builders and developers with advice on how best to solve waste management and odour issues in dwellings since 1976. We have a long history of completed projects within the Australian building environment. Recent major projects completed include:

- Karimbla Constructions – Meriton Infinity, Herschel Street Brisbane Qld
Won the International Property Award for 'Best Residential High-Rise Development' Australia in 2014
- Laing O'Rourke – M&A, McLachlan & Ann Streets, Brisbane Qld
- Dylam – 15 Young Street, Carlingford NSW
- Hickory Developments – Ilk Apartments, 227 Toorak Road, South Yarra VIC
- Equiset – 27 Little Collins Street, Melbourne VIC

Elephants Foot also provides waste management planning services; recent plans include:

- Meriton – 94-100 Dalmeny Avenue, Rosebery NSW
- Fife Capital – 38-48 York Street & 379-385 George Street, Sydney NSW
- Dylam – KOI, Parramatta NSW
- Mirvac – Green Square, Site 5A and 5B, NSW
- Bao Jia Developments – 300 George Street, Brisbane Qld

REVISIONS

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EXECUTIVE SUMMARY

This waste management plan covers the ongoing management of waste generated by the residential development located at Lord Sheffield Circuit, Thornton, Penrith NSW 2750.

Waste audit and management strategies are recommended for new developments to provide support for the building design and promote strong sustainability outcomes for the building. All recommended waste management plans will comply with council codes and any statutory requirements. The waste management plan has three key objectives:

- i. **Ensure waste is managed to reduce the amount of waste and recyclables to land fill** by assisting residents to segregate appropriate materials that can be recycled; displaying signage to remind and encouraging recycling practices; and through placement of recycling and waste bins in the retail precinct to reinforce these messages.
- ii. **Recover, reuse and recycle** generated waste wherever possible.
- iii. **Compliance** with all relevant codes and policies.

To assist in clean and well-segregated material, building management can work proactively with residents in the following way:

- Building management should ensure their communications achieve a regular and consistent message.
- By-laws: the resident's by-laws should include a requirement to actively participate in recycling/ diversion initiatives implemented within the residential buildings.

INTRODUCTION

The following waste management plan pertains to the proposed mixed development located at Lord Sheffield Circuit, Thornton, Penrith NSW 2750. This waste management plan is an operational waste management plan and will address the phases of the completed

For the purpose of this report the proposed development will consist of:

- Two multi-level buildings named Block A and Block C
- Block A (8 levels) with 64 units, Block C (4 levels) 19 units
- 83 residential units in total

All figures and calculations are based on area schedules as advised by our client and shown on architectural drawings.

PENRITH CITY COUNCIL

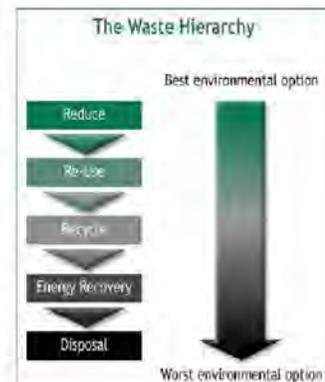
The assessment of waste volumes is an estimate only and will be influenced by the development's management and occupant's attitude to waste disposal and recycling.

The residential waste and recycling will be guided by the services and acceptance criteria of the Penrith City Council. The residential waste and recycling will be collected by council.

All waste facilities and equipment are to be designed and constructed to be in compliance with the Penrith City Council, Australian Standards and statutory requirements.

OBJECTIVES

- Facilitate sustainable waste management within the City of Penrith in accordance with the principles of Ecologically Sustainable Development
- Manage waste in accordance with the 'Waste Hierarchy' to:
 - avoid producing waste in the first place;
 - minimise the amount of waste produced;
 - re-use items as many times as possible to minimise waste;
 - recycling once re-use options have been exhausted; and
 - dispose of what is left, as a last resort, in a responsible way to appropriate waste disposal facilities
- Assist in achieving Federal and State Government waste minimisation targets as set out in the *Waste Avoidance and Resource Recovery Act 2001* and *NSW Waste Avoidance and Resource Recovery Strategy 2007*
- Minimise the overall environmental impacts of waste by:
 - encouraging development that facilitate ongoing waste avoidance and complements waste services offered by both Council and/or private contractors;
 - requiring on-site source separation and other design and siting standards which assist waste collection and management services;
 - encouraging building designs and construction techniques that minimise waste generation;
 - maximising opportunities to reuse and recycling building and construction materials as well as other wastes in the ongoing use of a premise; and
 - reducing the demand for waste disposal.



GENERATED WASTE VOLUMES

This assessment of waste volumes is an estimate only and will be influenced by the development's management and occupants' attitude to waste disposal and recycling.

CONSTRUCTION AND DEVELOPMENT WASTE

The head contractor will be responsible for removing all construction-related waste offsite in a manner that meets all authority requirements. Please refer to the separate waste management plan submitted for construction waste as part of the Development Application.

WASTE DEFINITION

Garbage:	all domestic waste (except recyclables and green waste)
Recycling:	glass bottles and jars – PET, HDPE and PVC plastics; aluminium, aerosol and steel cans; milk and juice cartons; soft drink, milk and shampoo containers; paper, cardboard, junk mail, newspapers and magazines.
Green:	garden organics such as small branches, leaves and grass clippings, tree and shrub prunings, plants and flowers, and weeds.
MGB:	Mobile garbage bin
L:	litres

BUILDING MANAGER/ WASTE CARETAKER

All equipment movements in the room are managed by the building manager/ cleaners at all times. No tenants will be allowed to transport waste or recyclables from the waste room; tenants will only transport their waste to the room allocated.

The building manager/ cleaner duties include, but are not limited to, the following:

- General maintenance and cleaning of the chute doors on each level (Frequency will depend on waste generation and will be determined based upon building operation)
- Organising, maintaining and cleaning the general and recycled waste holding areas (Frequency will depend on waste generation and will be determined based upon building operation)
- Transporting of bins as required
- Organising both garbage and recycled waste pick-ups as required
- Cleaning and exchanging all bins
- Ensure site safety for residents, children, visitors, staff and contractors
- Abide by all relevant OH&S legislation, regulations, and guidelines
- Assess any manual handling risks and prepare a manual handling control plan for waste and bin transfers
- Provide to staff/contractors equipment manuals, training, health and safety procedures, risk assessments, and PPE to control hazards associated with all waste management activities.

NOTE: It is the responsibility of the building manager to monitor the number of bins required for the development. As waste volumes may change according to the development's management and occupants' attitudes to waste disposal and recycling, bin numbers and sizes may need to be altered to suit the building operation.

REPORTING

It is recommended that building management ensure that all waste service providers submit monthly reports on all equipment movements and weights of any waste and recycling products removed from the development. Regular reviews of servicing should take place to ensure operational and economic best practise and to assist with sustainability reporting.

EDUCATION

Educational material encouraging correct separation of garbage and recycling items must be provided to each resident to ensure correct use of the garbage and recycling chutes and to ensure an understanding of each chute's use. This should include the correct disposal process for bulky goods (old furniture, large discarded items etc.). It is recommended that information is provided in multiple languages to support correct practises and minimise contamination in the collection MGB as well as chute blockages.

It is also recommended that the development's website contain information for residents to refer to regarding use of the chute. Information should include:

- directions on using the chute doors;
- recycling and garbage descriptions (Council provides comprehensive information);
- how to dispose of bulky goods and any other items that are not garbage or recycling;
- residents' obligations to WHS and building management; and
- how to prevent damage or blockages to the chute (example below).

TO PREVENT DAMAGE OR BLOCKAGE TO RUBBISH CHUTE DO NOT *place, umbrellas, bedding, cigarettes, cartons, coat hangers, brooms, mops, large plastic wrappings from furniture, white goods, any sharp objects, hot liquid or ashes, oil, unwrapped vacuum dust, syringes, paint and solvents, car parts, bike parts, chemicals, corrosive and flammable items, soil, timber, bricks or other building materials, furniture, etc. down the chute.*

RESIDENTIAL WASTE

Using council's waste generation rates, the total waste generated by the development can be calculated as follows:

Waste: 1 x 240L MGB/4 units - 2:1 compaction
 Recycling: 1 x 240L MGB/2 units uncompact bin
See Appendix 1 for bin dimensions

TABLE 1 – RESIDENTIAL WASTE GENERATION

Building	Units	Waste Bins	2xweekly collections	Recycling Bins
A	64	16 x 240L	8 x 240L	32 x 240L
C	19	5 x 240L	3 x 240L	10 x 240L
Total	83	21 x240L	11 x 240L	42 x 240L

The above assumptions have been taken into consideration for the calculation of these figures:

- Garbage is compacted at the base of each chute (2:1);
- Recycling is also not compacted;
- Full garbage and recycling bins will be transported to the loading dock for collection;
- Number of bins have been rounded up for best operational outcome; and
- Garbage bin numbers based on collections twice weekly/recycling collected weekly

WASTE MANAGEMENT

Council require for any building comprising three or more storeys, as a minimum, a garbage chute system is to be provided for the residential levels of the building.

Every residential level will be supplied with a chute outlet that provides the opportunity to dispose of garbage and recyclable items (dual chutes).

Each building will be supplied with a separate garbage and recycling chute. Each garbage chute will discharge into collection bins placed on a carousel or linear track fitted with a compactor (2:1 compaction). Recycling will discharge into collection bins (not compacted).

All residents will be supplied with a collection area in each unit (generally in the kitchen, under bench) to deposit waste and collect recyclable and compostable material suitable for one days storage. Residents should wrap or bag their waste. It is recommended that bagged garbage should not exceed 3kg in weight.

Recycling must not be bagged. It is recommend that residents use a crate or dedicated bin for collecting recyclables within the allocated residential space provided to ensure correct separation before using the recycling chute system. It is expected that residents will place clean and empty recycling items into the chute when using the recycling chute.

Cardboard furniture boxes or large cardboard containers should not be included in the waste chute – a collection bin should be made available to residents to deposit this material; flattened where possible.

Once putrescible and recyclable waste streams are separated, the resident will carry these to the waste compartment housing the chute door and deposit bagged waste into the garbage chute and loose recyclables into the recycling chute.

Council requires maximum storage area for each waste service compartment and doors are required to open outwards.

GREEN WASTE

There will be green waste generated by the buildings landscaping. Any green waste will be collected and removed from site by the maintenance contractor.

COMPOSTING

An area for composting may be provided on site and made available for residents' use (*see Appendix 1 – Waste Management Equipment*). The siting of composting facilities should consider:

- the location and proximity of dwellings (including those adjoining the subject property), to minimise likely odour impacts/nuisance;
- the location of the drainage system;
- whether the facility is appropriately designed for composting; and
- provision of signposting to ensure inappropriate waste is not added to the compost

Alternately, consideration should be given to providing space for individual home unit worm farms or small compost bins for residents to self-manage. Information on two styles of apartment suitable composting bins are included. *(See Appendix 3 – Composting)*

COMMON AREAS

Any common areas will be supplied with suitably branded waste and recycling bins. Building management will monitor use and ensure bins are exchanged and cleaned. *(See Appendix 1 – Waste Management Equipment)*

EWASTE RECYCLING

Recyclable electronic goods include batteries, equipment containing printed circuit boards, computers, televisions, fluorescent tubes and smoke detectors are able to be recycled yearlong at no cost to residents using Council's eWaste recycling centres:

Penrith Landfill: 842 Mulgoa Rd, Mulgoa. Collection Zone is located within the landfill. Phone 4773 8778 for more information and opening hours.

Eastern Creek Landfill: Wallgrove Rd, Eastern Creek. Drop Zone is located within the landfill.

Phone 1300 651 116 for more information and opening hours

No other electronic waste (such as DVD players, game consoles, television speakers) is accepted for recycling at these locations.

Council also holds regular free e-waste drop off days at Jamison Park, Penrith - usually each March and September.

OTHER WASTE STREAMS

A room or caged area must be allocated for the storage of discarded bulky items such as cardboard boxes, furniture and appliances. The allocated space must be a minimum of 8m³ and sign marked appropriately. Residents will liaise with building management regarding all bulky goods movements.

It is also recommended that donations to charitable organisations be encouraged. Clean, sound furniture and household goods etc. are highly sought after to provide for the disadvantaged. Donations will be arranged with the assistance of the building manager/caretaker. *(See Useful Contacts)*

WASTE ROOM AREAS

For communal waste areas/s:

- if not located at ground level, a pathway must be provided that leads to the waste storage area that does not exceed a maximum gradient of 7% or a maximum travel distance of 30m.
- have an opening of no less than 1.2m, which is free of doors and linked to the development and the adjoining kerbside collection point by suitable pathways to allow ease of access for both resident and contractors. Pedestrian pathways should have a width of at least 1.2m, a gradient of no more than 7% and should not incorporate steps.
- Be covered, with wall constructed to a maximum height of 1.4m above ground level

Each garbage room will need to hold all the bins generated weekly, and allow enough room to clean and safely manoeuvre bins.

COLLECTION OF WASTE

The waste storage and/or collection area must:

- allow 120/240L bins to be wheeled to the street kerb over flat or ramped surfaces with a maximum grade of 7% and not over steps, landscape edging or gutters;
- allow for bulk bins to be wheeled out and be serviced by a front loading garbage truck on a flat surface with a maximum grade of 5%, and not over steps, landscape edges or gutters; and
- be screened or discreetly located away from public spaces.

Where number of bins will not comfortably fit on the street frontage, or characteristics of the site restrict access, collection can be made from the development. There must be sufficient manoeuvring area on-site to allow collection vehicles to enter and leave the site in a forward direction and service the development efficiently with little or no need to reverse.

WASTE CHUTES

The waste and recycling chutes for the residential areas are supplied in either 510mm galvanised steel or 510mm recycled LLDPE plastic with 2-hour fire rated doors. Galvanised steel chute hoppers are wrapped with 50mm poly-wool R1.3 noise insulation foil to assist in noise reduction.

Penetrations on each building level at vertically perpendicular points with minimum penetration dimensions 600mm x 600mm (square or round) are required to accommodate each chute installation.

Chutes must be installed without offsets to achieve best operational outcome for all buildings.

Stainless steel, two-hour fire-rated (AS1530.4-2005) refuse chute doors are to be provided at each service level. All doors are fitted with a self-closing mechanism to meet BSA fire standards.

The chutes must be installed with a wash down system – a supply of a cold waster connection at the top of the chute with on/off valve required (for cleaners to access the chute for cleaning purposes.)

The discharge chute must be fitted with a fire damper so the chute can be closed during servicing and changeover of bins.

All chutes must be installed in a fire rated shaft and waste room as per BCA requirements. Note: Typical standard drawings have been included in the Appendices 3 and 4.

GARBAGE ROOMS CONSTRUCTION REQUIREMENTS

The garbage room will be required to contain the following facilities to minimise odours, deter vermin, protect surrounding areas, and make it a user-friendly and safe area:

- Waste room floor to be sealed with a two pack epoxy
- Waste room walls and floor surface is flat and even
- All corners coved and sealed 100mm up, this is to eliminate build-up of dirt
- For residential: a hot and cold water facility with mixing facility and hose cock must be provided for washing the bins
- For retail/commercial: a cold water facility with hose cock must be provided for washing the bins
- Any waste water discharge from bin washing must be trained to sewer in accordance with the relevant water board.
- Tap height of 1.6m
- Storm water access preventatives (grate)
- All walls painted with light colour and washable paint
- Equipment electric outlets to be installed 1700mm above floor levels
- The room must be mechanically ventilated
- Light switch installed at height of 1.6m
- Waste rooms must be well lit (sensor lighting recommended)
- Optional automatic odour and pest control system installed to eliminate all pest types. This process generally takes place at building handover – building management make the decision to install.
- All personnel doors are hinged and self-closing
- Waste collection area must hold all bins – bin movements should be with ease of access
- Conform to the Building Code of Australia, Australian Standards and local laws
- Childproofing and public/operator safety shall be assessed and ensured

SIGNAGE

The building manager/caretaker is responsible for waste room signage including safety signage.

Appropriate signage must be prominently displayed on walls and above all bins, clearly stating what type of waste or recyclables is to be placed in the bin underneath. (*See Appendix 2 – Signage*)

All chute doors on all levels will be labelled with a sign stating '*GARBAGE ONLY IN THE CHUTE*' Or '*RECYCLING ONLY IN THE CHUTE*'. Separate signage will direct chute operations and encouraging occupants to recycle and minimise their waste.

VENTILATION

Waste and recycling rooms must have their own exhaust ventilation system. Council prefers natural ventilation where possible.

- Naturally - permanent, unobstructed, and opening direct to the external air, not less than one-twentieth (1/20) of the floor area.

- Mechanically - exhausting at a rate of 5L/m² floor area, with a minimum rate of 100L/s minimum, or

Mechanical exhaust systems shall comply with AS1668 and not cause any inconvenience, noise or odour problem.

STORM WATER PREVENTION & LITTER REDUCTION

Building management shall be responsible for the following to minimise dispersion of site litter and prevent stormwater pollution to avoid impact to the environment and local amenity:

- promote adequate waste disposal into the bins
- secure all bin rooms (whilst affording access to staff/contractors)
- prevent overfilling of bins, keep all bin lids closed and bungs leak-free
- take action to prevent dumping or unauthorised use of waste areas
- ensure collection contractors clean-up any spillage that may occur when clearing bins

ADDITIONAL INFORMATION

Transfer of waste and all bin movements require minimal manual handling therefore the operator must assess manual handling risks and provide any relevant documentation to building management. If required, a bin-tug, trailer or tractor consultant should be contacted to provide equipment recommendations. Hitches may require installation to move multiple bins to the collection area. Council must be informed of any hitch attachments required to be installed on bins.

LIMITATIONS

The purpose of this report is to document a Waste Management Plan as part of a development application and is supplied with the following conditions:

- Drawings and information supplied by the project architect
- The figures presented in the report are an estimate only. The actual amount of waste generated will be dependent on the occupancy rate of the building/s and waste generation intensity as well as the building managements approach to waste management.
- The building manager will make adjustments as required based on actual waste volumes (if waste is greater than estimated) and increase the number of bins and collections accordingly.
- The report will not be used to determine or forecast operational costs or prepare any feasibility study or to document any safety or operational procedures.
- Any manual handling equipment should be provided at the recommendation of the appropriate equipment provider who will assess the correct equipment for supply.



USEFUL CONTACTS

Penrith City Council
Customer Service: 02 4732 7777
Waste Hotline: 1800 734 735
Email: council@penrithcity.nsw.gov.au

SULO MGB (MGB, Public Place bins, tugs and bin hitches)
Phone: 1300 364 388

RUD (Public place bins, recycling bins)
Phone: 07 3712 8000
Info@rud.com.au

Closed Loop (organic dehydrator/recycled cup product)
Phone: 02 9339 9801

National Association of Charitable Recycling Organisations Inc. (NACRO)
Phone: 03 9429 9884
Email: information@nacro.org.au

Purifying Solutions (odour control)
Phone: 1300 636 877 (1300 ODOURS)
sales@purifyingsolutions.com.au

Elephants Foot Recycling Solutions (Chutes, compactor and eDiverter systems)
44 – 46 Gibson Avenue
Padstow NSW 2211
Free call: 1800 025 073
Email: natalie@elephantsfoot.com.au

Note: Elephants Foot Recycling Solutions does not warrant or make representation for goods or services provided by suppliers

APPENDIX 1 – WASTE MANAGEMENT EQUIPMENT

MGBs with capacities up to 1700L should comply with the Australian Standard for Mobile Waste Containers (AS 4123). AS 4123 specifies standard sizes and sets out the colour designations for bodies and lids of mobile waste containers that relate to the type of materials they will be used for.

Indicative sizes only for common MGB sizes are provided below. Note that not all MGB sizes are shown; the dimensions are only a guide and differ slightly according to manufacturer, if bins have flat or dome lids and are used with different lifting devices. Refer to AS 4123 for further detail.



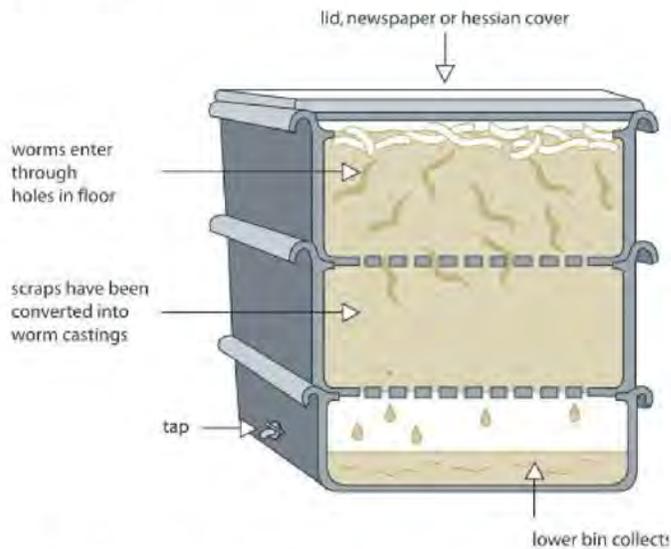
Bin Type	80 Litre MGB	120 Litre MGB	140 Litre MGB	240 Litre MGB	360 Litre MGB
Height	870 mm	940 mm	1065 mm	1080 mm	1100 mm
Depth	530 mm	560 mm	540 mm	735 mm	885 mm
Width	450 mm	485 mm	500 mm	580 mm	600 mm



Dome or flat lid containers

Bin Type	660 Litre MGB	770 Litre MGB	1100 Litre MGB	1300 Litre MGB	1700 Litre MGB
Height	1250	1425	1470	1480	1470
Depth	850	1100	1245	1250	1250
Width	1370	1370	1370	1770	1770

WORM FARMS



Space requirements for a typical worm farm for an average household:

Height – 300mm per level

Width – 600mm

Length – 900mm

There are many worm farm arrangements. The above dimensions are indicative only.

Source: Department of Environment and Climate Change NSW 2008, *Better Practice Guide for Waste Management in Multi-Unit Dwellings*



Typical Apartment Compost bin (See Useful Contacts)

Suitable for:

- Vegetables
- Coffee grounds and filters
- Tea and tea bags
- Crushed eggshells (but not eggs)
- Nutshells
- Houseplants
- Leaves
- Cardboard rolls, cereal
- Boxes, brown paper bags
- Clean paper
- Shredded newspaper
- Fireplace ashes
- Wood chips, sawdust,
- Toothpicks, burnt matches
- Cotton and wool rags
- Dryer and vacuum cleaner lint
- Hair and fur
- Hay and straw

Electric organic compost bin (See Useful Contacts)

Decomposition Method	Aerobic fermentation by microorganisms
Decomposition Capacity	2 metric tonnes per year** (4 kg per day**)
Rating	220-240 V 50/60 Hz - 1.1 A
Decomposition Time	24 hrs
Operating Temperature	0°C and 40°C***
Deodorisation Method	Nano-Filter system
Maximum Power	210 W
Weight	21 kgs
External Dimensions	w 400 mm d 400 mm h 780 mm

- * Excludes scallop and oysters shells and large bones.
- ** Food Waste Handling Capacity – based on an optimal operating environment.
- *** Ambient temperature range of area where unit may be installed.



APPENDIX 2 –SIGNAGE FOR WASTE AND RECYCLING BINS

WASTE SIGNS

Signs for garbage, recycling and organics bins should comply with the standard signs promoted by the Department of Environment and Heritage.

Example wall posters



Example bin lid stickers



SAFETY SIGNS

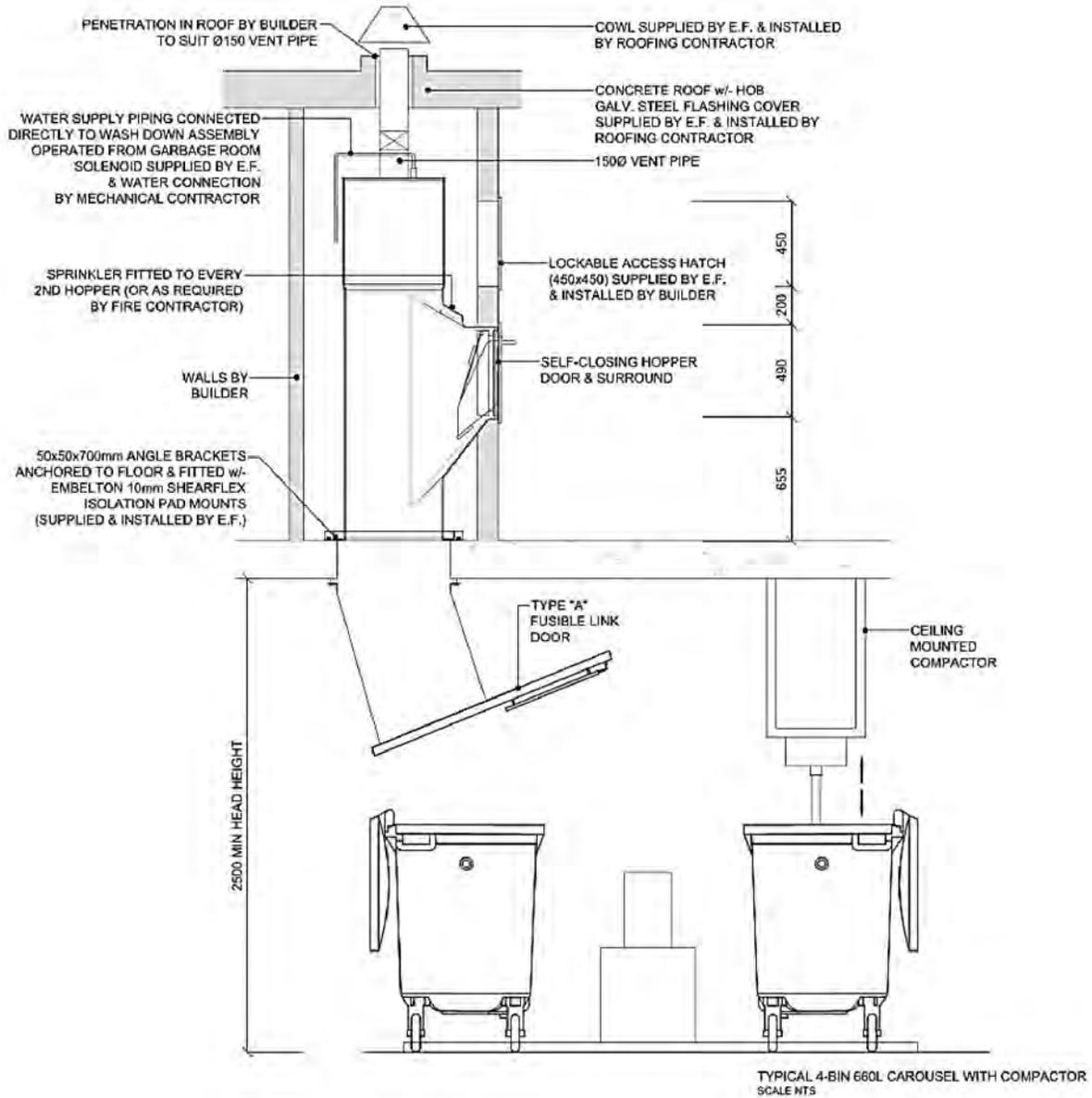
The design and use of safety signs for waste rooms and enclosures should comply with AS1319 Safety Signs for Occupational Environment. Safety signs should be used to regulate and control safety behaviour, warn of hazards and provide emergency information, including fire protection information. Below are some examples. Each development will need to decide which signs are relevant for its set of circumstances and service provided.

Examples of Australian Standards:



Australian Standards are available from the SAI Global Limited website (www.saiglobal.com).
Source: *Better Practice Guide to Waste Management in Multi-Unit Dwellings*, 2008, DECC

APPENDIX 3 – TYPICAL WASTE CHUTE



APPENDIX 4 – TYPICAL CAROUSEL SYSTEM

VENT:

PVC 150MM DIAMETER VENT PIPE WITH COWL, DEK TITE FLASHING AND EXTRACTION CAP FITTED FROM THE TOP OF THE CHUTES. PIPE EXITS AS PER REQUIRED BY BUILDER THROUGH PLANT ROOM ROOF AND CAPPED WITH GALVANISED STEEL REDUCTION CAP. ACCESS HATCH TO BE SUPPLIED ON LAST LEVEL FOR SERVICING OF THE WASH DOWN SYSTEM

CHUTE DOORS

SUPPLY AND FIT STAINLESS STEEL, TWO HOUR FIRE-RATED (AS1530.4-2005) REFUSE CHUTE DOORS AND THROAT ASSEMBLIES AT EACH SERVICE LEVEL. ALL DOORS ARE FITTED WITH A SELF-CLOSING MECHANISM TO MEET BSA FIRE STANDARDS. DOORS TO BE BLOCKED IN BY OTHERS INSTALLATION OF DOORS ON COMPLETION OF THE BUILDING STRUCTURE. THE CHUTE PIPES BRICKED IN, RENDERED AND THE WALLS PAINTED.

FIRE

FIRE SYSTEM CONTRACTOR TO:

- SUPPLY FIRE SPRINKLERS AND CONNECTION FOR SPRINKLER SYSTEM
- SPRINKLERS FITTED ON EVERY 2ND LEVEL (OR AS PER FIRE CONTRACTOR INSTRUCTION)

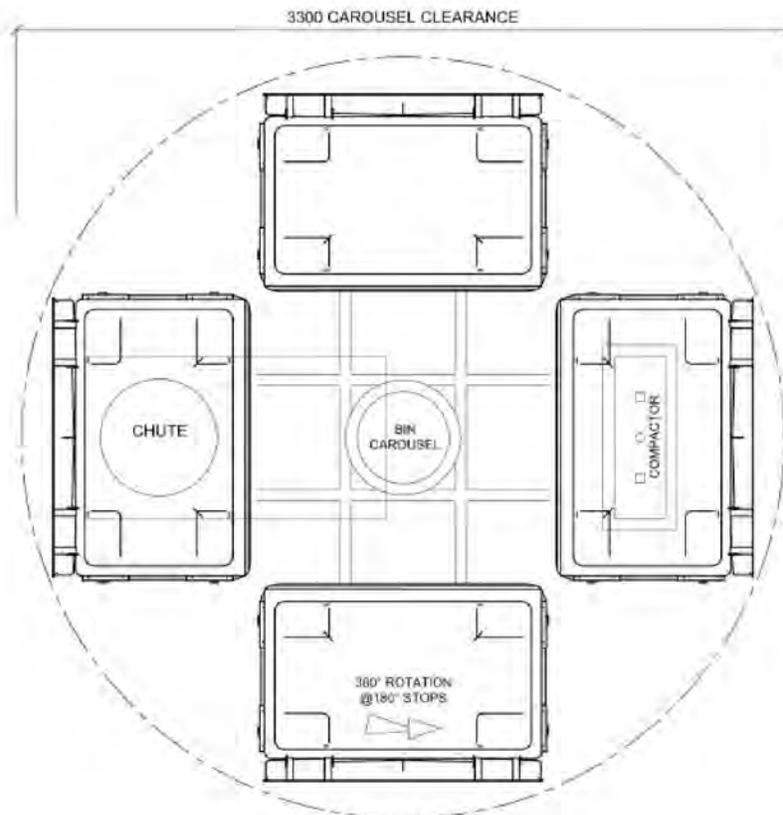
ELECTRICAL

YOUR ELECTRICIAN TO PROVIDE:

- ONE (1) STANDARD 240V GPO IN MAIN GARBAGE ROOM
- ONE (1) 415VOLTS, 5 PINS, 20AMPS FOR EACH REQUIRED COMPACTOR, CAROUSEL OR LINEAR
- COORDINATE WITH ELECTRICAL SUBCONTRACTOR

OPTIONAL EQUIPMENT

ELEPHANTS FOOT SUPPLY BALERS SUITABLE FOR BALING CARDBOARD PRODUCT IN COMMERCIAL, RETAIL AND RESIDENTIAL AREAS. BALED PRODUCT REDUCES THE REQUIREMENTS FOR ADDITIONAL COLLECTION EQUIPMENT. STATE OF THE ART COMPACTORS ARE ALSO AVAILABLE IN AUGER, BLADE AND ECO MODELS.





BUILDING REGULATION & FIRE SAFETY ENGINEERING CONSULTANTS

Project: **THORNTON CENTRAL
STAGE DA01
LORD SHEFIELD CIRCUIT
PENRITH**

Report: **ACCESS ASSESSMENT REPORT**

Reference: **105534-ACCESS-DA01-r1**

Date: 16 September 2014

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DOCUMENT CONTROL

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FINAL	16 September 2014		Prepared by	Checked by	Approved by
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PART 1 BASIS OF ASSESSMENT

1.1 Location and Description

The building development, the subject of this report, is to be located within the Thornton Housing estate situated immediately North of the Penrith Rail Station and Transport Interchange. It is proposed to construct an overall residential development that will comprise of a single level of basement car parking and a total of 158 residential units located within four separate towers above the basement level. The towers on the Southern side of the site will contain four levels whilst those on the Northern side will contain eight and seven levels respectively.

The overall development is to be constructed in two different stages, being stage 1 and 1A. This report relates to the stage 1 development which will 75 units.

Vehicular access is gained into the building from the Western end. The site adjoins public roadways to the North West and South which will allow pedestrian access to the site.

1.2 Purpose

The purpose of this report is to assess the existing building against the following Deemed-to-Satisfy provisions of BCA2014 and the Federal Disability (Access to Premises Standards) to clearly outline those areas where compliance is not achieved and provide recommendations to upgrade such areas to achieve relevant compliance:

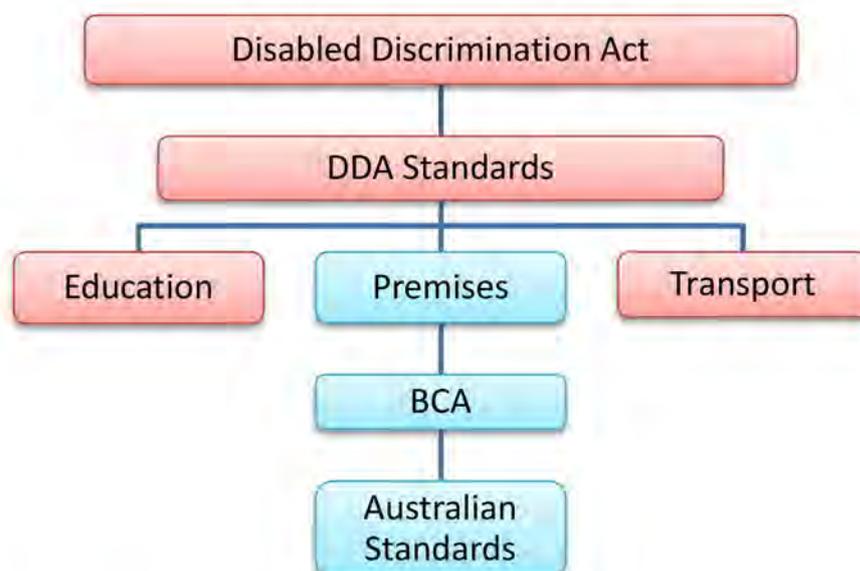
1. SEPP 65 Design Code;
2. Penrith Council requirements for Universal Design;
3. Part D3 – Access for People with a Disability;
4. Clause E3.6 – Passenger Lifts;
5. Clause F2.4 – Accessible Sanitary Facilities; and
6. Related Australian Standards as applicable including AS1428.1-2009, AS1428.2-1992, AS1428.4.1- 2009, AS2890.6-2009.

1.3 Limitations

This report is limited to an assessment of the access and amenity provisions for people with a disability against the provisions of the BCA2014 and Premises Standards as outlined in 1.2 above. It is not an assessment of the proposal against all provisions of the BCA2014 and if this is required, a separate report will be necessary.

1.4 Relationship to the DDA

The Disability Discrimination Act 1992 (DDA) applies nationally and is complaint based. While the BCA is recognised as a design standard to satisfy certain aspects of the DDA, compliance with the BCA and the referenced standards does not guarantee that a complaint will not be lodged. The graph below indicates the current relationship of the BCA to the DDA.



1.5 Organisational Responsibilities - Disability Discrimination Act 1992 (DDA)

All organisations have a responsibility, under the Federal Disability Discrimination Act (DDA), to provide equitable, dignified access to goods and services and to premises used by the public. Premises are broadly defined and would include all areas included within the subject development.

The DDA provides uniform protection against unfair and unfavourable treatment for people with a disability in Australia. It also makes it unlawful to discriminate against a person who is an “associate” (such as a friend, carer or family member).

Disability is broadly defined and includes disabilities which are:

- physical;
- intellectual;
- psychiatric;
- neurological;
- cognitive or sensory (a hearing or vision impairment);
- learning difficulties;
- physical disfigurement; and
- the presence in the body of disease causing organisms.

This broad definition means that everyone with a disability is protected. The Act supports the principle that people with a disability have the same fundamental rights as the rest of the community. Provisions apply to a wide range of life activities including:

- access to premises used by the public;
- education;
- provision of goods and services;
- employment;
- administration of Commonwealth laws and programs.

When a person with a disability wants to utilise premises including all buildings, outdoor spaces, car parking areas, pathways and facilities, then equitable, dignified access must be provided. The DDA requires that appropriate changes be made to provide access. A complaint can be made under the DDA if appropriate access is not provided.

1.6 Design Documentation

This report has been based on the Design plans and Specifications listed in Annexure A of this Report.

1.7 Limitations

This report does not include nor imply any detailed assessment for design, compliance or upgrading for: -

- the structural adequacy or design of the building;
- the inherent derived fire-resistance ratings of any existing or proposed structural elements of the building (unless specifically referred to); and
- the design basis and/or operating capabilities of any existing or proposed electrical, mechanical or hydraulic fire protection services.

This report does not include, or imply compliance with:

- (a) the Disability Discrimination Act (it cannot be guaranteed that that a complaint under the DDA will not be made, however should the building comply with BCA2014 and the Premises Standard then those responsible for the building cannot be subject to a successful complaint);
- (b) BCA Sections B, C, E (except Clause E3.6), F (except Clause F2.4), G, H, I, J and Parts D1 and D2;
- (c) Demolition Standards not referred to by the BCA;
- (d) Work Health and Safety Act;
- (e) Construction Safety Act;
- (f) Requirements of other Regulatory Authorities including, but not limited to, Telstra, Telecommunications Supply Authority, Water Supply Authority, Electricity Supply Authority, Work Cover, Roads and Maritime Services (RMS), Roads and Transport Authority, Local Council, ARTC, Department of Planning and the like;
- (g) Previous conditions of Development Consent issued by the Local Consent Authority; and
- (h) this report does not assess the safety of the particular aspects of the building but merely the minimum standards called up by the Access provisions of BCA2014.

1.8 Disability (Access to Premises – Buildings) Standards 2010 (Premises Standard)

On 15 March 2010 the Disability (Access to Premises - Buildings) Standards 2010, was tabled in Federal Parliament. These Standards have been under development for many years and significant public consultation has occurred during their development. The Premises standard has now been introduced on 1st May 2011 in line with an updated National Construction Code which will incorporate the Building Code of Australia and the National Plumbing Code.

The aim of the Standards is to provide the building and design industry with detailed information regarding the required access provisions associated with the design and construction of new buildings and upgrade to existing buildings. They do not apply to existing buildings that are not undergoing upgrade. They will only apply to elements addressed within

the Standards. All other elements related to premises will still be subject to the existing provisions of the DDA.

The Standards will generally align with the BCA (see below) and reference a range of Australian Standards relating to access and other associated matters. The Disability (Access to Premises - Buildings) Standards aim to provide certainty for the building industry in relation to meeting the requirements for access in new and upgraded buildings.

This Access Appraisal incorporates the key elements of the Standards as well as additional access requirements to assist in achieving best practice in the provision of access for all to buildings.

The Building Code of Australia 2014, in conjunction with the DDA, applies to all new buildings, new building works to existing buildings and buildings undergoing significant refurbishment or alteration.

Provision of access for a person using a wheelchair or mobility aid is often considered to be an indication of effective design to the built environment. However the majority of users of car parks, buildings and outdoor areas are pedestrians who also benefit greatly from wheelchair accessible design. Conversely, they can also be denied appropriate access if barriers are incorporated into designs.

In addition, older persons and people with disabilities within the community have a wide range of access needs that are not necessarily satisfied by just providing access for a person using a wheelchair. People also experience the effects of disability through impairment to:

- Sight;
- Hearing;
- Motor ability;
- Dexterity;
- Balance;
- Mental functioning etc.

Examples of a range of access challenges include:

- People who use wheelchairs face difficulties such as abrupt changes in levels (e.g. steps and steep slopes/gradients) and limited access under basins, benches and tables. They also need an increased circulation area, particularly at doorways and changes in direction.
- People who experience difficulty walking may have stiff hips, balance problems or uncoordinated movements which require attention to stairs and handrails, seating in waiting areas, slip resistant floor finishes and ramps with a gentle slope/gradient.
- People with manipulatory difficulties (finger or hand control) require appropriately selected handles, switches, buttons (in lifts) and taps to enable usage
- People with sensory disabilities, which affect either their hearing or vision, require clear, easy to understand signage and tactile indicators. This requires attention to a variety of factors including colour, contrast, print size, levels of illumination and the provision of appropriate communication systems in public areas.
- People with intellectual disabilities may have difficulty finding their way in new environments. Therefore, direct access routes and clear directional signage with graphics are important.

As a wide range of physical issues impact on the provision of access for people with disabilities, responsive design, incorporating a continuous accessible path of travel, needs to be equitable and therefore inclusive of the needs of all of the community. Access should cater for both pedestrians and users of wheelchairs and other mobility aids. In addition consideration must be given to the needs of users who may require assistance from other people as well as assistance animals.

PART 2 BUILDING DESCRIPTION

For the purposes of the Building Code of Australia (BCA2014) and the Disability (Access to Premises – Buildings) Standards 2010 (Access Code) the development may be described as follows.

2.1 Rise in Storeys (Clause C1.2)

The building has a rise in storeys of nine (9).

2.2 Classification (Clause A3.2)

The building has been classified as follows.

Class	Level	Description
2	Ground – level 7	Residential sole occupancy units for permanent residents or long term rental arrangements.
7a	Basement	Car parking.

2.3 Areas required to be Accessible

Under the provisions of Clause D3.1 of BCA2014 and Premises Standards Access Code, the following areas of the building are required to be accessible:

Level	Area / Room	Description
All	Common areas	<p>The residential unit common area corridors up to the entry door of each unit are required to maintain access on all levels served by the passenger lifts.</p> <p>Access to and within is to be maintained to common user facilities.</p> <p>Access within the basement car park is to be maintained from an accessible car space to the passenger lifts and stairways.</p>

Note: The limitations and exemptions of Clauses D3.2, D3.3 and D3.4 of the BCA have been considered where applicable in the process of developing the above table.

PART 3 ACCESS FOR PEOPLE WITH A DISABILITY

3.1 Introduction

The table below is a summary of all the individual elements that relate directly to the ability of a person with a disability to access all the portions of the building required to be accessible as outlined in Part 2.3 of this report.

Access has been assessed against the relevant portions of the BCA and the related Australian Standards for each item listed below.

Compliance has been indicated by using the following symbols:

Symbol	Description
✓	Compliance is achieved, and no further information is required.
✓	Specific details are not provided, but compliance can be readily achieved.
✗	From the documentation provided, compliance is not achieved.

3.2 SEPP 65 Design Code Requirements

The SEPP 65 Design Code requires the following in relation to adaptability / accessibility within a residential flat building:

1. Accessible routes through open spaces and between buildings (page 47);
2. High quality accessible routes to the public and semi-public areas of the building and site, including major entries, lobbies, communal open space, site facilities, parking area, public streets and internal roads (page 64).
3. Promotion of equity by (page 64):
 - a. Ensuring the main building entrance is accessible for all from the street and from carparking areas;
 - b. Integrating ramps into the overall building and landscape design.
4. Maximisation, and optimisation, of the number of accessible, visitable and adaptable apartments in a building (pages 64, 70 and 76).
5. A mix of unit types to be accessible / adaptable (page 70).
6. Maximisation of the number of accessible and visitable apartments on the ground floor (page 77-78).

Outlined below is a detailed assessment of the proposal against the relevant provisions of the SEPP 65 Design Code, with reference to the requirements as numbered above:

Item No:	Location / Description	Compliance
1.	Accessible routes to open spaces and between buildings	✓
Comment:	The development maintains a continuous level courtyard that serves as both open space and connection between the proposed towers.	
2.	High quality accessible routes	✓
Comment:	Accessible routes are continuous throughout the development and share that of the main pedestrian access paths.	

Item No:	Location / Description	Compliance
3.	Promotion of equity	
Comment:	Equity is considered to be achieved as accessible routes share the same arrangement as the able bodied paths. Accessible car spaces are provided and distributed within the basement level. No segregation of routes occur.	
4.	Maximisation, and optimisation, of the number of accessible, visitable and adaptable apartments	
Comment:	All units within the development will be visit able to the extent that each door of the sole occupancy units will be reached. 10% of the number of units will accommodate universal design features which will allow for adaptability and ensure that the unit can change with the needs of the occupant.	
5.	A mix of unit types to be accessible / adaptable	
Comment:	The development proposes one, two and three bedroom units, it is proposed that the universal units be a two bedroom type. This is considered reasonable type of unit to adopt given that it is a mid range representation between the types of units offered.	
6.	Maximisation of the number of accessible and visitable apartments on the ground floor	
Comment:	All units on the ground floors will be visitable to the point of entry into the units. As part of the overall development a universal unit is proposed on the ground floor and throughout other floors of the building which will be readily accessible by passenger lifts that will contain the required accessible features.	

3.3 Council Requirements

It is understood that Penrith Council requires that 10% of the overall number of residential units achieve the principles of Universal Design. These design principles relate to providing developments that are both practical and flexible to accommodate the different abilities and needs of people over time. Universal housing is designed to be useable by people over their life time or as their needs may change without having to carry out significant and major disruption.

For the purposes of design and assessment the document entitled 'Universal housing design guidelines', published by Landcom dated May 2008.

3.4 Universal Housing Design Guidelines - Assessment Summary

It is noted that the typical unit types include a Universally designed unit known as 2U being a two bedroom type. Accessible car spaces have been allowed for within the basement car park. The following table summarises relevant key design features of the referenced document;

Item No.	Design Feature	Comment	Compliance
1	DIRECT ACCESS Ensure there is direct and level access from the car parking space to the house.	Direct access will be provided between car parking and the universal units via passenger lifts. Paths of travel via the car spaces to the units will be level and comply with the requirements of AS 1428.1. Ease of access will be provided. Security will be provided given that	

		occupants will only need to travel within the building itself to connect from the car space to their unit.	
2	SPACE FOR CAR PARKING Provide a car parking space that is at least 6.0m in length and with potential for a width of 3.8m	<p>Whilst the proposed accessible spaces do not technically meet this dimension they have been designed in accordance with the most recent standard available for accessible car spaces.</p> <p>A total of five accessible spaces are proposed as part of this Development Application however as part of the overall development each universal unit will be allocated an accessible space.</p> <p>Car spaces will adopt the design criteria of AS/NZS 2890.6 incorporating the dimensions of 5400mm long x 2400mm wide with shared areas provided to the side and rear of the space.</p> <p>Connection to these spaces, from the driveway entrance, will be maintained by incorporating the required minimum head room clearances. A minimum head room clearance of 2200mm will be provided will additional clearance over the space itself of 2500mm.</p>	
3	WIDE FRONT DOOR Ensure the front entrance has a minimum internal clearance of 850mm	The main entrances into the building and those of the universal unit will maintain a clear and unobstructed width of 850mm. Suitable circulation spaces will also be able to be achieved either side of the doorways, including into the units. Adjustments can be made internally to achieve the minimum dimensions of Clause 13 of AS 1428.1.	
4	WIDE INTERNAL DOORS Ensure the internal doors on at least the entry level have a minimum internal clearance of 820mm	The doorways of the universal units can readily accommodate minimum clear unobstructed clearances of 820mm. Circulation spaces to either side of the internal doors to the potential accessible bedroom and bathroom could be achieved with adaptability at a later stage.	
5	WIDE CORRIDORS Ensure the internal corridors on at least the entry level have a minimum width of 1000mm.	Common areas will maintain the clearances necessary by AS 1428.1 and will exceed 1m in width. The proposed universal units have been designed without internal corridors. Circulation requirements into one of the bedrooms could be readily achieved. Access throughout the remainder of the unit would be relatively unimpeded.	
6	MAIN FACILITIES ON THE GROUND LEVEL	The units are single level throughout. Compromised spaces would not occur.	

	Ensure that the ground (or entry) level includes a living/family room, a room or other space capable of being used as a bedroom, and a bathroom		
7	CIRCULATION SPACE IN THE LIVING ROOM Ensure that the living or family room has at least 2.25m diameter circulation space, clear of furniture	It is considered that the furniture arrangement is largely indicative. However suitable space can be provided to accommodate 360 ⁰ wheel chair turn at points that allow interaction. Consideration will need to be given to allow connection onto the balcony by suitable details however this could form part of later construction detailing.	
8	SPACE IN THE BEDROOM Ensure that the bedroom space on the ground (or entry) level is large enough for a queen size bed and a wardrobe, space to move around them.	Space for a 180 ⁰ turn could be made adjacent the bed in direct travel from the doorway. 1m clearance around the bed could be achieved with wall relocation carried out at a post adaption stage. Wardrobe space could be retained in the fixtures outside the bathroom entry. The bedroom dimensions can meet one of those recommended within the guideline.	
9	BATHROOM DESIGNED FOR EASY AND INDEPENDENT ACCESS Ensure that the bathroom on the ground (or entry) level	It is noted that the bathroom is largely indicative at the moment. However the room dimensions meet the minimum specified by the guide lines and can meet those required by AS 1428.1. Where necessary it is considered that fixtures could be installed in compliant locations or additional plumbing connection points and fixing points for grab rails etc provided for. Compliant door circulation into the room could be carried out at a post adaption stage.	
10	ENOUGH SPACE IN THE KITCHEN Ensure the kitchen is designed with a minimum of 2.7m between any facing walls	The minimum of 2.7m between facing walls is provided. It is noted that an island bench may be provided. In this regard a clearance of at least 1540mm wide between opposite benches would be needed to ensure that a wheel chair could turn around. Final designs should provide this from the outset or plumbing connections provided for in the correct locations to ensure that adaption could be readily carried out if needed.	
11	ENOUGH SPACE IN THE LAUNDRY Ensure the laundry is designed with a minimum clear circulation space of 1.55m diameter	It is noted that required circulatory area has been allowed for in front of the laundry area.	
12	LOW WINDOW SILLS Ensure the window sills on at least the ground (or entry) level are no higher than 730mm above floor level	Window sills can be provided at this height. It is noted that the main glazing for the units will be full height doors that access to the balcony area, These are large and expansive.	

	(excluding utility areas)	This provides the main connection with the outside helping to alleviate the feeling of shut in.	
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3.5 Assessment Summary – BCA2014 and Premises Standards

Clause	Comment	Status
SECTION D: ACCESS AND EGRESS		
PART D3 - ACCESS FOR PEOPLE WITH A DISABILITY		
D3.0: Deemed-to-Satisfy Provisions	-	Noted
D3.1: General Building Access Requirements	<p>Buildings and parts of buildings must be accessible as required by table D3.1. Common areas of Class 2 buildings are required to be accessible in accordance with the following;</p> <ul style="list-style-type: none"> • From a pedestrian entrance required to be accessible to at least 1 floor containing sole-occupancy units and to the entrance doorway of each sole-occupancy unit located on that level. • To and within not less than 1 of each type of room or space for use in common by the residents, including a cooking facility, sauna, gymnasium, swimming pool, common laundry, games room, individual shop, eating area, or the like. • Where a ramp complying with AS 1428.1 or a passenger lift is installed to the entrance doorway of each sole-occupancy unit and to and within spaces or rooms for use in common by the residents. <p>Both the Northern and Southern residential towers will be provided with passenger lifts as such the common areas of all of the residential levels will need to be accessible to the entrance doors.</p> <p>No common user spaces or facilities are proposed to be provided.</p> <p>The basement level is to be accessible as far as providing connection between the car spaces and the passenger lifts.</p>	CRA
D3.2: Access to Buildings	<p>An accessway is required to be maintained from the main points of pedestrian entry at the allotment boundary, between the residential towers and from the proposed accessible car spaces.</p> <p>It is noted that two main pedestrian entrance point are proposed at the allotment boundaries. Suitable provision has been made in the form of ramps and pathways to connect with the building entrances.</p> <p>The internal paved courtyard allows will allow connection between the different towers.</p> <p>Connection with the accessible car spaces will be required and is suitably allowed for by the provision of passenger lifts serving both towers.</p>	CRA

SECTION D: ACCESS AND EGRESS		
	<p>The entrances into the building foyers are required to be accessible and the doorways are required to maintain a minimum unobstructed width of 850mm. The principal entrances will be appropriately accessible and will result in at least 50% of building entrances being accessible. A non-accessible entrance is provided to the Southern Tower however this is not more than 50m from an accessible point into the overall building.</p>	
D3.3: Parts of Buildings to be Accessible	<p>The required access ways and accessible areas must be constructed in accordance with this Clause and the requirements of AS 1428.1-2009. Ramps, stairways, walkways, circulation spaces at doorways, door widths and accessible paths are to comply with AS1428.1-2009.</p> <p>All stairways throughout the development are to comply with the requirements of Clause 11 of AS 1428.1-2009 except for the fire isolated stairwells will need to comply with Clause 11.1(f) and (g) of AS1428.1-2009. It is considered that the requirements can be achieved.</p> <p>The proposed walkways and ramps will need to comply with the requirements of Clause 10 of AS 1428.1-2009. It is noted that suitable provision has been made to ensure that ramp gradients will not exceed 1:14.</p> <p>It is considered that the access ways will maintain appropriate dimensions to facilitate turning and passing where necessary in accordance with AS 1428.1-2009.</p> <p>Dimensions have generally been allowed for within 2m of the corridor ends to facilitate 180° turning maintaining a minimum of 1540mm wide x 2070mm in the direction of travel. The Eastern end of the Southern Tower corridor will need particular attention to ensure final clear dimensions can be achieved, it is expected that this could be done by minor internal adjustments.</p> <p>Doorways openings entering the unit common areas will need to maintain an unobstructed clear opening width of 850mm. Appropriate provision has been made to ensure that doorways will be accessible as required by Clause 13 of AS 1428.1 in relation to required circulation spaces.</p> <p>Note: The Access to Premises Standards do not provide the concessions provided in sub-clauses (g) and (h) in this clause, hence compliance with the Access to Premises Standards will require the floor covering in the accessible areas to strictly comply with Clause 7.4.1(a) of AS1428.1-2009.</p>	CRA
D3.4: Exemptions	<p>The following areas in the building are considered to not be accessible due to the specific uses of the room or space:</p> <ul style="list-style-type: none"> Plant rooms, switch rooms and cleaners/maintenance contractor facilities. 	Noted
D3.5: Accessible Car Parking	<p>The BCA2014 or the Premises Standards do not specify that Class 2 buildings are to be provided with accessible car parking spaces. This is determined by the requirements of Penrith Council, being the consent authority, as discussed within a separate part of this report.</p>	NA
D3.6: Signage	<p>Braille and tactile signage complying with Specification D3.6 and incorporating the international symbols as appropriate must be provided in accordance with this</p>	

SECTION D: ACCESS AND EGRESS		
	Clause. Including nominating the location of accessible entrances and identifying exit doors at each level.	
D3.7: Hearing Augmentation	-	NA
D3.8: Tactile Indicators	Tactile ground surface indicators must be provided in accordance with this Clause and comply with sections 1 and 2 of AS/NZS 1428.4.1. This would include the proposed ramps and external stairways leading to the entrance to the Southern Tower.	✓
D3.9: Wheelchair seating spaces in Class 9b Assembly Buildings	-	NA
D3.10: Swimming Pools	-	NA
D3.11: Ramps	On an accessway a series of connected ramps must not have a combined vertical rise of 3.6m and a landing for a step ramp must not overlap a landing for another step ramp or ramp.	✓
D3.12: Glazing on an Accessway	On an accessway, where there is no chair rail, handrail or transom, all frameless or fully glazed doors, sidelights and any glazing capable of being mistaken for a doorway or opening, must be clearly marked in accordance with AS 1428.1.	✓
SPECIFICATION D3.6 – BRAILLE AND TACTILE SIGNS		
1. Scope	-	Noted
2. Location of Braille and Tactile Signs	This Clause specifies criteria relating to symbols, numbering, lettering and location.	✓
3. Braille and Tactile Sign Specification	This Clause specifies particular requirements for characters, design, colour etc of signage.	✓
4. Luminance-contrast	Signage must achieve the luminance contrast requirements of this Clause.	✓
5. Lighting	Required signs must be illuminated to ensure luminance contrast requirements when required to be read.	✓
6. Braille	Required Braille must meet the specification of this Clause.	✓
SECTION E: SERVICES AND EQUIPMENT		
PART E3 – LIFT INSTALLATIONS		
E3.0: Deemed-to-Satisfy Provisions	-	Noted
E3.6: Passenger Lifts	<p>The proposed passenger lifts are noted to be either electric or electrohydraulic which will be an appropriate type. The lift serving the Northern Tower must travel more than 12m therefore the lift floor dimensions are required to be 1400mm wide x 1600mm deep. The lift serving the Southern Tower must travel less than 12m therefore the lift floor dimensions are required to be 1100mm wide x 1400mm deep It is noted that suitably sized lifts can be provided.</p> <p>The lifts will need to contain the accessible features in accordance with Table E3.6b of this Clause.</p>	✓
SECTION F: HEALTH AND AMENITY		
PART F2 – SANITARY AND OTHER FACILITIES		
F2.0: Deemed-to-Satisfy Provisions	Noted	-
F2.4: Accessible Sanitary Facilities (including Table F2.4)	No accessible sanitary facilities required by this Clause. It is not considered that the contractors' facility is required to be an accessible facility.	NA

PART 4 STATEMENT OF COMPLIANCE

The design documentation as referred to in this report has been assessed against the applicable provisions of the BCA2014, Federal Premises Standards and Universal Design Principals as outlined in Part 1.2 of this report and it is considered that such documentation complies or is capable of complying (as outlined in Part 3.2 of this report) with those documents for the purposes of a Development Application.

Annexure A Design Documentation

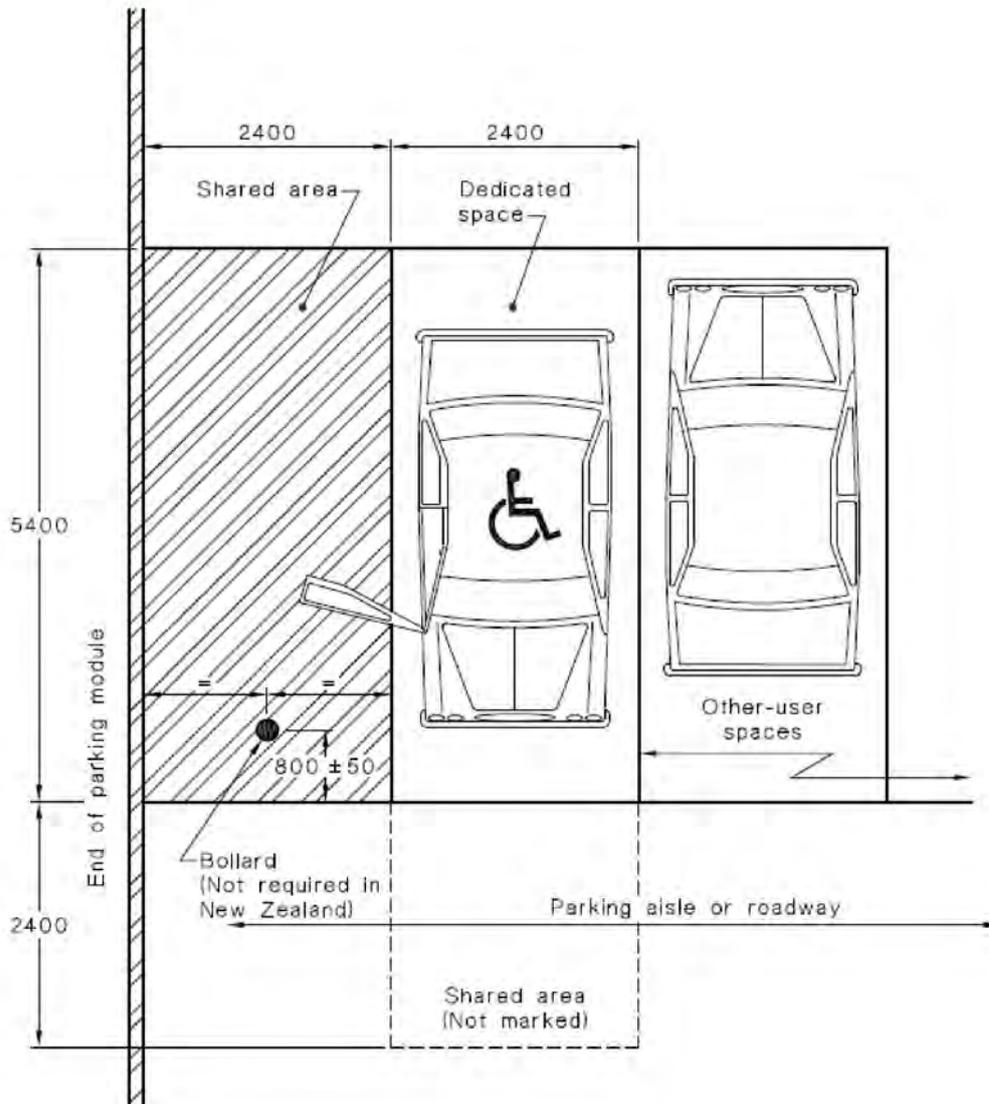
This report has been based on the following design documentation.

Architectural Plans Prepared by dKO Architecture dated the 16 September 2014

Drawing No.	Revision	Title
DA01-0000	A	Cover Sheet
DA01-1000	A	Site Analysis
DA01-1100	A	Site Plan
DA01-2100	A	Ground Floor Plan
DA01-2101	A	First Floor Plan
DA01-2102	A	Second Floor Plan
DA01-2103	A	Third Floor Plan
DA01-2104	A	Fourth Floor Plan
DA01-2105	A	Fifth Floor Plan
DA01-2106	A	Sixth Floor Plan
DA01-2107	A	Seventh Floor Plan
DA01-2108	A	Eighth Floor Plan
DA01-2109	A	Roof Plan
DA01-2110	A	Basement 1 Floor Plan
DA01-2111	A	Basement 2 Floor Plan
DA01-3000	A	Elevations 1
DA01-3001	A	Elevations 2
DA01-5000	A	Perspectives
DA01-5001	A	Perspectives
DA01-5002	A	Perspectives
DA01-5003	A	External Finishes Schedules
DA01-5004	A	External Finishes Schedules 2

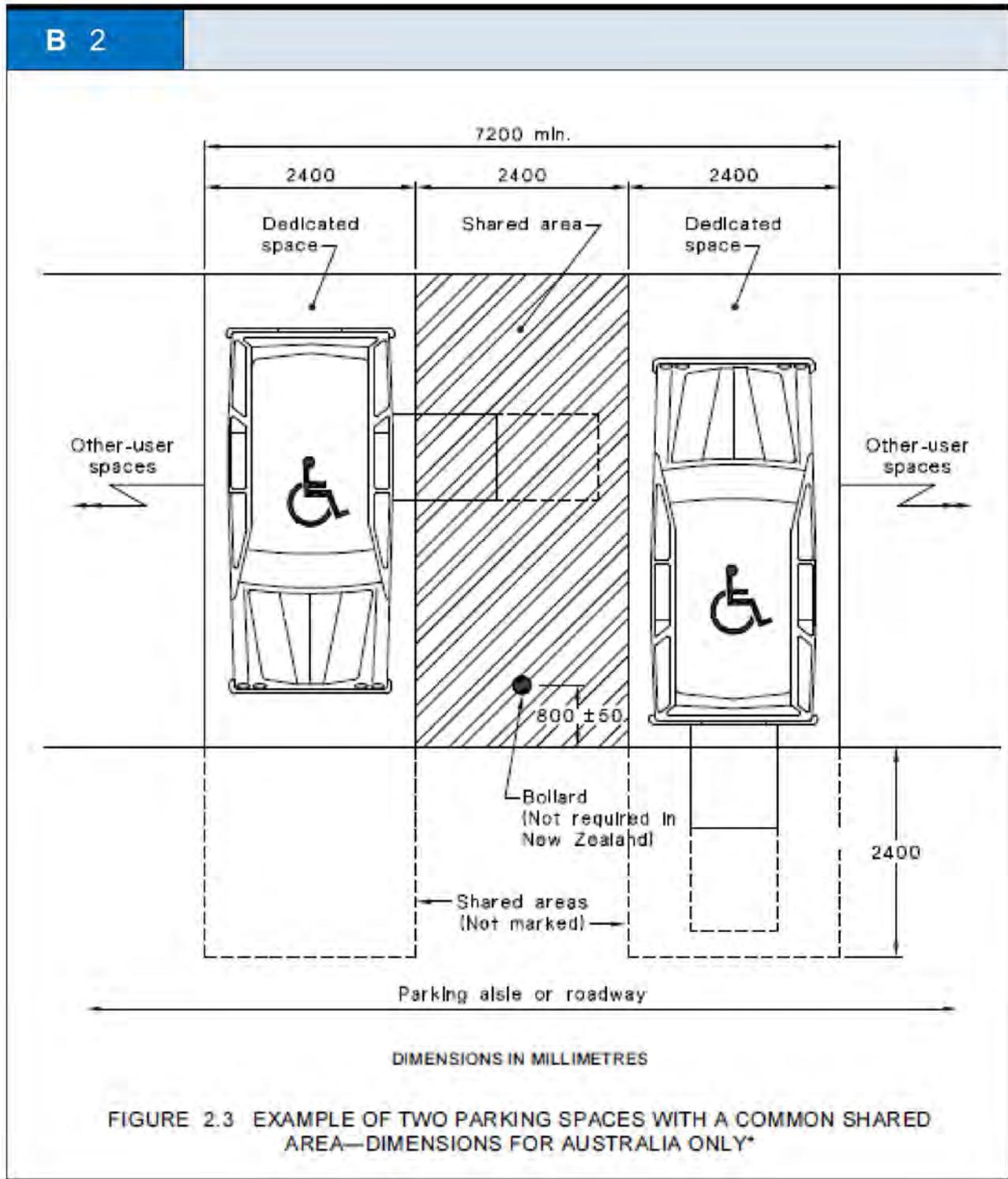
Annexure B Figures and Drawings Sample

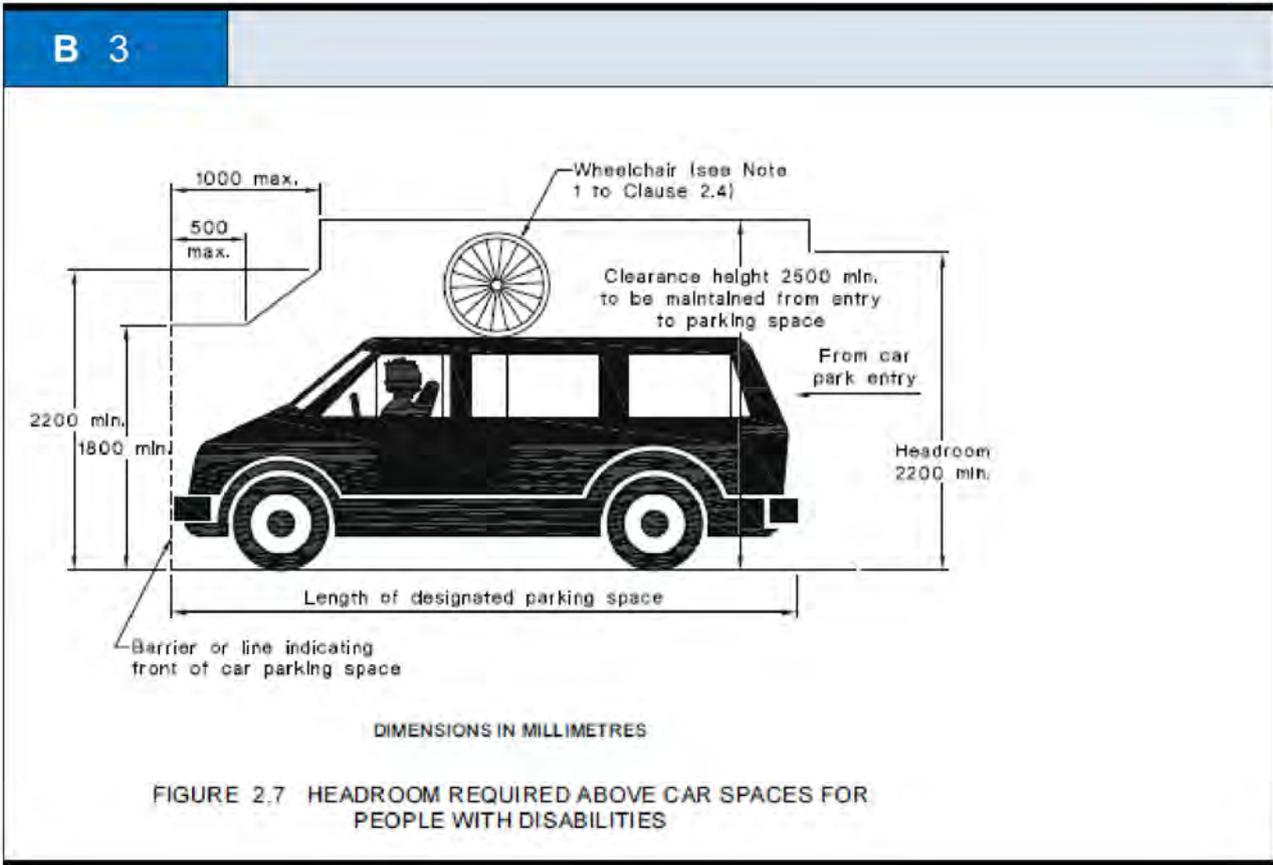
B 1



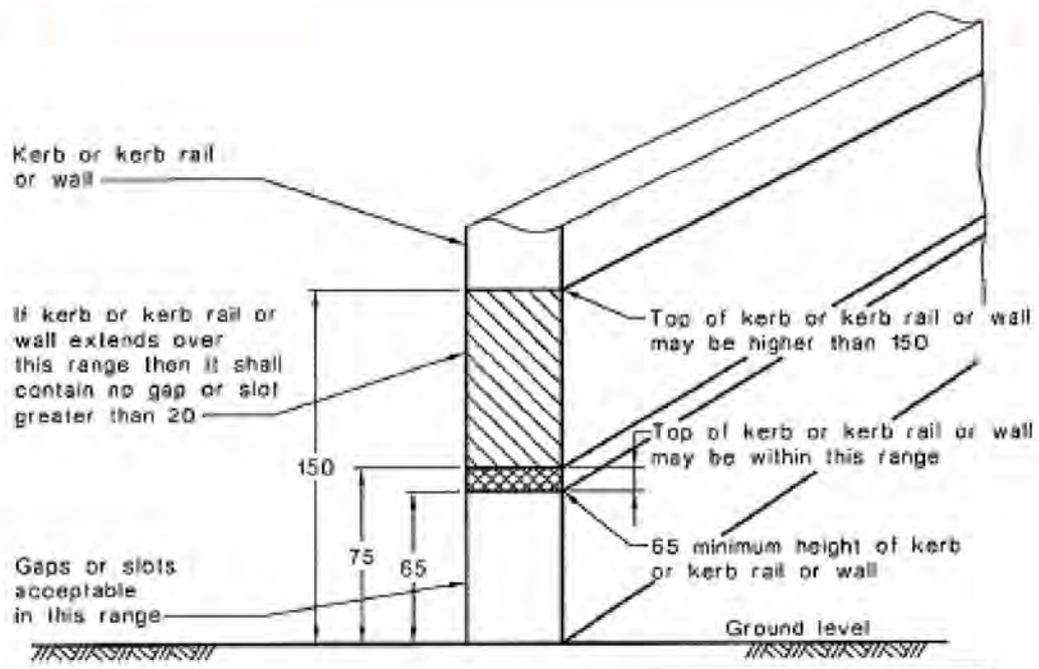
DIMENSIONS IN MILLIMETRES

FIGURE 2.2 EXAMPLE OF AN ANGLE PARKING SPACE WITH SHARED AREA ON ONE SIDE ONLY—DIMENSIONS FOR AUSTRALIA ONLY*



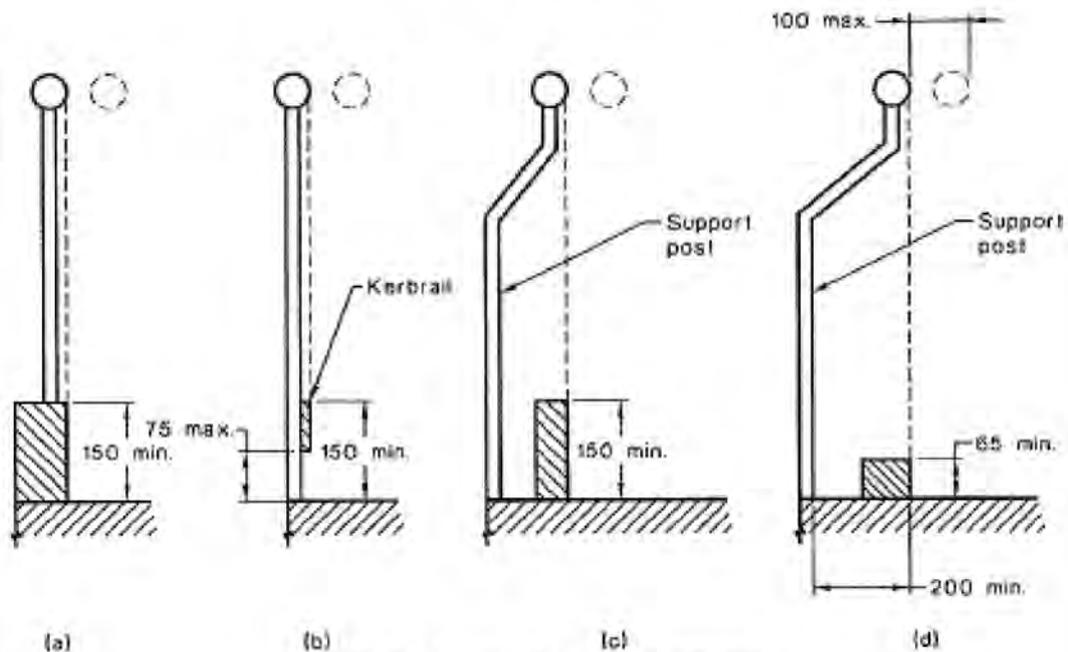


B 4



DIMENSIONS IN MILLIMETRES

FIGURE 18 KERB RAIL

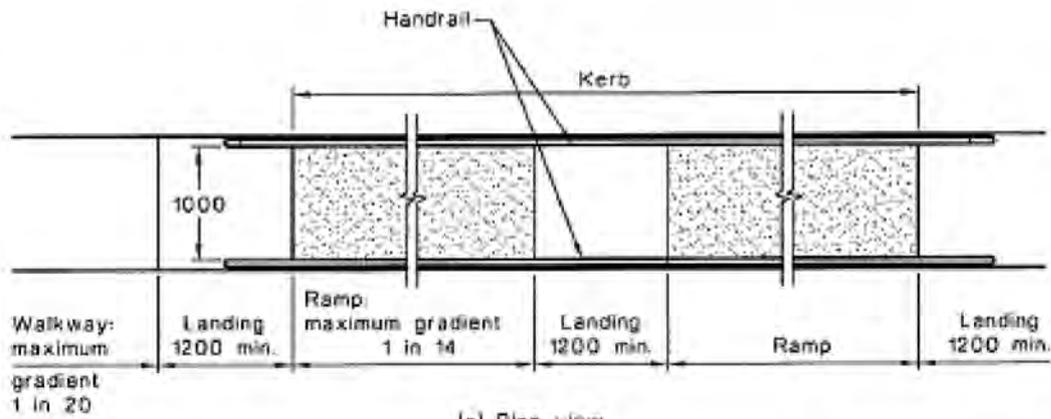


NOTE: See Appendix A for further clarification.

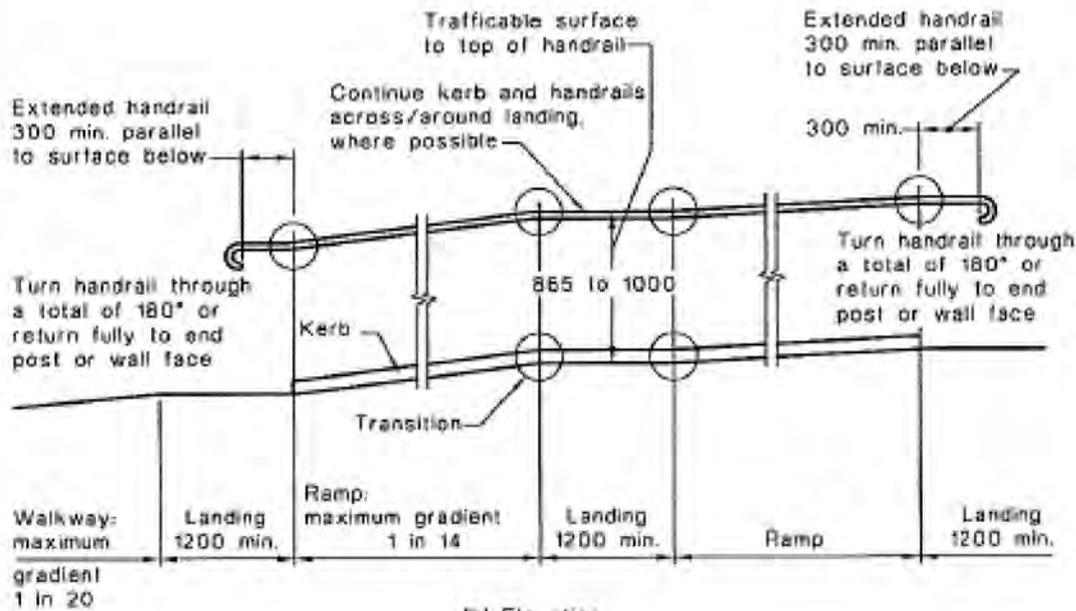
DIMENSIONS IN MILLIMETRES

FIGURE 19 SECTION SHOWING LOCATION OF KERB OR KERB RAIL IN RELATION TO HANDRAIL WITH VERTICAL SUPPORT

B 5



(a) Plan view



(b) Elevation

DIMENSIONS IN MILLIMETRES

FIGURE 14 RAMP HANDRAILS

B 6

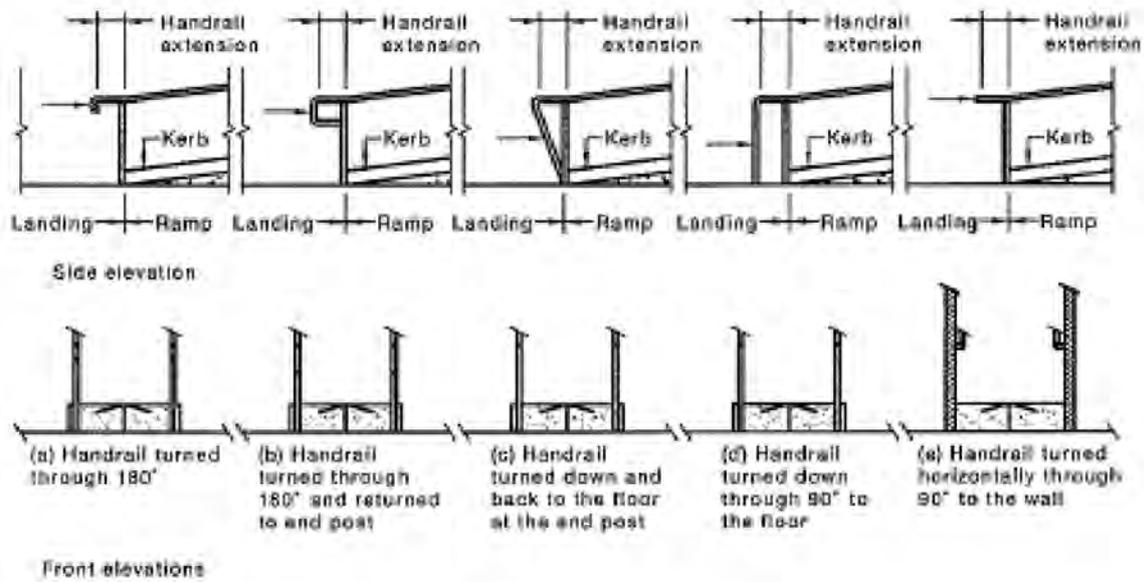
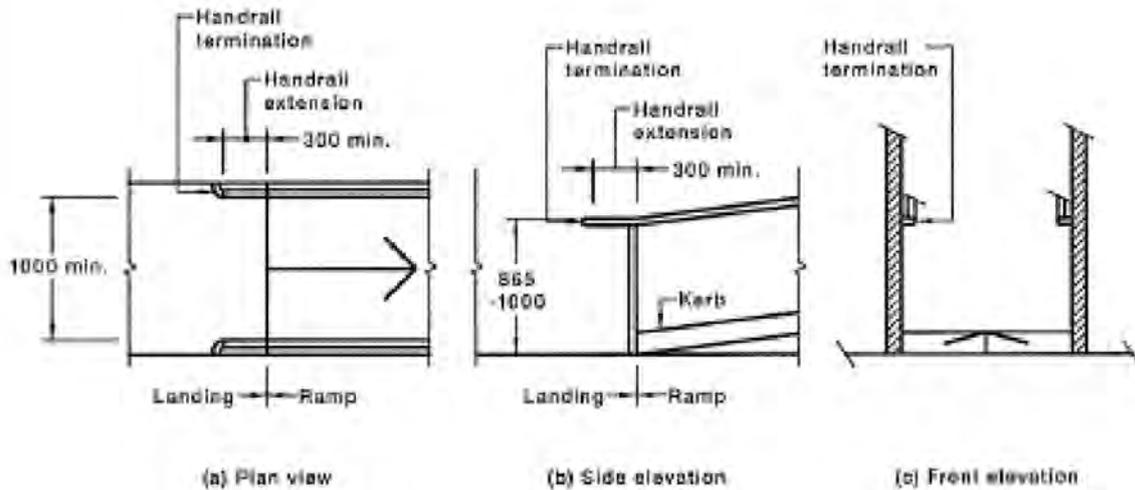


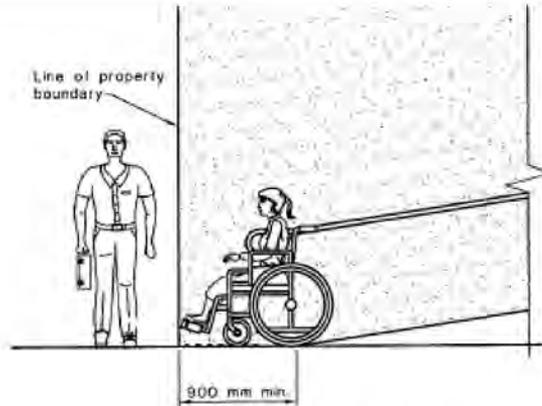
FIGURE 15(A) RAMP HANDRAILS—EXAMPLES OF HANDRAIL TERMINATIONS



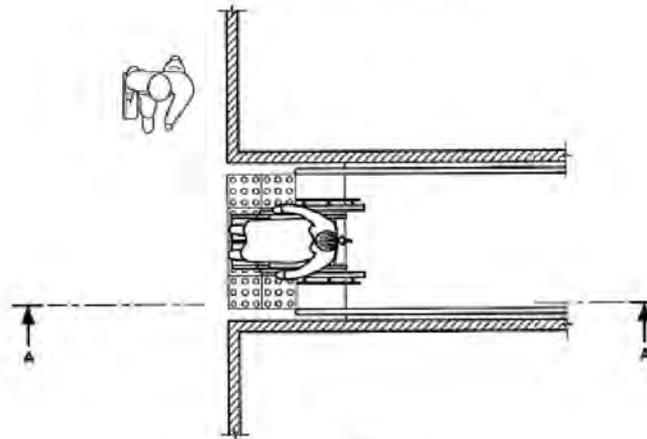
DIMENSIONS IN MILLIMETRES

FIGURE 15(B) RAMP HANDRAILS—DETAIL FOR HANDRAILS TERMINATED BY TURNING HORIZONTALLY THROUGH 90° TO THE WALL

B 7



SECTIONAL ELEVATION A-A

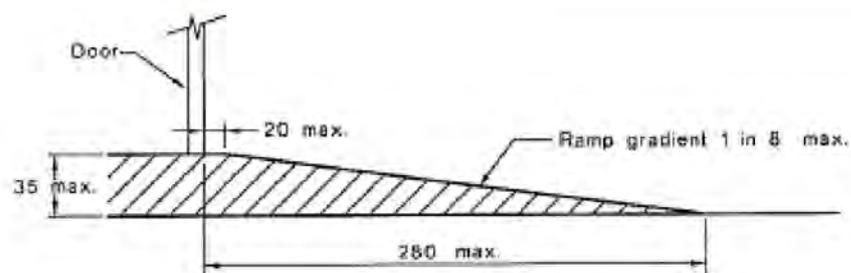


Plan

NOTE: TGSis to be installed within the property boundary.

FIGURE 16 LOCATION OF RAMP AT A BOUNDARY TO PREVENT PROTRUSION OF HANDRAILS AND TACTILE GROUND SURFACE INDICATORS (TGSis) INTO A TRANSVERSE PATH OF TRAVEL

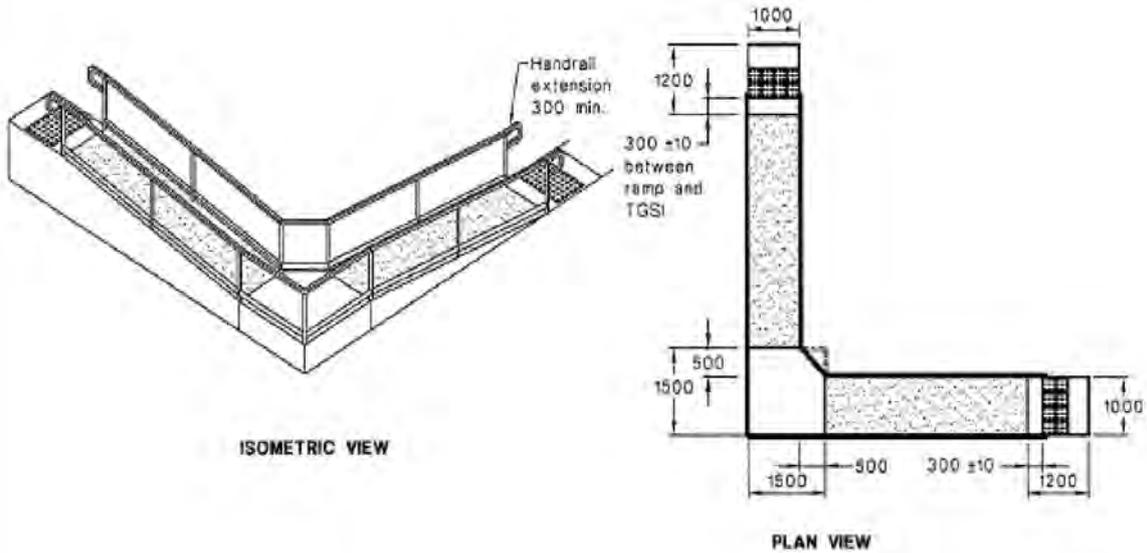
B 8



DIMENSIONS IN MILLIMETRES

FIGURE 21 THRESHOLD RAMP

B 9



DIMENSIONS IN MILLIMETRES

FIGURE 25(B) RAMP AND LANDINGS—90° LANDING—INTERNAL

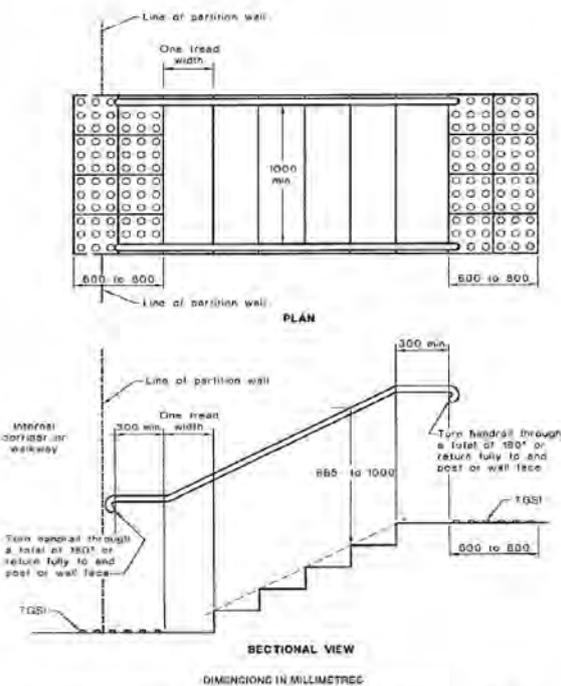


FIGURE 26(B) STAIRWAY LOCATION AND HANDRAIL EXTENSIONS AT END OF STAIRWAY OTHER THAN AT LINE OF BOUNDARY

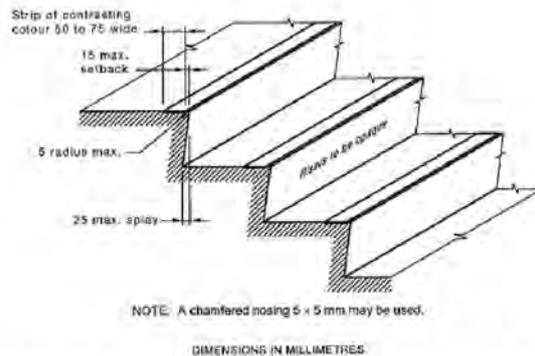
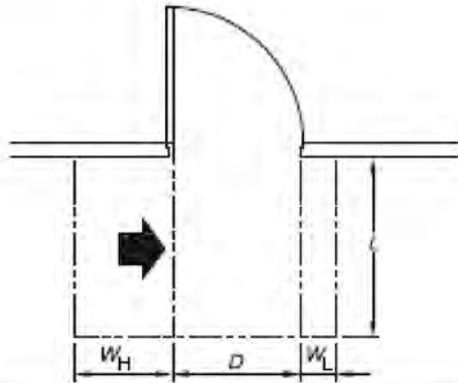


FIGURE 27(A) A TYPICAL STAIR NOSING PROFILE WITH NOSING STRIP

B 10

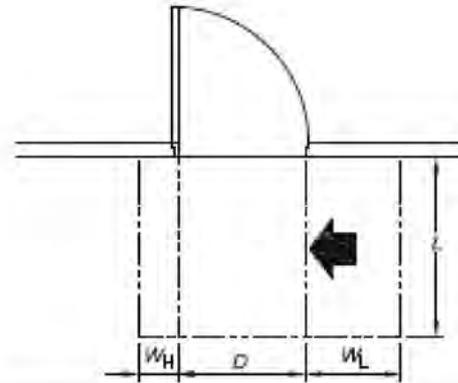
AS 1428.1—2009

58



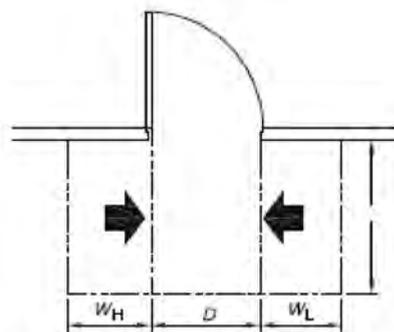
Dimension D	Dimension L	Dimension W_H	Dimension W_L
850	1220	560	340
900	1185	510	340
950	1150	460	340
1000	1140	410	340

(a) Hinge-side approach, door opens away from user



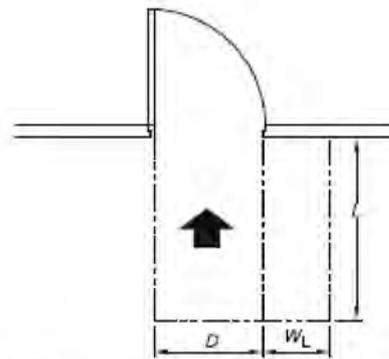
Dimension D	Dimension L	Dimension W_H	Dimension W_L
850	1240	240	660
900	1210	190	660
950	1175	140	660
1000	1155	90	660

(b) Latch-side approach, door opens away from user



Dimension D	Dimension L	Dimension W_H	Dimension W_L
850	1240	560	660
900	1210	510	660
950	1175	460	660
1000	1155	410	660

(c) Either side approach, door opens away from user



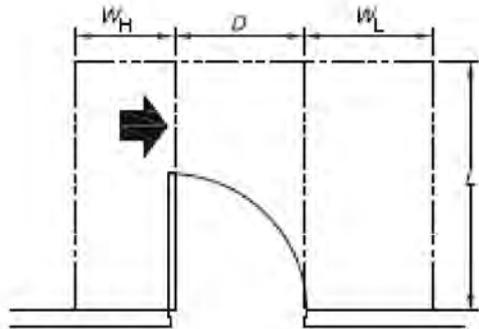
Dimension D	Dimension L	Dimension W_H	Dimension W_L
850	1450	0	510
900	1450	0	510
950	1450	0	510
1000	1450	0	510

(d) Front approach, door opens away from user

- LEGEND:
- D = Clear opening of width of doorway
 - L = Length
 - W_H = Width—hinge side
 - W_L = Width—latch side
 - \blackrightarrow = Direction of approach
 - \cdots = Circulation space

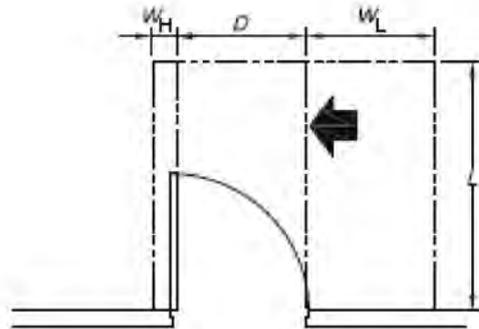
DIMENSIONS IN MILLIMETRES

FIGURE 31 (in part) CIRCULATION SPACES AT DOORWAYS WITH SWINGING DOORS



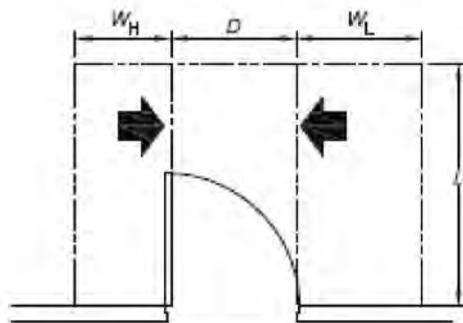
Dimension D	Dimension L	Dimension W_H	Dimension W_L
850	1670	650	900
900	1670	510	900
950	1670	560	900
1000	1670	510	900

(e) Hinge-side approach, door opens towards user



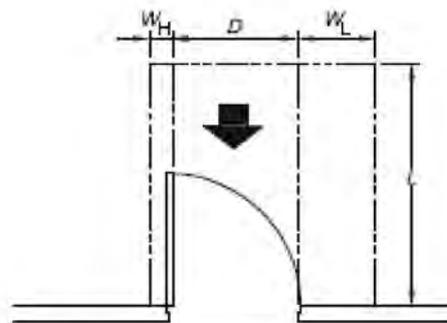
Dimension D	Dimension L	Dimension W_H	Dimension W_L
850	1670	110	900
900	1670	110	900
950	1670	110	900
1000	1670	110	900

(f) Latch-side approach, door opens towards user



Dimension D	Dimension L	Dimension W_H	Dimension W_L
850	1670	650	900
900	1670	510	900
950	1670	560	900
1000	1670	510	900

(g) Either side approach, door opens towards user



Dimension D	Dimension L	Dimension W_H	Dimension W_L
850	1450	110	530
900	1450	110	530
950	1450	110	530
1000	1450	110	530

(h) Front approach, door opens towards user

LEGEND:

- D = Clear opening of width of doorway
- L = Length
- W_H = Width—hinge side
- W_L = Width—latch side
- = Direction of approach
- = Circulation space

DIMENSIONS IN MILLIMETRES

FIGURE 31 (in part) CIRCULATION SPACES AT DOORWAYS WITH SWINGING DOORS

PROJECT :
 LOCATION :
 TYPE :
 DATE :

THORNTON CENTRAL DEVELOPEMENT.
 PENRITH, NSW.
 RESIDENTIAL.
 09/09/2014.

SUBJECT :

DA01 AND DA02 COST SUMMARY.

AREA	East site DA02	West site DA01	COMBINED TOTAL
Demolition	\$1,000	\$1,000	\$2,000
Site Preparation	\$16,800	\$23,200	\$40,000
Excavation	\$334,326	\$461,688	\$796,014
Building Construction	\$3,405,221	\$4,120,737	\$7,525,958
Internal Services	\$3,171,295	\$3,834,827	\$7,006,122
Internal Fitout	\$6,208,411	\$7,501,093	\$13,709,504
Other Structures - landscape, external works	\$207,020	\$285,884	\$492,904
External Services	\$0	\$0	\$0
Preliminaries	\$2,646,430	\$2,646,430	\$5,292,860
Professional Fees	\$661,500	\$808,500	\$1,470,000
Sub Total	\$16,652,002	\$19,683,360	\$36,335,362
GST @ 10%	EXCL	EXCL	EXCL
TOTAL COST	\$16,652,002	\$19,683,360	\$36,335,362

DA01

PROJECT:
**THORNTON
CENTRAL**

Lord Sheffield Circuit, Thornton, Penrith



Prepared by Urbis on behalf of Thornton, North Penrith Pty Ltd.

URBIS STAFF RESPONSIBLE FOR THIS REPORT WERE:

Director	Peter Strudwick
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Job Code	SA5206
Report Number	FINAL

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Executive Summary

- Thornton (or 'North Penrith') is a strategically significant locality in western Sydney, located in a prominent location adjacent to the Penrith Railway Station and Penrith Town Centre that has been declared a State Significant Site by The Minister for Planning to accommodate significant residential and employment growth for the region. Urban Growth has coordinated the redevelopment process with a number of development stages already constructed or currently under construction.
- In response to the strategic site qualities and opportunities, Thornton North Penrith Pty Ltd (a joint venture of St Hillier's and First Point Projects) have recently acquired the town centre and apartment precinct, with a vision of providing a high quality, mixed use development, supported by a new retail centre with improved street activation and pedestrian connectivity. This vision would enable the direct achievement of a range of both regional and local strategic planning objectives including job and housing growth in a highly accessible and connected location, and renewal of a prominent part of Penrith.
- The first stage of the project seeks development consent for four residential flat buildings on two separate land parcels on Lot 3007 at Lord Sheffield Drive. Two separate development applications will be submitted (known as DA01 & DA02) concurrently, with this application relating to DA01.
- The applicant has liaised closely with Penrith City Council in the preparation of this application, and has made design revisions in response to this feedback. More specifically, as a prelude to preparing and lodging this DA (as well as DA02), an indicative masterplan which provides guidance for potential height, massing and public domain improvements (specifically across the apartment and town centre precinct in North Penrith), was presented to and endorsed by Council's Design Review Panel and elected Council.
- The proposed design addresses the unique, strategic qualities of the site. These options have comprehensively evaluated the site conditions, the surrounding context, vehicular access, pedestrian access/connectivity, views and amenity considerations of surrounding properties.
- The proposed development has been assessed against the applicable state and local planning policies and concludes that the proposal represents a high quality design that is consistent with the objectives of the applicable planning policies and will have an acceptable environmental impact, particularly with regard to solar access, consistency the residential flat design code, the proposed built form arrangements, traffic and parking.
- In summary, the proposal should be supported as it provides:
 - Urban renewal of a key strategic site in Penrith which seeks to introduce a high quality residential proposal that will raise the bar of design quality in this precinct and revitalise this part of Penrith Town Centre.
 - Provision of 83 new, high quality designed residential apartments which supports the subregional housing targets for Penrith. The proposal will provide a range of different housing options for local people encouraging retention of population in the local area.
 - Substantial landscape enhancements and embellishments which will create a high quality ground plane treatment and communal landscaped area for the proposal.
 - The proposed built form addresses the ten design principles identified within SEPP 65 and provides a form of development in accordance with the Residential Flat Development Code. The design provides for a high standard of residential amenity for apartments, including good access to sunlight, cross ventilation, views and living space.

- A highly sustainable design which incorporates measures to reduce energy consumption including natural ventilation, passive solar design and recyclable waste management.

The proposal will not give rise to any unreasonable impacts such as traffic generation, privacy, overshadowing and noise on the surrounding current and future occupants of the Thornton Estate and allows for the orderly development of the adjoining and nearby stages within the broader Thornton Precinct.

- Responds to the unique site characteristics, surrounding land use context and site-specific guidance and integrates to the broader public domain established within the Concept Plan developed for the Thornton site.

1 Introduction

1.1 OVERVIEW

This report accompanies a Development Application (known as 'DA01') submitted on behalf of Thornton North Penrith Pty Ltd ('the applicant') for the development of two residential flat buildings and associated development at Lord Sheffield Circuit, North Penrith. Site details are provided in Section 2 of the report.

DA01 is submitted concurrently with a development application for the adjoining land parcel to the east of the site (known as 'DA02'). As the two applications are linked by a common basement and will share common facilities, services and landscaping it is expected that the applications will be assessed and also determined concurrently. Notwithstanding, the proposed design has provided for delineation between the two sites (such as separate vehicular access), but in the event that DA01 is determined prior to DA02 conditions of consent may need to be imposed to ensure that each application can be determined independently of one another. The applicant will resolve this with Council during the assessment process.

The report is structured into the following sections in response to the key matters for consideration under Section 79C of the Environmental Planning and Assessment Act 1979:

- A description of the site and surrounding context.
- An outline of development history and pre-application discussions.
- Detailed description of the proposed development.
- An assessment of the proposal against relevant planning controls.
- Identification and assessment of the issues relevant to the proposal.

1.2 APPROVAL PROCESS

The application is prepared pursuant to Part 4 of the Environmental Planning and Assessment Act 1979 and requires development consent. As the estimated cost of works is below \$20 million (see QS statement attached under separate cover), Penrith City Council will be the relevant consent authority.

1.3 THE PROJECT TEAM

A number of specialist consultants were engaged to assist in the preparation of the application, including:

- Urbis – Urban Planning
- DKO Architects – Architectural Design
- Urbis – Landscape Design
- Parsons Brinckerhoff – Traffic and Car Parking
- IGS – Civil Engineering
- Accessibility – BCA Logic
- Waste Management – Elephants Foot
- BCA Compliance – Blackett Maguire + Goldsmith

2 Site Analysis

2.1 THE SITE

The subject site is legally described as Lot 3007 Lord Sheffield Drive (a survey plan, prepared by Craig and Rhodes can be found attached at **Appendix A**) and forms part of the apartment and town centre precinct in the ownership of the applicant.

Figure 1 below provides a site location plan of this precinct in the context of Penrith Railway Station, Penrith Town Centre and other key areas in the surrounding locality.

FIGURE 1 – SITE LOCATION OF DA01 - LOT 3007 (SOURCE: LANDCOM)



2.2 SURROUNDING CONTEXT

The site is located in Thornton, north of the Penrith train station. The surrounding context is currently characterised by underdeveloped land, public open space and infrastructure. More specifically the following uses are located within proximity to the site:

East: Undeveloped land identified for future development by the applicant as part of a separate and future DA, a public oval and a recreational centre are located to the east of the site.

West: Undeveloped land identified for future development by the applicant as part of a separate and future DA is located to the immediate west of the site. Further west is an existing public car parking.

North: Large areas of cleared land part of the approved north Penrith staging plan, specifically Stage 2B and 2C of the approved concept plan are located to the north of the site. Refer to Figure 3.

South: Undeveloped land identified for future development by the applicant as part of a separate and future DA is located to the immediate south of the site. Further south is the Penrith train station and commercial core.

Figure 2 below provides an overview of the site's broader surrounding context.

FIGURE 2 – BROADER SITE LOCATION (SOURCE: DKO ARCHITECTS)



3 Project Background and Pre-Application Discussions

3.1 PROJECT BACKGROUND

3.1.1 CONCEPT PLAN APPROVAL

An approved Concept Plan (issued on 9 November 2011) for the Thornton site provides for a transit-oriented mixed uses development to accommodate 900–1,000 dwellings, employment generating uses, open space and associated infrastructure and facilities. The development was divided into stages. These Stages have all been approved and development has already commenced in some (some dwellings already occupied). Stage 3A (identified in purple below), in which Lot 3007 is located was approved on 7 May 2014.

FIGURE 3 – CONCEPT PLAN STAGING (SOURCE: LANDCOM)



Established street alignments, public domain and infrastructure have been approved under a Project Application by Urban Growth NSW. The approved super-lot arrangement and street alignment have informed the position of the proposed built form.

In accordance with the Concept Plan Approval, applications seeking approval for detailed design applications should respond to the guidance contained in the North Penrith Design Guidelines. Section 3.3 and 3.11 of the Design Guidelines stipulates that the maximum number of storeys for residential development on the site is six storeys. The proposal includes one eight storey residential flat building and one four storey residential flat building, both of which easily and full comply with the 30 metre height standard provided by the *Penrith City Centre Local Environmental Plan 2008*.

The Design Guidelines clarify (Section 1.7) that consent may be granted to a proposal “*providing the intent of the guidelines is achieved – as such each application will be assessed on its merits*”.

In response, Section 4 of the Design Guidelines (Figure 18) identifies the subject site (and super-lot) as a preferred land use for ‘High Density Residential’. Further, the ‘expected outcomes’ of the North Penrith Precinct in Section 2.2 promote “a dense and interconnected mixture of land uses” which is reflected in the B2 Local Centre zoning and height standard which the proposal complies with.

The proposal seeks to respond positively to these expected outcomes, provides an orderly design response to the surrounding built form, and in accordance with recent meetings with Penrith City Council and Design Review Panel, the proposed eight storey built form provides a logical height response and a high level of amenity and compliance with relevant planning controls.

3.2 PRE-APPLICATION DISCUSSIONS

The development application has been prepared in consultation with Penrith City Council, Penrith Design Review Panel and other key stakeholders in a manner indicated in Figure 4 below.

FIGURE 4 – OVERVIEW OF BACKGROUND TO APPLICATION SUBMISSION



The applicant has met with Council on several occasions, including a preliminary meeting with senior officers, a design review meeting, a briefing to Councillors and a formal Pre-DA meeting. Formal Pre-DA minutes have been provided to the applicant by Council.

In summary, the feedback from the pre-DA meetings was positive, and confirmed that:

- Council were generally supportive of the proposed bulk, scale and height of the proposed apartment buildings given these were consistent with the maximum height standard of Penrith City Centre LEP 2008.
- Acknowledged the need for flexibility with car parking provision on the site given that this was the first application for higher density residential development within North Penrith, and were willing to consider the potential for additional car parking spaces dependent on the traffic generation impacts and intersection performance arising from those additional spaces.
- There was support for the proposed 'stoop' design approach for ground floor apartments as an appropriate design response in relation to the interface between the public domain and private domain.
- There was support for the proposed direct access to ground floor apartments from the street frontage and/or the central courtyard was supported.
- There was support for the proposed central courtyard treatment and relationship to the surrounding hierarchy of public spaces including the Station Plaza provides for pedestrian permeability.
- Clarification would need to be sought for Urban Growth NSW regarding the intended status of the private access road which provides access to the proposed development.
- Compliance with key planning controls would need to be demonstrated in the planning report accompanying the DA.
- An acoustic impact assessment would only be required if works are within relevant distances required under the SEPP (Infrastructure).

In addition to the above, the pre-DA minutes identified a number of submission requirements that would be required to support the application, and identified assessment issues that needed to be addressed as part of the application. A response is provided within this report responding to each of those relevant items.

The applicant proposed to engage closely with Penrith City Council (and other key stakeholders) during the assessment of the application.

4 Description of Proposed Development

4.1 OVERVIEW

The proposed development is shown in the Architectural Plans prepared by DKO Architects, provided in **Appendix B** and described in the following sections. In summary, development consent is sought for the following:

- Construction of one 8 storey and one 4 storey residential flat building comprising a total of 83 apartments.
- Comprehensive landscaping works around the site edges including communal landscaped courtyards and through site link landscaping.
- Excavation works to accommodate up to two levels of underground car parking.

A detailed description of the proposed development is provided in the sections below.

4.2 CONSTRUCTION OF RESIDENTIAL FLAT BUILDINGS

The application drawings seek consent for the construction and detailed design of two residential flat buildings as part of DA01.

The proposal has been designed to reconcile various competing design considerations and provides a high quality built form outcome that integrates with the surrounding environment. The proposal will comply with all relevant requirements stipulated in the BCA (A BCA report is included at **Appendix C**).

The bulk, height and scale of the project respond positively to the surrounding properties and the scale of the street. The proposal provides a high level of amenity for the proposed dwellings in accordance with SEPP 65 – Design Quality of Residential Flat Development and the Residential Flat Design Code (RFDC). The proposal has been designed with regard to a comprehensive range of ESD measures.

FIGURE 5 – PHOTOMONTAGE OF 8 STOREY BUILT FORM (LOOKING EAST)



FIGURE 6 – PHOTOMONTAGE OF 8 STOREY BUILT FORM (LOOKING SOUTH)



FIGURE 7 – PHOTOMONTAGE OF 4 STOREY BUILT FORM (LOOKING SOUTH)



4.3 LANDSCAPING AND PUBLIC DOMAIN WORKS

Landscaping is a key element of the proposal that will play a critical role in shaping a great development outcome on the site. In particular, a landscape theme that is functional, responds positively to the existing site challenges, creates amenity at site boundaries and enhances the streetscape has needed to be adopted.

A comprehensive landscape scheme has been proposed and can be found attached at **Appendix D**. The strategy includes communal landscaped courtyards, wall edge landscaping between the concurrent adjacent DA, both of which provide considerable amenity to the apartment complexes.

Specifically the proposed landscaped courtyards which run west-east through the site consist of the following:

- Private courtyard paving for ground level apartments.
- Common lawn between the two residential flat buildings.
- Raised Planters.
- Seating benches.
- Podium tree planting.
- Access Ramps.
- North-south through site links between the site.

Detail of the proposed landscaping and domain arrangement can be seen in Figure 8. Refer to the Landscape Plans attached at **Appendix D** for additional detail.

FIGURE 8 – PROPOSED LANDSCAPE STRATEGY



FIGURE 9 – PROPOSED GROUND FLOOR APARTMENT LANDSCAPING



FIGURE 10 – PROPOSED GROUND FLOOR APARTMENT LANDSCAPING



4.4 VEHICULAR ACCESS AND CAR PARKING

A Traffic and Parking Report has been provided by Parsons Brinckerhoff at **Appendix E** which provides an overview of the proposed access and traffic arrangements specifically for the proposal. The key details of this are discussed below.

Access is proposed via a laneway from Lord Sheffield Circuit (south) that connects through to the parking street perpendicular to Aviators Way. The laneway will be two-way for vehicles at Lord Sheffield Circuit and one-way exit for vehicles at the parking street. This access is consistent with the requirements of the *North Penrith Design Guidelines*.

Two parking options are proposed (applying to both DA01 and DA02):

- Parking rates as per those given in the North Penrith Design Guidelines and Penrith Development Control Plan 2010. For DA01 this provides a total of 72 spaces comprising:
 - 68 regular spaces
 - 4 disabled spaces
- An option of increasing the parking rate for two bedroom apartments from 1.0 per dwelling to 1.5 per dwelling. This option has considered initial market feedback and also recognises that this proposal is the first of its kind in this location and may require additional parking to provide the necessary interest and take up to allow construction to commence. For DA01 this provides a total of 90 spaces comprising:
 - 85 spaces
 - 5 disabled spaces

In physical terms, the choice of parking option approved/built would influence the number of basement parking levels constructed. If the higher parking rate option is approved, both Basement 1 and Basement 2 levels would be constructed. If the additional parking is not approved or if the additional parking level is not built due further market review that confirms it is not required, only Basement 1 would be built.

If the proposed parking solution is acceptable it is proposed that a suitable condition of consent be agreed between the applicant and Penrith City Council which ensures that a modification to the approved development is not required in the event that the second basement is not pursued.

Refer to **Section 5** for justification of the proposed parking and traffic arrangements.

5 Section 79C (1) Assessment

5.1 COMPLIANCE WITH RELEVANT ENVIRONMENTAL PLANNING INSTRUMENTS

This Section provides an assessment of compliance for the proposal with relevant strategic and statutory planning considerations including:

- NSW 2021.
- Draft Metropolitan Strategy for Sydney to 2031.
- Western Subregional (draft) Strategy.
- State Environmental Planning Policy No 65- Design Quality of Residential Flat Development.
- State Environmental Planning Policy No 55- Remediation of Land (SEPP 55)
- State Environmental Planning Policy (Infrastructure) 2007.
- State Environmental Planning Policy (Building Sustainability Index: BASIX) 2004 (BASIX SEPP)
- Penrith City Centre Local Environmental Plan 2008.
- Residential Flat Design Code

5.1.1 STRATEGIC PLANNING CONSIDERATIONS

The proposed development will be consistent with the strategic planning framework as identified and discussed in the table below. It will achieve common planning themes set by each of the relevant strategies.

TABLE 1 – CONSISTENCY WITH STRATEGIC PLANNING FRAMEWORK

STRATEGIC PLAN	ASSESSMENT
NSW 2021	<p>The proposed development will contribute to achieving the objectives of NSW 2021 as it will:</p> <ul style="list-style-type: none"> ▪ Improve housing supply and choice in the western Sydney area; ▪ Assist in achieving housing target of 25,000 new dwellings in Sydney per year; ▪ Increases opportunities for people to live within 30 minutes by public transport of a city or major centre in metropolitan Sydney.
Draft Metropolitan Strategy for Sydney to 2031	<p>The draft Metro Strategy, released by the Department of Planning and Infrastructure in March 2013, is the NSW Government's strategic planning vision for metropolitan Sydney. The proposed development achieves the objectives of the draft Metro Strategy as it:</p> <ul style="list-style-type: none"> ▪ Locates higher-density residential development in an accessible location, close to jobs and transport infrastructure; ▪ Will assist in meeting housing and job targets set by the State Government with greater housing choice and local employment opportunities.

STRATEGIC PLAN

ASSESSMENT

- Will achieve a high-quality architectural and urban design outcome for the site in relation to its context.

Western Subregional Strategy (draft)

The proposed development is consistent with the draft Subregional Strategy as it will provide new residential development connected to active and public transport networks, and assists in meeting housing targets set for the Penrith LGA. The proposed development also allows for the design of a high-quality architectural outcome which will be able to achieve high standards in sustainable development.

5.1.2 STATE ENVIRONMENTAL PLANNING POLICIES

This section addresses the proposed development against relevant SEPPs.

TABLE 2 – ASSESSMENT OF THE PROPOSED DEVELOPMENT AGAINST RELEVANT STATE ENVIRONMENTAL PLANNING POLICIES

INSTRUMENT

ASSESSMENT

State Environmental Planning Policy No 65— Design Quality of Residential Flat Development

State Environmental Planning Policy No. 65 (SEPP 65) “*aims to improve the design quality of residential flat development in New South Wales*”, having regard to its economic, environmental, cultural and social benefits, including sustainability, the public domain, amenity and the changing needs of the population.

Clause 4 of SEPP 65 states that:

(1) This Policy applies to development being:

- a) The erection of a new residential flat building, and*
- b) The substantial redevelopment or the substantial refurbishment of an existing residential flat building, and*
- c) The conversion of an existing building to a residential flat building.*

Accordingly, the SEPP applies to this development application as it seeks consent for the construction of a residential flat building.

The proposed development responds to the ten principles of good design, and the requirements of SEPP 65 and the RFDC.

A detailed SEPP 65 Assessment and Design Verification Statement have been prepared by DKO Architects and are included at **Appendix F**. Detailed assessment of the residential apartments against the requirements of the Residential Flat Design Code (RFDC) is also included at **Appendix F**. Amenity considerations are discussed in further detail in Section 6 of this report.

In summary, the proposal responds positively to the key ‘rules of thumb’ including solar access, natural ventilation and building separation.

State Environmental Planning Policy No 55— Remediation of Land

SEPP 55 aims to promote the remediation of contaminated land for the purpose of reducing the risks of harm to human health or any other aspect of the environment by identifying what remediation work requires consent, and requiring that remediation work meets certain standards for the proposed use.

INSTRUMENT

ASSESSMENT

In accordance with Clause 7 of SEPP 55 if land is contaminated a consent authority must not consent to the carrying out of development unless it is satisfied that the land is suitable in its contaminated state (or will be suitable, after remediation) for the purpose which the development is proposed to be carried out.

As part of the Concept Plan process and subsequent approval for subdivision and infrastructure works, relevant testing and remediation was carried out to ensure the land was fit for residential purposes. As part of purchasing the land from Urban Growth further analysis and reporting was undertaken confirming this. This information is included in **Appendix G** of this report.

State Environmental Planning Policy (Building Sustainability Index: BASIX) 2004

State Environmental Planning Policy (Building Sustainability Index: BASIX) aims to ensure that new residential development within New South Wales is designed and constructed to use less water and energy. This policy incorporates BASIX, which is a web-based planning tool for the assessment of the potential performance of a development against an agreed set of criteria for energy and water conservation.

The residential apartments have been designed to be consistent with the requirements of the BASIX SEPP. Certification of the design is included at **Appendix H**.

State Environmental Planning Policy (Infrastructure) 2007

State Environmental Planning Policy (Infrastructure) 2007 came into force in December 2007 and aims to facilitate the effective delivery of infrastructure across the State. The SEPP identifies matters for consideration in the assessment of development adjacent particular types of infrastructure development.

Clause 87 of SEPP Infrastructure outlines acoustic controls for residential uses within proximity of a rail corridor. The proposed site is not within 25 metres of the rail corridor and as such, does not require an acoustic impact assessment to be undertaken. This will be undertaken in other stages which are located in closer proximity to the Penrith Railway Station.

5.1.3 PENRITH CITY CENTRE LOCAL ENVIRONMENTAL PLAN 2008

The Penrith City Centre Local Environmental Plan 2008 (the LEP) is the principal LEP applicable to the subject site. The site is located within the B2 Local Centre zone with 'Residential Flat Buildings' being permissible with development consent.

The relevant objectives of the B2 Local Centre zone are:

- *to provide a range of retail, business, entertainment and community uses that serve the needs of people who live in, work in and visit the local area,*
- *to encourage employment opportunities in accessible locations,*
- *to maximise public transport patronage and encourage walking and cycling*

The proposed development is consistent with these objectives as it provides the adequate provision of apartments, amenity and connectivity to the Penrith Town Centre, servicing the needs of the local community and aligning with the envisaged character of the site under the approved North Penrith Concept Plan.

A table of compliance with the development standards of the LEP is detailed in Table 3 below.

TABLE 3 – LEP COMPLIANCE TABLE

ITEM	DEVELOPMENT STANDARD	COMMENT	COMPLIANCE
CI 51 Height of Buildings Height	Maximum 30 metres	A maximum building height of 28.2m is proposed from the top of the lift overrun to the natural ground level)	✓
CI 30 ESD	ESD principles are to be incorporated into the proposed design.	The proposed development responds positively to the specified ESD measures and provides a high level of sustainability. A BASIX assessment has been undertaken and attached at Appendix H , detailing the proposals consistency with relevant water, energy and thermal comfort regulations. Additionally the proposal provides ESD initiatives through solar access, cross ventilation and appropriate waste management initiatives.	✓
CI 55 Earthworks	Proposals are to ensure that earthworks for which development consent is required will not have a detrimental impact on environmental functions and processes, neighbouring uses, cultural or heritage items or features of the surrounding land.	Excavation is proposed to construct up to two levels of basement car parking. As highlighted in the Geotechnical Report, the existing soil condition of the site is fit to accommodate the proposed excavation. Refer to Appendix I .	✓

5.2 DRAFT ENVIRONMENTAL PLANNING INSTRUMENTS

In accordance with S79C (a)(ii) of the Act, the provisions of any draft environmental planning instrument must be taken into consideration in the determination of a development application.

Penrith Council has lodged a Planning Proposal to prepare a City Wide LEP referred to as the 'Draft Penrith Stage 2 City Wide LEP'. The proposal has been placed on public exhibition and is expected to be gazetted towards the end of 2014.

The zoning and key development standards relating to the site are consistent with current provisions of PLEP 2008. Therefore, Planning Proposal does not directly impact on the proposed development. The applicant will liaise further with Penrith City Council on the Planning Proposal as part of the assessment process.

5.3 ANY DEVELOPMENT CONTROL PLAN

In accordance with the provisions of S79C(a)(iii) an assessment of the proposal against relevant development control plans and guidelines for development in North Penrith have been undertaken.

5.3.1 NORTH PENRITH DESIGN GUIDELINES 2013

The predominant guideline for development within North Penrith is the North Penrith Design Guidelines 2013 (the Design Guidelines). A comprehensive analysis of the proposal against the Guidelines has been undertaken and can be found attached at **Appendix J**. Where the proposed is inconsistent with a particular guideline, justification has been provided as follows:

Building Height

Section 3.3 and 3.11 of the Design Guidelines stipulates that the maximum number of storeys for residential development on the site is six storeys. The proposal includes one eight storey residential flat building and one four storey residential flat building, both of which easily and full comply with the 30 metre height standard provided by the *Penrith City Centre Local Environmental Plan 2008*.

The Design Guidelines clarify (Section 1.7) that consent may be granted to a proposal "*providing the intent of the guidelines is achieved – as such each application will be assessed on its merits*".

In response, Section 4 of the Design Guidelines (Figure 18) identifies the subject site (and super-lot) as a preferred land use for 'High Density Residential'. Further, the 'expected outcomes' of the North Penrith Precinct in Section 2.2 promote "a dense and interconnected mixture of land uses" which is reflected in the B2 Local Centre zoning and height standard which the proposal complies with.

The proposal seeks to respond positively to these expected outcomes, provides an orderly design response to the surrounding built form, and in accordance with recent meetings with Penrith City Council and Design Review Panel, the proposed eight storey built form provides a logical height response and a high level of amenity and compliance with relevant planning controls.

Car Parking

Section 3.11 of the Design Guidelines stipulates the following maximum car parking rates in relation to residential flat buildings in North Penrith:

- *Studio 0.5 space / dwelling*
- *1-2 bedroom 1 space / dwelling*
- *3+ bedroom 2 spaces / dwelling*
- *Visitor parking on street*

As discussed in Section 4 of this report, two options are provided in relation to the quantum of car parking to provide the applicant with flexibility during the marketing and sales of the apartments. The Traffic and Car Parking Report clarifies that both a complying and non-complying scheme (which provides 2 car parking spaces for 2 bedroom apartments rather than 1). The report identifies that both these options are justifiable from a traffic generation perspective.

As detailed in **Section 5.5.3** and **Appendix E**, the proposed provision of parking will not significantly impact the traffic network and intersections within proximity of the site.

6 Assessment of Key Issues

In accordance with S79C(b) of the Act, the potential impacts of the proposed development have been assessed and detailed as follows.

6.1 BUILT FORM AND DESIGN

The proposed built form responds positively to a range of design considerations which have been discussed in detail with Penrith City Council, and in particular the Penrith Design Review Panel.

To provide the Council with strategic context and an overview of how the apartment and town centre precinct may develop over the coming years, the applicant has prepared an indicative masterplan which provides guidance for potential height, massing and public domain improvements. This does not seek to replace the North Penrith Design Guidelines, but rather provides Council with an overview of the applicant's more detailed evaluation of the site conditions, constraints and opportunities based on a more thorough review of the precinct. As a prelude to prepared and lodging this DA (as well as DA02), this indicative masterplan was presented to and endorsed by Council's Design Review Panel and elected Council.

With regard to the first development applications (i.e. DA01 and DA02) in the apartment precinct, the proposed design has focused on providing two apartment building typologies within each application. Firstly, a taller apartment building (of 8 storeys) to the north to optimise solar access, views and amenity and a garden apartment building (of 4 storeys) which provides a more pedestrian scale to the boulevard type streetscape to the south.

The visual appearance of the buildings are highly articulated, unique, fresh and innovative for Penrith and will provide a new design palette for the area, complemented by a high quality landscaped area and ground plane treatment which fits within the surrounding built form context.

Overall, the design quality of the proposed is very high and will set a high benchmark for the apartment precinct in North Penrith.

6.2 RESIDENTIAL AMENITY

The architectural drawings demonstrate that the proposed development will provide a very high level of residential amenity to the future occupants of the proposed development. As discussed in this report, the proposal will provide for:

- A high proportion of north-facing apartments which achieves a high level of solar access to apartments in mid-winter in excess of the minimum 70% requirement in the RFDC.
- No unreasonable overshadowing of surrounding properties. The majority of shadows cast by the proposed development impacts on the smaller four-storey building which is located to the south of the taller eight-storey building.
- A high level of apartments being naturally cross-ventilated in excess of the minimum 60% requirement in the RFDC.
- High levels of visual privacy to surrounding residents and incoming residents by provision of appropriate setbacks, building separation and use of landscaping. In instances where strict compliance isn't achieved privacy measures such as blade walls, privacy screens and other devices are proposed.
- Significant setbacks from the Penrith Railway Station which, in accordance with the provisions of the SEPP (Infrastructure), does not require the provision of an acoustic impact assessment.

In summary, the proposed design satisfies the key 'rules of thumb' under the RFDC and will provide a high level of amenity to future occupants, and also provides for reasonable impacts on surrounding properties.

6.2.1 PARKING AND TRAFFIC

A Traffic and Parking report has been prepared by Parsons Brinckerhoff and is attached at **Appendix E**. The report provides an overview of existing transport conditions, details the proposed development, analyses the trip generation of the proposal on the surrounding road network, assesses site access and parking within the site, and outlines the anticipated construction details and assesses the impact.

It concludes that the proposal is supportable on parking and traffic grounds based on the following:

- **Vehicular Access:** Access to the basement car park is provided in accordance with the *North Penrith Design Guidelines*. The basement car park has been designed in accordance with Australian Standard AS2890.1-2004 Parking Facilities Part 1 Off-street car parking; and Australian Standard AS2890.6-2009 Parking Facilities Part 6 Off-street car parking for people with disabilities.
- **Car Parking:** Parking spaces have been proposed under two options. The complying option proposes 72 spaces provided within the first basement level which is 17 spaces less than the maximum allowable. The higher two bedroom parking option proposes 90 spaces within the first and second basement levels which equates to approximately 1.43 spaces per two bedroom apartment parking in addition to one space per one bedroom apartment and two spaces per three bedroom apartment. This is higher than the maximum provision in the *North Penrith Design Guidelines* but is supportable with regard to traffic generation in the local area. 10% of spaces are designed for people with disabilities under both options to match the 10% universal access apartments within the development.
- **Traffic Generation:** The traffic report clarifies the TMAP (approved as part of the Concept Plan for North Penrith) assessed a total yield including a range of between 900 and 1,000 residential dwellings. Traffic generation and impacts were assessed based on the upper limit. Given that the number of dwellings proposed does not exceed the number assessed for Stage 3A in the TMAP, the traffic generation (with the lower parking total) is within the trip numbers already assessed for the TMAP. If the number of dwellings in subsequent lots within Stage 3A causes the 1,000 dwelling total to be exceeded, the impact of this change in the overall development yield would need to be assessed as part of subsequent development applications. Considering that the proposed residential development is within the amount previously assessed for the approved Concept Plan, the impact is considered to be consistent with that of the approved Concept Plan.
- **Construction Traffic:** The volume of truck movements per hour is low and is anticipated to have a low impact, even during the peak traffic times. Truck routes are proposed to minimise the impact of truck movements on residents with the volume of traffic movement associated with construction workers arriving at/leaving the site likely to be lower than the ultimate traffic generation at ultimate development, and is likely to have a lower impact as it will typically occur outside peak traffic times. All construction staff parking is expected to be contained on site. A complete CTMP will be submitted for approval before the commencement of construction, but once the required detail is known.

6.2.2 STORMWATER MANAGEMENT & WATER QUALITY

At pre-application meetings it was clarified that the Project Application for Stage 3A (which includes the subject site) provides for various infrastructure works that are being delivered by Urban Growth NSW. This includes stormwater and water quality management infrastructure.

A proposed stormwater management plan is submitted with the application which connects to this surrounding infrastructure. The stormwater plans demonstrate that the proposed design is considered acceptable having regard to Council controls and guidance for stormwater management.

Details of the proposed stormwater connections associated with the application are provided in the Stormwater Plans attached at **Appendix K**.

6.2.3 SUSTAINABILITY

The proposed development has been designed to use a number of passive design initiatives to maximise amenity and minimise energy use. These include:

- **BASIX and BCA:** The proposed development has passed a BASIX assessment (refer **Appendix H**) and a BCA Assessment (**Appendix C**). ESD measures from these assessments will be incorporated into the building services design.
- **Ventilation:** The development provides adequate numbers of naturally cross ventilated apartments. In excess of 60% of apartments are naturally cross ventilating which complies with the minimum guidance contained in the RFDC. As discussed at the pre-application meeting, sufficient space for the drying of clothes on balconies is provided to reduce the dependency of mechanical clothes dryers.
- **Solar:** Passive solar design principles have been implemented to achieve maximum performance of apartments using a combination of orientation, external sun shading control and minimisation of dual aspect south facing apartments.
- **Recyclable Waste:** A range of waste management measures to reduce the amount of waste and recyclables to landfill are proposed including segregation of materials that can be recycled, displaying signage to remind and encourage recycling and placement of recycling and waste bins to reinforce these messages.

Overall, the proposal represents a highly sustainable built form outcome for the site which reduce dependency on energy consumption.

6.2.4 WASTE MANAGEMENT

A Waste Management Plan has been prepared by Elephants Foot and can be found attached at **Appendix L**. The plan covers the ongoing management of waste generated by the proposed development both during construction and operation.

Through correspondence with Council, appropriate recycling and waste management measures have been put into place. The proposal is deemed appropriate for the subject site and an effective approach to waste management.

6.2.5 COMPLIANCE WITH THE BCA AND ACCESSIBILITY STANDARDS

A Building Code of Australia (BCA) assessment has been undertaken, refer to **Appendix C**. The report contains an assessment of the referenced architectural documentation against the Deemed-to-Satisfy Provisions of the BCA 2014.

Arising from the review, the BCA report states that the proposed development can readily achieve compliance with the relevant provisions of the BCA with minor amendments to the plans. Where compliance matters are proposed to comply with the performance requirements (rather than DTS Provisions), the development of an Alternative Solution Report will be required prior to the issue of the Construction Certificate.

An Access Assessment Report has been undertaken which evaluates the proposed design with regard to relevant accessibility requirements. Refer to **Appendix M**.

The report clarifies that the design documentation has been assessed against the applicable provisions of the BCA2014, Federal Premises Standards and Universal Design Principals and it is considered that such documentation complies or is capable of complying with those documents for the purposes of a Development Application.

6.2.6 CONTAMINATION

In accordance with Clause 7 of SEPP 55 if land is contaminated a consent authority must not consent to the carrying out of development unless it is satisfied that the land is suitable in its contaminated state (or will be suitable, after remediation) for the purpose which the development is proposed to be carried out.

As part of the Concept Plan process and subsequent approval for subdivision and infrastructure works, relevant testing and remediation was carried out to ensure the land was fit for residential purposes. As part of purchasing the land from Urban Growth further analysis and reporting was undertaken confirming this. This information is included in **Appendix H** of this report.

Based on the assessment undertaken, the report concludes that the site can be made suitable for the proposed residential use subject to the implementation of the recommendations provided in the Contamination Assessment.

6.3 SUITABILITY OF THE SITE FOR THE DEVELOPMENT

The site is considered suitable for the proposed development as outlined below:

- The site is specifically zoned to accommodate residential development under the B2 Zone.
- The site has very unique, physical characteristics which make it ideally suited to accommodate higher density residential development, including a very large site area, generous street frontages, is relatively flat, provides access to public open space and retail/civic facilities, and is in close proximity to public transport.
- Remediation work has been undertaken to make the site suitable for residential development.
- Given that the site is located within an established area, existing essential services are available to the site including water, sewer, electricity, gas and telecommunications. Further, the site is well serviced by public transport providing access to Sydney CBD and other surrounding locations.

6.4 THE PUBLIC INTEREST

Section 79C (e) of the Act require that the public interest be considered in the development assessment process.

The proposed development is considered to be in the public interest as outlined below:

- It has been designed to relate to the characteristics of the site and to the existing and likely future development on adjoining properties.
- It provides a range of different housing options for local people encouraging retention of population in the local area.
- It is compatible with the type of development encouraged by the planning principles for North Penrith (PLEP 2008 and North Penrith Design Guidelines) and SEPP 65.
- It is been designed to minimise adverse impacts on surrounding properties.
- A number of public domain improvements are proposed to enhance the local area.

Therefore, the proposal is considered to be consistent with the public expectation for development in the locality and is in the public interest.

6.5 SUBMISSIONS

In accordance with Section 79C(d) of the Act, any submissions received by Council should be reviewed in the assessment of the application.

7 Conclusion

The purpose of this SEE has been to present the proposed development for Lot 3007 at North Penrith and to assess its potential impacts having regard to Section 79C (1) of the EP&A Act.

The proposed development is supported as it:

- Responds to the unique site characteristics, surrounding land use context and site-specific guidance contained in Council's local planning policies.
- Provides for a high quality, development on a strategically significant site within the Penrith LGA.
- Allows orderly development of the adjoining and nearby stages within the broader Thornton Precinct.
- Provides a strong benchmark for design and landscape quality for future development to follow.
- Relates well and integrates to the broader public domain established within the Concept Plan developed for the Thornton site.
- Is generally consistent with the relevant planning instruments and policies.
- Provides a range of potential landscape improvements and embellishments for the local area.
- The proposed built form addresses the ten design principles identified within SEPP 65 and provides a form of development in accordance with the Residential Flat Development Code. The design provides for a high standard of residential amenity for apartments, including good access to sunlight, cross ventilation, views and living space.
- The proposal will not give rise to any unreasonable impacts such as traffic generation, privacy, overshadowing and noise.

Overall, it is considered that the proposed assessment is satisfactory and the DA should be approved by Council.

Appendix A

Site Survey

Appendix B

Architectural Plans

Appendix C

BCA Statement

Appendix D

Landscape Plans

Appendix E

Traffic and Parking Report

Appendix F

SEPP 65 Documentation

Appendix G

Contamination Report

Appendix H

BASIX Assessment

Appendix I

Geotechnical Statement

Appendix J

Planning Tables of Compliance

Appendix K

Stormwater Management Plan

Appendix L

Waste Management Plan

Appendix M

Accessibility Report

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DESIGN REPORT ON SITE STORMWATER DRAINAGE SYSTEM
Lot 3007 LORD SHEFFIELD CIRCUIT & AVIATORS WAY, THORNTON

INTRODUCTION AND OVERVIEW

This design report deals with the Site Stormwater Management Plans prepared by LP Consulting Australia (*LP Consulting*) DA – STW 01 to 6 Issue B. These designs have been prepared in support of the drawings prepared by Architects, BKO Architecture.

The design plans address the following key areas:-

1. The Roof Water system will be designed for the 100 Year Design event in accordance with AS 3500
2. The in-ground site stormwater drainage system has been designed to cater for the 1 in 20 Year Average Recurrence Interval storm event consistent with the street system flow capacity
3. The driveway ramp will be raised to achieve the 300mm required threshold

THE EXISTING SITE

The existing site is bounded by Lord Sheffield Circuit and Aviators Way which are formed roadways and carparking areas. The site has been raised to improve protection against any impact of overland flow and river flooding.



PROPOSED FINISHED FLOOR LEVELS

The following initiatives are proposed for the subject redevelopment.

- ❖ The Finished Floor Levels for the site development will be set 500mm above the surrounding flood Level and this FFL 1.2m AHD.
- ❖ The proposed driveway threshold into the basement leading off the proposed private roadway shall be set 300mm above top of kerb.

ON SITE STORMWATER DETENTION

The site is connected to the formed roadway drainage system that ultimately drains to the community style wetland and detention basin system.

Council has advised that On Site Detention is NOT REQUIRED for this site.

ON SITE STORMWATER TREATMENT (Water Sensitive Urban Design - WSUD)

Penrith City Council's Development Engineer responsible for this precinct, Mr Shockair has indicated that the site has been catered for in terms of WSUD.

BASEMENT STORAGE AND PUMPOUT

(Refer to the attached Drawings DA – STW 06)

All exposed areas of the site that drain to the basement are drained to a central pumpout pit. The storage volume has been calculated based on the 100 year Average Recurrence Interval Storm (ARI) for a 1 hour storage. The STORAGE CONTROL VOLUME between top and bottom water levels is approximately 4m³.



WASTE MANAGEMENT PLAN

PREPARED FOR
THORNTON NORTH PENRITH PTY LTD

ON BEHALF OF
DKO ARCHITECTURE

RESIDENTIAL DEVELOPMENT
LORD SHEFIELD CIRCUIT
THORNTON
PENRITH NSW

ISSUED SEPTEMBER 2014

EDDY SAIDI
1800 025 073

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ABOUT ELEPHANTS FOOT

Elephants Foot Recycling Solutions is a family owned Australian company whose philosophy is providing quality recycling and waste solutions through product innovation. We are Australia's leading supplier of garbage, recycling and laundry chute systems.

Our team of experts has been proudly assisting architects, builders and developers with advice on how best to solve waste management and odour issues in dwellings since 1976. We have a long history of completed projects within the Australian building environment. Recent major projects completed include:

- Karimbla Constructions – Meriton Infinity, Herschel Street Brisbane Qld
Won the International Property Award for 'Best Residential High-Rise Development' Australia in 2014
- Laing O'Rourke – M&A, McLachlan & Ann Streets, Brisbane Qld
- Dylam – 15 Young Street, Carlingford NSW
- Hickory Developments – Ilk Apartments, 227 Toorak Road, South Yarra VIC
- Equiset – 27 Little Collins Street, Melbourne VIC

Elephants Foot also provides waste management planning services; recent plans include:

- Meriton – 94-100 Dalmeny Avenue, Rosebery NSW
- Fife Capital – 38-48 York Street & 379-385 George Street, Sydney NSW
- Dylam – KOI, Parramatta NSW
- Mirvac – Green Square, Site 5A and 5B, NSW
- Bao Jia Developments – 300 George Street, Brisbane Qld

REVISIONS

Revision	Copy No.	Date	Prepared by	Reviewed by	Approved by	Remarks
A	1	Sep-14	N Beattie	E Saidi	E Saidi	Planning - DA01

Authorised By:



Date:

16 September 2014

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EXECUTIVE SUMMARY

This waste management plan covers the ongoing management of waste generated by the residential development located at Lord Sheffield Circuit, Thornton, Penrith NSW 2750.

Waste audit and management strategies are recommended for new developments to provide support for the building design and promote strong sustainability outcomes for the building. All recommended waste management plans will comply with council codes and any statutory requirements. The waste management plan has three key objectives:

- i. **Ensure waste is managed to reduce the amount of waste and recyclables to land fill** by assisting residents to segregate appropriate materials that can be recycled; displaying signage to remind and encouraging recycling practices; and through placement of recycling and waste bins in the retail precinct to reinforce these messages.
- ii. **Recover, reuse and recycle** generated waste wherever possible.
- iii. **Compliance** with all relevant codes and policies.

To assist in clean and well-segregated material, building management can work proactively with residents in the following way:

- Building management should ensure their communications achieve a regular and consistent message.
- By-laws: the resident's by-laws should include a requirement to actively participate in recycling/ diversion initiatives implemented within the residential buildings.

INTRODUCTION

The following waste management plan pertains to the proposed mixed development located at Lord Sheffield Circuit, Thornton, Penrith NSW 2750. This waste management plan is an operational waste management plan and will address the phases of the completed

For the purpose of this report the proposed development will consist of:

- Two multi-level buildings named Block A and Block C
- Block A (8 levels) with 64 units, Block C (4 levels) 19 units
- 83 residential units in total

All figures and calculations are based on area schedules as advised by our client and shown on architectural drawings.

PENRITH CITY COUNCIL

The assessment of waste volumes is an estimate only and will be influenced by the development's management and occupant's attitude to waste disposal and recycling.

The residential waste and recycling will be guided by the services and acceptance criteria of the Penrith City Council. The residential waste and recycling will be collected by council.

All waste facilities and equipment are to be designed and constructed to be in compliance with the Penrith City Council, Australian Standards and statutory requirements.

OBJECTIVES

- Facilitate sustainable waste management within the City of Penrith in accordance with the principles of Ecologically Sustainable Development
- Manage waste in accordance with the 'Waste Hierarchy' to:
 - avoid producing waste in the first place;
 - minimise the amount of waste produced;
 - re-use items as many times as possible to minimise waste;
 - recycling once re-use options have been exhausted; and
 - dispose of what is left, as a last resort, in a responsible way to appropriate waste disposal facilities
- Assist in achieving Federal and State Government waste minimisation targets as set out in the *Waste Avoidance and Resource Recovery Act 2001* and *NSW Waste Avoidance and Resource Recovery Strategy 2007*
- Minimise the overall environmental impacts of waste by:
 - encouraging development that facilitate ongoing waste avoidance and complements waste services offered by both Council and/or private contractors;
 - requiring on-site source separation and other design and siting standards which assist waste collection and management services;
 - encouraging building designs and construction techniques that minimise waste generation;
 - maximising opportunities to reuse and recycling building and construction materials as well as other wastes in the ongoing use of a premise; and
 - reducing the demand for waste disposal.



GENERATED WASTE VOLUMES

This assessment of waste volumes is an estimate only and will be influenced by the development's management and occupants' attitude to waste disposal and recycling.

CONSTRUCTION AND DEVELOPMENT WASTE

The head contractor will be responsible for removing all construction-related waste offsite in a manner that meets all authority requirements. Please refer to the separate waste management plan submitted for construction waste as part of the Development Application.

WASTE DEFINITION

Garbage:	all domestic waste (except recyclables and green waste)
Recycling:	glass bottles and jars – PET, HDPE and PVC plastics; aluminium, aerosol and steel cans; milk and juice cartons; soft drink, milk and shampoo containers; paper, cardboard, junk mail, newspapers and magazines.
Green:	garden organics such as small branches, leaves and grass clippings, tree and shrub prunings, plants and flowers, and weeds.
MGB:	Mobile garbage bin
L:	litres

BUILDING MANAGER/ WASTE CARETAKER

All equipment movements in the room are managed by the building manager/ cleaners at all times. No tenants will be allowed to transport waste or recyclables from the waste room; tenants will only transport their waste to the room allocated.

The building manager/ cleaner duties include, but are not limited to, the following:

- General maintenance and cleaning of the chute doors on each level (Frequency will depend on waste generation and will be determined based upon building operation)
- Organising, maintaining and cleaning the general and recycled waste holding areas (Frequency will depend on waste generation and will be determined based upon building operation)
- Transporting of bins as required
- Organising both garbage and recycled waste pick-ups as required
- Cleaning and exchanging all bins
- Ensure site safety for residents, children, visitors, staff and contractors
- Abide by all relevant OH&S legislation, regulations, and guidelines
- Assess any manual handling risks and prepare a manual handling control plan for waste and bin transfers
- Provide to staff/contractors equipment manuals, training, health and safety procedures, risk assessments, and PPE to control hazards associated with all waste management activities.

NOTE: It is the responsibility of the building manager to monitor the number of bins required for the development. As waste volumes may change according to the development's management and occupants' attitudes to waste disposal and recycling, bin numbers and sizes may need to be altered to suit the building operation.

REPORTING

It is recommended that building management ensure that all waste service providers submit monthly reports on all equipment movements and weights of any waste and recycling products removed from the development. Regular reviews of servicing should take place to ensure operational and economic best practise and to assist with sustainability reporting.

EDUCATION

Educational material encouraging correct separation of garbage and recycling items must be provided to each resident to ensure correct use of the garbage and recycling chutes and to ensure an understanding of each chute's use. This should include the correct disposal process for bulky goods (old furniture, large discarded items etc.). It is recommended that information is provided in multiple languages to support correct practises and minimise contamination in the collection MGB as well as chute blockages.

It is also recommended that the development's website contain information for residents to refer to regarding use of the chute. Information should include:

- directions on using the chute doors;
- recycling and garbage descriptions (Council provides comprehensive information);
- how to dispose of bulky goods and any other items that are not garbage or recycling;
- residents' obligations to WHS and building management; and
- how to prevent damage or blockages to the chute (example below).

TO PREVENT DAMAGE OR BLOCKAGE TO RUBBISH CHUTE DO NOT place, umbrellas, bedding, cigarettes, cartons, coat hangers, brooms, mops, large plastic wrappings from furniture, white goods, any sharp objects, hot liquid or ashes, oil, unwrapped vacuum dust, syringes, paint and solvents, car parts, bike parts, chemicals, corrosive and flammable items, soil, timber, bricks or other building materials, furniture, etc. down the chute.

RESIDENTIAL WASTE

Using council's waste generation rates, the total waste generated by the development can be calculated as follows:

Waste: 1 x 240L MGB/4 units - 2:1 compaction
 Recycling: 1 x 240L MGB/2 units uncompact bin
See Appendix 1 for bin dimensions

TABLE 1 – RESIDENTIAL WASTE GENERATION

Building	Units	Waste Bins	2xweekly collections	Recycling Bins
A	64	16 x 240L	8 x 240L	32 x 240L
C	19	5 x 240L	3 x 240L	10 x 240L
Total	83	21 x240L	11 x 240L	42 x 240L

The above assumptions have been taken into consideration for the calculation of these figures:

- Garbage is compacted at the base of each chute (2:1);
- Recycling is also not compacted;
- Full garbage and recycling bins will be transported to the loading dock for collection;
- Number of bins have been rounded up for best operational outcome; and
- Garbage bin numbers based on collections twice weekly/recycling collected weekly

WASTE MANAGEMENT

Council require for any building comprising three or more storeys, as a minimum, a garbage chute system is to be provided for the residential levels of the building.

Every residential level will be supplied with a chute outlet that provides the opportunity to dispose of garbage and recyclable items (dual chutes).

Each building will be supplied with a separate garbage and recycling chute. Each garbage chute will discharge into collection bins placed on a carousel or linear track fitted with a compactor (2:1 compaction). Recycling will discharge into collection bins (not compacted).

All residents will be supplied with a collection area in each unit (generally in the kitchen, under bench) to deposit waste and collect recyclable and compostable material suitable for one days storage. Residents should wrap or bag their waste. It is recommended that bagged garbage should not exceed 3kg in weight.

Recycling must not be bagged. It is recommend that residents use a crate or dedicated bin for collecting recyclables within the allocated residential space provided to ensure correct separation before using the recycling chute system. It is expected that residents will place clean and empty recycling items into the chute when using the recycling chute.

Cardboard furniture boxes or large cardboard containers should not be included in the waste chute – a collection bin should be made available to residents to deposit this material; flattened where possible.

Once putrescible and recyclable waste streams are separated, the resident will carry these to the waste compartment housing the chute door and deposit bagged waste into the garbage chute and loose recyclables into the recycling chute.

Council requires maximum storage area for each waste service compartment and doors are required to open outwards.

GREEN WASTE

There will be green waste generated by the buildings landscaping. Any green waste will be collected and removed from site by the maintenance contractor.

COMPOSTING

An area for composting may be provided on site and made available for residents' use (*see Appendix 1 – Waste Management Equipment*). The siting of composting facilities should consider:

- the location and proximity of dwellings (including those adjoining the subject property), to minimise likely odour impacts/nuisance;
- the location of the drainage system;
- whether the facility is appropriately designed for composting; and
- provision of signposting to ensure inappropriate waste is not added to the compost

Alternately, consideration should be given to providing space for individual home unit worm farms or small compost bins for residents to self-manage. Information on two styles of apartment suitable composting bins are included. (See Appendix 3 – Composting)

COMMON AREAS

Any common areas will be supplied with suitably branded waste and recycling bins. Building management will monitor use and ensure bins are exchanged and cleaned. (See Appendix 1 – Waste Management Equipment)

EWASTE RECYCLING

Recyclable electronic goods include batteries, equipment containing printed circuit boards, computers, televisions, fluorescent tubes and smoke detectors are able to be recycled yearlong at no cost to residents using Council's eWaste recycling centres:

Penrith Landfill: 842 Mulgoa Rd, Mulgoa. Collection Zone is located within the landfill. Phone 4773 8778 for more information and opening hours.

Eastern Creek Landfill: Wallgrove Rd, Eastern Creek. Drop Zone is located within the landfill.

Phone 1300 651 116 for more information and opening hours

No other electronic waste (such as DVD players, game consoles, television speakers) is accepted for recycling at these locations.

Council also holds regular free e-waste drop off days at Jamison Park, Penrith - usually each March and September.

OTHER WASTE STREAMS

A room or caged area must be allocated for the storage of discarded bulky items such as cardboard boxes, furniture and appliances. The allocated space must be a minimum of 8m³ and sign marked appropriately. Residents will liaise with building management regarding all bulky goods movements.

It is also recommended that donations to charitable organisations be encouraged. Clean, sound furniture and household goods etc. are highly sought after to provide for the disadvantaged. Donations will be arranged with the assistance of the building manager/caretaker. (See Useful Contacts)

WASTE ROOM AREAS

For communal waste areas/s:

- if not located at ground level, a pathway must be provided that leads to the waste storage area that does not exceed a maximum gradient of 7% or a maximum travel distance of 30m.
- have an opening of no less than 1.2m, which is free of doors and linked to the development and the adjoining kerbside collection point by suitable pathways to allow ease of access for both resident and contractors. Pedestrian pathways should have a width of at least 1.2m, a gradient of no more than 7% and should not incorporate steps.
- Be covered, with wall constructed to a maximum height of 1.4m above ground level

Each garbage room will need to hold all the bins generated weekly, and allow enough room to clean and safely manoeuvre bins.

COLLECTION OF WASTE

The waste storage and/or collection area must:

- allow 120/240L bins to be wheeled to the street kerb over flat or ramped surfaces with a maximum grade of 7% and not over steps, landscape edging or gutters;
- allow for bulk bins to be wheeled out and be serviced by a front loading garbage truck on a flat surface with a maximum grade of 5%, and not over steps, landscape edges or gutters; and
- be screened or discreetly located away from public spaces.

Where number of bins will not comfortably fit on the street frontage, or characteristics of the site restrict access, collection can be made from the development. There must be sufficient manoeuvring area on-site to allow collection vehicles to enter and leave the site in a forward direction and service the development efficiently with little or no need to reverse.

WASTE CHUTES

The waste and recycling chutes for the residential areas are supplied in either 510mm galvanised steel or 510mm recycled LLDPE plastic with 2-hour fire rated doors. Galvanised steel chute hoppers are wrapped with 50mm poly-wool R1.3 noise insulation foil to assist in noise reduction.

Penetrations on each building level at vertically perpendicular points with minimum penetration dimensions 600mm x 600mm (square or round) are required to accommodate each chute installation.

Chutes must be installed without offsets to achieve best operational outcome for all buildings.

Stainless steel, two-hour fire-rated (AS1530.4-2005) refuse chute doors are to be provided at each service level. All doors are fitted with a self-closing mechanism to meet BSA fire standards.

The chutes must be installed with a wash down system – a supply of a cold waster connection at the top of the chute with on/off valve required (for cleaners to access the chute for cleaning purposes.)

The discharge chute must be fitted with a fire damper so the chute can be closed during servicing and changeover of bins.

All chutes must be installed in a fire rated shaft and waste room as per BCA requirements. Note: Typical standard drawings have been included in the Appendices 3 and 4.

GARBAGE ROOMS CONSTRUCTION REQUIREMENTS

The garbage room will be required to contain the following facilities to minimise odours, deter vermin, protect surrounding areas, and make it a user-friendly and safe area:

- Waste room floor to be sealed with a two pack epoxy
- Waste room walls and floor surface is flat and even
- All corners coved and sealed 100mm up, this is to eliminate build-up of dirt
- For residential: a hot and cold water facility with mixing facility and hose cock must be provided for washing the bins
- For retail/commercial: a cold water facility with hose cock must be provided for washing the bins
- Any waste water discharge from bin washing must be trained to sewer in accordance with the relevant water board.
- Tap height of 1.6m
- Storm water access preventatives (grate)
- All walls painted with light colour and washable paint
- Equipment electric outlets to be installed 1700mm above floor levels
- The room must be mechanically ventilated
- Light switch installed at height of 1.6m
- Waste rooms must be well lit (sensor lighting recommended)
- Optional automatic odour and pest control system installed to eliminate all pest types. This process generally takes place at building handover – building management make the decision to install.
- All personnel doors are hinged and self-closing
- Waste collection area must hold all bins – bin movements should be with ease of access
- Conform to the Building Code of Australia, Australian Standards and local laws
- Childproofing and public/operator safety shall be assessed and ensured

SIGNAGE

The building manager/caretaker is responsible for waste room signage including safety signage.

Appropriate signage must be prominently displayed on walls and above all bins, clearly stating what type of waste or recyclables is to be placed in the bin underneath. (*See Appendix 2 – Signage*)

All chute doors on all levels will be labelled with a sign stating '*GARBAGE ONLY IN THE CHUTE*' Or '*RECYCLING ONLY IN THE CHUTE*'. Separate signage will direct chute operations and encouraging occupants to recycle and minimise their waste.

VENTILATION

Waste and recycling rooms must have their own exhaust ventilation system. Council prefers natural ventilation where possible.

- Naturally - permanent, unobstructed, and opening direct to the external air, not less than one-twentieth (1/20) of the floor area.

- Mechanically - exhausting at a rate of 5L/m² floor area, with a minimum rate of 100L/s minimum, or

Mechanical exhaust systems shall comply with AS1668 and not cause any inconvenience, noise or odour problem.

STORM WATER PREVENTION & LITTER REDUCTION

Building management shall be responsible for the following to minimise dispersion of site litter and prevent stormwater pollution to avoid impact to the environment and local amenity:

- promote adequate waste disposal into the bins
- secure all bin rooms (whilst affording access to staff/contractors)
- prevent overfilling of bins, keep all bin lids closed and bungs leak-free
- take action to prevent dumping or unauthorised use of waste areas
- ensure collection contractors clean-up any spillage that may occur when clearing bins

ADDITIONAL INFORMATION

Transfer of waste and all bin movements require minimal manual handling therefore the operator must assess manual handling risks and provide any relevant documentation to building management. If required, a bin-tug, trailer or tractor consultant should be contacted to provide equipment recommendations. Hitches may require installation to move multiple bins to the collection area. Council must be informed of any hitch attachments required to be installed on bins.

LIMITATIONS

The purpose of this report is to document a Waste Management Plan as part of a development application and is supplied with the following conditions:

- Drawings and information supplied by the project architect
- The figures presented in the report are an estimate only. The actual amount of waste generated will be dependent on the occupancy rate of the building/s and waste generation intensity as well as the building managements approach to waste management.
- The building manager will make adjustments as required based on actual waste volumes (if waste is greater than estimated) and increase the number of bins and collections accordingly.
- The report will not be used to determine or forecast operational costs or prepare any feasibility study or to document any safety or operational procedures.
- Any manual handling equipment should be provided at the recommendation of the appropriate equipment provider who will assess the correct equipment for supply.



USEFUL CONTACTS

Penrith City Council
Customer Service: 02 4732 7777
Waste Hotline: 1800 734 735
Email: council@penrithcity.nsw.gov.au

SULO MGB (MGB, Public Place bins, tugs and bin hitches)
Phone: 1300 364 388

RUD (Public place bins, recycling bins)
Phone: 07 3712 8000
Info@rud.com.au

Closed Loop (organic dehydrator/recycled cup product)
Phone: 02 9339 9801

National Association of Charitable Recycling Organisations Inc. (NACRO)
Phone: 03 9429 9884
Email: information@nacro.org.au

Purifying Solutions (odour control)
Phone: 1300 636 877 (1300 ODOURS)
sales@purifyingsolutions.com.au

Elephants Foot Recycling Solutions (Chutes, compactor and eDiverter systems)
44 – 46 Gibson Avenue
Padstow NSW 2211
Free call: 1800 025 073
Email: natalie@elephantsfoot.com.au

Note: Elephants Foot Recycling Solutions does not warrant or make representation for goods or services provided by suppliers

APPENDIX 1 – WASTE MANAGEMENT EQUIPMENT

MGBs with capacities up to 1700L should comply with the Australian Standard for Mobile Waste Containers (AS 4123). AS 4123 specifies standard sizes and sets out the colour designations for bodies and lids of mobile waste containers that relate to the type of materials they will be used for.

Indicative sizes only for common MGB sizes are provided below. Note that not all MGB sizes are shown; the dimensions are only a guide and differ slightly according to manufacturer, if bins have flat or dome lids and are used with different lifting devices. Refer to AS 4123 for further detail.



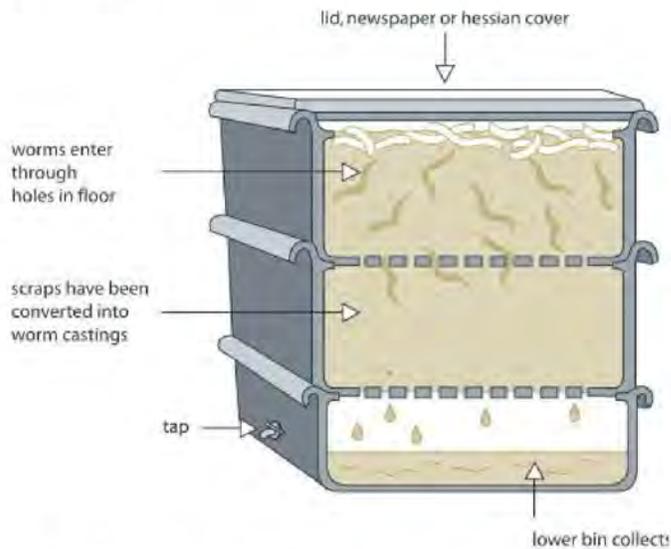
Bin Type	80 Litre MGB	120 Litre MGB	140 Litre MGB	240 Litre MGB	360 Litre MGB
Height	870 mm	940 mm	1065 mm	1080 mm	1100 mm
Depth	530 mm	560 mm	540 mm	735 mm	885 mm
Width	450 mm	485 mm	500 mm	580 mm	600 mm



Dome or flat lid containers

Bin Type	660 Litre MGB	770 Litre MGB	1100 Litre MGB	1300 Litre MGB	1700 Litre MGB
Height	1250	1425	1470	1480	1470
Depth	850	1100	1245	1250	1250
Width	1370	1370	1370	1770	1770

WORM FARMS



Space requirements for a typical worm farm for an average household:

Height – 300mm per level

Width – 600mm

Length – 900mm

There are many worm farm arrangements. The above dimensions are indicative only.

Source: Department of Environment and Climate Change NSW 2008, *Better Practice Guide for Waste Management in Multi-Unit Dwellings*



Typical Apartment Compost bin (See Useful Contacts)

Suitable for:

- Vegetables
- Coffee grounds and filters
- Tea and tea bags
- Crushed eggshells (but not eggs)
- Nutshells
- Houseplants
- Leaves
- Cardboard rolls, cereal
- Boxes, brown paper bags
- Clean paper
- Shredded newspaper
- Fireplace ashes
- Wood chips, sawdust,
- Toothpicks, burnt matches
- Cotton and wool rags
- Dryer and vacuum cleaner lint
- Hair and fur
- Hay and straw

Electric organic compost bin (See Useful Contacts)

Decomposition Method	Aerobic fermentation by microorganisms
Decomposition Capacity	2 metric tonnes per year** (4 kg per day**)
Rating	220-240 V 50/60 Hz - 1.1 A
Decomposition Time	24 hrs
Operating Temperature	0°C and 40°C***
Deodorisation Method	Nano-Filter system
Maximum Power	210 W
Weight	21 kgs
External Dimensions	w 400 mm d 400 mm h 780 mm

- * Excludes scallop and oysters shells and large bones.
- ** Food Waste Handling Capacity – based on an optimal operating environment.
- *** Ambient temperature range of area where unit may be installed.



APPENDIX 2 –SIGNAGE FOR WASTE AND RECYCLING BINS

WASTE SIGNS

Signs for garbage, recycling and organics bins should comply with the standard signs promoted by the Department of Environment and Heritage.

Example wall posters



Example bin lid stickers



SAFETY SIGNS

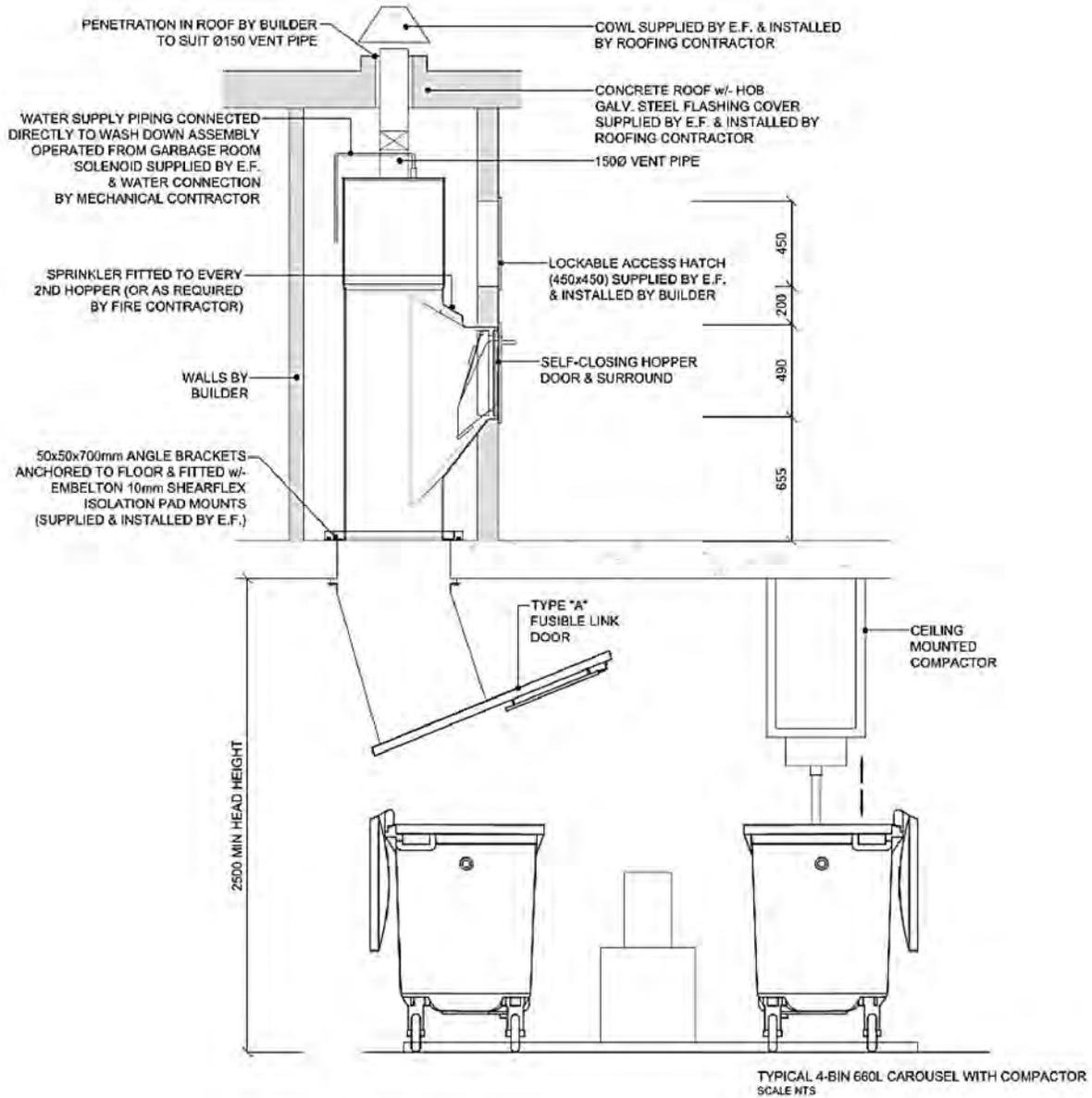
The design and use of safety signs for waste rooms and enclosures should comply with AS1319 Safety Signs for Occupational Environment. Safety signs should be used to regulate and control safety behaviour, warn of hazards and provide emergency information, including fire protection information. Below are some examples. Each development will need to decide which signs are relevant for its set of circumstances and service provided.

Examples of Australian Standards:



Australian Standards are available from the SAI Global Limited website (www.saiglobal.com).
Source: *Better Practice Guide to Waste Management in Multi-Unit Dwellings*, 2008, DECC

APPENDIX 3 – TYPICAL WASTE CHUTE



APPENDIX 4 – TYPICAL CAROUSEL SYSTEM

VENT:

PVC 150MM DIAMETER VENT PIPE WITH COWL, DEK TITE FLASHING AND EXTRACTION CAP FITTED FROM THE TOP OF THE CHUTES. PIPE EXITS AS PER REQUIRED BY BUILDER THROUGH PLANT ROOM ROOF AND CAPPED WITH GALVANISED STEEL REDUCTION CAP. ACCESS HATCH TO BE SUPPLIED ON LAST LEVEL FOR SERVICING OF THE WASH DOWN SYSTEM

CHUTE DOORS

SUPPLY AND FIT STAINLESS STEEL, TWO HOUR FIRE-RATED (AS1530.4-2005) REFUSE CHUTE DOORS AND THROAT ASSEMBLIES AT EACH SERVICE LEVEL. ALL DOORS ARE FITTED WITH A SELF-CLOSING MECHANISM TO MEET BSA FIRE STANDARDS. DOORS TO BE BLOCKED IN BY OTHERS INSTALLATION OF DOORS ON COMPLETION OF THE BUILDING STRUCTURE. THE CHUTE PIPES BRICKED IN, RENDERED AND THE WALLS PAINTED.

FIRE

FIRE SYSTEM CONTRACTOR TO:

- SUPPLY FIRE SPRINKLERS AND CONNECTION FOR SPRINKLER SYSTEM
- SPRINKLERS FITTED ON EVERY 2ND LEVEL (OR AS PER FIRE CONTRACTOR INSTRUCTION)

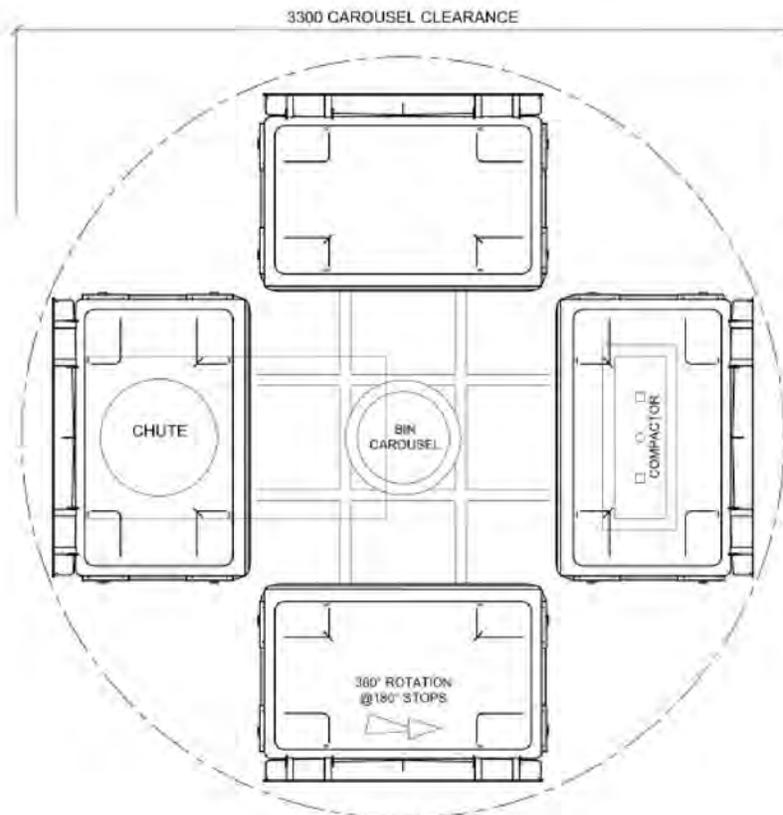
ELECTRICAL

YOUR ELECTRICIAN TO PROVIDE:

- ONE (1) STANDARD 240V GPO IN MAIN GARBAGE ROOM
- ONE (1) 415VOLTS, 5 PINS, 20AMPS FOR EACH REQUIRED COMPACTOR, CAROUSEL OR LINEAR
- COORDINATE WITH ELECTRICAL SUBCONTRACTOR

OPTIONAL EQUIPMENT

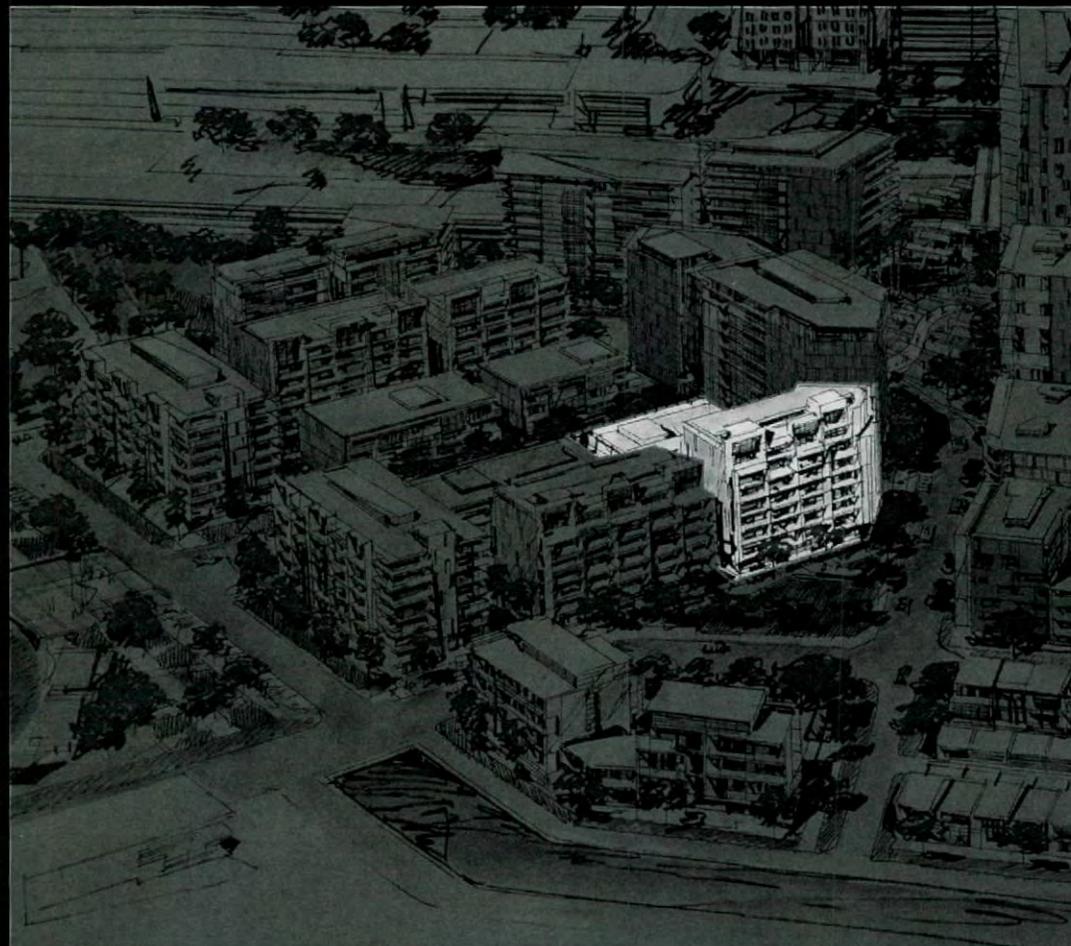
ELEPHANTS FOOT SUPPLY BALERS SUITABLE FOR BALING CARDBOARD PRODUCT IN COMMERCIAL, RETAIL AND RESIDENTIAL AREAS. BALED PRODUCT REDUCES THE REQUIREMENTS FOR ADDITIONAL COLLECTION EQUIPMENT. STATE OF THE ART COMPACTORS ARE ALSO AVAILABLE IN AUGER, BLADE AND ECO MODELS.



Thornton Central

DA01 Landscape Design Report

Development Application
Lord Sheffield Circuit, Thornton



CLIENT: Thornton North Penrith Pty Ltd
ARCHITECT: dKO Architecture

STATUS: DA SUBMISSION
ISSUE: A
DATE: 15 SEPTEMBER 2014



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THORNTON LANDSCAPE MASTER PLAN STRATEGY

Introduction

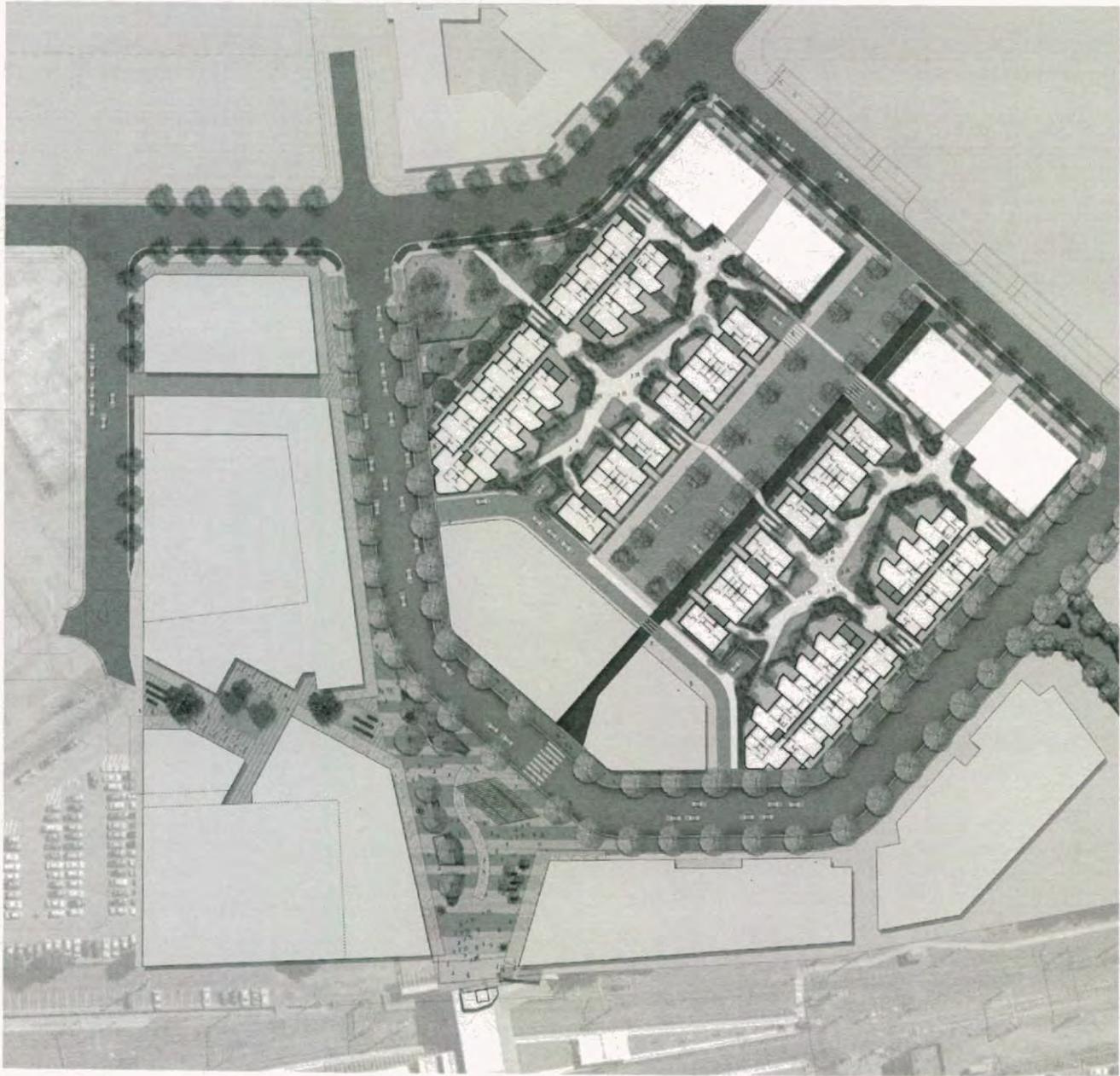
The public domain for Thornton Central will be largely formed by a rich network of public spaces at ground level, bounded by the railway line and station to the south, Lord Sheffield Circuit to the north and the proposed retail/commercial buildings to the eastern and western edges of Station Plaza.

Vision

There is a tremendous opportunity for the development to contribute meaningfully to the local community through a new integrated urban design footprint. The Station Plaza and adjacent pedestrian plaza links can contribute substantially to the social, economic and cultural fabric of the surrounding neighbourhood and those communities beyond, in the greater Penrith area.

This design theme will:

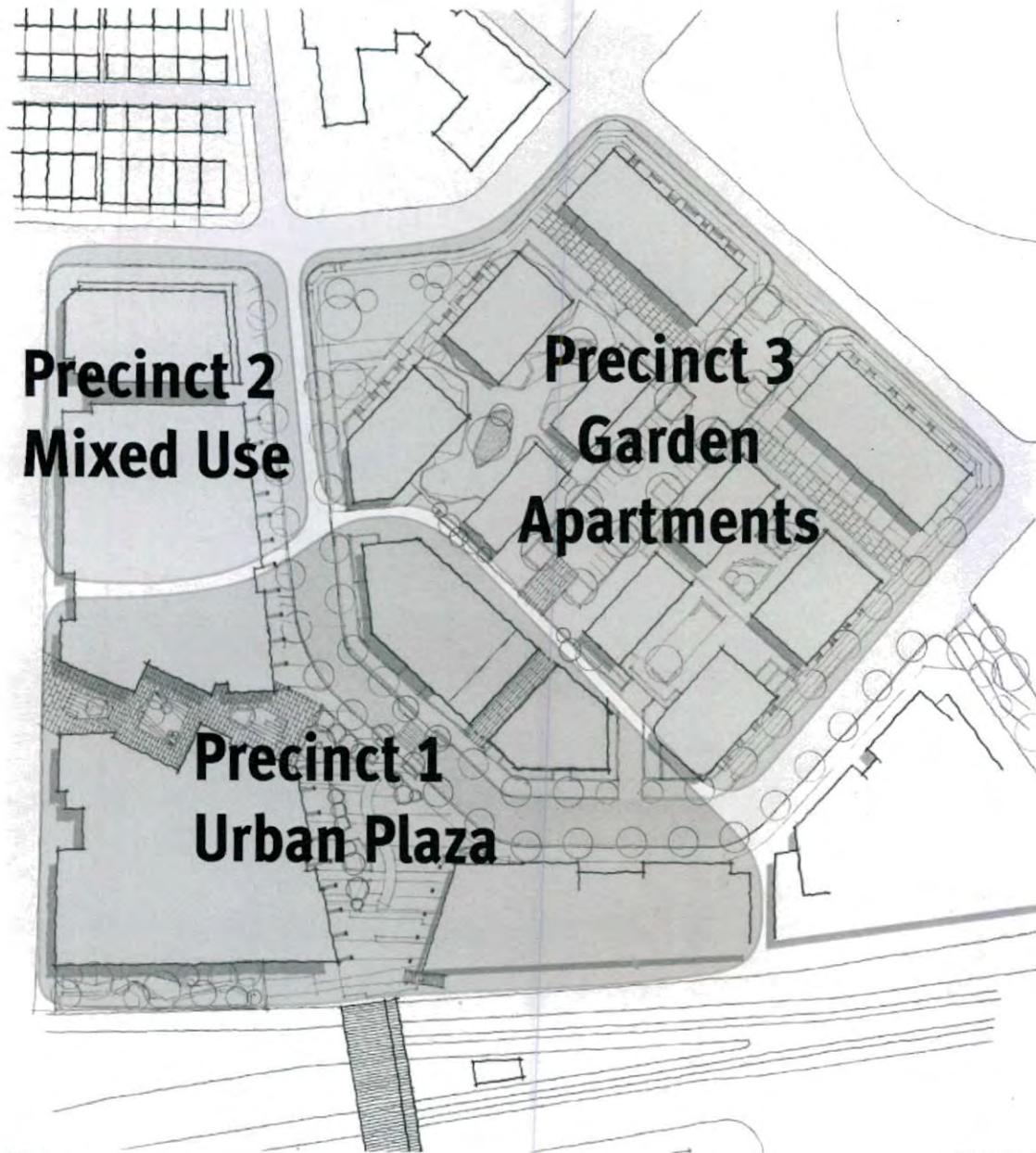
- Create an optimistic public open space for the people of Thornton and surrounding neighbourhoods with distinct landscape themes – Central Station Plaza, Pedestrian Plaza Links, Café Terraces and Promenades, pedestrian priority streetscapes and Podium Sky Gardens.
- Facilitate opportunities for passive, active, programmed and unprogrammed activities.
- Generate a strong sense of 'place' – that befits the location
- Promote ecological corridors – creating 'Urban Lungs' to improve the value of the natural environment through water re-use and filtration and promoting green links.
- Integrate a public transport corridor with pedestrian and cycleway connections to provide a truly multi-modal transport hub.



Draft Master Plan



THORNTON PRECINCT PLAN AND STAGING PLAN



The overall master plan is comprised of three distinctly identifiable precincts as illustrated in the image left:

- Precinct 1 - Urban Plaza;
- Precinct 2 - Mixed use, and;
- Precinct 3 - Garden Apartments.

The implementation of the master plan comprises stages 1 to 7A as illustrated in the image below. The subject site referred to in this Report apply to DA01 (formerly Stage 1A) of the Thornton Masterplan.



Precinct Plan

Image source: dKO Architecture, 2014

Staging Plan

Image source: dKO Architecture, 2014



THORNTON DA01 LANDSCAPE DESIGN STATEMENT

FUTURE
DEVELOPMENT SITE,
DP3006

DA02, DP3007

DA01, DP3007

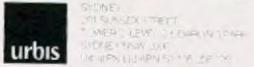
FUTURE
DEVELOPMENT SITE,
DP3008

Landscape Objectives

The landscape design responds to Council Landscape Objectives which are to:

- Ensure that landscape design reinforces the principles of Ecologically Sustainable Development;
- Promote landscape design and planning as part of a fully integrated approach to site development;
- Ensure landscape design takes into account the site's context, landscape and visual character, existing landscape features and amenity, both at the local and regional scale;
- Encourage the development of quality landscape design associated with new development that is consistent with industry best-practice;
- Encourage the retention of existing trees and vegetation to enhance landscape character;
- Ensure landscape design adequately complements the proposed built form and minimises the impacts of scale, mass and bulk of the development in its context;
- Encourage landscape design that can be effectively maintained to a high standard for the life of that development; and
- Establish a framework for allowing "Controlled Private Certification" of the landscape design components of new developments

Note:
 All Streetscape/ Public Realm Landscape has been approved and is under Construction



Site Context

The site subject to this report is located approximately 130 metres north of Penrith Railway Station. It forms DA01 of the proposed Thornton Urban Village, situated within Precinct Three, 'Garden Apartments' of the overall master plan.

The proposed development within DA01 has an activated frontage to McHenry Place, which is envisioned to serve as a small pocket park to provide the community with a passive recreation amenity, closely situated north-west of the proposed apartments. The main emphasis of McHenry Place is:

"the use of low maintenance plants with a large area of open space suitable for passive recreation with multiple seating opportunities and the provision of a small sloped sunning lawn for quiet contemplation or activation with small gatherings. Eucalyptus trees have been proposed within the open space as a small recognition of the previous inhabitants of this parks location and the greater Cumberland Plain Woodland" (UrbanGrowth 2014)

The site is accessible by car via the proposed 'Central Parking Street' from Aviators Way and the proposed laneway from Lord Sheffield Circuit, the main circuitous route that services the overall development. The streetscape proposed for Lord Sheffield Circuit will be:

"a predominant focus on the appropriate mix of formal and native plant species used through out the site. Overall, a leafy, deciduous character to the streetscapes will aid in the enforcement of a European styled village character". (UrbanGrowth, 2014)

The site's walkable catchment includes: Penrith Railway Station, Westfield Shopping Centre, Penrith CBD, Smith's Paddock and Thornton Hall.



Development Proposal

The development for DA01 of the Thornton North Masterplan comprises 83 apartments. Its landscape amenity is characterised by three typologies:

1. Communal Landscape Courtyards;
2. Private Courtyards, and;
3. Streetscape

LANDSCAPE CHARACTER

The underlying principles from which the landscape concept has been developed are set out below. The design approach to the landscape has been to:

- Create edges which both define the public realm and provide a dynamic experience.
- Provide a garden setting that is integrated with the surrounding built and natural environments;
- Provide through site linkages to McHenry Place, Lord Sheffield Circuit, 'Central Parking Street' and surrounding development;
- Enhance the arrival experience to the residential apartments;
- Clearly define the visual and physical connection to the streetscape adjacent 'Central Parking Street'.
- Provide high quality residential amenity to the development to help facilitate a strong sense of ownership and community. Programs include open recreational lawn area, seating areas and sensory gardens;
- Provide an understory layer of planting that achieves a level of

screening that is lush and green in appearance.

- Provide a movement network within the podium landscape that has a dynamic urban language with more intimate landscape experiences within private courtyards and at entry points.
- Delivering fully functional and legible treatments to the residential Roads. Park spaces at key locations create community and natural nodes, tying in with the surroundings and creating a sense of journey and destination to the whole development. In this way, a sensitive and appropriate standard of landscape design is maintained.

Landscape Masterplan

DESIGN RESPONSE:

- To generate a strong sense of 'place' by providing a passive, active, programmed and un-programmed spaces.
- Green interweaving into the urban fabric from residential apartments;
- Common landscape spaces are linked into a network of spaces (destinations)
- Landscape edges provide contrasting materials, defining level transitions and private spaces
- A serene, modern environment to private courtyards;
- Shade trees, seating benches and lighting define the paths through the site. These elements will be developed during the detail design stages;
- All paving materials and furniture would be subject to relevant Australian Standards.



LIGHTING

The proposed lighting will:

- Provide appropriate levels of lighting of public spaces such as driveways, gardens and through site links;
- Provide appropriate lighting and visibility of entries to dwellings;
- Be developed to provide maximum nocturnal programming opportunities
- Be designed to meet relevant Australian Lighting Standards. Integrated landscape lighting is proposed to all the landscape elements (benches, feature trees), the pathways will be lit by low level bollards and directional in-ground lights.

WATER MANAGEMENT

Water Sensitive Urban Design (WSUD) principals have been realised into the landscape design in a way that celebrates a sustainable water cycle.

- Water sourced from the onsite rainwater collection will be used for the landscape irrigation, all irrigation systems will comprise of subsurface drip systems and automatic timers with rainwater / soil moisture sensor controls;
- Where possible storm water runoff will be directed to the lawn and garden beds on the "Residential Sky Gardens";
- Irrigation will be provided to all soft landscape areas and will be specified within the tender package;
- Low water demand shrub planting is proposed.

PLANT ESTABLISHMENT MAINTENANCE

Maintenance works includes but is not limited to:

- Inspection of soil moisture levels and replenishment as necessary.
- Inspection for and control of soil and insect pests, diseases and other such infestations
- Pruning and repair of all branches and foliage, removal of debris and soil surface and addition of soil and / or mulch to soil surface.
- Maintenance of proper growing medium nutrient levels to ensure maximum vegetation health. A suitable list of health characteristics is to be provided by an agreed specialist and testing is to be maintained on a minimum yearly basis.
- Lawn to be mowed to maintain a leaf blade height of no greater than 50mm.
- Replacement of plants that fall below plant presentation standards for any cause.
- Monitoring and maintenance of efficiency and effectiveness of irrigation system.
- Control of pests and diseases infestation shall be in strict accordance with all regulations and manufactures recommendations. Supply documentation of such compliance upon request by responsible authority.

SAFETY AND SECURITY

An integrated approach to safety will improve actual and perceived personal security in pedestrian public domain areas:

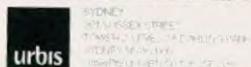
- Pedestrian routes will be continuous and without dead ends;
- All paths are overlooked from adjoining buildings and adjacent streets which will provide a high level of passive surveillance;

- All external spaces will have multiple clear sight lines without obstacles, proposed shrub planting is low level which will prevent places to hide;
- All paths will be well lit at night time and designed to meet relevant Australian Lighting Standards;
- Low-level lighting shall be provided to common areas of the development and be in accordance with AS 4282 to ensure external light does not spill onto adjoining properties.
- Signage will be provided across the precinct to assist with wayfinding and navigation through the site.
- Irrigation will be provided to all soft landscape areas.

ACCESSIBILITY

The landscape design will comply in accordance with the Federal Disabilities Discrimination Act 1992, the NSW Anti Discrimination Act 1977, the Disability (Access to Premises - Buildings) Standards 2010, and all relevant Australian Standards. The following design elements have been considered in the landscape proposal to ensure equal access for people with disabilities:

- Pedestrian routes;
- Tactile warning strips with a strong contrast to adjoining paving;
- Stairways/steps;
- Landings;
- Ramps;
- Handrails;
- Seating;
- Lighting; and
- Signage.



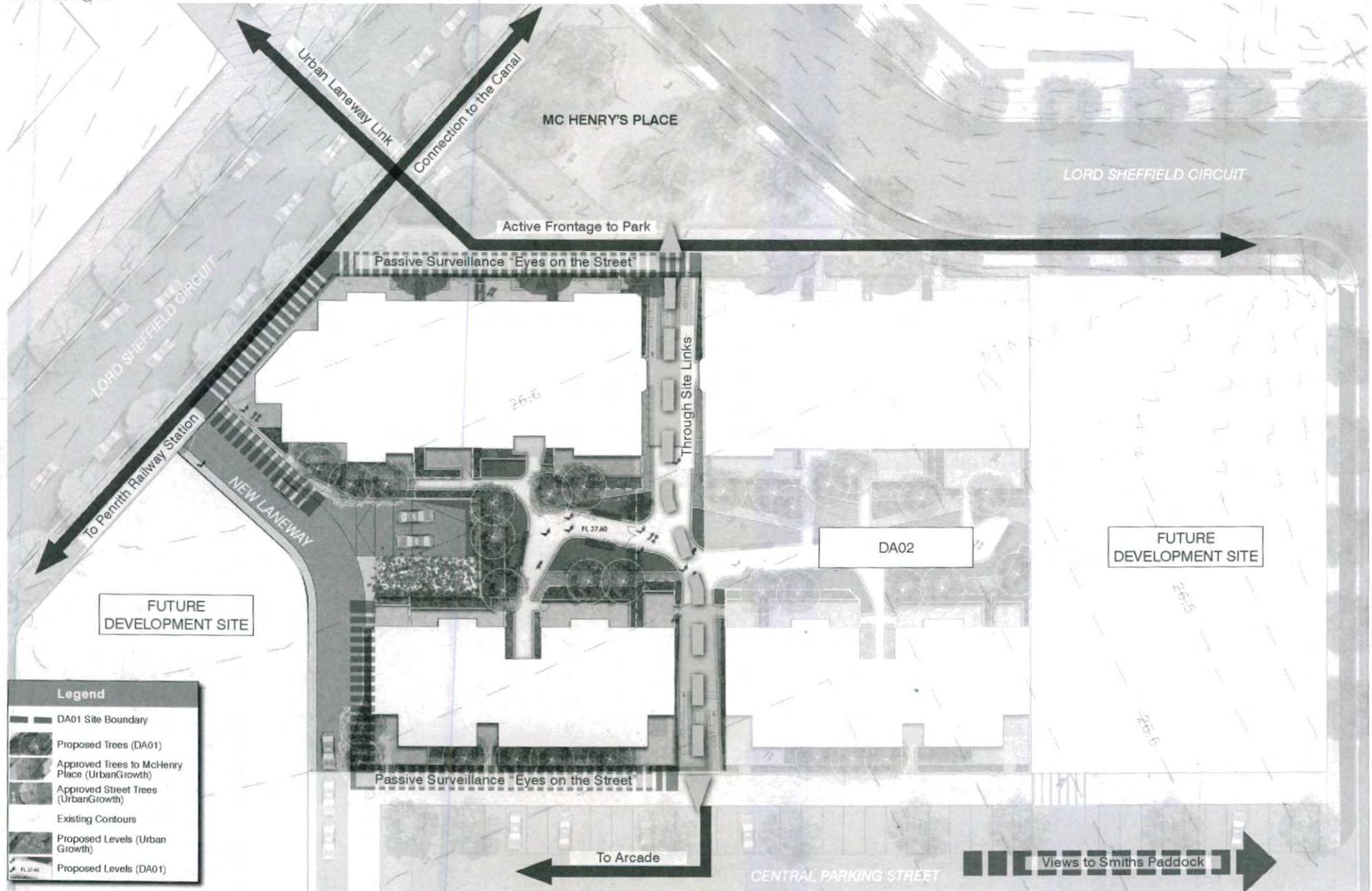
Thornton Central - Lord Sheffield Circuit, Thornton

DA01 - Landscape Design Report

PROJECT NO: 1010111
TYPE: Landscape Architecture
DATE: 25/04/2014
ISSUE: 1
PAGE NO: 1

DA01 LANDSCAPE SITE ANALYSIS PLAN

Scale 1:200 @ A1



Legend

- DA01 Site Boundary
- Proposed Trees (DA01)
- Approved Trees to McHenry Place (UrbanGrowth)
- Approved Street Trees (UrbanGrowth)
- Existing Contours
- Proposed Levels (Urban Growth)
- Proposed Levels (DA01)

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 201 ST JOSEPH STREET
 TORONTO, ONTARIO M5R 1A5
 PH: (416) 593-9300
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Thornton Central - Lord Sheffield Circuit, Thornton

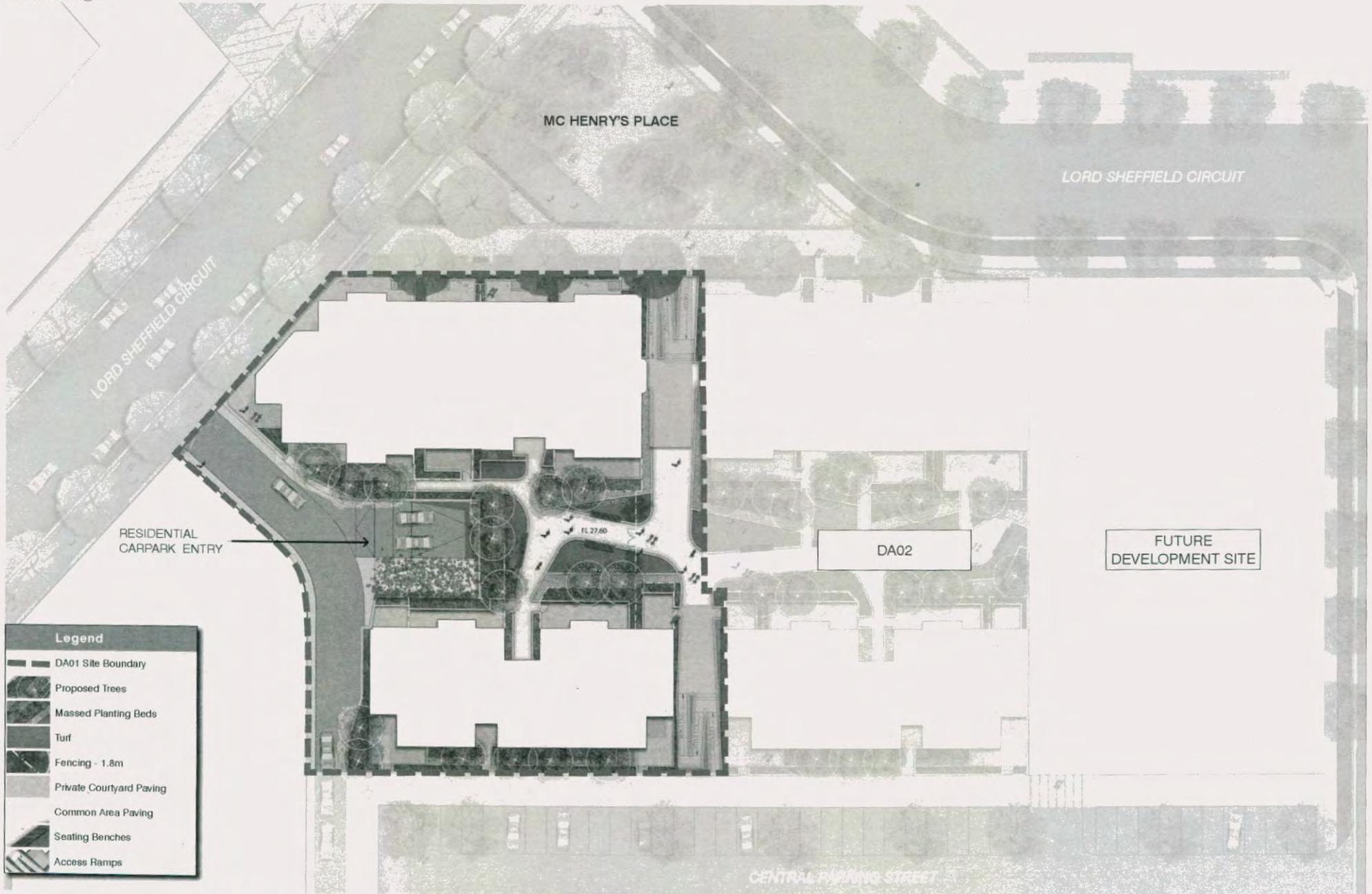
DA01 - Landscape Design Report



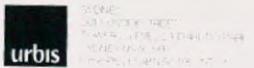
PROJECT NO: 121111
 TYPE: Landscape Design
 DATE: 15/10/2014
 ISSUE: 1
 PAGE NO: 1

DA01 LANDSCAPE PLAN

Scale 1:200 @ A1



Legend	
	DA01 Site Boundary
	Proposed Trees
	Massed Planting Beds
	Turf
	Fencing - 1.8m
	Private Courtyard Paving
	Common Area Paving
	Seating Benches
	Access Ramps



Thornton Central - Lord Sheffield Circuit, Thornton

DA01 - Landscape Design Report

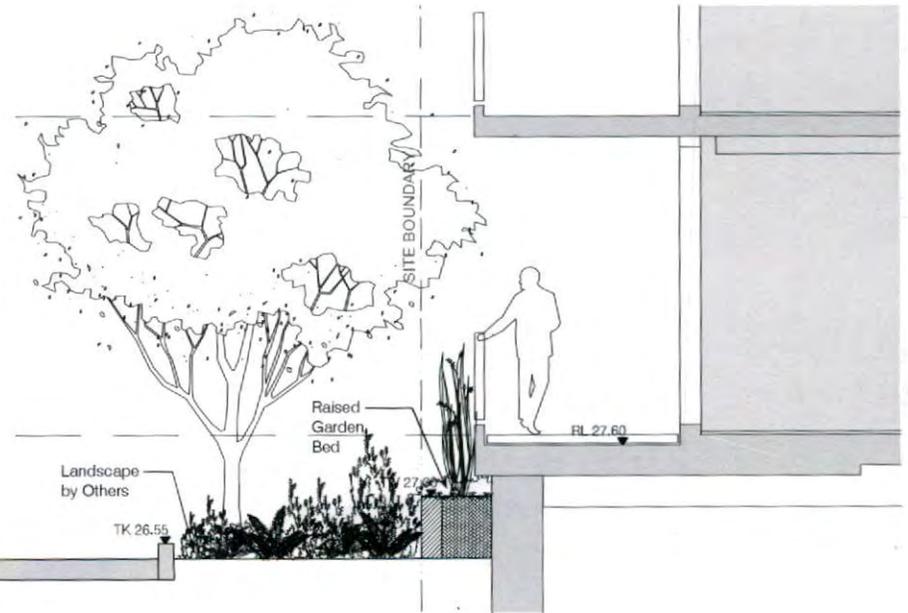


PROJECT NO.	DATE	ISSUE	PAGE NO.

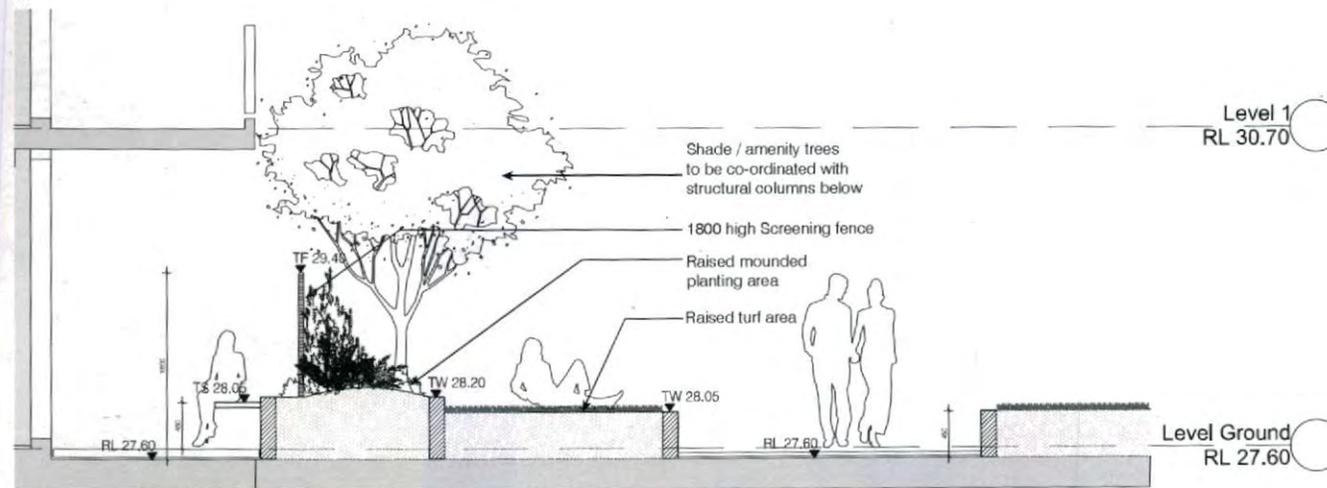
DA01 TYPICAL LANDSCAPE SECTIONS

Level 1
RL 30.70

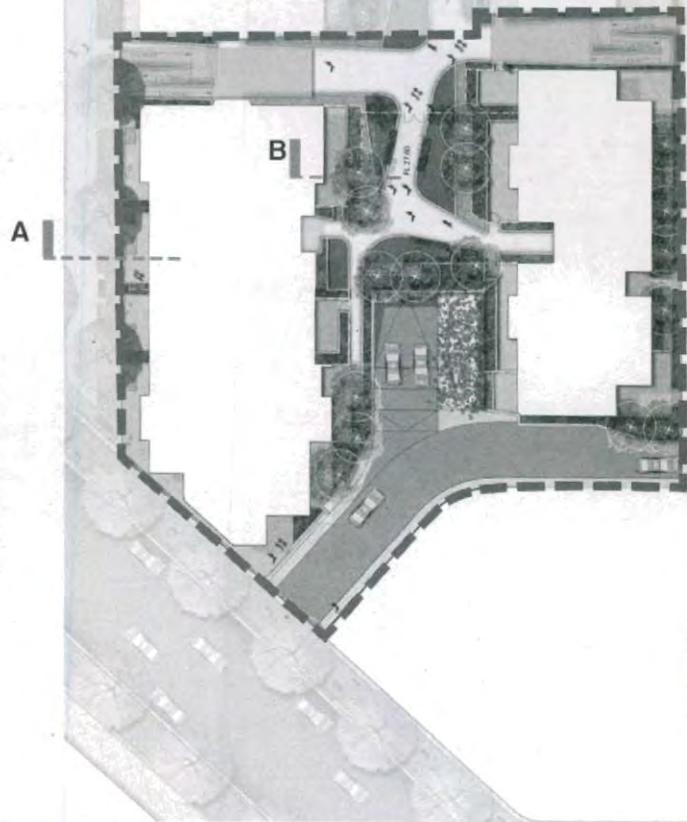
Level Ground
RL 27.60



SECTION A SCALE 1:50



SECTION B SCALE 1:50



INDICATIVE PLANTING STRATEGY

Species Selection

Plants have been chosen for their contrasting form, foliage and colour, promoting a diversity of trees and understory planting. Responding to the proposed streetscape planting on the site, the surrounding context and climatic conditions, we have proposed a combination of exotic and native plants, providing a strong connection to the surrounding streets.

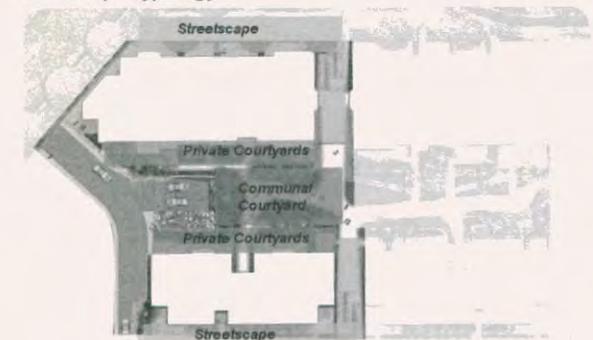
Proposed trees are primarily located along the new footpaths, providing shade to the walkways and seating benches on these circulation routes, the overall planting theme is to provide year round colour and vibrancy.



Botanical Name	Common Name	Height & Spread at Maturity (m)
STREETSCAPE AND PODIUM TREES		
<i>Acacia elata</i>	Cedar Wattle	20.0 x 10.0
<i>Acacia fimbriata</i>	Fringed Wattle	15 x 10.0
<i>Eucalyptus fibrosa</i>	Broad-leaved Red-Ironbark	20.0 x 15.0
<i>Eucalyptus maculata</i>	Spotted Gum	20.0 x 15.0
<i>Eucalyptus microcarpa</i>	Grey Box	20.0 x 15.0
<i>Eucalyptus sclerophylla</i>	Hard-leaved Scribbly Gum	20.0 x 15.0
<i>Fraxinus griffithii</i>	Flowering Ash	6.0 x 4.0
<i>Magnolia grandiflora</i>	Magnolia 'little gem'	5.0 x 2.5
<i>Melaleuca linearifolia</i>	Snow-in-Summer	10.0 x 6.0
<i>Melaleuca styphelioides</i>	Prickly Paperbark	12.0 x 6.0
<i>Melia azedarach</i>	White Cedar	10.0 x 10.0
<i>Prunus x blireana</i>	Double-pink Flowering Plum	4.0 x 4.0
<i>Robinia x ambigua 'Decaisneana'</i>	Pink robinia	8.0 x 5.0
<i>Syzygium australe</i>	Bush Cherry	10.0 x 8.0
<i>Tristania laurina</i>	Water Gum	12.0 x 8.0
SHRUBS AND HEDGES		
<i>Callistemon 'Captain Cook'</i>	Bottlebrush	4.0 x 3.0
<i>Callistemon 'Hannah Ray'</i>	Bottlebrush	2.5 x 2.0
<i>Callistemon 'Harkness'</i>	Gawler Hybrid / Bottlebrush	6.0 x 4.0
<i>Gardenia augusta</i>	Gardenia	2.0 x 1.0
<i>Grevillea 'Coconut Ice'</i>	Grevillea	2.0 x 2.0
<i>Grevillea 'Honey Gem'</i>	Grevillea	1.0 x 0.75
<i>Grevillea 'Ivanhoe'</i>	Grevillea	5.0 x 3.0
<i>Grevillea 'Superb'</i>	Grevillea	1.5 x 2.0
<i>Grevillea juniperina</i>	Grevillea	1.5 x 0.5
<i>Grevillea 'Pink Surprise'</i>	Grevillea	2.0 x 3.0
<i>Grevillea linearifolia</i>	Grevillea	2.0 x 2.0
<i>Grevillea rosmarinifolia</i>	Grevillea	0.5 x 2.0
<i>Leptospermum petersonii</i>	Lemon Scented Tea Tree	4.0 x 2.0
<i>Leptospermum flavescens</i>	Tea Tree	2.0 x 2.0
<i>Westringia fruticosa</i>	Coastal Rosemary	1.5 x 1.5
<i>Westringia longifolia</i>	Long Leaf Westringia	3.0 x 3.0

Botanical Name	Common Name	Height & Spread at Maturity (m)
PODIUM LANDSCAPE ONLY		
<i>Camellia sasanqua</i>	Camellia	2.0 x 1.0
<i>Daphne odora</i>	Winter Daphne	3.0 x 1.5
<i>Gardenia augusta</i>	Gardenia	2.0 x 1.0
<i>Leucadendron 'Sundance'</i>	Conebushes	1.5 x 1.5
<i>Nandina domestica</i>	Sacred Bamboo	1.8 x 1.5
<i>Nandina domestica 'Nana'</i>	Dwarf Sacred Bamboo	1.2 x 1.0
<i>Syzygium paniculatum 'Nana'</i>	Dwarf Bush Cherry	3.0 x 1.5
<i>Viburnum tinus</i>	Laurustinus	2.5 x 2.0
<i>Westringia fruticosa</i>	Coastal Rosemary	1.5 x 1.5
TREE FERNS + ACCENT PLANTS TO COURTYARDS		
<i>Lobelia gibberoa</i>	Lobelia	3.5 x 4.0
<i>Agave Americana Marginata M Variegated</i>	Variagated Octopus Agave	1.8 x 1.8
<i>Cyathea australis</i>	Black / rough Tree Fern	12.0 x 3.5
<i>Dicksonia antarctica</i>	Brown / Soft Tree Fern	15.0 x 6.0
GROUND COVERS, BULBS AND CLIMBERS		
<i>Agapanthus africanus</i>	Blue African Lily	0.6 x 0.6
<i>Helichrysum citrispinum</i>		0.3 x 0.4
<i>Iris pseudacorus</i>	Yellow Flag	1.0 x 0.5
<i>Narcissus 'King Alfred'</i>	Daffodil	0.6 x 0.2
<i>Jonquil etlicheer</i>	Jonquil	0.4 x 0.2
<i>Stachys byzantina</i>	Lamb's Ears	2.5 x 4.0
<i>Wisteria floribunda</i>	Japanese Wisteria	6.0 x 3.0
<i>Hedera helix</i>	European Ivy	Varies

Landscape Typology



INDICATIVE PLANTING PALETTE

TREES (Australian Native or Endemic to Penrith)



Acacia elata



Acacia elata



Acacia fimbriata



Eucalyptus fibrosa



Melaleuca linariifolia



Eucalyptus microcarpa



Eucalyptus microcarpa



Eucalyptus maculata



Eucalyptus maculata



Melaleuca linariifolia



Eucalyptus sclerophylla



Eucalyptus sclerophylla



Melaleuca styphelioides



Melaleuca styphelioides



Tristaniopsis laurina

INDICATIVE PLANTING PALETTE

TREES (Exotic Species)



Fraxinus griffithii



Fraxinus griffithii



Melia azedarach



Magnolia grandiflora



Prunus x blireana

SHRUBS



Callistemon 'Captain Cook'



Callistemon 'Hannah Ray'



Westringia fruticosa



Gardenia augusta



Grevillea 'Coconut Ice'



Grevillea 'Honey Gem'



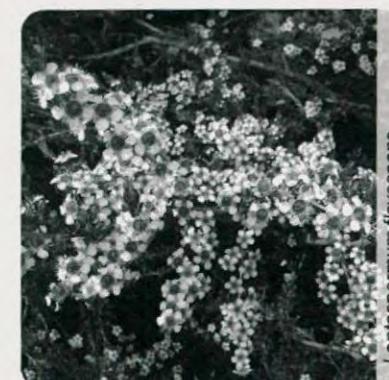
Grevillea 'Ivanhoe'



Grevillea linearifolia



Grevillea rosmarinifolia

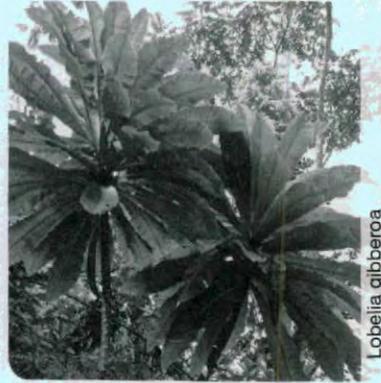


Leptospermum flavescens

ACCENT + TREE FERNS



Agave Americana Marginata M Variegated



Lobelia gibberoa



Aloe succotrina



Cyathea australis



Dicksonia antarctica

GROUNDCOVERS



Agapanthus africanus



Helichysum citrispinum



Stachys byzantina



Stachys byzantina



Helichysum citrispinum

BULBS + CLIMBERS



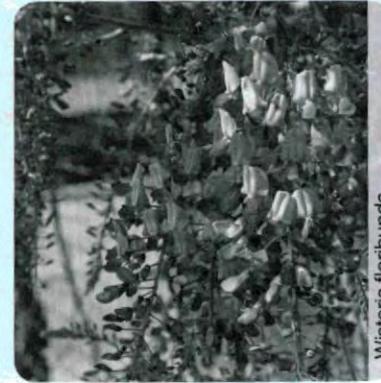
Iris pseudacorus



Jonquil erlicheer



Narcissus 'King Alfred'



Wisteria floribunda



Hedera helix

MATERIALS STRATEGY

All paving materials and street furniture would be subject to relevant Australian Standards and comply with Council's guidelines.

Paving will consist of contrasting finishes, textures and materials (concrete, stone and gravel). It is proposed that the primary path extends from the street and carpark to the new reception, providing a seamless connection between the external key arrival point and front door.

Park seating benches have been provided to the arrival forecourt garden and along the pathway, tables and chairs can also be accommodated in the undercover courtyard adjacent to the proposed main entrance.

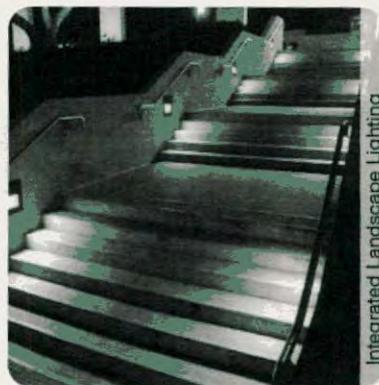
Indicative Materials Palette



Contrasting Paving Finishes



In-situ Concrete Path and Stainless Steel Handrails



Integrated Landscape Lighting



Tree Uplighting



Timber Decking



Precast Concrete Paving



Raised Planter Beds



Integrated Landscape Lighting



Low-level Lighting Bollards to Paths



Garden Seating Bench

Sydney

Level 23, Darling Park Tower 2
201 Sussex Street
Sydney, NSW 2000
t 02 8233 9900
f 02 8233 9966

Melbourne

Level 12, 120 Collins Street
Melbourne VIC 3000
t 03 8663 4888
f 03 8663 4999

Brisbane

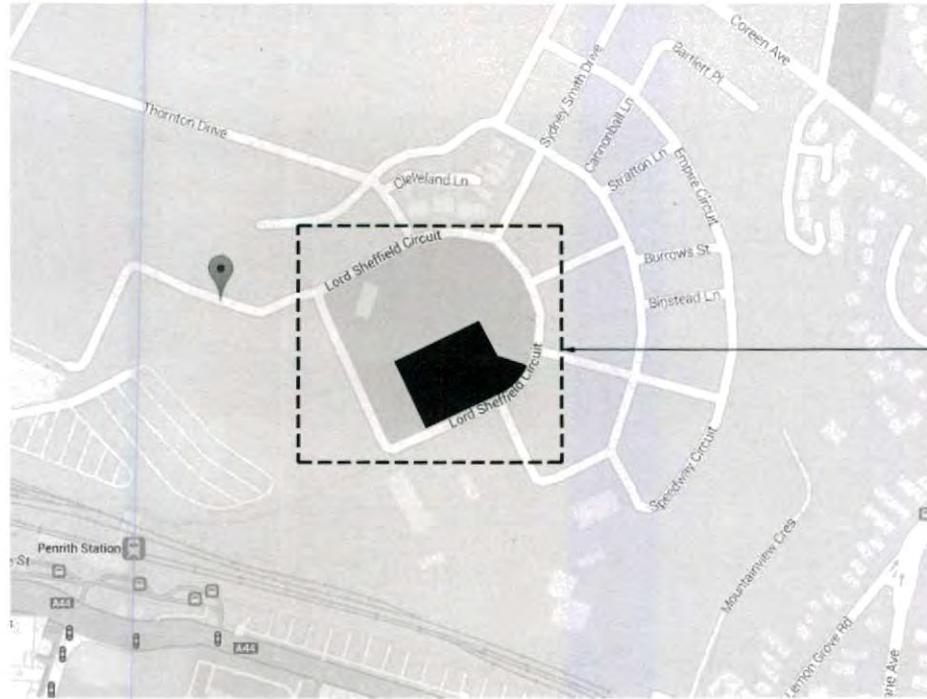
Level 7, 123 Albert Street
Brisbane QLD 4000
t 07 3007 3800
f 07 3007 3811

Perth

Level 1, 33 St Georges Terrace
Perth WA 6000
t 08 9346 0500
f 08 9221 1779

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www.urbis.com.au
info@urbis.com.au

THORNTON CENTRAL LORD SHEFFIELD CIRCUIT & AVIATORS WAY THORNTON, PENRITH STORMWATER DRAINAGE



LOCATION OF SITE

LOCALITY PLAN
NOT TO SCALE

DEVELOPMENT APPLICATION

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									<p>JOB No. 0295000</p>	<p>DA-STW-01</p>	<p>DATE 08/07/2014</p>	<p>JOB No. 0295000</p>	<p>DATE 08/07/2014</p>	<p>JOB No. 0295000</p>

LEGEND

CIVIL DRAINAGE AND HYDRAULIC SERVICES SYMBOLS



SERVICES & UTILITIES SYMBOLS

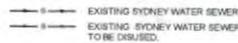


NOTE:
 'V' ON SERVICE LINE REPRESENTS EXISTING SERVICE OR THE USE OF LOWER CASE LETTER
 'X' ON SERVICE LINE REPRESENTS SERVICE TO BE ABANDONED.

EROSION & SEDIMENTATION SYMBOLS



WATER & SEWER AUTHORITY MAINS SYMBOLS



DRAFTING SYMBOLS



SCALE BARS



GENERAL ABBREVIATIONS

BO BALCONY OUTLET
 CTS CENTRES
 C CENTRE LINE
 DA DIAMETER
 DMR DEPARTMENT OF MAIN ROADS
 DWG DRAWING
 EX EXISTING
 GALV GALVANIZED
 HD HOT DIPED GALVANIZED
 ID INTERNAL DIAMETER
 IC LIMIT OF CONTRACT
 L.C.C. MAXIMUM
 MAX MINIMUM
 NBN NOMINAL BORE
 NB NOT IN CONTRACT
 N.I.C. NUMBER
 NB NOMINAL
 NOM NOT TO SCALE
 NTS OUTSIDE DIAMETER
 OD OVERSIZING
 REV ROADS AND TRAFFIC AUTHORITY
 SQ SQUARE
 STD STANDARD
 UNO UNLESS NOTED OTHERWISE
 VERT VERTICAL

CIVIL ABBREVIATIONS

LEVELS
 BWL BOTTOM WATER LEVEL
 IL INVERT LEVEL
 OL ORVERT LEVEL
 RL REDUCED LEVEL
 SL SURFACE LEVEL
 TWL TOP WATER LEVEL

GRATES & COVERS
 LD LIGHT DUTY CLASS 'B'
 MD MEDIUM DUTY CLASS 'C'
 HD HEAVY DUTY CLASS 'D'
 EHD EXTRA HEAVY DUTY CLASS 'E'
 MP MULTI PART COVER OR GRATE

PITS
 JP JUNCTION PIT
 KEP KERB ENTRY PIT
 SWP STORMWATER PIT

DRAINAGE LINES
 SS SUBSOIL DRAINAGE
 STW STORMWATER DRAIN

FEATURES
 CO CLEAROUT
 DP DOWN PIPE
 FP FLUSHING POINT
 IO INSPECTION OPENING
 OUF OUTER OVERFLOW PIPE
 RO RAINWATER OUTLET
 DTU DRAINAGE TURNUP

CATCHMENT ABBREVIATIONS
 LN LITRES PER SECOND
 M³/S METRES PER SECOND
 CUMEC CUBIC METRES PER SECOND
 Q QUANTITY OF FLOW

SECTION SYMBOL



DRAWING LIST

DA-STW-01	TITLE SHEET AND LOCALITY PLAN
DA-STW-02	LEGEND, ABBREVIATIONS AND DRAWING LIST
DA-STW-03	GENERAL NOTES
DA-STW-04	STORMWATER DRAINAGE GROUND FLOOR PLAN
DA-STW-05	STORMWATER DRAINAGE BASEMENT 1 PLAN
DA-STW-06	STORMWATER DRAINAGE BASEMENT 2 PLAN

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NOTES

GENERAL

- DESIGN HEREIN HAS BEEN PREPARED BY LP CONSULTING AUSTRALIA PTY LTD. TEL: 8221 6557 MOB: 341625695 FAX: 82 8341 3467 PO BOX 814 KENSINGTON NSW 1545 EMAIL: louis@lp-consulting.com.au
- THE DRAWINGS HEREIN SHALL BE READ AS CONJUNCTION WITH ARCHITECTURAL DRAWINGS BY DKO ARCHITECTURE.
- ALL DIMENSIONS IN MILLIMETRES UNLESS REDUCED LEVELS AND CHANGES ARE IN METRES DO NOT SCALE DRAWINGS USE FIGURED DIMENSIONS.
- THE PROPOSED WORKS DETAILED HEREIN SHALL BE CONSTRUCTED TO THE REQUIREMENTS OF COUNCIL, GENERALLY AS DETAILED HEREUNDER.
- ALL EXISTING SERVICES SHALL BE VERIFIED FOR DEPTH AND HORIZONTAL POSITION BY PHYSICAL MEANS PRIOR TO EXCAVATION. ANY DISCREPANCIES SHALL BE BROUGHT FORTH WITH TO THE PROJECT MANAGER'S ATTENTION.

STORMWATER AND SUBSOIL DRAINAGE

MATERIALS

- PIPE AND FITTINGS FOR STORMWATER DRAINAGE SHALL BE AS FOLLOWS UNLESS OTHERWISE SPECIFIED:
 - POLYVINYL CHLORIDE (PVC) WITH COLVET WELDED JOINTS FOR BELOW GROUND DRAINAGE UP TO 225mm.
 - FIBRE REINFORCED CEMENT WITH RUBBER RINGS FOR PIPE DIA'S GREATER THAN 225mm UNLESS OTHERWISE SPECIFIED.
 - REINFORCED CONCRETE WHERE REQUIRED BY AS 3600 FOR EXCESSIVE DEPTH.
 - INSTALL IN ACCORDANCE WITH AUSTRALIAN STANDARD AS 3600 EXCEPT WHERE VARYED BY THE CONTRACT DOCUMENTS.
 - PIPES & FITTINGS FOR SUBSOIL DRAINAGE SHALL BE SLOTTED POLYVINYL CHLORIDE (PVC) WITH SOLVENT WELDED JOINTS, MIN 150mm DIAMETER.
 - IN GROUND DRAINAGE PIPEWORK SERVING DRPS SHALL BE MINIMUM 150mm DIA. UNLESS OTHERWISE SPECIFIED.
 - GRATED DRAINS SHALL BE 150mm NOM.
 - 150mm NOM. WIDTH IN NON TRAFFICABLE AREAS
 - 225mm NOM. WIDTH IN TRAFFICABLE AREAS
 - STORMWATER PITS ARE AS SHOWN & SPECIFIED ON THE PLANS. PRECAST TYPE ACCEPTABLE WITH STEP INS FOR DEPTH GREATER THAN 1000. BENCH ALL PITS MIN 50mm & FORM SMOOTH TRANSITION FROM INLET TO OUTLET.
 - SELECT FILL SHALL BE MATERIAL OBTAINED FROM EXCAVATION OF THE PIPE TRENCH OR IMPORTED WITH A PARTICLE SIZE FOR ROADS NOT GREATER THAN 15mm OR FOR OTHER THAN ROADS NOT GREATER THAN 10mm.
 - IMPORTED FILL SHALL BE EITHER, AND GENERALLY CONSIST OF SINGLE SIZED AGGREGATE WITH PARTICLE SIZE NOT GREATER THAN 5mm WRAPPED ALL ROUND WITH GEOTEXTILE FILTER FABRIC OR APPROVED HIGH COMPACTION SAND OR APPROVED CRUSHED ROAD GRAVEL CONFORMING TO RTA FORM 3051 OR SIMILAR.
 - STORMWATER PITS AND GRATES TO CONFORM WITH STANDARD COUNCIL REQUIREMENTS WHERE ON PUBLIC LAND. GRATES TO BE SUPPLIED IN CLASS SHOWN ON THE DRAWINGS.
- INSTALLATION REQUIREMENTS**
- PIPES SHALL BE TRUE TO GRADE SHOWN AND ALIGNED SO THAT THE CENTRES OF THE INLET PIPES INTERSECT WITH THE CENTRE OF THE OUTLET PIPE AT THE DOWNSTREAM FACE OF THE FIT.
 - MINIMUM GRADES FOR GRAVITY STORMWATER DRAINAGE SHALL CONFORM TO AS3500 PARTS A5 FOLLOWS UNLESS OTHERWISE SPECIFIED:
 - 1% FOR 100 AND 150 mm DIA
 - 0.5% FOR 225 mm DIA
 - 0.4% FOR 300 mm DIA
 - 0.35% FOR 375 mm DIA
 - MINIMUM DEPTH OF COVER SHALL BE:
 - 300mm IN PRIVATE PROPERTY (NON VEHICULAR TRAFFIC)
 - 400mm IN PUBLIC AREAS
 - 600mm IN VEHICULAR TRAFFICABLE AREAS (FOOTWAY/ROADWAY)
 - BED ALL PIPES FIRMLY AND EVENLY ONTO IMPORTED BEDDING FILL MATERIAL.
 - STEPS, LAY AND JOINT ALL PIPES IN ACCORDANCE WITH THE MANUFACTURERS RECOMMENDATIONS AND:
 - AS 3725-1988 LOADS ON BURIED CONCRETE PIPES
 - AS 2550-1988 BURIED FLEXIBLE PIPELINES
 - AS 1557-2-1996 PRECAST REINFORCED CONCRETE BOX CULVERTS
 - AS 3000-1990 NATIONAL PLUMBING & DRAINAGE CODE, PART 2, SANITARY PLUMBING AND SANITARY DRAINAGE, SYDNEY WATER REQUIREMENTS.
 - ALLOW TO TEST ALL PIPES AND FITS TO MANUFACTURERS REQUIREMENTS.

CONCRETE WORKS

- ALL WORKMANSHIP AND MATERIALS SHALL BE IN ACCORDANCE WITH AS3600, THE STANDARDS ASSOCIATION AUSTRALIA, STANDARDS CITED IN AS3600, THE DRAWINGS AND THE SPECIFICATION.
- ALL CONCRETE SHALL BE 80mm NOMINAL SLUMP, 20mm MAXIMUM AGGREGATE WITH NO ADMIXTURES OR FLY ASH, UNLESS OTHERWISE APPROVED.
 - ALL CONCRETE WORK IN CONTACT WITH SEWER TO HAVE TYPE SL PORTLAND CEMENT, OTHERWISE TYPE A CEMENT.
 - FOR BRIDGE WORKS, A MAXIMUM 56 DAYS SHRINKAGE OF 600 MICROSTRAIN, A MINIMUM CEMENT CONTENT 350kg/m³ AND MAXIMUM WATER CEMENT RATIO OF 0.40
- STRENGTH GRADE OF CONCRETE SHALL BE:
 - 25 MPa (KERBS, EDGE STRIPS & CONCRETE EMBELEMMENT) AND 32 MPa ELSEWHERE.
- CONSTRUCTION JOINTS SHALL BE PROPERLY FORMED AND USED ONLY WHERE SHOWN OR APPROVED. GENERALLY FOR HAND PLACED KERB & GUTTER 6mm THICK APPROVED BITUMINOUS MASTIC JOINTING MATERIAL SHALL BE PROVIDED AT INTERVALS NOT EXCEEDING 9m. FOR MACHINE PLACED KERB & GUTTER 6mm THICK APPROVED BITUMINOUS MASTIC JOINTING MATERIAL SHALL BE PROVIDED AT INTERVALS NOT EXCEEDING 12m & GULLY/OUTLET DUMMIES GROoved JOINTS, 25mm IN DEPTH, SHALL BE FORMED EVERY 3m OF GUTTER. JOINTS ARE ALSO REQUIRED AT EACH END OF CUT CROSSING AND GULLY PITS. JOINTS SHALL BE SET VERTICAL AND SQUARE TO THE KERB.
- REINFORCEMENT IS REPRESENTED DIAGRAMMATICALLY AND IS NOT NECESSARILY SHOWN IN TRUE PROJECTION.
- WELDING OR SPLICES IN REINFORCEMENT SHALL BE USED ONLY IN POSITIONS APPROVED BY THE ENGINEER.
- CONCRETE CURING SHALL BE IN ACCORDANCE WITH AS3600. CURING SHALL BE COMMENCED WITHIN TWO HOURS OF FINISHING OPERATIONS AND SHALL BE CONTINUED FOR A MINIMUM OF SEVEN DAYS BY AN APPROVED PROPRIETARY COMPOUND OR BY KEEPING CONTINUOUSLY WET.
- FORMWORK SHALL BE DESIGNED AND CONSTRUCTED IN ACCORDANCE WITH AS3610. FORMWORK SHALL NOT BE STRIPPED NOR PROPS REMOVED WITHOUT APPROVAL.
- FABRIC LAP DETAILS SHALL BE IN ACCORDANCE WITH FIG 13.2.4 OF AS3600.
- HOOKS, LAPS AND BENDS SHALL BE IN ACCORDANCE WITH AS3600 UNLESS OTHERWISE SPECIFIED.
- ALL CHEMICAL ANCHORS SHALL BE EITHER "CHEMSET" BY "RAMSET" WITH THE GLASS CAPSULE SYSTEM INSTALLED IN STRICT ACCORDANCE WITH MANUFACTURERS INSTRUCTIONS OR "TECH" HAS ADHESIVE ANCHOR WITH POLY CAPSULE SYSTEM INSTALLED IN STRICT ACCORDANCE WITH MANUFACTURERS INSTRUCTIONS. ALL CHEMICAL ANCHORS SHALL BE HOT DIPPED GALVANIZED AND BE MIN M16 DIA. UNLESS OTHERWISE SPECIFIED.

GENERAL EARTHWORKS, SITEWORKS & FILLING

- FILLING**
- THESE CLAUSES SHALL BE READ IN CONJUNCTION WITH "REPORT ON GEOTECHNICAL INVESTIGATION BY _____".
 - REPORT NO: _____
 - PH: _____ FAX: _____
 - THE RECOMMENDATIONS CONTAINED IN THE GEOTECH REPORT SHALL OVERRIDE THE CLAUSES PRESENTED HEREIN.
 - STRIP ALL TOPSOIL AND UNDERLYING FILL AND STOCKPILE TOPSOIL FOR LATER REUSE FOR LANDSCAPING PURPOSES.
 - NEW FILL REQUIRED TO REINSTATE CUT LEVELS TO PROPOSED BENCHING LEVELS SHALL BE SOURCED FROM OTHER PARTS OF THE EXCAVATION AS SELECT FILL OR IMPORTED FILL AS SPECIFIED BELOW IN SOE 4 AND SOE 5.
 - SELECT FILL SHALL CONSIST OF LOCALLY DERIVED OR CUT NATURAL CLAYS.
 - IMPORTED FILL SHALL CONSIST OF RIPPED SANDSTONE OR SHALE OR SIMILAR MATERIAL WITH MAXIMUM PARTICLE SIZE NOT GREATER THAN 120mm AND A MOISTURE CONTENT WITHIN 2-3% OF STANDARD OPTIMUM.
 - ALL FILL (COHESIVE SOIL) SHALL BE PLACED IN LAYERS OF 200mm MAXIMUM THICKNESS, COMPACTED BY MACHINE ROLLING TO ACHIEVE A DRY DENSITY RATIO OF NOT LESS THAN 88% STANDARD MAXIMUM AT A CORRESPONDING MOISTURE CONTENT WITHIN 2-3% OF STANDARD OPTIMUM.
 - IN AREAS WHERE HIGH IMPACT ROLLING IS USED TEST EACH FINAL LAYER OF NOT GREATER THAN 300mm TO 400mm TO ACHIEVE A DRY DENSITY RATIO OF NOT LESS THAN 88% STANDARD MAXIMUM AT A CORRESPONDING MOISTURE CONTENT WITHIN 2-3% OF STANDARD OPTIMUM.
- EXCAVATION BATTERS**
- ALL TEMPORARY BATTERS CUT IN CLAY SUBSTRATE SHALL BE 1 HORIZ. 1 VERT. ALL LONG TERM EXPOSED BATTERS CUT IN CLAY SUBSTRATE SHALL BE 2 HORIZ. 1 VERT. ALL DETENTION BASIN BATTERS IN CLAY SUBSTRATE SHALL BE 3 HORIZ. 1 VERT. ALL DETENTION BASIN BATTERS IN ROCK SUBSTRATE SHALL BE NEAR VERTICAL.
 - GEOTECHNICAL TESTING IS TO BE UNDERTAKEN TO AT LEAST LEVEL 1 CONTROL OF FILL COMPACTION STANDARD, AS DEFINED IN AS 3738 AS FOLLOWS:
 - FOR GENERAL FILL OR CUT AREAS OVER THE AREA PROVIDE ONE (1) TEST PER 200mm LAYER, OVER AN AREA NOT GREATER THAN 500m².
 - FOR GENERAL FILL AREAS IN CONCENTRATED AREAS ADJACENT TO AND BEHIND THE STRUCTURE AND ADJACENT TO AND BEHIND RETAINING WALLS PROVIDE ONE (1) TEST PER 200mm LAYER, OVER AN AREA NOT GREATER THAN 50m².
 - SUBMIT ALL GEOTECHNICAL TEST RESULTS TO LP CONSULTING AUSTRALIA FOR REVIEW PRIOR TO CONTINUATION WITH SUBSEQUENT SECTION OF WORK.

EARTHWORKS FOR SERVICES

- EXCAVATE TRENCHES AND STOCKPILE ALL MATERIAL FOR INSPECTION WITH REGARD TO RE-USE FOR TRENCH BACKFILL. REMAINING MATERIAL TO BE REMOVED FROM SITE.
- BEDDING MATERIAL SHALL CONSIST OF IMPORTED FILL ONLY. THICKNESS OF BEDDING LAYER SHALL BE 75mm IN O.T.R. AND 200mm IN ROCK.
- EMBED ALL PIPES WITH IMPORTED FILL. PROVIDE 200mm SIDE SUPPORT AND 150mm OVERLAY ABOVE PIPE CROWN.
- TRENCH FILL ABOVE THE EMBEDMENT ZONE TO THE UNDERSIDE OF THE ROAD PAVEMENT OR FOOTWAY FILL MATERIAL SHALL BE AS FOLLOWS:
 - UNDER ROADWAY:
 - TRENCH FILL MATERIAL SHALL CONSIST OF IMPORTED FILL AS SPECIFIED HEREIN OF EITHER HIGH GRADE COMPACTION SAND OR APPROVED CRUSHED ROAD GRAVEL CONFORMING TO RTA FORM 3051 OR SIMILAR.
 - OTHER THAN ROADWAY:
 - TRENCH FILL MATERIAL EXCAVATED SHALL CONSIST OF SELECT FILL AS SPECIFIED HEREIN AND SHALL NOT CONTAIN MORE THAN 30% OF STONES OF SIZE BETWEEN 25mm & 150mm AND NONE LARGER THAN 150mm. PRIOR TO THE USE OF THE EXCAVATED MATERIAL IT SHALL BE INSPECTED AND APPROVED BY THE CONSULTANT.
 - COMPACTION BEDDING, EMBEDMENT AND TRENCH FILL MATERIALS AS FOLLOWS:
 - EMBEDMENT:
 - FOR GRANULAR FILL MATERIAL (NON-COHESIVE SOILS) EG. COARSE AGGREGATE FILL, HIGH GRADE COMPACTION SAND, THE DENSITY INDEX (DI) SHALL BE NOT LESS THAN 70%.
 - TRENCH FILL:
 - FOR GRANULAR MATERIAL (NON-COHESIVE SOILS) THE DENSITY INDEX (DI) SHALL BE NOT LESS THAN 70%.
 - FOR NON-GRANULAR FILL MATERIAL (COHESIVE SOILS) THE DRY DENSITY RATIO (DD) SHALL BE NOT LESS THAN 95%.
 - MEASURE OF COMPACTION:
 - THE DEGREE OF COMPACTION SHALL BE MEASURED BY ONE OF THE FOLLOWING PARAMETERS:
 - GRANULAR FILL (NON-COHESIVE SOILS): THE DENSITY INDEX (DI) DETERMINED IN ACCORDANCE WITH AS 1289.5.1 BASED ON THE MAXIMUM AND MINIMUM DRY DENSITIES IN ACCORDANCE WITH AS 1289.5.1 AND THE FIELD DRY DENSITY IN ACCORDANCE WITH AS 1289.5.3.2, AS 1289.5.3 OR AS 1289.5.1.
 - NON-GRANULAR FILL (COHESIVE SOILS): THE DRY DENSITY RATIO (DD) DETERMINED IN ACCORDANCE WITH AS 1289.5.4.1 BASED ON THE FIELD DRY DENSITY IN ACCORDANCE WITH AS 1289.5.3.2 AND THE MAXIMUM DRY DENSITY IN ACCORDANCE WITH AS 1289.5.1.1.
 - GEOTECHNICAL TESTING IS TO BE UNDERTAKEN TO AT LEAST LEVEL 1 CONTROL OF FILL COMPACTION STANDARD, AS DEFINED IN AS 3738 AS FOLLOWS:
 - TEST EACH 300mm LAYER ABOVE PIPE CROWN.
 - TEST BASE & SUB-BASE LAYERS WHERE APPLICABLE.
 - TESTS SHALL BE REQUIRED AT EACH 50m CENTRES WHERE THE LENGTH OF TRENCH IS WITHIN THE 50m REQUIREMENT.
 - SUBMIT ALL GEOTECHNICAL TEST RESULTS TO LP CONSULTING AUSTRALIA FOR REVIEW PRIOR TO CONTINUATION WITH SUBSEQUENT SECTION OF WORK.

RESTORATION

- RESTORE ALL TRAFFIC AREAS TO PRE EXISTING CONDITION.
- FOR ALL SURFACES OTHER THAN IN TRAFFIC AREAS RESTORE DISTURBED SURFACES TO PRE EXISTING CONDITIONS AND COMPACT AS SPECIFIED.
- RESTORE ALL AUTHORITY OWNED AREAS TO COUNCIL STANDARDS.

APPROVALS

- THE AS CONSTRUCTED WORKS SHALL BE INSPECTED BY DESIGN CONSULTANT. MINIMUM 48 HOURS NOTICE SHALL APPLY TO ALL INSPECTIONS.
- THE DESIGN PLANS HEREIN ARE SUBJECT TO COUNCIL APPROVAL PRIOR TO CONSTRUCTION. OBTAIN EXPRESS WRITTEN ADVICE TO PROCEED FROM PROJECT MANAGER PRIOR TO COMMENCEMENT.
- SUBMIT WORK AS EXECUTED DRAWINGS IN CIVILCAD OR DXF DIGITAL FORMAT AND HARD COPY FORMAT. VERIFY ALL CONSTRUCTION WORKS SHOWN HEREON.
- CERTIFY THAT THE AS CONSTRUCTED SYSTEM HAS BEEN BUILT IN ACCORDANCE WITH THE APPROVED PLANS ISSUED FOR CONSTRUCTION.

SURFACES UNDER ROAD SURFACES

- ALL OTHER SERVICES INCLUDING BUT NOT LIMITED TO WATER, HYDRANT, GAS, SEWER, ELECTRICAL, AND COMMUNICATIONS CONDUITS OR CABLES SHALL BE LAID WITH MINIMUM 800mm U/L/D COVER BELOW PROPOSED ROAD SURFACE OR APPROVED OTHER MEANS TO PROTECT DURING CONSTRUCTION.

HYDRAULIC SERVICES

- ALL WORKS CARRIED OUT SHALL COMPLY WITH AS 3500, SYDNEY WATER & COUNCIL REQUIREMENTS. OBTAIN NECESSARY AUTHORITIES APPROVALS PRIOR TO COMMENCING WORKS.
- PRIOR TO COMMENCING WORKS SURVEY & INSPECT SITE & CONFIRM LOCATION & LEVELS OF ALL HYDRAULIC SERVICES PIPEWORK. NO CLAIMS FOR ADDITIONAL COSTS RESULTING FROM THE LACK OF KNOWLEDGE OF SITE CONDITIONS RELATING TO WORKS TO BE DONE OR LOCATIONS AND LEVELS OF EXISTING AND NEW SERVICES WILL BE ACCEPTED.
- PRIOR TO CAPPING OFF & REMOVAL OF REDUNDANT SERVICES CONFIRM ON SITE THAT SERVICE IS NOT SUPPLYING EXISTING BUILDINGS OR AMENITIES.
- COLD WATER PIPEWORK SHALL CONSIST OF COPPER TUBE & FITTINGS IN ACCORDANCE WITH AS 1402 TYPE B. PIPES AND FITTINGS SHALL BE JOINTED WITH 15% SILVER SOLDER.
- ALL NEW UNDERGROUND METAL PIPEWORK SHALL BE INSTALLED WITH POLYETHYLENE SLEEVING OBTAINED FROM "TYCO WATER ADJUST" AND INSTALLED TO MANUFACTURERS REQUIREMENTS.
- LANDSCAPE IRRIGATION WATERING PIPEWORK SHALL CONSIST OF MEDIUM DENSITY POLYETHYLENE PIPE CLASS PN16 WITH ELECTRO FUSION JOINTS OR EQUAL TO EXISTING PIPEWORK.

<p>DO NOT SCALE FROM DRAWINGS. CHECK & VERIFY ALL DIMENSIONS & LEVELS BEFORE COMMENCEMENT OF ANY WORK.</p> <p>THIS DRAWING IS NOT TO BE COPIED IN PART OR WHOLE WITHOUT WRITTEN PERMISSION FROM LP CONSULTING AUSTRALIA PTY LTD.</p>	<p>DATE</p> <p>17/10/2014</p>	<p>REVISION</p> <p>1. THIS DRAWING IS FOR DEVELOPMENT APPLICATION PURPOSES & SHALL BE READ IN CONJUNCTION WITH LP CONSULTING AUSTRALIA PTY LTD. RELEVANT ACCOMPANYING REPORT & DWG DA-STW-03.</p>	<p>SCALE</p> <p>A1</p>	<p>PROJECT</p> <p>THORNTON CENTRAL LORD SHEFFIELD CIRCUIT & AVIATORS WAY THORNTON, PENRITH NSW 2150</p>	<p>CLIENT</p> <p>Thornton North Penrith Pty Ltd</p>	<p>CONSULTANT</p> <p>LP CONSULTING AUSTRALIA PTY LTD</p>	<p>TITLE</p> <p>STORMWATER DRAINAGE GENERAL NOTES</p>
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