INVESCO ASSET MANAGEMENT AUSTRALIA
(HOLDINGS) LIMITED

TRAFFIC REPORT FOR PROPOSED EXPANSION OF FORESTWAY SHOPPING CENTRE, FRENCHS FOREST

DECEMBER 2018

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1. INTRODUCTION

1.1 Colston Budd Rogers and Kafes Pty Ltd has been commissioned by Invesco Asset Management Australia (Holdings) Limited to prepare a report examining the traffic implications of the proposed expansion of Forestway Shopping Centre, Frenchs Forest (the 'Site'). The Site location is shown in Figure 1.

1.2 The existing shopping centre comprises some 9577m^2 GLA with some 428 car parking spaces (including some 80 spaces within Sorlie Place). Access is provided from Forest Way, Russell Avenue, Grace Avenue and Sorlie Place. It is proposed to expand the shopping centre to some 21,593m^2 GLA and increase parking provision to some 841 spaces (including the 80 spaces in Sorlie Place). Access will be provided from Forest Way (with modifications to the existing pedestrian signals to allow for left in, left out and right out) and Grace Avenue.

1.3 The traffic assessment takes into account the upgrades to the adjacent road network along Forest Way and Warringah Road as part of the Northern Beaches Hospital project. Prior to lodging the DA, discussions have been held with the RMS regarding appropriate access to the site and in particular the form of access on Forest Way. At the request of the RMS an alternative access arrangement has been investigated, left in/left out on Forest Way with the traffic signals at the intersection of Forest Way/Russell Avenue (with the existing pedestrian signals on Forest Way relocated to Russell Avenue).

1.4 This report assesses the implications of the proposed redevelopment of Forestway Shopping Centre through the following chapters:

- Chapter 2 - describing the existing conditions; and
- Chapter 3 - assessing the traffic implications of the proposed development.

2. EXISTING CONDITIONS

Site Location

2.1 Forestway Shopping Centre is located on the northern part of the block bounded by Forest Way to the east, Russell Avenue to the north and Grace Avenue to the west. Frenchs Forest Public School is located to the south of the Site. Surrounding land use is predominantly residential with some commercial development on the northern side of the Russell Avenue opposite the site. To the east of the Site are The Forest High School and the Northern Beaches Hospital.

2.2 The existing shopping centre comprises some 9,577m^2 GLA with some 428 car parking spaces (including some 80 spaces within Sorlie Place). Access is provided from Forest Way (left in only), Russell Avenue (all movements) and Grace Avenue (all movements). Service access to the centre is provided from Sorlie Place and Grace Avenue.

Road Location

2.3 The road network in the vicinity of the Site comprises Warringah Road, Forest Way, Grace Avenue, Russell Avenue, Naree Road and Sorlie Place. Warringah Road is an arterial road connecting the northern beaches with the lower north shore. In the vicinity of the Site it is a six lane divided road with additional turn lanes at major intersections. As part of the Northern Beaches Hospital project Warringah Road is being upgraded to improve traffic flow.

2.4 Forest Way is an arterial road connecting Warringah Road to the south with Mona Vale Road to the north. Adjacent to the Site, it is a six lane divided road. The intersection of Warringah Road and Forest Way is traffic signal controlled. Pedestrian signals are located on Forest Way, towards the southern frontage of the Site. These provide pedestrian access to the shopping centre and to the bus stops located either side of Forest Way. As part of the Northern Beaches Hospital project, Forest Way is being upgraded to improve traffic flow.

2.5 Russell Avenue is located along the northern boundary of the site and connects Forest Way to the east with Grace Avenue to the west. It provides for one traffic lane in each direction. With exception of the right turn out of Russell Avenue in the weekday morning peak period, all movements are permitted at the intersection of Russell Avenue and Forest Way. As part of the upgrade of Forest Way, a separate right turn bay into Russell Avenue has been provided on Forest Way. Due to the high traffic flows on Forest Way, there can be long delays in turning right out of Russell Avenue onto Forest Way.

2.6 Grace Avenue is located along the western boundary of the site and is a collector road providing access to development to the west of Forest Way. It provides for one traffic lane in each direction with kerb side parking located clear of intersections. The intersection of Grace Avenue and Russell Avenue is controlled by a single lane roundabout. To the south Fitzpatrick Street connects Grace Avenue to Warringah Road.

2.7 Sorlie Place is located to the south of Site's western frontage and provides an at-grade car park (some 80 spaces). Sorlie Place connects to Grace Avenue at two locations with one way traffic flow in a clockwise direction. Sorlie Place provides

service access to the existing shopping centre. During school set down and pick up periods the southern side of Sorlie Place is used as a school bus zone.

2.8 Naree Road is located to the north of the site and forms part of an east west road running parallel to Warringah Road. As part of the Northern Beaches Hospital Project, Naree Road is being upgraded from a two lane to a four lane road with traffic signals constructed at the intersection Naree Road and Forest Way.

Traffic Flows

2.9 Traffic generated by the proposed development will have its greatest effects during weekday afternoon and Saturday midday peak periods when it combines with other traffic on the surrounding road network. In order to gauge traffic conditions, traffic counts were undertaken at these times at the following intersections:

- Warringah Road/Forest Way (traffic signals);
- Forest Way/Russell Avenue (unsignalised);
- Forest Way/Naree Road (traffic signals);
- Grace Avenue/Russell Avenue (roundabout);
- Grace Avenue/Sorlie Place (unsignalised);
- Pedestrian signals on Forest Way; and
- Shopping centre access points on Forest Way, Russell Avenue and Grace Avenue (all unsignalised)

2.10 The results of the surveys are summarised in Table 2.1 and displayed in Figures 2 and 3.

Table 2.1: Existing Two-Way (Sum of Both Directions) Peak Hour Traffic Flows		
Road	**Weekday Afternoon**	**Saturday Midday**
Warringah Road		
– east of Forest Way	3705	3515
– west of Forest Way	3175	2775
Forest Way		
– north of Naree Road	3340	4165
– south of Naree Road	3120	4110
– south of Russell Avenue	2970	3815
– north of Warringah Road	3390	4020
Russell Avenue		
– east of Forest Way	510	465
– west of Grace Avenue	400	385
Grace Avenue		
– north of Russell Avenue	835	695
– south of Russell Avenue	835	650
– north of Sorlie Place (N)	845	610
– south of Sorlie Place (S)	830	595
Sorlie Place		
– entry	130	160
– exit	140	150
Naree Road		
– east of Forest Way	640	555
Site Accesses		
– Forest Way (entry only)	160	200
– Russell Avenue	285	355
– Grace Avenue	120	155

2.11 Table 2.1 reveals that:

- Warringah Road carried some 2,800 to 3,700 vehicles per hour two-way during the surveyed weekday afternoon and Saturday midday peak hours. Traffic flows were highest east of Forest Way. Traffic flows were highest during the weekday afternoon peak period;

- Forest Way carried some 3,000 to 4,200 vehicles per hour two-way during the surveyed weekday afternoon and Saturday midday peak hours. Traffic flows were highest during the Saturday peak hour;

- Russell Avenue carried some 400 to 500 vehicles per hour two-way during the surveyed weekday afternoon and Saturday midday peak hours. Traffic flows were highest west of Forest Way;

- Grace Avenue carried some 600 to 850 vehicles per hour two-way during the surveyed weekday afternoon and Saturday midday peak hours. Traffic flows were highest during the weekday afternoon peak hour;

- Sorlie Place carried some 150 vehicles per hour two-way during the surveyed weekday afternoon and Saturday midday peak hours;

- Naree Road carried some 550 to 650 vehicles per hour two-way during the surveyed weekday afternoon and Saturday midday peak hours. Traffic flows were highest during the weekday afternoon peak hour; and

- The existing shopping centre generated some 850 to 1020 vehicles per hour two-way during the surveyed weekday afternoon and Saturday midday peak hours. The highest traffic generation was during the Saturday peak hour.

2.12 Observations of traffic flows around the existing centre found that:

- traffic flows in Sorlie Place were generally associated with the shopping centre; and

- due to delays turning right out of Russell Avenue onto Forest Way, traffic departing the shopping centre and with a destination of Warringah Road (east) would use Grace Avenue (south) and Fitzpatrick Street to access Warringah Road.

Intersection Operations

2.13 The capacity of the road network is largely determined by the capacity of its intersections to cater for peak period traffic flows. The surveyed intersections have been analysed using the SIDRA 8 Network computer program for the traffic flows shown in Figures 2 and 3.

2.14 SIDRA 8 Network allows the analysis of a network of intersections and the interaction of traffic flows between intersections. It provides a number of performance measures. The most useful measure provided is average delay per vehicle expressed in seconds per vehicle.

2.15 Based on average delay per vehicle, SIDRA estimates the following levels of service (LOS):

- For traffic signals, the average delay per vehicle in seconds is calculated as delay/(all vehicles), for roundabouts the average delay per vehicle in seconds is selected for the movement with the highest average delay per vehicle, equivalent to the following LOS:

0 to 14	=	"A"	Good
15 to 28	=	"B"	Good with minimal delays and spare capacity
29 to 42	=	"C"	Satisfactory with spare capacity

43 to 56	=	"D"	Satisfactory but operating near capacity
57 to 70	=	"E"	At capacity and incidents will cause excessive delays. Roundabouts require other control mode
>70	=	"F"	Unsatisfactory and requires additional capacity

- For give way and stop signs, the average delay per vehicle in seconds is selected from the movement with the highest average delay per vehicle, equivalent to following LOS:

0 to 14	=	"A"	Good
15 to 28	=	"B"	Acceptable delays and spare capacity
29 to 42	=	"C"	Satisfactory but accident study required
43 to 56	=	"D"	Near capacity and accident study required
57 to 70	=	"E"	At capacity and requires other control mode
>70	=	"F"	Unsatisfactory and requires other control mode

2.16 It should be noted that for roundabouts, give way and stop signs, in some circumstances, simply examining the highest individual average delay can be misleading. The size of the movement with the highest average delay per vehicle should also be taken into account. Thus, for example, an intersection where all movements are operating at a level of service A, except one which is at level of service E, may not necessarily define the intersection level of service as E if that movement is very small. That is, longer delays to a small number of vehicles may not justify upgrading an intersection unless a safety issue was also involved.

2.17 The analysis found that:

- The intersection of Warringah Road and Forest Way operates with average delays of less than 60 seconds per vehicle in the weekday afternoon peak

period. This represents level of service D/E at capacity. In the Saturday midday peak hour the intersection operates with average delays per vehicle of less than 35 seconds per vehicle. This represents level of service C, a satisfactory level of intersection operation;

- The intersection of Forest Way and Russell Avenue operates with average delays of less than 45 seconds per vehicle for the movements with the highest delay (right turn out of Russell Avenue) during the weekday afternoon and Saturday midday peak periods. This represents level of service C/D, satisfactory but near capacity. All other movements operate with average delays of less than 30 seconds per vehicle (level of service B/C or better). As noted previously, due to delays in turning right out of Russell Avenue in the peak periods, traffic from the shopping centre uses Grace Avenue/Fitzpatrick Street to access Warringah Road (eastbound);

- The intersection of Forest Way and Naree Road operates with average delays of less than 20 seconds per vehicle during the weekday afternoon and Saturday midday peak periods. This represents level of service B. a reasonable level of service with spare capacity; and

- The intersection of Grace Avenue and Russell Avenue operates with average delays of less than 15 seconds per during the weekday afternoon and Saturday midday peak periods. This represents level of service A/B. a good level of service.

Road Network Improvements

2.18 As part of the Northern Beaches Hospital project, a number of road network upgrades are under construction adjacent and in the vicinity of the Site. These include:

- Grade separation of the intersections of Warringah Road with Forest Way and Wakehurst Parkway;
- New pedestrian bridges over Warringah Road;
- Traffic signals at the intersection of Forest Way and Naree Road;
- Widening of Naree Road from two to four traffic lanes; and
- Improvements to the indented bus bays along Forest Way (both sides) adjacent to the shopping centre.

2.19 These works are at various stages of construction and will be completed prior to the opening of the redeveloped Shopping Centre. Thus the assessment of the traffic effects of the proposed redevelopment of the Shopping Centre takes into account these changes to the road network.

Public Transport

2.20 The site is adjacent to bus services which operate along Forest Way with bus stops located on Forest Way adjacent to the shopping centre. Bus services are provided by Forest Way Coaches. Services include:

- route 260: North Sydney to Terry Hills;
- route 270: City QVB to Terry Hills;
- route 271: City QVB to Belrose;

- route 274: City QVB to Davidson, via Frenchs Forest;
- route 278: Chatswood to Killarney Heights;
- route 279: Frenchs Forest to Chatswood;
- route 280: Chatswood to Warringah Mall;
- route 281: Chatswood to Davidson;
- route 282: Chatswood to Davidson and Belrose;
- route 283: Chatswood to Belrose
- route 284: Chatswood to Terry Hills and Duffys Forest; and
- route L70: City QVB to Terry Hills.

2.21 Pedestrian access to the bus services on the opposite side of Forest Way are provided by the existing pedestrian traffic signals on Forest Way.

2.22 In addition Sydney Buses operates a number of services along Warringah Road to the south with bus stops located to the east and west of Forest Way. Bus stops on the southern side of Warringah Road are accessible using the pedestrian bridge at the intersection with Forest Way. These services include:

- route 136: Manly to Chatswood (via Warringah Mall);
- route 169: City Wynyard to Manly, via Narraweena;

2.23 Thus the Site is highly accessible by public transport with numerous local and regional bus services connecting the Site with the local area and regional destinations such as Chatswood, Manly and the City.

3. IMPLICATIONS OF PROPOSED DEVELOPMENT

3.1 This chapter assesses the implications of the proposed development through the following sections.

- proposed development;
- public transport;
- pedestrians;
- parking provision;
- access and internal layout;
- servicing;
- traffic effects;
- discussions with RMS; and
- summary

Proposed Development

3.2 It is proposed the existing shopping centre will be redeveloped to provide some 21,593m^2 GLA. Demolition of the existing car park will provide new retail area across two levels. Parking (some 741 spaces) will be provided across a rooftop and two basement levels below and above the new retail areas. This excludes the existing 80 spaces in Sorlie Place. These parking levels will be interconnected by internal ramps with access from Forest Way (left in, left out and right out via modifications to the existing pedestrian signals) and Grace Avenue (all movements).

Public Transport

3.3 As previously discussed, the Site is close to bus services on Forest Way which provide local and regional connections. The site therefore has good access to public transport.

3.4 The proposed development will increase retail and employment densities close to these public transport services. The proposal would therefore strengthen the existing demand for these services.

3.5 The proposed development is therefore consistent with government objectives and the planning principles of:

(a) improving accessibility to employment and services by walking, cycling, and public transport;

(b) improving the choice of transport and reducing dependence solely on cars for travel purposes;

(c) moderating growth in the demand for travel and the distances travelled, especially by car; and

(d) supporting the efficient and viable operation of public transport services.

Pedestrians

3.6 Pedestrian access will be provided to the redeveloped Shopping Centre from Forest Way, Russell Avenue and Sorlie Place. Pedestrian access will be maintained

across Forest Way with the pedestrian signals provided at the new site access on Forest Way.

Parking Provision

3.7 The parking requirements for different development types are set out in Warringah DCP 2011. For shopping centres, the DCP suggest the following rates:

- centres less than 10,000m^2 GLA – 6.1 space per 100m^2 GLA;
- centres 10,000m^2 to 20,000m^2 GLA – 5.6 spaces per 100m^2 GLA;
- centres 20,000m^2 to 30,000m^2 GLA – 4.3 spaces per 100m^2 GLA; and
- centres over 30,000m^2 – 4.1 spaces per 100m^2 GLA.

3.8 Using these rates the existing shopping centre would require 585 spaces and the expanded shopping centre 930 spaces.

3.9 Surveys of parking demand for the existing shopping centre (including parking in Sorlie Place) found a peak parking demand of 85% occupancy on a weekday and 75% occupancy on a Saturday. Thus peak surveyed parking demand was found to be 3.8 spaces per 100m^2.

3.10 As the surveyed parking demand is much lower than the parking required using the suggested DCP rates, application of the DCP rate for the redeveloped centre is considered inappropriate. Using the surveyed parking rate provides a more accurate baseline for estimating parking requirements for the redeveloped centre. The use of the surveyed parking rate as a baseline is also considered more appropriate than determining parking requirements for the various components of centre. This is because the various components of the centre will have peak

parking demands at different times. The surveyed parking rate takes this into account with the existing centre providing range of different uses.

3.11 Applying the surveyed parking rate to the redeveloped shopping centre results in a requirement for 820 spaces. However the DCP rates for shopping centres notes that as the size of the centre increases, parking required per 100m^2 decreases. The rate for a shopping centre of 22,000m^2 is some 30% less than the rate for shopping centre of some 9,500m^2. Being conservative and applying a reduction in the parking rate of 15%, (3.3 spaces per 100m^2) the redeveloped shopping centre would require 720 spaces. This is satisfied by the provision of 741 spaces. In practice parking in Sorlie Place (80 spaces) and on Grace Avenue (some 20 spaces) is also used by shopping centre customers, thus increasing parking provision to some 841 spaces

3.12 Appropriate accessible, motorcycle and bicycle parking will be provided in accordance with Council requirements

Access and Internal Layout

3.13 Vehicular access to the redeveloped shopping centre is proposed from Forest Way and Grace Avenue. The existing pedestrian signals on Forest Way will be modified to provide traffic signal controlled access (left in, left out and right out) to/from the shopping centre. A concept design of the proposed Forest Way access has been prepared by TTW and is provided in Attachment A. The new signalized access will allow right turns out of the Site (as well as left in/left out). Right turn access from the shopping centre onto Forest Way is currently provided from Russell Avenue. As noted in Chapter 2, this movement can experience long delays in peak periods due to the high traffic flows on Forest Way and is not

permitted in the weekday morning peak period. Provision of direct right turn egress from the expanded shopping centre will have the following benefits:

- better egress from the centre onto Forest Way and hence greater access to Warringah Road for customers; and
- less traffic on Russell Avenue and Grace Avenue.

3.14 The proposed signals will have a two phase operation with 'green time' allocated to the exit from the centre limited to the current time allocated for the existing pedestrian signals. Thus during peak periods (when the pedestrian signals are activated each cycle) there would be no increase in delays to through traffic on Forest Way. The proposed access will provide three exit lanes (two right turn lanes and left turn lane) and a single entry lane. The left turn exit lane is proposed to be a turn left at any time with care. Details of the proposed operation of the new traffic signal controlled access are provided in the section on traffic effects.

3.15 Access will also be provided from Grace Avenue, south of Russell Avenue. This access will provide for all turning movements with single entry and two exit lanes.

3.16 Within the Site both accesses will provide connections to basement and rooftop car park levels via internal ramps. The new car parks will be designed to comply with the requirements of AS2890.1-2004 and AS2890.6-2009 with respect to parking space dimensions, provision of shared zones for accessible spaces, aisle widths, ramp grades and height clearances. A review of the plans has found that the car park layout generally complies with the requirements of AS2890.1-2004 (aisles 6.6 metres wide with parking spaces 2.6 metres wide by 5.4 metres long and 2.4 metre wide shared zones for accessible spaces).

3.17 Overall, subject to detailed design, the proposed access arrangements and car park layouts are considered appropriate and are generally in accordance with the requirements of AS2890.1-2004 and AS2890.6-2009. This is an improvement compared to the existing car park layout which is non-compliant with AS2890.1-2004 (narrow parking spaces and aisle widths).

Service Arrangements

3.18 The existing service area accessed from Grace Avenue (that services Aldi) will be modified and expanded to provide seven docks (including two compactors). This expanded service area will service Aldi, the specialised grocery and specialty shops. The service area has been designed to accommodate two 19 metre articulated trucks (for Aldi and the specialised grocery) plus rigid trucks. Management of the service area will be required as not all docks are accessible when a 19 metre articulated truck is parked in the Aldi dock. Deliveries to Aldi and the specialised grocery will be staggered during the day.

3.19 The modified Grace Avenue dock will be designed to comply with the requirements of AS2890.2-2002 with respect to grades, height clearances and maneuvering areas. Entry and exit to/from the dock will be in a forward direction. Truck turn paths are provided in Attachment B.

3.20 The existing Woolworths dock accessed from Sorlie Place will be modified to allow a 19 metre articulated truck to reverse into the dock and park wholly within the building. This is an improvement over the existing situation where the truck either unloads from Sorlie Place or parks partially within the building. Both of these outcomes affect traffic and pedestrian flow in Sorlie Place. Deliveries to

Woolworths will also be restricted so as not to occur in school set down and pick up periods.

3.21 To manage deliveries to the Site, a loading dock management plan will be prepared prior to the issue of a construction certificate. The loading dock management plan will address matters such as:

- truck arrival and departure routes;
- loading dock hours of operation;
- time restrictions for the Woolworths dock (no deliveries during school set down and pick up); and
- staggering of deliveries by large trucks to the Grace Avenue dock.

3.22 Subject to detailed design and implementation of an appropriate loading dock management plan, the proposed service arrangements for the expanded shopping centre are considered appropriate.

Traffic Effects

3.23 The existing shopping centre was found to generate some 850 and 1020 vehicles per hour (two way) in the weekday afternoon and Saturday midday peak hours respectively. RMS Guidelines suggest that as shopping centres get larger the generation rate per 100m^2 GLA decreases reflecting a higher proportion of linked trips from a more diverse development.

3.24 For shopping centres between 20,000m^2 and 30,000m^2, RMS Guidelines suggest a generation of 6 vehicles per 100m^2 GLA in the weekday afternoon peak hour and 7 vehicles per hour per 100m^2 in the Saturday midday peak hour. Applying these

rates the redeveloped shopping centre, with some 21,593m^2 GLA, would generate some 1,300 vehicles per hour (two way) in the weekday afternoon peak hour and some 1,510 vehicles per hour (two way) in the Saturday midday peak hour. These are increases of 450 and 490 vehicles per hour (two way) in the weekday afternoon and Saturday midday peak hours respectively.

3.25 This additional traffic has been assigned to the road network based on existing travel patterns and adjustments for the changes in access arrangements. Existing traffic generated by the shopping centre has been redistributed to take into account the change in access arrangements. The results are summarized in Table 3.1 and displayed in Figures 2 and 3. It is expected that all additional traffic will use the on-site car park as surveys found that existing parking in Sorlie Place is at capacity during peak periods.

3.26 Table 3.1 reveals that:

- Traffic flows on Warringah Road would increase by some 65 to 120 vehicles per hour two-way during the weekday afternoon and Saturday midday peak hours;

- Traffic flows on Forest Way (north of the site access) would increase by some 40 to 90 vehicles per hour two-way during the weekday afternoon and Saturday midday peak hours. Between the Site access and Warringah Road, the increase in traffic flows would be higher at some 160 to 250 vehicles per hour two-way;

Table 3.1: Existing + Development Two-Way (Sum of Both Directions) Peak Hour Traffic Flows				
Road	**Weekday Afternoon**		**Saturday Midday**	
	Existing	+ Dev	Existing	+ Dev
Warringah Road				
– east of Forest Way	3705	+95	3515	+120
– west of Forest Way	3175	+65	2775	+110
Forest Way				
– north of Naree Road	3340	+40	4165	+45
– south of Naree Road	3120	+55	4110	+65
– south of Russell Avenue	2970	+95	3815	+90
– north of Warringah Road	3390	+160	4020	+250
Russell Avenue				
– east of Forest Way	510	-95	465	-85
– west of Grace Avenue	400	-40	385	-30
Grace Avenue				
– north of Russell Avenue	835	+115	695	+105
– south of Russell Avenue	835	+305	650	+375
– north of Sorlie Place (N)	845	+100	610	+70
– south of Sorlie Place (S)	830	+100	595	+70
Sorlie Place				
– entry	130	+0	160	+0
– exit	140	+0	150	+0
Naree Road				
– east of Forest Way	640	+15	555	+20
Site Accesses				
– Forest Way (entry only)	160	+315	200	+400
– Russell Avenue	285	-285	355	-355
– Grace Avenue	120	+405	155	+445

- Traffic flows on Russell Avenue would decrease by some 30 to 95 vehicles per hour two-way during the weekday afternoon and Saturday midday peak hours. This is due to the closure of the Russell Avenue access and provision of improved access onto Forest Way;

- Traffic flows on Grace Avenue, north of Russell Avenue and south of the Site access, would increase by some 70 to 100 vehicles per hour two-way during the weekday afternoon and Saturday midday peak hours. In the short section

between the site access and Russell Avenue, the increase in traffic flows would be higher at some 305 to 375 vehicles per hour two-way. This is due to the closure of the Russell Avenue access;

- Traffic flows in Sorlie Place would be unchanged as existing parking in Sorlie Place is at capacity during peak periods;

- Traffic flows on Naree Road would increase by some 15 to 20 vehicles per hour two-way during the weekday afternoon and Saturday midday peak hours.

3.27 The intersections analysed in Chapter 2 were reanalysed with development traffic in place and the upgrades currently under construction completed using the SIDRA 8 network program. The results of the analyses are summarised below:

- The intersection of Warringah Road and Forest Way would operate with average delays of less than 30 seconds per vehicle in the weekday and Saturday peak periods. This represents level of service B/C a satisfactory level of intersection operation;

- The intersection of Forest Way and the Site access would operate with average delays of less than 15 seconds per vehicle in the weekday and Saturday peak periods. This represents level of service A/B a good level of intersection operation. The analysis found that the 95% back of queue on Forest Way (northbound) was some 70 metres and would therefore not extend back to Warringah Road (some 140 metres south);

- The right turn movement out of Russell Avenue at the intersection of Forest Way and Russell Avenue would operate at capacity. However, it should be noted that this right turn movement has low traffic flows of some 5 to 10 vehicles per hour. Thus, in practice these low flows would use gaps created by traffic signals either side of Russell Avenue to turn right onto Forest Way. All other movements would operate with average delays of less than 30 seconds per vehicle (level of service B/C or better);

- The intersection of Forest Way and Naree Road would operate with average delays of less than 20 seconds per during the weekday afternoon and Saturday midday peak periods. This represents level of service B. a reasonable level of service with spare capacity;

- The intersection of Grace Avenue and Russell Avenue would operate with average delays of less than 15 seconds per during the weekday afternoon and Saturday midday peak periods. This represents level of service A/B. a good level of service; and

- The Grace Avenue access would operate with average delays of less than 15 seconds per during the weekday afternoon and Saturday midday peak periods. This represents level of service A/B. a good level of service.

3.28 Thus, with the revised access arrangements and the road upgrades currently under construction completed, the surrounding road network can satisfactorily accommodate additional traffic generated by the redeveloped shopping centre.

3.29 As a sensitivity test the SIDRA 8 network model was rerun with through traffic flows on Forest Way and Warringah Road increased by 10% to account for future

traffic growth (this equates to some 200 vehicles per hour in each direction on Forest Way). The analysis found that:

- The intersection of Warringah Road and Forest Way would operate with average delays of less than 35 seconds per vehicle in the weekday and Saturday peak periods. This represents level of service C a satisfactory level of intersection operation;

- The intersection of Forest Way and the Site access would operate with average delays of less than 15 seconds per vehicle in the weekday and Saturday peak periods. This represents level of service A/B a good level of intersection operation. The analysis found that the 95% back of queue on Forest Way (northbound) was some 80 metres and would therefore not extend back to Warringah Road (some 140 metres south); and

- The intersection of Forest Way and Naree Road would operate with average delays of less than 25 seconds per during the weekday afternoon and Saturday midday peak periods. This represents level of service B. a reasonable level of service with spare capacity.

3.30 In summary the sensitivity test found that with increased traffic flows along Forest Way and Warringah Road, the road network (with the road upgrades completed) would continue to operate at the same level of service with only minor increases in average delays and queue lengths.

Discussions with RMS

3.31 Prior to lodging the DA, discussions were initiated with the RMS regarding the proposed access onto Forest Way. The SIDRA 8 network modelling has been provided to RMS for review. However, at the time of DA lodgement no response to the modelling had been received. Initial RMS feedback was that the option of signalising the intersection of Forest Way and Russell Avenue should be investigated as an alternative to the proposed modifications to the existing pedestrian signals on Forest Way to allow signalised right turn egress from the Site. Access from Forest Way would be limited to left in/left out. Provision of traffic signals at the Russell Avenue would allow removal of the existing pedestrian signals (pedestrian crossing relocated to Russell Avenue). The RMS rationale for signalising the Russell Avenue intersection was that it would move the traffic signals further away from Warringah Road.

3.32 The option of signalising the intersection of Russell Avenue intersection with Forest Way was considered in early stages of planning for the redevelopment of the shopping centre. It was rejected as Russell Avenue is located some 100 metres south of the new traffic signal controlled intersection with Naree Road. RMS Guidelines suggest that traffic signal controlled intersections should be located a minimum of 130 metres apart. RMS has since advised that it may relax the minimum separation requirement if the Russell Avenue option results in benefits to the operation of traffic flow on Forest Way.

3.33 As requested by RMS we have analysed the operation of the Russell Avenue option using SIDRA 8 network. Traffic flows have been redistributed to take into account the changes in access arrangements (left in/left out to Forest Way, no right turn egress), no pedestrian signals on Forest Way and traffic signals at the

intersection of Russell Avenue and Forest Way. A concept design for traffic signals at the intersection of Russell Avenue and Forest Way is provided in Attachment C.

3.34 The analysis found that:

- Traffic flows on Russell Avenue and Grace Avenue (between the site access and Russell Avenue) would increase by some 150 to 240 vehicles per hour compared to the signalised site access option;

- Russell Avenue would require upgrading to at least two eastbound lanes between Grace Avenue and Forest Way;

- Pedestrian connectivity between the shopping centre and the bus stops on the eastern side of Forest Way is reduced (as the pedestrian crossing has been relocated to the north); and

- The SIDRA analysis found generally similar levels of service as the signalised access option. However the analysis found that:

    - 95% queue (southbound) extended back from Russell Avenue through the intersection at Naree Road; and
    - The 95% queue (northbound) on Forest Way from Russell Avenue was some 280 metres. This length extends almost back to Warringah Road (some 300 metres south of Russell Avenue). The longer northbound queue compared to the Site access option is due to the Russell Avenue intersection operating a three phase cycle (while the signalised Site access is a two phase cycle).

3.35 Overall, while the Russell Avenue option is a workable option it has a number of greater impacts compared to the signalised access option, including queuing extending closer to Warringah Road.

Summary

3.36 In summary, the main points relating to the traffic implications of the proposed expansion of Forestway Shopping Centre redevelopment are:

i) the proposed redevelopment has good access to public transport services with local and regional bus services operating along Forest Way adjacent to the Site;

ii) the proposed redevelopment is in accordance with government objectives and would increase retail and employment densities close to public transport services;

iii) the proposed parking provision is appropriate;

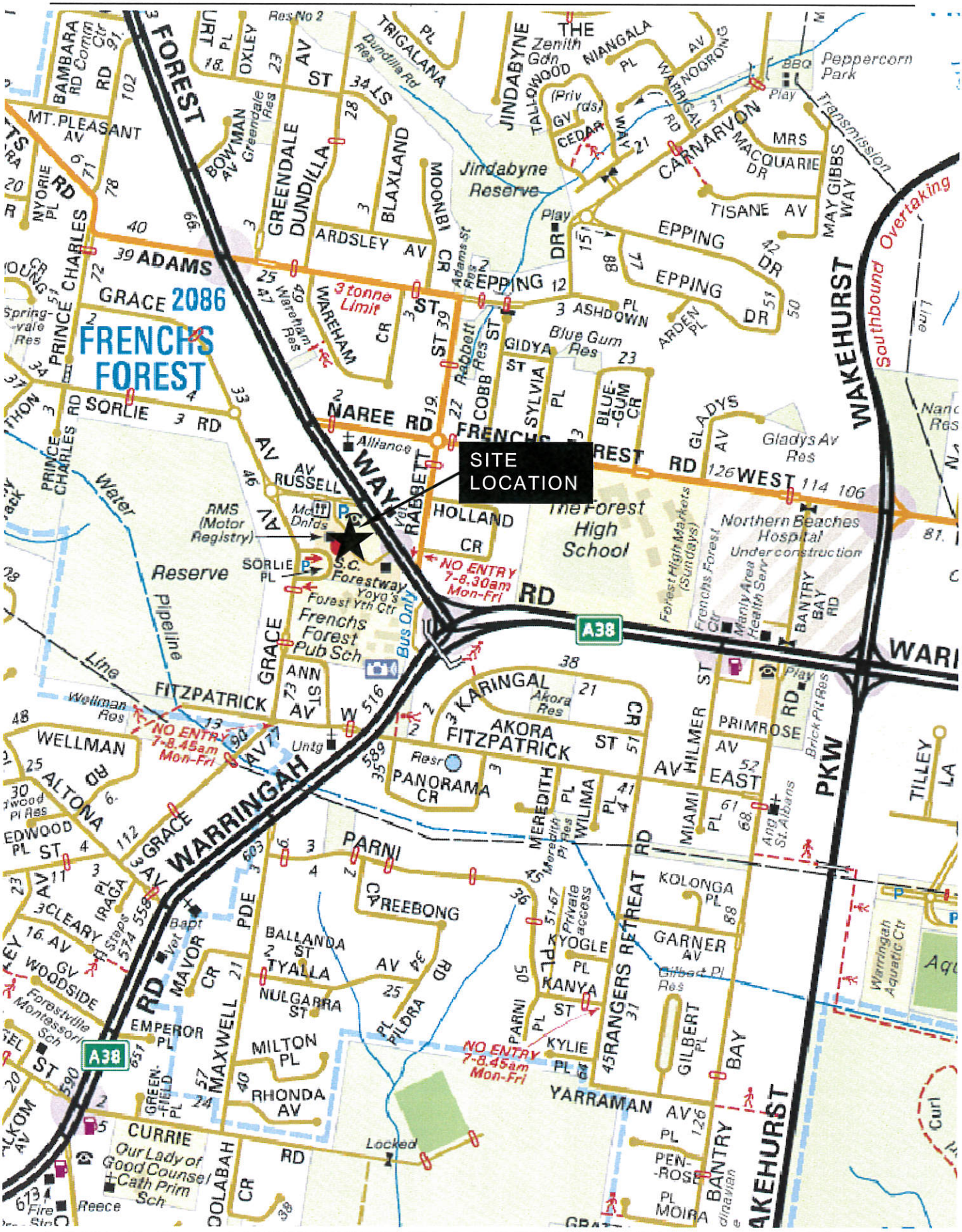
iv) access and internal layout are considered appropriate (subject to detailed design) in accordance with the requirements AS 2890.1-2004 and AS2890.6-2009;

v) proposed service arrangements are considered appropriate (subject to detailed design) in accordance with the requirements of AS2890.2-2002 and implementation of a loading dock management plan;

vi) with the proposed road upgrades under construction completed, the surrounding road network can satisfactorily accommodate the additional traffic generated by the proposed redevelopment;

vii) the proposed signalised access on Forest Way has minimal impact on the operation of Forest Way with queues not extending back to Warringah Road;

viii) the Russell Avenue traffic signal option has been investigated. While a workable option, it is not favoured as it has a number of greater impacts compared to the signalised access option, including queuing extending closer to Warringah Road.

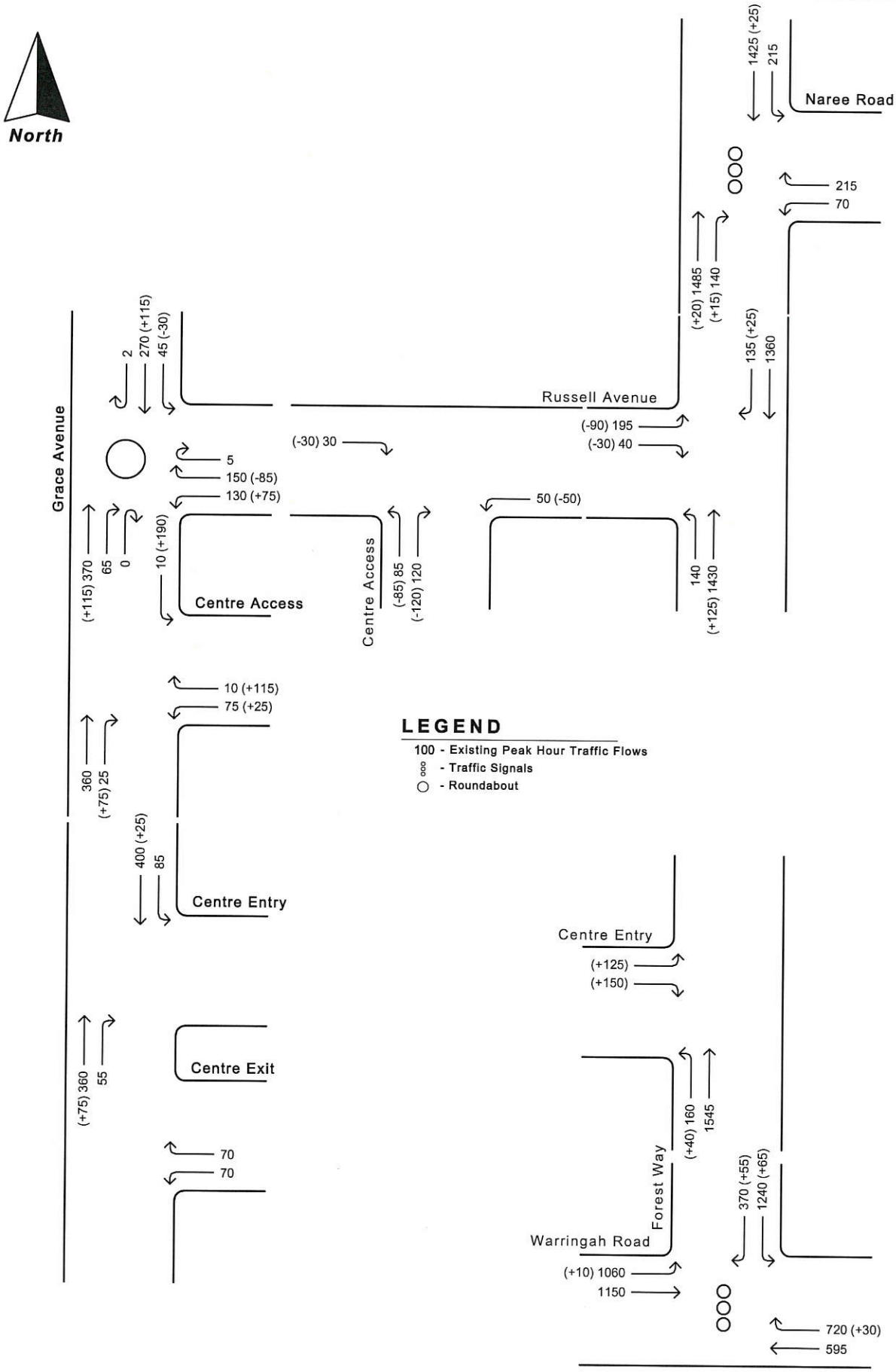


Location Plan

Colston Budd Rogers & Kafes Pty Ltd

DRAWN BY CBRK Pty Ltd_mc Ref: 10857 4.09.2018

Figure 1



Existing weekday afternoon peak hour traffic flows plus development traffic

Figure 2

Colston Budd Rogers & Kafes Pty Ltd

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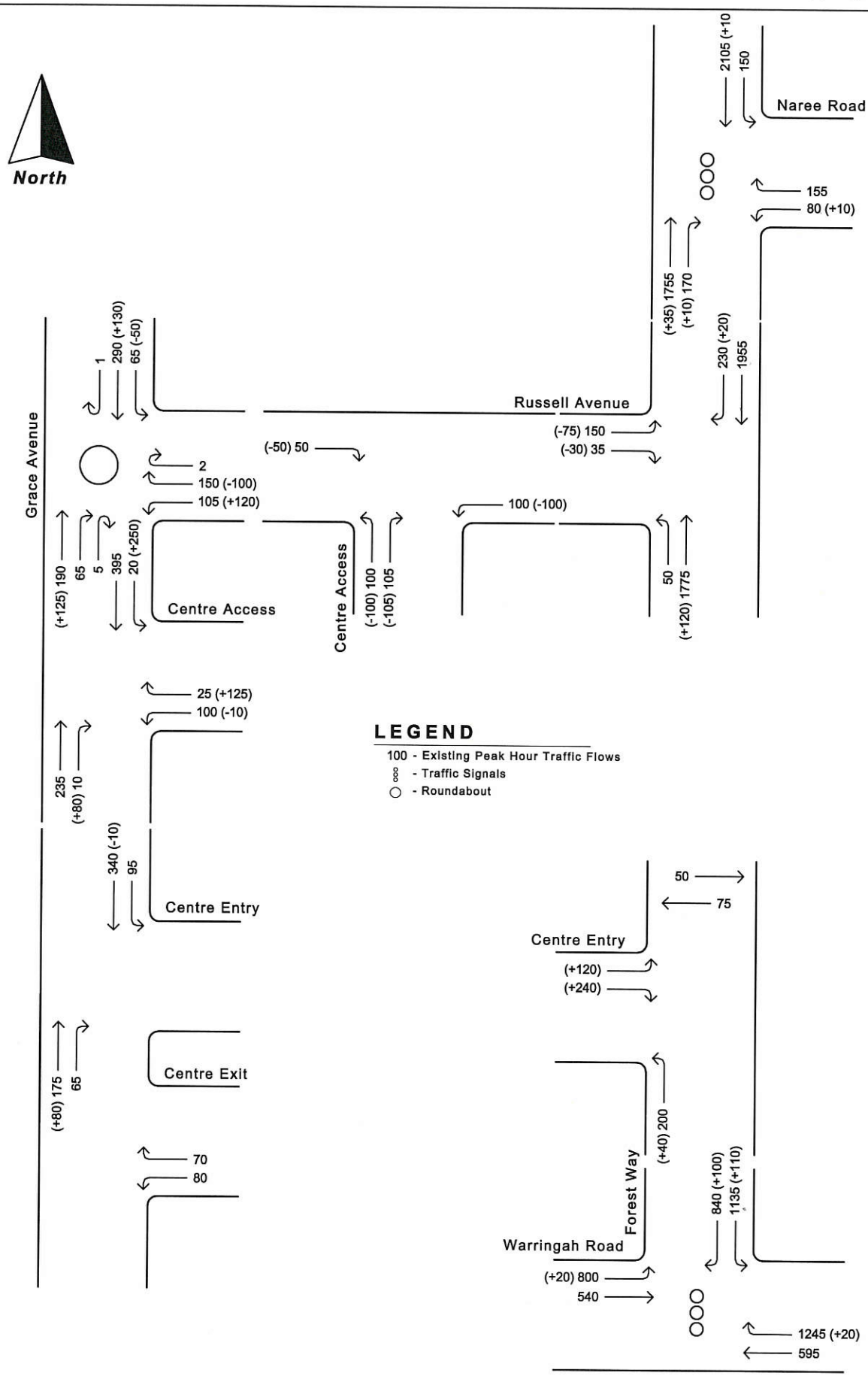


Existing Saturday Midday peak hour traffic flows plus development traffic

Figure 3

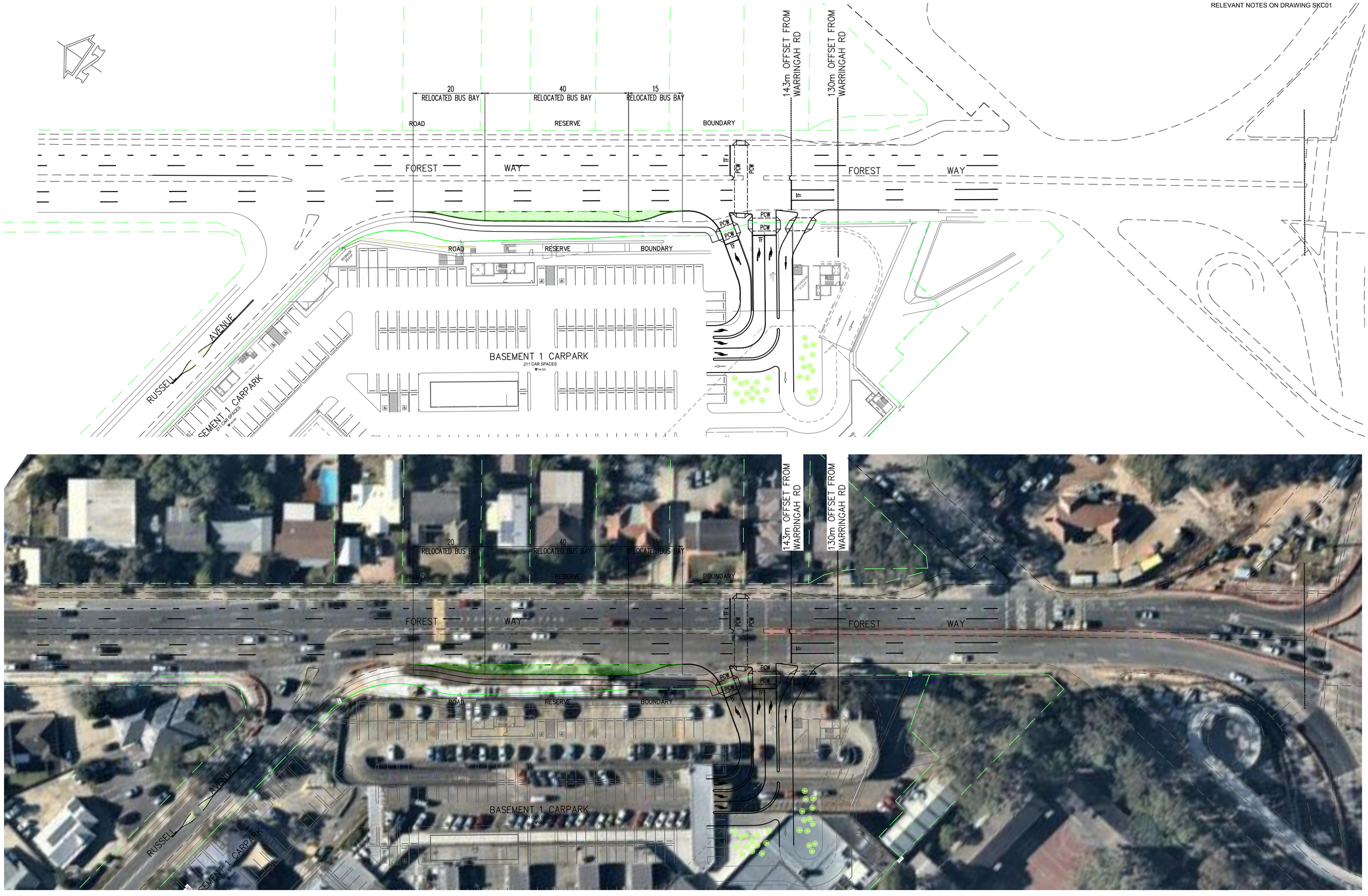
Colston Budd Rogers & Kafes Pty Ltd

DRAWN BY CBRK Pty Ltd_mc Ref: 10857 4.09.2018

ATTACHMENT A

PROPOSED FOREST WAY ACCESS

THIS DRAWING TO BE READ IN CONJUNCTION WITH ALL RELEVANT NOTES ON DRAWING SKC01



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AT ORIGINAL SIZE

PRELIMINARY

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P2	PRELIMINARY	SB	GG	12.09.18
P1	PRELIMINARY	SB	GG	17.08.18

Architect
THE BUCHAN GROUP
LEVEL 1, 7 KELLY STREET, ULTIMO, NSW, 2007

Civil Engineer
Taylor Thomson Whitting
612 9439 7288 | 48 Chandos Street St Leonards NSW 2065

Project
FORESTWAY SHOPPING CENTRE REDEVELOPMENT

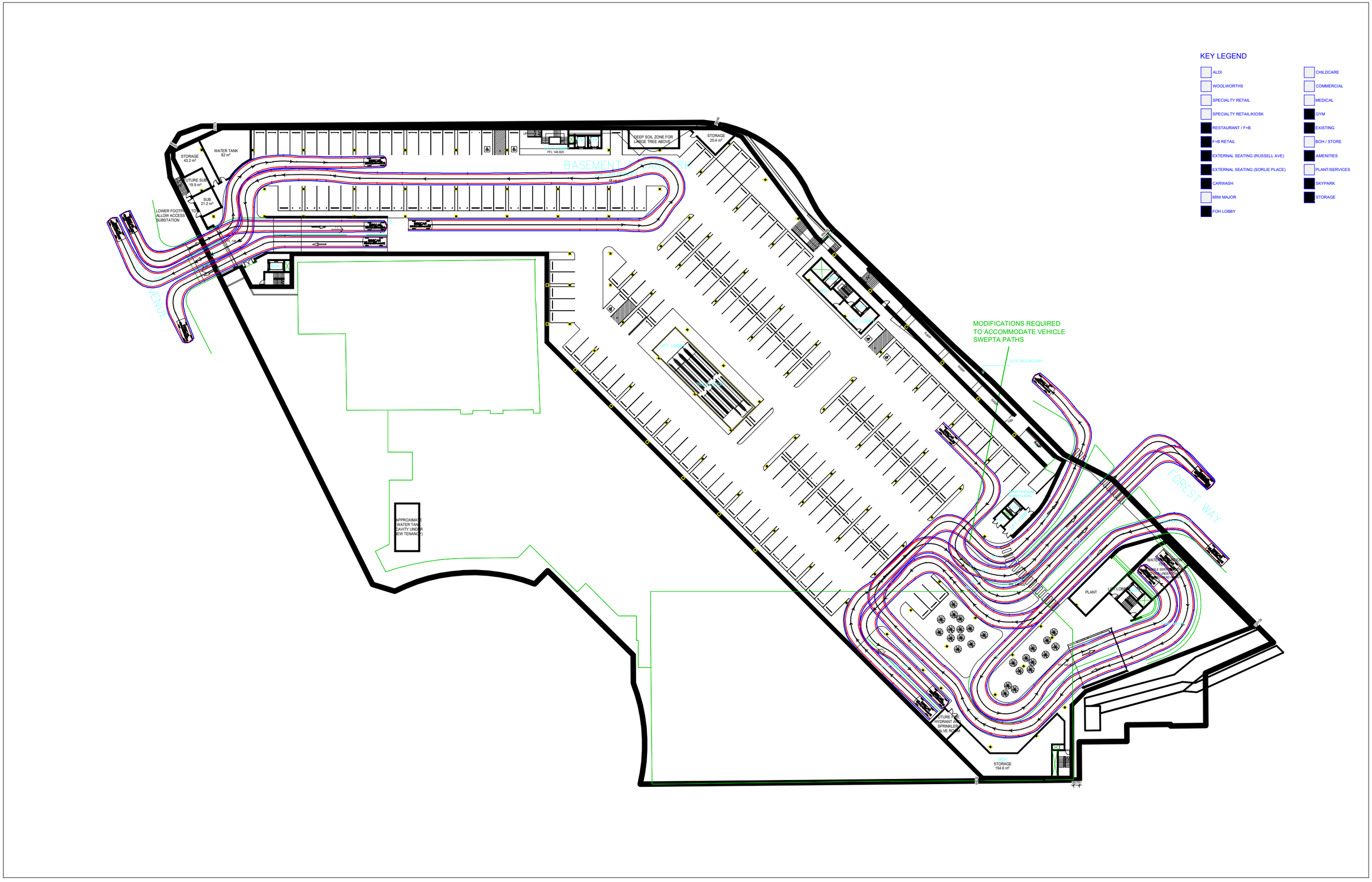
Sheet Subject
SITEWORKS PLAN
FOREST WAY EXIT
BUS BAY RELOCATED

Scale : A1 1:500
Drawn AS
Authorised
Job No 181210
Drawing No SKC36
Revision P3
Plot File Created: Sep 12, 2018 - 11:27am

FileName: SKC36.dwg - USER: Gregg - Plot File Created: Sep 12, 2018 - 11:27am

ATTACHMENT B

VEHICLE TURN PATHS



NOTE:
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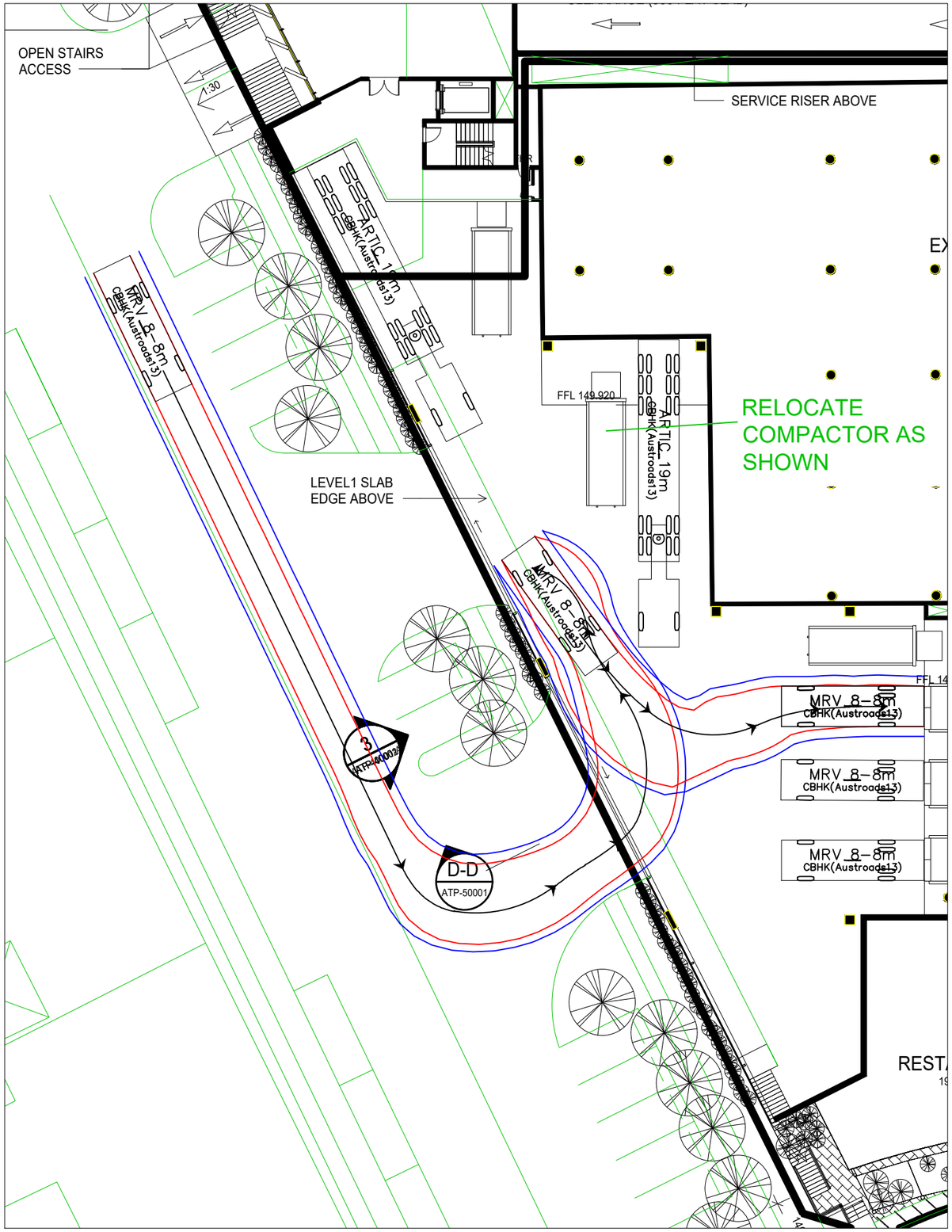
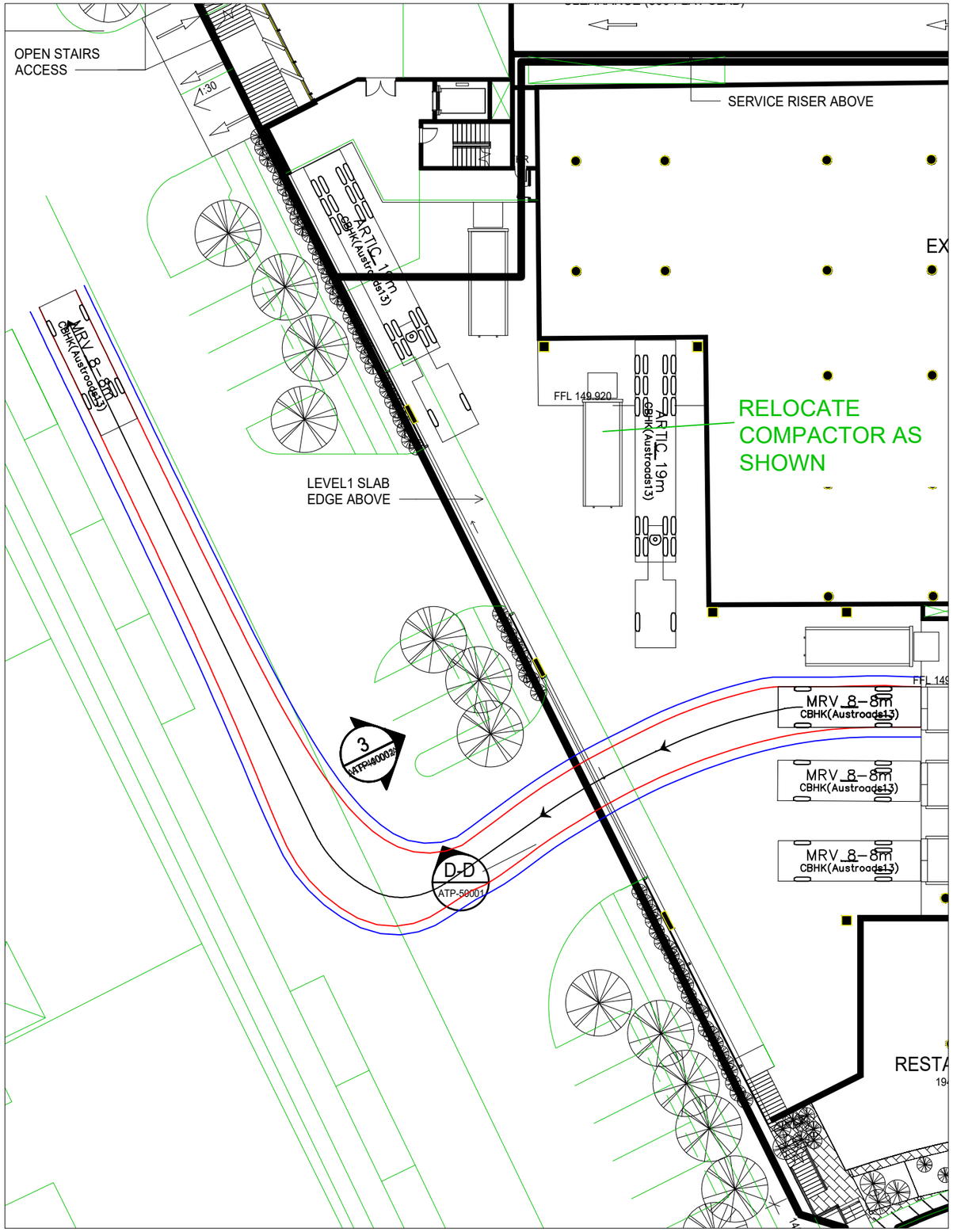
Swept Path of Vehicle Body
Swept Path of Clearance to Vehicle Body

B85 & B99 VEHICLE SWEPT PATHS

DRAWN BY CBRK Pty Ltd_mc Ref: 10857 4 DECEMBER 2018

1





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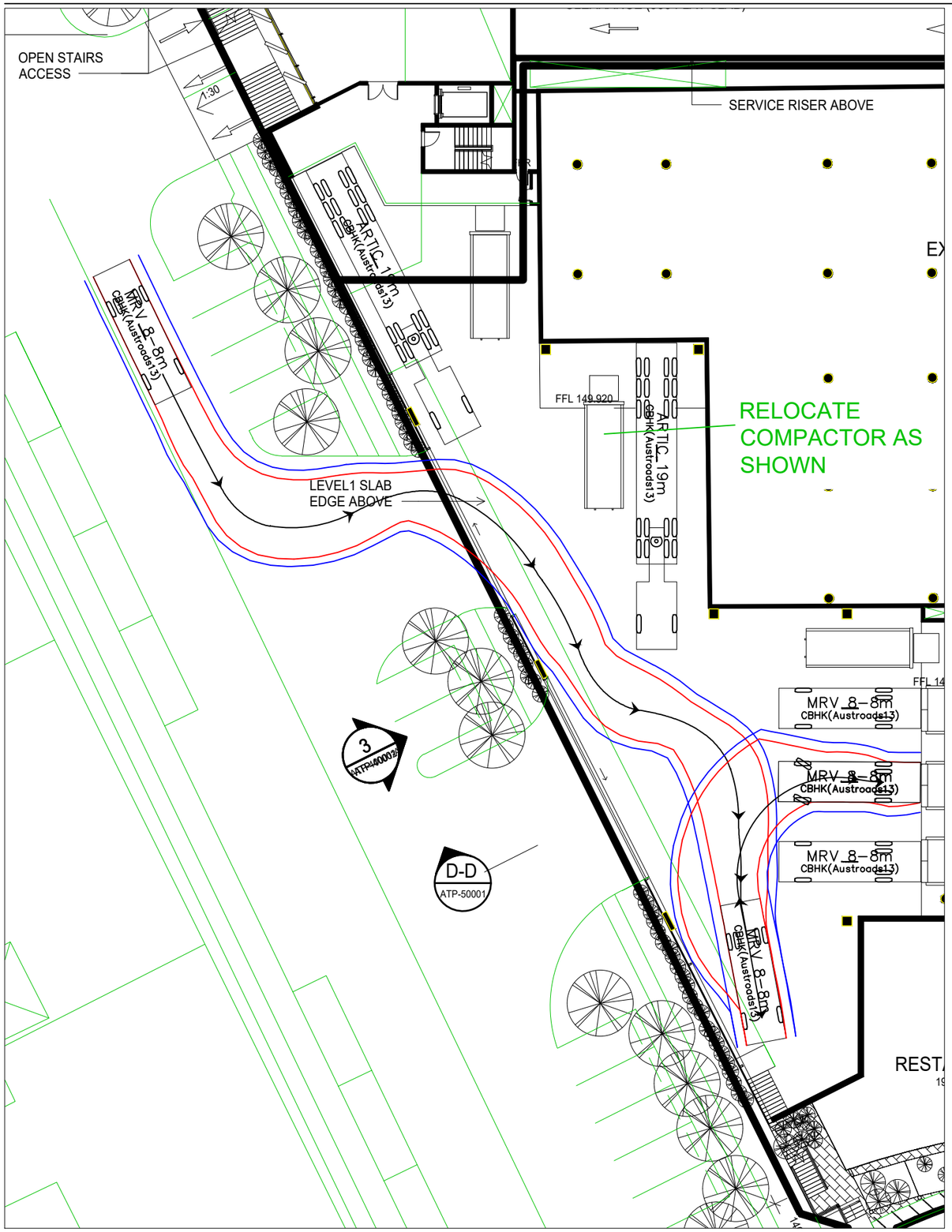
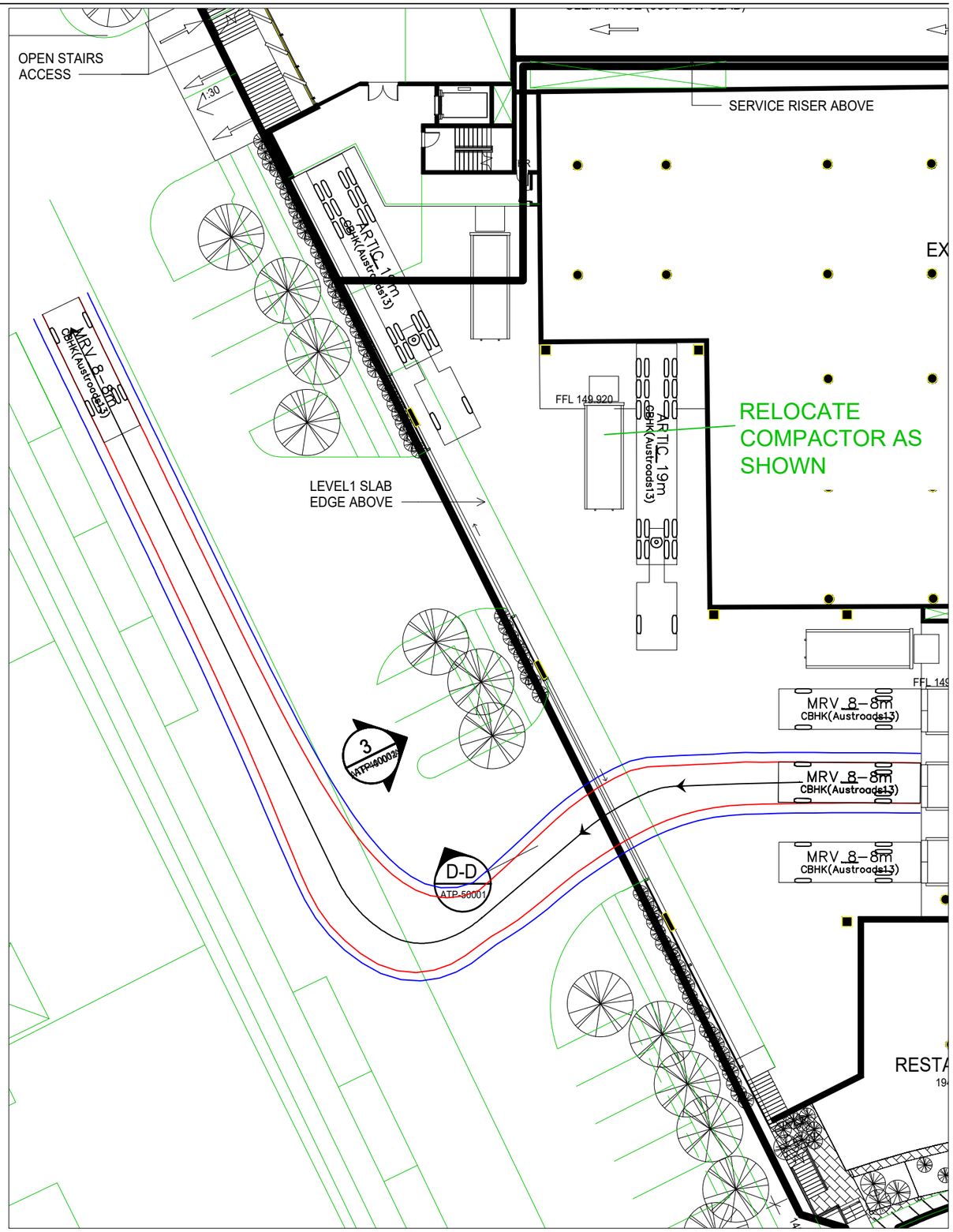
Swept Path of Vehicle Body
Swept Path of Clearance to Vehicle Body

8.8m MEDIUM RIGID VEHICLE SWEPT PATHS

DRAWN BY CBRK Pty Ltd_mc Ref: 10857 4 DECEMBER 2018

2





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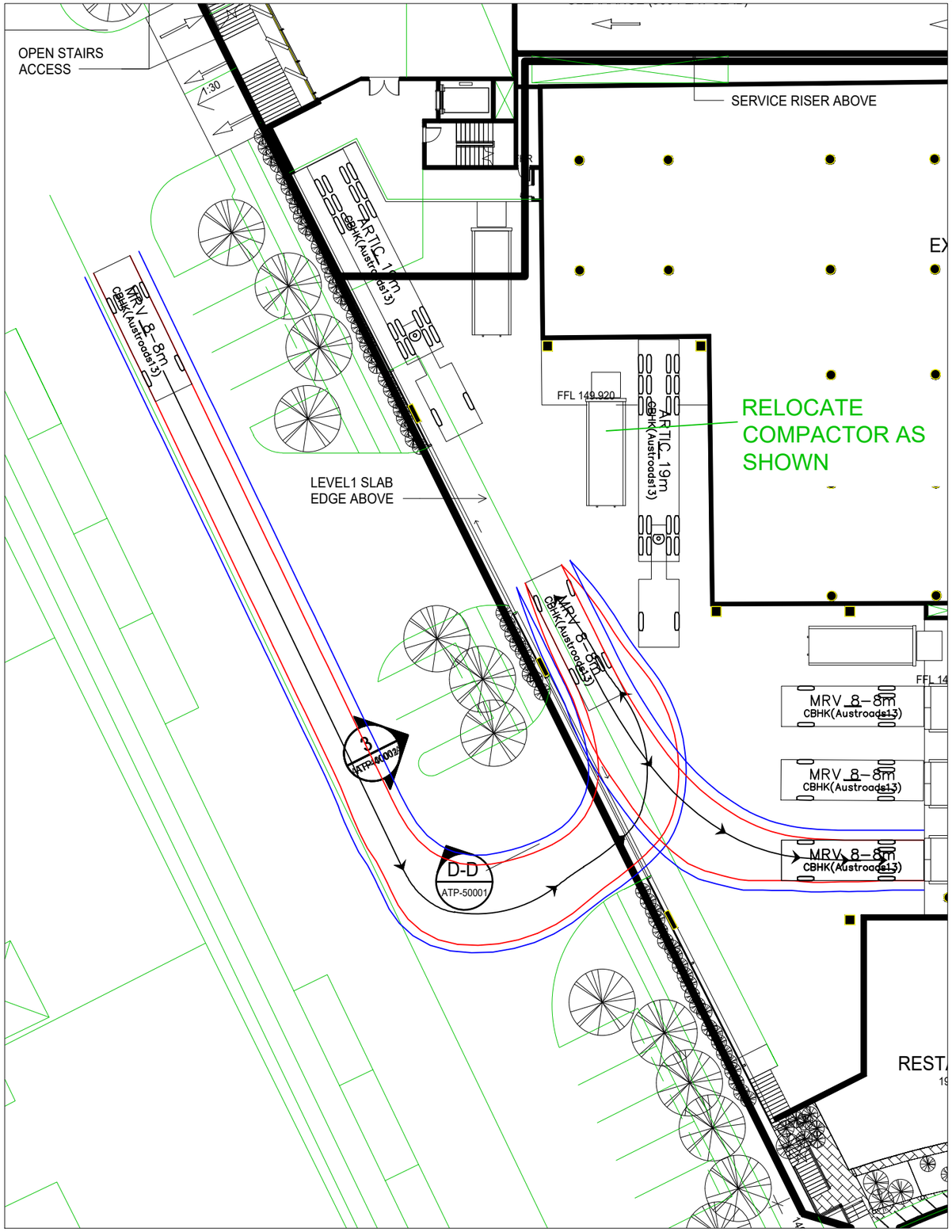
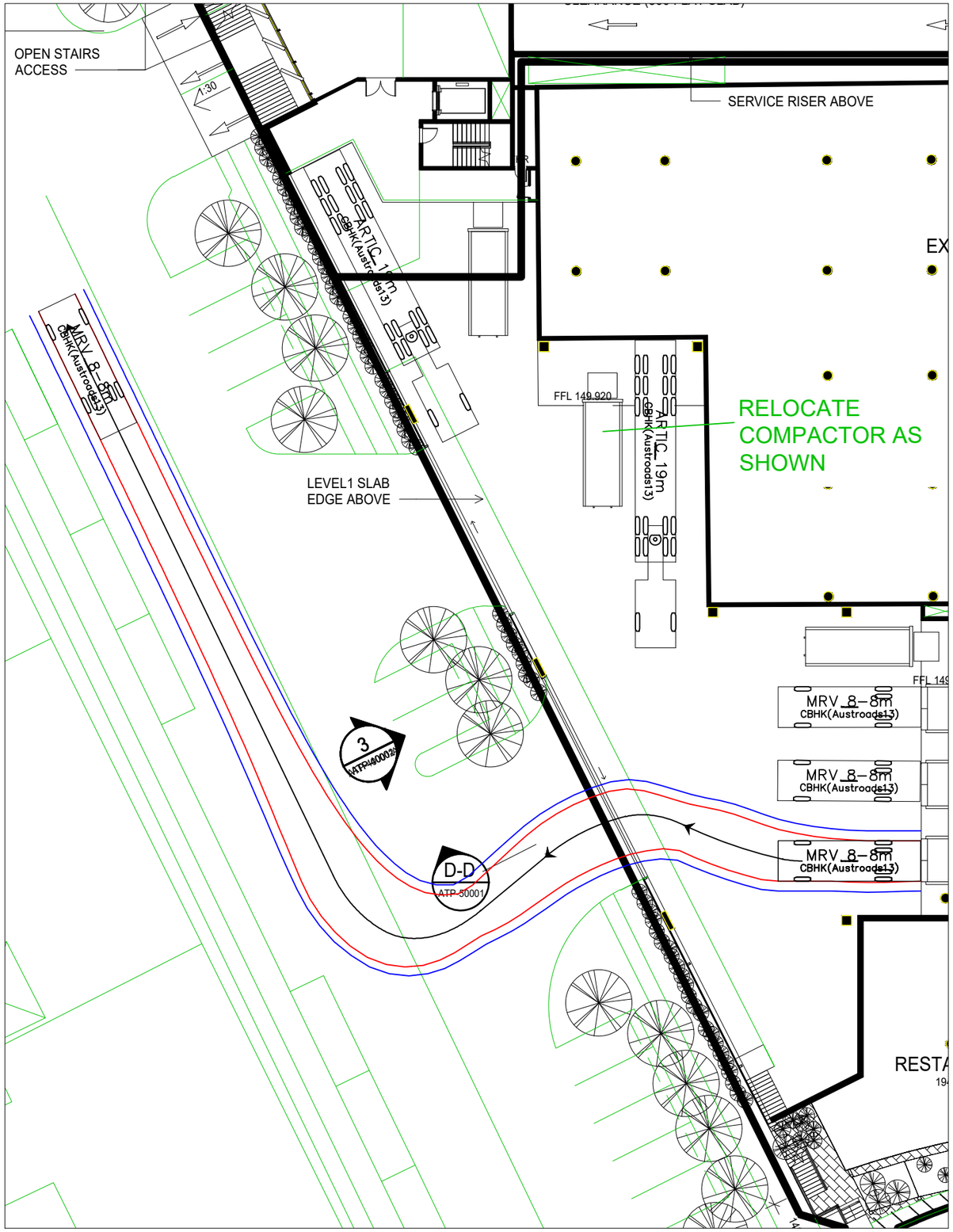
Swept Path of Vehicle Body
Swept Path of Clearance to Vehicle Body

8.8m MEDIUM RIGID VEHICLE SWEPT PATHS

DRAWN BY CBRK Pty Ltd_mc Ref: 10857 4 DECEMBER 2018

3





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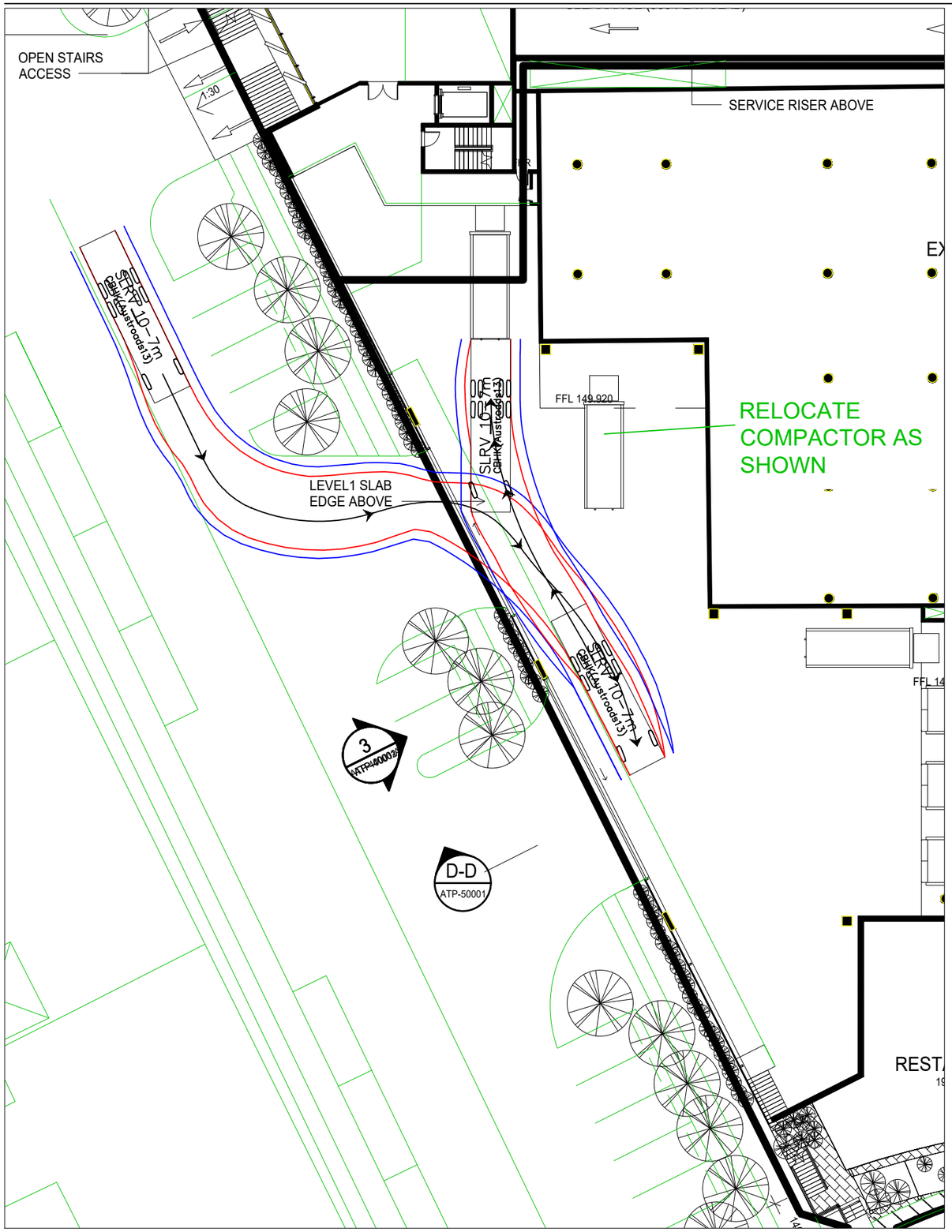
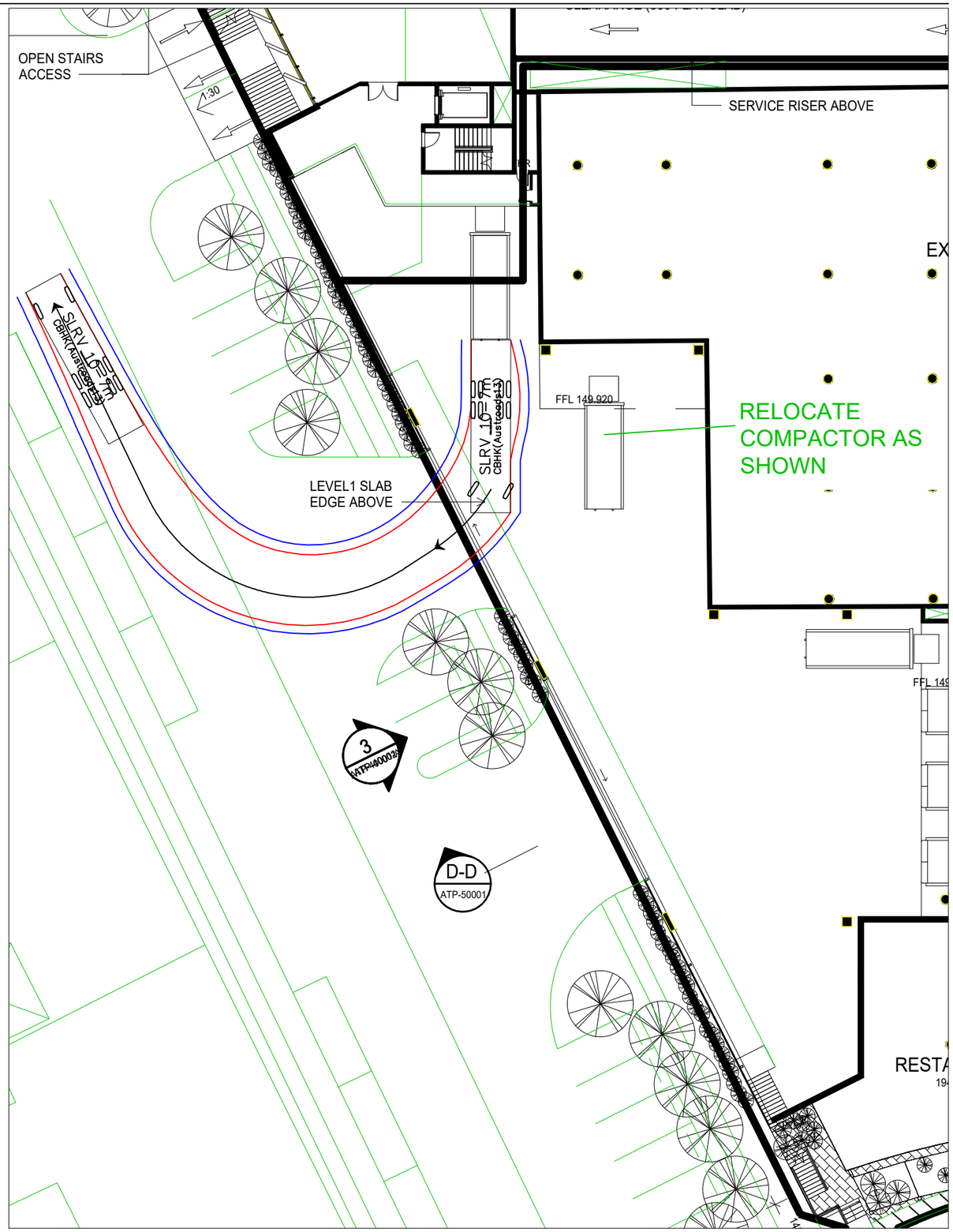
Swept Path of Vehicle Body
Swept Path of Clearance to Vehicle Body

8.8m MEDIUM RIGID VEHICLE SWEPT PATHS

DRAWN BY CBRK Pty Ltd_mc Ref: 10857 4 DECEMBER 2018

4





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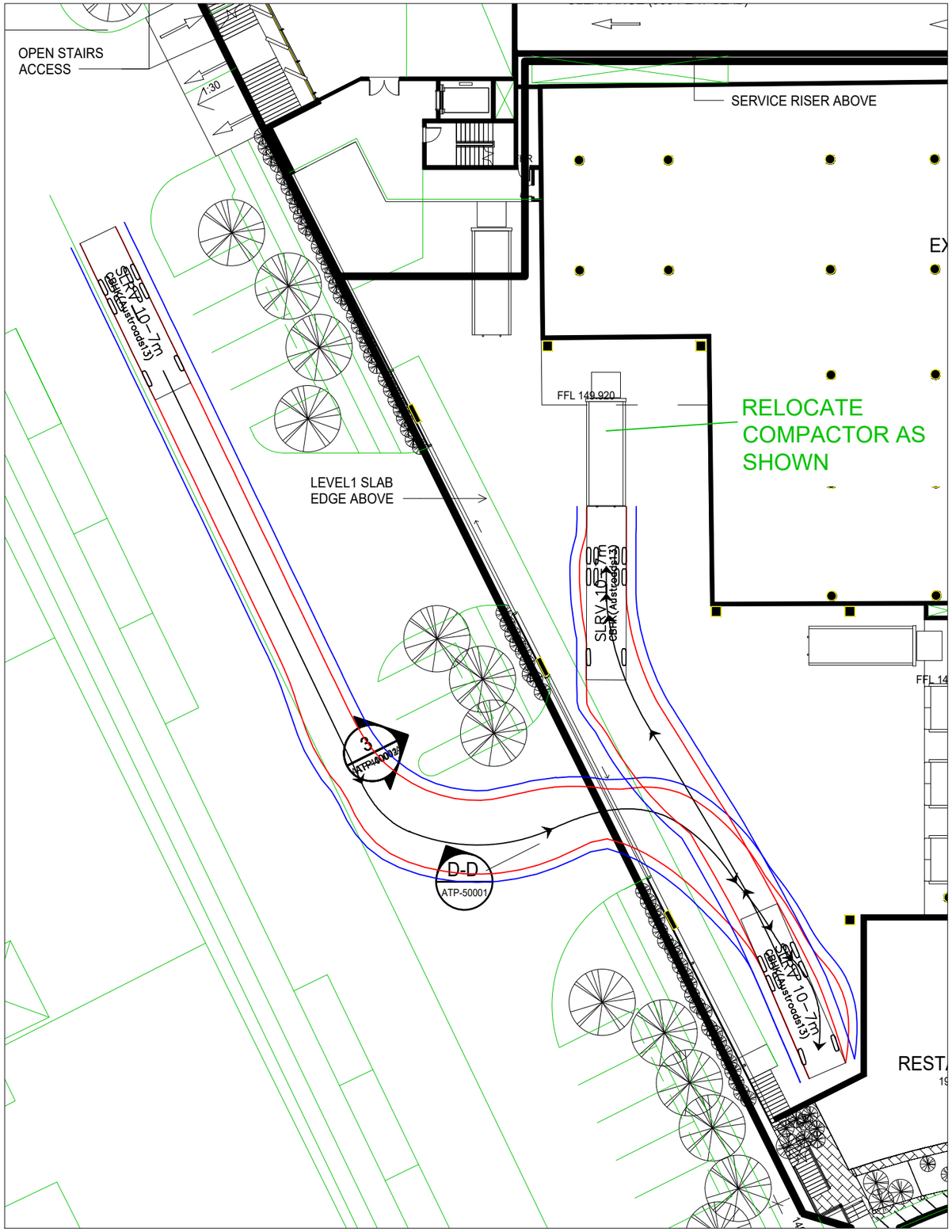
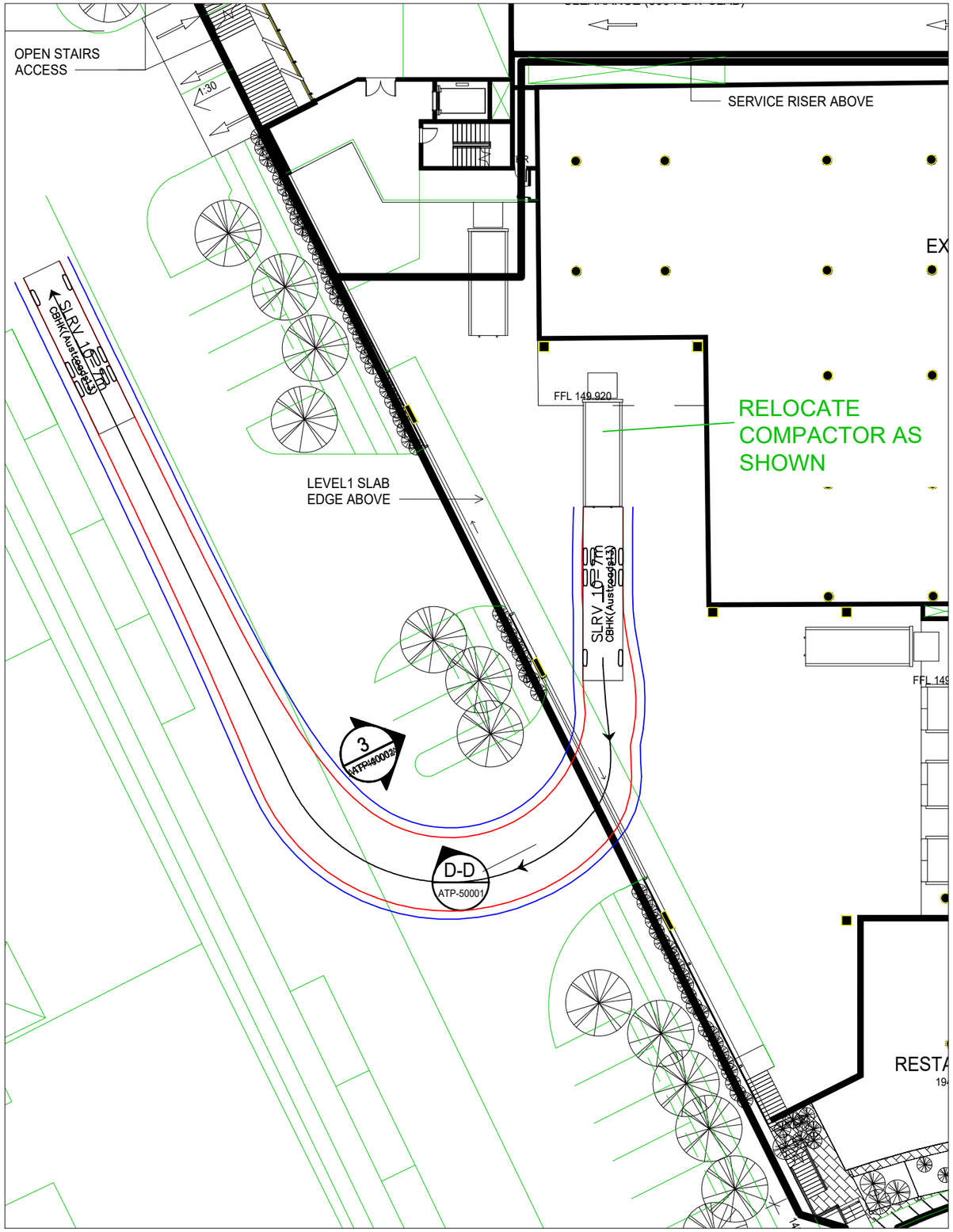
Swept Path of Vehicle Body
Swept Path of Clearance to Vehicle Body

10.7m LARGE RIGID VEHICLE SWEPT PATHS

DRAWN BY CBRK Pty Ltd_mc Ref: 10857 4 DECEMBER 2018

5





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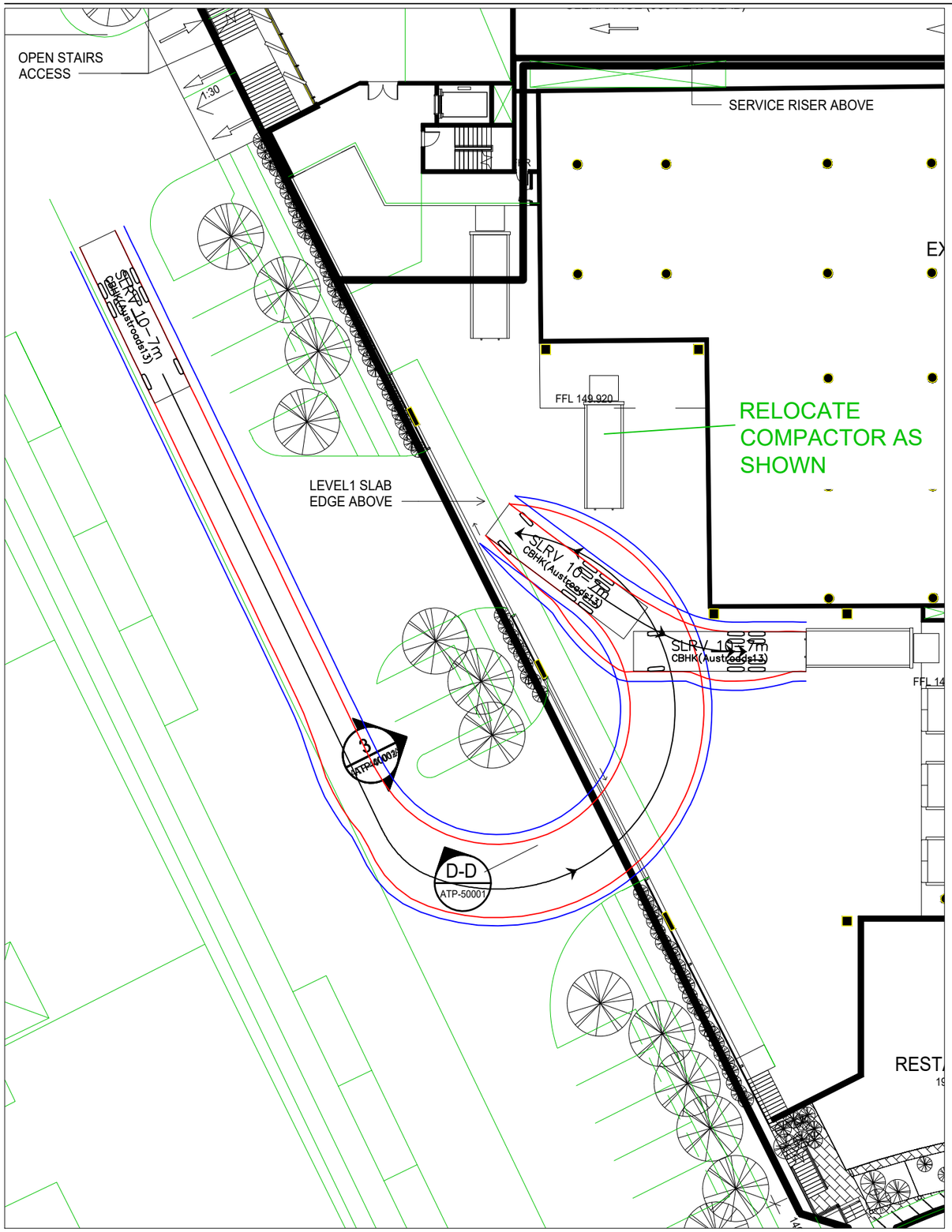
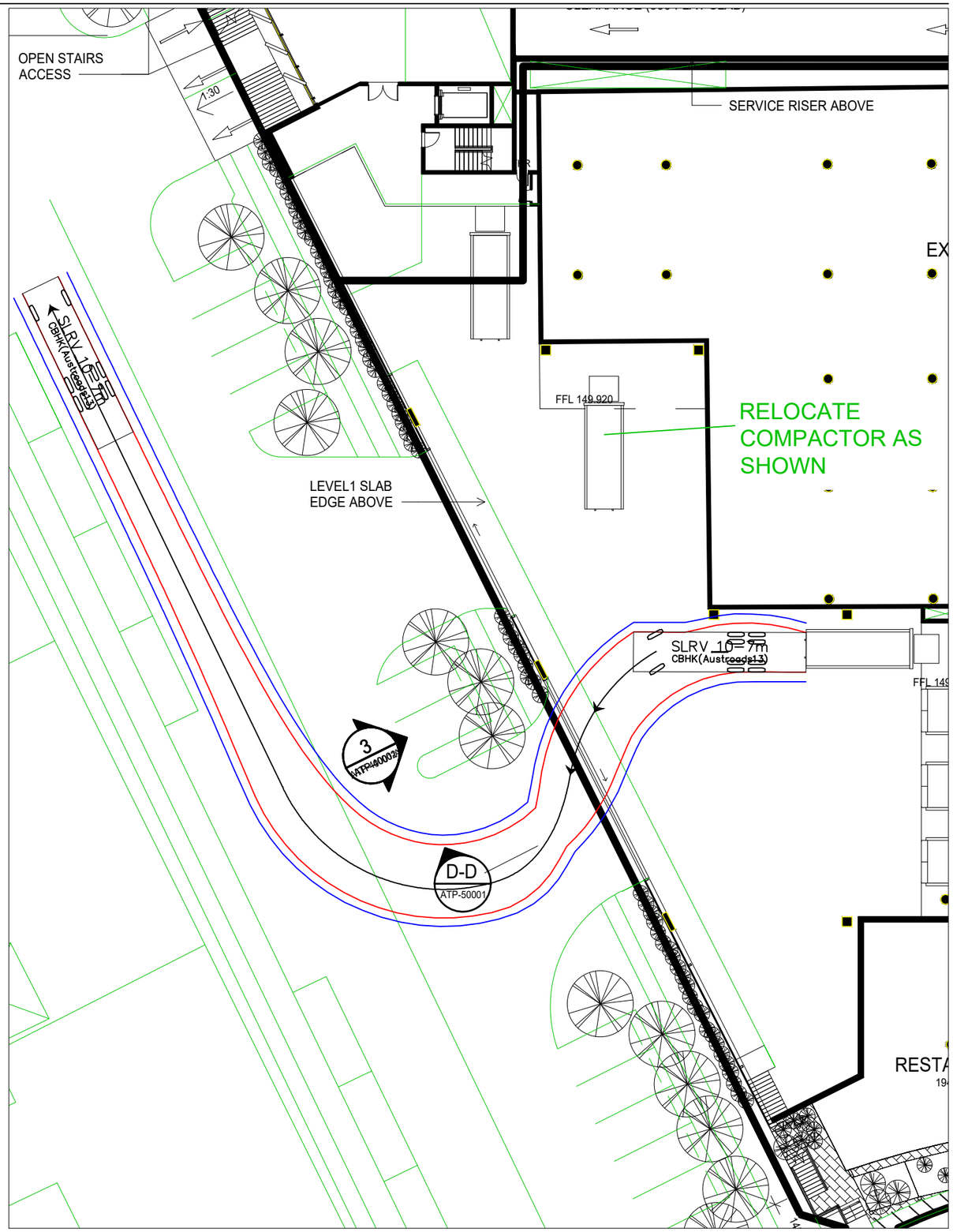
Swept Path of Vehicle Body
Swept Path of Clearance to Vehicle Body

10.7m LARGE RIGID VEHICLE SWEPT PATHS

DRAWN BY CBRK Pty Ltd_mc Ref: 10857 4 DECEMBER 2018





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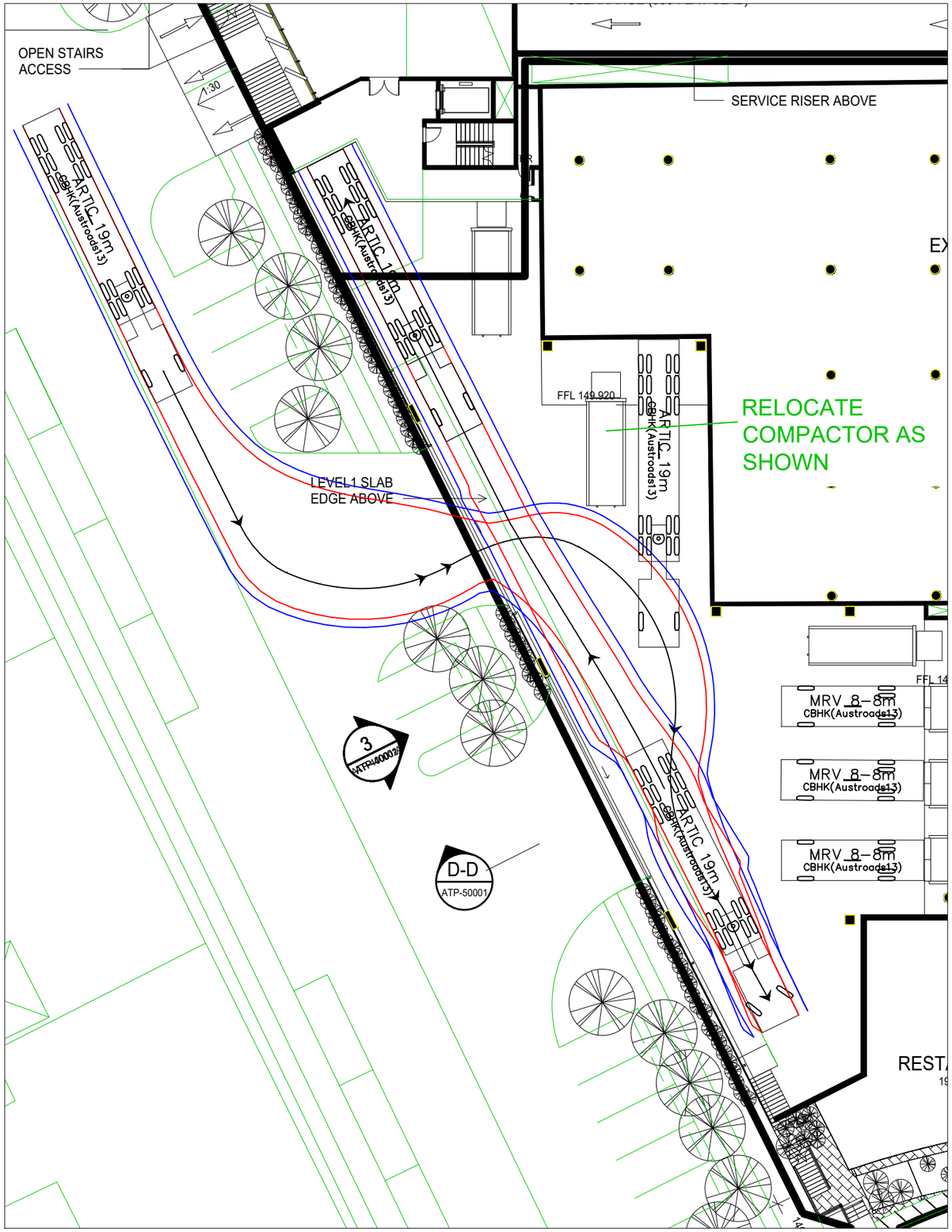
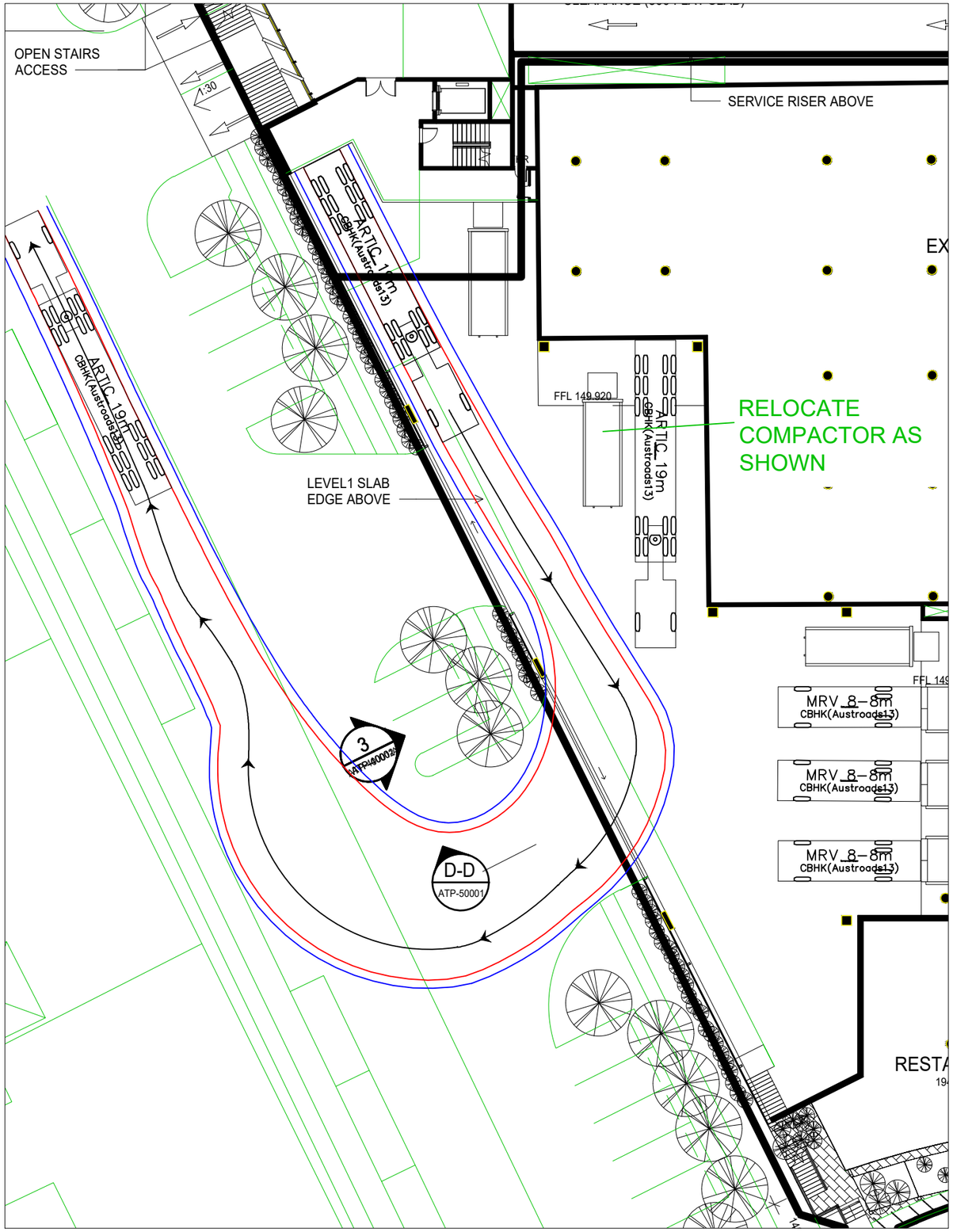
Swept Path of Vehicle Body
Swept Path of Clearance to Vehicle Body

10.7m LARGE RIGID VEHICLE SWEPT PATHS

DRAWN BY CBRK Pty Ltd_mc Ref: 10857 4 DECEMBER 2018





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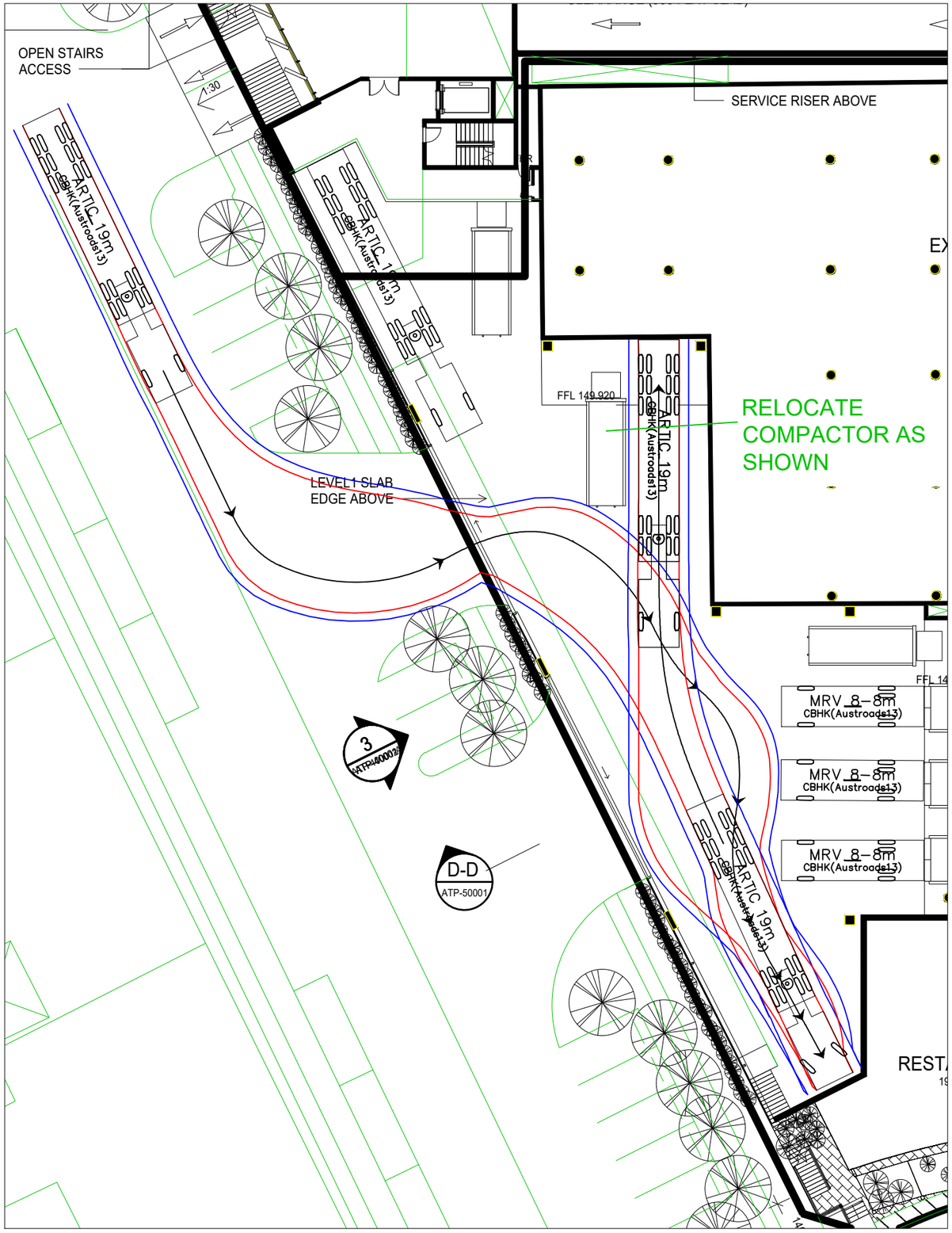
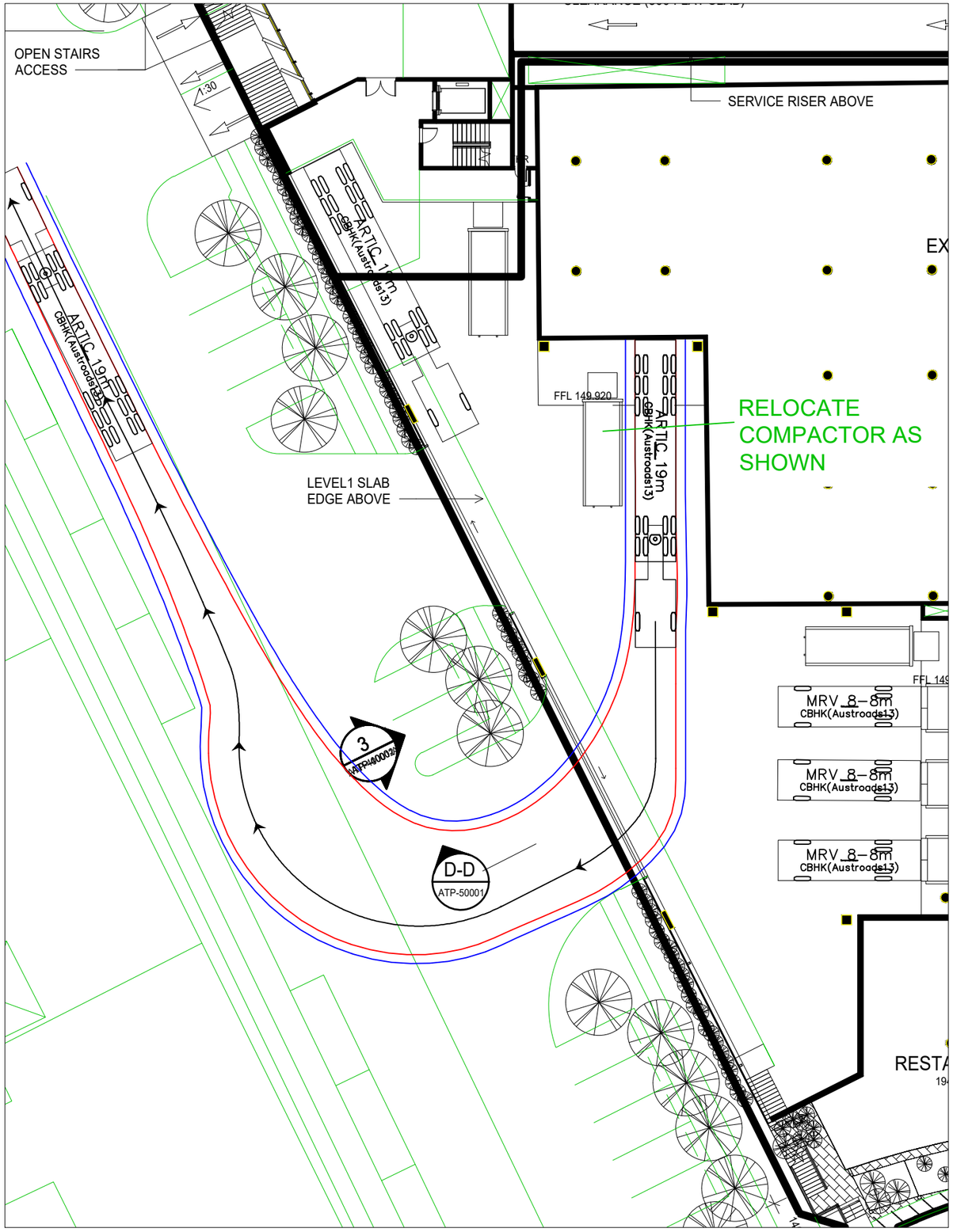
Swept Path of Vehicle Body
Swept Path of Clearance to Vehicle Body

19.0m ARTICULATED VEHICLE SWEPT PATHS

DRAWN BY CBRK Pty Ltd_mc Ref: 10857 4 DECEMBER 2018





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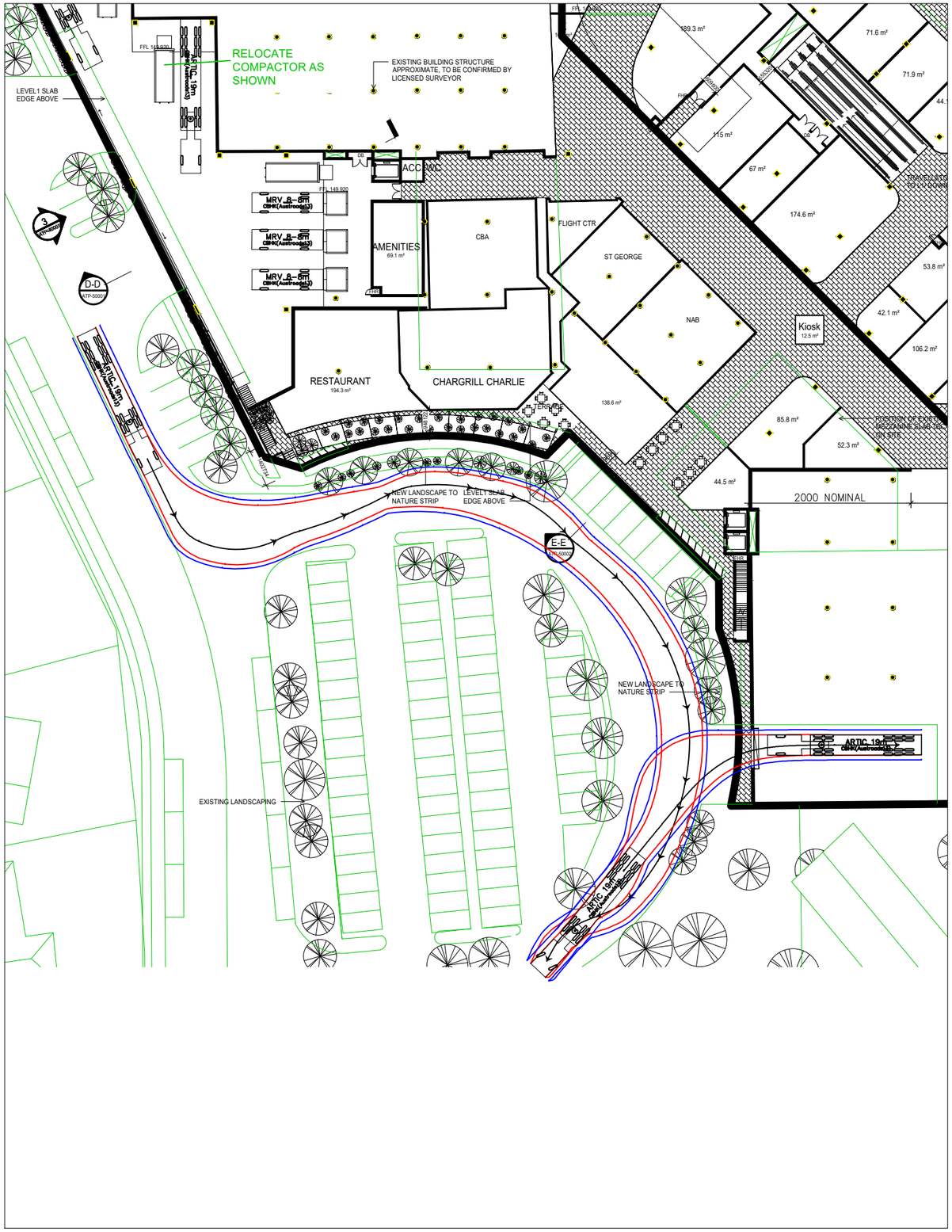
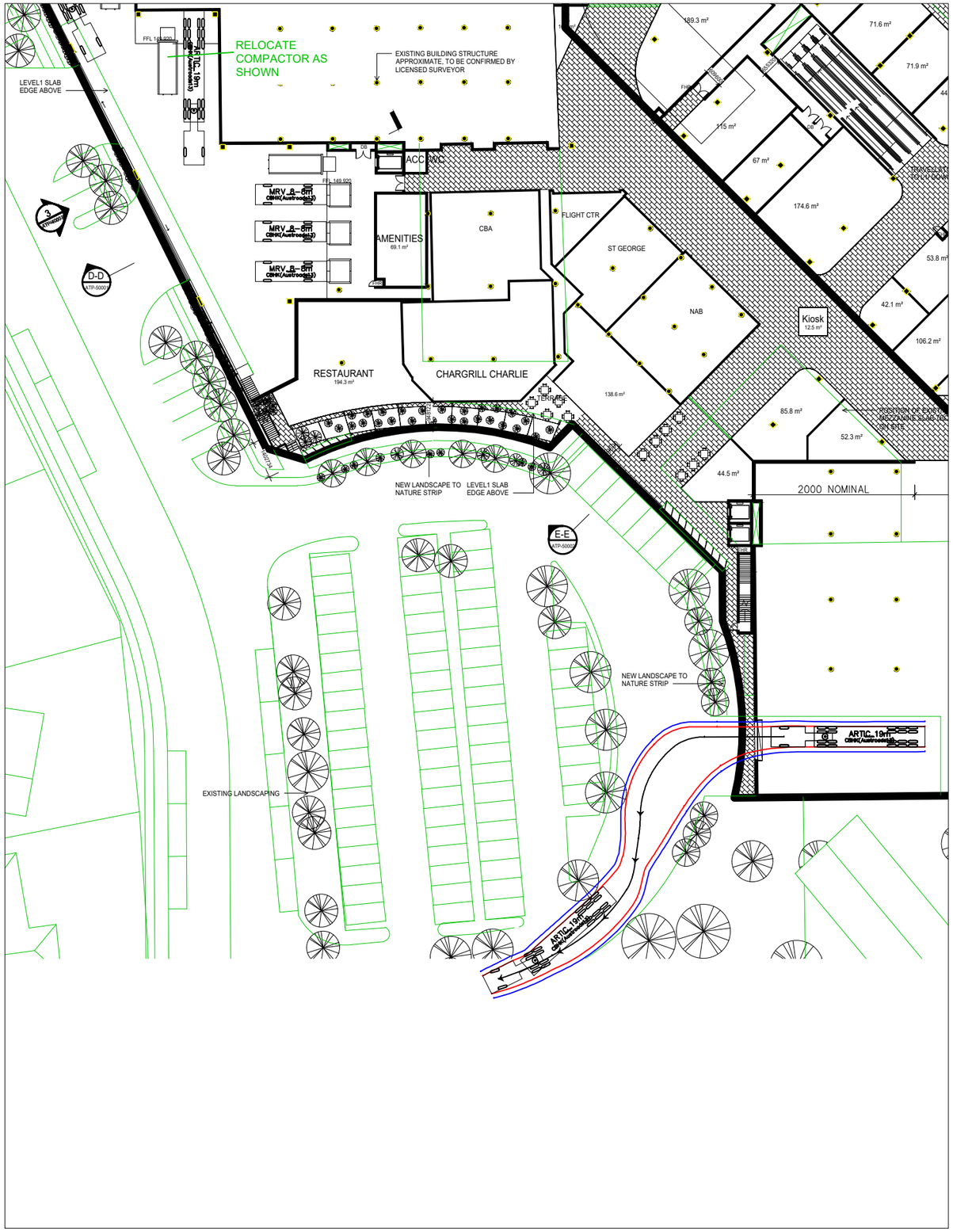
Swept Path of Vehicle Body
Swept Path of Clearance to Vehicle Body

19.0m ARTICULATED VEHICLE SWEPT PATHS

DRAWN BY CBRK Pty Ltd_mc Ref: 10857 4 DECEMBER 2018





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Swept Path of Vehicle Body
Swept Path of Clearance to Vehicle Body

19.0m ARTICULATED VEHICLE SWEPT PATHS

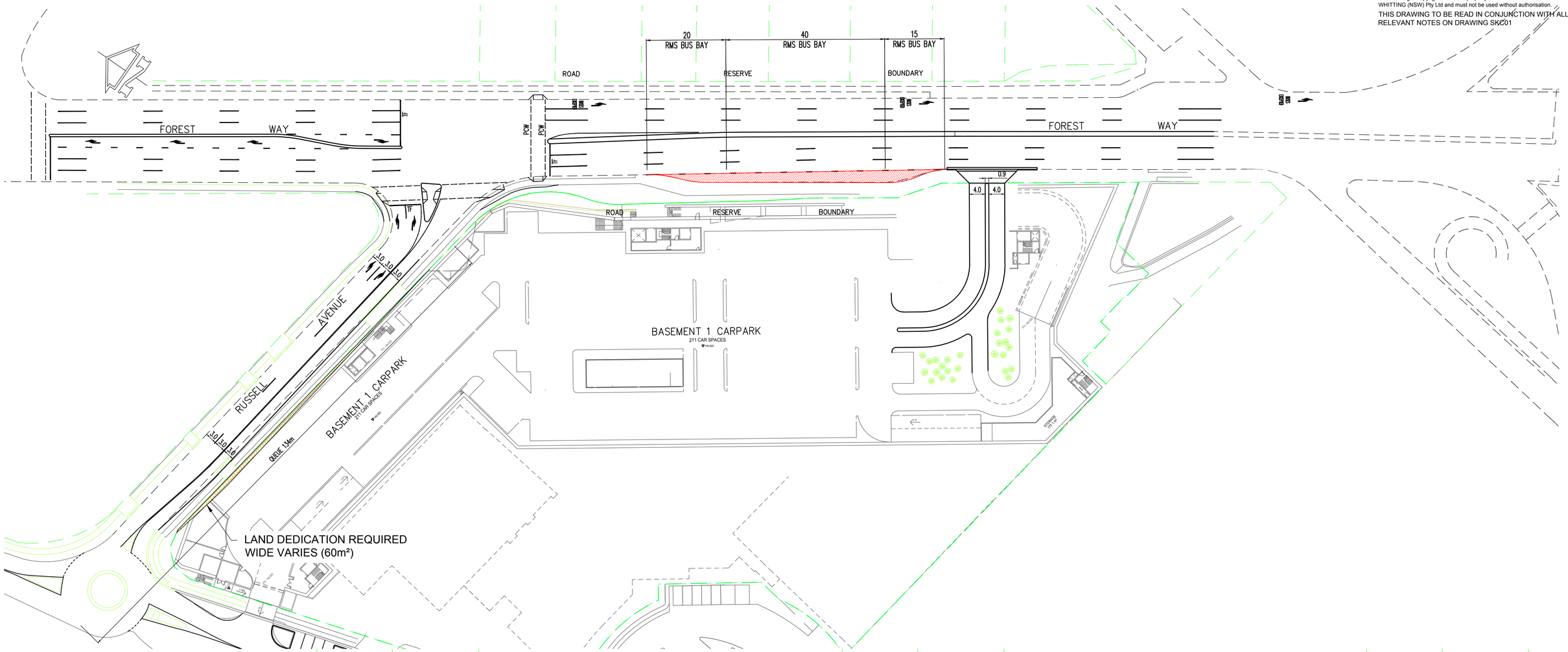
DRAWN BY CBRK Pty Ltd_mc Ref: 10857 4 DECEMBER 2018

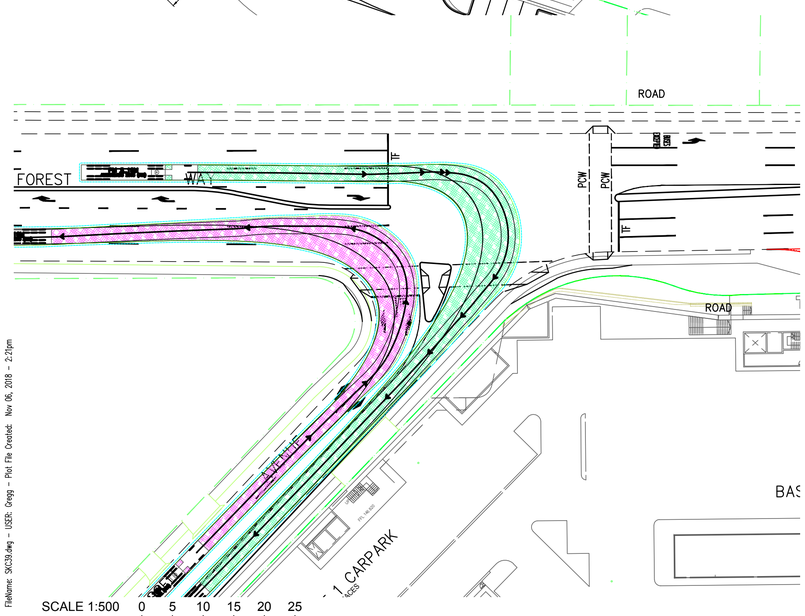
10

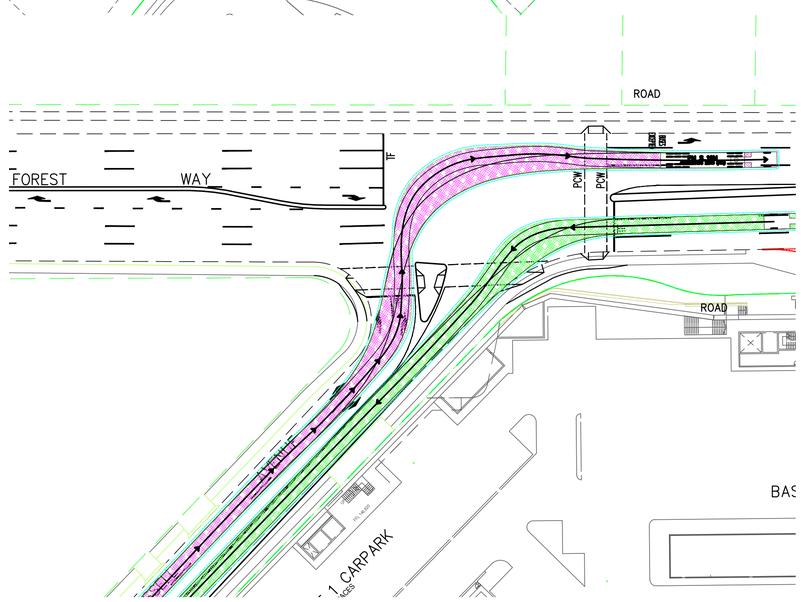
ATTACHMENT C

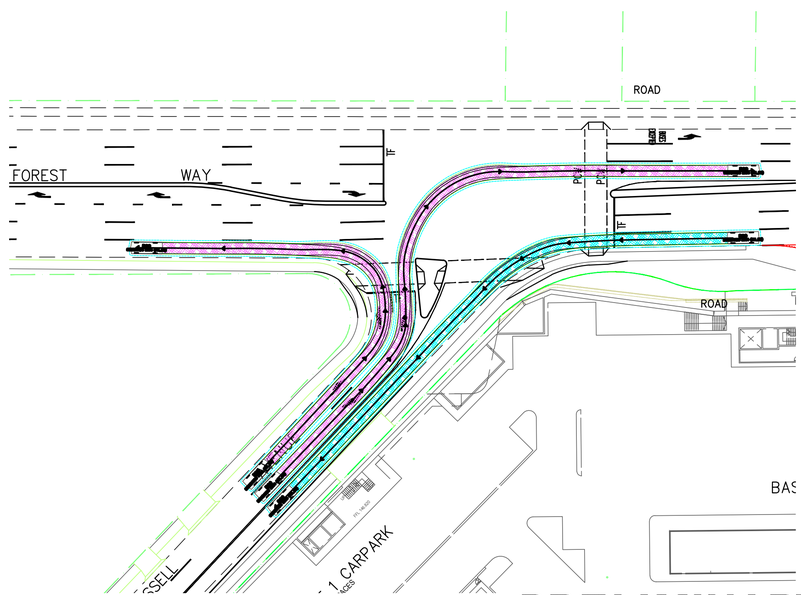
RUSSELL AVENUE TRAFFIC SIGNAL OPTION

THIS DRAWING TO BE READ IN CONJUNCTION WITH ALL RELEVANT NOTES ON DRAWING SKC01









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PRELIMINARY

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Architect
THE BUCHAN GROUP
LEVEL 1, 7 KELLY STREET, ULTIMO, NSW, 2007

Civil Engineer
Taylor Thomson Whitting
612 9439 7288 | 48 Chandos Street St Leonards NSW 2065

Project
FORESTWAY SHOPPING CENTRE REDEVELOPMENT

Sheet Subject
SITEWORKS PLAN
RUSSELL AVE FOREST WAY INTERSECTION - OPTION 2
1 LEFT - 1 RIGHT

Scale : A1	Drawn	Authorised
1:500	AS	

Job No	Drawing No	Revision
181210	SKC39	P1

Plot File Created: Nov 06, 2018 - 2:21pm