

# **Western Sydney Aerotropolis Constraints and Land Capability Assessment**

Stage 2 - Noise and Vibration

**Department of Planning,  
Industry and Environment  
(DPIE) and Western Sydney  
Planning Partnership (WSPP)**

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# Abbreviations

Term	Meaning
AS	Australian Standard
AVTG	Assessing Vibration: A Technical Guideline (DEC 2006)
CNVS	Construction Noise and Vibration Strategy (TfNSW 2018)
DEC, DECC, DECCW	See OEH
DIN	Deutsches Institut für Normung E.V.
DPIE	Department of Planning, Industry and Environment
ENMM	Environmental Noise Management Manual (RTA, 2001)
EPA	Environment Protection Authority
GSC	Greater Sydney Commission
ICNG	Interim Construction Noise Guideline (DECC 2009)
Infrastructure SEPP	State Environmental Planning Policy
ISO	International Standards
LUIIP	Land Use and Infrastructure Implementation Plan
NPfI	Noise Policy for Industry (EPA 2017)
NSW	New South Wales
NML	Noise management level
OEH	The Office of Environment and Heritage (OEH). Formerly the Department of Environment and Conservation (DEC) before becoming the Department of Environment and Climate Change (DECC), later known as the Department of Environment Climate Change and Water (DECCW).
OSO	Outer Sydney Orbital
POEO Act	Protection of the Environment Operations Act 1997 (NSW Government 1999)
POEO Regulation	Protection of Environment Operations Regulation 2008 (NSW Government 2008)
RING	Rail Infrastructure Noise Guideline (EPA 2013)
RMS	Roads and Maritime Services (formerly Roads & Traffic Authority, RTA)
RNP	Road Noise Policy (DECCW 2011)
TfNSW	Transport for NSW
WSAP	Western Sydney Aerotropolis Plan
WSFL	Western Sydney Freight Line
WSPP	Western Sydney Planning Partnership

# Reference Documentation

Author	Year	Title
AECOM	2018	Outer Sydney Orbital Transport Corridor – Draft Strategic Environmental Assessment (revision 1)
Australian Standard	1989	AS 3671-1989 Acoustics—Road traffic noise intrusion—Building siting and construction
Australian/New Zealand Standards	2016	AS/NZS 2107:2016 Acoustics—Recommended design sound levels and reverberation times for building interiors
Deutsches Institut für Normung E.V.	1999	Structural vibration Part 3: Effects of vibration on structures
Hassell ©	2020	Western Sydney Aerotropolis Urban Design and Landscape Report (draft for public comment issue)
Hill Thalys Architecture + Urban Projects ©	2020	Northern Gateway Urban Design and Landscape Report (draft for public comment issue)
International Standard	2005	ISO 14837-1:2005 Mechanical vibration – Ground-borne noise and vibration arising from rail systems
Jacobs	2017	The Northern Road Upgrade – Mersey Road, Bringelly to Glenmore Parkway, Glenmore Park Final Environmental Impact Statement
	2019	M12 Motorway Environmental Impact Statement, Appendix K Noise and Vibration Assessment Report
Liverpool City Council	2008	Liverpool Development Control Plan 2008
	2008	Liverpool Local Environmental Plan 2008
Penrith City Council	2010	Penrith Local Environmental Plan 2010
	2014	Penrith Development Control Plan 2014
NSW Department of Planning, Industry and Environment	2008	State Environmental Planning Policy (Infrastructure)
	2008	Development Near Rail Corridors and Busy Roads – Interim Guideline
NSW Environment Protection Authority	2006	Assessing Vibration: a technical guideline
	2009	Interim Construction Noise Guideline
	2011	NSW Road Noise Policy
	2013	Noise Guide for Local Government
	2017	Noise Policy for Industry
NSW Government	1999	Protection of the Environment Operations Act 1997
	2008	Protection of Environment Operations Regulation 2008
Studio Hollenstein	2020	Agribusiness Precinct Urban Design and Landscape Report (draft for public comment issue)
Transport for NSW	2020	Future Transport Links – Western Sydney Map (version 1)
Western Sydney Planning Partner (WSPP)	2020	Draft Aerotropolis Precinct Plan (draft for public comment issue)
Wilkinson Murray	2016	Western Sydney Airport Environmental Impact Statement (EIS), Appendix E2 Airport ground-based noise and vibration

# 1 Introduction

## 1.1 Project overview

The Western Sydney Aerotropolis Plan (WSAP) sets the planning framework for the Western Sydney Aerotropolis (the Aerotropolis). This Plan draws on the collaborative work being undertaken across the three levels of government and responds to the submissions received on the Stage 1 Land Use and Infrastructure Implementation Plan (LUIIP). The WSAP will set the vision for the Aerotropolis as Greater Sydney's next global gateway with new jobs and places to learn within a cool, green and connected Parkland City.

As part of the project, Western Sydney Planning Partnership (WSPP) has developed a high-level Structure Plan and land use plan for all precincts to guide precinct planning and subsequent master planning.

Aurecon has been engaged to provide engineering and land capability advice to support planning for the development of the Aerotropolis. The advice provided will inform the development of Precinct Plans for the following initial precinct groupings:

- Northern Gateway Precinct
- Aerotropolis Core, Badgerys Creek and adjoining land in the Wianamatta-South Creek Precinct
- Agribusiness Precinct

## 1.2 Purpose of report

This report identifies the opportunities and constraints associated with noise and vibration within the initial precinct groupings of the Aerotropolis, to inform decision making around urban planning, specifically relating to managing and enhancing the local environment and the Western Parkland City vision.

The report is based on a desktop review of the draft precinct plans contained in the *Draft Aerotropolis Precinct Plan* report (WSPP, 2020) and the *Urban Design and Landscape Report (Various, 2020)* for each precinct, and includes:

- Study area site context – existing land uses, identification of Local Government Area (LGA), current land zoning and location of existing environmental noise and vibration sources (road and rail)
- A general overview of the existing ambient noise environment within the initial precincts, based on the qualitative analysis of existing environmental sources
- Summary of proposed future Western Sydney transport plans and corridors
- Relevant regulatory framework and statutory guidelines
- A preliminary qualitative assessment of noise and vibration impacts associated with each precinct, which will include key findings, issues for consideration and recommendations

The scope of works is limited to the three (3) initial precinct groupings, of which some of the precincts have very limited existing infrastructure. In the interest of completeness, Aurecon has expanded the commentary to outside the precinct, where relevant, to provide a holistic understanding of the potential noise and vibration impacts associated with the Aerotropolis.

**Note: This report does not address aircraft noise impacts associated with the Western Sydney International (Nancy-Bird Walton) Airport.**

## 2 Study Area

### 2.1 Site Context

The Aerotropolis is a 11,200-hectare growth area surrounding the Western Sydney International (Nancy-Bird Walton) Airport (the Airport). The study area delineated for the current Western Sydney Aerotropolis Constraints and Land Capability Assessment focuses on approx. 6,500 Ha of land directly bordering the Airport site. The location of the Aerotropolis growth area and subject study area in relation to the Greater Sydney Metropolitan Area, is illustrated in **Figure 2-1**.

The study has been grouped into three (3) initial precinct groupings (Aerotropolis Precincts), as illustrated in **Figure 2-2**:

- Northern Gateway
- Badgerys Aerotropolis Core and adjoining areas of Wianamatta-South Creek
- Agribusiness.

The Aerotropolis is located within the Penrith City Council and Liverpool City Council LGA's (see **Figure 2-3**), and existing land within these precincts is generally used for agricultural and rural purposes with scattered areas of medium-density development such as Luddenham Village. Existing transport infrastructure within the Aerotropolis is limited primarily due to its agricultural and rural land use and lack of user demand. A brief context of the Aerotropolis Precincts and existing land uses are provided in Section 2.2.



**Figure 2-1: The Aerotropolis & Study Area – Regional Setting**

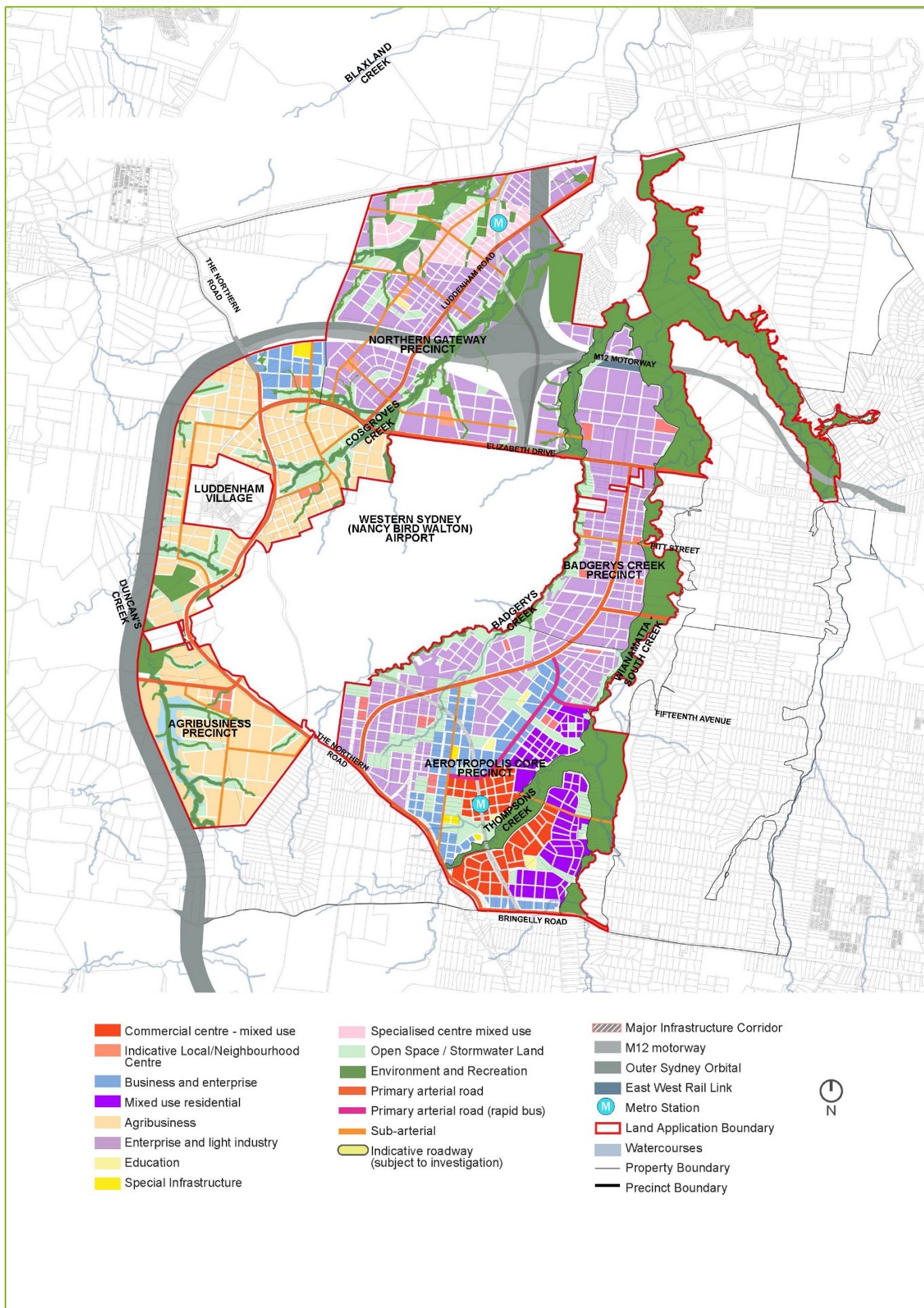
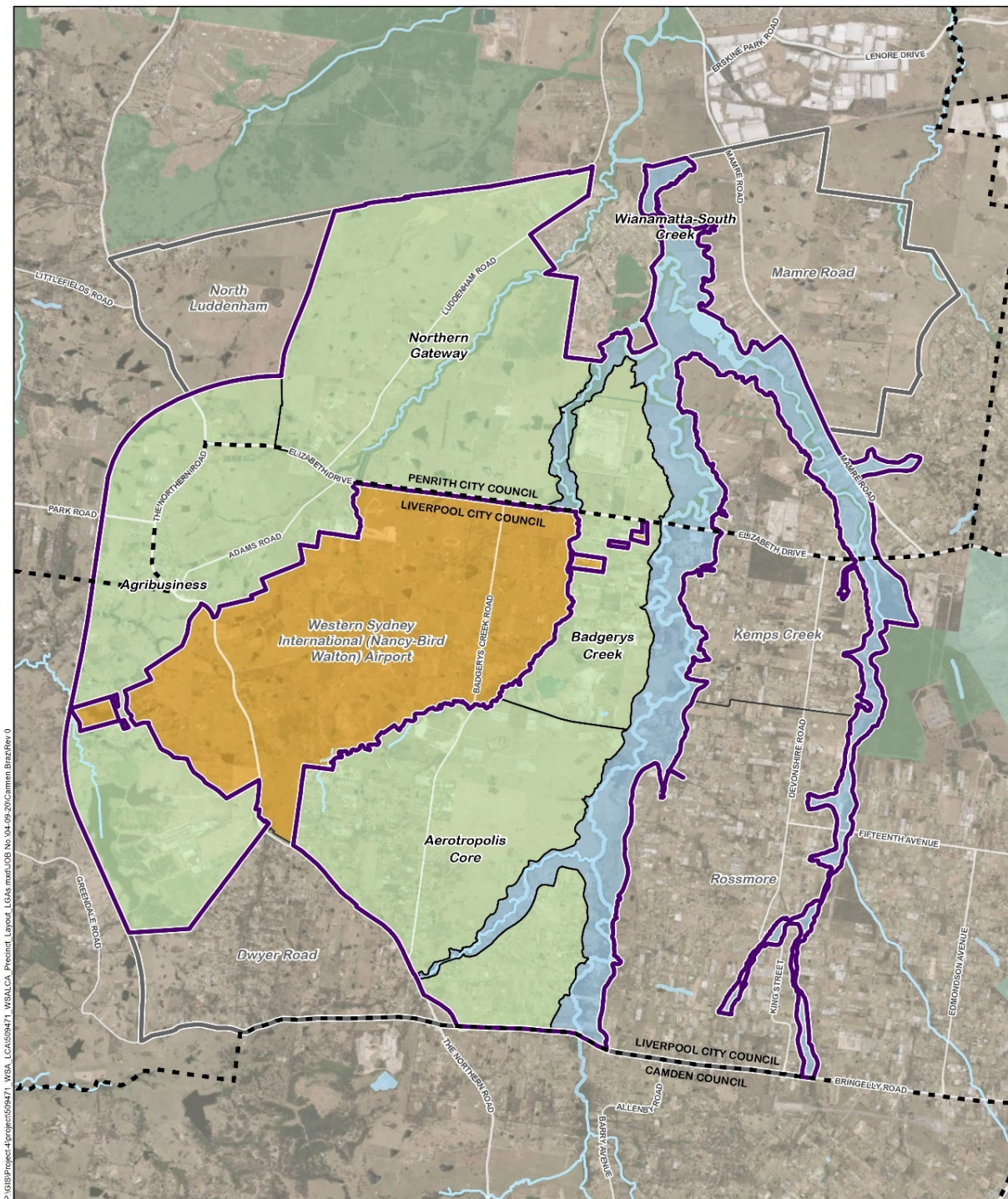


Figure 2-2: Initial Precinct Groupings & Draft Precinct Plans



Source: Aurecon, DPIE, NSW Spatial Services, ESRI



A3 scale: 1:55,000

0 1 2 km

Date: 4/09/2020

Projection: GDA 1994 MGA Zone 56

Western Sydney Aerotropolis Constraints and Land Capability Assessment

Precinct Layout & LGAs

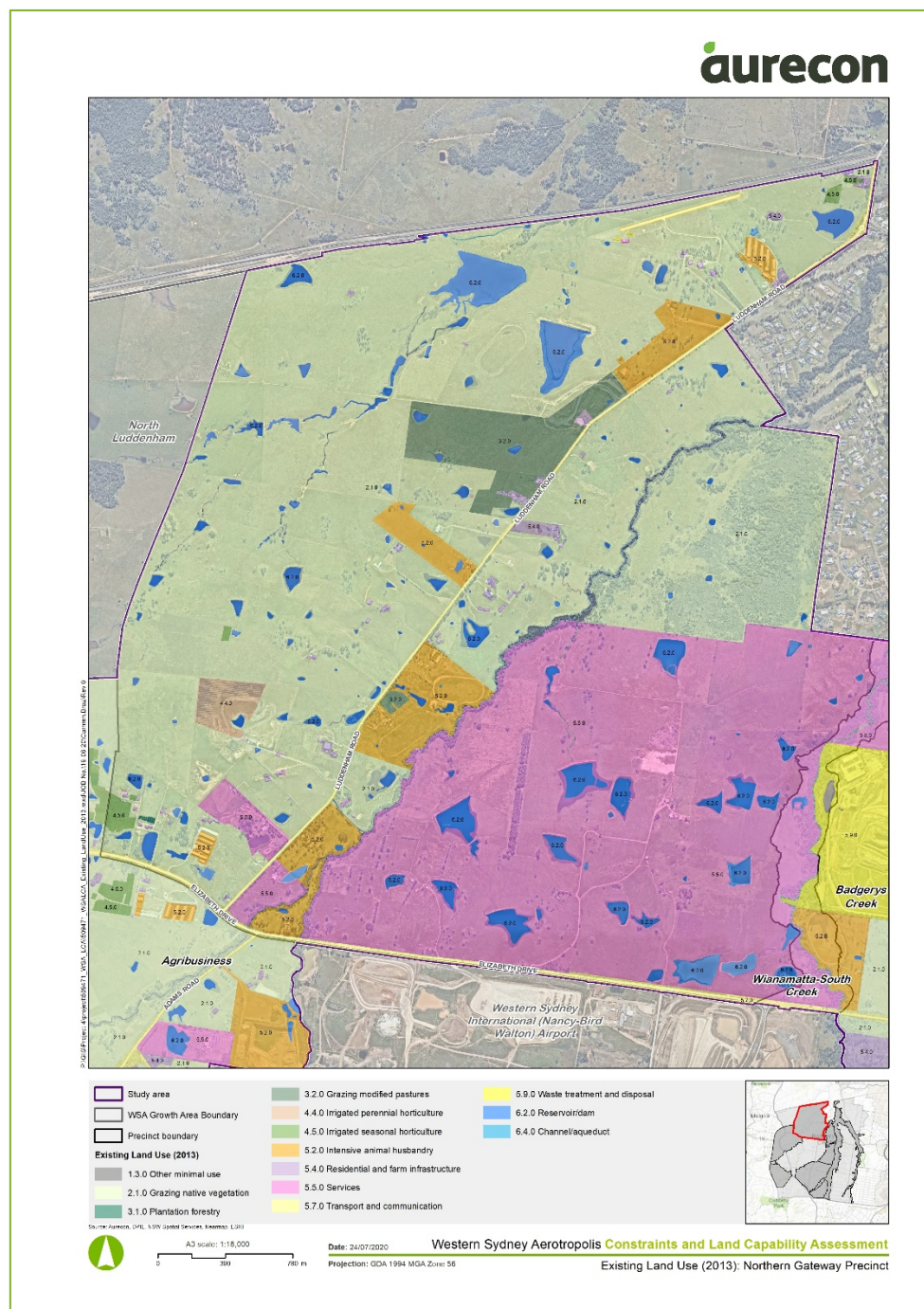
Figure 2-3: Initial Precinct Groupings LGA

## 2.2 Initial Precinct Groupings

### 2.2.1 Northern gateway

The Northern Gateway precinct covers approx. 1,616 ha and is located within the Penrith LGA. Located to the north of the Airport site it is bounded by the Agribusiness precinct to the south-west and Badgerys Creek and Wianamatta-South Creek precincts to the east and south-east. The precinct is bisected from the south-west to north-east by Cosgrove Creek. Luddenham Road (running mostly adjacent to Cosgrove Creek) and Elizabeth Drive (along southern boundary of precinct) are the only principal road carriageways within this precinct, with no current rail transport infrastructure.

**Figure 2-4** illustrates the existing land use within the precinct. The precinct is largely undeveloped comprising primarily of agricultural rural land and some farm properties. The Luddenham Raceway – Go Karting, Paintball & Motorsport Park located at 821-849 Luddenham Road, Luddenham is the only existing development within this precinct with the potential to generate significant noise impacts. Noise from typical farming activities is also expected. Vibration impacts are not anticipated.

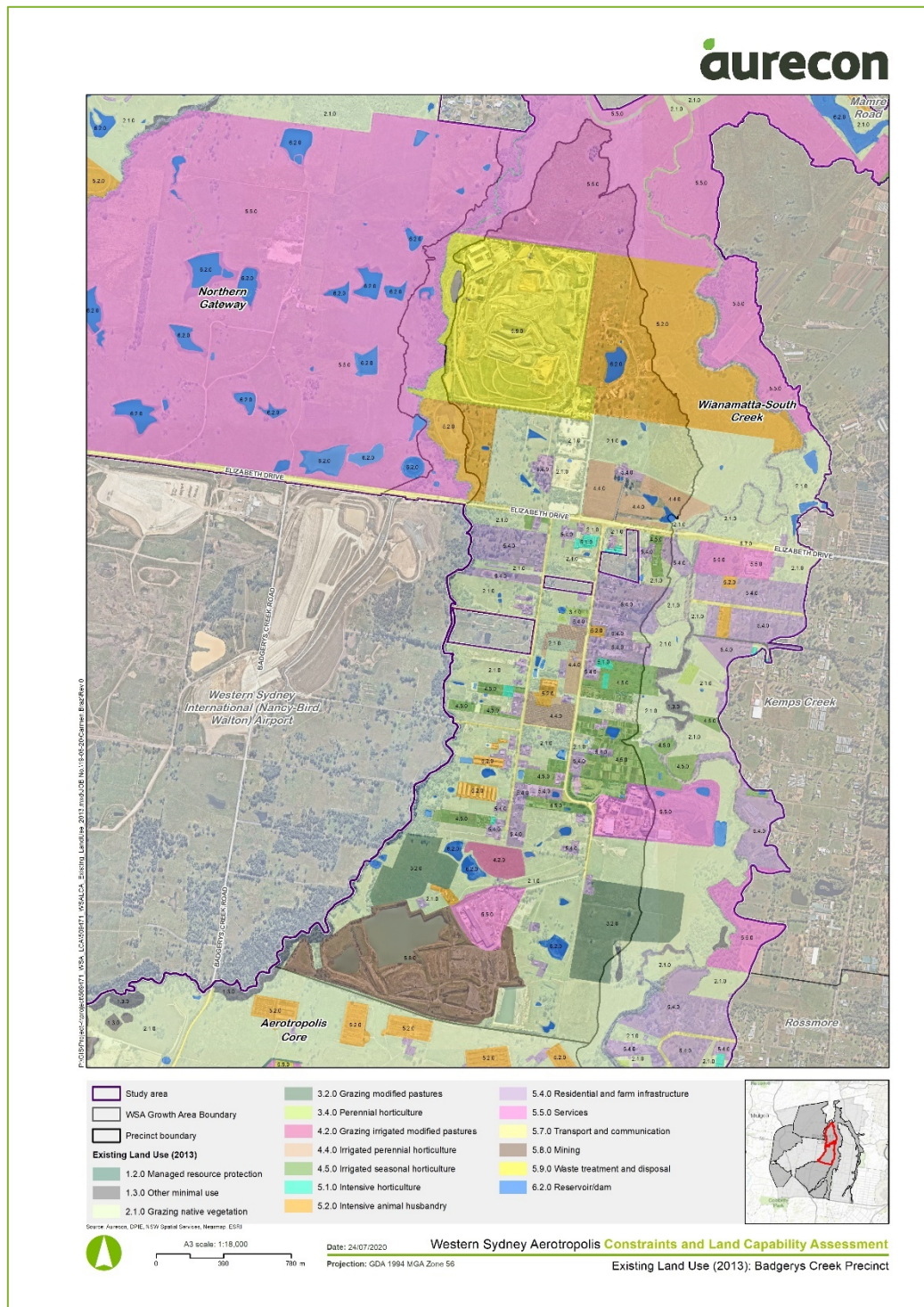


**Figure 2-4: Northern Gateway Precinct – Existing Land Use**

## 2.2.2 Badgerys creek

Badgerys Creek precinct is the smallest of the four urban precincts included in the current study, covering approx. 634 ha. Located within the Liverpool LGA, the precinct is to the east of the Airport site and has parcels of land demarcated for airport infrastructure, as shown in **Figure 2-2**. The precinct is bounded by the Airport to the west and Wianamatta-South Creek precinct to the north, east and south-east. Elizabeth Drive is the only transport corridor in this precinct, crossing it in the east-west direction towards the centre of the precinct.

**Figure 2-5** illustrates the existing land use within the precinct and shows that it is primarily composed of agricultural and rural land with farm properties and a few waste treatment and disposal facilities. The SUEZ Kemps Creek Resource Recovery Park & West Sydney Sand and Soil at 1725 Elizabeth Drive, Kemps Creek and the Australian Native Landscapes at 210 Martin Road, Badgerys Creek are the only existing developments within this precinct with the potential to generate significant noise impacts. Vibration impacts are not anticipated.



**Figure 2-5: Badgerys Creek Precinct – Existing Land Use**

The Aerotropolis Core precinct is the southernmost precinct, spanning approx. 1,382 Ha and located within the Liverpool LGA. The precinct is bounded by the Airport site to the north/north-west, Badgerys Creek precinct to the north/north-east and the Wianamatta-South Creek precinct to the east. The Northern Road and Bringelly Road (east of The Northern Road and Bringelly Road intersection) are the two principal traffic corridors bordering this precinct, located along the south and south-west boundaries respectively. Badgerys Creek Road is also located within this precinct, roughly crossing the centre and with an alignment in the north-south direction.

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Western Sydney International (Nancy-Bird Walton) Airport

Badgerys Creek

Wianamatta-South Creek

Dwyer Road

Greendale Road

Rosemore

**Legend:**

- Study area
- WSA Growth Area Boundary
- Precinct boundary
- Existing Land Use (2013)**
  - 1.2.0 Managed resource protection
  - 1.3.0 Other minimal use
  - 2.1.0 Grazing native vegetation
  - 3.2.0 Grazing modified pastures
  - 3.3.0 Cropping
  - 3.4.0 Perennial horticulture
  - 4.2.0 Grazing irrigated modified pastures
  - 4.5.0 Irrigated seasonal horticulture
  - 5.1.0 Intensive horticulture
  - 5.2.0 Intensive animal husbandry
  - 5.3.0 Manufacturing and industrial
  - 5.4.0 Residential and farm infrastructure
  - 5.5.0 Services
  - 5.6.0 Utilities
  - 5.7.0 Transport and communication
  - 5.8.0 Mining
  - 5.9.0 Waste treatment and disposal
  - 6.2.0 Reservoir/dam

**Scale:** 1:18,000

**Date:** 24/07/2020

**Projection:** GDA 1994 MGA Zone 56

**Western Sydney Aerotropolis Constraints and Land Capability Assessment**

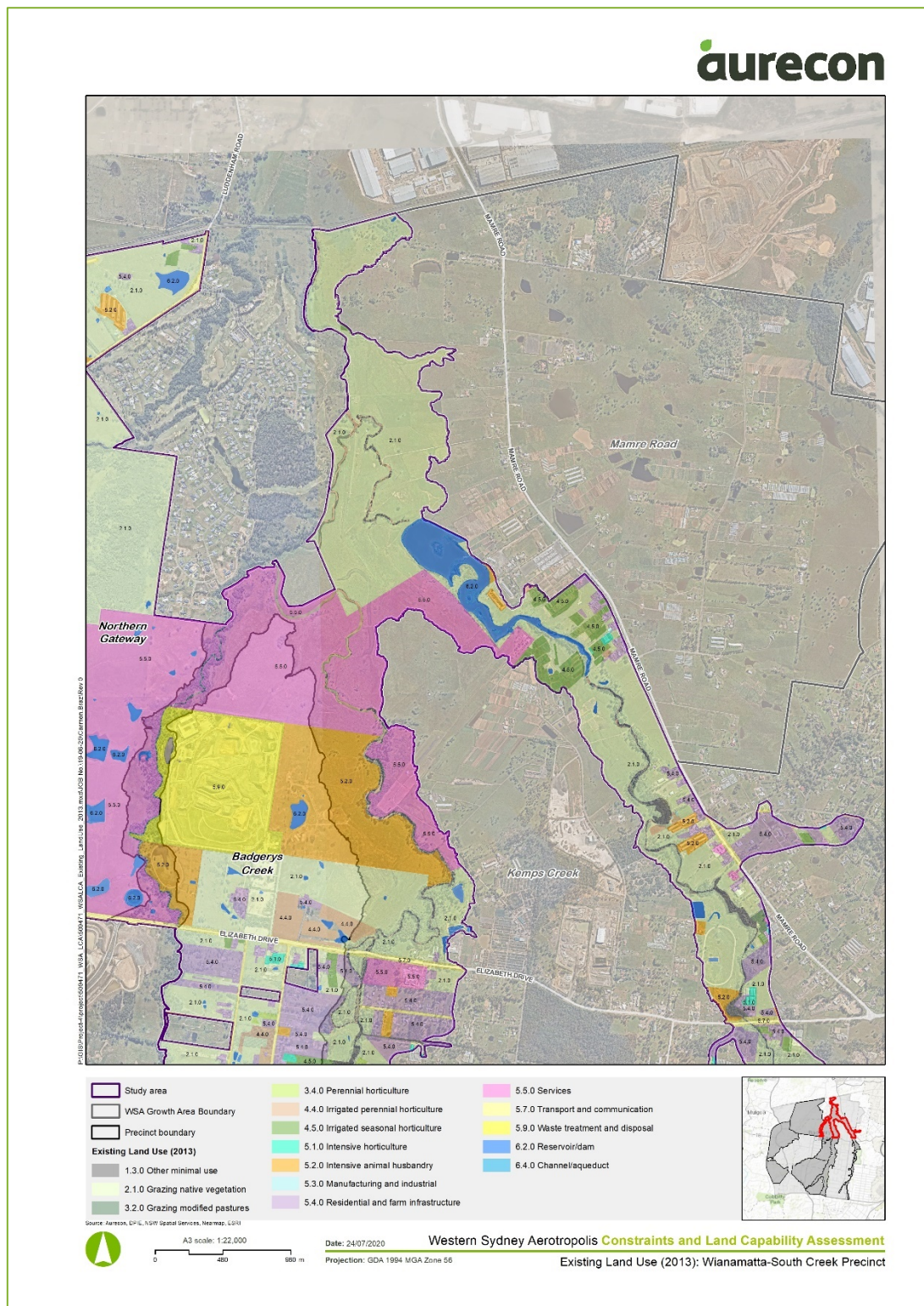
**Existing Land Use (2013): Aerotropolis Core Precinct**

Project number 509471 File 509471 WSA Constraints and LCA Stage 2 - Noise and Vibration rev3.docx, 2021-12-13 Revision 3 15

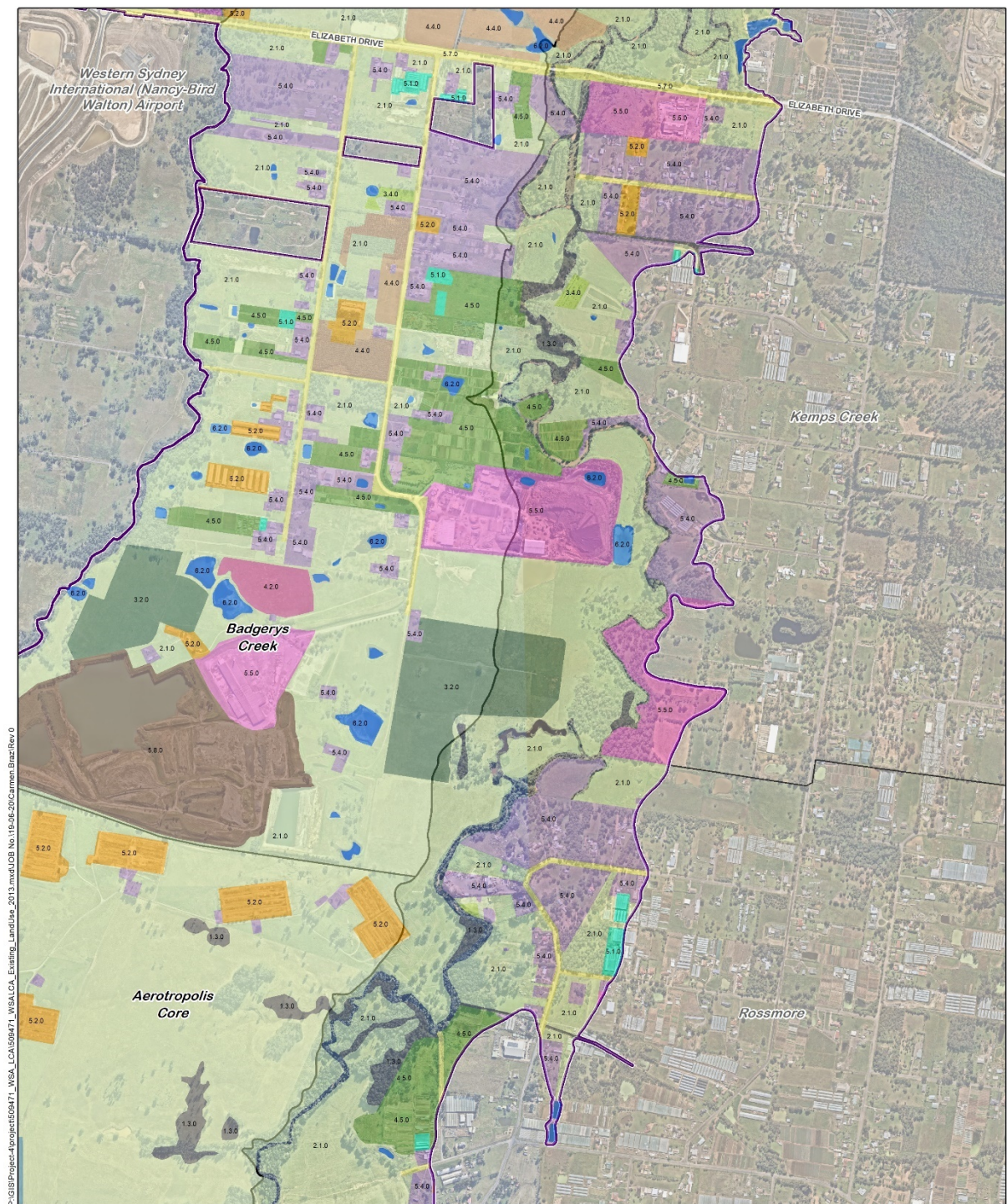
## 2.2.4 Wianamatta-South creek

Wianamatta-South Creek precinct borders the three major river systems comprising the South Creek catchment (South Creek, Kemps Creek and Badgerys Creek), covering approx. 1,330 Ha. Land to the north of Elizabeth Drive is located within the Penrith LGA and land to the south of Elizabeth Drive is located within the Liverpool LGA.

**Figure 2-7, Figure 2-8, Figure 2-9, Figure 2-10 & Figure 2-11** illustrate the existing land use within the precinct. The precinct primarily envelopes the South Creek catchment areas with largely undeveloped greenfield land and some residential / farm properties. Two sections of Elizabeth Drive form the only major transport corridor in this precinct, with alignment in the east-west direction. Operational noise associated with commercial farming and warehouse properties is expected. Vibration impacts are not anticipated.



**Figure 2-7: Wianamatta-South Creek Precinct – Existing Land Use (1/5)**



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- |                                 |   |   |
|---------------------------------|---|---|
| Study area                      | 3.3.0 Cropping                            | 5.4.0 Residential and farm infrastructure |
| WSA Growth Area Boundary        | 3.4.0 Perennial horticulture              | 5.5.0 Services                            |
| Precinct boundary               | 4.2.0 Grazing irrigated modified pastures | 5.7.0 Transport and communication         |
| <b>Existing Land Use (2013)</b> | 4.4.0 Irrigated perennial horticulture    | 5.8.0 Mining                              |
| 1.3.0 Other minimal use         | 4.5.0 Irrigated seasonal horticulture     | 6.2.0 Reservoir/dam                       |
| 2.1.0 Grazing native vegetation | 5.1.0 Intensive horticulture              |   |
| 3.2.0 Grazing modified pastures | 5.2.0 Intensive animal husbandry          |   |

Source: Aurecon, DPIE, NSW Spatial Services, Nearmap, ESRI



A3 scale: 1:14,000  
0 300 600 m

Date: 24/07/2020

Projection: GDA 1994 MGA Zone 56

Western Sydney Aerotropolis Constraints and Land Capability Assessment

Existing Land Use (2013): Wianamatta-South Creek Precinct

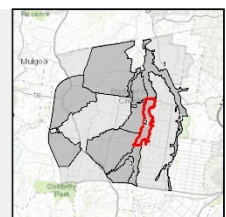


Figure 2-8: Wianamatta-South Creek Precinct – Existing Land Use (2/5)

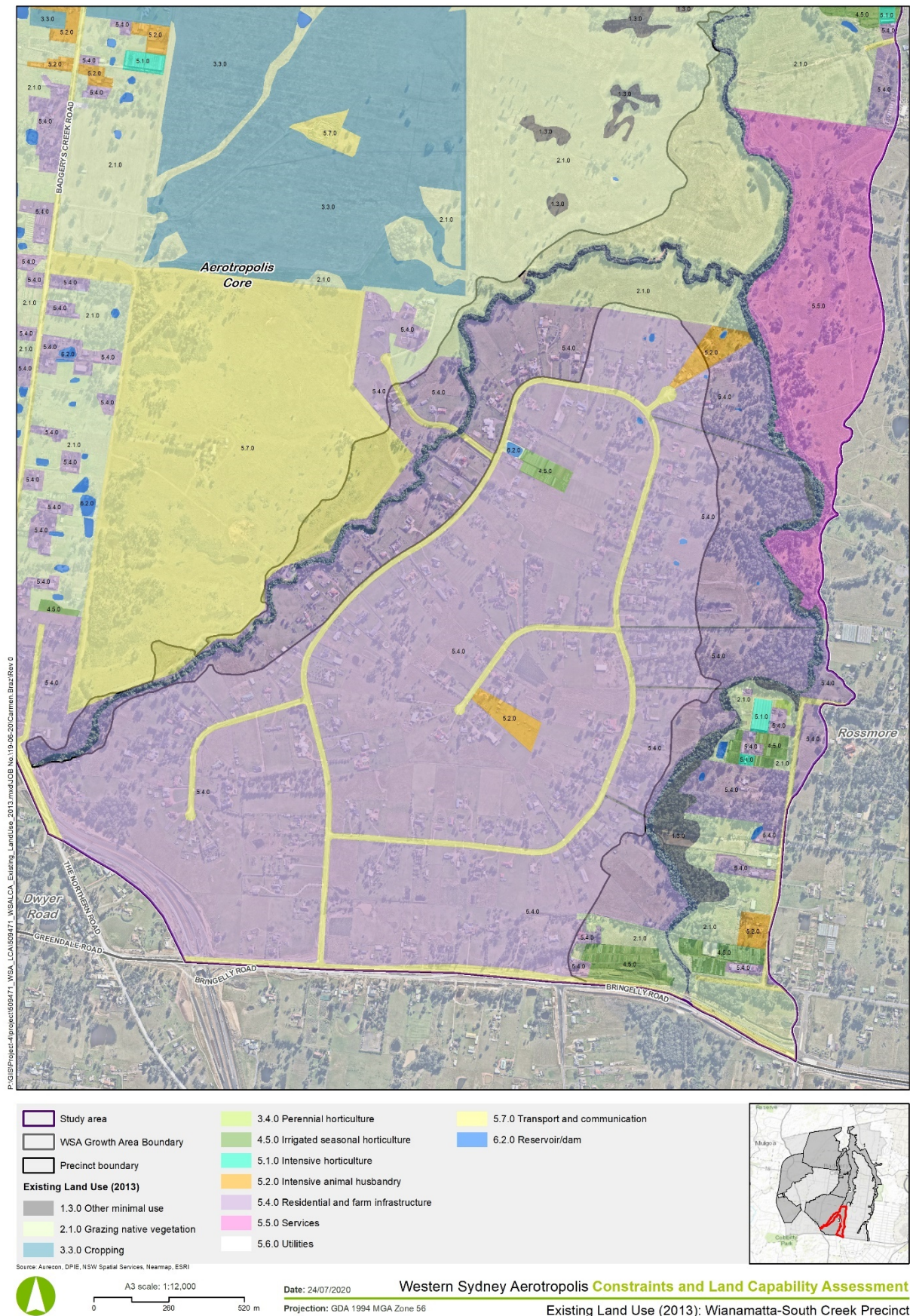


Figure 2-9: Wianamatta-South Creek Precinct – Existing Land Use (3/5)

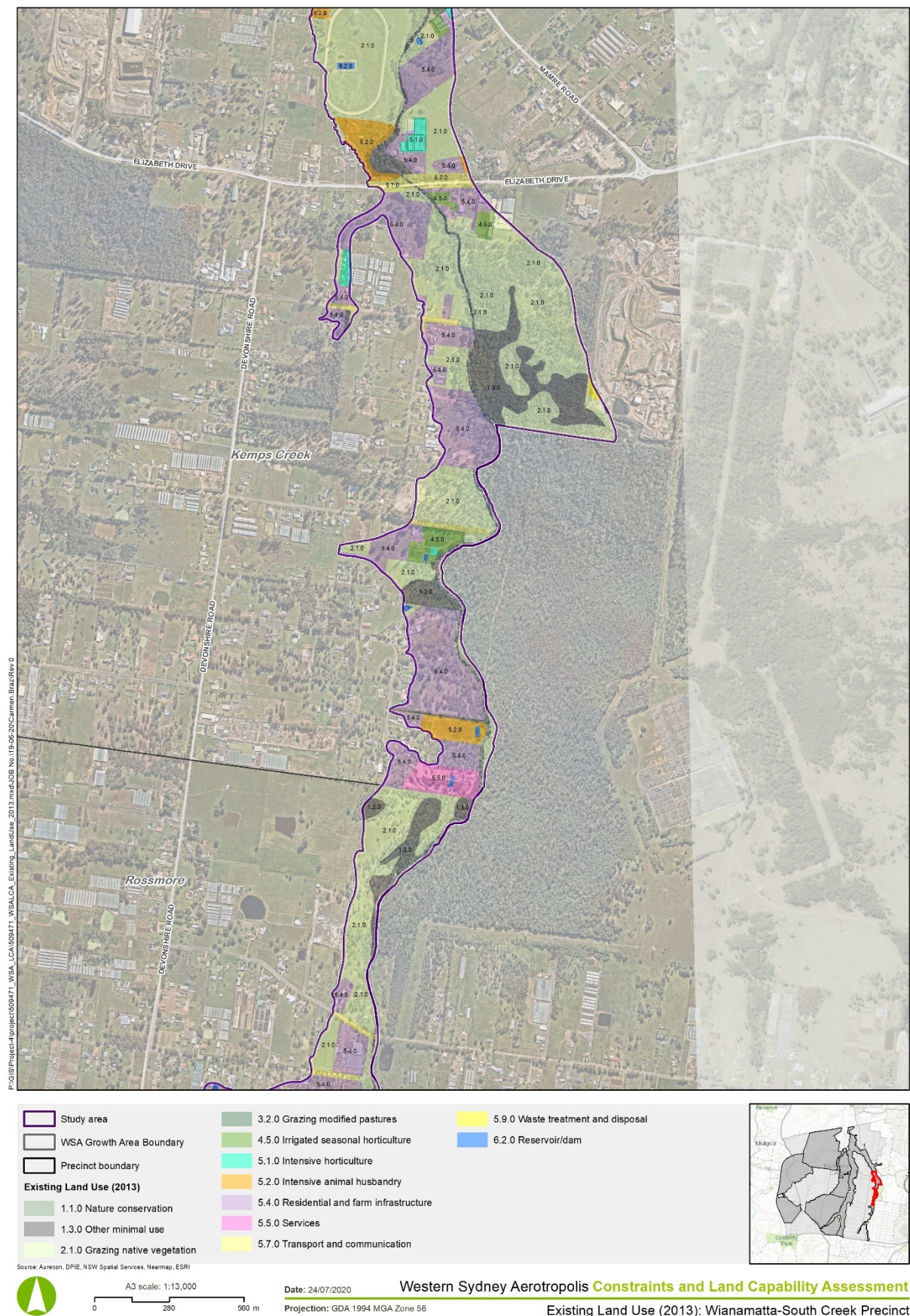
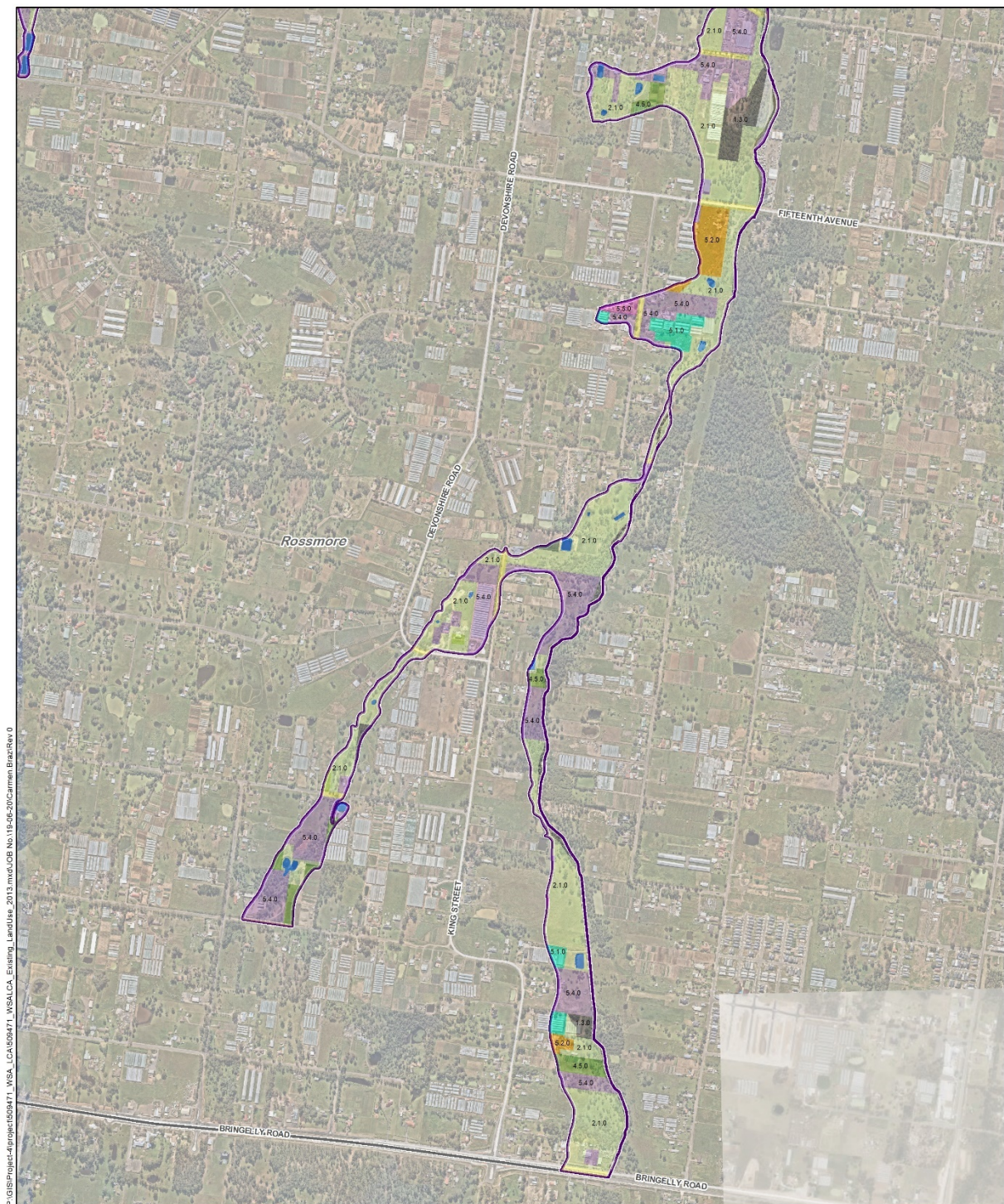


Figure 2-10: Wianamatta-South Creek Precinct – Existing Land Use (4/5)



- |                                 |   |                                   |
|---------------------------------|---|-----------------------------------|
| Study area                      | 3.4.0 Perennial horticulture              | 5.7.0 Transport and communication |
| WSA Growth Area Boundary        | 4.5.0 Irrigated seasonal horticulture     | 6.2.0 Reservoir/dam               |
| Precinct boundary               | 5.1.0 Intensive horticulture              |                                   |
| <b>Existing Land Use (2013)</b> |   |                                   |
| 1.3.0 Other minimal use         | 5.2.0 Intensive animal husbandry          |                                   |
| 2.1.0 Grazing native vegetation | 5.4.0 Residential and farm infrastructure |                                   |
| 3.2.0 Grazing modified pastures | 5.5.0 Services                            |                                   |
|                                 | 5.6.0 Utilities                           |                                   |

Source: Aurecon, DPE, NSW Spatial Services, Neamap, ESRI



A3 scale: 1:14,000  
0 300 600 m

Date: 24/07/2020

Projection: GDA 1994 MGA Zone 56

Western Sydney Aerotropolis Constraints and Land Capability Assessment

Existing Land Use (2013): Wianamatta-South Creek Precinct

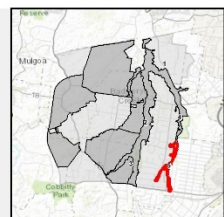


Figure 2-11: Wianamatta-South Creek Precinct – Existing Land Use (5/5)

## 2.2.5 Agribusiness

The Agribusiness precinct covers approx. 1,560 ha and is primarily located in the Liverpool LGA. Land to the north of Adams Road, west of The Northern Road and north of Elizabeth Drive is in the Penrith LGA. This is illustrated in **Figure 2-12**.

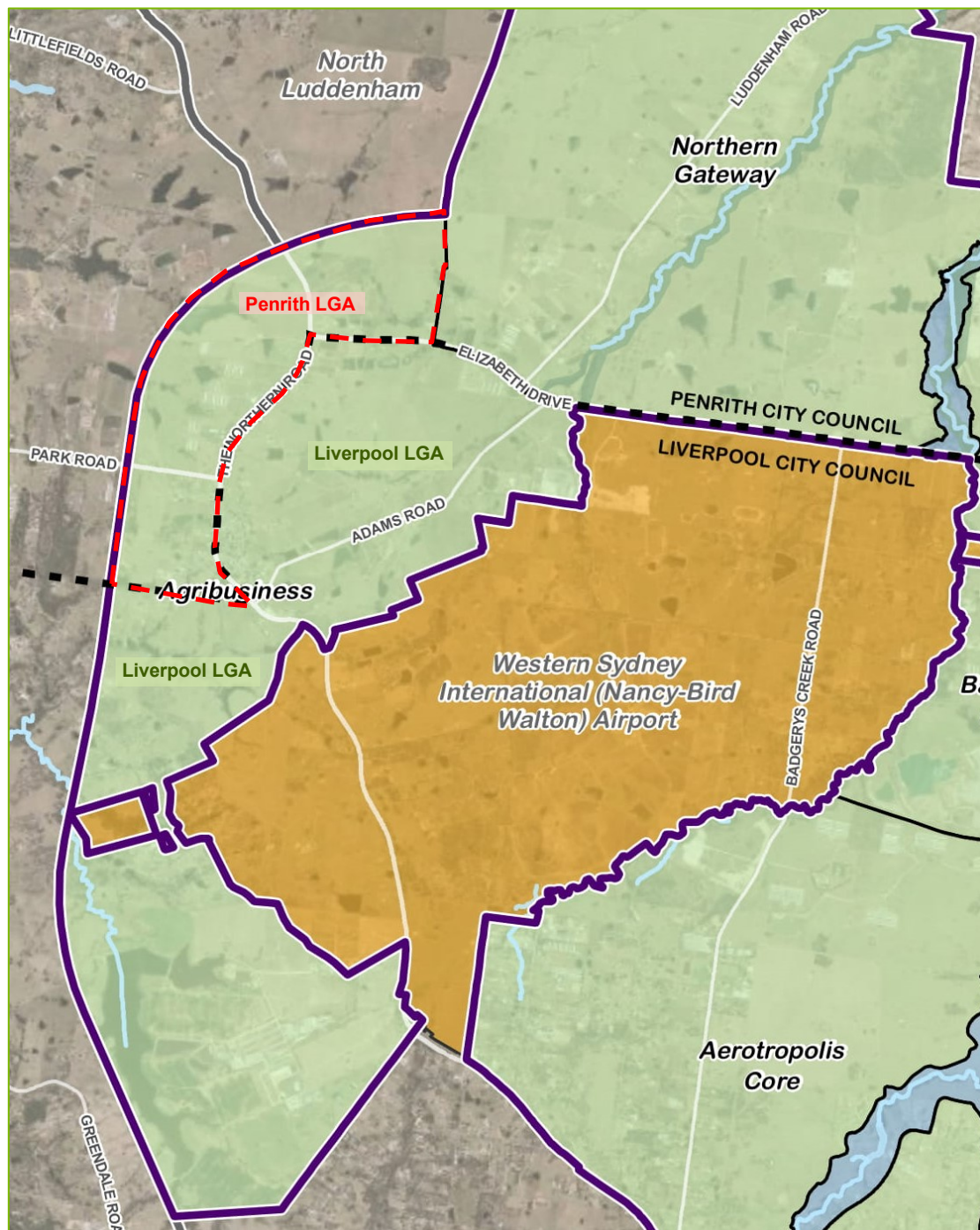


Figure 2-12: Agribusiness Precinct – Applicable LGA

The precinct is located to the west of the Airport site and is characterised by a large network of interlinked drainage paths and creeks, the most prominent of which is Duncans Creek flowing from south to north along the western boundary of the precinct. Elizabeth Drive and the Northern Road are the principal traffic corridors located within this precinct.

**Figure 2-13 & Figure 2-14** illustrate the existing land uses. Except for Luddenham Village (along The Northern Road, south of Park Road), a medium-density development area with residential, mixed-use, retail and public infrastructure properties (schools and religious centres), the precinct is largely undeveloped comprising primarily of agricultural and rural land. Except for existing operational noise associated with Luddenham Village there are no noise generating developments in this precinct.

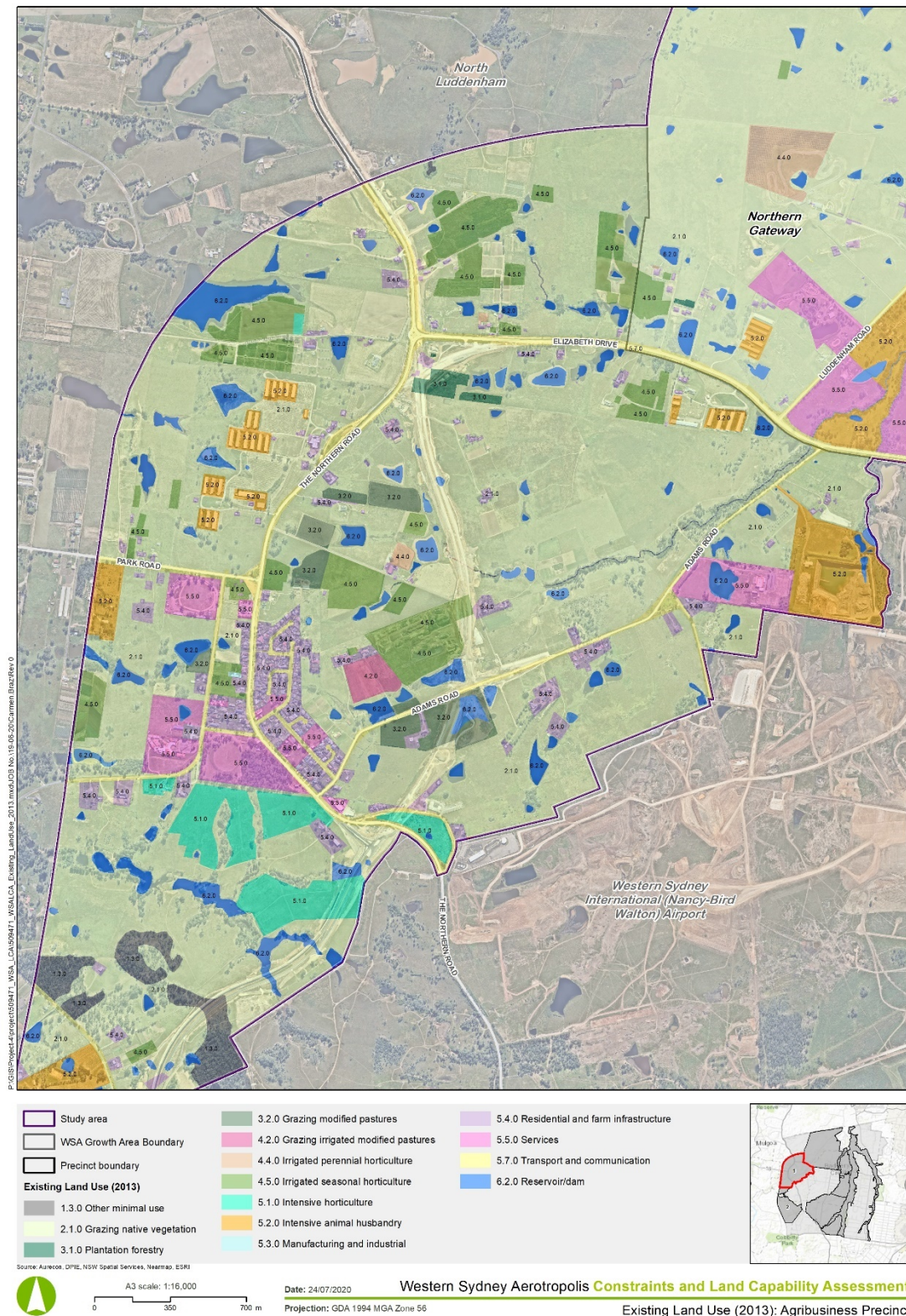


Figure 2-13: Agribusiness Precinct – Existing Land Use (1/2)

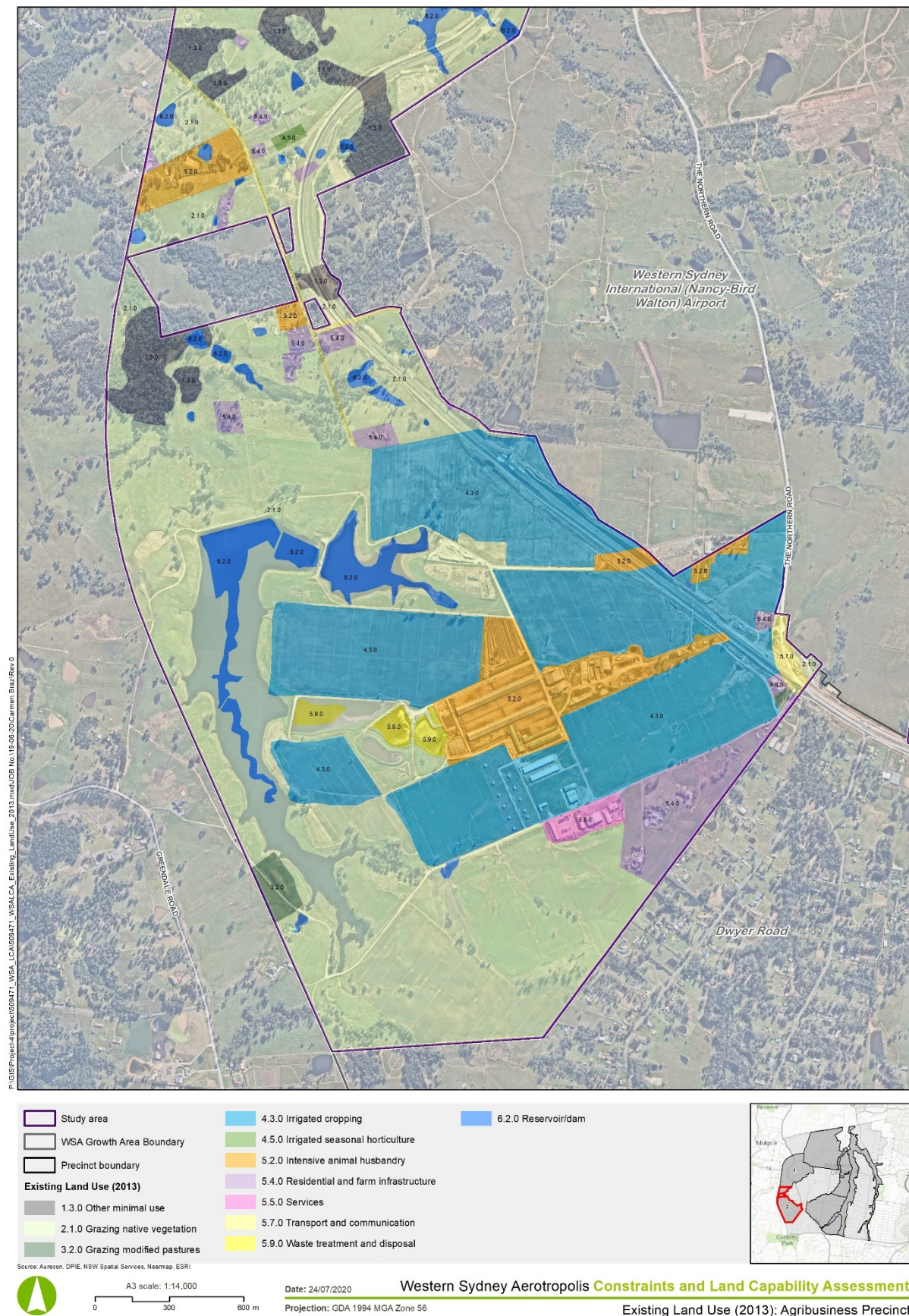


Figure 2-14: Agribusiness Precinct – Existing Land Use (2/2)

## 3 Regulatory Context

### 3.1 Liverpool Development Control Plan 2008

The objective of the Liverpool Development Control Plan (DCP) 2008 is to provide a framework for the control of noise and vibration nuisance for developments proposed on land located within the Liverpool LGA. This framework is based on the type of development and its location with reference to land zoning and different precincts within the LGA. Generally, the council defines noise pollution as a noise source that is intrusive and/or offensive, under the provisions of the *Protection of the Environment Operations Act 1997* (POEO Act) (NSW Government, 1999). However, the POEO Act does not provide a quantitative guideline to what constitutes offensive noise. The DCP refers to the following State legislation and Australian Standards, for the control of noise and vibration impacts:

- State Environmental Planning Policy (Infrastructure) 2007 (Infrastructure SEPP) (NSW Department of Planning, Industry and Environment (DPIE), 2008) and NSW Environment Protection Authority (EPA) guidelines for the assessment of environmental (road and rail) noise and vibration impacts,
- *Protection of Environment Operations Regulation 2008* (POEO Regulation) (NSW Government, 2008) and NSW EPA guidelines for the assessment of operational noise and vibration emissions.

### 3.2 Penrith Development Control Plan 2014

Like the Liverpool DCP 2008, Penrith DCP 2014 provides a framework for the control of noise and vibration nuisance for developments proposed on land located within the Penrith LGA. This framework is based on land uses, types of development and key precincts. Section C12 in Volume 1 of the DCP summarises all the applicable noise and vibration provisions. Volume 2 outlines specific provisions for key precincts, none of which are in this assessment study area. The provisions detailed in Section C12 of this DCP are:

- Road traffic noise – compliance with provisions and standards by relevant State Government authorities/agencies and Australian Standards
- Rail traffic noise and vibration – compliance with the standards and criteria detailed in the Infrastructure SEPP, *Development Near Rail Corridors and Busy Roads – Interim Guideline* (DPIE, 2008) and relevant NSW EPA guidelines
- Open Air Entertainment – compliance with the provisions and restrictions detailed in part 12.6 of this section for different use types i.e. Motor sport, Open air concerts and Sporting activities
- POEO Regulation and NSW EPA guidelines for the assessment of operational noise and vibration emissions (generally).

### 3.3 NSW Department of Planning, Industry and Environment

The publications of the NSW Department of Planning, Industry and Environment (DPIE) referenced in this section identify sensitive land use developments as follows:

- A building for residential use,
- Hospitals,
- Places of public worship, and
- Educational establishments or childcare centres.

#### 3.3.1 Infrastructure SEPP

The Infrastructure SEPP aims to identify matters to be considered in the assessment of sensitive developments proposed adjacent to particular types of infrastructure. To ensure a suitable level of acoustic amenity is achieved for developments proposed on land in or adjacent to transport corridors, this guideline nominates the provisions of:

- **Clause 87** for Impact of rail noise or vibration on non-rail development,
- **Clause 102** for Impact of road noise or vibration on non-rail development.

### 3.3.2 Development near rail corridors and busy roads – interim guideline

Consideration of this guideline is a requirement for sensitive land use developments specified under the Infrastructure SEPP, however it is also a useful guide for all developments (and the planning and design of developments) that may be impacted by noise and vibration impacts from rail corridors and major roads. Section 3 of this guideline details noise and vibration provisions which include:

- A methodology for when an assessment is required (section 3.5), applicable for developments located in the vicinity of rail corridors (Section 3.5.1) and applicable for developments located in the vicinity of busy roads (Section 3.5.2).
- Airborne noise criteria (Table 3.1, in Section 3.6.1<sup>1</sup>)
- Ground-borne noise provisions (Section 3.6.2<sup>2</sup>)
- Intermittent vibrations emitted by trains shall comply with the provisions of:
  - NSW EPA *Assessing Vibration: a technical guideline* for human comfort impacts, and
  - German Standard DIN 4150 Part 3 1999 for vibration damage on structures.
- Planning strategies (e.g. land subdivision, building orientation & design) and mitigation measures (e.g. acoustic screens, noise barriers, mounds, buffer distances) to be considered through good design, to avoid adverse airborne noise and vibration impacts (Section 3.8).

## 3.4 NSW Environment Protection Authority

### 3.4.1 Interim construction noise guideline

The *Interim Construction Noise Guideline* (ICNG) (DECC, 2009) is the principal publication referenced in NSW, for the assessment and management of noise and vibration from construction works. This guideline has been developed by several State agencies (NSW EPA, NSW DPIE, NSW RTA), in conjunction with Local Government and Shire Associations of NSW and is generally used to inform decision making and consenting.

Neither the Liverpool DCP 2008 nor the Penrith DCP 2014 outline specific provisions for the control of construction noise and vibration impacts. Hence, Aurecon recommends reference to the provisions of this guideline for the assessment and management of noise and vibration impacts from construction activities within these LGA's. This guideline outlines two assessment methods:

- Quantitative assessment method – recommended for major construction projects (e.g. new public infrastructure, major commercial or industrial developments etc.) as detailed in Schedule 1 of the POEO Act. This method involves detailed noise emission predictions and assessment against management levels detailed in the guideline.
- Qualitative assessment method – recommended for short-term small construction projects, especially in rural areas, where works are not likely to affect an individual or sensitive land use for more than three weeks in total.

Assessment is generally not required for emergency works. Relevant sections of this guideline are summarised below:

- Recommended standard hours for construction works (Section 2.2 of ICNG)
- Airborne noise criteria for quantitative assessments (Section 4.1 of ICNG)
- Ground-borne noise criteria for quantitative assessments (Section 4.2 of ICNG)
- Provisions for the assessment of sleep disturbance impacts (Section 4.3 of ICNG)
- Human comfort vibrations from construction works (excluding blasting) are to be assessed against the provisions of *Assessing Vibration: a technical guideline* (DEC, 2006)

<sup>1</sup> The DPIE's *Interim Guidelines for the Assessment of Noise from Rail Infrastructure Projects* should be referred to for additional guidance.

- Methodology for qualitative assessment (Section 5 of ICNG).

### 3.4.2 Assessing vibration: a technical guideline

This publication outlines vibration criteria to assess the effects on human exposure to vibration from industry, transportation and machinery. The principal aim of this publication is to ensure the amenity of tenants, within surrounding affected properties is not adversely impacted. This guideline classifies vibrations in buildings into three categories and defines assessment criteria for each category:

- Continuous vibration – typically associated with machinery and continuous construction activity (e.g. tunnel boring machine), where vibration impacts continue uninterrupted for a defined period. These impacts are assessed based on weighted RMS acceleration values (Section 2.3 of the guideline).
- Impulsive vibration – associated with rapid build up to a peak followed by a damped decay. Generally associated with infrequent activities that create up to three distinct vibration events in an assessment period (e.g. shocks, occasion dropping of heavy equipment, loading/unloading etc.). These impacts are also assessed based on weighted rms acceleration values (Section 2.3 of the guideline).
- Intermittent vibration – defined as interrupted periods of continuous or repeated periods of impulsive or continuous vibration, that vary significantly in magnitude. Typically associated with trains, passing traffic, general construction activities (pile driving, jack hammers, drilling, breakers etc.) and are assessed based on vibration dose values (VDV), (Section 2.4 of this guideline).

### 3.4.3 Noise guide for local government

The *Noise Guide for Local Government* (EPA, 2013) provides a checklist as to what constitutes 'offensive noise'. For the assessment of operational noise impacts this checklist must be considered first to determine if nearby noise sensitive receivers are likely to consider the noise source as 'offensive' (qualitative assessment). These include:

- Is the noise loud in the absolute sense? Is it loud relative to other noise in the area?
- Does the noise include characteristics that make it particularly irritating? Is the noise typical for the area?
- Does the noise occur at times when people expect to enjoy peace and quiet? Does the noise occur often?

### 3.4.4 Noise policy for industry

Where operational noise impacts are considered 'offensive' based on the qualitative checklist of the *Noise Guide for Local Government*, a quantitative assessment is recommended. The *Noise Policy for Industry* (NPfI) (EPA, 2017) is the principal publication referenced in NSW, for the quantitative assessment of operational noise emissions. Both the Liverpool and Penrith DCP's reference this policy with regard to noise emission limits for operational activities associated with developments. Relevant information contained within this policy is detailed below:

- Fact Sheet A & B of this policy details methodology and measurement procedures for determining existing ambient noise levels. The procedures contained within the fact sheets must be followed for all existing noise surveys and these are referenced by other State Government policies and guidelines.
- The NPfI nominates two components which both need to be complied with, namely intrusiveness and amenity,
  - the **intrusiveness criterion** aims to limit the degree of change a new source introduces to an existing environment and applies to residential receiver types only (Section 2.3 of NPfI).
  - the **amenity criterion**<sup>2</sup> is intended to limit continuing increases in noise levels from application of intrusiveness level alone, by nominating absolute noise levels for all noise sources to a level that is consistent with the general environment. These noise levels will also protect against noise impacts such as speech interference, community annoyance and some sleep disturbance (Section 2.4 of NPfI).
    - In areas with high traffic noise levels (land adjacent to or in close proximity to highway/freeway/transitway), the level of road traffic noise may be high enough to make noise from assessment source effectively inaudible,

<sup>2</sup> Excludes noise impacts associated with construction works, windfarms, venues and events, sporting activities and transportation sources.

even when the average noise level from industrial source may exceed the project amenity noise level. In such cases, the NPfl recommends the derivation of the project amenity noise levels based on the measured period specific average noise levels (Section 2.4.1 of NPfl).

- The project noise trigger level is the lower (that is, the more stringent) value of the project intrusiveness noise level and project amenity noise level.
- The NPfl provides guidance for the assessment of residual noise impacts (Section 4 of NPfl).
- Fact Sheet C provides guidance for the evaluation of certain characteristics of noise (tonality, intermittency, dominant low-frequency content) which may cause greater annoyance than other noise at the same level. Relevant correction factors that need to be applied to source noise level prior to assessment against project trigger levels (Table C1 of Fact Sheet C).
- Fact Sheet D provides guidance for accounting for noise-enhancing weather conditions.

### 3.4.5 Road noise policy

The *Road Noise Policy* (RNP) (DECCW, 2011) provides guidance during the early planning stages (land use and development, road and transport) to address noise impacts to existing properties impacted by new road projects, redevelopment of existing roads and new traffic generating developments.

- Assessment criteria is detailed in Section 2 of this policy. This section also details functional role for various road categories, top assist in the classification of proposed/redeveloped roadways.
- Part B4 in Appendix B of this policy outlines the recommended noise modelling methods for the calculation of traffic noise levels.
- The RNP is also the principal publication referenced for the assessment of sleep disturbance impacts. Section 5.4 of this policy outlines methodology and provisions for the assessment of operational and construction noise emission impacts, with the potential to cause sleep awakenings.

## 3.5 Australian Standards

AS 3671-1989: *Acoustics—Road traffic noise intrusion—Building siting* (Australian Standard, 1989) and *construction* details the methodology to determine road traffic noise exposure levels at building sites and provides general guidance on the building constructions required to reduce road traffic noise intrusions. This standard does not nominate any quantitative noise level criteria and recommends that the building shell be acoustically designed such that internal noise levels comply with the requirements of AS/NZS 2107:2016 *Acoustics - Recommended design sound levels and reverberation times for building interiors* (Australian/New Zealand Standards, 2016).

Where internal noise criteria for land use developments impacted by road and rail corridor noise is not clearly stipulated in the council DCP (see Section 3.1 and 3.2), Infrastructure SEPP (see Section 3.3.1) and DPIE publication (see 3.3.2), the internal design sound levels recommended in Table 1 of AS/NZS 2107:2016 can be used as a guideline, for approval and consent.

## 3.6 International Standards

Vibration transmission through the ground can cause a structure and structure coupled elements (walls, windows, roof etc.) to radiate. The transmitted vibration energy has the potential to damage and compromise the integrity of a structure as well as increase the risk of damage to building contents.

There is no current Australian Standard that sets criteria for the assessment of building damage caused by vibrations. Guidance on limiting vibration values with the potential to cause structural damage is typically referenced from the DIN 4150: Part 3 – 1999 *Effects of Vibration on Structures* (DIN guideline) (German Standard, 1999).

The DIN guideline recommended maximum permissible levels of vibration (expressed as peak particle velocity or PPV) that reduce the likelihood of building damage caused by vibration. Table 1 of this standard nominates guideline values

for vibration velocity for various types of structures, including heritage listed structures<sup>3</sup>, which when complied with has shown to not cause building damage.

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<sup>3</sup> It should be noted that heritage structures should be considered on a case by case basis, as a heritage listed structure may not necessarily be more sensitive to vibration than a standard structure. Where a historic heritage structure is deemed to be sensitive to damage, the criteria in Line 3 of Table 1 of the standard, should be considered.

## 4 Precinct Specific Preliminary Noise and Vibration Assessment

Risk of noise and vibration impacts associated with the development of the Aerotropolis precincts are from:

- Construction noise and vibration
- Transportation noise and vibration (Road and Rail only<sup>4</sup>)
- Operational noise and vibration.

These noise and vibration sources have been assessed, with respect to the current regulatory framework, for each precinct.

### 4.1 Northern Gateway

#### 4.1.1 Existing acoustic environment

- The existing land use and transport corridors in this precinct are detailed in Section 2.2.1. Traffic volume map 13 of Infrastructure SEPP classifies Luddenham Road and Elizabeth Drive as Regional and State Roads respectively, with low-medium volumes of traffic (<20,000 AADT).
- Hence, ambient noise levels in this precinct reflect noise levels associated with a semi-rural environment. Existing noise sources are generally localised and will be associated with motor vehicles and farming and agricultural activities.
- There is potential for increased ambient noise levels on land in the vicinity of the Luddenham Raceway – Go Karting, Paintball & Motorsport Park (821-849 Luddenham Road, Luddenham) and the SUEZ Kemps Creek Resource Recovery Park (1725 Elizabeth Drive, Kemps Creek), as a result of operational noise impacts associated with these land use developments (both developments are only approved to operate during daytime period i.e. during standard business hours).



Figure 4-1: Northern Gateway Precinct – Existing Noise generating Land Uses<sup>5</sup> (source: Google Maps)

<sup>4</sup> This report does not address aircraft noise impacts associated with the Western Sydney International (Nancy-Bird Walton) Airport.

<sup>5</sup> Source: Google Maps

## 4.1.2 Precinct land uses and transport framework

### Land uses

Land use planning for this precinct is governed by the constraints (noise and building height limitations) associated with its proximity to the Airport and the potential for road corridor locations, to facilitate connection to existing and proposed transport infrastructure (Luddenham Road, Elizabeth Drive, M12 and Sydney Metro).

The current typologies planned for this precinct include residential, general retail/commercial (small to medium scale enterprise), specialised centre, local centres and industrial (large scale enterprise), as indicated in **Figure 4-2**<sup>6</sup>.

- The Strategic Centre for the precinct is proposed around a new station for the 'Sydney Metro – Western Sydney Airport' line (Sydney Metro - WSA), with the highest densities and greatest mix of uses and tight urban blocks. This will include general residential, mixed-use, general commercial/retail, education, public and community and a specialised centre (science-based businesses, tertiary education and research facilities, high-density residential).
- Away from the Strategic Centre, the blocks become larger and are generally proposed for enterprise use, which are expected to include major warehousing, distribution and manufacturing activities, and associated secondary and service uses.
- Several local centres (e.g. Hilltop Park) will be distributed across the precinct and will primarily include retail and community land uses.
- Large scale enterprise is proposed to the southern half of the precinct, north of Elizabeth Drive and between Elizabeth Drive and the M12 corridor, as these areas will have best access to the Airport. Land uses are expected to include warehouses, distribution centres and large industrial format buildings.

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<sup>6</sup> This land use plan is likely to evolve as key issues and opportunities present for further investigation during subsequent master planning stages or in the preparations and assessment of detailed development proposals.

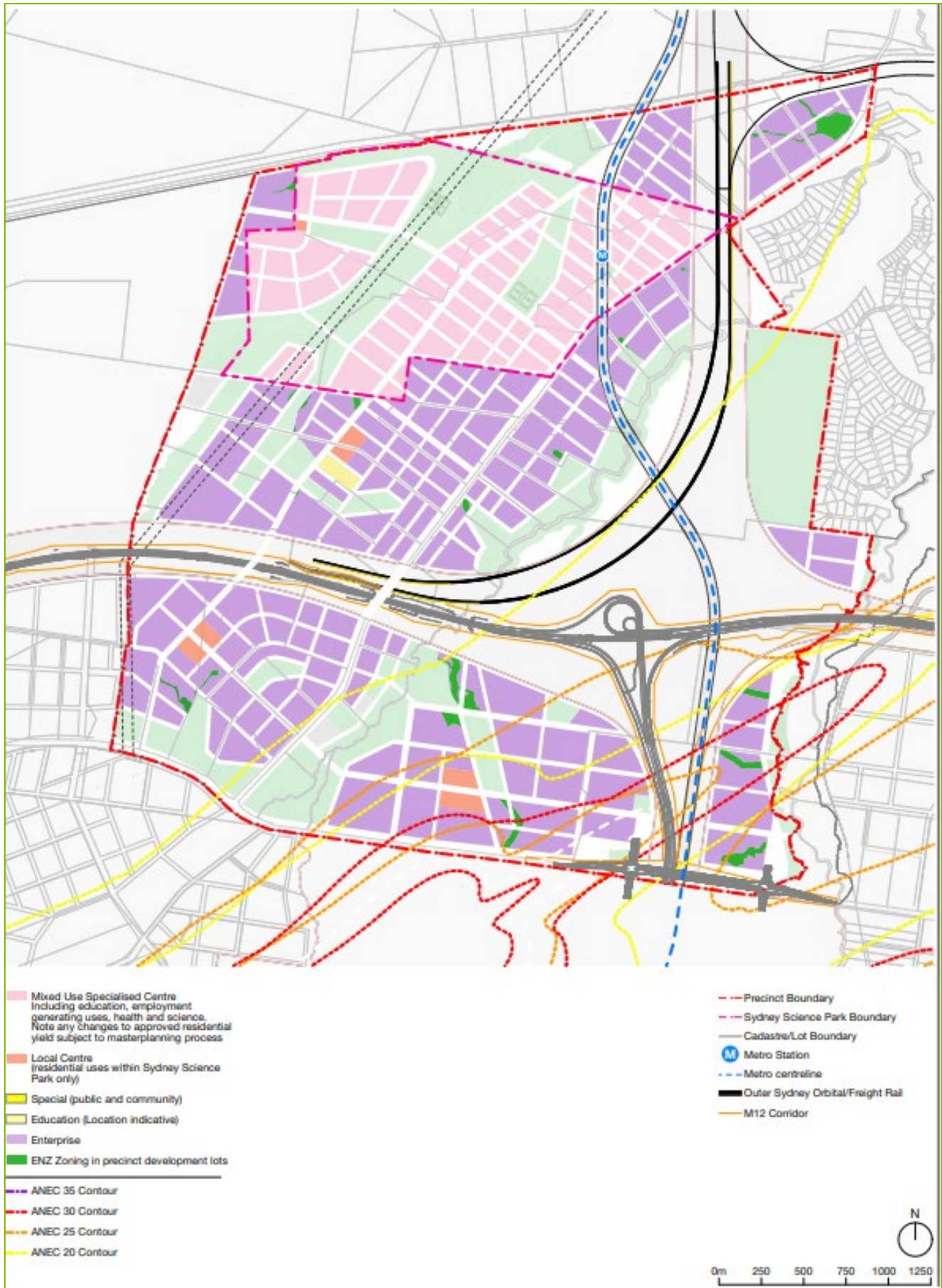


Figure 4-2: Northern Gateway Precinct – Precinct Plan<sup>7</sup>

<sup>7</sup> Source: Northern Gateway Urban Design and Landscape Report (Final - December 2021)

## Transport corridors

- Public roads and streets within the precinct are classified into three street environments<sup>8</sup>. This classification and the street typologies currently proposed for each environment is illustrated in **Figure 4-3** and **Figure 4-4**.
  - Local Streets – provides local access both outside of centres and within centres. They primarily include High Streets (22 metres and 25 metres), Industrial Street – Edge Streets (22 metres and 25 metres), Local Collector Streets (30 metres) and some Local Collector USN Roads (40 metres).
  - Main Streets – traverses through areas with greater land use intensity, such as strategic centre and mixed-use areas. This includes Sub-Arterial USN Roads (40 metres) and Local Collector USN Roads (40 metres).
  - Main Roads – facilitates sub-regional, regional and metropolitan movement both within and between the WSA precincts, and major land uses. This includes Sub-Arterial USN Roads (40 metres), TfNSW Arterial Roads (60 metres), and all Motorways (e.g. M12 corridor).
- Public transport within this precinct will largely include an integrated bus network and a new station for the Metro, as illustrated in **Figure 4-5**.
  - Rapid bus route – ultimately could have dedicated bus lanes.
  - Frequent and local bus routes – bus capable public roads, with stops.
- In addition to the internal public road network within the precinct, major State infrastructure future transport corridors intersect the precinct. They include:
  - Land corridor within this precinct has been earmarked for the future delivery of Outer Sydney Orbital (OSO), one of five critical long-term infrastructure corridors in western Sydney. This corridor is for a north-south road and freight line that will facilitate a link to the proposed Sydney Metro – WSA line via the Airport, and to other key rail lines on the Sydney network. This corridor transverses the precinct north to south and includes the M12 corridor. The proposed corridor is illustrated in **Figure 4-5**.
  - A new passenger railway line Sydney Metro – WSA proposed as a key part of delivering an integrated transport system for the Western Parkland City. Stage 1 of this project proposes a north-south rail alignment, connecting the existing T1 Western Line at St Marys to the Airport, with a station proposed at Luddenham. The rail line will traverse the precinct from north to south and is illustrated in **Figure 4-6**.
  - A dedicated freight rail line ‘Western Sydney Freight Line (WSFL)’ is also proposed across Western Sydney, connecting growing industrial areas and distribution centre. Stage 1 of this line will run from the future OSO located in the north-west corner of this precinct, to the M7 Motorway. The proposed corridor alignment is illustrated in **Figure 4-6**.
  - M12 Motorway (for completion before opening of the Airport), which will provide primary access to the Airport and Sydney’s motorway network. The M12 Motorway is proposed to run east-west between M7 Motorway at Cecil Hills and the Northern Road at Luddenham. A section of this proposed 16km road corridor is proposed to traverse the precinct from east to west as illustrated in **Figure 4-7**.

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<sup>8</sup> Classification from the Movement and Place Framework (Government Architects NSW 2020).

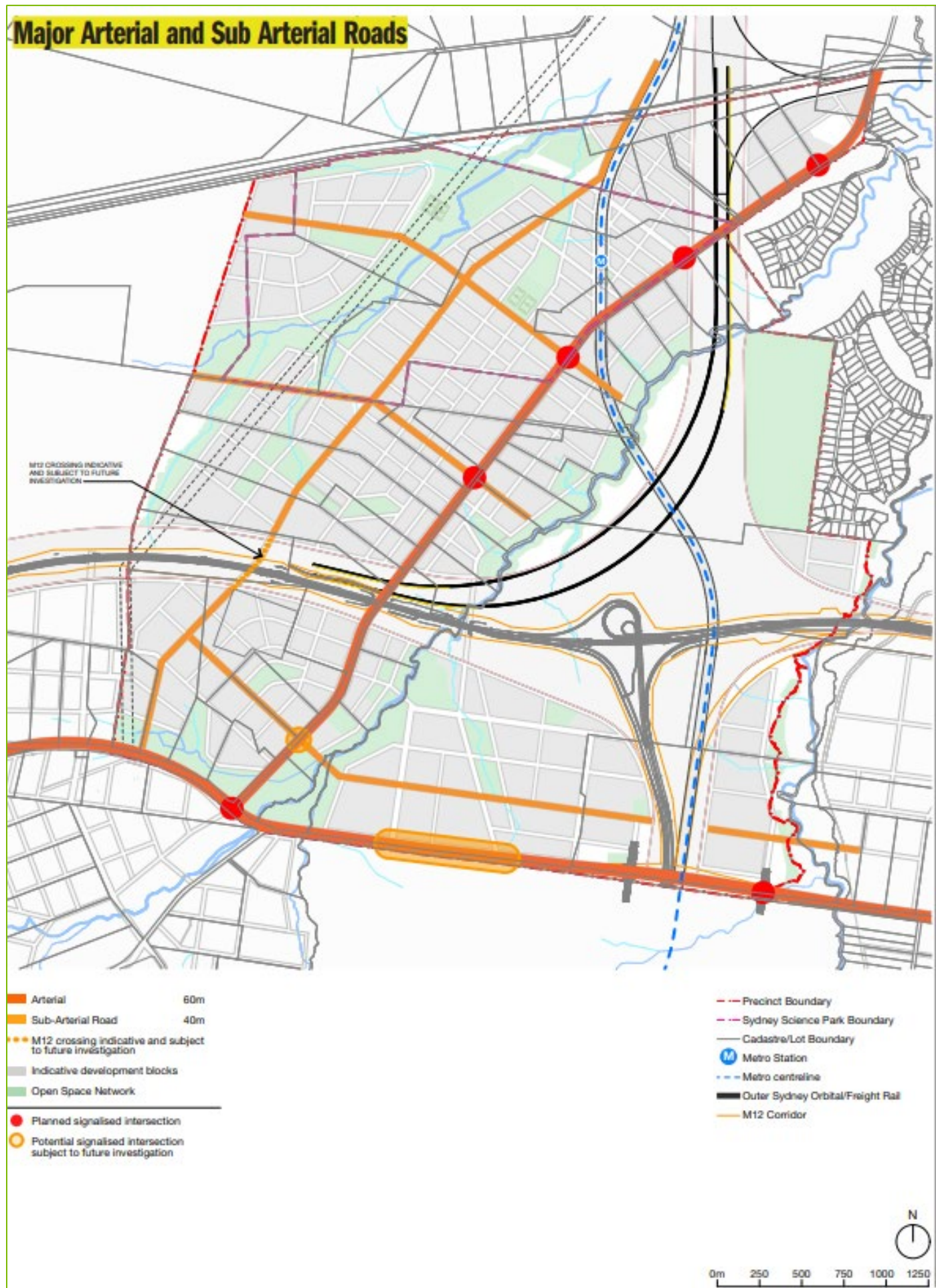


Figure 4-3: Northern Gateway Precinct – Proposed Street Environment Classifications<sup>7</sup>

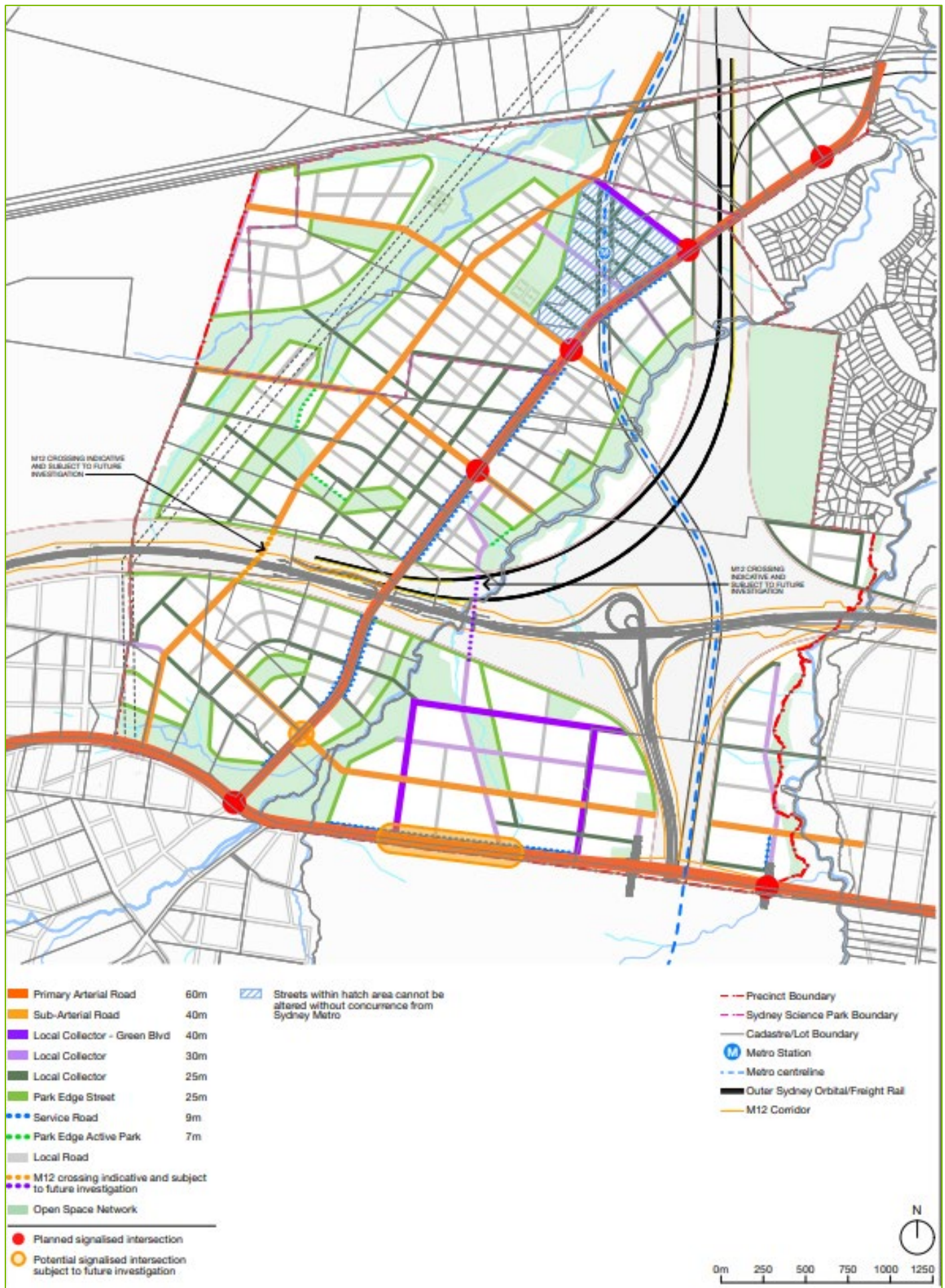


Figure 4-4: Northern Gateway Precinct – Proposed Street Typologies<sup>7</sup>

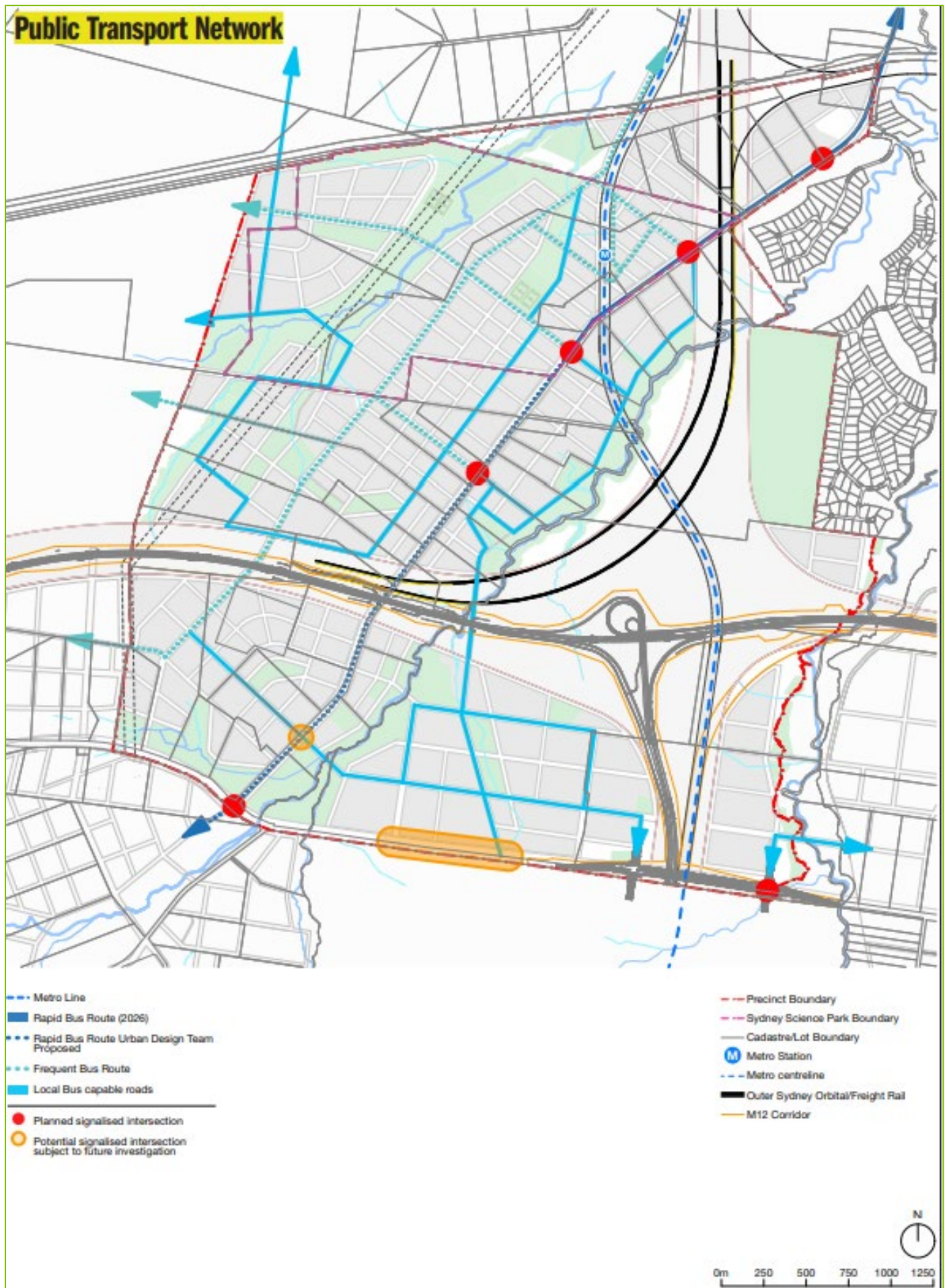


Figure 4-5: Northern Gateway Precinct – Proposed Public Transport Network<sup>7</sup>

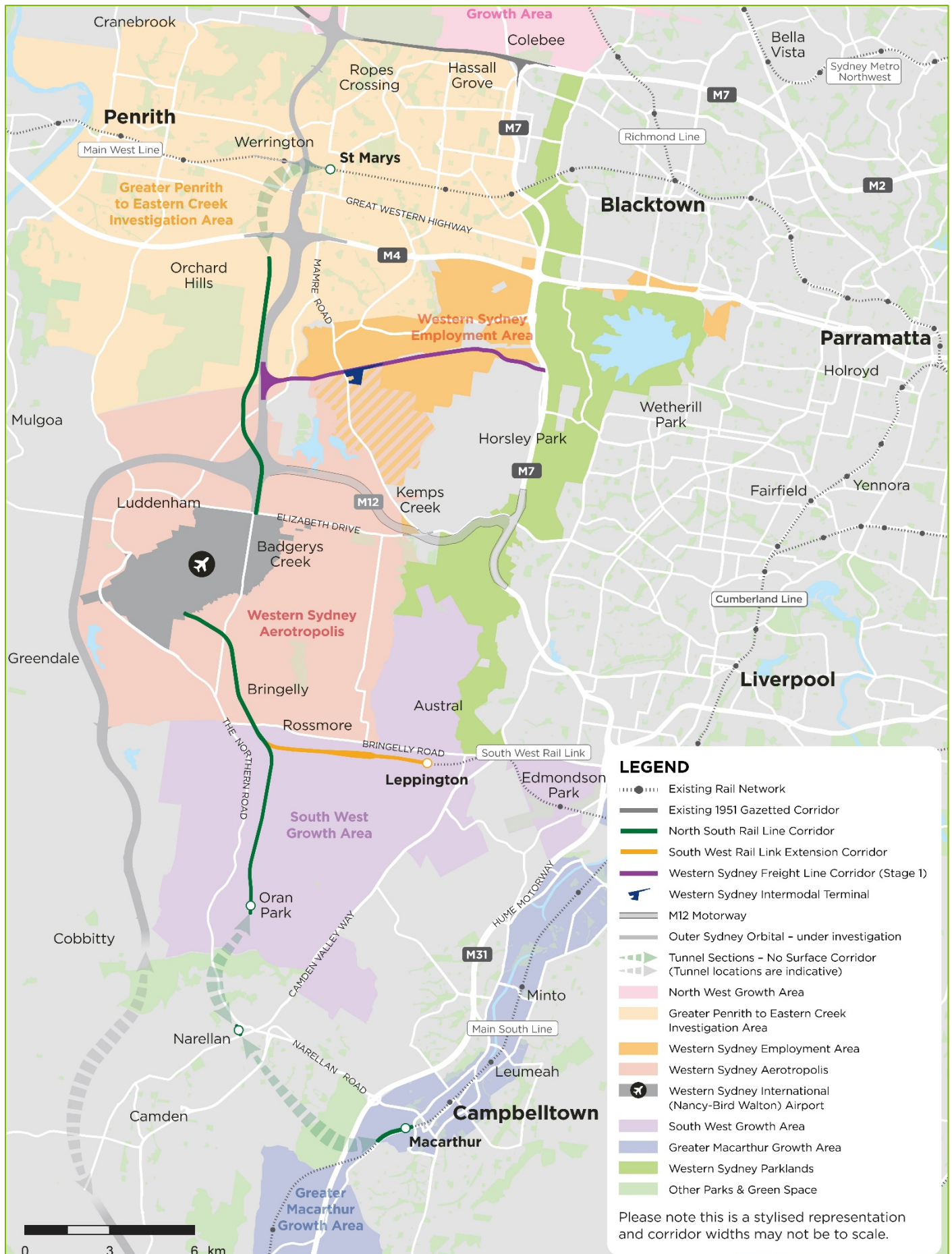


Figure 4-6: Future Transport Links in Western Sydney<sup>9</sup>

<sup>9</sup> TfNSW Future Transport Links – Western Sydney Map, version 1 June 2020.

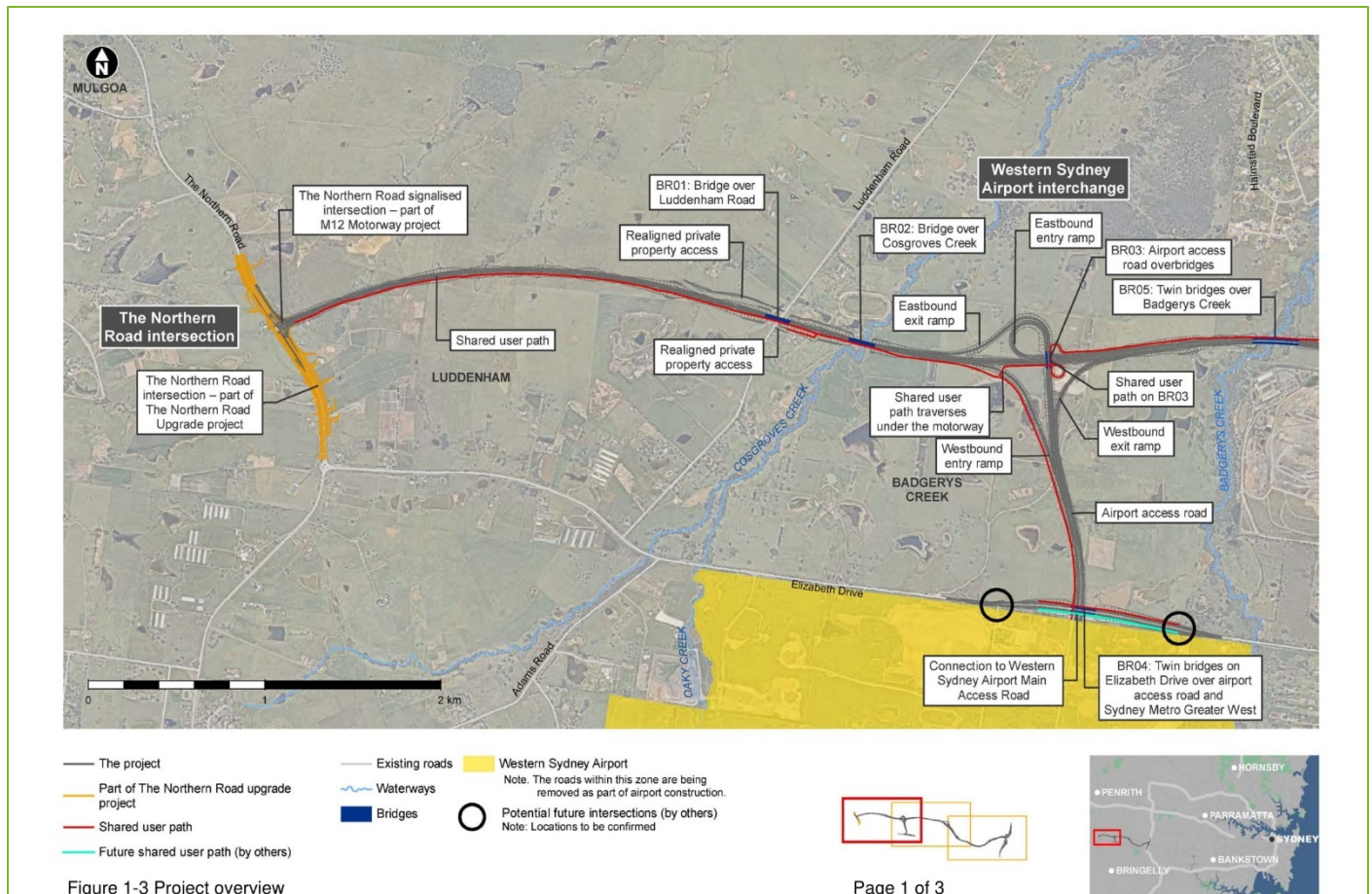


Figure 4-7: Proposed M12 alignment through Northern Gateway Precinct (source: M12 Motorway EIS, 2019)

### 4.1.3 Key findings

- The proposed urbanisation of the precinct, which will include new internal public roads, an integrated public transport system and new major transport infrastructure corridors (M12, OSO, Sydney Metro – WSA and WSFL), will introduce new noise sources (motor vehicles, passenger & freight trains, stations and fixed facilities) to an environment which currently has low background noise levels. Rail infrastructure sources also have the potential to introduce vibration, which is currently not present in this precinct.
- The proposed transport operations (road, rail and aircraft) combined with the operations of the Airport and planned urban development of land within the Greater Penrith, Eastern Creek Growth Area and WSAP precincts, will increase both the background and environmental noise levels within this precinct over time.
- Industrial developments, warehousing facilities and retail precincts generally have operational noise associated with them. They are likely to result in new noise sources within this precinct and will potentially contribute to increasing the background noise level.
- The potential for high levels of aircraft noise impacts from the Airport has influenced land use planning with enterprise and industrial type land uses proposed adjacent to major transport corridors and the southern half of the precinct (nearest to the Airport). Sensitive land uses are concentrated around a small pocket near the north-west corner of the precinct, maximising distance to the Airport and planned major transport infrastructure corridors.

### 4.1.4 Issues for consideration and recommendations

**Table 4-1: Northern Gateway Precinct – Issues for consideration and Recommendations**

Issues for consideration		Recommendations
Environmental noise and vibration impacts	<ul style="list-style-type: none"> <li>■ airborne noise and vibration from motor vehicles operations on the public road network<sup>10</sup></li> <li>■ airborne noise from freight and passenger trains operating at the surface (at-grade and/or in-cutting) and elevated/viaduct sections of proposed rail corridors</li> <li>■ ground-borne noise and vibrations from the operation of freight and passenger trains along the proposed rail corridors</li> </ul>	<ul style="list-style-type: none"> <li>■ An environmental noise and vibration study is recommended for all sensitive land use developments (refer to Section 3.3) proposed on land in or adjacent to rail corridors and/or roads, in accordance with the requirements of the Infrastructure SEPP and NSW DPIE <i>Development near rail corridors and busy roads – interim guideline</i>. <ul style="list-style-type: none"> <li>– The technical study should include evaluation of existing noise environment, in addition to the assessment of forecasted future volumes (typically at-opening and future period when corridor reaches its expected operational peak capacity).</li> <li>– A noise model of the study area is recommended for the assessment methodology, with transport noise impacts predicted using the most suitable and accurate prediction algorithm (e.g. <i>Calculation of Road Traffic Noise</i> (CoRTN)<sup>11</sup>) in a computer noise modelling software (SoundPLAN or equivalent), determined by a qualified acoustic specialist.</li> <li>– Ground-borne noise and vibration impacts associated with rail operations shall be assessed based on the prediction models detailed in ISO 14837-1.</li> </ul> </li> <li>■ An environmental noise and vibration study is also recommended for all commercial and office type land use developments, proposed in the vicinity of the new transport corridors. <ul style="list-style-type: none"> <li>– A noise model of the study area is recommended for the assessment, with predicted transport noise impacts (most suitable and accurate prediction algorithms in SoundPLAN or equivalent software) assessed considering the recommendations of AS 3671 and AS/NZS 2107.</li> <li>– Ground-borne noise and vibration impacts associated with rail operations be predicted based on the prediction models detailed in ISO 14837-1 and comply with the provisions of NSW EPA <i>Assessing Vibration: a technical guideline</i>.</li> </ul> </li> <li>■ Arterial and Sub-Arterial roads are typically associated with heavy volumes of traffic and precinct planning must focus on opportunities to locate business and enterprise land uses within the specialised centre and mixed-use zone, on land immediately adjacent to these transport corridors. These land use types generally have a higher tolerance for environmental noise impacts and can generally be treated with standard building standards and mitigation measures (IGU or thick single glazed façade systems, masonry building envelop with openings for forced/mechanical ventilation etc.).</li> <li>■ This will ensure sensitive land use types (residential, special, education) are located away from high volume traffic carriageways, with the business and enterprise land uses also potentially providing barrier/screening of the road traffic noise sources. Depending on the distance and location of sensitive land uses to Arterial and Sub-Arterial roads, masonry building envelope construction is recommended to alleviate the need for onerous façade and roof mitigation treatments (large airgap DGU, multiple layer large airgap wall and roof systems). This will potentially create opportunities to include design elements such as natural ventilation and good amenity for open spaces, which is not possible if sensitive land uses are located immediately adjacent to arterial and sub-arterial roads.</li> <li>■ Local Collector, High Street and Industrial Street-Edge Street are typically associated with low-medium volumes of traffic. It is recommended to maximise the opportunity of locating sensitive land uses along these carriageways, to facilitate standard building treatments (single glazing, light-weight building envelope constructions) and design elements such as natural ventilation, good amenity for open spaces, outdoor play areas etc.</li> <li>■ Building damage (including heritage listed structures) is not usually likely for operation of rail and road infrastructure. A building dilapidation survey of the heritage structures identified within the vibration assessment zone (Figure 3.2 of DPIE <i>Development near rail corridors and busy roads – interim guideline</i>) should be carried out, and if the survey indicates that the heritage buildings are structurally unsound, then the conservative criteria recommended in German Standard DIN 4150-3:1999 <i>Structural Vibration Part 3: Effects of vibration structures</i> should be use.</li> </ul>

<sup>10</sup> Generally, motor vehicles operating on roadways are unlikely to cause vibration impacts at adjacent receivers unless there are significant road irregularities, such as can occur at poorly maintained bridge joints or speed humps. As all the roadways in this precinct will be new or upgraded, impacts from operational vibration are not expected.

<sup>11</sup> NSW EPA Road Noise Policy, 2011

Operational noise and vibration impacts	airborne noise associated with the operations (building services plant/equipment, loading dock operations, on-grade carparking/hardstand areas etc.) of new land use developments,	<ul style="list-style-type: none"> <li>Operational noise impacts associated with new land use developments are first recommended to be assessed against the NSW EPA <i>Noise Guide for Local Government</i> 'offensive noise' checklist. If considered 'offensive', these impacts must be assessed (quantitatively) against the provisions of the NSW EPA NPfl. This includes maximum noise level assessments (sleep disturbance).</li> <li>Given the precinct is largely undeveloped and comprises primarily of agricultural rural land and farm properties, the minimum rating background levels (RBLs) proposed in the NPfl can be adopted in place of baseline noise monitoring, to inform land use impacts at this stage. NPfl amenity levels are not recommended unless baseline monitoring confirms intrusiveness noise limits of the NPfl are then higher than recommended project amenity levels.</li> <li>Precinct planning should consider location and type of enterprise and high-density land uses adjacent to existing sensitive receivers (isolated residences and farm properties). These existing sensitive receivers should be afforded protection commensurate with rural residential status as defined in the NPfl, for noise assessment purposes. Therefore, operational noise impacts associated with any new enterprise or high-density development permitted as part of the rezoning, must be assessed against project noise trigger levels (PNTLs) developed using the minimum RBLs recommended in Table 2.1 of the NPfl. Buffer zones in the form of open spaces and low-density local centres are recommended on land immediately adjacent to these existing isolated sensitive land uses, to reduce the potential for intrusive noise impacts associated enterprise and high-density land uses, without compromising precinct planning.</li> <li>Noise emission predictions based on empirical formulas are recommended for small and medium scale developments, with computational noise modelling (ISO 9613 algorithms in SoundPLAN or equivalent software) recommended for large scale developments or developments with multiple noise sources and/or significant external operations (industrial developments with loading docks, hardstands, packing and distribution zones etc.).</li> </ul>
	airborne noise associated with additional traffic on existing roads generated by new land use developments.	<ul style="list-style-type: none"> <li>Change in road traffic noise levels from additional traffic associated with proposed new land uses shall be assessed against the provisions of NSW EPA <i>Road Noise Policy</i>.</li> <li>Noise predictions must generally be carried out using the most suitable and accurate noise modelling method (e.g. CoRTN, determined by a qualified acoustic specialist), however, use of the UK Department of Transport's <i>Federal Highway Administration Model</i> (FHWA) calculation method<sup>11</sup> should be considered during the early stages of precinct development, due to existing low traffic flows.</li> </ul>
	ground-borne noise and vibration associated with the operations of new commercial and industrial land use developments (these are not expected to be significant),	Ground-borne noise and vibration impacts from land use operations will typically be contained within the property boundary (localised treatments) and are unlikely to impact on surrounding receivers. However, if external vibration intrusive operations are proposed as part of the proposed land use, an empirical evaluation approach is recommended, assessed against the provisions of NSW EPA <i>Assessing Vibration: a technical guideline</i> .
	airborne noise from existing industrial/recreational noise generating land uses illustrated in <b>Figure 4-1</b> , if retained (Luddenham Raceway – Go Karting, Paintball & Motorsport Park & SUEZ Kemps Creek Resource Recovery Park)	<ul style="list-style-type: none"> <li>The Luddenham Raceway land use may result in noise intrusion and annoyance, resulting from the operations of high-performance motor vehicles and intermittent nature of activity. Hence, a 1/3 octave band (31.5Hz to 8kHz range) operational noise impact assessment is recommended for sensitive land uses proposed within 1km of this land use.</li> <li>The assessment methodology must include existing ambient and reference operational noise surveys conducted in accordance with the requirements of NSW EPA <i>Noise Policy for Industry</i> (NPfl). A computational noise model must then be development using ISO 9613 algorithms in SoundPLAN or equivalent software, to predict noise impacts from cumulative operations to proposed surrounding sensitive receivers, to comply with the requirements of NSW EPA NPfl.</li> </ul>
Construction noise and vibration impacts	See <b>Table 4-4</b> .	

## 4.2 Badgerys Creek, Aerotropolis Core & Wianamatta South Creek

### 4.2.1 Existing Acoustic Environment

- The existing land use and transport corridors in these precincts are detailed in Sections 2.2.2, 2.2.3 and 2.2.4. Traffic volume map 13 of Infrastructure SEPP classifies The Northern Road, Bringelly Road and Elizabeth Drive as State Roads, with low-medium volumes of traffic (<20,000 AADT). All other roadways in this precinct (including Badgerys Creek Road) are classified as Local Roads with low volumes of traffic.
- Hence, ambient noise levels in this precinct reflect noise levels associated with a semi-rural environment. Existing noise sources in these areas are generally localised and from motor vehicles and farm/agricultural activities.
- There is potential for increased ambient noise levels on land in the vicinity of waste treatment and disposal facilities (refer to Section 2.2.2) located in the Badgerys Creek precinct, as a result of operational noise impacts associated with these facilities (both facilities are only approved to operate during daytime period i.e. during standard business hours). These areas are illustrated in **Figure 4-8**.

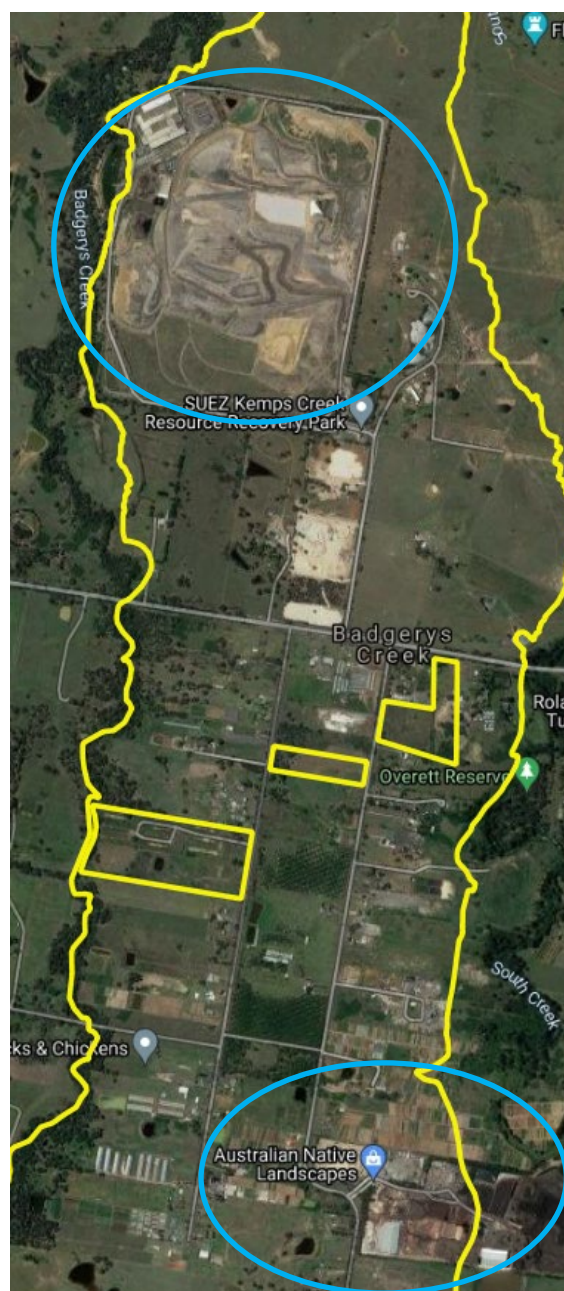


Figure 4-8: Badgerys Creek Precinct – Existing Noise generating Land Uses (source: Google Maps)

## 4.2.2 Precinct land uses and transport framework

### Land uses

Similar to the Northern Gateway precinct, land use planning for these precincts are governed by constraints associated with their proximity to the Airport, however Aerotropolis Core and Badgerys Creek are expected to support up to 71,000 jobs by 2056 and hence major areas of these precincts have been earmarked for enterprise and light industrial uses. The current typologies planned for these precincts include mixed use centre and residential, business and enterprise (general retail/commercial), special uses for community infrastructure, local centres and enterprise and light industry, as indicated in **Figure 4-9**<sup>12</sup>.

- A mixed-use centre proposed around the Metro station and Thompsons Creek regional park, with the highest densities and greatest mix of uses and tight urban blocks. This will include medium and high-density residential, community and schools, medium and high-density commercial and retail precincts.
- Business and enterprise land uses are primarily proposed adjacent to Badgerys Creek Road and Fifteen Avenue, to enable urban boulevards to eventuate.
- Enterprise and light industry land uses are generally proposed to all other areas within these precincts.
- Wianamatta-South Creek is dedicated to environment and recreational zoning, with potential land uses to include greenspaces, water management facilities and community and cultural facilities.

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<sup>12</sup> This land use plan is likely to evolve as key issues and opportunities present for further investigation during subsequent master planning stages or in the preparations and assessment of detailed development proposals.

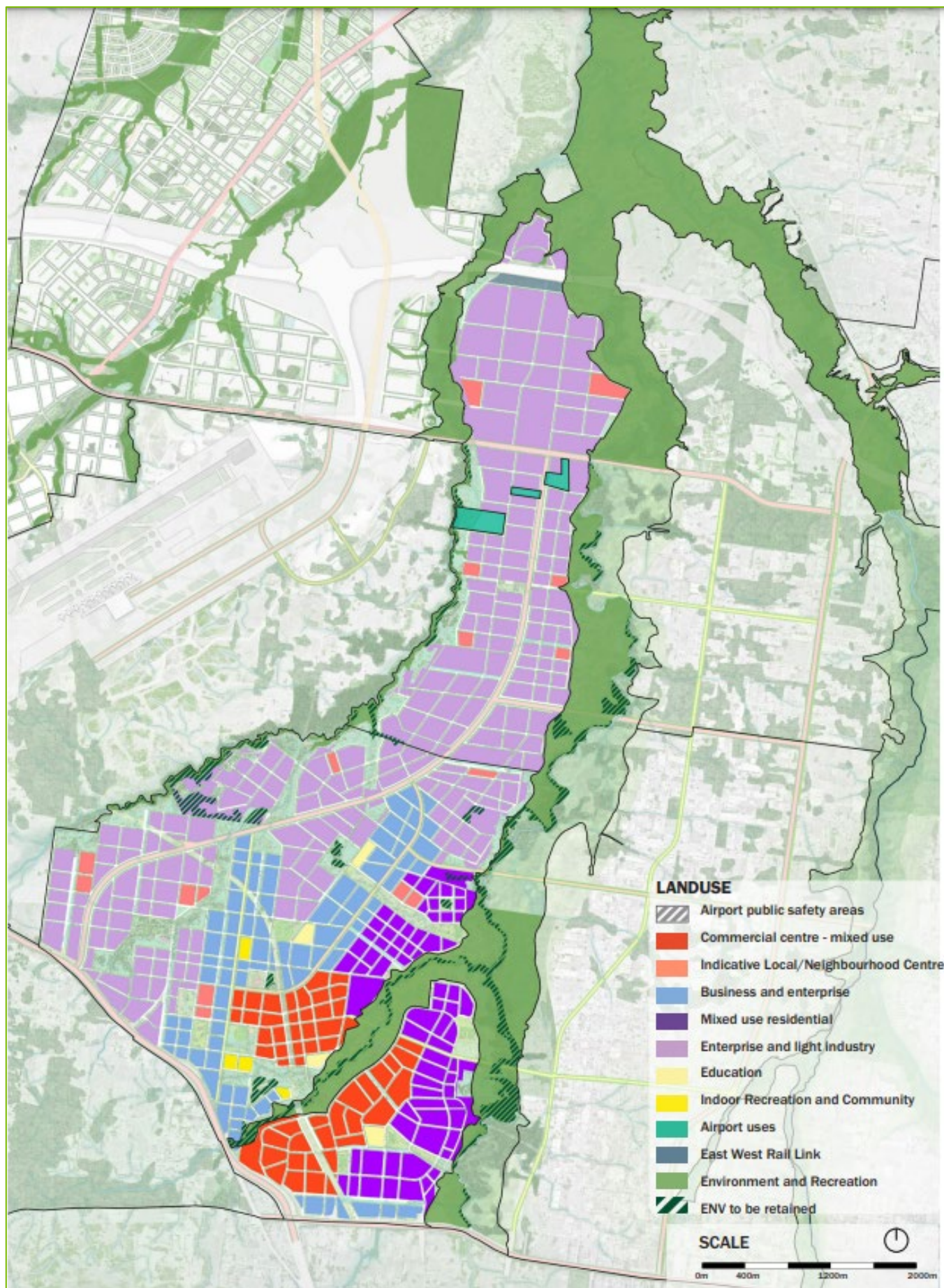


Figure 4-9: Badgerys Creek, Aerotropolis Core & Wianamatta-South Creek Precincts – Precinct Plan<sup>13</sup>

<sup>13</sup> Source: Western Sydney Aerotropolis Urban Design and Landscape Report (Final - December 2021)

## Transport corridors

- This classification and the street typologies currently proposed for the precincts are illustrated in **Figure 4-10** and **Figure 4-11**.
  - Local Streets – provides local access both outside of centres and within centres. They primarily include Local Streets (19 metres, 20 metres and 25 metres) and High Streets (25 metres).
  - Main Streets – traverses through areas with greater land use intensity, mixed-use centre and employment zone centres. This includes Primary Arterial Roads (45 metres and 40 metres).
  - Main Roads – facilitates sub-regional, regional and metropolitan movement both within and between the WSA precincts, and major land uses. This includes Primary Arterial Roads (60 metres), Primary Arterial Roads (45 metres and 40 metres) and all Motorways (e.g. M12 corridor).
- Public transport within this precinct will largely include an integrated bus network and a new station for the Sydney Metro – WSA, as illustrated in **Figure 4-12**.
  - Rapid bus corridor – ultimately could have dedicated bus lanes.
  - Frequent and local bus corridors – bus capable public roads, with stops.
- In addition to the internal public road network within the precinct, major State infrastructure future transport corridors intersect the precinct. They include:
  - A section of the Sydney Metro – WSA is planned to connect the Aerotropolis Core to the Airport precinct northbound, traversing the Aerotropolis Core precinct roughly through its centre, south to north-west. This is illustrated in **Figure 4-6**.
  - A section of stage 1 of WSFL will run adjacent to the northern boundary of the Wianamatta-South Creek precinct, as illustrated in **Figure 4-6**.
  - A section of the M12 Motorway (east of the Airport interchange) is proposed to traverse through the northern tip of the Badgerys Creek precinct, as illustrated in **Figure 4-13**.



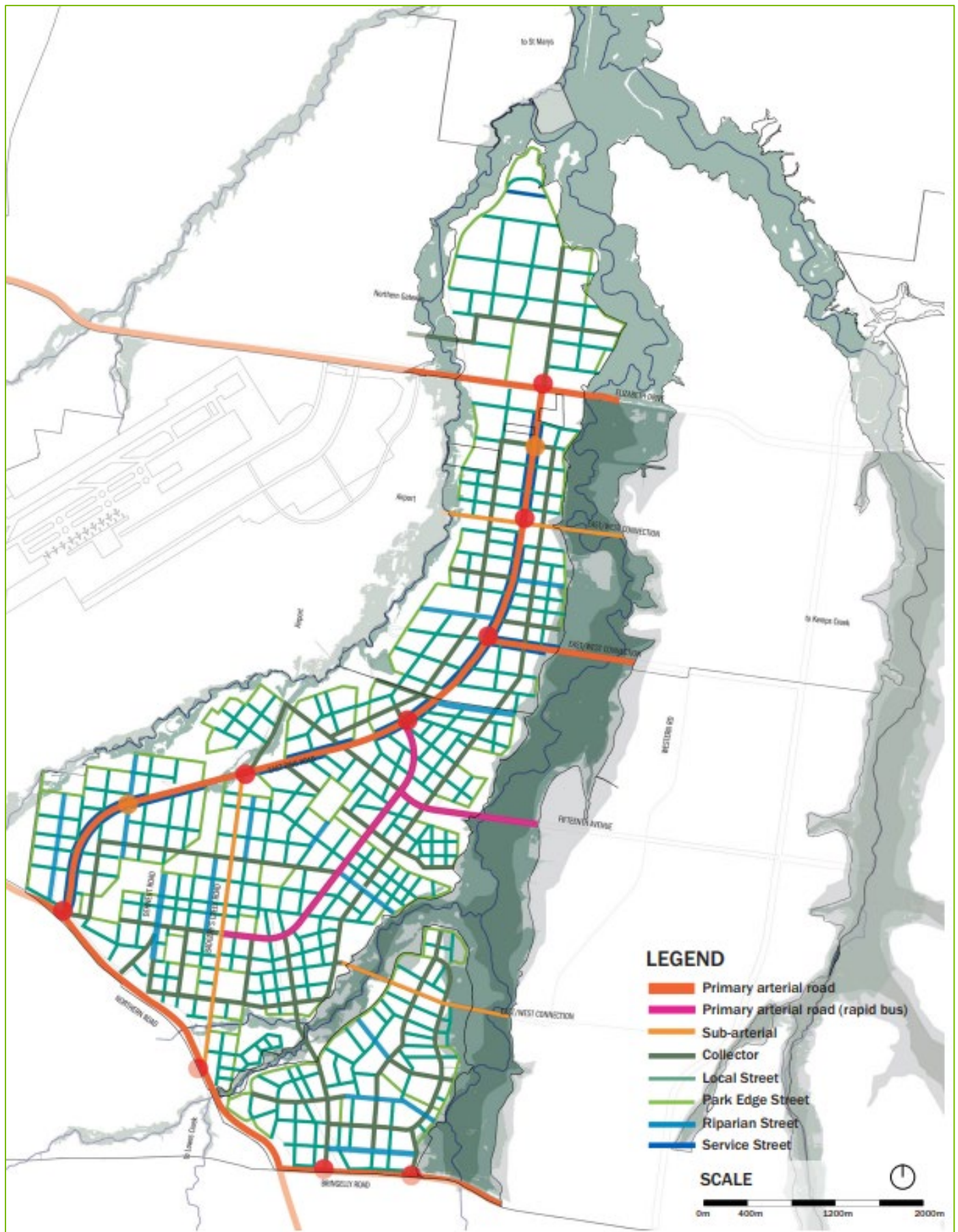


Figure 4-11: Badgerys Creek, Aerotropolis Core & Wianamatta-South Creek Precincts – Proposed Street Typologies<sup>13</sup>

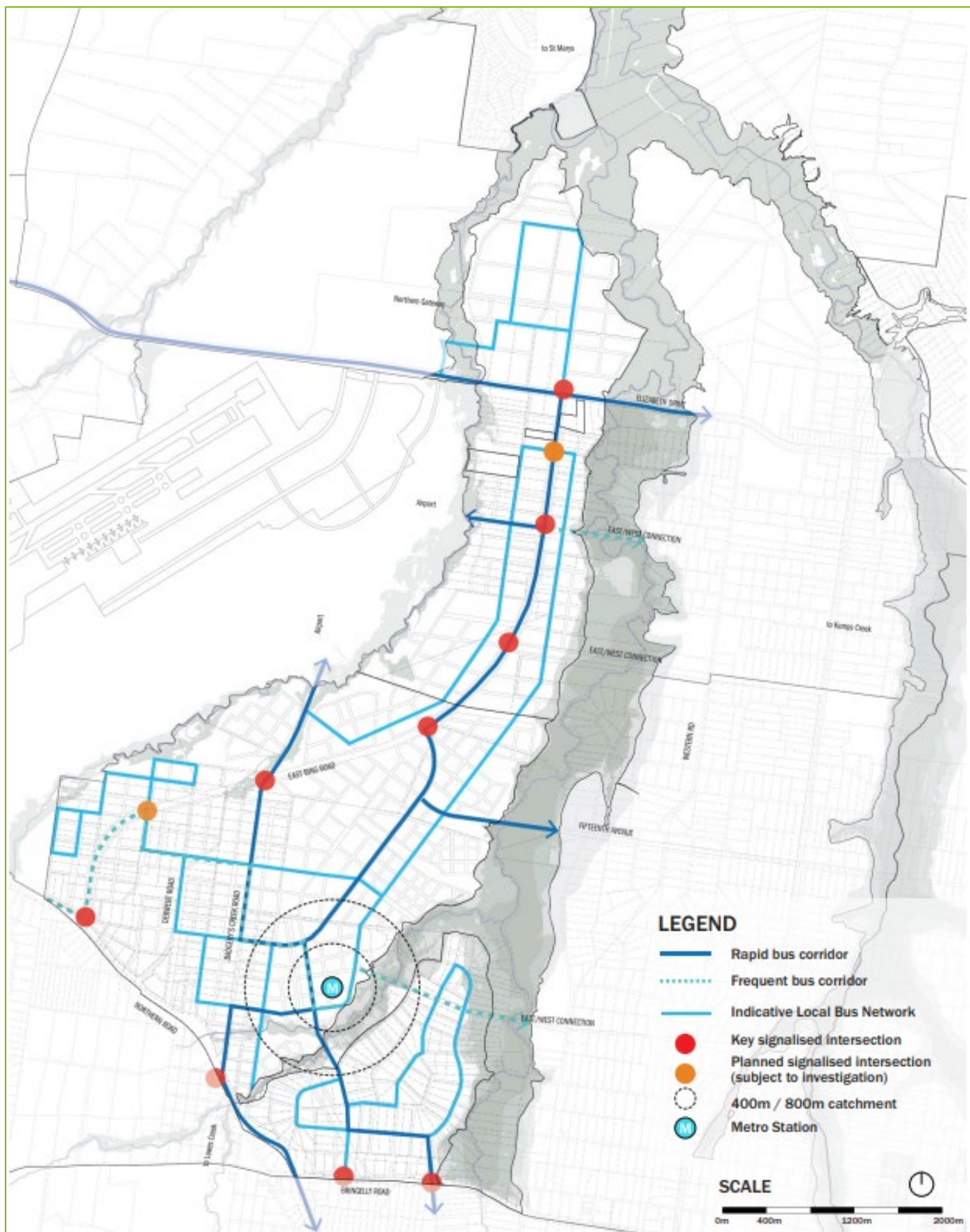


Figure 4-12: Badgerys Creek, Aerotropolis Core & Wianamatta-South Creek Precincts – Proposed Public Transport Network<sup>13</sup>

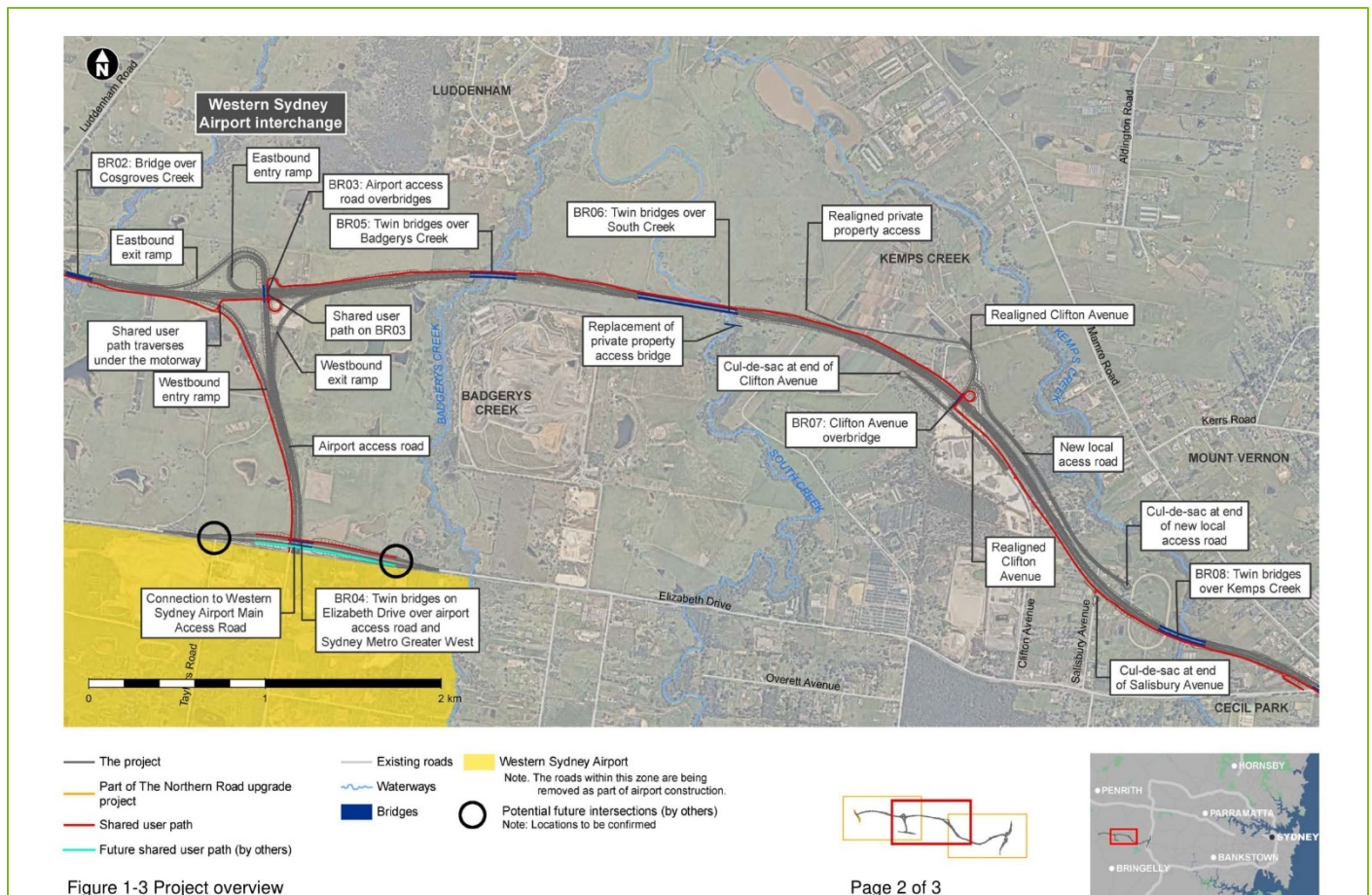


Figure 4-13 Proposed M12 alignment through Badgerys Creek Precinct (source: M12 Motorway EIS, 2019)

### 4.2.3 Key findings

- The proposed urbanisation of the precinct, which will include new internal public roads, an integrated public transport system and new major transport infrastructure corridors (M12 and Sydney Metro – WSA), will introduce new noise sources (motor vehicles, passenger & freight trains, stations and fixed facilities) in an environment (semi-rural) with low existing background noise levels. Rail infrastructure sources also have the potential to introduce vibration, which is currently not present in this precinct.
- Combined with the operations of the Airport and WSAP precincts, these new sources, will increase the background noise levels within this precinct over time.
- Industrial developments, warehousing facilities and retail precincts generally have operational noise associated with them. They are likely to result in new noise sources within this precinct and will potentially contribute to increasing the background noise level.
- The potential for high levels of aircraft noise impacts from the Airport has influenced land use planning with enterprise and light industrial type land uses proposed to a majority of the Badgerys Creek and Aerotropolis precincts. Sensitive land uses are concentrated around a small pocket near the south-east corner of the precinct, maximising distance to the Airport and planned major transport infrastructure corridors.

### 4.2.4 Issues for consideration and recommendations

**Table 4-2: Badgerys Creek, Aerotropolis Core & Wianamatta-South Creek Precincts – Issues for consideration and Recommendations**

Issues for consideration	Recommendations
<p>Environmental noise and vibration impacts</p> <ul style="list-style-type: none"> <li>■ airborne noise and vibration from motor vehicles operations on the public road network<sup>14</sup>, including existing State Roads ((The Northern Road and Bringelly Road)</li> <li>■ airborne noise from freight and passenger trains operating at the surface (at-grade and/or in-cutting) and elevated/viaduct sections of proposed rail corridors</li> <li>■ ground-borne noise and vibrations (human comfort) from the operation of freight and passenger trains along the proposed rail corridors</li> </ul>	<ul style="list-style-type: none"> <li>■ An environmental noise and vibration study is recommended for all sensitive land use developments (refer to Section 3.3) proposed on land in or adjacent to rail corridors and/or roads, in accordance with the requirements of the Infrastructure SEPP and NSW DPIE <i>Development near rail corridors and busy roads – interim guideline</i>. <ul style="list-style-type: none"> <li>– The technical study should include evaluation of existing noise environment, in addition to the assessment of forecasted future volumes (typically at-opening and future period when corridor reaches its expected operational peak capacity).</li> <li>– A noise model of the study area is recommended for the assessment methodology, with transport noise impacts predicted using the most suitable and accurate prediction algorithm (e.g. CoRTN) in a computer noise modelling software (SoundPLAN or equivalent), determined by a qualified acoustic specialist.</li> <li>– Ground-borne noise and vibration impacts associated with rail operations shall be assessed based on the prediction models detailed in ISO 14837-1.</li> </ul> </li> <li>■ An environmental noise and vibration study is also recommended for all commercial and office type land use developments, proposed in the vicinity of the new transport corridors. <ul style="list-style-type: none"> <li>– A noise model of the study area is recommended for the assessment, with predicted transport noise impacts (most suitable and accurate prediction algorithms in SoundPLAN or equivalent software) assessed considering the recommendations of AS 3671 and AS/NZS 2107.</li> <li>– Ground-borne noise and vibration impacts associated with rail operations be predicted based on the prediction models detailed in ISO 14837-1 and comply with the provisions of NSW EPA <i>Assessing Vibration: a technical guideline</i>.</li> </ul> </li> <li>■ Primary Arterial Roads and the existing State Roads are typically associated with heavy volumes of traffic and precinct planning must focus on opportunities to locate business and enterprise land uses within the specialised centre and mixed-use zone, on land immediately adjacent to these transport corridors. These land use types generally have a higher tolerance for environmental noise impacts and can generally be treated with standard building standards and mitigation measures (IGU or thick single glazed façade systems, masonry building envelop with openings for forced/mechanical ventilation etc.).</li> <li>■ This will ensure sensitive land use types (residential, special, education) are located away from high volume traffic carriageways, with the business and enterprise land uses also potentially providing barrier/screening of the road traffic noise sources. Depending on the distance and location of sensitive land uses to Primary Arterial and State Roads, masonry building envelope construction is recommended to alleviate the need for onerous façade and roof mitigation treatments (large airgap DGU, multiple layer large airgap wall and roof systems). This will potentially create opportunities to include design elements such as natural ventilation and good amenity for open spaces, which is not possible if sensitive land uses are located immediately adjacent to arterial and sub-arterial roads.</li> <li>■ Local and High Streets are typically associated with low-medium volumes of traffic. It is recommended to maximise the opportunity of locating sensitive land uses along these carriageways, to facilitate standard building treatments (single glazing, light-weight building envelope constructions) and design elements such as natural ventilation, good amenity for open spaces, outdoor play areas etc.</li> <li>■ Building damage (including heritage listed structures) is not usually likely for operation of rail and road infrastructure. A building dilapidation survey of the heritage structures identified within the vibration assessment zone (Figure 3.2 of DPIE <i>Development near rail corridors and busy roads – interim guideline</i>) should be carried out, and if the survey indicates that the heritage buildings are structurally unsound, then the conservative criteria recommended in German Standard DIN 4150-3:1999 <i>Structural Vibration Part 3: Effects of vibration structures</i> should be use.</li> </ul>

<sup>14</sup> Generally, motor vehicles operating on roadways are unlikely to cause vibration impacts at adjacent receivers unless there are significant road irregularities, such as can occur at poorly maintained bridge joints or speed humps. As all the roadways in this precinct will be new or upgraded, impacts from operational vibration are not expected.

Operational noise and vibration impacts	airborne noise associated with the operations (building services plant/equipment, loading dock operations, on-grade carparking/hardstand areas etc.) of new land use developments,	<ul style="list-style-type: none"> <li>Operational noise impacts associated with new land use developments are first recommended to be assessed against the NSW EPA <i>Noise Guide for Local Government</i> 'offensive noise' checklist. If considered 'offensive', these impacts must be assessed (quantitatively) against the provisions of the NSW EPA NPfI. This includes maximum noise level assessments (sleep disturbance).</li> <li>Given the precinct is largely undeveloped and comprises primarily of agricultural rural land and farm properties, the minimum rating background levels (RBLs) proposed in the NPfI can be adopted in place of baseline noise monitoring, to inform land use impacts at this stage. NPfI amenity levels are not recommended unless baseline monitoring confirms intrusiveness noise limits of the NPfI are then higher than recommended project amenity levels.</li> <li>Precinct planning should consider location and type of enterprise, light industry and business land uses adjacent to existing sensitive receivers (isolated residences and farm properties). These existing sensitive receivers should be afforded protection commensurate with rural residential status as defined in the NPfI, for noise assessment purposes. Therefore, operational noise impacts associated with any new enterprise, light industry or business developments permitted as part of the rezoning, must be assessed against project noise trigger levels (PNTLs) developed using the minimum RBLs recommended in Table 2.1 of the NPfI. Buffer zones in the form of open spaces and low-density local centres are recommended on land immediately adjacent to these existing isolated sensitive land uses, to reduce the potential for intrusive noise impacts associated enterprise and high-density land uses, without compromising precinct planning.</li> <li>Noise emission predictions based on empirical formulas are recommended for small and medium scale developments, with computational noise modelling (ISO 9613 algorithms in SoundPLAN or equivalent software) recommended for large scale developments or developments with multiple noise sources and/or significant external operations (industrial developments with loading docks, hardstands, packing and distribution zones etc.).</li> </ul>
	airborne noise associated with additional traffic on existing roads generated by new land use developments.	<ul style="list-style-type: none"> <li>Change in road traffic noise levels from additional traffic associated with proposed new land uses shall be assessed against the provisions of NSW EPA <i>Road Noise Policy</i>.</li> <li>Noise predictions must generally be carried out using the most suitable and accurate noise modelling method (e.g. CoRTN, determined by a qualified acoustic specialist), however, use of the UK Department of Transport's <i>Federal Highway Administration Model</i> (FHWA) calculation method<sup>11</sup> should be considered during the early stages of precinct development, due to existing low traffic flows.</li> </ul>
	ground-borne noise and vibration (human comfort) associated with the operations of new commercial and industrial land use developments (these are not expected to be significant),	Ground-borne noise and vibration impacts from land use operations will typically be contained within the property boundary (localised treatments) and are unlikely to impact on surrounding receivers. However, if external vibration intrusive operations are proposed as part of the proposed land use, an empirical evaluation approach is recommended, assessed against the provisions of NSW EPA <i>Assessing Vibration: a technical guideline</i> .
Construction noise and vibration impacts	See <b>Table 4-4</b> .	

## 4.3 Agribusiness

### 4.3.1 Existing Acoustic Environment

- The existing land use and transport corridors in this precinct are detailed in Section 2.2.5. Traffic volume map 13 of Infrastructure SEPP classifies The Northern Road and Elizabeth Drive as State Roads, with low-medium volumes of traffic (<20,000 AADT). All other roadways in this precinct (Adams Rd, Willowdene Ave, Park Rd) are classified as Local Roads with low volumes of traffic.
- Hence, ambient noise levels in this precinct generally reflect noise levels associated with a rural environment (i.e. localised noise sources associated with motor vehicles and farming and agricultural activities).
- A semi-rural ambient noise environment is likely for areas around the Luddenham Village (illustrated in **Figure 4-14**), with marginally higher background noise levels primarily during the daytime period (7am-6pm), associated with operational noise impacts from retail and public infrastructure properties (schools and religious centres).

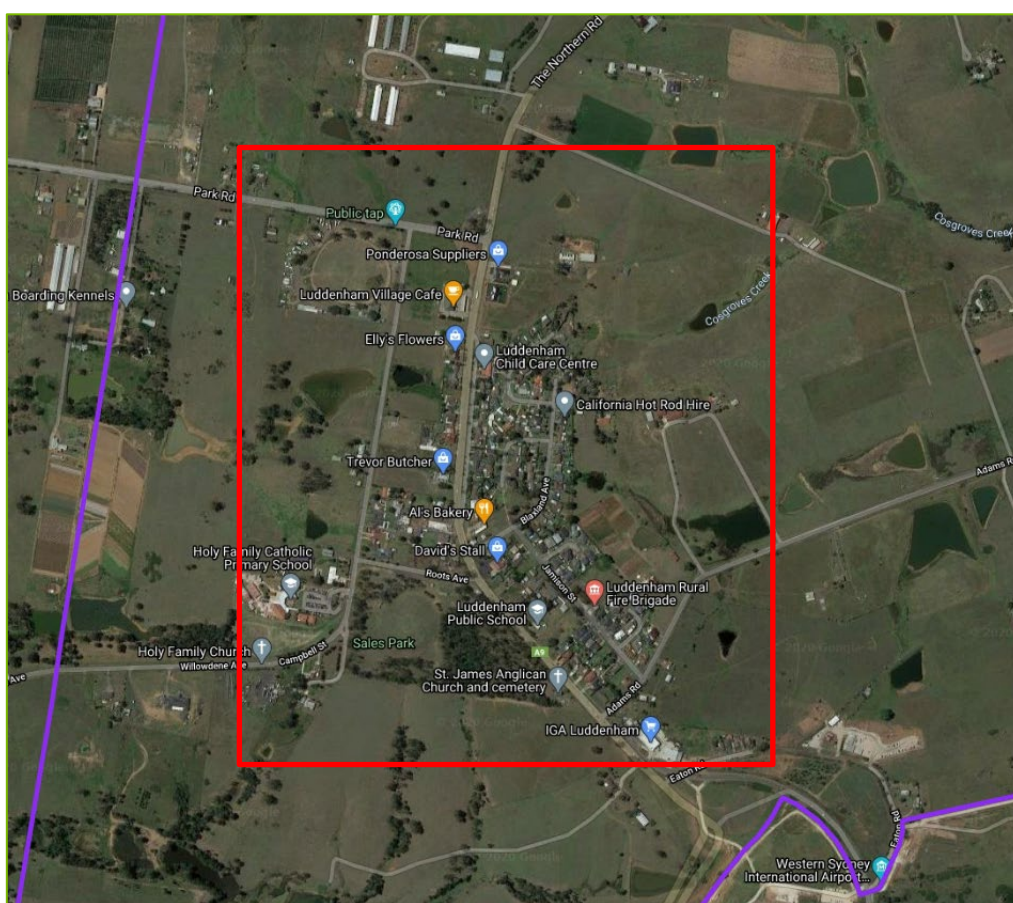


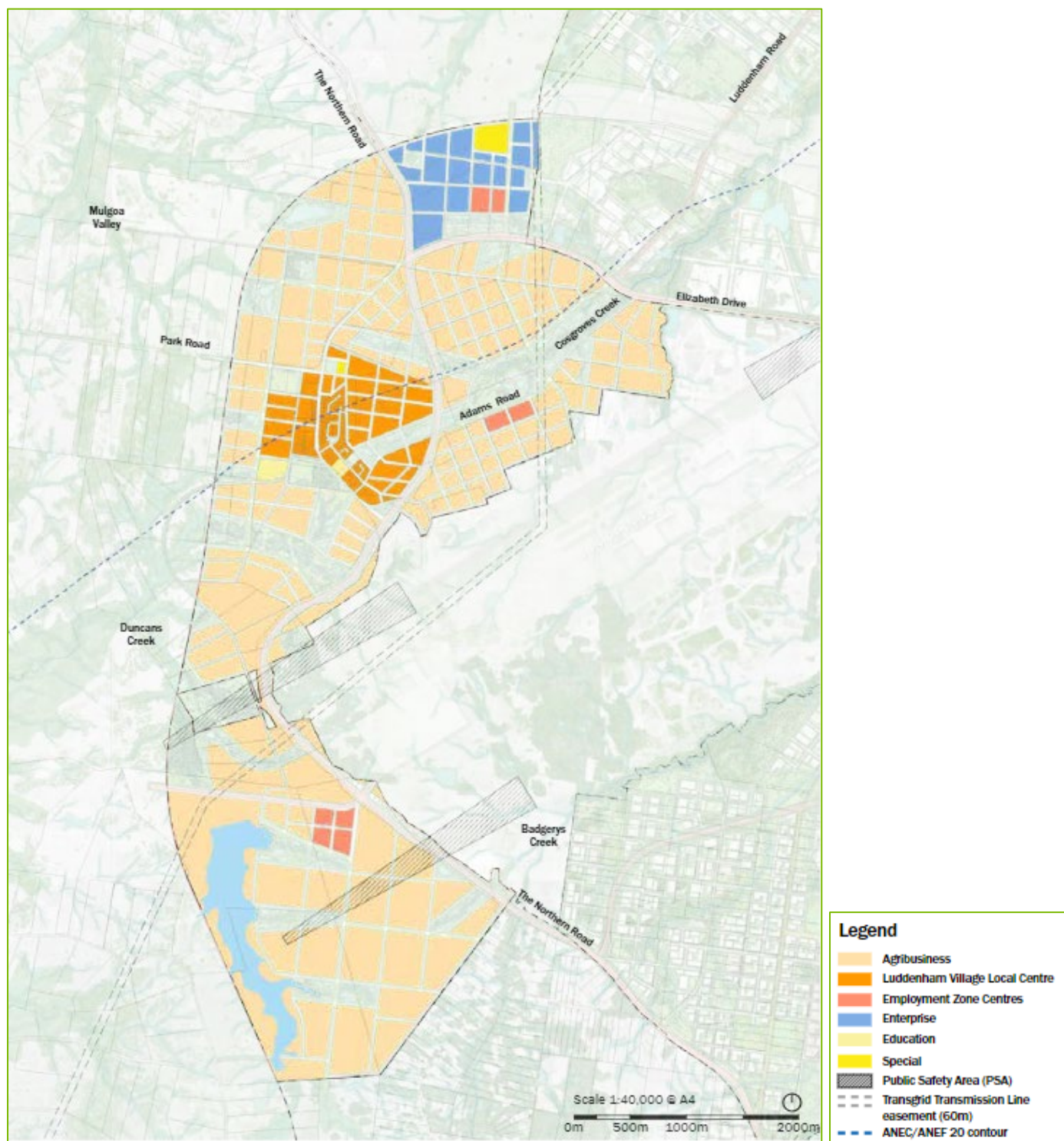
Figure 4-14: Proposed M12 alignment through Northern Gateway Precinct (source: Google Maps)

### 4.3.2 Precinct land uses and transport framework

#### Land uses

Land use planning for this precinct is governed by Luddenham Village and managing wildlife attraction. Luddenham Village forms a compact Local Centre at the heart of the precinct, with Agribusiness uses generally proposed throughout much of the precinct. Agribusiness will include a mix of industrial and warehousing facilities (food production and processing, warehousing and logistics), complimented by associated commercial and retail development (offices, food produce markets, logistics hub).

Enterprise land uses are proposed to the north of the precinct, adjacent to the enterprise land uses of the Northern Gateway precinct. This is illustrated in **Figure 4-15**<sup>15</sup>.



**Figure 4-15: Agribusiness Precinct – Precinct Plan**<sup>16</sup>

<sup>15</sup> This land use plan is likely to evolve as key issues and opportunities present for further investigation during subsequent master planning stages or in the preparations and assessment of detailed development proposals.

<sup>16</sup> Agribusiness Precinct Urban Design and Landscape Report (Final - December 2021)

## Transport corridors

- This classification and the street typologies currently proposed for the precincts are illustrated in **Figure 4-16** and **Figure 4-17**.
  - Local Streets – provides local access both outside of centres and within centres. This includes Local Collector Roads (20-30 metres), Edge Streets (19 metres), Park Edge Streets (19 metres) and Primary Industrial Roads (25 metres).
  - Main Streets – traverses through areas with greater land use intensity. This includes Local Collector Roads (20-30 metres).
  - Main Roads – facilitates sub-regional, regional and metropolitan movement both within and between the WSA precincts, and major land uses. This includes Arterial Roads (60 metres), Sub-Arterial Roads (40 metres) and all Motorways (e.g. M12 corridor).
- Public transport within this precinct will largely include an integrated bus network, as illustrated in **Figure 4-18**.
  - Rapid bus corridor – ultimately could have dedicated bus lanes.
  - Frequent and local bus corridors – bus capable public roads, with stops.
- In addition to the internal public road network within the precinct, major State infrastructure future transport corridors intersect the precinct. They include:
  - The Outer Sydney Orbital road is currently proposed to be aligned along the northern and western boundaries of this precinct (illustrated in **Figure 4-18**).
  - A section of the M12 Motorway (west of Luddenham Road till intersection with the Northern Road) is also currently aligned along the northern boundary of the precinct (forms part of the OSO), as illustrated in **Figure 4-7** and **Figure 4-18**.
  - A 16km section of The Northern Road between Mersey Road and Glenmore park is proposed to be upgraded as part of the Western Sydney Infrastructure Plan (WSIP). This includes construction of new six-lane carriageway to run through this precinct, to replace the existing roadway located within the Airport site. This new carriageway will also include several key intersections now located within this precinct, as illustrated in **Figure 4-19**.

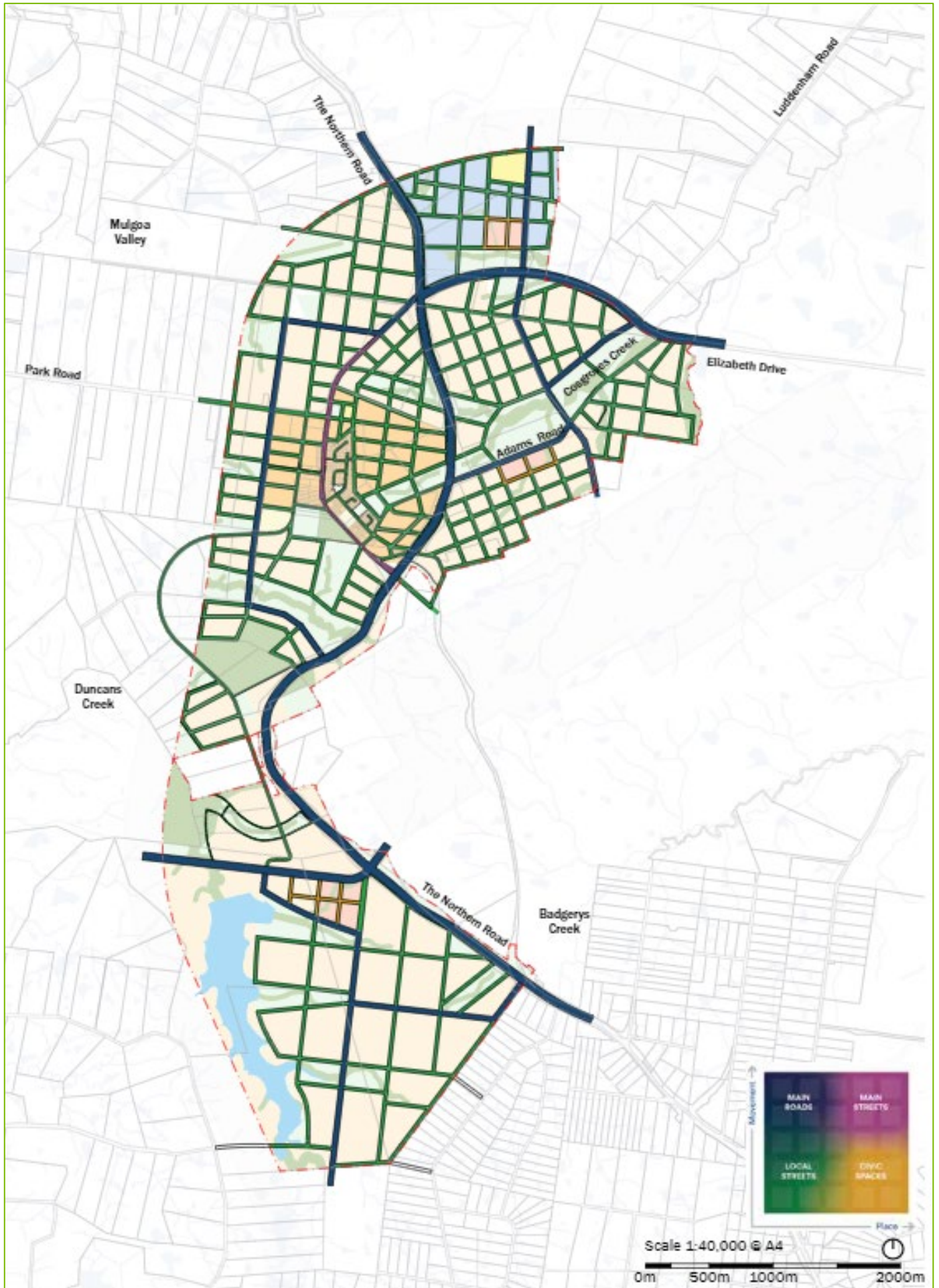


Figure 4-16: Agribusiness Precinct – Proposed Street Environment Classifications<sup>16</sup>

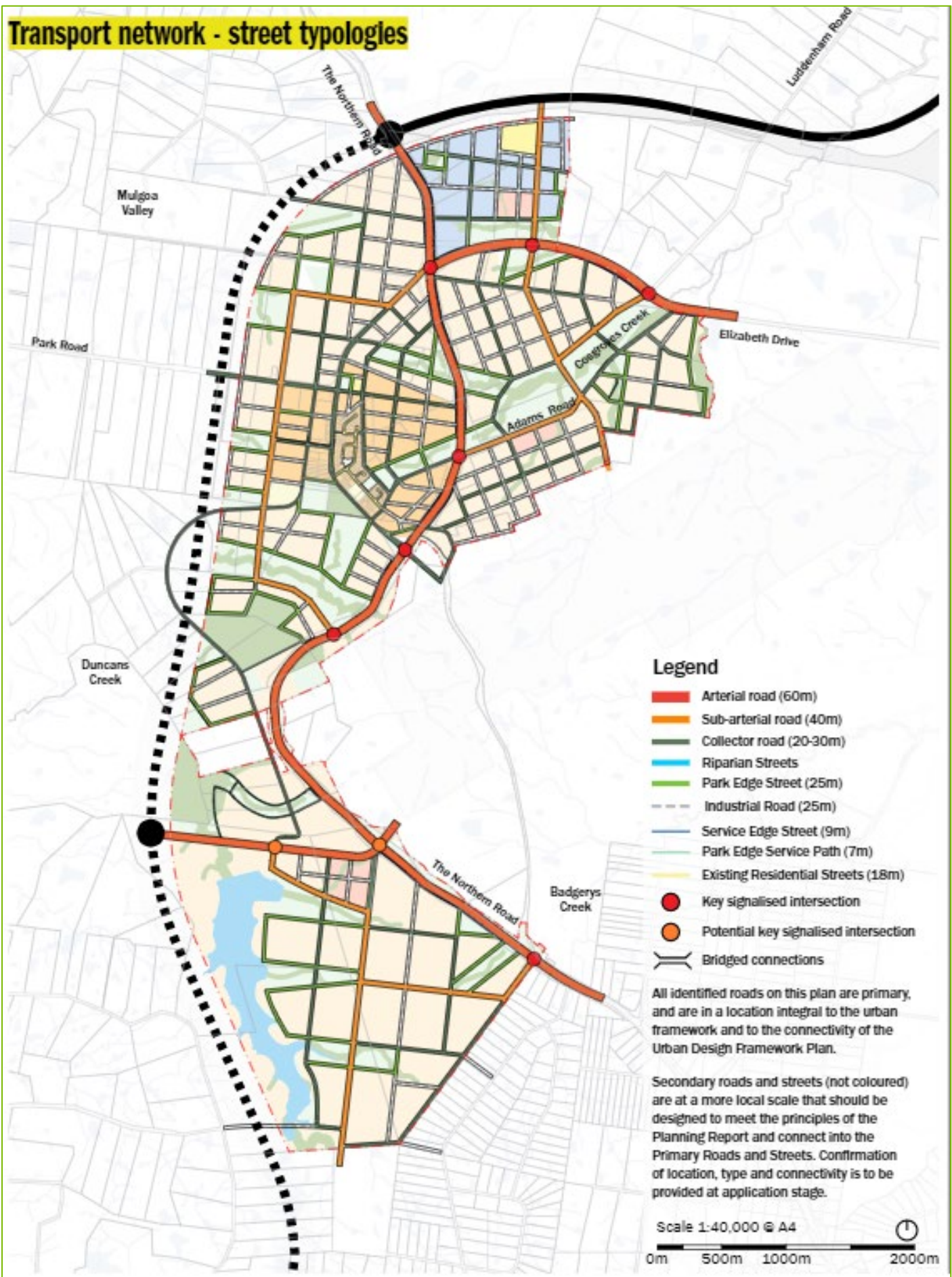


Figure 4-17: Agribusiness Precinct – Proposed Street Typologies<sup>16</sup>

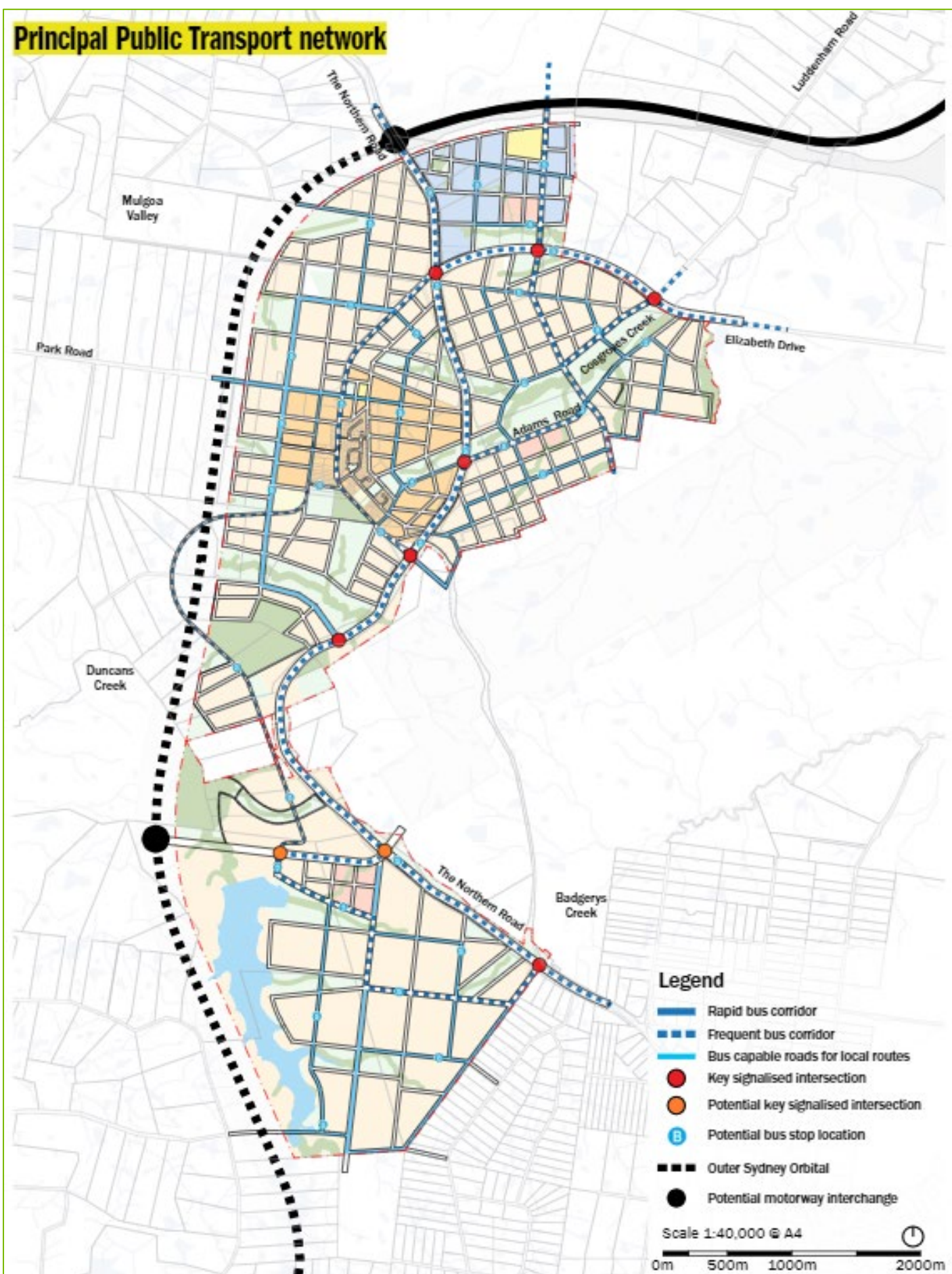
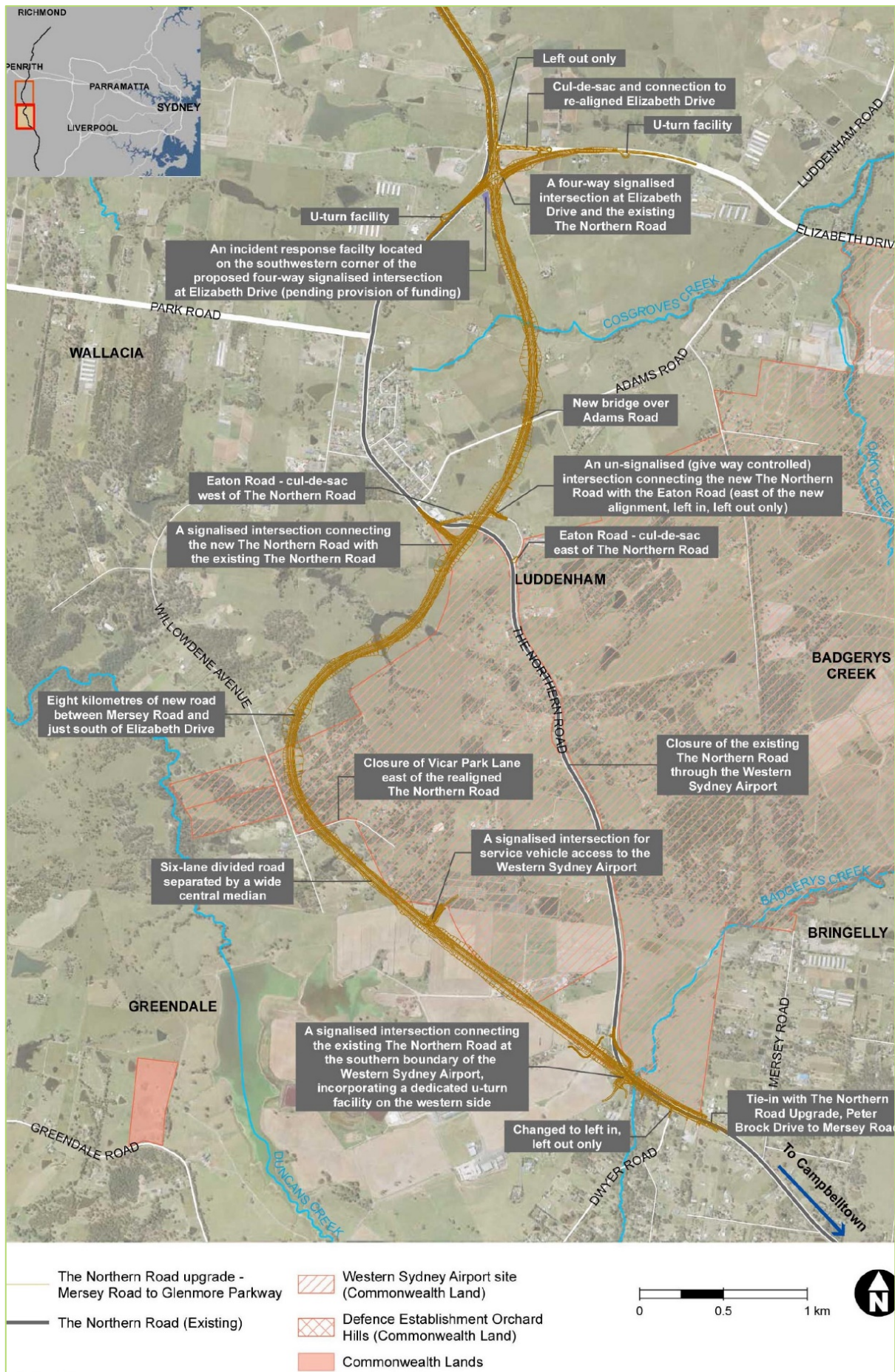


Figure 4-18: Agribusiness Precinct – Proposed Public Transport Network<sup>16</sup>



**Figure 4-19: Proposed the Northern Road alignment through Agribusiness Precinct (source: The Northern Road Upgrade Final EIS, 2017)**

### 4.3.3 Key Findings

- The proposed new M12 and OSO transport corridors, will introduce new noise and vibration sources to areas along the northern and western precinct boundaries.
- This combined with the new Northern Road alignment, increased future traffic volume on this carriageway (compared to existing volumes on the current Northern Road), the operations of the Airport and planned urban development of land within the Greater Penrith and WSAP precincts, will increase the background noise levels within this precinct over time.
- An increase in existing traffic noise levels for Luddenham Village Local Centre is also likely, due to new road corridors and increased traffic volumes on the current and upgraded regional road network. Additionally, environmental noise impacts in the future will also include contributions from rail noise from freight train operations along the OSO corridor.
- Industrial developments, warehousing facilities and retail precincts generally have operational noise associated with them. They are likely to result in a new noise sources within this precinct and will potentially contribute to increasing the background noise level.
- The existing agricultural operations and natural landscape within this precinct, has influenced land use planning to support the long-term growth of agriculture and agribusiness in the Aerotropolis, with the Airport development further acting as a catalyst to service connections for an increasing demand of agricultural products domestically and internationally.

### 4.3.4 Issues for consideration and recommendations

**Table 4-3: Agribusiness Precinct – Issues for consideration and Recommendations**

Issues for consideration		Recommendations	
Environmental noise and vibration impacts	<ul style="list-style-type: none"> <li>■ airborne noise and vibration from motor vehicles operations on the public road network<sup>17</sup>,</li> <li>■ airborne noise from freight trains operating at the surface (at-grade and/or in-cutting) and elevated/viaduct sections of proposed rail corridors</li> <li>■ ground-borne noise and vibrations (human comfort) from the operation of freight trains along the proposed rail corridors</li> </ul>	<ul style="list-style-type: none"> <li>■ An environmental noise study is recommended for any new sensitive land use developments (refer to Section 3.3) proposed within the Luddenham Village Local Centre, in accordance with the requirements of the Infrastructure SEPP and NSW DPIE <i>Development near rail corridors and busy roads – interim guideline</i>. <ul style="list-style-type: none"> <li>– The technical study should include evaluation of existing noise environment, in addition to the assessment of forecasted future volumes (typically at-opening and future period when corridor reaches its expected operational peak capacity).</li> <li>– A noise model of the study area is recommended for the assessment methodology, with transport noise impacts predicted using the most suitable and accurate prediction algorithm (e.g. CoRTN) in a computer noise modelling software (SoundPLAN or equivalent), determined by a qualified acoustic specialist.</li> </ul> </li> <li>■ An environmental noise and vibration study is recommended for all commercial and office type land use developments, proposed in the vicinity of the OSO freight corridor, as recommended by the NSW DPIE <i>Development near rail corridors and busy roads – interim guideline</i>. <ul style="list-style-type: none"> <li>– A noise model of the study area is recommended for the assessment, with predicted transport noise impacts (most suitable and accurate prediction algorithms in SoundPLAN or equivalent software) assessed considering the recommendations of AS 3671 and AS/NZS 2107.</li> <li>– Ground-borne noise and vibration impacts associated with rail operations be predicted based on the prediction models detailed in ISO 14837-1 and comply with the provisions of NSW EPA <i>Assessing Vibration: a technical guideline</i>.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>■ Arterial and Sub-arterial Roads are typically associated with heavy volumes of traffic, however precinct planning (see <b>Figure 4-15</b>) does not illustrate any sensitive land use developments in the immediate vicinity of these carriageways. Proposed Agribusiness land use developments (offices, logistics hub) adjacent to these carriageways can generally be treated with standard building standards and mitigation measures (IGU or thick single glazed façade systems, masonry building envelop with openings for forced/mechanical ventilation etc.).</li> <li>■ Building damage (including heritage listed structures) is not usually likely for operation of rail and road infrastructure. A building dilapidation survey of the heritage structures identified within the vibration assessment zone (Figure 3.2 of DPIE <i>Development near rail corridors and busy roads – interim guideline</i>) should be carried out, and if the survey indicates that the heritage buildings are structurally unsound, then the conservative criteria recommended in German Standard DIN 4150-3:1999 <i>Structural Vibration Part 3: Effects of vibration structures</i> should be use.</li> </ul>

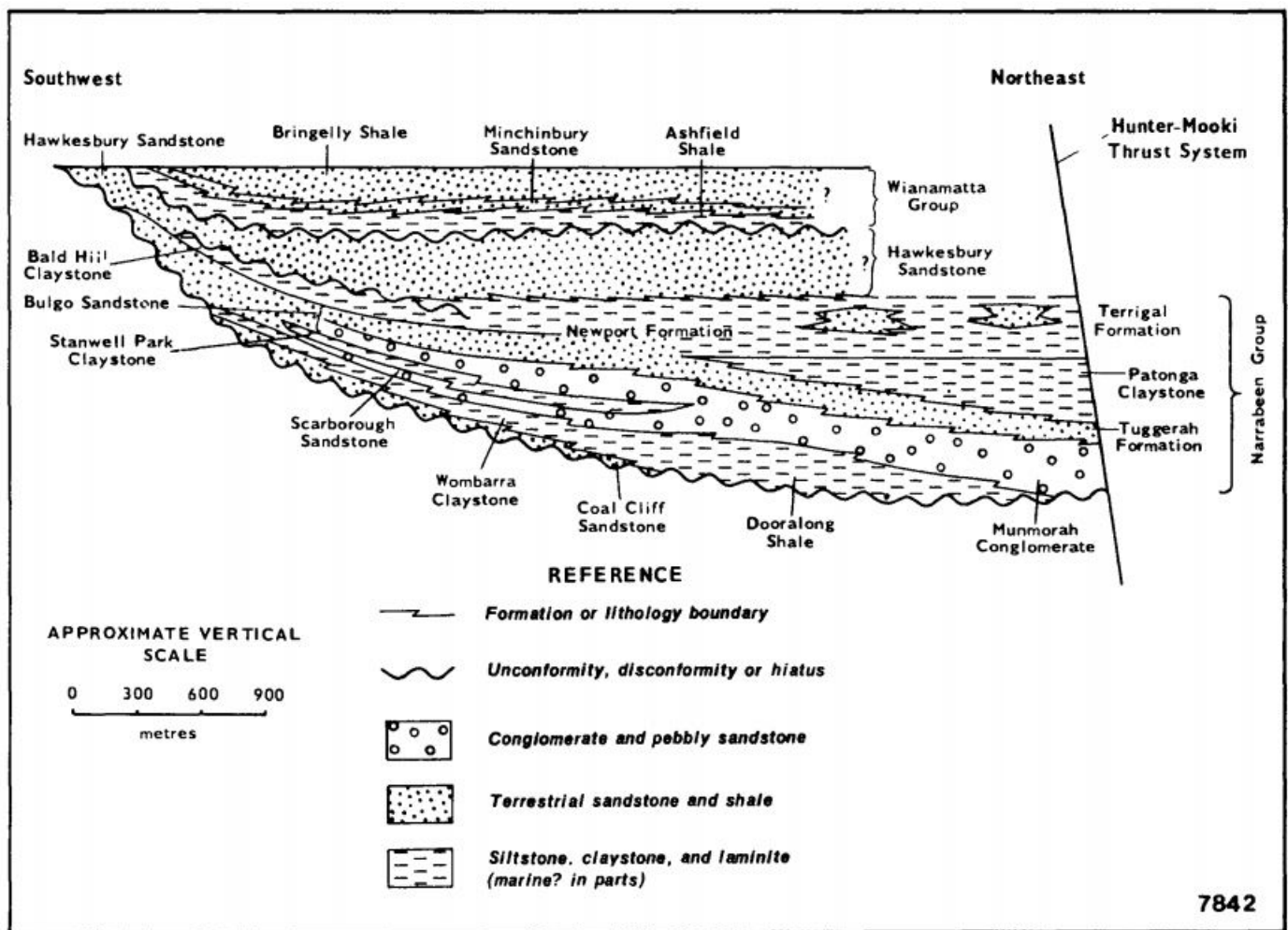
<sup>17</sup> Generally, motor vehicles operating on roadways are unlikely to cause vibration impacts at adjacent receivers unless there are significant road irregularities, such as can occur at poorly maintained bridge joints or speed humps. As all the roadways in this precinct will be new or upgraded, impacts from operational vibration are not expected.

Operational noise and vibration impacts	airborne noise associated with the operations (building services plant/equipment, loading dock operations, on-grade carparking/hardstand areas etc.) of new land use developments,	<ul style="list-style-type: none"> <li>Operational noise impacts associated with new land use developments are first recommended to be assessed against the NSW EPA <i>Noise Guide for Local Government</i> 'offensive noise' checklist. If considered 'offensive', these impacts must be assessed (quantitatively) against the provisions of the NSW EPA NPfl. This includes maximum noise level assessments (sleep disturbance).</li> <li>Precinct planning should consider location and type of Agribusiness land uses immediately adjacent to sensitive land uses (existing and future proposed) the Luddenham Village Local Centre, to ensure operational noise impacts can be sufficiently controlled to comply with the requirements of the NSW EPA NPfl. Given the semi-rural setting of this centre and low ambient noise levels, 24-hour operational facilities must not be located within 250m of residential, mixed-use or hospital land uses. Additionally, high noise enterprise and light-industrial facilities must also not be located within 150 metres of educational land uses (e.g. Holy Family Catholic Church, Luddenham Public School). Enterprise land uses in the form of commercial office facilities, storage warehouses and tertiary education are generally recommended within 250m of Luddenham Village Local Centre.</li> <li>Baseline noise monitoring in accordance with the provisions of the NPfl is required for all land use developments proposed within or near (within 250m of any existing sensitive land uses) the Luddenham Village Local Centre.</li> <li>Other areas of the precinct are largely undeveloped and comprises primarily of agricultural rural land and isolated farm properties. These existing sensitive receivers should be afforded protection commensurate with rural residential status as defined in the NPfl, for noise assessment purposes. Therefore, operational noise impacts associated with any new type of Agribusiness land use permitted as part of the rezoning, must be assessed against project noise trigger levels (PNTLs) developed using the minimum RBLs recommended in Table 2.1 of the NPfl. Buffer zones in the form of open spaces and low-density local centres are recommended on land immediately adjacent to these existing isolated sensitive land uses, to reduce the potential for intrusive noise impacts associated enterprise and high-density land uses, without compromising precinct planning.</li> <li>Noise emission predictions based on empirical formulas are recommended for small and medium scale developments, with computational noise modelling (ISO 9613 algorithms in SoundPLAN or equivalent software) recommended for large scale developments or developments with multiple noise sources and/or significant external operations (industrial developments with loading docks, hardstands, packing and distribution zones etc.).</li> </ul>
	airborne noise associated with additional traffic on existing roads generated by new land use developments.	<ul style="list-style-type: none"> <li>Change in road traffic noise levels from additional traffic associated with proposed new land uses shall be assessed against the provisions of NSW EPA <i>Road Noise Policy</i>.</li> <li>Noise predictions must generally be carried out using the most suitable and accurate noise modelling method (e.g. CoRTN, determined by a qualified acoustic specialist), however, use of the UK Department of Transport's <i>Federal Highway Administration Model</i> (FHWA) calculation method<sup>11</sup> should be considered during the early stages of precinct development, due to existing low traffic flows.</li> </ul>
	ground-borne noise and vibration (human comfort) associated with the operations of new commercial and industrial land use developments (these are not expected to be significant),	Ground-borne noise and vibration impacts from land use operations will typically be contained within the property boundary (localised treatments) and are unlikely to impact on surrounding receivers. However, if external vibration intrusive operations are proposed as part of the proposed land use, an empirical evaluation approach is recommended, assessed against the provisions of NSW EPA <i>Assessing Vibration: a technical guideline</i> .
Construction noise and vibration impacts	See <b>Table 4-4</b> .	

## 4.4 All Precincts – Construction Noise and Vibration

### 4.4.1 Key findings

Regionally, the Aerotropolis is located within the Permo-Triassic Sydney Basin. This basin consists of sub-horizontal sedimentary deposits, mainly sandstone with interbedded shale layers deposited unconformably on a basement of the Lachlan Fold Belt. A detailed illustration of the stratigraphic relationship of the Wianamatta Group, Hawkesbury Sandstone and the underlying Narrabeen Group geological formations relevant to the study area are presented in **Figure 4-20** below.



**Figure 4-20: Stratigraphic relationship between the Wianamatta Group, Hawkesbury Sandstone and the Narrabeen Group**  
 (source: Aurecon, 2020)

Surface outcrops of geological units associated with the initial precincts have been determined from a review of the Penrith 1:100 000 Geological Map and are depicted in **Figure 4-21**. The formations consist of two primary groups: The Wianamatta Group's Bringelly Shale which extends to a depth of 60m and consists of shale, carbonaceous claystone, claystone, laminate, fine to medium grained lithic sandstone, rare coal and tuff (Penrith 1:100 000 Geological Map (9030)); and, the Quaternary alluvium made up of fine-grained sand, silt and clay is also present along South Creek, Kemps Creek and Badgerys Creek.

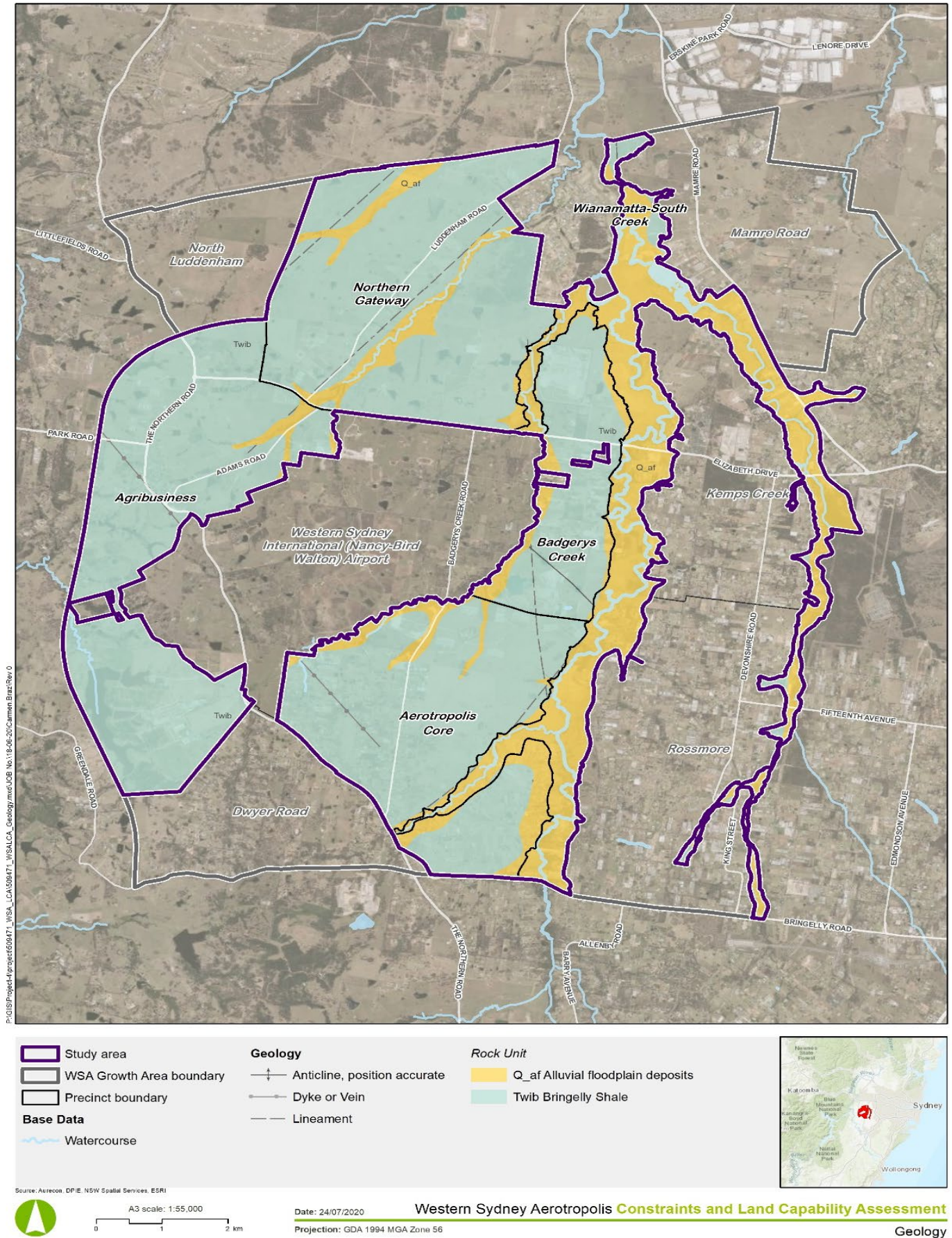


Figure 4-21 Regional Surface Geology

## 4.4.2 Issues for consideration and recommendations

Table 4-4: Construction Noise and Vibration Impacts (All Precincts) – Issues for consideration and Recommendations

Issues for consideration	Recommendations
<ul style="list-style-type: none"> <li>■ The land geology indicates the potential need for noise and vibration intrusive rock breaking operations (bulk excavation, piling, hydraulic hammer) for future development.</li> <li>■ The potential impacts associated with typical construction activities/scenarios from the development of precincts may include: <ul style="list-style-type: none"> <li>– noise (airborne and ground-borne) and vibration impacts from site preparation works, including spoil management activities,</li> <li>– noise (airborne and ground-borne) and vibration impacts from construction activities within construction sites,</li> <li>– noise (airborne and ground-borne) and vibration impacts from civil works, existing utility protection, installation of new utility services and adjustment and relocations,</li> <li>– noise (airborne and ground-borne) and vibration impacts from the construction of internal road network (local roads)</li> <li>– Increase to road traffic noise from the movement of construction vehicles, including spoil haulage vehicles</li> </ul> </li> <li>■ The degree of construction noise and vibration impact on individual sensitive receivers depends on (i) proposed construction scenarios i.e. works associated with each scenario, (ii) distance between construction activities and sensitive receivers, (iii) the duration of works and (iv) the time of day or night that the works take place.</li> <li>■ Works proposed outside of the recommended standard construction hours, increase the potential for noise and vibration impacts on surrounding sensitive receivers, due to lower ambient noise levels and the potential for sleep disturbance.</li> </ul>	<ul style="list-style-type: none"> <li>■ The assessment and management of noise and vibration impacts from construction works associated with the development of precincts, shall be in accordance with the provisions of the NSW EPA ICNG.</li> <li>■ Considering the initial precincts are all predominantly greenfield areas, all construction work will be able to be done during the recommended standard hours, as outlined in Section 2.2 of the ICNG. For any works proposed outside the recommended standard hours, strict compliance with all the provisions of Section 2.3 of the ICNG should be mandated.</li> <li>■ A construction noise and vibration technical report is recommended for all development proposals, generally using the quantitative assessment method (Section 4 of the ICNG). <ul style="list-style-type: none"> <li>– Computational modelling using ISO 9613 algorithms in SoundPLAN software is recommended to predict noise impacts from construction works to identified surrounding affected receivers.</li> <li>– Construction vibration impacts shall be assessed with reference to the minimum safe working distances recommended in Appendix D of the TfNSW <i>Construction Noise and Vibration Strategy</i> (CNVS) document. Where activities are proposed within the recommended safe working distances, <ul style="list-style-type: none"> <li>■ peak particle velocity levels must be calculated for the proposed activity based on the guidance of NSW RMS <i>Environmental Noise management Manual</i> (ENMM) and British Standard BS 5228.1. These predicted levels must be assessed against the requirements of NSW EPA's publication <i>Assessing Vibration: a technical guideline</i> to determine suitable mitigation measures and management controls.</li> <li>■ for heritage structures, a building dilapidation survey should be carried out, and if the survey indicates that the heritage buildings are structurally unsound, then the conservative criteria of 3mm/s provided by DIN 4150-3:1999 should be use.</li> </ul> </li> <li>– Noise impacts from construction traffic shall be assessed against the provisions of NSW RMS <i>Construction Noise and Vibration Guideline</i>. Noise predictions shall generally be carried out using the CoRTN noise modelling method, however, use of the FHWA calculation method should be considered during the early stages of precinct development, which provides a greater accuracy and wider range of validity for low traffic areas.</li> </ul> </li> <li>■ The Warragamba Pipelines are concrete lined and prone to impacts from vibration. Construction activities (and subsequent operation of any infrastructure nearby or crossing the corridor) must be monitored and not exceed WaterNSW's requirements. Any damage caused to the Pipelines as a result of construction vibration will require repairs at the proponent's expense.</li> <li>■ A qualitative assessment methodology (Section 5 of ICNG) may also be considered acceptable for the construction noise and vibration technical report if: <ul style="list-style-type: none"> <li>– Only short-term infrastructure maintenance works are proposed, with project duration under 3 weeks, and</li> <li>– Development proposals are for a small to medium scale development located in rural areas and may not generate significant noise to surrounding receivers. This shall be reviewed on a case by case basis.</li> </ul> </li> <li>■ A subsequent construction noise and vibration management plan should be formulated, detailing recommendations of mitigation strategies and management procedures where exceedances of the project noise management levels and vibration criteria are predicted/expected.</li> </ul>

## 5 Expected Outcomes of the Recommendations

The results of the recommendations detailed in Section 4 above are expected to:

- Locate non-sensitive land uses adjacent to planned major State infrastructure future transport corridors and proposed high volume public road corridors (Arterial Roads, Sub-arterial roads, State Roads and Collector Roads), any rail corridor) within the precincts.
- Use the non-sensitive land uses to block noise to sensitive land uses (as defined by the NSW DPIE, refer to Section 3.3).
- Inform stakeholders of the preferred noise and vibration standards and assessment methodologies for all potential noise and vibration sources.
- Adoption of the recommendations of NPfI in relation to typical existing background noise levels in place of baseline noise monitoring, to inform land use impacts at this stage.
- Reduce the extent of noise and vibration mitigation required through early planning and due diligence reviews.
- Achieve sustainable outcomes such as natural ventilation, amenity in open spaces etc.

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