Traffic Impact Assessment

Proposed Mixed-Use Development
Section 75W Application
Kirrawee Brick Pit, Kirrawee

traffix
traffic & transport planners

po box 1061
potts point nsw 1335
t: +61 2 8324 8700
f: +61 2 9380 4481
w: www.traffix.com.au
abn: 66065132961

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traffix
traffic & transport planners

po box 1061
potts point nsw 1335
t: +61 2 8324 8700
f: +61 2 9380 4481
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abn: 66065132961

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1. Introduction

TRAFFIX has been commissioned by South Village Ltd to undertake a Traffic Impact Assessment (TIA) in support of a Section 75W (S75W) application to modify the Concept Plan Approval MP10-0076 for the Kirrawee Brick Pit site, 566-594 Princes Highway, Kirrawee.

With regard to traffic, transport and parking, the approved concept plan submission was supported by an Updated Traffic Management and Accessibility Plan, Version 4, prepared by Halcrow Pacific Pty Ltd, dated 27th October 2011 (referred to in this report as the Updated Halcrow TMAP).

This report documents the findings of our investigations and should be read in the context of the S75W modification report prepared separately by Sutherland & Associates Planning (November 2013). The development is of a scale that requires referral to the NSW Roads & Maritime Service under the provisions of SEPP (Infrastructure) 2007.

The report is structured as follows:

- Section 2: Provides relevant details of the Concept Plan Approval MP10-0076;
- Section 3: Describes the site and its location;
- Section 4: Documents existing traffic conditions;
- Section 5: Describes the proposed development;
- Section 6: Assesses the traffic implications;
- Section 7: Assesses the parking implications of the modified concept plan; and
- Section 8: Presents the overall study conclusions.

2. MP10-0076 Concept Approval

2.1 Approved Concept Plan Development

On the 23rd August 2012, the NSW Department of Planning and Infrastructure (DPI) issued the Instrument of Approval (IoA) for the Kirrawee Brick Pit concept plan approval. The following presents the development for which concept plan approval has been granted, as stated at Schedule 2 – Terms of Approval, Part A – Administrative Conditions:

- Use of the site for a mixed use development with associated public open space;
- Indicative building envelopes for 9 buildings to a maximum height of 14 Storeys;
- 60,735m^2 of Gross Floor Area, comprising:
  - 45,505m^2 of residential (432 dwellings);
  - 15,230m^2 of retail/commercial floor space (including 3,900m^2 supermarket and 1,470m^2 discount supermarket);
- Basement level, ground and above ground car parking;
- Road layout to support the development;
- Public pedestrian and cycle pathway;
- Public park with lake and surrounding forest; and
- Landscaping areas throughout the site.

The non-residential and residential floor areas above can be summarised as follows; it is noteworthy that the development schedule below draws upon information extracted from the Updated Halcrow TMAP:

- 15,230m^2 of non-residential floor space, consisting of:
  - 7,940m^2 of retail/commercial (exc. supermarket);

- 5,370m^2 of supermarket floor area;
- 1,920m^2 of internal mall, toilets/centre management, etc floor area.

- 45,505m^2 of residential (432 dwellings), consisting of:
  - 59 one bedroom units;
  - 277 two bedroom units;
  - 96 three bedroom units.
- 1,150 space basement car park, consisting of:
  - 603 residential parking spaces; and
  - 547 non-residential parking spaces.

2.2 Schedule 2 – Concept Plan Modifications

Schedule 2 of the IoA, Part B – Modifications provides the conditions that need to be adhered to should changes to the concept plan development be proposed as part of subsequent development applications. Of the four conditions stipulated, one relates to car parking. **Table 1** presents this condition (and related sub-conditions); Table 1 also states whether the condition requires modification or is maintained as part of this S75W application.

Table 1: Schedule 2, Part B – Modifications, Conditions of Consent

CONDITION	ITEM	ACTION
B4 **B4(a)**	**CAR PARKING** The maximum total number of car parking spaces shall not exceed 1,150 spaces	***Modified***
B4(b)	Maximum car parking to be allocated for residential purposes shall not exceed 603 parking spaces, inclusive of 54 residential visitors spaces.	***Modified***
B4(c)	Development must comply with the Concept Plan's non-residential car parking rates identified in the Updated Traffic Management and Accessibility Plan prepared by Halcrow Pacific Pty Ltd, dated 27 October, 2011 (Version 4), including the replacement of a minimum of 40 street car parking spaces displaced by the development.	Maintained

2.3 Schedule 3 – Future Environmental Assessment Requirements

Schedule 3 of the IoA, provides the conditions that need to be addressed as part of the future environmental assessments for the development. **Table 2** presents the relevant transport, traffic and parking conditions; Table 2 also states whether each condition is to be modified or maintained as part of this S75W application.

Table 2: Schedule 3 – Future EA Requirements, Conditions of Consent

CONDITION	ITEM	ACTION
3.	**TRAVEL ACCESS GUIDE (TAG) / GREEN TRAVEL PLAN** Future applications shall provide details of any Travel Access Guide (TAG) / Green Travel Plan. This should include an investigation of car sharing schemes.	Maintained
8.	**NSW TRANSPORT- ROADS & MARITIME SERVICES** Future development applications shall demonstrate that the RMS requirements have been met in relation to:	Maintained
8a.	**Princes Highway Intersection at Oak Road** The layout of the existing signalised intersection on Princes Highway at Oak Road shall be reconfigured as follows; a) Three northbound lanes shall be provided on oak Road on the southern leg of the intersection and each lane shall be a minimum of 90 metres in length. b) An 80 metre long left turn slip lane shall be provided on the westbound carriageway of Princes Highway into Oak Road. c) Two southbound lanes shall be provided on Oak Road on the southern leg of the intersection. d) Half closure of the Oak Road northern approach to the Princes Highway involving the discontinuation of southbound lanes with northbound lanes remaining open. e) A raised central concrete median island shall be installed on Oak Road in front of the proposed left in/left out driveway and the median shall extend from the stop line at the Princes Highway intersection to an appropriate point to the south of the proposed driveway. This median shall be a minimum of 900mm wide. The above requirements are subject to the outcomes of the Road Safety Audit at Condition 8h, and may be modified with the agreement of RMS and Council.	Maintained
8b.	**Traffic Signals on Princes Highway at Bath Road Intersection** Traffic control signals shall be provided at the intersection of Princes Highway and Bath Road and shall consist of the following works: a) Left in/left out only for the Bath Road southern approach. The left turn out would be signalised. b) No through movements across Princes Hwy (ie no north-south traffic from Bath Road) c) Signalised left and right turn out of Bath Road northern approach with the following lane configuration (L/R/R). d) No right turns permitted from Princes Highway from either direction to Bath Road. The above requirements are subject to the outcomes of the Road Safety Audit at Condition 8h, and may be modified with the agreement of RMS and Council.	Maintained

Table 2 (Cont'd): Schedule 3 – Future EA Requirements, Conditions of Consent

CONDITION	ITEM	ACTION
8c.	**Traffic Signals at Oak Road and Flora Street Intersection** The applicant shall upgrade Oak Road and Flora Street intersection to a signalised intersection generally in accordance with the attached sketch (Note that sketch is indicative only and subject to change upon development of a detailed signal design plan). The provision of traffic signals at this intersection shall be designed and constructed in accordance with Austroads and RMS supplements.	Maintained
8d.	**Traffic Management Plan** The redistribution of traffic associated with the closure of the Oak Road north approach to the Princes Highway will require a Traffic Management Plan, including a Green Travel Plan (GTP), to be submitted to Council and referred to RMS for review, prior to commencement of the roadworks. Further, this partial road closure will also require monitoring (post closure) to determine if any further remedial works are required. This monitoring period shall consist of a detailed traffic report, which examines the traffic impact on the local road network associated with the redistribution of the traffic caused by the road closure and shall be submitted to Council and referred to RMS for review 6 months after the road closure. Upon review of the traffic analysis, the applicant may be requested to undertake some further remedial works within reason.	Maintained
8f.	**Deceleration Lane on Princes Highway** The left turn deceleration lane into the subject site from Princes highway shall be a minimum of 60 metres in length (including taper) and shall be designed and constructed in accordance with Austroads and RMS requirements.	Maintained
8h.	**Road Safety Audit** Road safety concerns are raised with regard to the close proximity of the proposed left in/left out driveway on Oak Road to the proposed left turn slip lane on Princes Highway into Oak Road and the subsequent potential for rear end accidents. In this regard, prior to any 'Construction Certificate' being issued for any stage of the proposed development, an independent Road Safety Audit shall be undertaken that investigates this issue and is to be undertaken by a certified Road Safety Auditor. The Audit shall be completed in accordance with Austroads: *Guidelines for Road Safety Audits*. A Copy of the findings of the Audit shall be submitted to Council and the RMS for review. Should the Audit recommend any remedial measures, then the developer shall be required to implement such measures at no cost to the RMS, Council or DoP&I.	Maintained
8j.	**Construction Certificate** The Construction Certificate for any stage of the proposed development shall not be released until such time that the abovementioned WAD has been executed, the detailed design drawings and geotechnical reports for the excavation of the site and support structures have been assessed by the RMS and all the detailed signal and civil road design plans have been approved by the RMS construction approval. Further to the above, no Construction Certificate shall be approved for any stage of the development until such time that a detailed Construction Traffic Management Plan (CTMP) and associated Traffic Control Plan (TCP) is submitted to Council and the RMS for review and acceptance. The CTMP and TCP shall be undertaken in accordance with the RMS's Traffic Control at Worksites Manual and the author shall be certified.	Maintained
8p.	**Off-Street Parking** Off-Street parking shall be designed and constructed in accordance with AS 2890.1-2004 and AS 2890.2-2002.	Maintained

Table 2 (Cont'd): Schedule 3 – Future EA Requirements, Conditions of Consent

CONDITION	ITEM	ACTION
8q.	**Swept Path** The swept path of the longest vehicle entering and exiting the subject site shall be in accordance with Austroads.	Maintained
14.	**CAR PARKING** Future applications shall address the following:	Maintained
a)	The total amount of car parking to be provided as part of the development shall not exceed 1,150 spaces.	***Modified***
b)	An updated schedule of parking allocations shall be prepared and submitted with each subsequent application.	Maintained
c)	Parking facilities (public, commercial and bicycle) shall be designed in accordance with relevant Australian Standards.	Maintained
d)	The design of the parking and commercial vehicle facilities shall be designed so that all vehicles, including commercial vehicles, enter and exit the development in a forward direction.	Maintained
e)	The provision and implementation of a car share scheme.	Maintained
f)	All loading and unloading associated with the use of the development shall take place wholly within the site from designated loading bays as identified in the Concept Plan. Loadings bays shall not be used for storage or any other purpose that would restrict their use for the purposes of loading and unloading.	Maintained
g)	Henroth Investments Pty Ltd shall enter into an agreement with Sutherland Shire Council that will delegate powers to Council to enforce regulatory parking signs within the internal road network.	Maintained
h)	Relocation of the Flora Street community bus and taxi drop off to the main central Flora Street pedestrian entry, in a location and of a design that achieves reasonable accessibility for people with mobility restrictions between vehicles and the retail shops.	Maintained
17	**STAGING OF DEVELOPMENT** Future applications shall provide details of the final form of staging of the development are to be submitted with the first application to ensure the orderly and coordinated development of the site. The initial stages of the development should include the construction of the retail precinct and lake and neighbourhood park within the southwestern portion of the site. Each stage described shall provide full details of inclusions in respect of:	Maintained
a)	Demolition;	
b)	Earthworks;	
c)	Buildings and all other structures (including basements);	
d)	Any elements of the overall public domain plan to be dedicated or embellished;	
e)	Any site remediation works;	
f)	Stormwater management works;	
g)	Any vehicular or pedestrian access to the site;	
h)	Measures to mitigate and manage nuisance caused by stages under construction to completed stages and clashes between stages including vehicle access, noise, parking and safety; and	
i)	Waste and Construction Management.	
	An access application shall be made to Council to obtain footpath crossing and boundary alignment levels before commencing the detailed design of internal driveways, paths and car park area.	

3. Location and Site

The site is situated on the southern side of the Princes Highway and lies within the sector bounded by the Princes Highway to the north, Flora Street in the south, Oak Road to the west and existing industrial developments to the east. It is also due north of Kirrawee railway station and approximately 22 kilometres south of the Sydney CBD.

The site was formerly used for brick manufacture; however, the site has remained vacant for a number of years since its previous use ceased. The site has a rectangular configuration a site area of approximately 4.25 hectares. It has a northern frontage of approximately 250 metres to the Princes Highway, a southern frontage of approximately 250 metres to Flora Street, a western frontage of approximately 160 metres to Oak Road and an eastern boundary of approximately 180 metres to neighbouring industrial developments.

A Location Plan is presented in **Figure 1**, with a Site Plan presented in **Figure 2**.

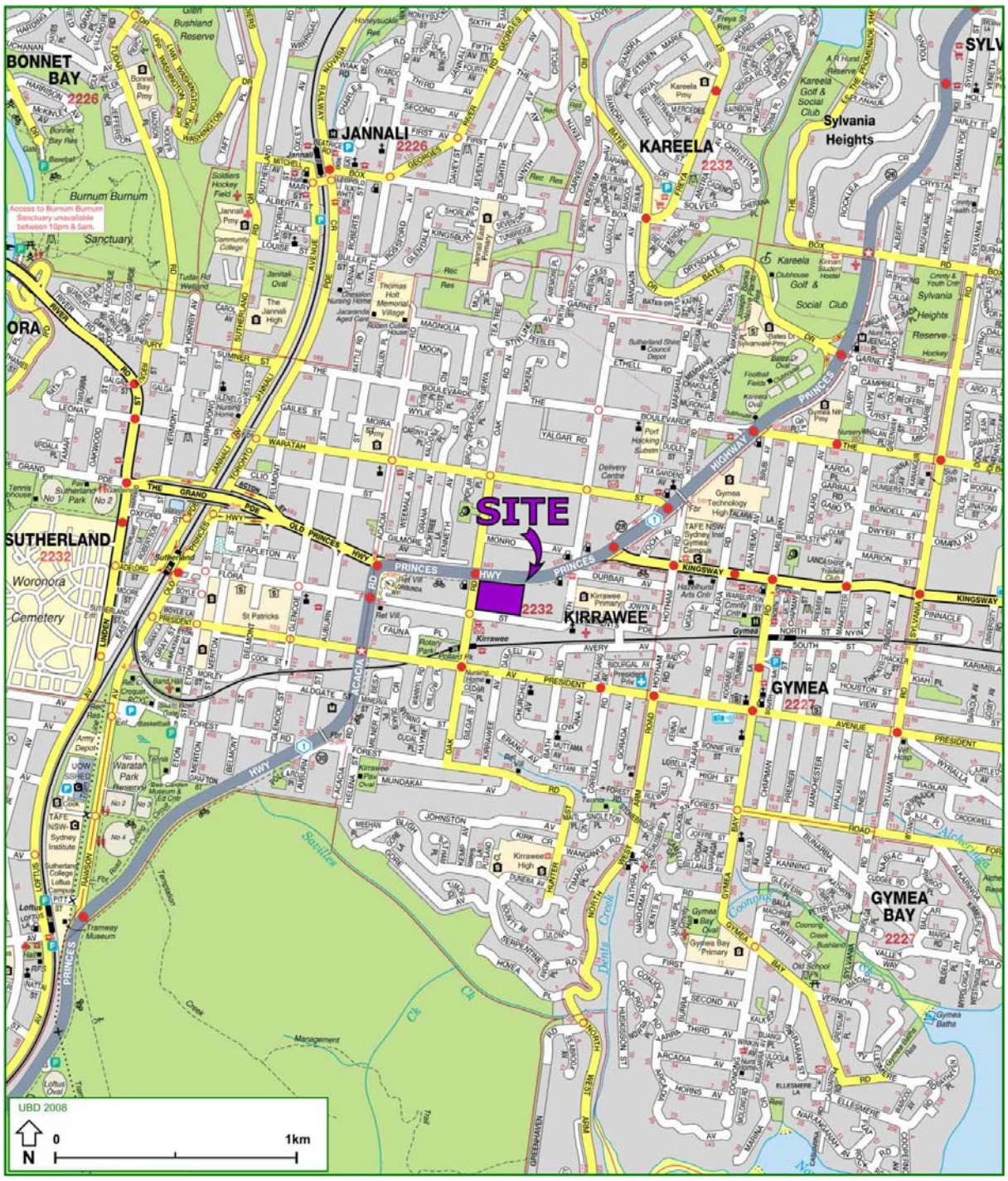


Figure 1: Location Plan

Figure 2: Site Plan

4. Existing Traffic Conditions

4.1 Road Network

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

- Princes Highway: a Roads and Maritime Services (RMS) State Road (MR 1) that generally runs in an east-west direction in vicinity of the site and forms part of an interstate link between Sydney in the north and Melbourne in the south. The Princes Highway carries about 70,000 vpd (vehicles per day) in the vicinity of the site. The Princes Highway is subject to a 70km/h speed zoning in the vicinity of the site and generally carries three lanes of traffic in either direction, with 'no stopping' restrictions, within a separated carriageway of about 20 metres width.

- Oak Road: a local unclassified road that runs in a north-south direction in the vicinity of the site and provides the function of a sub-arterial or busy collector route. Parking is permitted along certain sections. Oak Road is subject to a 50km/h speed zoning and generally carries a single lane of traffic in either direction along an undivided carriageway.

- Flora Street: a local unclassified road that runs in an east-west direction in the vicinity of the site and provides the function of a sub-arterial or busy collector route. Parking is generally provided on both sides of Flora Street, including 40 perpendicular (90 degree angle, rear to kerb) parking spaces located adjacent to the site. Flora Street is subject to a 50km/h speed zoning and generally carries a single lane of traffic in either direction along an undivided carriageway.

- Bath Road: a local unclassified road that runs in a north-south direction between the Princes Highway in the north and Flora Street in the south. Bath Road permits unrestricted kerbside parallel parking on both sides and is subject to a 50km/h speed zoning. Bath Road carries a single lane of traffic in either direction along an undivided carriageway.

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.

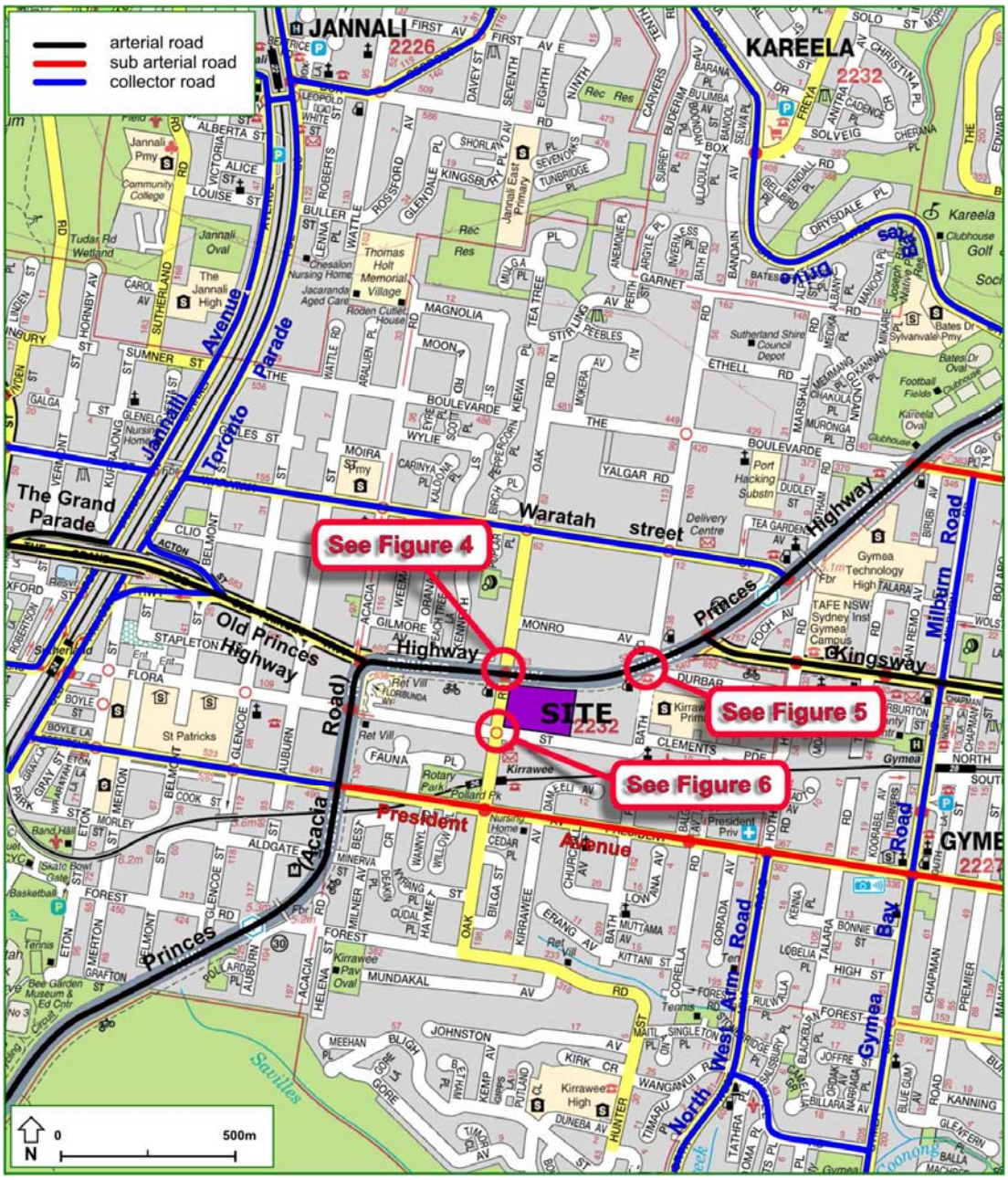


Figure 3: Road Hierarchy

4.2 Key Intersections

The key intersections in the vicinity of the site are shown below and provide an understanding of the existing road geometry and alignment.

Source: Near Map

Figure 4: Intersection of Princes Hwy and Oak Rd

It can be seen from **Figure 4** that Princes Highway intersects with Oak Road in the form of a traffic signal crossroads intersection adjacent to the northwest corner of the site. Footpaths are provided on all approaches with pedestrian crossings on both Oak Road approaches and the west approach of Princes Highway.

Source: Near Map

Figure 5: Intersection of Princes Hwy and Bath Rd

It can be seen from **Figure 5** that Princes Highway is divided by a raised median in this location. Accordingly, Princes Highway intersects separately with Bath Road North and Bath Road South in the form of two priority controlled, left-in & left-out accesses.

Source: Near Map

Figure 6: Intersection of Princes Hwy and Bath Rd

It can be seen from **Figure 6** that Oak Road intersects with Flora Street in the form of a roundabout adjacent to the southwest corner of the site. Footpaths are provided on all approaches with a pedestrian zebra crossing on the south approach of Oak Road.

4.3 Study Network

The following summarises the relevant study road network (including the key intersections above) for the subject development site; these accord with the study network assessed by the Updated Halcrow TMAP:

- Princes Highway intersections, comprising:
  - Princes Highway signalised intersection with Kingsway;
  - Princes Highway priority intersections with Bath Road (north and south);
  - Princes Highway signalised intersection with Oak Road;
  - Princes Highway signalised intersection with Acacia Road North;
- South of Princes Highway Network, comprising:
  - Oak Road roundabout intersection with Flora Street;
  - Oak Road signalised intersection with President Avenue;
- North of Princes Highway Network, comprising:
  - Oak Road priority intersection with Monro Avenue;
  - Oak Road roundabout intersection with Waratah Street;
  - Bath Road priority intersection with Monro Avenue; and
  - Bath Road roundabout intersection with Waratah Street.

The 2010 and 2011 surveyed traffic flows have been extracted from the Updated Halcrow TMAP and are attached at **Appendix A**. It is noteworthy that these traffic flows provided the baseline traffic conditions that informed the traffic modelling and analysis within the Updated Halcrow TMAP that supported the approved concept plan submission.

4.4 Public Transport

4.4.1 Rail Services

The existing train services that operate in the locality are shown in **Figure 7**. The subject site is located approximately 150m (walking distance) from Kirrawee train station, on the Eastern Suburbs & Illawarra Line. Kirrawee station provides direct services to Redfern, Central, Town Hall and Bondi Junction train stations. At Redfern and Central stations, connections are available to other services on the CityRail Network as well as to Intercity train services.

The Brick Pit site is also located approximately 1.4 kilometres from Sutherland train station, the next citybound stop past Kirrawee train station. Sutherland station is also a stop on the South Coast Intercity train line. **Table 3** summarises the peak hour train frequencies for these two stations.

Table 3: Train Frequencies

Station / Line	To City	From City	Total
KIRRAWEE STATION - via Eastern suburbs & Illawarra line			
Morning Peak Hour (7-8AM)	6	4	10
Off Peak Hour	4	5	9
Afternoon Peak Hour (5-6PM)	4	5	9
SUTHERLAND STATION - via Eastern suburbs & Illawarra and South Coast lines			
Morning Peak Hour (7-8AM)	10	7	17
Off Peak Hour	7	7	14
Afternoon Peak Hour (5-6PM)	8	8	16

As can be seen, the Brick Pit site is within easy walking distance of Kirrawee train station at which frequent train services would provide access for future residents, employees and visitors.

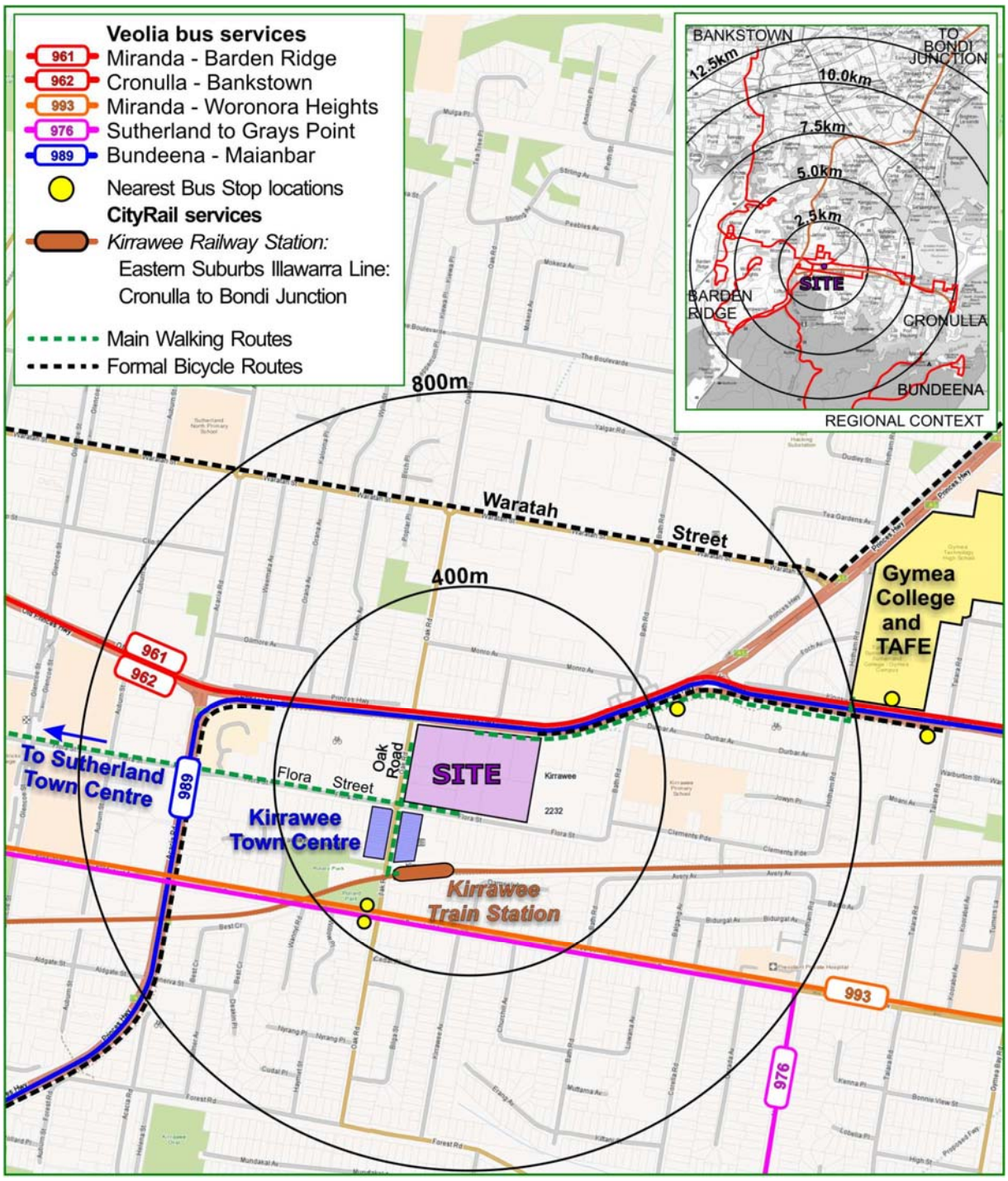


Figure 7: Alternative Transport Facilities

4.4.2 Bus Services

Kirrawee is located in 'Region 10' and is serviced by Veolia Transport NSW. Bus routes servicing the area (as shown on Figure 7) are:

- 961 Miranda – Barden Ridge;
- 962 Cronulla – Bankstown;
- 976 Sutherland – Grays Point;
- 989 Maianbar – Bundeena; and
- 993 Woronora Heights – Miranda.

The frequencies of these services are summarised in **Table 4**.

Table 4: Bus Service Frequencies

Route Number	via	Weekday			Saturday	Sunday
		AM Peak Hour	Off-Peak Hour	PM Peak Hour		
961/962	Princes Hwy	7	8	8	6	3
976	President Ave	2	-	1	-	-
989	Princes Hwy	Only limited services				
993	President Ave	3	2	3	2	1

Table 4 shows that the area is well serviced by buses along Princes Highway between Miranda and Sutherland during the weekday peak and off-peak periods. The frequency of buses during the Saturday is about one every 15 minutes and one every 30 minutes on Sundays and public holidays.

4.4.3 Pedestrians and Cyclists

Surrounding the site, pedestrian footpaths are provided on both sides of Princes Highway and Oak Road and along the southern side of Flora Street. Footpaths in the Kirrawee area vary in quality and width and generally all local roads provide footpaths on at least one side of the road, if not both sides.

Figure 7 identifies three significant pedestrian routes from the site which provide access to the following:

- Gymea College and South Sydney Institute of TAFE in the northeast;
- Kirrawee town centre and train station in the south; and
- Sutherland town centre and train station in the west.

Figure 7 also shows the formal bicycle routes serving the area. These routes form part of a network that connects Sutherland in the west with Cronulla in the east and all suburbs between. The network also extends to the Botany Bay cycleway which links to other parts of Sydney.

5. Description of Proposed Development

5.1 Modified Concept Plan Development Schedule

A detailed description of the modified concept plan development is provided in the S75W report prepared separately. In summary, the concept plan development for which approval is currently sought comprises the following components:

- Demolition of all existing structures;
- Construction of 14,190m^2 of ground floor non-residential uses, consisting of:
  - 9,700m^2 of retail/commercial (exc. supermarket);
  - 4,320m^2 of supermarket floor area; and
  - 170m^2 of internal mall, toilets/centre management, etc floor area.
- The provision of ground and basement level car parking with a total of 1,566 spaces, consisting of:
  - 1,013 residential parking spaces;
  - 513 non-residential parking spaces; and
  - 40 parking spaces to replace Flora Street parking spaces lost to the development.

The traffic and parking implications arising from the modified concept plan development are discussed in Sections 6 and 7, respectively. Reference should be made to the plans submitted with this application which are presented at reduced scale in **Appendix B**.

6. Traffic Analysis

6.1 Traffic Methodology

This section assesses the traffic implications of the changes in changes in non-residential floor area and residential units as a result of the modifications to the approved concept plan. In order to do this, the following sections firstly set the 'agreed' forecast future traffic demand flows and corresponding network performance, based on the Updated Halcrow TMAP analysis that supported the approved concept plan submission. The analysis then identifies the forecast future traffic demand flows anticipated for the modified concept plan and compares this with the agreed traffic demand flows.

It is noteworthy that the Updated Halcrow TMAP developed a number of road infrastructure and intersection improvements that were assessed as suitable for accommodating the traffic generation forecast for the approved concept plan. In summary, these improvements can be summarised as follows (refer to Conditions 8a, 8b, 8c and 8f in Table 2, Section 2.3 for further details):

- Improvements and modifications to the intersection Princes Highway with Oak Road;
- Improvements and modifications to the intersection Princes Highway with Bath Road;
- Signalisation of the existing Oak Road / Flora Street roundabout; and
- A left-in entry only deceleration lane access on Princes Highway.

The main objective of this traffic analysis is to demonstrate that the approved concept plan improvements summarised above remain acceptable for accommodating the future traffic demand flows anticipated for the modified concept plan.

6.2 Approved Concept Plan Traffic – Updated Halcrow TMAP Report

6.2.1 Approved Traffic Generation Volumes

Table 5 presents the development schedule of the approved concept plan as assessed by the Updated Halcrow TMAP. Table 5 also presents the trip rates that were adopted and agreed with RMS, in particular the RMS individual category shopping centre rates. The table also presents the corresponding traffic generation forecasts calculated by the Updated Halcrow TMAP.

Table 5: Approved Concept Plan, Updated Halcrow TMAP Traffic Generation Forecast

Land Use	GLA / Units	Thursday Evening Peak		Saturday Peak	
		Rate	Trips	Rate	Trips
Supermarket	5,370	14.00	752	13.20	709
Mini-Major	1,280	4.60	59	1.17	15
Specialty	2,940	4.14	122	9.60	282
Showroom	2,860	1.46	42	2.88	82
Office	860	2.00	17	0.00	0
Residential	432	0.29	125	0.29	125
Total			**1117**		**1213**

NOTE: All rates are in trips / 100m^2 of GLA, except for the office which is GFA and residential which is in trips / unit

In summary, Table 5 shows that for the critical Thursday evening and Saturday midday peak hours, the Updated Halcrow TMAP study forecasted:

- 1,117 trips during the Thursday evening peak hour; and
- 1,213 trips during the Saturday peak hour.

In addition, a 20% 'pass-by' trip discount was applied to the relevant retail uses. Based on these traffic generation assumptions and the traffic distribution assumptions adopted for earlier Brick Pit proposals, future traffic demand flows were developed for the study network. These have been extracted from the Updated Halcrow TMAP and are also attached at Appendix A.

6.2.2 Anticipated Network Performance Measures

These future network traffic flows were assessed using both SCATES and SIDRA Intersection modelling software. Based on this modelling, the Updated Halcrow TMAP made the following network performance conclusions:

- With regard to the Princes Highway intersections, the proposed infrastructure and intersection improvements would assist the flow of traffic along the Princes Highway corridor, such that the road network would operate similarly to current operating conditions post-opening of the Brick Pit development;
- With regard to the study network south of Princes Highway, all intersections would operate satisfactorily (LoS C or better) during the peak periods including the proposed site accesses on Flora Street and Oak Road and the proposed signalised intersection of Oak Road with Flora Street; and
- With regard to the study network north of Princes Highway, the operation of the Waratah Street / Oak Road roundabout would effectively remain the same as the amount of traffic diverted away from the roundabout as a result of the proposed infrastructure and intersection improvements, offsets the impact of the development traffic associated with the Brick Pit development; the Waratah Street / Bath Road roundabout is predicted to operate satisfactorily with a LoS C.

6.3 Modified Concept Plan Traffic

6.3.1 RMS Trip Rates – Updated Traffic Surveys (TDT 2013/04a) and Medical use

The RMS *Guide to Traffic Generating Developments* 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 this latest revision process, in August 2013 RMS released Technical Direction TDT 2013/04a, which provided revised trip generation advice for a number of land uses based on 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.

TDT 2013/04a provides revised trip rates for all the uses proposed at the subject site; however, the revised retail rates are aggregate rates for shopping centres as opposed to the individual category shopping centre rates that were adopted by Halcrow and RMS for the Kirrawee Brick Pit concept plan assessment. Recognising that the 'individual' category shopping centre rates provide a higher traffic generation assessment, the traffic analysis within this report retains the retail rates adopted by the Updated Halcrow TMAP with a view to providing a conservatively high estimate of the future traffic generation of the modified concept plan.

In light of the above, the only trip rates that have been revised as a result of TDT 2013/04a are the trip rates relating to residential and office development. The following presents the relevant trip rate information from TDT 2013/04a:

- High density residential
  - Weekday morning peak hour – 0.19 trips per unit
  - Weekday evening peak hour – 0.15 trips per unit
  - Weekend peak hour – no rate provided
- Office
  - Weekday morning peak hour – 1.6 trips per 100m^2 of GFA
  - Weekday evening peak hour – 1.2 trips per 100m^2 of GFA
  - Weekend peak hour – no rate provided

In addition, the latest concept plan introduces a new land use – medical centre. Within the context of a shopping centre, medical centre falls under the following category definition:

A(OM): Office, medical GLFA: includes medical centres and general business offices

RMS guidance provides the following rates for A(OM) uses:

- Thursday evening peak hour – 2.2 trips per 100m^2 of GLFA
- Friday evening peak hour – 0.5 trips per 100m^2 of GLFA
- Saturday peak hour – no rate provided

6.3.2 Modified Concept Plan Traffic Generation

Table 6 provides the traffic generation assumptions for the modified concept plan development. Table 6 also presents the indicative development schedule that has been adopted for the purpose of assessing the modified concept plan. The trip rates that have been used accord with the rates used by the Updated Halcrow TMAP; however, the high density residential and office rates have been revised based on TDT 2013/04a and the medical centre use based on the individual category shopping centre rate.

With regard to the residential and medical uses, in the absence of weekend trip rate advice, the Thursday (weekday) rates have been adopted. Furthermore, for completeness, the office rates are shown below despite the current modified concept plan no longer proposing this use.

Table 6: Modified Concept Plan, Traffic Generation Forecast

Land Use	GLA / Children / Units	Thursday Evening Peak		Saturday Peak	
		Rate	Trips	Rate	Trips
Supermarket	4,320	14.00	605	13.20	570
Mini-Major	2,500	4.60	115	1.17	29
Specialty	2,902	4.14	120	9.60	279
Showroom	3,881	1.46	57	2.88	112
Office	0	1.20	0	0.00	0
Medical Centre	417	2.20	9	2.20	9
Residential	749	0.15	112	0.15	112
Total			**1018**		**1111**

NOTE: All rates are in trips / 100m^2 of GLA, except for the office which is GFA and residential which is in trips / unit

Table 6 shows that for the critical Thursday evening and Saturday peak hours, the modified concept plan is forecast to generate:

- 1,018 trips during the Thursday evening peak hour; and
- 1,113 trips during the Saturday peak hour.

In comparison with the approved concept plan traffic generation levels (Table 5) the analysis demonstrates that the modified concept plan would generate:

- 99 fewer trips during the Thursday evening peak hour; and
- 102 fewer trips during the Saturday peak hour.

6.4 Traffic Analysis Summary

The analysis above demonstrates that the modified concept plan development is anticipated to generate traffic demand volumes below that which were assessed (modelled) by the Updated Halcrow TMAP study. Accordingly, the proposed infrastructure and intersection improvements remain an appropriate infrastructure upgrade response to the traffic generating potential of the Kirrawee Brick Pit site.

It is therefore concluded that in terms of traffic generation, agreed intersection upgrades and future network performance, the modified concept plan has less impact on the surrounding road network than the currently approved concept plan and should therefore be supported.

7. Parking Analysis

7.1 Approved Concept Plan Parking Rates

7.1.1 Non-Residential Parking Rates

The following presents the Updated Halcrow TMAP rates that were adopted by the approved concept plan proposal for the non-residential uses that were proposed. The rates were based on guidance within the RMS *Guide to Traffic Generating Developments* and the retail rates were based primarily on the individual shopping centre category rates:

- Supermarket – 4.5 spaces per 100m^2
- Mini-Major (faster trade retail) – 4.0 spaces per 100m^2
- Specialty Retail (inc. secondary retail, kiosks) – 4.2 spaces per 100m^2
- Showroom – 2.4 spaces per 100m^2
- Office – 2.5 spaces per 100m^2

It is noteworthy that Condition B4(c) (see Section 2.2) specifically refers to these rates and stipulates that all non-residential parking be provided in accordance with these rates. In addition, the condition requires the replacement of 40 Flora Street parking spaces displaced by the development.

7.1.2 Residential Parking Rates

The following presents the Updated Halcrow TMAP rates that were adopted by the approved concept plan proposal for the residential development proposed:

- One bedroom – 1.00 spaces per unit
- Two bedroom – 1.25 spaces per unit

- Three bedroom – 1.50 spaces per unit
- Visitor – 0.125 spaces per unit (1 space per 8 units)

It is noteworthy that the volume of residential parking stipulated in Condition B4(b) (see Section 2.2) was based upon the application of these rates to the approved concept plan's residential development schedule. Furthermore, the total volume of off-street parking stipulated in Condition B4(a) was based upon the application of the above non-residential and residential rates to the approved concept plans full development schedule.

7.2 Modified Concept Plan Parking Provision

As previously mentioned, the modified concept plan includes introduces a new land use – medical centre – which falls under the individual shopping centre category of *A(OM)*. The RMS *Guide to Traffic Generating Developments* recommends that parking for this component of shopping centre use be provided at the following rate:

- Medical – 0.9 spaces per 100m^2

The modified concept plan adopts the approved concept plan parking rates identified in the Updated Halcrow TMAP and the medical parking rate above. Application of these rates results in a parking provision of 1,566 parking spaces consisting of:

- Non-Residential 513 spaces
  - Supermarket – 194.4 spaces
  - Mini-Major – 100.0 spaces
  - Specialty Retail – 121.9 spaces
  - Showroom – 93.1 spaces
  - Office – 0.0 spaces

- Medical – 3.8 spaces

- Residential 1,013 spaces
  - One bedroom – 127.0 spaces
  - Two bedroom – 702.5 spaces
  - Three bedroom – 90.0 spaces
  - Visitor – 93.6 spaces
- Flora Street replacement 40 spaces

7.3 Commentary on Parking Implications

The above demonstrates that the modified concept plan is generally in accordance with the approved concept plan parking rates adopted by in the Updated Halcrow TMAP report. However, it is recognised that the Schedule 2 conditions B4(a) and B4 (c) set upper parking thresholds, particularly for the residential development, that will now be exceeded.

It is understood that the upper parking thresholds for the site and the residential development were intended to manage the traffic demand generated by the development. In this regard, it should be noted that RMS guidance does not reflect a relationship between parking provision in high density residential developments and traffic generation. Rather, it is the proximity of good public transport and good local facilities that best moderates traffic generation.

To provide evidence for this, the Updated Halcrow TMAP referred to Halcrow studies based on the surveys of two residential apartment blocks close to Circular Quay station; one with an over provision of parking (with respect to RMS guidance) and the other with an under provision of parking. The survey data indicated that both developments generated the same level of vehicular traffic. This concurs with the accepted view that parking restraint at trip 'origin' (i.e. place of residence) does not discourage vehicle use as much as at trip destination ('destination' parking).

Importantly, it should be noted that the traffic demand analysis in Section 6 clearly demonstrates that traffic generation will reduce as a result of the proposed development of the modified concept plan. This can be attributed to the modified development promoting a 'shift' from relatively high order traffic generating retail development, towards low order residential development. Furthermore, the approved concept plan proposed 547 non-residential ('destination') parking spaces; however, the modified concept plan provides 513 non-residential parking spaces. As mentioned above, constraining destination parking can work towards discouraging car use and managing traffic demand; therefore, the reduction in non-residential parking enforces the position that the modified concept plan would generate fewer trips compared with the approved concept plan despite residential (and therefore overall parking) increasing above the levels proposed by the approved concept plan.

It should also be also be noted that some owners, tenants and investors, who have a demonstrated willingness to use public transport, will not locate or invest in a transport friendly centre if they do not have adequate car parking. This in turn can reduce the amenity, saleability and attractiveness of a residential development because residents living in such areas still wish to own cars, even if they do not use them for their regular commute or to the same extent as other persons for social/recreation trips. It would be a pity if such persons with a low propensity for car use, were obliged to live in less transport friendly areas just because they wished to own a car.

Finally, RMS generally defers judgement and advice on parking to the local Council. As such, it is important to note comments from Sutherland Shire (received during the determination process for the approved concept plan) indicating that Council considered the proposed parking to be an under provision, with the report submitted by Council's Traffic Consultant (McLaren Traffic Engineering) stating that the on-site parking provision is, "*insufficient in terms of residential parking provision*". It is understood that subsequent to approval, this is still a position that is held by Council.

7.4 Parking Analysis Summary

In summary, the modified concept plan intends to provide parking generally in accordance with the parking rates that were issued in the Updated Halcrow TMAP that supported the approved concept plan.

It is recognised that due to modifications to the concept plan development for the site, the modified concept plan provides parking, particularly residential parking, in excess of the thresholds specified in the Schedule 2 conditions B4(a) and B4(c). These thresholds were set with the intention to manage traffic demand generated by the development; however, the analysis above and in Section 6 clearly demonstrates that the modified concept plan would generate fewer trips compared with the approved concept plan despite residential and overall parking increasing above the levels proposed by the approved concept plan.

It is therefore concluded that in terms of car parking, the proposed provision will ensure that the development accommodates all parking demands on site without increasing the traffic demand generation of the site and the modified concept plan should therefore be supported.

8. Access & Internal Design Aspects

8.1 Vehicular Access

The modified vehicular access arrangement accords with the principles of the access arrangement of the approved concept plan. The following characteristics are noteworthy:

- The left-in deceleration lane access for westbound traffic on Princes Highway is retained;
- The left-in, left-out access for southbound traffic on Oak Road (with raised median island) is retained;
- The approved concept plan proposed a single Flora Street access that would be shared by cars accessing the basement parking and trucks accessing the loading dock. A beneficial aspect of the modified concept plan is to provide separate access driveways on Flora Street for standard car traffic and truck traffic; and
- All car parking areas within the site can be accessed from all driveway locations on Princes Highway, Oak Road and Flora Street.

In summary, the proposed vehicular access arrangement will provide safe access and effectively distribute traffic on to the surrounding road network.

8.2 Internal Road Design

8.2.1 Design Standards

The internal basement car park generally complies with the Australian Standard requirements of AS2890.1 (2004) *Part 1: Off-street car parking*, AS2890.2 (2002) *Part 2: Off-street commercial vehicle facilities* and AS2890.6 (2009) *Part 6: Off-street parking for people with disabilities*. The following characteristics are noteworthy:

8.2.2 Parking Modules

- All non-residential parking spaces have been designed in accordance with a Class 3A user and are provided with a minimum space length of 5.4m a minimum width of 2.7m and a minimum aisle width of 6.2m;
- 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;
- All spaces located adjacent to obstructions of greater than 150mm in height are provided with an additional width of 300mm;
- Dead-end aisles are provided with the required 1.0m aisle extension in accordance with Figure 2.3 of AS2890.1.
- All disabled parking spaces are designed in accordance with AS2890.6. Spaces are provided with a clear width of 2.4m and located adjacent to a minimum shared area of 2.4m.

8.2.3 Ramps

- All ramps accessing the non-residential basement car park have a maximum gradient of 20% (1 in 5) with transitions of 10% (1 in 10).
- 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 AS2890.1 for the car park;

8.2.4 Clear Head heights

- 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.

8.2.5 Other Considerations

- All columns are required to be located outside of the parking space design envelope shown in Figure 5.2 of AS2890.1.

- Appropriate visual splays are to be provided in accordance with the requirements of Figure 3.3 of AS2890.1 at all accesses.

- The internal design complies with the Section 3.4 of AS2890.1 with appropriate queuing areas provided. Furthermore the max gradient of 1:10 for not less than 80% of the queuing length has also been achieved.

8.2.6 Service Area Design

- 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 a 19.0m Articulated Truck (AV)

- A minimum clear head height of 4.5m is provided within the service area

- All ramps have been designed in accordance with Table 3.2 of AS2890.2 with a maximum grade not in excess of 1:6.5 (15.4%) and maximum rate of change of 1:16 (6.25%) in 10 metres of travel.

- A minimum bay width of 3.5m is provided for all service bays.

In summary, the internal configuration of the basement car park and loading areas has been designed in accordance with AS2890.1, AS2890.2 and AS2890.6. 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 and subsequent DA stages and/or prior to the release of a Construction Certificate.

9. Conclusions

In summary:

- TRAFFIX has been commissioned by South Village Ltd to undertake a Traffic Impact Assessment in support of a Section 75W application to modify the Concept Plan Approval MP10-0076 for the Kirrawee Brick Pit site, 566-594 Princes Highway, Kirrawee;
- With regard to traffic and parking, the main conditions that are to be modified are:
  - B4(a) The maximum total number of car parking spaces shall not exceed 1,150 spaces;
  - B4(b) Maximum car parking to be allocated for residential purposes shall not exceed 603 parking spaces, inclusive of 54 residential visitors spaces;
- The Updated Halcrow TMAP developed a number of road infrastructure and intersection improvements that were assessed as suitable for accommodating the traffic generation forecast for the approved concept plan. These improvements can be summarised as follows:
  - Improvements and modifications to the intersection Princes Highway with Oak Road;
  - Improvements and modifications to the intersection Princes Highway with Bath Road;
  - Signalisation of the existing Oak Road / Flora Street roundabout;
  - A left-in entry only deceleration lane access on Princes Highway;
- The traffic analysis within this report demonstrates that the modified concept plan development is anticipated to generate traffic demand volumes below that which were assessed (modelled) by the Updated Halcrow TMAP study. Accordingly, the proposed infrastructure and intersection improvements remain an appropriate infrastructure upgrade response to the traffic generating potential of the Kirrawee Brick Pit site;
- The modified concept plan intends to provide parking generally in accordance with the parking rates that were issued in the Updated Halcrow TMAP that supported the approved concept plan. It is recognised that the modified concept plan provides parking, particularly residential parking, in excess of the thresholds specified in the Schedule 2 conditions B4(a) and B4(c). These

thresholds were set with the intention to manage traffic demand generated by the development; however, the parking analysis within this report clearly demonstrates that the modified concept plan would generate fewer trips compared with the approved concept plan despite residential (and therefore overall) parking increasing above the levels proposed by the approved concept plan;

- The modified vehicular access arrangement accords with the principles of the access arrangement of the approved concept plan and will provide safe access and effectively distribute traffic on to the surrounding road network;

- The internal configuration of the basement car park and loading areas has been designed in accordance with AS2890.1, AS2890.2 and AS2890.6. 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 and subsequent DA stages and/or prior to the release of a Construction Certificate.

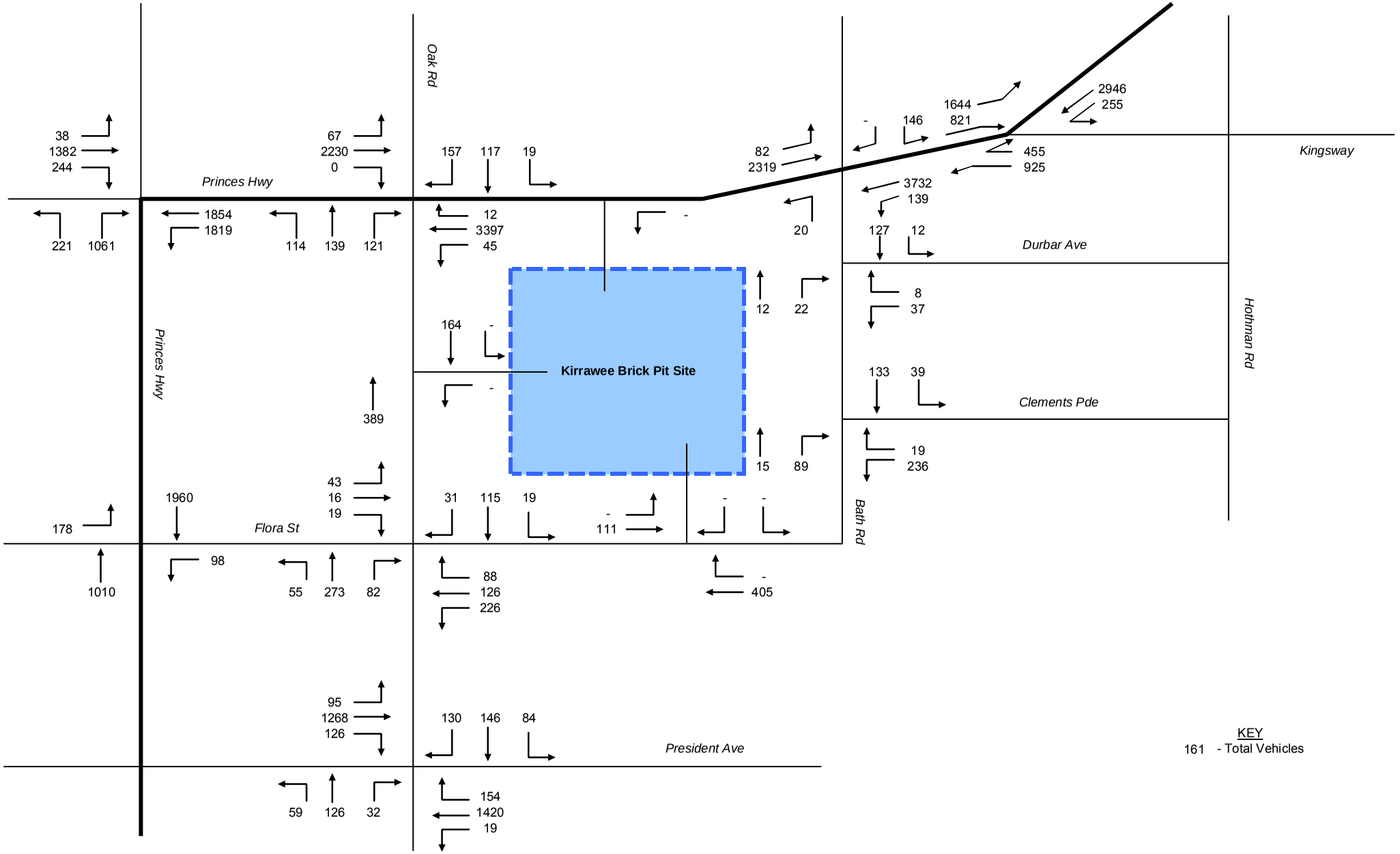
It is therefore concluded that in terms of traffic generation, agreed intersection upgrades, future network performance, parking, vehicular access and internal design, the modified concept plan is supportable on traffic planning grounds and will operate satisfactorily.

Appendix A

Network Traffic Flow Diagrams (Updated Halcrow TMAP)

2010 Surveyed, Existing Network Traffic Flows, Evening Peak

KIRRAWEE BRICK PIT TMAP



Halcrow

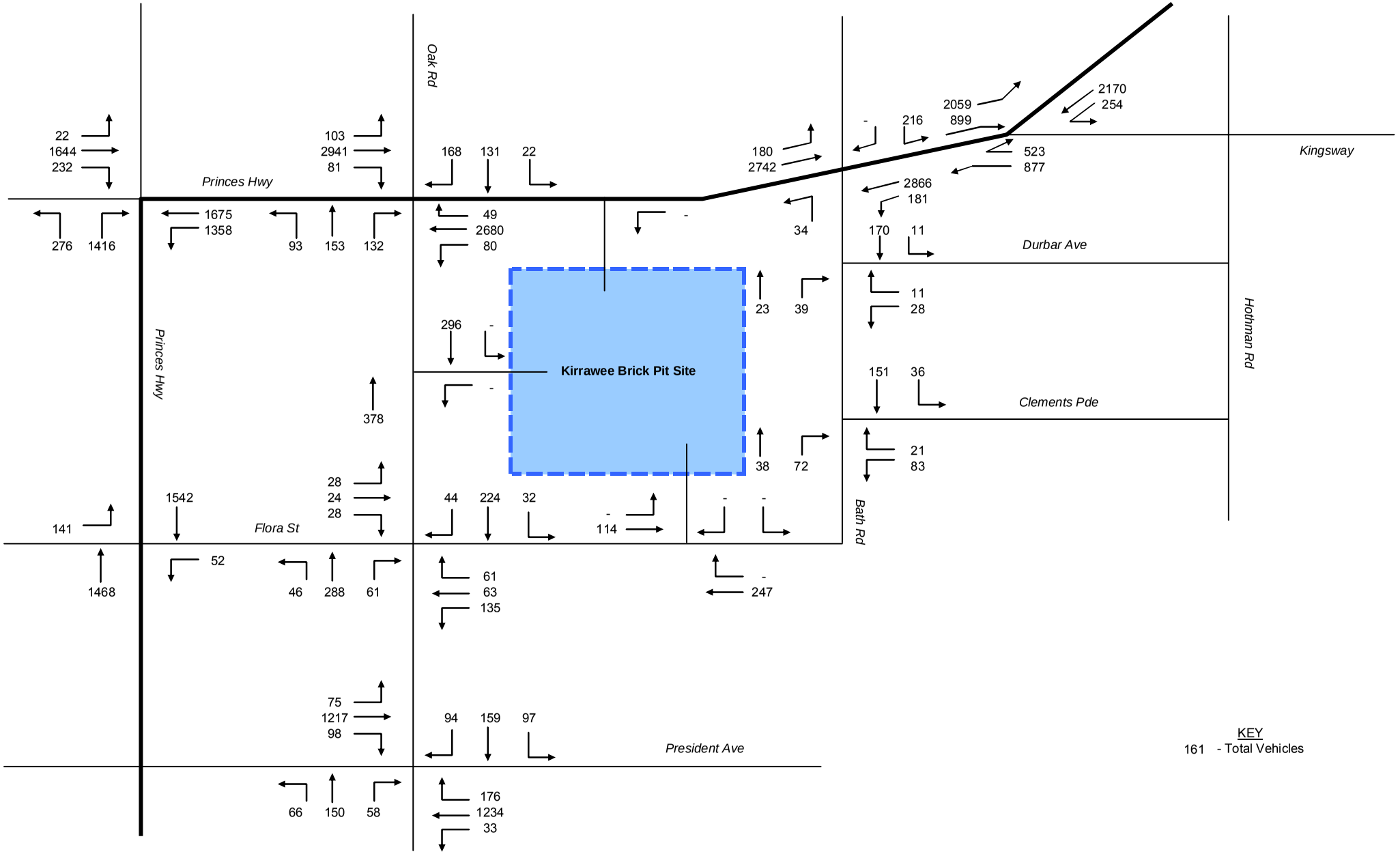
Figure 3

X:\CTLRLQ - Kirrawee Part 3a\67 - Calculations\CGXTPI302x03 Network Kirrawee_v06.xls - 19/10/2010

Original TMAP, Oct. 2010 - Part 2 of 2

2010 Surveyed, Existing Network Traffic Flows, Saturday Peak

KIRRAWEE BRICK PIT TMAP



Halcrow

Figure 4

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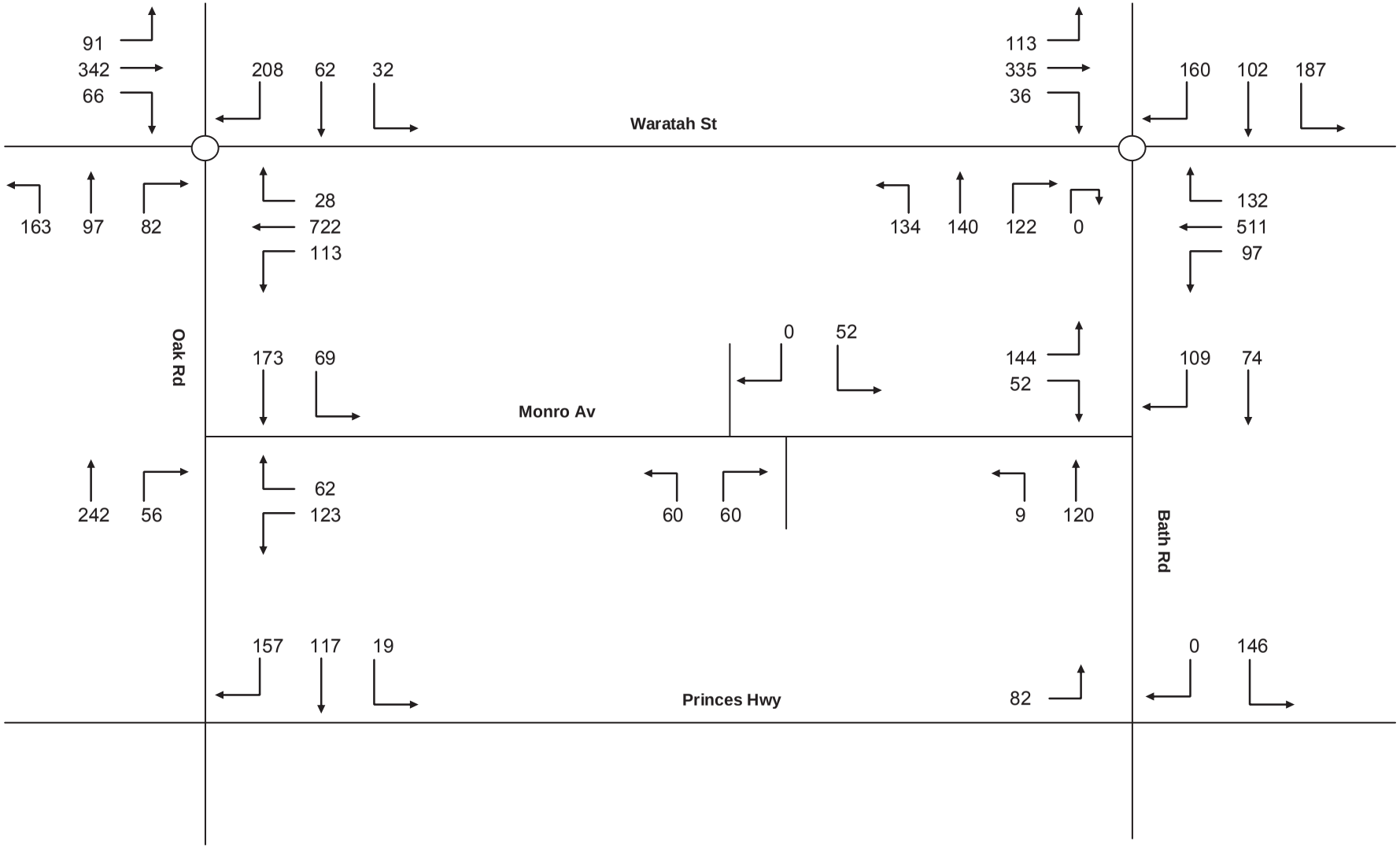
Original TMAP, Oct. 2010 - Part 2 of 2

Surveyed Traffic Flows - Thursday Evening Peak Hour
MP 10_0076 - MIXED USE DEVELOPMENT, KIRRAWEE BRICK PIT



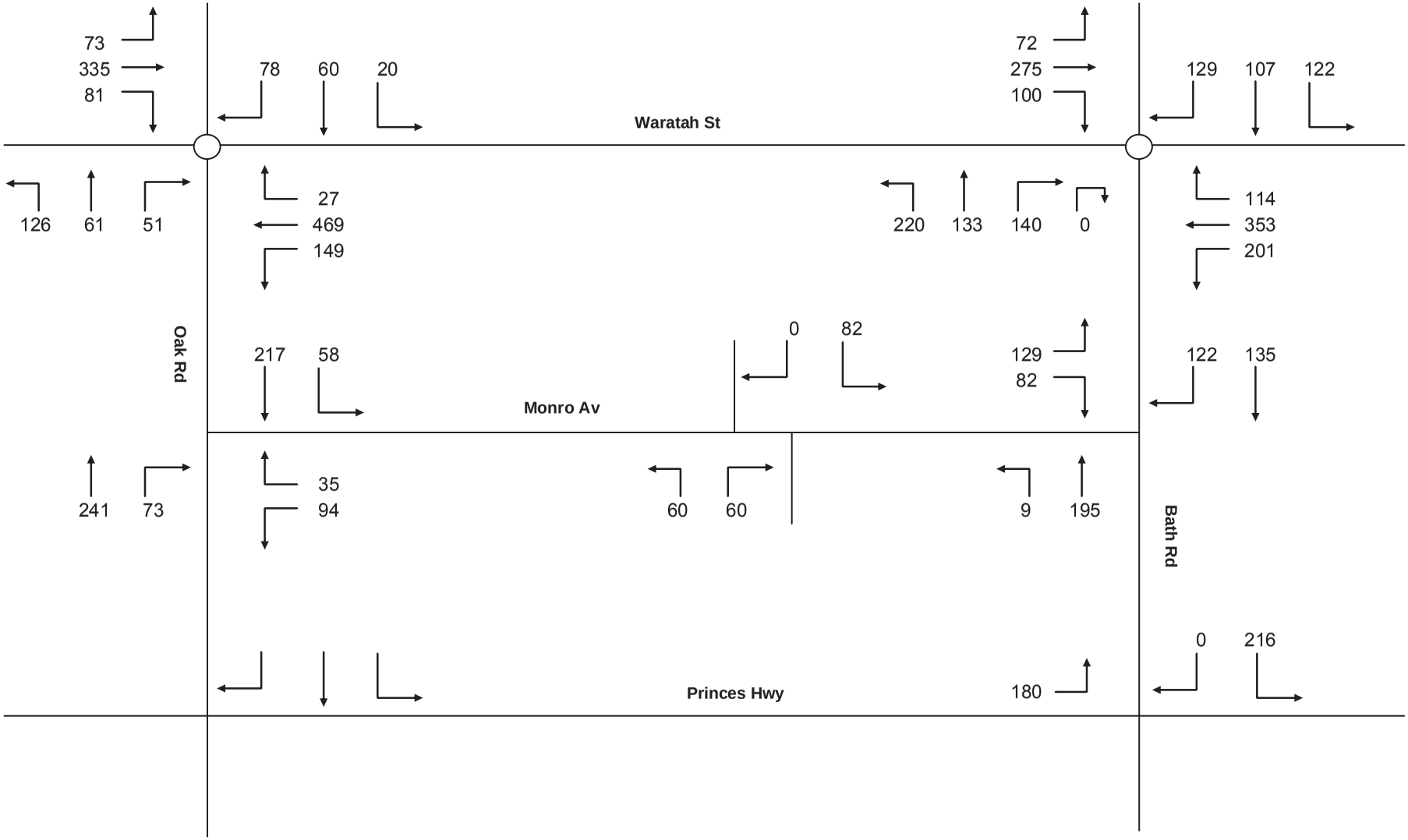
Halcrow

Halcrow Pacific Pty Ltd

FIGURE F.1
February 2011
CTLRLQx07Av6 Network North Princes Hwy_Thu PM.xls

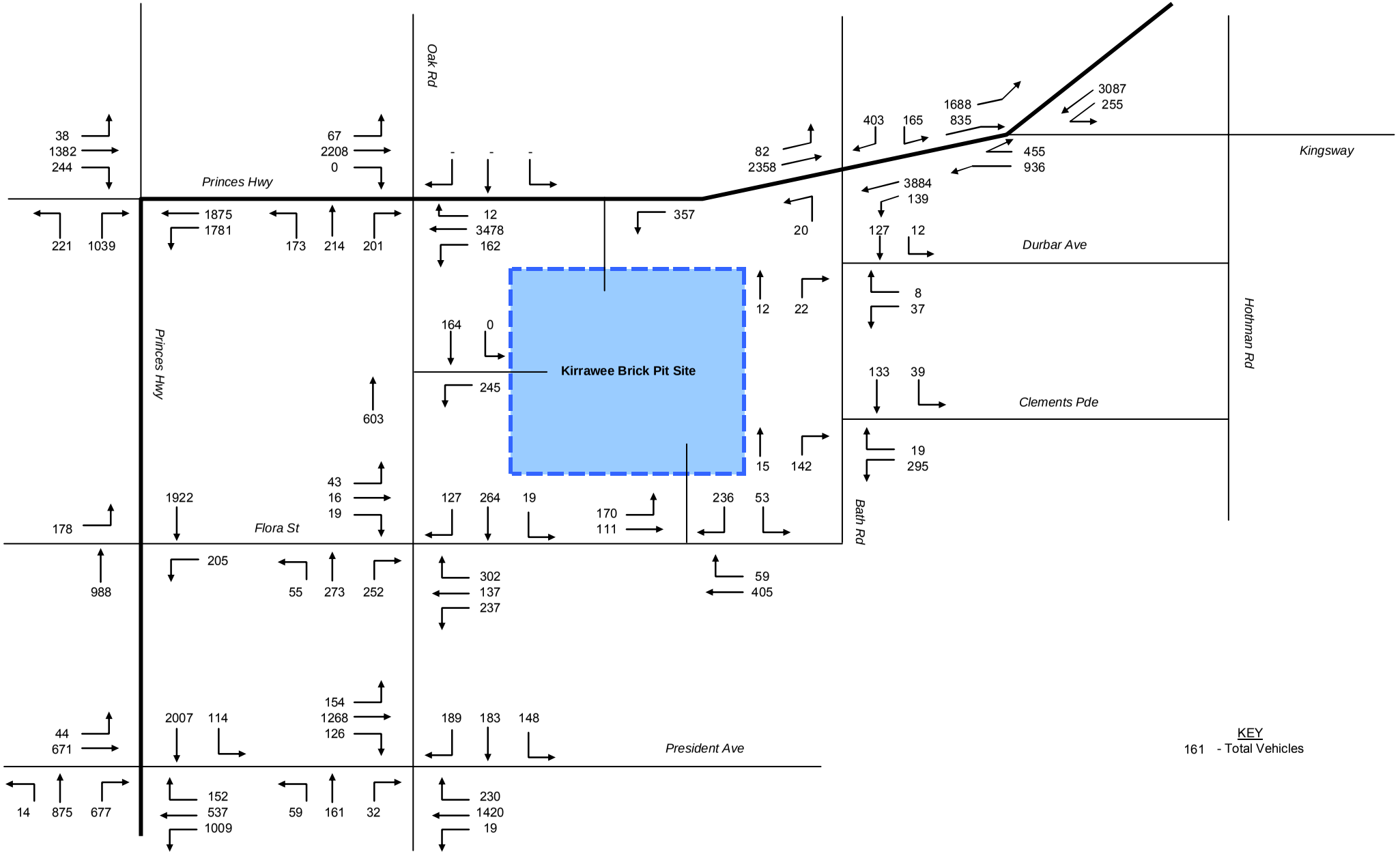
Updated TMAP, Oct. 2011 - Part 1 of 2

Surveyed Traffic Flows - Saturday Peak Hour
MP 10_0076 - MIXED USE DEVELOPMENT, KIRRAWEE BRICK PIT



Future Network Traffic Flows (under Stage 2 works), Evening Peak

MP 10_0076 - MIXED USE DEVELOPMENT, KIRRAWEE BRICK PIT



Halcrow

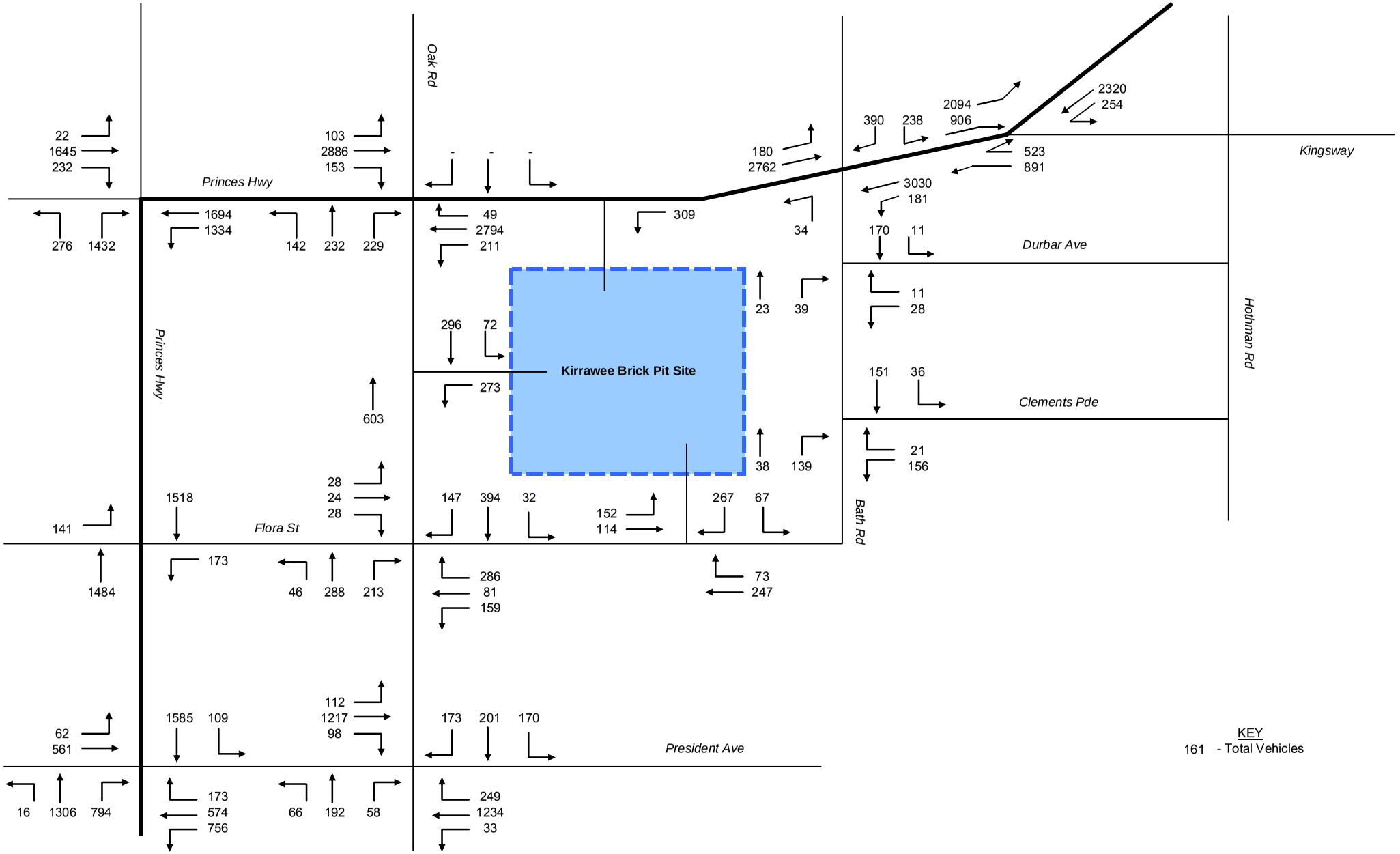
Figure 1

X:\CTLRLQ - Kirrawee Part 3a\67 - Calculations\CTLRLQx03 Network Kirrawee_v12.xls - 14/10/2011

Updated TMAP, Oct. 2011 - Part 1 of 2

Future Network Traffic Flows (under Stage 2 works), Saturday Peak

MP 10_0076 - MIXED USE DEVELOPMENT, KIRRAWEE BRICK PIT



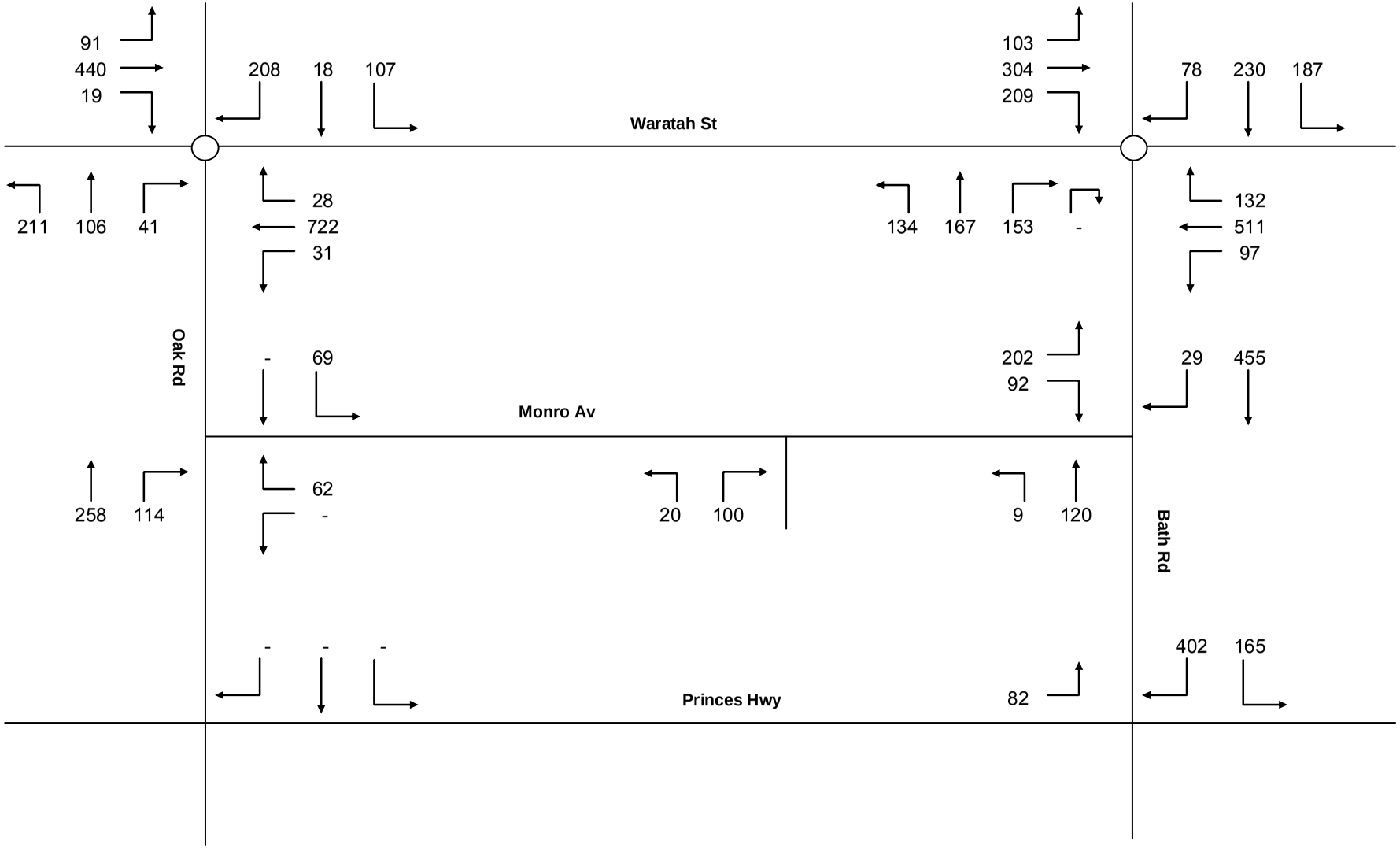
Halcrow

Figure 2

X:\CTLRLQ - Kirrawee Part 3a\67 - Calculations\CTLRLQx03 Network Kirrawee_v12.xls - 14/10/2011

Updated TMAP, Oct. 2011 - Part 1 of 2

Future (with Development) Traffic Flows - Thursday Evening Peak Hour
MP 10_0076 - MIXED USE DEVELOPMENT, KIRRAWEE BRICK PIT



Halcrow

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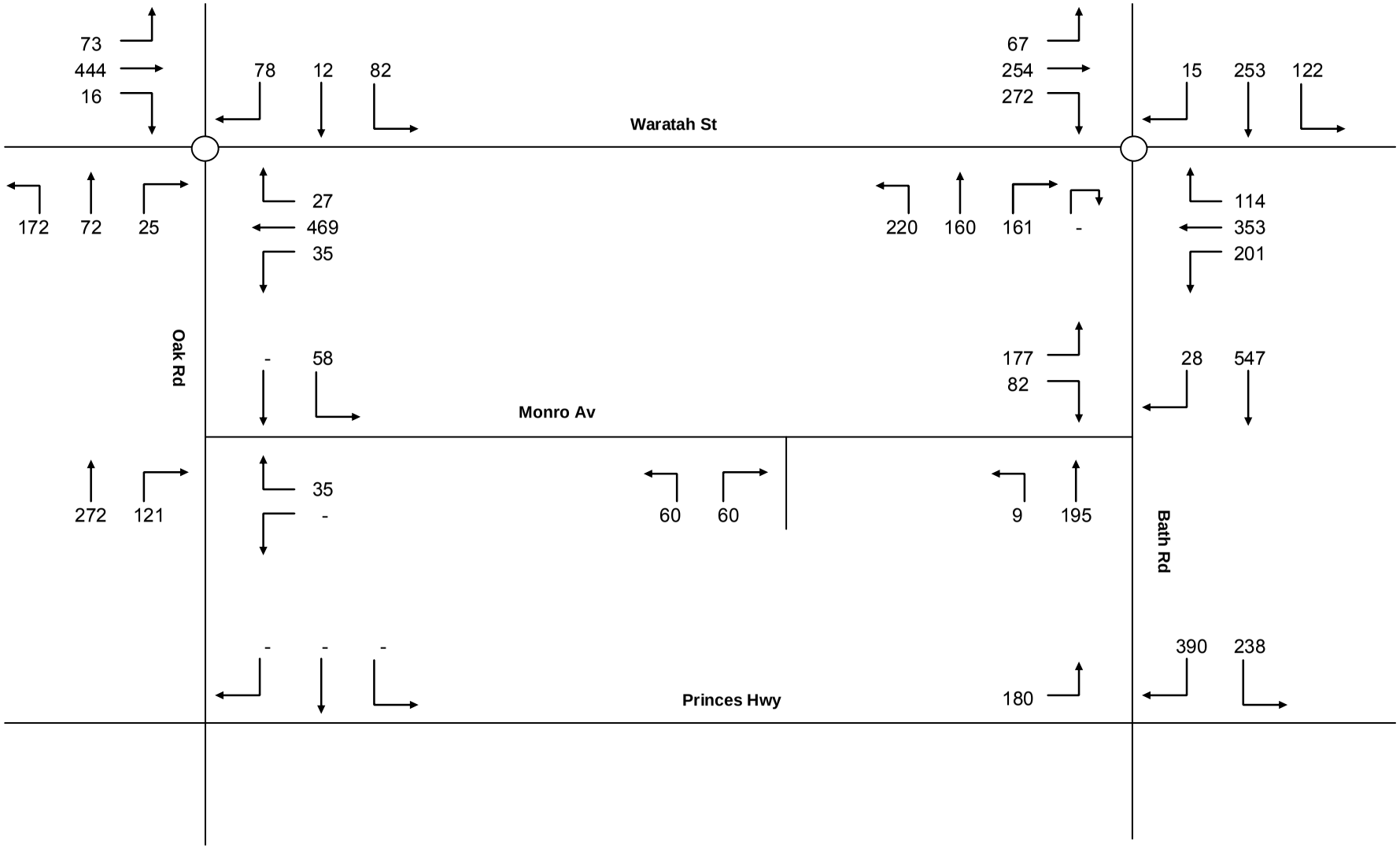
FIGURE 3
October 2011
CTLRLQx07Av7 Network North Princes Hwy_Thu PM.xls

Updated TMAP, Oct. 2011 - Part 1 of 2

Future (with Development) Traffic Flows - Saturday Peak Hour
MP 10_0076 - MIXED USE DEVELOPMENT, KIRRAWEE BRICK PIT



Halcrow

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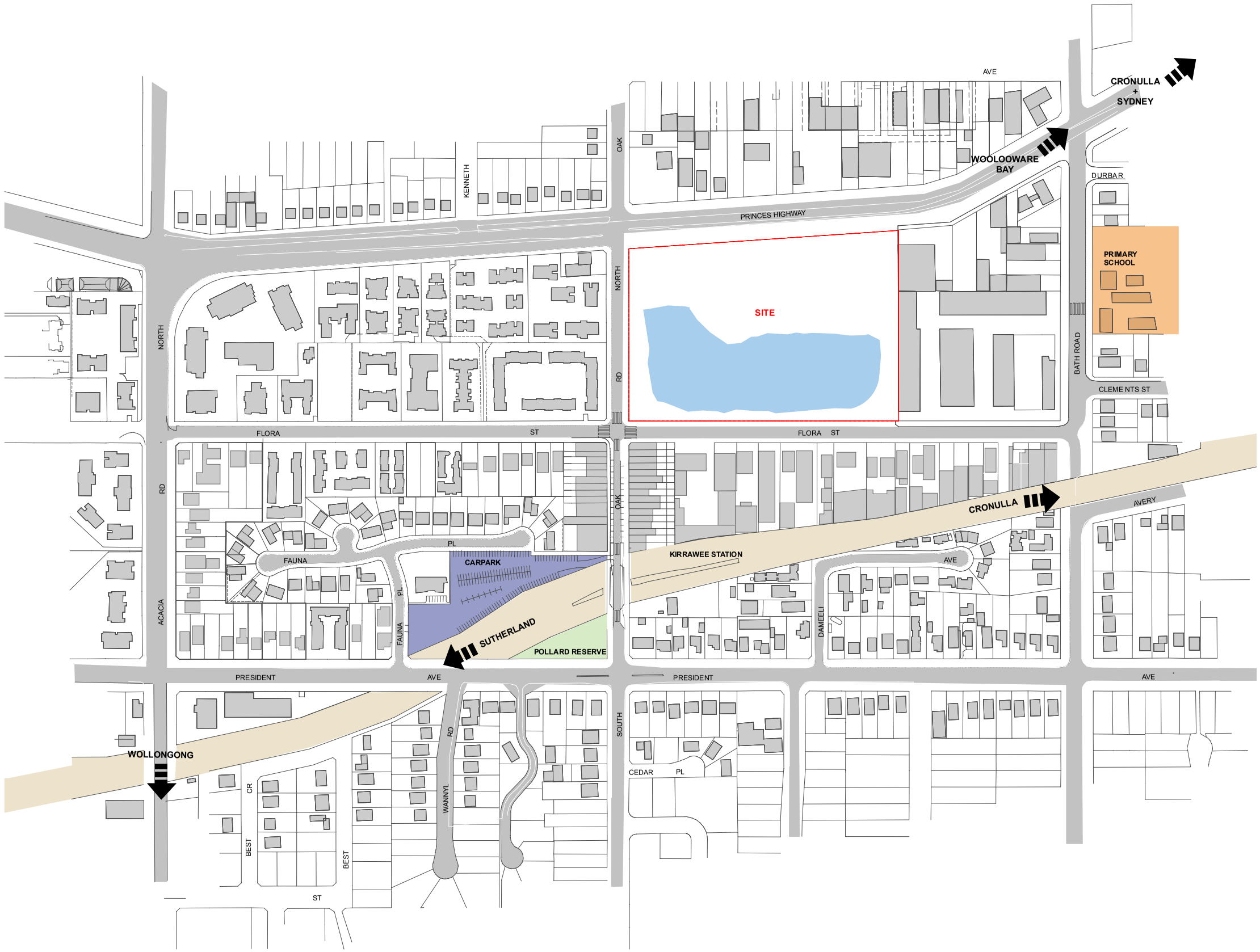
FIGURE 4
October 2011
CTLRLQx07Bv7 Network North Princes Hwy_SAT.xls

Updated TMAP, Oct. 2011 - Part 1 of 2

Appendix B

Reduced Plans



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DLCS Quality Endorsed Company ISO 9001:2008, License Number 4168
Nominated Architect: Nicholas Turner 6935, ABN 86 064 084 911

CLIENT
PAYCE
Level 37, Chifley Tower 2 Chifley Square
Sydney NSW 2000 Australia

Project Title
KIRRAWEE BRICK PIT
KIRRAWEE

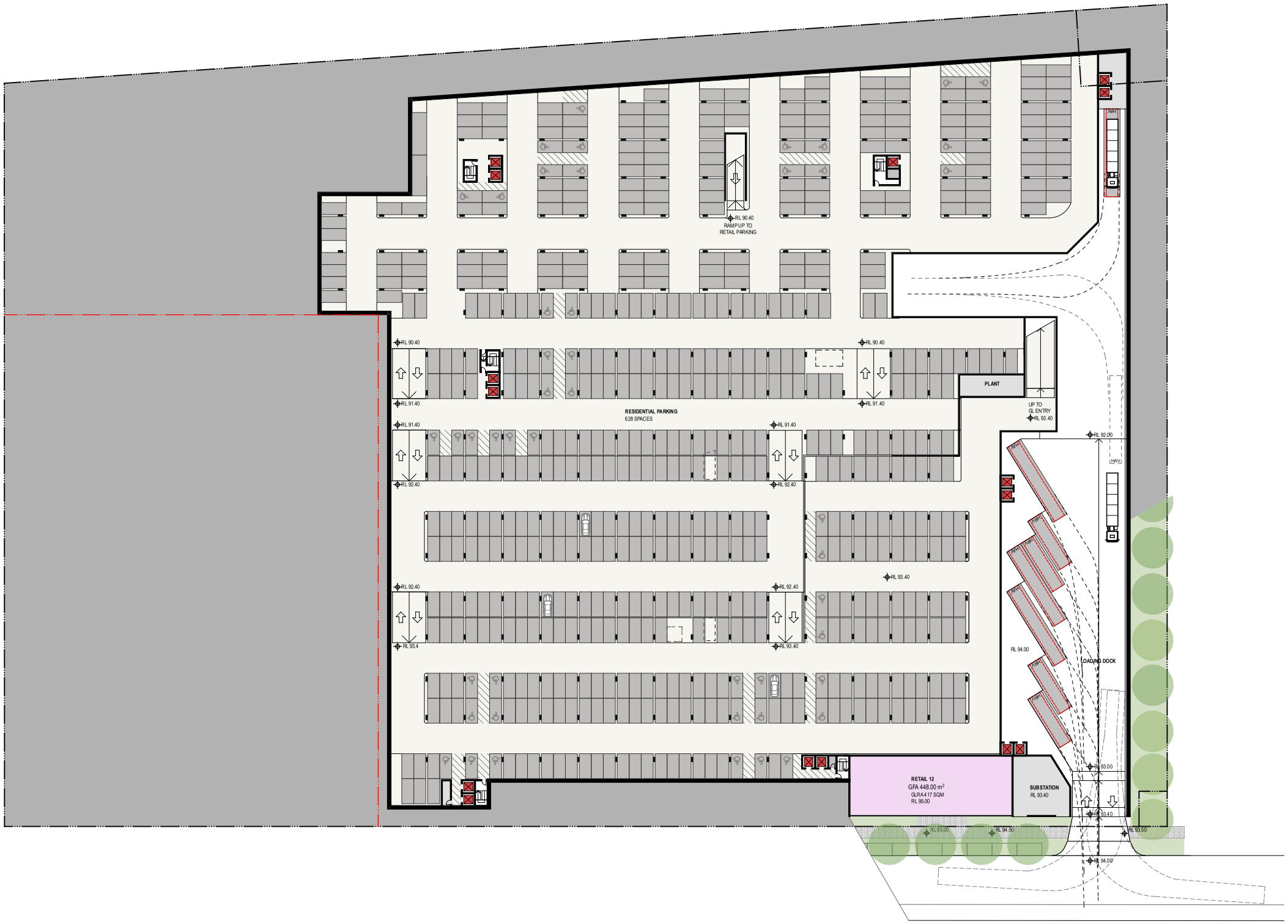
Drawing Title
GA Plans
Context Plan

PLANNING DETAIL INDICATIVE ONLY

Rev.	Date	Approved by	Revision Notes

Scale: 1:2000@A1, 50%@A3
Project No.: 13040
Drawn by: XX
North
Status: For Information
Dwg No.: A-SK-100-001
Rev: 00

turner
Level 1, 410 Crown Street
Surry Hills NSW 2010
Australia
T +61 2 8999 0000
F +61 2 8999 0099
turnerstudios.com.au



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DLCS Quality Endorsed Company ISO 9001:2008. License Number 4168
Nominated Architect: Nicholas Turner 6695, ABN 86 064 084 911

CLIENT
PAYCE
Level 37, Chifley Tower 2 Chifley Square
Sydney NSW 2000 Australia

Project Title
KIRRAWEE BRICK PIT
KIRRAWEE

Drawing Title
GA Plans
Illustrative Basement 2 Plan

PLANNING DETAIL INDICATIVE ONLY

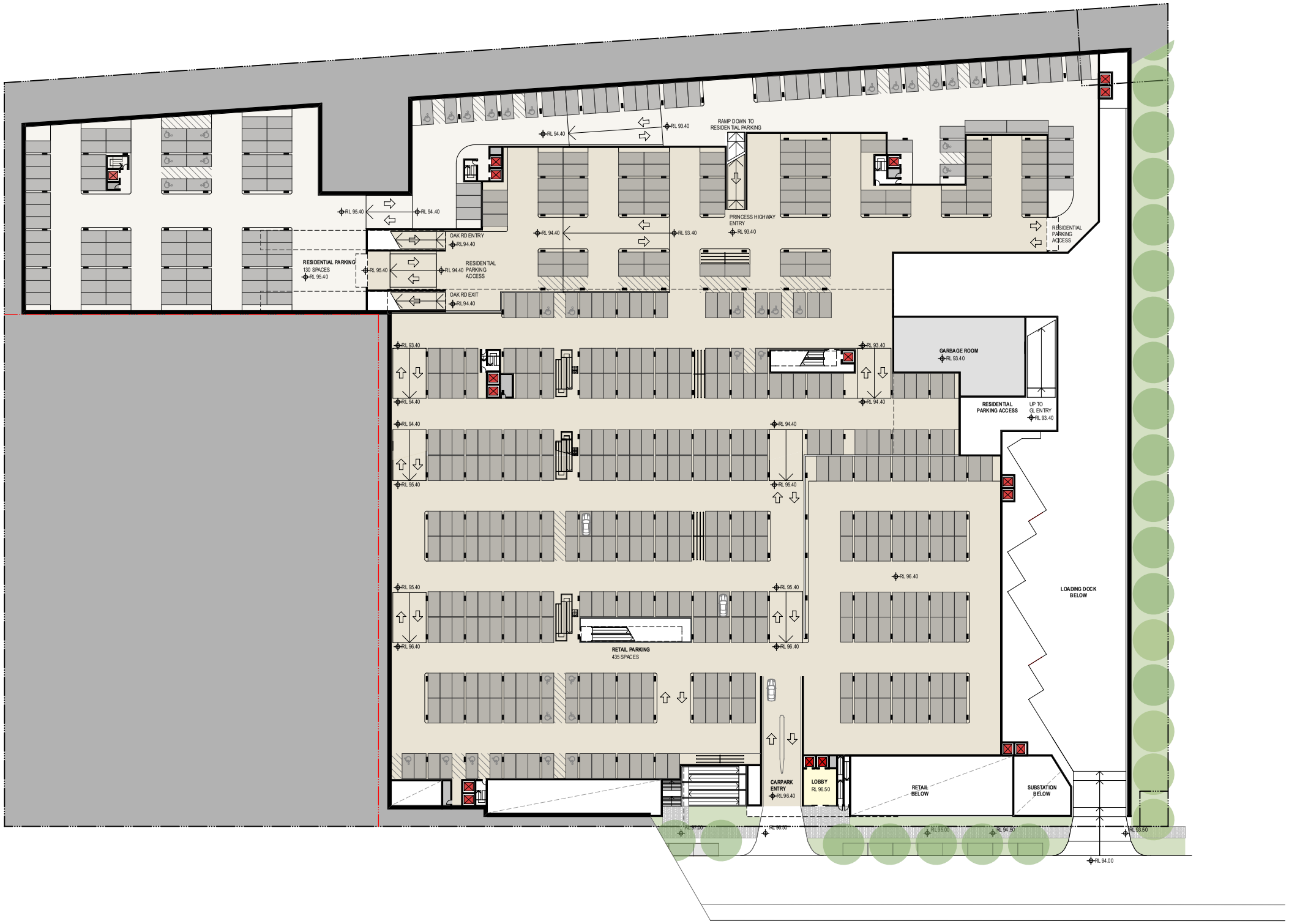
Rev.	Date	Approved by	Revision Notes

Scale: 1:500 @A1, 50%@A3
Project No.: 13040
Drawn by: XX
Status: For Information
Dwg No.: A-SK-110-B02
Rev: 00
North

turner

Level 1, 410 Crown Street
Surry Hills NSW 2010
Australia

T +61 2 8668 0000
F +61 2 8668 0088
turnerstudio.com.au



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DLCS Quality Endorsed Company ISO 9001:2008, License Number 4168
Nominated Architect: Nicholas Turner 6695, ABN 98 004 384 911

CLIENT

PAYCE
Level 37, Chifley Tower 2 Chifley Square
Sydney NSW 2000 Australia

Project Title
KIRRAWEE BRICK PIT
KIRRAWEE

Drawing Title
GA Plans
Illustrative Basement 1 Plan

PLANNING DETAIL INDICATIVE ONLY

Rev.	Date	Approved by	Revision Notes

Scale: 1:500 @A1, 50%@A3
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Dwg No.: A-SK-110-B01
Drawn by: XX
Rev: 00
North

turner.
Level 1, 410 Crown Street
Surry Hills NSW 2010
Australia
T +61 2 8968 0000
F +61 2 8968 0080
turnerstudios.com.au

PLANNING DETAIL INDICATIVE ONLY

CLIENT
PAYCE
Level 37, Chifley Tower 2 Chifley Square
Sydney NSW 2000 Australia

Project Title
KIRRAWEE BRICK PIT
KIRRAWEE

Drawing Title
GA Plans
Illustrative Ground Level & Mezzanine Plan

Rev.	Date	Approved by	Revision Notes

Scale: 1:500 @A1, 50%@A3
Project No.: 13040
Drawn by: XX
Status: For Information
Dwg No.: A-SK-110-000
Rev: 00
North

turner
Level 1, 410 Crown Street
Surry Hills NSW 2010
Australia
T +61 2 8588 0000
F +61 2 8588 0088
turnerstudios.com.au

CLIENT
PAYCE
Level 37, Chifley Tower 2 Chifley Square
Sydney NSW 2000 Australia

Project Title
KIRRAWEE BRICK PIT
KIRRAWEE

Drawing Title
GA Plans
Illustrative Level 1 Building B-C & G Podium Plan

PLANNING DETAIL INDICATIVE ONLY

Rev.	Date	Approved by	Revision Notes

Scale	Project No.	Drawn by	North
1:500 @A1, 50%@A3	13040	XX	
Status	Dwg No.	Rev	
For Information	A-SK-110-001	00	

turner
Level 1, 410 Crown Street
Surry Hills NSW 2010
Australia
T +61 2 8668 0300
F +61 2 8668 0388
turnerstudio.com.au