This document has been prepared for Walker Corporation by:

Northstar Air Quality Pty Ltd,
Suite 1504, 275 Alfred Street, North Sydney, NSW 2060

northstar-env.com | Tel: 1300 708 590

Air Quality Opportunities and Constraints Review

Appin (Part) Precinct Plan

Addressee(s):	Walker Corporation
Site Address:	Appin
Report Reference:	22.1101.FR1V4
Date:	7 October 2022
Status:	Revised Final

Quality Control

Study	Status	Prepared by	Checked by	Authorised by
INTRODUCTION	Final	Northstar Air Quality	MD, LS	MD
THE PROPOSAL	Final	Northstar Air Quality	MD, LS	MD
LEGISLATION, REGULATION AND GUIDANCE	Final	Northstar Air Quality	MD, LS	MD
EXISTING ENVIRONMENT	Final	Northstar Air Quality	MD, LS	MD
METHODOLOGY	Final	Northstar Air Quality	MD, LS	MD
AIR POLLUTION EMISSION SOURCES	Final	Northstar Air Quality	MD, LS	MD
RISK ASSESSMENT	Final	Northstar Air Quality	MD, LS	MD
CONCLUSION	Final	Northstar Air Quality	MD, LS	MD

Report Status

Northstar References		Report Status	Report Reference	Version
22	1101	Revised Final	R1	V4
Based upon the above, the specific reference for this version of the report is:				22.1101.FR1V4

Final Authority

This report must by regarded as draft until the above study components have been each marked as final, and the document has been signed and dated below.

Martin Doyle 7 October 2022

Non-Technical Summary

Northstar Air Quality Pty Ltd was engaged by Walker Corporation, to prepare an air quality constraints and opportunities assessment report for the proposed rezoning of Appin (Part) Precinct for urban development.

Appin (Part) Precinct occupies an area of approximately 1 300 hectares of land within the Appin Precinct. The Appin Precinct is the southernmost precinct of the Greater Macarthur Growth Area (GMGA).

A review was performed using assessment of published separation distances from existing or potential future sources of air emissions to existing or future locations of sensitive land uses.

The review and risk assessment identified a number of sources of air emissions located within the recommended separation distance guidelines. However, it is anticipated that with appropriate land use planning, the proposed rezoning design and consideration of appropriate regulatory standards and guidelines, identified potential hazards would be adequately managed and sufficiently reduced.

Based on the assessment undertaken, it has been determined that the existing and proposed identified sources of air emissions will not form a significant constraint on the rezoning and proposed development of the Proposal site.

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1. INTRODUCTION

Northstar Air Quality Pty Ltd (Northstar) have been engaged by the Proponent to prepare an air quality opportunities and constraints review to support the Appin (Part) Precinct Plan (the Precinct Plan) and Appin (Part) Precinct Structure Plan (the Structure Plan).

The precinct and structure plan boundaries are Wilton Road to the east, the Nepean River to the west and Ousedale Creek to the north, the boundaries of which are shown in Figure 1.

The Appin (Part) Precinct Plan zones land for conservation, urban development and infrastructure and establishes the statutory planning framework permitting the delivery of a range of residential typologies, retail, education, business premises, recreation areas, and infrastructure services and provide development standards that development must fulfil. Within the proposed urban development zone, 12 000+ dwellings can be delivered.

1.1. Purpose of the Report

The purpose of this high-level review is to review and identify potential constraints and potential opportunities associated with the proposed urban land use rezoning with respect to air quality and identify constraints from existing and proposed sources of emissions to air proximate to the proposed Appin (Part) Precinct site.

This report has been prepared to accompany a rezoning application for the Proposal site to be developed into a new urban community as outlined in Section 2.1.

1.2. Scope of Assessment

This report presents information and data that summarises and characterises the existing environmental conditions and identified potential air quality pollutants associated with both the existing and proposed nature of the Proposal. It examines the potential risk of both of these scenarios and provides commentary on the suitability (or otherwise) for the land to be rezoned for urban development land uses.

2. THE PROPOSAL

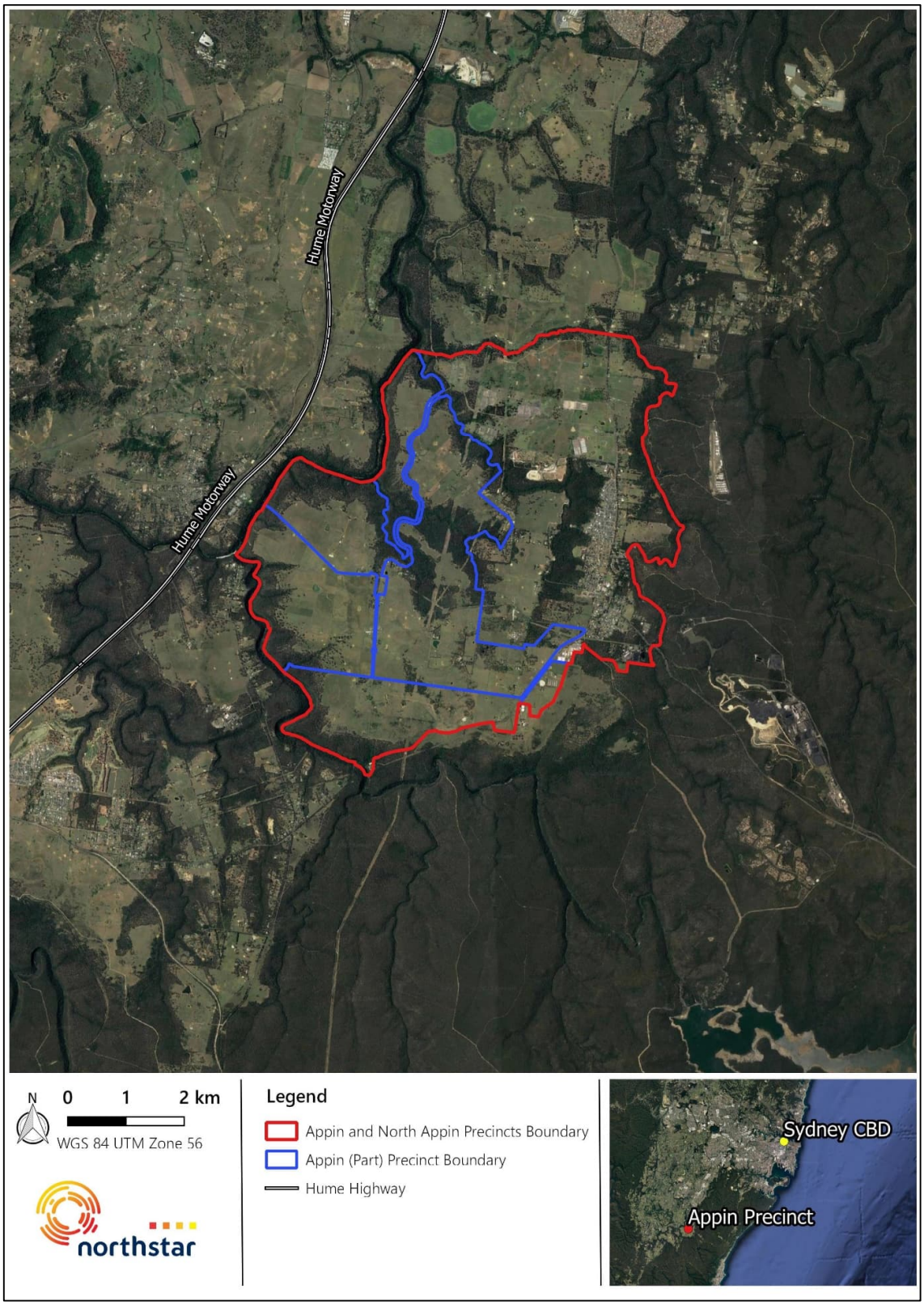
2.1. Environmental Setting

The Proponent is the landowner of approximately 1 284 ha of land located along Macquariedale Road, Appin in Southwestern Sydney. The Proposal site is located approximately 12 kilometres (km) south of Campbelltown and is predominantly bound by waterways, with Mallaty Creek to the north, Georges River to the east, Nepean River to the west and Cataract River to the south (see Figure 1) and is located predominantly within the Wollondilly Shire Council area. A portion at the northern end of the Proposal site lies within the Campbelltown Local Government Area (LGA).

The site is undulating in character and lies at an elevation of between 70 and 250 meters (m). The site is currently highly vegetated and features a number of steep secondary ridge lines. Vehicle access is currently limited with only a small number of existing roads. Along Appin Road is the existing Appin township with low density housing and a range of local community facilities, services and amenities. The remainder of the site is mostly largely grazing holdings.

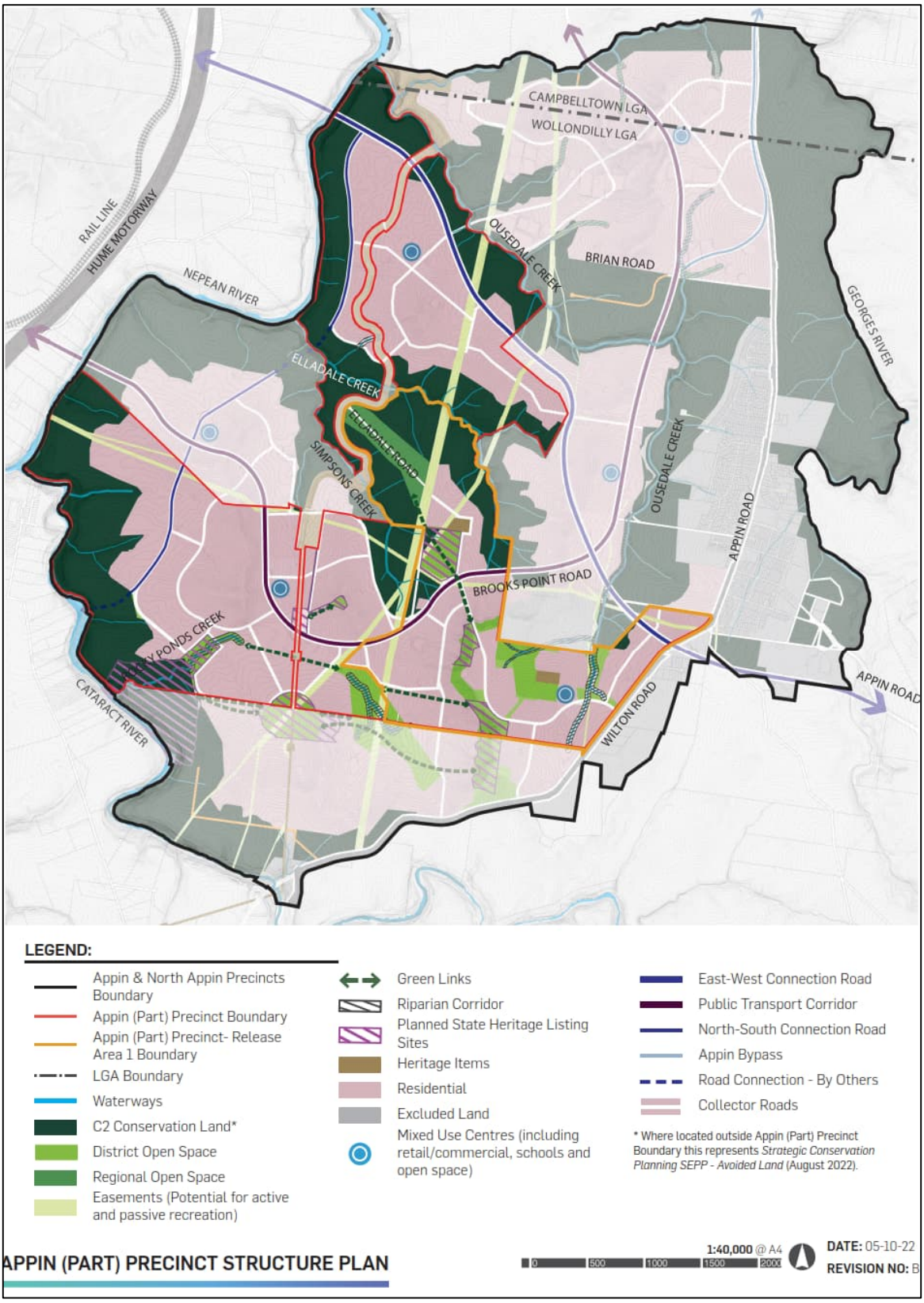
A proposed masterplan layout indicating the proposed land use types is presented in the structure plan in Figure 2.

Figure 1 Proposal Site Location



Source: Northstar Air Quality

Figure 2 Proposed structure plan



Source: Provided by Walker Corporation October 2022

2.2. Project Overview

The NSW Government has identified Growth Areas as major development areas that will assist in accommodating this growth. The Greater Macarthur Growth Area (GMGA) is one such growth area and is a logical extension of the urban form of south-west Sydney. The GMGA is divided into precincts. The Appin Precinct and North Appin Precincts are the southernmost land release precincts of the GMGA. The goal is to deliver 21 000+ dwellings.

The land is to be rezoned and released for development to achieve this goal. A submission has been prepared the Proponent to rezone 1 378 hectares of land within the Appin Precinct from RU2 Rural Landscape to the following zones:

- Urban Development Zone - Zone 1 Urban Development (UD)
- Special Purposes Zone - Zone SP2 Infrastructure (SP2)
- Conservation Zone - Zone C2 Environmental Conservation (C2)

The submission is aligned with strategic land use planning, State and local government policies and infrastructure delivery. The development potential is tempered by a landscape-based approach that protects the environment and landscape values, shaping the character of new communities. A series of residential neighbourhoods are to be delivered within the landscape corridors of the Nepean and Cataract Rivers, supported by local amenities, transit corridors and community infrastructure.

3. LEGISLATION, REGULATION AND GUIDANCE

3.1. NSW Government Air Quality Planning

NSW Environment Protection Authority (EPA) has formed a comprehensive strategy with the objective of driving improvements in air quality across the State. This comprises several drivers, including:

- Legislation: formed principally through the implementation of the Protection of the Environment Operations Act 1997, and the Protection of the Environment Operations (Clean Air) Regulations 2021. The overall objective of this legislative instruments is to achieve the requirements of the National Environment Protection (Ambient Air Quality) Measure;
- Clean Air for NSW: The 10-year plan for the improvement in air quality;
- Inter-agency Taskforce on Air Quality in NSW: a vehicle to co-ordinate cross-government incentives and action on air quality;
- Managing particles and improving air quality in NSW; and
- Diesel and marine emission management strategy.

In regard to the relevance of the NSW Government's drive to improve air quality across the State and this air quality assessment, it is imperative that this Proposal demonstrates leadership in the development of the NSW economy (in terms of activity and employment) and concomitantly not cause a detriment in achieving its objectives.

3.2. Air Quality Criteria – Criteria Air Pollutants

The NSW EPA document 'Approved Methods for the Modelling and Assessment of Air Quality in NSW' (NSW EPA, 2016) (the Approved Methods) lists the statutory methods that are to be used to model and assess emissions of criteria air pollutants from stationary sources in NSW. Section 7.1 of the Approved Methods clearly outlines the impact assessment criteria for the Proposal. The criteria listed in the Approved Methods are derived from a range of sources (including National Health and Medical Research Council (NHMRC), National Environment Protection Council (NEPC), Department of Environment (DoE), World Health Organisation (WHO), and Australian and New Zealand Environment and Conservation Council (ANZECC)). The following criteria as set out in Section 7.1 of NSW EPA (2016) is outlined in Table 1 below for reference within this report.

Table 1 NSW EPA air quality standards and goals

Pollutant	Averaging period	Units	Criterion	Notes
Nitrogen dioxide (NO_2)	1 hour	$\mu g \cdot m^{-3}$	246	Numerically equint to the AAQ NEPM[(b)] standards and goals.
	Annual	$\mu g \cdot m^{-3}$	62	
Particulates (as PM_{10})	24 hours	$\mu g \cdot m^{-3}$	50	

Pollutant	Averaging period	Units	Criterion	Notes
Particulates (as $PM_{2.5}$)	1 year	$\mu g \cdot m^{-3}$	25	
	24 hours	$\mu g \cdot m^{-3}$	25	
	1 year	$\mu g \cdot m^{-3}$	8	
Particulates (as Total Suspended Particulate)	1 year	$\mu g \cdot m^{-3}$	90	
Particulates (as dust deposition)	1-year[c]	$g \cdot m^{-2} \cdot month^{-1}$	2	Assessed as insoluble solids as defined by AS 3580.10.1
	1-year[d]	$g \cdot m^{-2} \cdot month^{-1}$	4	
Ozone (O_3)	1 hour	$\mu g \cdot m^{-3}$	214	
	4 hours	$\mu g \cdot m^{-3}$	171	

Notes: (a): micrograms per cubic metre of air
(b): National Environment Protection (Ambient Air Quality) Measure
(c): Maximum increase in deposited dust level
(d): Maximum total deposited dust level

Air quality criteria are not specifically adopted within this assessment but are presented for context.

3.3. Air Quality Criteria - Odour

Experience gained through odour assessments from proposed and existing facilities in NSW indicates that an odour performance goal of 7 OU is likely to represent the level below which "offensive" odours should not occur (for an individual with a 'standard sensitivity' to odours). Therefore, the Odour Technical Framework (DECC, 2006) recommends that, as a design goal, no individual be exposed to ambient odour levels of greater than 7 OU. In modelling and assessment terms, this is expressed as the 99th percentile value, as a nose response time average (approximately one second).

Odour assessment criteria need to consider the range in sensitivities to odours within the community to provide additional protection for individuals with a heightened response to odours. This is addressed in the Technical Framework (DECC, 2006) by setting a population dependant odour assessment criterion, and in this way, the odour assessment criterion allows for population size, cumulative impacts, anticipated odour levels during adverse meteorological conditions and community expectations of amenity. A summary of odour performance goals for various population sizes, as referenced in the Odour Technical Notes (DECC, 2006) is shown in Table 2. This table shows that in situations where the population of the affected community lies between 125 and 500 people, an odour assessment criterion of 4 OU at the nearest residence (existing or any likely future residences) is to be used. For isolated residences, an odour assessment criterion of 7 OU is appropriate.

Table 2 NSW EPA odour impact criterion

Population of affected community	Complex mixture of odours (OU)
Urban area (≥2000)	2.0
500 – 2000	3.0
125 – 500	4.0
30 – 125	5.0
10 – 30	6.0
Single residence (≤2)	7.0

Source: The Odour Technical Notes, DECC 2006

3.3.1. Odour Control under the POEO Act

The *Protection of the Environment and Operations Act* 1997 (POEO Act) is applicable to scheduled activities in NSW and emphasises the importance of preventing 'offensive odour'. Although the operations at the Proposal site are non-scheduled activities under the POEO Regulations, they are regulated by Council and the principles contained within the POEO framework are applicable.

For reference, 'offensive odour' is defined within the POEO Act as:

> *an odour:*
> *(a) that, by reason of its strength, nature, duration, character or quality, or the time at which it is emitted, or any other circumstances:*
> *(i) is harmful to (or is likely to be harmful to) a person who is outside the premises from which it is emitted, or*
> *(ii) interferes unreasonably with (or is likely to interfere unreasonably with) the comfort or repose of a person who is outside the premises from which it is emitted, or*
> *(b) that is of a strength, nature, duration, character or quality prescribed by the regulations or that is emitted at a time, or in other circumstances, prescribed by the regulations.*

3.4. Greater Macarthur 2040

The Greater Macarthur 2040 plan (DPE, 2018) was developed as a land use and infrastructure implementation plan (LUIIP) to help set the vision for the planned Greater Macarthur Growth Area as it develops and changes. The plan is based on five themes that collectively encompass an area, as experienced by people: place; land use; movement; landscape and built form. Matters relating to air quality are found within the 'landscape' theme, which outlines relevant planning principles to consider as part of the development, relating to air quality.

The planning principles relevant to this review include:

- Set back residential and other sensitive uses, such as childcare centres and schools away from existing and likely future sources of air pollution, such as busy roads, with Annual Average Daily Traffic (AADT) flows, or likely AADT of above 20 000 movements, and rail corridors;
- Incorporate setbacks to minimise exposure and odours from agricultural uses; and
- Utilise best practice emissions controls to minimise air pollution from industrial and commercial uses.

The above have been considered within this review and how they may present limitations or otherwise on development types and locations within the Proposal site.

3.5. Child Care Centre Planning Guideline

The NSW Child Care Centre Planning Guideline (DP&E, 2017) is generally used to reference and inform appropriate design to maximise the safety, health and overall care of young children. Clause 28 of the Child Care Guidelines outlines the requirements for an air quality assessment to ensure that air quality is acceptable where childcare facilities are proposed close to external sources of air pollution such as major roads and industrial development. While there is no specific guidance on design of childcare centres within the ACT guidelines, other than prohibiting development within certain areas of the Proposal site, the NSW Guidelines may be referenced as a guide for the appropriate planning from an air quality perspective.

Clause 28 of the Child Care Guideline outlines the requirement for an air quality assessment to ensure that air quality is acceptable where childcare facilities are proposed close to external sources of air pollution such as major roads and industrial development:

> *A suitably qualified air quality professional should prepare an air quality assessment report to demonstrate that proposed child care facilities close to major roads or industrial developments can meet air quality standards in accordance with relevant legislation and guidelines. The air quality assessment report should evaluate design considerations to minimise air pollution such as:*

- *creating an appropriate separation distance between the facility and the pollution source. The location of play areas, sleeping areas and outdoor areas should be as far as practicable from the major source of air pollution*
- *using landscaping to act as a filter for air pollution generated by traffic and industry. Landscaping has the added benefit of improving aesthetics and minimising visual intrusion from an adjacent roadway*
- *incorporating ventilation design into the design of the facility.*

Reference is also made to the NSW Department of Planning document "*Development Near Rail Corridors and Busy Roads – Interim Guideline*" (NSW DoP, 2008) (the Roads Guideline) which supports the specific rail and road provisions of the NSW State Environmental Planning Policy (Infrastructure) 2007. An aim of the

Roads Guideline is to assist in reducing the health impacts of adverse air quality from road traffic on sensitive adjacent development and assists in the planning, design and assessment of development in, or adjacent to busy roads (NSW DoP, 2008). The Roads Guideline also provides those situations in which air quality should be a design consideration:

- Within 10 m of a congested collector road (traffic speeds of less than 40 km·hr^{-1} at peak hour) or a road grade > 4 %, or heavy vehicle percentage flows > 5 %;
- Within 20 m of a freeway or main road (with more than 2 500 vehicles per hour, moderate congestions levels of less than 5 % idle time and average speeds of greater than 40 km·hr^{-1});
- Within 60 m of an area significantly impacted by existing sources of air pollution (road tunnel portals, major intersection / roundabouts, overpasses or adjacent major industrial sources); or
- As considered necessary by the approval authority based on consideration of site constraints, and associated air quality issues.

While specific development types within the Proposal are not yet known, it is envisaged the masterplan will include childcare facilities within the proposed neighbourhoods. Appropriate location of these with due consideration of orientation, placement of outdoor areas and incorporation of appropriate ventilation design and landscaped areas as recommended in the above would minimise any potential air quality impacts as a result of emission sources.

3.6. Separation Distance Guidance

Separation distance guidelines provide recommended separation distances between various pollution emitters and sensitive land uses. They aim to ensure incompatible land uses are located in a way that minimises the impacts of odour and polluting air emissions when applied in the assessment of new development applications. While guidelines assist in the siting of new developments, they may also be used to ensure industrial activities in appropriate zones are protected from encroachment by residential and other sensitive land uses that would have a negative effect on the viability of industry (ACT EPSDD, 2018). Separation distance guidelines consider impacts of air pollutants including odour.

Based on the industry type and scale, separation distances from activities have been determined through review of guidelines presented in:

- Separation distance guidelines for air emissions (ACT EPSDD, 2018); and
- Evaluation distances for effective air quality and noise management (EPA South Australia, 2016).

The NSW EPA or Department of Planning and Environment (DPE) do not publish separation distance guidelines. It is noted that the ACT Environment, Planning and Sustainable Development Directorate have released a separation distance guideline for air emissions in November 2018, which consequently provides the most contemporary reference in regard to separation distances (ACT EPSDD, 2018). Those separation distances relevant to relevant activities are outlined in Table 4.

3.7. Wollondilly Shire Council Development Control Plan 2016

The Wollondilly Shire Council Development Control Plan (DCP) outlines the specific controls and objectives for development undertaken with the Wollondilly Shire area. The purpose of the DCP is to provide guidance for future development within the Proposal site.

While the specific conditions relating to air quality management require air quality impact assessments for development or activities which are likely to emit odour or hazardous chemicals, Section 3.3 of the DCP outlines a minimum separation distance of 500 m setback for poultry farms from all residential zones which is applicable for the Proposal. No other setback requirements for activities applicable to this Proposal are identified in the DCP.

3.8. Campbelltown City Council Development Control Plan 2015

Section 7.7.2 of the Campbelltown City Council Development Control Plan (DCP) outlines design requirements relating to air quality. Any development that is likely to generate levels of air emissions exceeding the POEO requirements are to demonstrate appropriate measures to mitigate against air pollution. No other specific requirements relating to air quality or separation distances are outlined the Campbelltown DCP.

Section 6.4.5 of the DCP relates to residential interface and requires that all commercial buildings designed to accommodate the preparation of food from a commercial tenancy shall provide ventilation facilities to ensure that no odour is emitted in a matter that adversely impacts upon any residential premises. Any facilities within the future masterplan which have potential odour generating activities would be required to provide adequate ventilation facilities in line with the DCP requirements.

4. EXISTING ENVIRONMENT

4.1. Air Quality

The air quality experienced at any location will be a result of emissions generated by natural and anthropogenic sources on a variety of scales (local, regional and global). The relative contributions of sources at each of these scales to the air quality at a location will vary based on a wide number of factors including the type, location, proximity and strength of the emission source(s), prevailing meteorology, land uses and other factors affecting the emission, dispersion and fate of those pollutants.

The Proposal site is located proximate to an air quality monitoring station (AQMS) operated by NSW DPE. The closest active representative AQMS is noted to be located at Campbelltown West which has been operating since 2012 when the station was commissioned. This AQMS is considered to be reflective of the conditions at the Proposal site. Data over the period 2017 to 2021 has been assessed, representing the last 5-years of data.

A summary of the air quality monitoring data is presented in Table 3 (mean, 99th percentile value and maximum for each year shown only). The measured values are compared to the air quality standards as outlined in Section 3.2. Where there are measured exceedances of those criteria this is highlighted in red in Table 3.

The summary shows periodic exceedance (non-attainment) of the 24-hour average PM_{10} and $PM_{2.5}$ criteria in most years 2017 to 2021. This is not unexpected and is typical of most monitoring stations across NSW. The exceedances are typically associated with sporadic regional pollutant events, such as bushfires and dust storms.

Figure 3 indicates that periodic exceedance of 1-hour ozone (O_3) and 4-hour (rolling) O_3 were experienced at Campbelltown West AQMS, predominantly in summer months. High temperatures can accelerate the formation of O_3 following the generation of precursor pollutants including NO_2 and VOCs. O_3 exceedances measured at Campbelltown AQMS for the period 2017-2021 generally coincided with days of high temperatures.

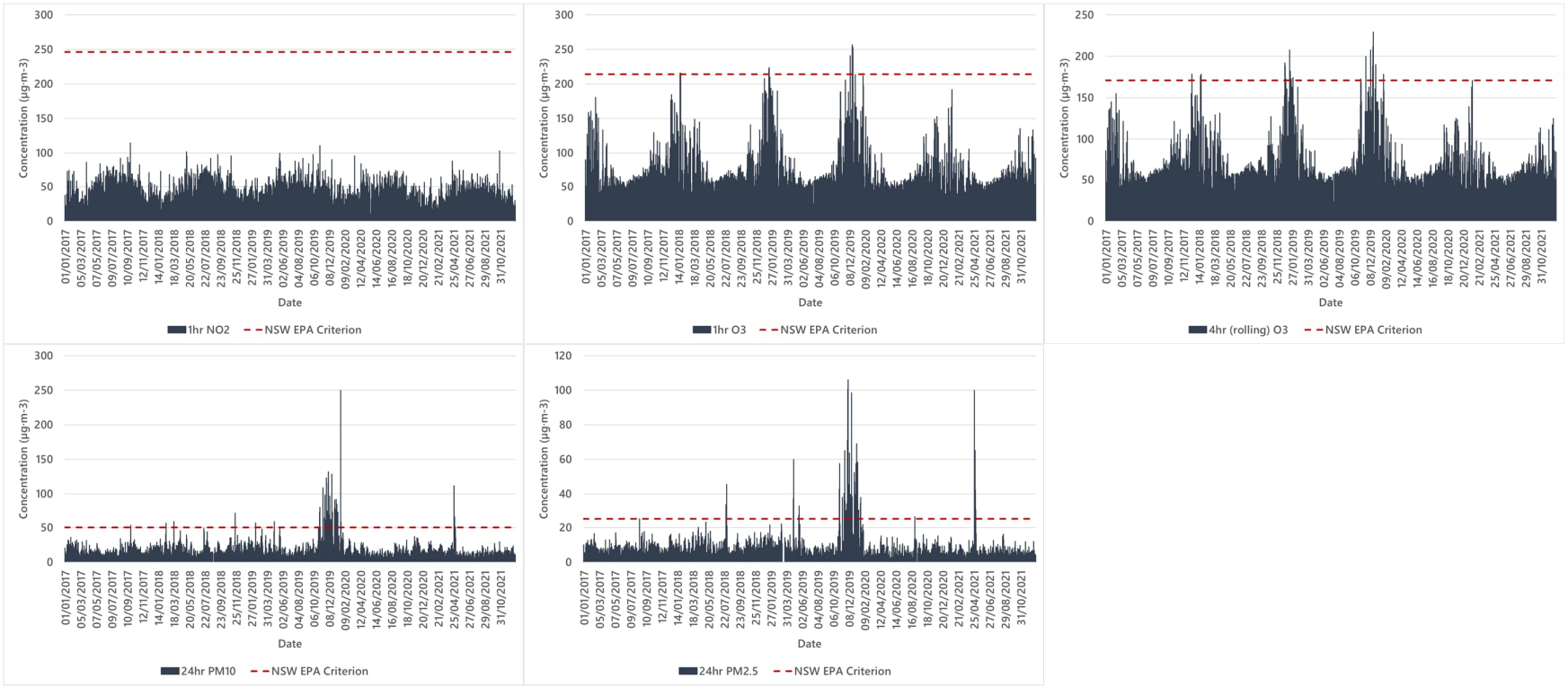
The time-series plots of measured concentrations of 1-hour NO_2, 1-hour O_3, 4-hour (rolling) O_3, 24-hour PM_{10} and 24-hour $PM_{2.5}$ are provided in Figure 3.

Odour is not measured at the Campbelltown West AQMS, and is not measured routinely at any AQMS in NSW or Australia. Impacts associated with odour are required to be considered individually.

Table 3 Summary of background air quality monitoring data

Year	AQMS	Campbelltown West AQMS				
	Pollutant	NO2	O3	O3	PM10	PM2.5
	Ave Period	1h	1h	4h rolling	24h	24h
	Units	µg·m-3	µg·m-3	µg·m-3	µg·m-3	µg·m-3
All	Mean	18.5	32.7	32.1	17.3	8.2
	99%ile	65.8	121.5	115.6	73.5	45.4
	Max	114.7	256.8	229.3	249.7	106.0
2017	Mean	19.8	32.5	31.8	15.7	7.4
	99%ile	67.9	115.6	107.8	32.2	16.8
	Max	114.7	184.2	178.4	53.1	25.0
2018	Mean	20.1	33.9	33.2	17.9	8.4
	99%ile	69.6	123.4	113.7	47.0	20.7
	Max	101.5	215.6	192.1	72.3	45.4
2019	Mean	20.1	34.8	34.0	22.3	11.8
	99%ile	69.6	152.9	145.0	111.8	69.8
	Max	110.9	256.8	229.3	132.0	106.0
2020	Mean	17.2	32.3	31.7	17.0	7.5
	99%ile	62.0	115.6	111.7	80.3	42.8
	Max	95.9	211.7	178.4	249.7	69.0
2021	Mean	15.2	30.2	29.6	13.8	6.3
	99%ile	56.4	100.0	95.9	34.5	30.1
	Max	103.4	192.1	170.5	111.9	99.9

Figure 3 Time series plots of measured 1-hour NO_2, 1-hour O_3, 4-hour (rolling) O_3, 24-hour PM_{10} and 24-hour $PM_{2.5}$

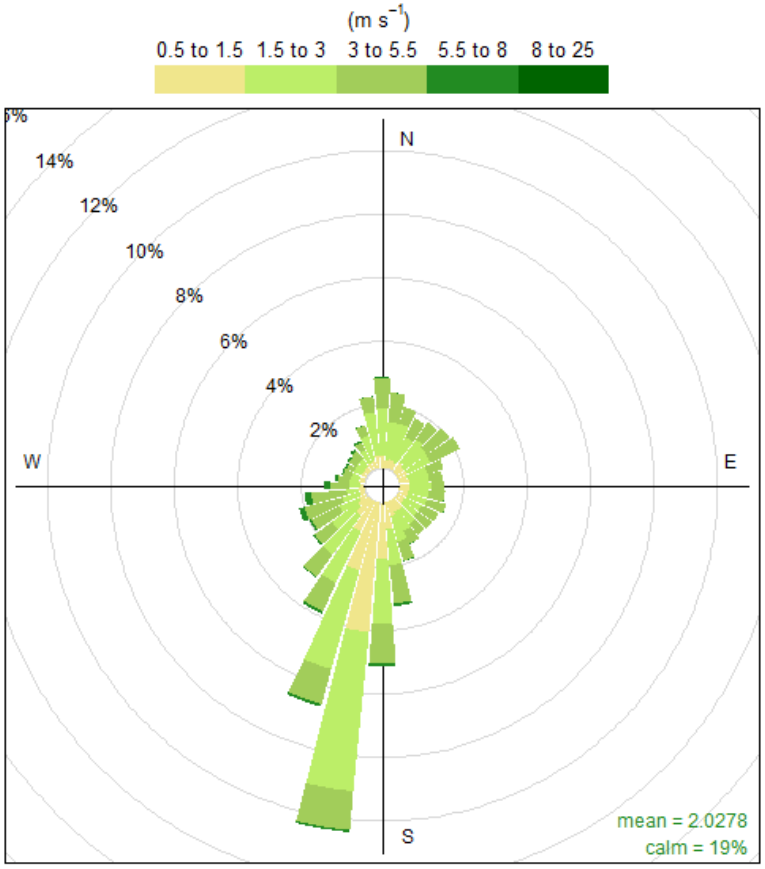


4.2. Meteorology

The meteorology experienced within an area can govern the generation (in the case of wind-dependent emission sources), dispersion, transport and eventual fate of pollutants in the atmosphere. The meteorological conditions surrounding the Proposal site have been characterised using data collected by the Australian Government Bureau of Meteorology (BoM) at a number of surrounding Automatic Weather Stations (AWS).

To adequately describe the prevailing meteorological conditions surrounding the Proposal site, measurements taken at the Campbelltown (Mount Annan) AWS, a 5-year (2017-2021) analysis of observed meteorology is provided as a wind rose in Figure 4. The wind rose presented in Figure 4 indicates that from 2017 to 2021, winds at Campbelltown (Mount Annan) AWS shows a predominant south south-westerly wind direction.

Figure 4 Wind rose 2017-2021, Campbelltown (Mount Annan) AWS



The majority of wind speeds experienced at Campbell (Mount Annan) AWS over the 5-year period 2017 to 2021 are generally in the range < 0.5 metres per second ($m \cdot s^{-1}$) to 5.5 $m \cdot s^{-1}$ with the highest wind speeds (greater than 8 $m \cdot s^{-1}$) occurring from westerly directions. Winds of this speed occur during less than 0.02 % of the observed hours over the 6-year period. Calm winds are more frequent, occurring more than 19 % of observed hours.

5. METHODOLOGY

5.1. Overview

This assessment has been prepared to identify the potential risks or constraints associated with air quality impacts relevant for the development of the Proposal.

The assessment of potential operational air quality risks is based on information provided at the time of the assessment for proposed future land uses on the Proposal site.

5.2. Construction Phase

Construction phase activities have the potential to generate short-term emissions of particulates. Generally, these are associated with uncontrolled (or 'fugitive') emissions and are typically experienced by neighbours as amenity impacts, such as dust deposition and visible dust plumes, rather than associated with health-related impacts. Localised engine-exhaust emissions from construction machinery and vehicles may also be experienced, but given the scale of the proposed works, fugitive dust emissions would have the greatest potential to give rise to downwind air quality impacts.

Modelling of dust from construction Proposals is generally not considered appropriate, as there is a lack of reliable emission factors from construction activities upon which to make predictive assessments, and the rates would vary significantly, depending upon local conditions.

Given that construction activities have not yet been determined, further assessment of the construction phase activities has not been undertaken for the Proposal. It is considered that any relevant mitigation measures to manage potential construction phase impacts would be outlined in a site-specific Construction Environmental Management Plan (CEMP) developed for the Proposal.

5.3. Operational Phase

This assessment has been prepared to address the potential air quality impacts / risks of the Proposal. The assessment of operational phase impacts / risks needs to account for:

- Air emissions from existing external sources (i.e. those not contained within the Proposal site) affecting sensitive land uses within the Proposal site;
- Air emissions from future (unknown) internal sources (i.e. those which may be contained within the Proposal site in the future) affecting sensitive land uses inside and outside of the Proposal site.

This has been performed using an assessment of published separation distances from existing or potential future sources to existing or future locations for sensitive land uses.

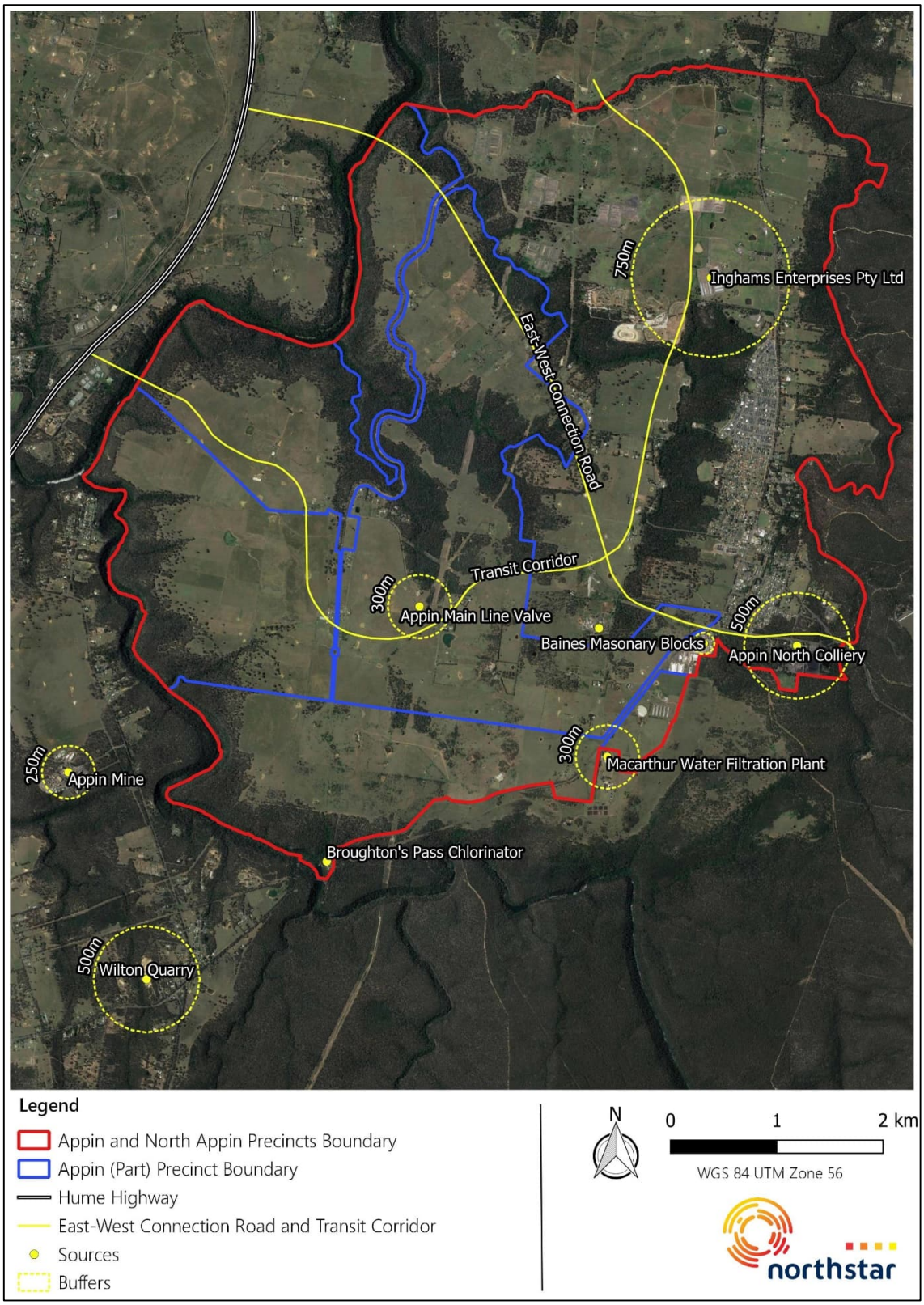
A review of the land uses and activities in the vicinity of the Proposal site was undertaken through a desktop mapping survey, online review of the relevant EPA Environmental Protection Licence (EPL) register for facilities within proximity to the Proposal site and a search of relevant sources from the National Pollution Inventory (NPI) to determine potential sources of air (and odour) emissions within the vicinity of the Proposal site.

Through a review of identified sources of air and odour emission sources, those which may have the potential to impact upon air quality at the Proposal site have been identified as shown in Figure 5.

While the development types within the Proposal site are yet to be confirmed, it is assumed these would be typical of a populated suburban centre. As such, potential air emission sources from the future development would be expected to include kitchen exhaust outlets from cooking processes and emissions associated with road traffic, in line with a typical urban environment. Major sources of potential air pollutants, such as those resulting from industrial or manufacturing processes which may impact on receptors both within and outside of the Proposal site are considered unlikely.

As such, appropriate design in accordance with the relevant guidelines and Australian Standards would be appropriate to manage any potential impacts of these future sources of air emissions resulting from within the Proposal site.

Figure 5 Air quality sources and buffer distance



Source: Northstar Air Quality

6. AIR POLLUTION EMISSION SOURCES

As outlined in Section 5.3, a desktop survey review, a search of the EPA EPL register and review of the NPI database has been performed to identify potential industrial sources within the immediate vicinity or located within the Proposal site.

The following potential local air quality influences (see Table 4) have been identified around an approximate 5 km radius of the Proposal site, through either desktop mapping of the site and surrounds, and/or search results of the NPI database. The relevant buffer distances have been presented in Figure 5.

Table 4 Identified local air quality influences

Facility Name	Location	Category	Separation distance guidelines (m)	Approximate distance (m) from Proposal boundary	Main Pollutant of Concern
Appin Main Line Valve	Brooks Point Road, Appin	Gas distribution works	300[a]	Within Proposal site	Odour
Appin Coal Seam Methane Power Station	Northampton Dale Road	Electricity generation	-	155 north	VOCs, NO_X, CO
Broughton's Pass Chlorinator	Broughton's Pass	Water chlorination	300[c]	1 500 south	Odour
Inghams Enterprises Pty Ltd	345 Appin Road	Poultry farm	750[a]	1 430 north east	Odour
Appin West Colliery	Douglas Park Drive	Coal mining	250[b]	1 200 south east	Particulate matter
Baines Masonry Blocks	900 Wilton Road, Appin	Concrete works	100[a]	118 m east	Particulate matter
Macarthur Water Filtration Plant	550 Wilton Road, Wilton	Water filtration	300[c]	70 south east	Odour
Wilton Quarry	155 Wilton Road, Wilton	Mining and extractive industry	500[b]	2 700 south	Particulate matter
Appin North Colliery	Appin Road, Appin	Mining and extractive industry	500	780 east	Particulate matter
East-West Connection Road & Transit Corridor (Proposed)	Appin Road to proposed Hume Motorway interchange	Road traffic	100[d]	Within Proposal site	Particulate matter, NO_X

Facility Name	Location	Category	Separation distance guidelines (m)	Approximate distance (m) from Proposal boundary	Main Pollutant of Concern
Hume Highway	Existing Hume Highway	Road traffic	100	700 m west	

Notes: a) taken from Separation distance guidelines for air emissions, ACT Government

b) taken from Recommended separation distances for industrial residual air emissions, EPA Victoria

c) No specific distance provided for water filtration, therefore separation distance for sewage treatment works has been applied

d) South Australian EPA 2019 *Evaluation distances for effective air quality and noise management*

Based on the separation distances outlined in Table 4, a number of facilities are located within the recommended separation distance guidelines (highlighted) and have the potential to adversely impact on the air quality and/or odour of the Proposal site. Further assessment to guide the reduction of potential impacts has been undertaken and outlined in Section 7. Identified sources which are located within the recommended separation distance have been subject to a risk assessment in order to understand the level of risk, as outlined in Table 5 overleaf.

7. RISK ASSESSMENT

Where a risk assessment is undertaken for the purposes of assessing potential impacts of proposed emissions sources, the aim of the assessment is generally to determine the level of control required (if applicable) for that source. Given that this this assessment is largely focused on existing emissions sources, over which the Proponent has little control, this high-level risk assessment has therefore been performed in order to understand the level of risk associated with those sources and further describe how the emission source may present any constraints if applicable, for the Proposal.

A full explanation of definitions describing the metrics of *sensitivity* and *magnitude* that are used to derive *risk* as outlined in this process is provide in Appendix A, to help understand potential air quality constraints on the Proposal.

Using the methodology outlined in Appendix A derives an assessment of risk (as expressed on a scale: *high – medium – low*), as summarised in Table 5, for those facilities identified as having the potential to result in air quality impacts within the Proposal site. Each of these risks are detailed further below.

Table 5 Risk assessment

Facility	Air Quality Impact	Sensitivity	Pre-Mitigation		
			Magnitude	Risk	Outcome
Appin Main Line Valve	Odour	Very High	Slight	Medium	Manage risk
Appin Methane Power Station	VOCs, NO_x, CO		Slight	Medium	Manage risk
Macarthur Water Filtration Plant	Odour		Slight	Medium	Manage risk
East-West Connection Road & Transit Corridor (Proposed)	PM, NOx		Slight	Medium	Manage risk

Appin Main Line Valve

The Appin Main Line Valve is located within the Proposal site and according to the indicative structure plan, is located on the fringe of an area which is proposed as urban capable land. Based on the separation distance guidelines, the recommended distance between gas distribution works and sensitive land uses i.e. schools, residential dwellings, child care centres etc, is 300 m. However, given that the activities are limited to one valve only (and not the full suite of infrastructure associated with gas distribution works), potential air quality impacts as a result of the gas line valve relate to potential leakages and/or emergency maintenance scenarios which may require dispersion of gas into the atmosphere.

It is noted that there is an existing dwelling within approximately 100 m of the Appin Main Line Valve, which further indicates that the separation distance of 300 m may be conservative. Any development of land within

300 m of the Appin Main Line Valve would be performed with full consultation with the relevant gas distribution authority/company to ensure that any risks are minimised.

Given the scale of the source and existing land uses surrounding this, the potential magnitude is considered to be *slight* and the corresponding risk is *medium.*

Appin Methane Power Station

The Appin methane power station is located within the Proposal site and according to the indicative structure plan, is located at distance approximately 800 m from the nearest proposed future town centre. While there is no recommended separation distance guideline for an operating methane power station, review of air quality impact data for the site indicates compliance with air quality standards at the nearest sensitive receptors.

Given the above, the potential magnitude is considered to be *slight* and the corresponding risk is *medium.*

Macarthur Water Filtration Plant

The Macarthur Water Filtration Plant is located across Wilton Road, approximately 70 m to the south east of the Proposal site boundary. Potential air quality impacts as a result of the operation of the water filtration plant relate to potential odour impacts resulting from the filtration process and water storage systems.

Given that this plant treats raw fresh water from the nearby weir and does not treat sewage or associated wastewater, the potential impact magnitude is considered to be *slight* and the corresponding risk is *medium.* Furthermore, the wind direction taken from the nearby Campbelltown weather station indicates a predominant south westerly which is less likely to affect the Proposal site.

East-West Connection Road and Transit Corridor

According to the SA EPA (SA, 2019), the recommended separation distance for sensitive receptors to a major road is 100 m, and (NSW DoP, 2008) refer to air quality being a design consideration when development is to occur within 10 m to 20 m of a collector or main road. While the neighbourhood land uses adjacent to the proposed East West Connection Road and Transit Corridor are not yet defined, appropriate separation from the roadway would be expected within the planning and design phase. Appropriate setback distances from the East-West Connection Road and Transit Corridor would be included, in addition to a consideration of design measures to further ameliorate any potential air quality impacts, which would also be relevant for any identified acoustic issues. The requirements of the Child Care Centre Planning Guideline (see Section 3.5) would be required to be addressed during the selection of appropriate sites for that use. Given the above, the potential impact magnitude is considered to be *slight* and the corresponding risk is *medium.*

Based upon the above, the proposed rezoning design is adequate to manage identified potential hazards and determined to represent medium risks. The objective associated with medium risks is management to reduce that risk as low as possible

8. CONCLUSION

Northstar has been commissioned by Walker Corporation to prepare an air quality constraints and opportunities report for the proposed rezoning of a portion of land within the Appin Precinct, known as Appin (Part) Precinct, for the development of a new urban community.

This high-level review has been performed to review and identify potential constraints and opportunities associated with the proposed urban land use with respect to air quality, and identify constraints from existing and proposed sources of emissions to air proximate to the proposed Appin (Part) Precinct site.

A review was performed using assessment of published separation distances from existing or potential future sources to existing or future locations for sensitive land uses. Identified sources located within the recommended distance guidelines include:

- Main line gas valve;
- Methane power station;
- Water filtration plant; and
- Major roadways, proposed.

While a high-level risk review demonstrated that medium (i.e. manageable) air quality risks were associated with identified sources located within the relevant recommended separation distances, it is anticipated that with appropriate land use planning and design and consideration of appropriate regulatory standards and guidelines, these would be further reduced. Review of historic air quality data for the local region indicates instances of exceedances of ozone and particulate matter which also coincide with periods of high temperature. It is anticipated that these conditions would prevail during development of the Proposal, and not present any further adverse effects for the rezoning application.

Based on the high-level assessment undertaken, it has been determined that the existing and proposed identified sources of air quality and odour will not form a significant constraint on the rezoning and proposed development of the Proposal site.

9. REFERENCES

ACT EPSDD. (2018). *Separation Distance Guidelines for Air Emissions, Environment, Planning and Sustainable Development Directorate.*

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NSW DoP. (2008). *Development Near Rail Corridors and Busy Roads - Interim Guideline.*

NSW DPIE. (2020). *New South Wales Annual Compliance Report 2018.*

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APPENDIX A

Risk Assessment

Provided below is an outlined of the risk assessment methodology used for a typical air quality impact assessment. It is based upon the definitions provided under ISO 31000.

The risk assessment presented in below is generally performed in two stages:

- Step 1: Pre-mitigated risk: This is used to identify any significant risks and identify the need to control;
- Step 2: Control and mitigation: An examination of what constitutes best available technology (BAT) for emissions control for that process. Note for this assessment, this Step is not undertaken as the risk assessment is not being used to inform an air quality impact assessment.

The risk assessment procedure adopted uses the determinations of:

- sensitivity of receptors; and
- impact magnitude; to derive
- risk.

These terms are defined and discussed in the following subsections.

Sensitivity of Receptors

Sensitivity terminology may vary depending upon the environmental effect, but generally this may be described in accordance with a scale from 'very high' to 'low', as defined in Table A1.

Table A1 Methodology - sensitivity of receptors

Sensitivity		Descriptions
4	Very high	Receptors are highly sensitive to changes in the air quality / odour environment. Areas may be typified by extended (day-long) exposure times and/or an expectation of high amenity values. Typical examples may include residential areas, health care facilities, retirement homes
3	High	Receptors have a high sensitivity to changes in the air quality / odour environment. Areas may be typified by working-day exposure times and/or an expectation of high amenity values. Typical examples may include commercial zones, recreation facilities, schools, high-end office space (banking etc).
2	Medium	Receptors have a medium sensitivity to changes in the air quality / odour environment. Areas may be typified by up to working-day exposure times and an expectation of reasonable amenity values commensurate with the land-uses. Typical examples may include agricultural and environmental conservation spaces, industrial zones.
1	Low	Receptors have a low sensitivity to changes in the air quality / odour environment. Areas may be typified by short-term exposure times and a low expectation of amenity values. Typical examples may include infrastructure land uses, open and undeveloped land.

Impact Magnitude

Impact magnitude is a descriptor for the predicted scale of change to the air quality environment that may be attributed to the operation of the Proposal and is evaluated on a scale from 'major' to 'negligible' as defined in Table A2.

Table A2 Methodology - impact magnitude

Magnitude		Descriptions
4	Major	Potential impact magnitude may cause statutory objectives / standards to be exceeded. Potential major magnitude of impacts may generate nuisance complaints, resulting in regulatory action.
3	Moderate	Potential impact may give rise to a perceivable health and/or amenity impact. Potential moderate magnitude of impacts may generate nuisance complaints, likely to require management but not result in regulatory action.
2	Slight	Potential impact may be tolerated. Potential slight magnitude of impacts is not likely to generate nuisance complaints.
1	Negligible	Potential impact magnitude is unlikely to cause significant consequences. Potential negligible magnitude of impacts is unlikely to generate nuisance complaints and is likely to only be perceptible within the site boundary.

Risk

The risk matrix provided in Table A3 illustrates how the definition of the impact magnitude and sensitivity of receptors interact to produce impact risk (composite risk index). For example, an impact of *slight* magnitude at a *medium* sensitive receptor location would be determined to be of *medium* risk (significance).

Table A3 Methodology -risk matrix

Magnitude Sensitivity	Negligible (1)	Slight (2)	Moderate (3)	Major (4)
Very High (4)	Medium (4)	Medium (8)	High (12)	High (16)
High (3)	Medium (3)	Medium (6)	Medium (9)	High (12)
Medium (2)	Low (2)	Medium (4)	Medium (6)	Medium (8)
Low (1)	Low (1)	Low (2)	Medium (3)	Medium (4)

The 'risk' derived through this methodology is presented on a simplified three-point scale:

High	A high risk that requires management, through changes to impact magnitude and/or sensitivity
Medium	An intermediate risk, and recommendations are to reduce risk as low as practicable through changes to impact magnitude and/or sensitivity
Low	No further management required, although risks should be managed

The relative risk is provided as a dimensionless product of the defined values attributed to receptor sensitivity and impact magnitude.

The determined risk (significance) may be used to highlight the relative environmental risk and to highlight the general requirement for the application of controls and mitigation. It is noted that the above approach is designed to provide an overall impact risk and is not intended to represent the defining determination for the requirement for mitigation and control. The determined risk methodology is not designed to exclude impacts with a lower determined significance from receiving mitigation and control treatments, in accordance with the principle of reducing environmental impacts to maximum extent practicable.

The following represents the risk assessment that is used to identify the risks associated with operation without any supplementary mitigation and identify the type and nature of controls that are required to be applied to avoid unreasonable emissions to air.

Pre-Mitigated Sensitivity of Receptors

Rezoning of the Proposal site is anticipated to include residential neighbourhoods, including ancillary support infrastructure such as schools, dayacares and health care facilities. Given the nature of the proposed landuses, the sensitivity of receptors is determined to be *very high*.

Pre-Mitigated Impact Magnitude

In the context of the risk assessment methodology, the impact magnitude relates to the definitions presented in Table A2, and is described on a scale from *substantial* to *negligible*. The key considerations in the assessment of potential impact magnitude are:

- Assessing the potential emissions from the processes to give rise to off-site impacts; and,
- Assessing the scale, frequency and duration of those process emissions.

The sources identified may demonstrate potential risk of emissions to air are briefly described in Section 6. These processes can be generally categorised as follows:

- Appin Main Line Valve
- Appin Methane Power Station
- Macarthur Water Filtration plant
- East West Connection Road & Transit Corridor (proposed).

Table A4 Impact magnitude (pre-mitigated)

Process	Comments and application	Pre-mitigated magnitude
Appin Main Line Valve	Pre-mitigated	Slight
Appin Methane Power Station	Pre-mitigated	Slight
Macarthur Water Filtration Plant	Pre-mitigated	Slight
East-West Connection Road & Transit Corridor (Proposed)	Pre-mitigated	Slight

Pre-Mitigated Risk

Based upon the above, the pre-mitigated risk may be determined as presented in Table A5.

Table A5 Risk (pre-mitigated)

Hazard	Sensitivity	Pre-Mitigation		
		Magnitude	Risk	Outcome
Appin Main Line Valve	Very high	Slight	Medium	Manage risk
Appin Methane Power Station		Slight	Medium	
Macarthur Water Filtration Plant		Slight	Medium	
East-West Connection Road & Transit Corridor (Proposed)		Slight	Medium	

Based upon the above, the proposed rezoning design is adequate to manage all identified potential hazards and determined to represent medium risks. The objective associated with medium risks is management to reduce that risk as low as possible.