



**Landcom**

# Hills Showground Station Precinct Concept Design Air Quality Assessment

October 2019

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# 1. Introduction

## 1.1 Overview

A Plan for Growing Sydney provides a strategic framework to guide land use and planning decisions to accommodate Sydney's future population growth over the next 20 years. The Plan identified the Sydney Metro Northwest, including the adjacent Hills Showground Station Precinct as a key growth area.

This report has been prepared for Landcom on behalf of Sydney Metro to support a State Significant Development Application (SSDA).

The concept for which approval is sought (the 'Concept Proposal') is for a high-density mixed-use precinct with a new public park and plaza, and associated facilities on land located within the Hills Showground Station Precinct (the 'Site') on development lots (Lot 53, Lot 55 and 56 in DP 1253217) (the 'DA Area') (Refer Figure 2-1).

This air quality assessment assesses the likely air quality impacts on the Hills Showground Station Precinct and provides relevant air quality design mitigation to be considered.

## 1.2 Scope and limitations

GHD has undertaken the following works as part of this air quality assessment:

- A review of all relevant information in the local area was conducted including Office of Environmental and Heritage (OEH) air quality monitoring data and any significant existing sources of localised emissions, road traffic emissions and any expected rail emissions.
- The relevant criteria relating to air quality was outlined as per the Approved Methods for the Modelling and Assessment of Air Pollutants in NSW (EPA, 2016).
- Based on the information provided in the EIS of the Sydney Metro North West Rail Link (2012) and preliminary assessment, the likely air quality impacts on the proposed sensitive receivers (residential, commercial and industrial) in the precinct have been assessed.
- High level (in-principle) recommendations for building locations and design were provided to minimise air quality impacts.

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*Investigations undertaken in respect of this report are constrained by the particular site conditions, such as the location of buildings, services and vegetation. As a result, not all relevant site features and conditions may have been identified in this report.*

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### 1.3 Structure of this report

The structure of the report is outlined below:

- **Section 1 – Introduction:** This section introduces the assessment.
- **Section 2 – The project:** This section describes the project and location.
- **Section 3 – Existing environment:** This section describes the existing environmental characteristics of the site relevant to the air quality assessment.
- **Section 4 – Air quality criteria:** This section provides an overview of relevant air quality criteria.
- **Section 5 – Air quality assessment:** This section outlines the predicted air emissions and impacts on the project.
- **Section 6 – Recommendations:** This section outlines high level recommendations for the project regarding air quality.
- **Section 6 – Conclusions:** This section presents a summary of the air quality findings, sets out the principal conclusions and provides an overview of the proposed air quality mitigation measures to be undertaken during the project.

### 1.4 Assumptions

The following assumptions were relied upon in the air quality assessment:

- Air quality emissions and impacts for road and rail were taken from the Sydney Metro North West Rail Link (NWRL) Environmental Impact Statement (EIS) Stage 2 chapter 19 air quality assessment (2012). The NWRL EIS assessed the impacts from road and rail sources on the surrounding land (this land is the Hills Showground Precinct)
- For the Sydney Metro Northwest State Significant Infrastructure applications, air quality was not identified as a key issue in the SEARs for either Environmental Impact Statement (EIS) 1 or EIS 2 and therefore there were no specialist studies undertaken for the air quality. Likewise, no air quality monitoring was required during construction, so there are no existing measurements from around the stations.
- Traffic volumes and composition on Showground Road and Carrington Road provided by SCT Consulting
- Preliminary concept plan designs have been provided to GHD by Cox Architecture

## 2. The project

### 2.1 Overview

The NSW Government and Sydney Metro have finalised the first stage of Australia's biggest public transport project that saw the commencement of new metro services in Sydney's northwest in May 2019.

Under the Sydney Metro Northwest (SMNW) Places Program, Landcom and Sydney Metro are working collaboratively with the Department of Planning, Industry and Environment, local councils, other government organisations and key stakeholders to develop the long-term vision and delivery program to guide the redevelopment and urban renewal of surplus government owned or controlled land around new SMNW station precincts.

SMNW Places Program will deliver vibrant and integrated precincts surrounding the new metro station that will facilitate the renewal and delivery of a greater supply and diversity of housing, new employment opportunities and new public and community facilities.

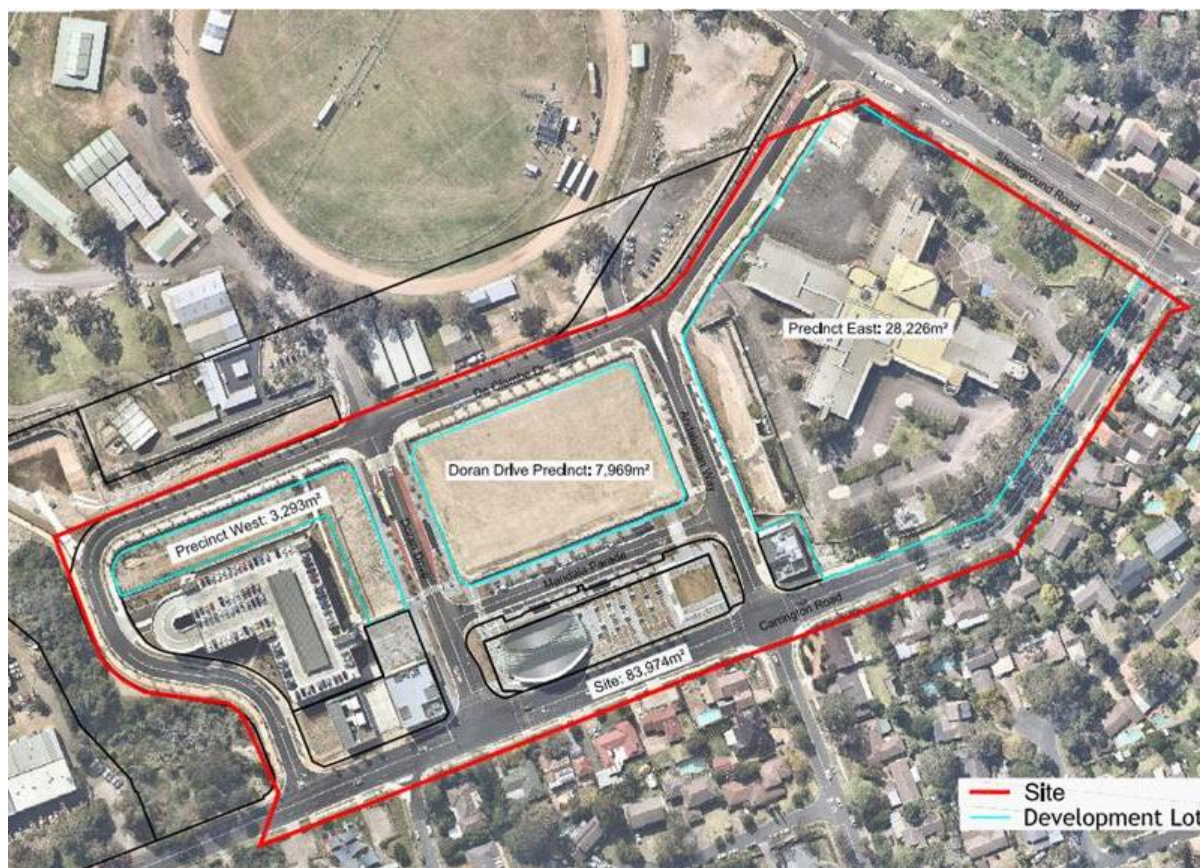
### 2.2 Project description

The term 'the Site' reflects the Hills Showground Station Precinct boundary identified in the SRDP SEPP and includes the areas detailed in Table 2-1 and illustrated in Figure 2-1. The Site has a total area of 8.4 hectares.

**Table 2-1 Hills Showground Station Precinct**

Existing use	Legal description	Address
Sydney Metro commuter carpark and plaza	Lot 52 1253217	3 De Clambe Drive, Castle Hill
Development Lot – Hills Showground Precinct West	Lot 53 DP 1253217	5 De Clambe Drive, Castle Hill
Development Lot – Doran Drive Precinct	Lot 55 DP 1253217	2 Mandala Parade, Castle Hill
Development Lot – Hills Showground Precinct East	Lot 56 DP 1253217	3 Andalusian Way, Castle Hill
Hills Showground Station Box and service facility boxes	Lot 54 & Lot 50 1253217	1 Mandala Parade, Castle Hill
Mandala Parade, De Clambe Drive, Doran Drive, Andalusian Way	N/A	N/A





**Figure 2-1 The Hills Showground Station Precinct (The Site) Source: Cox Architecture 2019**

The eastern part of the Site (Hills Showground Precinct East – Lot 56 DP 1253217) currently contains the former Council administration building and associated parking and landscaping. It was being used as a Sydney Metro’s construction site office but is proposed to be demolished by way of a separate DA (304/2020/LA) currently under consideration by Council.

The western part of the Site contains the recently opened Hills Showground Metro Station, plaza and commuter car park. The remainder was cleared to create the two development lots (Lots 53 - Hills Showground Precinct West and Lot 55 - Doran Drive Precinct, DP 1253217) and the roads listed in the table above.

Former development on the western part of the Site consisted of The Hills Entertainment Centre which included an Auditorium and Council’s works depot that were demolished to make way for the metro.

The Site is bordered by the following:

- North and northwest – De Clambe Drive with a drainage basin Castle Hill and The Castle Hill Showground further north
- West – De Clambe Drive and Cattai Creek riparian zone with commercial/industrial warehouses further west
- South to southeast – Carrington Road across which are low density residential developments, a child care and medical/physiotherapy
- East – Showground Road across which are low density residential development.

The Concept Proposal comprises residential and non-residential land uses and building envelopes of varying heights from four (13 m) to up to twenty storeys (68 m). The proposal also includes a new road, landscaping, services and the provision of publicly accessible open space in the form of Doran Drive Plaza and a park. An indicative yield of up to 1,900 dwellings is anticipated to be provided by the proposal.

More specifically, the Concept Proposal comprises:

- Total gross floor area (GFA) of 175,796 m<sup>2</sup> across all three development lots
- A maximum residential GFA of 169,096 m<sup>2</sup> equating for up to 1,900 dwellings including a minimum of five percent for affordable housing
- Maximum GFA for non-residential uses of 13,600 m<sup>2</sup>
- Doran Drive Plaza – minimum of 1,400 m<sup>2</sup>
- A new public park to be referred to as Precinct East Park – minimum of 3,500 m<sup>2</sup>
- Building envelopes, and allocation of GFA to the three development lots
- Provision of car parking up to a maximum of 2,291 car spaces and bicycle parking in accordance with The Hills Shire Council DCP
- Strategies for utilities and services provision, managing stormwater and drainage, achievement of ecologically sustainable development (ESD) and design excellence
- Civil plan addressing the timing of future subdivision, construction, release and development of land
- Concept principal subdivision of development Lot 56 DP 1253217 (Hills Showground Precinct East) into future major lots, public domain areas and roads.

No building or construction works are proposed to be undertaken as part of this Concept Proposal. Once the SSDA is approved, the successful purchasers of the development precincts and/or lots from Sydney Metro, will be responsible for submitting subsequent DAs for the design and construction of the buildings and public domain areas in accordance with the approved Concept.



## 3. Existing environment

### 3.1 Existing air quality

#### 3.1.1 Nearby emission sources

The National Pollution Inventory (NPI) (Australian Government, Department of the Environment and Energy) provides public information about the emissions in specific regions in Australia. The NPI is implemented and enforced by the NSW EPA. The regulation requires industrial facilities in NSW to report the types and amount of certain substances being emitted. It is then collated and uploaded in the NPI database.

A review of the NPI database for the most recent reporting period (2017/2018 year) was undertaken to identify significant sources of air quality emissions in the surrounding area. Two facilities within a 5 km radius of the project site were identified. The name, distance from proposal and pollutants emitted from each facility are provided in Table 3-1.

**Table 3-1 Nearby polluting facilities (NPI database)**

Facility	Air quality pollutant emissions	Approximate distance from proposal
Castle Hill Sewage Treatment Plant	Ammonia	1.5 km North of proposal
HURD HAULAGE PTY LTD, Hy-tec Yarrabee Road Quarry	PM <sub>10</sub> , PM <sub>2.5</sub> , CO, VOC, NO <sub>2</sub> , Boron & compounds, Chromium (III) compounds, Copper & compounds, Fluoride compounds, Manganese & compounds, Nickel & compounds, PAH, SO <sub>2</sub> , Zinc and compounds	4.7 km South of proposal

#### 3.1.2 Background air quality

The NSW Office of Environmental Heritage (OEH) operates ambient air quality monitoring stations in selected areas around NSW. The nearest stations to the site are the Macquarie Park and Rouse Hill. Rouse Hill only commenced operating in June 2019 and it does not contain a long enough dataset for use in an air quality assessment.

Background pollutant concentrations at Macquarie Park for the most recent complete calendar year (01/01/2018 – 01/01/2019) are provided in Table 3-2. 90<sup>th</sup> percentile background air quality concentrations were adopted for this assessment as suggested by the Tool for Roadside Air Quality (TRAQ). Monitoring data from the Macquarie Park OEH station found the average PM<sub>2.5</sub><sup>1</sup> level to be 6.96 µg/m<sup>3</sup> and PM<sub>10</sub><sup>2</sup> to be 17.22 µg/m<sup>3</sup> (a ratio of about 0.4). Based on previous guidance from EPA (27 March 2018), GHD has assumed a conservative ratio of PM<sub>2.5</sub> to PM<sub>10</sub> of 0.5 for emissions in this assessment.

<sup>1</sup> Particulate matter less than 2.5 µm in aerodynamic equivalent diameter

<sup>2</sup> Particulate matter less than 10 µm in aerodynamic equivalent diameter

**Table 3-2 Background air quality - Macquarie Park OEH station**

Pollutant	Averaging period	90 <sup>th</sup> percentile concentration
PM <sub>10</sub> (µg/m <sup>3</sup> )	24 hour	26.8
	Annual	17.2
PM <sub>2.5</sub> (µg/m <sup>3</sup> )	24 hour	11.0
	Annual	7.0
CO (mg/m <sup>3</sup> )	1 hour	0.3
	8 hour	0.3
NO <sub>2</sub> (µg/m <sup>3</sup> )	1 hour	24.4
	Annual	11.3

## 4. Air quality criteria

### 4.1 Legislative and policy context to the assessment

The relevant legislation and government guidance for the air quality assessment are:

- *Protection of the Environment Operations Act 1997*
- Protection of the Environment Operations (Clean Air) Regulation 2010
- Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales (EPA, 2016) (Approved Methods)

The Protection of the Environment Operations (POEO) Act 1997 provides the statutory framework for managing pollution in NSW, including the procedures for issuing licences for environmental protection on aspects such as waste, air, water and noise pollution control.

The Approved Methods lists the statutory methods for modelling and assessing emissions of air pollutants from stationary sources in NSW. It considers the above-mentioned legislation and outlines pollutant assessment criteria.

The Development Near Rail Corridors and Busy Roads – Interim Guideline (DEP, 2008) provides some guidance on when air quality should be a design consideration and what design considerations to include.

### 4.2 Project impact assessment criteria

Assessment criteria have been set based on those outlined in the Approved Methods. These criteria should be met at existing or future off-site sensitive receptors. The criteria are used to assess cumulative impacts, where the predicted impact of the project (incremental) is added to the existing levels (background) in order to assess the total air quality impact. To determine the level of air quality impacts on the proposal, cumulative emissions from sources in the area must be assessed against the assessment criteria as shown in Table 4-1. The 100<sup>th</sup> percentile concentrations are to be used as this is a screening level assessment.

**Table 4-1 Air quality impact assessment criteria**

Pollutant	Averaging period	Percentile	Assessment criteria (µg/m <sup>3</sup> )
TSP (total suspended particulates)	Annual	100th	90
PM <sub>10</sub>	24 hour	100th	50
	Annual	100th	25
PM <sub>2.5</sub>	24 hour	100th	25
	Annual	100th	8
CO	1 hour	100th	30000
	8 hour	100th	10000
NO <sub>2</sub>	1 hour	100th	246
	Annual	100th	62
SO <sub>2</sub>	1 hour	100th	570
	24 hour	100th	228
	Annual	100th	60

## 5. Air quality assessment

An air quality assessment is needed to demonstrate that the concentrations of air pollutants at the Hills Showground Station Precinct meet the relevant NSW objectives. Air emissions from local road, rail and industry have the potential to negatively impact the air quality environment of the site.

Air quality impacts on sensitive receptors adjacent to the rail line (including Hills Showground Precinct) were assessed through a review of the Sydney Metro North West Rail Link (formerly known as North West Rail Link (NWRL) (SMNW) Environmental Impact Statement (EIS Stage 2) and a desktop review of nearby existing emissions sources. Other sources of emissions to air considered in the assessment included traffic on local roads and industrial sources.

### 5.1 Emissions assessment

Emissions sources with potential to impact receptors within the Hills Showground Precinct include:

- Rail emissions from SMNW train movements
- Local industrial activities
- Road vehicle emissions

### 5.2 Rail emissions

The NWRL EIS (Stage 2 chapter 19 air quality assessment) assessed the impacts from train movements on nearby sensitive receptors. Particulate matter emissions from wheel and brake actions, as well as entrainment of surface particles emissions are deemed minor (Parsons Brinckerhoff, 2012).

The NWRL EIS concluded that the proposed design and positioning of air vents, car parks and 'kiss and ride' facilities will reduce the likelihood of air quality impacts as a result of the operation of the NWRL. The EIS states that station air ventilation shafts would be located away from sensitive receptors to reduce unnecessary impacts.

The Hills Showground Station is underground, and the trains operate in tunnels at the Precinct location meaning any significant emissions from its operation in this area are not anticipated.

The Tallawong Stabling Facility would be used for train stabling and maintenance activities. The Tallawong Stabling Facility is located approximately 8.5 km northwest of the proposal.

The NWRL EIS found that impacts from train movements are minor. The trains at the Precinct operating underground will reduce these potential impacts even more and no adverse air quality impacts from rail emissions are expected on the Hills Showground Station Precinct.

### 5.3 Local industrial emissions

Australian industrial facilities that meet the reporting criteria are required by law to report annually to the National Pollutant Inventory (NPI). The NPI allows transparency to determine the emissions and likely air quality impacts from industrial activities in the area surrounding Hills Showground Precinct. Local industrial air quality emitting facilities were identified in Table 3-1. These facilities are located over 1.5 km from the proposal and pollutants from these sites are not expected to impact on the proposal due to low levels of emissions and the distance.

These sites operate in accordance with their Environmental Protection Licence (EPL's). EPL's are issued and managed by the EPA and include air quality limits to manage air quality impacts

from industrial sources. Assuming the facilities maintain compliance with their EPL, no adverse air quality impacts are expected on the Hills Showground Station Precinct.

The assessment considers cumulative impacts in the area which includes local emission sources at background air quality monitoring stations.

## 5.4 Road emissions modelling

### 5.4.1 Overview and assumptions

Road emissions have been assessed from Carrington Road and Showground Road only. Traffic emissions from other roads within and surrounding the development are not included in the assessment due to low anticipated traffic levels.

In order to determine key air pollutants from Showground Road and Carrington Road, which are adjacent the Hills Showground Precinct, GHD used the Roads and Maritime assessment tool called Tool for Roadside Air Quality (TRAQ). TRAQ assesses the potential air quality impacts from vehicles using a new or existing roadway. TRAQ is a first pass screening assessment to estimate pollutant emission rates and concentrations due to road traffic. Worst case Peak (PM) traffic volume forecasted to 2031 includes background traffic as well as traffic from the proposed development (SCT Consulting, 2019). The vehicle fleet database year used was 2026 and is as far in the future that is available in the model. The model season as worst-case assumes worst case meteorology occurring all year, if it that is unlikely to occur.

The inputs used in the TRAQ model are summarised in Table 5-1.

**Table 5-1 TRAQ modelling assumptions**

Parameter	Showground Road	Carrington Road
Traffic speed	40 km/hr	40 km/hr
Modelled traffic year	2031	2031
Traffic volume	3,330 veh/hr	1,840 veh/hr
Number of lanes	4	2
Vehicle fleet database	2026	2026
Local land use	High rise	High rise
Season	Worst-case	Worst-case

### 5.4.2 Buildings assessed

Preliminary concept plan designs have been provided to GHD by Cox Architecture. The plans used in this assessment are provided in Appendix A. The building locations have been reviewed in order to determine the setback distances from roads included in the assessment.

The nearest habitable room from Showground Road is 10.5 m from the road and the nearest building envelope is 7.5 m. It is assumed that the difference is a balcony (3 m wide) which faces the road.

The nearest habitable room from Carrington Road is 13 m from the road and the nearest building envelope is 10 m. It is assumed that the difference is a balcony (3 m wide) which faces the road.



### 5.4.3 TRAQ modelling results

Results of air quality modelling for Carrington Road are shown in Table 5-2. The screening level modelling, which is conservative, predicts no exceedances of the applicable criteria. All proposed balconies and habitable spaces facing Carrington Road are more than 10 m from the roadway.

**Table 5-2 TRAQ screening model results – Carrington Road**

Pollutant and averaging period	Predicted impact			Assessment criteria
	Incremental (10 m from roadway)	Background	Cumulative	
Maximum 1 hour average CO concentrations (mg/m <sup>3</sup> )	0*	0.3	0.3	30
Maximum 8 hour average CO concentrations (mg/m <sup>3</sup> )	0*	0.3	0.3	10
Maximum 1 hour average NO <sub>2</sub> concentrations (µg/m <sup>3</sup> )	7.2	32.0	39.2	246
Annual average NO <sub>2</sub> concentrations (µg/m <sup>3</sup> )	1.4	15.0	16.4	62
Maximum 24 hour average PM <sub>10</sub> concentrations (µg/m <sup>3</sup> )	4.8	26.8	31.6	50
Annual average PM <sub>10</sub> concentrations (µg/m <sup>3</sup> )	1.9	17.2	19.1	25
Maximum 24 hour average PM <sub>2.5</sub> concentrations (µg/m <sup>3</sup> )	2.4	11.0	13.4	25
Annual average PM <sub>2.5</sub> concentrations (µg/m <sup>3</sup> )	0.95	7.0	7.95	8

\*the TRAQ model rounds to 1 decimal place. Values lower than 0.05 round to zero.

Results of air quality modelling for Showground Road are shown in Table 5-3. Predicted PM<sub>10</sub> and PM<sub>2.5</sub> levels are characterised by relatively high background and lower site specific (incremental) concentrations. The predicted annual PM<sub>2.5</sub> concentration (at 10 m from the roadway) exceeds the assessment criteria and is discussed in more detail below.

**Table 5-3 TRAQ screening model results – Showground Road**

Pollutant and averaging period	Predicted impact			Assessment criteria
	Incremental (10 m from roadway)	Background	Cumulative	
Maximum 1 hour average CO concentrations (mg/m <sup>3</sup> )	0.1	0.3	0.4	30
Maximum 8 hour average CO concentrations (mg/m <sup>3</sup> )	0.1	0.3	0.4	10
Maximum 1 hour average NO <sub>2</sub> concentrations (µg/m <sup>3</sup> )	11.5	32.0	43.5	246
Annual average NO <sub>2</sub> concentrations (µg/m <sup>3</sup> )	2.3	15.0	17.3	62
Maximum 24 hour average PM <sub>10</sub> concentrations (µg/m <sup>3</sup> )	7.8	26.8	34.6	50
Annual average PM <sub>10</sub> concentrations (µg/m <sup>3</sup> )	3.1	17.2	20.3	25
Maximum 24 hour average PM <sub>2.5</sub> concentrations (µg/m <sup>3</sup> )	3.9	11.0	14.9	25
Annual average PM <sub>2.5</sub> concentrations (µg/m <sup>3</sup> )	1.6	7.0	<b>8.6</b>	8

As discussed in Section 5.4.2, the nearest habitable room from Showground Road is 10.5 m from the road and the nearest building envelope is 7.5 m.

The annual PM<sub>2.5</sub> exceedance for proposed buildings along Showground Road (10 m from roadway) was composed of the model predicted incremental component of 1.6 µg/m<sup>3</sup> due to road emissions and a background component of 7.0 µg/m<sup>3</sup>. The sum of these components is results in a cumulative concentration of 8.6 µg/m<sup>3</sup>, in comparison to an 8 µg/m<sup>3</sup> criteria.

It is important to note that predicted pollutant concentrations are outdoors and do not consider complex building shielding and air flow effects that may reduce direct exposure of the building to the impacts of road traffic emissions. If the buildings are all air conditioned we can expect an improvement of indoor air quality whilst in use.

It should be noted that the background annual PM<sub>2.5</sub> concentration of 7 µg/m<sup>3</sup> is high, accounting for 87.5% of the assessment criteria (8 µg/m<sup>3</sup>). This background concentration was taken from the Macquarie Park Office of Environmental Heritage (OEH) air quality monitoring station. This indicates poor air quality on a regional level and would impact the proposed development regardless of the exact location of the proposed use.

It is important however that all residents and users of the Hills Showground Station Precinct have access to clean air, and efforts should be made during design to reduce the risk of occupants experiencing elevated pollutant levels. Recommendations are made in Section 6.

## 6. Recommendations

As discussed in Section 5, emissions from the SMNW and industrial sources are not expected to impact on the proposal. Based on a conservative assessment, screening level road traffic emission predictions identified that under worst-case conditions, the annual PM<sub>2.5</sub> emissions may exceed the criteria for dwellings and buildings located directly along Showground Road. Further investigations should be completed during detailed design to confirm the necessary mitigation measures and recommendations below.

General air quality design considerations mentioned in the Development near Rail Corridors and Busy Roads – Interim Guideline are to be considered. The following specific design recommendations are made for any sensitive uses directly along Showground Road:

- The internal area of residential dwellings in Precinct East to be located at least 10 m from the roadway.
- Any balconies directly facing Showground Road on the ground and first floor should be able to be closed (i.e. a winter garden or sun room). Windows on the balcony should be openable/closable to allow the occupant to prevent direct air flow from Showground Road as desired.
- All dwellings and sensitive spaces (such as childcare centres) to have mechanical ventilation/air conditioning that directly face Showground Road.
- Any sensitive uses (such as a childcare centre) should not have open areas located directly facing Showground Road.
- Design to consider the formation of urban canyons that can reduce pollutant dispersion. Having buildings of different heights interspersed with open areas, and setting back the upper stories of multi-level buildings helps to avoid urban canyons.
- Additional road traffic emissions modelling should be undertaken during detailed design. This can include a more advanced dispersion model such as the Graz Lagrangian Model (GRAL) and will provide a more detailed and less conservative assessment.

## 7. Conclusion

A conservative air quality impact assessment has been undertaken of the Hills Showground Station Precinct. No air quality impacts are anticipated at the Precinct from the NWRL or existing industrial sources in the local area. Screening level road traffic emission predictions identified that under worst-case conditions, the annual PM<sub>2.5</sub> emissions may exceed the criteria for dwellings and buildings located directly along Showground Road.

Recommendations have been made for the Hills Showground Precinct that are to be considered during concept design in regards to air quality.

The concept design is feasible from an air quality perspective, based on a conservative assessment and consider the design to be capable of conforming to the recommendations/criteria within this report. Further assessment is recommended during detailed design to confirm air quality considerations.

## **Appendices**



# Appendix A – Concept design drawings

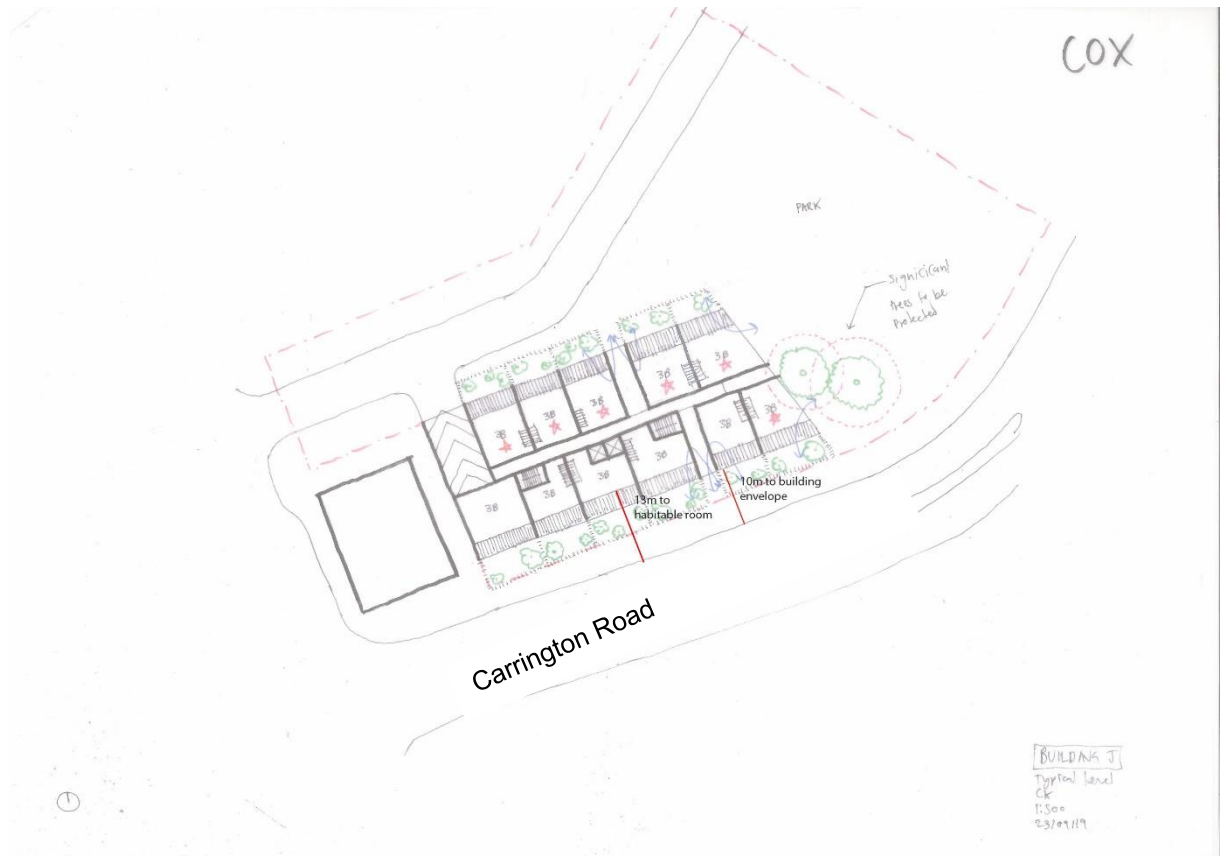
Concept Proposal Reference Scheme



Height plan



## Setbacks – Carrington Road



## Setbacks – Showground Road



GHD

Level 15

133 Castlereagh Street

T: 61 2 9239 7100 F: 61 2 9239 7199 E: [sydmal@ghd.com](mailto:sydmal@ghd.com)

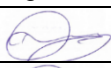
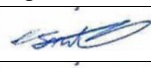

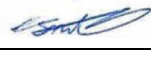
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#### Document Status

Revision	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
0	E Smith	D Craggs		E Smith		18/10/19
1	E Smith	D Craggs		E Smith		30/10/2019

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