

APPENDIX G

Air Quality Assessment



AIR QUALITY ASSESSMENT
PROPOSED SERVICE STATION, FOOD & DRINK OUTLETS
& CHILDCARE CENTRE

2-26 HOTZ ROAD

LOGAN VILLAGE

Prepared for:
Start Yarrabilba Pty Ltd
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of onefin

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1.0 INTRODUCTION

1.1 STUDY BRIEF

MWA Environmental has been engaged to prepare an Air Quality Assessment report for the proposed service station, food and drink outlets and childcare centre development at Logan Village. The assessment has considered the potential impact of air pollutant and odour emissions from the proposed development at surrounding sensitive uses and the proposed onsite childcare centre.

The assessment of air pollutant concentrations at surrounding and onsite 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 2019* and Queensland *Ecoaccess Guideline: Odour Impact Assessment from Developments*.

1.2 SITE DESCRIPTION

The site is located at 2-26 Hotz Road, Logan Village. The site has a real property description of Lot 1 and Lot 5 on RP201777 and is zoned *Rural Residential* under the Logan City Council Planning Scheme.

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

Surrounding land uses are described as follows:

To the North:	Hotz Road adjoining the subject site with land zoned <i>Rural Residential</i> located beyond with several residential dwellings present.
To the East:	Waterford-Mount Tamborine Road adjoining the subject site with undeveloped land zoned <i>Rural</i> located beyond
To the South:	Residential dwelling on land zoned <i>Rural Residential</i> .
To the West:	Residential dwelling on land zoned <i>Rural Residential</i> .

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

1.3 PROPOSED DEVELOPMENT

The proposed service station will comprise of four double-sided multi-product bowsers located under the refuelling canopy, with the refuelling canopy located on the eastern portion of the subject site fronting Waterford-Mount Tamborine Road. A food and drink outlet will adjoin the service station shop building and a second food and drink outlet is proposed in the southeast corner of the subject site. A proposed childcare centre is located on the western portion of the subject site.

Vehicular ingress and egress will be from Hotz Road to the north and Waterford-Mount Tamborine Road to the east.

Proposed development plans are included in **Attachment 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 incorporate Stage 2 ("VR2") vapour recovery control systems to minimise emissions during the refuelling of vehicles.

Presented on **Figure 3** are the locations of the nominated discrete receptors, representative of the most exposed surrounding and onsite sensitive uses.

Discrete receptors have been nominated on the facades of the nearest surrounding offsite residential dwellings, in addition to several discrete receptors located on the subject site at the boundary of internal and external educational areas of the proposed onsite childcare centre.

The underground tank vent pipes are proposed to be located to the east of the fuel dispensing area (refer **Figure 3**). The vent pipes are recommended to be a minimum height of 4 metres above ground level in accordance with AS1940:2017. The minimum setback distance from the vent pipes to a sensitive use is approximately 90 metres to the proposed onsite childcare centre.

Four double-sided multi-product bowsers are proposed to be located under the refuelling canopy (refer **Figure 3**). The minimum setback distance from a bower to a sensitive use is approximately 70 metres to the proposed onsite childcare centre.

The fuel sales volume has been estimated based upon similar sized service stations in proximity to high volume roads. Projected fuel sales for the service station are approximately:

Average Daily Fuel Sales:	15,068 Litres per day
Peak Daily Fuel Sales:	19,589 Litres per day
Annual Average Fuel Sales:	5.5 Million litres per annum

Unleaded fuel has a higher vapour pressure and lower boiling point than diesel, with unleaded fuel more readily evaporating from a liquid state to gaseous state.

Emissions associated with diesel are therefore minor in comparison to motor spirit (unleaded petrol) related emissions.

Conservatively for the purposes of assessing peak day emissions, total fuel sales have been represented as entirely consisting of the more volatile unleaded fuel i.e. the assessment has been based upon 5.5 Million litres of unleaded fuel per annum and 19,589 litres of unleaded fuel per peak day.

Food and Drink Outlets

The food and drink outlets proposed at the site may emit cooking odours which are considered in the context of potential odour amenity impact at surrounding sensitive uses. The northern food and drink outlet adjoining the service station shop has a proposed Gross Floor Area (GFA) of 210 m², while the southern food and drink outlet has a GFA of 280 m².

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 Buildings* to mitigate potential odour impacts at surrounding sensitive uses.

1.4 RELEVANT ASSESSMENT OUTCOMES

The principal air quality issue related to the proposed development is the potential impact of volatile organic compounds and odour emissions from the service station and odour emissions from the food and drink outlets on surrounding sensitive uses.

The assessment of air pollutant concentrations at 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 2019* and Queensland *Ecoaccess Guideline: Odour Impact Assessment from Developments*.

Presented below is an extract of the relevant outcomes from the *Logan Planning Scheme, Centre zone code* with respect to the proposed food and drink outlets.

Table 6.2.1.3.1 - Centre zone code - accepted development (subject to requirements) and assessable development

Performance Outcome	Acceptable Outcome
<p>PO5 <i>Development protects the intended amenity for the zone and precinct of an adjoining premises by having regard to:</i></p> <p><i>b. air emissions;</i></p>	<p>AO5 <i>Development complies with the following emissions standard of <u>Planning scheme policy 3 - Environmental management</u>:</i></p> <p><i>c. <u>Table 3.2.2.1 - Air emission standards</u>;</i></p>

To address Performance Outcome PO5(b) of the *Logan Planning Scheme, Centre zone code*;

- A detailed air quality assessment has been prepared to address the potential air quality impacts from the food and drink outlets at surrounding sensitive uses and the proposed onsite childcare centre.

Presented on the following page is an extract of the relevant outcomes from the *Logan Planning Scheme, Management of emissions and hazardous activities code* with respect to a proposed service station.

Table 9.4.5.3.1–Management of emissions and hazardous activities code: accepted development (subject to requirements) and assessable development

Performance Outcome	Acceptable Outcome
<p>PO2 A Service station is designed and constructed to ensure that on-site operations:</p> <ol style="list-style-type: none"> a. do not cause environmental harm; b. do not result in the release of untreated pollutants; c. prevent the emission of contaminant to land, surface water or groundwater. 	<p>AO2 A Service station:</p> <ol style="list-style-type: none"> a. is designed and constructed to comply with: <ol style="list-style-type: none"> i. AS1940-2004–The storage and handling of flammable and combustible liquids; ii. AS/NZS 1596:2008–The storage and handling of LP Gas; iii. Equipment Level 1 of AS4897-2008–The design, installation and operation of underground petroleum storage systems; iv. AS4977-2008–Petroleum products – Pipeline, road tanker compartment and underground tank identification; b. has installed and maintains and operates Stage 1 and Stage 2 Vapour Recovery Systems in compliance with NSW DECC Standards and Best Practice Guidelines for Vapour Recovery at Petrol Service Stations; c. is designed and managed to prevent the discharge of contaminants to the stormwater system by: <ol style="list-style-type: none"> i. discharging contaminants in the fuel dispensing area (under canopy) to a blind sump with a minimum capacity of 10kL; ii. discharging contaminants in the general forecourt (not under canopy) to the stormwater system via a separator with a minimum capacity of 10kL; iii. discharging contaminants from the underground storage tank remote fill point to an on-site holding tank; d. has a spill activated cut-off valve installed.

With reference to Acceptable Outcome AO2 of the *Logan Planning Scheme, Management of emissions and hazardous activities code*;

- 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 incorporate Stage 2 (“VR2”) vapour recovery control systems to minimise emissions during the refuelling of vehicles.

To address Performance Outcome PO2a of the *Logan Planning Scheme, Management of emissions and hazardous activities code*;

- A detailed air quality assessment has been prepared to address the potential air quality impacts from operation of the service station development at surrounding sensitive uses and the proposed onsite childcare centre.

2.0 AIR QUALITY ASSESSMENT

2.1 DESCRIPTION OF SERVICE STATION EMISSIONS

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 Manual¹, 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 threshold²

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/m³ 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 Units. As a conservative assumption, the lower measured odour detection threshold of 1,888 µg/m³ Total VOC has been applied for the purposes of assessing odour concentrations from Total VOC modelling results.

¹ *Emissions Estimation Techniques Manual for Aggregated Emissions from Service Stations* (Environment Australia, 1999)

² Based upon Air Noise Environment and The Odour Unit testing commissioned by MWA Environmental in April 2015

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 conservatively undertaken by 54,500 litre tankers.
- Several bulk tanker fuel deliveries per week³ 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 5.5 million litres per annum
- Estimated peak daily fuel sales of 19,589 litres which relates to 30 percent higher than the average fuel sales.
- Hourly emissions distributed based upon a daily sales profile as distributed per Brisbane City Council guidance⁴ 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**.

³ Fewer than one per day based upon tanker capacity and estimated annual fuel sales

⁴ Applied in lieu of specific guidance from Logan City Council

2.2 DESCRIPTION OF FOOD AND DRINK OUTLET EMISSIONS

Potential cooking exhaust vents located on the roof of the food and drink outlets will discharge air emissions which must be appropriately managed to not cause odour nuisance at surrounding sensitive uses.

Control on air quality of cooking exhaust emissions can be maintained to a high standard using 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 3.10 *Air Discharges* of AS 1668.2-2012 includes:

3.10.1 *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.

Specific detail with respect to exhaust hoods and cooking exhaust ventilation is not yet available and will be included in the detailed design. Generally, 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.

The following provides the performance standard requirements that are deemed satisfactory under the National Construction Code.

- The regulatory code with respect to cooking exhaust hoods as enforced by the National Construction Code is **AS1668.2-2012**.
- 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 accordance with **AS1668.2** 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** 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.
 - Each of the food and drink outlets are setback greater than 6 metres from the nearest boundaries of surrounding properties.
 - The required **AS1668.2** 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** 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 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 outlets, the available separation distances between cooking source emission points and the surrounding sensitive land uses are located further than the minimum required by Australian Standard AS1668.2.

Based on 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 outlets such that the amenity of surrounding sensitive uses with respect to cooking odours will not be adversely affected.

2.3 QUANTITATIVE FOOD AND DRINK OUTLET ODOUR EMISSIONS

For a screening assessment of potential odour emissions from cooking undertaken at the food and drink outlets, reference has been made to odour sampling previously undertaken for a report prepared by Heggies Pty Ltd for McDonalds Australia, *McDonalds Haberfield Odour Impact Assessment Restaurant Operation July 2010*.

Presented below in **Table 1** and **Table 2** is a summary of the odour emission rates derived from the sampling of a McDonalds restaurant.

Table 1: McDonalds Fryer Odour Emission Rates

Sample	Odour Concentration (ou/m ³)	Odour Emission Rate (ou/s)
Test 1	1785	-
Test 2	1260	-
Test 3	1665	-
Maximum	1785	484 ou/s

Table 2: McDonalds Grill Odour Emission Rates

Sample	Odour Concentration (ou/m ³)	Odour Emission Rate (ou/s)
Test 1	1450	-
Test 2	776	-
Test 3	675	-
Maximum	1450	705 ou/s

The future operators of the food and drink outlets are presently unknown. As an initial screening assessment, cooking odour emissions from the food and drink outlets have been represented as being released continuously 24-hours at the peak odour emission rate of 705 ou/s.

The screening modelling is considered to provide a conservative assessment of potential emissions from the proposed food and drink outlets with potential future operators like sandwich shops (e.g Subway) or coffee shops (e.g Zarraffas) resulting in lower odour emissions.

2.4 AMBIENT AIR QUALITY

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

Key air pollutant emissions associated with service stations are Volatile Organic Compounds (VOCs) including Toluene, Xylene and Benzene.

Ambient air quality data for these three pollutants is routinely monitored at Springwood. An assessment of ambient concentrations of Toluene, Xylene and Benzene has been performed for five recent years of hourly-averaged air quality monitoring data from the Springwood monitoring site.

A summary of the annual average and 70th percentile ambient air pollutant measurements from the Springwood monitoring site over years 2015 to 2019, for inclusion in the dispersion modelling predictions as background concentrations is presented in **Table 3**.

Table 3: Ambient Air Pollutant Concentrations – Queensland Government Data - Springwood

Pollutant	Averaging Period	Concentration ¹ (µg/m ³)	Statistical Reference
Benzene	1-hour average	4.2	1-hour average 70 th percentile over 5 years from 2015 to 2019 at Springwood
	Annual Average	3.5	Average over 5 years from 2015 to 2019 at Springwood
Toluene	1-hour average	13.2	1-hour average 70 th percentile over 5 years from 2015 to 2019 at Springwood
	24-hour average	14.3	24-hour average 70 th percentile over 5 years from 2015 to 2019 at Springwood
	Annual Average	11.7	Average over 5 years from 2015 to 2019 at Springwood
Xylenes	1-hour average	40.3	1-hour average 70 th percentile over 5 years from 2015 to 2019 at Springwood
	24-hour average	39.9	24-hour average 70 th percentile over 5 years from 2015 to 2019 at Springwood
	Annual Average	35.4	Average over 5 years from 2015 to 2019 at Springwood

2.5 RELEVANT AIR QUALITY PLANNING CRITERIA

The assessment of air pollutant concentrations at surrounding sensitive uses and the proposed onsite childcare centre 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 2019* and Queensland *Ecoaccess Guideline: Odour Impact Assessment from Developments*.

Presented in **Table 4** are the adopted air quality planning criteria relevant to the assessment of air pollutant impacts from the service station and food and drink outlets.

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

Table 4: Air Quality Planning Criteria

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
	Annual	5.4	Health and wellbeing	EPP (Air)
Ethyl-benzene	3-minute	14,500	Design ground level concentrations	Logan
Styrene	3-minute	210	Design ground level concentrations	Logan
	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
	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	3-minute	350	Design ground level concentrations	Logan
	24 hours	1,200	Health and wellbeing	EPP (Air)
	Annual	950	Health and wellbeing	EPP (Air)
Odour	1-hour 99.5 th percentile	2.5 Odour Units	Odour	QLD Odour Guideline

2.6 METEOROLOGICAL MODELLING

To enable assessment of air pollutant concentrations at surrounding sensitive uses as a result of emissions from the service station and food and drink outlets, 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)^{5,6}.

The centre coordinates for the model grid were Latitude -27°47'30" and Longitude 153°6'. The following nested model grids were applied to the TAPM modelling:

- 25 x 30 km grid (total area 750 km x 750 km)
- 25 x 10 km grid (total area 250 km x 250 km)
- 25 x 3 km grid (total area 75 km x 75 km)
- 25 x 1 km grid (total area 25 km x 25 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 2020, as provided by CSIRO.

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

⁵ Hurley, P.J. (2002) The Air Pollution Model (TAPM) Version 2: User Manual. Aspendale: CSIRO Atmospheric Research Internal Paper.

⁶ Hurley, P.J. (2002) The Air Pollution Model (TAPM) Version 2: Part 1: Technical Description. Aspendale: CSIRO Atmospheric Research Technical Paper.

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**.

2.7 MODELLING METHODOLOGY

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

The dispersion modelling has predicted the resultant cumulative exposure of air pollutants at surrounding sensitive receptors from the service station and the proposed onsite childcare centre and ambient background concentrations.

The CALPUFF model was set up to model dispersion within a 340m x 340m area covering the service stations and surrounding sensitive uses. A gridded receptor mesh with 5 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** are locations of the nominated discrete receptors representative of the most exposed surrounding sensitive uses.

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.

2.8 EMISSION SOURCE REPRESENTATION

Service Station

The underground storage tank vent pipe emissions were represented as being released from a stack to the east 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 (4) volume sources under the canopy area with the following properties:

Height:	1 metre above ground
Initial Vertical Spread:	1.16 metres
Initial Horizontal Spread:	1.16 metres

Emissions from fuel spillage under the canopy area have been modelled as being released from four (4) area sources with the following properties:

Height:	0 metres above ground
Length:	3 metres
Width:	3 metres

Food and Drink Outlets

The kitchen exhaust fans from the food and drink outlets have been represented as a stack located above each building. The kitchen exhaust was represented with the following properties:

Height:	0.5 metre above building roof height 6 metres AGL
Diameter:	0.6 metres
Exit velocity:	5 m/s
Release temperature:	30 °C

2.9 RESULTS OF DISPERSION MODELLING

Service Station

The results of the air pollutant dispersion modelling of the service station are provided in **Table 5** for the discrete receptors representing surrounding sensitive uses.

Table 5: Predicted Air Pollutant Concentrations ($\mu\text{g}/\text{m}^3$) from Proposed Service Station including Ambient

Pollutant	Averaging Period	Highest Predicted Concentration Including Ambient at Surrounding Sensitive Uses and the Proposed onsite Childcare Centre ($\mu\text{g}/\text{m}^3$)							Air Quality Planning Criteria ($\mu\text{g}/\text{m}^3$)	Comply ?
		R1	R2	R3	R4	R5	R6	Childcare Centre		
Benzene	3-minute	10.0	6.9	5.7	5.9	7.5	8.4	13.7	53	Yes
	Annual	3.54	3.53	3.52	3.52	3.52	3.53	3.58	5.4	Yes
Ethyl-benzene	3-minute	1.4	0.7	0.4	0.4	0.8	1.0	2.3	14,500	Yes
Styrene	3-minute	0.05	0.02	0.01	0.01	0.03	0.04	0.08	210	Yes
	30-minute	0.03	0.01	0.01	0.01	0.02	0.02	0.05	75	Yes
	7 days	2E-03	8E-04	5E-04	4E-04	8E-04	2E-03	3E-03	280	Yes
Toluene	3-minute	32.3	22.1	18.2	18.9	24.1	27.0	44.3	650	Yes
	30-minute	25.0	18.7	16.3	16.7	19.9	21.7	32.4	1,100	Yes
	24 hours	15.5	15.1	14.8	14.7	15.1	15.6	16.7	4,100	Yes
	Annual	11.8	11.8	11.8	11.8	11.8	11.8	12.0	410	Yes
Xylenes	3-minute	47.9	43.9	42.3	42.6	44.7	45.8	52.8	350	Yes
	24 hours	40.4	40.2	40.1	40.1	40.2	40.4	40.9	1,200	Yes
	Annual	35.5	35.4	35.4	35.4	35.4	35.4	35.5	950	Yes
Odour	1-hour 99.5 th percentile	0.15	0.09	0.07	0.06	0.10	0.16	0.28	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 surrounding sensitive uses and the proposed onsite childcare centre.

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 surrounding sensitive uses and the proposed onsite childcare centre.

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 surrounding sensitive uses and the proposed onsite childcare centre.

Food and Drink Outlet

The results of the screening air pollutant dispersion modelling of the food and drink outlets considering the peak odour emission rate are provided in **Attachment 6** as odour contour plots at ground level, 1.5 metres and 3.0 metres above ground level.

The results of dispersion modelling of the food and drink outlets demonstrate compliance with the odour criteria at surrounding sensitive uses and the proposed onsite childcare centre.

It is considered that the proposed food and drink outlets can be designed and operated with appropriate odour control measures such that adverse cooking odours will not occur at surrounding sensitive uses and the proposed onsite childcare centre.

3.0 CONCLUSION

MWA Environmental has been engaged to prepare an Air Quality Assessment report for the proposed service station, food and drink outlets and childcare centre development at Logan Village. The assessment has considered the potential impact of air pollutant and odour emissions from the proposed development at surrounding sensitive uses and the proposed onsite childcare centre.

Service Station

With reference to Acceptable Outcome AO2 of the *Logan Planning Scheme, Management of emissions and hazardous activities code*;

- 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 incorporate Stage 2 (“VR2”) vapour recovery control systems to minimise emissions during the refuelling of vehicles.

To address Performance Outcome PO2a of the *Logan Planning Scheme, Management of emissions and hazardous activities code*;

- A detailed air quality assessment has been prepared to address the potential air quality impacts from operation of the service station development at surrounding sensitive uses.

The assessment of air pollutant concentrations at 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 2019* and Queensland *Ecoaccess Guideline: Odour Impact Assessment from Developments*.

Detailed emission estimations and dispersion modelling have been undertaken in accordance with accepted methodologies to assess the potential impacts of the service station on surrounding sensitive uses and the proposed onsite childcare centre.

The results of the air quality assessment demonstrate that, with the proposed Stage 1 and Stage 2 vapour recovery systems, the relevant air quality planning criteria will be satisfied at surrounding sensitive uses and the proposed onsite childcare centre.

Food and Drink Outlet

Considering the layout of the proposed development, it is considered that cooking odours associated with the food and drink outlets can be managed to comply with acceptable limits at 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.

The results of the screening air pollutant dispersion modelling of the food and drink outlets indicate the compliance with the odour criteria at surrounding sensitive uses and the proposed onsite childcare centre.

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. Appropriate in-line odour control equipment be utilised in the kitchen cooking exhaust system, as required, to achieve compliance with regulatory odour criteria at surrounding sensitive uses and the proposed onsite childcare centre.
4. Regular maintenance and cleaning of exhaust fans, canopies and duct systems be conducted to ensure that odour emissions are minimised.

MWA Environmental
28 June 2022

FIGURES



LEGEND
 SITE LOCATION

DRAWING REFERENCE
 © THE STATE OF QUEENSLAND
 DNR&E QLDGLOBE.

N

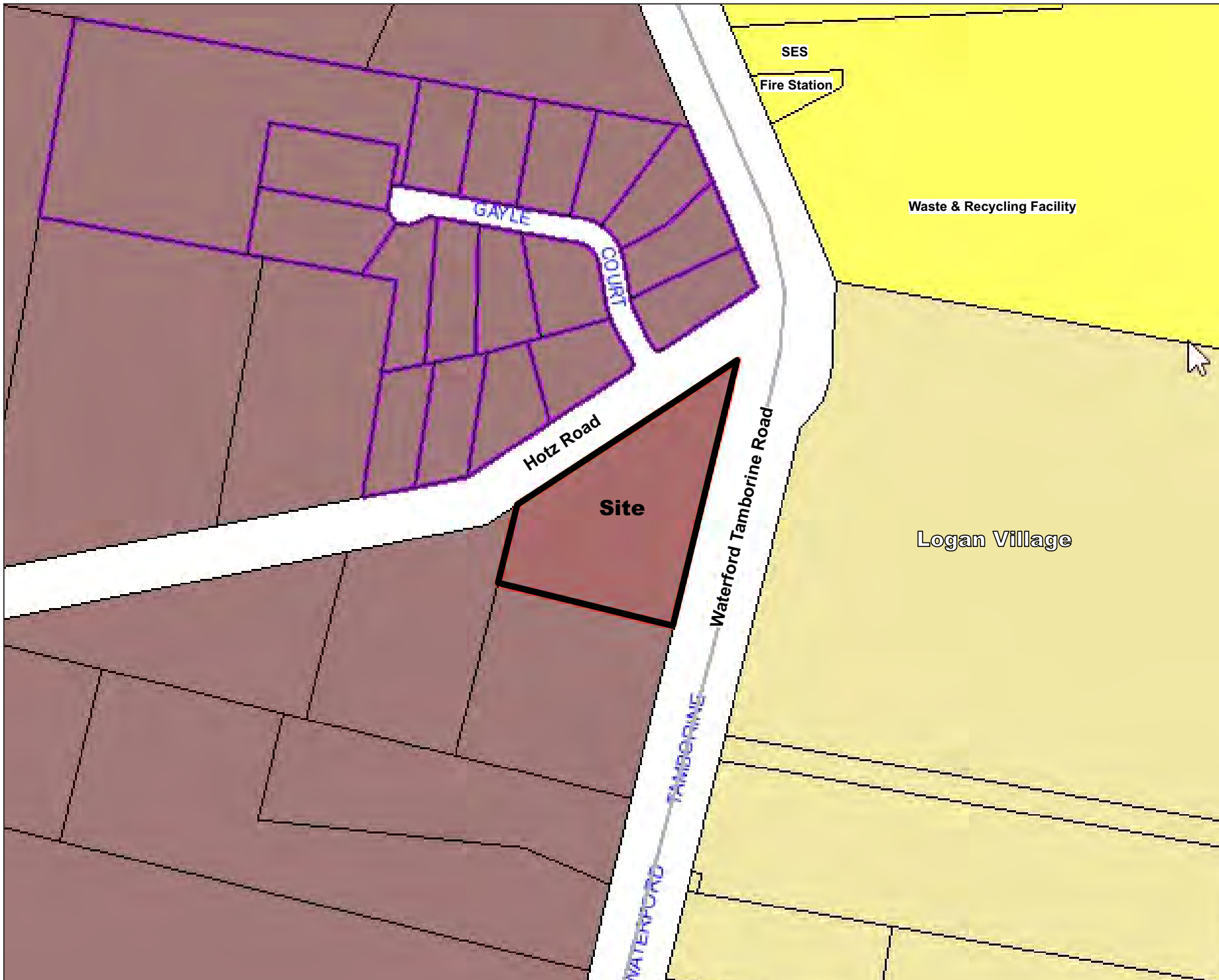
CLIENT
 START YARRABILBA PTY LTD

PROJECT
AIR QUALITY ASSESSMENT
 PROPOSED FOOD & DRINK OUTLETS
 SERVICE STATION & CHILDCARE CENTRE
 2-26 HOTZ ROAD LOGAN VILLAGE

TITLE
SITE LOCATION AND SURROUNDING LAND USES

JOB	LOGAN VILLAGE	FIGURE 1
JOB NO.	21-188	DWG NUMBER
DATE	15/06/22	21-188-1
SCALE	1:4000 (A4)	

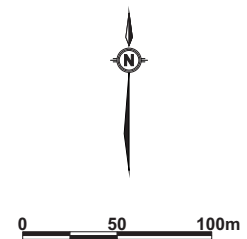
Max Winders & Associates Pty Ltd t/as MWA Environmental
 Level 15, 241 Adelaide St, Brisbane, QLD 4001
 P 07 3002 5500 F 07 3002 5588 E mail@mwaenviro.com.au
 W www.mwaenviro.com.au
 ABN 94 010 833 084



LEGEND

- SITE BOUNDARY
- LOGAN PLANNING SCHEME 2015 ZONES**
- RURAL RESIDENTIAL
- RURAL
- COMMUNITY FACILITIES

DRAWING REFERENCE
 LOGAN CITY COUNCIL PLANNING SCHEME 2015, PD HUB INTERACTIVE MAPPING, PRECINCTS AND ZONES.



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PROJECT
AIR QUALITY ASSESSMENT
 PROPOSED FOOD & DRINK OUTLETS
 SERVICE STATION & CHILDCARE CENTRE
 2-26 HOTZ ROAD LOGAN VILLAGE

TITLE
ZONING MAP

JOB	LOGAN VILLAGE	FIGURE 2
JOB NO.	21-188	DWG NUMBER
DATE	15/06/22	
SCALE	1:4000 (A4)	21-188-2

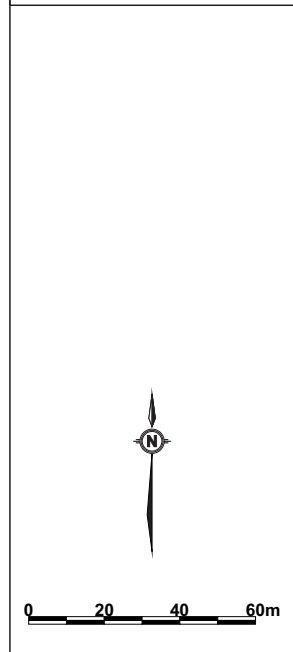


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 W www.mwaenviro.com.au
 ABN 94 010 833 084



LEGEND
— SITE LOCATION
● R6 NEAREST SENSITIVE RECEPTORS (R1-R6)

DRAWING REFERENCE
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PROJECT
AIR QUALITY ASSESSMENT
 PROPOSED FOOD & DRINK OUTLETS
 SERVICE STATION & CHILDCARE CENTRE
 2-26 HOTZ ROAD LOGAN VILLAGE

TITLE
SENSITIVE RECEPTOR LOCATIONS

JOB	LOGAN VILLAGE	FIGURE 3
JOB NO.	21-188	DWG NUMBER
DATE	15/06/22	21-188-3
SCALE	1:2000 (A4)	

ATTACHMENT 1

Proposed Development Plans



PAD SITE 4290m² (FUTURE CHILDCARE CENTRE-150 PLACE) BY RAUNIK DESIGN GROUP

- WAIT BAYS
- PLAYGROUND 50m²
- OUTDOOR DINING 65m²
- FOOD & DRINKS OUTLET 280m²
- REFUSE 35m²
- 6000mm WIDE LANDSCAPE BUFFER STRIP
- ORDER STATIONS
- FOOD AND DRINK PYLON SIGN

- SERVICE STATION 240m²
- FOOD & DRINKS OUTLET 210m²
- WAIT BAYS
- FUEL CANOPY
- 3.5m WIDE PULL THRU LANE BETWEEN BOWSERS

DEVELOPMENT SCHEDULE

USE	GFA	CARS REQUIRED
FOOD & DRINKS OUTLET	490m ²	49 (1/10m ²)
FOOD & DRINKS OUTDOOR DINING	65m ²	13 (2/10m ²)
SERVICE STATION	240m ²	12 (1/20m ²)
CHILDCARE CENTRE	1130m ²	43
TOTALS	795m²	117
CARS PROVIDED		117

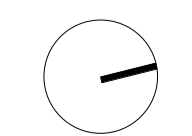
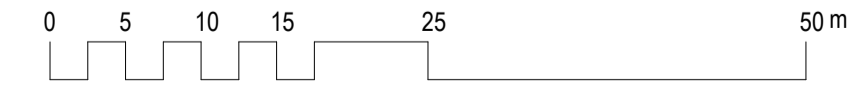
SITE AREA

SURFACE TYPE	AREA	% OF DEVELOPMENT SITE COVERAGE
IMPERVIOUS AREA	9921 m ²	49%
LANDSCAPE	10398 m ²	51%
TOTAL AREA	20319 m²	100%

SITE COVER

	AREA	% OF DEVELOPMENT SITE COVERAGE
SITE COVER (ROOFED)	3315 m ²	16%
SITE COVER (NOT ROOFED)	17004 m ²	84%
TOTAL AREA	20319 m²	100%

DEVELOPMENT APPLICATION



YARRABILBA SERVICE CENTRE
 2-26 HOTZ ROAD LOGAN VILLAGE QLD 4207 AUSTRALIA
 START YARRABILBA PTY LTD C/- ONEFIN PROPERTY

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 bne@thomsonadsett.com
 128 Robertson Street
 Fortitude Valley
 Qld 4006 Australia
 thomsonadsett.com



SITE PLAN

1 : 500 @ A1

TA # 20.0303.17

A1.01

06.06.2022

rev. 7

ATTACHMENT 2

Odour Detection Threshold of Unleaded Fuel

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

APRIL 2015 UNLEADED FUEL SAMPLE ODOUR DETECTION THRESHOLD CALCULATION

Air Noise Environment Total VOC analysis

The Odour Unit olfactometry analysis

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

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

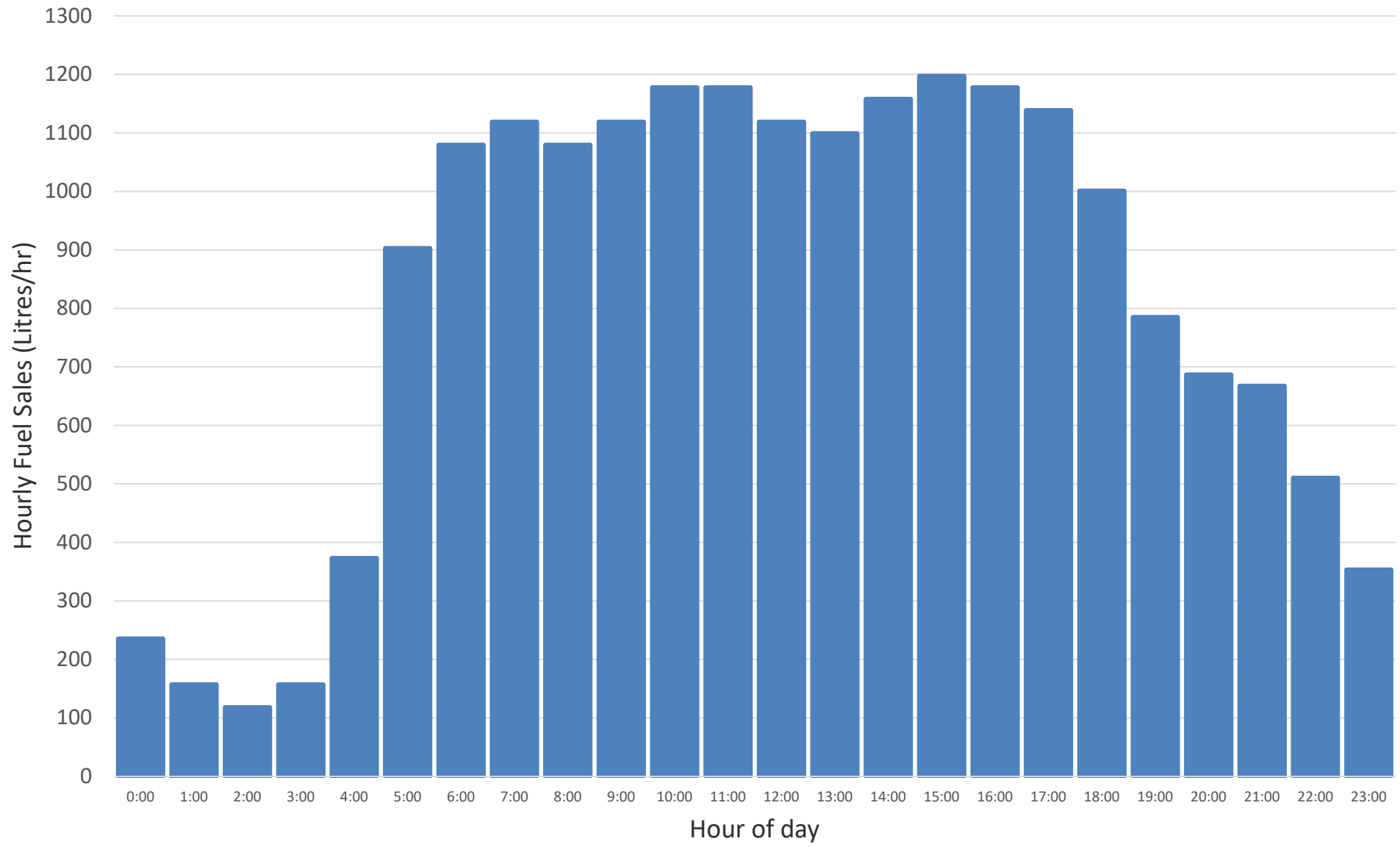
Proposed Service Station Hourly Fuel Sales Estimate

<i>Annual Average Fuel Sales:</i>	5,500,000	L/annum
<i>Daily Average Fuel Sales:</i>	15,068	L/day
<i>Peak Daily Fuel Sales:</i>	19,589	L/day
<i>Peak Hourly Fuel Sales:</i>	1,197	L/hour

HOURLY FUEL SALES BREAKUP

HOURLY FUEL SALES BREAKUP	% WEEK DAY SALES	PEAK HOURLY FUEL SALES (l/hr)
12MN	1.2	236
1am	0.8	157
2am	0.6	118
3am	0.8	157
4am	1.9	373
5am	4.6	903
6am	5.5	1080
7am	5.7	1119
8am	5.5	1080
9am	5.7	1119
10am	6.0	1178
11am	6.0	1178
12pm	5.7	1119
1pm	5.6	1099
2pm	5.9	1158
3pm	6.1	1197
4pm	6.0	1178
5pm	5.8	1138
6pm	5.1	1001
7pm	4.0	785
8pm	3.5	687
9pm	3.4	667
10pm	2.6	510
11pm	1.8	353

PEAK FUEL SALES VERSUS TIME OF DAY



VOC Emission Factors

Source	Value	Units
Underground Tank Breathing	120	mg / l
Refuelling Vehicles with Stage 2 Vapour Recovery	198	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	Peak Hourly Fuel Throughput (Litres)	VOC Emission Rates					Units
		Underground Tank Breathing	Refuelling Vehicles	Spillage at Vehicles	Whoosh at Vehicles	Bulk Tanker Refuelling	
12MN	236	0.0079	0.0130	0.0052	0.0052	0.61 ¹	g/s
1am	157	0.0052	0.0086	0.0035	0.0034	-	g/s
2am	118	0.0039	0.0065	0.0026	0.0026	-	g/s
3am	157	0.0052	0.0086	0.0035	0.0034	-	g/s
4am	373	0.0124	0.0205	0.0083	0.0082	-	g/s
5am	903	0.0301	0.0497	0.0201	0.0198	-	g/s
6am	1080	0.0360	0.0594	0.0240	0.0236	-	g/s
7am	1119	0.0373	0.0615	0.0249	0.0245	-	g/s
8am	1080	0.0360	0.0594	0.0240	0.0236	-	g/s
9am	1119	0.0373	0.0615	0.0249	0.0245	-	g/s
10am	1178	0.0393	0.0648	0.0262	0.0258	-	g/s
11am	1178	0.0393	0.0648	0.0262	0.0258	-	g/s
12pm	1119	0.0373	0.0615	0.0249	0.0245	-	g/s
1pm	1099	0.0366	0.0605	0.0244	0.0241	-	g/s
2pm	1158	0.0386	0.0637	0.0257	0.0254	-	g/s
3pm	1197	0.0399	0.0659	0.0266	0.0262	-	g/s
4pm	1178	0.0393	0.0648	0.0262	0.0258	-	g/s
5pm	1138	0.0379	0.0626	0.0253	0.0249	-	g/s
6pm	1001	0.0334	0.0551	0.0222	0.0219	-	g/s
7pm	785	0.0262	0.0432	0.0174	0.0172	-	g/s
8pm	687	0.0229	0.0378	0.0153	0.0150	-	g/s
9pm	667	0.0222	0.0367	0.0148	0.0146	-	g/s
10pm	510	0.0170	0.0281	0.0113	0.0112	-	g/s
11pm	353	0.0118	0.0194	0.0079	0.0077	-	g/s

¹ 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 Logan Village

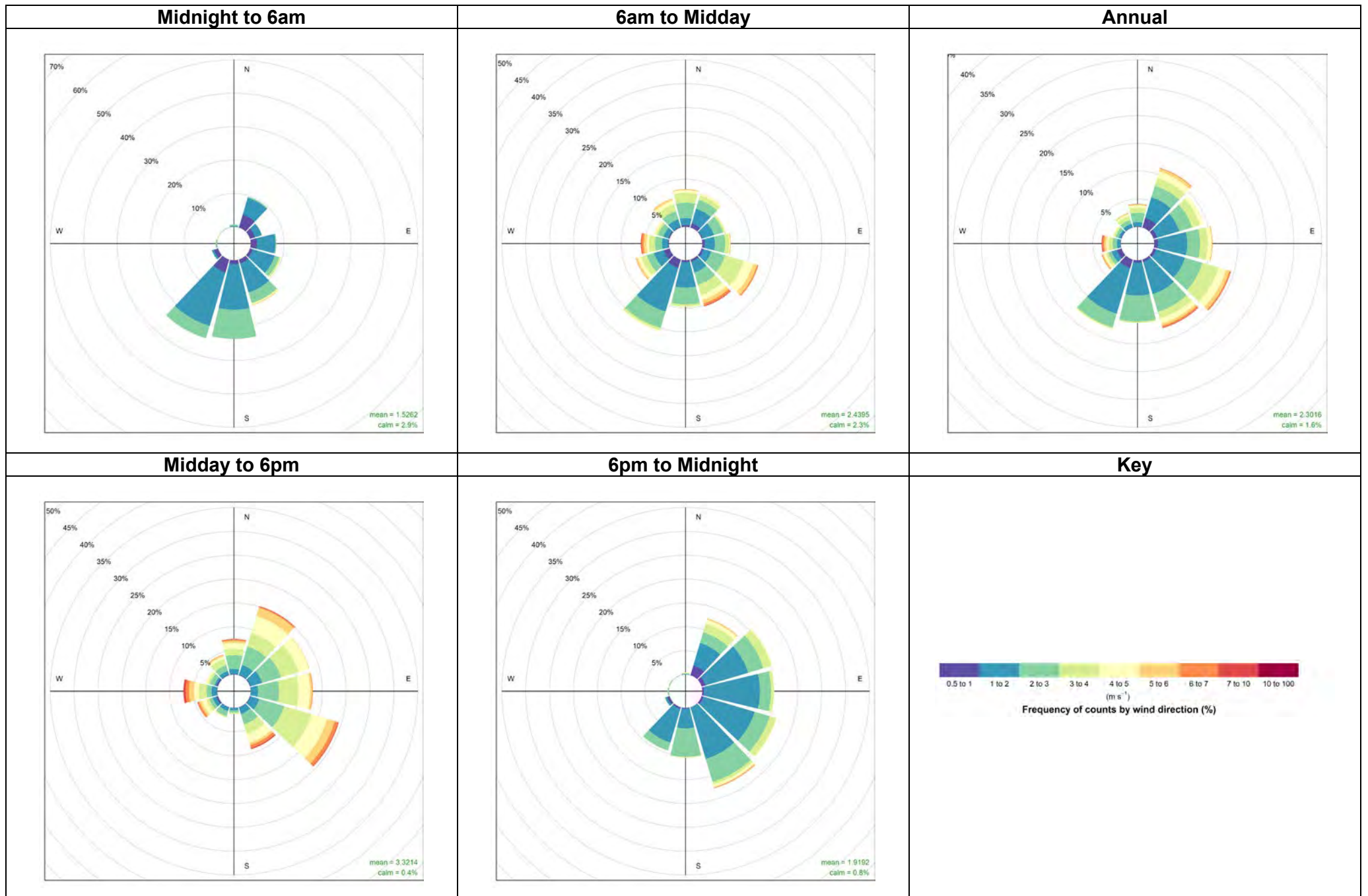


Figure A4.1 Diurnal wind roses for Site as generated by CALMET

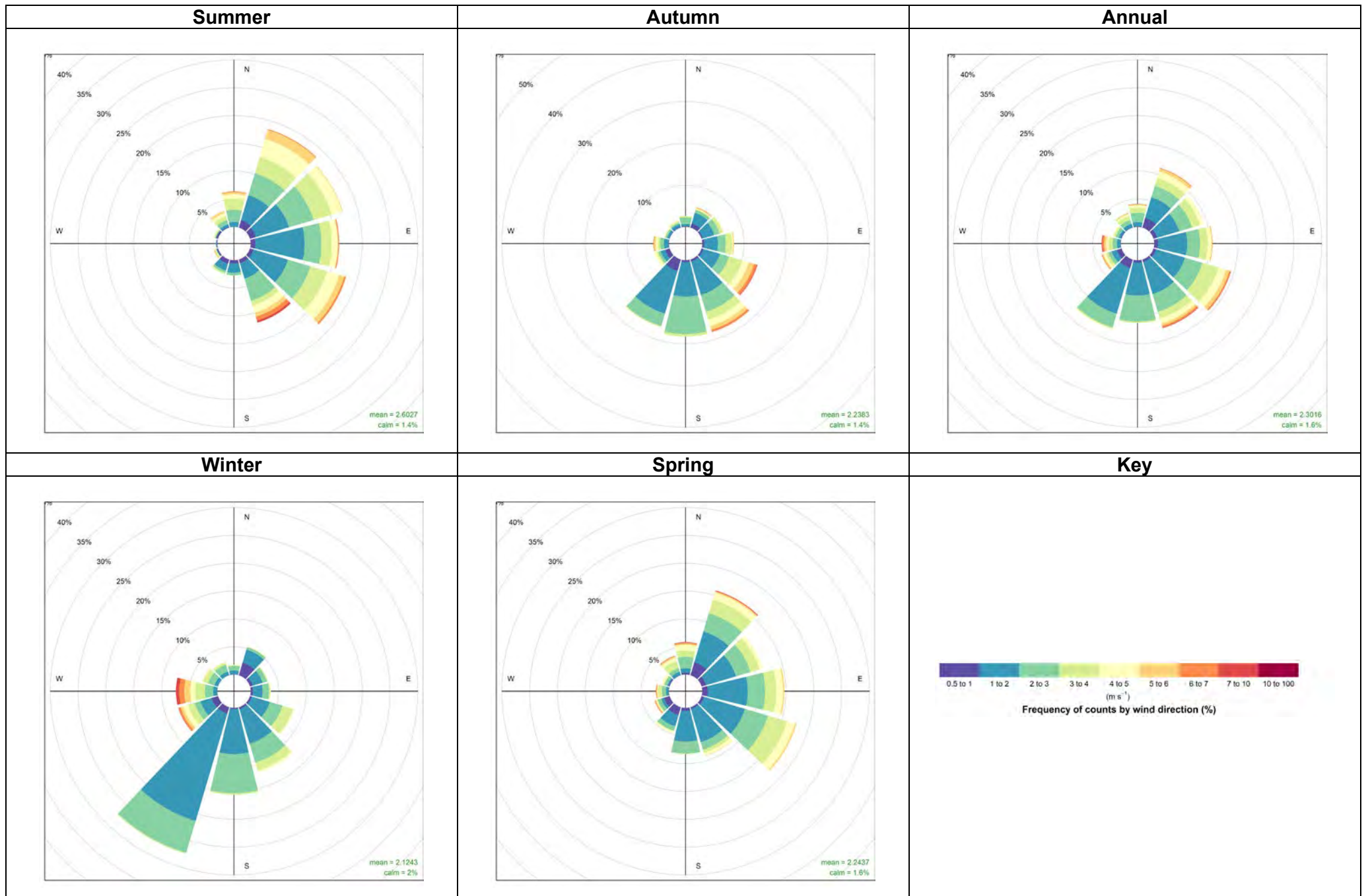


Figure A4.2 Seasonal wind roses for Site as generated by CALMET

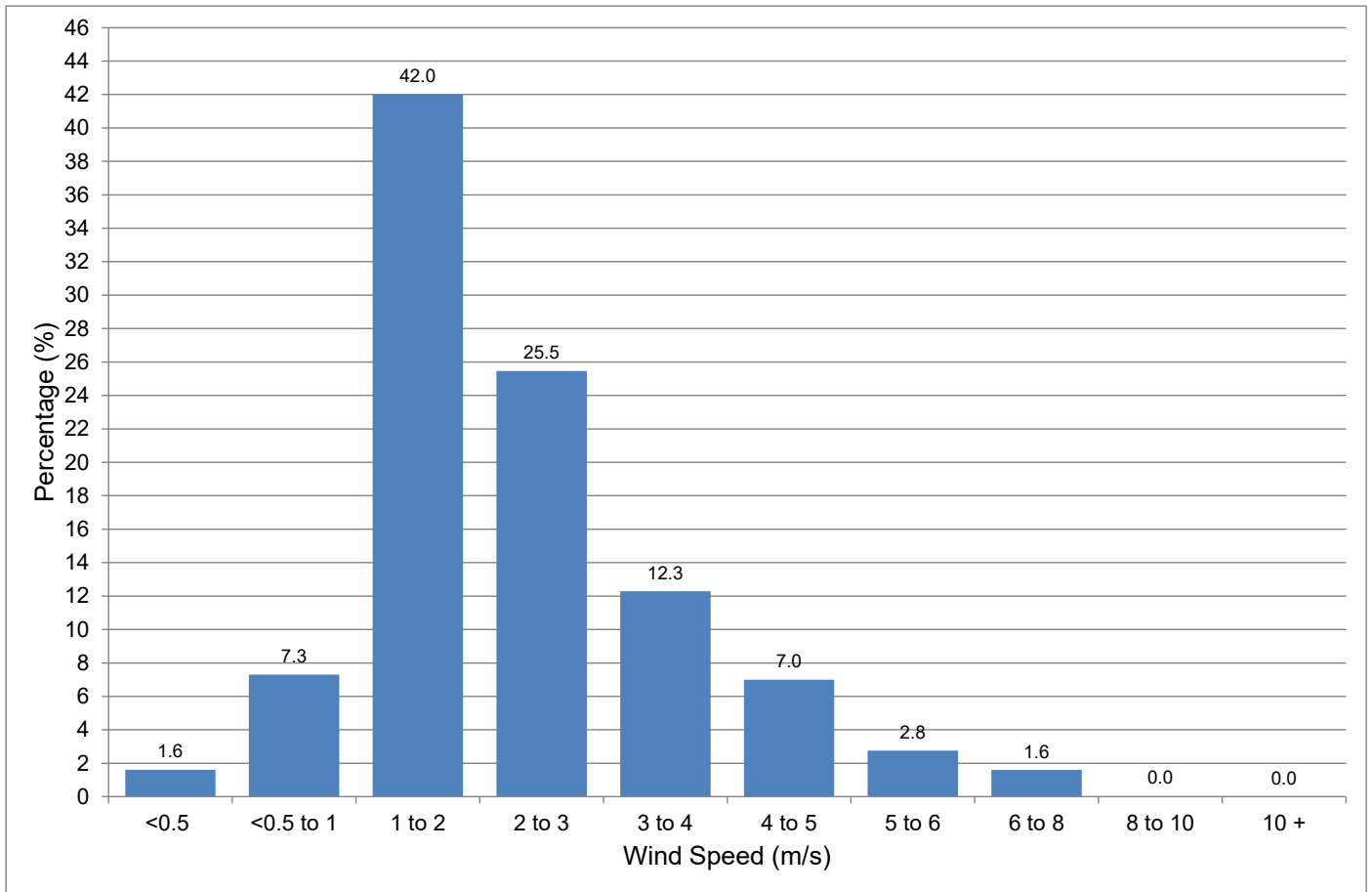


Figure A4.3 Wind frequency graph for Site as generated by CALMET

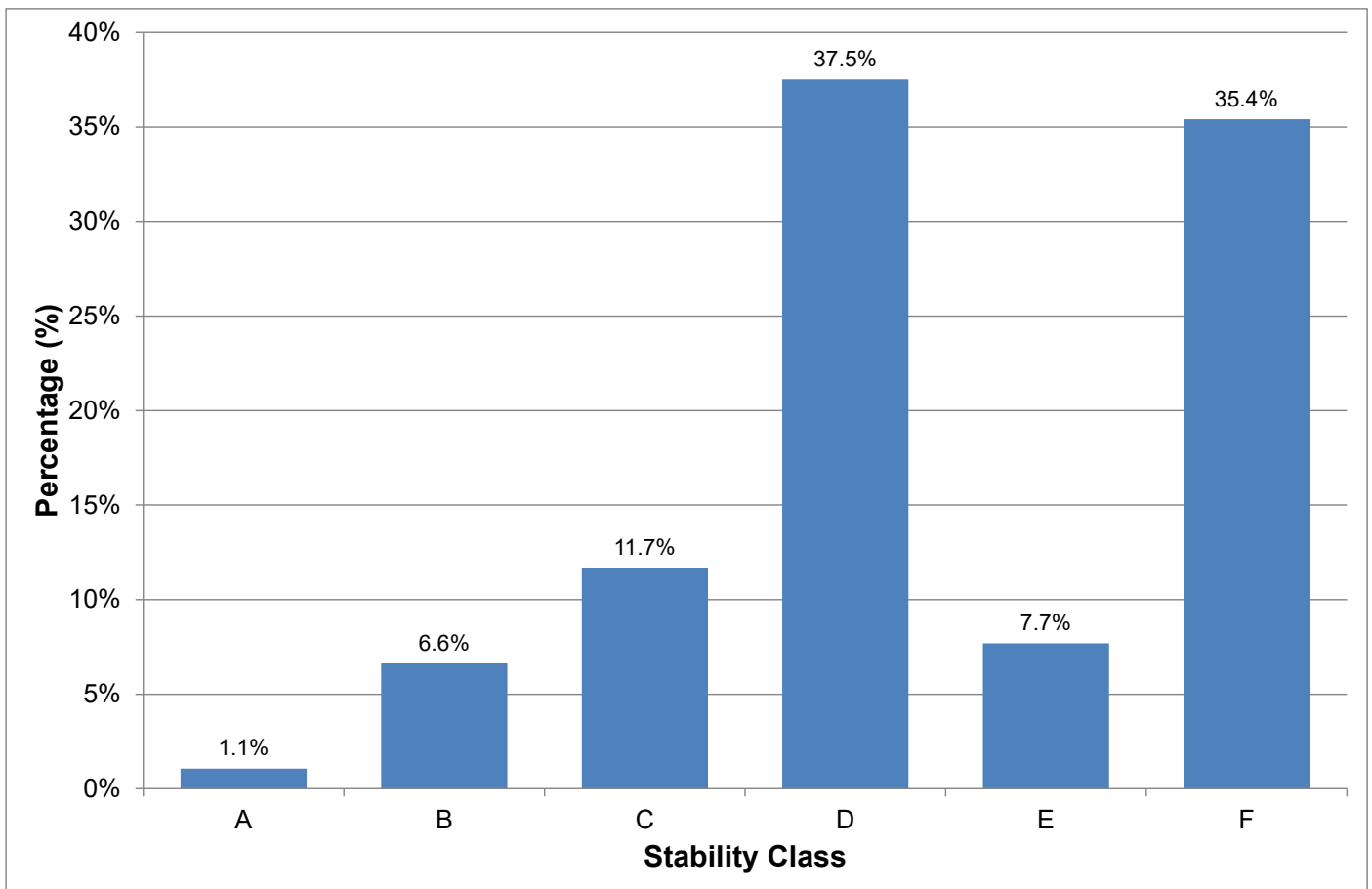


Figure A4.4 Stability Class distribution for Site as generated by CALMET

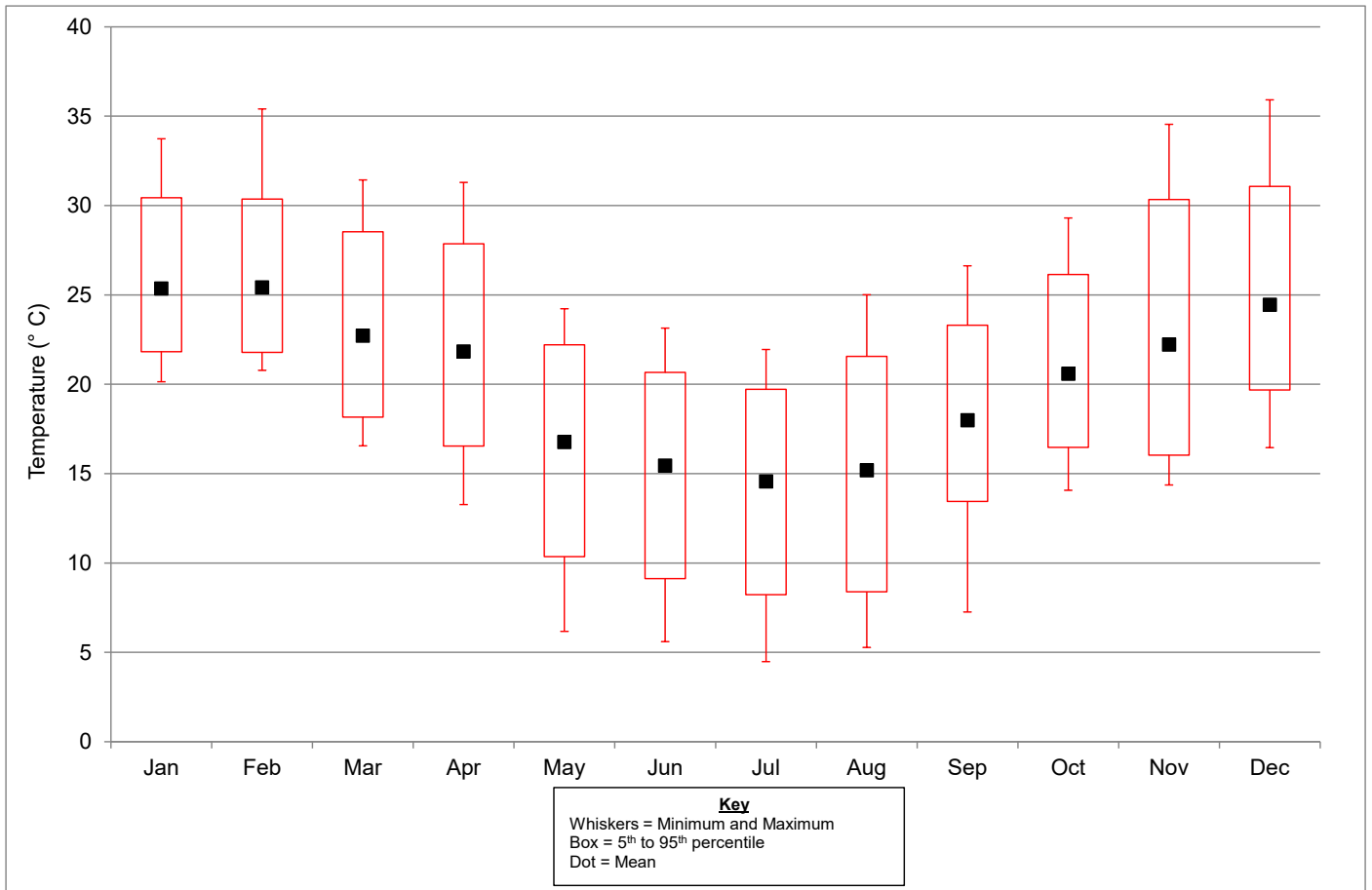


Figure A4.5 Box and Whisker plot of monthly temperature for Site as generated by CALMET

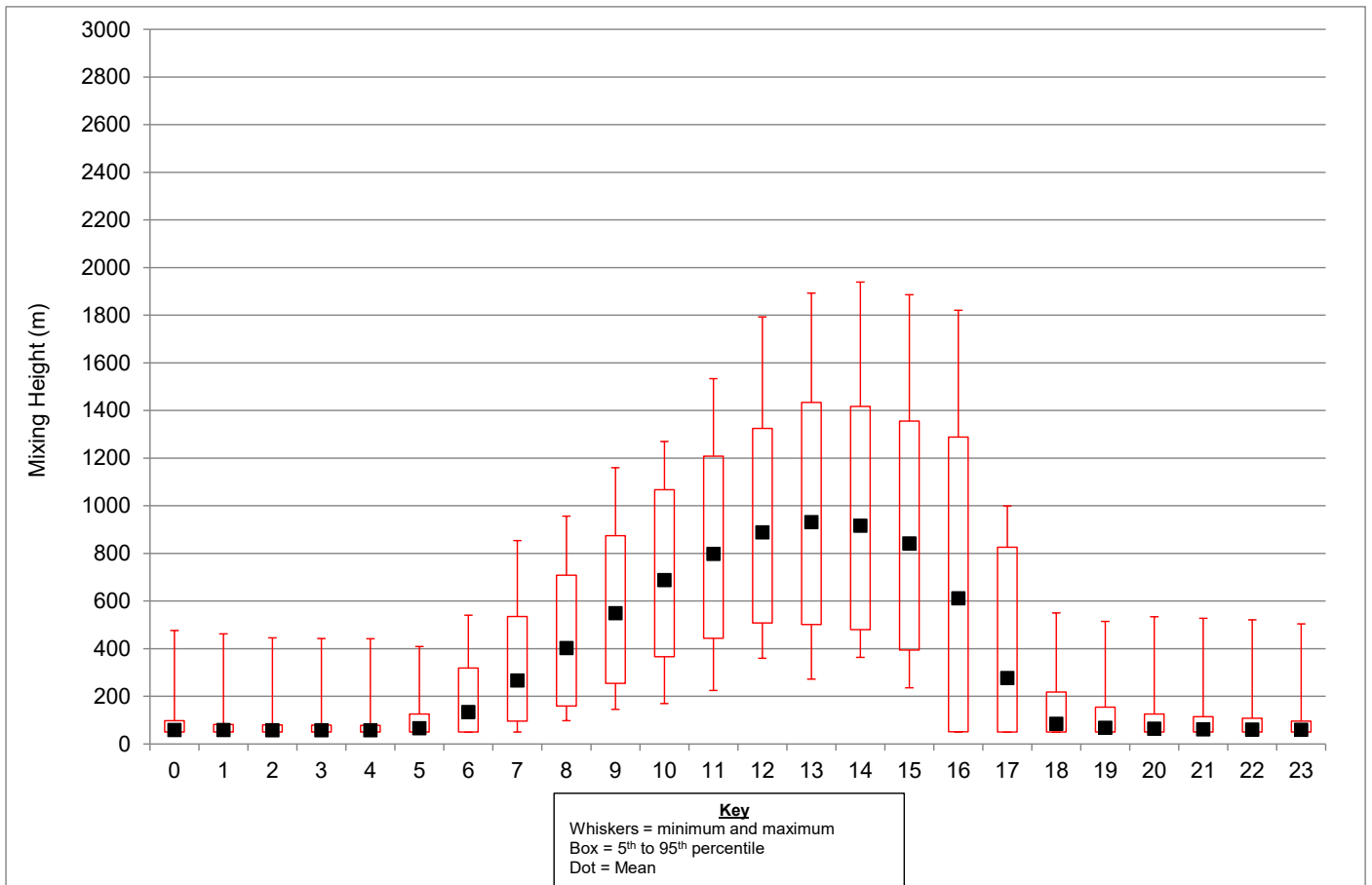
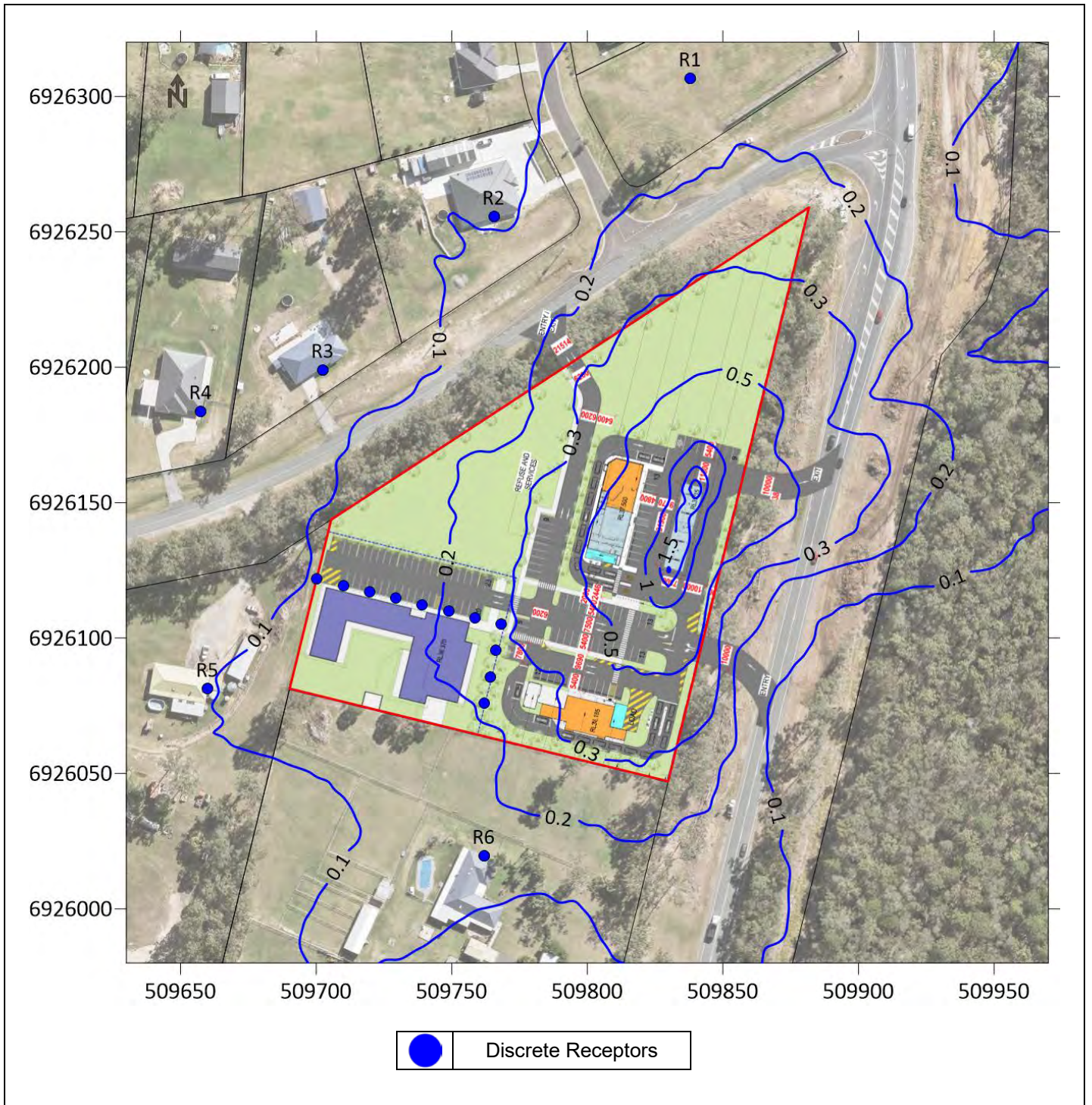


Figure A4.6 Box and Whisker plot of diurnal mixing height for Site as generated by CALMET

ATTACHMENT 5


Contour Plots

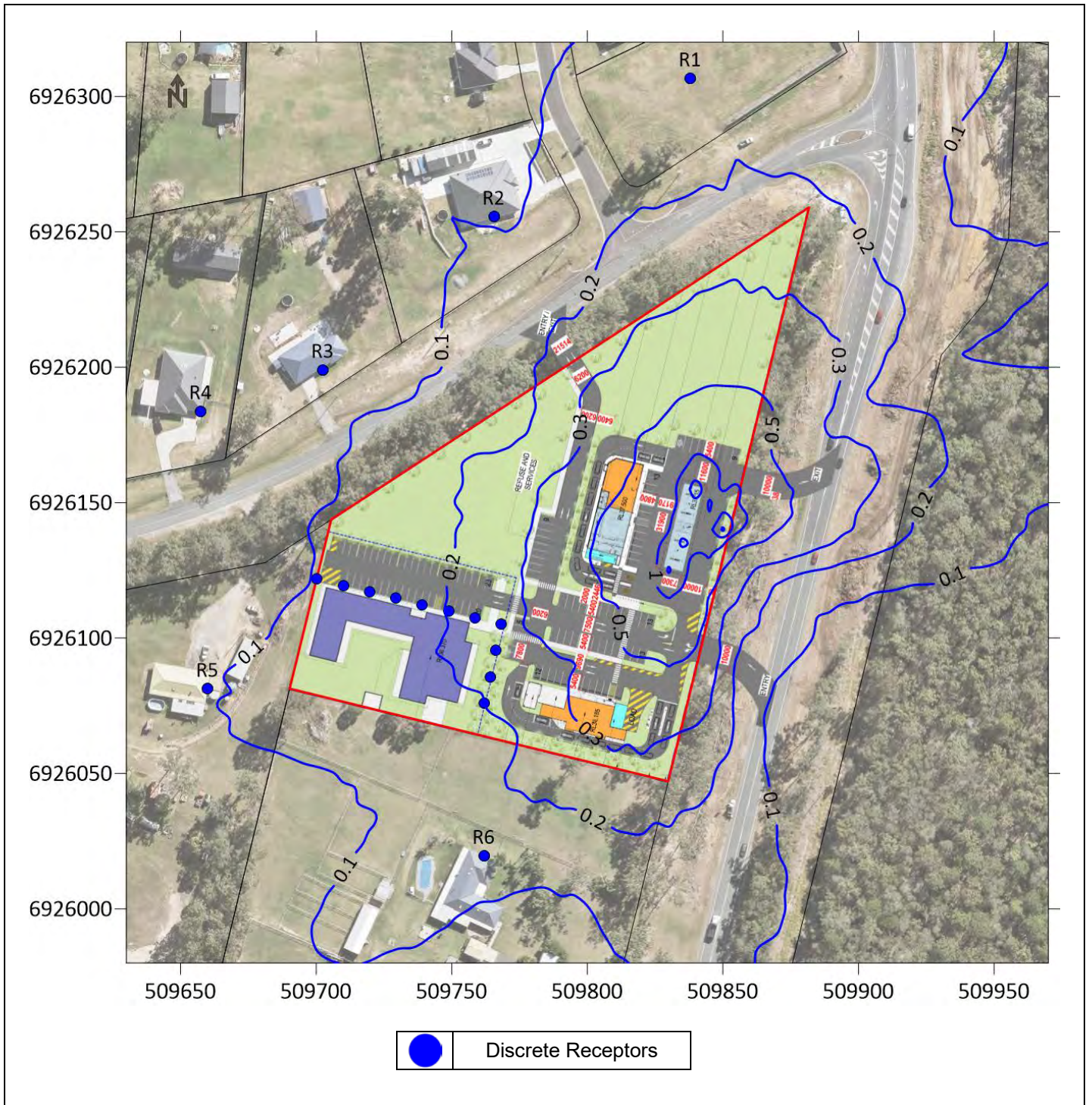
Odour and Benzene Concentrations for Proposed Service Station



Logan Village 21-188


1-hour average 99.5th concentrations of Odour from Proposed Service Station at ground level

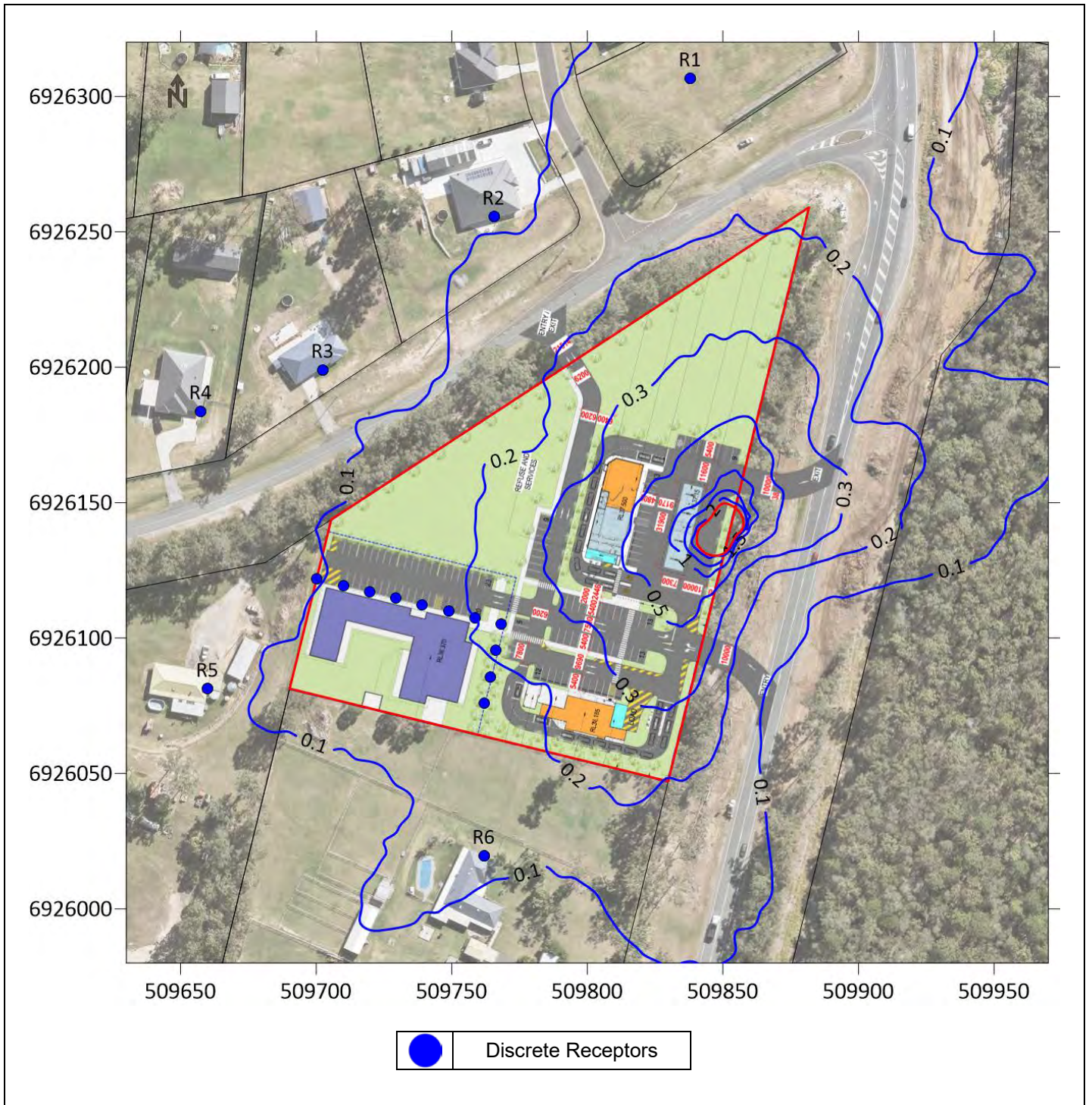
Figure A5.1	Source	Pollutant	Averaging Period	Guideline	Units	Date
	Proposed Service Station	Odour	1-hour average 99.5 th	2.5	Odour Units	14-Jun-2022



Logan Village 21-188


1-hour average 99.5th concentrations of Odour from Proposed Service Station at 1.5 metres above ground level

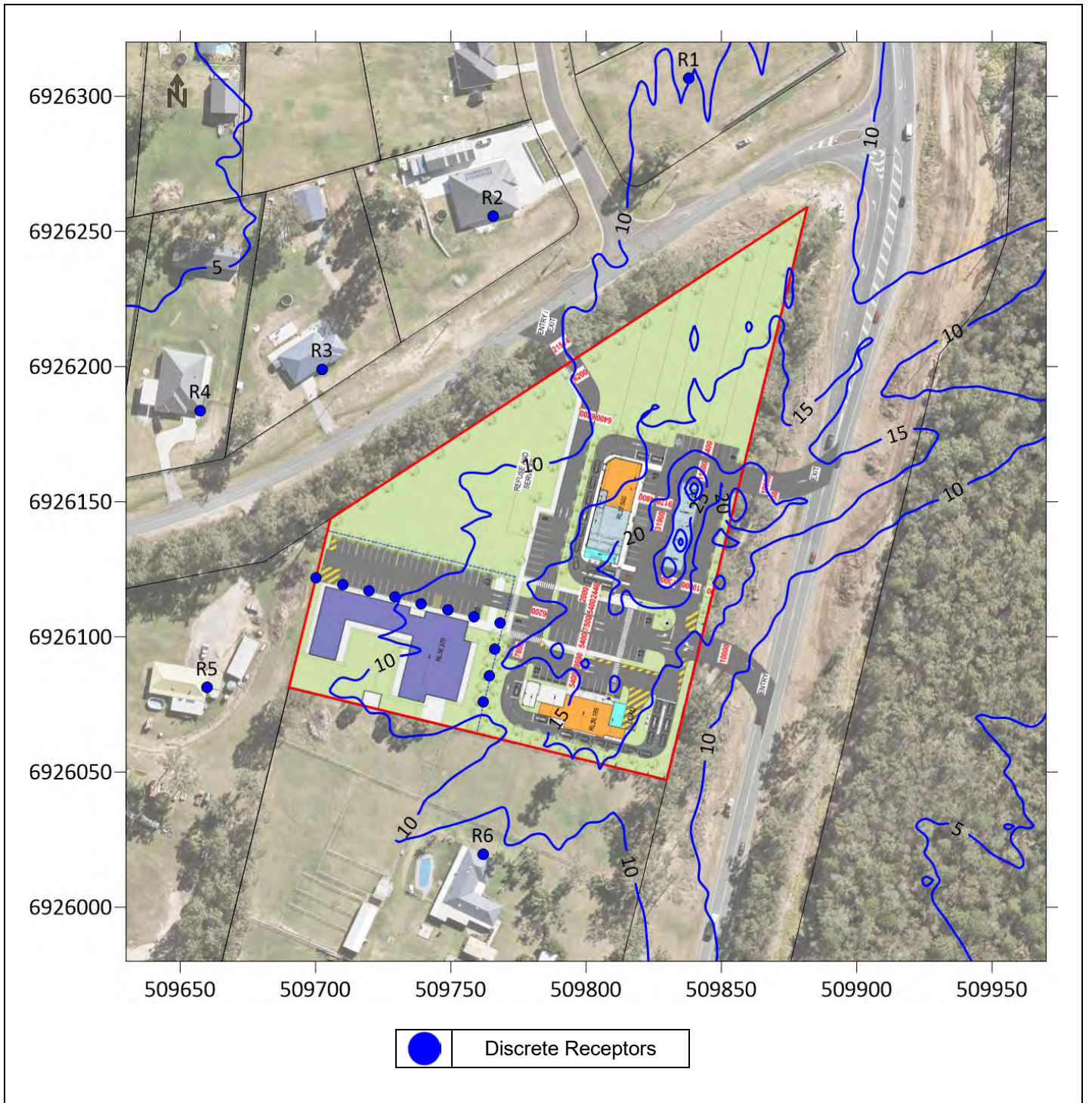
Figure A5.2	Source	Pollutant	Averaging Period	Guideline	Units	Date
	Proposed Service Station	Odour	1-hour average 99.5 th	2.5	Odour Units	14-Jun-2022



Logan Village 21-188


1-hour average 99.5th concentrations of Odour from Proposed Service Station at 3 metres above ground level

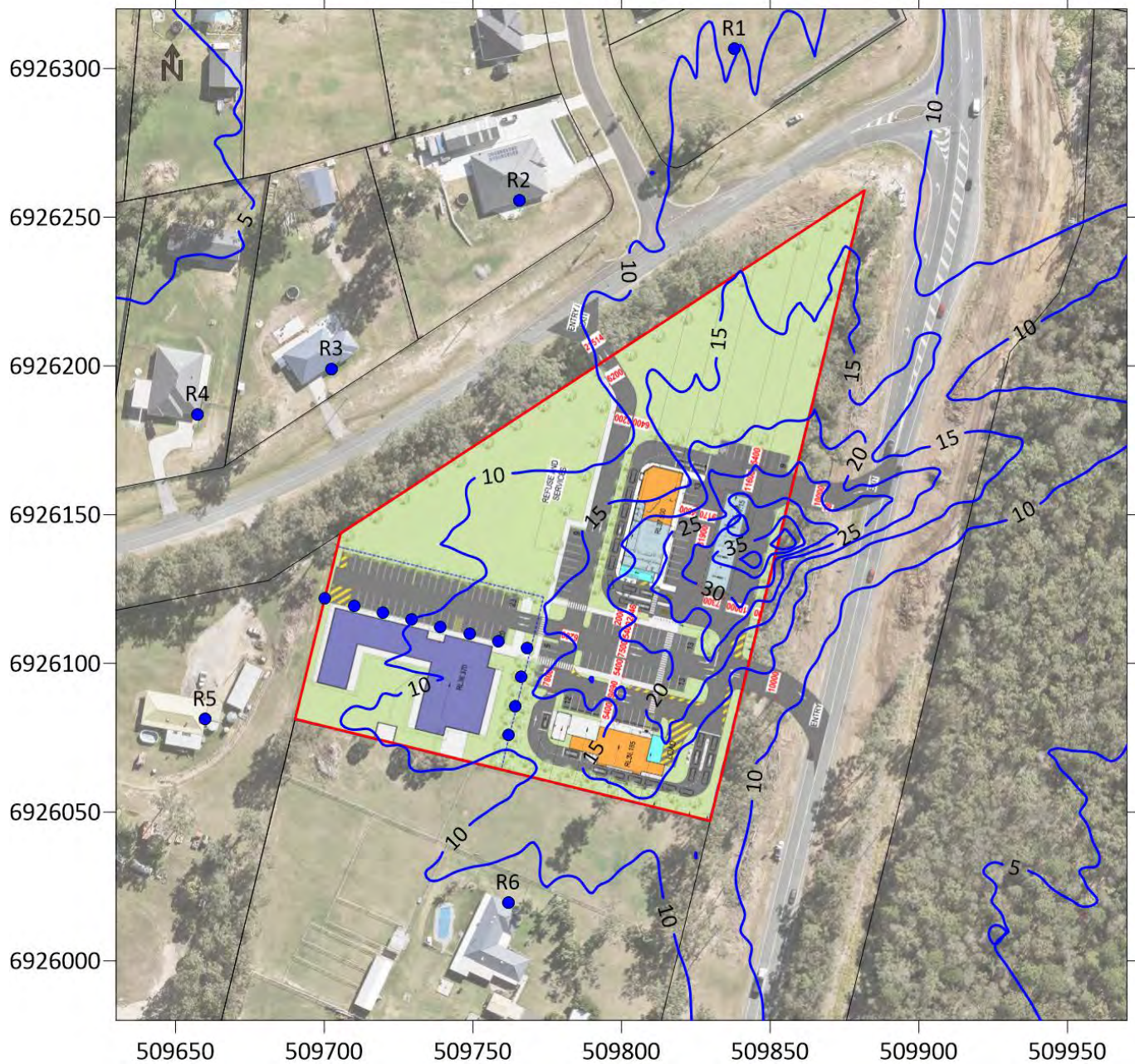
Figure A5.3	Source	Pollutant	Averaging Period	Guideline	Units	Date
	Proposed Service Station	Odour	1-hour average 99.5 th	2.5	Odour Units	14-Jun-2022



Logan Village 21-188

3-minute average concentrations of Benzene from Proposed Service Station including ambient concentrations of 4.2 µg/m³ at ground level


Figure A5.4	Source	Pollutant	Averaging Period	Guideline	Units	Date
	Proposed Service Station	Benzene	3-minute	53	µg/m ³	14-Jun-2022

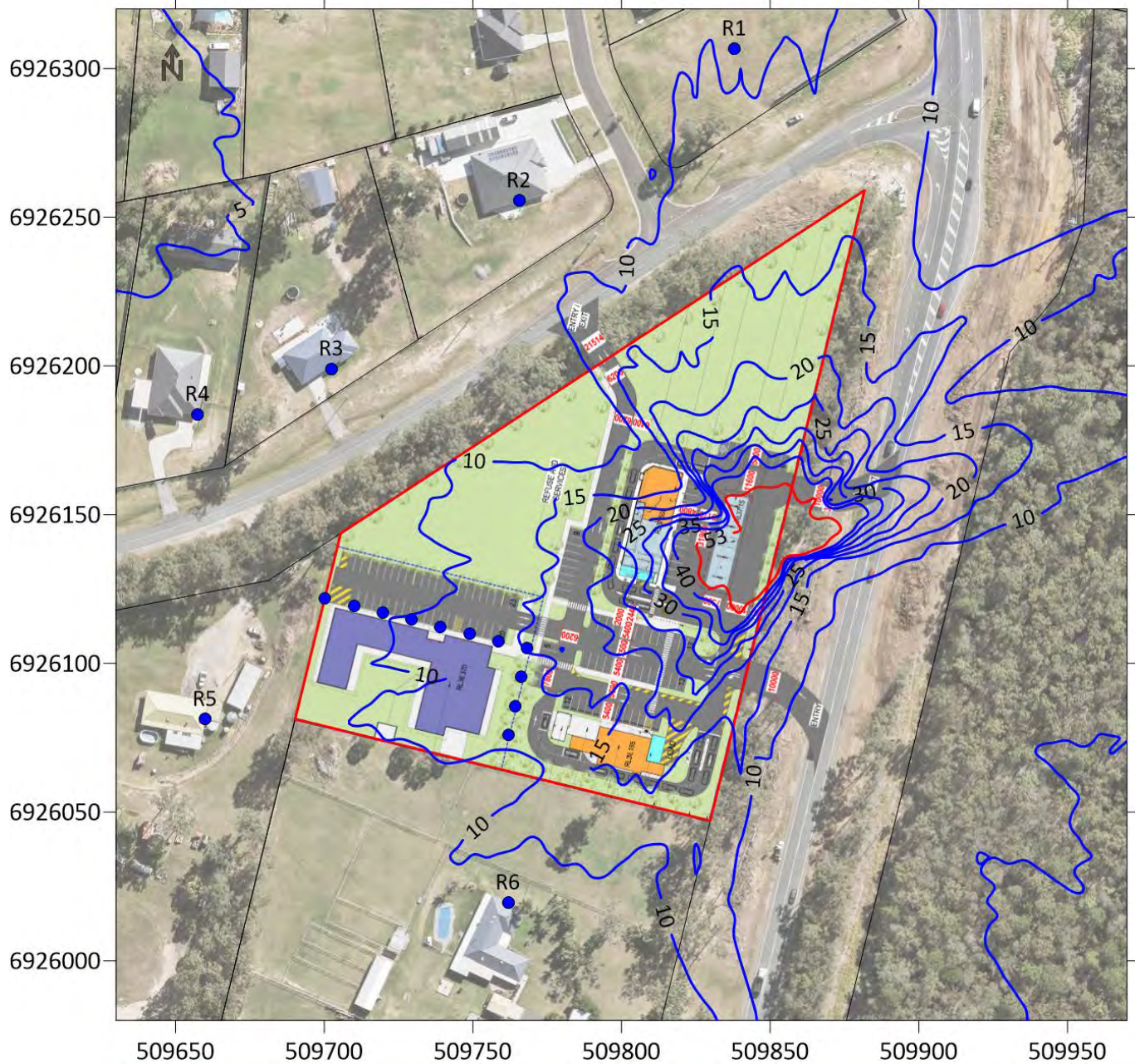


● Discrete Receptors

Logan Village 21-188

3-minute average concentrations of Benzene from Proposed Service Station including ambient concentrations of 4.2 µg/m³ at 1.5 metres above ground level


Figure A5.5	Source	Pollutant	Averaging Period	Guideline	Units	Date
	Proposed Service Station	Benzene	3-minute	53	µg/m ³	14-Jun-2022

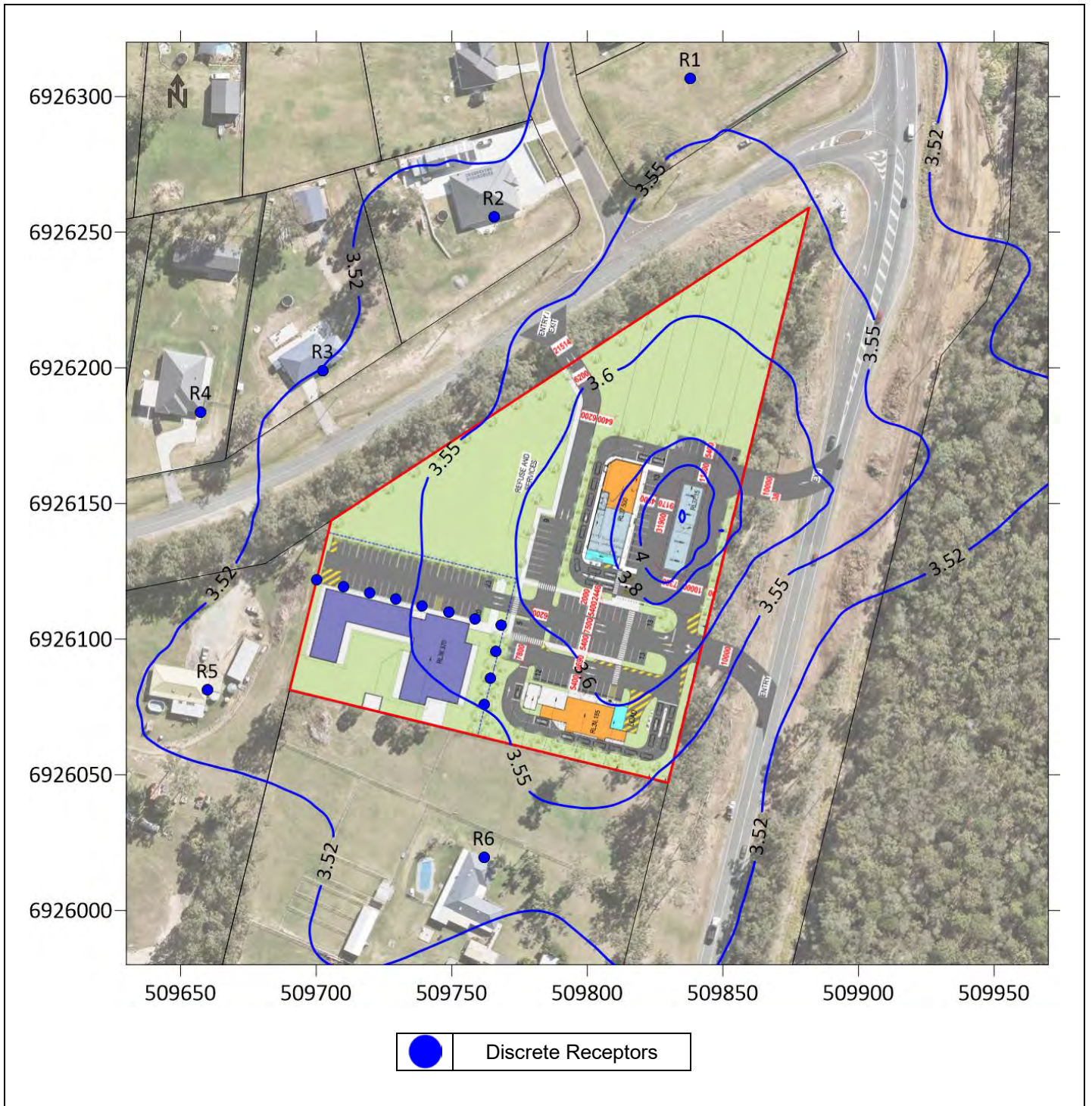


● Discrete Receptors

Logan Village 21-188


3-minute average concentrations of Benzene from Proposed Service Station including ambient concentrations of 4.2 µg/m³ at 3 metres above ground level

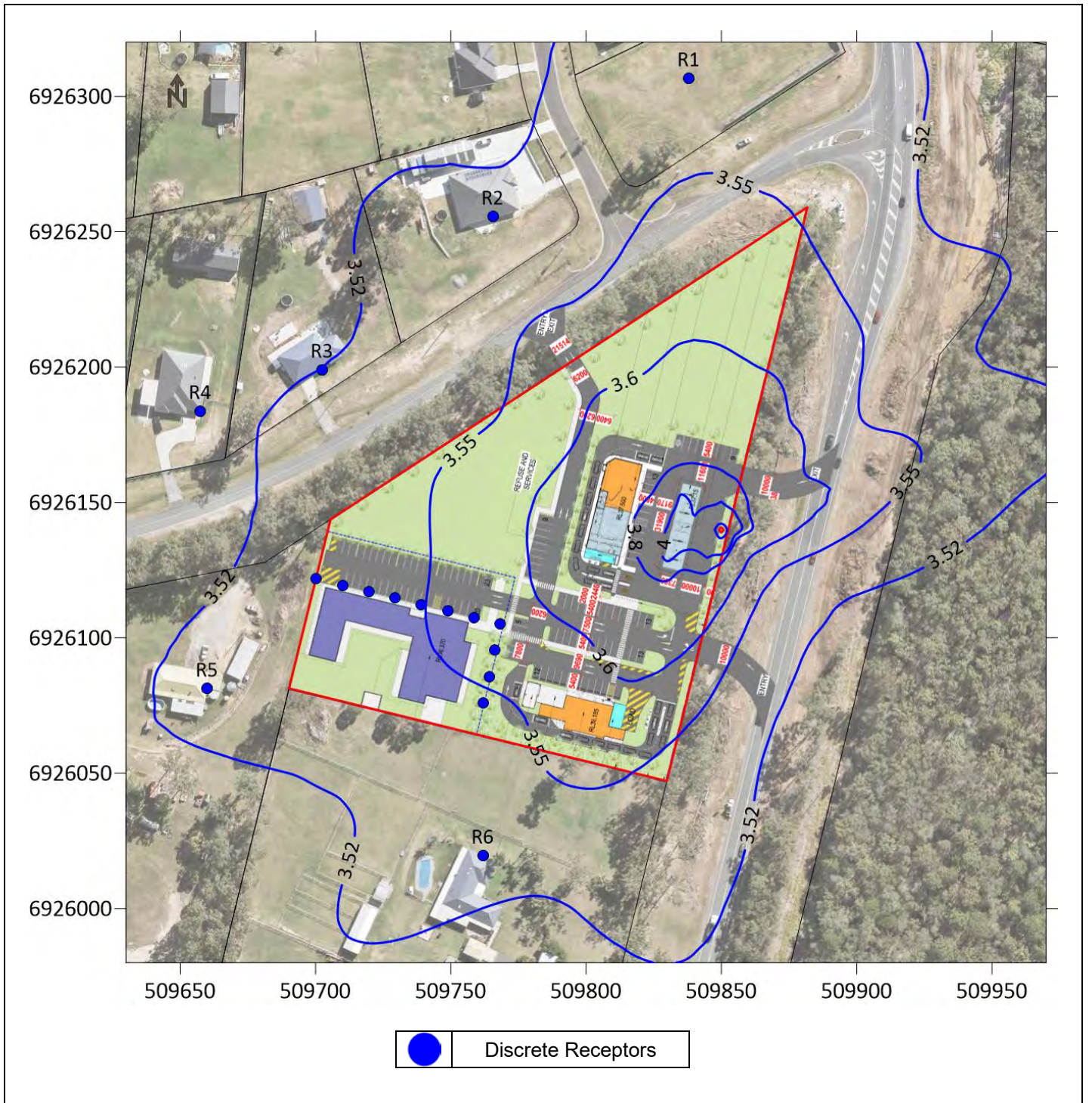
Figure A5.6	Source	Pollutant	Averaging Period	Guideline	Units	Date
	Proposed Service Station	Benzene	3-minute	53	µg/m ³	14-Jun-2022



Logan Village 21-188


Annual average concentrations of Benzene from Proposed Service Station including ambient concentrations of 3.5 $\mu\text{g}/\text{m}^3$ at 1.5 metres above ground level

Figure A5.8	Source	Pollutant	Averaging Period	Guideline	Units	Date
	Proposed Service Station	Benzene	Annual	5.4	$\mu\text{g}/\text{m}^3$	14-Jun-2022



Logan Village 21-188

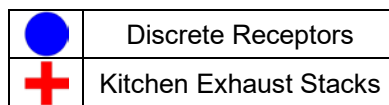
Annual average concentrations of Benzene from Proposed Service Station including ambient concentrations of 3.5 µg/m³ at 3 metres above ground level

Figure A5.9	Source	Pollutant	Averaging Period	Guideline	Units	Date
	Proposed Service Station	Benzene	Annual	5.4	µg/m ³	14-Jun-2022

ATTACHMENT 6


Contour Plots

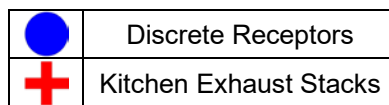
Odour Concentrations
Food and Drink Outlets



Logan Village 21-188


1-hour average 99.5th concentrations of Odour from Proposed Food and Drink Outlets at ground level

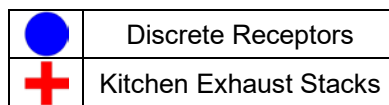
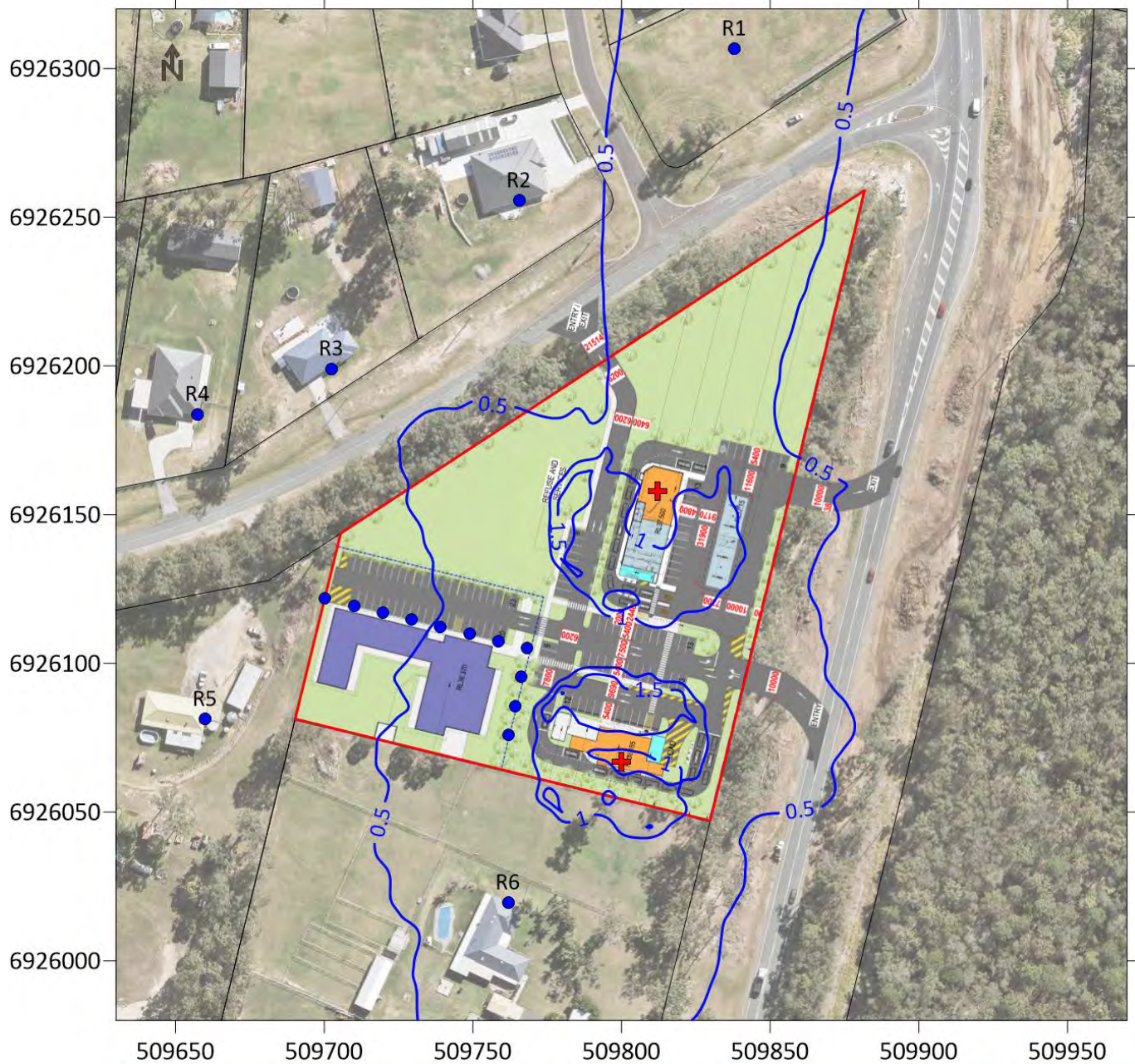
Figure A6.1	Source	Pollutant	Averaging Period	Guideline	Units	Date
	Proposed Food and Drink Outlets	Odour	1-hour average 99.5 th	2.5	Odour Units	14-Jun-2022



Logan Village 21-188


1-hour average 99.5th concentrations of Odour from Proposed Food and Drink Outlets at 1.5 metres above ground level

Figure A6.2	Source	Pollutant	Averaging Period	Guideline	Units	Date
	Proposed Food and Drink Outlets	Odour	1-hour average 99.5 th	2.5	Odour Units	14-Jun-2022



Logan Village 21-188

1-hour average 99.5th concentrations of Odour from Proposed Food and Drink Outlets at 3 metres above ground level

Figure A6.3	Source	Pollutant	Averaging Period	Guideline	Units	Date
	Proposed Food and Drink Outlets	Odour	1-hour average 99.5 th	2.5	Odour Units	14-Jun-2022