



## **AIR QUALITY ASSESSMENT**

### **PARK RIDGE SERVICE CENTRE - PROPOSED SERVICE STATION, FOOD AND DRINK OUTLET AND CHILDCARE CENTRE**

**17 – 25 PARK RIDGE ROAD  
PARK RIDGE**

**Prepared for:**

Park Ridge 88 Pty Ltd  
C/- Urbis

**Prepared by:**

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## 1.0 INTRODUCTION

### 1.1 STUDY BRIEF

MWA Environmental has been engaged to prepare an Air Quality Impact Assessment for the proposed Park Ridge Service Centre which will consist of a service station, food and drink outlet and childcare centre on land located at 17-25 Park Ridge Road, Park Ridge. The assessment has considered the following air pollutant emissions from activities which have the potential to impact on the proposed childcare centre and surrounding sensitive uses:

- Volatile Organic Compounds (VOCs) and odour emissions from a proposed service station and predicted impacts at the proposed childcare centre and surrounding sensitive uses.
- Potential cooking odour from the food and drink outlet and assessment of separation distances to the proposed childcare centre and surrounding sensitive uses.
- Air pollutant emissions generated from motor vehicle exhausts from surrounding roads and predicted impacts at the proposed childcare centre.
- Air pollutant emissions generated from motor vehicle exhausts on the service station site and associated with food and drink outlet drive-thru adjacent to the proposed childcare centre.

The assessment of air pollutant concentrations at the proposed childcare centre and surrounding sensitive uses has been made against the air emission standards described in the *Environmental Management Planning Scheme Policy* of the *Logan Planning Scheme 2015*. Reference has also been made to the Air Quality Objectives in the *Environmental Protection (Air) Policy 2008* and Queensland *Ecoaccess Guideline: Odour Impact Assessment from Developments*.

### 1.2 SITE DESCRIPTION

The site is located at 17 to 25 Park Ridge Road, Park Ridge. The site has a real property description of Lot 16 SP119024.

The site location is shown on **Figure 1**.

Surrounding land uses are described as follows:

<b>To the North:</b>	Jedfire Park on land zoned <i>Recreation Parks</i> . Park Ridge Town Centre to the northwest on land zoned <i>Commercial/Retail</i> .
<b>To the South:</b>	Park Ridge Primary School on land zoned <i>Education</i> .
<b>To the East:</b>	Detached dwellings on large lots on land zoned <i>Emerging Community</i> .
<b>To the West:</b>	Mount Lindesay Highway with on/off ramps to the service road adjacent the subject site.

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An aerial photograph of the site and surrounding land uses is included as **Figure 2**.

## **1.3 PROPOSED DEVELOPMENT**

The proposed development will comprise a service station, a single food and drink outlet with drive-thru and a childcare centre. Proposed development plans are included in **Attachment 1**.

### **1.3.1 Proposed Service Station**

The air quality assessment has considered the air pollutant emissions from the proposed service station at the proposed childcare centre and surrounding sensitive uses.

The service station is proposed to trade 24 hours / 7 days. Three double-sided multi-product bowsers are proposed to be located under the refuelling canopy. The minimum setback distance from a refuelling bowser to the boundary of the onsite childcare centre, is approximately 50 metres. The minimum setback distance from a refuelling bowser to the nearest offsite sensitive use, is approximately 54 metres to the residential dwelling located to the east.

The underground tank vent pipes are proposed to be located to the north of the refuelling canopy and are recommended to have a minimum release height of 4 metres above ground level. The minimum setback distance from the vent pipes to the boundary of the childcare centre is approximately 71 metres.

The proposed service station will incorporate a Stage 1 ("VR1") vapour recovery control system to minimise emissions from underground tank vent pipes when bulk refilling is occurring.

The proposed service station will also incorporate a Stage 2 ("VR2") vapour recovery control system to minimise fugitive emissions from vehicles refuelling under the canopy.

Based upon the site location, the proposed installation of three double-sided multi-product bowsers, and previous experience with other service stations operating in Southeast Queensland, the applicant has conservatively advised annual fuel sales for the service station to be:

**'Fuel'<sup>1</sup> Total (excl. Diesel): 4 Million litres per annum**

For the assessment of peak day emissions, **fuel sales have been conservatively modelled as 30 percent greater than the annual fuel sale rate.**

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<sup>1</sup> Diesel has a substantially lower vapour pressure than the aforementioned motor spirit fuel types and thus atmospheric emissions from diesel are minor in comparison to the fuel types assessed

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### 1.3.2 Proposed Food and Drink Outlet

The food and drink outlet proposed at the site may emit cooking odours which are considered in the context of potential odour amenity impact at the proposed childcare centre and surrounding sensitive uses.

If other than reheat food preparation is undertaken a future kitchen would be fitted with exhaust fans located at roof level suitably designed in accordance with Australian Standard *AS 1668 Parts 1 and 2 The Use of Mechanical Ventilation and Air-conditioning in Building* to mitigate potential odour impacts at the proposed childcare centre and surrounding sensitive uses.

### 1.3.3 Motor Vehicle Emissions

The proposed childcare centre has been designed and located so that sensitive internal and external educational zones are located away from the service station and food and drink outlet with associated drive-thru.

A designated carpark for parents accessing the childcare centre, provides further separation between the childcare centre building and the drive-thru on the northern commercial uses.

The Mount Lindsay Highway is a state-controlled road located to the west of the subject site. The nearest trafficked lane of the highway is 195 metres from the boundary of the subject site.

Park Ridge Road is a two-lane road located to the north of the subject site.

An assessment of motor vehicle exhaust emissions on the proposed childcare centre has considered the cumulative impact of the following:

- Vehicles on Mount Lindsay Highway
- Vehicles on Park Ridge Road
- Vehicles on Highway On/Off Ramps
- Vehicles accessing the proposed service station onsite
- Vehicles accessing the proposed food and drink outlet drive-thru onsite
- Vehicles accessing the proposed childcare centre onsite, and
- Representative ambient concentrations

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## 2.0 AIR QUALITY ASSESSMENT

### 2.1 DESCRIPTION OF EMISSIONS

#### 2.1.1 Proposed Service Station

Air pollutant emissions from a service station are predominantly Volatile Organic Compounds (VOCs) released during the following processes:

- Fuel Delivery **Loading** of Underground Tanks
- Underground Storage Tank **Breathing**
- Fugitive Emissions from **Refuelling** of vehicles
- Fugitive Emissions from **Spillages**

For the purposes of estimating representative air pollutant and odour emission rates reference has been made to:

- (a) **Published emission factors** in the NPI Manual<sup>2</sup>, for the estimation of Total VOC and speciated individual contaminant emissions, and
- (b) **Mass balance analysis**, for the estimation of odour emissions based upon NPI Manual Total VOC emission factors with reference to the unleaded fuel odour detection threshold<sup>3</sup>

Air pollutant emission rates of individual contaminants have been determined from the NPI Manual Total VOC emission factors (Table 2) with speciation based upon typical unleaded composition (Table 3).

'Whoosh' emissions released by vehicles prior to refuelling, have been estimated based upon California Air Pollution Control Officers Association (CAPCOA) – Air Toxics "Hot Spots" Program - Gasoline Service Station Industrywide Risk Assessment Guidelines.

Calculated odour emissions are based upon predicted Total VOC concentrations and an odour detection threshold of 1,888 µg Total VOC/m<sup>3</sup> as determined from an investigation commissioned by MWA Environmental in April 2015.

MWA commissioned Air Noise Environment to take duplicate samples of fugitive emissions from an unleaded petrol can in April 2015. The samples were analysed for Total VOC concentration and for odour (by olfactometry) by The Odour Unit. The results of the analysis allow for calculation of the odour detection threshold and thus correlation between predicted Total VOC concentrations and Odour

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<sup>2</sup> *Emissions Estimation Techniques Manual for Aggregated Emissions from Service Stations* (Environment Australia, 1999)

<sup>3</sup> Based upon Air Noise Environment and The Odour Unit testing commissioned by MWA Environmental in April 2015

Units. As a conservative assumption, the lower measured odour detection threshold of 1,888  $\mu\text{g}/\text{m}^3$  Total VOC has been applied for the purposes of assessing odour concentrations from Total VOC modelling results.

The results of the analyses and calculation of the odour detection threshold for representative fuel based upon Total VOC concentration are provided in **Attachment 2**.

The following assumptions have been made for the purpose of estimating air pollutant emissions from the proposed service station.

- 24-hour operation of the service station
- Delivery of fuel to underground storage tanks undertaken by 54,500 litre tankers.
- Several bulk tanker fuel deliveries per week<sup>4</sup> as required which may occur at any time of day as triggered by automated tank level monitors but more typically during the daytime and evening periods;
- Bulk refuelling conservatively represented as occurring for 1 hour of every day of the year with delivery hour delayed by one hour each day (i.e. 1 January bulk refuelling from Midnight to 1am, 2 January bulk refuelling from 1am to 2am, 3 January bulk refuelling from 2am to 3am, etc.). This methodology provides a representation of bulk refuelling events and also considers the different periods of the day when these events may occur.
- Conservative estimate of annual fuel sales of 4 million litres per annum
- Estimated peak daily fuel sales of 14,247 litres which relates to 30 percent higher than the average fuel sales.
- Hourly emissions distributed based upon a daily sales profile as distributed by Brisbane City Council for the assessment of service station developments.
- Stage 1 ("VR1") vapour recovery system
- Stage 2 ("VR1") vapour recovery system
- 'Whoosh' emissions based upon the 'upper limit' emission factor specified by CAPCOA.

The emission rate calculations have considered the maximum 1% volume national Benzene regulation that came into effect on 1 January 2006. The previous Queensland regulation was for a maximum of 3.5% Benzene in petrol. Thus, the current national regulation has resulted in a significant reduction in Benzene emissions from service stations in Queensland.

Detailed emission estimation calculations are included as **Attachment 3**.

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<sup>4</sup> Fewer than one per day based upon tanker capacity and estimated annual fuel sales

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## 2.1.2 Caltex Service Station

To the northwest of the subject site, an existing Caltex service station is located at the southern entrance to Park Ridge Town Centre as identified in **Figure 2**. The Caltex service station vent pipes are located approximately 130 metres from the boundary of the subject site.

An assessment of the cumulative impact of air pollutant emissions from the existing and proposed service stations has been undertaken for this assessment.

Logan City Council PD-Online documents were consulted which identified the Caltex service station as only having Stage 1 ("VR1") vapour recovery system installed.

The following assumptions have been made for the purpose of estimating air pollutant emissions from the Caltex service station.

- 24-hour operation of the service station
- Delivery of fuel to underground storage tanks undertaken by 54,500 litre tankers.
- Several bulk tanker fuel deliveries per week as required which may occur at any time of day as triggered by automated tank level monitors but more typically during the daytime and evening periods;
- Estimate of annual fuel sales the same as the proposed service station at 4 million litres per annum, however it is noted the Caltex service station has one less bowser.
- Estimated peak daily fuel sales of 14,247 litres which relates to 30 percent higher than the average fuel sales.
- Hourly emissions distributed based upon a daily sales profile as distributed by Brisbane City Council for the assessment of service station developments.
- Stage 1 ("VR1") vapour recovery system
- 'Whoosh' emissions based upon the 'upper limit' emission factor specified by CAPCOA.

With respect to bulk refuelling of underground storage tanks, it is highly unlikely, but not impossible, that this will simultaneously occur at both service stations.

Rather than progressively stagger the bulk refuelling by 1-hour for every day of the year at the Caltex service station, a random bulk refuelling profile was adopted.

Bulk refuelling at the Caltex service station has been represented as occurring 1 hour per day, at any hour of the day. Bulk refuelling has been represented as occurring every day of the year. An assessment of 10 years of randomised daily profiles has been undertaken for the Caltex service station. Simultaneous bulk refuelling at both service stations was predicted between 6 and 23 hours per annum on this basis.

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### 2.1.3 Proposed Food and Drink Outlet

The primary air quality issues associated with the food and drink outlet is odour emissions discharged from cooking exhaust vents.

Control on air quality of cooking exhaust emissions can be maintained to a high standard by the use of separate exhaust ventilation fans for various internal kitchen areas, use of appropriately sized range hoods fitted with appropriate filters and regular maintenance of these systems.

Experience demonstrates that cooking odours are controlled by using appropriate exhaust ventilation systems, which include filtration and appropriate exhaust heights and discharge velocities in accordance with AS1668.2 - *The use of ventilation and air-conditioning in buildings - Part 2: Ventilation design for indoor air contaminant control*.

Cooking odours are also typically managed by range hoods which remove grease and other odorous contaminants before discharge through the roof top exhaust fans. The design height of fan discharge is required to ensure that odours are adequately dispersed. The design of mechanical exhaust ventilation systems must comply with Australian Standard AS 1668 Parts 1 and 2 *The Use of Mechanical Ventilation and Air-conditioning in Buildings*.

Section 5.10 *Air Discharges* of AS 1668.2-1991 includes:

#### 5.10.1 *General*

*All exhaust air shall be discharged to atmosphere in such a manner as not to cause danger or nuisance to occupants in the building, occupants of neighbouring buildings or members of the public.*

The operators of the food and drink outlet is yet to be confirmed, therefore specific detail with respect to exhaust hoods and cooking exhaust ventilation is not available. Generally however, the exhaust ventilation design should be such that the location of exhaust fan outlets and their height and discharge rates meet the requirements of AS1668.2, taking account of surrounding land uses, including in this instance, the proposed childcare centre.

The following provides the performance standard requirements that are deemed satisfactory under the Building Code of Australia.

- The regulatory code with respect to cooking exhaust hoods as enforced by the **Building Code of Australia** is **AS1668.2-1991**.
- This code was superseded by **AS1668.2-2002**.
- The aim of the kitchen exhaust system is to capture the cooking odours, greases and particulates at the cooking location with a canopy over the cooking surface with the filter in the canopy containing the majority of emissions.
- The design of the canopy can either be a “deemed to satisfy” solution in

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accordance with **AS1668.2-1991** or it may be performance engineered and warranted to operate in a satisfactory manner by the proprietary canopy hood manufacturer.

- Performance engineered solutions can be employed where the use is unable to comply with required **AS1668.2-1991** discharge location i.e. inadequate separation distance between discharge point and adjacent sensitive land use. This typically relates to an installation where the discharge point is within 6 metres of a neighbouring building. A minimum separation distance of 19 metres exists between the food and drink outlet and the proposed childcare centre.
- The required **AS1668.2-1991** discharge location is important to ensure that odours are discharged sufficiently far enough away to not cause health impacts or nuisance complaints from surrounding sensitive uses.
- The required **AS1668.2-1991** discharge separations from outside air intakes, neighbour boundaries and natural ventilation openings in buildings can be reduced via performance engineered solutions if the kitchen exhaust discharge is treated to remove odours and particulates using specific in-line treatment measures.

There are design alternatives to the standard deemed to satisfy AS1668.2-1991 exhaust ventilation systems which can be implemented either from day one or as a retrofit installation where high levels of odour control are required. In the case of the proposed food and drink outlet, the available separation distances between suitable cooking source emission points and the surrounding sensitive land uses are greater than required by the Australian Standard deemed to satisfy provisions i.e. AS1668.2-1991 would require less setback than is actually available to surrounding sensitive uses.

On the basis of the above, it is considered that the available engineered solutions to contain and prevent odour emissions from cooking range hoods will be implemented as part of detailed design for the proposed food and drink outlet such that the amenity of the proposed childcare centre and surrounding sensitive uses with respect to cooking odours will not be adversely affected.

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## 2.1.4 Motor Vehicle Exhaust Emissions

Emission factors were adopted in accordance with the Brisbane City Council *Composite Vehicle Emission Factors for Brisbane* (August 2016) dataset<sup>5</sup> developed in conjunction with the Department of Science, Information Technology and Innovation based upon the COPERT Australia inventory.

The assessment has considered assessment of emissions from the following two scenarios:

- Year 2010 vehicle fleet emission factors
- Year 2025 vehicle fleet emission factors

Emission Factors have been based upon the following assumptions:

- Assumption of 'Worst' seasonal factors;
- Assumption of 'Congested' traffic conditions for Light-Duty vehicles onsite
- Assumption of 'Freeway' traffic conditions for vehicles on the Mount Lindsay Highway

An assumption of 100% 'Light Duty Vehicles' has been made for the representation of vehicle movements on the commercial site.

For the representation of vehicles on the Mount Lindsay Highway, an assumption of 10% Commercial Vehicles has been made.

For the representation of vehicles on Park Ridge Road, an assumption of 5% Commercial Vehicles has been made.

The road traffic emission factors used in the assessment are summarised in

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Department of Science, Information Technology and Innovation, *Composite Motor Vehicle Emission Factors for Air Quality Modelling using COPERT Australia, Version 1*, Prepared for Brisbane City Council (BCC), Queensland Government, Brisbane, July 2016.

**Table 1** below.

**Table 1: Motor Vehicle Exhaust Emission Factors**

Road Description	Commercial Vehicle %	Year	EMISSION FACTORS				
			NO <sub>x</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	Benzene	Benzo(a)pyrene
			g/VKT	mg/VKT	mg/VKT	mg/VKT	µg/VKT
Onsite Vehicle Movements	0%	2010 Vehicle Fleet	1.8	133.6	114.9	63.5	2.5
		2025 Vehicle Fleet	0.4	47.2	28.5	9.8	2.0
Offsite Vehicle Movements (freeway)	10%	2010 Vehicle Fleet	2.1	60.9	55.2	15.7	0.7
		2025 Vehicle Fleet	0.3	20.1	14.3	3.7	0.8
Offsite Vehicle Movement (urban)s	5%	2010 Vehicle Fleet	1.9	115.1	94.6	33.1	1.4
		2025 Vehicle Fleet	0.4	49.1	28.6	6.0	1.3

## 2.2 AMBIENT AIR QUALITY

The Queensland Government operates a network of ambient air quality monitoring stations across the state.

Key air pollutant emissions associated service stations are Volatile Organic Compounds (VOCs) including Toluene, Xylene and Benzene. Key air pollutant emissions associated with motor vehicle emissions include PM<sub>10</sub>, PM<sub>2.5</sub>, Nitrogen Oxides and Benzene.

Ambient air quality data for these pollutants is routinely monitored at Springwood. An assessment of 6 recent years of hourly-averaged ambient air pollutant concentrations has been performed for the Springwood monitoring site.

A summary of the annual average and 70<sup>th</sup> percentile ambient air pollutant measurements from the Springwood monitoring site over years 2010 to 2016, for inclusion in the dispersion modelling predictions as background concentrations is presented in **Table 2**.

**Table 2: Ambient Air Pollutant Concentrations – Queensland Government Data - Springwood**

Pollutant	Averaging period	Statistic	Ambient Concentration	
			ppb	µg/m <sup>3</sup>
Benzene	Annual	Average for 2010-2016	0.8	2.7
Toluene	1 hour	70 <sup>th</sup> percentile 1-hour average for 2010-2016	4.2	15.8
	24 hours	70 <sup>th</sup> percentile 24-hour average for 2010-2016	4.2	15.9
	Annual	Average for 2010-2016	3.4	12.7
Total Xylenes	24 hours	70 <sup>th</sup> percentile 24-hour average for 2010-2016	7.1	30.8
	Annual	Average for 2010-2016	5.9	25.7
Particulate Matter PM <sub>10</sub>	24 hours	70 <sup>th</sup> percentile 24-hour average for 2010-2016	n/a	14.6
Particulate Matter PM <sub>2.5</sub>	24 hours	70 <sup>th</sup> percentile 24-hour average for 2010-2016	n/a	5.4
	Annual	Average for 2010-2016	n/a	4.7
Nitrogen Dioxide	1 hour	70 <sup>th</sup> percentile 1-hour average for 2010-2016	7.0	13.2
	Annual	Average for 2010-2016	6.0	11.3

## 2.3 RELEVANT AIR QUALITY PLANNING CRITERIA

The assessment of air pollutant concentrations at the proposed childcare centre and surrounding sensitive uses has been made against the air emission standards described in the *Environmental Management Planning Scheme Policy* of the *Logan Planning Scheme 2015*. Reference has also been made to the Air Quality Objectives in the *Environmental Protection (Air) Policy 2008* and Queensland *Ecoaccess Guideline: Odour Impact Assessment from Developments*.

The adopted air quality planning criteria relevant to the assessment of air pollutant impacts from each of the activities considered is presented in the following tables.

For averaging periods, less than or equal to 1 hour, 99.9<sup>th</sup> percentile concentrations are assessed. For longer averaging times, assessment is based upon the maximum predicted concentrations.

### 2.3.1 Service Station

Presented in **Table 3** are the adopted air quality planning criteria relevant to the assessment of air pollutant impacts from the service station.

**Table 3: Adopted Air Quality Planning Criteria for the Assessment of the Service Station**

Pollutant	Averaging Period	Adopted Air Quality Planning Criteria ( $\mu\text{g}/\text{m}^3$ )	Health Outcome Protected	Source
Benzene	3-minute	53	Design ground level concentrations	Logan Planning Scheme
	Annual	10	Health and wellbeing	EPP (Air)
Ethyl-benzene	3-minute	14,500	Design ground level concentrations	Logan Planning Scheme
Styrene	3-minute	210	Design ground level concentrations	Logan Planning Scheme
	30-minute	75	Protecting aesthetic environment	EPP (Air)
	7 days	280	Health and wellbeing	EPP (Air)
Toluene	3-minute	650	Design ground level concentrations	Logan Planning Scheme

Pollutant	Averaging Period	Adopted Air Quality Planning Criteria ( $\mu\text{g}/\text{m}^3$ )	Health Outcome Protected	Source
	30-minute	1,100	Protecting aesthetic environment	EPP (Air)
	24 hours	4,100	Health and wellbeing	EPP (Air)
	Annual	410	Health and wellbeing	EPP (Air)
Xylenes (as a total of ortho, meta and para isomers)	3-minute	350	Design ground level concentrations	Logan Planning Scheme
	24 hours	1,200	Health and wellbeing	EPP (Air)
	Annual	950	Health and wellbeing	EPP (Air)
Odour	1-hour 99.5 <sup>th</sup> percentile	1 Odour Unit	Design concentration at the premises boundary to an air emission sensitive land use	Logan Planning Scheme
	1-hour 99.5 <sup>th</sup> percentile	2.5 Odour Units	Odour	QLD Odour Guideline

### 2.3.2 Motor Vehicle Exhaust Emissions

Presented in **Table 4** are the adopted air quality planning criteria relevant to the assessment of air pollutant impacts generated from motor vehicle emissions.

**Table 4: Adopted Air Quality Planning Criteria for the assessment of Motor Vehicle Emissions**

Pollutant	Averaging Period	Adopted Air Quality Planning Criteria ( $\mu\text{g}/\text{m}^3$ )	Health Outcome Protected	Source
Benzene	3-minute	53	Design ground level concentrations	Logan Planning Scheme
	Annual	10	Health and wellbeing	EPP (Air)
Benzo(a)pyrene	Annual	0.0003	Health and wellbeing	EPP (Air)
Nitrogen Dioxide	1-hour	190	Design ground level concentrations	Logan Planning Scheme
	1-hour	250	Health and wellbeing	EPP (Air)
	Annual	62	Health and wellbeing	EPP (Air)
PM <sub>10</sub>	1-hour	80	Design ground level concentrations	Logan Planning Scheme
	24-hour	50	Health and wellbeing	Logan Planning Scheme / EPP (Air)
PM <sub>2.5</sub>	1-hour	50	Design ground level concentrations	Logan Planning Scheme
	24-hour	25	Health and wellbeing	Logan Planning Scheme / EPP (Air)
	Annual	8	Health and wellbeing	EPP (Air)

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## 2.4 METEOROLOGICAL MODELLING

To enable assessment of air pollutant concentrations at the proposed childcare centre and surrounding sensitive uses as a result of emissions from the service station, detailed dispersion modelling has been conducted using the TAPM / CALMET / CALPUFF modelling suite.

Following accepted methodology for detailed assessment, the TAPM software was utilised to develop a prognostic meteorological model which generated a year of representative hourly meteorological data for the region.

TAPM has been used to predict meteorological parameters specific to the region including temperature, wind speed, wind direction and stability classification. The model accesses databases of surface characteristics (terrain height, soil and vegetation) and synoptic weather analyses provided by CSIRO to carry out these analyses. TAPM is able to process the output data to produce input meteorological data files suitable for input to the CALMET / CALPUFF modelling system i.e. hourly predictions of meteorological parameters over a full year and generation of surface, upper air and geophysical data files.

Technical discussion of the model algorithms, inputs and model validation studies are provided in the *Part 1: Technical Paper* (Hurley, 2002) and *Part 2: Summary of Verification Studies* (Hurley *et al*, 2002)<sup>6,7</sup>.

The centre coordinates for the model grid were Latitude -27°43'30" and Longitude 153°5'30". The following nested model grids were applied to the TAPM modelling:

- 40 x 30 km grid (total area 1200 km x 1200 km)
- 40 x 10 km grid (total area 400 km x 400 km)
- 40 x 3 km grid (total area 120 km x 120 km)
- 40 x 1 km grid (total area 40 km x 40 km)

Twenty-five vertical grid levels were modelled.

The TAPM model was set up to generate a site-specific meteorological data file for the locality, based upon synoptic analysis data for the representative Year 2008, as provided by CSIRO.

Observed wind speeds and wind directions for the Bureau of Meteorology (BoM) Archerfield, the Queensland Government North Maclean and the BoM Gold Coast Seaway stations were incorporated into the TAPM model as assimilation data. Considering surrounding topographical influences, data assimilation at the above stations were given a radius of influence of 20km, 10km and 20km respectively.

The TAPM output was processed using the CALTAPM software to produce a 3-dimensional data file suitable for input to the diagnostic CALMET model as an 'initial guess field'. The CALMET model further resolved the prognostic meteorology to a finer terrain, land use and soil type resolution of 100 metres over

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<sup>6</sup> Hurley, P.J. (2002) The Air Pollution Model (TAPM) Version 2: User Manual. Aspendale: CSIRO Atmospheric Research Internal Paper.

<sup>7</sup> Hurley, P.J. (2002) The Air Pollution Model (TAPM) Version 2: Part 1: Technical Description. Aspendale: CSIRO Atmospheric Research Technical Paper.

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a 6 x 6 km area covering the subject site and surrounding region for the purpose of dispersion modelling.

Analysis of the CALMET derived meteorology for the site including a wind rose, wind frequency graph, monthly average temperatures graph and stability class analysis is contained in **Attachment 4**.

## 2.5 MODELLING METHODOLOGY

### 2.5.1 Service Stations

The CALPUFF model has been used for the service station assessment to predict the resultant concentrations of Total VOC, individual contaminants and odour emissions at the proposed childcare centre and surrounding sensitive uses.

The dispersion modelling has predicted the resultant cumulative exposure of air pollutants at the proposed childcare centre and surrounding sensitive uses from the proposed service station, the existing Caltex service station to the northwest and ambient background concentrations.

The CALPUFF model was set up to model dispersion within a 600m x 600m area covering the service stations and surrounding sensitive uses. A gridded receptor mesh with 10 metre spacing over the modelling domain was used for the CALPUFF model given the proximity of the proposed service station to the surrounding sensitive uses.

Presented in **Figure 3** is the location of three nominated discrete receptors representative of the most exposed surrounding sensitive uses. Also presented in **Figure 3** are discrete receptors at 5 metre spacing along the northern and western boundaries of the proposed childcare centre.

For the assessment of air pollutant concentrations with sub 1-hour average criteria, the *CSIRO Peak to Mean Calculator* has been adopted for scaling output by the CALPUFF model. For 3-minute averaging periods, a peak to mean ratio of 1.88 has been applied to the CALPUFF model output. For 30-minute averaging periods, a peak to mean ratio of 1.16 has been applied to the CALPUFF model output.

## 2.5.2 Motor Vehicle Emissions

Detailed road traffic pollutant modelling has been undertaken using the United States Environmental Protection Agency (USEPA) CAL3QHCR model. The CAL3QHCR model has been used for various air quality assessments by MWA Environmental and other consultants in recent years for modelling motor vehicle emissions from roadways across South East Queensland and is considered appropriate for this assessment.

The CALRoads View Version 3.1 graphical user interface software developed by Lakes Environmental has been used to configure and analyse the results of the CAL3QHCR modelling.

The CAL3QHCR model was set up to model dispersion within a 400m x 200m area capturing surrounding road links and the proposed childcare centre. A gridded receptor mesh with 5 metre spacing over the modelling domain was used for the CAL3QHCR model.

From previous experience, 1-hour average Nitrogen Dioxide concentrations and PM<sub>2.5</sub> annual average concentrations are the air pollutants and averaging periods that are most constraining.

Existing AADT and Heavy Vehicle percentage for the Mount Lindsay Highway were sourced from the *Transport and Main Roads, Queensland Government, 2016 traffic census data*.

A 24-hour traffic profile for Mount Lindsay Highway for the year 2016 was sourced from *Transport and Main Roads, Queensland Government, Queensland traffic data Averaged by hour of day and day of week*.

Conservative estimates for AADT volumes on Park Ridge Road and the highway service road ramps has been made for this assessment. The 24-hour traffic profile for Park Ridge Road has been based off a homogenisation of the northbound and southbound traffic volumes for the Mount Lindsay Highway.

Predicted peak motor vehicle movements generated on the commercial development have been based upon information provided by traffic engineers Lambert and Rehbein for the development application.

- The service station has been represented with a peak generation of 139 vehicles per hour.
- The food and drink outlet has been represented with a peak generation of 100 vehicles per hour.
- The childcare centre has been represented with a peak generation of 90 vehicles over two hours in the morning and three hours in the afternoon.

The 24-hour traffic profiles for the service station and drive-thru has been based off a daily sales profile as distributed by Brisbane City Council for the assessment of service station developments.

The peak generation for the drive-thru restaurant would be distributed between dine-in customers and drive-thru customers. For a highly conservative assessment of potential impacts from motor vehicle emissions from the drive-thru restaurant on the childcare centre, all vehicles accessing the food and drink outlet have been represented through the drive-thru (1 vehicle every 36 seconds).

The results of the air pollutant dispersion modelling of the service station are provided in

**Table 5** for the discrete receptors representing the childcare centre.

**Table 5: Summary of Existing and Ultimate Daily Traffic Volumes**

Road Link Description	Lane Direction	Existing Daily Volumes		Ultimate Daily Volumes	
		Sub total	Total	Sub total	Total
Mt Lindsay Highway <sup>8</sup>	Northbound	21,160	44,012	28437	59,148
	Southbound	22,852		30711	
Park Ridge Road <sup>9</sup>	Eastbound	7,500	15,000	10079	20,159
	Westbound	7,500		10079	
Highway Service Roads	Off Ramp	-	5,000	-	6,720
	On Ramp	-	5,000	-	6,720
Vehicles accessing Service Station	Entrance from Highway On Ramp	1,134	2,268	Same as existing peak day	
	Entrance from Park Ridge Road	1,134			
	Exit to Park Ridge Road	2,268			
Vehicles accessing Drive-Thru	Entrance from Highway On Ramp	818	1,636	Same as existing peak day	
	Entrance from Park Ridge Road	818			
	Exit to Park Ridge Road	1,636			
Vehicles accessing Child Care Centre <sup>10</sup>	Entrance from Highway On Ramp	101	202	Same as existing peak day	
	Entrance from Park Ridge Road	101			
	Exit to Highway On Ramp	101			
	Exit to Park Ridge Road	101			

<sup>8</sup> Conservatively adopted Mount Lindsay Highway, North of Green Road segment, weekday average

<sup>9</sup> Averaged the daily north and southbound highway profiles and scaled to a conservative estimate of volumes on Park Ridge Road

<sup>10</sup> Based on 90 Parent's vehicles arriving twice per day (spread over two entrances) bringing 112 Children + 22 Educators arriving once per day (spread over two entrances)

---

## 2.6 EMISSION SOURCE REPRESENTATION

### 2.6.1 Proposed Service Station

The underground storage tank vent pipe emissions were represented as being released from a stack to the north of the refuelling canopy with the following properties:

Height:	4 metres above ground
Diameter:	0.075 metres
Exit velocity:	0.01 metres per second
Release temperature:	18 degrees Celsius

Emissions from vehicle refuelling including 'whoosh' emissions were modelled as being released from four volume sources under the canopy area with the following properties:

Height:	2 metres above ground
Initial Vertical Spread:	2.33 metres
Initial Horizontal Spread:	1.16 metres

The assessment has been undertaken on the basis of the service station operating with Stage 1 and Stage 2 vapour recovery infrastructure.

### 2.6.2 Caltex Service Station

The underground storage tank vent pipe emissions were represented as being released from a stack located to the southwest of the Caltex refuelling canopy with the following properties:

Height:	4 metres above ground
Diameter:	0.075 metres
Exit velocity:	0.01 metres per second
Release temperature:	18 degrees Celsius

Emissions from vehicle refuelling including 'whoosh' emissions were modelled as being released from three volume sources under the canopy area with the following properties:

Height:	2 metres above ground
Initial Vertical Spread:	2.33 metres
Initial Horizontal Spread:	1.16 metres

The assessment has been undertaken on the basis of the Caltex service station operating with Stage 1 vapour recovery infrastructure only.

### **2.6.3 Motor Vehicle Emissions**

Presented in **Figure 4** is a layout identifying the road links included in the assessment.

Conservatively, vehicle emissions have been represented as being released at ground level which results in the highest impact at proposed childcare centre and surrounding sensitive uses.

---

## 2.7 RESULTS OF DISPERSION MODELLING

### 2.7.1 Service Station

The results of the air pollutant dispersion modelling of the service station are provided in **Table 6** for the discrete receptors representing the proposed childcare centre and surrounding sensitive uses.

**Table 6: Predicted Air Pollutant Concentrations ( $\mu\text{g}/\text{m}^3$ ) from Proposed Service Station including existing Caltex and Ambient**

Pollutant	Averaging Period	Ambient Concentration ( $\mu\text{g}/\text{m}^3$ )	Highest Predicted Concentration Including Ambient		Air Quality Planning Criteria ( $\mu\text{g}/\text{m}^3$ )	Complies?
			At Childcare Centre ( $\mu\text{g}/\text{m}^3$ )	At Surrounding Sensitive Receptors ( $\mu\text{g}/\text{m}^3$ )		
Benzene	3-minute	2.7	10.8	12.3	53	Yes
	Annual	2.7	2.76	2.78	10	Yes
Ethyl-benzene	3-minute	-	1.6	1.9	14,500	Yes
	30-minute	-	0.1	0.1	210	Yes
Styrene	30-minute	-	0.04	0.04	75	Yes
	7 days	-	0.002	0.002	280	Yes
Toluene	3-minute	15.8	38.2	42.4	650	Yes
	30-minute	15.8	29.6	32.2	1,100	Yes
	24 hours	15.9	17.4	18.3	4,100	Yes
Xylenes (as a total of ortho, meta and para isomers)	Annual	12.7	12.9	12.9	410	Yes
	3-minute	30.8	39.8	41.4	350	Yes
	24 hours	30.8	31.4	31.8	1,200	Yes
	Annual	25.7	25.8	25.8	950	Yes

Pollutant	Averaging Period	Ambient Concentration ( $\mu\text{g}/\text{m}^3$ )	Highest Predicted Concentration Including Ambient		Air Quality Planning Criteria ( $\mu\text{g}/\text{m}^3$ )	Complies?
			At Childcare Centre ( $\mu\text{g}/\text{m}^3$ )	At Surrounding Sensitive Receptors ( $\mu\text{g}/\text{m}^3$ )		
Odour	1-hour 99.5 <sup>th</sup> percentile	-	0.5	0.6	1 Odour Unit	Yes
	1-hour 99.5 <sup>th</sup> percentile	-	0.3	0.3	2.5 Odour Units	Yes

The results demonstrate air pollutant emissions from the proposed service station will readily satisfy the relevant 'air quality planning criteria' and 'odour criteria' at the proposed childcare centre and surrounding sensitive uses.

Contour plots are presented in **Attachment 5** for concentrations of Odour and Benzene which have the highest predicted concentrations with respect to the relevant 'air quality planning criteria' and 'odour criteria' at the proposed childcare centre and surrounding sensitive uses.

The predicted concentrations of other pollutants are a small fraction of the relevant 'air quality planning criteria', therefore gridded contour plots were not considered necessary for development assessment purposes.

The results of the air quality assessment demonstrate that, with the proposed Stage 1 ("VR1") and Stage 2 ("VR2") vapour recovery systems and a conservative estimate of annual fuel sales, the relevant 'air quality planning criteria' and 'odour criteria' will be readily satisfied at the proposed childcare centre and surrounding sensitive uses.

## 2.7.2 Motor Vehicle Exhaust Emissions

The results of the air pollutant dispersion modelling of motor vehicle emissions from the commercial site and surrounding road links are provided in **Table 7** for discrete receptors representing the proposed childcare centre.

A selection of air pollutants are presented graphically as contour plots in **Attachment 6**

**Table 7: Predicted concentrations from Road Traffic Pollution Modelling**

Pollutant	Averaging Period	Ambient Concentration ( $\mu\text{g}/\text{m}^3$ )	Highest Predicted Concentration at Childcare Centre Including Ambient ( $\mu\text{g}/\text{m}^3$ )		Adopted Air Quality Planning Criteria ( $\mu\text{g}/\text{m}^3$ )	Complies?
			Existing Volumes with 2010 Emission Factors	Ultimate Volumes with 2025 Emission Factors		
Benzene	3-minute	2.7	5.6	3.5	53	Yes
	Annual	2.7	2.72	2.70	10	Yes
Benzo(a)pyrene	Annual	-	3E-06	4E-06	0.0003	Yes
Nitrogen Dioxide	1-hour	13.2	50.0	22.7	190 / 250	Yes
	Annual	11.3	14.1	12.7	62	Yes
PM <sub>10</sub>	1-hour	14.6	20.1	17.6	80	
	24-hour	14.6	15.6	15.0	50	Yes
PM <sub>2.5</sub>	1-hour	5.4	10.0	7.1	50	
	24-hour	5.4	6.0	5.5	25	Yes
	Annual	4.7	4.9	4.7	8	Yes

The results of the air quality dispersion modelling demonstrate motor vehicle exhaust emissions will satisfy the relevant air quality planning criteria at the most exposed boundaries of the proposed childcare centre.

---

## 3.0 CONCLUSION

MWA Environmental has been engaged to prepare an Air Quality Impact Assessment for the proposed Park Ridge Service Centre which will consist of a service station, food and drink outlet and childcare centre on land located at 17-25 Park Ridge Road, Park Ridge. The assessment has considered the following air pollutant emissions from activities which have the potential to impact on the proposed childcare centre and surrounding sensitive uses:

- Volatile Organic Compounds (VOCs) and odour emissions from a proposed service station and predicted impacts at the proposed childcare centre and surrounding sensitive uses.
- Potential cooking odour from the food and drink outlet and assessment of separation distances to the proposed childcare centre and surrounding sensitive uses.
- Air pollutant emissions generated from motor vehicle exhaust from surrounding roads and predicted impacts at the proposed childcare centre.
- Air pollutant emissions generated from motor vehicle exhaust on the commercial site and associated with food and drink outlet drive-thru adjacent to the proposed childcare centre.

The assessment of air pollutant concentrations at the proposed childcare centre and surrounding sensitive uses has been made against the air emission standards described in the *Environmental Management Planning Scheme Policy* of the *Logan Planning Scheme 2015*. Reference has also been made to the Air Quality Objectives described in the *Environmental Protection (Air) Policy 2008* and Queensland *Ecoaccess Guideline: Odour Impact Assessment from Developments*.

### 3.1.1 Service Station

The proposed service station will incorporate a Stage 1 (“VR1”) vapour recovery control system to minimise emissions from underground tank vent pipes when bulk refilling is occurring.

The proposed service station will also incorporate a Stage 2 (“VR2”) vapour recovery control system to minimise fugitive emissions from vehicles refuelling under the canopy.

Conservative estimate based on the passing traffic volumes, number of bowzers and previous experience with other service stations operating in Southeast Queensland, is for annual fuel sales of 4 Million litres per annum excluding diesel. For the assessment of peak day emissions, fuel sales have been conservatively modelled as 30 percent greater than the annual fuel sale rate.

Detailed emissions estimations and dispersion modelling has been undertaken in accordance with accepted methodologies to assess the potential impact of the service proposed station on the proposed childcare centre and surrounding sensitive uses.

---

In conclusion, the assessment has demonstrated that the proposed service station development minimises air pollutant emissions through the provision of Stage 1 (“VR1”) and Stage 2 (“VR2”) vapour recovery system and the relevant air quality planning criteria will be satisfied at the proposed childcare centre and surrounding sensitive uses.

### **3.1.2 Food and Drink Outlet**

On the basis of the odour assessment conducted, it is considered that cooking odours associated with the proposed development can be managed within acceptable limits at the proposed childcare centre and surrounding sensitive uses with the provision of appropriately designed cooking exhaust systems and routine maintenance and cleaning of exhaust filters to avoid the generation of excessive odour emissions.

It is recommended that the proposed development be approved with reasonable and relevant development approval conditions with respect to odour impacts requiring that:

1. Mechanical exhaust ventilation systems comply with Australian Standard *AS1668 Parts 1 and 2 - The Use of Mechanical Ventilation and Air-conditioning in Buildings*.
2. Appropriate range hood filters or similar equipment are operated and maintained to minimise odour emissions from various cooking processes.
3. Regular maintenance and cleaning of exhaust fans, canopies and duct systems be conducted to ensure that odour emissions are minimised.

### **3.1.3 Motor Vehicle Exhaust Emissions**

An assessment of air pollutant emissions generated from motor vehicle exhausts on the commercial site and surrounding roads has been undertaken to assess whether the internal and external educational areas of the proposed childcare centre achieve the air quality planning criteria.

A detailed assessment has been undertaken with conservative assumptions which has identified the predicted concentrations at the proposed childcare centre will satisfy the air quality planning criteria.

**MWA Environmental**  
**19 January 2018**

## FIGURES

DRAWING REFERENCE  
 UBD : AUSTRALIAN CITY STREETS 2016



CLIENT  
 PARK RIDGE 88 PTY LTD

PROJECT  
**AIR QUALITY ASSESSMENT**  
 PARK RIDGE SERVICE CENTRE  
 17-25 PARK RIDGE ROAD  
 PARK RIDGE QLD

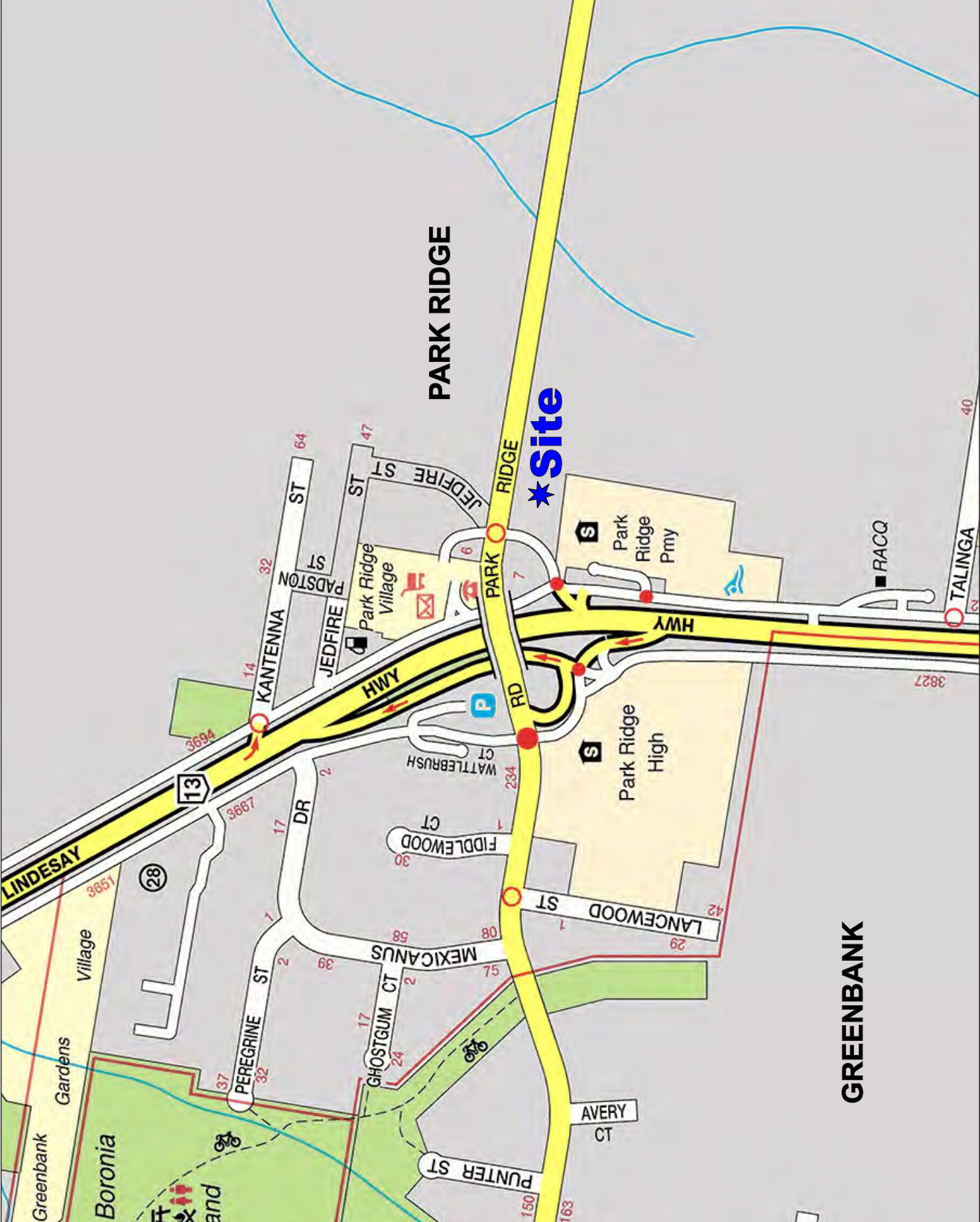
TITLE

**SITE LOCATION**

JOB	PARK RIDGE	<b>FIGURE 1</b>
JOB NO.	17-158	
DATE	19/01/18	DWG NUMBER
SCALE	NOT TO SCALE	17-158-1
REV.		



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 www.mwaenviro.com.au  
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**GREENBANK**

**LEGEND**  
 - SITE BOUNDARY  
**DRAWING REFERENCES**  
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 - GOOGLE EARTH PRO 2016.



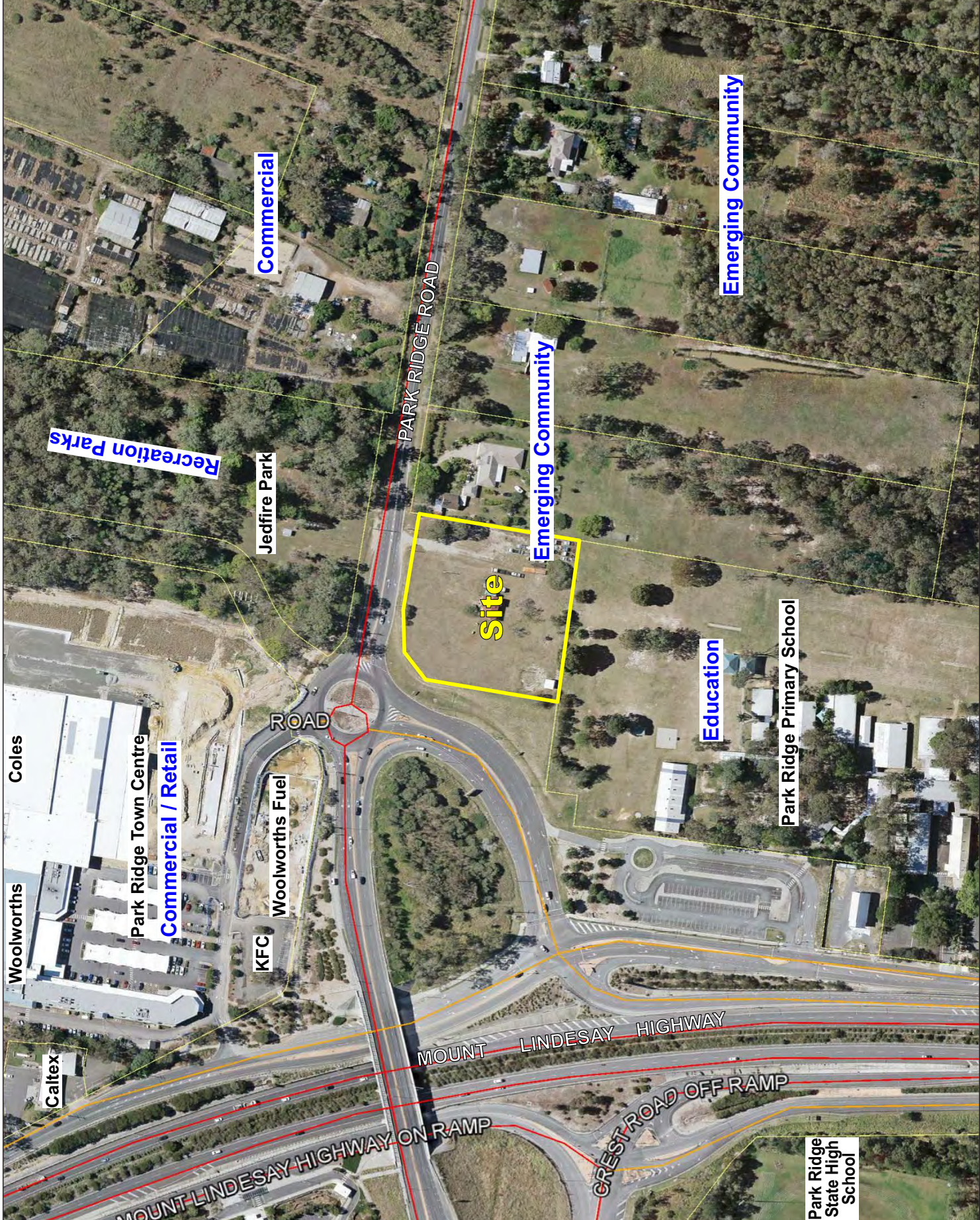
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**PROJECT**  
**AIR QUALITY ASSESSMENT**  
 PARK RIDGE SERVICE CENTRE  
 17-25 PARK RIDGE ROAD  
 PARK RIDGE QLD

**TITLE**  
**SURROUNDING LAND USES**

<b>JOB</b>	PARK RIDGE	<b>FIGURE 2</b>
<b>JOB NO.</b>	17-158	<b>DWG NUMBER</b>
<b>DATE</b>	19/01/18	<b>SCALE</b>
<b>SCALE</b>	1:3000 (A4)	<b>REV.</b>
		17-158-2

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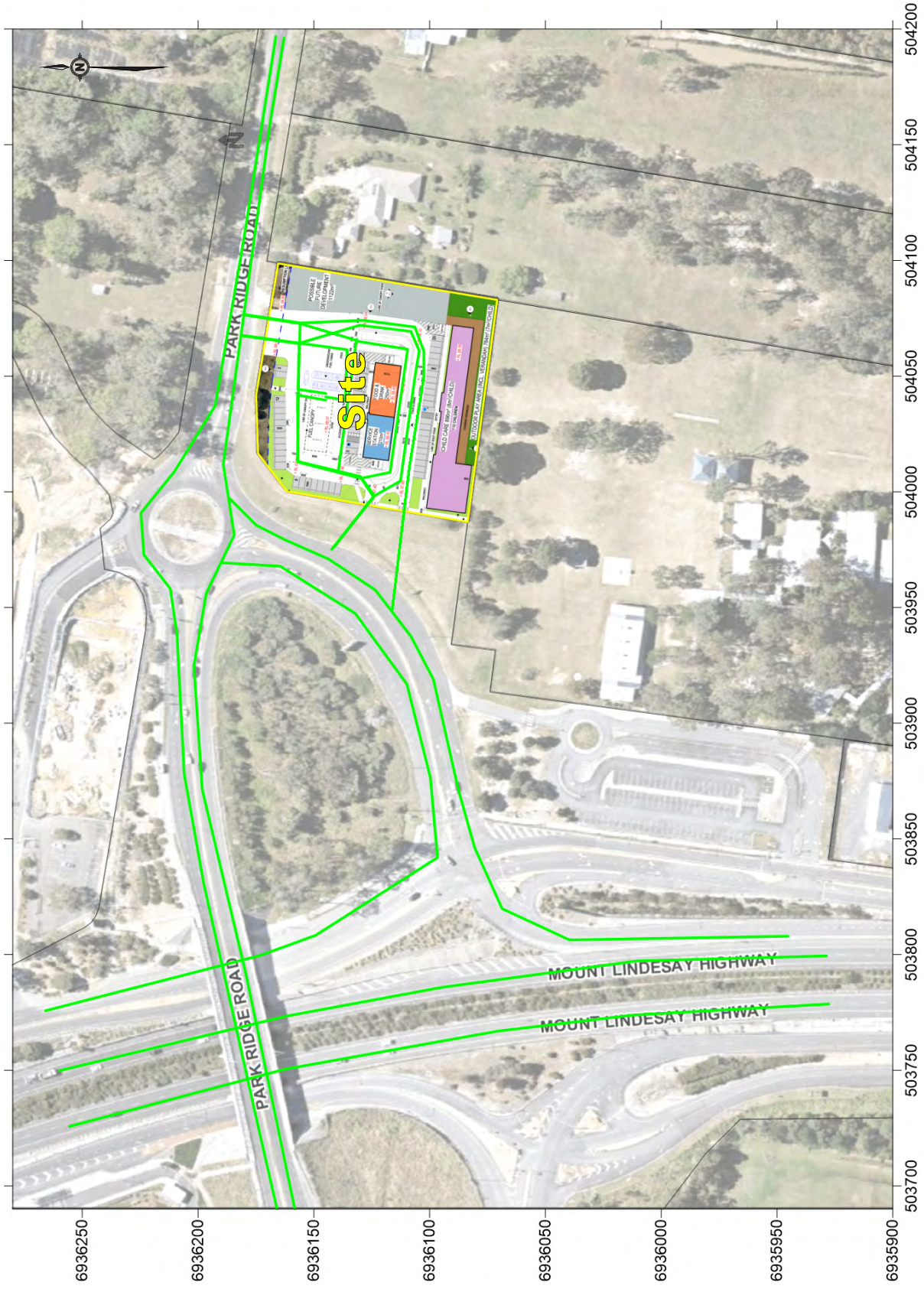
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 PARK RIDGE SERVICE CENTRE  
 17-25 PARK RIDGE ROAD  
 PARK RIDGE QLD

**TITLE**  
**MODELLED ROAD LINKS**

<b>JOB</b>	PARK RIDGE	<b>FIGURE 4</b>
<b>JOB NO.</b>	17-158	<b>DWG NUMBER</b>
<b>DATE</b>	19/07/18	<b>SCALE</b>
<b>REV.</b>	1-2500 (A4)	<b>17-158-4</b>



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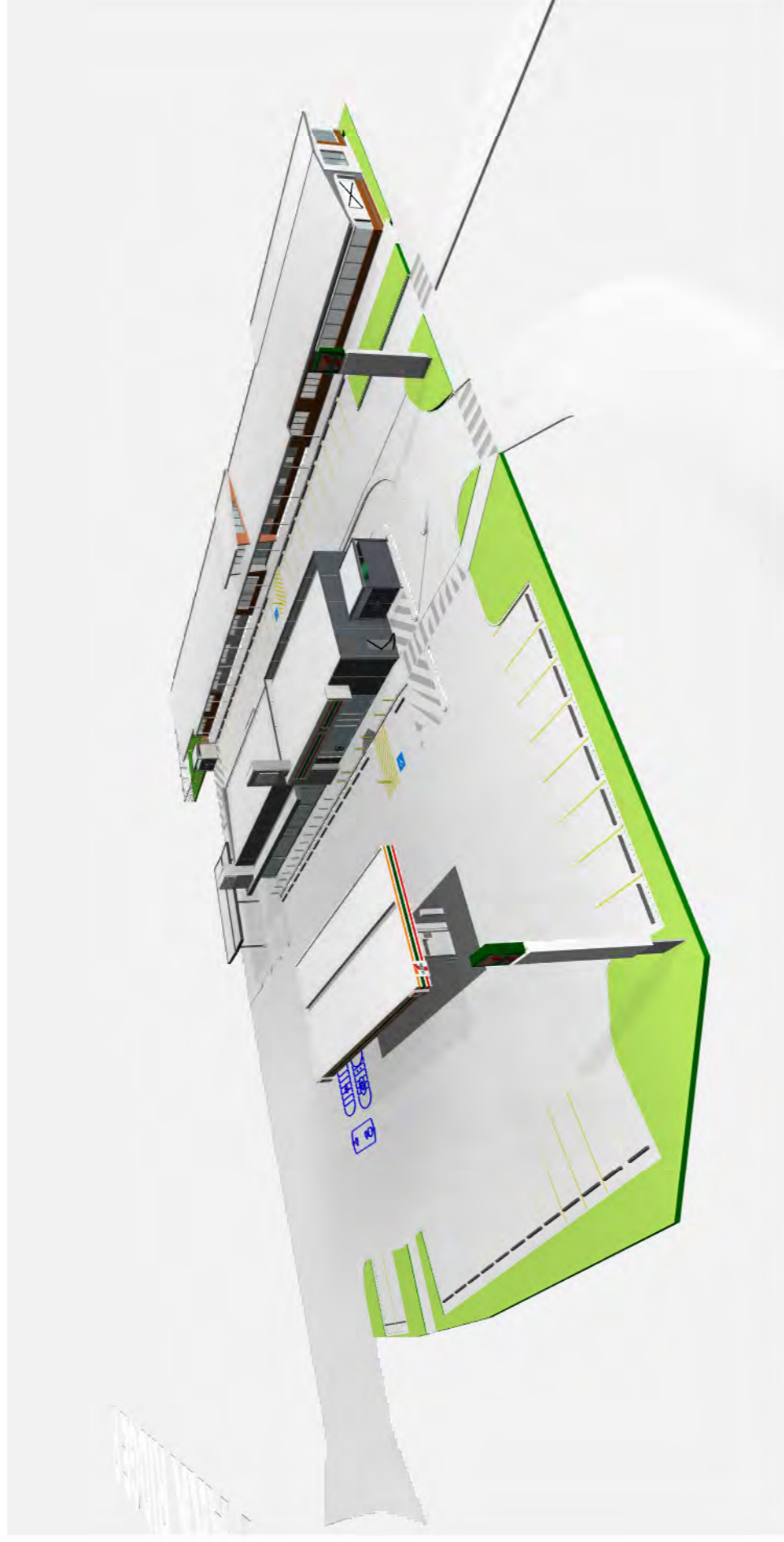


## **ATTACHMENT 1**

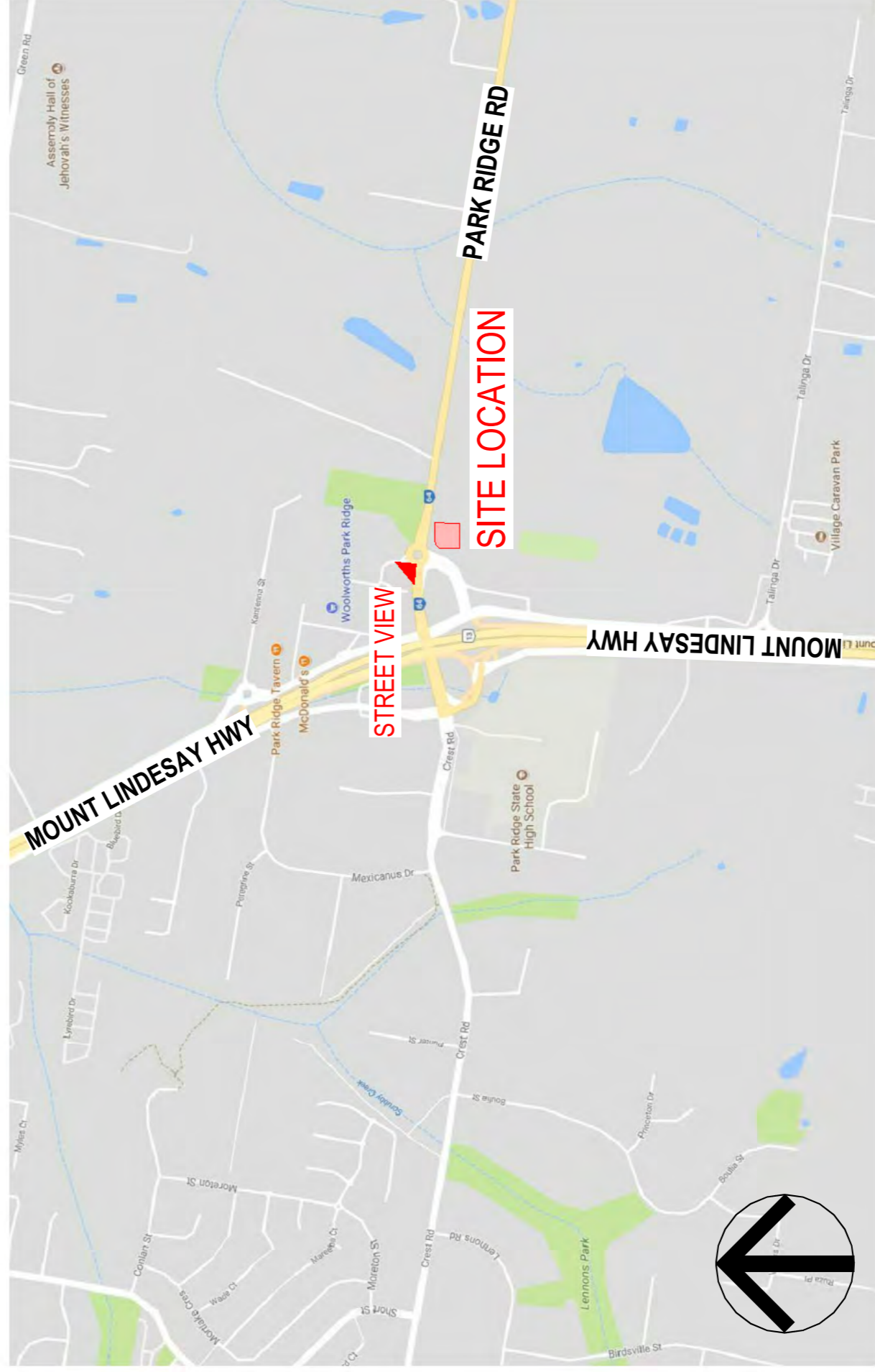
### Proposed Development Plans

# PARK RIDGE SERVICE CENTRE

17-25 PARK RIDGE ROAD, PARK RIDGE, QUEENSLAND



SITE PERSPECTIVE - INDICATIVE ONLY



LOCATION PLAN (NOT TO SCALE)

## DESIGN DRAWING LIST

SHEET NUMBER SHEET NAME

A 00.0	COVER SHEET
A 01.0	CONTEXT PLAN
A 10.0	SITE PLAN
A 30.0	RETAIL BUILDING ELEVATIONS
A 30.1	CHILD CARE CENTRE ELEVATIONS
A 40.0	SECTIONS
A 90.0	PERSPECTIVES



STREET VIEW OF SITE LOOKING TOWARDS CNR OF PARK RIDGE ROAD AND MOUNT LINDESAY HWY ON RAMP

**PARK RIDGE SERVICE CENTRE**  
17-25 PARK RIDGE ROAD, PARK RIDGE, QLD 4125

**PARK RIDGE 88 PTY LTD**

# DEVELOPMENT APPLICATION

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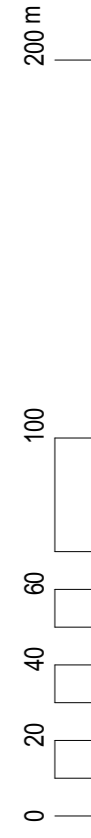
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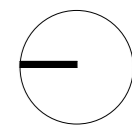
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1 SITE CONTEXT  
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CONTEXT PLAN

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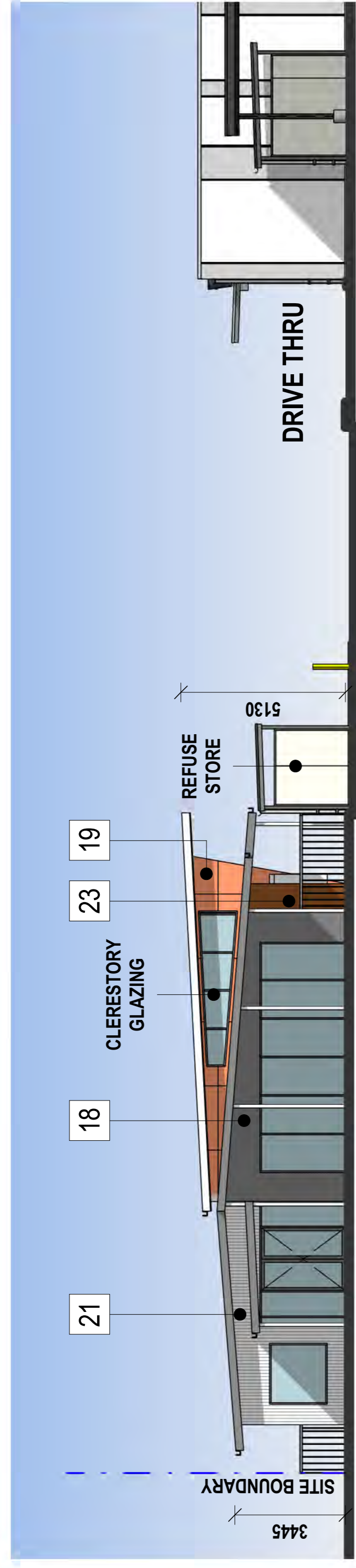
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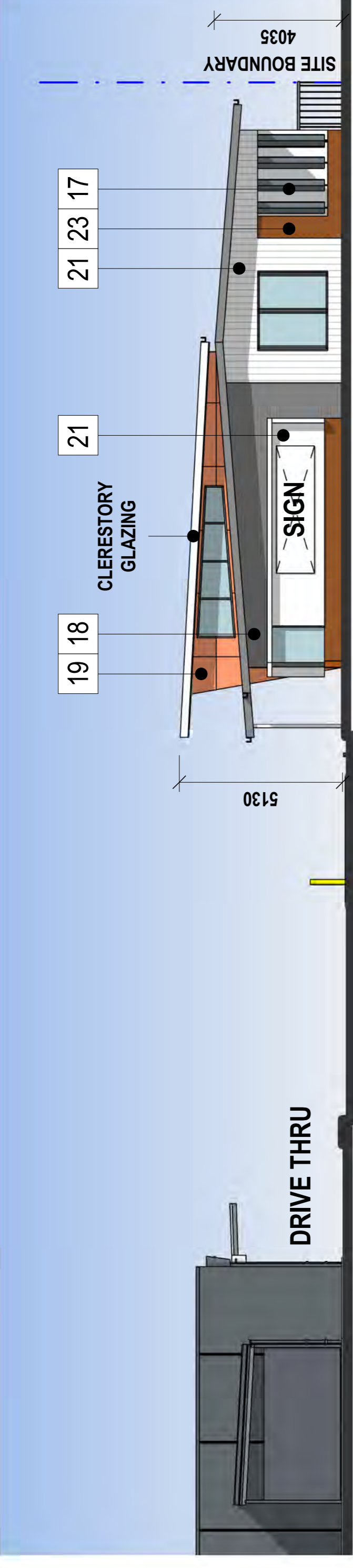
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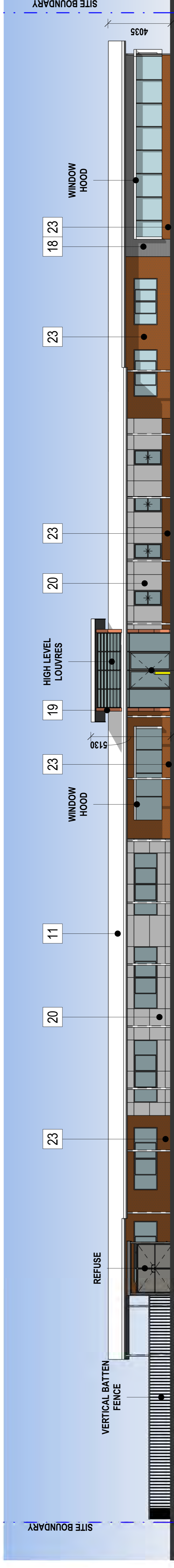




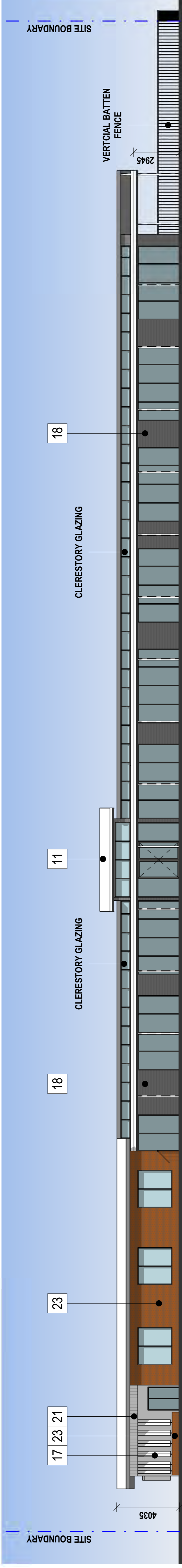
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4 CHILD CARE WEST ELEVATION  
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3 CHILD CARE SOUTH ELEVATION  
10.0 1 : 125

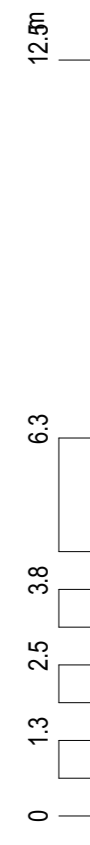
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2	7-11 ORANGE
3	7-11 GREEN
4	7-11 RED

FINISHES LEGEND	
5	COLORBOND IRONSTONE
6	SILVER GREY PAINT FINISH
7	PAINT FINISH GONDOLA GREY
8	TIMBER EFFECT HPL CLADDING

FINISHES LEGEND	
9	COLORBOND CAPPINGS & FLASHINGS
10	PLAIN GREY CONCRETE
11	COLORBOND SURF MIST
12	TEXTURED CONCRETE FINISH

FINISHES LEGEND	
15	ACM CLADDING CHARCOAL GREY
16	ACM CLADDING OFF WHITE
17	LIGHT BLUE LOUVRES
18	PAINTED GREY HORIZONTAL CLADDING

FINISHES LEGEND	
19	ORANGE HPL CLADDING
20	CFC SHEET CLADDING EXPRESSED JOINT PAINTED WHITE
21	PAINTED WHITE VERTICAL CLADDING
23	MASONRY BRICK



# DEVELOPMENT APPLICATION

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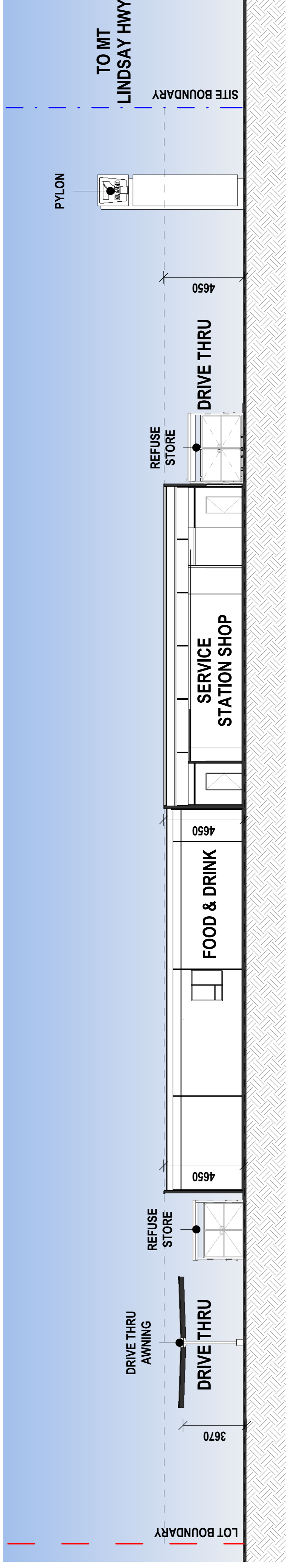
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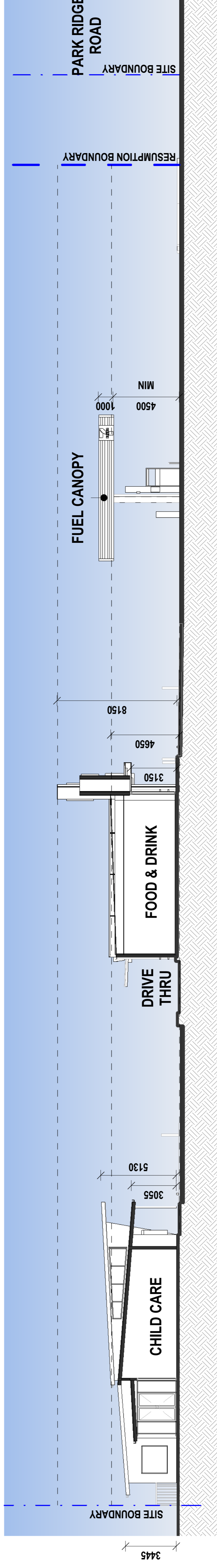
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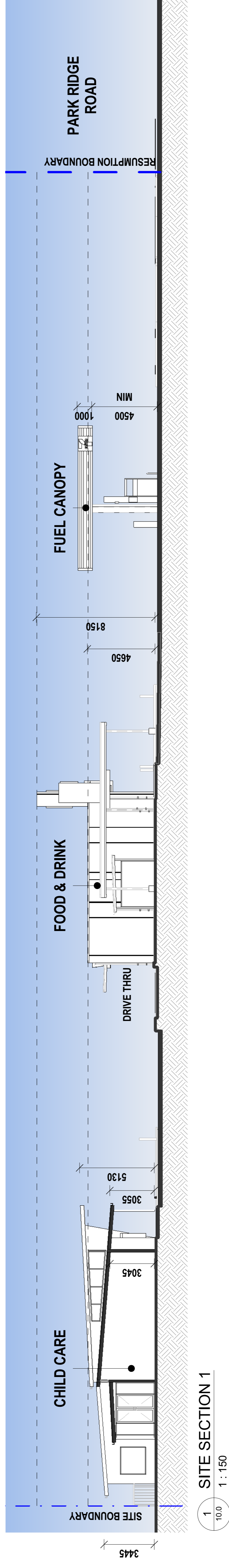
CHILD CARE CENTRE ELEVATIONS



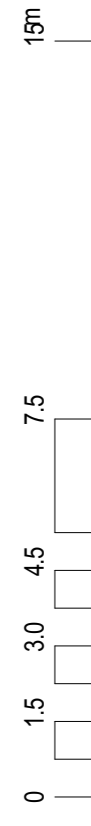
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2 SITE SECTION 2  
10.0 1 : 150



1 SITE SECTION 1  
10.0 1 : 150



# DEVELOPMENT APPLICATION

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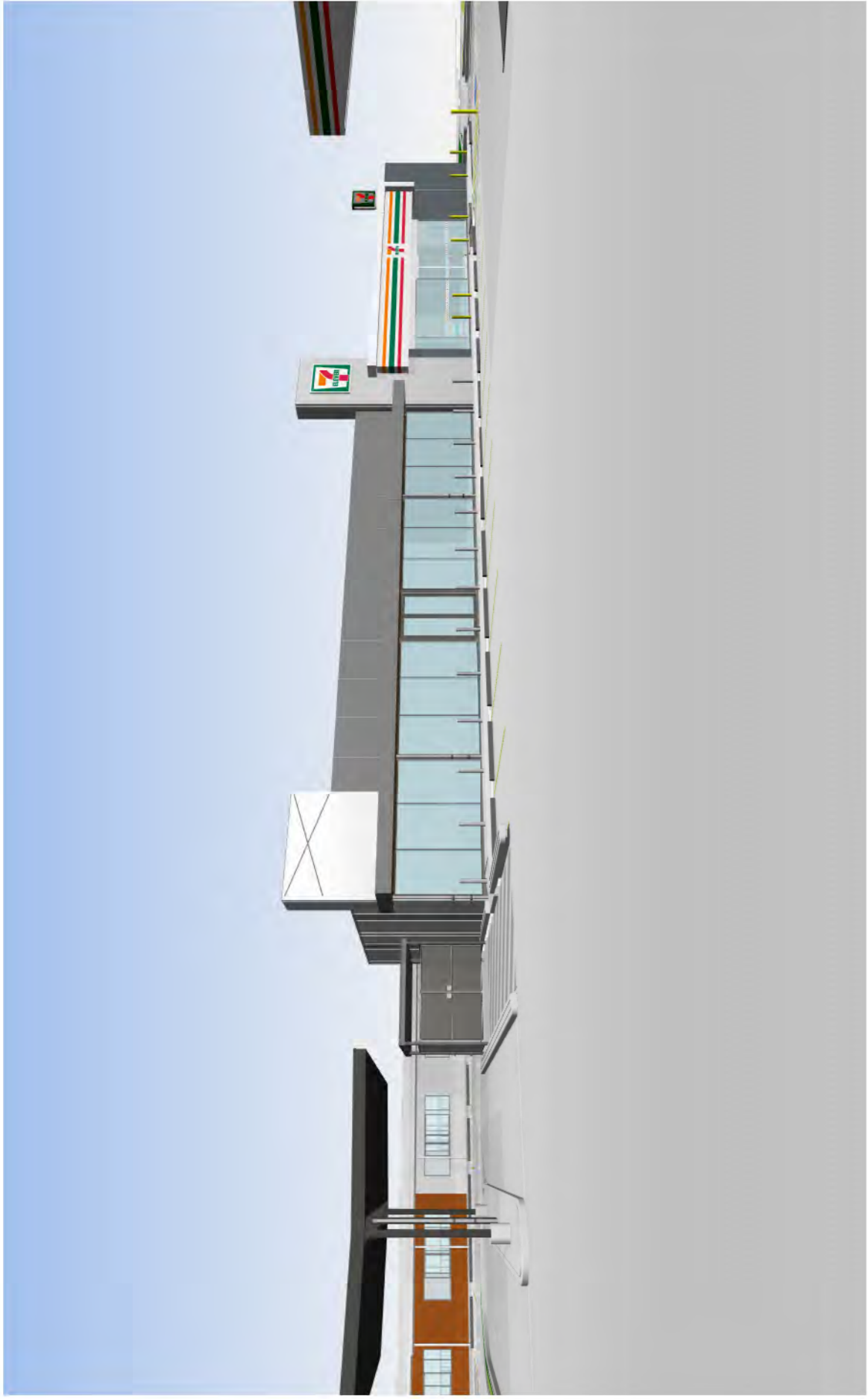
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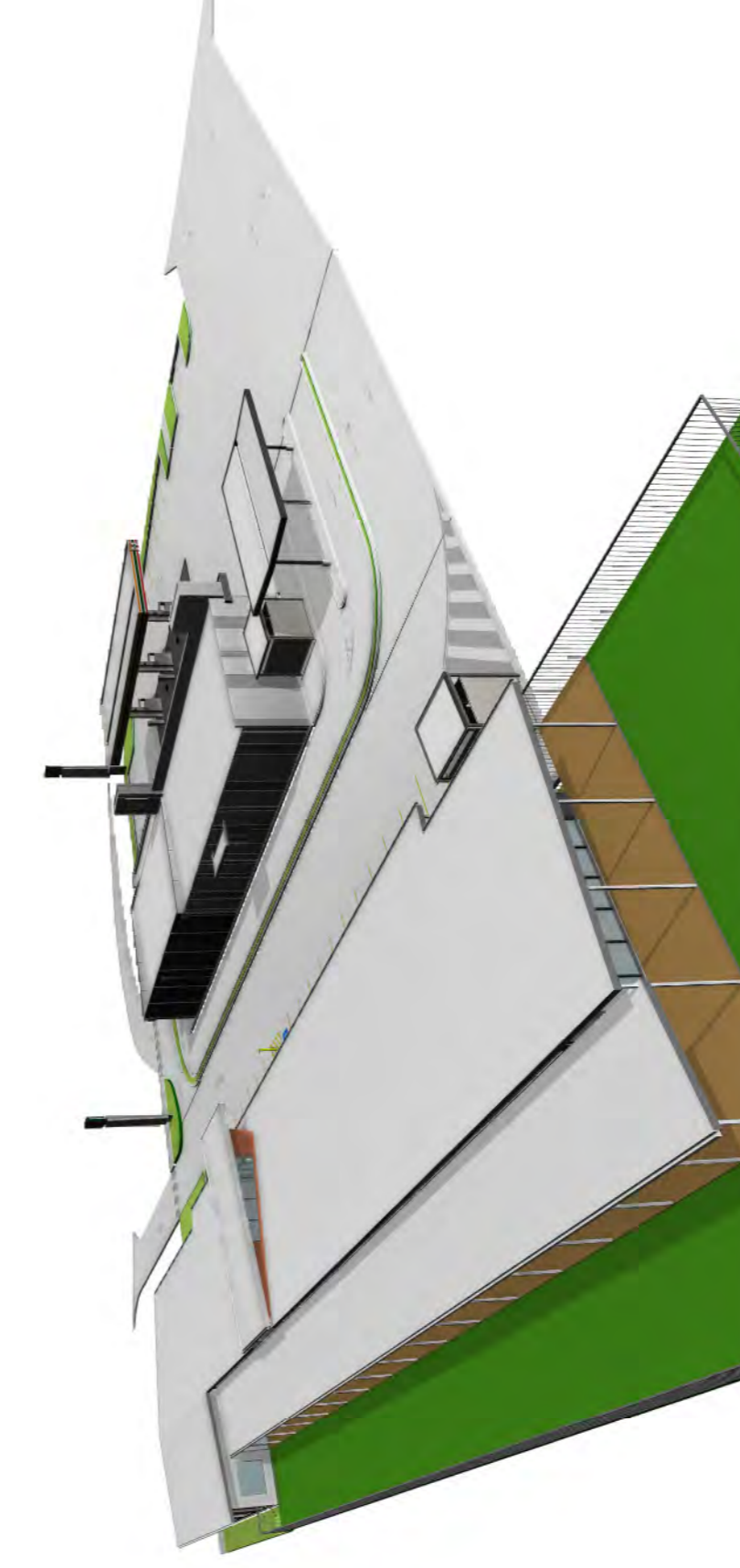
2 SERVICE STATION SHOP VIEW



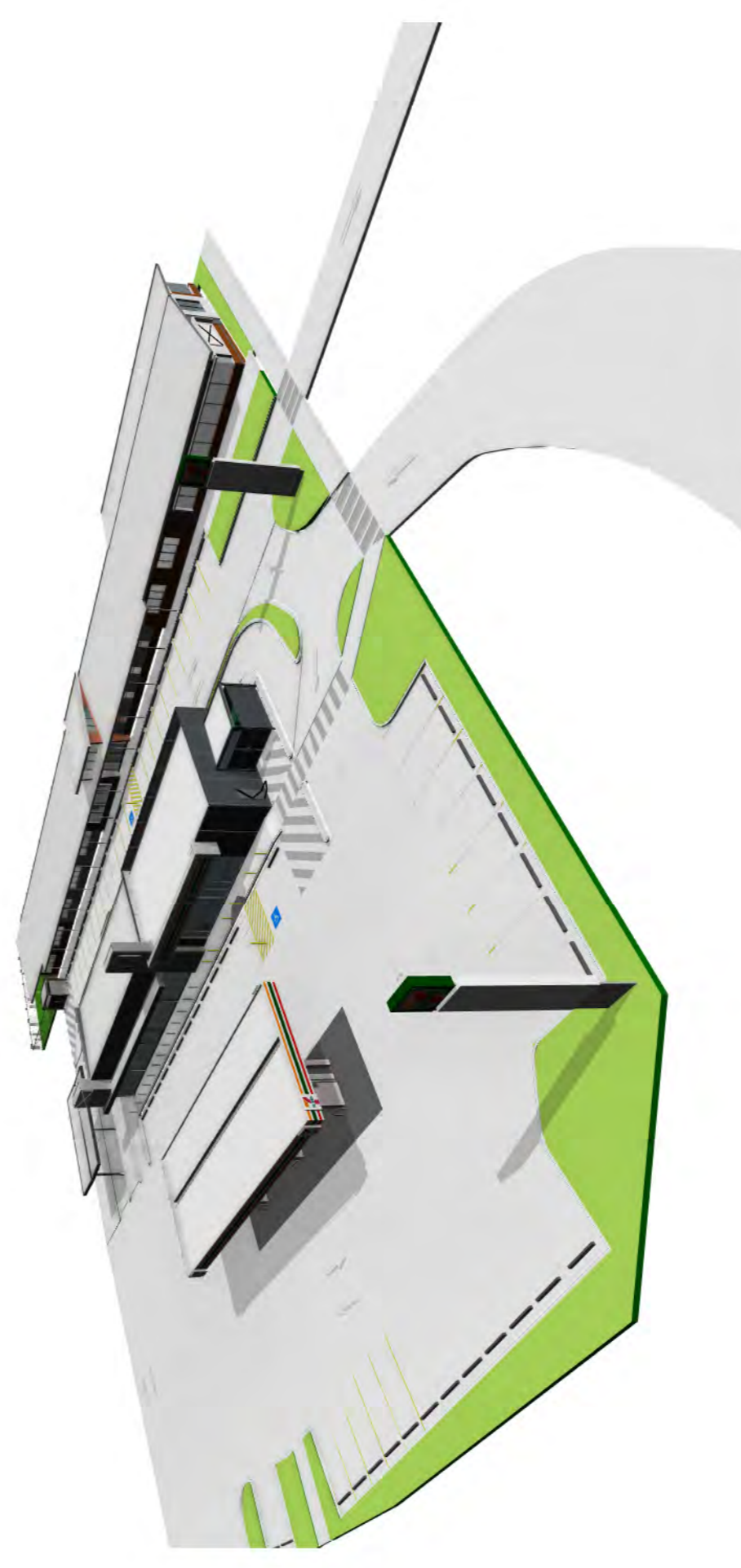
3 CHILD CARE VIEW



4 SITE PERSPECTIVE 1



5 SITE PERSPECTIVE 2



6 SITE PERSPECTIVE 3

# DEVELOPMENT APPLICATION

**PARK RIDGE SERVICE CENTRE**  
 17-25 PARK RIDGE ROAD, PARK RIDGE, QLD 4125  
**PARK RIDGE 88 PTY LTD**

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 PERSPECTIVES  
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15/01/2018  
 rev. 4

## **ATTACHMENT 2**

### Odour Detection Threshold of Unleaded Fuel

Based upon  
Air Noise Environment and The Odour Unit testing  
commissioned by MWA Environmental

April 2015

**APRIL 2015 UNLEADED FUEL SAMPLE ODOUR DETECTION THRESHOLD CALCULATION**

*Air Noise Environment Total VOC analysis*

*The Odour Unit olfactometry analysis*

<b>SAMPLE</b>	<b>Total VOC (mg/m3)</b>	<b>Total VOC (ug/m3)</b>	<b>Odour Units</b>	<b>Calculated Odour Threshold (ug/m3)</b>
1	57772	57771777	30600	1888
2	61043	61043200	21600	2826
<b>Average</b>				<b>2357</b>

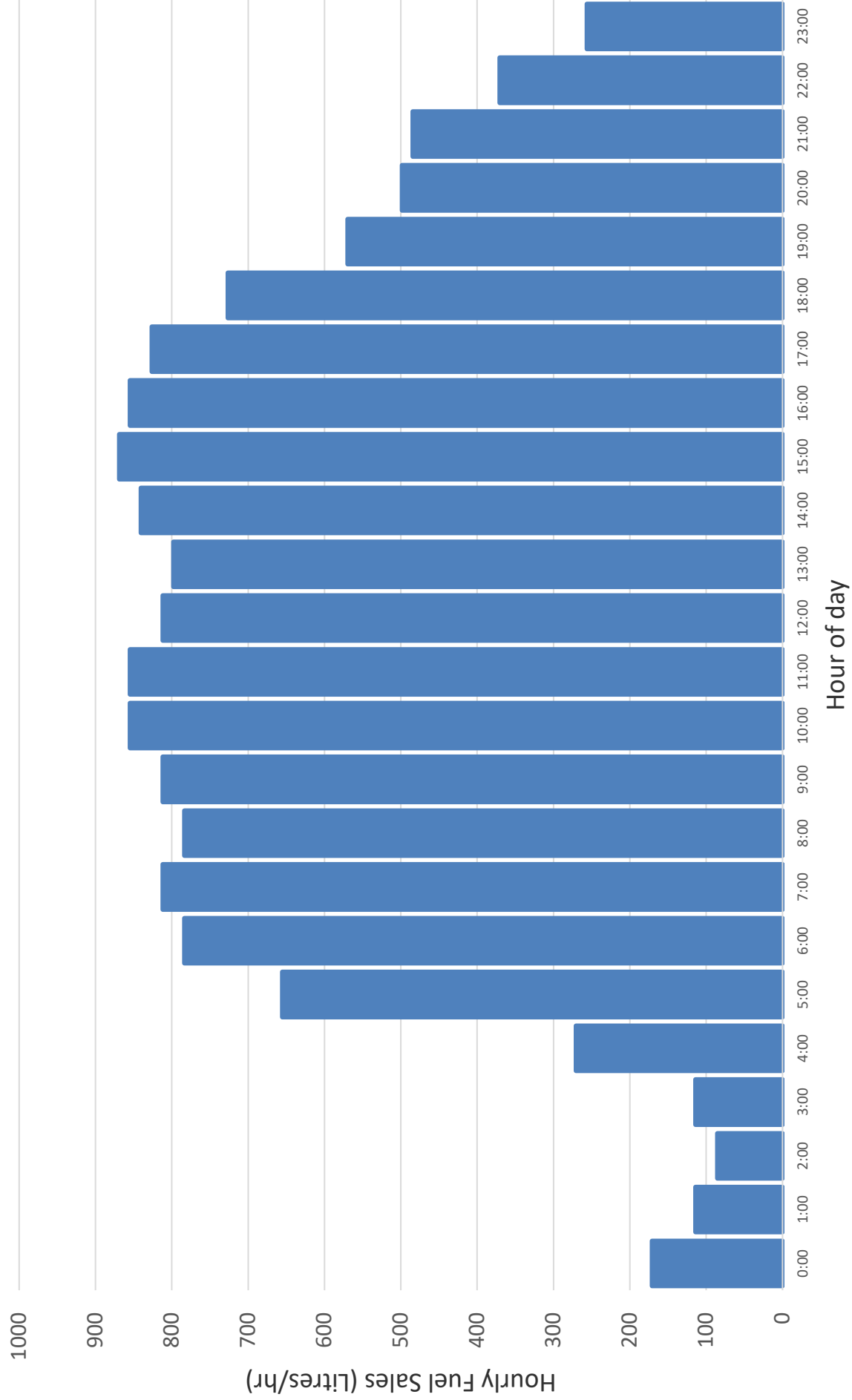
Calculated odour detection threshold is comparable to Neumann Fuels Unleaded Petrol MSDS NC317ECP of 0.25ppm (2150 ug/m3)

## **ATTACHMENT 3**

### Service Station Emission Estimations



# PEAK FUEL SALES VERSUS TIME OF DAY



### VOC Emission Factors

Source	Value	Units
Underground Tank Breathing	120	mg / l
Refuelling Vehicles with with Stage 2 Vapour Recovery	132	mg / l
Spillage at Vehicles	80	mg / l
Whoosh Emissions at Vehicles	79	mg / l
Bulk Tanker Refuelling with Stage 1 Vapour Recovery	40	mg / l

### Bulk Tanker Refuelling

Parameter	Value	Units
Volume of Refuelling Tanker	54500	Litres
Total VOC emissions per fill	2180	grams
Total VOC emission rate	0.61	g/s

### VOC Emission Rates from Various Sources by Hour of Day

Hour Beginning	Hourly Fuel Throughput (Litres)	VOC Emission Rates					Units
		Underground Tank Breathing	Refuelling Vehicles	Spillage at Vehicles	Whoosh at Vehicles	Bulk Tanker Refuelling	
12MN	171	0.0057	0.0063	0.0038	0.0037	0.61 <sup>1</sup>	g/s
1am	114	0.0038	0.0042	0.0025	0.0025	-	g/s
2am	85	0.0028	0.0031	0.0019	0.0019	-	g/s
3am	114	0.0038	0.0042	0.0025	0.0025	-	g/s
4am	271	0.0090	0.0099	0.0060	0.0059	-	g/s
5am	655	0.0218	0.0240	0.0146	0.0144	-	g/s
6am	784	0.0261	0.0287	0.0174	0.0172	-	g/s
7am	812	0.0271	0.0298	0.0180	0.0178	-	g/s
8am	784	0.0261	0.0287	0.0174	0.0172	-	g/s
9am	812	0.0271	0.0298	0.0180	0.0178	-	g/s
10am	855	0.0285	0.0313	0.0190	0.0187	-	g/s
11am	855	0.0285	0.0313	0.0190	0.0187	-	g/s
12pm	812	0.0271	0.0298	0.0180	0.0178	-	g/s
1pm	798	0.0266	0.0293	0.0177	0.0175	-	g/s
2pm	841	0.0280	0.0308	0.0187	0.0184	-	g/s
3pm	869	0.0290	0.0319	0.0193	0.0190	-	g/s
4pm	855	0.0285	0.0313	0.0190	0.0187	-	g/s
5pm	826	0.0275	0.0303	0.0184	0.0181	-	g/s
6pm	727	0.0242	0.0266	0.0161	0.0159	-	g/s
7pm	570	0.0190	0.0209	0.0127	0.0125	-	g/s
8pm	499	0.0166	0.0183	0.0111	0.0109	-	g/s
9pm	484	0.0161	0.0178	0.0108	0.0106	-	g/s
10pm	370	0.0123	0.0136	0.0082	0.0081	-	g/s
11pm	256	0.0085	0.0094	0.0057	0.0056	-	g/s

<sup>1</sup> Conservatively assume that a full tanker is unloaded at the service station once per day, progressively rolling for each day of the year

## **ATTACHMENT 4**

### CALMET Meteorology for Park Ridge

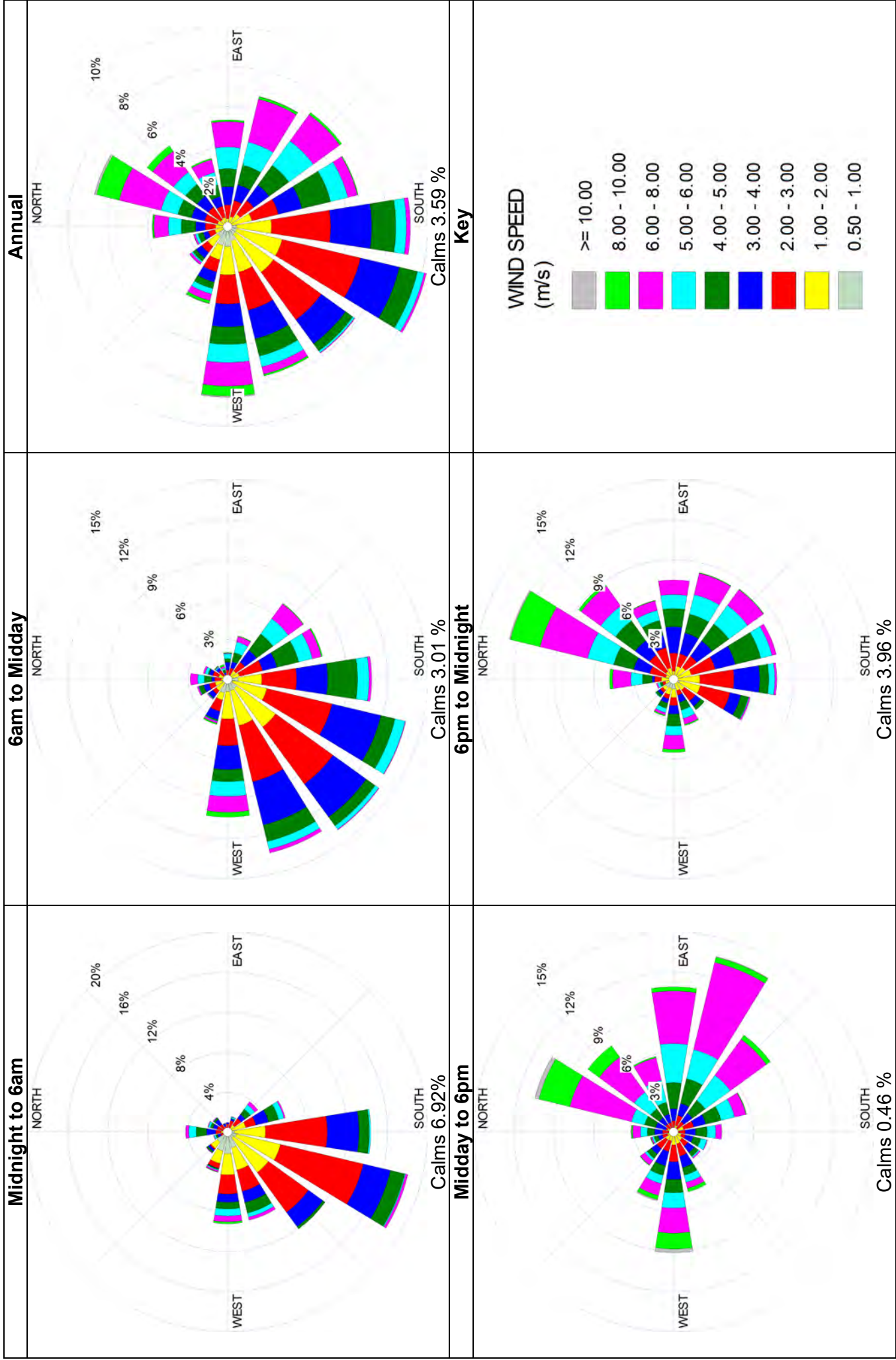


Figure A4.1 Diurnal wind roses for Site as generated by CALMET

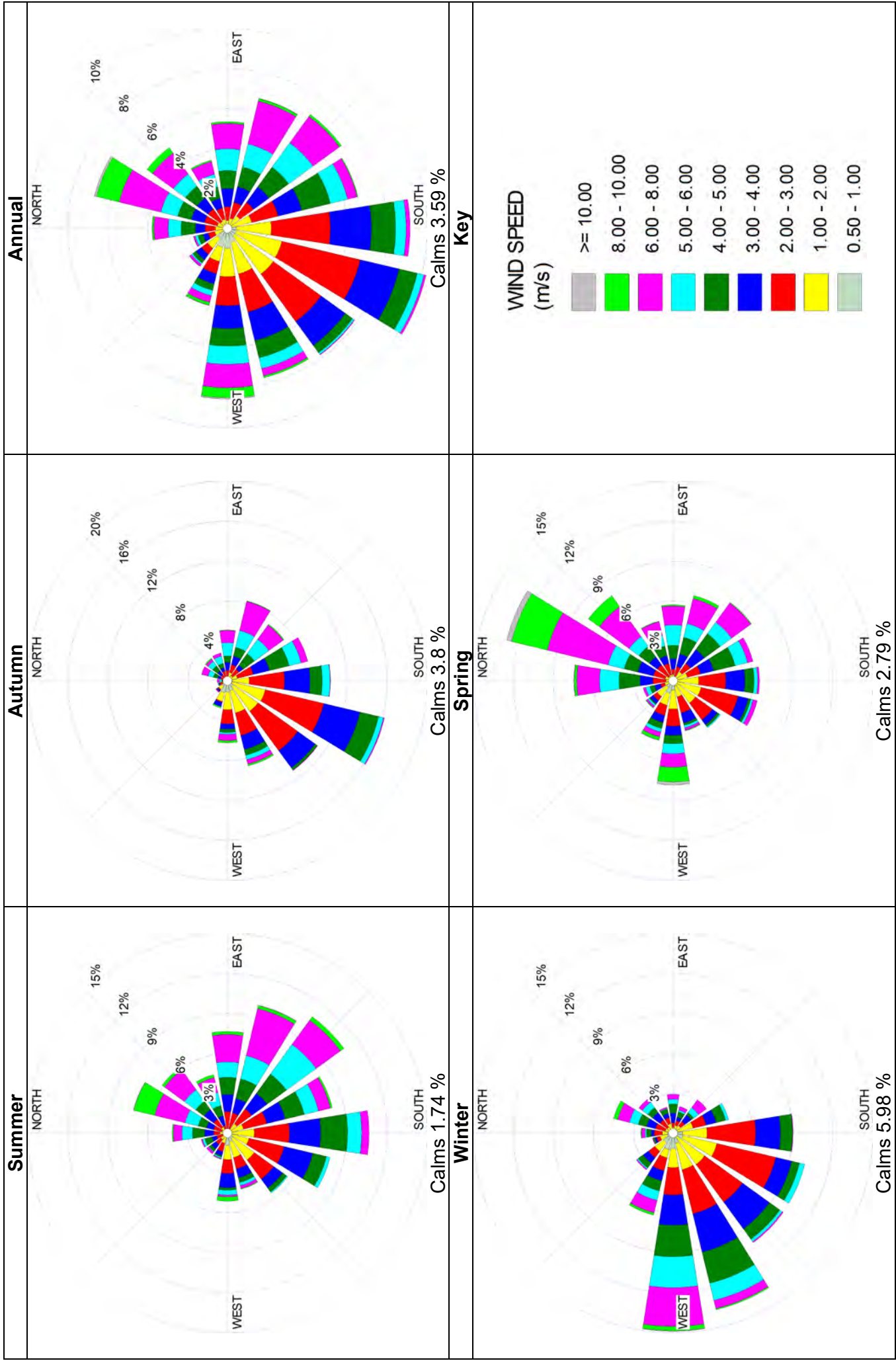
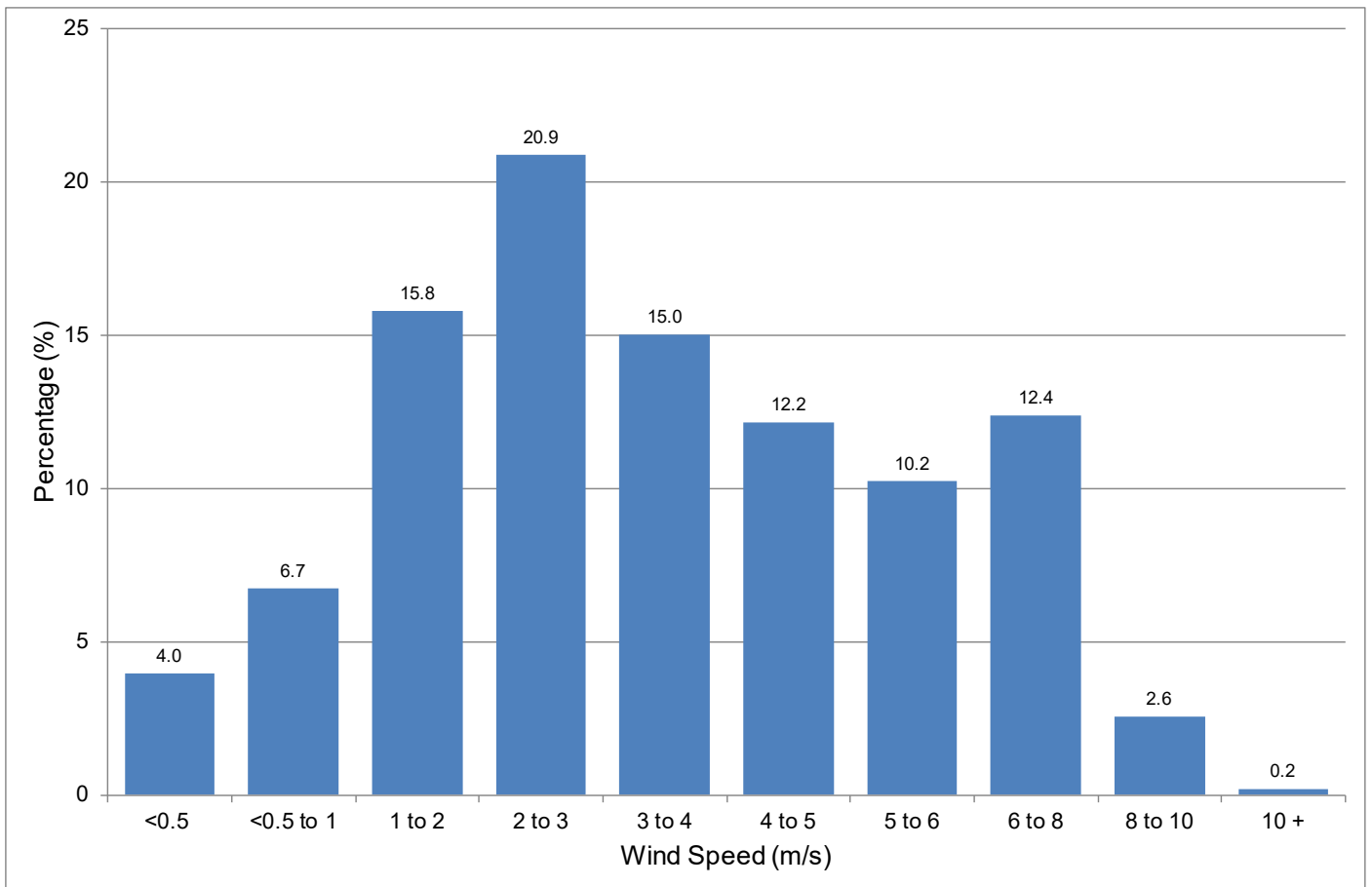
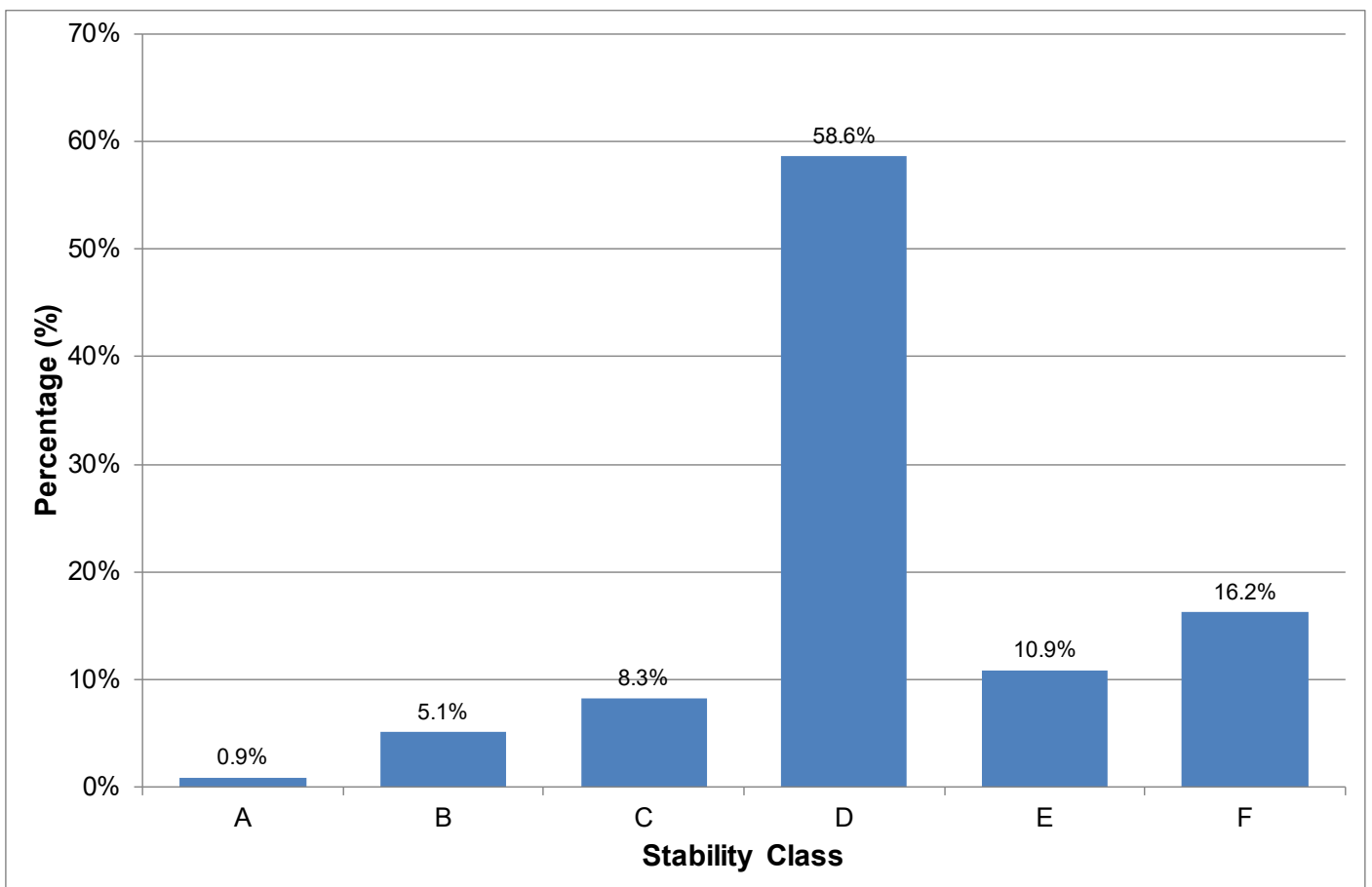


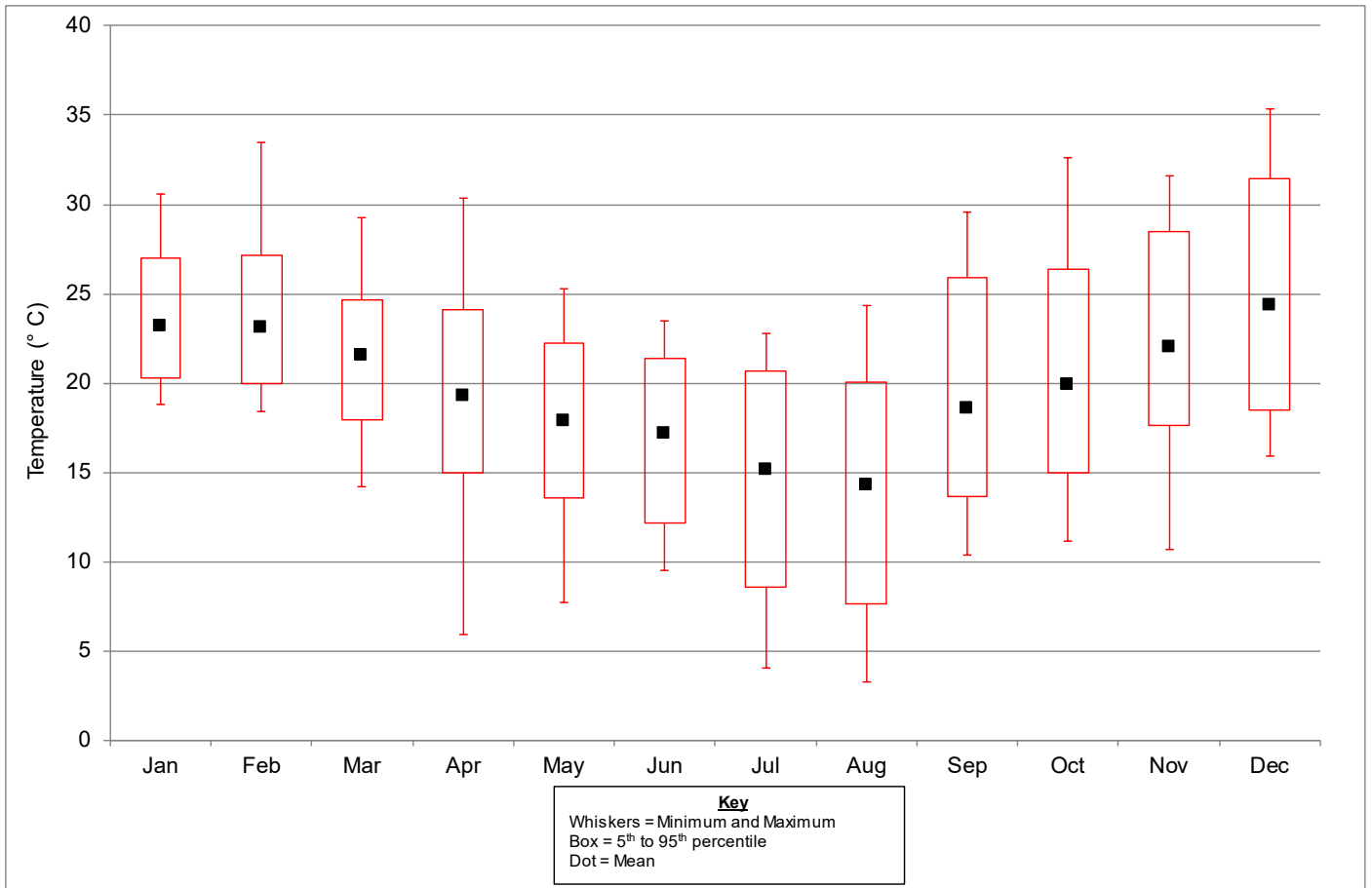
Figure A4.2 Seasonal wind roses for Site as generated by CALMET



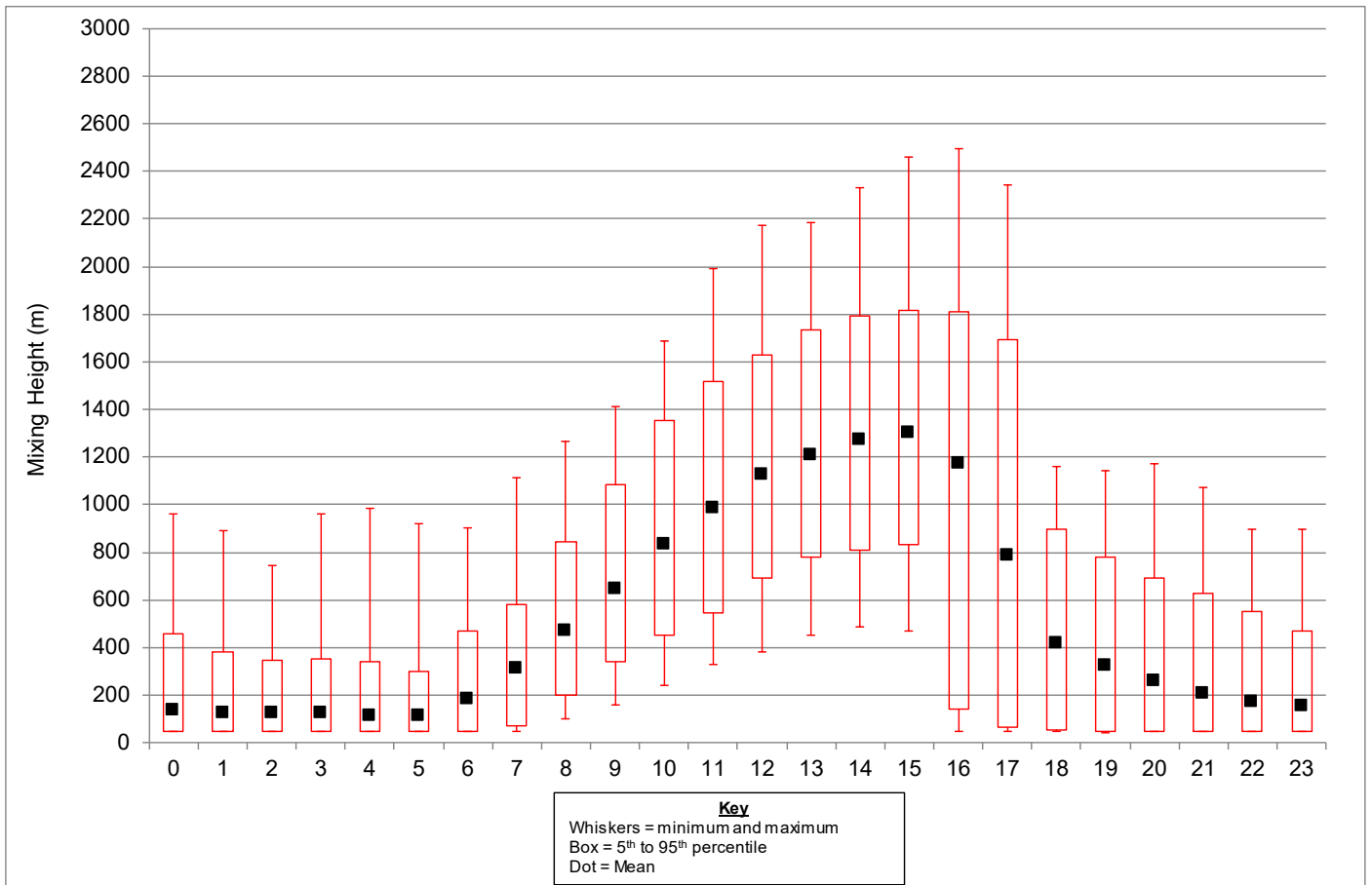
**Figure A4.3 Wind frequency graph for Site as generated by CALMET**



**Figure A4.4 Stability Class Histograms for Site as generated by CALMET**



**Figure A4.5** Box and Whisker plot of monthly temperature for Site as generated by CALMET

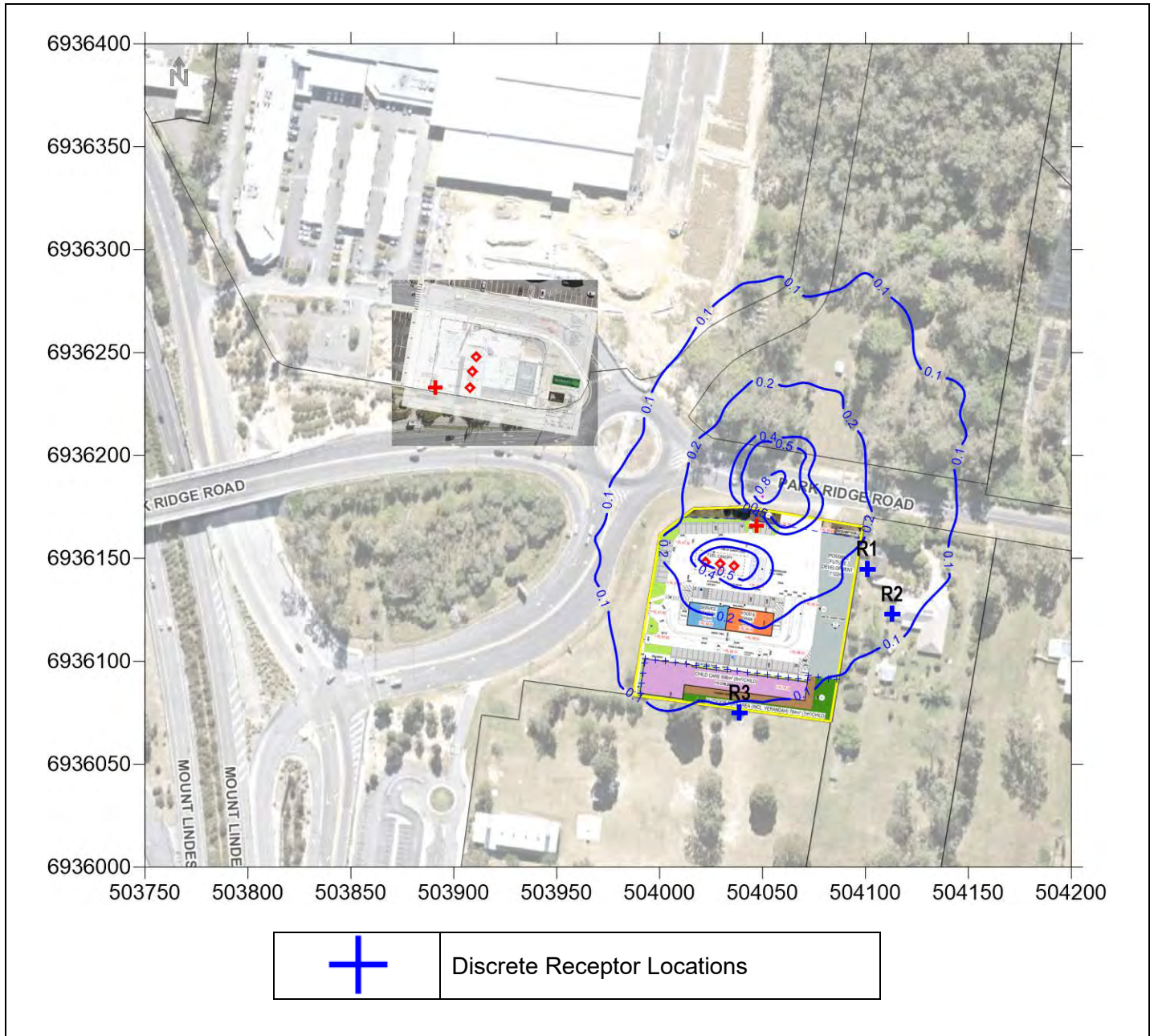


**Figure A4.6** Box and Whisker plot of diurnal mixing height for Site as generated by CALMET

## **ATTACHMENT 5**


Contour Plots

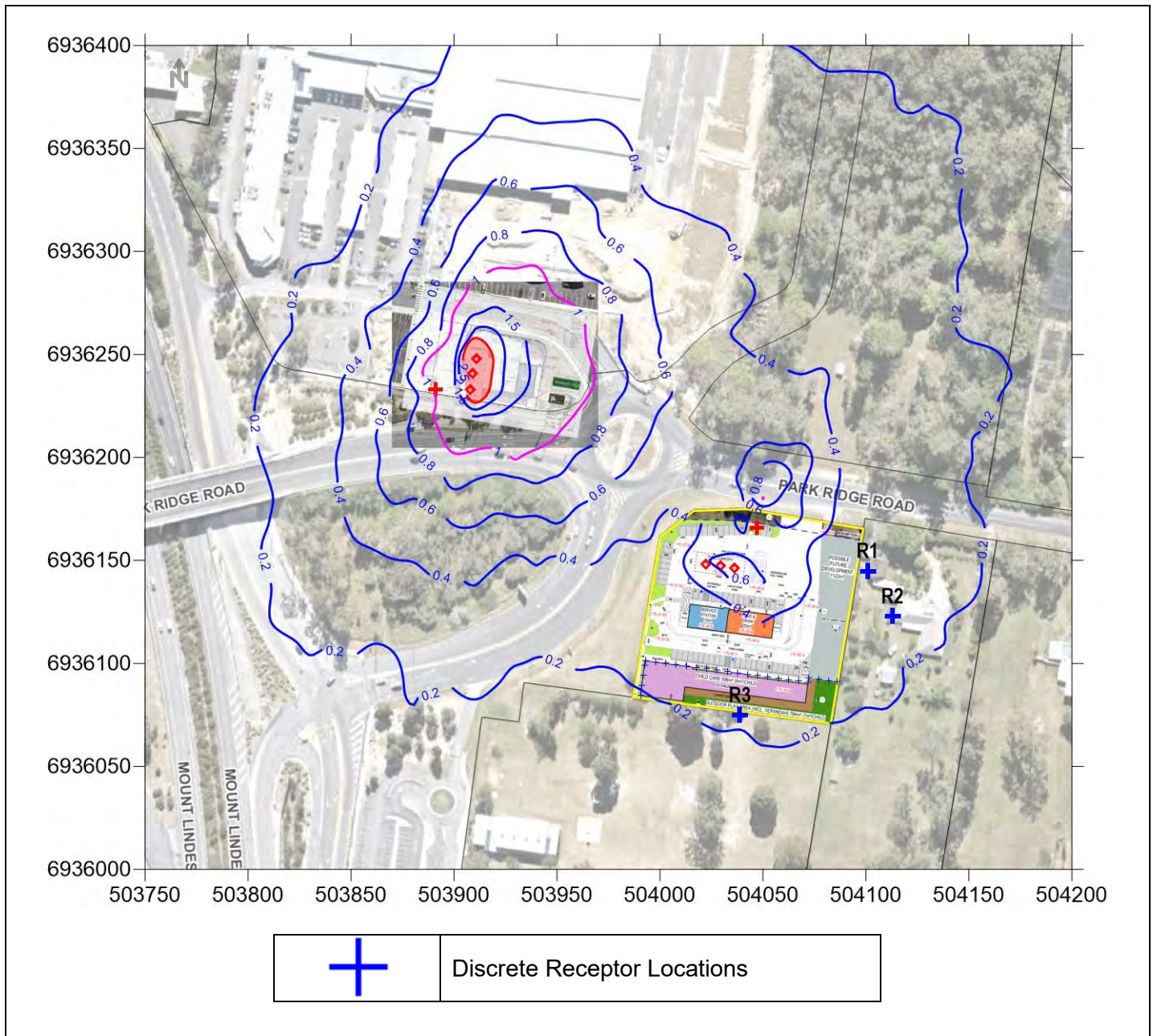
Odour Concentrations  
from Proposed Service Station



**Park Ridge 17-158**


**1-hour average 99.5<sup>th</sup> ground level concentrations of Odour from Proposed Service Station in Isolation**

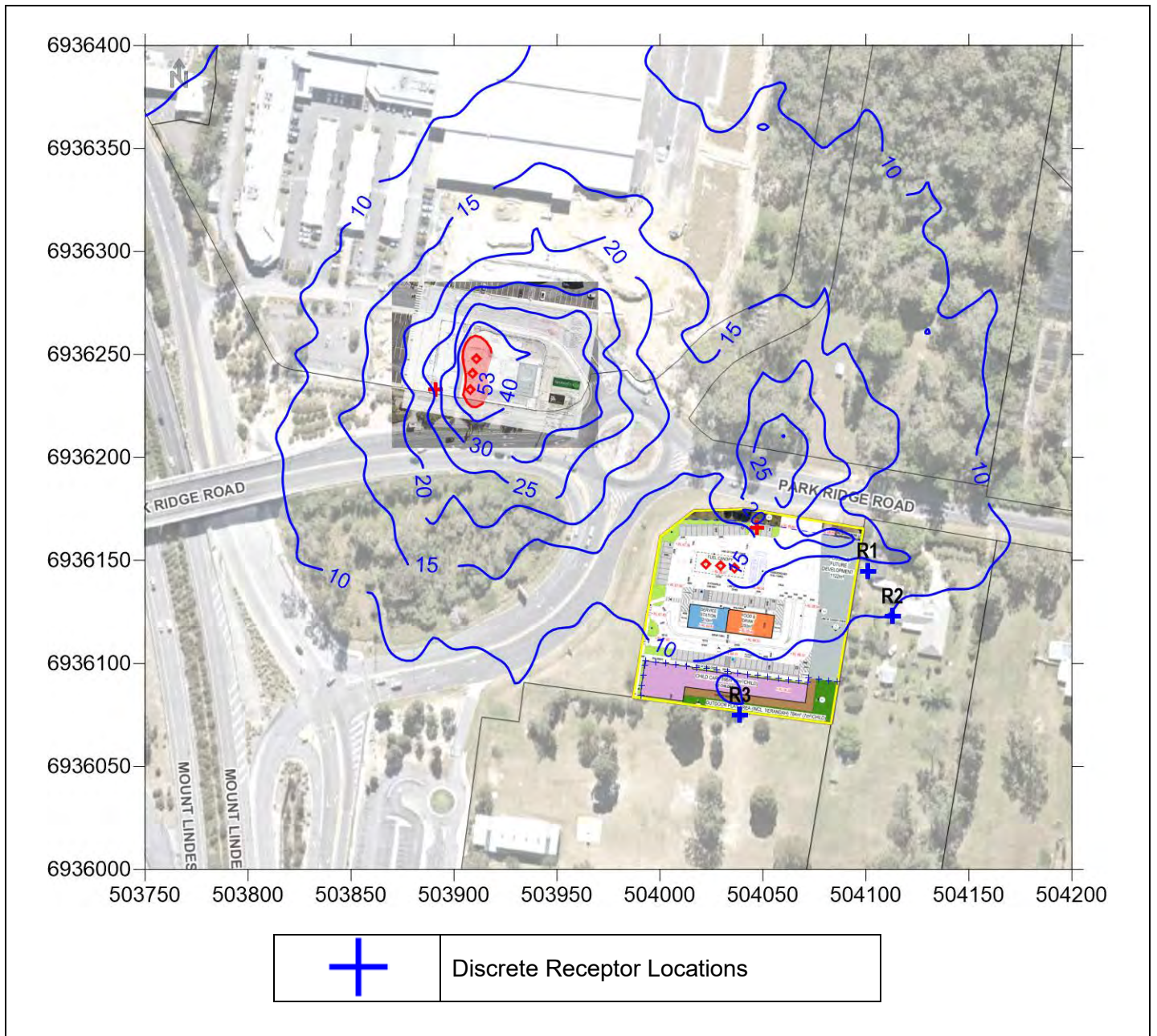
Figure A5.1	Source	Pollutant	Averaging Period	Guideline	Units	Date
	Proposed Service Station	Odour	1-hour average 99.5 <sup>th</sup>	1 / 2.5	Odour Units	2018-01-19



**Park Ridge 17-158**


**1-hour average 99.5<sup>th</sup> ground level concentrations of Odour from Proposed Service Station plus existing Caltex Service Station**

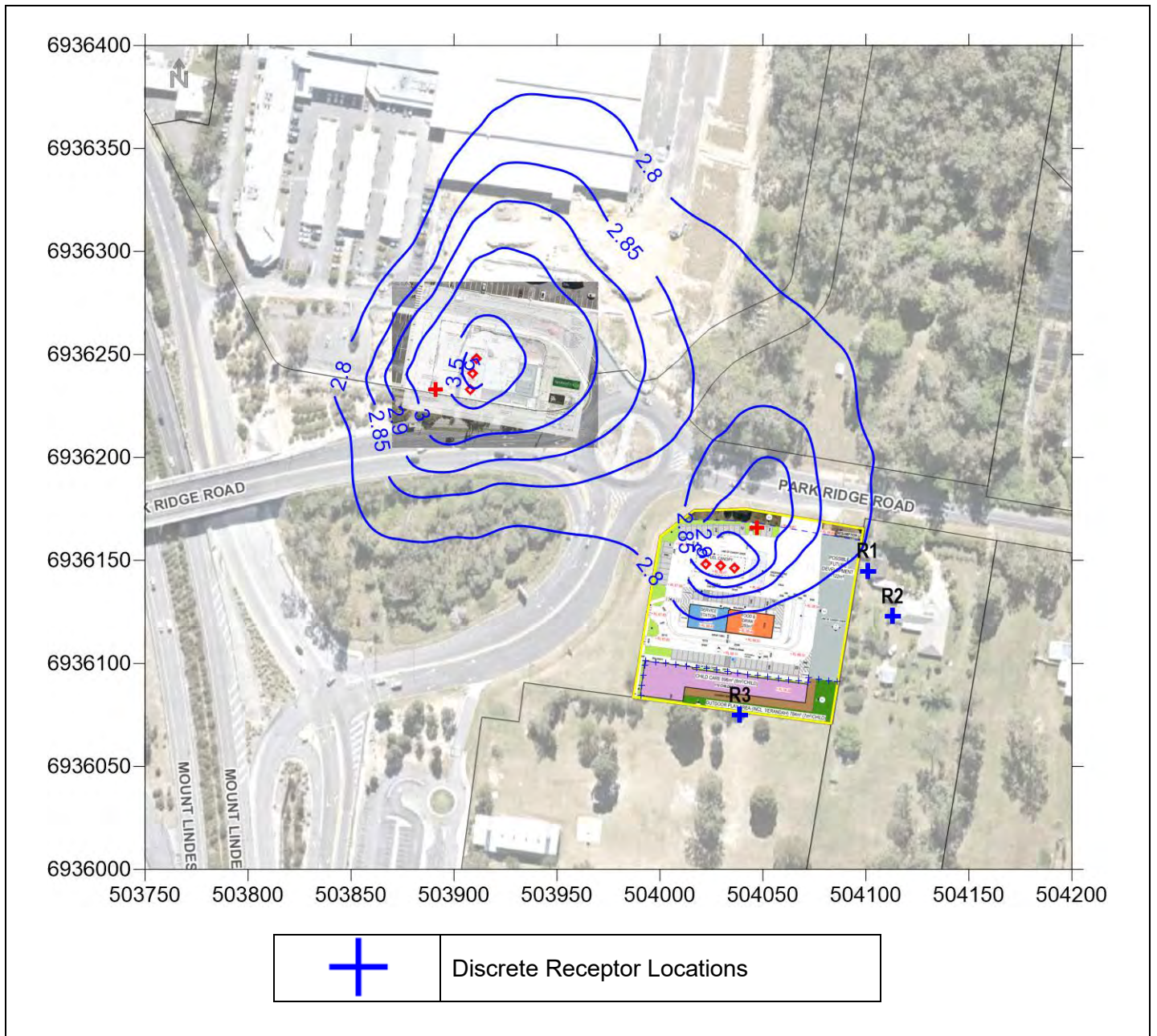
Figure A5.2	Source	Pollutant	Averaging Period	Guideline	Units	Date
	Existing plus Proposed Service Station	Odour	1-hour average 99.5 <sup>th</sup>	1 / 2.5	Odour Units	2018-01-19



**Park Ridge 17-158**


**3-minute average ground level concentrations of Benzene from Proposed Service Station plus existing Caltex Service Station including ambient concentrations of 2.7  $\mu\text{g}/\text{m}^3$**

Figure A5.3	Source	Pollutant	Averaging Period	Guideline	Units	Date
	Existing plus Proposed Service Station	Benzene	3 minute average 99.9 <sup>th</sup>	53	$\mu\text{g}/\text{m}^3$	2018-01-19



**Park Ridge 17-158**

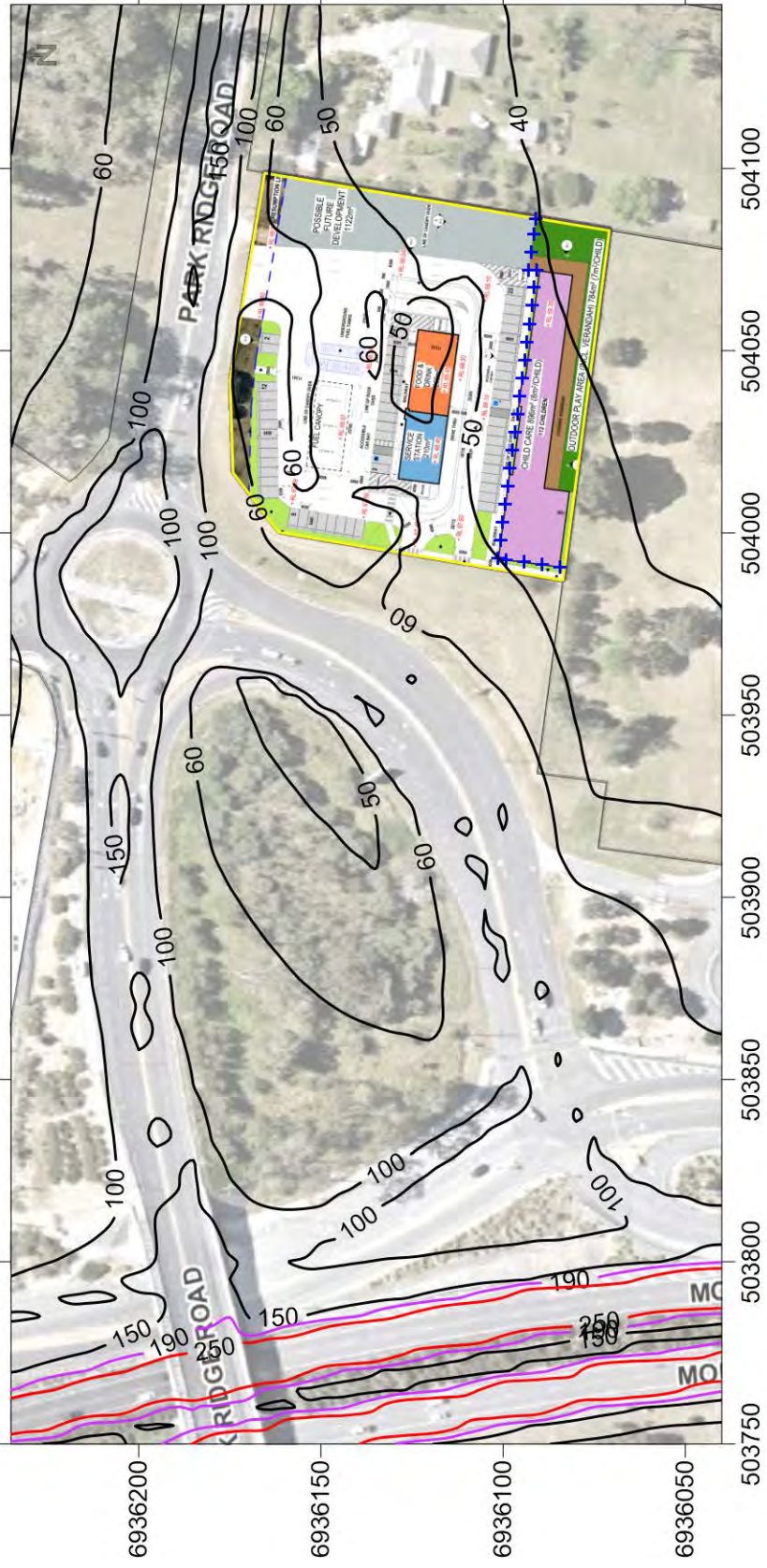
**Annual average ground level concentrations of Benzene from Proposed Service Station plus existing Caltex Service Station including ambient concentrations of 2.7  $\mu\text{g}/\text{m}^3$**

Figure A5.4	Source	Pollutant	Averaging Period	Guideline	Units	Date
	Existing plus Proposed Service Station	Benzene	Annual	10	$\mu\text{g}/\text{m}^3$	2018-01-19

## **ATTACHMENT 6**

### Contour Plots

### Air Pollutant Concentrations from Onsite and Offsite Traffic

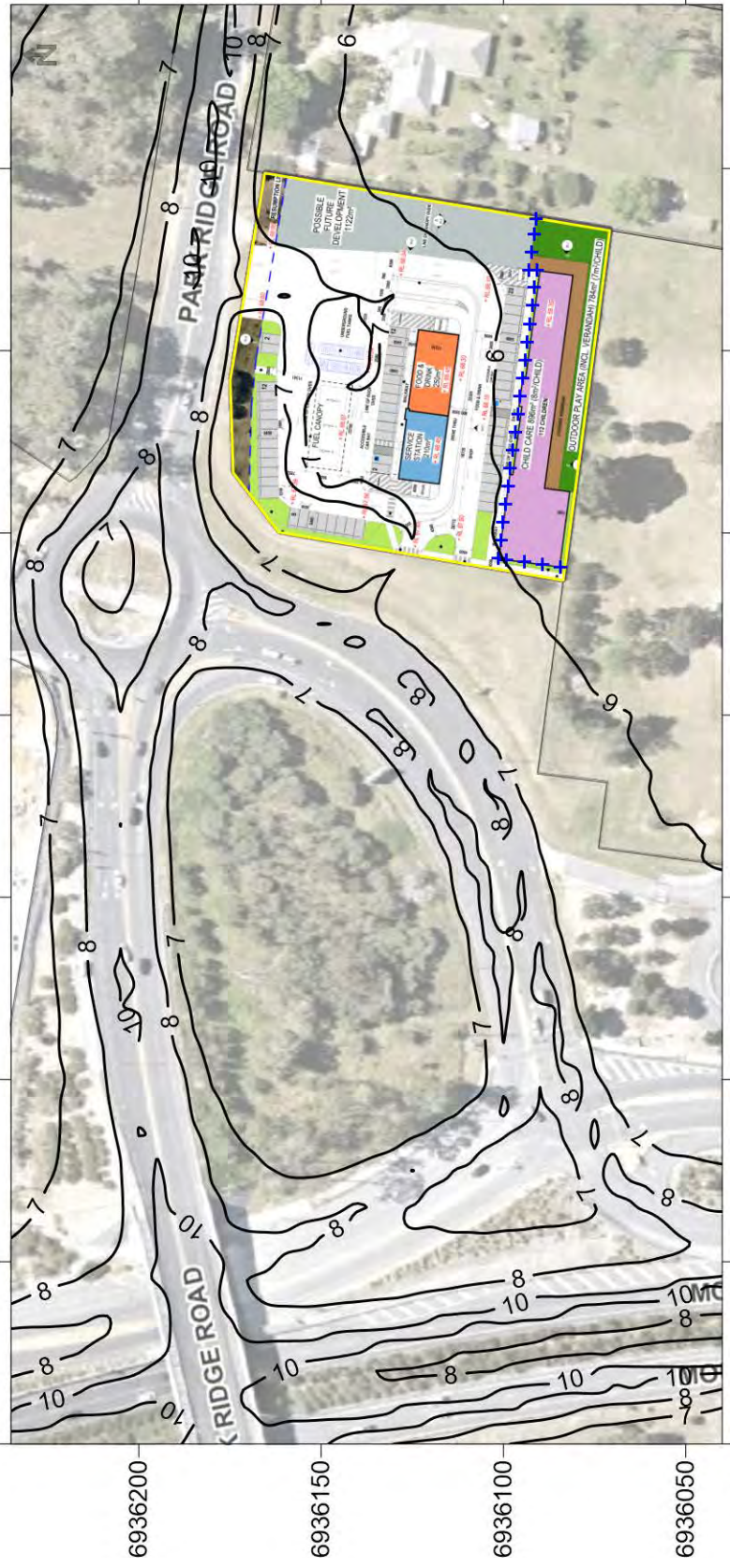


Discrete Receptor Locations



**Park Ridge 17-158**  
**Maximum 1-hour average ground level concentrations of Nitrogen Dioxide from Motor Vehicle Exhaust Emissions**

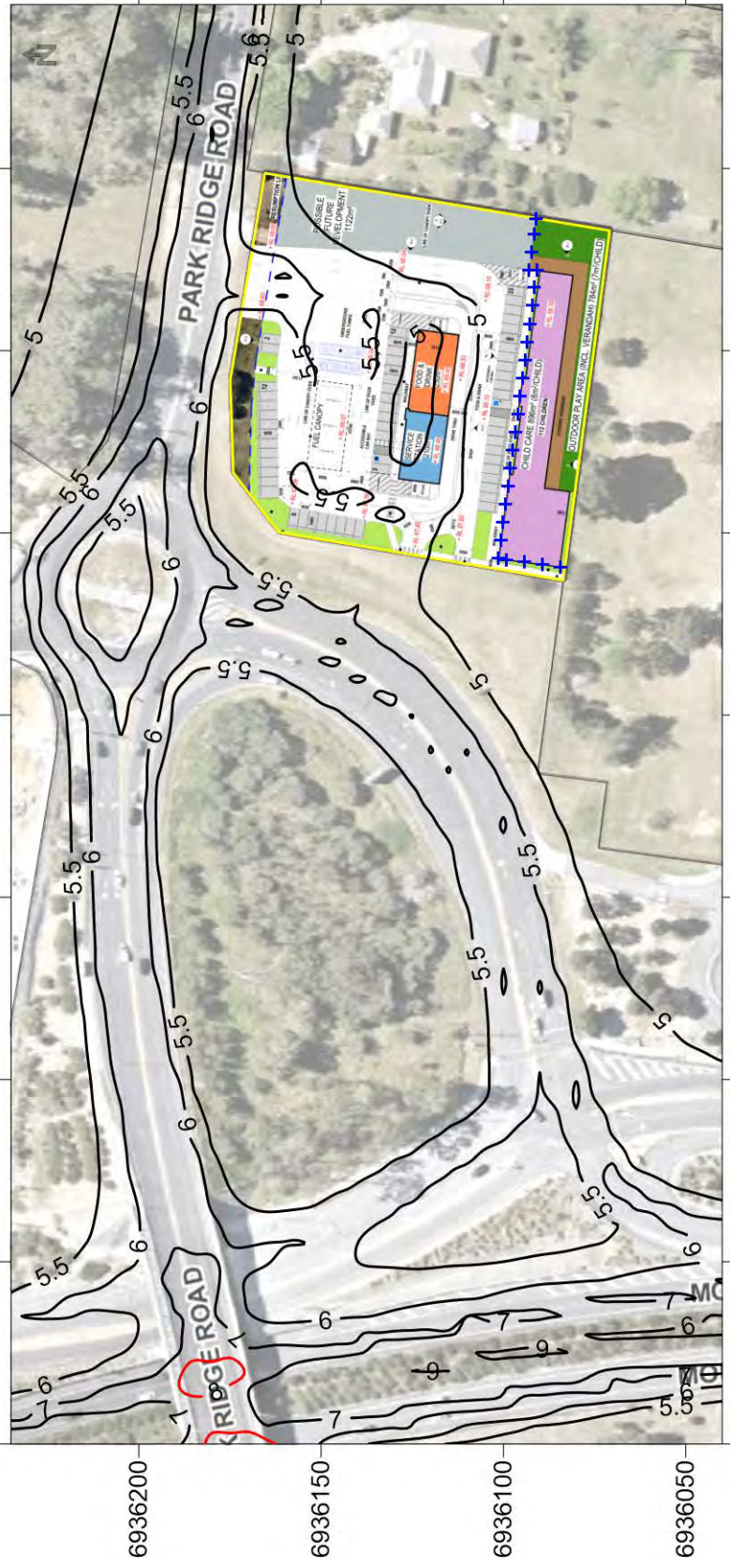
Figure A6.1	Source	Pollutant	Averaging Period	Guideline	Units	Date
	Onsite Vehicles + Offsite Vehicles + Ambient	Nitrogen Dioxide	Maximum 1-hour average	190 / 250	µg/m <sup>3</sup>	2018-01-19



Discrete  
Receptor  
Locations

**Park Ridge 17-158  
Maximum 24-hour average ground level concentrations of PM<sub>2.5</sub> from Motor Vehicle Exhaust Emissions**

Figure A6.2	Source	Pollutant	Averaging Period	Guideline	Units	Date
	Onsite Vehicles + Offsite Vehicles + Ambient	PM <sub>2.5</sub>	Maximum 24-hour average	25	µg/m <sup>3</sup>	2018-01-19



+	Discrete Receptor Locations
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**Park Ridge 17-158**  
**Annual average ground level concentrations of PM<sub>2.5</sub> from Motor Vehicle Exhaust Emissions**

Figure A6.3	Source	Pollutant	Averaging Period	Guideline	Units	Date
	Onsite Vehicles + Offsite Vehicles + Ambient	PM <sub>2.5</sub>	Annual Average	8	µg/m <sup>3</sup>	2018-01-19