



Traffic Impact Assessment

**Proposed Mixed Use Development
85 Harrington Street, The Rocks**

Reference: 14.563r01v2
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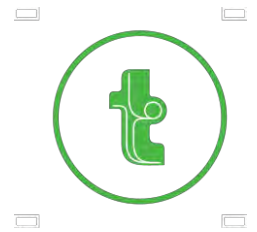


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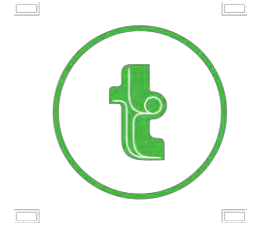
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Appendix A: Photographic Record

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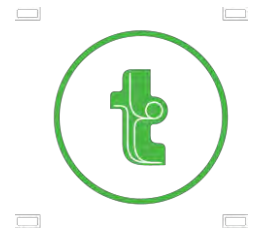
1. Introduction

TRAFFIX has been commissioned by Golden Age and Hannas The Rocks Pty Ltd to undertake a traffic impact assessment to accompany a development application for a proposed mixed use development at 85 Harrington Street, The Rocks. Approval is sought to construct a 9.5 storey building containing 64 residential apartments, 1,921m² gross floor area of commercial space and 753m² gross floor area of retail space. The development is located in the City of Sydney local government area, however the Minister for Planning is the consent authority for this development as it is located within the boundary of the Sydney Cove Redevelopment Authority Scheme – The Rocks (SCRAS)

This report documents the findings of our investigations and should be read in the context of the Environmental Impact Assessment prepared separately. The development is not of a size or capacity that requires referral to the Roads and Maritime Services (Roads and Maritime) under the provisions of State Environmental Planning Policy (Infrastructure) 2007.

The report is structured as follows:

- ➊ Section 2: Describes the site and its location
- ➋ Section 3: Documents existing traffic conditions
- ➌ Section 4: Describes the proposed development
- ➍ Section 5: Assesses the parking requirements
- ➎ Section 6: Assesses traffic impacts
- ➏ Section 7: Discusses access and internal design aspects
- ➐ Section 8: Presents the overall study conclusions.



2. Location and Site

The site is located at 85 Harrington Street in The Rocks, on the western side of the road, immediately north of the Cahill Expressway overpass. In a regional context, it lies on the northwest fringe of the Sydney central business district, approximately 330 metres west of Circular Quay Railway Station.

The site has an irregular configuration with a site area of approximately 2,109m². It has an eastern frontage to Harrington Street that measures approximately 77 metres and a western frontage to Gloucester Street that measures approximately 46 metres, whilst sharing a boundary to the south with public reserve that measures approximately 24 metres. The northern boundary of the site has a staggered alignment which follows the path of Cambridge Street and pedestrian links.

The existing development on-site accommodates a five storey commercial building on-site, with two vehicular accesses provided along Harrington Street.

A Location Plan is presented in **Figure 1**, with a Site Plan presented in **Figure 2**. Reference should also be made to the Photographic Record presented in **Appendix A**, which provides an appreciation of the general character of roads and other key attributes in proximity to the site.

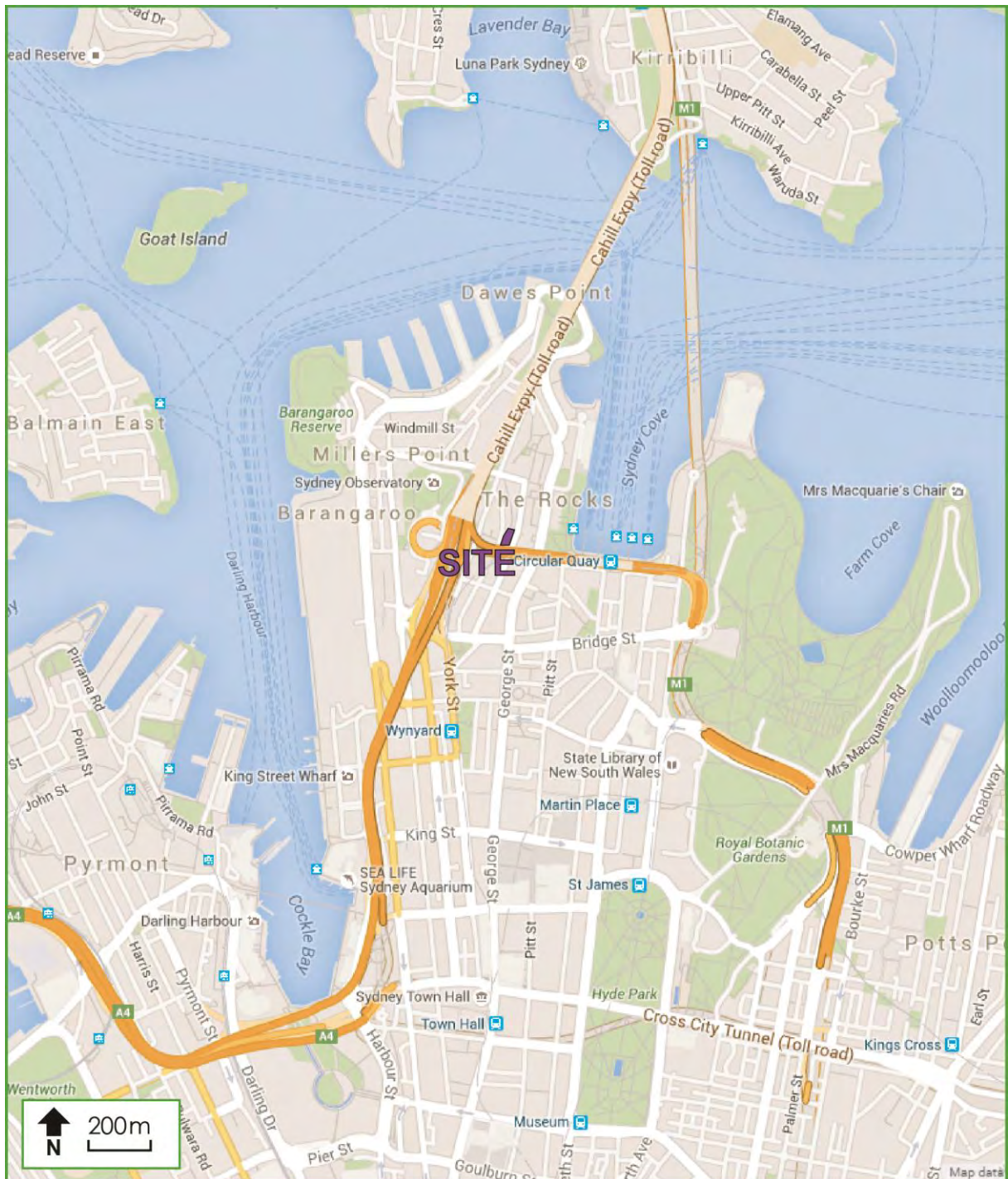


Figure 1: Location Plan

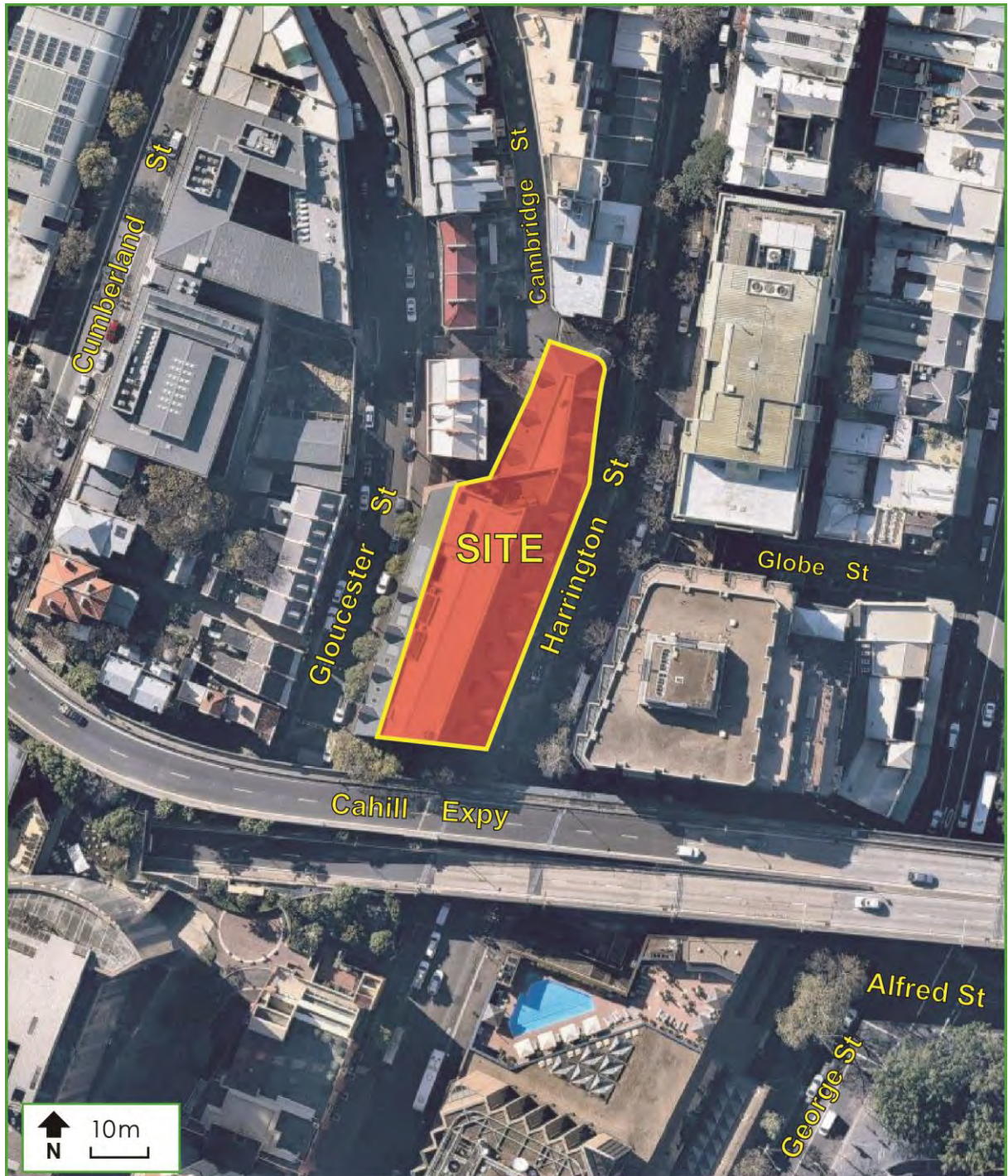
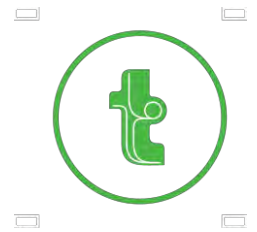


Figure 2: Site Plan

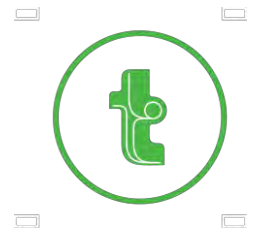


3. Existing Traffic Conditions

3.1 Road Network

The road hierarchy in the vicinity of the site is shown in **Figure 3** with the following roads of particular interest:

- ➊ Bradfield Highway: an RMS Main Road (MR632) that runs in a north-south direction, connecting the Warringah Freeway at North Sydney in the north with the Western Distributor (77,600 vehicles per day, 2012 AADT) in the Sydney CBD to the south. It has a posted speed limit of 70 km/h with a toll payable to southbound motorists. The Bradfield Highway generally accommodates at least three lanes of traffic in each direction within a mostly undivided carriageway, where centre lanes are configurable.
- ➋ George Street: a classified regional road (RR7300) that runs in a north-south direction between Lower Fort Street in the north and Harris Street to the south. North of Alfred Street, it has a 40 km/h speed limit and accommodates a single lane of traffic in each direction. Conversely, south of Alfred Street, George Street has a 50 km/h speed limit and accommodates two lanes of traffic in each direction.
- ➌ Grosvenor Street: a local road that runs in an east-west direction between George Street in the east and Bradfield Highway to the west. It accommodates at least two lanes of traffic in each direction and has a 50 km/h speed limit.
- ➍ Harrington Street: a local road that runs in a north-south direction between Argyle Street in the north and Grosvenor Street to the south. It accommodates a single lane of traffic in each direction and has a 40 km/h speed limit. Kerbside parking is permitted along Harrington Street.
- ➎ Gloucester Street: a local road that runs in a north-south direction between Cumberland Street in the north and Grosvenor Street to the south, however is divided by the Cahill Expressway overpass. It accommodates a single lane of traffic in each direction and has a 40 km/h speed limit. Kerbside parking is permitted along Gloucester Street.



- ② Cambridge Street: a local pedestrian laneway that runs in a north-south direction extending from Argyle Street in the north and terminating at the subject site, adjacent to pedestrian links connecting to Harrington Street and Gloucester Street. Cambridge Street is not traversable by vehicles.

It can be seen from Figure 3 that the site is conveniently located with respect to the arterial and local road systems serving the region. It is therefore able to effectively distribute traffic onto the wider road network, minimising traffic impacts.

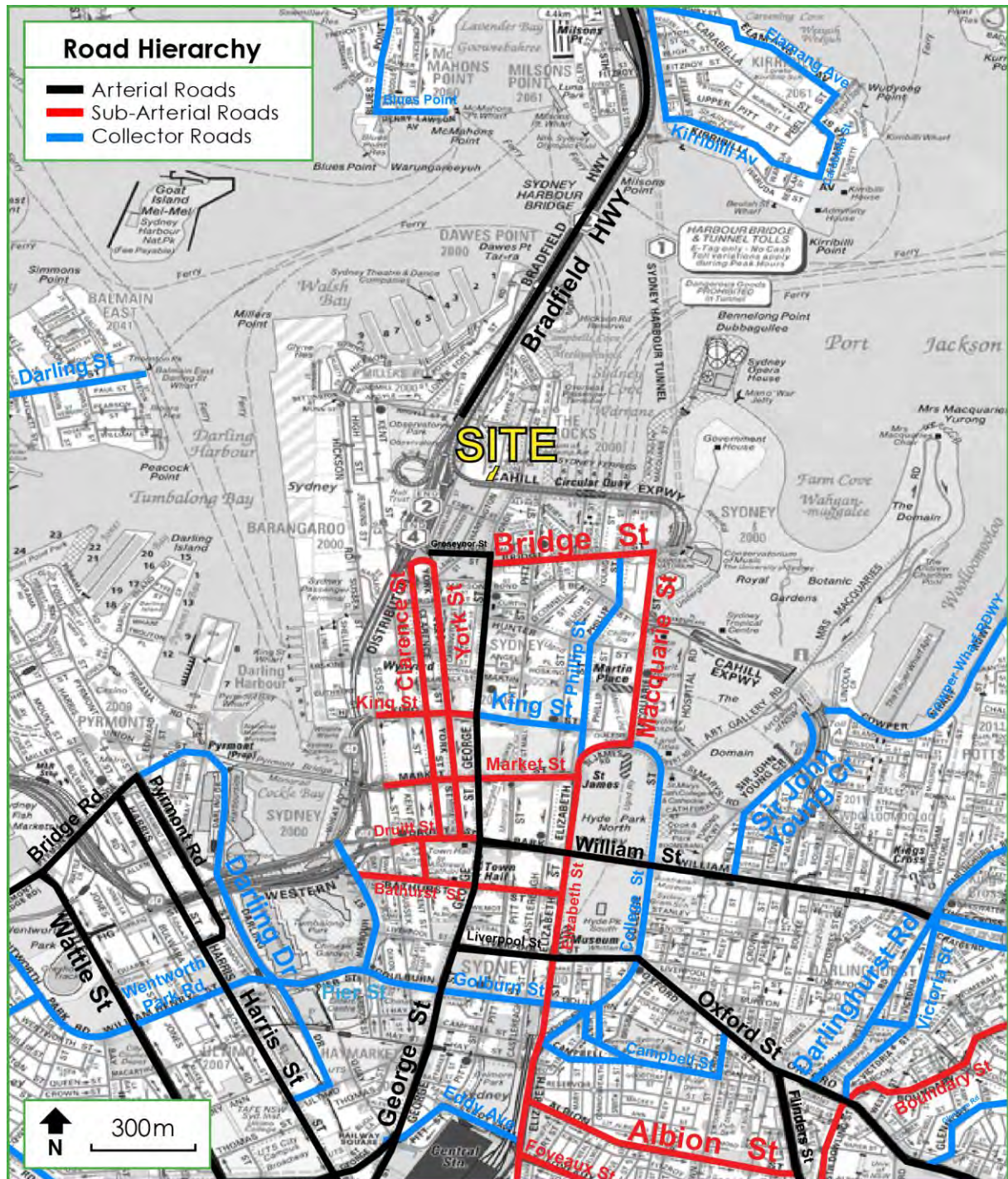
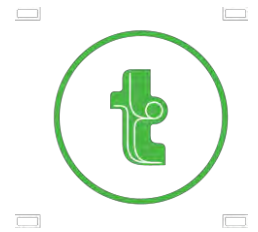


Figure 3: Road Hierarchy



3.2 Public Transport

The existing public transport services available within the locality are shown in **Figure 4**. The site is approximately 350 metres walking distance (i.e. a five (5) minute walk) to Circular Quay Railway Station and approximately 700 metres walking distance (i.e. a nine (9) minute walk) to Wynyard Railway Station. These stations are serviced by the following lines:

- ➡ T1 North Shore, Northern & Western Line;
- ➡ T2 Airport, Inner West & South Line; and
- ➡ T3 Bankstown Line.

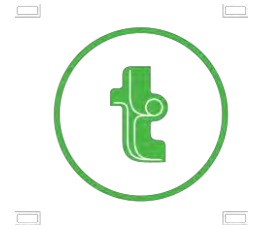
As these stations are situated in the Sydney central business district, services depart at a high frequency and connect to key regional destinations within the Sydney metropolitan region.

In addition to rail services, several bus stops are situated within approximately 400 metres walking distance (i.e. a six (6) minute walk) of the site on Argyle Place, Alfred Street, Young Street, Bridge Street and York Street. They are serviced by routes extending to:

- ➡ Elizabeth Bay, Watsons Bay, Bondi Junction and Maroubra to the east;
- ➡ Cremorne, Northbridge, Chatswood and East Lindfield to the north;
- ➡ Ryde, Macquarie Park and Eastwood to the northwest;
- ➡ Parramatta to the west; and
- ➡ Botany, Eastgardens and Sans Souci to the south.

Circular Quay wharf is also located within 400 metres walking distance (i.e. a six (6) minute walk) of the site. This wharf is a terminal for all ferry lines including:

- ➡ F1 Manly Line
- ➡ F2 Taronga Zoo
- ➡ F3 Parramatta River
- ➡ F4 Darling Harbour
- ➡ F5 Neutral Bay
- ➡ F6 Mosman Bay
- ➡ F7 Eastern Suburbs



It is also noteworthy that the CBD and South East Light Rail line is currently under construction and due to be complete by 2018. The route will operate between Circular Quay in the north and Kingsford and Randwick to the south, via Surry Hills. Two (2) stops on Alfred Street and George Street (adjacent to Grosvenor Street) will be built within 400 metres of the site.

Finally, bicycle routes are also easily accessible from the site, including a bicycle trail along the Cahill Expressway (accessible from Cumberland Street and Circular Quay) as well as bicycle-friendly roads along George Street, Alfred Street and Cumberland Street. These routes supplement the existing pedestrian network within the vicinity of the site, including along the perimeter of the site and the pedestrianised Cambridge Street.

In summary the site has excellent access to a multitude of public transport services that provide extensive connections to key regional destinations within the Sydney Metropolitan Region. This is notwithstanding that the proposed development is situated on the fringe of the Sydney Central Business District and is surrounded by convenient pedestrian links between Gloucester Street and Harrington Street.

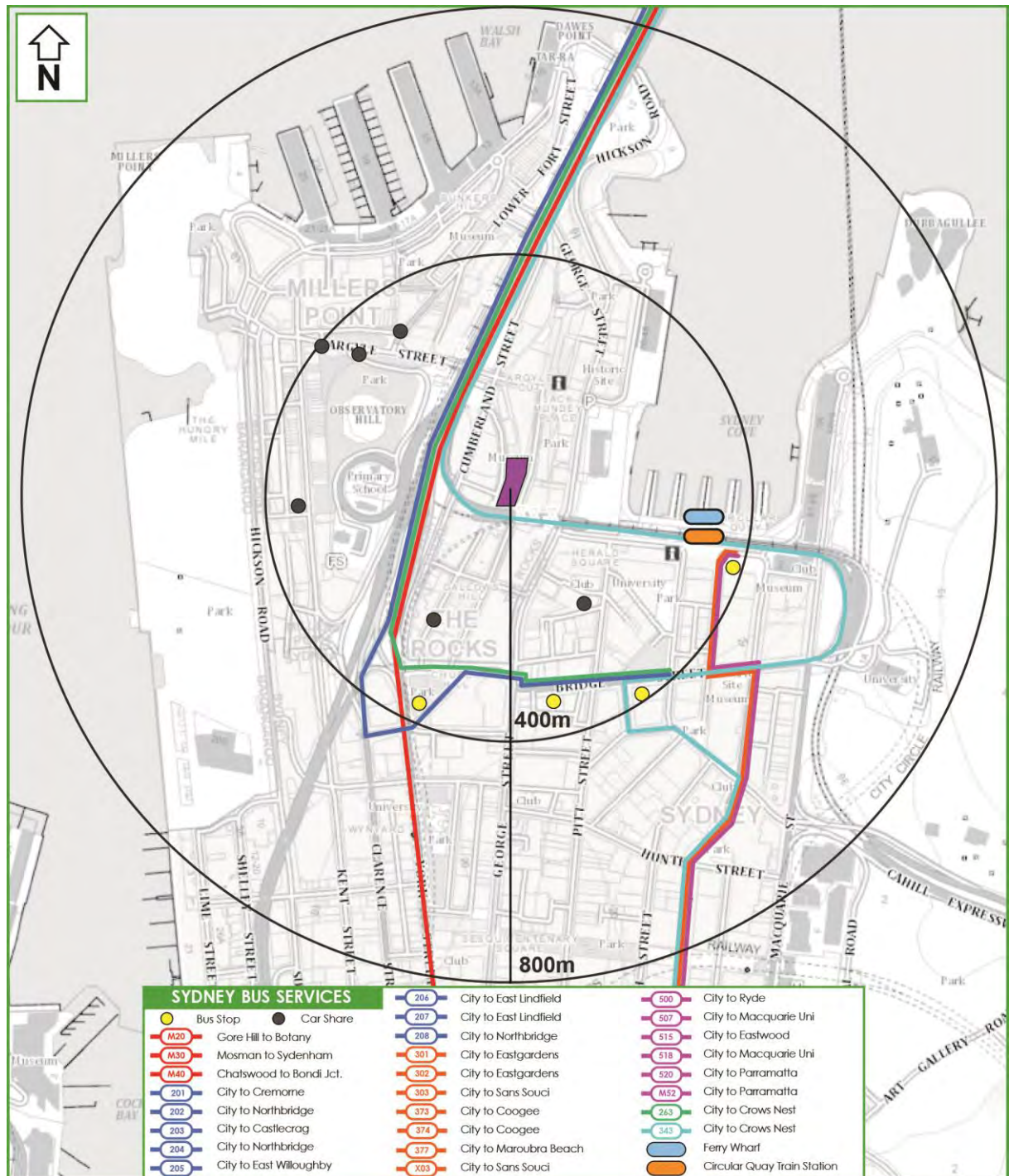
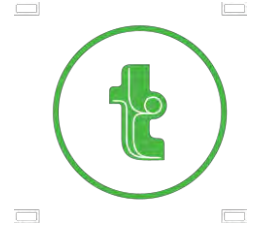


Figure 4: Public Transport



3.3 Existing Site Generation

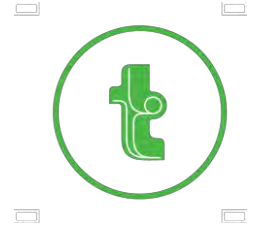
The existing development on-site comprises a five (5) storey commercial development with basement level car parking. Given its central location, traffic generated by the site is curtailed by the on-site parking supply, with 52 parking spaces are provided. The RMS Technical Direction TDT 2013/04a provides traffic generation rates for commercial developments based upon surveys conducted during 2010.

For an office development surveyed in North Sydney, situated within three (3) kilometres of the Sydney Central Business District, it established a trip generation rate of 0.324 vehicle trips per parking space during the AM peak hourly period and 0.243 vehicle trips per parking space during the PM peak hourly period. As the site is located within a similar proximity to the Sydney Central Business District and with comparable levels of access to public transport, these rates are considered applicable to the existing development.

Accordingly, the approved traffic generation for the site is assumed to be:

- ➊ 17 vehicle trips per hour during the AM peak period; and
- ➋ 13 vehicle trips per hour during the PM peak period.

These traffic volumes are relevant in the context of the net traffic impacts of the proposed development, discussed in Section 6.



4. Description of Proposed Development

A detailed description of the proposed development is included in the Statement of Environmental Effects prepared separately. In summary, approval is sought for the demolition of all existing structures and construction of a 9.5 storey building, to comprise of the following mixed use development:

- ② 64 residential apartments, consisting of:
 - 18 x one (1) bedroom apartments;
 - 26 x two (2) bedroom apartments;
 - 16 x three (3) bedroom apartments;
 - Three (3) x town homes;
 - One (1) x penthouse
- ② 1,921m² gross floor area of commercial space;
- ② 753m² gross floor area of retail space; and
- ② Provision for three levels of basement car parking with access from Harrington Street, containing 95 parking spaces, including seven (7) accessible spaces, one (1) service vehicle space, eight (8) motorcycle spaces and one (1) car share space.

The parking requirements and traffic impacts arising from this development scenario are discussed in Sections 5 and 6 respectively. Reference should also be made to the architectural plans submitted separately, for which plans of the basement and ground levels are presented at reduced scale in **Appendix B**.



5. Parking Requirements

5.1 Council Controls

As the development is located within the Sydney Cove Redevelopment Authority Scheme – The Rocks (SCRAS), there are no parking requirements associated with the development. The City of Sydney DCP and the RMS Guide to Traffic Generating Developments however provide parking rates for residential apartment, retail and commercial space, which provide a guide for the number of parking spaces required. The rates are presented in Table 1.

Table 1: Council and RMS Parking Rates and Provision

Type	Number	Council Parking Rates	RMS Parking Rates	Spaces Required Council (Maximum)	Spaces Required RMS (Minimum)	Spaces Provided
1 bedroom	18	0.3 spaces per unit	0.4 spaces per unit	5.4	7.2	95
2 bedrooms	26	0.7 spaces per unit	0.7 spaces per unit	18.2	18.2	
3 bedrooms	20	1 space per unit	1.2 spaces per unit	20	24	
Visitors	64	No Requirement	1 space per 7 units	0	9.1	
Retail	753m ²	See formula	4.5 spaces per 100m ²	3.1	48	0
Commercial	1,921m ²	See formula	1 space per 40m ²	8	33.9	
Totals				54.7	140.4	95

For a retail development in a Category D land with a floor space ratio (FSR) of more than 3.5:1, the required parking is to be calculated using the following formula:

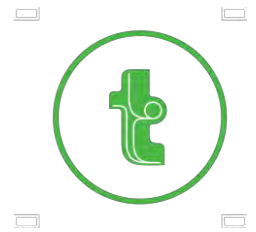
M = (G x A) / (50 x T) where:

M is the maximum number of parking spaces, and

G is the gross floor area of all retail premises in the building in square metres, and

A is the site area in square metres, and

T is the total gross floor area of all buildings on the site in square metres.



It can be seen from Table 1 that with 64 units, 753m² retail GFA and 1,921m² commercial GFA, there is a requirement to provide a maximum of 55 parking spaces assuming the City of Sydney DCP parking rates, and a minimum of 140 parking spaces assuming the RMS parking rates. In response, the development proposes 95 parking spaces, all of which are intended for the use of the residential units. This lies within the range established by Council's DCP rates and the RMS parking rates.

Retail and Commercial Parking

No retail or commercial parking is proposed, as is permitted under Council's DCP. In this regard, the site is well located to major public transport links, and it is assumed that staff of the retail and commercial tenancies will access the site via these means. Customers and visitors will also be drawn from the locality as pedestrians.

Residential Parking

It is understood that the proposed number of parking spaces in this instance has been driven by the market expectations (demand) for a reasonably high level of parking associated with these high-quality apartments which will attract residents with a high car ownership. The RMS Guideline requires a minimum of 59 spaces for this use, whereas 95 spaces are proposed.

Notwithstanding this high level of provision, it is considered that residential tenants are still likely to use public transport for their trips to and from work, which is the main trip type that contributes to peak period congestion. Conversely, cars will be required for more casual use, relating to trips outside peak periods such as shopping, recreational, social and educational trips, many of which require the use of a car as they occur during the evenings and on weekends. Furthermore, as discussed in Section 6 of this report the parking numbers do not cause significant trip generation in the AM and PM peak hours.

It should also be noted that the most recent major development in the Sydney Cove Redevelopment Authority Scheme permitted a development with a parking rate of 1.26 spaces per unit. This development is proposing 1.5 spaces per unit, which is reasonably comparable and in any case, is understood to have been adjusted to respond to market enquiries/expectations.



5.2 Bicycle Facilities

The City of Sydney DCP requires the minimum bicycle parking to be provided at the following rates:

② Retail Use:

- Employees: One (1) per 250m² GFA of 'Class 2' standard; and
- Customer: Two (2) plus one (1) per 100m² over 100m² GFA of 'Class 3' standard.

② Commercial Use:

- Employees: One (1) per 150m² GFA of 'Class 2' standard; and
- Customer: One (1) per 400m² GFA of 'Class 3' standard;

② Residential Use:

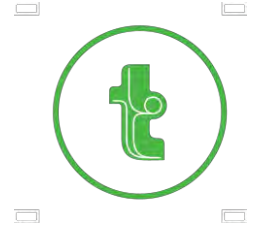
- Residents: One (1) per dwelling of 'Class 1' standard; and
- Visitors: One (1) per 10 dwellings of 'Class 3' standard.

Accordingly, the development is nominally required to provide a minimum number of bicycle parking spaces as shown in Table 2 below. The development is not required to meet the DCP requirements, however this may be used a guide to the number of bicycle parking spaces required:

Table 2: Bicycle Parking Requirements

	Residents	Retail Staff	Commercial Staff	Visitors
Facilities Required	'Class 1' individual cages	'Class 2' secure area	'Class 2' secure area	'Class 3' rails
Number Required	64	4	11	22

In response, the development does not propose to provide any dedicated bicycle parking facilities on the site. The development is however providing each unit with a storage cage within the basement levels of the car park, which has the spatial capacity to store one (1) bicycle per unit. Furthermore, 26 class 3 bicycle parking rails are being provided in the public domain on Harrington Street and Gloucester Street. The residential, commercial, and retail units also provide trip end facilities internally. The number of bicycle parking spaces is understood to be determined by the expected market demand in this instance. It is however recognised that the deficiency is considerable and that opportunities for dedicated bicycle parking spaces can be investigated at construction certificate stage.



5.3 Motorcycle Parking

Schedule 7.8.4 of Council's DCP 2012 states the following with regard to motorcycle parking:

In all buildings that provide onsite parking, one (1) motorcycle parking space for every 12 car parking spaces is to be provided as separate parking for motorcycles. Each motorcycle parking space is to be designated and located so that parked motorcycles are not vulnerable to being struck by a manoeuvring vehicle.

Application of this control to the 95 car spaces indicates that the development should provide an area for motorcycle parking capable of parking eight (8) motorcycles. In response to this, the development is proposing eight (8) motorcycle parking spaces, and therefore satisfies the requirement of the DCP.

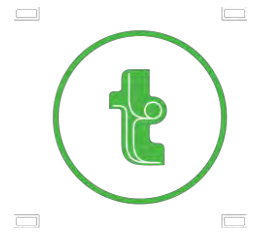
5.4 Accessible Parking

Schedule 7.8.5 of Council's DCP 2012 states the following with regard to accessible parking:

- One (1) accessible car parking space is to be provided for every adaptable residential unit.
- One (1) space for every 20 car parking spaces or part thereof is to be allocated as accessible visitor parking.
- The space shall meet the requirements of AS2890.6 providing an adjacent 'shared zone' of 2.4m x 5.4m to assist with loading and unloading.
- For residential development, accessible car parking spaces are to be allocated to adaptable units, or as visitor parking. Accessible car parking spaces allocated to adaptable dwelling units are to be a part lot to an adaptable unit in the strata plan.

With regards to the subject development, the site location within land use Category A precludes the provision of visitor parking on site. As such, accessible visitor spaces are not required.

The development proposes seven (7) accessible units, and 95 car parking space. This equates to a total DCP requirement of 12 accessible parking spaces. In response, the development proposes seven (7) accessible parking spaces.



5.5 Green Travel Plan

Section 3.11.1 of Council's DCP 2012 provides the following thresholds above which a proposed development is required to provide a Green Travel Plan:

- ➊ 100 vehicles per hour for non-residential development;
- ➋ 50 vehicles per hour for residential development within a Category A LUTI zone.

With reference to the traffic generation analysis presented in Section 6, it is clear that the peak hour traffic demand forecasts for the development are not sufficient to warrant the preparation of a Green Travel Plan.

Nevertheless, it is recommended that a green travel plan be implemented to encourage staff and residents to use alternative transport modes (public transport, cycling, walking) to commute/travel to and from the site. Council is therefore encouraged to include the preparation of a green travel plan as a condition of consent, which – in conjunction with the car share scheme – would moderate the traffic demand on the surrounding road network.

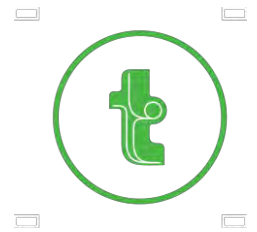
5.6 Car Share

Available evidence from car share operators indicate that a car share car can reduce car ownership (in the surrounding area) by 10 cars. This in turn reduces traffic demand on the surrounding road network and accordingly, provisions for car share schemes are actively encouraged by Councils, including the City of Sydney.

Section 3.11.2 of Council's DCP 2012 contains the following relevant controls with regard to required car share provisions:

- ➊ The maximum amount of car parking spaces for a development is inclusive of the minimum number of parking spaces required for car share schemes;
- ➋ Residential development – other than dwelling houses and dual occupancies – on Category A LUTI zoned land requires one (1) car share space per 50 car spaces provided.

Having regard for the provision of 95 residential spaces, the development would be nominally required to provide two (2) car share space.



In response, the proposed development provides a single car share space within the basement car park. The inclusion of this car share space however will depend on detailed assessment relating to its commercial viability. Specifically, a car share space within a secure car park would result in the exclusive use of this vehicle for residents of the development only, so that the demand is unlikely to be sufficient. Similarly, access to this space by the general public presents security concerns.

In summary, as the application is not being assessed under the DCP controls, it is considered justifiable to include a space in the basement car park at this stage, and to assess its viability at a later stage. This would also give due consideration to the fact that there are already numerous on-street car share facilities in the locality of the site, which may possibly negate the requirement to have a facility within the development.

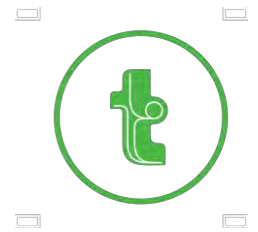
5.7 Servicing

Schedule 7.8.1 of Council's DCP 2012 requires service vehicle parking for the subject development to be provided in accordance with the minimum rates specified in Table 3:

Table 3: DCP 2012 Minimum Service Vehicle Parking Rates and Provision

Use	Number	Council Parking Rates	Spaces Required
RESIDENTIAL			
0-50 Units	50	0.02 spaces per room	1.0
50+ Units	14	0.01 spaces per room	0.14
Sub-Total (1)			1.14
COMMERCIAL			
Commercial GFA	1,921m ²	1.0 space per 3,300 m ²	0.58
Retail GFA	753m ²	1.0 space per 350m ²	2.15
Sub-Total (3)			2.73
TOTAL -			3.87

As can be seen, the development requires four (4) loading bays under the requirements of DCP 2012 and these would reasonably include provision for large and small trucks as well as vans. This assumes that demands overlap whereas in reality, there is the potential to share loading through a management regime. Accordingly, provision of up to four spaces are proposed, depending upon the mix of vehicles at any one time. In this regard, the following combinations are possible, based on the provision/dedication of two van (normal parking) spaces in the basement:



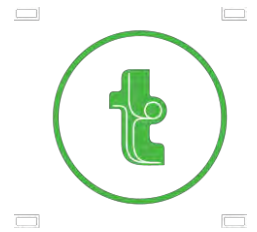
- One SRV in the main dock and 2 van in the basement; or
- Two vans in the main dock and 2 vans in the basement;

The DCP also stipulates that vehicle access for collection and loading should provide for a 9.25m Council garbage truck and a small rigid vehicle (SRV), with a minimum of 4m head height clearance. In response, the development is proposing one (1) loading dock that has been designed to cater for SRV's with a 3.5m head height clearance. There is a turntable facility to ensure that vehicles are able to enter and exit the site in a forward trajectory. This is considered justifiable for this development as it is recognised that the demand for a significant proportion of these bays would be generated by vans which have the opportunity to utilise the on-site service spaces as well as the existing on street loading zone on Harrington Street or the time limited parking adjacent to site on Harrington Street and Gloucester Street.

The main uses for the loading dock will be for any potential larger deliveries generated by the retail/commercial tenants. On a less frequent basis, small removal trucks will also use the loading dock for residents who are entering or vacating residential premises within the proposed development. The development provides a head height clearance of approximately 6m, which is suitable for an SRV. Larger vehicles that are required for servicing the building will need to do so using the existing on-street parking/loading facilities.

With regard to garbage collection, the driveway access is not suitable for Council's nominated garbage truck. Garbage collection will need to take place either on-street (through an agreement with Council), or by a privately appointed garbage collection contractor using an SRV.

It is envisioned that a loading dock management plan will be prepared to ensure the smooth operation of the area.



6. Traffic Impacts

6.1 Trip Generation

The RMS *Guide to Traffic Generating Developments* (GTGD) was first released in 1991. It provides guidance on a number of matters that relate to traffic impacts, in particular, advice on traffic generation and parking demand. The guide was revised in 2001 and it is currently in the process of further revisions with a view to providing advice that reflects current travel characteristics.

As part of the latest revision process, in 2013 RMS released Technical Direction TDT 2013/04a, which provided revised trip generation advice for a number of land uses based on current survey data obtained since 2009. TDT 2013/04a consists of two parts: an initial summary of the results presenting average trip rates and tables summarising the raw survey data.

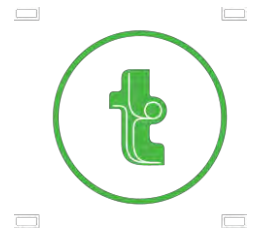
Residential development

One of the land uses covered by TDT 2013/04a is high density residential development. In addition to trip rates on a per unit basis – as provided by the RMS GTDG – the TDT 2013/04a also provides trip generation on a per car space and per bedroom basis. The per car space trip rates have been adopted by this assessment. These trip rates are:

- 0.15 trips per car space during the morning peak hour; and
- 0.12 trips per car space during the evening peak hour.

The application of these rates to the on-site provision of 95 spaces yields the following traffic generation based upon a 20/80 split to represent the direction of traffic during the AM and PM traffic flow:

- 14 vehicle trips in the AM Peak (11 out and three (3) in); and
- 11 vehicle trips in the PM Peak (nine (9) in and two (2) out)



Commercial and Retail development

The RMS guide provides the peak hour trip rates for commercial and retail developments based on the assumption that the development has adopted the RMS parking rates for such developments. In this instance, the RMS parking rates have not been adopted and therefore the use of these rates is not appropriate. Using the trip generation rates per space, the commercial and retail developments will not produce any traffic generation as there are no parking spaces provided for these tenancies.

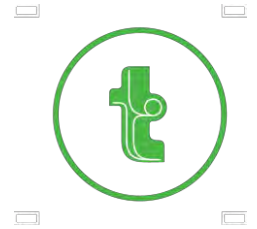
6.2 Traffic impacts

The existing traffic generation of the site as presented in section 3.3 is 17 vehicle trips in the peak AM peak hour, which equates to approximately one (1) additional trip every four (4) minutes. The AM peak hour forecasts above equate to a generation of (on average) approximately one (1) additional trip every four (4) minutes. Taking the existing generation into account, there is a minimal net traffic generation decrease of three (3) vehicle trips per hour in the AM peak hour. Net traffic volume changes of such a low order would have no material impact on the operation or performance of the surrounding road network and accordingly no external road/intersection improvements are required to facilitate this development. Furthermore, computer modelling techniques available to analyse intersection performances are not sensitive to such small changes.

6.3 Queuing Analysis

With the one-way traffic flow at the entrance (effectively a control point), AS2890.1 (2004) *Part 1: Off-street car parking* requires the 98th percentile queue to be accommodated on site. That is, no waiting bay is required where the probability of a vehicle waiting is less than 2%. For this purpose, the evening peak hour is the 'critical' peak hour with regard to on-street queuing as the majority of the peak hour trips are inbound trips from the street.

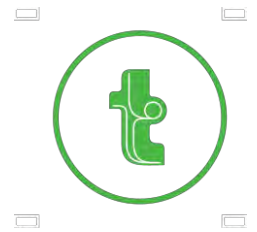
The analysis in Section 6.1 forecasts the evening peak hour traffic demand generated by residents using the on-site car parking to be 11 peak hour trips (nine (9) inbound and two (2) outbound). Queuing analysis of the parking system has been undertaken using statistical probability modelling. The analysis has been used to determine the queuing requirements to be provided in order to satisfy the 98th percentile queue and is presented in **Appendix D**. A queueing area is not required for a probability of 2% or less and the results indicate that with 95 spaces as proposed, there will be a 7.3% chance of queueing, which triggers the requirement for a queueing storage area for one (1) vehicle to



be provided on site. In response, no queuing area is proposed on the site. The result of this may cause vehicles to queue on Harrington Street, with the potential for vehicles to be forced to reverse either internally or externally across the footpath to give way if the traffic signals are ignored or multiple vehicles require ingress/egress from the site at once.

This is a matter that can be addressed at construction certificate stage, noting that the need for a waiting bay would in any event be overcome by the provision of a two-way driveway, involving a slight widening; or through a commensurate reduction in parking to achieve a 2% probability.

The recommendation to satisfy this requirement would be to reduce the number of parking spaces provided at the site, or to widen the driveway to allow two-way flow.



7. Access & Internal Design Aspects

7.1 Access

The proposed development requires a Category 1 Driveway under AS 2890.1 (2004), being a combined entry-exit driveway of width 3.0 to 5.5 metres. In response, the development proposes a combined entry-exit driveway of width 3.9 metres with access to Harrington Street. This width is acceptable due to the low traffic volumes expected at the site, and the one-way working operating on the driveway and thereby satisfying the minimum requirements of AS 2890.1 (2004) and AS 2890.2 (2002) for an SRV.

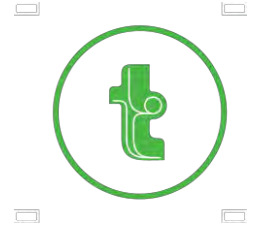
Swept path analysis has been undertaken of the site access, as is permissible under AS 2890.1 (2004), demonstrating a satisfactory operation of this driveway for vehicles sized up to and including an SRV. This is included in **Appendix C**.

7.2 Internal Design

The internal basement car park generally complies with the requirements of AS 2890.1 (2004) and the following characteristics are noteworthy:

7.2.1 Parking Modules

- ② All residential parking spaces have been designed in accordance with a Class 1A user and are provided with a minimum space length of 5.4m a minimum width of 2.4m and a minimum aisle width of 5.8m.
- ② All spaces located adjacent to obstructions of greater than 150mm in height have been provided with an additional width of 300mm.
- ② Dead-end aisles have generally been provided with the required 1.0m aisle extension in accordance with Figure 2.3 of AS2890.1. There are instances at parking bay No's 1, 28, 61 and 95 where the required aisle extension has not been provided, however swept path analysis proves the acceptable working of these spaces, so are considered supportable on these grounds.



- ➊ All disabled parking spaces have been designed with a width of 3.8m. AS2890.6 stipulates that disabled spaces should be provided either with a width of 2.4m and located adjacent to a minimum shared area of 2.4m, or at a width of 3.8m for wall to wall adaptable spaces.

7.2.2 Ramps

- ➋ Ramps associated with the residential basement car park have a maximum gradient of 25% (1 in 4) with transitions of 12.5% (1 in 8). These provisions satisfy the requirements of AS 2890.1 (2004) for the car park;

7.2.3 Clear Head heights

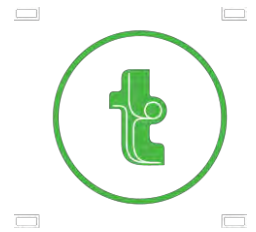
- ➌ A minimum clear head height of 2.2m is provided for all areas within the basement car park as required by AS2890.1. A clear head height of 2.5m is provided above all disabled spaces as required by AS2890.6. A clear head height of approximately 6m is provided at the entrance to the access driveway, which more than exceeds the requirements outlined in AS2890.2.

7.2.4 Other Considerations

- ➍ All columns have been located outside of the parking space design envelope shown in Figure 5.2 of AS 2890.1 (2004).
- ➎ Appropriate visual splays have been provided in accordance with the requirements of Figure 3.3 of AS2890.1 at all accesses.
- ➏ Traffic signals shall be used to manage traffic flow due to the one-way traffic flow through the entrance driveway and the lack of queueing area provision. Vehicles will be held at the entrance to the driveway, and also at the bottom of the first basement level ramp, with priority being given to drivers entering the development to try and prevent queueing on Harrington Street. This can be achieved with a green signal for entering traffic in 'passive' mode so that the signals will on change when a service vehicle is using the loading dock or when a vehicle is waiting to exit the car park. It is however inevitable that vehicles will be required to queue on Harrington Street when vehicles are exiting the site and the loading dock is in use, which should be detailed in the loading dock management plan.
- ➐ A swept path analysis of all critical movements has been undertaken to confirm geometry and compliance with the relevant standards. The swept path assessment is included in **Appendix C**.

7.2.5 Service Area Design

- ➑ The internal design of the service area has been undertaken in accordance with the requirements of AS28090.2 for the maximum length vehicle permissible on-site being an SRV.



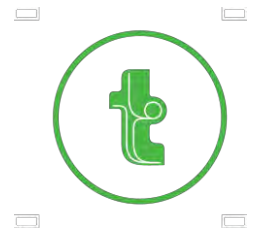
- ⑦ A minimum clear head height of 3.5m is provided within the service area
- ⑦ A turntable has been provided to accommodate the turning of the service vehicle. The turntable will have a radius of 5m and a clearance of radius 5.5m
- ⑦ A swept path analysis has been undertaken as permissible under AS2890.2 and confirms the internal design. The swept path assessment is included in **Appendix C**.

In summary the internal configuration of the basement car park and loading areas have been designed in accordance with the both AS2890.1 and AS2890.2, with the exception of the provision of a sufficient queueing area. It is however envisaged that a condition of consent would be imposed requiring compliance with these standards and as such any minor amendments considered necessary (if any) can be dealt with prior to the release of a Construction Certificate.

7.3 Construction Management Plan

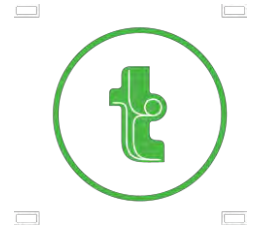
It is anticipated that a standard condition of consent will be imposed requiring the preparation of a detailed construction management plan (CTMP). Such a plan cannot be prepared until such time as a builder has been appointed and the construction methodology confirmed. Nevertheless it is considered that adherence will generally be made to the following principles:

- ⑦ It is intended that a construction work zone will be sought on Harrington Street immediately adjacent to the site.
- ⑦ Access to the site will be available via Gloucester Street for vehicles up to and including a Small Rigid Vehicle (SRV). All other vehicles will be able to access the site via Harrington Street subject to the building stage. A work zone will be sought on Gloucester Street for use by vehicles up to a 6.4m SRV.
- ⑦ Worker numbers will vary during each construction phase. However, it is proposed that car-pooling will be encouraged during the entire construction period to minimise the reliance on on-street and public parking in the vicinity. The opportunity will be taken for the workers to park in the basement as soon as practicable during the construction process.
- ⑦ Small trucks will access the site via Gloucester Street as well as Harrington Street. All larger vehicles will access the site via Harrington Street only. At this stage it is expected that the largest truck accessing the site will be a 12.5m Heavy Rigid Vehicle (HRV). Craneage requirements are



expected to be contained within the site. However, in the event that the standing of a crane on street is proposed, an occupancy licence will be applied for under RMS procedures.

- Pedestrian control and management will be undertaken along both street facades at all times.
- There are a number of routes available for construction traffic to access the site. These routes will need to be determined once a building contractor has been appointed to ensure that minimal impacts occur on surrounding local streets.



8. Conclusions

In summary:

- ② The traffic generation arising from the proposed mixed use development has been assessed as a net increase over and above existing traffic conditions. The net decrease is three (3) vehicles per hour for the AM peak period. These trips will be split into both directions and can be readily accommodated, with minimal impacts on the surrounding road system;
- ② With 95 off-street parking spaces, the development will contain all parking demands within the site. Consideration has been made for accessible parking, and alternative travel modes through the provision of bicycle parking, motorcycle parking, car share facilities and the production of a green travel plan.
- ② Access to the site car park and loading dock for this development will be achieved through a one-way access driveway, operated by a signal system that will allow service vehicles to use the turntable, as well as vehicles to enter and exit the site. The design dimensions of the driveway is compliant with AS 2890.1 (2004), however there is a deficiency in the design through the absence of an appropriate queuing area as per the requirement of the queueing analysis. The result of this may cause vehicles to queue on Harrington Street, with the potential for vehicles to be forced to reverse either internally or externally across the footpath to give way if the traffic signals are ignored or multiple vehicles require ingress/egress from the site at once.
- ② The proposed car park layout complies with the requirements of both AS 2890.1 (2004). The car park has also been assessed using the computer program Auto Track, as permitted by AS 2890.1 (2004) and operates safely and efficiently. Any minor adjustments to ramp swept paths can be altered at construction certificate stage;
- ② The proposed traffic signal system is considered appropriate with a green signal for entering traffic in 'passive' mode so that the signals will only change when a service vehicle is using the loading dock provided or when a vehicle is waiting at the bottom of ramp on basement level 1. The waiting area on basement level 1 can then be utilised (which is a low probability event even during peak periods). Vehicles waiting to enter the site will need to queue on Harrington Street.

It is therefore concluded that the proposed development is generally supportable on traffic planning grounds, however represents some deficiencies in the design. Recommendations have been made to alleviate these deficiencies, and will be required for compliance with Australian Standards and for the site to operate satisfactorily.



Appendix A

Photographic Record



View of the north of the subject site on Harrington Street.



View of the south of the subject site on Harrington Street.





View of Harrington Street looking north from the subject site



View of Harrington Street looking south from the subject site





View of the intersection of Harrington Street and Argyll Street looking north from Harrington Street.



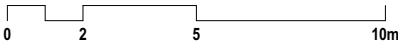
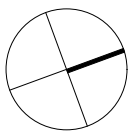
View of the intersection of Harrington Street and Essex Street looking south from Harrington Street





Appendix B

Reduced Plans



- GENERAL NOTES**
- ALL DIMENSIONS AND EXISTING CONDITIONS SHALL BE CHECKED AND VERIFIED BY THE CONTRACTOR BEFORE PROCEEDING WITH THE WORK
 - ALL LEVELS RELATIVE TO 'AUSTRALIAN HEIGHT DATUM'
 - DO NOT SCALE DRAWINGS. USE FIGURED DIMENSIONS ONLY

LEGEND

1 BED
2 BED 2 BATH
3 BED
TOWNHOUSE
LOBBY
COMMERCIAL
LIVE/ WORK
RETAIL

- Adaptable Apartment
- Cross Ventilation Path
- Solar Compliant Apartment
- Solar Compliant Balcony
- AL1** Powdercoated Aluminium Panel 1
- AL2** Powdercoated Aluminium Panel 2
- ALP** Aluminium Composite Panel
- BAL1** Glazed Balustrade 1
- BAL2** Glazed Balustrade 2
- BAL3** Aluminium Plate Balustrade
- BYRK1** Bicycle Rack
- GL1** Aluminium Framed Retail Glazing
- GL2** Performance Glazed Aluminium Framed Sliding Door
- GL3** Glazing With White Interlay & Integrated Venetians
- LV1** Sandstone Louvre
- PAV1** Paving 1
- PC1** Precast Concrete 1
- SC1** Perforated Screen
- SC2** Integrated Screen
- SC3** Louvred Screen
- SS1** Sandstone 1
- SS2** Sandstone 2
- TC1** Terracotta Cladding 1
- TC2** Terracotta Cladding 2
- TC3** Terracotta Cladding 3
- TIM** Timber Composite Panel

I	27/01/2016	For Coordination	CHS
H	12/01/2016	For Coordination	CHS
G	21/12/2015	For Coordination	CHS
F	25/11/2015	For Coordination	CHS
E	11/11/2015	For Coordination	CHS
D	27/10/2015	For Coordination	CHS
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PROJECT

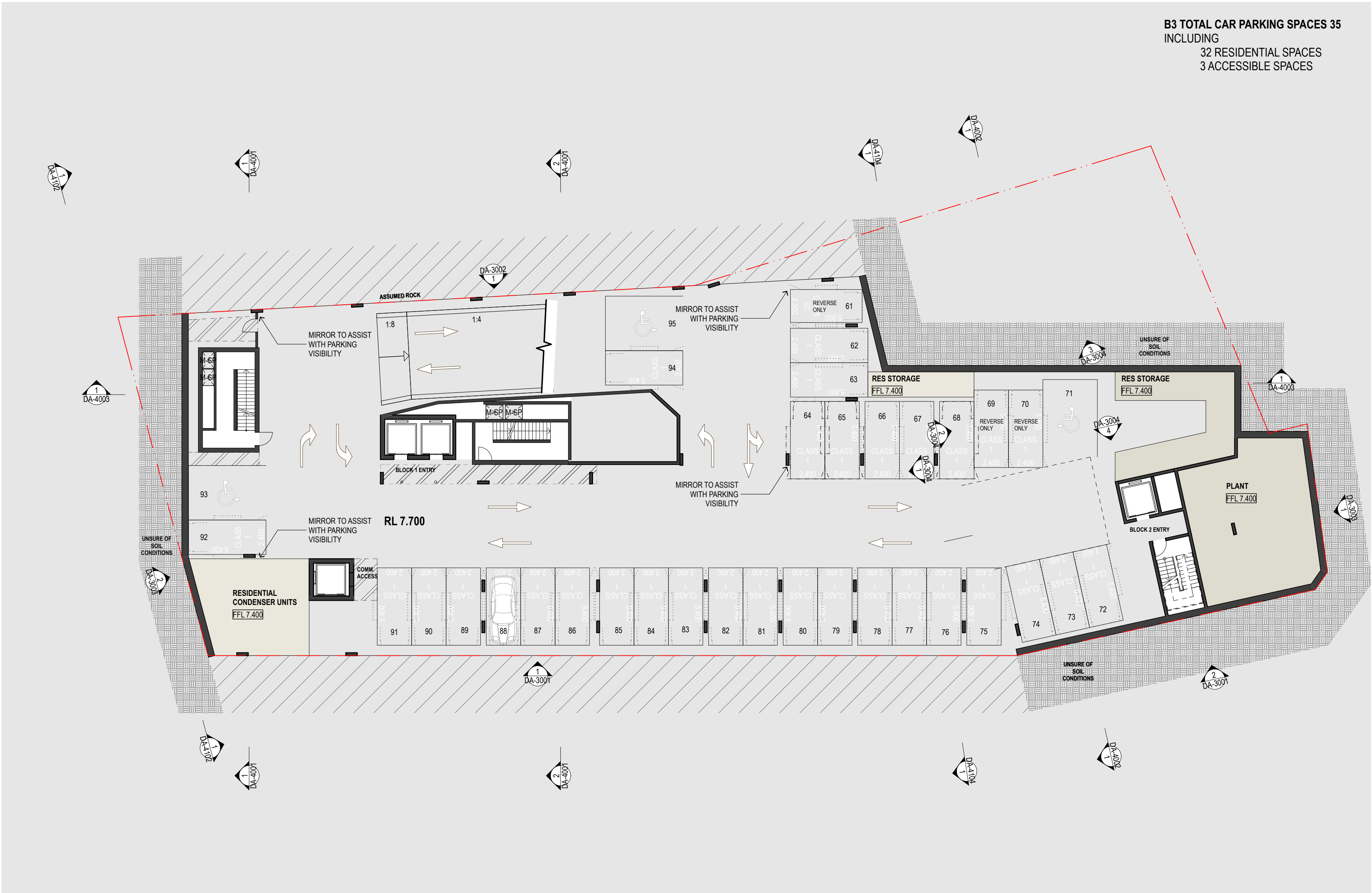
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The Rocks
GOLDEN AGE & HANNAS THE ROCKS**

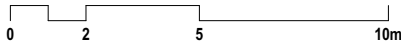
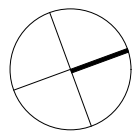
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**Plans
Basement Level 3**

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DATE	11/09/2015	GA85H
SHEET NO.	DA-2013	REVISION
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For Information





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LEGEND

1 BED
2 BED 2 BATH
3 BED
TOWNHOUSE
LOBBY
COMMERCIAL
LIVE/ WORK
RETAIL

- Adaptable Apartment
- Cross Ventilation Path
- Solar Compliant Apartment
- Solar Compliant Balcony
- AL1** Powdercoated Aluminium Panel 1
- AL2** Powdercoated Aluminium Panel 2
- ALP** Aluminium Composite Panel
- BAL1** Glazed Balustrade 1
- BAL2** Glazed Balustrade 2
- BAL3** Aluminium Plate Balustrade
- BYRK1** Bicycle Rack
- GL1** Aluminium Framed Retail Glazing
- GL2** Performance Glazed Aluminium Framed Sliding Door
- GL3** Glazing With White Interlay & Integrated Venetians
- LV1** Sandstone Louvre
- PAV1** Paving 1
- PC1** Precast Concrete 1
- SC1** Perforated Screen
- SC2** Integrated Screen
- SC3** Louvred Screen
- SS1** Sandstone 1
- SS2** Sandstone 2
- TC1** Terracotta Cladding 1
- TC2** Terracotta Cladding 2
- TC3** Terracotta Cladding 3
- TIM** Timber Composite Panel

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G	21/12/2015	For Coordination	CHS
F	25/11/2015	For Coordination	CHS
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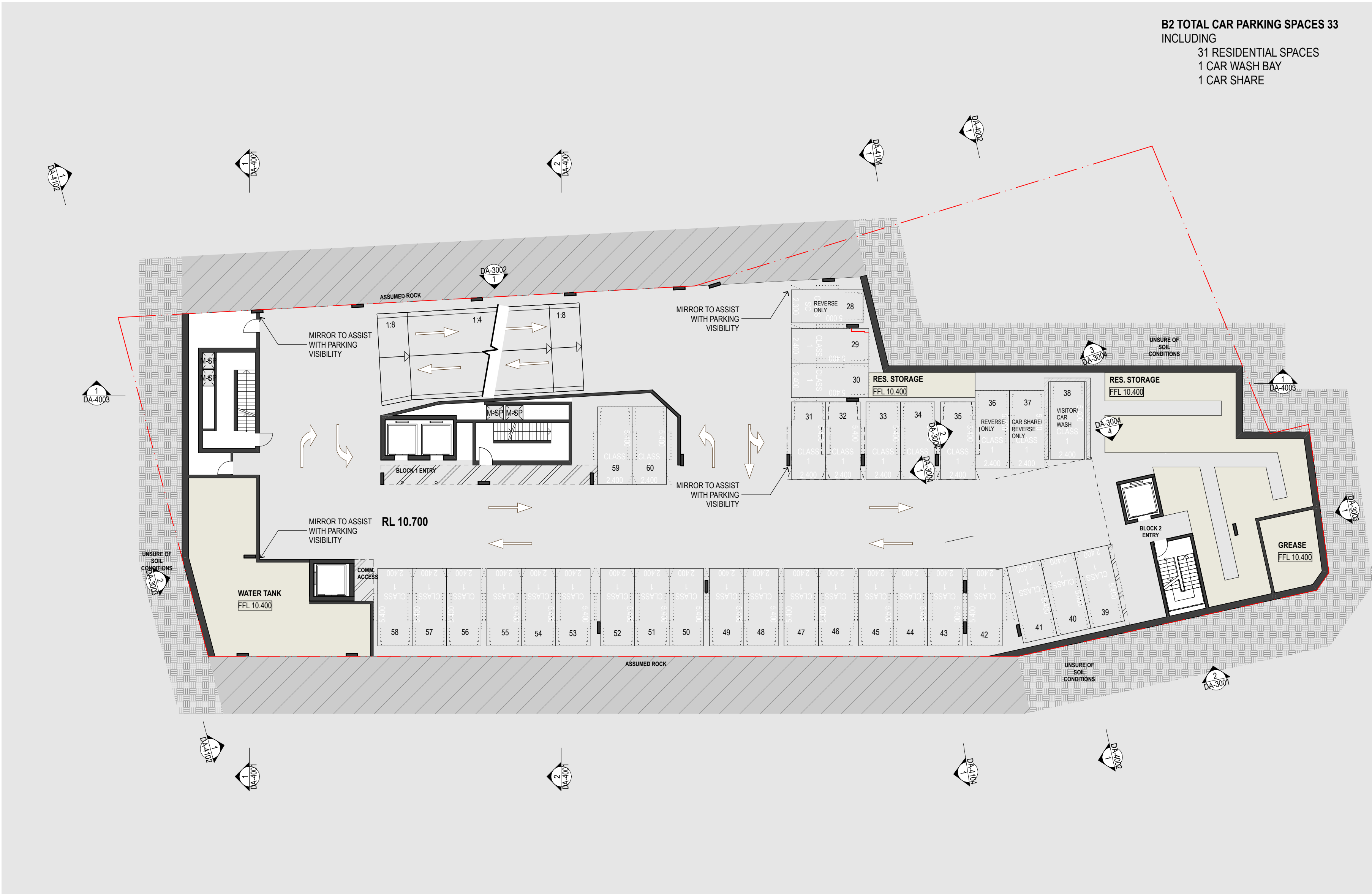
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The Rocks
GOLDEN AGE & HANNAS THE ROCKS**

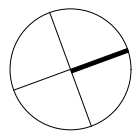
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**Plans
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SCALE	1:200 @ A2	PROJECT CODE
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ALL LEVELS RELATIVE TO 'AUSTRALIAN HEIGHT DATUM'

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LEGEND

1 BED
2 BED 2 BATH
3 BED
TOWNHOUSE
LOBBY
COMMERCIAL
LIVE/ WORK
RETAIL

-  Adaptable Apartment
-  Cross Ventilation Path
-  Solar Compliant Apartment
-  Solar Compliant Balcony

- AL1 Powdercoated Aluminium Panel 1
- AL2 Powdercoated Aluminium Panel 2
- ALP Aluminium Composite Panel
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- GL1 Aluminium Framed Retail Glazing
- GL2 Performance Glazed Aluminium Framed Sliding Door
- GL3 Glazing With White Interlay & Integrated Venetians
- LV1 Sandstone Louvre
- PAV1 Paving 1
- PC1 Precast Concrete 1
- SC1 Perforated Screen
- SC2 Integrated Screen
- SC3 Louvred Screen
- SS1 Sandstone 1
- SS2 Sandstone 2
- TC1 Terracotta Cladding 1
- TC2 Terracotta Cladding 2
- TC3 Terracotta Cladding 3
- TIM Timber Composite Panel

I	27/01/2016	For Coordination	CHS
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F	25/11/2015	For Coordination	CHS
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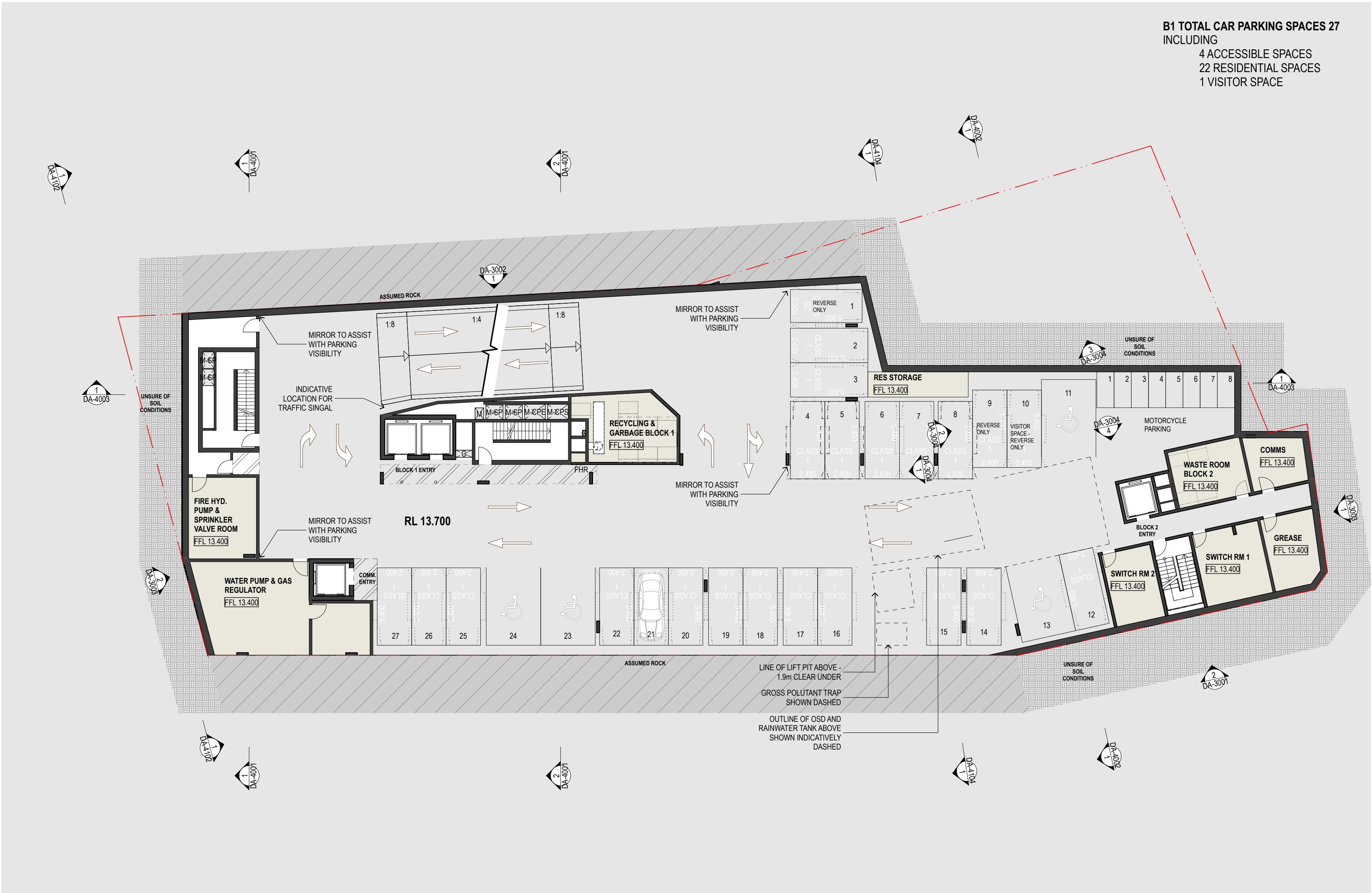
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GOLDEN AGE & HANNAS THE ROCKS

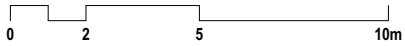
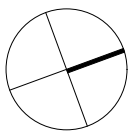
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Plans
Basement Level 1

SCALE	1:200 @ A2	PROJECT CODE
DATE	11/09/2015	GA85H
SHEET NO.	DA-2011	REVISION
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LEGEND

	1 BED
	2 BED 2 BATH
	3 BED
	TOWNHOUSE
	LOBBY
	COMMERCIAL
	LIVE/ WORK
	RETAIL

- Adaptable Apartment
- Cross Ventilation Path
- Solar Compliant Apartment
- Solar Compliant Balcony

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- AL2** Powdercoated Aluminium Panel 2
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- SC1** Perforated Screen
- SC2** Integrated Screen
- SC3** Louvred Screen
- SS1** Sandstone 1
- SS2** Sandstone 2
- TC1** Terracotta Cladding 1
- TC2** Terracotta Cladding 2
- TC3** Terracotta Cladding 3
- TIM** Timber Composite Panel

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G	21/12/2015	For Coordination	CHS
F	25/11/2015	For Coordination	CHS
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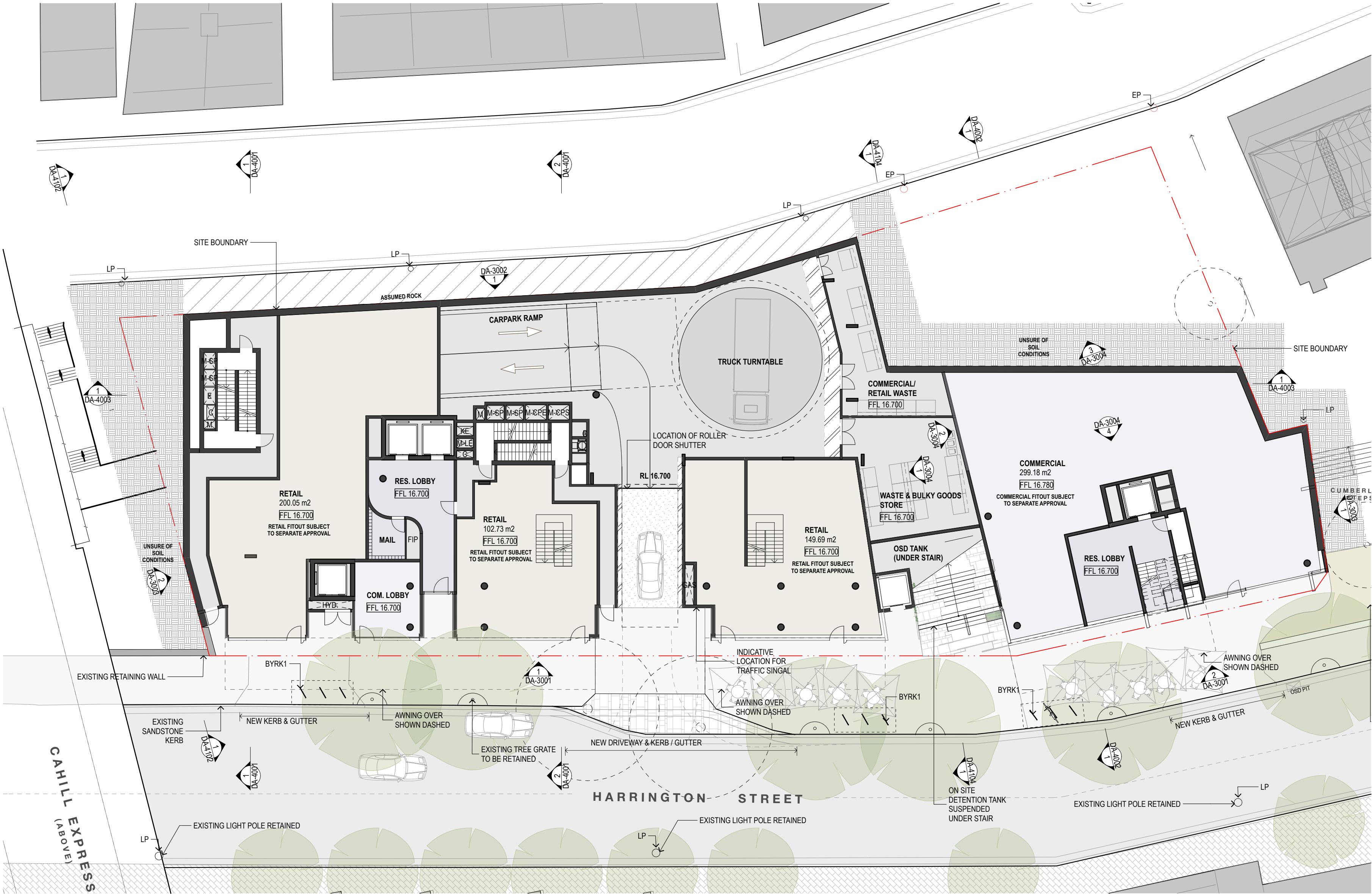
PROJECT

85 Harrington Street
The Rocks
GOLDEN AGE & HANNAS THE ROCKS

TITLE
Plans
Ground Floor Plan (Harrington Street)

SCALE	1:200 @ A2	PROJECT CODE
DATE	11/09/2015	GA85H
SHEET NO.	DA-2000	REVISION
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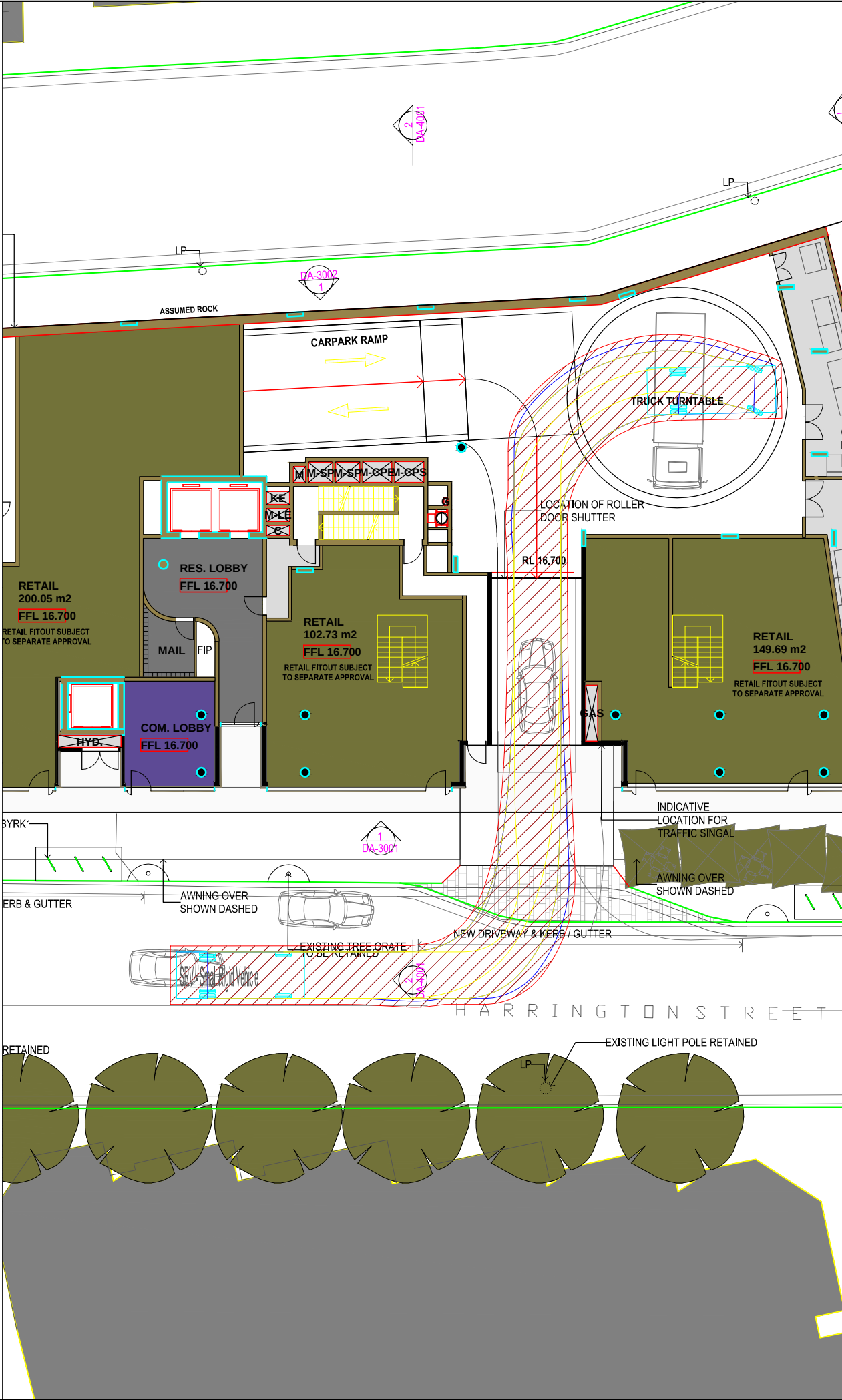
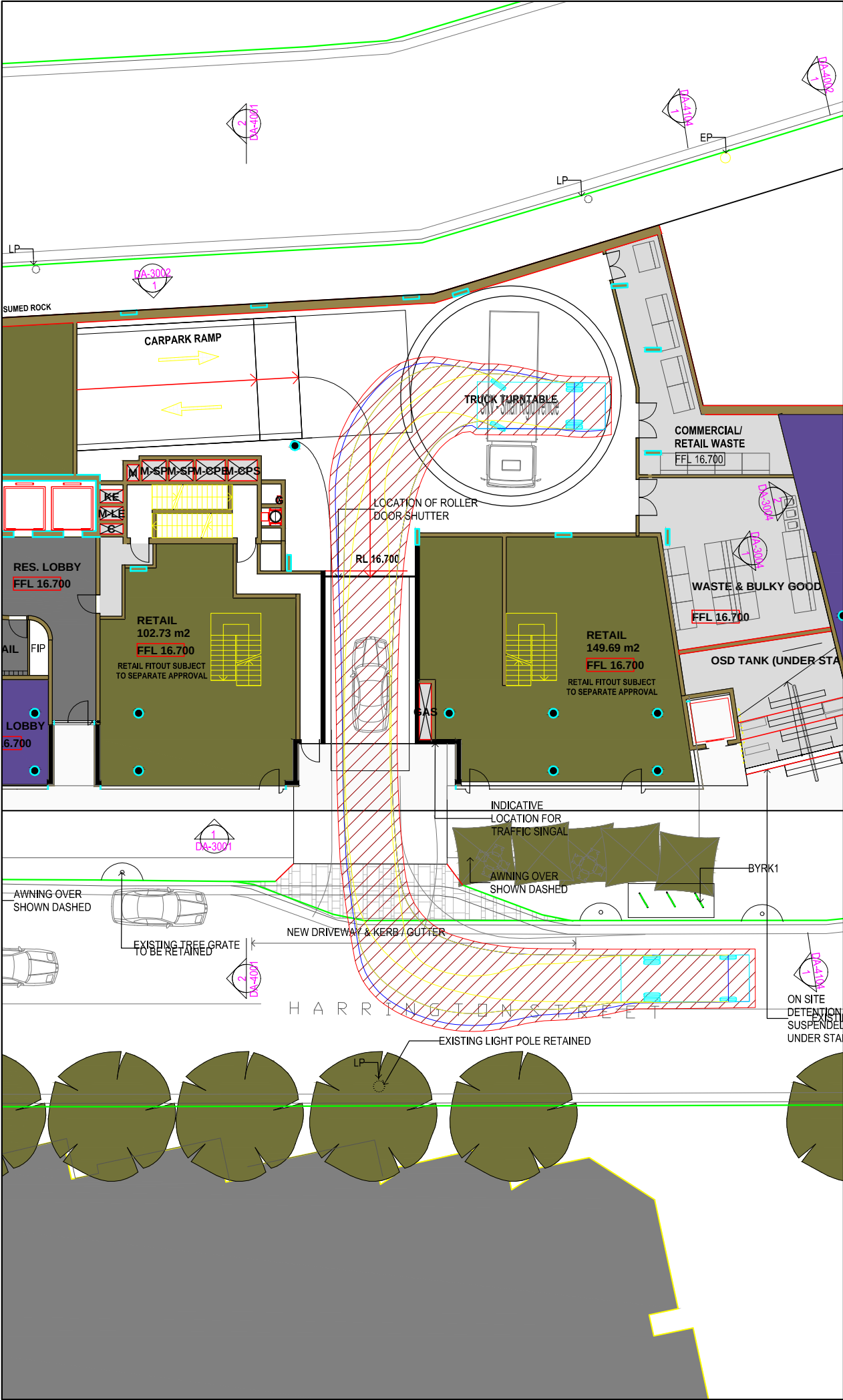
For Information





Appendix C

Swept Path Analysis



Notes

This drawing is prepared for information purposes only. It is not to be used for construction.

TRAFFIX is responsible for vehicle swept path diagrams and/or drawing mark-ups only. Base drawing prepared by others.

Vehicle swept path diagrams prepared using computer generated turning path software and associated CAD drawing platforms. Vehicle data based upon relevant Australian Standards (AS/NZS 2890.1-2004 *Parking facilities - Off-street car parking*, and/or AS 2890.2-2002 *Parking facilities - Off-street commercial vehicle facilities*). These standards embody a degree of tolerance, however the vehicle characteristics in these standards represent a suitable design vehicle and do not account for all variations in vehicle dimensions / specifications and/or driver ability or behaviour.

no.	revision note	by.	date

Swept Path Legend:

- Wheel Path
- Vehicle Body Envelope
- Clearance Envelope (300mm)

architect

FJMT Studio

client

Golden Age & Hannas The Rocks Pty Ltd
c/- Savills Project Management

scale

1:100 @ A3

0m 1 2 3 4

project

85 Harrington Street, The Rocks

drawing prepared by

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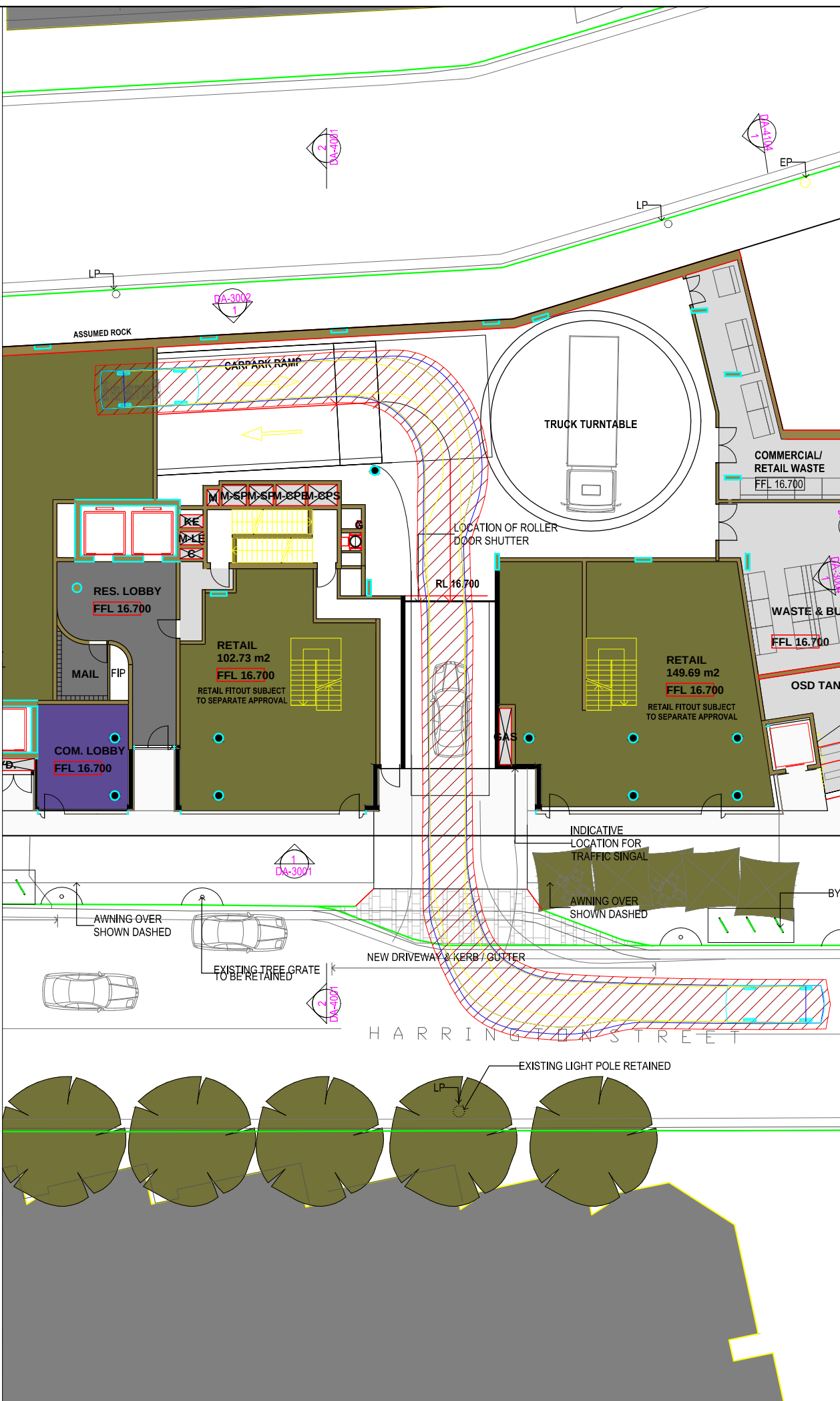
traffix
traffic & transport planners

drawing title

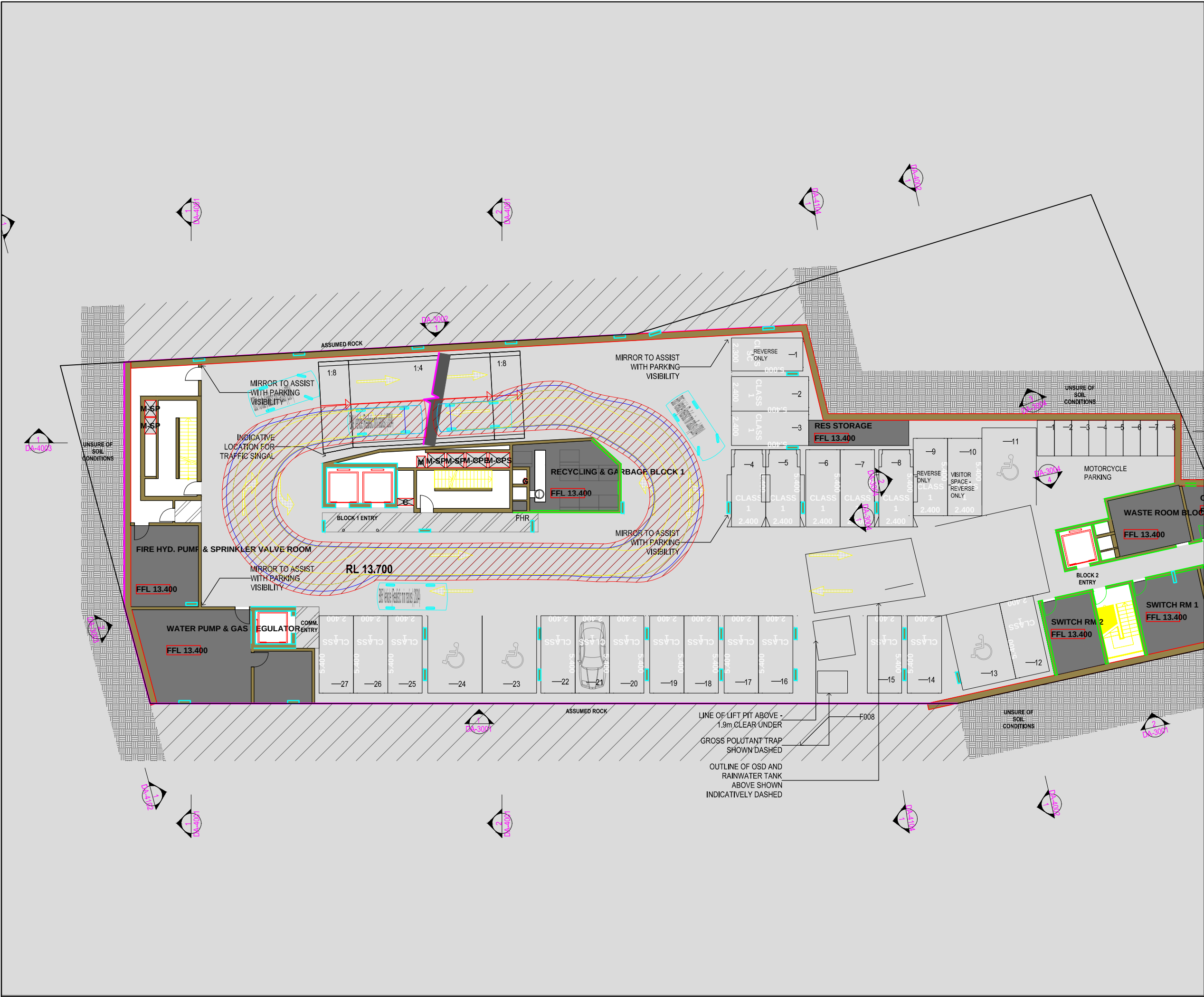
Swept Path Analysis
Ground Level - Harrington Street Access
Small Rigid Vehicle

drawn: MM	checked: MM	date: 01-02-2016
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14.563	-	SK.A1	-
project no.	drawing phase.	drawing no.	rev



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Notes

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no. revision note

by. date

Swept Path Legend:

Wheel Path

Vehicle Body Envelope

Clearance Envelope (300mm)

architect

FJMT Studio

client

Golden Age & Hannas The Rocks Pty Ltd
c/- Savills Project Management

scale

1:100 @ A3

0m

1

2

3

4

project

85 Harrington Street, The Rocks

drawing prepared by

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trafix

traffic & transport planners

drawing title

Swept Path Analysis and Comments
Basement Level 1
B99 & B85 Vehicle

drawn: MM

checked: MM

date: 01-02-2016

14.563

-

SK.05

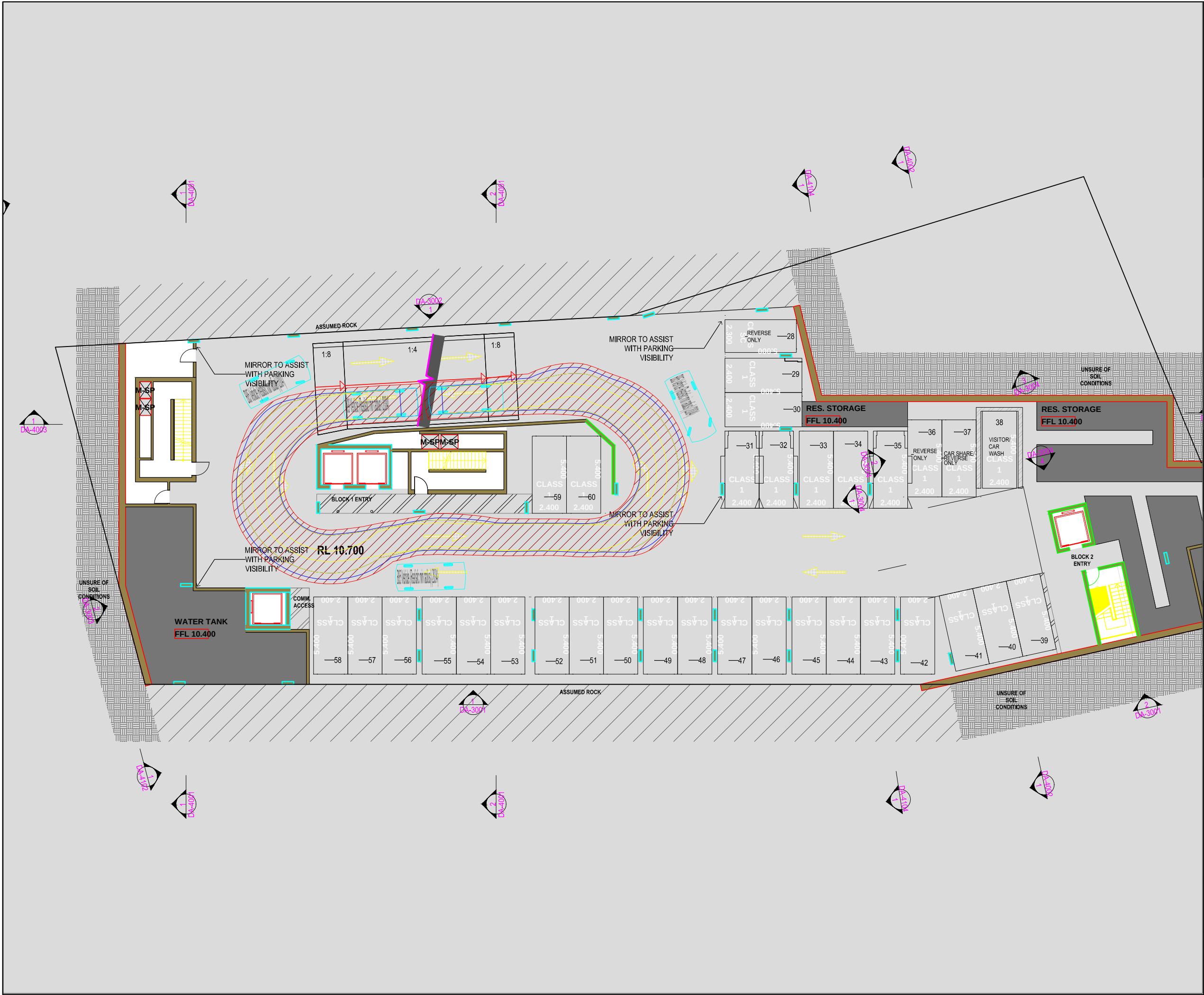
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project no.

drawing phase.

drawing no.

rev



Notes

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no. revision note

by. date

Swept Path Legend:

Wheel Path

Vehicle Body Envelope

Clearance Envelope (300mm)

architect

FJMT Studio

client

Golden Age & Hannas The Rocks Pty Ltd
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scale

1:200 @ A3

0m

2

4

6

8

project

85 Harrington Street, The Rocks

drawing prepared by

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traffix
traffic & transport planners

drawing title

Swept Path Analysis and Comments
Basement Level 2
B85 & B99 Vehicle

drawn: MM

checked: MM

date: 01-02-2016

14.563

-

SK.06

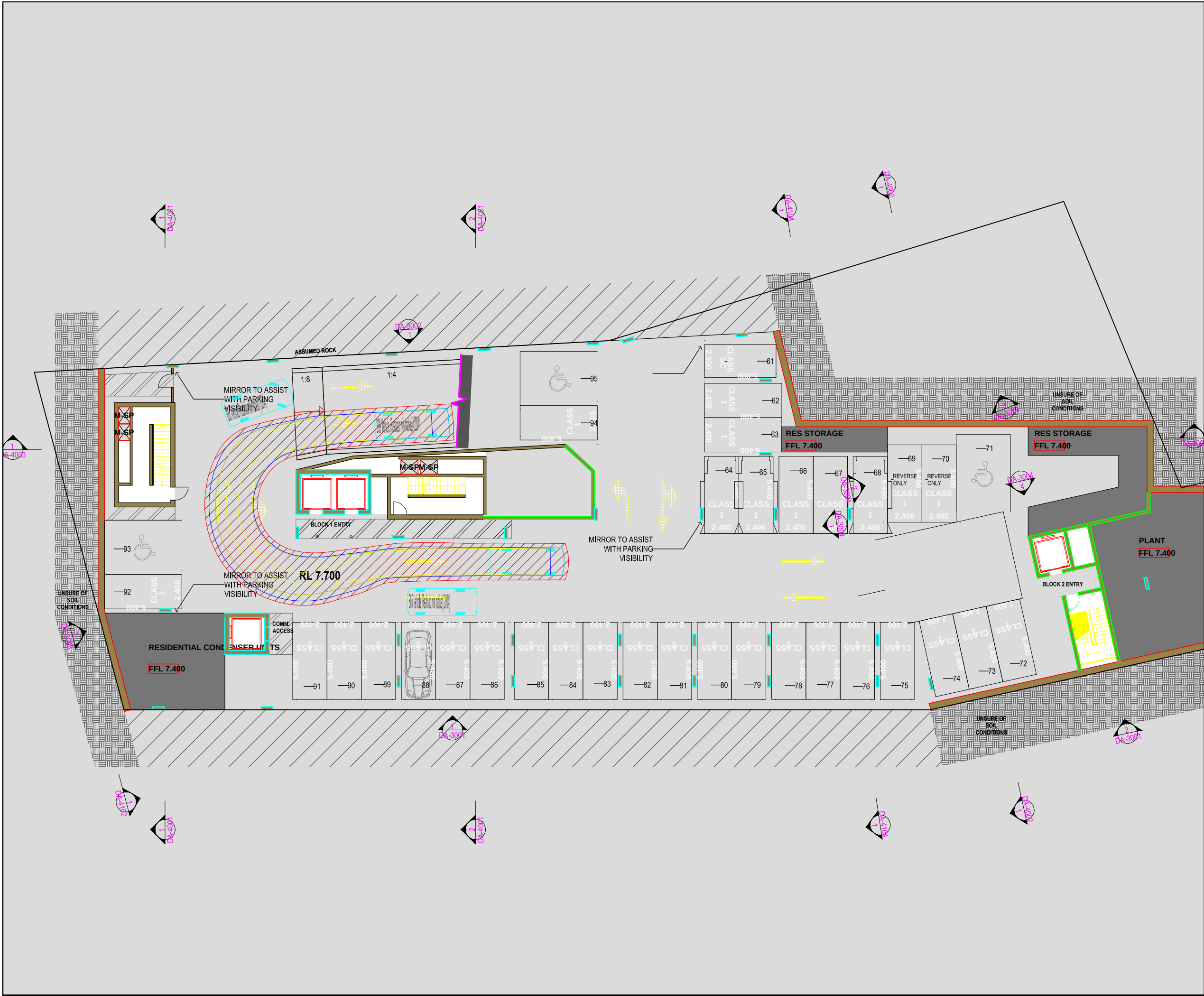
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project no.

drawing phase.

drawing no.

rev



Notes

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no. revision note

by. date

Swept Path Legend:

Wheel Path

Vehicle Body Envelope

Clearance Envelope (300mm)

architect

FJMT Studio

client

Golden Age & Hannas The Rocks Pty Ltd
c/- Savills Project Management

scale

1:200 @ A3

0m

2

4

6

8

project

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drawing prepared by

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drawing title

Swept Path Analysis and Comments
Basement Level 3
B85 & B99 Vehicle

drawn: MM

checked: MM

date: 01-02-2016

14.563

-

SK.07

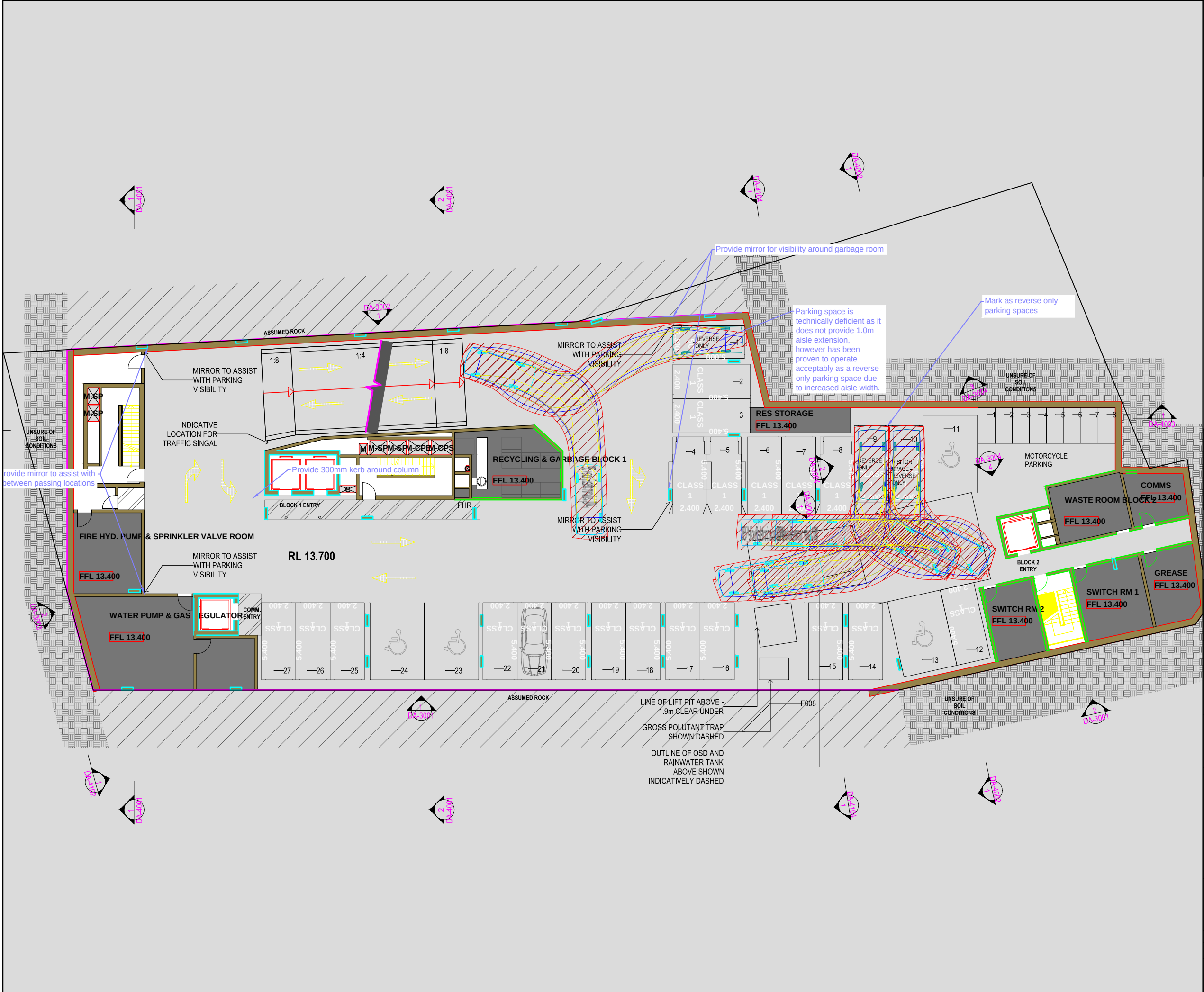
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project no.

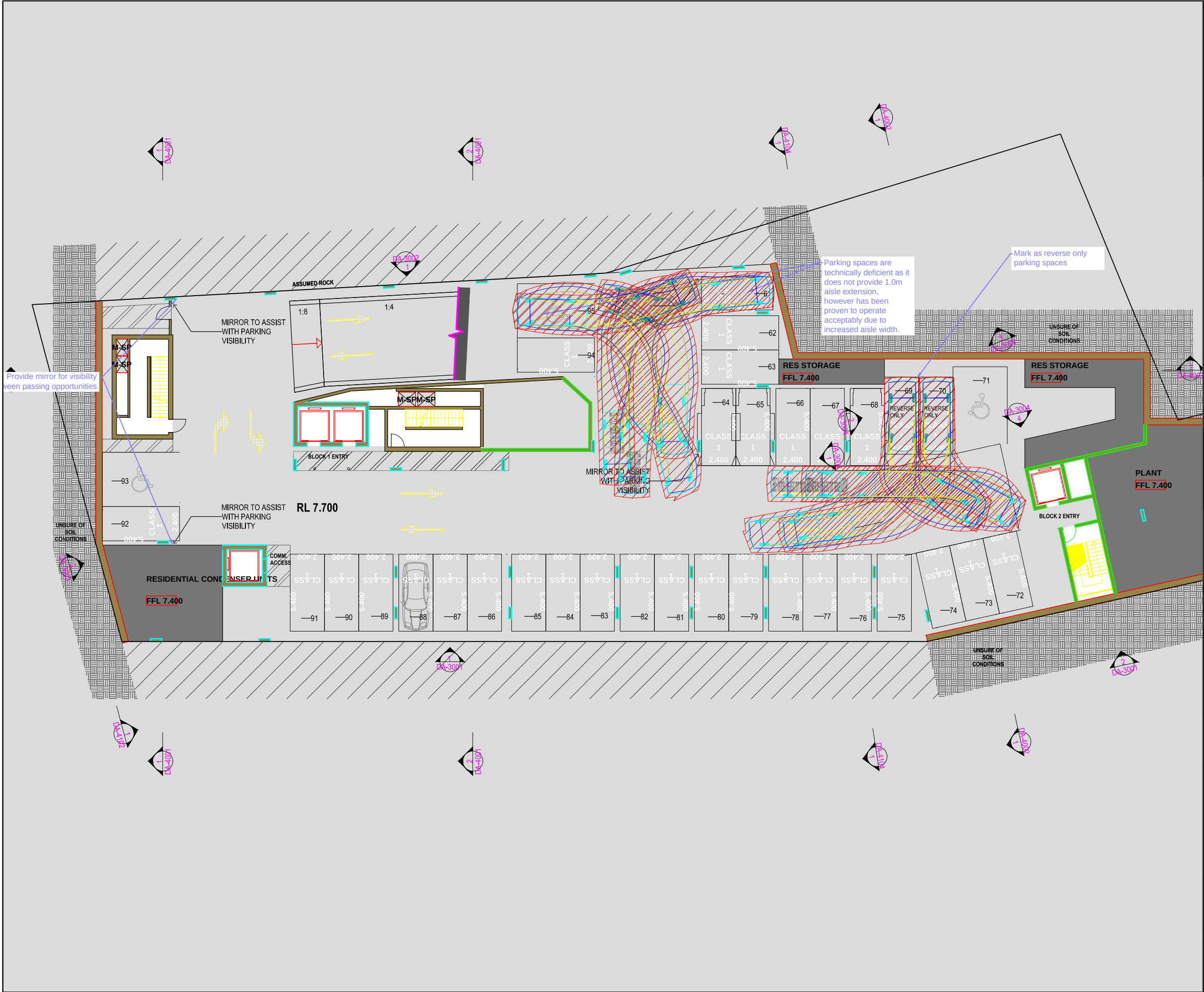
drawing phase.

drawing no.

rev



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no.	revision note	by.	date
Swept Path Legend: Wheel Path Vehicle Body Envelope Clearance Envelope (300mm)			
architect FJMT Studio			
client Golden Age & Hannas The Rocks Pty Ltd c/- Savills Project Management			
scale 1:200 @ A3 0m 2 4 6 8			
project 85 Harrington Street, The Rocks			
drawing prepared by TRAFFIX traffic and transport planners Suite 2.08, 50 Holt Street Surry Hills NSW 2010 PO Box 1124 Strawberry Hills NSW 2012 t: +61 2 8324 8700 f: +61 2 9380 4481 e: info@traffix.com.au			
drawing title Swept Path Parking Review Basement Level 1			
drawn:	MM	checked:	MM
date:	01-02-2016		
project no.	14.563	drawing phase.	-
drawing no.	SK.08	rev	-



Notes

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no.	revision note	by.	date

Swept Path Legend:

Wheel Path

Vehicle Body Envelope

Clearance Envelope (300mm)

architect

FJMT Studio

client

Golden Age & Hannas The Rocks Pty Ltd
c/- Savills Project Management

scale

1:200 @ A3

0m

2

4

6

8

project

85 Harrington Street, The Rocks

drawing prepared by

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traffix

traffic & transport planners

drawing title

Swept Path Parking Review
Basement Level 3

drawn: MM	checked: MM	date: 01-02-2016
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14.563	-	SK.09	-
project no.	drawing phase.	drawing no.	rev



Appendix D

Queuing Analysis

Queuing Analysis



Input Data	
Travel Distance (d) (m)	275
Travel Speed (km/hr)	10
Vehicle Arrivals/Departures (veh/hr)	9
Start Delay (t_{sd}) (s)	3
Signal Safety Margin (t_{sm}) (sec)	3

Calculated Timings	
Travel Speed (v) (m/s)	2.777777778
Travel Time Between Passing ($t_{passing}$) (sec)	99

Adopted 'Green Time' (t_{gt}) (sec)	6
Adopted 'Clearance Time' (t_{ct}) (sec)	102
Total Average Time (t_T) (sec)	108

Queuing Theory Factors	
average arrival rate (r)	9.00000
average service rate (s)	33.33333
utilisation factor (p)	0.27000

Probability of more than 'n' vehicles in system	
No. Vehicles in System, including queued vehicle (n)	Probability of exceeding no. vehicles in system (%)
0	27.0%
1	7.3%
2	2.0%
3	0.5%
4	0.1%
5	0.0%

* r =(veh/hr)

* s =3600/(Total Average Time)

* p = r/s

Equation 4.5 of Austroads Guide to Traffic Management - Part 2: Traffic Theory
* $P(>n)=p^{(n+1)}$

NOTE: Design queue length should accommodate 98% of queues. i.e. Probability of exceedance should be <2.0%.
No. of 'waiting bays' required is No. Vehicles in System - 1

NOTE(s):

1) Clearance time should, for safety reasons, be based on the longest time taken to clear the system. Average time only relevant to car lifts and not to be used in this particular case.

2) Analysis assumes all vehicles arrive to a red signal. Passive green signal display will reduce queue beyond that shown. In this regard, this is a conservative analysis.

passing time
 $t_{passing} = d / v$

adopted green time
 $t_{gt} = t_{sd} + t_{sm}$

adopted clearance time
 $t_{ct} = t_{passing} + t_{sm}$ (rounded up)

total average system time
 $t_T = t_{gt} + t_{ct}$

1 x Waiting Bays Required