

St Hilliers Pty Limited

Thornton Central Development Lot 3007 - DA02

Traffic and Parking Report

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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 DA02 covers the building of the second half of the Lot. An associated DA (DA01) covers the first half. 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.

1.2 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

1.3 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

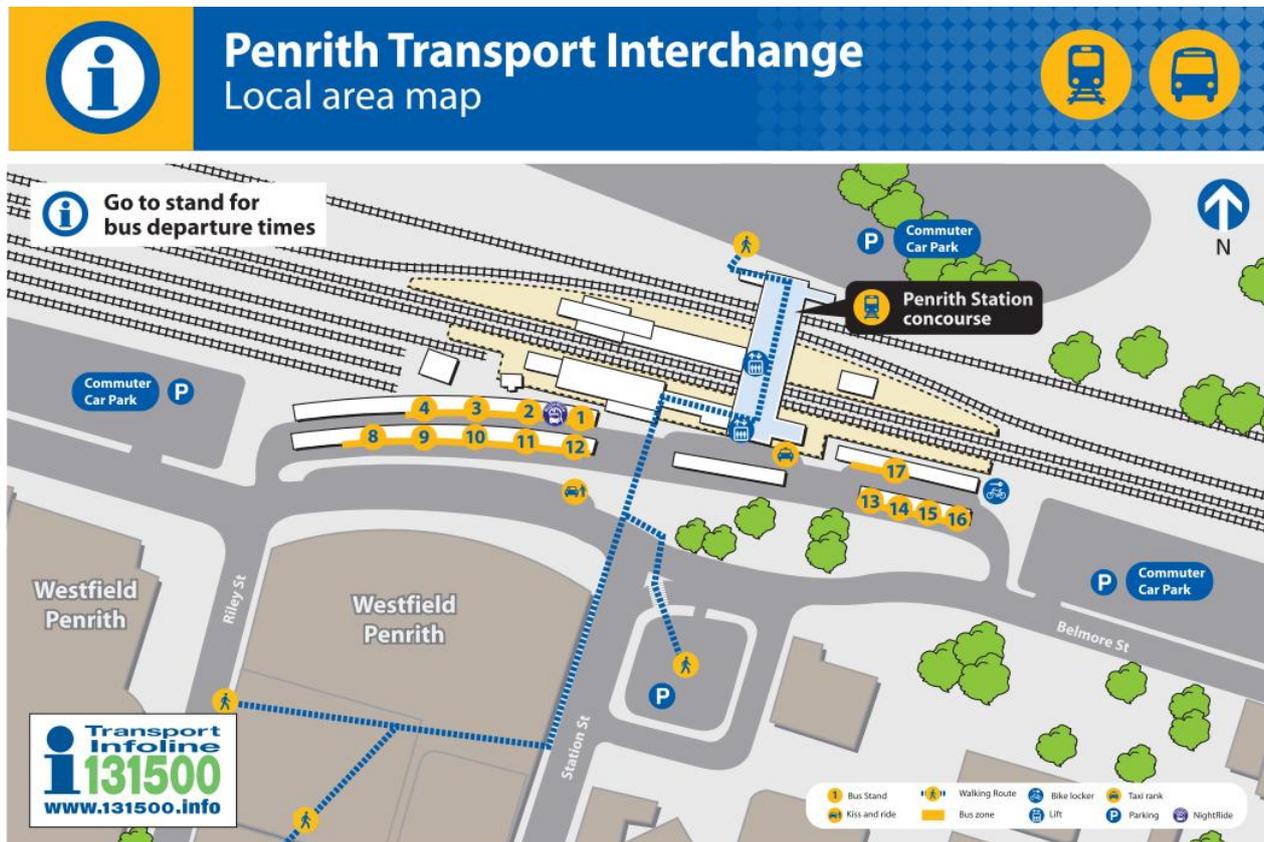
The Thornton development site is within an 800 m walking catchment of Penrith Station. Penrith Station received an Easy Access upgrade in 2000 so a wider range of commuters with mobility restrictions could access the station. It included the installation of four lifts, a new overhead concourse, and other 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** 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** (the subject of this report) covers the remaining two of four buildings and the remainder of the basement car park level(s). This DA assumes that DA01 will have been completed, with shared access.

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	DA02 (This DA)	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 Guidelines*¹ 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 68 apartments in DA02 (and combined 151 apartments with DA01) 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 DA02 (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
DA02 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 DA02 only, or less than three 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 seven 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. The DA02 traffic and parking assessment assumes that DA01 will have been built prior to the opening of DA02. Hence the access arrangements for DA01 have been assumed to apply for DA02.

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)

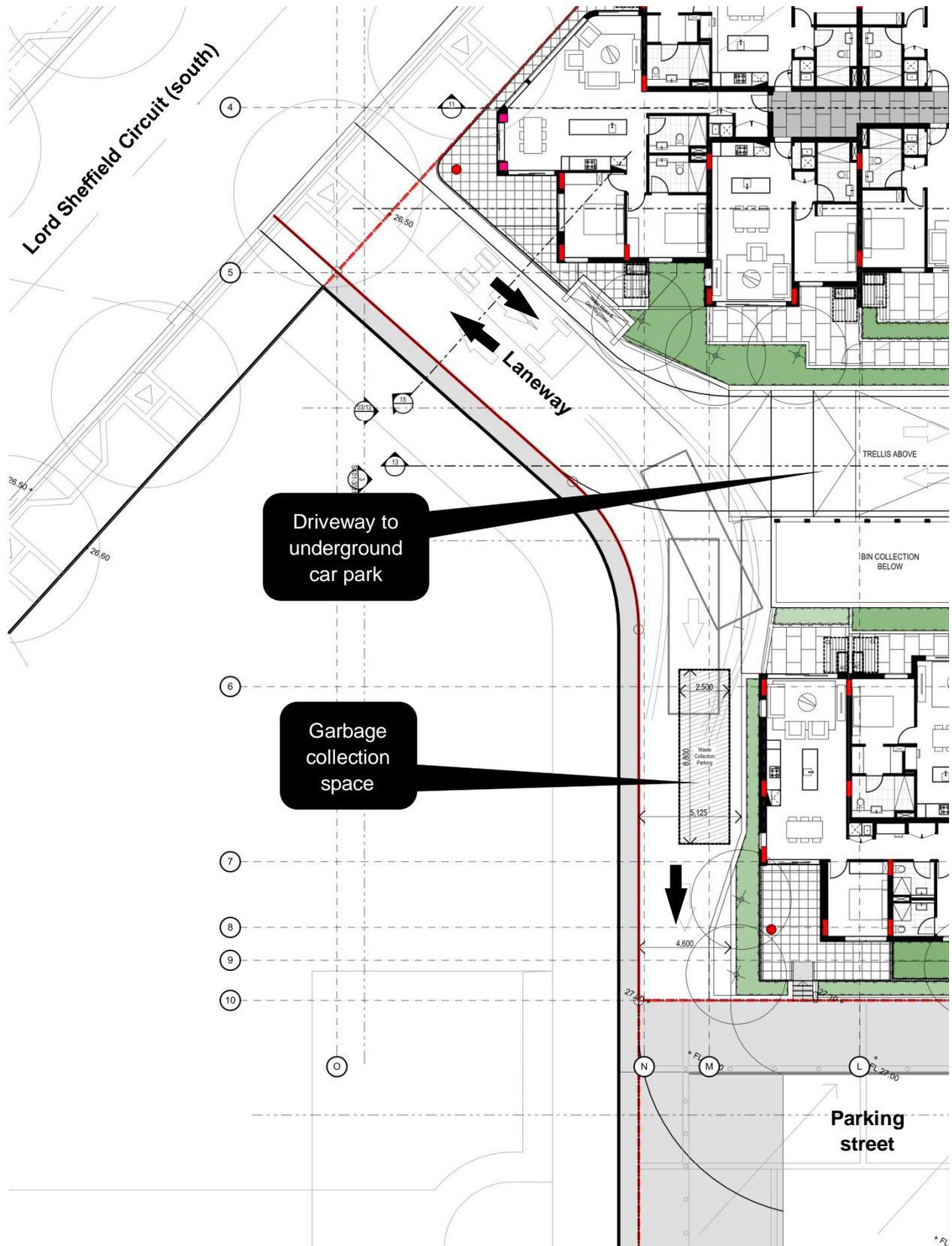
Figure 5.1 Vehicle access location

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

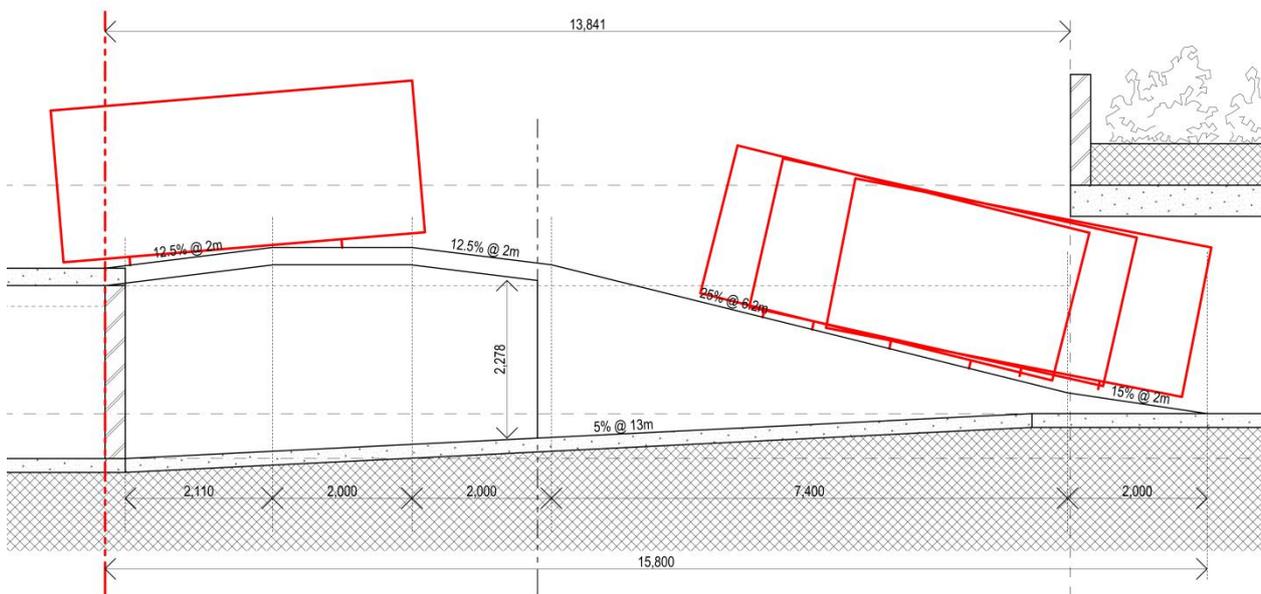
Figure 5.2 Vehicle access arrangement

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 m 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	DA02 (This DA)	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 DA02 the parking provided would be two 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.

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

	Rate per dwelling	DA01	DA02 (This DA)	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 DA02 the parking provided would be some 13 spaces more than the maximum allowed by the *Guidelines* and *DCP*. However, this surplus would be used to balance some of the deficit in DA01. The surplus spaces is likely to result in 33 out of 41 two-bedroom apartments being offered with an additional parking space. Alternatively the surplus spaces could be offered to owners of two-bedroom apartments in DA01 that missed out on a second space in that DA.

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.



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.

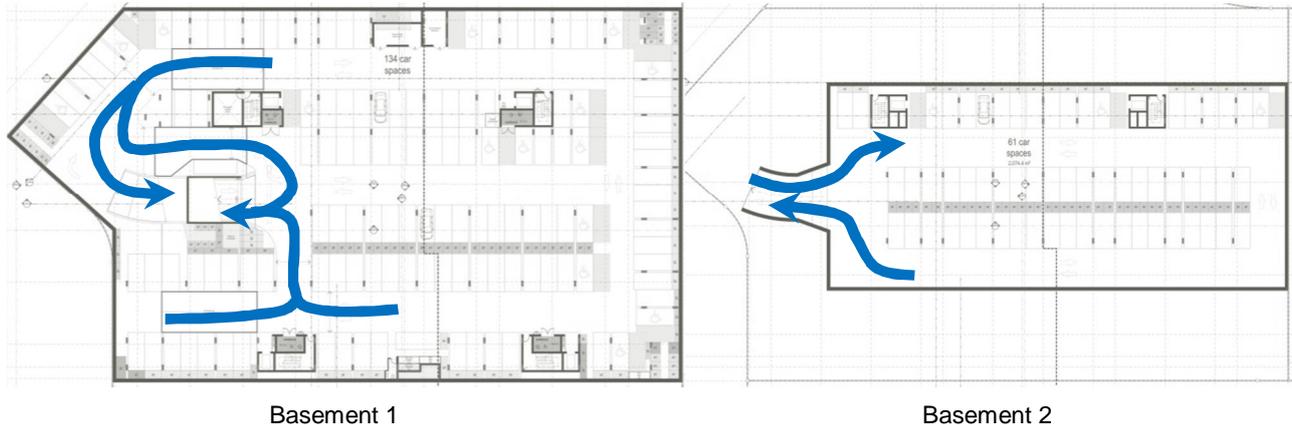


Figure 5.5 Car park swept path analysis

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.

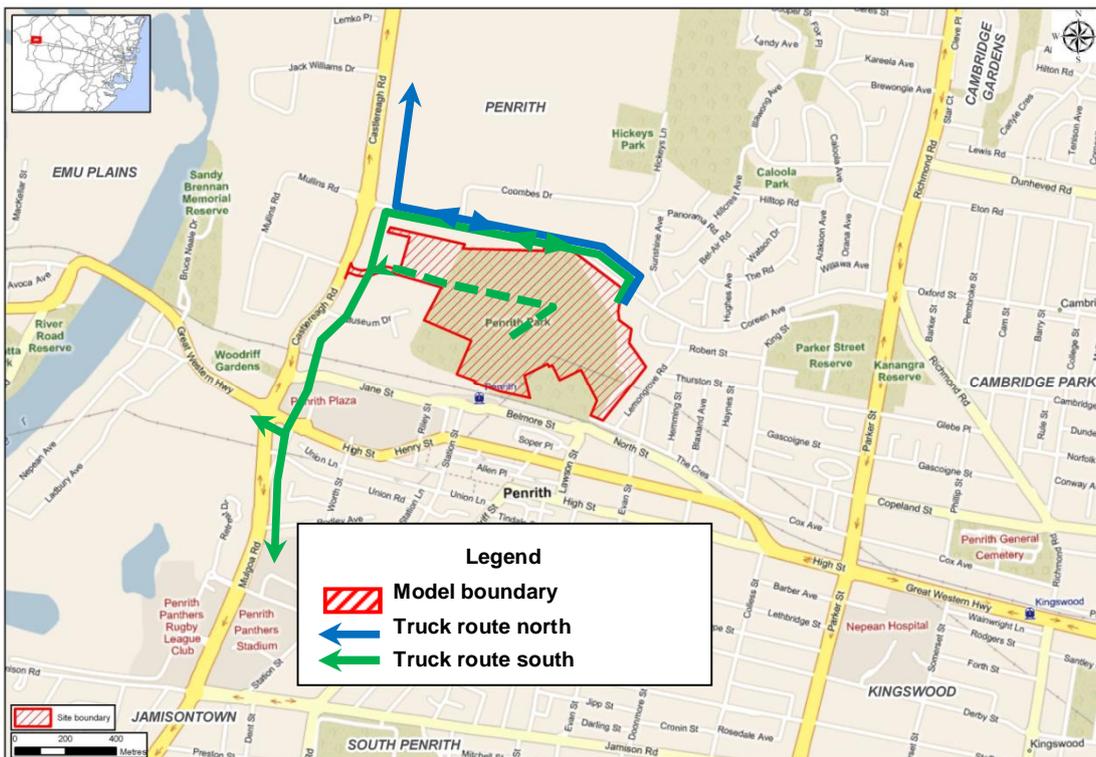


Figure 6.1 Proposed construction truck route

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 DA02 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 DA01.

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.

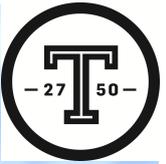
7.2 Conclusions

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 66 spaces provided within the first basement level is two spaces less than the maximum allowable.
 - ▶ Higher two bedroom parking: the 101 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.

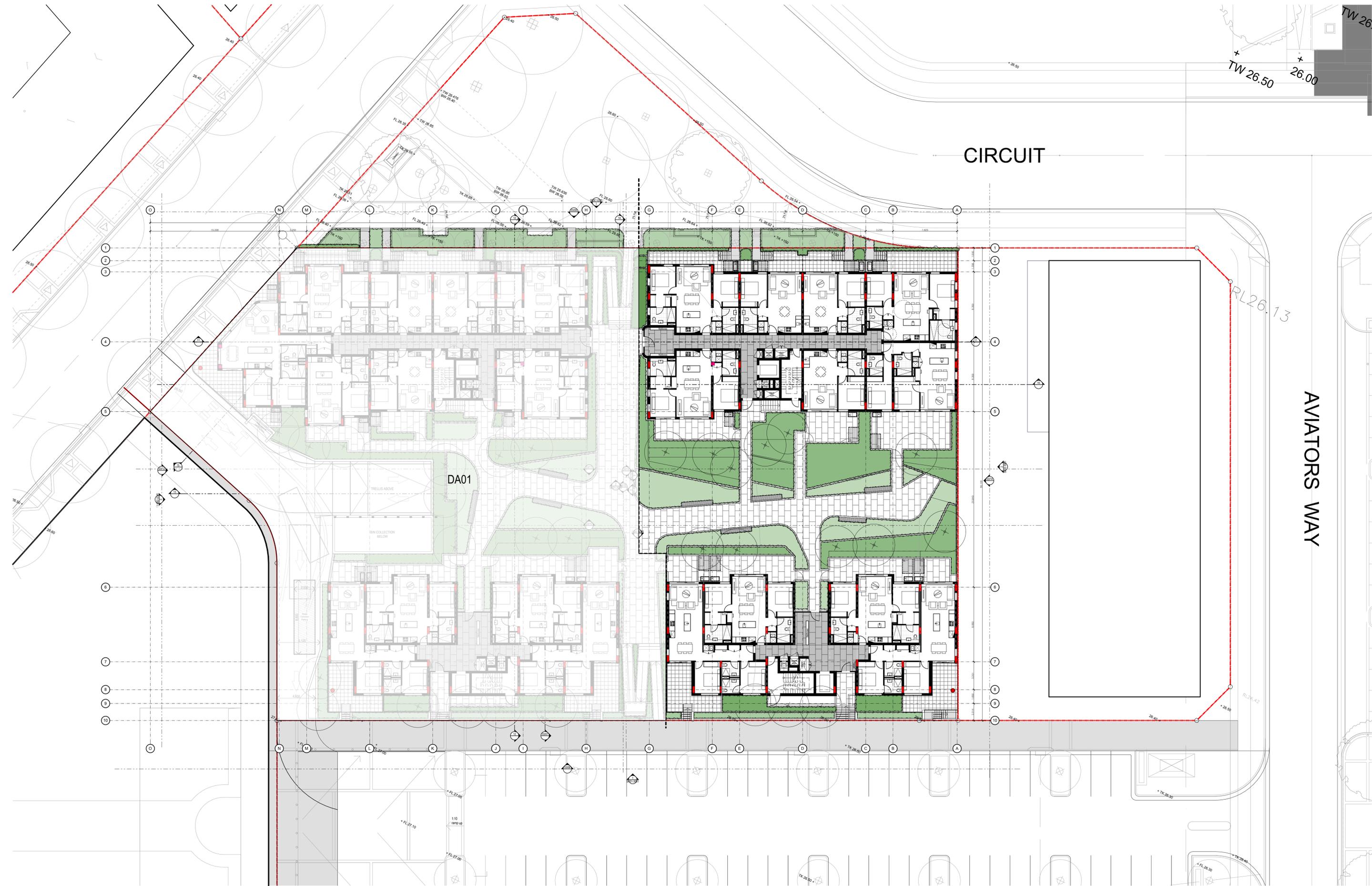
Appendix A

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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 NOMINATED ARCHITECT
 David Randerson 8542 (NSW)
 Kees de Kieper 5787 (NSW)

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C	DRAFT Revised - For Information Only	JF	12/09/2014
B	DRAFT Revised - For Information Only	JF	09/09/2014
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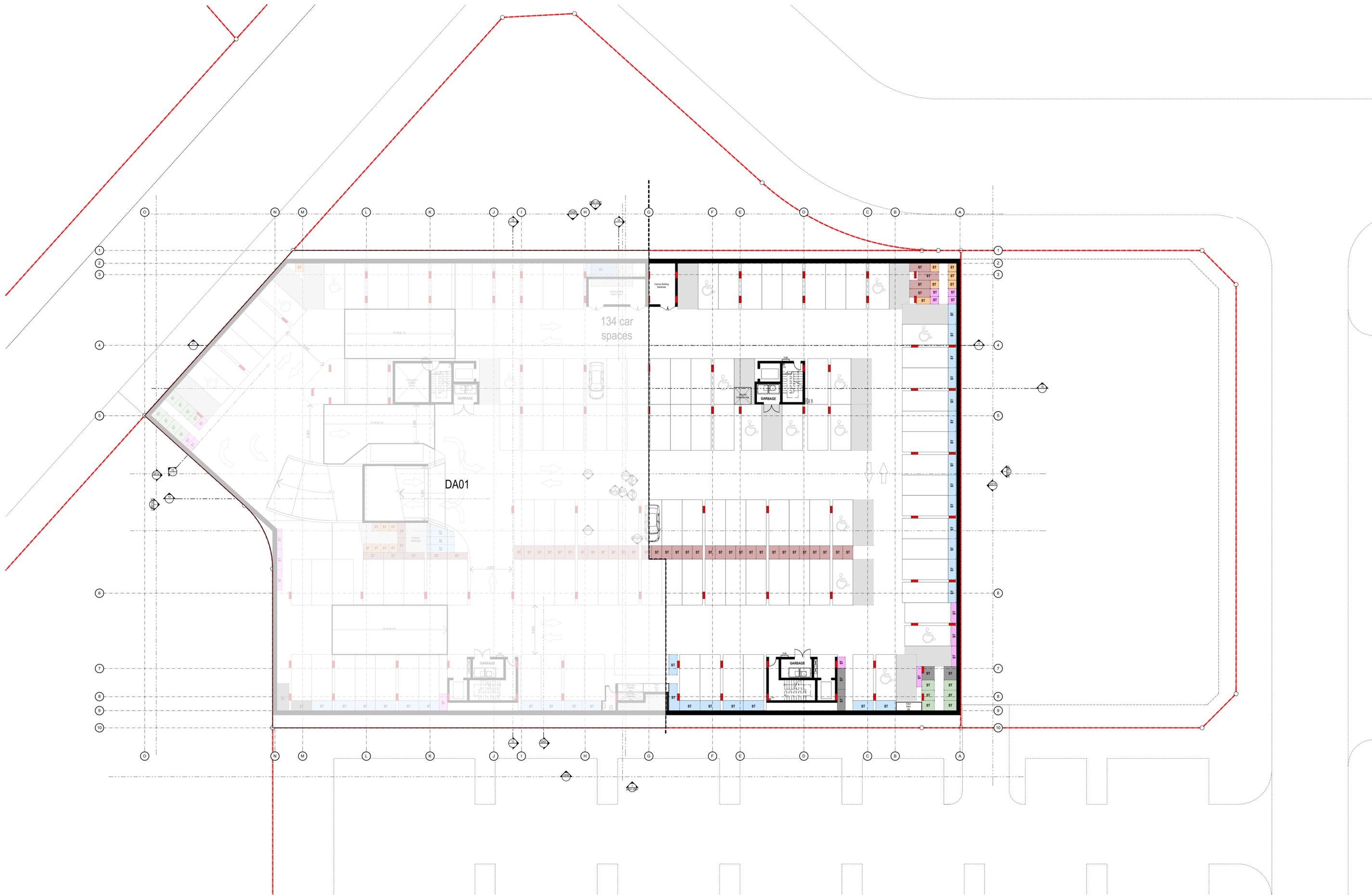
Client Details
**St Hillers
 First Point**

Project
**Lord Sheffield Circuit
 Apartments - DA02**
 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
SK02-2100



1 **Basement 1**
1:200

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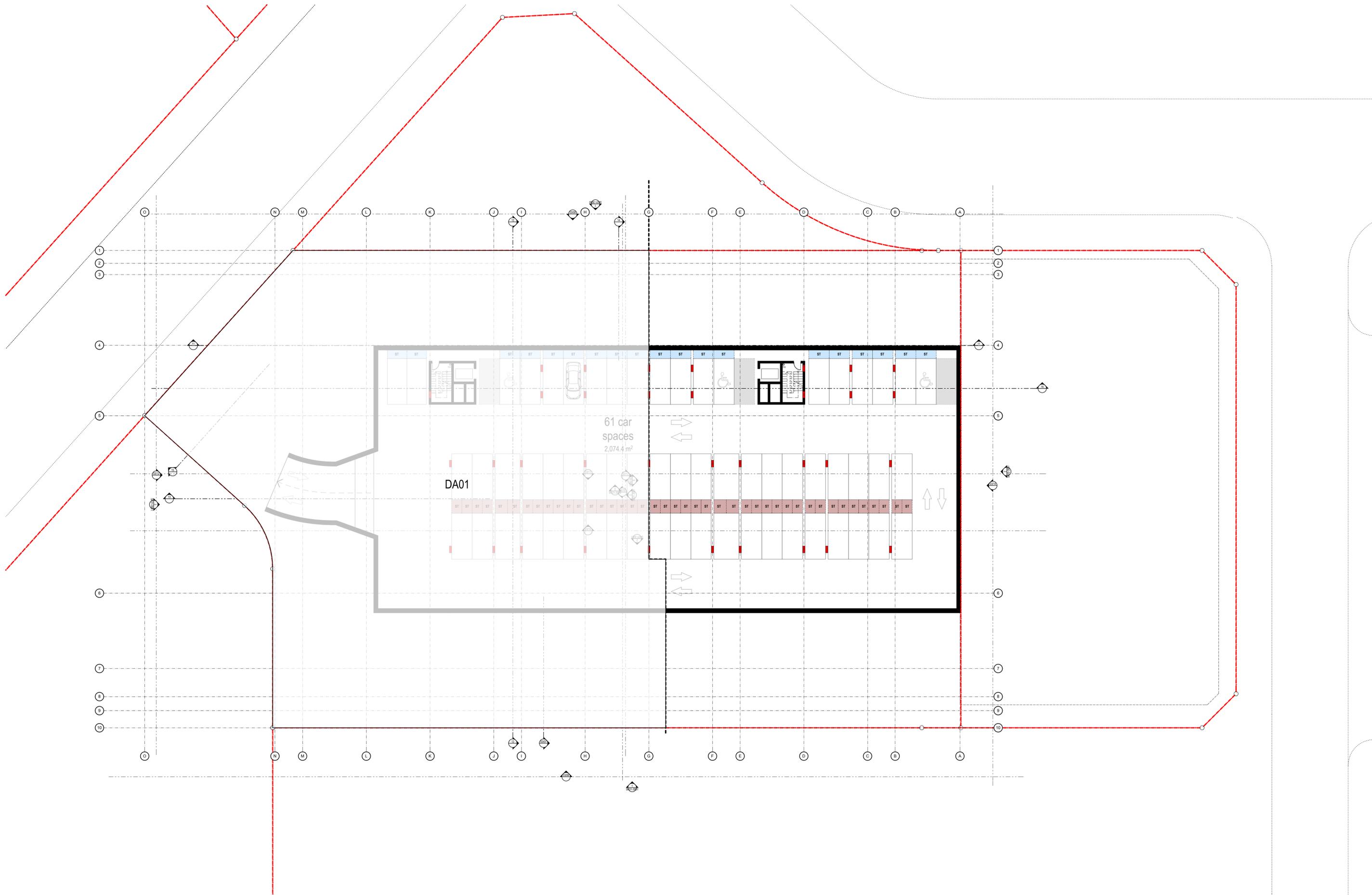
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Client Details
**St Hillers
 First Point**

Project
**Lord Sheffield Circuit
 Apartments - DA02**
 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
SK02-2110
 Revision
 C



1 Basement 2
1:200

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Client Details
**St Hillers
 First Point**

Project
**Lord Sheffield Circuit
 Apartments - DA02**
 Project Address
 Lord Sheffield Circuit,
 Thornton, Penrith, Australia

Project Number
00010935

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

Drawing Number
SK02-2111
 Revision
 C

Appendix B

Truck swept path diagrams

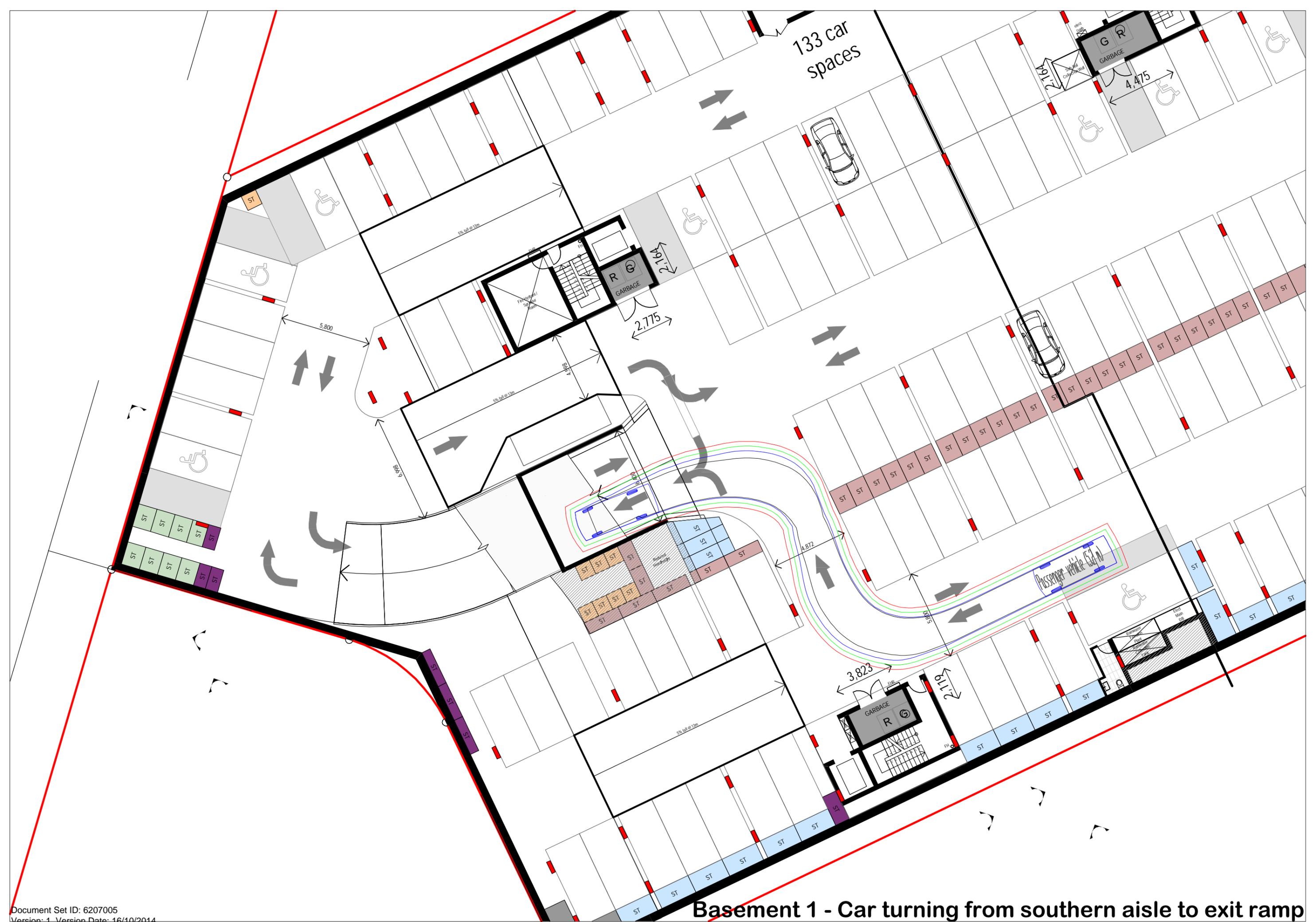


Swept path analysis provided includes:

- 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 - 12.5m Removalist Truck



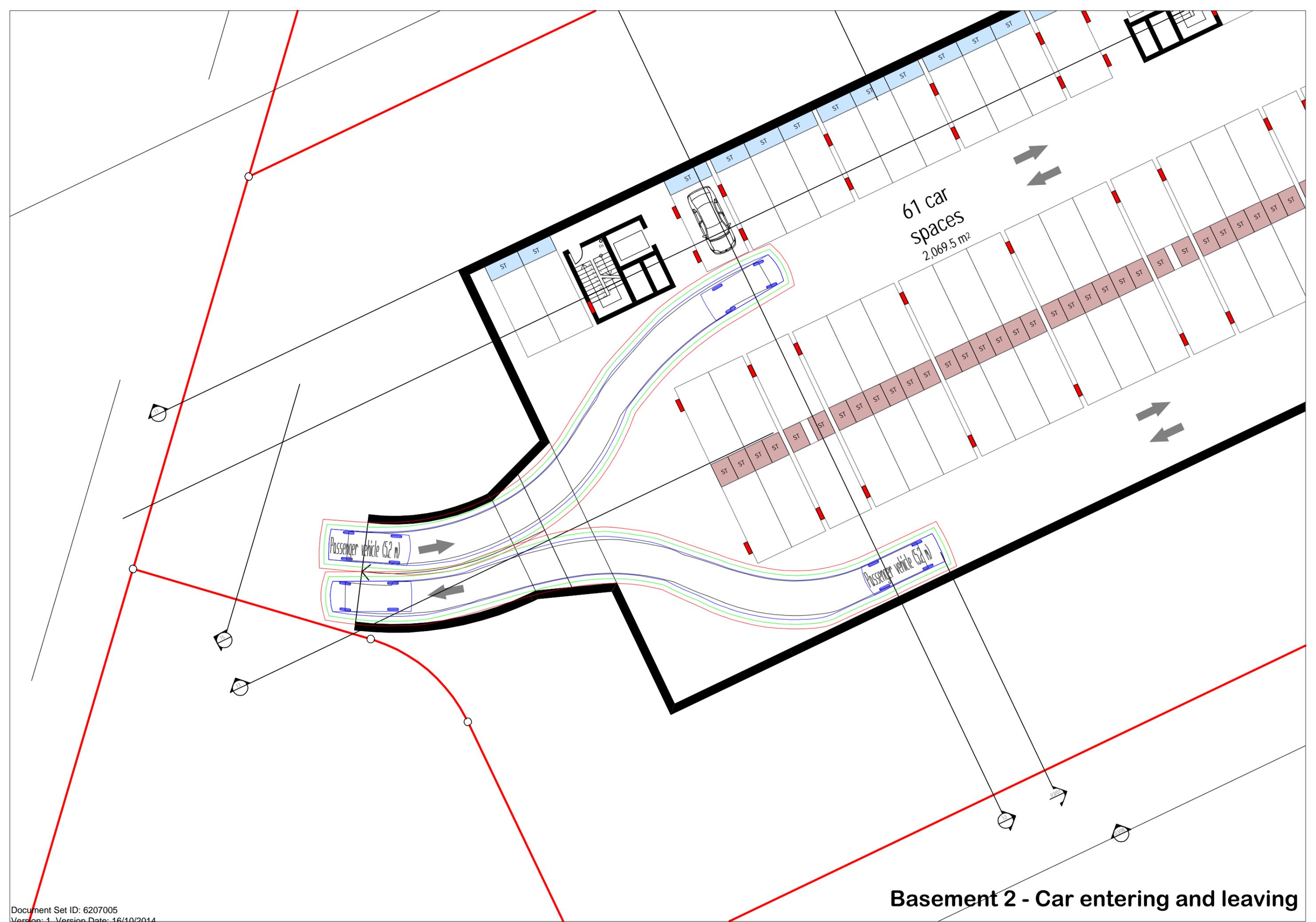
Basement 1 - Car turning from southern aisle to exit ramp



133 car spaces

Passenger vehicle (5.5m)

Basement 1 - Car entering ramp to Basement 2



Basement 2 - Car entering and leaving