TTW Structural Civil Traffic Façade

Transport and Accessibility Impact Assessment

The Gables New Primary School

Prepared for School Infrastructure NSW

4 February 2025

241021

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Revision Register

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Executive Summary

This Transport and Accessibility Impact Assessment (TAIA) accompanies a Review of Environmental Factors (REF) pursuant to Part 5 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) and State Environmental Planning Policy (Transport and Infrastructure) 2021 (SEPP TI), for the construction and operation of a new primary school and pre-school in the Gables.

The new primary school is intended to be constructed in one stage to provide a maximum capacity of 1,000 students and 68 staff, with an anticipated opening year enrolment of approximately 750 students and 50 staff. The pre-school is expected to operate with a maximum capacity of 60 students and 6 staff. Transport behaviours at and around the site are expected to change over time as the population of the school grows which has been considered throughout the development of a transport strategy for this site.

The holistic transport strategy for the project prioritises active transport (i.e. walking and cycling) and public transport over private vehicle movements. This is consistent with NSW state government policy and is a core part of School Infrastructure NSW's ongoing commitment to sustainable transport across its portfolio of projects. The overall transport strategy across all elements of the project have been discussed with The Hills Shire Council ('Council') and Transport for NSW (TfNSW) during a pre-lodgement consultation stream of Transport Working Group (TWG) meeting.

In order to encourage and prioritise active transport, it is proposed to provide external infrastructure improvements such as pedestrian crossings and a shared path facility along the frontage of the site, along with internal infrastructure including bicycle storage and end-of-trip facilities. The scope of these works has been developed through the TWG consultation. The scope of works to be provided as part of this REF proposal will operate in conjunction with existing facilities and will connect to a broader network of footpaths being delivered throughout the Gables during ongoing subdivision and development works.

For cyclists, a minimum of 100 on-site bicycle storage spaces will be provided for students (meeting 10% of total population) and an additional 6 spaces for staff. Unisex shower and change rooms for staff, with lockers will also be provided on-site. These provisions are broadly in line with the NSW Planning Guidelines for Walking and Cycling and would meet future demand levels with a shift to more sustainable transport modes.

Public transport will be utilised as part of the primary school operations and will be addressed through provision of additional bus zone along Fontana Drive. The proposed bus zone will be located on the east side of Fontana Drive which will provide convenient access to the school entrance.

Both the primary school and pre-school will be serviced by a single loading dock with capacity for vehicles up to and including 12.5m Heavy Rigid Vehicles (HRV), which will be sufficient for all potential waste collection and service vehicles coming to the site. The loading dock area is located west of the primary school carpark, with controlled access at a secure access point from Cataract Road, with intercom facilities to the main administration building. The loading dock is open, with no overhead obstructions or height limitations.

Drop-off and pick-up by car ("kiss & ride") will also be catered for at the site, however, is a low priority mode in the sustainable transport hierarchy. Two kiss & ride (K&R) areas are provided, one along the southern side of Pennant Way and one along the eastern side of Fontana Drive. Two areas have been allocated to distribute traffic volumes to reduce congestion and to better suit individual approach and departure directions for drivers. These zones have been designed in accordance with AS2890.5 for on-street parking facilities. Pre-school kiss & ride activity is proposed to be catered for wholly within the pre-school car park. 10 designated car spaces have been allocated to kiss & ride activity, this provision is in accordance with the Hills DCP.

Car parking is the lowest priority travel mode for the project. The proposed primary school on-site car park with a capacity of 35 spaces (including 1 accessible parking spaces) is designed to accommodate 50% of staff once the school reaches full capacity. The car park will adequately serve all staff in opening year, with allowance for travel behaviours to change over time and reduce the car driver mode share before reaching full capacity. In line with SINSW policy, no car parking will be provided for students or visitors to the site.

The pre-school on-site car park provides a total of 6 car spaces for staff (including 1 accessible parking space), this is a 100% provision for staff in accordance with the Hills DCP.

To ensure the safety of pedestrians in the vicinity while maintaining appropriate vehicular traffic flows, a package of off-site public domain works will be provided as part of this development. These include 3 new wombat crossings and 3 new pedestrian refuges, changes to signage and line marking along Pennant Way and Fontana Drive and footpath widening along the southern side of Pennant Way and eastern side of Fontana Drive.

It is proposed that the implementation of a School Transport Plan (submitted separately as part of this REF), and the provision of active and public transport infrastructure such as end-of-trip facilities for staff, will assist in shifting staff and student travel behaviour as the school population grows over time (such as reducing staff car driver mode split). This shift to a lower car driver mode split is a deliberate strategy as part of the sustainable transport goals. It has been implemented for a number of reasons including provision of acceptable and sufficient quantities of on-site play space, reductions in hardstand space to avoid urban heat island effects, limiting vehicle movements to reduce congestion, and reducing the carbon emissions of staff travel to and from the site. This shift over time is expected to coincide with gradual growth of the school population over time, regardless of whether the development is physically constructed in multiple stages or a single stage.

Overall, the transport provisions of this project across all travel modes have been selected and developed in order to provide a sustainable, safe, and efficient site. These provisions include physical infrastructure works on and off-site, along with management measures to be implemented during operation of the school. While school sites generate significant volumes of travel demand in short periods of time, the proposed transport strategy is considered an appropriate balance and is demonstrated to provide appropriate outcomes for the site.

Contents

Section 1 Introduction

1.1 Scope of Works

This Transport and Accessibility Impact Assessment (TAIA) has been prepared by TTW on behalf of School Infrastructure NSW (SINSW) (the Applicant) to assess the potential environmental impacts that could arise from the development of The Gables New Primary School at Lot 301 DP 1287967 on Fontana Drive, Gables (the site).

This report has been prepared to assess and address the traffic and transport impacts of the proposed development and define the key traffic-related design elements of the proposal.

This report accompanies a REF that seeks approval for the construction and operation of a new primary school at the site, which involves the following works:

- Construction of school buildings, including learning hubs, a school hall and an administration and library building.
- Construction and operation of a public pre-school.
- Delivery of a sports court and fields.
- Construction of car parking, on-site waste storage and loading area.
- Separated vehicle access to primary school and pre-school via Cataract Road
- Associated site landscaping and open space improvements.
- Associated off-site infrastructure works to support the school, including (but not limited to) services, driveways and pedestrian crossings.

For a detailed project description, refer to the Review of Environmental Factors prepared by Ethos Urban.

A preliminary School Transport Plan (STP) and preliminary Construction Traffic Management Plan (CTMP) have also been prepared and included as part of this REF application. These plans satisfy REF requirements however are considered preliminary in nature and would be finalised post-approval as a condition of consent.

1.2 Statement of Significance

Based on the identification of potential issues, and an assessment of the nature and extent of the impacts of the proposed development, it is determined that:

- The extent and nature of potential impacts are moderate, and will not have significant adverse effects on the locality, community and the environment;
- Potential impacts can be appropriately mitigated or managed to ensure that there is minimal effect on the locality, community.

1.3 Operational Details

The following breakdown of school operation hours shown in Table 1 provides an overview of the anticipated school activities throughout a typical school calendar year.

Table 1: Operational Details

Activities	Operating Hours
School hours – Use of all school facilities	Between 8:00am and 4:00pm (exact school hours within this timeframe to be confirmed by school prior to operation), Monday to Friday.
Out of School Hours Care (OSHC)	From 6:30am to 9:00am (as confirmed by school), Monday to Friday.(before school) From 3:00pm to 6:30pm (as confirmed by school), Monday to Friday.(after school)
School community – use of school facilities (as required)	9:00am to 10:00pm, Saturday. 9:00am to 6:00pm, Sunday. The above hours provide opportunities for out of hours use of school facilities for broader school community activities such as before and after school classes, schools sports training sessions, meetings, performances, fundraising events and fetes at the school, and the like.
Cleaning	Between 5.30am and 10:00pm, Monday to Saturday.
Waste collection	Between 6:00am and 7:30pm, Monday to Friday.

Additional details about the operation, the preschool will be operated by Department of Education and will cater to students aged between 3 and 5 years. Whereas the OSHC will be run by external / private providers and will cater approximately 15% of students capacity.

1.4 Transport Assessment Basis

For the purposes of the design and assessment for all traffic and transport elements of the project, the future student and staff capacities as a result of the project are the primary inputs and main assessment criteria.

As shown in Table 2, it is anticipated that 1,000 students and 68 staff members will be accommodated at full capacity. Gradually, the number of students and staff will increase from 750 students to 50 staff members in the opening year. The project will also include a pre-school adjacent to the proposed primary school with approximately 60 students and 6 staff. The proposed preschool will cater children aged 3 to 5 years old.

Table 2: Proposed Development Capacity

	Primary School		Pre-school (Aged 3-5 years)
	Opening Year	Full Capacity	
Students	750	1,000	60
Staff	50	68	6

1.5 School Catchment

The proposed school catchment boundary is shown in Figure 1. The school site is located centrally within the catchment area, with a majority of the current and future residential growth area located in the eastern and northern portion of the catchment.

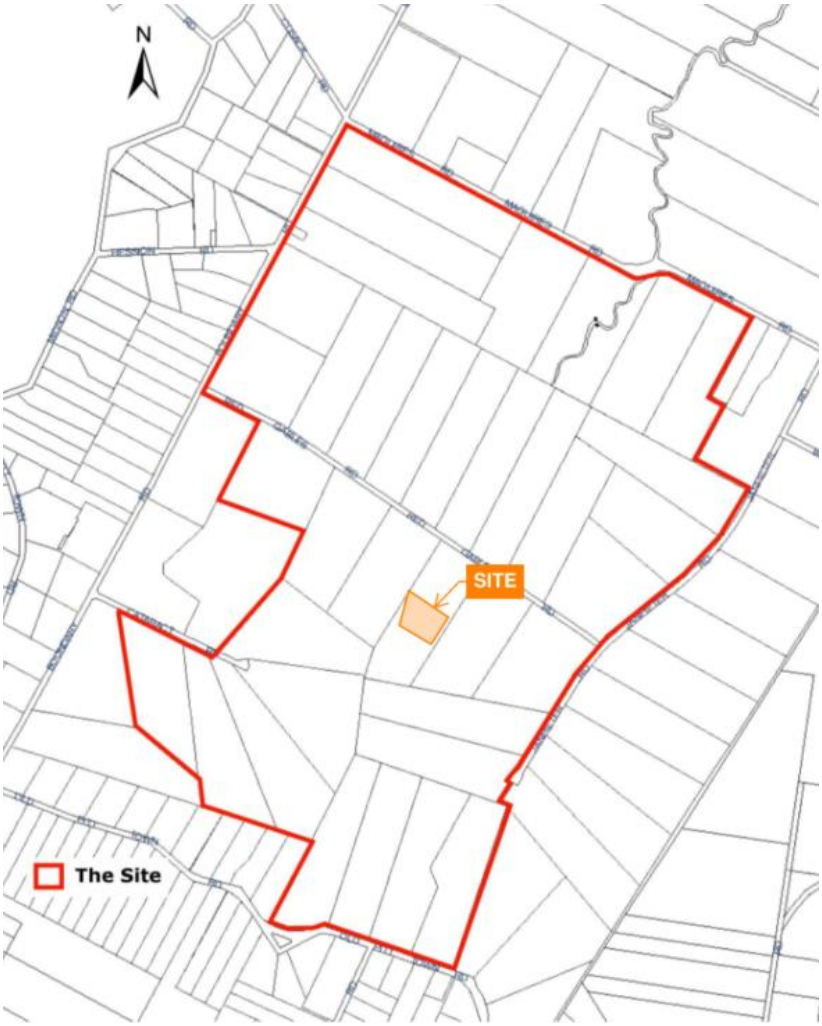
Figure 1: Proposed School Catchment Boundary
Source: Modified from Nearmap

1.6 Strategic Planning Context

1.6.1 Environmental Planning Instruments

Table 3 outlines the relevant strategic plans and strategies related to the traffic and transport assessment of this project. It is noteworthy to mention, the Box Hill North precinct was renamed as 'Gables' precinct in 2020, therefore throughout this report Box Hill North will be referred to as the Gables.

Table 3: Relevant Strategic Context

Legislation	Comment
The Hills Development Control Plan 2012	This document contains general controls for all developments within the Hills Shire LGA and is referred to within this report as 'The Hills DCP'.
The Hills Development Control Plan Part D 2012 - Section 17 - Box Hill North	This sub document from The Hills DCP relates to development on the land known as Box Hill North (Gables), which includes the proposed primary school site as shown in the figure below. This document is referred to within this report as 'Box Hill North DCP'. 
Hills Local Environmental Plan 2012	This legal document applies to land in The Hills Shire LGA and contains development standards and is referred to as 'the LEP' within this report.

1.6.2 Gables Development Plans

The Gables Masterplan DA (1397/2015/JP) and Town Centre Stage 1 DA (1118/2023/JP), and any relevant subsequent modifications, were also considered when assessing the traffic and transport impacts of the school and the suburb's development. Details of the planning history is outlined below in Table 4.

Table 4: Development Applications Overview

No.	Project Applications	Plan Overview
N/A	West Gables Precinct Planning Proposal **(1/2024/PLP)**	▪ Rezone from RU6 Transition to R3 Medium Density Residential, R2 Low Density Residential, RE1 Public Recreation, Amend Minimum Lot Size from 2ha to 450sqm and 700sqm. ▪ Introduce a local provision allowing a dwelling cap and further lot size reductions ▪ Currently under evaluation
1	Box Hill North Master Plan Development **(1397/2015/JP)**	▪ The application is required by a provision of the Voluntary Planning Agreement applying to the majority of the site. Masterplan for residential with a dwelling yield of 4,600 dwellings within the Gables. ▪ Approved 12 May 2015.
	The Gables Modification **(1397/2015/JP/A)**	▪ Section 96(1A) Modification to the Approved Masterplan for The Gables to Amend BioBanking Requirements and Road Works. ▪ Approved 19 September 2017.
	The Gables Modification **(1397/2015/JP/B)**	▪ Section 4.55(1A) Modification to the Approved Masterplan for The Gables – Amendments to the Road Network in Precinct F ▪ Approved 27 April 2022.
2	The Gables Town Centre Stage 1 **(1118/2023/JP)**	▪ The concept DA for a Town Centre includes a full line supermarket, around 18 specialty shops, food and beverage, as well as a function centre and gym. ▪ Approved 01 December 2023
	The Gables Town Centre Stage 2 **(103/2024/JP)**	▪ Medical Centre and Centre Based Child Care Facility for 102 Children on Proposed Lot 62 (proposed under Development Application 1118/2023/JP). ▪ Approved 04 March 2024

Table 4 above provides details of the approved precinct development applications. Section 11.5 of this report provides detailed discussions in relation to the cumulative traffic impacts associated with the above approval.

In any case, this TAIA for the proposed new primary school in the Gables treats the project as "new" development, over and above any traffic forecasts and external plans, and considers the impacts (and therefore any required mitigation measures) in their own right. This is unaffected by whether or not any further adjustments (such as Mod A, Mod B, or others) are made to the precinct plans.

1.6.3 Cumulative Impacts

Given the Gables precinct is currently undergoing significant development, Table 5 and Figure 2 below provide further details of surrounding developments to evaluate the cumulative impacts of any potential neighbouring properties to the proposed new school development.

Table 5: Neighbouring Developments

No.	Address	Development Application Number and Status	Scope of Works
3	1 Lakefront Crescent, Gables NSW 2765	SSD 9972 – Finished & in operation with 1,500 enrolled students in 2024	Santa Sophia Catholic College - Construction of a new school for up to 1,920 students from Kindergarten to Year 12, inclusive of 60 student early learning centre.
4	99 Fontana Drive Gables 2765	110/2019/HA – In construction	Construction and Landscaping of Playing Fields and Associated Amenities Building within Precinct C of Box Hill North (The Gables).
5	95 Fontana Drive Gables 2765	730/2023/JP – In construction	Junior Aspect school (ASA The Gables) - Educational Establishment for 80 Students and 30 Staff and Associated Works.
6	93 Fontana Drive Gables 2765	1739/2022/JP - Approved	Construction of a Centre Based Child Care Facility for 130 Children on Proposed Lot 300 in a Subdivision of Lot 201 DP 1256554 Red Gables Road, Gables Pursuant to Development Consent 1099/2019/ZB.

For all above developments, including those listed in Table 5, it is assumed that the mitigation measures for those developments (as determined through their respective assessment processes) will be implemented at an appropriate point in time for those developments. Relevant external developments (either approved or under assessment) are illustrated in Figure 2.

Figure 2: Neighbouring Developments
Source: Modified from Nearmap

It is noteworthy to mention, the traffic effects of the Gables Precinct and the Gables Town Centre were addressed in the Planning Proposal Traffic Impact Assessments, Ref: Box Hill North Planning Proposal, TIA prepared by GTA Consultants 2013 & The Gables Town Centre TIA, prepared by Ason group (August 2018) respectively. These reports have been reviewed and generally capture the traffic impacts associated with all of the neighbouring developments detailed above.

To provide a conservative assessment it has been assumed the proposed primary school has been considered over and above any external approvals or baseline assumptions and is therefore unaffected by these external developments.

1.7 Codes, Standards & References

The traffic and transport strategy for the project has been prepared in the context of a variety of relevant codes, standards, and references listed below.

- The Hills Shire Development Control Plan 2012 (Council's DCP)
- The Hills Shire Local Environmental Plan 2012 (Council's LEP)
- The Hills Development Control Plan (2012) (Part D – Section 17 Box Hill North)
- Box Hill Growth Centre Precincts Development Control Plan
- Box Hill North Planning Proposal – Traffic and Access Assessment, GTA Consultants (31/07/2013, Rev C)
- Box Hill North Masterplan Development Application, GTA Consultants (01/05/2015, Rev B)
- The Gables Town Centre, Box Hill North – Planning Proposal Traffic Impact Assessment, Ason Group ref: (14/08/2018, Rev0392r04v04)
- Australian Standards, including:
    - AS2890 – Parking facilities
    - AS1742 – Manual of uniform traffic control devices
    - AS1428 – Design for access and mobility
- Austroads Guidelines, including:
    - Guide to Traffic Management
    - Guide to Road Design
    - Guide to Road Safety
- RTA Guide to Traffic Generating Developments
- NSW Planning Guidelines for Walking and Cycling
- Educational Facilities Standards and Guidelines (EFSG)
- The Gables Childcare Development, TIA report, Ason ref: (23/02/2022, 1927r01)
- The Proposed Junior Primary School, TIA report, McLaren ref: (22053-7.01FA)

1.8 Consultation

This report has been prepared following consultation between the design team and relevant stakeholders, including The Hills Shire Council (Council) and Transport for New South Wales (TfNSW). Consultation events and outcomes are identified in Table 6.

Table 6: Consultation Summary

Date	Attendees	Discussions	Outcomes
05 June 2024	Transport Working Group (Council + TfNSW)	▪ A video conference was held with representatives from Council and TfNSW. ▪ The project's general transport strategy and strategic context were introduced. The meeting discussed key transport challenges for the project, the early concepts for multi-modal transport strategy, and proposed public infrastructure upgrades to prepare for the school opening year.	▪ Key feedback included advice on the traffic demand analysis for the proposed school during pick-up and drop-off. Feedback regarding the proposed public infrastructure upgrades within the vicinity of the site was provided. ▪ Feedback was also received regarding updates to existing bus services to accommodate the proposed new school.
07 June 2024	Stockland TTW SINSW	▪ Discussion on timing of precinct construction with the developer Stockland & SINSW	▪ Stockland provided details of precinct construction and proposed public domain upgrades within the vicinity of the site.

Outside these formal meeting streams, additional consultation and coordination has taken place with TfNSW and Council particularly around the detailed inputs for intersection modelling and traffic growth forecasts. These discussions with have generally resulted in the following agreements and outcomes:

- Traffic survey location and timing have been discussed and agreed with Council & TfNSW.
- The proposed school is located outside the mesoscopic model, and therefore Strategic Travel Forecasting Model does not cover this area in detail. Traffic growth forecasts have therefore been assumed based on other traffic reports completed for the wider Gables precinct.

1.9 REF Deliverable Requirement

The NSW Guidelines for preparing a REF were reviewed to ensure the traffic and parking requirements were met in this report. Table 7 below identifies the typical requirements which need to be met for a school planning submission and identifies where they have been addressed in various sections of this report.

Table 7: Planning Submission Requirements

Items	Requirements	Section reference
1	An analysis of the existing transport network, including the road hierarchy and any pedestrian, bicycle or public transport infrastructure, current daily and peak hour vehicle movements, and existing performance levels of nearby intersections.	Road hierarchy – Section 2.1 Pedestrian infrastructure – Section 2.3 Cyclist infrastructure – Section 2.4 Public transport – Section 2.5 Current vehicle movements – Section 2.7 Existing intersection performance – Section 2.7
2	An outline of the proposed development, including likely pedestrian and vehicular access arrangements (including swept path analysis of the largest vehicle and height clearances), parking arrangements and rates (including bicycle and end-of-trip facilities), drop-off/pick-up-zone(s) and bus bays (if applicable), and provisions for servicing and loading/unloading.	Pedestrian access – Section 5 Cyclist access – Section 6 Vehicular access – 9.4 Parking facilities – 9.4 Cyclist facilities – Section 6 Drop-off and pick-up zones – Section 9 Bus bays – Section 7 Service vehicles – Section 8 Swept path analysis – Appendix B
3	An analysis of the impacts of the proposed development (including justification for the methodology used), including predicted modal split, a forecast of additional daily and peak hour multimodal network flows as a result of the development (using industry standard modelling), potential queuing in drop-off/pick-up zones and bus bays during peak periods, identification of potential traffic impacts on road capacity, intersection performance and road safety (including pedestrian and cyclist conflict), and any cumulative impact from surrounding approved developments.	Modal split – Section 4 Multi-modal trip generation – Section 4 Public transport – Section 7 Drop-off and pick-up zones – Section 9 Car parking – 9.4 Traffic impacts – Section 11 Cumulative impact – Section 11.5
4	Measures to mitigate any traffic impacts, including details of any new or upgraded infrastructure to achieve acceptable performance and safety, and the timing, viability and mechanisms (including proposed arrangements with local councils or government agencies) of delivery of any infrastructure improvements in accordance with relevant standards.	Mitigation measures – Section 12 Infrastructure upgrades – Section 3.2 Operations and management – Section 1.3
5	Measures to promote sustainable travel choices for employees, students and visitors, such as connections into existing walking and cycling networks, minimising car parking provision, encouraging car share and public transport, providing adequate bicycle parking and high quality end-of-trip facilities, and implementing a Green Travel Plan.	Refer to School Transport Plan (lodged separately with this REF)

Items	Requirements	Section reference
6	A preliminary operational traffic and access management plan for the development, including drop-off/pick-up zones, number of bus movements, bus bays and their operations.	Refer to School Transport Plan (lodged separately with this REF)
7	Traffic Counts Assessment This must include assessment of the school's impacts on the surrounding road network. Counts should not be undertaken close to school holidays or long	Existing Traffic Count – Section 2.7

Section 2 Existing Conditions

2.1 Site Description

The site is located on Cataract Road, Gables, within The Hills Local Government Area (LGA), approximately 50km northwest of the Sydney CBD and 10km north of the Rouse Hill Town Centre. It comprises one lot, legally described as Lot 301 DP 1287967, that measures approximately 2.2ha in area. The site is bound by Pennant Way to the north, Cataract Road to the east, Fontana Drive to the west and a vacant lot to the south.

The surrounding context of the site has experienced significant transformation as part of the Gables new precinct and rapid housing growth in release areas that has seen development of greenfield sites to new communities. An aerial view of the site is shown at Figure 3.

Figure 3: Site Aerial
Source: Nearmap, edits by Ethos Urban

2.2 Road Hierarchy

2.2.1 Existing Road Network

The key roads in the local network are described in Table 8 & Figure 4.

Table 8: Existing Road Network

Road name	Classification	Speed limit	Road geometry	Parking restrictions
Windsor Road	Main Road (MR184)	80km/hr	Two lane in each direction Within a 14.5m divided carriageway	No parking
Boundary Road	Regional Road (7205)	80km/hr	One lane in each direction Within a 11m undivided carriageway	No parking
Red Gables Road	Collector Road	50km/hr	One lane in each direction with one parking lane on both sides within a 12m undivided carriageway	Unrestricted parking
Fontana Drive	Collector Road	50km/hr	One lane in each direction with one parking lane on both sides within a 12.5m divided carriageway	Unrestricted parking
Cataract Road	Local Road	50km/hr	One lane in each direction Within a 10.5m undivided carriageway	Unrestricted parking
Pennant Way	Local Road	50km/hr	One lane in each direction with one parking lane on both sides within a 10.5m divided carriageway	Unrestricted parking

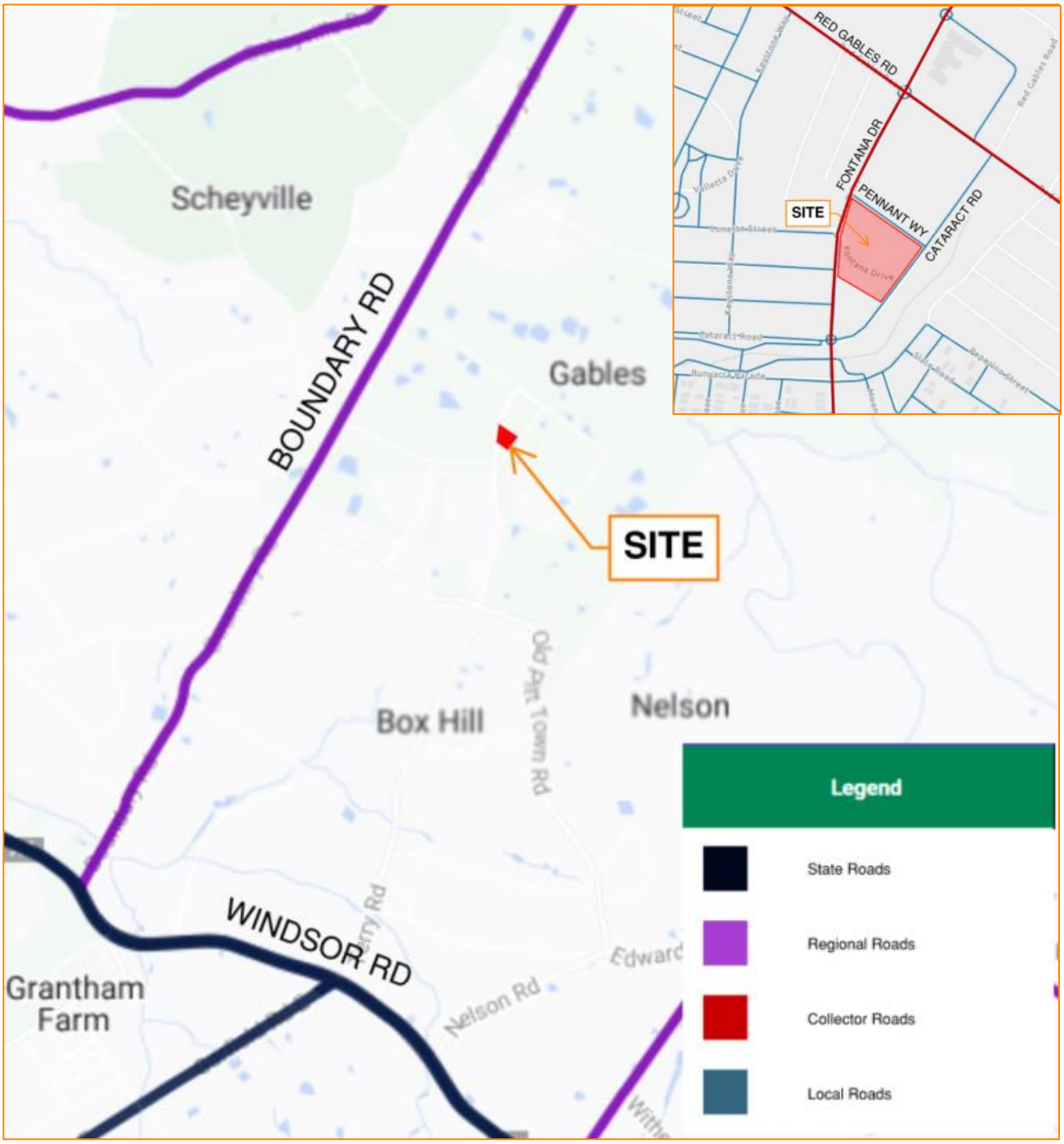


Figure 4: Existing Road Classification

Source: Modified from NSW Road Network Classification

2.2.2 Proposed Road Network

Given surrounding areas to the site are currently undergoing significant development, there are a number of roads that are in construction or yet to be constructed (at the time of writing). As confirmed by the developer Stockland, these roads will be completed as part of the voluntary planning agreement (VPA) once the subdivisions have been created. The complete development of the roads in the vicinity of the site is illustrated in Figure 5 and detailed in Table 9.

Table 9: Future Road Network (under construction)

Road Name	Classification	Speed Limit	Road Geometry	Parking Restriction
Red Gables Road East	Collector Road	50km/hr	One lane in each direction with one parking lane on both sides within a 7m undivided carriageway	Unrestricted parking
Travertine Grove	Riparian Edge Road	50km/hr	One lane in each direction with one parking lane on both sides within a 8.3m undivided carriageway	Unrestricted parking
Fontana Drive North	Collector Road	50km/hr	One lane in each direction with one parking lane on both sides within a 10.5m divided carriageway	Unrestricted parking
Chadwick Drive	Collector Road	50km/hr	One lane in each direction with one parking lane on both sides within a 7m undivided carriageway	Unrestricted parking

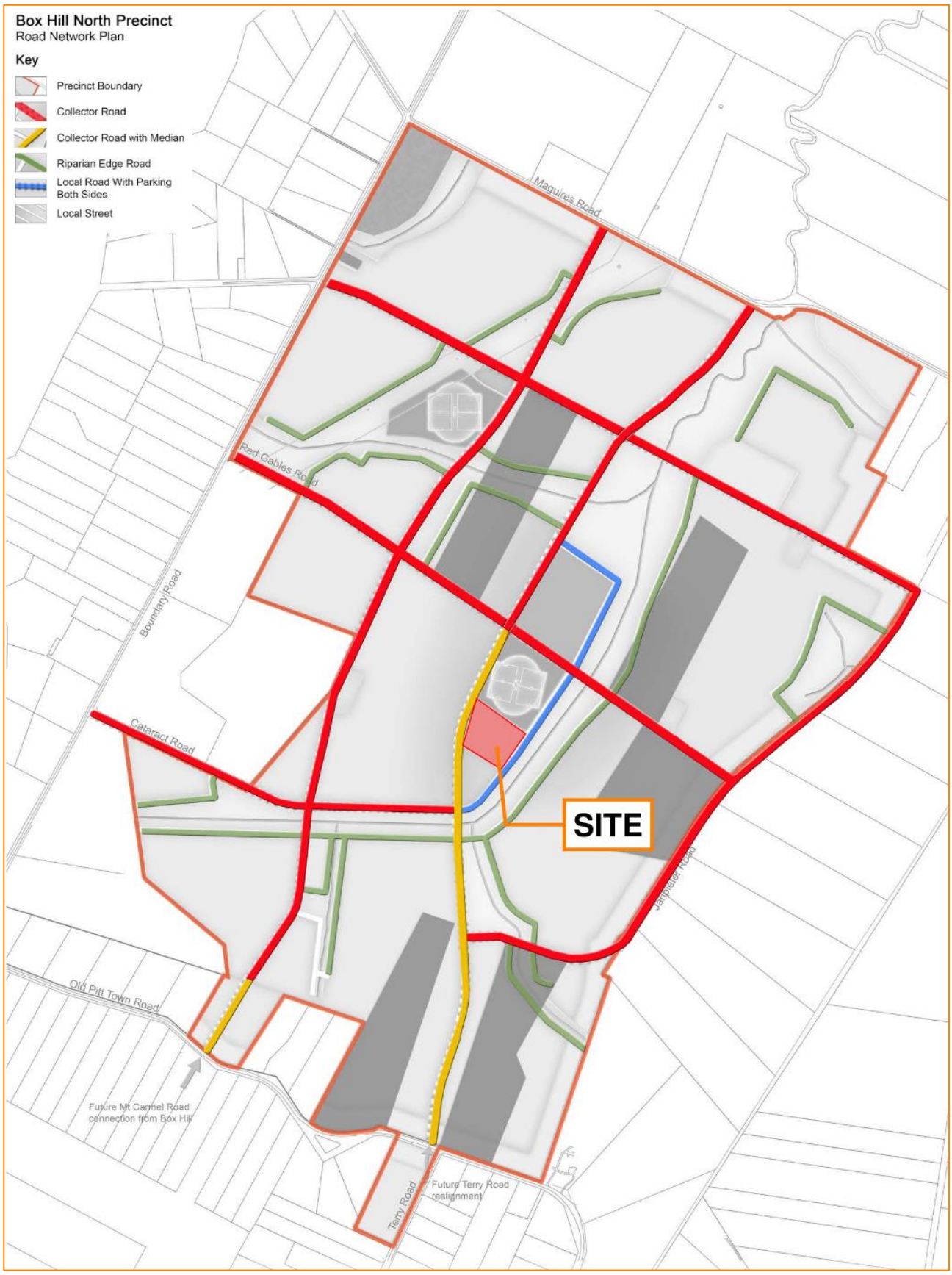


Figure 5: Proposed Gables Road Network
Source: 1397/2015/JP – Gables Masterplan DA

2.3 Pedestrian Infrastructure

2.3.1 Existing Pedestrian Footpaths

Figure 6 show an overview of the existing pedestrian infrastructure within a 400-metre radius (or 5 minute walking distance) of the site. Footpaths are currently provided along all the site frontages. The footpaths in the local area range from 1.5m to 3m in width. As observed during our site inspections, the area is well equipped with pedestrian infrastructure within the vicinity of the site.

Figure 6: Local Pedestrian Infrastructure
Source: Modified from Nearmap

2.3.2 Proposed Pedestrian Footpaths

The Box Hill North DCP indicates proposed pedestrian infrastructure throughout the Gables Precinct. This includes proposed pedestrian footpath along Red Gables Road on both sides of the road, proposed pedestrian footpath on Travertine Grove that connects Red Gables Road and Fontana Drive and connections to the north through Fontana Drive. Figure 7 illustrates the existing and proposed pedestrian infrastructure within the vicinity of the site.

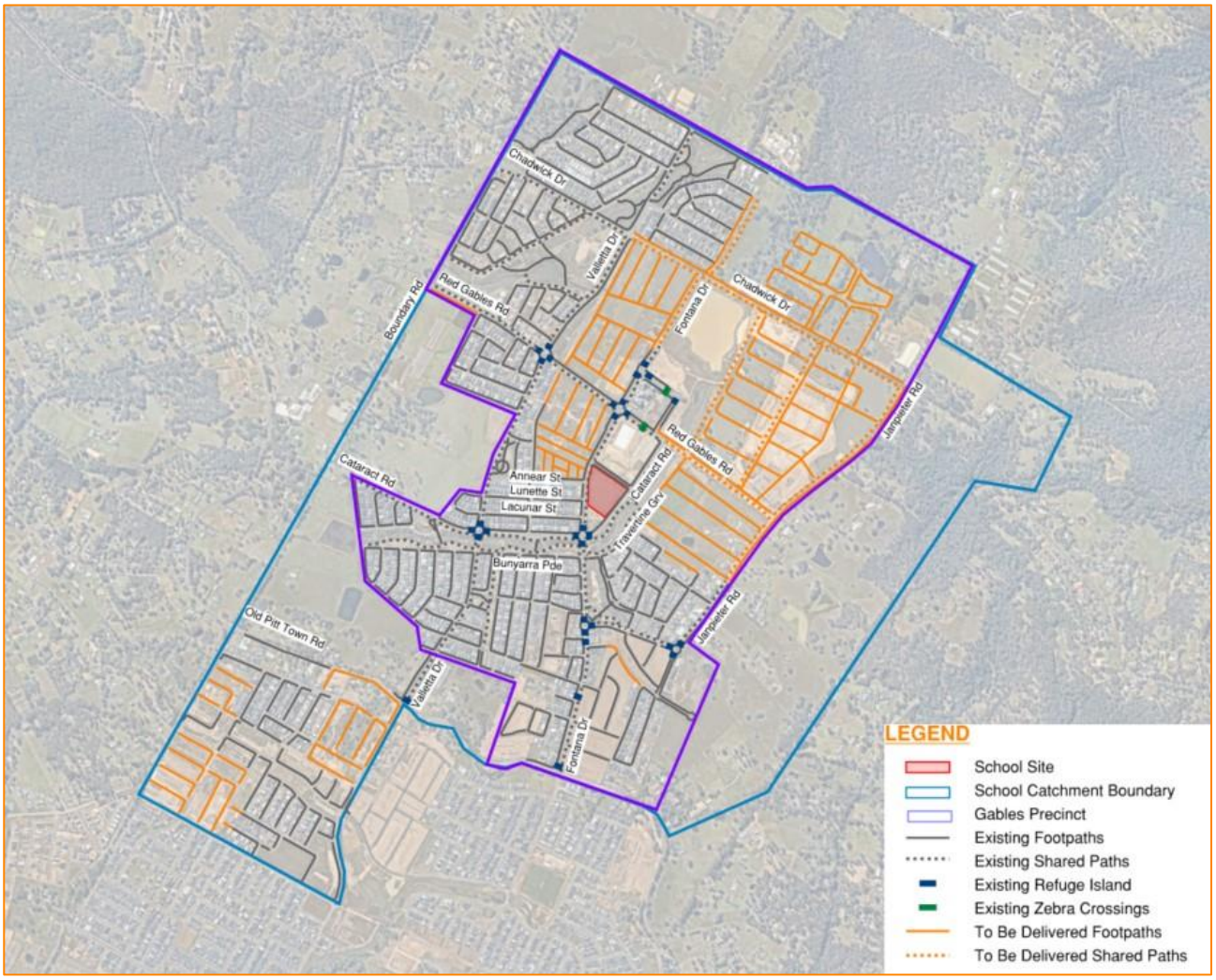


Figure 7: Indicative Proposed Pedestrian Infrastructure
Source: Modified from Nearmap

As detailed above in Figure 7, it is evident there is an abundance of pedestrian infrastructure both existing and proposed for the Gables precinct. The proposed footpath connections which are yet to be constructed will be completed as part of the VPA subdivision works which are required to be implemented prior to residential occupancy. It is therefore concluded the surrounding pedestrian infrastructure is sufficient to facilitate the site.

2.4 Cyclist Infrastructure

2.4.1 Existing Cycling Infrastructure

Figure 8 shows that the site has good access to the local bicycle network with several shared cycle paths within the vicinity of the site. Particularly along Fontana Drive and Valletta Drive where a shared path cycleway is provided. It should be noted that The Gables is under development, future cycling links will be constructed in the future and detailed in Section 2.4.2.

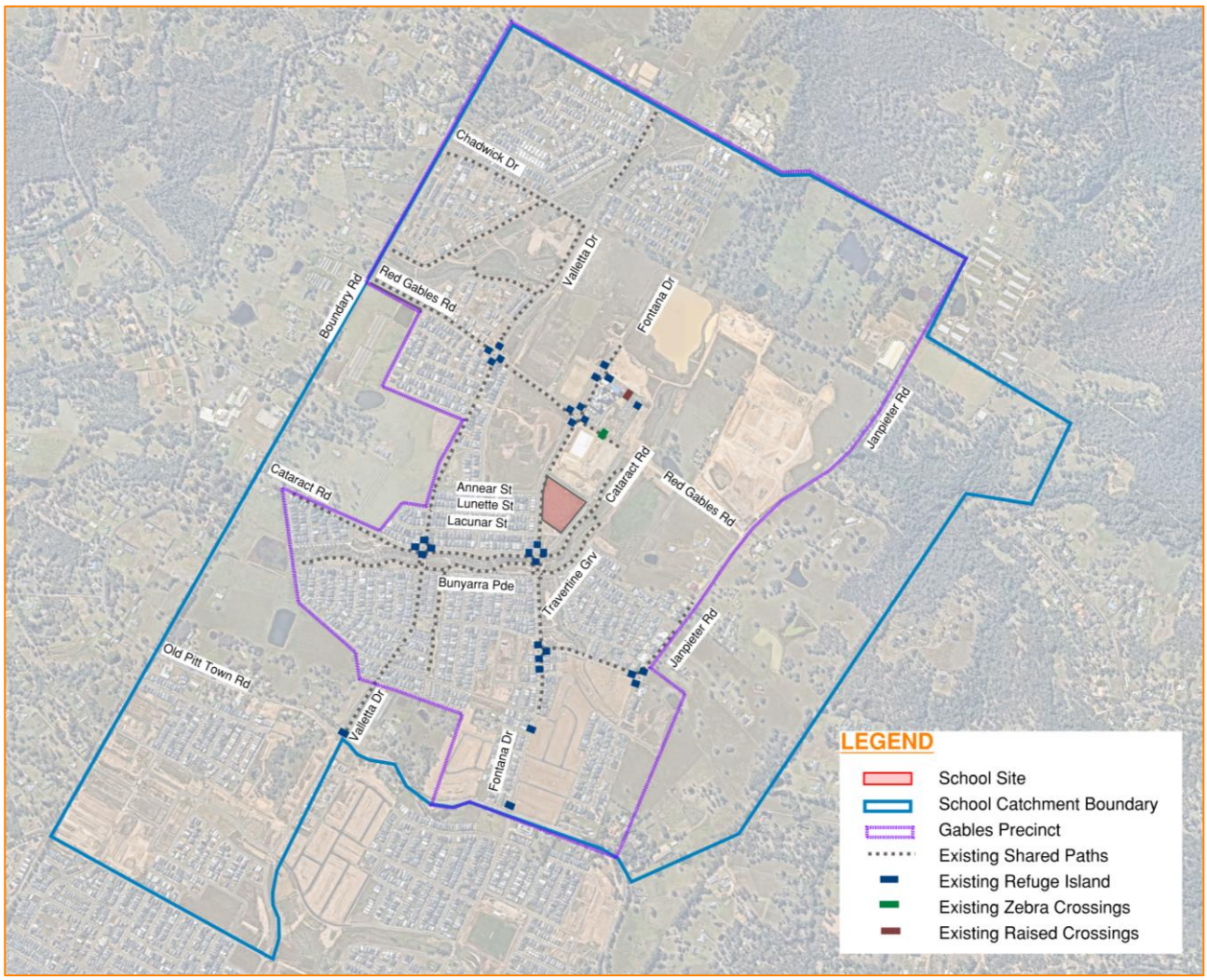


Figure 8: Existing Cycling Infrastructure
Source: Modified from Nearmap

2.4.2 Proposed Cycling Infrastructure

The Box Hills North DCP indicates proposed cycling infrastructure near to the site that links to the main cycle networks within the precinct. This includes proposed off-road bicycle routes along Fontana Drive on the east side of the site, and connections through to the south to Terry Road.

Figure 9 illustrates the existing and proposed cycling infrastructure around the site.

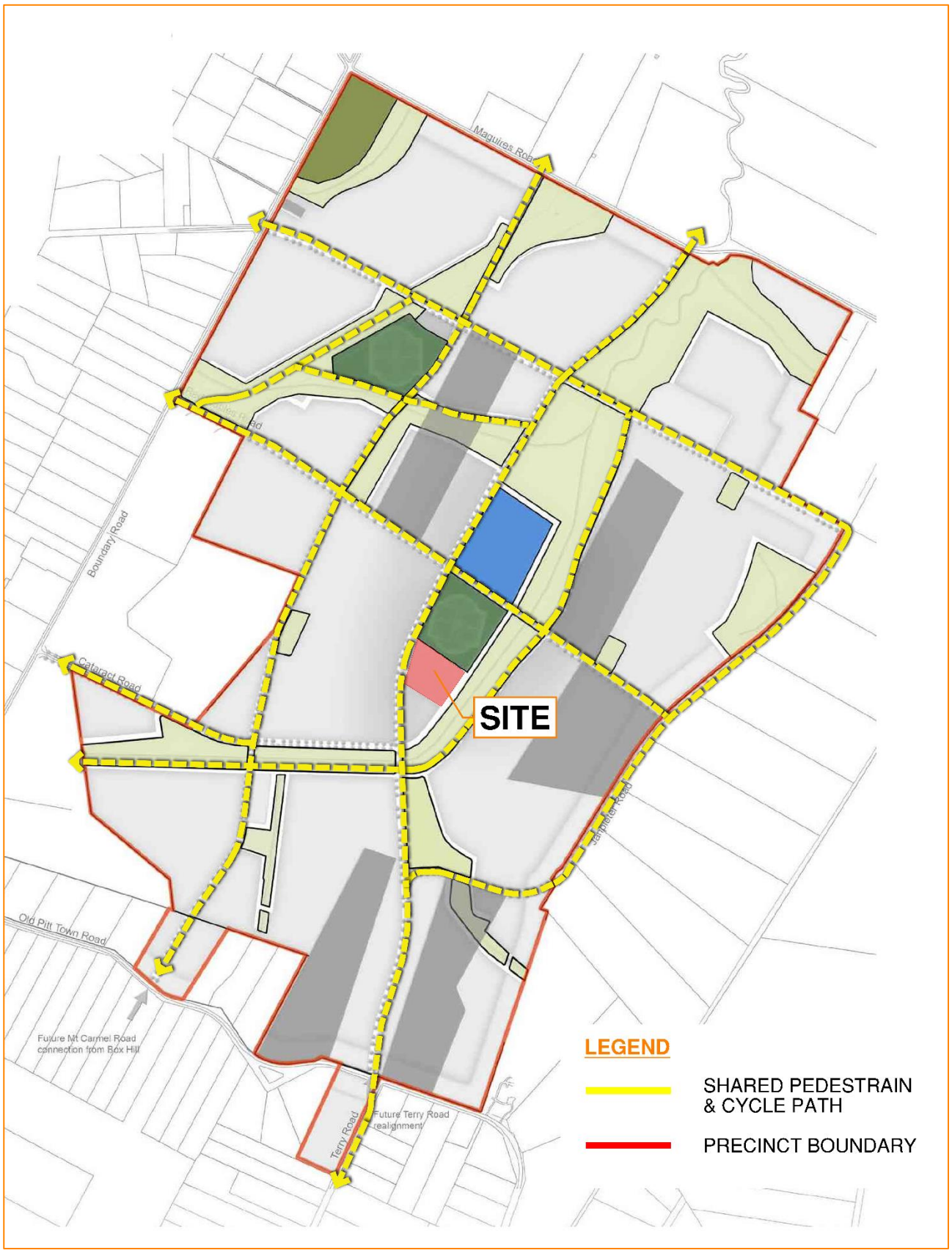


Figure 9: Proposed Cycling Infrastructure
Source: Modified from 1397/2015/JP – Gables Masterplan DA

2.5 Public Transport

2.5.1 Bus

Currently, the nearest bus stops are located 250 metres south-west of the site, at Cataract Road after Fontana Road. Bus services operating from these bus stops are operated by Interline. Table 10 summarise the bus routes and frequencies operated from these bus stops Figure 10 illustrates the location of the nearest bus stops and relevant bus routes in the vicinity of the site.

Table 10 Bus Services Nearby

Bus Services	Bus service	Frequency
643	Gables to Rouse Hill via Box Hill	Every 30 mins
741	Oakville to Riverstone via Maraylya & Box Hill	Weekday: Every 1 hour peak Every 30 mins off peak Weekend: Every 1 hour
2118	Santa Sophia College to Gables (Loop Service)	1 daily service
2688	Santa Sophia College to Rouse Hill Station	1 daily service
2690	Santa Sophia College to Clower Ave, Rouse Hill	1 daily service
2715	Santa Sophia College to Pitt Town	1 daily service
2716	Santa Sophia College to Cattai via Maraylya	1 daily service
2717	Santa Sophia College to Pitt Town Village Shops	1 daily service

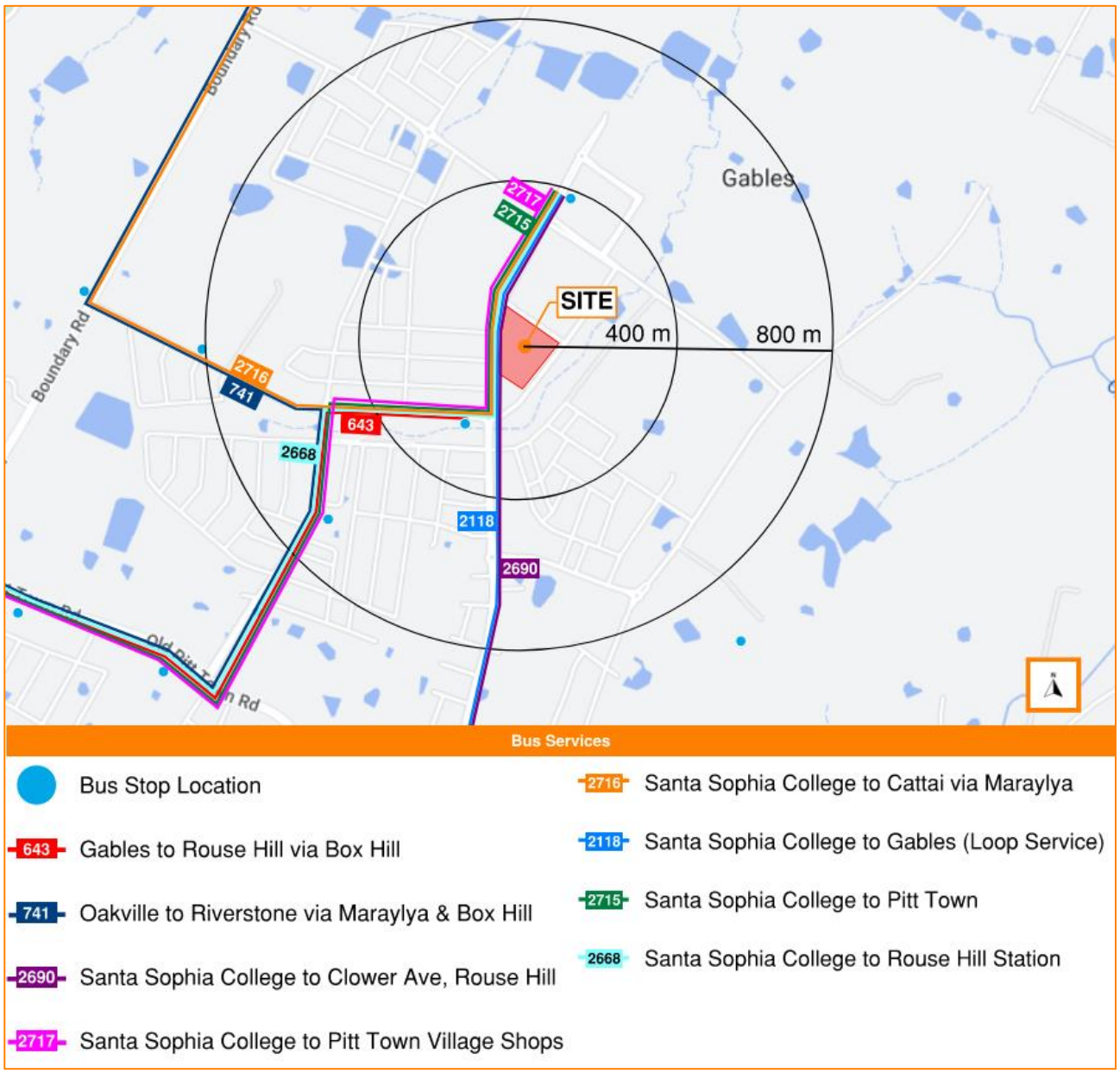


Figure 10 Local Bus Services
Source: Modified from Google Maps

2.5.2 Metro & Railway Services

As shown in Figure 11, the site is located 5.7 kilometres north-east of Vineyard Railway Station, 7.2 kilometres north of Rouse Hill Metro Station and 7.1 Kilometres north of Tallawong Metro Station. The site is situated well outside the walking catchment area, with the nearest station located 5.7 kilometres south-west of the site. With this in mind, there is expected to be limited reliance on the use of rail & metro services by students and staff, however these services may be used as part of a multi-modal journey to the site i.e. bus and train to the site.

Figure 11: Local Train Stations
Source: Modified from Google Maps

Rouse Hill and Tallawong Metro Stations are serviced by a single M1 metro line. Vineyard Railway Station is serviced by two (2) railway lines, being the T1 Western Line and T5 Richmond Line. Table 11 below shows the notable town centres that are accessible along the metro and railway lines and the average service headways during the peak and off-peak periods.

Table 11 Frequency of Train Services

Metro / Train line	Service	Frequency
T1	Western Line	Every 30 minutes
T5	Cumberland Line	Every 30 minutes
M1	Tallawong to Chatswood	Peak: Every 10 minutes Off peak: Every 4 minutes

Figure 12 illustrates Sydney Trains and Metro network map with the nearest station highlighted.

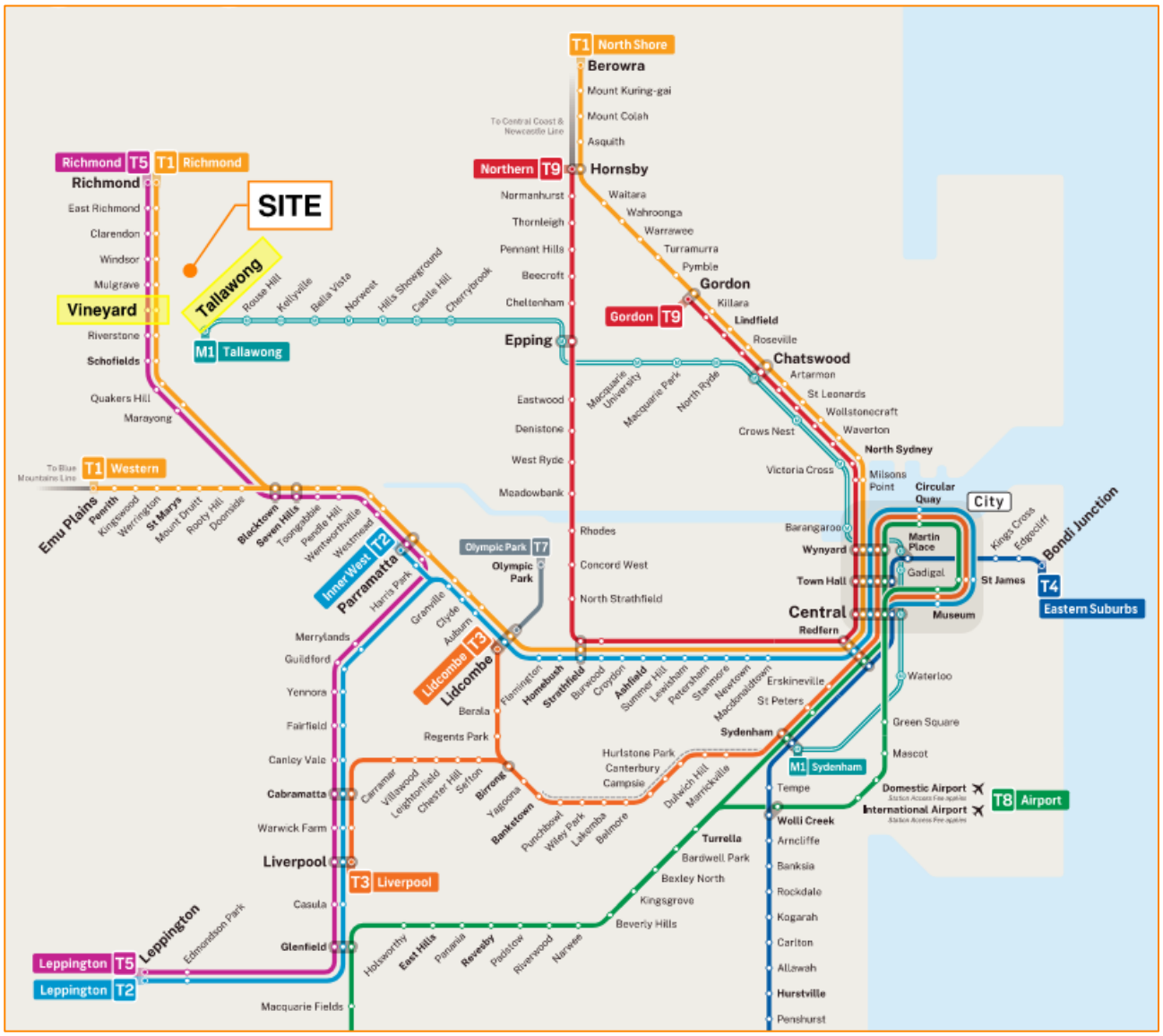


Figure 12 Sydney Trains Network Map
Source: Modified from TfNSW

2.6 Parking Facilities

2.6.1 On-Street Parking

Within the vicinity of the site, on-street car parking is generally unrestricted and available in the surrounding streets. Parking is restricted within the bus zones along Fontanna Drive and Cataract Road, and during school days near Santa Sophia school.

Figure 13 shows the current on-street parking restrictions within a 500m radius in the surrounding streets.

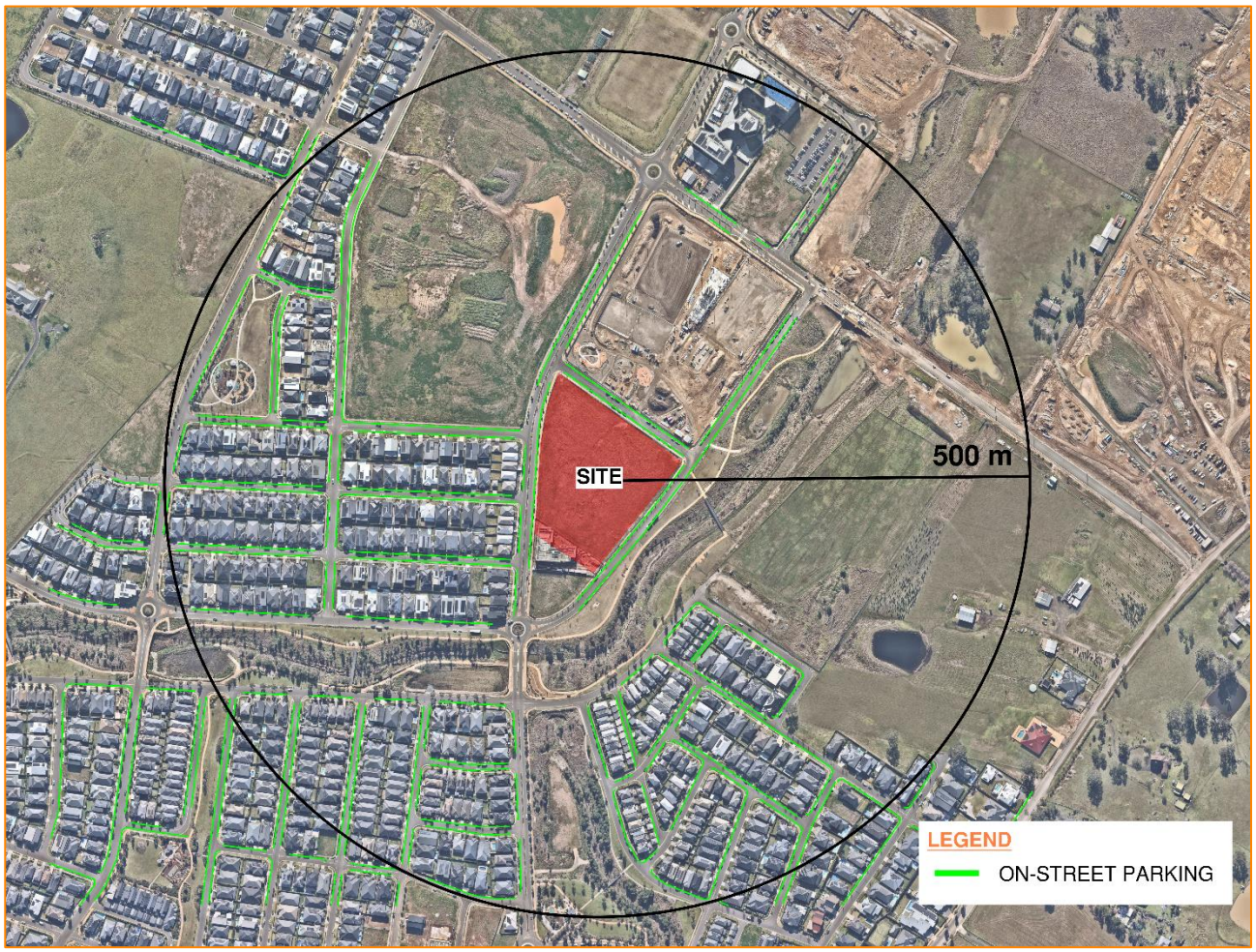


Figure 13: On-street Parking Restrictions
Source: Modified from Nearmap

2.7 Off-site Works by Developers

2.7.1 Ongoing Public Domain Works by Stockland

As previously mentioned, the Gables precinct was still under construction at the time of writing. To understand timing of infrastructure deliverables TTW held a meeting with the developer Stockland who are currently completing the majority of public domain works within the Gables precinct. A summary of the main information is provided below:

- The western section of Red Gables Road is anticipated to be completed by mid 2025.
- The northern portion of Fontana Drive is anticipated to be completed by late 2024.
- All subdivision works and public domain works are anticipated to be completed by 2030.

Figure 14 below identifies the current completed public domain works and the yet to be delivered works. It is noteworthy to mention, Stockland confirmed that incomplete public domain works are associated with undeveloped areas. The Stockland voluntary planning agreement (VPA) requires works including footpaths to be completed prior to subdivision taking place.

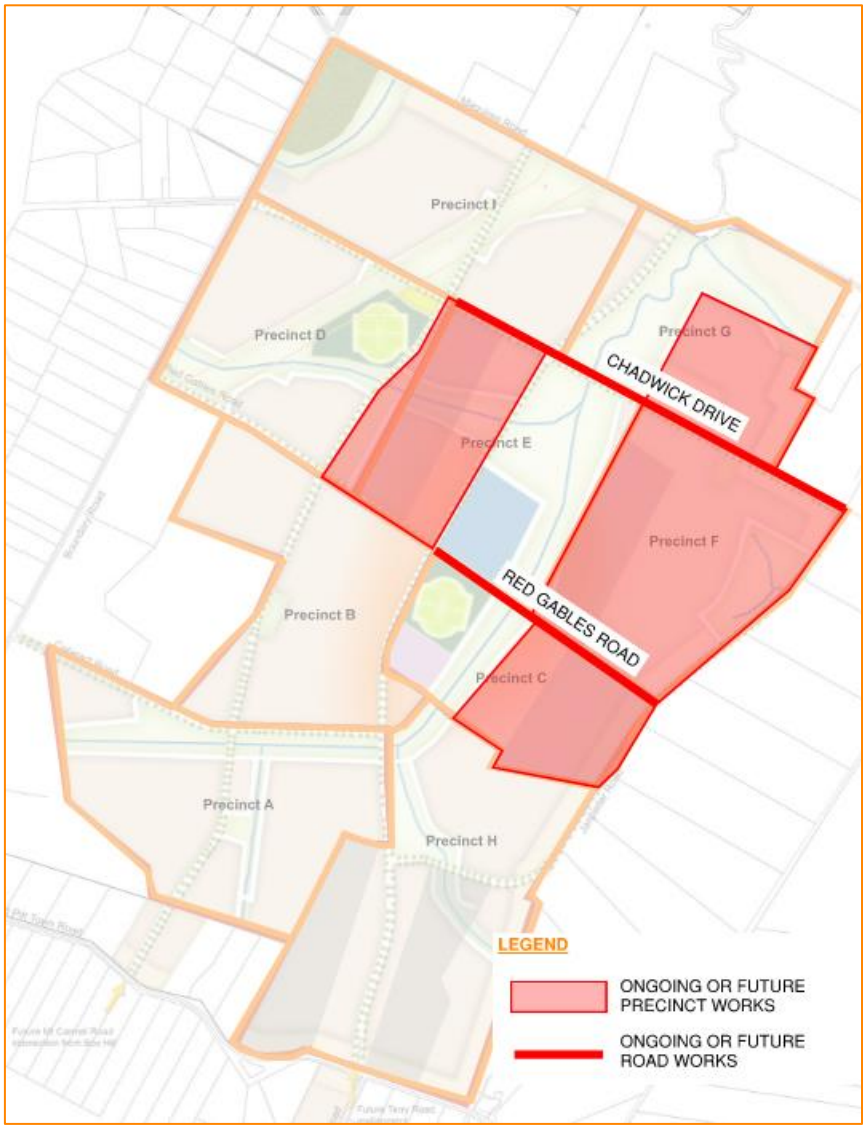


Figure 14: Ongoing Public Domain Works by Stockland

2.8 Traffic Conditions

2.8.1 Traffic Data Collection

To analyse the existing traffic conditions within the vicinity of the site, intersection movement counts were completed at various locations close to the site, as shown in Figure 15. The scope of intersection studies was reviewed and agreed with both Council and TfNSW. This data collection was undertaken on Tuesday 7 May 2024 between 7:00 – 10:00am and 2:00 – 6:00pm. The traffic counts included light vehicles, heavy vehicles, and buses. Traffic modelling has been undertaken for these intersections and includes:

- Red Gables Road & Fontana Drive
- Cataract Road & Fontana Drive

Figure 15: Scope of Traffic Data Collection
Source: Modified from Nearmap

2.8.2 Traffic Volumes

The two-way traffic volumes along Fontana Drive near the proposed school are summarised in Figure 16 and Figure 17, for the morning and afternoon survey periods, respectively. The existing morning peak period peak period was recorded as **7:15 to 8:15am (AM peak)** and the existing afternoon peak period was recorded as **2:00 to 3:00pm (PM peak).**

It is noteworthy to mention, we assumed the AM peak period would coincide with the Santa Sophia College morning bell time of 8:30am. However, the peak period was earlier than this. From our on-site observations the AM peak period occurred between 7:15 to 8:15am as there are a number of construction workers currently working on subdivision construction works as part of the Gables Precinct. These workers were driving to the on-site construction compound which is located directly north of Santa Sophia College. It is anticipated, that once the Gables Precinct is completed the AM peak period will coincide with the morning bell times. Nevertheless, to complete a conservative assessment the **7:15-8:15am peak** period has been used to conduct our traffic assessment. The PM peak period coincides just after the Santa Sophia College afternoon bell time.

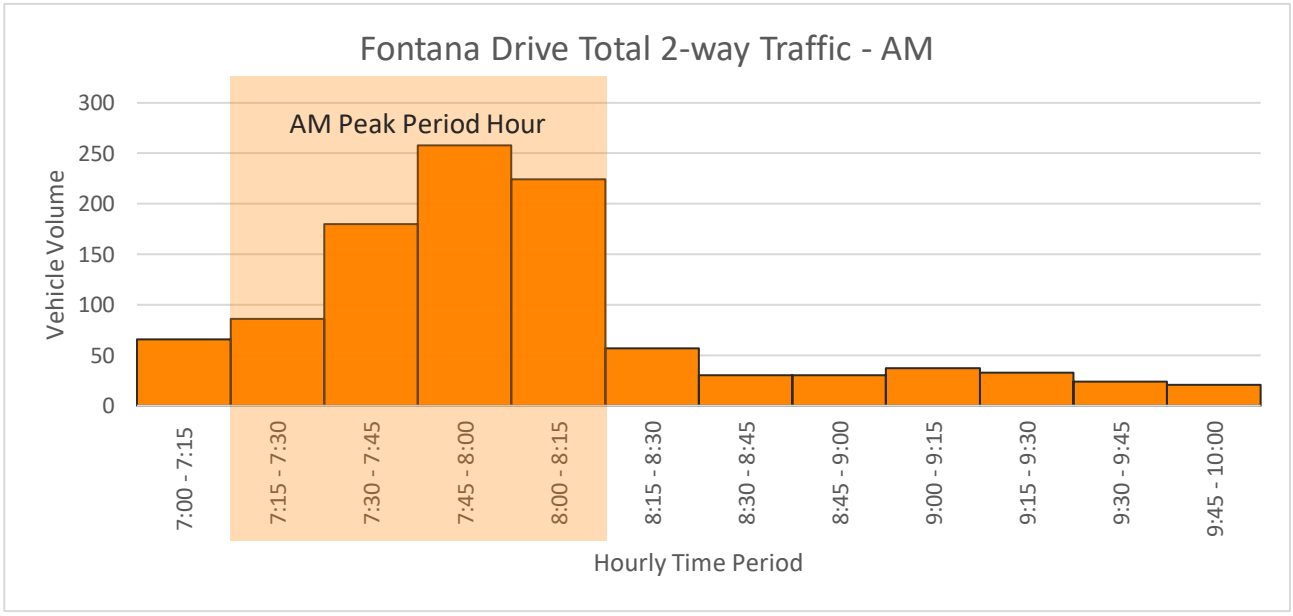


Figure 16: Existing AM Two-way Traffic Volumes on Fontana Drive

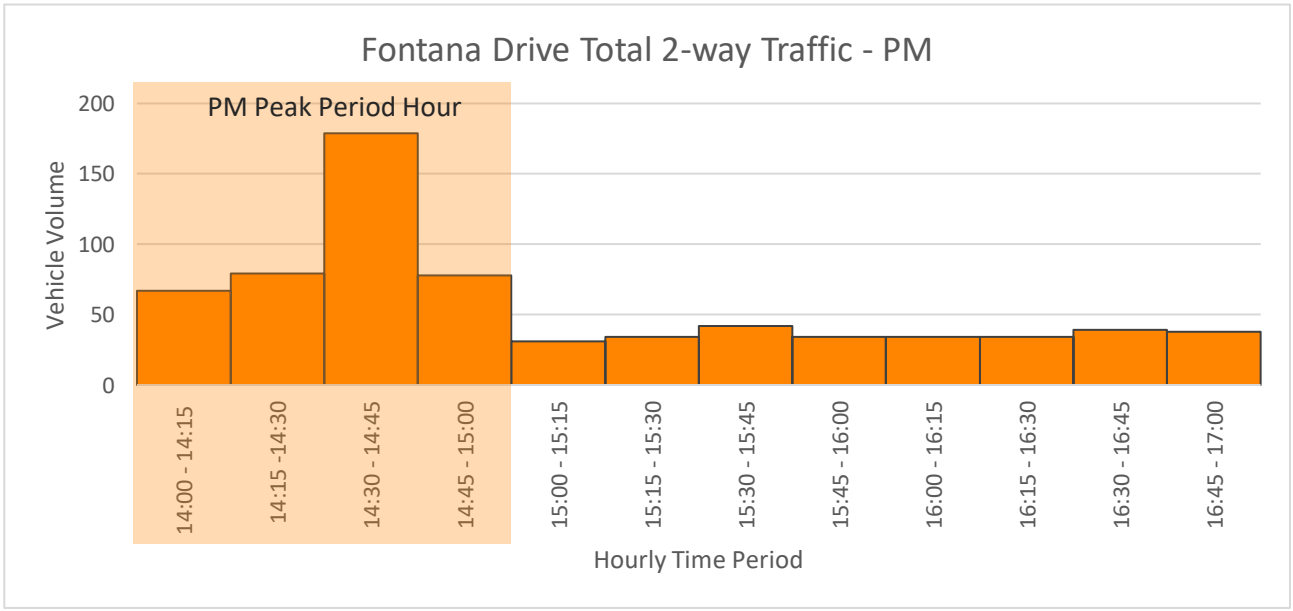


Figure 17: Existing PM Two-way Traffic on Fontana Drive

The full set of traffic volume data collected at each intersection is attached to Appendix A. Refer to Section 11 for a detailed summary of the traffic volumes adopted in the traffic modelling.

2.9 Travel Mode

2.9.1 Baseline School Travel Surveys

In order to understand the typical travel mode pattern and establish an expected baseline for travel behaviour at the proposed site (refer Section 4), consultation was completed with Council to determine a suitable school within close proximity which has similar characteristics. It was confirmed that Ironbark Ridge Public School would be a similar comparison given its similar characteristics of, school catchment boundary size, located predominantly in a residential area, proximity to public transport and, number of students. Both schools location are shown in Figure 18

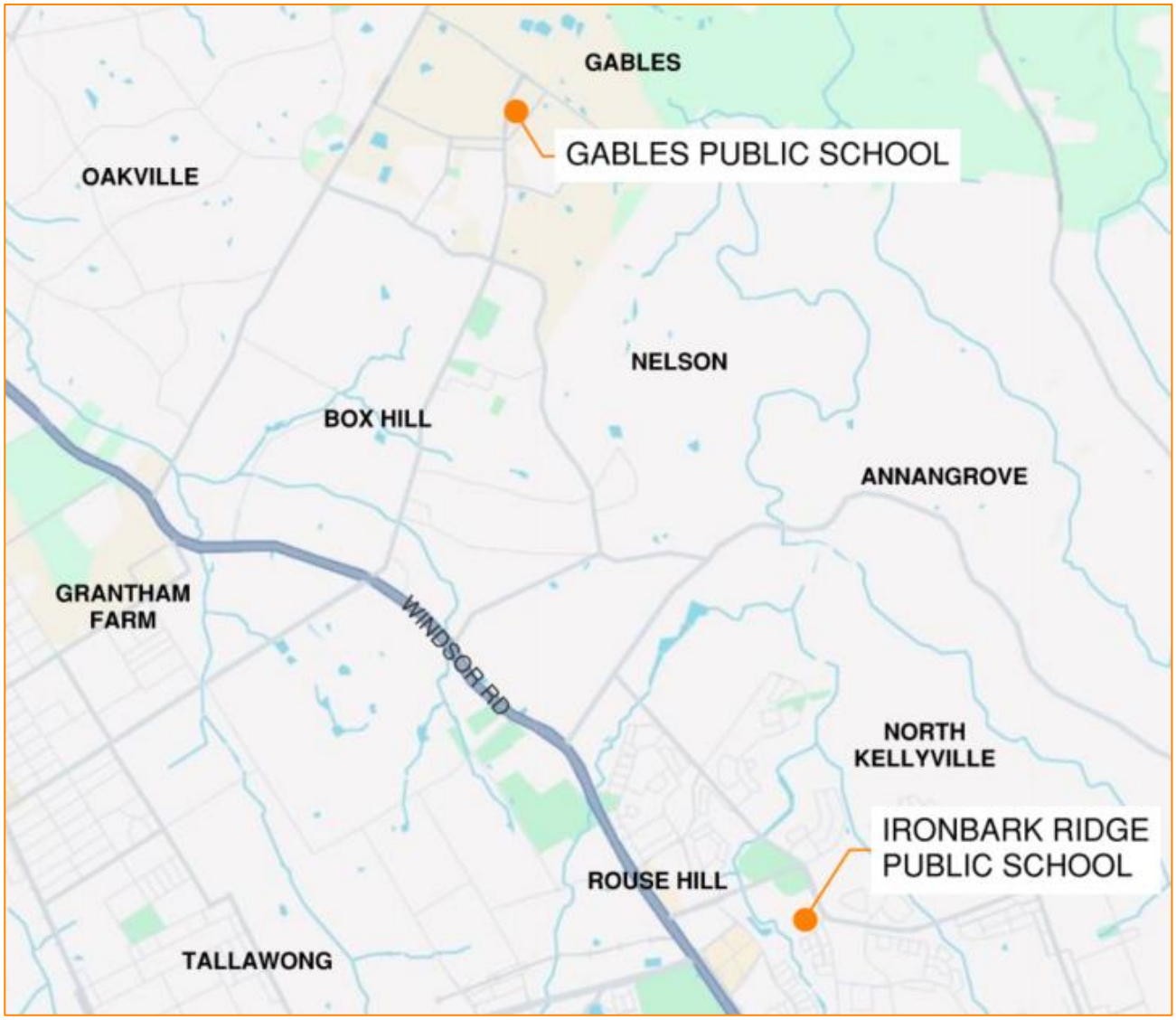


Figure 18: Gables PS and Ironbark Ridge PS Location
Source: Modified from Google maps

The travel mode survey was distributed online for staff of Ironbark Ridge Public School to complete. For students the data was collected by teachers in the form of a 'Hands Up Survey', teachers of each class were instructed to ask students to raise their hand and confirm how they travelled to / from school on a typical day, the results were recorded by teachers and uploaded onto the Survey Monkey online survey. The surveys were completed on 1st July 2024.

In summary, **574 student** responses and **37 staff** responses were obtained. The quantity and response rate are considered high enough to provide accurate summaries of travel behaviour to / from the school.

The splits for students and staff are shown in Table 12.

Table 12 Baseline School Mode Share Data

Travel Mode	Student				Staff			
	AM Vol.	AM %	PM Vol.	PM %	AM Vol.	AM	PM Vol.	PM
Walk	89	16%	125	22%	0	0%	0	0%
Skateboard/ Scooter	17	3%	18	3%	0	0%	0	0%
Train/Metro	3	1%	5	1%	0	0%	0	0%
Bike	19	3%	17	3%	0	0%	0	0%
Bus	60	10%	85	15%	0	0%	0	0%
Car	386	67%	323	56%	37	100%	37	100%
Total	**574**	**100%**	**573**	**100%**	**37**	**100%**	**37**	**100%**

As shown above in Table 12 currently 16% of students walk to school in the AM, while 10% of students typically travel to school via bus. 67% of students travel to school via car during the AM. Travel mode splits for the PM were relatively similar with more students walking and catching the bus home from school rather than traveling by car. Table 12 also shows, currently 100% of staff travel to and from Ironbark Ridge Primary school by car.

It is noteworthy to mention these travel mode splits are considered for comparison reasons only. It is anticipated give the proposed Gables primary school is a new school this is an opportunity to reduce private vehicle dependency and promote active and public transport modes for both students and staff.

2.9.2 Census Travel Data

For comparison, the 2021 Journey to Work (JTW) data[1] was also reviewed. The data provides an estimate of employee travel modes into and out of the local areas defined by Destination Zones (DZN) and Statistical Area Level 2 Zones (SA2).

As shown in Figure 19 the site is located within DZN 116230001. This area is predominantly residential, with a number of public and private schools and the Carmel View Village Shopping Centre, the main contributors to attract employment within the zone.

Method of Travel to Work (MTWP) data from the 2021 Australia Bureau of Statistics (ABS) Census provides an estimate of travel modes to and from the local area as defined by Statistical Area Level 2 (SA2) zones. The site is located within SA2 zone Box Hill as illustrated in Figure 19.

[1] *Bureau of Transport Statistics public dataset derived from 2021 Census Population and Housing*

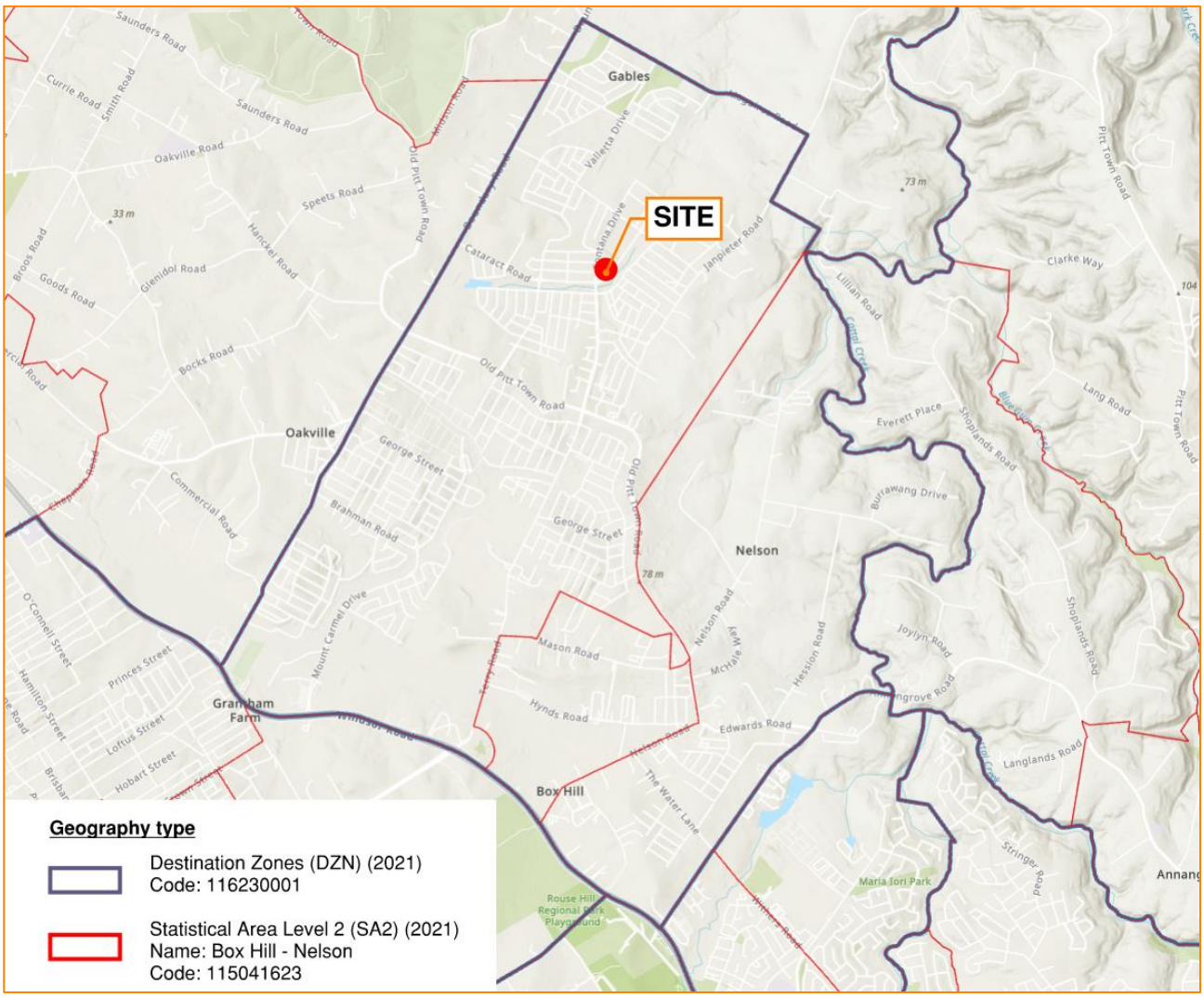


Figure 19 Statistical Area of Site
Source: Modified from ABS Maps

Responses for "worked at home", "did not go to work", and "mode not stated" have been excluded from this analysis. The census travel data is summarised in Table 13, for this SA2 zone as both a place of work (i.e., travelling from somewhere else to Box Hill) and as a place of residence (i.e.,travelling from Box Hill to somewhere else).

Table 13: Census Travel Data 2021

Travel Mode	Place of Work	Place of Residence
Train	2%	7%
Bus	0%	1%
Taxi	1%	0%
Car, as driver	82%	83%
Car, as passenger	4%	4%
Truck	7%	2%
Motorbike/scooter	1%	0%

Travel Mode	Place of Work	Place of Residence
Bicycle	0%	0%
Other Mode	2%	1%
Walked only	2%	0%
Total	**100%**	**100%**

The census 2021 travel data detailed in Table 13 identified that the majority of the population commute using their own personal car, which is the most popular mode of travel for both workers and residents. Public transport within the area was generally low.

It is important to acknowledge that since 2021 this area has experienced significant development and growth as part of the Box Hill and Gables masterplans. It is therefore considered as additional infrastructure is provided to facilitate the increase in population growth, travel mode trends will change and an uptake in active and public transport will become more popular.

2.10 Other Site Conditions and Observations

Observations of the existing site and the adjacent Santa Sophia Catholic College were undertaken during multiple morning and afternoon peak periods across May 2024, with the key findings noted as follows:

- No traffic or parking impacts were observed within the vicinity of the site (i.e. vehicles parked or queuing) as a result of the morning drop-off and afternoon pick-up at Santa Sophia College which is located approximately 300 metres north-east of the site. All traffic and parking was consolidated within 100 metres of Santa Sophia College.
- Santa Sophia College had minor impacts on the Fontana Drive / Red Gables Road intersection during both the AM and PM peaks, with a proximately a maximum of 4-6 vehicles queuing being observed.
- Santa Sophia College had minimal impact on the Fontana Drive / Cataract Road intersection during both the AM and PM peaks, with no queuing or adverse traffic impacts observed.
- Kiss and ride (K&R) activities occurred for approximately 15-10 minutes along the school frontages, particularly along the northern frontage. Traffic conditions in the vicinity return back to normal at around 2:50pm.

Section 3 Proposed Works

3.1 Description of Works

The proposed development comprises a new primary school on Fontana Drive, Gables. The new school will accommodate a maximum of 1,000 students and 68 staff, it will also include a pre-school, accommodating a maximum of 60 students and 6 staff. A detailed description of the proposal is as follows:

- Construction of school buildings, including learning hubs, a school hall and an administration and library building.
- Construction and operation of a public pre-school.
- Delivery of a sports court and fields.
- Construction of 51 car parking spaces (35 primary school spaces and 16 pre-school car spaces), on-site waste storage and loading area accommodating a 12.5 metre HRV vehicle.
- Two, separated vehicle accesses to primary school and pre-school via Cataract Road
- Associated site landscaping and open space improvements.
- Associated off-site infrastructure works to support the school, including (but not limited to) services, driveways and pedestrian crossings.

The following operational details are provided below:

- Construction is planned to commence mid 2025.
- Opening year, day 1 term 1, 2027 – expected enrolment 750 students and 50 staff.
- Full capacity – 1,000 students and 68 staff.

The overall proposed site plan is illustrated in Figure 20.

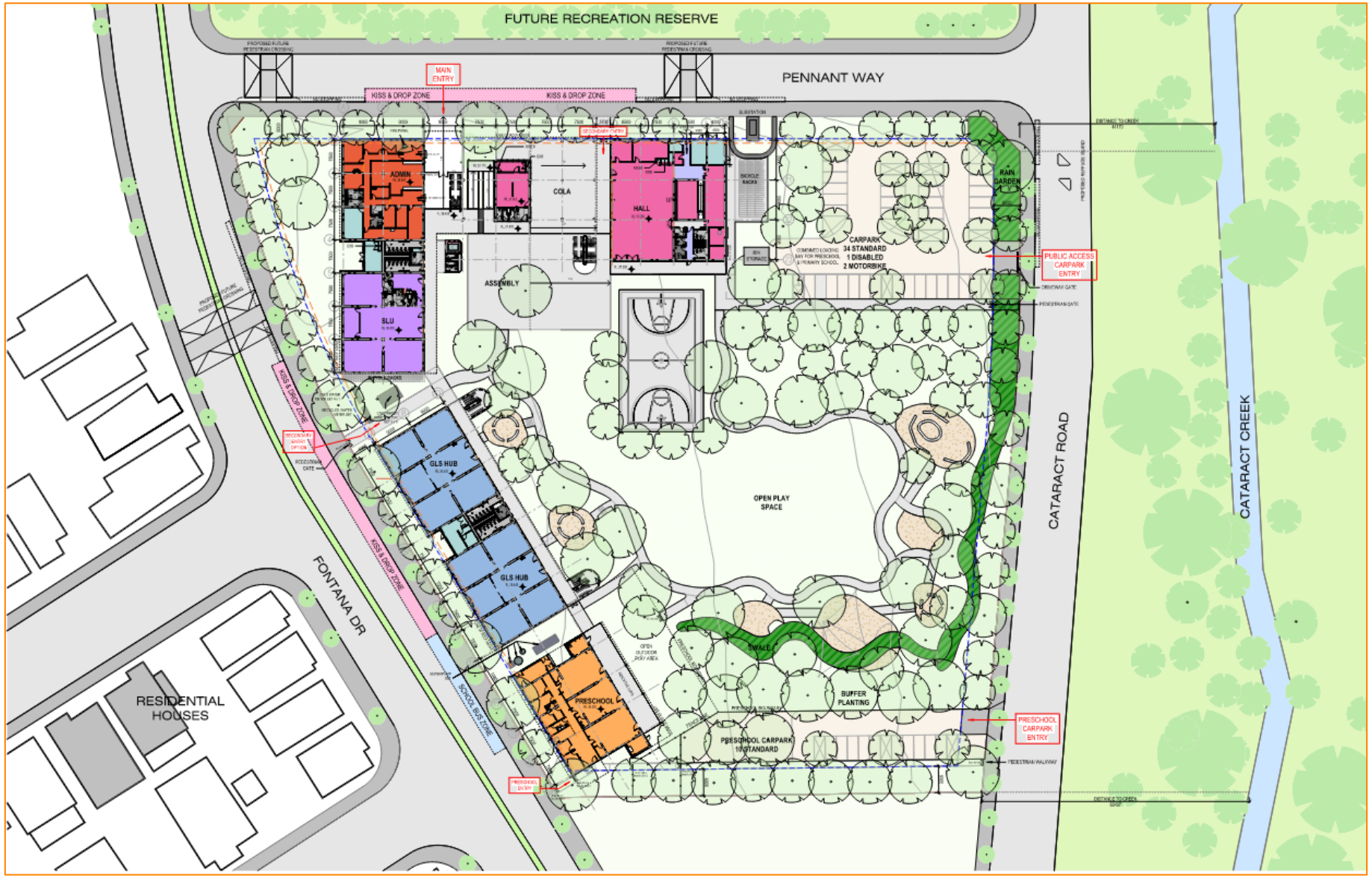


Figure 20: Proposed Site Plan

Source: architectus

3.2 On-Site Provisions

The proposed school will provide the following on-site provisions from a traffic and transport perspective:

- 2 pedestrian access points, via Fontana Drive and Pennant Way
- 100 student bicycle spaces & 4 staff bicycle spaces
- 2 shower / change room and of trip facilities for staff, including lockers
- 1 service vehicle bay accommodating a 12.5m HRV for both the primary school and pre-school
- 2 vehicle accesses via Cataract Road comprising of:
    - 8 metre combined entry/exit vehicle access providing access to the primary school
    - 6 metre combined entry/exit vehicle access providing access to the pre-school
- 35 primary school staff parking spaces, including 1 accessible car parking space
- 16 pre-school parking spaces, including 1 accessible car parking space:
    - 6 staff parking spaces
    - 10 parent PUDO spaces

3.3 Off-Site Works

Site Specific Public Domain Works Associated with the Proposed School

In order to encourage and prioritise active transport, the project provides external infrastructure improvements such as pedestrian crossings and a shared path facility along the frontage of the site, along with internal infrastructure including bicycle storage and end-of-trip facilities. The scope of these works has been developed through the TWG consultation. Details are provided below and illustrated in Figure 21.

- 4 wombat crossings located on Fontana Drive, Cataract Road and Pennant Way.
- 3 pedestrian refuges located on Cataract Road, Bunyarra Parade, and Travertine Grove.
- New 30 metre bus zone located along the eastern kerbside of Fontana Drive.
- 2 new 70 metre K&R zones along southern side of Pennant Way and eastern side of Fontana Drive.
- Footpath widening along southern side of Pennant Way and eastern side of Fontana Drive.

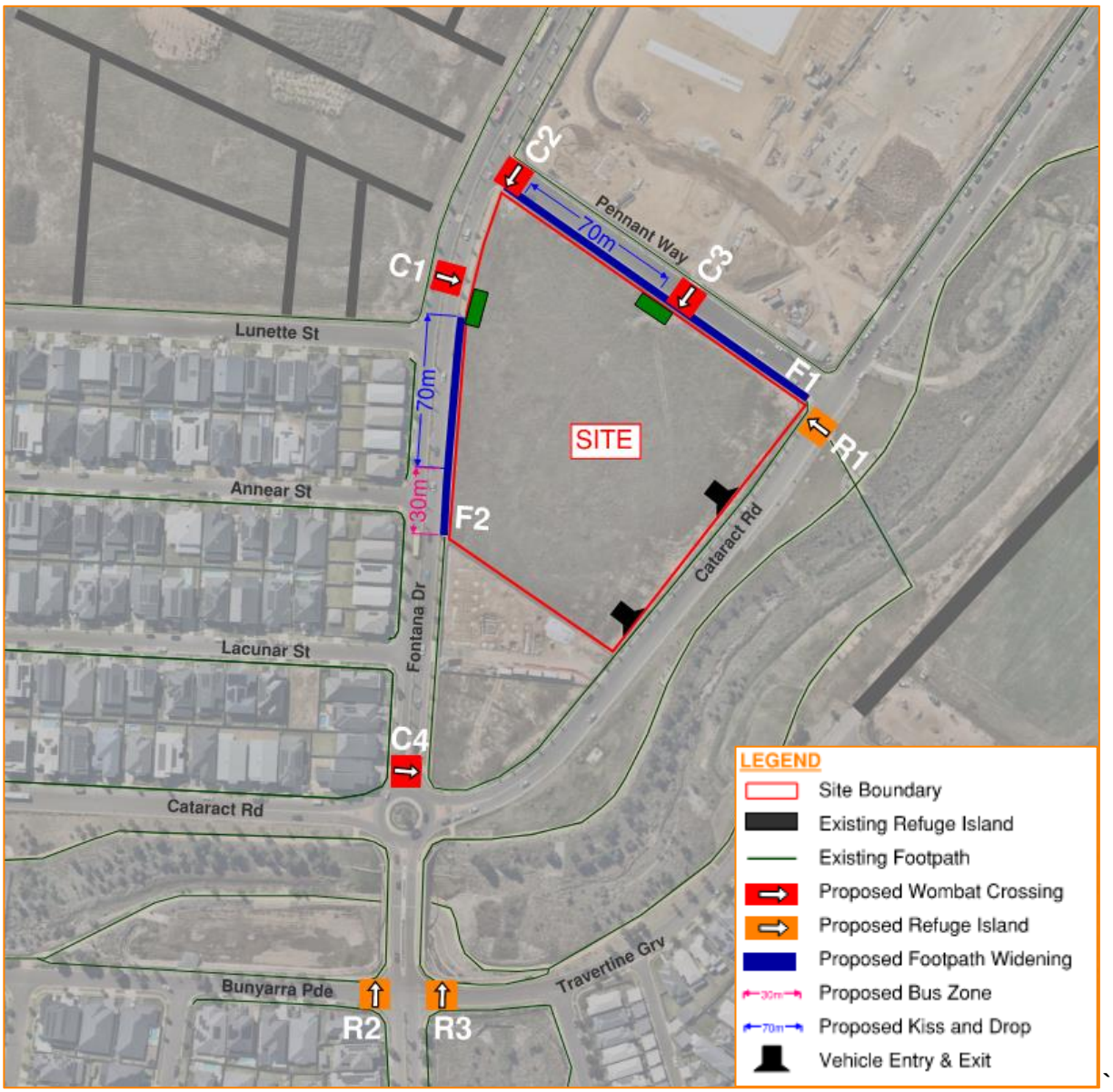


Figure 21: Proposed Public Domain Works
Source: Modified from Nearmap

Table 14: Proposed Public Domain Works

Item	Crossing Infrastructure	Type
C1	Fontana Drive (North)	Wombat Crossing
C2	Fontana Drive / Pennant Way Intersection	Wombat Crossing
C3	Pennant Way	Wombat Crossing
C4	Fontana Drive / Cataract Road Intersection (North Leg)	Wombat Crossing
R1	Cataract Road at proposed footbridge through riparian zone	Pedestrian Refuge
R2	Fontana Drive / Bunyarra Parade Intersection	Pedestrian Refuge
R3	Fontana Drive / Travertine Grove Intersection	Pedestrian Refuge
F1	Pennant Way	Footpath Widening
F2	Fontana Drive (along site boundary)	Footpath Widening

3.3.1 Fontana Drive Cross-Section

To the west of the site, Fontana Drive is proposed to contain a bus zone, K&R zone, shared path and travel lanes in each direction. To accommodate the bus and K&R zone the existing shared path along the eastern kerbside is proposed to be widened by 1.4 metres for 100 metres. This will ensure students alighting from vehicles will have convenient access to the footpath when entering and exiting a vehicle. This is illustrated below in Figure 22 and Figure 23. No other changes are proposed to the remaining sections of Fontana Drive

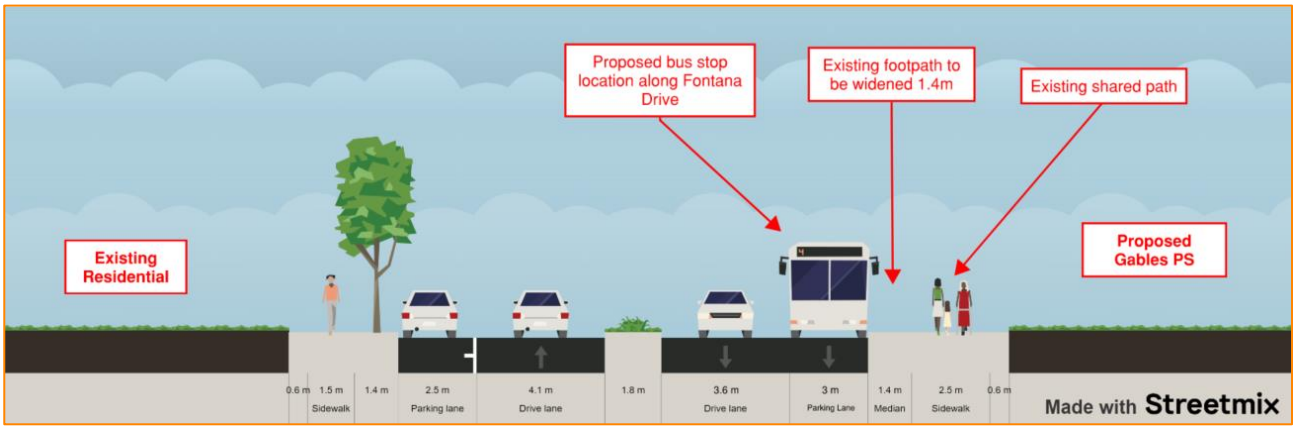


Figure 22: Proposed 30m Bus Zone Cross-section on Fontana Drive
Source: TTW Note: Figure is for diagrammatic purposes only.

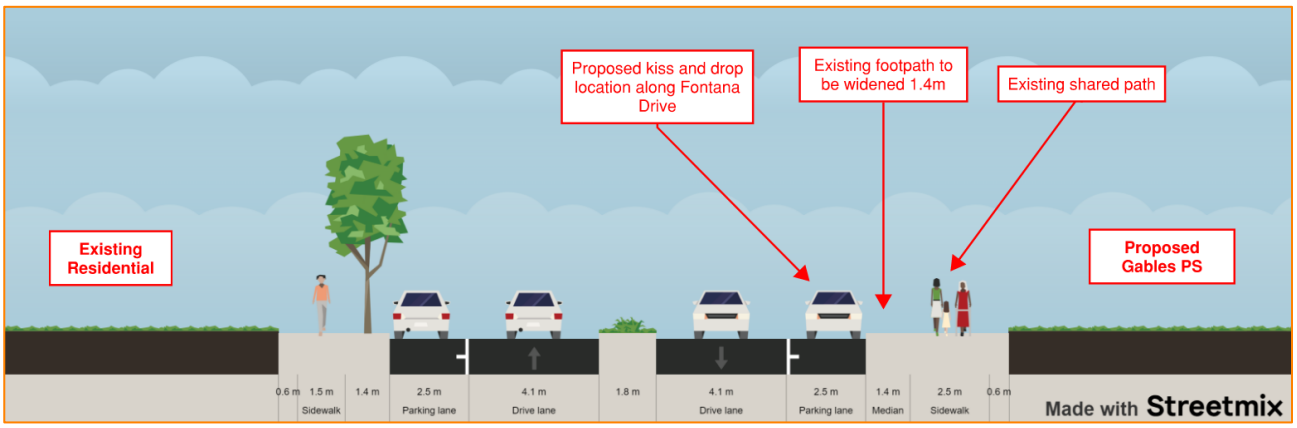


Figure 23: Proposed 70m K&R Cross-section on Fontana Drive

Source: TTW Note: Figure is for diagrammatic purposes only.

3.3.2 Pennant Way Cross-Section

To the north-east of the site, Pennant Way is proposed to contain a K&R zone, shared path and travel lanes in each direction. The existing footpath is proposed to be widened to 1.5 metres for 170 metres, this will enable this footpath to be converted to a shared path and allow students alighting from vehicles to have convenient access to the footpath when entering and exiting a vehicle. The existing trees will be contained within planter boxes to protect them.

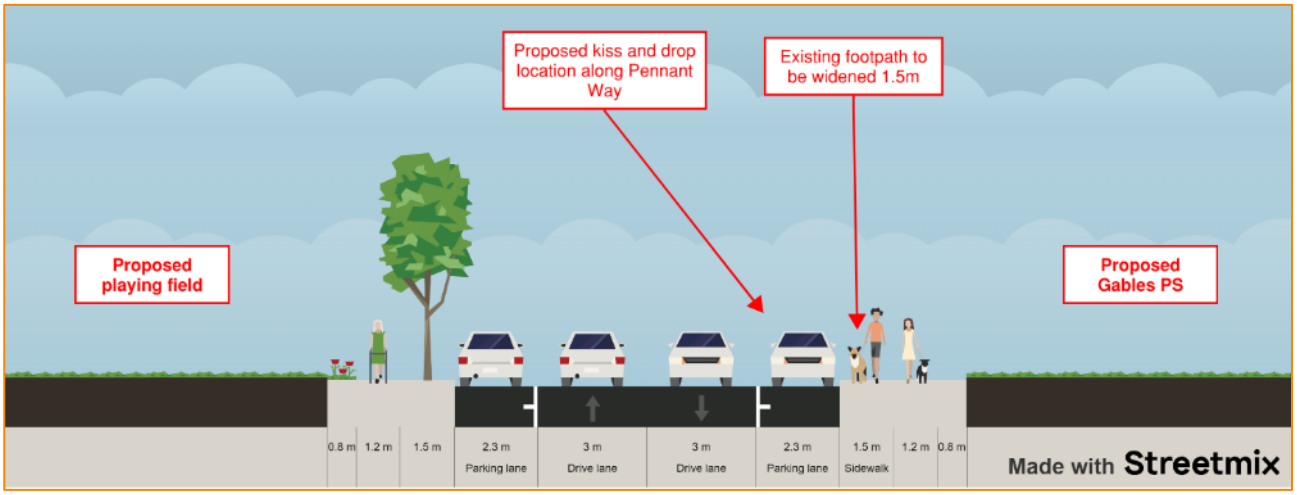


Figure 24: Proposed 170m Cross-section on Pennant Way

Source: TTW Note: Figure is for diagrammatic purposes only.

Section 4 Travel Demands

4.1 Transport Hierarchy

The transport strategy for the project is designed as a sustainable transport strategy, prioritising non-vehicle modes such as active transport (i.e. walking, cycling) and public transport, while discouraging private vehicle travel (including K&R and car parking). This hierarchy is indicatively illustrated in Figure 25.

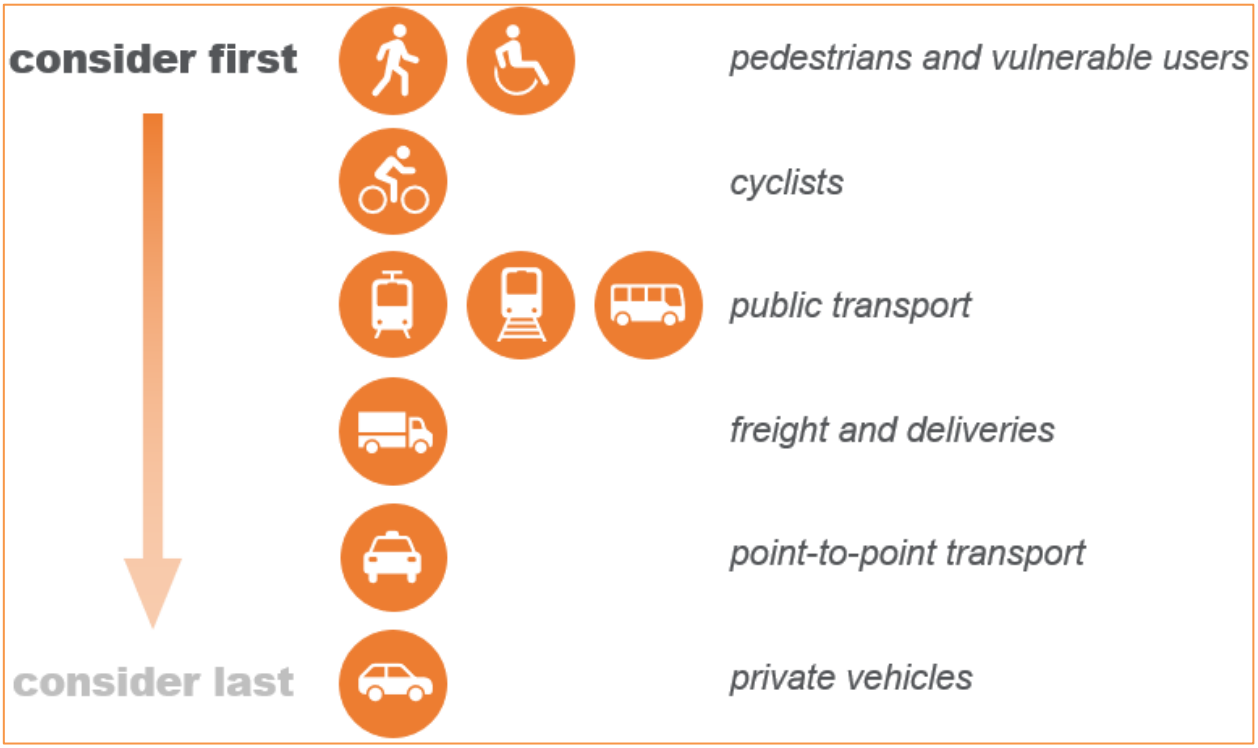


Figure 25: Sustainable Transport Hierarchy
Source: TfNSW

This strategy is consistent with NSW Government Policy, specifically the Road User Space Allocation Policy. This strategy is applied across all current SINSW projects and has been presented to Council and TfNSW through the TWG consultation stream.

4.2 Student Location Analysis

Typically to confirm where students currently live within the catchment SINSW will provide student location data within 5km radius of the site. This allows an assessment to be completed and determine where students live within the catchment, and therefore determine suitable travel modes to / from school.

However, as the Gables is a relatively new precinct with many undeveloped areas within the school catchment and within close proximity to the school, existing student location data does not capture students who will be living in the new precinct areas within the next few years. To complete a more accurate assessment of proposed student locations, TTW utilised NSW Land Zoning Map to estimate residential density within the catchment and locate students within the proposed catchment. The methodology is further detailed below:

- NSW Land Zoning Map was utilised to confirm residential density within the catchment area
- The land was separated into high, medium & low-density zones. Land zones identified as RU6 (transition zone) were not included in the analysis
- Residential densities per hectare were extracted from Table 5 of the *Box Hill Growth Centre DCP* and a dwelling per hectare was calculated for each of the zones shown in Figure 26.
    - It is acknowledged that the majority of the Gables New Primary School intake area sits outside the Box Hill Growth Centre, however for the purposes of approximate density and distribution calculations, this is still considered an appropriate method given the available information
- To determine student numbers within the catchment we distribute the maximum capacity of 1,000 students into each of these zones by applying a ratio based on the zone area and density.
- Students were evenly distributed within each of the below zones to get an understanding of where students would live and ultimately determine how they would travel to / from school.

The student distribution according to NSW Land Zoning Map is shown in Figure 26.

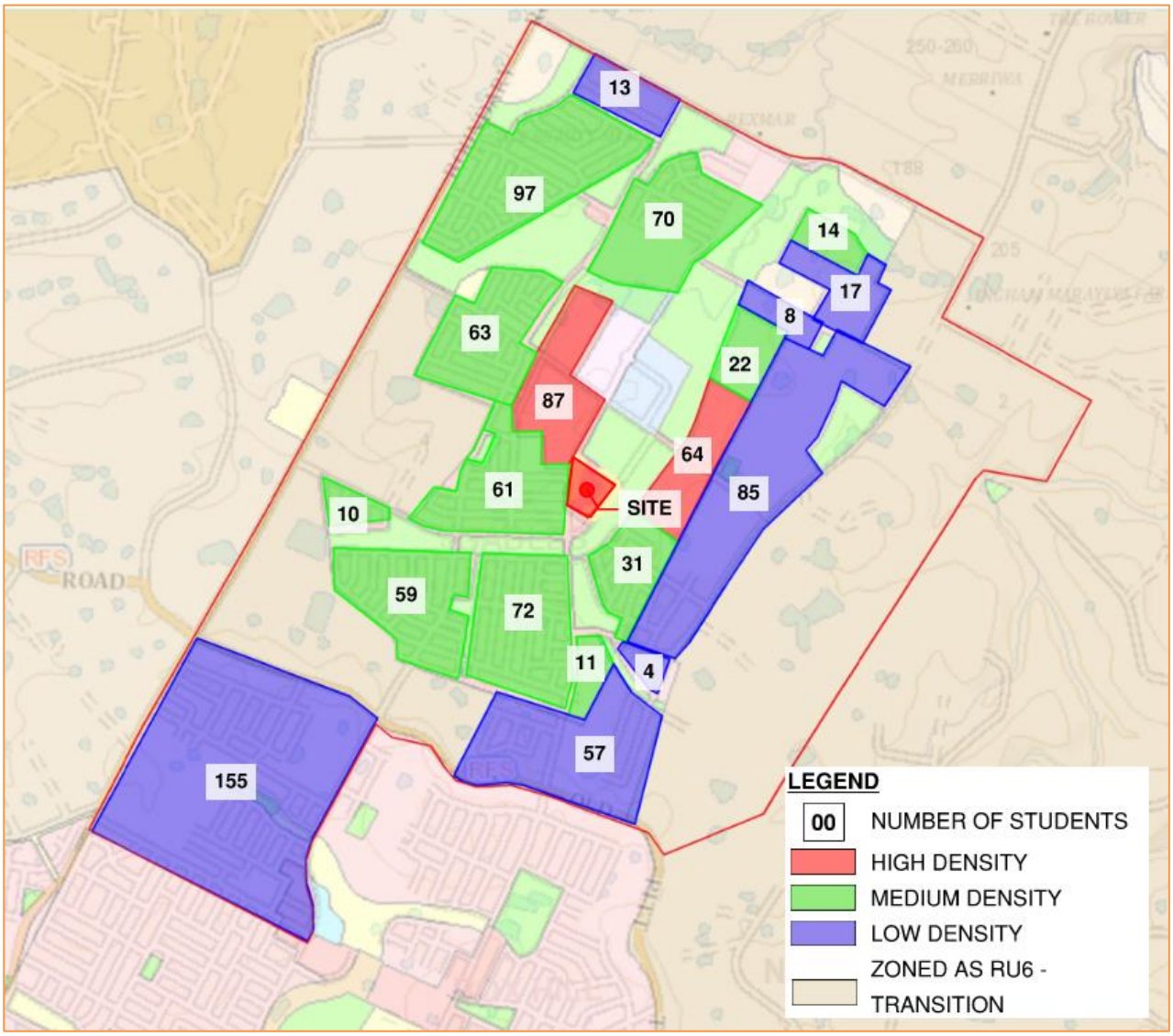


Figure 26: NSW Land Zoning Map Analysis

By incorporating the proposed road network on the Gables Indicative Layout Plan (ILP), the projected number of students, and the projected location of students, the analysis was able to estimate student's distance to / from the school, which can determine the relevant travel modes to / from the school. The distribution of estimated student's location is detailed in Table 15 and shown in Figure 27.

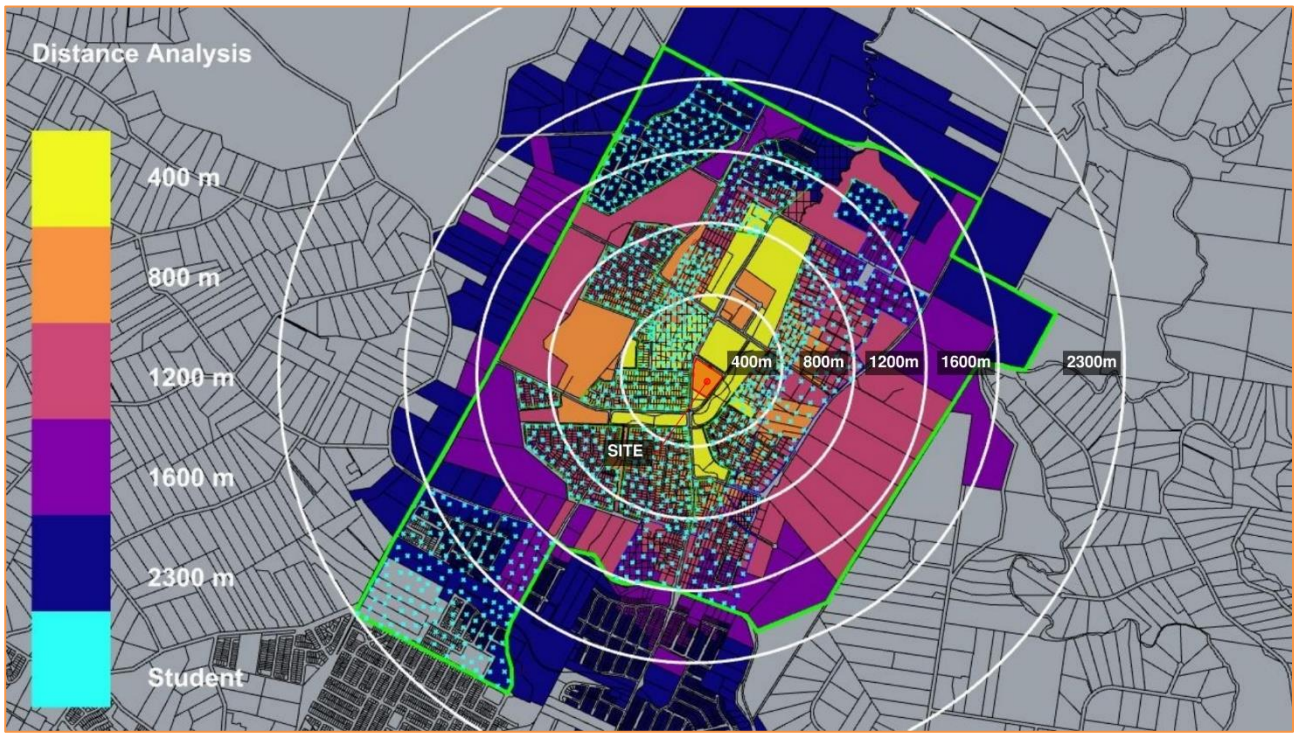


Figure 27: Walking and Radial Distances

Table 15: Student Location Distribution within the School Catchment

Distance	Actual Walking Distance		Notional (Straight Line) Distance	
	%	Students	%	Students
0 – 400m (5min walk)	7%	70	14%	140
400 – 800m (10min walk)	26%	260	31%	310
800 – 1200m (15min walk)	26%	260	25%	250
1200 - 1600m	10%	100	18%	180
1600 – 2300m	24%	240	11%	110
>2300m	7%	70	1%	10
Total	**100%**	**1,000**	**100%**	**1,000**

The key findings derived from this walking distance analysis include the following:

- Approximately 59% of students live within a 15-minute walk of the site.
- Approximately 41% of students are located outside a 15-minute walk of the site.
- 12% of students (more than 1.6km straight line distance) or 7% of students (more than 2.3km actual walking distance) are eligible for free public transport in accordance with the School Student Transport Scheme (SSTS)

- It is therefore anticipated, students living in the south-western parts of the precinct which are located more than 2,300m from the site will be likely to travel via bus or car.

4.3 Travel Scenarios

As detailed in Section 1.2, the proposal is for a school with a full capacity of 1,000 students and 68 staff. This will be reached gradually as the Gables precinct continues to develop. The projected travel mode splits for full capacity have been presented for two (2) different scenarios including **moderate** and **reach** mode splits, described in the following paragraphs.

The basis for the transport assessment presented in the remainder of this document will adopt a conservative approach that assesses the school at full capacity and considers either the moderate or reach mode share splits, whichever results in the largest travel demand (unless otherwise indicated).

4.3.1 Moderate Target Scenario

The moderate target scenario represents the expected travel demands developed based on a review of a benchmark school (Ironbark Ridge Public School), plus anticipated travel habits based on the proposed school catchment area, proposed student locations based on the student location analysis and the projects transport provision.

Refer to Section 2.9.1 which discusses existing travel habits at a benchmark school. A sample of existing travel habits include:

- 16% and 22% walking mode split in the morning and afternoon at Ironbark Ridge Public School.
- 3% bicycle usage in the morning and afternoon at Ironbark Ridge Public School.
- 10% and 15% bus usage in the morning and afternoon at Ironbark Ridge Public School
- 67% and 56% private vehicle usage in the morning and afternoon at Ironbark Ridge Public School

Site-specific considerations based on the student location analysis detailed in Section 4.2 for the transport provisions at the school and catchment area include:

- Based on our analysis it is anticipated approximately 59% of students will live within 0-1.2km of the school, which equates to a 15-minute walk.
- Based on our analysis it is anticipated approximately 10% of students will live within 1.2km-1.6km of the school, which equates to a 10-minute cycle.
- Pedestrian and cyclist infrastructure nearby the school site provides good connections within the local road network and to nearby residential areas. This includes shared paths and footpaths along a vast majority of roads.

The proposed on-site transport facility based on Section 3 include:

- The project proposes to provide 4 wombat crossings and 3 pedestrian refuges within the vicinity of the site. This will encourage and promote safe active transport travel for both students and staff to the school.
- Proposed on-site bike parking for students and staff as well as end-of-trip provisions for staff.
- Proposed bus infrastructure with capacity to service future bus routes to the school frontage.

Other relevant policies and considerations include:

- The school is a new campus, allowing students and staff to form new travel habits.

- Local staff recruitment considerations are currently under review by DoE.

4.3.2 Reach Target Scenario

Importantly, the project is seeking to use the opportunities presented by a new site to establish new targets for travel behaviour which differs from other existing schools. In transport planning terminology, this is the change from a 'predict and provide' methodology based on existing behaviours to a 'decide and provide' methodology to achieve a preferred future and vision. In order to avoid generating high levels of additional vehicular traffic through induced demand, transport provisions and capacity are specifically targeted and are supported with infrastructure and services across the full spectrum of transport options.

This strategic vision is also consistent with the recently released Future Transport Strategy, which in relation to schools, states that a specific priority action is to be implemented (which are "actions to be implemented as a priority, with the view to delivery outcomes in 1-5 years"):

> *"Partner with the Department of Education and key stakeholders to improve safe walking, cycling and public transport access to schools."*[i]

This priority action indicates that higher levels of walking, cycling, and public transport, and conversely lower levels of private vehicle travel, are of high importance to the success of local neighbourhoods, and that existing travel behaviours are expected to change as new facilities or services are implemented.

On these grounds, the target travel mode splits presented in the following tables are considered realistic and feasible. The target travel demands outlined Table 16 have been developed in light of this, with a greater emphasis on active and public transport, and seeking to minimise private vehicle usage for both students and staff as much as possible.

4.3.3 Proposed Travel Mode Splits

It is acknowledged that these target mode splits are ambitious and depart reasonably significantly from the benchmark school travel mode splits. However, as mentioned, the mode splits are considered achievable due to the considerations listed above, and the opportunity for the new school to establish new travel habits. Further to this, it is important to note that the targets are not expected to be achieved in the opening year of the school, but rather reached over time as the school grows.

Table 16: Mode Share Scenarios for Students

Travel mode	Students				Staff			
	Moderate Target		Reach Target		Moderate Target		Reach Target	
Walk	40%	400	50%	500	3%	2	5%	4
Bicycle	5%	50	10%	100	2%	1	5%	4
Bus	5%	50	10%	100	5%	4	10%	7
Train	0%	0	0%	0	0%	0	0%	0
Car (passenger)	50%	500	30%	300	15%	11	30%	22
Car (driver)	0%	0	0%	0	75%	56	50%	37
Total	**100%**	**1,000**	**100%**	**1,000**	**100%**	**74[1]**	**100%**	**74[1]**

[1]Staff numbers also include 6 proposed pre-school staff as it is anticipated staff travel habits will be relatively similar to the proposed primary school mode share splits.

[2]Given the limited information on pre-school student locations, a mode share target has not been developed and sole reliance on The Hills DCP parking requirements has been adopted.

Section 5 Pedestrians

5.1 Projected Demands

Future pedestrian volumes have been calculated in the proposed travel mode splits above in Section 4.3, and are summarised in Table 17 for reference.

Table 17: Summary of Pedestrian Travel Demands

Pedestrians	Moderate Target		Reach Target	
	Mode Split	Volume	Mode Split	Volume
Students	40%	400	50%	**500**
Primary School Staff	3%	2	5%	**3**
Pre-school Staff		1		**1**

The assessment projected that largest travel demand occurs as the most conservative scenario. As **underlined** in Table 17, this scenario would be the students and staff numbers with the reach mode split applied. The analysis of the projected demand is detailed in Section 5.3 and supported with the proposed facilities shown in Section 5.2.

5.2 Pedestrian Analysis

5.2.1 Estimated Student Pedestrian Volumes

To understand the most utilised paths of travel to the school a shortest trip assessment was completed based on the student location analysis data. As shown below in Figure 28 a total of 52% of students will utilise Fontana Drive as the main pathway to the school. These pedestrians are mainly from travel from the south and the west of the precinct. It is also shown that 48% of students will utilise Pennant Way as their access to the proposed school. The analysis shown that 21% travel to / from the north and northwest of the precinct, 17% travel to / from the northeast, and 10% travel to / from the east of the precinct.

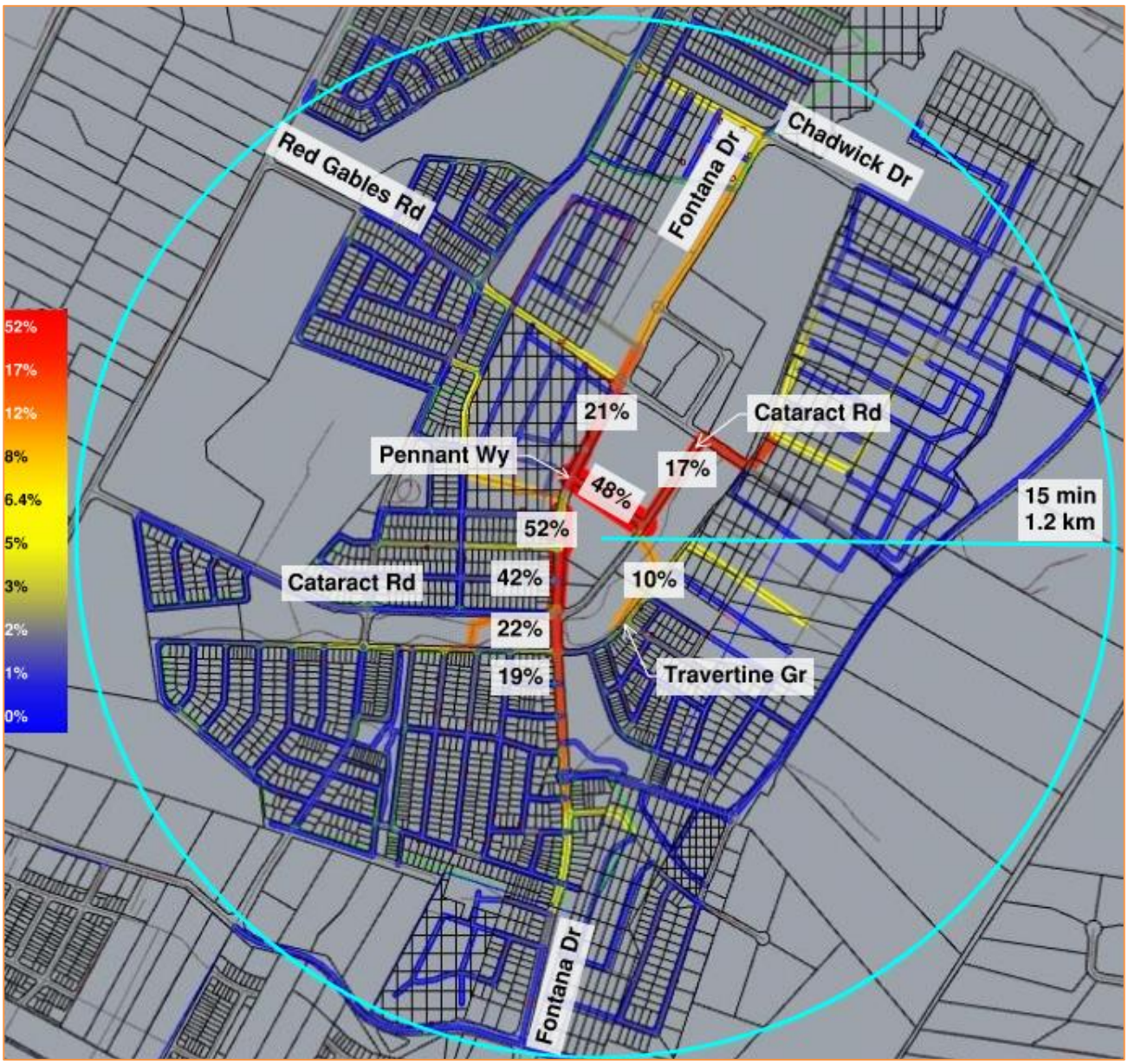


Figure 28: Pedestrian Inbound Trip Distribution

The above percentage splits are then applied to the number of students that live within a 15-minute walk of the site. As per the student location data, it was estimated that 590 students of the maximum 1,000 students will live within a 15-minute walk of the school. These numbers have informed the locations of the proposed pedestrian crossings and refuges.

Figure 29 below applied the above percentages to the actual number of students who have the potential to walk to school.

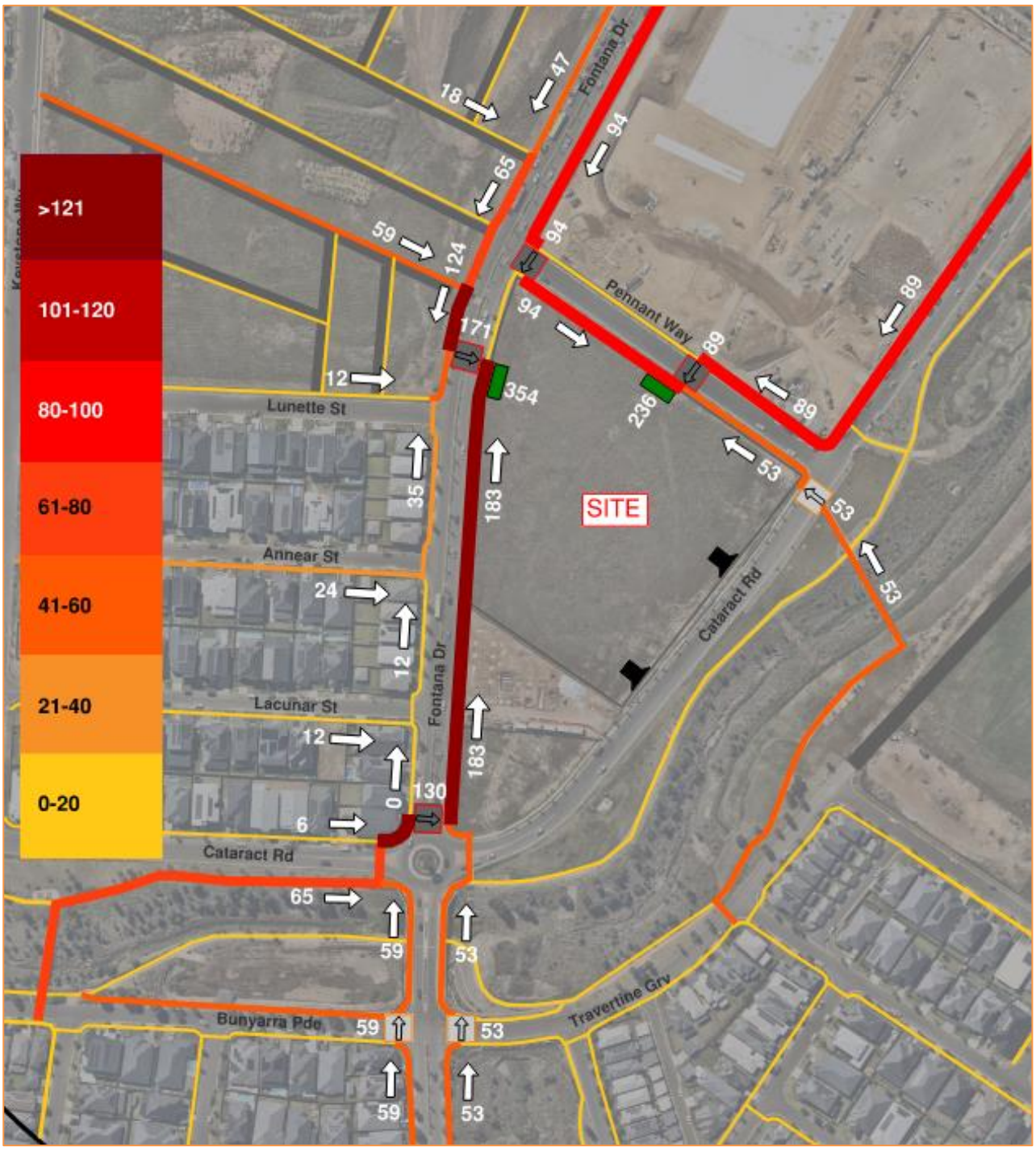


Figure 29: Footpath Utilisation Near the Vicinity of The Proposed School

Based on the student walking analysis above, the maximum student reach trip generation is summarised below:

- Approximately 170 students will utilise the proposed raised crossing at the site access, along Fontana Drive to walk to / from the school.
- It is estimated that 130 students will utilise the northern leg of the Fontana Drive / Cataract Road intersection to walk to / from the school.
- Approximately 80 to 95 students will utilise each of the proposed wombat crossing along Pennant Way respectively.

- It is estimated that approximately 50 to 60 students will utilise the proposed pedestrian refuge at the western and eastern leg of Bunyarra Parade and Travertine Grove.
- Approximately 50 students will utilise the pedestrian refuge crossing along Cataract Road to / from the eastern footpath.

Note, the above is a conservative assessment and has only considered walking travel mode habits, it does not account for students that travel to / from school by other travel modes, i.e. private vehicle and utilise a crossing to access the site. The assessment also does not include proposed students for the pre-school, it is anticipated that some pre-school students & parents will walk to the site, however their proposed locations have not been determined as part of this assessment.

5.2.2 Pedestrian Crossing Warrants

Pedestrian Crossing Guideline

In relation to pedestrian volume demands at the proposed raised crossings, the *Pedestrian Crossing Guideline* issued by TfNSW (TS 00043, dated 13 September 2022) notes:

> *Local governments may choose to use TfNSW's warrants outlined in the Supplement to Australian Standard AS 1742.10-2009. However, the threshold of combined pedestrian and vehicle volumes required by the TfNSW warrants may be difficult to achieve on local or subarterial roads.*
>
> *As an alternate to the TfNSW warrants, councils may use the following pedestrian demand calculation:*
>
> - *In each of two separate one-hour periods in a typical day, the pedestrian flow per hour (P) crossing the road is, or is expected to be, equal to or greater than 20.*
> - *Children and elderly or mobility impaired pedestrians count as two pedestrians.*

As shown in section above, the expected trip generation at each of the proposed pedestrian crossings would substantially exceed (by an order of magnitude) the 20 pedestrians per hour threshold, particularly once applying the doubled volumes for children. The proposed crossing locations and quantities are therefore deemed suitable.

Supplement to AS 1742.10-2009

The forecast pedestrian volumes have also been assessed against the TfNSW warrants for completeness. The Supplement to AS 1742.10-2009 (Version 3.1) notes:

> *Transport practice for numerical warrants for Pedestrian (Zebra) Crossings on arterial roads are:*
>
> *i. Normal Warrant:*
> *A pedestrian (Zebra) Crossing is warranted where:*
> *In each of three separate one hour periods in a typical day*
> *a) The pedestrian flow per hour (P) crossing the road is greater than or equal to 30 AND*
> *b) The vehicular flow per hour (V) through the site is greater than or equal to 500 AND*
> *c) The product PV is greater than or equal to 60,000*
>
> *ii. Reduced Warrant for sites used predominantly by children and by aged or impaired pedestrians:*
> *If the crossing is used predominately by school children, is not suitable site for a Children's Crossing and in two counts of one hour duration immediately before and after school hours:*
> *a) P ≥ 30 AND*
> *b) V ≥ 200*
> *a pedestrian (Zebra) Crossing may be installed.*

The forecast pedestrian demands at wombat crossings and pedestrian refuge crossing as shown in Section 5.3 are at least 50 pedestrians per peak hour (not including accompanying parents, cyclists, or students getting dropped off outside the designated K&R areas). This would also substantially exceed the TfNSW warrant requirements of 30 pedestrians per hour. Vehicular flow may be below the warrants (500 vehicles per hour) in some locations on the surrounding local roads but would be exceeded on Fontana Drive. The site would qualify for reduced warrants due to the crossings being predominantly used by children. In this case, the pedestrian volumes would similarly exceed the warrant requirements of 30 pedestrians per hour, and the vehicle volumes are also greater than or equal to 200.

It should be noted that, historically, numerical warrants for pedestrian zebra crossings have been defined in the Transport for NSW Supplement to Australian Standard AS1742.10-2009, Manual of Uniform Traffic Control Devices – Part 10: Pedestrian control and protection. The most recent version of this document (Version 3.1, dated 16 March 2021) supersedes the previous version (3.0), and in particular this latest version clarifies that TfNSW's numerical warrants only apply to arterial roads. Local roads are therefore not considered in this document and should be assessed by local councils on their own basis.

5.3 Proposal

The scope of proposed pedestrian provisions including site access points, footpath works and crossing facilities are illustrated in Figure 30.

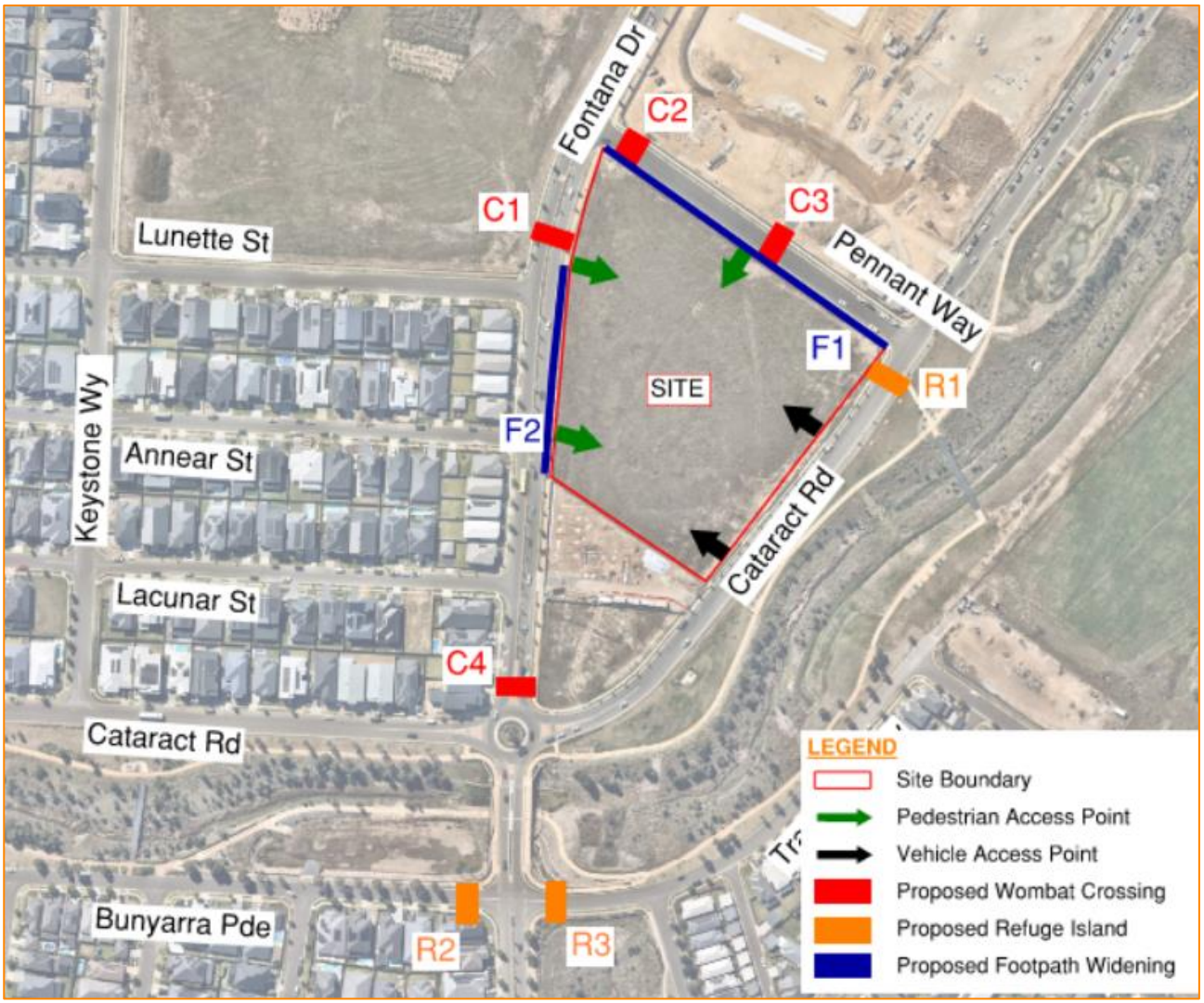


Figure 30: Proposed Pedestrian Facilities

5.3.1 Pedestrian Site Access

The proposed primary school will have its main pedestrian access points on the northern site frontage on Pennant Way. The proposal also includes secondary access points located at the northern and western side of the school at Pennant Way and Fontana Drive, respectively.

The proposed pre-school will also include a main pedestrian access to the pre-school through Fontana Drive.

5.3.2 Footpaths

Pennant Way

As shown in Figure 30, the existing footpath along the southern side of Pennant Way is proposed to be widened to 2.5 metres along the entire site frontage. This will accommodate pedestrian activity to the main primary school pedestrian entry and also provide a shared path connection with Fontana Drive to the west and the shared path to the east of Cataract Road. The proposed footpath widening will also facilitate student K&R activity within the dedicated K&R area along Pennant Way.

Fontana Drive

As shown in Figure 30, the existing footpath along the eastern side of Fontana Drive is proposed to be widened to 3.5 metres along the proposed bus zone area and K&R area. This will accommodate student bus and K&R activity within the dedicated areas along Fontana Drive.

5.3.3 Crossings

As shown in Figure 30, the proposal includes four (4) new raised pedestrian crossings including two along Pennant Way site frontage and two along Fontana Drive. The proposed pedestrian access along Pennant Way will provide pedestrian access to the northern part of the precinct. Whereas the proposed pedestrian crossing along Fontana Drive will provide a safe access for students coming from the western and southern side of the precinct. The proposed works will also include three (3) pedestrian refuge crossing including one along Cataract Road and at the eastern and western leg of Travertine Grove/ Fontana Drive/ Bunyarra Parade Intersection. These upgrades will provide access to students located at the eastern and southern part of the catchment, respectively.

Section 6 Cyclists

6.1 Demands

Future cyclist volumes have been calculated in the proposed travel mode splits within Section 4.3, and are summarised in Table 18 for reference.

Table 18: Summary of cyclist travel demands

Cyclists	Moderate Target		Reach Target	
	Mode Split	Volume	Mode Split	Volume
Students	5%	50	10%	**100**
Staff	2%	1	5%	**4**

The assessment projected that largest travel demand occurs as the most conservative scenario. As **underlined** in Table 18, this scenario would be the students and staff numbers with reach mode split applied. The analysis of the projected demand is detailed in Section 6.2 and supported with the proposed facilities shown in Section 6.2.

6.2 Analysis

6.2.1 Bicycle Facilities

The number of bicycle parking spaces has been assessed with regards to The Hills DCP Part C Section 1 Table 3 with rates detailed below in Table 19.

Table 19: Bicycle Requirement Based on The Hills DCP

Cyclist	Volume	DCP Bicycle Rates	DCP Requirements	Parking Provision
Students	300[1]	1 space per 5 pupils over Year 4	60	100
Staff	68	-	0	6
Total			**60**	**106**

[1]*Of the total 1,000 students, approx. 300 students assumed to be over year 4*

As shown above in Table 19, the Hills DCP requires approximately 60 student bicycle parking spaces and nil staff bicycle parking spaces. The proposed site will provide a total of 106 bicycle parking spaces, comprising 100 student bicycle spaces and 6 staff bicycle spaces.

Based on Section 4.2, it is expected that there are approximately 100 students or equivalent to 10% of the capacity that will live 1.2 to 1.6km to the school. This indicates that approximately 10% of students (or, approximately 100 students) would cycle to school. As the project intention to promote more sustainable travel to the school, the project has considered 10% bicycle parking for both staff and students to be suitable. Therefore, the proposed number of bicycle parking spaces for students is adequate to support the expected demand.

6.2.2 Staff Facilities

As detailed above, the proposal includes provision for approximately 6 staff bicycle parking spaces, 2 showers, 2 changerooms, and 9 lockers. The Hills DCP does not provide any EOTF rates for school. Hence, The *Green Star Building Guidelines* has been referenced and rate is shown below for a staffing body of 68:

- 2 showers (unisex)
- 2 changerooms (unisex)
- 1 locker must be provided every eight building occupants or staff

This reference resulted in 2 showers, 2 changerooms, and 9 lockers staff as a minimum requirement for an educational establishment. which the project has successfully met. Additionally, the forecast travel demands indicate approximately 5% of staff (or, 4 staff members) will cycle to site. Therefore, the proposed number of end-of-trip facilities for staff are adequate to support the expected demand and allows for an increase in cycling mode share into the future.

6.2.3 Design

Student and staff bicycle parking has been designed for convenience to be near the main site access points. Bicycle storage shall be designed in accordance with AS2890.3.

6.3 Proposal

6.3.1 Student and Staff Cyclist Facilities

The proposal includes bicycle storage with capacity for 100 bicycles for students and 6 bicycle for staff. The pre-school students will not be provided any bike parking since the bicycle usage is considered low and able to be accommodated with the primary school bicycle parking. The location of the bicycle parking is shown in orange circle in Figure 31.

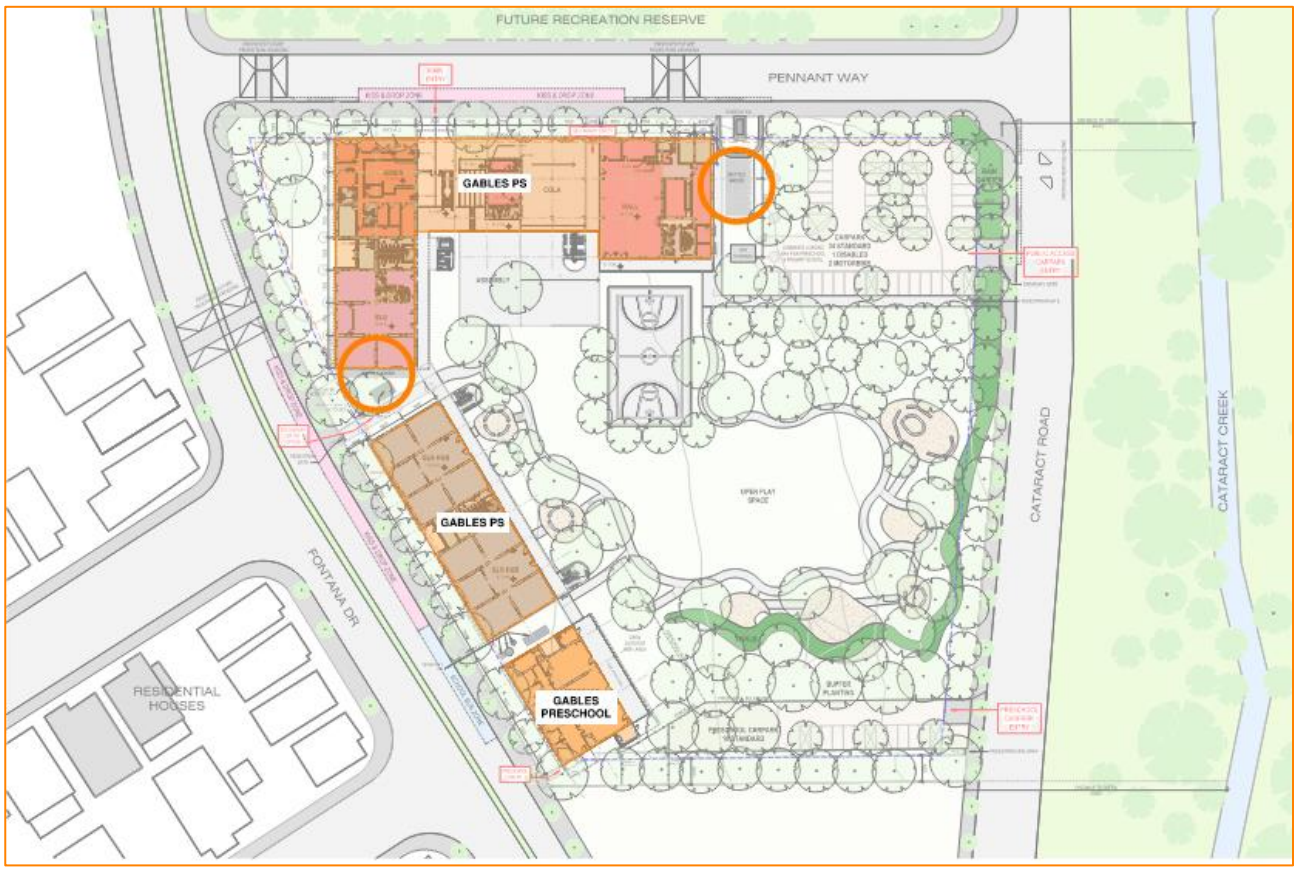


Figure 31: Proposed Student Bicycle Parking Locations

Source: Modified from architectus

6.3.2 Staff EOT Facilities

The proposed end-of-trip and changing rooms facilities for staff will be provided near the hall and main building of the school, as shown in Figure 31.

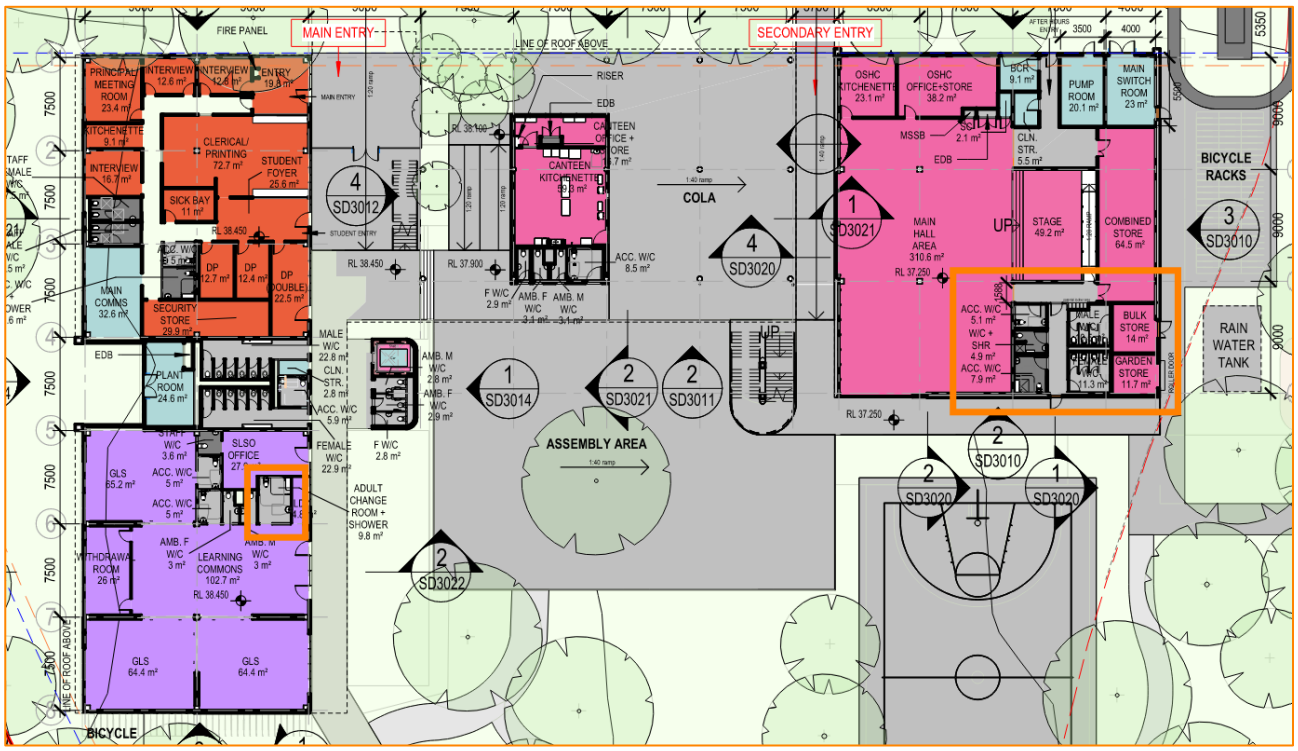


Figure 32: End-of-Trip Facilities for Staff

Source: Modified from Architectus

Section 7 Public Transport

7.1 Demands

Future bus volumes have been calculated in the proposed travel mode splits within Section 4.3, and are summarised in Table 20 for reference.

Table 20: Summary of Bus Travel Demands

Bus users	Moderate Target		Reach Target	
	Mode Split	Volume	Mode Split	Volume
Students	5%	50	10%	**100**
Staff	5%	4	10%	**7**

The assessment projected that largest travel demand occurs as the most conservative scenario. As **underlined** in Table 20, this scenario would be the students and staff numbers with reach mode split applied. The analysis of the projected demand is detailed in Section 7.2 and supported with the proposed facilities shown in Section 7.2.

7.2 Analysis

7.2.1 Bus

As part of the project to improve the public transport mode to the school and to accommodate the forecasted demand, one of the bus services (643 service) is proposed to be altered to provide bus services from the southern part of the school catchment to the school. SINSW is currently consulting with TfNSW to alter the existing bus service to the school. These discussions are currently still ongoing.

To accommodate public and school bus services, the proposal includes the provision of a 30-metre bus zone, to the west of the site, along the eastern kerbside of Fontana Drive.

As detailed above, the target demand for bus services is approximately 100 students once the school reaches full capacity. At 50 students per full bus, this would be equivalent to filling 2 buses in each of the morning and afternoon travel periods.

It is anticipated that students and staff travelling to the site by bus would do so on a mixture of general public route services and dedicated school services, subject to future operations to be determined by TfNSW. Buses may be shared by members of the public and/or other schools. Therefore, the demand for 2 full buses would likely be spread across more buses.

The proposed bus zone provides the provision of 1 bus at any one time and is considered compliant in accordance with the NSW Bus Infrastructure Guide, noting a standard 12.5 metre bus can be accommodated, along with a minimum 11.5 metre draw-in length and 6.0 metre draw-out length, totalling 30 metres.

Assuming a timetabled separation of services by 5-10 minutes, this could be cleared within approximately 10 to 15 minutes in the afternoon (when bus service demand is often highest) and would likely be more spread during the morning.

7.2.2 Metro/Train

It is unlikely that many students will utilise travel by train due to the size of the school catchment area which does not span across any train stations.

As shown in Section 2.5.2, the closest train station is located approximately 6km to the proposed school and the closest metro station is location approximately 7km to the proposed school. It is expected that travel by

train may be used by some out of area students, as well as a portion of staff who typically travel further distances than students. The proximity of Vineyard Train Station and Rouse Hill Metro Station to the school means that travel by train is an accessible option, with frequent services available throughout the day.

7.3 Proposal

The proposed works include the provision of bus zones on the eastern side of Fontana Drive at the frontage of the school as shown in Figure 33.

The bus zone is 30m in length and 3m in width, as per *Bus Infrastructure Guidelines*. The bus zones will typically accommodate 1 bus at any one time.

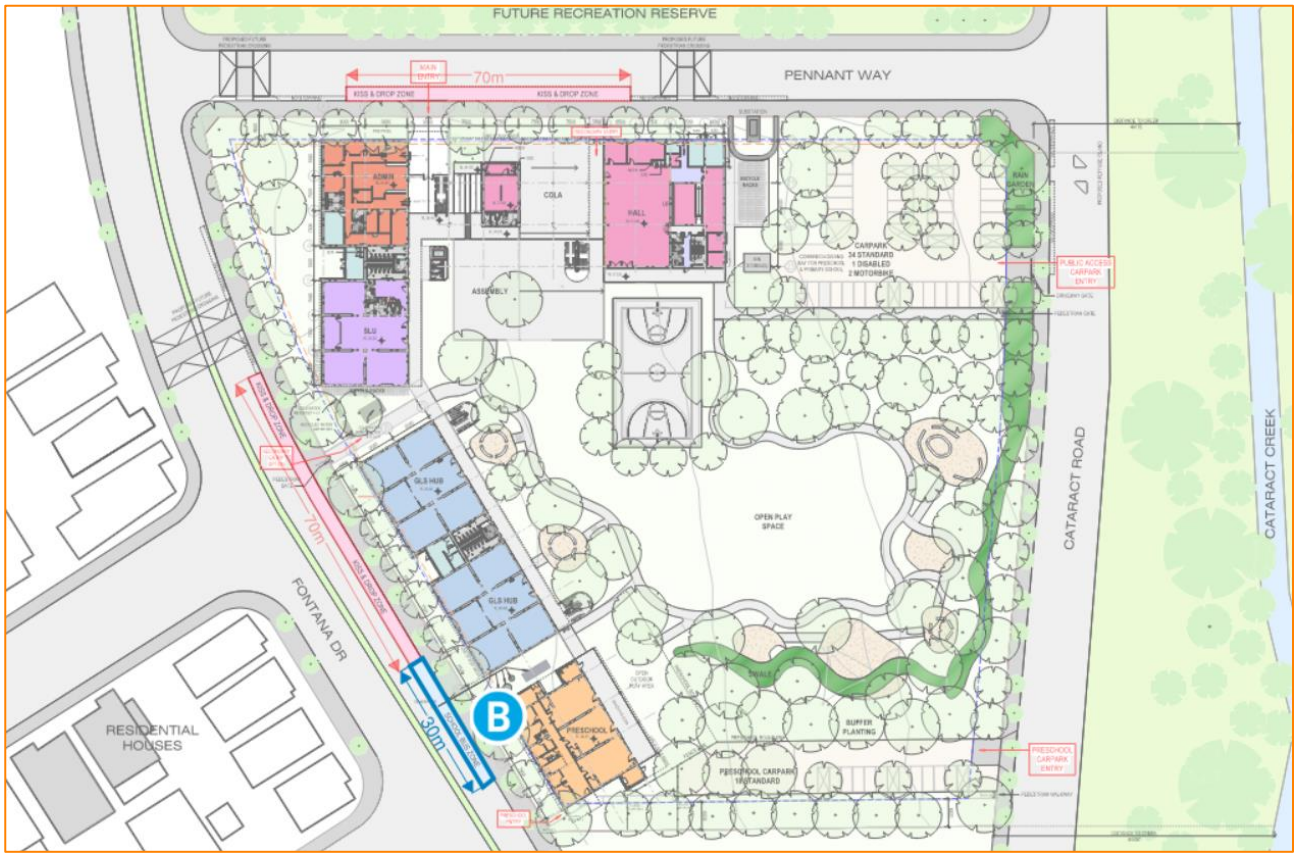


Figure 33: Proposed Bus Zones
Source: Modified from Architectus

Section 8 Loading and Servicing

8.1 Analysis

Neither The Hill Shire DCP nor the Box Hill Growth Precinct DCP stipulate a service vehicle parking rate for education establishment.

Nevertheless, the proposed development provides an on-site shared loading area for both the primary school and pre-school. The loading area will accommodate a total of one (1) service vehicle up to and including a 12.5 metre HRV, including provisions for the swept paths of these vehicles. It is anticipated that the site would be serviced maximum once daily, with waste collection occurring 3 times weekly.

This level of provision is considered acceptable noting that the development would generate a minimal demand for service vehicles, with a low number of deliveries expected per day. The proposed service vehicle and waste collection arrangements are therefore considered acceptable and ensure all vehicles will enter and exit the site in a forward direction. Swept path analysis for the loading dock and service vehicle area is provided in Appendix B, with an extract shown in Figure 34.

Figure 34: Swept Path of Proposed Loading Area

Service vehicle facilities shall be designed in accordance with AS2890.2.

8.2 Proposal

The primary school and the pre-school will utilise a single loading area located within the staff primary school car park. The loading area for service vehicles and waste collection is located at the east of the site. The loading area is designed to sufficiently manoeuvre a 12.5m HRV. Figure 35 shows the proposed design for the loading dock.

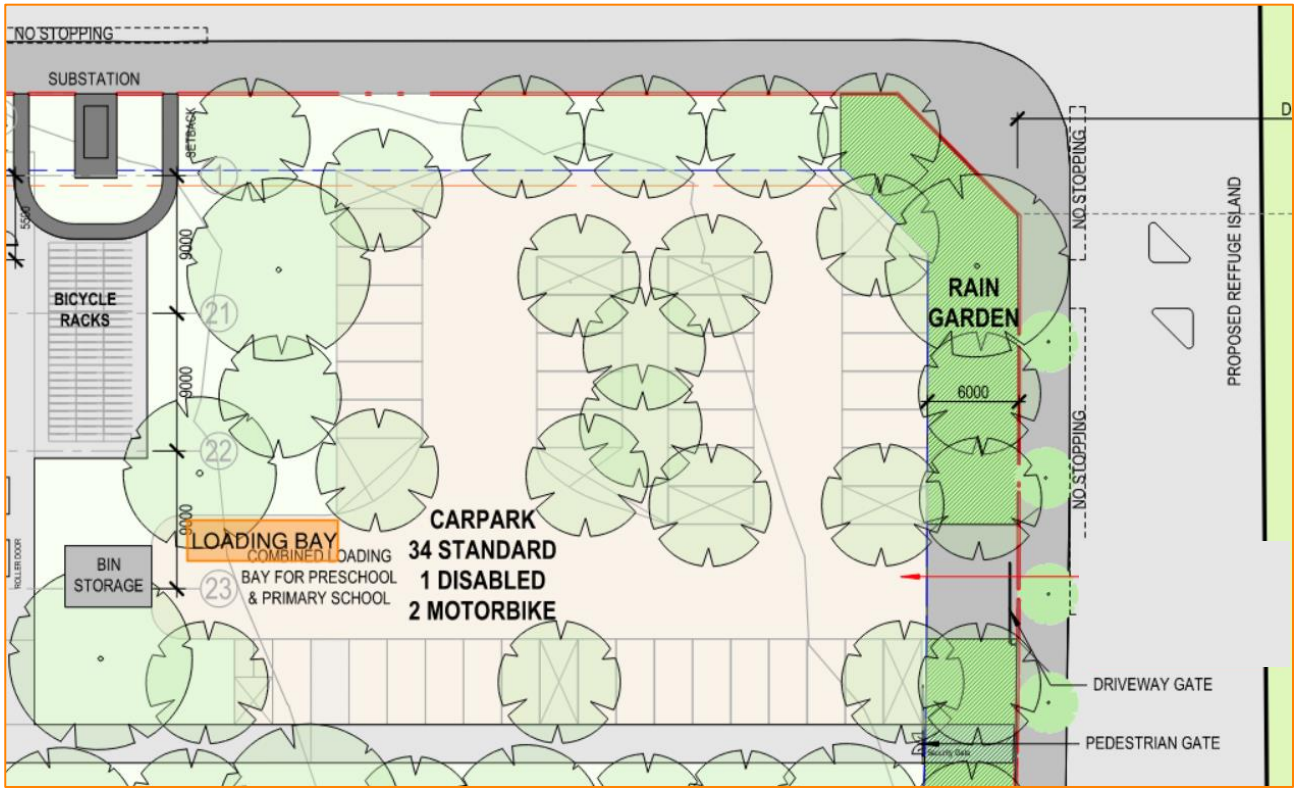


Figure 35: Loading Dock for Service Vehicles and Waste Collection
Source: Modified from architectus

8.2.1 Emergency Vehicles

There is no dedicated parking areas provided for emergency vehicles, however emergency vehicles can access both the primary school and pre-school via the vehicle accesses on Cataract Road, or alternatively utilise parking along Fontana Drive and enter via the pedestrian access points.

Section 9 Kiss & Ride

9.1 Demands

Future K&R volumes have been calculated in the travel mode split scenarios included in Section 4.3, and are summarised in Table 21 for reference.

Table 21: Summary of Kiss & Ride Travel Demands

Kiss and ride users	Moderate Target		Reach Target	
	Mode Split	Volume	Mode Split	Volume
Students	50%	**500**	30%	300

The traffic assessment projected that largest travel demand as the most conservative scenario. As **underlined** in Table 21, this scenario would be the students numbers with moderate mode split applied. The analysis of the projected demand is detailed in Section 9.2 and supported with the proposed facilities shown in Section 9.4.

9.2 Queueing Analysis

Table 22 outlines the forecast vehicle demands at each of the K&R zones, and the anticipated arrival rate during the peak period. The values listed may vary in operation, based on the actual turnover time of individual vehicles, and the initiatives in the operational School Transport Plan that will be implemented to ensure reasonable operation of the K&R facilities.

The following key assumptions have been adopted in a base analysis:

- Each K&R bay has a turnover rate of 60 seconds per vehicle;
- The K&R zones will operate and be managed in groups of 12 to accommodate 12 vehicles per 60 seconds.
- Each K&R bay would be 6 metres in length.
- 90% of K&R activity would occur over the peak period.

Table 22 overleaf provides a breakdown of the forecast vehicle demands associated with the proposed K&R zones.

Table 22: Kiss & Ride Queueing Analysis

Parameter	Value
Forecast student demand	1,000 students
Portion travelling by car within peak	50%
Students travelling to school via private vehicle	500 students
Assumed occupancy	1.2 students per vehicle
Forecast vehicles	417 vehicles
Vehicles using dedicated K&R	90%
Forecast vehicles using K&R	375 vehicles
Kerbside available	Approx. 24 bays
Turnover required	16 cycles per bay
Assumed turnover rate	1 minute per cycle
Peak duration	16 minutes

As shown in Table 22, this analysis demonstrates that the forecast demands for the primary school can be accommodated or processed in approximately 16 minutes. This is considered reasonable and a typical amount of time for K&R activity. Importantly, this also assumes that 90% of K&R activity would occur through the signposted bays at the school frontages.

9.3 Design

As shown in the cross-section diagrams in Section 3.2, the K&R zones on Fontana Drive and Pennant Way are proposed to be 2.5m wide, which matches the existing conditions cross-section on Fontana Drive and Pennant Way.

As a point of reference, Australian Standards AS2890.5 for on-street parking facilities requires a parking space width of 2.0 to 2.3m for a road with a 50km/h speed limit. It is acknowledged that a K&R zone operates differently to an on-street parking lane with more movements to and from the kerbside lane and high volumes of activity occurring in a short period of time. The proposed 2.5m width caters for this type of operation by providing a greater buffer to the adjacent lanes, and ensuring vehicles have adequate space to manoeuvre in and out of the kerbside lane and between other vehicles stopped in the K&R lane.

9.4 Proposal

The proposed K&R zones are shown in Figure 36, including one zone on Fontana Drive and one zone on Pennant Way. These zones are approximately 70 metres each in length, accommodating 12 vehicles respectively.

It is noted that the school is located with large areas of students located either at the north or the south of the school, therefore the K&R provision needs to consider both north and south approaches to the site. Therefore, the K&R zones have been split into two areas. The Pennant Way K&R zone will accommodate traffic arriving from the south (via Fontana Drive) and the east (via Cataract Road). The Fontana Drive K&R zone can accommodate traffic arriving from the north (via Red Gables Road) and the proposed precinct from the east (via Red Gables Road)g*enerally*, noting that individual drivers may choose to drop off in locations that suit them (including outside these formalised zones).

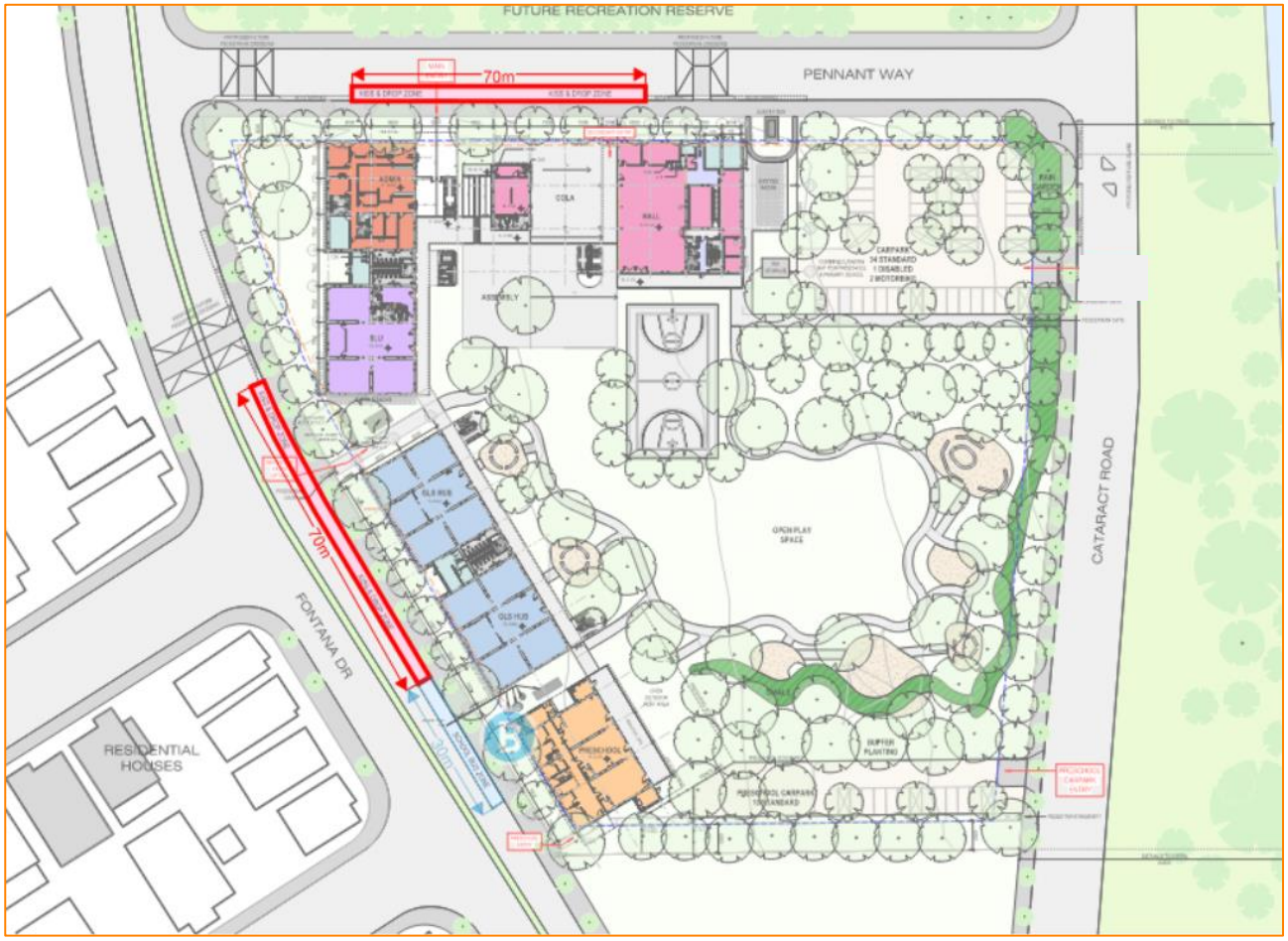


Figure 36: Proposed Kiss & Ride Zones
Source: Modified from architectus

Section 10 Car Parking

10.1 Demands

Future car parking demands for staff of the primary school and pre-school have been calculated in the travel mode scenarios included Section 4.3, and are summarised in Table 23 for reference. It is noteworthy to mention, no on-site parking will be provided for primary school students or parents. On-site drop off and pick up provisions will be provided for pre-school parents, however given the limited information on pre-school student locations, a mode share target has not been developed and sole reliance on The Hills DCP parking requirements has been adopted.

Table 23: Summary of Car Parking Demands

Car users	Moderate Target		Reach Target	
	Mode Split	Volume	Mode Split	Volume
Primary School Staff	75%	51	50%	**34**
Pre-school Staff	75%	5	50%	**3**

It is acknowledged that the scenario resulting in the largest travel demand would be when the school is at full capacity applying the moderate target split. However, as further detailed in the following sections, due to a combination of site constraints and provision of alternative travel measures, it is reasonable to design and provide 35 primary school staff car spaces and 6 pre-school staff car spaces, as per the target mode splits and overall transport strategy for the project. Refer to Section 10.2 for a detailed assessment of the parking provision and its adequacy.

10.2 Analysis

10.2.1 The Hills DCP Requirements

The car parking rates contained in The Hills DCP for educational establishments are shown in Table 24.

Table 24: DCP Parking Requirements

Proposed Staff / Student No.	DCP Rate	DCP Requirement	Proposed Capacity
Educational Establishments (Primary School)			
68 staff	1 space per employee	68 spaces	35 spaces
1,000 students	1 space per 30 students enrolled for visitors / or parent parking	33 spaces	0 spaces
Childcare Centre (inc Kindergarten)[1]			
6 staff	Minimum 1 space per employee,	6 spaces	6 spaces
60 students	plus 1 space per 6 children enrolled for visitors and/or parent parking	10 spaces	10 spaces
Total		**117 spaces**	**51 spaces**

[1]Note: Given similar characteristics parking rates for a childcare centre have been adopted for the pre-school component of the development.

From Table 24 above, it is evident the proposed pre-school component requires 6 car parking spaces for staff and 10 car spaces for students in accordance with the Hills Shire DCP. The proposed pre-school provides 6 on-site staff car parking spaces and 10 car parking spaces for parents. This is considered acceptable, ensuring all student drop-off activities are accommodated on-site. The provision aligns with the Hills DCP and is therefore considered acceptable.

From Table 24 above, it is evident The Hills DCP rate in its entirety would require a provision of 101 car spaces for the primary school, including 68 spaces for staff and 33 spaces for students. Excluding parking for students (as this is not consistent with DoE policy), the residual parking rate for staff would be 68 spaces for primary school staff. The development will deviate from The Hills DCP requirements for the primary school component for the development. The adequacy of the proposed parking provision of 35 spaces for the primary school staff car park is addressed below.

10.2.2 Adequacy of Proposal

As discussed at length in Section 4.3.2 and throughout this document, the project is seeking to use the opportunities presented by a new site to establish new targets for travel behaviour which differs from other existing schools. In order to avoid generating high levels of additional vehicular traffic through induced demand, transport provisions and capacity (including car parking provision) are specifically targeted to achieve a mode shift away from private vehicle usage.

Firstly, the provision of a car park almost three times the size of that proposed (35 spaces proposed compared to up to 101 spaces at full DCP rates) would encroach significantly into the available open space / play space at the school and reduce amenity of the site for students. Further, the site-specific travel demand analysis undertaken for this project indicates a baseline mode split of 75% car usage, and a target mode split of 50%. Application of the DCP rates would include provisions for a mode split of 100% car usage for staff, plus additional parking for students. This would significantly exceed the expected demand for parking (even when considering the more conservative baseline scenario) and therefore applying the DCP rates would not be appropriate.

To support the sustainable transport strategy for the project and work towards this target car parking demand, the following is provided:

- The proposal for a new 30-metre bus zone, to the west of the site, along the eastern kerbside of Fontana Drive will assist TfNSW in operating additional routes and services in the future. As additional routes are implemented into the future, access to public transport will improve for both staff and students.

- The proposed school provides storage for approximately 106 bicycles, as well as showers and change facilities for staff. This ensures that active transport is a good and accessible option for staff and assists in reducing travel by car. The bicycle storage area is fully enclosed and is adjacent to staff shower and change facilities, providing an excellent level of amenity.

- The Department of Education is currently reviewing and considering options for local staff recruitment, i.e. encouraging employment of staff who live in close proximity to the site. All recruitment will continue to be decided on a merit basis, with proximity to site being just one element in the recruitment process. Higher numbers of staff living close to the site, compared to other typical schools, will allow the walking and cyclist mode shares to be increased.

It is acknowledged that the target mode splits are ambitious and depart reasonably significantly from the baseline scenario. However, as mentioned, the mode splits are considered achievable due to the considerations listed above, and the opportunity for the new school to establish new travel habits. Further to this, it is important to note that the targets are not expected to be achieved in the opening year of the school, but rather reached over time as the school grows.

10.2.3 Accessible Parking

The Hills DCP stipulates an accessible car parking rate to be 3% of the total car parking provided by the development. As the result, the development is required to provide a minimum of the following:

- 1 accessible parking space for the primary school car park
- 1 accessible parking space for the pre-school car park.

10.3 Operation

The proposed car park would be controlled by a sliding gate at the entry point to act as the out-of-hours secure perimeter, along with boom gates to provide access controls for the regular morning and afternoon peak activity periods for staff.

10.4 Proposal

On-site parking is available via the two vehicle access driveways located on Cataract Road. The proposed primary school car park has a capacity of 35 car parking spaces including 1 accessible space, while the pre-school car park has a capacity for 6 staff parking spaces and 10 on-site pick-up and drop-off spaces including 1 accessible space. The layout of the proposed car park is illustrated in Figure 37.

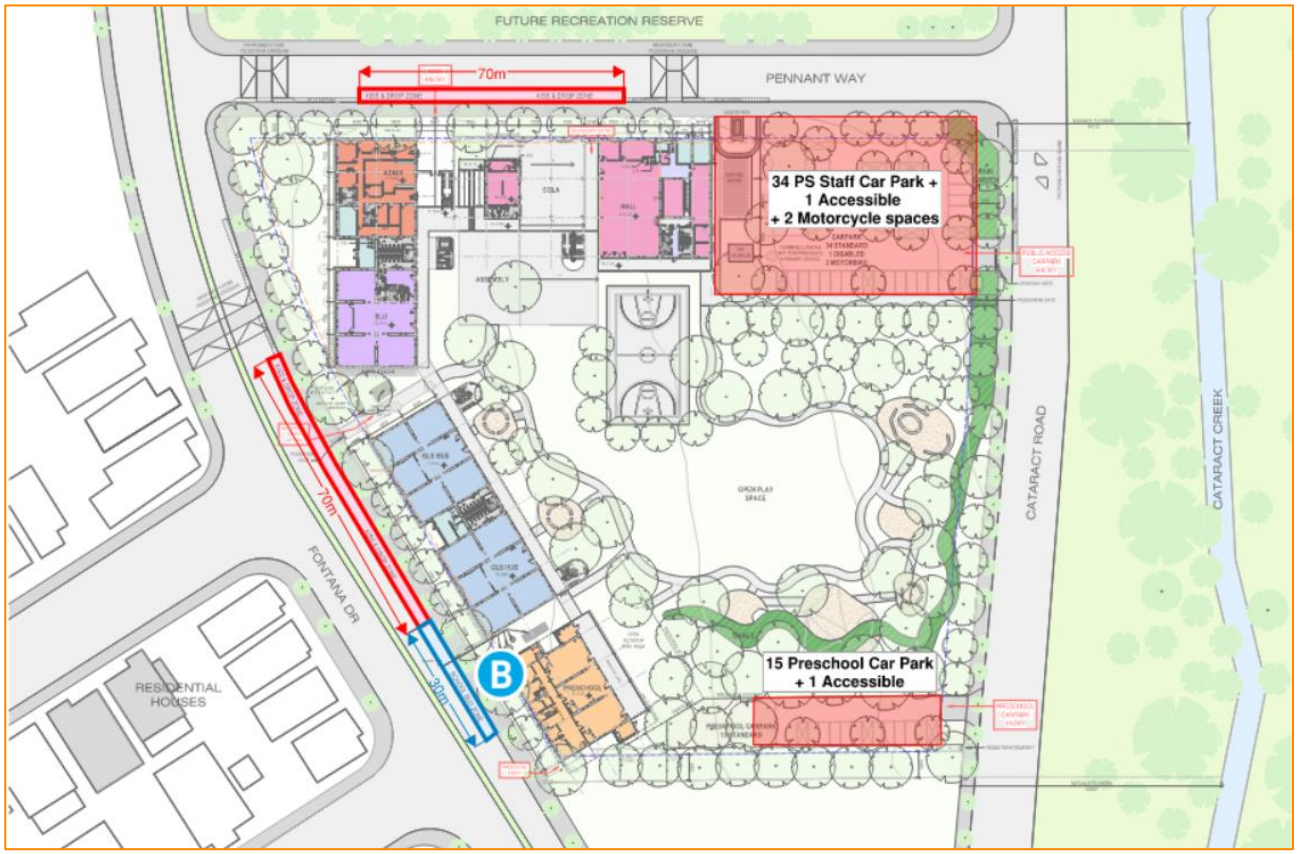


Figure 37: Proposed Car Park
Source: Modified from architectus

10.5 Design

Car parking is to be provided in accordance with AS2890.1:2004. Key design parameters for 90-degree angled parking include:

10.5.1 Staff Parking Spaces

- Classification: Class 1 (all-day employee parking) or higher
    - *Note: Higher classes are typically only required for higher turnover usage and would not be required for this use class, however does have a narrower aisle width (with wider space) which can be a useful design option to consider.*
- Parking space width: 2.5m or higher
- Aisle width: 6.2m (or as required by class)
- Parking space length: 5.4m
- Gradient: 1:20 (5%) maximum
- Classification: Class 1 (all-day employee parking) or higher
    - *Note: Higher classes are typically only required for higher turnover usage and would not be required for this use class, however does have a narrower aisle width (with wider space) which can be a useful design option to consider.*

10.5.2 Pre-school Student PUDO

- Classification: Class 3A (short term high turnover parking)
- Parking space width: 2.7m or higher
- Aisle width: 6.2m (or as required by class)
- Parking space length: 5.4m
- Gradient: 1:20 (5%) maximum

Swept path analysis for the car park and vehicle access point is provided in Appendix B.

Section 11 Analysis of Impacts

11.1 Traffic Generation

11.1.1 Pedestrian Volumes

As outlined in Section 5, the expected future pedestrian volume (for users walking directly to and from site) is approximately 500-600 students and 3 staff once the school reaches full capacity. Therefore, a total volume of 600 pedestrians has been applied in the traffic modelling for the proposal. These pedestrian volumes have been analysed in detail in Section 5 to assess the performance of the proposed wombat crossings.

11.1.2 Bus Volumes

As outlined in Section 7, the expected future demand for bus services is approximately 100 students once the school reaches full capacity. At 50 students per full bus, this would be equivalent to filling 2 buses in each of the morning and afternoon travel periods. However, it is expected that the demand for 2 full buses would be spread across more buses, say 4. The proposed bus zone provides the provision of 1 bus at any one time and is considered compliant in accordance with the NSW Bus Infrastructure Guide, noting a standard 12.5 metre bus can be accommodated, along with a minimum 11.5 metre draw-in length and 6.0 metre draw-out length, totalling 30 metres.

Assuming a timetabled separation of services by 5-10 minutes, this could be cleared within approximately 10 to 15 minutes in the afternoon (when bus service demand is often highest) and would likely be more spread during the morning.

11.1.3 Primary School Vehicle Volumes

Future travel demands for car usage for students and staff have been calculated in Section 4.3 and are summarised in Table 25 and Table 26, respectively. It is important to note that typically some students do not travel alone with their parents, often carpooling or siblings occupying the same vehicle, as such, an occupancy rate of 1.2 students has been applied to estimate the number of vehicles generated by the travel demands.

Table 25: Summary of Student Vehicle Volumes

	Moderate Target		Reach Target	
	Opening Year	Max Capacity	Opening Year	Max Capacity
Student number	750	1,000	750	1,000
Mode share split	50%	50%	30%	30%
Travel demand	375	500	225	300
Occupancy rate	1.2 students / car	1.2 students / car	1.2 students / car	1.2 students / car
Vehicle volume	313	**417**	188	250

Table 26: Summary of Staff Vehicle Volumes

	Moderate Target		Reach Target	
	Opening Year	Max Capacity	Opening Year	Max Capacity
Staff number	50	68	50	68
Mode share split	100%	100%	50%	50%
Travel demand	50	68	25	34
Occupancy rate	1 staff member / car	1 staff member / car	1 staff member / car	1 staff member / car
Vehicle volume	50	**68**	25	34

This traffic assessment considers the scenario which results in the largest travel demand as the most conservative approach. As **underlined** in Table 25 and Table 26, this scenario would be maximum capacity student and staff numbers with the moderate mode splits applied. Therefore, a total vehicle generation of **485** (417 students + 68 staff) is expected, which has been applied in the traffic modelling for the proposal. As previously mentioned, the peak hour periods which have been adopted are noted below:

- 7:15 to 8:15am (AM peak)
- 2:00 to 3:00pm (PM peak)

These peak periods were based on the existing traffic counts, however in practice we would estimate bell times around 9am and 3pm (to be confirmed prior to opening of the school), resulting in peak traffic generation around 8-9am and maybe 2:30-3:30pm. We have applied all of our traffic generation to the existing peak periods as a conservative assessment.

The total traffic generation during the AM and School PM peak period are detailed below:

- 7:15 to 8:15 AM Peak: 902 trips (485 in, 417 out)
- 2:00 to 3:00 PM Peak: 902 trips (417 in, 485 out)

The above total trip generations account for 834 student trips (417 in & 417 out) during both the AM and PM peak period. They also account for 100% (68) staff trips during the AM and PM peak period as a conservative measure.

11.1.4 Pre-School Vehicle Volumes

The RMS Guide does not provide specific trip rates for pre-schools, however does provide trip rates for childcare centres. The proposed pre-school will exhibit similar characteristics of a childcare centre and as such the RMS traffic generation rates for a Long-day childcare centre have been adopted. The RMS Guide recommends application of a peak period traffic generation rate of 0.8 trips / child / hour during the AM peak period and a trip generation rate of 0.3 trips / child / hour has been adopted during the school PM peak period. Application of these rates to the 60-child capacity results in the following peak period traffic generation:

- 7:15 to 8:15 AM Peak: 48 trips (24 in, 24 out)
- 2:00 to 3:00 PM Peak: 18 trips (9 in, 9 out)

11.1.5 Summary of Proposed Vehicle Volumes

Combining the proposed primary school trip generation and pre-school trip generation will result in the following proposed vehicles during the AM and school PM peak period:

- 7:15 to 8:15 AM Peak: 950 trips (509 in, 441 out)
- 2:00 to 3:00 PM Peak: 920 trips (426 in, 494 out)

11.2 Vehicle Trip Distribution

Traffic distribution developed in subsequent sections have been calculated using proposed student location data for students and the existing traffic distributions for staff and the pre-school.

Detailed traffic distribution diagrams are provided in Appendix C which shows the expected distribution of development traffic for the primary school students, staff and pre-school on the external road network.

11.2.1 Student Vehicle Trip Distribution

The student vehicle distribution splits during the AM peak period across the network are illustrated below in Figure 38. Students' vehicular trips will be distributed across the two K&R zones, located at Fontana Drive and Pennant Way. The detailed distributions are outlined in Appendix C and summarised below:

- 50% of students are picked up and dropped off at the Fontana Drive kiss & ride zone.
- 40% of students are picked up and dropped off at the Pennant Way kiss & ride zone.
- 10% of students are informally picked up and dropped off along the western side of Fontana Drive.

The above distribution is conservative as it assumes 90% of kiss & ride activity would occur through the signposted bays at the school frontages. In practice, it is anticipated that some kiss & ride activity would occur informally at other locations, reducing the demands on the main frontage kiss & ride zones.

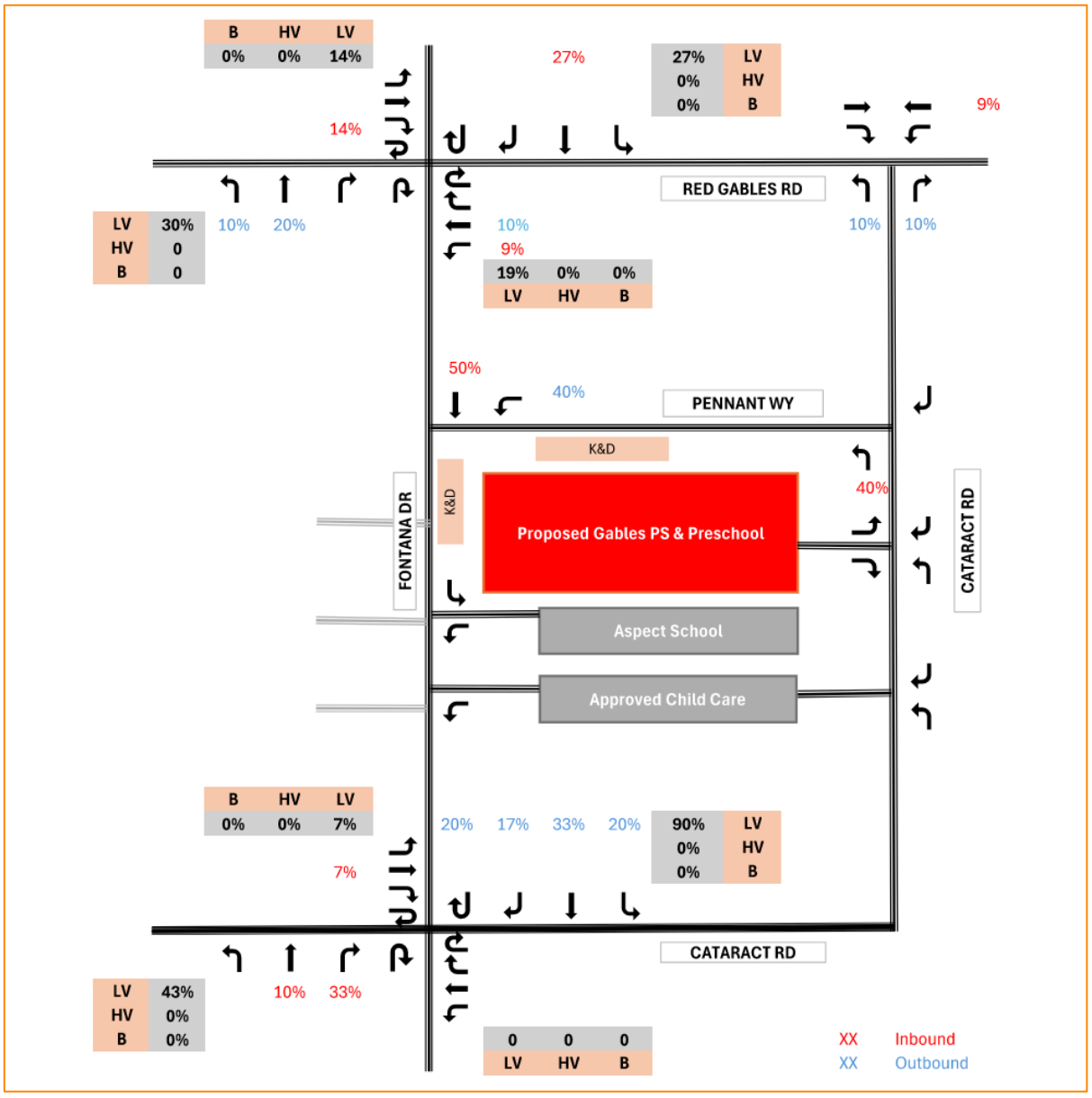


Figure 38: Student Inbound and Outbound Vehicle Trip Distribution - AM

Source: TTW Analysis

11.2.2 Staff Trip Distribution

The generated vehicle volumes by staff during the AM peak period are distributed across the road network as displayed below in Figure 39 and detailed in Appendix C. Staff traffic distributions have been produced based on estimations (based on the site's general location relative to surrounding residential areas in the south region) that most staff would travel from the south, particularly those travelling by car. It is assumed that roughly 70% of staff would travel from the south, 30% from the north respectively.

As opposed to students, staff are not bounded by the proposed catchment area, and there is currently no accurate way of forecasting staff trip distribution given that there are no existing staff to analyse. Therefore, it is important to note that these are broad estimates that may vary significantly during the operation of the school and based on the location of staff during any given year. However, given the scale of staff trip generation in comparison to the student trip generation (and the overall levels of background traffic), these uncertainties relating to staff trip distribution are not considered to have any impact on overall results and assessment.

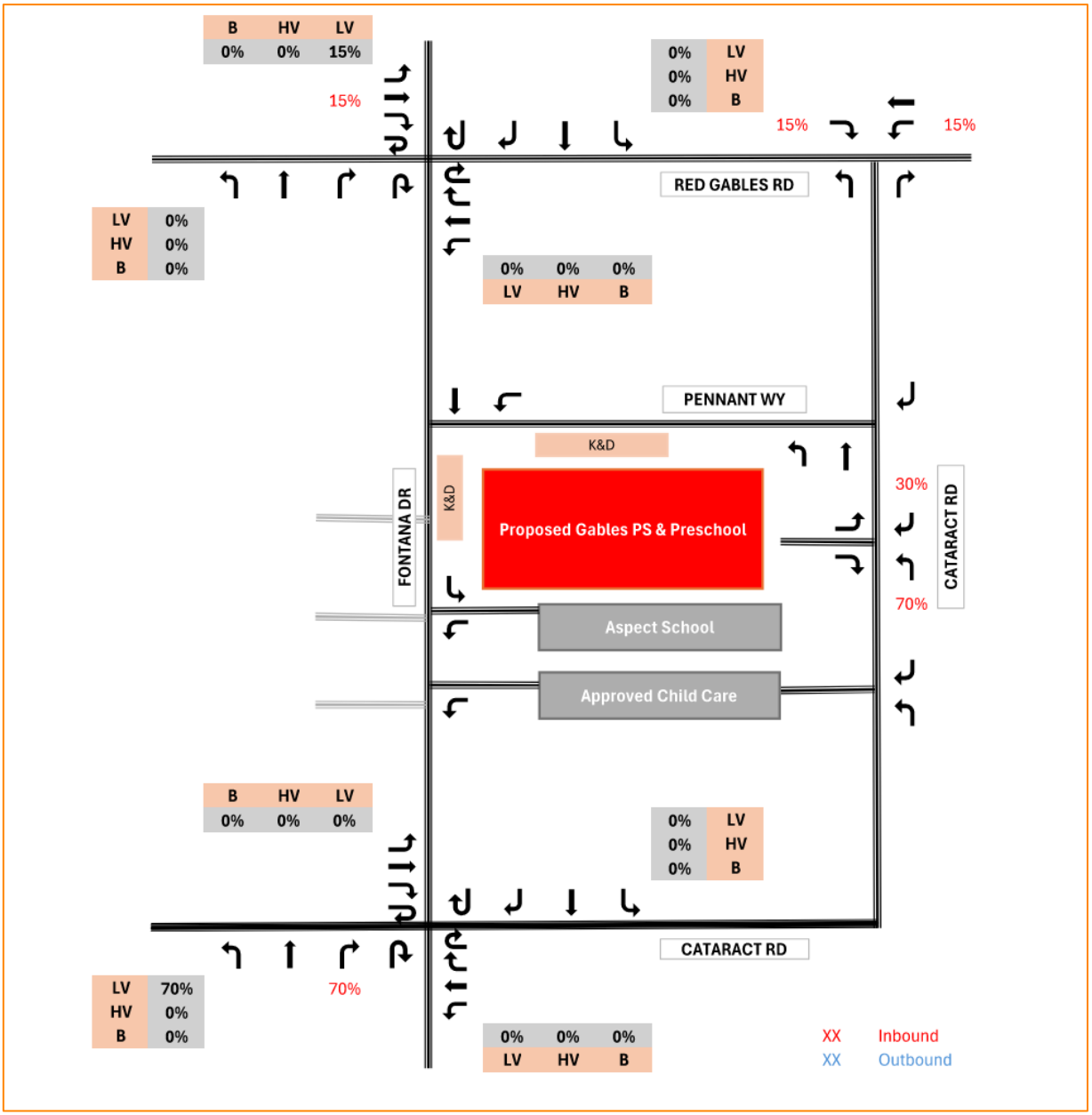


Figure 39: Staff Inbound Vehicle Trip Distribution - AM

Source: TTW Analysis

11.2.3 Pre-School Trip Distribution

The generated vehicle volumes by pre-school students during the AM peak period are distributed across the road network as displayed below in Figure 40 and detailed in Appendix C.

Similar to the primary school students, the pre-school student vehicular trips have been assumed to be split 50% from the north and 50% from the south, with 100% of vehicle trips entering the site via Cataract Road. The detailed distributions are outlined in Appendix C.

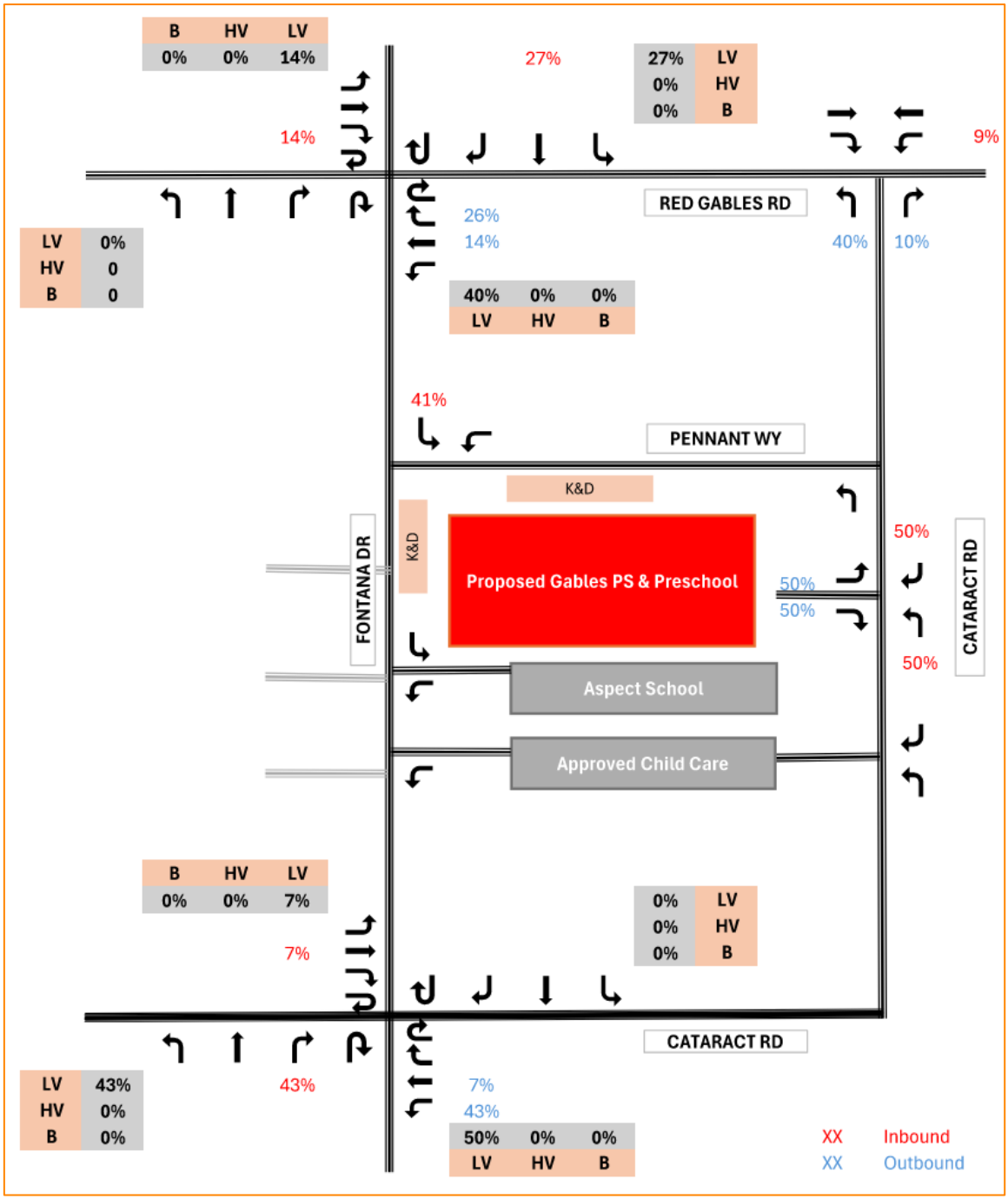


Figure 40: Pre-School Student Inbound Vehicle Trip Distribution - AM
Source: TTW Analysis

11.3 Scope of Traffic Modelling

As part of the analysis the traffic modelling scope involved the assessment of two intersections, being Fontana Drive / Red Gables Road and Fontana Drive / Cataract Road, these are detailed below in Figure 41. The scope of modelling has been discussed with and accepted by both Council and TfNSW.

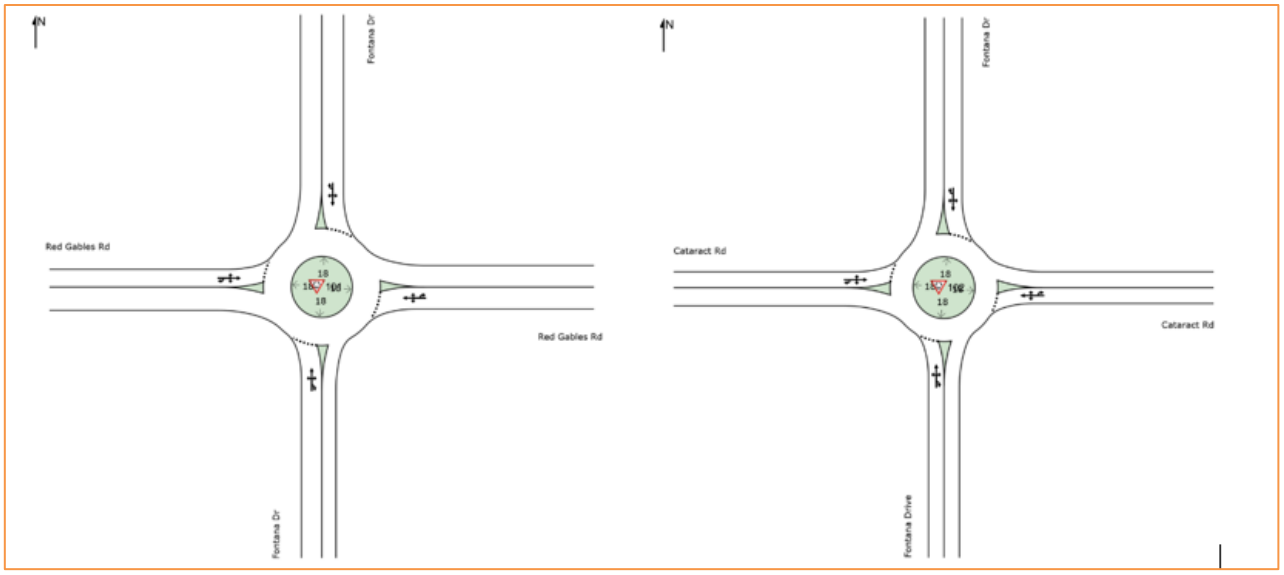


Figure 41: Existing & Future Intersection Arrangement
Source: TTW

The intersections have been modelled in SIDRA (Version 9.1) and set up as individual sites for existing and future conditions. Note that these diagrams are schematic only and do not reflect the actual road geometry.

11.4 Modelling Methodology

11.4.1 Intersection Performance

SIDRA modelling outputs provide a range of performance measures, in particular:

- Degree of saturation (DOS) – The DOS is used to measure the performance of intersections, where a value of 1.0 represents an intersection at theoretical capacity. As the performance of an intersection approaches DOS of 1.0, queue lengths and delays increase rapidly. It is usual to attempt to keep DOS to less than 0.9, with satisfactory intersection operation generally achieved with a DOS below 0.8.

- Average Vehicle Delay (AVD) – The AVD (or average delay per vehicle in seconds) for intersections also provides a measure of the operational performance of an intersection and is used to determine an intersection's Level of Service (see below). For signalised intersections, the AVD reported relates to the average of all vehicle movements through the intersection. For priority intersections, the AVD reported relates to the worst performing vehicle movement at the intersection.

- Level of Service (LOS) – This is a comparative measure that provides an indication of the operating performance, based on AVD.

Table 27: Intersection Performance Criteria

LOS	AVD (Seconds)	Traffic Signals	Give Way and Roundabouts
A	Less than 14	Good operation	Good operation
B	15 to 28	Good with acceptable delays and spare capacity	Acceptable delays and spare capacity
C	29 to 42	Satisfactory	Satisfactory, but accident study required
D	43 to 56	Operating near capacity	Near capacity and accident study required
E	57 to 70	At capacity; at signals, incidents will cause delays	At capacity, requires other control mode
F	More than 70	Unsatisfactory and requires additional capacity	Unsatisfactory and requires other control mode

The SIDRA intersection modelling has been completed based on the scenarios as detailed in Section 11.4 and detailed in the Section 11.7 below.

11.4.2 Modelling Scenarios

To better understand the impact of the proposed development two scenarios have been assessed, scenario 1 includes a review of the existing intersections with 2024 peak hour background traffic volumes, which were extracted from the 2024 traffic survey results. Scenario 2 includes a review of the existing intersections proposed and recently approved associated traffic within the vicinity of the site. Further details of each scenario are shown below in Table 28.

Table 28: Intersection Modelling Scenarios

Scenario	Year	Description
1	2024	**Existing** – existing configuration and existing traffic volumes
2	2027	**Existing + development** – new Gables primary school 1,000 student capacity, Approved Junior Aspect School (95 Fontana Dr), Approved Childcare (93 Fontana Dr), plus 6% background growth rate per annum.

The purpose of this assessment is to compare the intersections existing performance to the future scenario under the increased load as a result of the proposed development and recently approved developments.

11.4.3 Traffic Modelling Calibration

The SIDRA base models have been validated by reviewing the modelled queue lengths against on-site queue length observations. Site observations of the morning and afternoon peak periods were undertaken on the same day as the intersection movement counts for consistency. The typical and maximum queues were recorded at each intersection, which represent the average and 95th percentile queues in SIDRA, respectively. Interrogation of the SIDRA outputs indicates that the model accurately reflects the observed on-site queues for the same day and peak period.

11.5 Cumulative Traffic Impacts

For the cumulative impacts during operation, the below items have been considered, and all of these items have been incorporated into the analysis throughout this report (that is, no additional analysis is required to address these items):

- Junior Aspect School, 95 Fontana Drive, Gables (730/2023/JP). The site is located directly south of the school and is currently under construction. The school will accommodate 80 Students & 30 Staff. Traffic volumes for the proposed school have been extracted from the approved TIA report prepared by McLaren Traffic Engineering (ref: 220537.01FA) dated 16th September 2022.
    - Morning AM Peak: 104 trips (67 in, 37 out)
    - Afternoon PM Peak: 104 trips (37 in, 67 out)
- Childcare centre, 93 Fontana Drive, Gables (1739/2022/JP). The site is located to the south of the school adjacent to the Fontana Drive / Cataract Road intersection. The childcare centre will accommodate 130 children. Traffic volumes for the proposed childcare centre have been extracted from the approved TIA report prepared by Ason Group (ref: 1927r01) dated 23rd February 2022.
    - Morning AM Peak: 104 trips (52 in, 52 out)
    - Afternoon PM Peak: 91 trips (45 in, 47 out)

Detailed traffic volume inputs and distribution are included in Appendix C for reference.

11.6 Future Year Traffic Growth

11.6.1 STFM Data

Strategic Travel Forecasting Model (STFM) data provided by TfNSW was reviewed to gain an understanding of the growth rates within the Gables precinct and within the vicinity of the site, however the site is located outside the mesoscopic model, and therefore the STFM does not cover this area in detail. Traffic volumes are only available for the main roads around the target intersection, but these also include a share of through traffic as shown below in Figure 42.

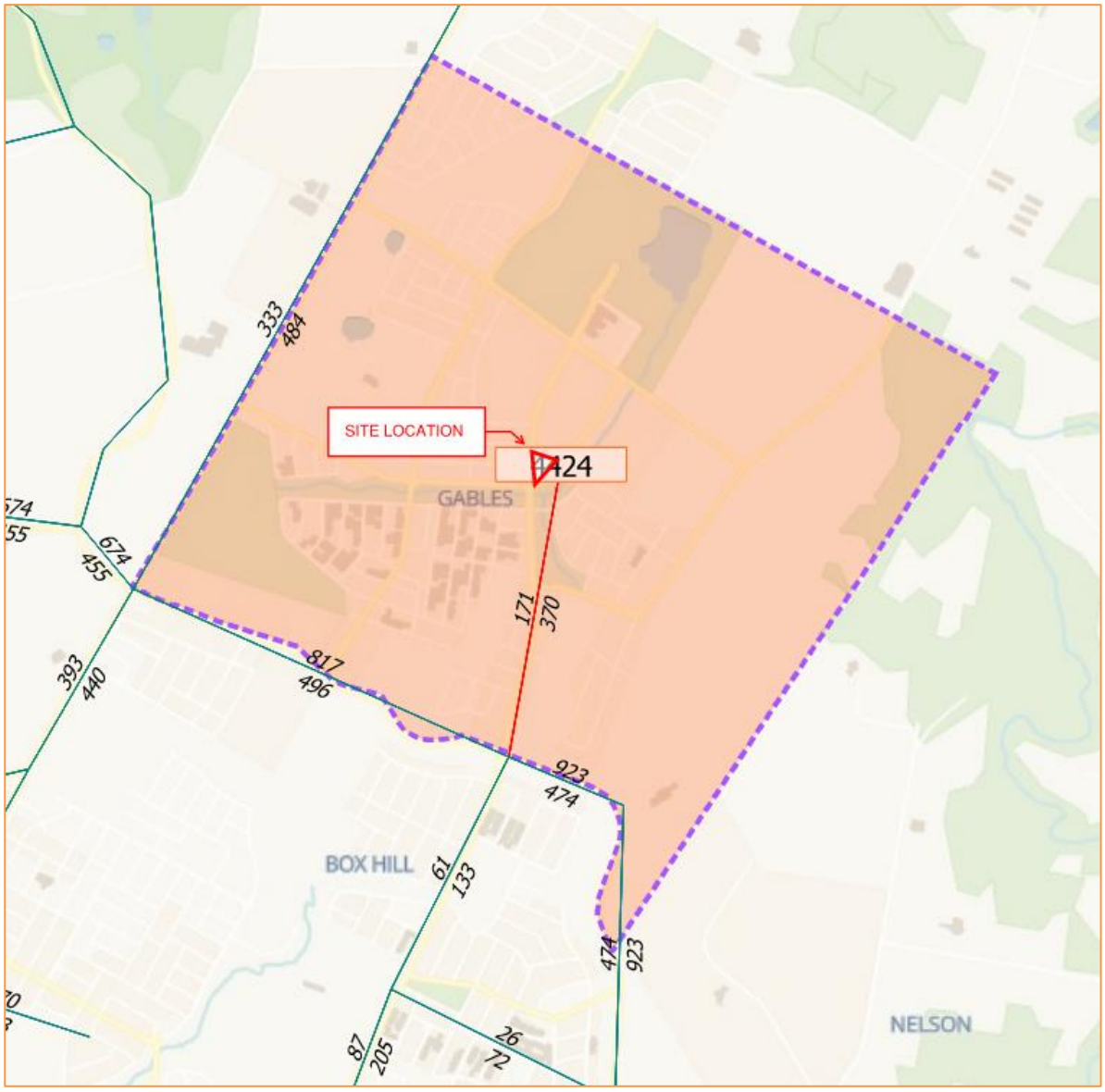


Figure 42: 2026 STFM 2hour AM Peak Traffic Volumes

As shown in Figure 42 the forecasted 2026 2 hour AM peak traffic volumes show 171 traffic volumes northbound and 370 traffic volumes southbound. When compared to the 2 hour AM peak 2024 existing traffic volumes there are 604 traffic volumes northbound and 300 traffic volumes southbound. It is therefore considered that the STFM traffic projections do not take into account the growth within the Gables precinct.

STFM data was therefore not utilised as it was not detailed enough to show an accurate representation growth rate when compared to the existing traffic volumes within the Gables precinct.

11.6.2 Gables Precinct & Town Centre Masterplan

As the Gables is undergoing substantial growth and development, involving the development of both new residential subdivisions and a new town centre to the north of the site, on the corner of Red Gables Road and Fontana Drive. The impact of the ultimate development yield has already been considered in initial traffic impact assessment for the subdivision, titled Box Hill North GTA Consultants (01/05/2015, Rev B), however this assessment focused primarily on the external intersections of the broader subdivision with local collector and arterial roads. No traffic modelling was completed along Fontana Drive or within the vicinity of the site as part of this assessment.

Reference was also made to the Gables Town Centre, Box Hill North – Planning Proposal Traffic Impact Assessment, Ason Group (14/08/2018, Rev0392r04v04) (Town Centre TIA). This assessment includes traffic modelling of the internal intersections surrounding the proposed town centre including the Red Gables Road / Fontana Drive intersection, under its ultimate design as a signalised intersection. However, no traffic volumes or traffic modelling was provided for the Fontana Drive / Cataract Road intersection.

The Gables precinct & Town Centre Masterplan TIA reports were not utilised within the main traffic modelling assessment as they did not provide detailed traffic volumes for both Fontana Drive / Red Gables Road intersection and Fontana Drive / Cataract Road intersection.

11.6.3 Background Traffic Growth Rate

Given the limited STFM data and data from the Gables precinct & Town Centre Masterplan TIA reports, reference was made to the Boundary Road & Old Pitt Town Road Intersection Traffic Warrant Study prepared by The Hills Council (ref: Issue 1) dated 30th July 2024. This report had adopted a growth factor of 6% per annum to background traffic in the precinct. This growth factor was considered to reflect the increase traffic generation per annum as a result of the increase in development throughout the precinct.

To provide a conservative assessment, a growth factor of **6% per annum** was applied to the existing 2024 background traffic counts to estimate background traffic volumes in opening year 2027.

11.7 Traffic Modelling Result

A summary of the modelling results for the existing intersections is provided in Table 29 below. Reference should also be made to the detailed SIDRA outputs provided in Appendix D which provide additional information regarding intersection performance.

Table 29: 2024 & 2027 Modelling Results – Existing Arrangements

Intersection	Peak Period	DOS	AVD	LOS	Q (m)
Existing Arrangement (2024)					
Fontana Dr / Red Gables Rd	AM	0.254	9.1	A	10m
	PM	0.116	7.6	A	3m
Fontana Dr / Cataract Rd	AM	0.250	11.7	A	10m
	PM	0.108	10.3	A	4m
Existing Arrangement + Development (2027)					
Fontana Dr / Red Gables Rd	AM	0.553	12.9	A	34m
	PM	0.266	9.7	A	8m
Fontana Dr / Cataract Rd	AM	0.921	24.5	B	138m
	PM	0.714	14.0	B	51m

In accordance with RMS Guide the above results show the movement with the highest delay per vehicle.

From Table 29 above, it is evident that both intersections operate well, with low DOS, minimal AVD and Level of Service A during both the AM and PM peak periods. It is important to note that the most relevant use of these results is to compare the relative change in performance as a result of the proposed development as is discussed in the following sections. From Table 29 above, it is evident that the Fontana Drive / Red Gables Road intersection operates well in 2027 opening year, with low DOS, minimal AVD and Level of Service A during both the AM and PM peak periods.

The Fontana Drive / Cataract Road intersection also operates at a satisfactory level in 2027 opening year, at a LOS B in the AM and PM, however there has been an increase in delay and degree of saturation between 2024 and 2027 opening year. This increase is mainly due to the increase in background traffic between 2024 and 2027 (6% growth per annum), particularly on Fontana Drive northern leg in both the AM and PM, resulting in the highest delay on these legs increasing from LOS A in 2024 to LOS B both the AM and PM by 2027 opening year.

Nevertheless, it is considered this assessment is extremely conservative and it is noted the increase in traffic generation resulting from the proposed development can be accommodated by the existing road network, with no external improvements required. The traffic impacts of the proposed development are therefore considered acceptable.

11.8 Sensitivity Test - Red Gables Road / Fontana Drive Signalised Intersection

It is understood as part of the Gables Town Centre Masterplan there is a proposal to upgrade the existing Red Gables Road / Fontana Drive roundabout to a signalised intersection in the future. As part of our assessment a sensitivity test was completed to ensure the proposed ultimate design has the capacity to accommodate the proposed new primary school and cumulative traffic.

To provide a robust assessment background traffic volumes, intersection layout and signal timings were extracted from the Gables Town Centre TIA report. The AM and PM peak traffic volumes for the Gables Town Centre are detailed below in Figure 43 and Figure 44.

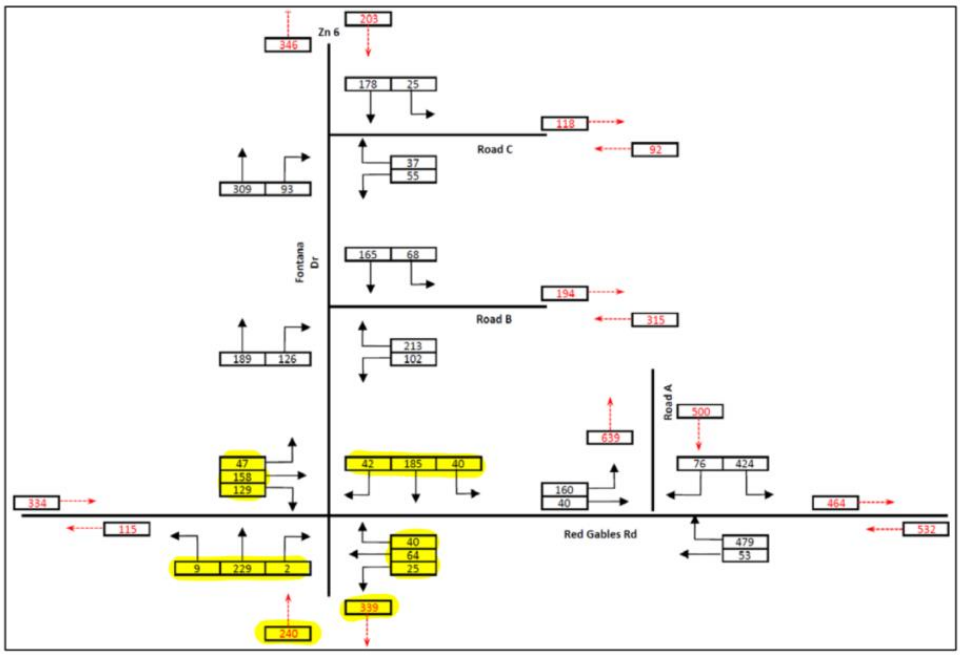


Figure 43: Town Centre Traffic Volumes – AM Peak Period

Source: Ason group Gables Town Planning Proposal

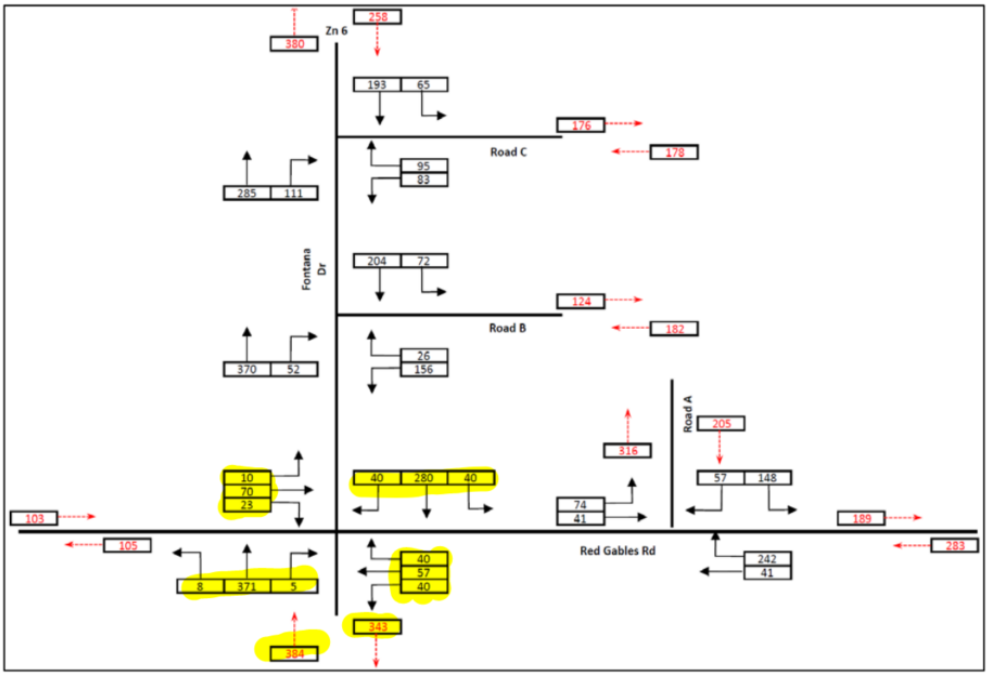


Figure 44: Town Centre Traffic Volumes – PM Peak Period
Source: Ason group Gables Town Planning Proposal

11.8.1 Sensitivity Test Modelling Scenarios

As part of the sensitivity test and to understand the impact of the proposed development two scenarios have been assessed, scenario 1 includes a review of the proposed signalised intersection with Town Centre background traffic volumes, which were extracted from the Town Centre TIA report. Scenario 2 adds the proposed Gables new school traffic and also the recently approved cumulative traffic. Further details of each scenario are shown below in Table 28.

Table 30: Intersection Modelling Scenarios

Scenario	Year	Description
1	2027	**Ultimate** – proposed ultimate design configuration & Town Centre background traffic (extracted from Town Centre TIA)
2	2027	**Ultimate + development** – Ultimate background traffic + new Primary School 1,000 student capacity, Approved Junior Aspect School (95 Fontana Dr), Approved Childcare (93 Fontana Dr)

No traffic modelling has been completed for Fontana Drive / Cataract Road as part of the Town Centre Masterplan and therefore given the lack of information this has been excluded from this sensitivity test.

11.8.2 Sensitivity Test – Traffic Modelling Results

A summary of the modelling results for the sensitivity test of the ultimate signalised intersection, is provided in Table 31 below. Reference should also be made to the detailed SIDRA outputs provided in Appendix D which provide additional information regarding intersection performance.

Table 31: Ultimate Intersection Arrangement

Intersection	Peak Period	DOS	AVD	LOS	Q (m)
Ultimate Arrangement – Existing Performance					
Fontana Dr / Red Gables Rd	AM	0.442	23.9	B	58
	PM	0.667	25.1	B	101
Ultimate Arrangement + Development					
Fontana Dr / Red Gables Rd	AM	0.672	25.6	B	86
	PM	0.813	24.9	B	141

From Table 31 above, it is evident that the Fontana Drive / Red Gables Road intersection operates well in the ultimate design scenario, with low DOS, minimal AVD and Level of Service B during both the AM and PM peak periods. From a detailed review of the SIDRA results the 95th percentile 101 metre queue recorded in the PM is due to through movement on the southern leg of Fontana Drive.

Once the proposed development traffic has been added to the intersection, it is evident that the Fontana Drive / Red Gables Road intersection operates well in the ultimate design scenario plus development, with the same LOS in the AM and PM. During both the AM and PM there is minimal delays and additional capacity, indicating that there will be negligible impact on the existing road network as a result of the proposed development in ultimate state of the Gables subdivision and town centre.

In summary, it is noted the increase in traffic generation resulting from the proposed development can therefore be accommodated in the ultimate design scenario, with no additional improvements required. The traffic impacts of the proposed development are therefore considered acceptable.

Section 12 Mitigation Measures

An overall summary is provided below to outline the infrastructure upgrades and operational measures to be implemented to mitigate its impacts. All mitigation measures listed have been included in the design proposal for this REF; no measures need to be further investigated.

Table 32: Mitigation Measures Summary

Project Stage Design (D) Construction (C) Operation (O)	Mitigation Measures	Section reference
Design	**Infrastructure Upgrades** ▪ Construction of four (4) wombat crossing, including two on Fontana Drive and two on Pennant Way to facilitate safe and controlled pedestrian movements. ▪ Construction of Three (3) pedestrian refuges located on Cataract Road, Bunyarra Parade, and Travertine Grove. ▪ Provision of signposted bus zones for the new 30 metre bus zone located along the eastern kerbside of Fontana Drive. ▪ Provision of signposted kiss and ride zones for Two (2) new 70 metre K&R zones along southern side of Pennant Way and eastern side of Fontana Drive. ▪ Footpath widening along southern side of Pennant Way and eastern side of Fontana Drive, providing full width footpath at the kiss & ride zones and bus zones ▪ Provision of 100 on-site bicycle parking spaces for students plus 6 bicycle parking spaces for staff, along with change rooms, showers, and lockers to act as end-of-trip facilities (EOTF) for staff ▪ Provision of 35 on-site car parking spaces, including 1 accessible for PS ▪ Provision of 6 onsite staff parking and 10 parents' internal PUDO, including 1 accessible parking space for pre-school parking.	Pedestrian access – Section 5 Cyclist access – Section 6 Vehicular access – 9.4 Parking facilities – 9.4 Cyclist facilities – Section 6 Drop-off and pick-up zones – Section 9 Bus bays – Section 7 Service vehicles – Section 8 Swept path analysis – Appendix B
Operation	Staggering of bell times between the Santa Sophia College times, Aspect School and the new primary school, indicatively by approximately 20 minutes (timing subject to confirmation once the schools are operational)	Refer to School Transport Plan (lodged separately with this REF)

Project Stage Design (D) Construction (C) Operation (O)	Mitigation Measures	Section reference
Operation	Implementation of a School Transport Plan (noting a Preliminary version has been prepared by TTW and submitted separately with this REF), which may include measures such as: ▪ Regular communication and reminders to the school community ▪ Regular monitoring of school operations and traffic conditions around the site. For example, if certain points along the road network are becoming congested, the school can encourage parents to use alternative approach routes and/or kiss & ride zones to spread vehicular traffic (refer to Section 9 for discussion of multiple kiss & ride zones) ▪ Regular data collection and monitoring of transport strategy progress ▪ Publishing a Travel Access Guide ▪ A travel coordinator will be engaged for the first 12 months to implement the School Transport Plan; and ▪ Maintaining a governance framework between SINSW, Council, and TfNSW. ▪ Seeking additional bus services to the site, through coordination of enrolment and depersonalised location data with Transport for NSW on an ongoing basis.	Refer to School Transport Plan (lodged separately with this REF)
Construction	A preliminary Construction Traffic Management Plan has also been developed by TTW to assess and manage traffic impacts expected to occurring construction works and accompanies this REF.	Refer to Construction Management Plan (lodged separately with this REF)

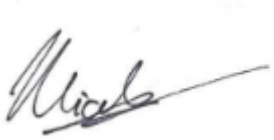
Section 13 Conclusion

The overall transport strategy for the proposed new primary school in The Gables is as follows:

- Provide a sustainable transport strategy, prioritising active and public transport and discouraging travel by private vehicle;
- Encourage and facilitate pedestrian movements within a walkable local catchment through provision of infrastructure such as pedestrian crossings and safety devices such as pedestrian fencing;
- Encourage and facilitate cyclist movements across the wider catchment by connecting to existing dedicated bike lanes (and maintaining these for public usage) and providing on-site facilities for both students and staff;
- Encourage and facilitate public transport activity by providing additional capacity to bus zones along Fontana Drive, and working with TfNSW to provide additional routes and services for the growing school population over time;
- Accommodate service vehicles on the site with a dedicated on-site loading dock for vehicles up to 12.5m Heavy Rigid Vehicles, separated from the staff car park and pedestrian areas;
- Facilitate K&R activity while discouraging its uptake, with provision of multiple K&R zones to distribute traffic and associated footpath infrastructure for high intensity areas, and implement a School Transport Plan to encourage and advertise the range of alternative transport options available; and
- Facilitate car parking activity while discouraging its uptake, with provision of on-site car parking for 50% of staff when the school is at full capacity, achieving a shift from higher initial usage to this lower percentage usage over time, in parallel to the growth of the student and staff population at the school.
- Outcomes of the traffic modelling, Fontana Drive / Red Gables Road and Fontana Drive / Cataract Rd intersections are currently operating with LOS A during both AM and PM periods. In the opening year (2027), by including the full capacity of the proposed school and cumulative impacts, the intersections will still be operating in a satisfactory level at a LOS B in the AM and PM.
- A sensitivity test was completed to ensure the proposed upgrade of the existing Red Gables Road / Fontana Drive roundabout to a signalised intersection in the future. Based on the traffic modelling, it is evident that the Fontana Drive / Red Gables Road intersection operates well in the ultimate design scenario plus development, with the same LOS in the AM and there is minimal delays and additional capacity, indicating that there will be negligible impact on the existing road network as a result of the proposed development in ultimate state of the Gables subdivision and town centre.

This overall strategy has been proposed to and discussed with both Council and TfNSW during ongoing project liaison through a Transport Working Group for the project. Meetings have been held with these authorities several times since July 2024, and the project has refined the transport strategy during that period in response to feedback received.

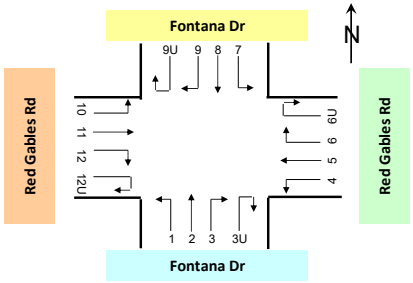
Overall, the transport provisions of this project across all travel modes have been selected and developed in order to provide a sustainable, safe, and efficient site. These provisions include physical infrastructure works on- and off-site, along with management measures to be implemented during operation of the school. While school sites generate significant volumes of travel demand in short periods of time, the proposed transport strategy is considered an appropriate balance and is demonstrated to provide appropriate outcomes for the site.

Prepared by	Reviewed by	Approved by
TTW (NSW) PTY LTD	**TTW (NSW) PTY LTD**	**TTW (NSW) PTY LTD**
		
MICHAEL PARTADINATA	**MARIA MULHOLLAND**	**PAUL YANNOULATOS**
Traffic Engineer	Senior Engineer	Technical Director

Appendix A Existing Traffic Count Surveys

Job No. : AUNSW9302
Client : TTW (Taylor Thomson Whitting) (NSW) Pty Ltd
Suburb : Fontana Drive - Gables
Location : 1. Red Gables Rd & Fontana Dr

Day/Date : Tue, 7th May 2024
Weather : Fine
Description : Classified Intersection Count
: Peak Hour Summary



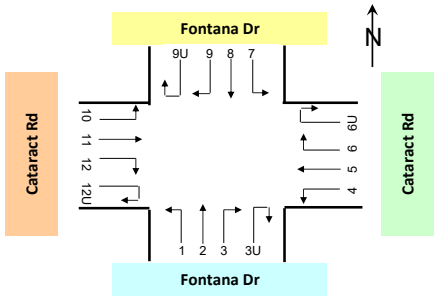
MATRIX Traffic and Transport Data

	Approach	Fontana Dr				Red Gables Rd				Fontana Dr				Red Gables Rd				Grand Total
	Time Period	Lights	Heavies	Buses	Total	Lights	Heavies	Buses	Total	Lights	Heavies	Buses	Total	Lights	Heavies	Buses	Total	
AM	7:15 to 8:15	511	3	12	**526**	125	2	0	**127**	252	2	13	**267**	242	4	1	**247**	**1,167**
PM	14:00 to 15:00	189	2	14	**205**	120	0	0	**120**	125	0	14	**139**	130	5	0	**135**	**599**

Approach	Fontana Dr				Red Gables Rd				Fontana Dr				Red Gables Rd				Grand Total
Time Period	Lights	Heavies	Buses	Total	Lights	Heavies	Buses	Total	Lights	Heavies	Buses	Total	Lights	Heavies	Buses	Total	
7:00 to 8:00	419	7	12	**438**	60	2	0	**62**	152	2	13	**167**	188	4	1	**193**	**860**
7:15 to 8:15	511	3	12	**526**	125	2	0	**127**	252	2	13	**267**	242	4	1	**247**	**1,167**
7:30 to 8:30	485	3	10	**498**	130	1	0	**131**	269	1	11	**281**	220	2	1	**223**	**1,133**
7:45 to 8:45	368	1	2	**371**	117	0	0	**117**	230	0	6	**236**	167	1	1	**169**	**893**
8:00 to 9:00	202	0	0	**202**	82	0	0	**82**	154	0	1	**155**	97	2	0	**99**	**538**
8:15 to 9:15	97	1	0	**98**	19	0	0	**19**	48	0	0	**48**	35	2	0	**37**	**202**
8:30 to 9:30	85	1	0	**86**	13	0	0	**13**	17	0	0	**17**	31	2	0	**33**	**149**
8:45 to 9:45	80	4	0	**84**	14	1	0	**15**	12	0	0	**12**	37	2	0	**39**	**150**
9:00 to 10:00	73	4	0	**77**	14	1	0	**15**	11	0	0	**11**	32	5	0	**37**	**140**
AM Totals	**694**	**11**	**12**	**717**	**156**	**3**	**0**	**159**	**317**	**2**	**14**	**333**	**317**	**11**	**1**	**329**	**1,538**
14:00 to 15:00	189	2	14	**205**	120	0	0	**120**	125	0	14	**139**	130	5	0	**135**	**599**
14:15 to 15:15	149	2	14	**165**	117	1	0	**118**	138	0	15	**153**	117	3	0	**120**	**556**
14:30 to 15:30	102	2	13	**117**	107	1	0	**108**	145	0	15	**160**	97	3	0	**100**	**485**
14:45 to 15:45	62	1	4	**67**	27	1	0	**28**	102	0	8	**110**	61	4	0	**65**	**270**
15:00 to 16:00	72	1	0	**73**	12	1	0	**13**	51	0	1	**52**	47	2	0	**49**	**187**
15:15 to 16:15	83	1	0	**84**	11	0	0	**11**	47	0	0	**47**	45	3	0	**48**	**190**
15:30 to 16:30	78	1	0	**79**	9	1	0	**10**	44	0	0	**44**	37	3	0	**40**	**173**
15:45 to 16:45	85	0	0	**85**	9	1	0	**10**	38	0	0	**38**	28	3	0	**31**	**164**
16:00 to 17:00	86	0	0	**86**	10	1	0	**11**	40	0	0	**40**	32	3	0	**35**	**172**
16:15 to 17:15	88	2	0	**90**	14	1	0	**15**	43	0	0	**43**	40	2	0	**42**	**190**
16:30 to 17:30	104	2	0	**106**	14	0	0	**14**	41	0	0	**41**	47	2	0	**49**	**210**
16:45 to 17:45	106	3	0	**109**	17	0	0	**17**	47	0	0	**47**	52	0	0	**52**	**225**
17:00 to 18:00	94	3	0	**97**	14	0	0	**14**	47	0	0	**47**	49	0	0	**49**	**207**
PM Totals	**441**	**6**	**14**	**461**	**156**	**2**	**0**	**158**	**263**	**0**	**15**	**278**	**258**	**10**	**0**	**268**	**1,165**

Job No. : AUNSW9302
Client : TTW (Taylor Thomson Whitting) (NSW) Pty Ltd
Suburb : Fontana Drive - Gables
Location : 2. Cataract Rd & Fontana Dr

Day/Date : Tue, 7th May 2024
Weather : Fine
Description : Classified Intersection Count
: Peak Hour Summary



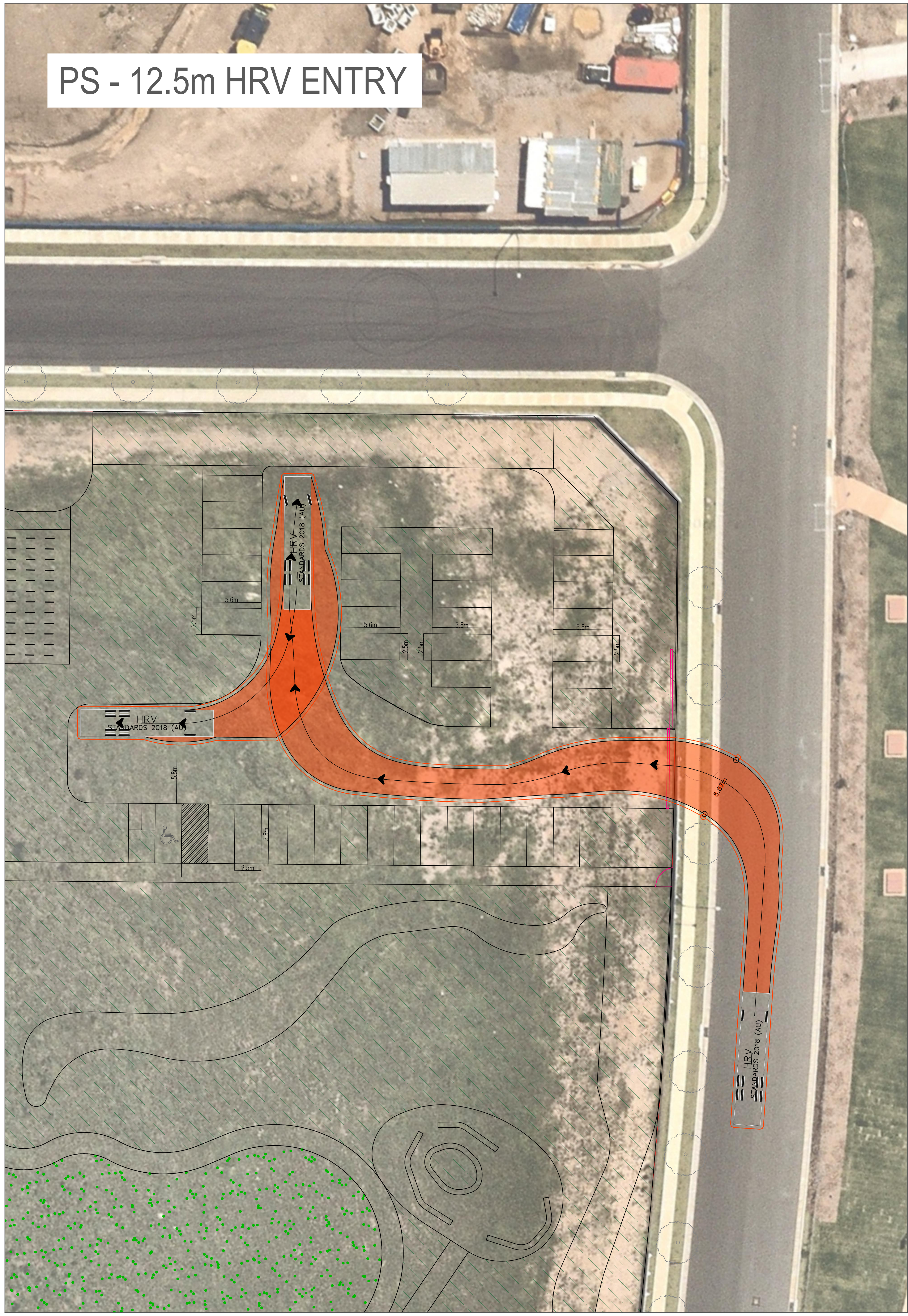
MATRIX Traffic and Transport Data

	Approach	Fontana Dr				Cataract Rd				Fontana Dr				Cataract Rd				Grand Total
	Time Period	Lights	Heavies	Buses	Total	Lights	Heavies	Buses	Total	Lights	Heavies	Buses	Total	Lights	Heavies	Buses	Total	
AM	7:15 to 8:15	428	4	7	**439**	210	2	0	**212**	234	4	12	**250**	230	3	8	**241**	1,142
PM	14:00 to 15:00	206	3	9	**218**	148	2	0	**150**	179	3	13	**195**	104	2	4	**110**	673

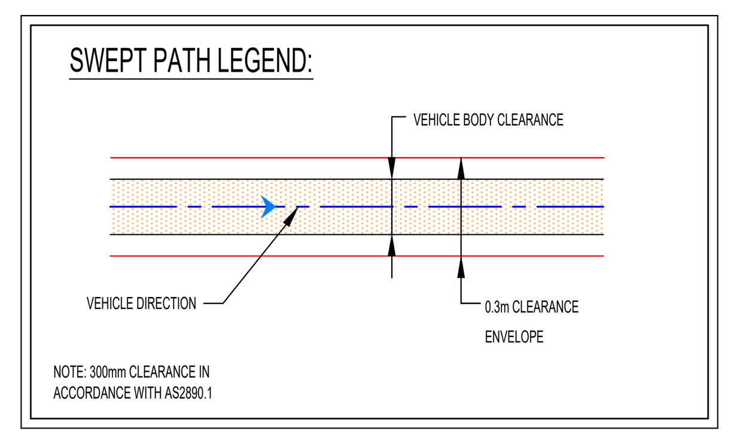
Approach	Fontana Dr				Cataract Rd				Fontana Dr				Cataract Rd				Grand Total
Time Period	Lights	Heavies	Buses	Total	Lights	Heavies	Buses	Total	Lights	Heavies	Buses	Total	Lights	Heavies	Buses	Total	
7:00 to 8:00	351	7	7	**365**	124	3	0	**127**	148	4	12	**164**	191	4	6	**201**	**857**
7:15 to 8:15	428	4	7	**439**	210	2	0	**212**	234	4	12	**250**	230	3	8	**241**	**1,142**
7:30 to 8:30	404	5	7	**416**	219	1	0	**220**	246	1	10	**257**	220	2	5	**227**	**1,120**
7:45 to 8:45	338	6	2	**346**	196	1	0	**197**	219	0	6	**225**	167	1	2	**170**	**938**
8:00 to 9:00	217	7	0	**224**	131	2	0	**133**	146	0	1	**147**	92	2	3	**97**	**601**
8:15 to 9:15	128	7	0	**135**	44	2	0	**46**	48	2	0	**50**	38	2	2	**42**	**273**
8:30 to 9:30	122	9	0	**131**	28	2	0	**30**	26	2	0	**28**	32	2	2	**36**	**225**
8:45 to 9:45	119	10	0	**129**	28	1	0	**29**	21	4	0	**25**	31	3	3	**37**	**220**
9:00 to 10:00	107	9	0	**116**	30	0	0	**30**	19	7	0	**26**	28	5	2	**35**	**207**
AM Totals	**675**	**23**	**7**	**705**	**285**	**5**	**0**	**290**	**313**	**11**	**13**	**337**	**311**	**11**	**11**	**333**	**1,665**
14:00 to 15:00	206	3	9	**218**	148	2	0	**150**	179	3	13	**195**	104	2	4	**110**	**673**
14:15 to 15:15	165	3	7	**175**	172	2	0	**174**	187	2	13	**202**	96	4	4	**104**	**655**
14:30 to 15:30	127	3	5	**135**	185	2	0	**187**	192	2	14	**208**	70	3	4	**77**	**607**
14:45 to 15:45	103	2	3	**108**	110	2	0	**112**	94	3	10	**107**	44	3	2	**49**	**376**
15:00 to 16:00	104	4	0	**108**	73	1	0	**74**	60	2	1	**63**	48	3	3	**54**	**299**
15:15 to 16:15	114	5	0	**119**	65	1	0	**66**	53	2	1	**56**	40	1	3	**44**	**285**
15:30 to 16:30	111	5	1	**117**	53	2	0	**55**	50	3	0	**53**	41	2	4	**47**	**272**
15:45 to 16:45	115	4	2	**121**	49	1	0	**50**	42	3	0	**45**	42	2	3	**47**	**263**
16:00 to 17:00	117	3	2	**122**	43	1	0	**44**	40	4	0	**44**	50	1	3	**54**	**264**
16:15 to 17:15	130	3	2	**135**	35	2	0	**37**	51	4	0	**55**	61	2	3	**66**	**293**
16:30 to 17:30	143	2	1	**146**	36	1	0	**37**	53	3	0	**56**	66	1	2	**69**	**308**
16:45 to 17:45	143	3	0	**146**	43	1	0	**44**	62	3	0	**65**	67	1	3	**71**	**326**
17:00 to 18:00	143	2	0	**145**	49	1	0	**50**	63	2	0	**65**	59	2	2	**63**	**323**
PM Totals	**570**	**12**	**11**	**593**	**313**	**5**	**0**	**318**	**342**	**11**	**14**	**367**	**261**	**8**	**12**	**281**	**1,559**

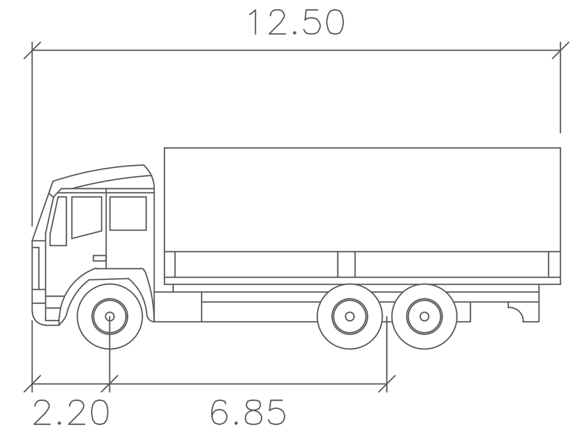
Appendix B Swept Path Analysis

THIS DRAWING TO BE READ IN CONJUNCTION WITH ALL RELEVANT NOTES ON DRAWING C01



SWEPT PATH LEGEND:





HRV

	meters
Width	: 2.50
Track	: 2.50
Lock to Lock Time	: 6.0
Steering Angle	: 36.7

THIS DRAWING HAS BEEN PREPARED USING COLOUR

0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8m

1:10 A1 1:20 A3

FileName: 241021-TTW-00-SK-TR-00001-[P1]-SWEPT PATH SKETCH - PS - 12.5M HRV Entry & Exit.dwg - USER: mpartadinata - Plot File Created: Oct 22, 2024 - 10:10am

Rev	Description	Eng	Draft	Date
A	PLANNING SUBMISSION	MP	MP	22.10.24

Architect
OCULUS
Gadigal Country
Level 1, 5 Wilson Street
Newtown NSW 2042

Engineer
TTW Structural Civil Traffic Façade
612 9439 7288 | Level 6, 73 Miller Street, North Sydney, NSW 2060

Project
THE GABLES NEW PRIMARY SCHOOL

Sheet Subject
WASTE AND LOADING SWEPT PATH SKETCH 12.5m HRV ENTRY & EXIT

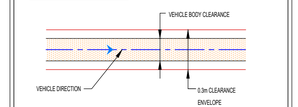
Scale : A1	Drawn	Authorised
1:250	MP	MM

Job No	Drawing No	Revision
241021	SKTR00001	P1

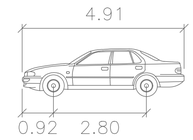
Plot File Created: Oct 22, 2024 - 10:10am

THIS DRAWING TO BE READ IN CONJUNCTION WITH ALL RELEVANT NOTES ON DRAWING C01

SWEPT PATH LEGEND:

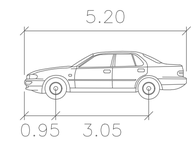


NOTE: 300mm CLEARANCE IN ACCORDANCE WITH AS2890.1



B85

	meters
Width	: 1.87
Track	: 1.77
Lock to Lock Time	: 6.0
Steering Angle	: 34.1



B99

	meters
Width	: 1.94
Track	: 1.84
Lock to Lock Time	: 6.0
Steering Angle	: 33.9

THIS DRAWING HAS BEEN PREPARED USING COLOUR

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1:10 A1 1:20 A3

FileName: 241021-TTW-00-SK-TR-00002.[P1]-SWEPT PATH SKETCH - PS - B99 & B85 Entry & Exit.dwg - USER: mpartadinata - Plot File Created: Oct 22, 2024 - 10:10am

Rev	Description	Eng	Draft	Date
A	PLANNING SUBMISSION	MP	MP	22.10.24

Architect
OCULUS
Gadigal Country
Level 1, 5 Wilson Street
Newtown NSW 2042

Engineer
TTW Structural Civil Traffic Façade
612 9439 7288 | Level 6, 73 Miller Street, North Sydney, NSW 2060

Project
THE GABLES NEW PRIMARY SCHOOL

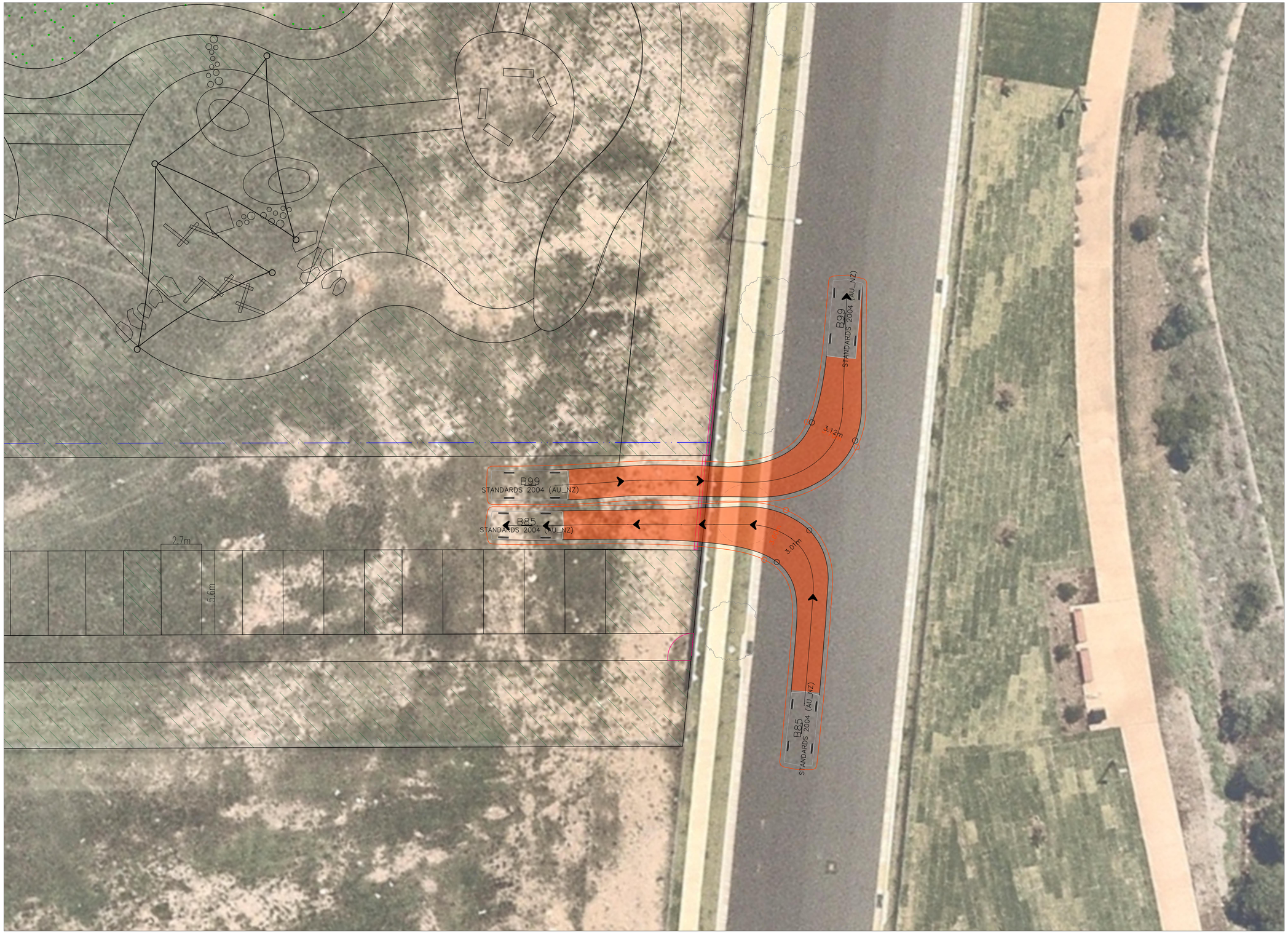
Sheet Subject
CIRCULATION
SWEPT PATH SKETCH
B99 & B85 ENTRY & EXIT

Scale : A1	Drawn	Authorised
1:125	MP	MM

Job No	Drawing No	Revision
241021	SKTR00002	P1

Plot File Created: Oct 22, 2024 - 10:10am

THIS DRAWING TO BE READ IN CONJUNCTION WITH ALL RELEVANT NOTES ON DRAWING C01



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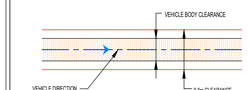
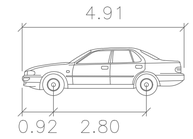
1:10 A1 1:20 A3

SWEPT PATH LEGEND:

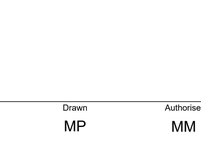


NOTE: 300mm CLEARANCE IN ACCORDANCE WITH AS2890.1



B85

	meters
Width	: 1.87
Track	: 1.77
Lock to Lock Time	: 6.0
Steering Angle	: 34.1



B99

	meters
Width	: 1.94
Track	: 1.84
Lock to Lock Time	: 6.0
Steering Angle	: 33.9

THIS DRAWING HAS BEEN PREPARED USING COLOUR

Rev	Description	Eng	Draft	Date
A	PLANNING SUBMISSION	MP	MP	22.10.24

Architect
OCULUS
Gadigal Country
Level 1, 5 Wilson Street
Newtown NSW 2042

Engineer
TTW Structural Civil Traffic Façade
612 9439 7288 | Level 6, 73 Miller Street, North Sydney, NSW 2060

Project
THE GABLES NEW PRIMARY SCHOOL

Sheet Subject
PRESCHOOL
SWEPT PATH SKETCH
B99 & B85 ENTRY & EXIT

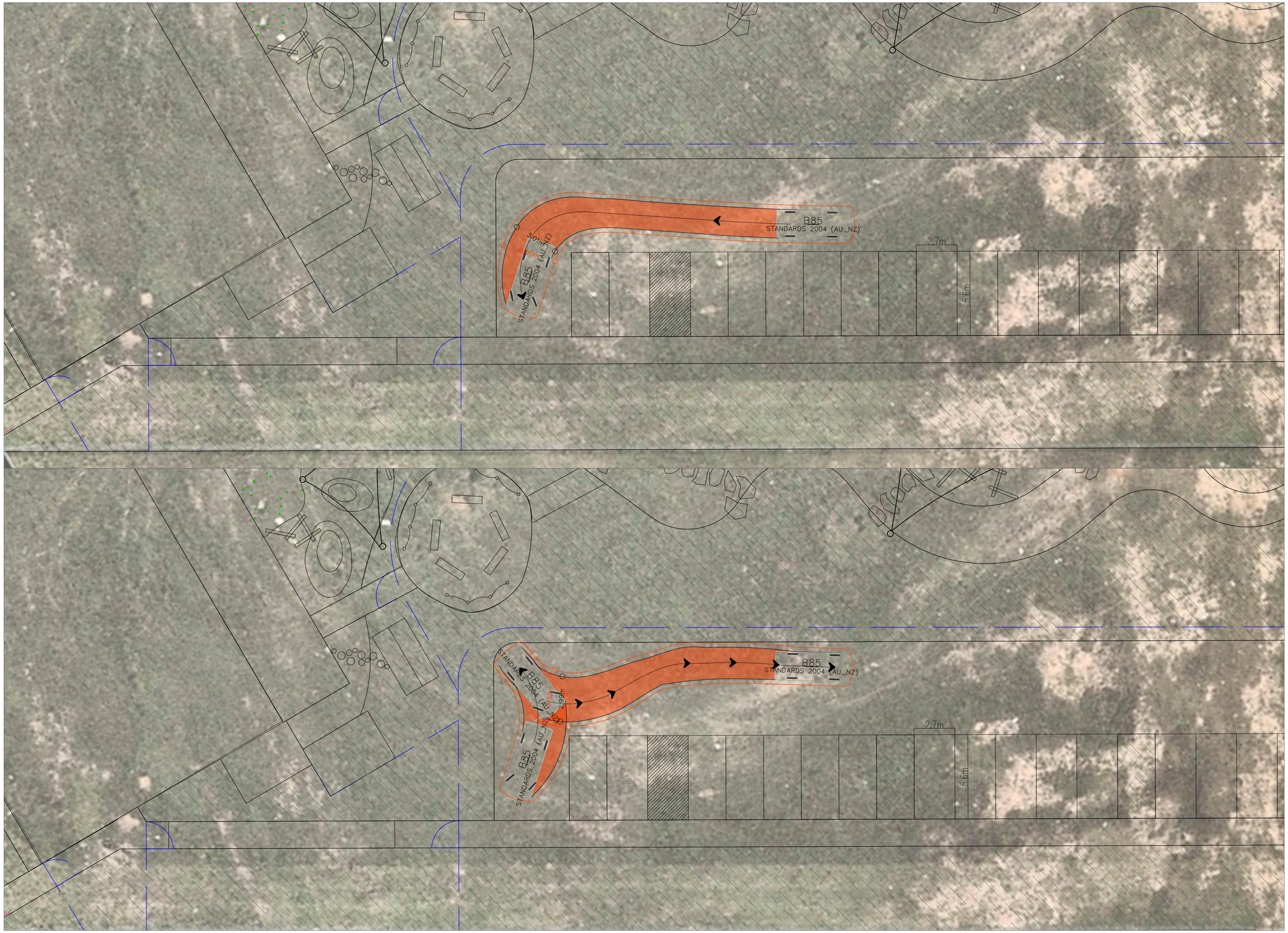
Scale : A1 1:125 | Drawn MP | Authorised MM

Job No 241021 | Drawing No SKTR00003 | Revision P1

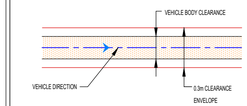
Plot File Created: Oct 22, 2024 - 10:11am

FileName: 241021-TTW-00-SK-TR-00003-[P1]-SWEPT PATH SKETCH- PRESCHOOL - B99 & B85 Entry & Exit.dwg - USER: mpartabatinats - Plot File Created: Oct 22, 2024 - 10:11am

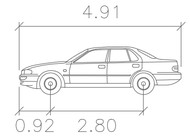
THIS DRAWING TO BE READ IN CONJUNCTION WITH ALL RELEVANT NOTES ON DRAWING C01



SWEPT PATH LEGEND:



NOTE: 300mm CLEARANCE IN ACCORDANCE WITH AS2890.1



B85

	meters
Width	: 1.87
Track	: 1.77
Lock to Lock Time	: 6.0
Steering Angle	: 34.1

THIS DRAWING HAS BEEN PREPARED USING COLOUR

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1:10 A1 1:20 A3

FileName: 241021-TTW-00-SK-TR-0000A-[P1]-SWEPT PATH SKETCH - PRESCHOOL - B85 Circulation.dwg - USER: mpartadinata - Plot File Created: Oct 22, 2024 - 10:12am

Rev	Description	Eng	Draft	Date
A	PLANNING SUBMISSION	MP	MP	22.10.24

Architect
OCULUS
Gadigal Country
Level 1, 5 Wilson Street
Newtown NSW 2042

Engineer
TTW Structural Civil Traffic Façade
612 9439 7288 | Level 6, 73 Miller Street, North Sydney, NSW 2060

Project
THE GABLES NEW PRIMARY SCHOOL

Sheet Subject
PRESCHOOL
SWEPT PATH SKETCH
B85 3 POINT TURN
FROM TURNING BAY

Scale : A1	Drawn	Authorised
1:125	MP	MM

Job No	Drawing No	Revision
241021	SKTR00004	P1

Plot File Created: Oct 22, 2024 - 10:12am

Appendix C Proposed Traffic Distribution & Generation

Maximum Capacity Trip Generation as per the proposed travel mode estimates / PUDO calculations

Student Vehicle Volume

Student Traffic Generation	Moderate Target		Reach Target	
	Primary School	Preschool	Primary School	Preschool
Student number	1000	60	1000	60
Mode share split AM	50%	0.8 trip / child / hour	30%	0.8 trip / child / hour
Mode share split PM		0.3 trip / child / hour		0.3 trip / child / hour
Travel demand	500		300	
Occupancy Rate	1.2 Students per vehicle		1.2 Students per vehicle	
Vehicle volume	**417**		250	
Trips rate	2 parents trips per students		2 minibus trips per 11 students	
Total trips (AM)	**833**	**48**	500	**48**
Total trips (PM)	**833**	**18**	500	**18**
Morning Peak (AM)				
In	417	24	250	24
Out	417	24	250	24
Afternoon Peak (PM)				
In	417	9	250	9
Out	417	9	250	9

Staff Vehicle Volume

Staff Traffic Generation	Moderate Target	Reach Target
	Primary School	Primary School
Staff number	68	68
Mode share split	100%	50%
Travel demand	**68**	34
Occupancy Rate	1 staff member per car	1 staff member per car
Vehicle volume	68	34
Total trips (AM)	**68**	34
Total trips (PM)	**68**	34
Morning Peak (AM)		
In	68	34
Out	0	0
Afternoon Peak (PM)		
In	0	0
Out	68	34

Total Vehicle Volume

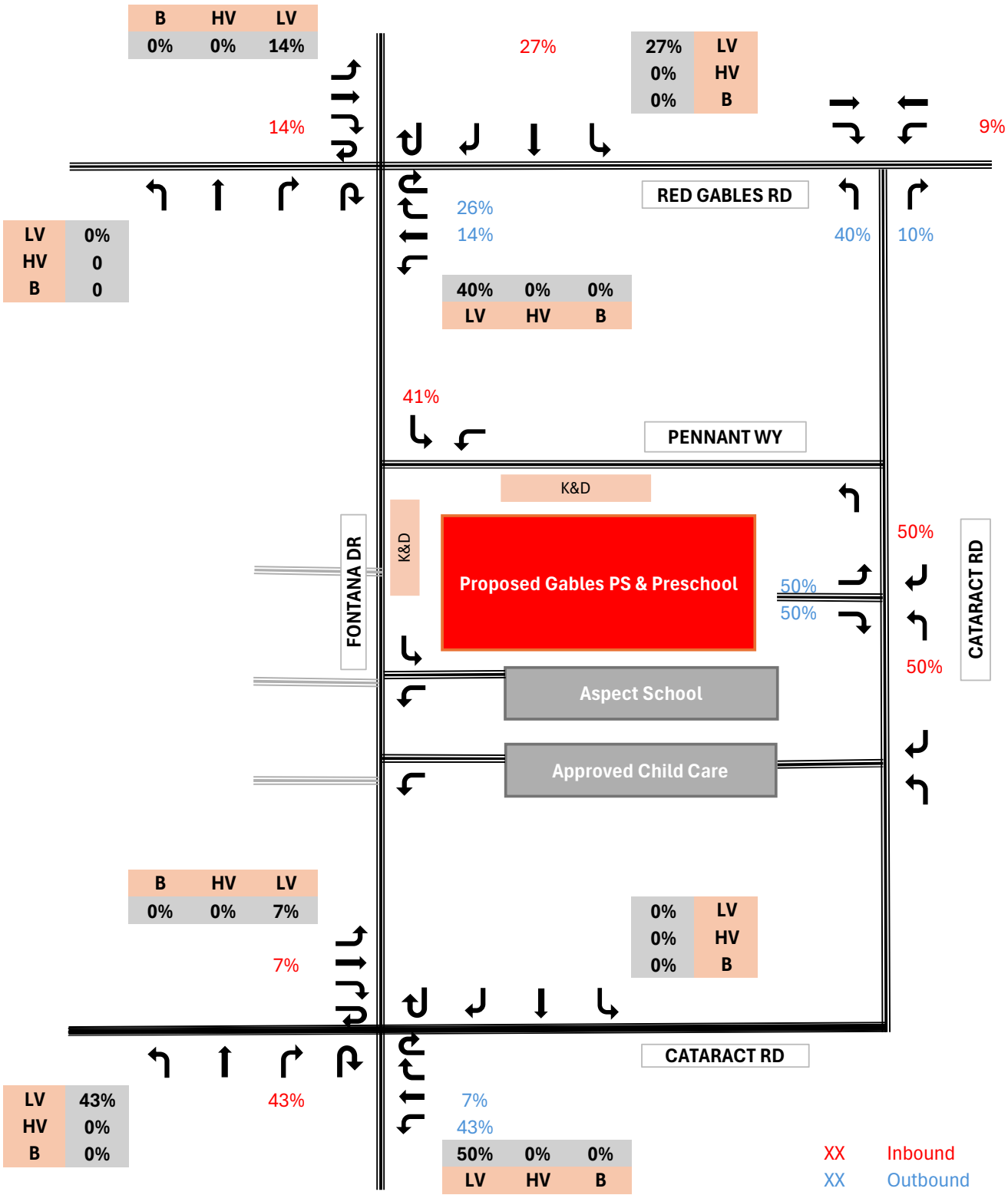
Total Traffic Generation	Moderate Target	Reach Target
	Primary School + Preschool	Primary School + Preschool
Total trips (AM)	**950**	534
Total trips (PM)	**920**	534
Morning Peak (AM)		
In	509	284
Out	441	250
Afternoon Peak (PM)		
In	426	250
Out	494	284

Notes

1. Staff split is assumed to be 100% as a conservative assessment
2. Pre School rates taken from RMS Guide as per Section 11.14 in the TIA report
3. Pre-school staff trip generation captures in the student calculation for RMS Guide as per Section 11.4 of the TIA report

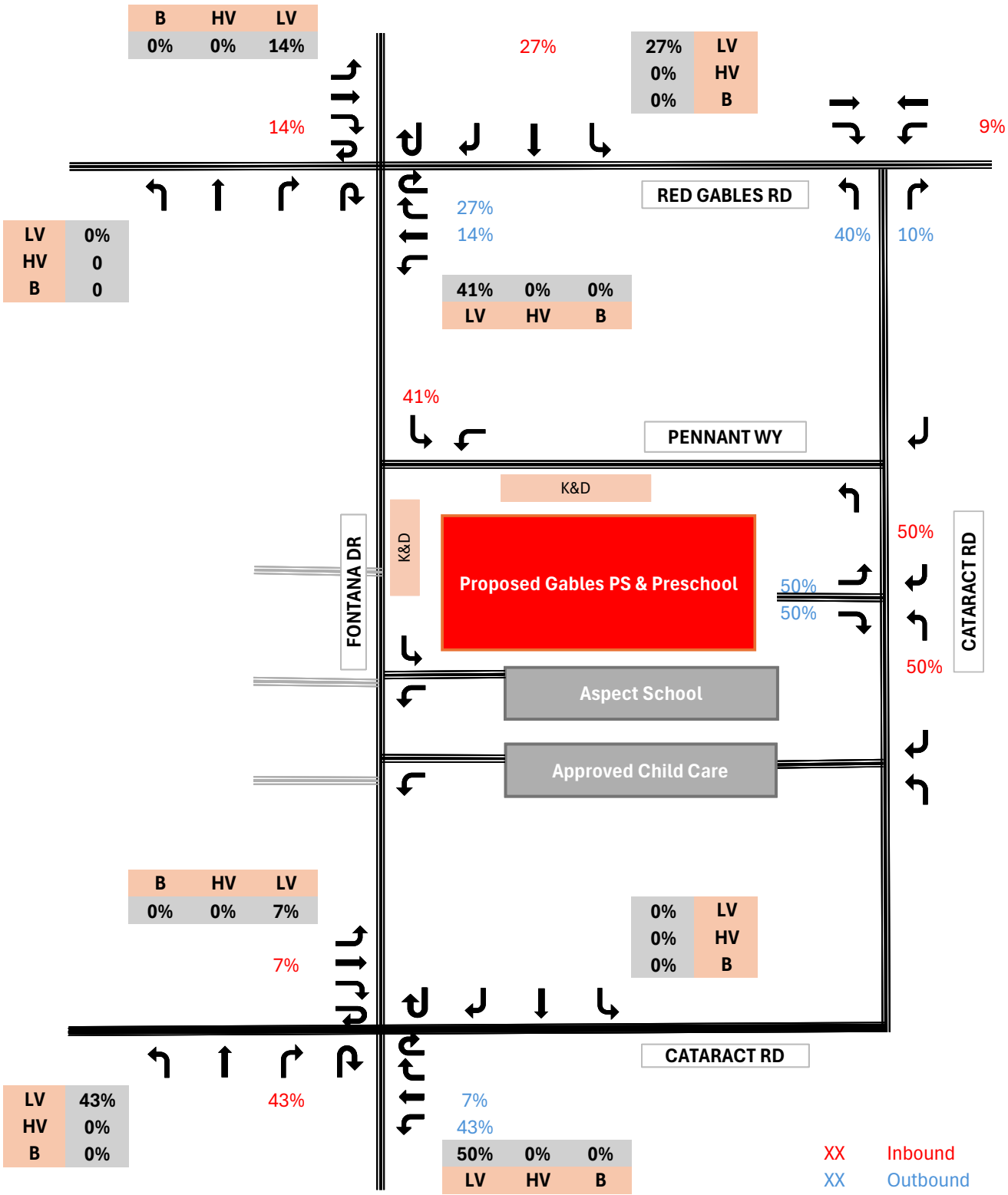
Proposed Trip Distribution - Pre-School Students

7:15 to 8:15 AM Peak Period
Vehicle Trips Distribution



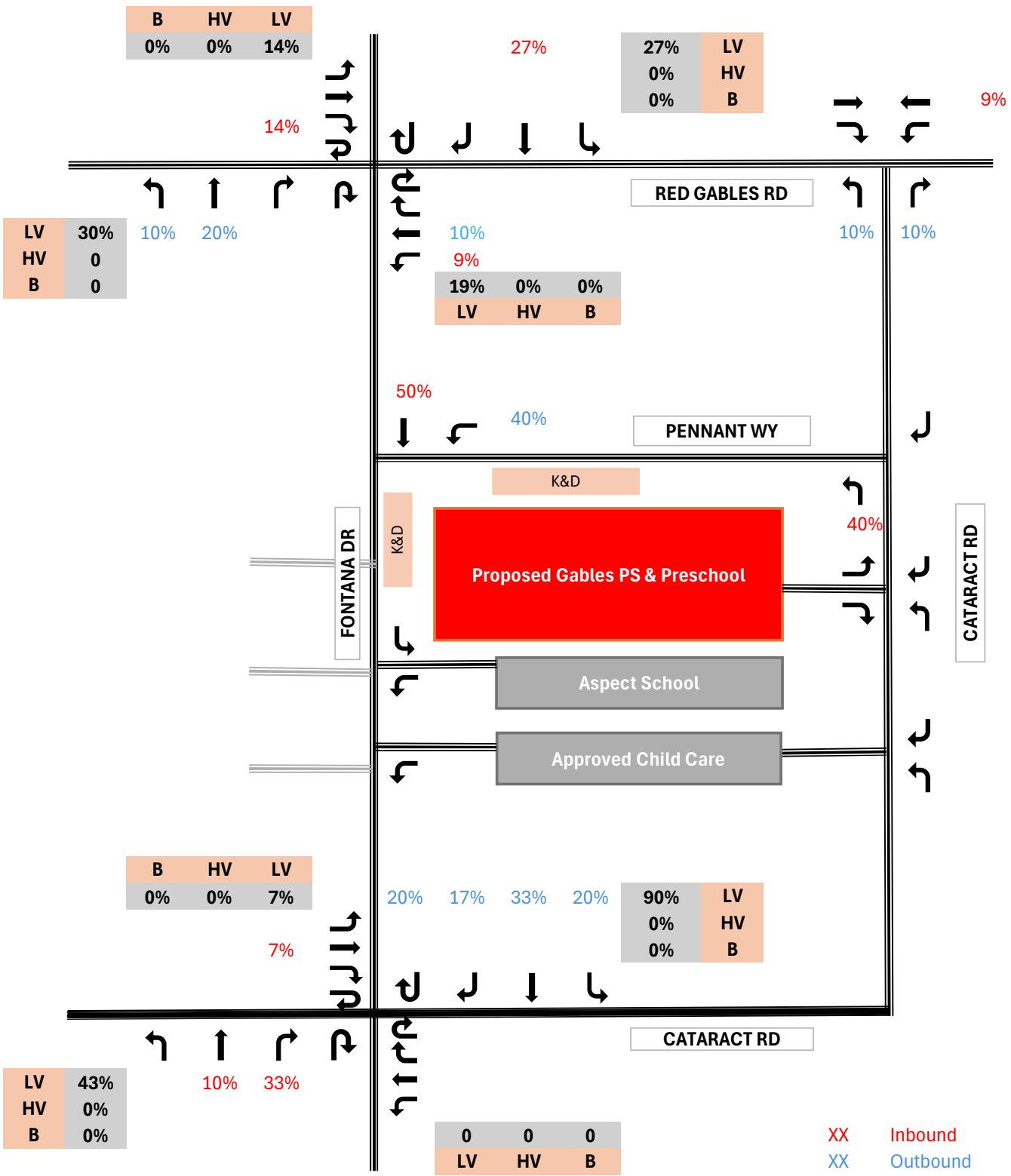
Proposed Trip Distribution - Pre-School Students

14:00 to 15:00 PM Peak Period
Vehicle Trips Distribution



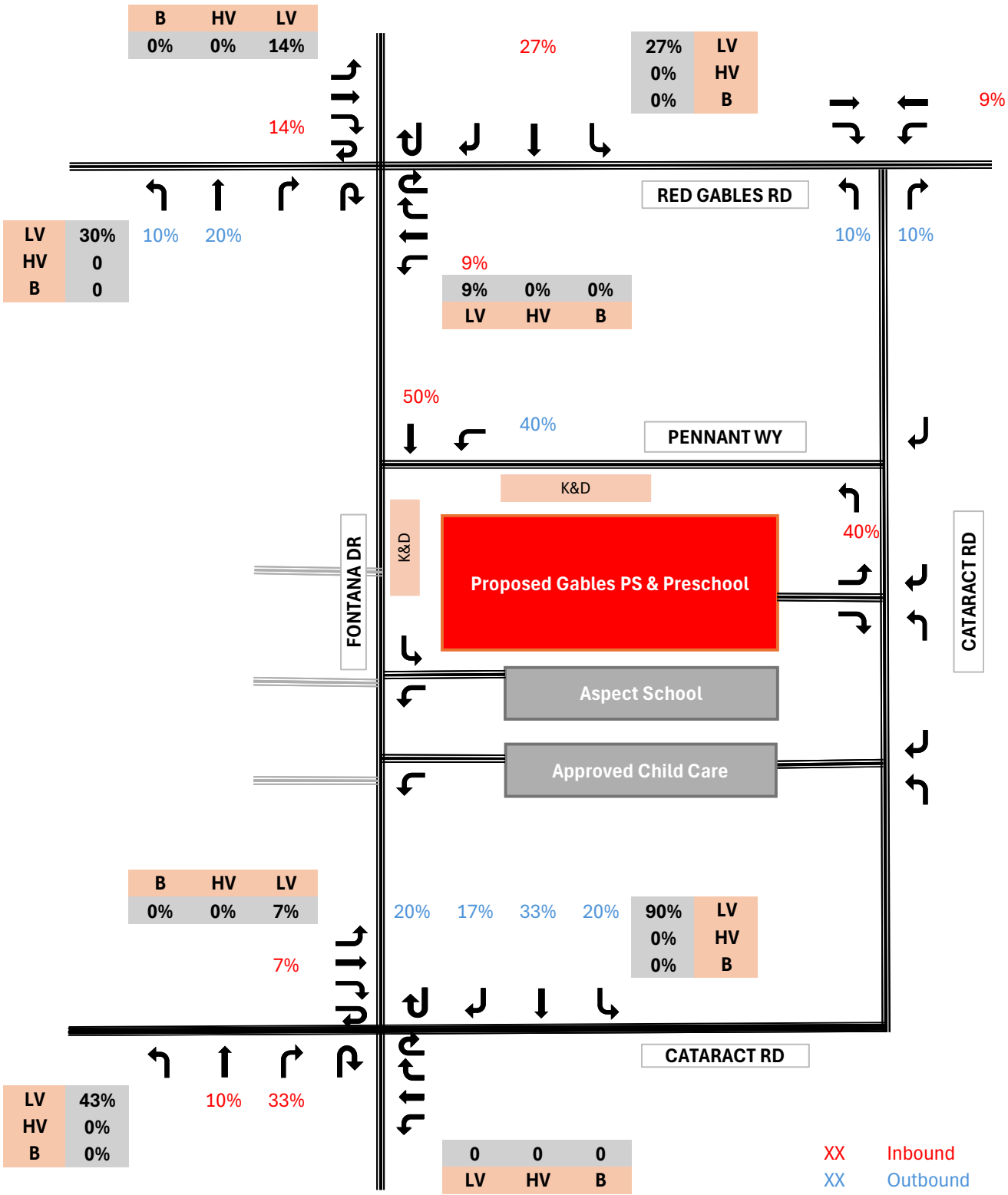
Proposed Trip Distribution - Primary School Students

7:15 to 8:15 AM Peak Period
Vehicle Trips Distribution



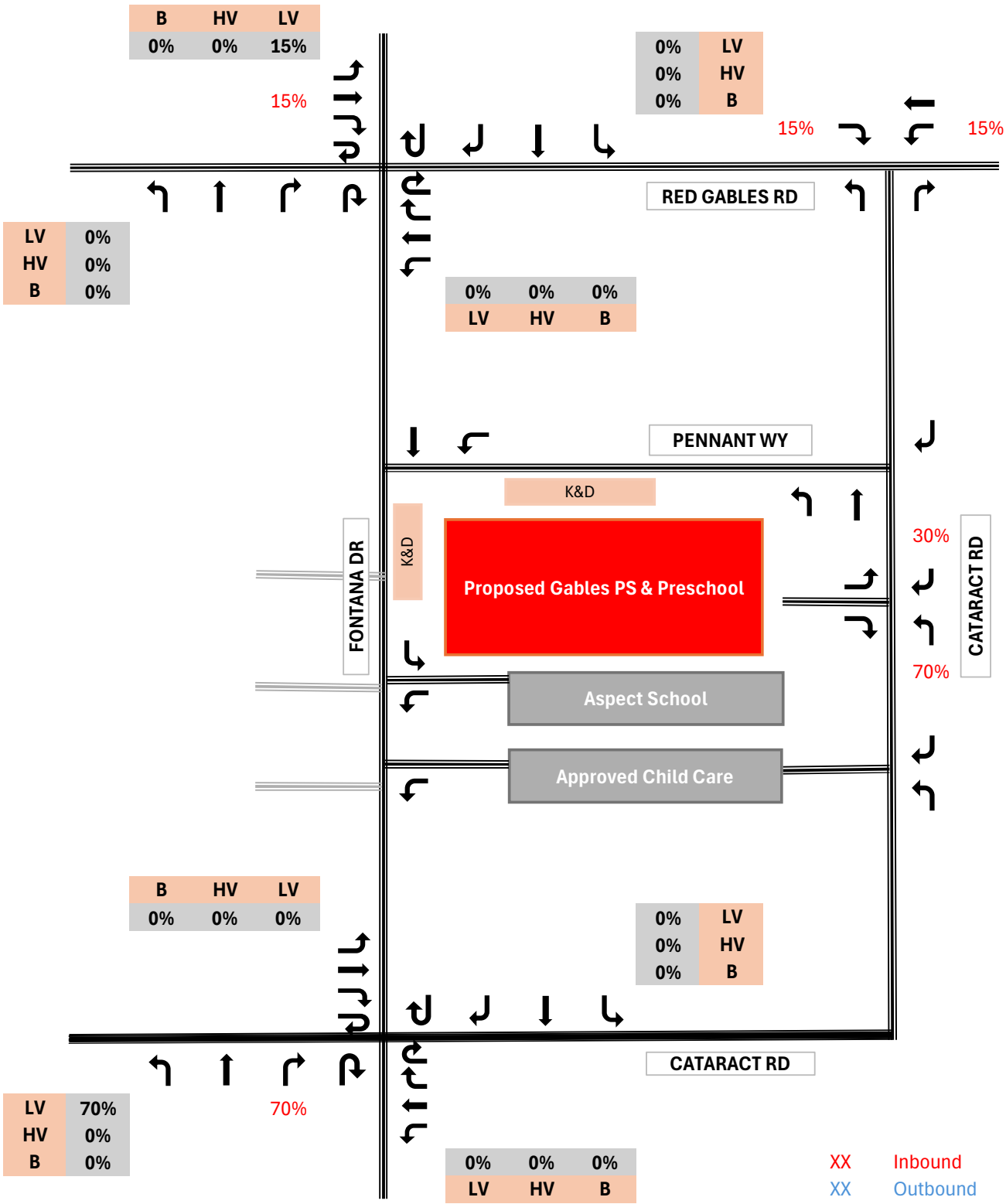
Proposed Trip Distribution - Primary School Students

14:00 to 15:00 PM Peak Period
Vehicle Trips Distribution



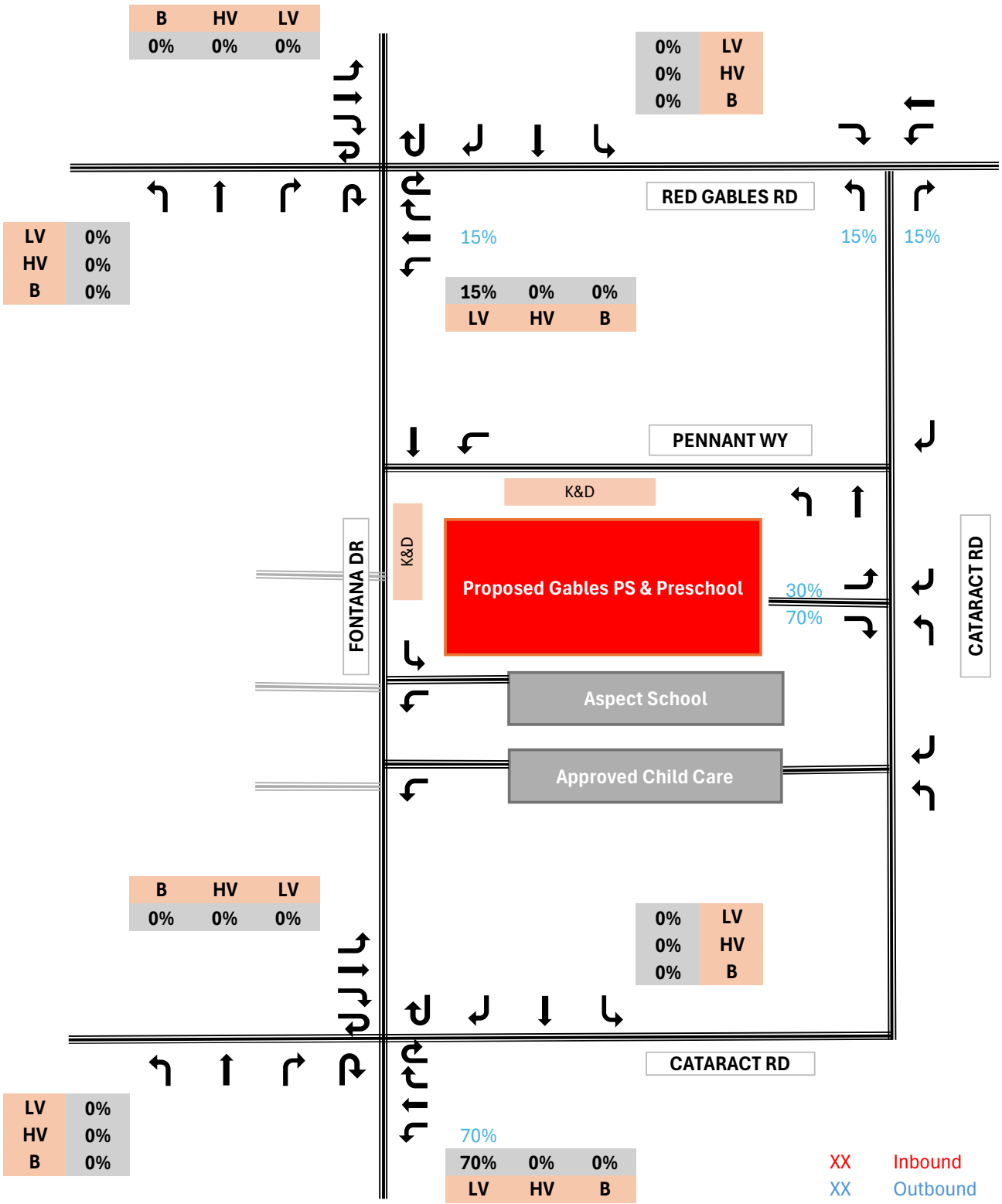
Proposed Trip Distribution - Staff

7:15 to 8:15 AM Peak Period
Vehicle Trips Distribution



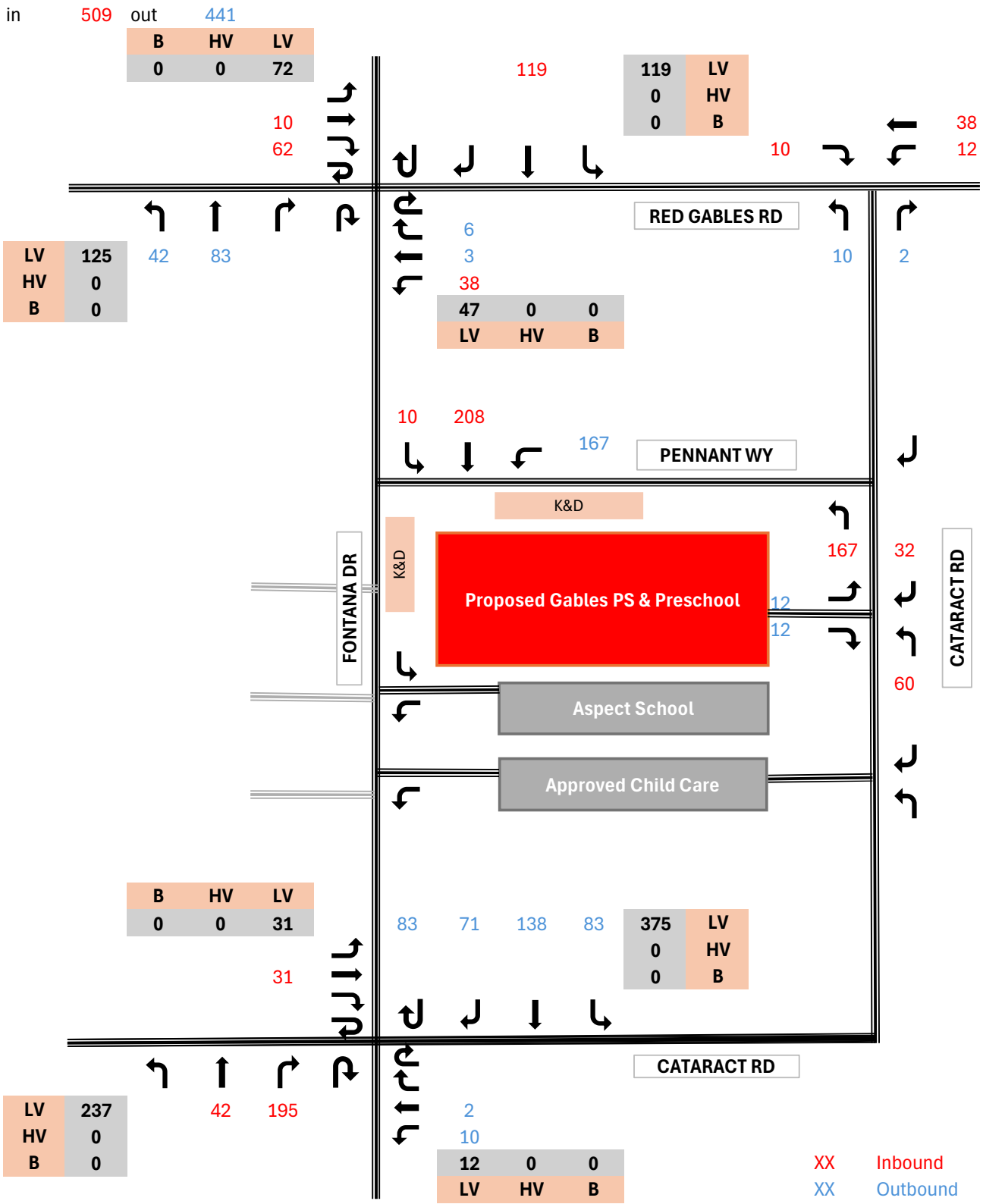
Proposed Trip Distribution - Staff

14:00 to 15:00 PM Peak Period
Vehicle Trips Distribution



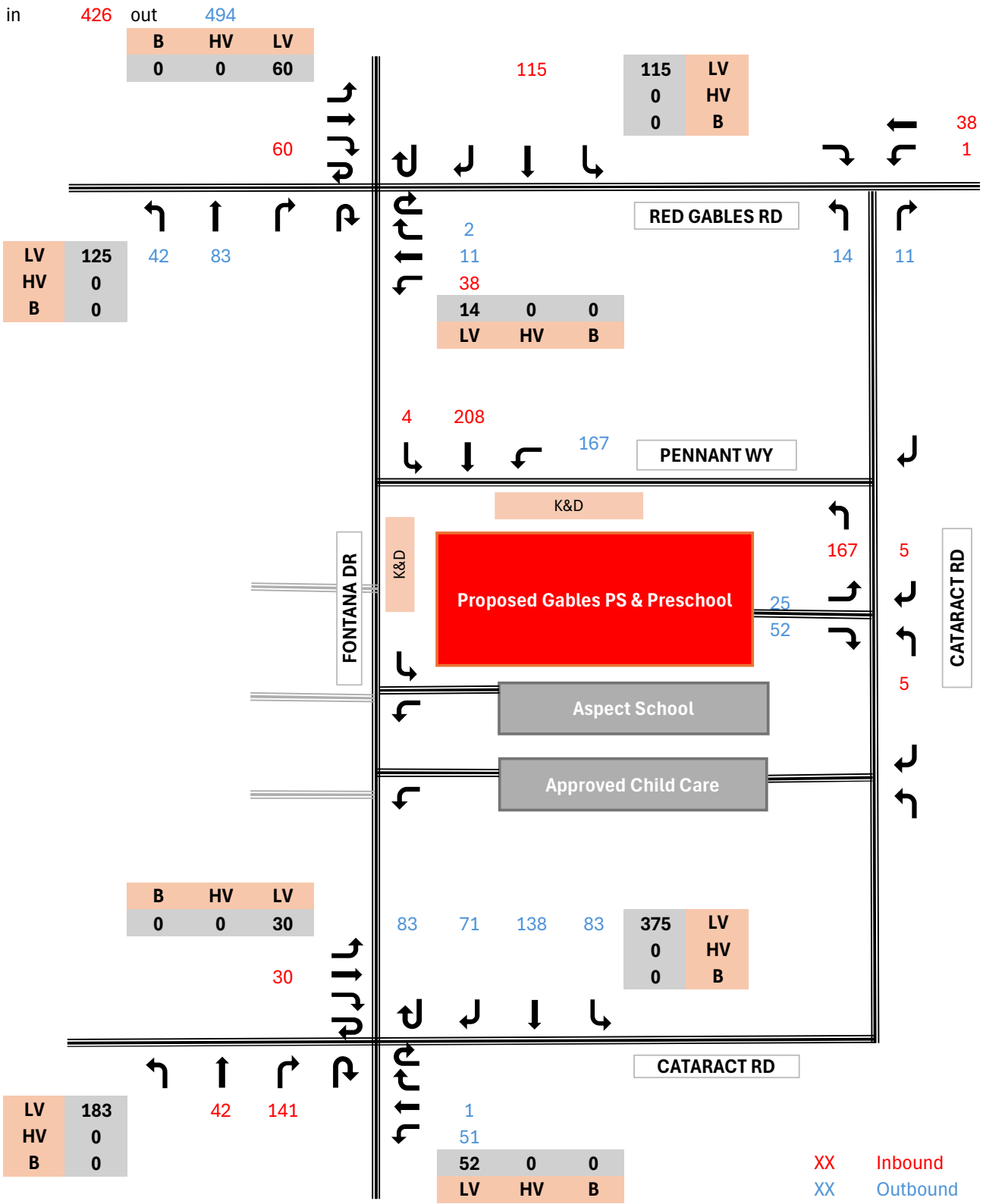
Proposed Total Trip Generation

7:15 to 8:15 AM Peak Period
Vehicle Trips Distribution



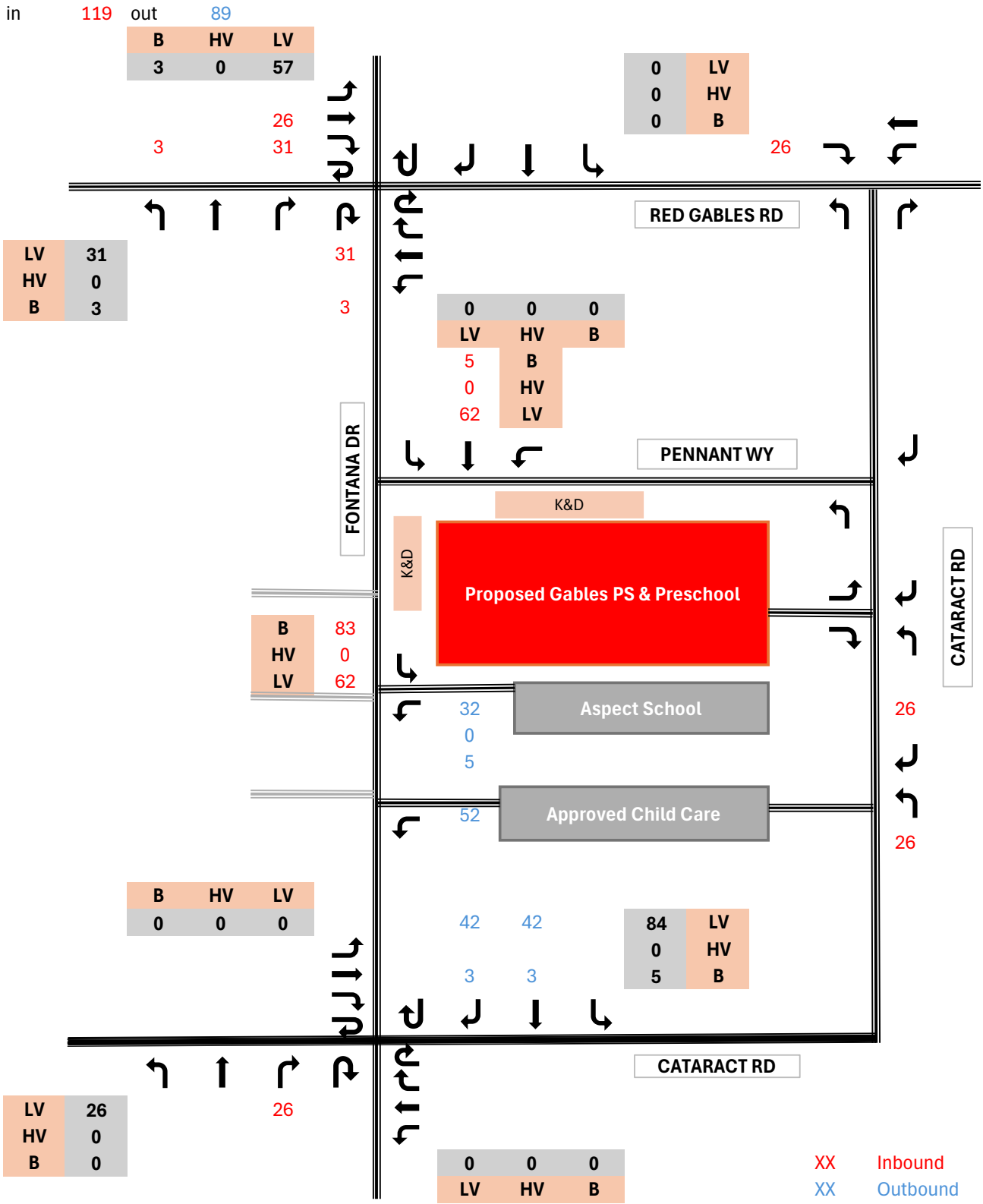
Proposed Total Trip Generation

14:00 to 15:00 PM Peak Period
Vehicle Trips Distribution



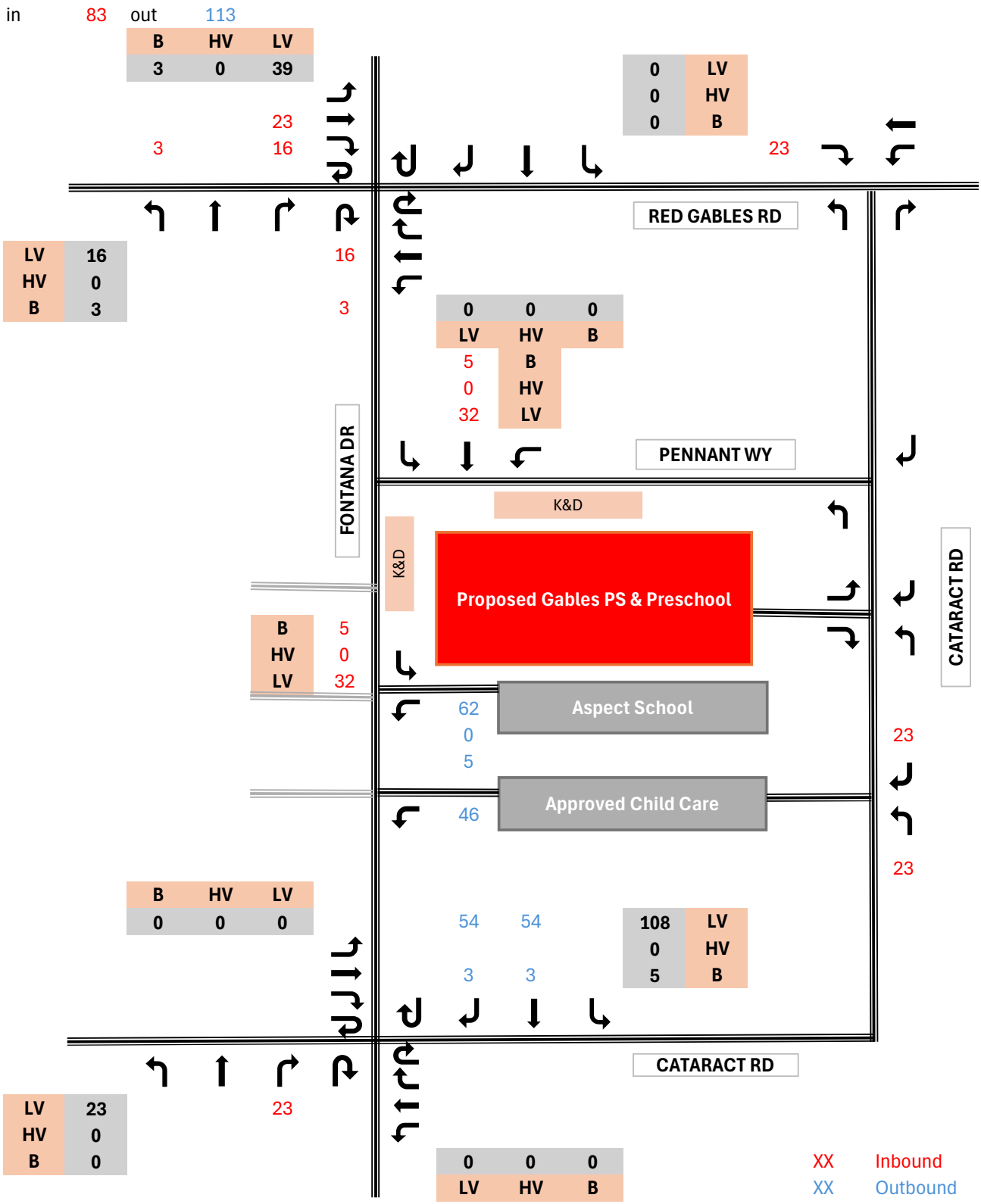
Aspect School and Childcare Centre
Total Approved Developments

7:15 to 8:15 AM Peak Period
Student & Staff Vehicle Trips Distribution



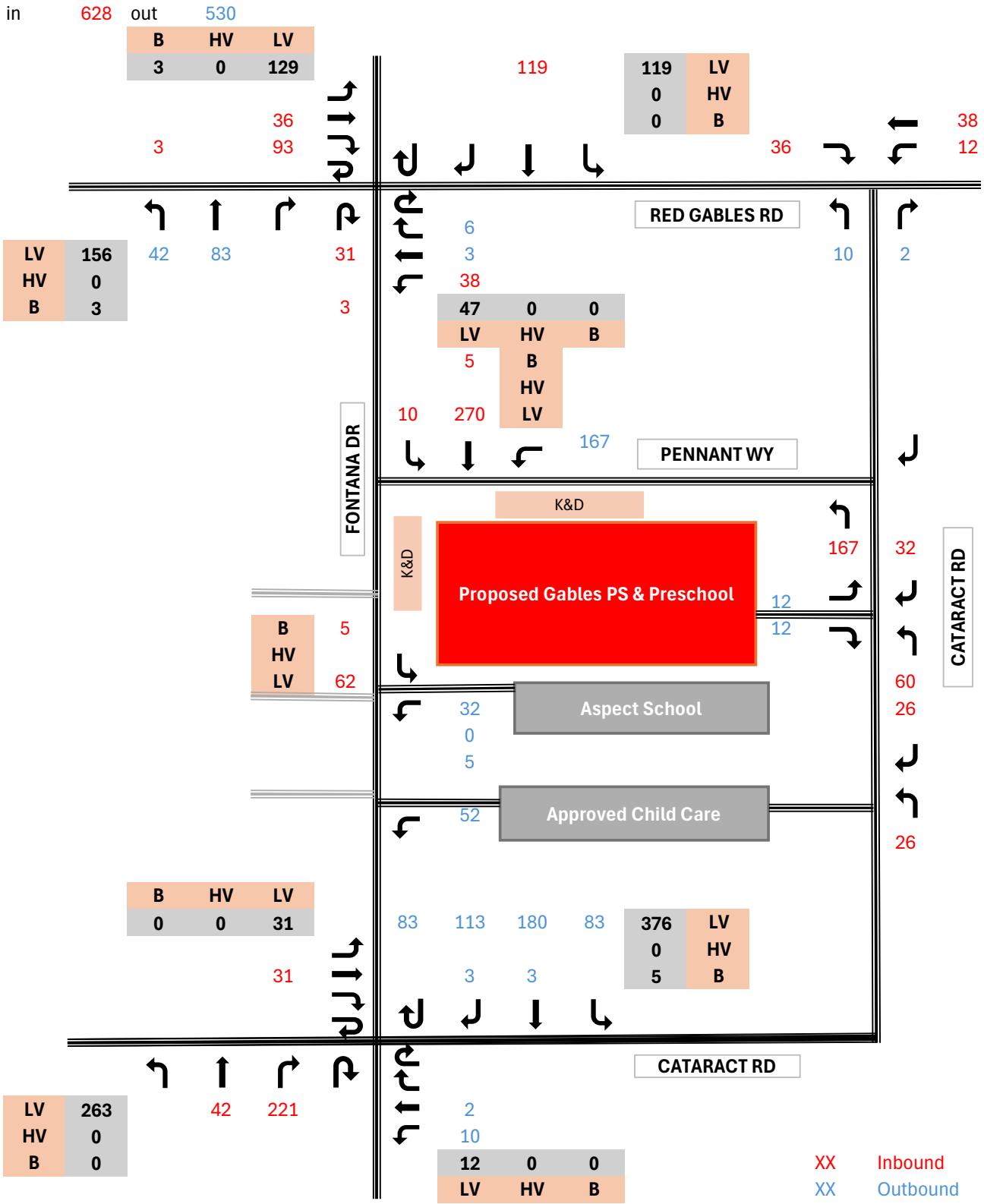
Aspect School and Childcare Centre
Total Approved Developments

14:00 to 15:00 PM Peak Period
Student & Staff Vehicle Trips Distribution



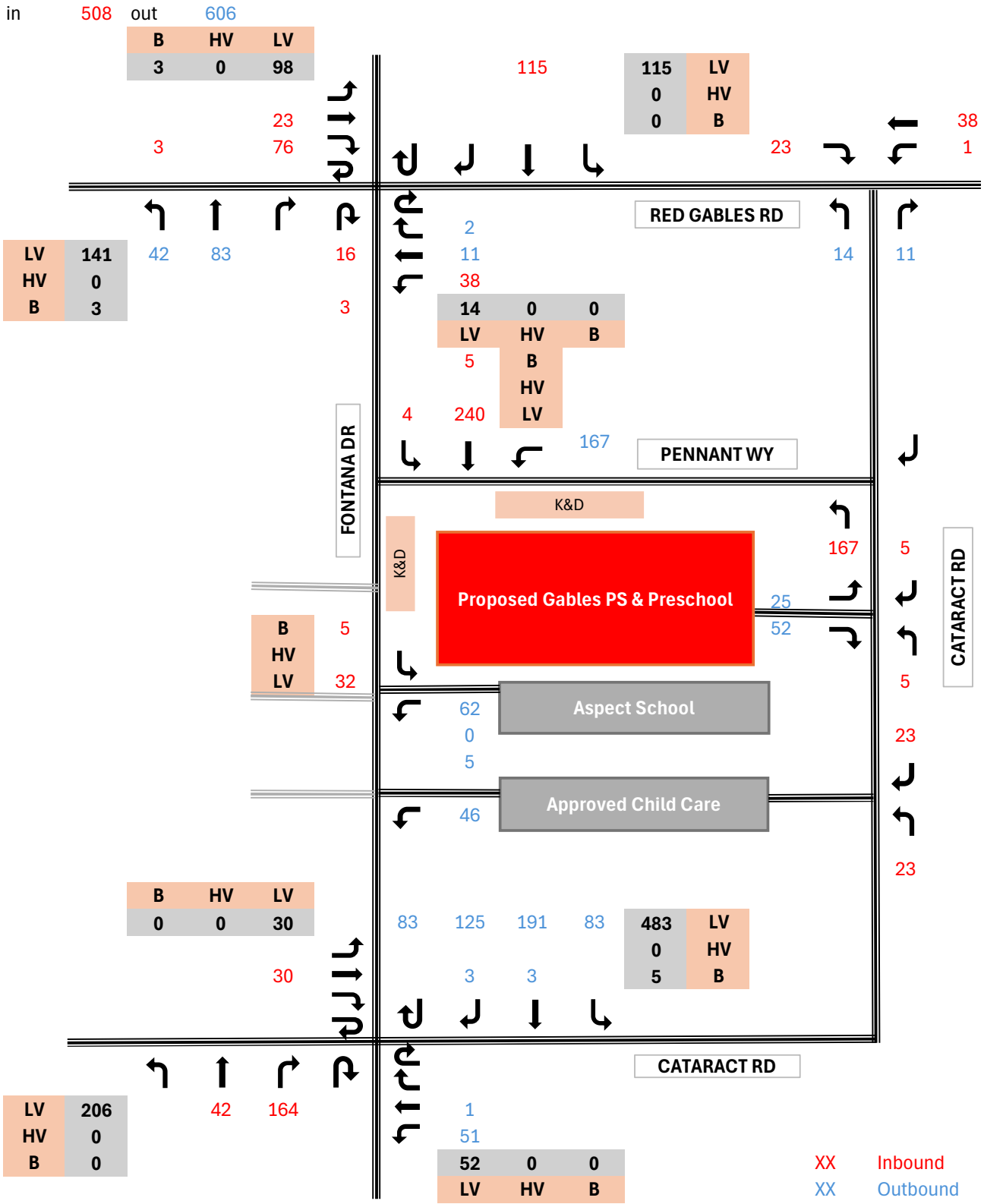
Total Approved Developments and Proposed Total Trip Generation

7:15 to 8:15 AM Peak Period
Student & Staff Vehicle Trips Distribution



Total Approved Developments and Proposed Total Trip Generation

14:00 to 15:00 PM Peak Period
Student & Staff Vehicle Trips Distribution



Appendix D SIDRA Traffic Modelling

MOVEMENT SUMMARY

Site: 101 [Fontana Drive / Red Gables Rd - AM Peak (Site Folder: Existing Intersection (2024))]

AM Peak Hour : 7:15 - 8:15 AM
Fontana Drive / Red Gables Rd
Site Category: Existing Condition (2024)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Fontana Dr														
1	L2	56	2	59	3.6	0.437	2.9	LOS A	2.0	14.2	0.36	0.54	0.36	38.0
2	T1	137	12	144	8.8	0.437	2.3	LOS A	2.0	14.2	0.36	0.54	0.36	38.8
3	R2	320	0	337	0.0	0.437	6.3	LOS A	2.0	14.2	0.36	0.54	0.36	39.1
3u	U	13	1	14	7.7	0.437	7.8	LOS A	2.0	14.2	0.36	0.54	0.36	39.8
Approach		526	15	554	2.9	0.437	4.9	LOS A	2.0	14.2	0.36	0.54	0.36	38.9
East: Red Gables Rd														
4	L2	53	1	56	1.9	0.113	3.1	LOS A	0.4	3.0	0.36	0.44	0.36	38.6
5	T1	56	0	59	0.0	0.113	2.5	LOS A	0.4	3.0	0.36	0.44	0.36	39.4
6	R2	10	0	11	0.0	0.113	6.4	LOS A	0.4	3.0	0.36	0.44	0.36	39.7
6u	U	7	0	7	0.0	0.113	7.9	LOS A	0.4	3.0	0.36	0.44	0.36	40.5
Approach		126	1	133	0.8	0.113	3.3	LOS A	0.4	3.0	0.36	0.44	0.36	39.1
North: Fontana Dr														
7	L2	7	0	7	0.0	0.261	3.3	LOS A	1.1	8.2	0.45	0.53	0.45	38.2
8	T1	158	14	166	8.9	0.261	3.0	LOS A	1.1	8.2	0.45	0.53	0.45	39.0
9	R2	101	1	106	1.0	0.261	7.0	LOS A	1.1	8.2	0.45	0.53	0.45	39.2
9u	U	1	0	1	0.0	0.261	8.4	LOS A	1.1	8.2	0.45	0.53	0.45	40.0
Approach		267	15	281	5.6	0.261	4.5	LOS A	1.1	8.2	0.45	0.53	0.45	39.0
West: Red Gables Rd														
10	L2	133	2	140	1.5	0.254	3.8	LOS A	1.3	9.5	0.56	0.64	0.56	38.0
11	T1	28	0	29	0.0	0.254	3.3	LOS A	1.3	9.5	0.56	0.64	0.56	38.8
12	R2	21	1	22	4.8	0.254	7.6	LOS A	1.3	9.5	0.56	0.64	0.56	39.1
12u	U	65	2	68	3.1	0.254	9.1	LOS A	1.3	9.5	0.56	0.64	0.56	39.8
Approach		247	5	260	2.0	0.254	5.5	LOS A	1.3	9.5	0.56	0.64	0.56	38.6
All Vehicles		1166	36	1227	3.1	0.437	4.8	LOS A	2.0	14.2	0.42	0.55	0.42	38.9

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [Fontana Drive / Red Gables Rd - PM Peak (Site Folder: Existing Intersection (2024))]

PM Peak Hour : 2:00-3:00 PM
Fontana Drive / Red Gables Rd
Site Category: Existing Condition (2024)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Fontana Dr														
1	L2	40	1	42	2.5	0.171	2.4	LOS A	0.5	4.0	0.20	0.46	0.20	37.8
2	T1	54	14	57	25.9	0.171	1.9	LOS A	0.5	4.0	0.20	0.46	0.20	38.0
3	R2	97	1	102	1.0	0.171	5.8	LOS A	0.5	4.0	0.20	0.46	0.20	37.7
3u	U	14	0	15	0.0	0.171	7.3	LOS A	0.5	4.0	0.20	0.46	0.20	37.7
Approach		205	16	216	7.8	0.171	4.2	LOS A	0.5	4.0	0.20	0.46	0.20	37.8
East: Red Gables Rd														
4	L2	47	0	49	0.0	0.099	2.6	LOS A	0.3	2.2	0.24	0.39	0.24	38.3
5	T1	53	0	56	0.0	0.099	2.1	LOS A	0.3	2.2	0.24	0.39	0.24	38.4
6	R2	11	0	12	0.0	0.099	6.0	LOS A	0.3	2.2	0.24	0.39	0.24	38.1
6u	U	9	0	9	0.0	0.099	7.4	LOS A	0.3	2.2	0.24	0.39	0.24	38.1
Approach		120	0	126	0.0	0.099	3.0	LOS A	0.3	2.2	0.24	0.39	0.24	38.3
North: Fontana Dr														
7	L2	7	0	7	0.0	0.124	2.4	LOS A	0.4	3.0	0.25	0.42	0.25	38.1
8	T1	80	13	84	16.3	0.124	2.1	LOS A	0.4	3.0	0.25	0.42	0.25	38.2
9	R2	52	1	55	1.9	0.124	6.1	LOS A	0.4	3.0	0.25	0.42	0.25	37.9
9u	U	1	0	1	0.0	0.124	7.5	LOS A	0.4	3.0	0.25	0.42	0.25	37.9
Approach		140	14	147	10.0	0.124	3.6	LOS A	0.4	3.0	0.25	0.42	0.25	38.1
West: Red Gables Rd														
10	L2	28	0	29	0.0	0.116	2.3	LOS A	0.5	3.3	0.29	0.45	0.29	37.9
11	T1	42	0	44	0.0	0.116	1.8	LOS A	0.5	3.3	0.29	0.45	0.29	38.0
12	R2	45	5	47	11.1	0.116	6.2	LOS A	0.5	3.3	0.29	0.45	0.29	37.7
12u	U	21	1	22	4.8	0.116	7.6	LOS A	0.5	3.3	0.29	0.45	0.29	37.7
Approach		136	6	143	4.4	0.116	4.3	LOS A	0.5	3.3	0.29	0.45	0.29	37.9
All Vehicles		601	36	633	6.0	0.171	3.9	LOS A	0.5	4.0	0.24	0.43	0.24	38.0

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 102 [Fontana Drive / Cataract Rd - AM Peak (Site Folder: Existing Intersection (2024))]

AM Peak Hour: 7:15 - 8:15 AM
Fontana Drive / Cataract Rd
Site Category: Existing Condition (2024)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Fontana Drive														
1	L2	45	2	47	4.4	0.300	4.0	LOS A	1.7	12.0	0.39	0.50	0.39	46.4
2	T1	241	9	254	3.7	0.300	3.8	LOS A	1.7	12.0	0.39	0.50	0.39	47.4
3	R2	53	0	56	0.0	0.300	8.1	LOS A	1.7	12.0	0.39	0.50	0.39	47.5
3u	U	1	0	1	0.0	0.300	9.9	LOS A	1.7	12.0	0.39	0.50	0.39	48.3
Approach		340	11	358	3.2	0.300	4.5	LOS A	1.7	12.0	0.39	0.50	0.39	47.3
East: Cataract Rd														
4	L2	122	1	128	0.8	0.209	4.5	LOS A	1.1	7.5	0.45	0.55	0.45	46.5
5	T1	88	0	93	0.0	0.209	4.3	LOS A	1.1	7.5	0.45	0.55	0.45	47.6
6	R2	2	1	2	50.0	0.209	9.8	LOS A	1.1	7.5	0.45	0.55	0.45	47.0
6u	U	1	0	1	0.0	0.209	10.4	LOS A	1.1	7.5	0.45	0.55	0.45	48.5
Approach		213	2	224	0.9	0.209	4.5	LOS A	1.1	7.5	0.45	0.55	0.45	47.0
North: Fontana Dr														
7	L2	1	1	1	100.0	0.221	4.9	LOS A	1.0	7.1	0.28	0.50	0.28	45.9
8	T1	161	14	169	8.7	0.221	3.6	LOS A	1.0	7.1	0.28	0.50	0.28	47.2
9	R2	81	1	85	1.2	0.221	7.8	LOS A	1.0	7.1	0.28	0.50	0.28	47.3
9u	U	1	0	1	0.0	0.221	9.5	LOS A	1.0	7.1	0.28	0.50	0.28	48.1
Approach		244	16	257	6.6	0.221	5.0	LOS A	1.0	7.1	0.28	0.50	0.28	47.2
West: Cataract Rd														
10	L2	155	5	163	3.2	0.250	4.6	LOS A	1.3	9.8	0.49	0.60	0.49	46.2
11	T1	40	1	42	2.5	0.250	4.5	LOS A	1.3	9.8	0.49	0.60	0.49	47.2
12	R2	42	3	44	7.1	0.250	8.9	LOS A	1.3	9.8	0.49	0.60	0.49	47.2
12u	U	4	2	4	50.0	0.250	11.7	LOS A	1.3	9.8	0.49	0.60	0.49	47.8
Approach		241	11	254	4.6	0.250	5.5	LOS A	1.3	9.8	0.49	0.60	0.49	46.6
All Vehicles		1038	40	1093	3.9	0.300	4.9	LOS A	1.7	12.0	0.40	0.53	0.40	47.0

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 102 [Fontana Drive / Cataract Rd - PM Peak (Site Folder: Existing Intersection (2024))]

PM Peak Hour : 2:00-3:00 PM
Fontana Drive / Cataract Rd
Site Category: Existing Condition (2024)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Fontana Drive														
1	L2	31	1	33	3.2	0.190	3.6	LOS A	0.9	6.8	0.30	0.44	0.30	46.2
2	T1	155	11	163	7.1	0.190	3.5	LOS A	0.9	6.8	0.30	0.44	0.30	46.4
3	R2	32	0	34	0.0	0.190	7.8	LOS A	0.9	6.8	0.30	0.44	0.30	45.8
3u	U	1	0	1	0.0	0.190	9.6	LOS A	0.9	6.8	0.30	0.44	0.30	45.8
Approach		219	12	231	5.5	0.190	4.2	LOS A	0.9	6.8	0.30	0.44	0.30	46.3
East: Cataract Rd														
4	L2	98	2	103	2.0	0.140	4.1	LOS A	0.7	4.6	0.38	0.48	0.38	46.2
5	T1	50	0	53	0.0	0.140	4.0	LOS A	0.7	4.6	0.38	0.48	0.38	46.5
6	R2	1	0	1	0.0	0.140	8.3	LOS A	0.7	4.6	0.38	0.48	0.38	45.9
6u	U	1	0	1	0.0	0.140	10.0	LOS A	0.7	4.6	0.38	0.48	0.38	45.9
Approach		150	2	158	1.3	0.140	4.1	LOS A	0.7	4.6	0.38	0.48	0.38	46.3
North: Fontana Dr														
7	L2	1	0	1	0.0	0.171	3.4	LOS A	0.7	5.1	0.21	0.48	0.21	45.8
8	T1	120	10	126	8.3	0.171	3.4	LOS A	0.7	5.1	0.21	0.48	0.21	46.1
9	R2	72	6	76	8.3	0.171	7.6	LOS A	0.7	5.1	0.21	0.48	0.21	45.5
9u	U	3	0	3	0.0	0.171	9.3	LOS A	0.7	5.1	0.21	0.48	0.21	45.5
Approach		196	16	206	8.2	0.171	5.0	LOS A	0.7	5.1	0.21	0.48	0.21	45.9
West: Cataract Rd														
10	L2	52	4	55	7.7	0.108	4.0	LOS A	0.5	3.6	0.35	0.52	0.35	45.7
11	T1	27	0	28	0.0	0.108	3.8	LOS A	0.5	3.6	0.35	0.52	0.35	46.0
12	R2	30	1	32	3.3	0.108	8.1	LOS A	0.5	3.6	0.35	0.52	0.35	45.4
12u	U	4	1	4	25.0	0.108	10.3	LOS A	0.5	3.6	0.35	0.52	0.35	45.3
Approach		113	6	119	5.3	0.108	5.2	LOS A	0.5	3.6	0.35	0.52	0.35	45.7
All Vehicles		678	36	714	5.3	0.190	4.6	LOS A	0.9	6.8	0.30	0.47	0.30	46.1

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [Fontana Drive / Red Gables Rd - AM Peak (Site Folder: Existing Intersection 2027 Opening Year)]

AM Peak Hour : 7:15 - 8:15 AM
Fontana Drive / Red Gables Rd
(Proposed Dev Traffic + Approved Traffic + 2027 Background 6% growth rate per annum)
Site Category: 2027 Opening Year Baseline
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Fontana Dr														
1	L2	108	2	114	1.9	0.665	5.0	LOS A	4.9	35.2	0.55	0.68	0.60	41.9
2	T1	246	14	259	5.7	0.665	4.5	LOS A	4.9	35.2	0.55	0.68	0.60	42.5
3	R2	381	0	401	0.0	0.665	7.4	LOS A	4.9	35.2	0.55	0.68	0.60	40.2
3u	U	46	1	48	2.2	0.665	11.6	LOS A	4.9	35.2	0.55	0.68	0.60	45.3
Approach		781	17	822	2.2	0.665	6.4	LOS A	4.9	35.2	0.55	0.68	0.60	41.4
East: Red Gables Rd														
4	L2	101	1	106	1.0	0.230	5.8	LOS A	1.2	8.7	0.64	0.68	0.64	42.6
5	T1	70	0	74	0.0	0.230	4.4	LOS A	1.2	8.7	0.64	0.68	0.64	41.0
6	R2	18	0	19	0.0	0.230	9.4	LOS A	1.2	8.7	0.64	0.68	0.64	43.4
6u	U	8	0	8	0.0	0.230	9.7	LOS A	1.2	8.7	0.64	0.68	0.64	41.7
Approach		197	1	207	0.5	0.230	5.8	LOS A	1.2	8.7	0.64	0.68	0.64	42.1
North: Fontana Dr														
7	L2	8	0	8	0.0	0.521	6.6	LOS A	3.7	27.0	0.74	0.89	0.87	39.1
8	T1	307	16	323	5.2	0.521	7.5	LOS A	3.7	27.0	0.74	0.89	0.87	42.9
9	R2	120	1	126	0.8	0.521	10.2	LOS A	3.7	27.0	0.74	0.89	0.87	40.2
9u	U	1	0	1	0.0	0.521	11.7	LOS A	3.7	27.0	0.74	0.89	0.87	41.0
Approach		436	17	459	3.9	0.521	8.2	LOS A	3.7	27.0	0.74	0.89	0.87	42.0
West: Red Gables Rd														
10	L2	158	2	166	1.3	0.553	7.6	LOS A	4.7	33.6	0.85	0.98	1.02	38.2
11	T1	69	0	73	0.0	0.553	8.7	LOS A	4.7	33.6	0.85	0.98	1.02	42.7
12	R2	124	7	131	5.6	0.553	14.0	LOS A	4.7	33.6	0.85	0.98	1.02	43.8
12u	U	77	2	81	2.6	0.553	12.9	LOS A	4.7	33.6	0.85	0.98	1.02	40.0
Approach		428	11	451	2.6	0.553	10.6	LOS A	4.7	33.6	0.85	0.98	1.02	40.8
All Vehicles		1842	46	1939	2.5	0.665	7.7	LOS A	4.9	35.2	0.67	0.80	0.76	41.5

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [Fontana Drive / Red Gables Rd - PM Peak (Site Folder: Existing Intersection 2027 Opening Year)]

PM Peak Hour : 2:00-3:00 PM
Fontana Drive / Red Gables Rd
(Proposed Dev Traffic + Approved Traffic + 2027 Background 6% growth rate per annum)
Site Category: 2027 Opening Year Baseline
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Fontana Dr														
1	L2	89	1	94	1.1	0.320	3.7	LOS A	1.3	9.3	0.28	0.52	0.28	44.5
2	T1	148	17	156	11.5	0.320	3.8	LOS A	1.3	9.3	0.28	0.52	0.28	46.0
3	R2	115	1	121	0.9	0.320	6.0	LOS A	1.3	9.3	0.28	0.52	0.28	42.1
3u	U	36	3	38	8.3	0.320	9.5	LOS A	1.3	9.3	0.28	0.52	0.28	46.2
Approach		388	22	408	5.7	0.320	5.0	LOS A	1.3	9.3	0.28	0.52	0.28	44.5
East: Red Gables Rd														
4	L2	94	0	99	0.0	0.182	4.5	LOS A	0.8	5.3	0.43	0.55	0.43	43.6
5	T1	74	0	78	0.0	0.182	3.5	LOS A	0.8	5.3	0.43	0.55	0.43	42.6
6	R2	15	0	16	0.0	0.182	7.4	LOS A	0.8	5.3	0.43	0.55	0.43	42.7
6u	U	11	0	12	0.0	0.182	8.4	LOS A	0.8	5.3	0.43	0.55	0.43	42.4
Approach		194	0	204	0.0	0.182	4.6	LOS A	0.8	5.3	0.43	0.55	0.43	43.1
North: Fontana Dr														
7	L2	8	0	8	0.0	0.266	3.1	LOS A	1.1	8.1	0.41	0.54	0.41	41.1
8	T1	210	15	221	7.1	0.266	4.4	LOS A	1.1	8.1	0.41	0.54	0.41	46.4
9	R2	62	1	65	1.6	0.266	6.7	LOS A	1.1	8.1	0.41	0.54	0.41	42.4
9u	U	1	1	1	100.0	0.266	9.7	LOS A	1.1	8.1	0.41	0.54	0.41	43.1
Approach		281	17	296	6.0	0.266	4.9	LOS A	1.1	8.1	0.41	0.54	0.41	45.3
West: Red Gables Rd														
10	L2	33	0	35	0.0	0.243	3.0	LOS A	1.2	8.4	0.44	0.61	0.44	40.4
11	T1	73	0	77	0.0	0.243	3.5	LOS A	1.2	8.4	0.44	0.61	0.44	44.0
12	R2	133	9	140	6.8	0.243	8.9	LOS A	1.2	8.4	0.44	0.61	0.44	45.7
12u	U	24	0	25	0.0	0.243	8.2	LOS A	1.2	8.4	0.44	0.61	0.44	42.5
Approach		263	9	277	3.4	0.243	6.6	LOS A	1.2	8.4	0.44	0.61	0.44	44.2
All Vehicles		1126	48	1185	4.3	0.320	5.3	LOS A	1.3	9.3	0.38	0.55	0.38	44.4

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 102 [Fontana Drive / Cataract Rd - AM Peak (Site Folder: Existing Intersection 2027 Opening Year)]

AM Peak Hour: 7:15 - 8:15 AM
Fontana Drive / Cataract Rd
(Proposed Dev Traffic + Approved Traffic + 2027 Background 6% growth rate per annum)
Site Category: 2027 Opening Year Baseline
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Fontana Drive														
1	L2	53	2	56	3.8	0.841	16.9	LOS B	13.8	98.4	1.00	1.28	1.69	40.9
2	T1	328	10	345	3.0	0.841	16.9	LOS B	13.8	98.4	1.00	1.28	1.69	42.0
3	R2	284	0	299	0.0	0.841	22.1	LOS B	13.8	98.4	1.00	1.28	1.69	43.6
3u	U	1	0	1	0.0	0.841	22.7	LOS B	13.8	98.4	1.00	1.28	1.69	42.3
Approach		666	12	701	1.8	0.841	19.1	LOS B	13.8	98.4	1.00	1.28	1.69	42.5
East: Cataract Rd														
4	L2	155	1	163	0.6	0.694	14.3	LOS A	7.7	54.1	1.00	1.17	1.38	41.4
5	T1	107	0	113	0.0	0.694	14.1	LOS A	7.7	54.1	1.00	1.17	1.38	42.1
6	R2	145	1	153	0.7	0.694	18.4	LOS B	7.7	54.1	1.00	1.17	1.38	42.1
6u	U	1	0	1	0.0	0.694	20.1	LOS B	7.7	54.1	1.00	1.17	1.38	42.7
Approach		408	2	429	0.5	0.694	15.7	LOS B	7.7	54.1	1.00	1.17	1.38	41.8
North: Fontana Dr														
7	L2	166	0	175	0.0	0.921	17.6	LOS B	19.5	138.9	1.00	1.29	1.78	42.5
8	T1	372	17	392	4.6	0.921	17.8	LOS B	19.5	138.9	1.00	1.29	1.78	43.2
9	R2	209	1	220	0.5	0.921	22.0	LOS B	19.5	138.9	1.00	1.29	1.78	43.4
9u	U	84	0	88	0.0	0.921	24.5	LOS B	19.5	138.9	1.00	1.29	1.78	44.9
Approach		831	18	875	2.2	0.921	19.5	LOS B	19.5	138.9	1.00	1.29	1.78	43.3
West: Cataract Rd														
10	L2	185	6	195	3.2	0.622	15.3	LOS B	6.0	43.4	0.99	1.14	1.33	41.2
11	T1	78	1	82	1.3	0.622	15.6	LOS B	6.0	43.4	0.99	1.14	1.33	43.1
12	R2	49	3	52	6.1	0.622	19.6	LOS B	6.0	43.4	0.99	1.14	1.33	42.1
12u	U	4	2	4	50.0	0.622	23.8	LOS B	6.0	43.4	0.99	1.14	1.33	42.5
Approach		316	12	333	3.8	0.622	16.1	LOS B	6.0	43.4	0.99	1.14	1.33	41.8
All Vehicles		2221	44	2338	2.0	0.921	18.2	LOS B	19.5	138.9	1.00	1.25	1.62	42.6

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 102 [Fontana Drive / Cataract Rd - PM Peak (Site Folder: Existing Intersection 2027 Opening Year)]

PM Peak Hour : 2:00-3:00 PM
Fontana Drive / Cataract Rd
(Proposed Dev Traffic + Approved Traffic + 2027 Background 6% growth rate per annum)
Site Category: 2027 Opening Year Baseline
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Fontana Drive														
1	L2	37	1	39	2.7	0.508	5.8	LOS A	3.8	27.0	0.69	0.74	0.71	46.3
2	T1	227	13	239	5.7	0.508	6.0	LOS A	3.8	27.0	0.69	0.74	0.71	48.0
3	R2	202	0	213	0.0	0.508	11.0	LOS A	3.8	27.0	0.69	0.74	0.71	49.9
3u	U	1	0	1	0.0	0.508	11.7	LOS A	3.8	27.0	0.69	0.74	0.71	48.2
Approach		467	14	492	3.0	0.508	8.2	LOS A	3.8	27.0	0.69	0.74	0.71	48.6
East: Cataract Rd														
4	L2	167	2	176	1.2	0.345	7.8	LOS A	2.3	16.4	0.81	0.83	0.81	47.0
5	T1	61	0	64	0.0	0.345	7.3	LOS A	2.3	16.4	0.81	0.83	0.81	47.0
6	R2	1	0	1	0.0	0.345	11.6	LOS A	2.3	16.4	0.81	0.83	0.81	47.0
6u	U	1	0	1	0.0	0.345	13.4	LOS A	2.3	16.4	0.81	0.83	0.81	47.8
Approach		230	2	242	0.9	0.345	7.7	LOS A	2.3	16.4	0.81	0.83	0.81	47.0
North: Fontana Dr														
7	L2	84	0	88	0.0	0.714	7.7	LOS A	7.1	51.3	0.72	0.81	0.83	49.7
8	T1	337	15	355	4.5	0.714	7.4	LOS A	7.1	51.3	0.72	0.81	0.83	49.5
9	R2	214	10	225	4.7	0.714	11.7	LOS A	7.1	51.3	0.72	0.81	0.83	49.5
9u	U	87	0	92	0.0	0.714	14.0	LOS A	7.1	51.3	0.72	0.81	0.83	51.4
Approach		722	25	760	3.5	0.714	9.5	LOS A	7.1	51.3	0.72	0.81	0.83	49.8
West: Cataract Rd														
10	L2	62	5	65	8.1	0.211	6.0	LOS A	1.2	8.8	0.65	0.72	0.65	46.0
11	T1	62	0	65	0.0	0.211	6.4	LOS A	1.2	8.8	0.65	0.72	0.65	48.6
12	R2	36	1	38	2.8	0.211	10.1	LOS A	1.2	8.8	0.65	0.72	0.65	47.0
12u	U	4	1	4	25.0	0.211	12.5	LOS A	1.2	8.8	0.65	0.72	0.65	47.7
Approach		164	7	173	4.3	0.211	7.2	LOS A	1.2	8.8	0.65	0.72	0.65	47.2
All Vehicles		1583	48	1666	3.0	0.714	8.6	LOS A	7.1	51.3	0.72	0.78	0.78	48.7

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [Fontana Drive / Red Gables Rd - AM Peak (Site Folder: Proposed Signalised Intersection Background)]

AM Peak Hour : 7:15 - 8:15 AM
Fontana Drive / Red Gables Rd
Site Category: Ultimate Scenario Background Traffic (Town Centre TIA Vol)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 80 seconds (Site User-Given Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Fontana Rd														
1	L2	9	3.0	9	3.0	0.017	26.6	LOS B	0.3	1.9	0.73	0.66	0.73	40.5
2	T1	241	3.0	254	3.0	*0.442	24.7	LOS B	8.1	58.2	0.86	0.72	0.86	42.7
3	R2	2	3.0	2	3.0	0.015	43.9	LOS D	0.1	0.6	0.94	0.61	0.94	34.1
Approach		252	3.0	265	3.0	0.442	24.9	LOS B	8.1	58.2	0.85	0.71	0.85	42.6
East: Red Gables Rd														
4	L2	26	3.0	27	3.0	0.027	14.3	LOS A	0.5	3.4	0.48	0.66	0.48	46.9
5	T1	67	3.0	71	3.0	0.147	25.4	LOS B	2.2	15.6	0.81	0.63	0.81	42.4
6	R2	42	3.0	44	3.0	*0.115	23.8	LOS B	1.1	8.2	0.80	0.70	0.80	41.9
Approach		135	3.0	142	3.0	0.147	22.8	LOS B	2.2	15.6	0.74	0.66	0.74	43.0
North: Fontana Rd														
7	L2	42	3.0	44	3.0	0.054	18.8	LOS B	1.0	6.9	0.59	0.69	0.59	44.3
8	T1	195	3.0	205	3.0	0.238	14.5	LOS B	4.9	35.3	0.65	0.55	0.65	48.5
9	R2	44	3.0	46	3.0	*0.170	22.9	LOS B	0.9	6.5	0.90	0.72	0.90	42.4
Approach		281	3.0	296	3.0	0.238	16.5	LOS B	4.9	35.3	0.68	0.59	0.68	46.8
West: Red Gables Rd														
10	L2	49	3.0	52	3.0	0.071	21.4	LOS B	1.2	8.9	0.65	0.70	0.65	42.9
11	T1	166	3.0	175	3.0	0.365	27.2	LOS B	5.7	41.2	0.87	0.71	0.87	41.5
12	R2	136	3.0	143	3.0	*0.430	35.3	LOS C	5.0	35.7	0.90	0.79	0.90	37.1
Approach		351	3.0	369	3.0	0.430	29.5	LOS C	5.7	41.2	0.85	0.74	0.85	39.8
All Vehicles		1019	3.0	1073	3.0	0.442	23.9	LOS B	8.1	58.2	0.79	0.68	0.79	42.7

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Effective Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Fontana Rd												
P1	Full	316	333	34.7	LOS D	0.7	0.7	0.94	0.94	188.6	200.0	1.06
East: Red Gables Rd												
P2	Full	632	665	35.2	LOS D	1.4	1.4	0.95	0.95	189.0	200.0	1.06

North: Fontana Rd											
P3	Full	316	333	34.7	LOS D	0.7	0.7	0.94	0.94	188.6	200.0	1.06
West: Red Gables Rd											
P4	Full	211	222	34.5	LOS D	0.5	0.5	0.93	0.93	188.4	200.0	1.06
All Pedestrians		1475	1553	34.9	LOS D	1.4	1.4	0.94	0.94	188.7	200.0	1.06

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 101 [Fontana Drive / Red Gables Rd - PM Peak (Site Folder: Proposed Signalised Intersection Background)]

AM Peak Hour : 2:00-3:00 PM
Fontana Drive / Red Gables Rd
Site Category: Ultimate Scenario Background Traffic (Town Centre TIA Vol)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 80 seconds (Site User-Given Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Fontana Rd														
1	L2	8	3.0	8	3.0	0.014	33.5	LOS C	0.2	1.6	0.70	0.65	0.70	41.2
2	T1	391	3.0	412	3.0	*0.667	33.9	LOS C	14.1	100.9	0.92	0.80	0.92	42.4
3	R2	5	3.0	5	3.0	0.039	44.3	LOS D	0.2	1.4	0.95	0.64	0.95	34.0
Approach		404	3.0	425	3.0	0.667	34.0	LOS C	14.1	100.9	0.92	0.79	0.92	38.5
East: Red Gables Rd														
4	L2	42	3.0	44	3.0	0.046	15.4	LOS B	0.8	5.9	0.51	0.67	0.51	46.2
5	T1	60	3.0	63	3.0	0.147	27.1	LOS B	2.0	14.4	0.84	0.64	0.84	41.6
6	R2	42	3.0	44	3.0	*0.103	24.6	LOS B	1.2	8.5	0.77	0.70	0.77	41.5
Approach		144	3.0	152	3.0	0.147	23.0	LOS B	2.0	14.4	0.72	0.67	0.72	42.8
North: Fontana Rd														
7	L2	42	3.0	44	3.0	0.051	17.6	LOS B	0.9	6.6	0.56	0.68	0.56	45.0
8	T1	295	3.0	311	3.0	0.342	14.1	LOS A	7.6	54.4	0.67	0.57	0.67	48.7
9	R2	42	3.0	44	3.0	*0.162	23.0	LOS B	0.9	6.5	0.90	0.72	0.90	42.3
Approach		379	3.0	399	3.0	0.342	15.5	LOS B	7.6	54.4	0.68	0.60	0.68	47.5
West: Red Gables Rd														
10	L2	11	3.0	12	3.0	0.017	22.3	LOS B	0.3	2.0	0.65	0.66	0.65	42.5
11	T1	74	3.0	78	3.0	*0.181	27.4	LOS B	2.5	17.9	0.85	0.66	0.85	41.4
12	R2	24	3.0	25	3.0	0.083	34.3	LOS C	0.8	5.9	0.84	0.70	0.84	37.4
Approach		109	3.0	115	3.0	0.181	28.4	LOS B	2.5	17.9	0.83	0.67	0.83	40.6
All Vehicles		1036	3.0	1091	3.0	0.667	25.1	LOS B	14.1	100.9	0.79	0.69	0.79	42.3

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Effective Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Fontana Rd												
P1	Full	316	333	34.7	LOS D	0.7	0.7	0.94	0.94	188.6	200.0	1.06
East: Red Gables Rd												
P2	Full	632	665	35.2	LOS D	1.4	1.4	0.95	0.95	189.0	200.0	1.06

North: Fontana Rd											
P3	Full	316	333	34.7	LOS D	0.7	0.7	0.94	0.94	188.6	200.0	1.06
West: Red Gables Rd											
P4	Full	211	222	34.5	LOS D	0.5	0.5	0.93	0.93	188.4	200.0	1.06
All Pedestrians		1475	1553	34.9	LOS D	1.4	1.4	0.94	0.94	188.7	200.0	1.06

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 101 [Fontana Drive / Red Gables Rd - AM Peak + Dev (Site Folder: Proposed Signalised Intersection Background + Dev)]

AM Peak Hour : 7:15 - 8:15 AM
Fontana Drive / Red Gables Rd
Site Category: Ultimate Scenario Background Traffic (Town Centre TIA Vol) + Dev
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 80 seconds (Site User-Given Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Fontana Rd														
1	L2	51	0	54	0.5	0.106	29.0	LOS C	1.6	11.1	0.78	0.72	0.78	39.9
2	T1	324	7	341	2.2	* 0.672	28.4	LOS B	12.1	86.1	0.94	0.81	0.95	41.0
3	R2	36	3	38	8.5	* 0.289	46.2	LOS D	1.5	11.3	0.98	0.73	0.98	33.6
Approach		411	11	433	2.6	0.672	30.0	LOS C	12.1	86.1	0.92	0.79	0.93	40.1
East: Red Gables Rd														
4	L2	64	1	67	1.2	0.064	13.5	LOS A	1.1	8.1	0.46	0.67	0.46	48.0
5	T1	70	2	74	2.9	0.140	23.7	LOS B	2.2	15.7	0.79	0.61	0.79	43.2
6	R2	48	1	51	2.6	* 0.130	22.6	LOS B	1.3	9.0	0.79	0.71	0.79	42.9
Approach		182	4	192	2.2	0.140	19.8	LOS B	2.2	15.7	0.67	0.66	0.67	44.7
North: Fontana Rd														
7	L2	42	1	44	3.0	0.057	20.0	LOS B	1.0	7.2	0.62	0.69	0.62	44.2
8	T1	314	6	331	1.9	0.404	17.2	LOS B	9.0	63.8	0.74	0.63	0.74	46.8
9	R2	44	1	46	3.0	0.170	22.8	LOS B	0.8	6.1	0.90	0.72	0.90	42.8
Approach		400	8	421	2.1	0.404	18.1	LOS B	9.0	63.8	0.74	0.65	0.74	46.0
West: Red Gables Rd														
10	L2	49	1	52	3.0	0.067	20.1	LOS B	1.2	8.5	0.62	0.70	0.62	44.1
11	T1	202	5	213	2.5	0.403	25.9	LOS B	6.9	49.2	0.86	0.71	0.86	42.1
12	R2	229	4	241	1.8	* 0.660	36.3	LOS C	8.9	63.4	0.95	0.85	0.99	37.0
Approach		480	11	505	2.2	0.660	30.3	LOS C	8.9	63.4	0.88	0.78	0.90	39.7
All Vehicles		1473	34	1551	2.3	0.672	25.6	LOS B	12.1	86.1	0.83	0.73	0.84	41.9

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Effective Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Fontana Rd												
P1	Full	316	333	34.7	LOS D	0.7	0.7	0.94	0.94	201.8	217.2	1.08
East: Red Gables Rd												
P2	Full	632	665	35.2	LOS D	1.4	1.4	0.95	0.95	202.3	217.2	1.07

North: Fontana Rd											
P3	Full	316	333	34.7	LOS D	0.7	0.7	0.94	0.94	201.8	217.2	1.08
West: Red Gables Rd											
P4	Full	211	222	34.5	LOS D	0.5	0.5	0.93	0.93	201.6	217.2	1.08
All Pedestrians		1475	1553	34.9	LOS D	1.4	1.4	0.94	0.94	202.0	217.2	1.08

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: 101 [Fontana Drive / Red Gables Rd - PM Peak + Dev (Site Folder: Proposed Signalised Intersection Background + Dev)]

AM Peak Hour : 2:00-3:00 PM
Fontana Drive / Red Gables Rd
Site Category: Ultimate Scenario Background Traffic (Town Centre TIA Vol) + Dev
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 80 seconds (Site User-Given Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Fontana Rd														
1	L2	50	0	53	0.5	0.087	25.7	LOS B	1.4	10.0	0.73	0.71	0.73	41.4
2	T1	474	12	499	2.5	*0.813	31.3	LOS C	19.8	141.7	0.98	0.95	1.11	39.7
3	R2	21	0	22	0.7	*0.160	45.3	LOS D	0.9	6.1	0.97	0.70	0.97	33.9
Approach		545	12	574	2.2	0.813	31.3	LOS C	19.8	141.7	0.95	0.92	1.07	39.5
East: Red Gables Rd														
4	L2	80	1	84	1.6	0.087	15.6	LOS B	1.6	11.5	0.52	0.69	0.52	46.7
5	T1	71	2	75	2.5	0.173	27.3	LOS B	2.4	17.1	0.84	0.65	0.84	41.4
6	R2	44	1	46	2.9	*0.113	24.8	LOS B	1.2	9.0	0.79	0.71	0.79	41.8
Approach		195	4	205	2.2	0.173	21.9	LOS B	2.4	17.1	0.70	0.68	0.70	43.5
North: Fontana Rd														
7	L2	42	1	44	3.0	0.051	17.6	LOS B	0.9	6.6	0.56	0.68	0.56	45.5
8	T1	410	9	432	2.2	0.507	15.3	LOS B	11.4	81.3	0.72	0.63	0.72	48.0
9	R2	42	1	44	3.0	0.162	23.0	LOS B	0.9	6.5	0.90	0.72	0.90	42.7
Approach		494	11	520	2.3	0.507	16.1	LOS B	11.4	81.3	0.73	0.64	0.73	47.3
West: Red Gables Rd														
10	L2	11	0	12	3.0	0.017	22.3	LOS B	0.3	2.0	0.65	0.66	0.65	43.0
11	T1	97	2	102	2.3	0.236	27.8	LOS B	3.3	23.7	0.86	0.68	0.86	41.2
12	R2	100	1	105	0.7	*0.351	36.4	LOS C	3.7	25.9	0.90	0.78	0.90	37.0
Approach		208	3	219	1.6	0.351	31.6	LOS C	3.7	25.9	0.87	0.72	0.87	39.1
All Vehicles		1442	31	1518	2.2	0.813	24.9	LOS B	19.8	141.7	0.83	0.76	0.87	42.4

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Effective Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Fontana Rd												
P1	Full	316	333	34.7	LOS D	0.7	0.7	0.94	0.94	201.8	217.2	1.08
East: Red Gables Rd												
P2	Full	632	665	35.2	LOS D	1.4	1.4	0.95	0.95	202.3	217.2	1.07

North: Fontana Rd											
P3	Full	316	333	34.7	LOS D	0.7	0.7	0.94	0.94	201.8	217.2	1.08
West: Red Gables Rd											
P4	Full	211	222	34.5	LOS D	0.5	0.5	0.93	0.93	201.6	217.2	1.08
All Pedestrians		1475	1553	34.9	LOS D	1.4	1.4	0.94	0.94	202.0	217.2	1.08

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.