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APPLICATION REF
A007001729

CONSULT PLANNING
57 HAYWARD STREET, STAFFORD

Reference: 18075

R1

DATE OF RELEASE: 12/06/2026

Consult Planning
PO BOX 807
New Farm, QLD, 4005

ATTN: Aaron Sweet [asweet@consultplanning.com.au]

RE: 57 Hayward Street, Stafford – Air Quality Review

An Indoor Sport and Recreation Facility at 57 Hayward Street, Stafford (herein referred to as 'Subject Site') within an existing building.

The Subject Site is within the Industry Zone, General Industry A Precinct and the proposal is not incompatible with surrounding existing or potential industrial uses and is consistent with existing development within the area.

The proposed use is to be located within an existing industrial tenancy/building, and that educational/recreational type uses have previously been approved on the site, including the former Harvest Rain Theatre Group approval and a current dance school tenancy operating within part of the facility. A recent update to the planning scheme policy has classed indoor sport and recreation facilities as sensitive uses and therefore impact assessable under the planning scheme.

Brisbane City Council has issued an Information Request (under Development Application A007001729 dated 18 May 2026) seeking further justification in relation to compliance with the Industry Overlay Code, specifically relating to potential air quality and noise impacts associated with nearby industrial land uses.

This letter has been prepared in response to the Information Request in relation to air quality.

1 REQUEST FOR INFORMATION

The request for information for air quality is as follows:

> *2) Compliance with AO27, PO27 of the Industry code has not been adequately demonstrated, which requires that development for indoor sport and recreation is located no closer to an industrial use than the distance stated in Table 9.3.12.3.J. As the minimum distances in Table 9.3.12.3.J are not being met, an air quality statement is required to be submitted for assessment.*

The Performance Outcomes (PO) 27 for the Industry Code are presented in Table 1. To address and determine surrounding industrial land uses, a suite visit was undertaken by Assured Environmental personnel to identify where the separation distances in Table 9.3.12.3.J are met.

Table 1: Performance Outcomes of the Industry Code

Performance Outcomes	Acceptable Outcomes
PO27 Development for indoor sport and recreation: a. is located, designed and constructed to achieve the air quality (planning) criteria in Table 9.3.12.3.B, odour criteria in Table 9.3.12.3.C and health risk criteria in Table 9.3.12.3.D; b. does not compromise the intended industrial function of land in the Industry zone, General industry B zone precinct and General industry C zone precinct, and Special industry zone. Note—An air quality impact report prepared in accordance with the Air quality planning scheme policy can assist in demonstrating achievement of this performance outcome.	AO27 Development for indoor sport and recreation is located no closer to an industrial use than the distance stated in Table 9.3.12.3.J.

Table 9.3.12.3.J—Minimum Separation Distances For Indoor Sport and Recreation

Established use	Minimum separation distance (measured to the property boundary of the development)
Medium impact industry A	150 m
Medium impact industry B	250 m
High impact industry	500 m
Special industry	1,500 m

2 INDUSTRIAL OVERLAY MAPPING

A review of the Industrial Amenity Overlay Map has identified that the nearest industrial activity is the BP Service Station at 475 Stafford Road located approximately 610 m NNW of the Subject Site boundary as shown in Figure 1. The Subject Site is outside the buffer zone and therefore is not considered further in this review.

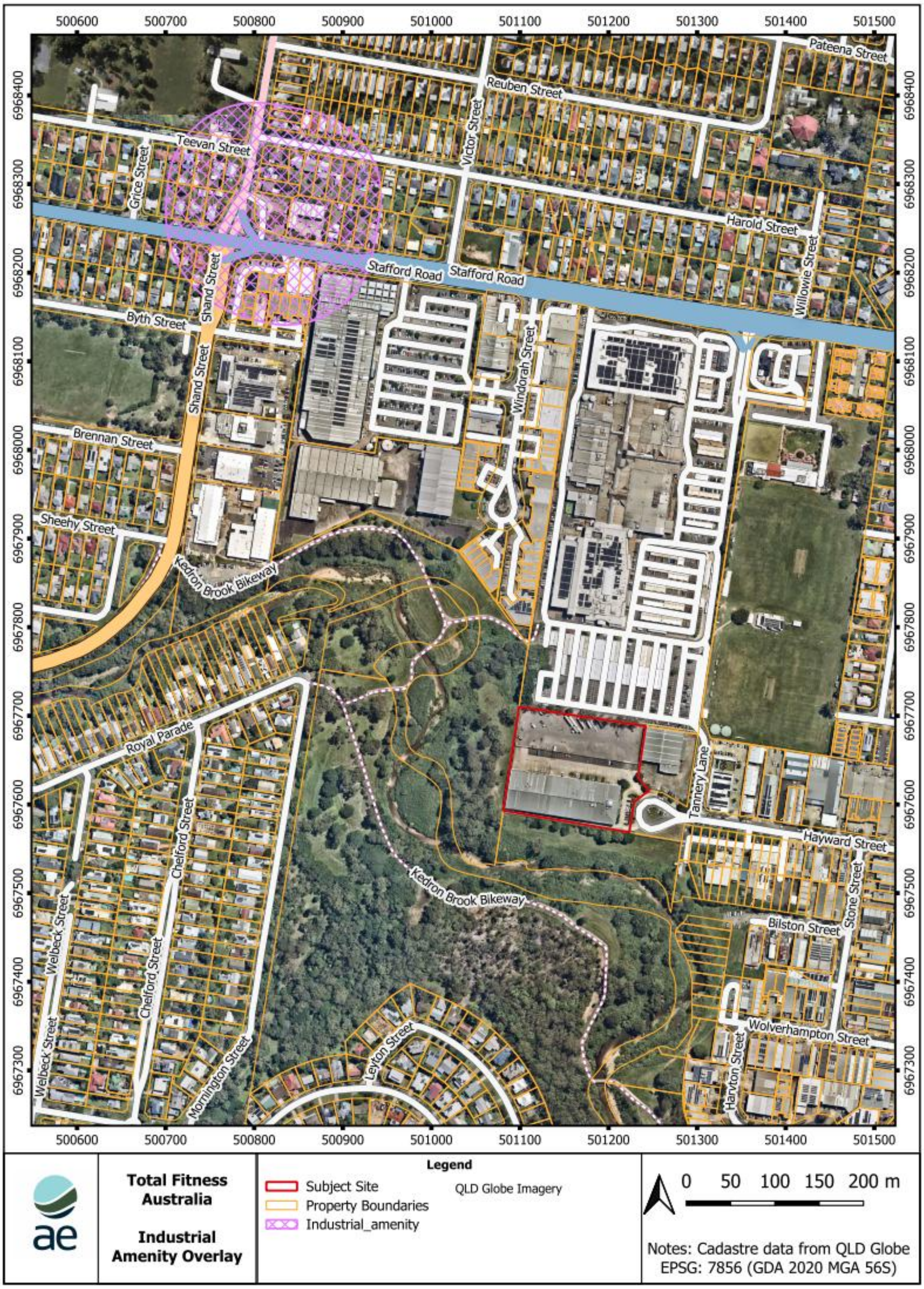

Figure 1: Industrial Overlay Mapping

3 SITE INVESTIGATION

To address the Information Request, a site visit was undertaken by senior personnel on 2 June 2026 to identify any industries that need to be assessed based on their industry classification and separation distance from the Subject Site.

The aerial imagery and zoning mapping (Figure 1) indicate that the Subject Site is located within an established industrial precinct that forms part of a broader employment and urban services area. The Subject Site itself is zoned General Industry A and is situated immediately adjacent to a larger area of General Industry B zoning to the east. A smaller area of Low Impact Industry zoning is located along the eastern boundary of the industrial estate. The industrial precinct contains a range of existing warehouses, manufacturing facilities, workshops, storage yards and commercial-industrial developments, with several large-format industrial buildings evident immediately north and east of the Subject Site.

3.1 Existing Indoor Sport and Recreational Facilities

A review of the local area identified that there are a number of existing indoor sport and recreation uses within the Industrial Zoning including the following:

- Powerhouse 40353 gym and Fight House Industries at 23 Wolverhampton St;
- Living well hub Yoga Studio at 44B Wolverhampton St;
- YMCA Gymnastics at 25 Harvton St;
- Brisbane Academy of Dance at 15 Harvton St;
- Integrated MMA / Yoga and True Body Balance at 2/39 Hayward St; and
- Strength Sancuary at 3/39 Hayward St.

These facilities are located closer to the identified industrial uses than the Subject Site, however recent amendments to the Planning Scheme have reclassified indoor sport and recreation facilities as sensitive land uses. Historically, a number of existing indoor sport and recreation facilities within industrial areas were established without the need for detailed assessment of surrounding industrial emissions, as these uses were not previously considered sensitive receptors under the planning framework. Under the updated policy, new indoor sport and recreation facilities are now required to be assessed as sensitive uses, with consideration given to potential impacts from nearby industrial activities including air quality.

3.2 Existing Industrial Uses

A summary table of the existing industries in the area is presented in Table 2. Where the industry threshold was unknown, the higher industry class was adopted. For example, the food and beverage was assumed to be medium impact. It can be seen that:

- All low impact industries are greater than 150 m (boundary to boundary) from the Subject Site;
- One medium impact industry was greater than 250 m (boundary to boundary) from the Subject Site. Note this industry is currently zoned low impact;
- No high impact industries were identified; and

- No special industries were identified.

Overall, all existing industrial uses, except one are located at greater distances from the Subject Site than the minimum separation distances outlined in Table 9.3.12.3.J

Table 2: Existing Industries

Ref	Address	Name	Industry	Ind. Class	Distance to Subject Site	To be Assessed
1	29 Hayward St	Peach Performance	Car Repair	Low	156 m	No
2	2 Hayward St	Northside Smash Repairs	Vehicle Repairs	Low	298 m	No
3	10/12 Hayward St	Elixir Coffee Roaster	Food and Beverage	Medium	259 m	No
4	23 Stone Street	Alpine Automotive	Vehicle Repair	Low	273 m	No
5	11 Wolverhampton St	Future Auto Stafford	Vehicle Repair	Low	333 m	No
6	32 Webster Rd	Wyer + Craw	Cabinet Maker	Medium	389 m	No
7	34 Wolverhampton St	Happy Valley Brewing Company	Food and Beverage	Medium	297 m	No
8	28 Hayward St	Custom VeeDub	Vehicle Repair	Low	170 m	No
9	18 Bilston St	Northside Rust & Dents	Vehicle Repair	Low	202 m	No
10	2 Blyth St	ALS Laboratories	-	-	278 m	No
11	18 Hayward St	Benga Designs	Printing Signs	Medium	228 m	Yes

Assured Environmental have previously undertaken detailed air quality assessment for ALS Laboratories under Development Application A005926324. A review of the results show there are no impacts upon the Subject Site and therefore do not need to be reassessed.

Table 2 identifies that Benga Designs (ref 11) operates from land zoned Low Impact Industry. However, a review of the planning scheme definitions indicates that the business activities undertaken on the site are more consistent with a Medium Impact Industry due to the use of spray painting as part of the sign manufacturing process.

The planning scheme identifies a spray-painting workshop involving the spray painting of signs, where equipment other than aerosol cans or airbrushes is used, as a Medium Impact Industry activity. While low impact industry definitions allow limited painting and surface finishing activities, dedicated spray-painting operations (such as spray booths) associated with sign manufacturing fall within the medium impact category.

3.3 Conclusion

The review has identified that Benga Designs should be assessed as a Medium Impact Industry and evaluated against the applicable amenity impact requirements of the planning scheme. Given that the recommended 250 metre separation distance is not achieved, a detailed assessment of potential air impacts upon the Subject Site are required.

DOCUMENT CONTROL

Tabel: Document Approval

	Name	Position Title	Signature	Date
Author	Michelle Clifton	Principal Consultant	M. Clifton	12/06/2026

Table 3: Revision Register

Revision	Date	Issued to	Comment
R0	05/06/2026	A. Sweet	Initial Release
R1	12/06/2026	A. Sweet	Comments

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57 HAYWARD STREET, STAFFORD: AIR QUALITY IMPACT ASSESSMENT

Project ID: 18075

12/06/2026

Release: R1

Prepared For:

Consult Planning

Assured Environmental

DOCUMENT CONTROL PAGE

Project Title: 57 HAYWARD STREET, STAFFORD: AIR QUALITY IMPACT ASSESSMENT

Project Reference ID: 18075

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Author: Michelle Clifton

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Reviewer: Baraa Matalqah

Table 1: History of Revisions

Revision	Date	Issued to	Changes
R0	12/06/2026	A. Sweet	Initial Release
R1	12/06/2026	A. Sweet	Comments

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GLOSSARY

°C	Degrees centigrade
Conversion of ppm to mg/m^3	Where R is the ideal gas constant; T, the temperature in kelvin (273.16 + T°C); and P, the pressure in mm Hg, the conversion is as follows: $\text{mg m}^3 = (P/RT) \times \text{Molecular weight} \times (\text{concentration in ppm})$ $= \dfrac{P \times \text{Molecular weight} \times (\text{concentration in ppm})}{62.4 \times (273.2 + T°C)}$ For the purposes of the air quality assessment all conversions were made at 0°C unless stated otherwise.
g/s	Grams per second.
g/m^2	Gram per metre square.
g/m^2/month	Gram per metre square per month.
ha	Hectares.
m	Metre.
m/s	Metres per second
mg/m^3	Milligrams (10^{-3}) per cubic metre. Conversions from mg/m^3 to parts per volume concentrations (i.e., ppm) are calculated at 0 °C.
kg	Kilograms.
kg/annum	Kilograms per annum.
km	Kilometre
µg/m^3	Micrograms (10^{-6}) per cubic metre. Conversions from µg/m^3 to parts per volume concentrations (i.e., ppb) are calculated at 0 °C.
ppb	Parts per billion.
ppm	Parts per million.
PM_{10}, $PM_{2.5}$, PM_1	Fine particulate matter with an equivalent aerodynamic diameter of less than 10, 2.5 or 1 micrometres, respectively. Fine particulates are predominantly sourced from combustion processes. Vehicle emissions are a key source in urban environments.
TSP	Total suspended particulate.
70th percentile	The value exceeded for 70 % of the time.

ABBREVIATIONS

BCC	Brisbane City Council
BOM	Bureau of Meteorology
DETSI	Department of Environment, Tourism, and Science
ESL	Effects Screening Levels
GFA	Gross Floor Area
SDS	Safety Data Sheet
SRTM	Shuttle Radar Topography Mission
TAPM	The Air Pollution Model
TCEQ	Texas Commission on Environmental Quality
VOC	Volatile Organic Compounds

1 INTRODUCTION

1.1 Background

An Indoor Sport and Recreation Facility at 57 Hayward Street, Stafford (herein referred to as 'Subject Site') within an existing building.

Brisbane City Council has issued an Information Request (under Development Application A007001729 dated 18 May 2026) seeking further justification in relation to compliance with the Industry Overlay Code, specifically relating to potential air quality and noise impacts associated with nearby industrial land uses.

The request for information for air quality is as follows:

> *2) Compliance with AO27, PO27 of the Industry code has not been adequately demonstrated, which requires that development for indoor sport and recreation is located no closer to an industrial use than the distance stated in Table 9.3.12.3.J. As the minimum distances in Table 9.3.12.3.J are not being met, an air quality statement is required to be submitted for assessment.*

Assured Environmental carried out a site visit and review of the existing industrial uses in relation to the Subject Site and identified that there was one facility, Benga Designs, a medium impact industry that was within 250 m of the Subject Site.

1.2 Scope of Works

Assured Environmental was engaged by Consult Planning to undertake an AQIA of the Benga Designs for the proposed development.

In undertaking the assessment, reference has also been made to the following regulations and guidelines:

- Environmental Protection Act 1994;
- Environmental Protection Regulation 2019;
- Environmental Protection (Air) Policy 2019; and
- Brisbane City Council Planning Scheme 2014.

In accordance with the requirements of the above guidelines, computational modelling have been undertaken to assess the potential impact of the existing industry (Benga Designs) for adverse amenity on the proposed development.

1.3 This Report

This report summarises the methodology, results, and conclusions of the AQIA.

2 THE PROPOSED DEVELOPMENT

2.1 Overview

The proposed indoor sport and recreation facility will operate as a fitness and gymnasium use comprising a large open gym floor area, multiple exercise rooms, member facilities, reception area, bathrooms and a spa/recovery area. The development occupies approximately 1,996 m^2 gross floor area (GFA) within an existing tenancy and forms part of an established commercial and recreational precinct containing the Queensland National Ballet School and Fantastic Furniture.

The Facility is provided with access to the existing shared car park, which contains approximately 136 parking spaces across the Subject Site.

The gymnasium is expected to operate as a typical indoor fitness centre offering a combination of cardiovascular exercise equipment, resistance training equipment, free-weight training areas, functional fitness spaces and group exercise rooms. Activities undertaken within the facility are anticipated to include individual fitness training, group exercise classes, circuit training, strength and conditioning programs, personal training sessions and general health and wellness activities. Ancillary facilities include reception and member waiting areas, change facilities, bathrooms and a spa/recovery area for members. The proposed plans are presented in Appendix B.

2.2 Sensitive Receptors

The entire Subject Site, shown in Figure 2 has been represented in the modelling using 2,812 receptors. Specifically, the modelling has considered a series of discrete receptors (5 m spacing) at different heights above ground level as detailed in Table 2.

Table 2: Sensitive Receptors

Height (storeys)	Heights Modelled (m) AHD
Building is 8 m tall	Ground floor: 0 m; Ground floor breathing zone: 1.5 m; Mezzanine: 4.8 m; Mezzanine breathing zone: 6.3 m;

Notes: Cadastre data from QLD Globe
EPSG: 7856 (GDA 2020 MGA 56S)

Figure 1: Site Location

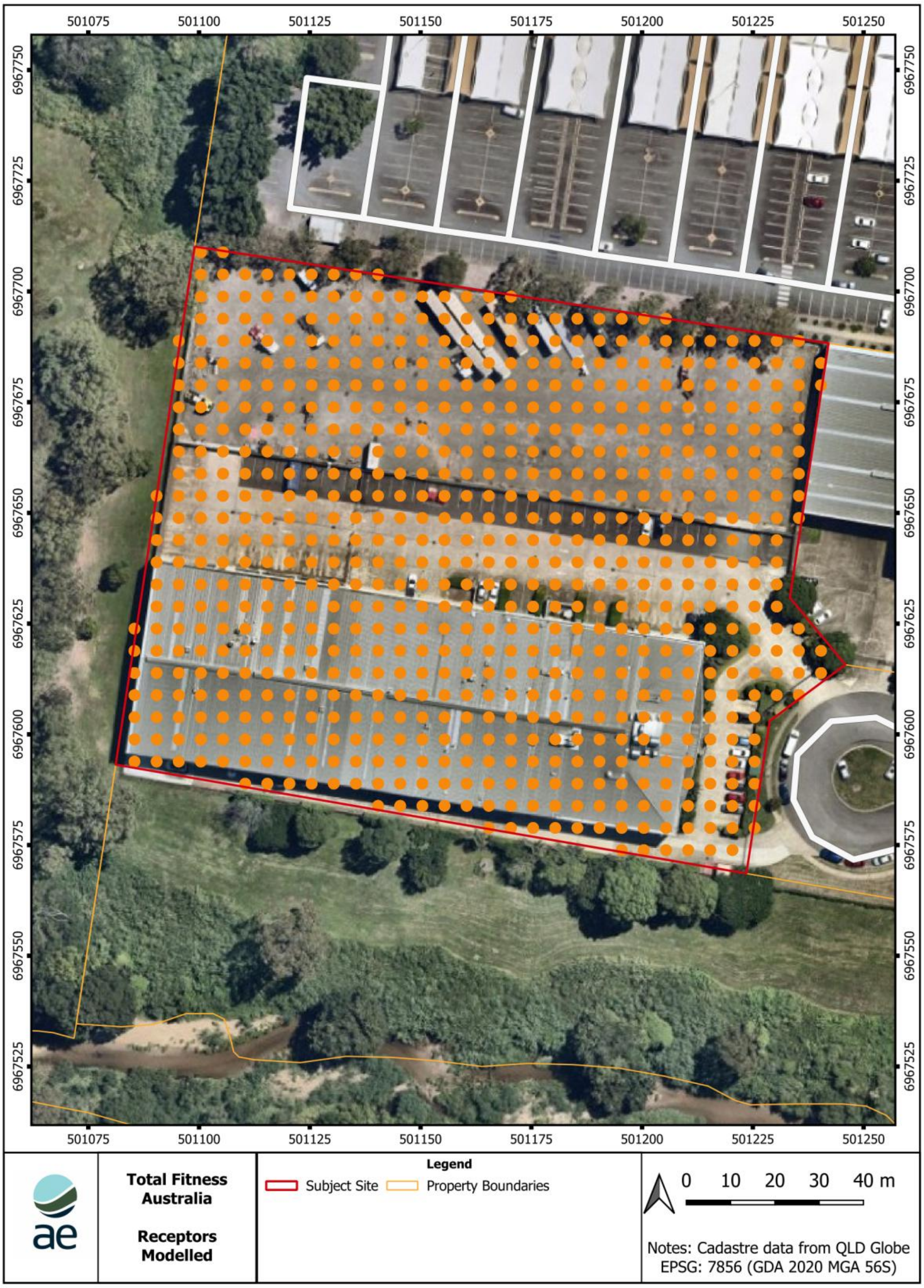


Figure 2: Sensitive Receptors

3 EMISSION ESTIMATION

3.1 Site Visit

A site visit to the Benga Designs located at 18 Hayward Street, on 2 June 2026 by Assured Environmental personnel with the aim to discuss the current operations of the facility. During the site visit, the spray-booth were inspected.

3.2 Operational Overview

During the site visit, the following information was provided by Benga Designs:

- Operating hours: Monday to Friday 06:00 – 15:30 hours.
- Spray booths: one downdraft spray booth that regularly undergoes maintenance and carbon filters were recently replaced.

3.3 Spray Booth Operations

The existing facility undertakes spray painting activities associated with the manufacture and finishing of signs. Painting is conducted within a downdraft spray booth using a combination of two-pack polyurethane coatings, acrylic lacquer coatings and etch primers.

The paint systems are mixed on-site immediately prior to application, with the exact formulation varying depending on ambient weather conditions, substrate requirements and finish specifications.

The two-pack coating system typically comprises approximately 50% Colourthane 2K Topcoat, 25% Colourthane Part B hardener, 23% GP Thinners and 2% Accelerator 2. The acrylic lacquer system generally comprises 50% Spartan Acrylic White and 50% L743 Thinner.

The primer system comprises approximately 50% Super Etch Primer and 50% GP Thinners.

Whilst these proportions are representative of typical usage, minor variations may occur to optimise drying time, viscosity and application performance under different operating conditions.

Spray painting activities are intermittent and dependent upon the types and quantities of signs being manufactured. Painting does not occur continuously throughout the week and is generally undertaken only when required as part of the sign fabrication process. Based on discussions with Benga Designs personnel, spray painting occurs for approximately four hours per day, on average three days per week.

Paint consumption is relatively low and has been estimated at approximately one litre of mixed paint product per hour of spray booth operation. Based on the average operating schedule, this equates to a typical weekly paint usage of approximately 12 litres of mixed coating products.

For this assessment, the following stack parameters listed in Table 3 were adopted from the manufacturer specifications and site visit.

Table 3: Spray Booth Exhaust Parameters

Parameter	Unit	Spray Booth Exhaust
Stack Location	X, Y	501460,6967511
Building Height	m	6
Stack Height	m	9
Exit Temperature	K	298
Exhaust exit	m^3/sec	6.1
Velocity	m/s	12.16
Diameter	m	0.80
Operational hours modelled	-	06:00 – 16:00 Mon to Friday

3.4 Emissions Quantification

3.4.1 Methodology

Safety Data Sheets (SDS) for each coating, solvent, and additive used within the spray coating process were reviewed (a list of SDS provided by Benga Designs is in Appendix A) to identify the relevant chemical constituents and their associated physical properties. The SDS documentation provided information including compound composition, density, and the highest proportion of Volatile Organic Compounds (VOC) present within each product. This information formed the basis for estimating potential emissions from spray coating activities.

Emission rates for individual compounds were calculated using a mass balance approach based on product usage and VOC content. The emission rate was determined using the following equation:

Emission Rate (g/hour) = Product Usage (L/hour) x density (g/L) x VOC content (%)

Where:

- Product Usage (L/hr) represents the maximum rate of product applied during spray operations as provided by Benga Designs.
- Density (g/L) is the product density as reported in the relevant SDS.
- VOC Content (%) represents the maximum proportion of volatile organic compounds present in the product formulation.

This approach assumes that the entire volatile fraction of each product applied during spraying has the potential to volatilise and enter the spray booth ventilation system. The calculated emission rates therefore represent a conservative estimate of potential VOC emissions associated with the coating process with VOC emissions typically released over a number of hours.

For compounds contained in multiple products, the highest VOC proportion and product usage were accounted for. This enabled the estimation of maximum emission rates for each compound of interest. Only compounds with an identifiable CAS number and for which ambient air quality criteria or guideline values are available were included in the detailed assessment.

For the odour assessment, compound-specific emission rates were combined with published odour threshold values to calculate odour emission rates, allowing the relative contribution of individual compounds to potential odour impacts to be evaluated.

3.4.2 Chemical Composition and Emission Rates

Table 4 presents the associated product, product usage rate, and VOC content for each compound. The emission rates assume 100% of sprayed product is exhausted in the hour of application.

Table 4: Chemical Composition and Emission Rates

Compound	CAS No.	Density (kg/L)	Max. VOC Proportion (%/w)	VOC Content (kg/L)	Molecular Weight	Emission Rate (g/s)
1-Butanol	71-36-3	1.09	10	0.109	74.1	0.030
1-Methoxy-2-propanol	107-98-2	0.89	30	0.267	130.2	0.148
2-Butoxyethyl acetate	112-07-2	0.88	3	0.026	160.2	0.007
2-Methoxy-1-methylethyl acetate	108-65-6	0.89	30	0.267	132.2	0.148
4-Hydroxy-4-methylpentan-2-one	123-42-2	0.88	3	0.026	116.0	0.007
Acetone	67-64-1	0.88	30	0.263	58.1	0.073
Dibutyltin dilaurate	77-58-7	0.88	1	0.009	631.6	0.002
Ethyl 3-ethoxypropionate	763-69-9	0.97	30	0.291	146.2	0.108
Ethyl acetate	141-78-6	1.09	30	0.263	88.1	0.073
Ethylbenzene	100-41-4	0.97	10	0.097	106.2	0.049
Hexamethylene Diisocyanate (HDI)	28182-81-2	0.97	60	0.582	168.2	0.216
Toluene	108-88-3	1.09	30	0.327	92.1	0.091
Xylene	1330-20-7	0.97	30	0.291	106.2	0.148
n-Butyl acetate	123-86-4	0.97	60	0.534	116.2	0.297
Solvent (petroleum)	64742-89-8	0.82	30	0.245	120.0	0.068
Ethanol	64-17-5	0.82	10	0.082	46.1	0.023
Isopropanol	67-63-0	1.00	30	0.300	60.1	0.083
Methyl ethyl ketone (MEK)	78-93-3	1.00	10	0.100	72.1	0.028
Phosphoric acid	7664-38-2	1.00	1	0.010	98.0	0.003
Bisphenol A diglycidyl ether resin, solid	25068-38-6	1.00	10	0.100	340.0	0.028
Carbon black	1333-86-4	1.00	1	0.010	12.0	0.003
Titanium dioxide	13463-67-7	1.00	10	0.100	79.9	0.028

Odour emission rates (ou.m^3/sec) were derived from published odour thresholds of each compound and summing the emissions from each product type and multiplying by the corresponding airflow rate. The product with the highest potential odour emission was used as the basis for modelling, as shaded in light green in Table 5.

It is noted that the calculated odour concentration for the topcoat is the highest; however, this result is primarily driven by the inclusion of HDI oligomers. HDI oligomers are high molecular weight, low vapour pressure compounds that exist predominantly in the aerosol phase during spraying rather than as vapour-phase species. As a result, their contribution to odour is limited, as odour perception is governed by compounds present in the gas phase that can interact with olfactory receptors. While HDI monomers may have detectable odour thresholds, the oligomeric forms typically do not volatilise sufficiently under ambient conditions to contribute meaningfully to odour.

Accordingly, including HDI oligomers in the odour calculation is considered to overestimate odour impacts, as it assumes these compounds behave similarly to volatile solvents. In practice, odour from spray coating operations is predominantly driven by volatile organic compounds (VOCs) such as esters, aromatics and alcohols, which readily evaporate and have relatively low odour thresholds.

On this basis, and excluding the influence of HDI oligomers, the results indicate that the topcoat represents the worst-case odour source, as it contains the highest proportion of volatile, odour-active compounds and consistently produces the greatest odour emission rates across the assessed scenarios.

Table 5: Odour Emission Rates by Product Type

Product Type	Sum Odour (OU/m^3)	Odour Emission Rate (ou.m^3/sec)
Topcoat	591 (3,239 a))	3,610 (19,795 a))
Accelerator	308	1879
Clearcoat and Hardener	56	341
Thinner	1,136	6,941

a) Note value in brackets includes HDI

3.5 Particulate Compounds

The emission rates in Table 5 assume 100% of sprayed product is exhausted. However, a number of compounds identified in the reviewed SDS are present in as non-volatile solids or high molecular weight resins. These substances do not readily evaporate under typical spray booth operating conditions and are therefore not expected to be emitted as vapour-phase pollutants. Instead, they are associated with paint droplets or overspray particles generated during the spray application process.

Compounds in this category include dibutyltin dilaurate (CAS 77-58-7). These materials function primarily as pigments or coating binders and are characterised by extremely low vapour pressures. As a result, they remain bound within the liquid coating matrix and are emitted only if entrained within spray droplets or particulate overspray. The majority of these materials are expected to deposit on the coated surface, settle within the spray booth, or be captured by the booth filtration system prior to discharge.

Similarly, hexamethylene diisocyanate (HDI) polymers (CAS 28182-81-2), which are used as curing agents in two-component polyurethane coatings, have very low volatility and high molecular weight. Under spray application conditions, HDI oligomers are typically present as aerosol droplets rather than vapour-phase compounds. Consequently, their emission behaviour is governed primarily by overspray generation, and filtration capture rather than evaporation. As with other particulate-bound coating components, the majority of HDI-containing droplets are expected to deposit on the workpiece or be removed by the spray booth filters.

For the purposes of this assessment, a conservative transfer efficiency assumption was applied to represent the proportion of sprayed material that does not reach the coated surface and therefore has the potential to become airborne overspray. The fraction of overspray that reaches the exhaust system was then further reduced by applying the spray booth filter capture efficiency, which represents the ability of the exhaust filters to remove paint particulates from the airflow.

Emission rates for particulate-associated compounds were therefore estimated using the following relationship:

$$\textit{Emission Rate to Atmosphere} = M \times (1-TE) \times (1-\eta)$$

Where:

- M = mass of compound applied during spraying (Table 4);
- TE = transfer efficiency (40%); and
- η = spray booth filter capture efficiency (90%).

This approach reflects the expected behaviour of coating droplets within a downdraft spray booth, where the majority of overspray is captured by the filtration system or deposited within the booth rather than emitted externally. The application of transfer efficiency and filter capture assumptions therefore provides a realistic estimate of the small fraction of particulate-bound coating constituents that may be released via the spray booth exhaust system.

Using this equation, it is estimated only 6% of the emission rate in Table 5 is emitted to atmosphere for the following compounds:

- hexamethylene diisocyanate (HDI);
- bisphenol-A-(epichlorhydrin) epoxy resin; and
- Dibutyltin dilaurate.

3.6 Source Locations

Figure 3 presents the source location utilised in the model.

3.7 Modelled Hours

Benga Designs operate from 06:00 – 15:30 hours Monday to Friday, however spray-painting operations only occur a few hours a day. For the purposes of this assessment, the emission rates presented in Table 4 and Table 5 are modelled between 06:00 – 15:30 hours Monday to Friday.

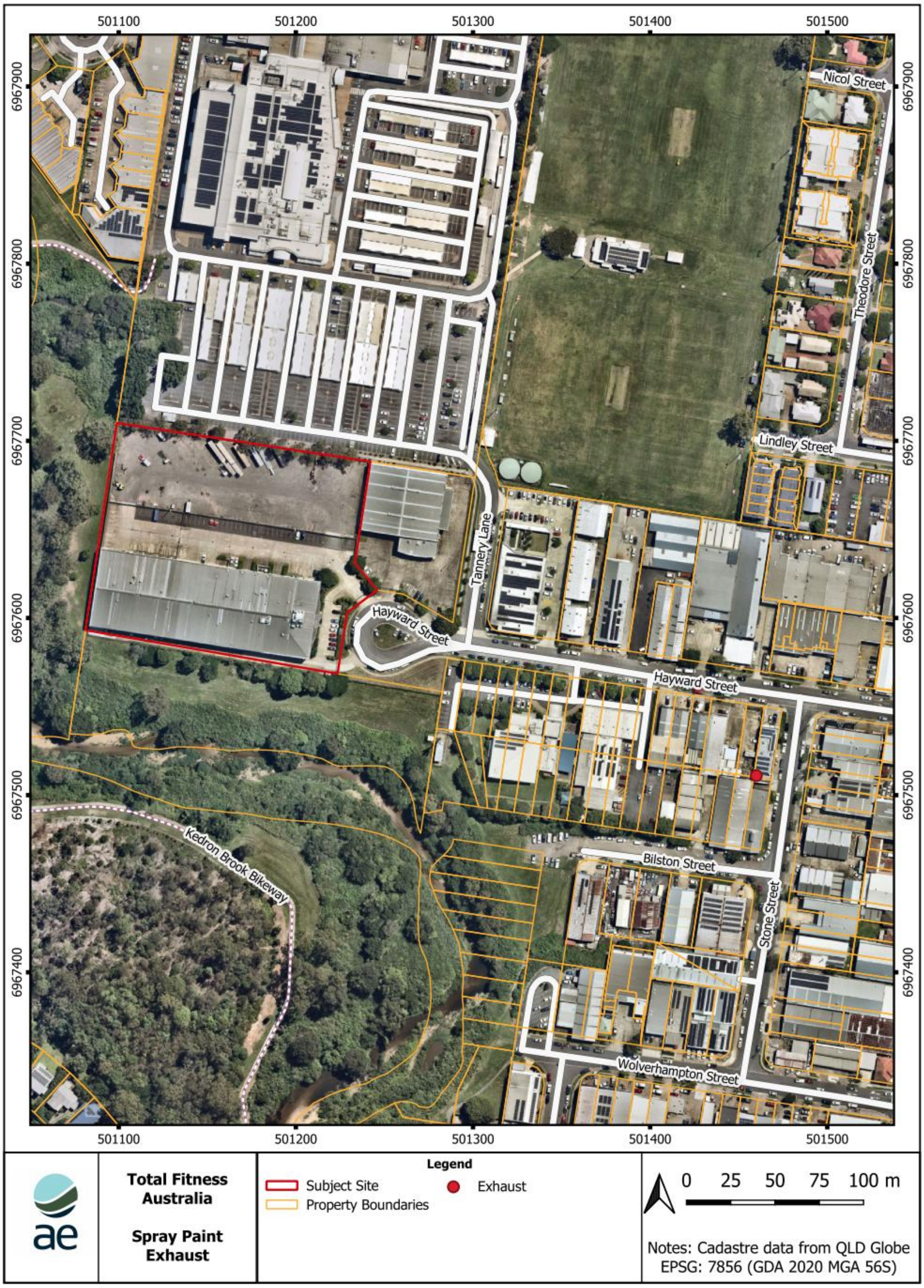


Figure 3: Source Location

4 DESCRIPTION OF ENVIRONMENTAL VALUES

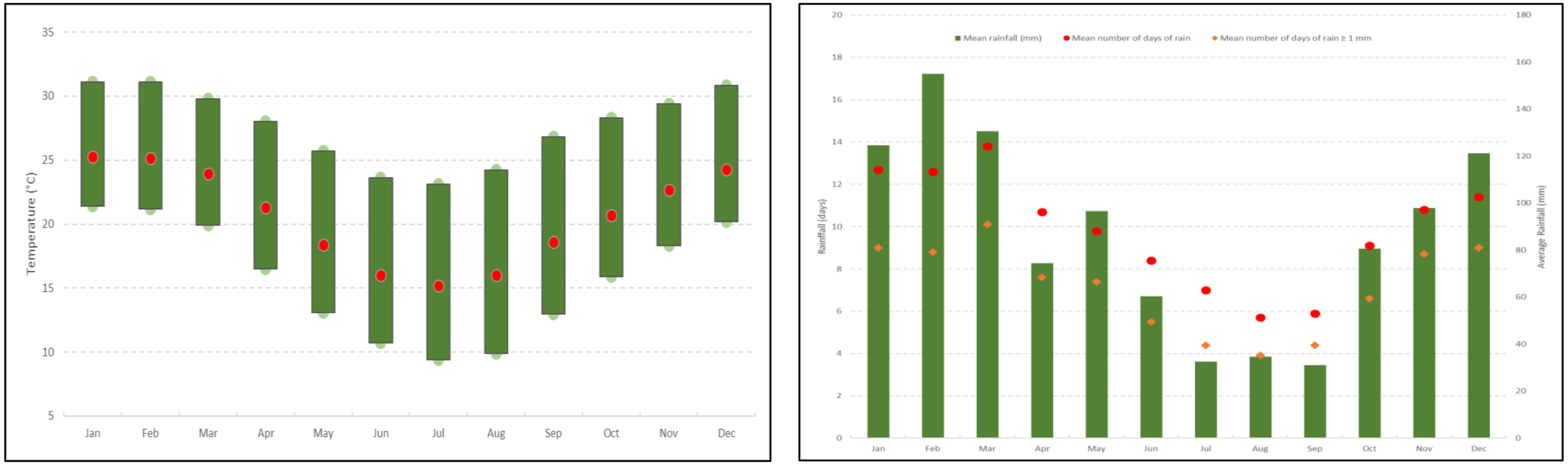
4.1 Terrain

Figure 4 illustrates the local topography, as obtained from Nasa Shuttle Radar Topography Mission (SRTM) 1-second (approximately 30 m) digital elevation model. The topography of the Subject Site and surrounds is around 25 - 30 m above sea level.

4.2 Climate

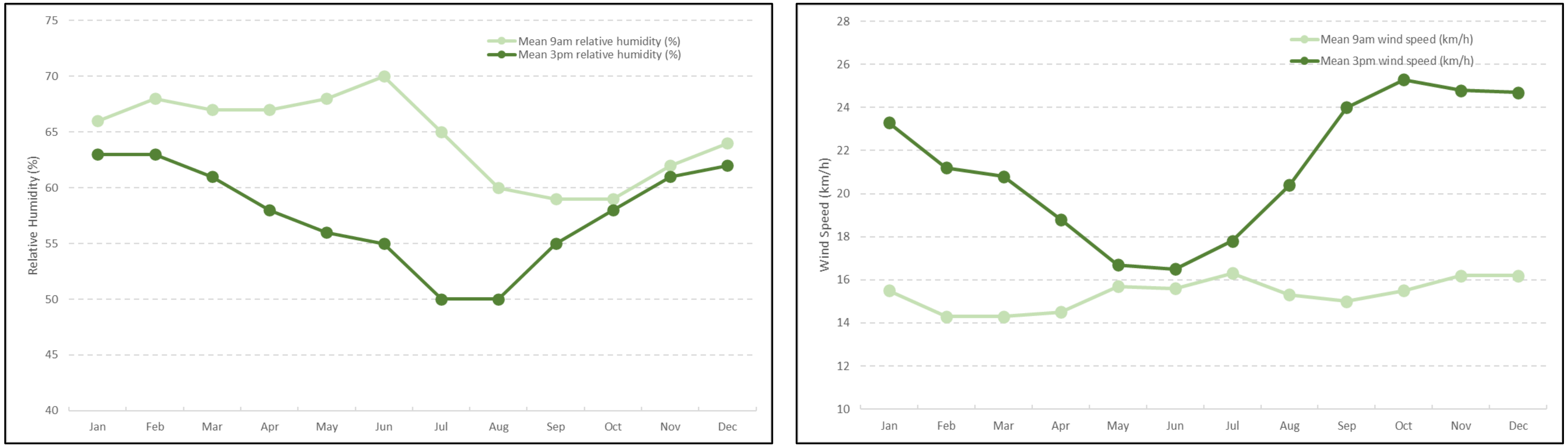
The Brisbane region has a sub-tropical climate influenced by tropical systems from the north and fluctuations in the high-pressure ridge to the south. The average annual maximum temperature is 27°C, whilst the annual average minimum is 13°C. Annual and seasonal average rainfall are variable, affected by local factors such as topography and vegetation, and broader scale weather patterns, such as the El Niño– Southern Oscillation. Most rainfall occurs in summer and autumn. Figure 5 presents a summary climatic condition for Brisbane Airport.

Figure 4: Surrounding Topography from SRTM v3 (Extracted from CALMET)



Average Temperature (Min, Max, Mean over 30-year Average)

Average Rainfall and Rainfall Days (30-year Average)



Relative Humidity (30-year Average)

Wind Speed (30-year Average)

Figure 5: Climatic Conditions (BOM Brisbane Airport)

5 REGULATORY REQUIREMENTS

5.1 Overview

This Section reviews the applicable criteria taking into consideration the Brisbane City Council Planning Scheme.

5.2 Industry Code

The Performance Outcomes (PO) 27 for the Industry Code are presented in Table 6.

Table 6: Performance Outcomes of the Industry Code

Performance Outcomes	Acceptable Outcomes
PO27 Development for indoor sport and recreation: a. is located, designed and constructed to achieve the air quality (planning) criteria in Table 9.3.12.3.B, odour criteria in Table 9.3.12.3.C and health risk criteria in Table 9.3.12.3.D; b. does not compromise the intended industrial function of land in the Industry zone, General industry B zone precinct and General industry C zone precinct, and Special industry zone. Note—An air quality impact report prepared in accordance with the Air quality planning scheme policy can assist in demonstrating achievement of this performance outcome.	AO27 Development for indoor sport and recreation is located no closer to an industrial use than the distance stated in Table 9.3.12.3.J.

5.3 Assessment Criteria

Where the Brisbane City Council City Plan does not have criteria for a pollutant, the Effects Screening Levels (ESL) have been applied. These limits are published by Texas Commission on Environmental Quality (TCEQ). The applicable criteria are presented in Table 7.

Table 7: Assessment Criteria

Pollutant	Averaging Period	Concentration ($\mu g/m^3$)	Source	Environmental Value
Odour	Annual	2.5	BCC City Plan 2014	Odour
1-butanol	1 hour	610	Texas ESL	Toxicity
	Annual	61	Texas ESL	Toxicity
1-methoxy-2-propanol	1 hour	3700	Texas ESL	Toxicity
	Annual	370	Texas ESL	Toxicity
2-butoxyethyl acetate	1 hour	330	Texas ESL	Toxicity
	Annual	33	Texas ESL	Toxicity
2-methoxy-1-methylethyl acetate	1 hour	2700	Texas ESL	Toxicity
	Annual	270	Texas ESL	Toxicity
Acetone	1 hour	22000	BCC City Plan 2014	Health and wellbeing
Dibutyltin dilaurate	1 hour	5.3	Texas ESL	Toxicity

Pollutant	Averaging Period	Concentration (µg/m^3)	Source	Environmental Value
	Annual	0.53	Texas ESL	Toxicity
Ethyl 3-ethoxypropionate	1 hour	270	Texas ESL	Toxicity
	Annual	27	Texas ESL	Toxicity
Ethyl acetate	1 hour	12100	BCC City Plan 2014	Odour
Ethylbenzene	1 hour	8000	BCC City Plan 2014	Health and wellbeing
Hexamethylene diisocyanate (HDI)	1 hour	8.1	Texas ESL	Toxicity
	Annual	0.55	Texas ESL	Toxicity
Toluene	1 hour	958	BCC City Plan 2014	Odour
	24 hours	4100	BCC City Plan 2014	Health and wellbeing
	Annual	410	BCC City Plan 2014	
Xylenes	24 hours	1200	BCC City Plan 2014	
	Annual	950	BCC City Plan 2014	
Ethanol	1 hour	2100	BCC City Plan 2014	Odour
Solvent naphtha (petroleum)	1 hour	3500	Texas ESL	Toxicity
	Annual	350	Texas ESL	Toxicity
Methyl ethyl ketone (MEK)	1 hour	3200	BCC City Plan 2014	Odour
Phosphoric acid	1 hour	10	Texas ESL	Toxicity
	Annual	1	Texas ESL	Toxicity
Carbon black	1 hour (99.9th)	50	NSW Approved Methods	Toxicity
Titanium(IV) dioxide	1 hour	50	Texas ESL	Toxicity
	Annual	5	Texas ESL	Toxicity
Isopropanol	1 hour	4920	Texas ESL	Toxicity
	Annual	492	Texas ESL	Toxicity
Bisphenol-A-(epichlorhydrin); epoxy resin	1 hour	Must Meet NAAQS	Texas ESL	Toxicity
	Annual		Texas ESL	Toxicity

It can be seen from Table 7 that bisphenol-A-(epichlorhydrin) epoxy resin, is identified as "Must Meet NAAQS." This reference relates to the United States National Ambient Air Quality Standards (NAAQS) for particulate matter.

For the purposes of this assessment, these compounds have been treated as particulate-bound emissions and assessed against the PM_{10} ambient air quality criteria. The maximum predicted concentrations for these compounds were summed and compared against the applicable PM_{10} standards, being 50 µg/m^3 for the 24-hour averaging period and 25 µg/m^3 for the annual averaging period.

6 EXISTING AIR ENVIRONMENT

To assess cumulative impacts, background air quality data has been obtained from the Department of Environment, Tourism, and Science (DETSI) for five years for the period 2021 – 2025. Table 8 presents the statistical background air quality data for PM_{10} from Rocklea monitoring station.

Table 8: Background Concentrations of PM_{10}

Compound	Averaging Period	Parameter	Concentration ($\mu g/m^3$)					
			2021	2022	2023	2024	2025	Modelled
PM_{10} (Rocklea)	1 hour	Maximum	143	73.5	95.1	79.8	363	-
	1 day	70th percentile	12.2	16.2	18.9	16.2	20.9	**20.9**
	1 year	Average	10.1	13.1	16.5	13.7	19.5	**19.5**

Toluene, and xylene were only measured at Springwood monitoring station. Monitoring ceased in 2020 as the long-term trends and averages are consistent from year to year. As such only the last three years of data was reviewed and summarised in Table 9.

Table 9: Background Concentrations of Volatile Compounds

Compound	Averaging Period	Parameter	Concentration ($\mu g/m^3$)			
			2018	2019	2020	Modelled
Xylenes	1 day	70th percentile	40.9	32.5	51.9	**51.9**
	1 year	Average	36.8	34.2	46.1	**46.1**
Toluene	1 hour	70th percentile	9.1	8.0	9.0	**9.1**
	1 day	70th percentile	9.1	7.8	8.9	**9.1**
	1 year	Average	8.7	7.1	8.3	**8.7**

7 METEROLOGICAL MODELLING METHODOLOGY

7.1 Introduction

Atmospheric dispersion modelling involves the mathematical simulation of the dispersion of air contaminants in the environment. The modelling utilises a range of information to estimate the dispersion of pollutants released from a source including:

- Meteorological data for surface and upper air winds, temperature, and pressure profiles, as well as humidity, rainfall, cloud cover and ceiling height information;
- Emissions parameters including source location and height, source dimensions and physical parameters (e.g., exit velocity and temperature) along with pollutant mass emission rates;
- Terrain elevations and land use both at the source and throughout the surrounding region; and
- The location, height, and width of any obstructions (such as buildings or other structures) that could significantly impact on the dispersion of the plume.

7.2 Meteorological Modelling

For the purpose of the assessment, meteorological modelling has been undertaken using TAPM (The Air Pollution Model) and CALMET to predict localised meteorological conditions. The meteorological data derived from these models have been used as an input for the CALPUFF dispersion modelling.

A site-specific meteorological dataset has been determined using the prognostic model TAPM. Prognostic models, such as TAPM, permit the development of localised meteorological datasets, based on synoptic weather conditions. The model predicts the regional flows important to dispersion, such as sea breezes and terrain induced flows, against a background of larger-scale meteorology provided by synoptic analyses.

The output of this model, when used with a diagnostic meteorological model, such as CALMET, provides a meteorological dataset suitable for introduction into the wind field results. This methodology is the recommended approach for the modelling of contaminant concentrations using CALMET[a].

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[a] TRC Environmental Corporation (March 2011) 'Generic Guidance and Optimum Model Settings for the CALPUFF Modelling System for Inclusion into the 'Approved Methods for the Modelling and Assessments of Air Pollutants in NSW, Australia' prepared on behalf of the NSW Office of Environment and Heritage

Table 10: Summary of Meteorological Modelling Parameter

Model	Aspect	Assigned Parameter
TAPM (v4.04)	Year Modelled	One full year - 2019 which is compared to long-term observations to demonstrate suitability. Observations from BOM Brisbane Airport and Brisbane City was included in TAPM model (refer to Appendix C).
	Centre Grid	27deg 25.0 min, 153 deg 1.0 min
	Domains Grid	35 x 35 x 25 grid points
	Nesting Spacing	30 km, 10 km, 3 km, and 1 km
	Databases	Default databases for sea temperature, terrain and land cover applied
CALMET (v 7.00)	Model Domain	30-km x 30-km grid (200 m grid intervals)
	Terrain Data	Nasa Shuttle Radar Topography Mission (SRTM) 1-second (approximately 30 m) digital elevation model
	Land Use	Default from USGS for 1 km spacing. Review of the land use was undertaken and updated based on recent aerial imagery at 50 m intervals.
	Vertical Layers	13 Layers – 0 m, 20 m, 40 m, 60 m, 80 m, 100 m, 160 m, 320 m, 640 m, 1,200 m, 2,000 m, 3,000 and 4,000 m
	TAPM Input	3D meteorological data (no-obs mode) was derived from the 1 km meteorological grid from TAPM used as initial guess field to predict meteorological conditions

7.3 Wind Speed Distribution and Frequency at Subject Site

Figure 6 presents the annual wind rose for the Subject Site for 2019 as generated by CALMET, illustrating the frequency of winds blowing from each direction and their associated wind speeds.

The annual wind rose indicates that the Subject Site experiences generally light winds, with an average wind speed of 1.44 m/s and calm conditions occurring 12.73% of the time. The relatively high proportion of calm conditions suggests that periods of limited atmospheric dispersion can occur, particularly during stable weather conditions.

The prevailing winds are predominantly from the southeast (SE) sector, which represents the most frequent wind direction throughout the year. Winds from the southeast also exhibit some of the highest wind speeds recorded at the site, with a noticeable proportion occurring in the 2.1–5.7 m/s range and occasional stronger winds exceeding 5.7 m/s. Secondary prevailing wind directions occur from the north-northwest (NNW) and west to west-northwest (W–WNW) sectors.

Overall, the wind regime is characterised by a dominant southeasterly flow, supplemented by less frequent winds from the northwestern and western sectors. Most winds occur at speeds below 5.7 m/s, with higher wind speeds occurring infrequently. This pattern is typical of locations influenced by both regional synoptic weather systems and local land-use or topographic effects, resulting in pollutant transport predominantly towards the northwest under prevailing conditions and towards the east and southeast during secondary wind regimes.

Atmospheric stability plays a critical role in determining how pollutants disperse in the atmosphere. It is influenced by variables such as vertical temperature gradients, solar radiation, wind speed, and time of day. Stability is classified into categories ranging from A (very unstable) to G (extremely stable), with Class A conditions promoting strong vertical mixing and efficient dispersion of emissions, while Class F and G indicate very stable conditions with limited vertical movement, often resulting in poor dispersion and higher ground-level concentrations. A detailed meteorological analysis of the dataset is provided in Appendix D.

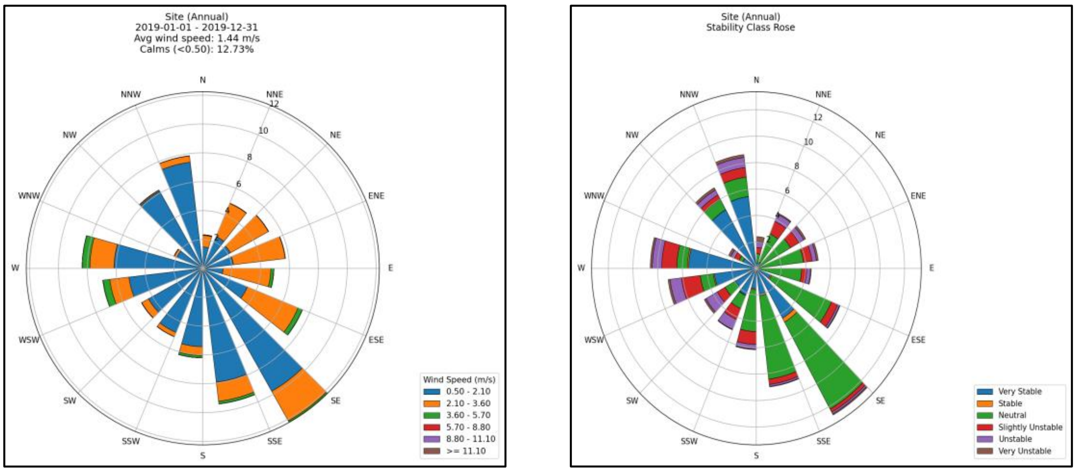


Figure 6: Predicted Annual Wind Rose and Stability Rose at Subject Site for 2019

8 DISPERSION MODELLING METHODOLOGY

8.1 CALPUFF Modelling

The CALPUFF modelling system treats emissions as a series of puffs. These puffs are then dispersed throughout the modelling area and allowed to grow and bend with spatial variations in meteorology. In doing so, the model can retain a memory of the plume's movement throughout a single hour and from one hour to the next while continuing to better approximate the effects of complex air flows.

CALPUFF utilises the meteorological processing and prediction model CALMET to provide three-dimensional wind field predictions for the area of interest. The final wind field developed by the model (for consideration by CALPUFF) includes an approximation of the effects of local topography, the effects of varying surface temperatures (as is observed in land and sea bodies) and surface roughness (resulting from varied land uses and vegetation cover in an area). The CALPUFF model can resolve complex terrain influences on local wind fields including consideration of katabatic flows and terrain blocking.

Post processing of modelled emissions is undertaken using the CALPOST package. This allows the rigorous analysis of pollutant predictions generated by the CALPUFF system. CALPOST is able to provide an analysis of predicted pollutant concentrations for a range of averaging periods from 1 hour to 1 year.

8.2 Gridded Receptors

The following additional gridded receptors were incorporated into the model, as outlined below:

- a computational grid covering an area of 6 km x 6 km was established with a 200 m resolution.
- nested grid located in the centre of all sources (501459, 696751) with a grid of 500 m at 20 m intervals.

8.3 Wake Effect

As air flows over physical structures, it generates aerodynamic wakes. These wakes can create significant turbulence and lead to downward mixing. When emissions originate from point sources in close proximity to these wakes, they can be drawn downward and recirculated within the sheltered region behind the wake. This process results in localised increases in pollutant concentrations and diminishes the extent of plume rise at a downwind distance. This phenomenon is referred to as "building downwash." In this assessment, the exhaust stack was screened for potential building wakes, where wakes were assumed to:

- extend 5 times the lesser of the projected structure width or height of the building; and
- extend to a height of 2.5 times the height of the structure.

8.4 Other Settings

For the purposes of the assessment, the air dispersion modelling has utilised the following settings for CALPUFF:

- Three-dimensional mode using meteorological data file from CALMET;
- ISC urban wind speed profile;

- No chemical transformation;
- No gaseous deposition;
- Transitional plume rise;
- Stack tip downwash for point sources;
- Partial plume penetration for point sources;
- Dispersion coefficients using Pasquill–Gifford coefficients or turbulence calculated from micro-meteorology;
- No adjustment of dispersion curves for roughness;
- Partial plume path adjustment method for terrain using default coefficients; and
- Building wakes were modelled using PRIME.

8.5 Assumptions and Limitations

The atmosphere constitutes an intricate physical system where the movement of air in a particular area depends on various factors. These factors include temperature, topography, land use, and larger-scale synoptic processes. Dispersion modelling is a technique employed to simulate the dispersion of air pollutants within the atmosphere through mathematical equations. To make these simulations feasible, model equations necessitate a degree of simplification due to the complexity of the processes involved, the available input data, limitations in processing time, and data storage constraints.

These simplifications inevitably compromise accuracy, which is particularly notable in certain meteorological conditions and for specific types of pollutant sources. For instance, predicting pollutant dispersion under low wind speed conditions (typically defined as less than one meter per second) or for sources that emit pollutants close to the ground and lack buoyancy poses challenges for most dispersion models. In response to these recognised limitations, model outputs tend to provide conservative estimates of pollutant concentrations at specific locations.

Consequently, the results of dispersion modelling provide indicative insights into the likely distribution of pollutant concentrations across the modelled area. When applied appropriately with reliable, site-specific input data, dispersion models can offer valuable estimates of the magnitude and spatial extent of air pollutant concentrations, including the potential locations of maximum impact. However, model outputs should not be interpreted as precise representations of pollutant concentrations at any specific location or point in time.

9 PREDICTED EMISSIONS

9.1 Overview

The results in this Section are presented as predicted concentrations are based on the following:

- current operations of Benga Designs as detailed during a site visit and subsequent correspondence;
- background concentrations as shown in section 6 where applicable; and
- predicted concentrations are presented at any receptor located within the Subject Site as detailed in Table 2 and Figure 2.

9.2 Maximum Predicted Results

Table 11 presents the maximum predicted concentrations, the relevant criteria, and the percentage of the applicable criterion for each pollutant and averaging period.

The dispersion modelling results indicate that all assessed pollutants comply with the adopted air quality and odour impact assessment criteria at all receptors across the Subject Site. Predicted ground level concentrations were generally a small fraction of the applicable criteria, demonstrating that emissions associated with the spray-painting activities will not result in adverse air quality impacts at the Subject Site.

The maximum predicted odour concentration was 0.21 OU 1-hour 99.5th percentile, compared to the adopted criterion of 2.5 OU 1-hour 99.5th percentile, representing approximately 8.6% of the criterion. This indicates that odour emissions from the spray-painting operations are expected to be well below levels likely to cause nuisance.

The highest relative speciated VOC impact was predicted for HDI, with a maximum 1-hour concentration of 1.9 µg/m^3 compared to the adopted criterion of 8.1 µg/m^3. This represents 23.8% of the applicable criterion and remains compliant with a substantial margin of safety. Annual HDI concentrations were also low, reaching only 0.019 µg/m^3 or 3.5% of the annual criterion.

Among the solvent compounds assessed, ethyl 3-ethoxypropionate produced the highest relative concentration, with a maximum 1-hour concentration of 16.1 µg/m^3, representing 6% of the adopted criterion. Toluene and xylenes were also identified as notable contributors due to their prevalence within the coating formulations; however, predicted concentrations remained low, with maximum annual concentrations corresponding to 2.2% and 4.9% of the relevant criteria, respectively. Predicted 24-hour xylene concentrations reached 53.6 µg/m^3, representing only 4.5% of the adopted criterion. Both toluene and xylene concentrations are driven by background concentrations.

The remaining compounds, including acetone, ethyl acetate, ethylbenzene, 1-butanol, 1-methoxy-2-propanol, 2-methoxy-1-methylethyl acetate, 2-butoxyethyl acetate and dibutyltin dilaurate, were all predicted to occur at concentrations less than approximately 1% of the relevant assessment criteria, indicating negligible contribution to overall air quality impacts.

Overall, the modelling demonstrates that emissions associated with the existing spray-painting operations are expected to comply with all applicable speciated VOCs and odour assessment criteria.

Table 11: Summary of Maximum Predicted GLC at Any Sensitive Receptor at Subject Site

Pollutant	Averaging Period	Maximum Predicted GLC ($\mu g/m^3$)	Criteria ($\mu g/m^3$)	% of Criteria
Odour	Annual	0.21	2.5	8.6%
1-butanol	1 hour (max)	4.5	610	0.7%
	Annual	0.04	61	<0.1%
1-methoxy-2-propanol	1 hour (max)	22.11	3700	0.6%
	Annual	0.22	370	<0.1%
2-butoxyethyl acetate	1 hour (max)	1.0	330	0.3%
	Annual	0.010	33	0.0%
2-methoxy-1-methylethyl acetate	1 hour (max)	22.1	2700	0.8%
	Annual	0.22	270	<0.1%
Acetone	1 hour (max)	10.5	22000	0.0%
Dibutyltin dilaurate	1 hour (max)	0.022	5.3	0.4%
	Annual	2.18 x10^{-4}	.53	<0.1%
Ethyl 3-ethoxypropionate	1 hour (max)	16.1	270	6.0%
	Annual	0.16	27	0.6%
Ethyl acetate	1 hour (max)	10.9	12100	0.09%
Ethylbenzene	1 hour (max)	7.3	8000	<0.1%
Hexamethylene diisocyanate	1 hour (max)	1.9	8.1	23.8%
	Annual	0.019	0.55	3.5%
Toluene[1]	1 hour (99.9th)	13.0	958	1.4%
	24 hours	10.1	4100	0.2%
	Annual	8.8	410	2.2%
Xylenes[1]	24 hours	53.6	1200	4.5%
	Annual	46.3	950	4.9%
Ethanol	1 hour (max)	3.4	2100	0.2%
Solvent (petroleum)	1 hour (max)	10.2	3500	0.3%
	Annual	0.1	350	<0.1%
Methyl ethyl ketone	1 hour (max)	4.2	3200	0.1%
Phosphoric acid	1 hour (max)	0.4	10	4.5%
	Annual	4.48 x10^{-3}	1	0.4%
Carbon black	1 hour (max)	0.4	50	0.9%
Titanium(IV) dioxide	1 hour (max)	4.2	50	8.36%
	Annual	0.0042	5	0.8%
Isopropanol	1 hour (max)	12.4	4920	0.3%
	Annual	0.1	492	<0.1%

[1] Including background concentrations (Table 9).

9.3 Particulate Results

Three particulate-bound compounds are assessed as particulate matter. These substances are non-volatile and associated with overspray particulates; therefore, they are evaluated collectively against particulate matter criteria rather than individual compound limits.

Table 12 presents the results of the cumulative PM_{10} concentration, including background concentrations, at any sensitive receptor; it can be seen that the predicted PM_{10} 24-hour and annual average concentrations are below the assessment criteria, and the predicted concentrations are driven by the background PM_{10} levels.

Table 12: Summary of Maximum PM_{10} GLC at Any Sensitive Receptor at Subject Site

Pollutant	Averaging Period	Maximum Predicted GLC ($\mu g/m^3$)	Criteria ($\mu g/m^3$)	% of Criteria
PM_{10} (HDI, bisphenol-A-(epichlorhydrin) epoxy resin, and dibutyltin dilaurate)	24 hours	21.0	50	42.1%
	Annual	19.5	25	78.1%

9.4 Predicted Pollutant Isopleths

The predicted ground level concentrations for Brisbane City Plan criteria are presented in Figure 7 to Figure 26. Due to the interpolation of the gridded results, there may be slight discrepancies with the predicted concentrations for discrete receptors in Table 11.

Figure 7: 1-Hour 99.5th percentile Odour GLC including Background Concentration (OU)

Figure 8: Maximum 1-Hour 99.9th Percentile Toluene Concentration including Background Concentrations (µg/m^3)

Figure 9: Maximum 24-Hour Xylene GLC including Background Concentration (µg/m^3)

Figure 10: Maximum 1-Hour Acetone Concentration (µg/m^3)

Figure 11: Maximum 1-Hour 1-butanol Concentration (µg/m^3)

Figure 12: Maximum 1-Hour 1-methoxy-2-propanol Concentration (µg/m^3)

Figure 13: Maximum 1-Hour Ethyl acetate Concentration (µg/m^3)

Figure 14: Maximum 1-Hour 2-butoxyethyl acetate Concentration (µg/m^3)

Figure 15: Maximum 1-Hour Ethylbenzene Concentration (µg/m^3)

Figure 16: Maximum 1-Hour 2-methoxy-1-methylethyl acetate Concentration (µg/m^3)

Figure 17: Maximum 1-Hour Dibutyltin dilaurate Concentration (µg/m^3)

Figure 18: Maximum 1-Hour Ethyl 3-ethoxypropionate Concentration (µg/m^3)

Figure 19: Maximum 1-Hour Hexamethylene diisocyanate Concentration (µg/m^3)

Figure 20: Maximum 1-Hour Ethanol Concentration (µg/m^3)

Figure 21: Maximum 1-Hour Solvent (petroleum) Concentration (µg/m^3)

Figure 22: Maximum 1-Hour MEK Concentration (µg/m^3)

Figure 23: Maximum 1-Hour Phosphoric Acid Concentration (µg/m^3)

Figure 24: Maximum 1-Hour Carbon Black Concentration ($\mu g/m^3$)

Figure 25: Maximum 1-Hour Titanium(IV) dioxide Concentration ($\mu g/m^3$)

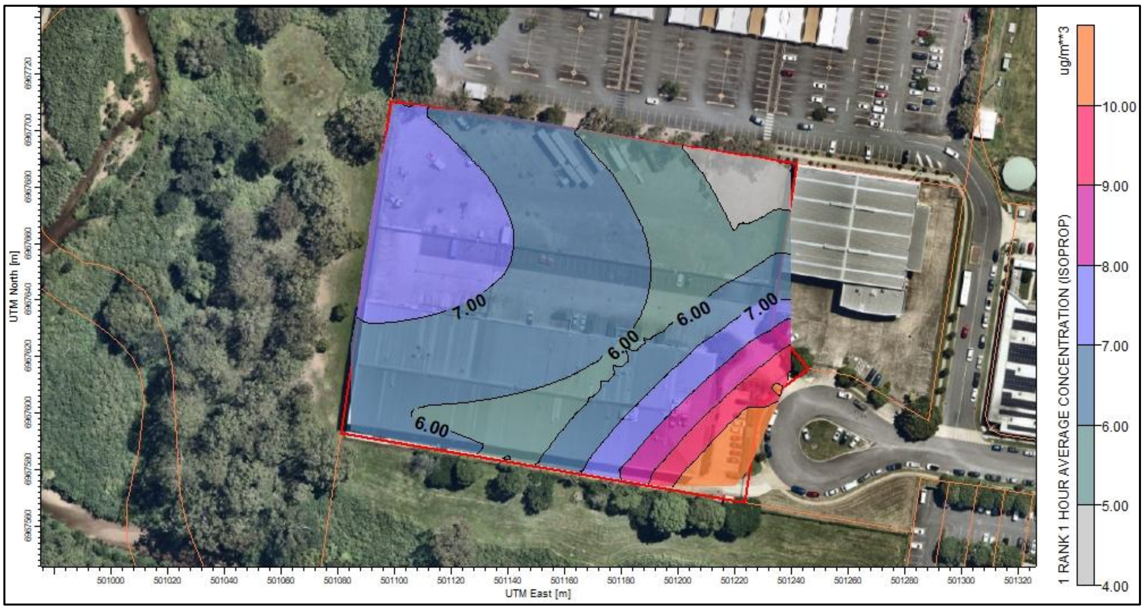


Figure 26: Maximum 1-Hour Isopropanol Concentration (µg/m^3)

10 CONCLUSIONS AND RECOMMENDATIONS

Assured Environmental (AE) was appointed by Consult Planning to carry out an air quality impact assessment for the nearby sign printing facility (Benga Designs) located at located at 18 Hayward Street. This facility operates a spray-paint booth as part of their operations.

The air quality assessment was carried out to assess the potential adverse impacts on the proposed indoor gym at 57 Hayward Street in accordance with Brisbane City Plan.

Dispersion modelling has been undertaken for activities associated with Benga Designs as provided and SDS for the products used.

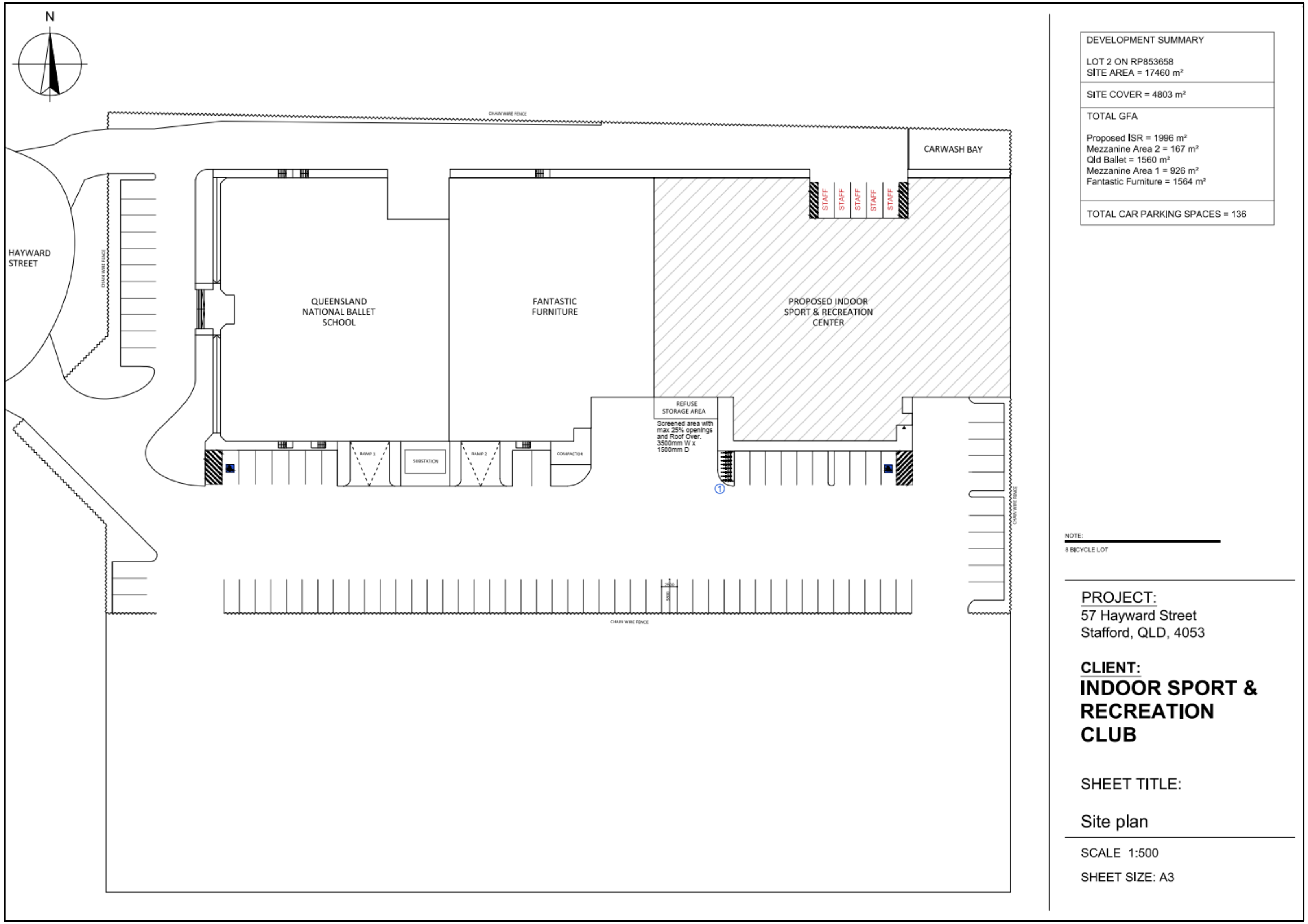
The dispersion modelling results indicate that all assessed pollutants comply with the adopted air quality and odour impact assessment criteria at all receptors across the Subject Site. Predicted ground level concentrations were generally a small fraction of the applicable criteria, demonstrating that emissions associated with the spray-painting activities will not result in adverse air quality impacts at the Subject Site.

APPENDIX A: SAFETY DATASHEETS REVIEWED

The table below provides a list of the safety datasheets provided by Benga Designs.

Product	Type
Colourthane C-Series Topcoat (mixed 2A:1B)	Topcoat
Super Etch Primer	Primer
Wattyl L743 Thinner	Thinner/reducer
Plus Accelerator 2	Accelerator/additive
Colourthane C-Series Part B	Hardener component
Spartan Acrylic White	Acrylic coating

APPENDIX B: PROPOSED PLANS



DEVELOPMENT SUMMARY

LOT 2 ON RP853658
SITE AREA = 17460 m²

SITE COVER = 4803 m²

TOTAL GFA

Proposed ISR = 1996 m²
Mezzanine Area 2 = 167 m²
Qld Ballet = 1560 m²
Mezzanine Area 1 = 926 m²
Fantastic Furniture = 1564 m²

TOTAL CAR PARKING SPACES = 136

NOTE:
8 BICYCLE LOT

PROJECT:
57 Hayward Street
Stafford, QLD, 4053

CLIENT:
INDOOR SPORT & RECREATION CLUB

SHEET TITLE:

Site plan

SCALE 1:500

SHEET SIZE: A3

LEGEND OF THE TAGS

▲ Entrance

GFA - 1996 m^2
TUA - 1785 m^2

PROJECT:
57 Hayward Street
Stafford, QLD, 4053

CLIENT:
INDOOR SPORT & RECREATION CLUB

SHEET TITLE:
Base plan

SCALE 1:150	SHEET SIZE: A2

APPENIDX C: METEOROLOGICAL VARIBILITY AND ASSESSMENT YEAR SELECTION

Methodology

There are two automatic weather stations (AWS) near the project area that are operated by the Bureau of Meteorology which has been assimilated into TAPM as outlined in Table 13.

Table 13: Summary of Meteorological Parameters Available at Stations Reviewed

Station	Distance to Subject Site	Years Reviewed	Meteorological Parameters Available				
			Wind Speed	Wind Direction	Air Temp.	Sea Level Pressure	Rainfall
BOM Brisbane Airport (040842)	11.5 km	2015 - 2024	Y	Y	Y	Y	Y
BOM Brisbane City (040913)	7.4 km		Y	Y	Y	Y	Y

A representative meteorological assessment was undertaken for Brisbane Airport and Brisbane City AWS due to its proximity to the Subject Site to identify the most suitable year for use in the dispersion modelling. The assessment compared each year against the long-term meteorological conditions recorded at the selected Bureau of Meteorology station. The purpose of the analysis was to identify a dataset that best represented typical long-term climatic conditions for the region.

The assessment considered key meteorological parameters including temperature, wind speed, wind direction, relative humidity, and rainfall. Monthly averages and rainfall totals for each year period were compared against the long-term average conditions using statistical correlation and ranking methods. Wind direction was assessed using vector-based analysis to ensure representative prevailing wind patterns were considered.

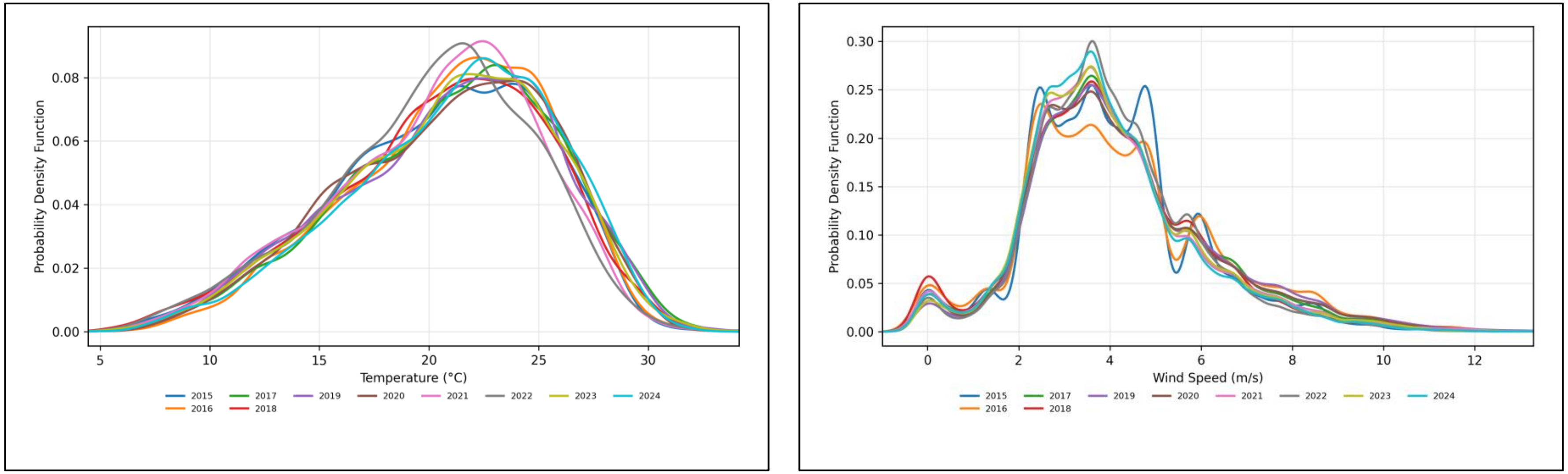
In addition to the statistical assessment, Southern Oscillation Index (SOI) data were reviewed to identify whether candidate periods were dominated by strong El Niño or La Niña conditions. Preference was given to periods exhibiting relatively neutral climatic behaviour where practicable, to ensure the selected meteorological dataset was broadly representative of long-term regional conditions.

The adopted representative year was therefore selected on the basis of:

- Consistency with long-term meteorological averages;
- Representative seasonal wind patterns;
- Representative rainfall conditions; and
- Absence of strongly anomalous climatic conditions where possible.

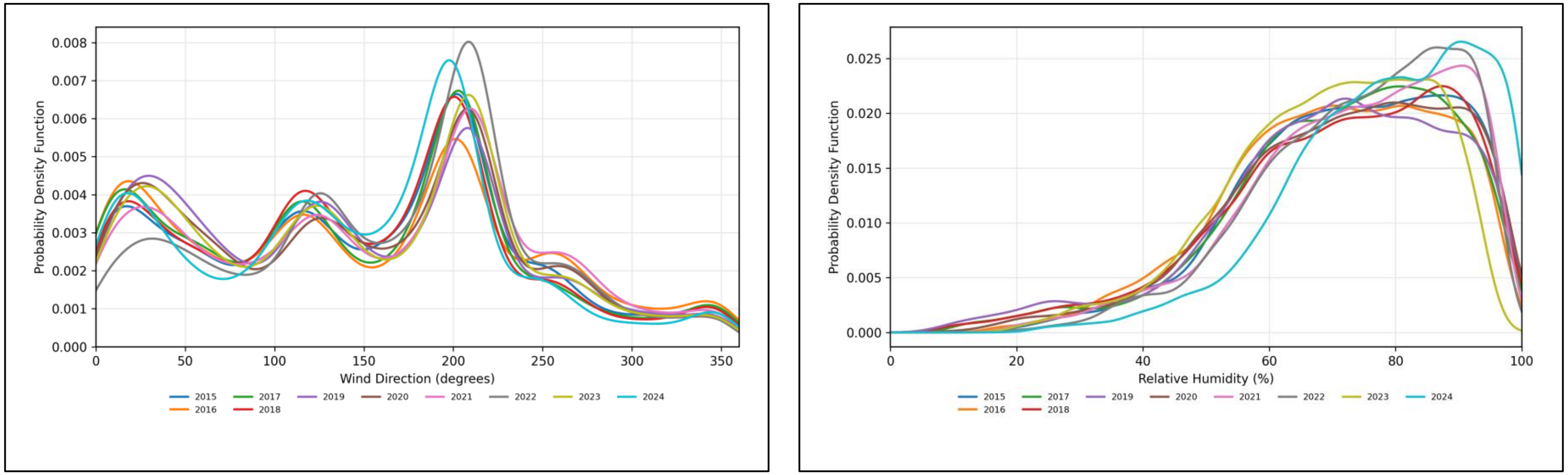
An overall ranking was then assigned to each year based on how closely it matched the long-term climatology across all assessed parameters. The year with the best overall agreement with the long-term dataset was adopted as the representative meteorological period for the assessment.

To most statistically representative year analysed at Brisbane Airport is 2019. The Probability Density Functions for each year assessed are shown in Figure 27.



Temperature

Wind Speed



Wind Direction

Relative Humidity

Figure 27: Analysis of Meteorological Parameters (2015 - 2024) for Brisbane Airport

APPENDIX D: METEOROLOGICAL MODEL PERFORMANCE AND SITE CONDITIONS

Model Performance

Model performance was evaluated using a suite of complementary statistical indicators consistent with established meteorological model evaluation guidance (e.g. US EPA, EEA, and Australian best practice dispersion modelling frameworks).

These metrics collectively assess:

- Index of Agreement (IOA);
- Root Mean Square Error (RMSE);
- Systematic over- or under-prediction (Bias); and
- Temporal pattern similarity (Correlation).

The overall performance statistics demonstrate strong agreement between CALMET predictions and BOM observations at Brisbane Airport as shown in Table 14.

Table 14: Statistical Analysis of Model Performance

Statistics		Bias	RSME	IoA	Correlation
Parameter	Performance Evaluation	0	Close to 0	Close to 1	Close to 1
Wind Speed	Benchmark	<±0.5 m/s	<2 m/s	>0.6	>0.6
	Model Performance	-0.25	0.45	0.98	0.98
Temperature	Benchmark	-	-	>0.8	
	Model Performance	0.19	2.4	0.91	0.89
Wind Direction	Benchmark	-	-	>0.8	-
	Model Performance	-	-	0.98	-
Statistics		**Min.**	**Mean**	**Max.**	**Std Dev.**
Wind Speed	BOM Observations	0	4.3	14.3	2.1
	Model (CALMET)	0	4.1	12.0	1.9
Temperature	BOM Observations	5.1	20.9	34.0	4.9
	Model (CALMET)	8.4	21.1	29.9	3.4
Wind Direction	BOM Observations	0	150	360	96.9
	Model (CALMET)	0	149	360	94.1

Review of the data has identified that the modelled and observed datasets are almost identical as the BOM station data was included into CALMET as a surface file. It is noted that the only visible differences are with wind direction; this is a result of BOM reporting wind direction in 10° intervals, whereas the modelling output is presented as 0.01°.

Collectively, these results demonstrate that CALMET provides a robust representation of wind speed, wind direction, and temperature at the Brisbane Airport station for 2019. The high correlations, strong IOA values, and good directional alignment support the suitability of the meteorological dataset for use in dispersion modelling applications.

Figure 28 presents a comparison of the 9 am, 3 pm and annual 2019 predicted and observed wind roses at BOM Brisbane Airport.

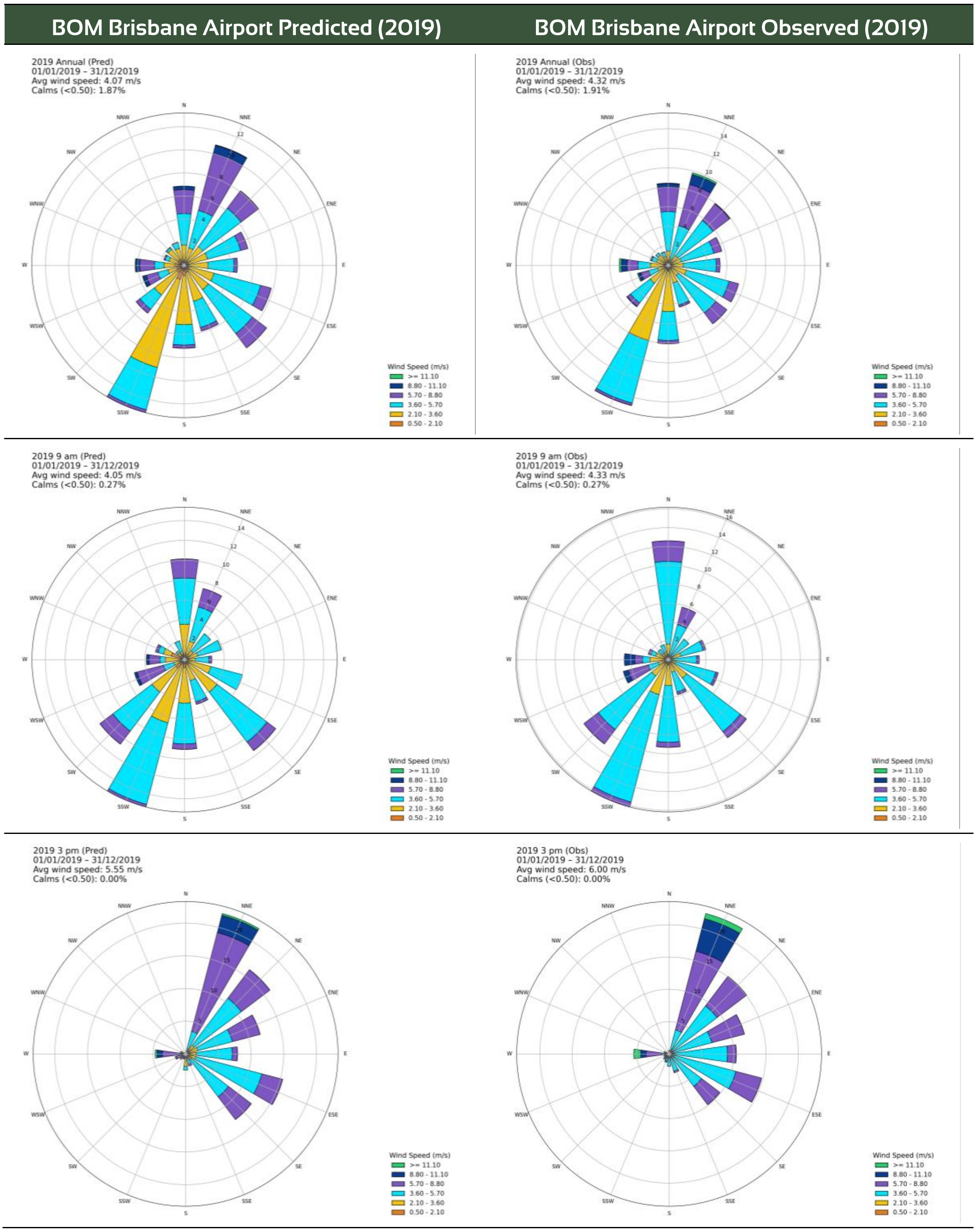


Figure 28: Comparison of Predicted (2019) and BOM Observed Wind Roses (2019)

Prognostic Dataset Review at Subject Site

This section provides an analysis of the prognostic meteorological dataset extracted from the CALMET model for 2019 at the Subject Site.

Predicted Atmospheric Stability (Coastal Setting)

The amount of turbulence in the ambient air has a major effect upon the rise and dispersion of emissions. In particular, the amount of turbulence in the atmosphere plays a key role in diffusion of an emitted plume in the air with stronger turbulence (increased instability) increasing the rate of diffusion. Where the atmosphere exhibits weak turbulence (increased stability), downwind contaminant concentrations can be expected to increase due to the limited diffusion.

Figure 29 presents the diurnal variability in atmospheric stability identified in the predicted meteorological dataset. In contrast to inland locations where strong daytime convective instability typically develops as a result of land surface heating, the predicted stability regime at this seaside site is characterised by a predominance of neutral atmospheric conditions throughout the daytime period. This behaviour reflects the influence of maritime air masses and the frequent development of onshore sea-breeze flows, which advect relatively cool marine air across the land surface and suppress the generation of strong buoyancy-driven turbulence. As a result, while weakly unstable conditions are predicted to occur intermittently during the late morning to early afternoon period, neutral conditions remain dominant for much of the day.

During the night-time and early morning hours, the dataset indicates an increased frequency of stable and very stable atmospheric conditions. These conditions are associated with reduced surface heat flux and the development of shallow temperature inversions under light wind conditions following the decay of daytime mixing.

Monin-Obukhov Length

The Monin-Obukhov Length represents a parameter (with dimension of length) which provides a relationship between parameters characterising dynamic, thermal, and buoyant processes. The parameter, first described by Obukhov in 1946, is the characteristic height scale of the dynamic sub-layer of the atmosphere and is positive for stable stratifications and negative for unstable stratifications.

Figure 29 presents a graphical representation of the reciprocal of the Monin-Obukhov length (1/L) for the 2019 prognostic (CALMET) dataset. In this figure, neutral stability conditions have the 1/L value of zero (0), stable conditions have positive values of 1/L and unstable conditions have negative values of 1/L. The more positive 1/L value, the more stable the atmosphere is assumed to be by the model. Similarly, the more negative 1/L becomes, the more unstable the atmosphere is assumed to be by the model.

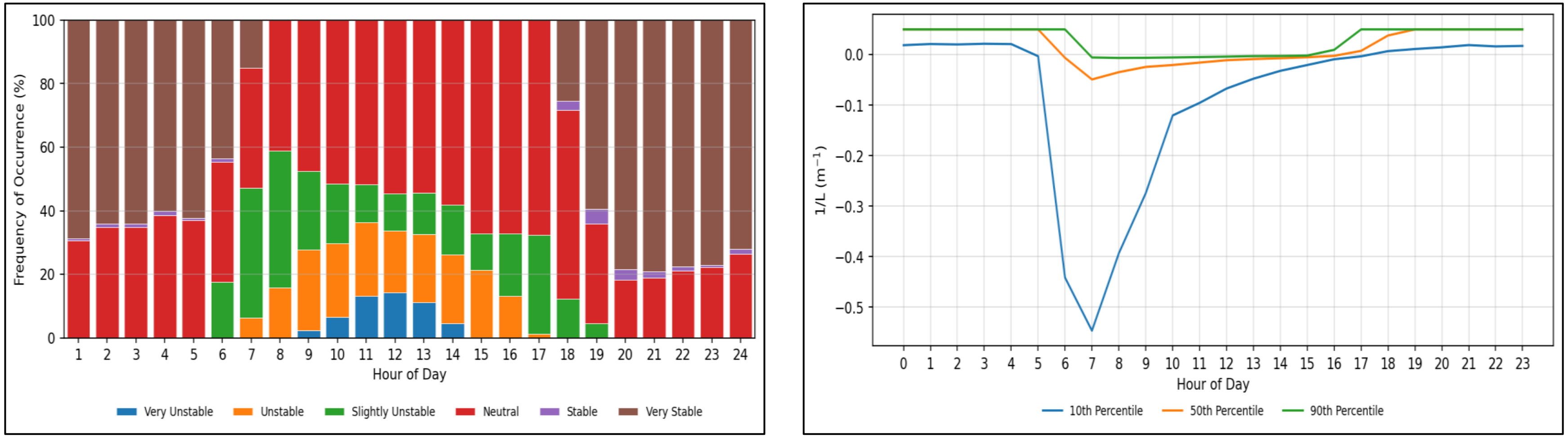
Consistent with the predicted stability class distribution, the diurnal variation in 1/L indicates that daytime conditions are predominantly neutral to weakly unstable, with only limited development of strongly convective instability. This behaviour is typical of coastal environments where the advection of cooler marine air associated with sea-breeze circulation suppresses surface sensible heat flux and constrains the development of convective turbulence within the atmospheric boundary layer. Overnight periods are characterised by positive values of 1/L, indicating the presence of stable stratification associated with reduced turbulence and limited vertical mixing.

Predicted Atmospheric Mixing Height

Figure 29 presents an illustration of diurnal variations in maximum and average mixing heights predicted by CALMET at the Subject Site across the 2019 prognostic meteorological dataset. As expected, an increase in mixing height during the morning is apparent, arising due to the onset of vertical mixing following sunrise. Maximum mixing heights generally occur in the mid to late afternoon, due to the dissipation of ground-based temperature inversions and growth of the convective mixing layer. The highest maximum mixing height for the Subject Site occurs during the late afternoon period.

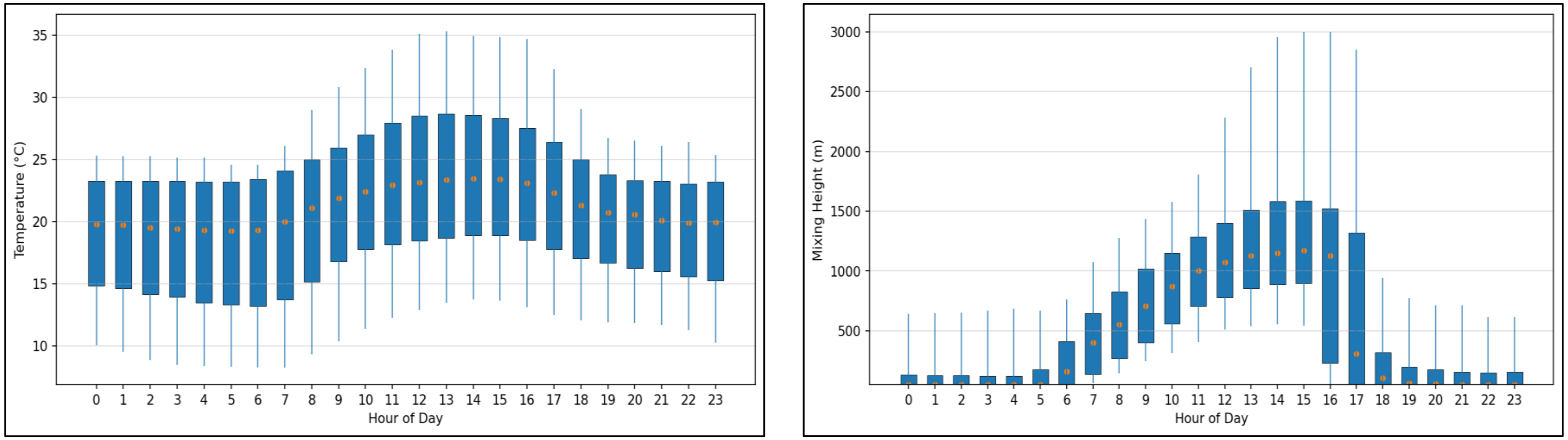
Temperature

Figure 29 presents an illustration of diurnal variations in maximum and average temperatures predicted by CALMET at the Subject Site across the 2019 prognostic meteorological dataset.



Annual Atmospheric Stability by Hour

Monin Obukhov Length by Hour



Temperature by Hour

Mixing Height by Hour

Figure 29: Meteorological Analysis at Subject Site