

706-752 Mamre Road Data Centre Campus, Kemps Creek

Environmental Health Risk (EHRA) & Health Impact Assessment (HIA)

Project No.	P02638
Revision	Draft -05
Issued	30.06.2026
Author	Mayra Valladares
Client	Plan Project Management



E-LAB Consulting
Where Engineering and Science Inspire Design.





Issue And Revision Record

Revision	Date	Comments	Engineer	Reviewer
01	26.11.2025	Draft 1	MV	AK
02	08.12.2025	Draft 2	MV	AP/JK/MD/AL
03	09.12.2025	Final	MV	AK
04	12.12.2025	Minor Update	MV / ZM	AK
05	24.06.26	Draft -Includes feedback from NSW Health	MV	JK/AP
06	30.06.26	Final Report-Includes feedback from Agencies	MV	JK/AP

Information presented in this report is based on E-LAB Consulting's understanding of the **Mamre Road Data Centre Campus** Project and the documentation, data, and environmental studies provided by the client and associated consultants.

This report has been prepared specifically to assess the project's potential health impacts in accordance with relevant Australian legislation, environmental guidelines, and planning requirements, as detailed within this document.

The project design and construction teams are required to review and consider the implications of the findings and recommendations contained herein, ensuring that they are integrated into detailed design, construction, and operational management processes.

Design coordination should take into account any related air-quality, acoustic, heat, structural, safety, or maintenance considerations applicable to this particular project.

Engineering Lab NSW Pty Ltd

This document has been prepared for the exclusive use of Plan Project Management Pty Ltd as the commissioning party and for specific purposes associated with the **Mamre Road Data Centre Campus** Project.

It should not be relied upon by any other party or used for any purpose other than that for which it was prepared.

E-LAB Consulting accepts no responsibility or liability for the consequences of this document being relied upon by third parties, for any unauthorised use, or for errors or omissions resulting from information supplied by others.

This document contains confidential information and proprietary intellectual property of E-LAB Consulting. It must not be reproduced or distributed to third parties without prior written consent from E-LAB Consulting and the commissioning client.

Mayra Valladares | Principal Consultant

E-LAB Consulting

e-lab.com.au

Table of Contents

1.1	Key Findings	x
1.1.1	Air Quality	x
1.1.2	Noise and Vibration	x
1.1.3	Soil and Contamination.....	x
1.1.4	Urban Heat Island (UHI)	x
1.2	Management Strategies	xi
1.2.1	Air Quality Controls:.....	xi
1.2.2	Noise & Vibration Controls:.....	xi
1.2.3	Soil & Contamination Controls:.....	xi
1.2.4	Urban Heat Mitigation:	xi
1.3	Conclusions.....	xi
2	Introduction.....	xiii
2.1	Purpose of the HIA and EHRA.....	xiii
2.2	Project Description	xiii
2.3	Site Context and Sensitive Surroundings	xv
2.4	Construction staging and operational Program	xv
2.5	Electrical Supply and Redundancy.....	xv
2.6	Agency Submissions.....	19
3	Policy, Legislation and Technical Framework.....	26
3.1	Integration within the SEARs Framework.....	26
3.2	NSW Legislative Framework.....	26
3.3	National and Technical Guidance	26
3.4	Integration with the SEARs Process	27
4	Environmental Health Risk Assessment (EHRA) and Health Impact Assessment (HIA) Methodology	28
4.1	Assessment Approach	28
4.2	Qualitative Risk Assessment Method	28
4.2.1	Qualitative Assessment Process	28
4.2.2	Likelihood and Consequence Ratings	29
4.2.3	Mitigation and Residual Risk.....	29
4.2.4	Treatment of Uncertainty	29
4.2.5	Escalation to Quantitative Assessment.....	29
4.2.6	Qualitative Risk Matrix and Management Criteria.....	30
4.3	Quantitative Health Risk Assessment Method	32
4.3.1	Quantitative Assessment Pathways.....	32
4.4	Conceptual Site Model	32
4.5	Exposure Assessment	32



4.6	Risk Characterisation	33
4.7	Population and Sensitive Receptor Considerations	34
4.8	Treatment of Uncertainty and Sensitivity	34
4.9	Interface with Mitigation and Residual Risk	34
4.10	Cumulative Impact Approach	35
5	Sensitive Receptors and Population profile	36
5.1	Air Quality Receptors	36
5.2	Receptor Distribution of Air Quality Risk	38
5.3	Noise and Vibration Receptors	38
5.3.1	Sensitive Activity Areas	39
5.4	Soil and Contamination Receptors	41
5.5	Sensitive Sub-Populations	42
5.6	Consolidated Receptor Framework	42
6	Air Quality Health Assessment	45
6.1	Existing Background Air Quality	45
6.2	Sources, Hazards and Exposure Pathways	45
6.3	Receptors and Sensitive Populations Relevant to Air Quality	46
6.4	Air Quality Assessment (Construction and Operational Phase)	46
6.5	Summary Air Quality Qualitative Assessment	49
6.6	Quantitative Air Quality Assessment	51
6.6.1	Air Quality Conceptual Model	51
6.6.2	Exposure Scenarios	51
6.6.3	Exposure Inputs	51
6.6.4	Scenario Definition	52
6.6.5	Health Outcome Selection	52
6.7	Quantified Air Quality Exposure Health Impacts	53
6.8	Health Risk Characterisation	53
6.9	Mitigation, Monitoring and Residual Risk	54
6.9.1	Monitoring and Management	54
6.9.2	Summary of Air Quality Quantitative Health Risks, Mitigation Measures and Residual Risk	55
6.9.3	Air Quality Residual Risk Interpretation	57
7	Noise and Vibration Health Assessment	58
7.1	Existing Acoustic Environment	58
7.2	Sources, Hazards and Exposure Pathways	58
7.3	Receptors and Sensitive Populations Relevant to Noise	59
7.4	Noise and Vibration Assessment	60
7.4.1	Construction Phase	60
7.4.2	Operational Phase	63

7.5	Summary Noise and vibration Qualitative Assessment.....	65
7.6	Quantitative Noise Assessment	67
7.6.1	Noise Conceptual Model.....	67
7.6.2	Exposure Scenarios.....	67
7.6.3	Exposure Inputs.....	68
7.6.4	Scenario Definition.....	68
7.6.5	Noise Health Outcome Selection	68
7.7	Quantified Noise Health Impacts	69
7.8	Health Risk Characterisation.....	69
7.9	Mitigation, Monitoring and Residual Risk	70
7.9.1	Construction noise and vibration mitigation	70
7.9.2	Operational noise mitigation	71
7.9.3	Mitigation for sensitive receivers.....	71
7.9.4	Monitoring	72
7.9.5	Noise Residual Risk interpretation.....	73
7.9.6	Summary of Noise Quantitative Health Risks, Mitigation Measures and Residual Risk	75
7.10	Cumulative Noise Assessment.....	76
7.10.1	Operational cumulative industrial noise	76
7.10.2	Cumulative construction noise	76
7.10.3	Overlap between construction and operation.....	77
7.10.4	Health interpretation	78
7.10.5	Management and mitigation relevant to cumulative noise	78
7.10.6	Monitoring and adaptive management.....	79
7.10.7	Residual cumulative risk	79
7.10.8	Noise Residual Risk Interpretation.....	82
8	Soil and Contamination Health Assessment.....	83
8.1	Existing Soil conditions	83
8.2	Sources, Hazards and Exposure Pathways	83
8.2.1	Hazards	84
8.2.2	Exposure Pathways	84
8.3	Receptors and Sensitive Populations Relevant to Soil contamination	84
8.4	Soil Assessment.....	85
8.5	Soil Qualitative Assessment.....	86
9	Urban Heat and Microclimate Health Assessment	87
9.1	Existing Microclimate Context	87
9.2	Urban Heat Island Assessment.....	87
9.3	Mathematical Basis for Urban Heat Island Calculation	88
9.4	Urban Heat Island Analysis	89



9.5	Urban Thermal Climate Index	90
9.6	Urban Heat Island Mitigation Measures	91
10	Conclusions	92
10.1	Construction Phase	92
10.2	Operational Phase	92
10.3	Cumulative Impacts and Sensitive Receptors	93
10.4	Soil Assessment.....	93
10.5	Overall Risk Assessment	93

We recognise the Traditional Custodians of the land on which the proposed development will be constructed. We respect their enduring cultural and spiritual connections to the land and waters, and celebrate their knowledge, kinship, and values. We acknowledge that these connections to the land and waters have existed for millennia and will continue into the future. We respect the Elders who have gone before, together with those of today for their guidance on our shared journey. We recognise that we are, and always will be, on Aboriginal land.

Abbreviations

Abbreviation	Meaning
AQIA	Air Quality Impact Assessment
AQMS	Air Quality Monitoring Station
AQC	Air Quality Category (NSW EPA)
AWS	Automatic Weather Station
BTEX	Benzene, Toluene, Ethylbenzene, Xylenes
CAQMP	Construction Air Quality Management Plan
CO	Carbon Monoxide
CSM	Conceptual Site Model
DA	Development Application
DCP	Development Control Plan
DPHI	NSW Department of Planning, Housing and Infrastructure
EER	Energy Efficiency Ratio
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
EHRA	Environmental Health Risk Assessment
EPA	Environment Protection Authority
EP&A Act	Environmental Planning and Assessment Act 1979
EPL	Environment Protection Licence
ESL	Ecological Screening Levels
HIA	Health Impact Assessment
ICNG	Interim Construction Noise Guideline (DECCW, 2009)
IT Load	Information Technology Electrical Load
LGA	Local Government Area
LAeq	Equivalent Continuous Sound Level
MWD	Minimum Working Distance (vibration assessment)
MRP	Mamre Road Precinct
NEPM	National Environment Protection Measure
NO₂	Nitrogen Dioxide
NO_x	Oxides of Nitrogen
PAH	Polycyclic Aromatic Hydrocarbons
PFC	Power Factor Correction
PNTL	Project Noise Trigger Level



Abbreviation	Meaning
POEO Act	Protection of the Environment Operations Act 1997
PM_{2.5} / PM₁₀	Particulate Matter $\leq 2.5 \mu\text{m}$ / $\leq 10 \mu\text{m}$
RAP	Remedial Action Plan
REMP	Remediation Environmental Management Plan
RBL	Rating Background Level
SBU	Switchboard Unit / Site Battery Unit
SEARs	Secretary's Environmental Assessment Requirements
SSD	State Significant Development
TARP	Trigger Action Response Plan
TRH	Total Recoverable Hydrocarbons
TSP	Total Suspended Particulates
UHI	Urban Heat Island
UHIE	Urban Heat Island Effect
UTCI	Universal Thermal Climate Index
VOC	Volatile Organic Compound

Executive Summary

This Environmental Health Risk Assessment (EHRA) and Health Impact Assessment (HIA) has been prepared to support the State Significant Development application for the Mamre Road Data Centre Campus at 706–752 Mamre Road, Kemps Creek. The assessment considers potential human health impacts during construction, staged commissioning and operation, drawing on the Air Quality Impact Assessment, Noise and Vibration Impact Assessment, Remedial Action Plan, project staging information and relevant NSW and national health guidance.

The Proposal involves a multi-stage data centre campus to be delivered over an approximately 10-year program. The assessment has considered air quality, noise and vibration, soil and contamination, urban heat and microclimate, sensitive receptors, cumulative impacts and the proposed mitigation, monitoring and adaptive management framework. It evaluates both physical health outcomes and wellbeing pathways such as annoyance, sleep disturbance, learning interference, perceived risk and reduced amenity.

The assessment applies a combined qualitative and quantitative approach consistent with enHealth Environmental Health Risk Assessment and Health Impact Assessment guidance. Quantitative assessment has been applied where suitable exposure data and exposure–response evidence are available, particularly for long-term air quality and noise-related population health outcomes. Qualitative assessment has been used to characterise short-term, intermittent, receptor-specific and cumulative pathways.

This report presents an assessment of the amended design of the proposal. In addition, comments were received on the original EHRA/HIA report (submitted in December 2025) from the NSW Environment Protection Authority (EPA), Secretary's Environmental Assessment Requirements (SEARs), NSW Health, and Penrith City Council. These comments have been addressed in this revised report and summarised in section 2.6.

The HIA responds to the Nepean Blue Mountains Local Health district (HBMLHFD) comments, which required clearer consideration of sensitive receptors, construction and operational air quality, generator maintenance testing and emergency operation, noise and vibration, soil contamination, urban heat, cumulative impacts and uncertainty. Current sensitive receptors, including nearby schools, the Emmaus Retirement Village and existing residences within or near the Mamre Road Precinct, have been assessed while they remain occupied.

This HIA focuses on environmental determinants that have plausible exposure pathways to surrounding populations:

- **Air quality:** construction dust emissions; diesel generator emissions (NO₂, PM₁₀, PM_{2.5}, CO, SO₂, PAH, VOCs).
- **Noise and vibration:** construction equipment, operational mechanical plant, and emergency/maintenance generator noise.
- **Land and soil contamination:** asbestos in shallow soils, mixed waste, hydrocarbon impacts, sediment quality.
- **Urban heat:** altered microclimate from large impervious surfaces and building mass.

Psychosocial determinants, including annoyance, perceived risk, cognitive effects on students, and quality-of-life considerations, were also assessed where relevant.

The concerns raised by NSW Health regarding Legionella risk and proximity to vulnerable receptors are acknowledged. In response, the amended scheme replaces the previously proposed hybrid dry coolers and water-cooled chillers with air-cooled chillers. This substantially reduces the facility's dependence on water-based heat rejection systems and effectively removes the cooling tower-related pathway typically associated with Legionella transmission

Unlike traditional systems, the proposed design :

- Uses predominantly air-based heat rejection, substantially reducing water use and the conditions that may support Legionella growth;
- Avoids large open water basins, cooling tower sumps and recirculating evaporative systems that can promote bacterial growth and biofilm formation;
- Greatly reduces the potential for aerosol generation, which is the primary pathway through which Legionella bacteria may be transmitted to people;
- Minimises the potential for off-site exposure to nearby sensitive receptors, including residents of the Emmaus Retirement Village

Overall, while not entirely water-free, the system functions predominantly as a low-risk, air cooling solution, aligning with NSW Health's recommendation to minimise water-based heat rejection and providing a substantial reduction in Legionella risk compared to conventional cooling towers.

1.1 Key Findings

1.1.1 Air Quality

- Construction dust is the main air-quality pathway, with short-term PM₁₀ and PM_{2.5} impacts most relevant to nearby schools, residences and aged-care receptors. With the CAQMP, real-time monitoring and trigger-action controls, risk is low to medium for the closest sensitive receptors and low for more distant receptors.
- The quantitative air quality assessment indicates that long-term population-level health impacts from annual average PM_{2.5} and NO₂ increments are negligible to minor. Using the HIA functions applied in this assessment, the estimated increases in all-cause mortality and respiratory hospital admissions are substantially less than one additional case per year for both current and future population scenarios. These results indicate that project-related air quality impacts are unlikely to result in a measurable or significant change in population health outcomes.
- The AQIA demonstrates that air quality criteria during construction and regular operations can be achieved. Short-term air quality impacts such as construction dust, generator maintenance testing and rare emergency generator operation are expected to be effectively managed through the CAQMP, real-time monitoring, construction and operational TARPs, generator testing restrictions, operating records, communication and complaint response procedures. Residual air quality risks are calculated to be low at a population level and low to medium at the closest sensitive receptors.

1.1.2 Noise and Vibration

- Construction noise is the principal short-term noise and vibration pathway. High-noise works, overlapping construction phases and works close to sensitive receptors may intermittently result in minor to moderate disturbance, such as temporary annoyance, reduced speech clarity, or brief disruptions to concentration, teaching or outdoor activity.
- The quantitative and qualitative noise assessment indicates that noise and vibration risks are generally low at a population level and low to medium at the closest sensitive receptors during specific short-term or intermittent scenarios, including construction works, generator testing and cumulative precinct activity.
- Operational plant noise is expected to be managed through embedded acoustic design, compliance with Project Noise Trigger Levels, plant selection, acoustic screening, enclosures, commissioning verification and ongoing operational management. Operational noise may be perceptible at some nearby receivers while the surrounding area transitions to industrial land uses; however, the available assessment indicates that any associated impacts are expected to be limited to minor changes in amenity and are unlikely to result in significant long-term health effects.
- Emergency critical power failure operations involving emergency generators operation are expected to be rare and of short duration.
- The NVIA indicates that sleep-disturbance screening and awakening criteria are not predicted to be exceeded at residential locations. Construction vibration is not expected to cause structural damage where minimum working distances and monitoring controls are implemented.

1.1.3 Soil and Contamination

- Site investigations identified localised contamination, including asbestos in shallow soils, anthropogenic waste and isolated hydrocarbon-impacted materials, with potential exposure pathways for construction and remediation workers, future site users and downstream environmental receptors.
- These risks are expected to be managed through the Remedial Action Plan, asbestos management procedures, unexpected finds protocols, waste classification, compliant disposal, dust controls, occupational hygiene measures and WHS requirements.
- Residual health risk following remediation is low and acceptable for the proposed land use.

1.1.4 Urban Heat Island (UHI)

- Urban heat and microclimate impacts are associated with increased hardstand, building mass and thermal storage. The assessment identifies potential night-time heat retention and heat-stress or sleep-related considerations as relevant to future design refinement and monitoring, particularly during summer conditions.

- Mitigation measures, including high-albedo materials, landscaping, tree canopy, shading, permeable or lower-heat-absorption surfaces and building design measures, are expected to reduce the project contribution to local heat exposure where implemented and maintained.

1.2 Management Strategies

A comprehensive suite of mitigation measures has been developed to address identified risks across all project phases:

1.2.1 Air Quality Controls:

Construction Air Quality Management Plan, real-time particulate monitoring, construction-phase Trigger Action Response Plan, dust suppression, haul-route and speed controls, progressive stabilisation, limits on concurrent generator testing, daytime scheduling, operational TARP, generator operating records, communication and complaint response procedures.

1.2.2 Noise & Vibration Controls:

Construction Noise and Vibration Management Plan, quiet plant selection, acoustic screening and enclosures, staging optimisation, standard construction hours where practicable, vibration minimum working distances, monitoring, notification, complaint response, operational acoustic design, compliance verification and adaptive management.

1.2.3 Soil & Contamination Controls:

Remediation of impacted soils, asbestos air monitoring, waste classification and compliant disposal, dewatering controls and implementation of an Unexpected Finds Protocol.

1.2.4 Urban Heat Mitigation:

High-albedo roofing, increased vegetation coverage, shaded pedestrian areas, and use of permeable, low-heat-absorption paving materials.

Collectively, these strategies reduce most inherent risks to low or low to medium residual risk. Residual risks are primarily short-term, localised and receptor-specific, and relate to construction dust, construction noise, generator testing, rare emergency generator operation, cumulative precinct activity and urban heat uncertainty.

1.3 Conclusions

This assessment concludes that the Mamre Road Data Centre Campus can proceed without unacceptable risk to human health, provided the mitigation, monitoring, communication, record keeping, Trigger Action Response Plans and adaptive management measures identified in this report and supporting technical assessments are implemented and reviewed over time.

- **Transparent risk characterisation:** The assessment recognises both low long-term population health burden and short-term receptor-specific risks, including construction dust, generator emissions, construction noise, vibration, operational noise and cumulative precinct exposure.
- **Low residual population health risk:** After implementation of the recommended controls, residual risks are generally low at a population level and low to medium at the closest sensitive receptors during specific short-term or intermittent exposure scenarios.
- **Robust environmental management framework:** The project incorporates construction and operational management plans, monitoring, trigger-action response procedures, operating records, post-event review, communication protocols, complaint response and adaptive management.
- **Strategic Alignment with the Mamre Road Precinct Vision:** The development supports the broader transformation of the precinct into a high-tech industrial hub, consistent with SEPP (Western Sydney Employment Area) objectives and regional economic growth plans.
- **Protection of sensitive receptors:** Nearby schools, the Emmaus Retirement Village, existing residences, workers and vulnerable sub-populations have been assessed while present, with conservative residual risk ratings where receptor relocation timing or cumulative impacts remain uncertain.
- Overall, the Health Impact Assessment concludes that the Mamre Road Data Centre Campus is not expected to result in adverse population health impacts and can proceed with an acceptable level of health risk. The Overall,



the assessment indicates that long-term population-level health effects associated with air quality and noise are expected to be negligible to low. The quantitative assessment indicates no measurable changes in population health outcomes associated with project-related air quality and noise exposures, with predicted impacts remaining negligible and well below levels expected to result in observable health effects. Potential health impacts are primarily limited to temporary and localised effects associated with specific construction activities and intermittent operational events. The Proposal incorporates a comprehensive framework of design controls, mitigation measures, monitoring programs, stakeholder engagement processes and adaptive management mechanisms that are expected to effectively minimise potential impacts and protect nearby sensitive receptors..

2 Introduction

Health Impact Assessment (HIA) and Environmental Health Risk Assessment (EHRA) are complementary processes used to evaluate how proposed developments may affect human health. As defined by the World Health Organization (WHO) and enHealth guidelines, an HIA provides a systematic approach to assessing the potential direct and indirect health impacts of a proposal, considering environmental, social and economic determinants.

The EHRA forms the technical component of this framework, focusing on potential adverse health effects arising from environmental exposures such as contaminants and physical stressors. It follows a structured methodology comprising hazard identification, exposure assessment, dose–response assessment and risk characterisation.

Together, the HIA and EHRA provide an integrated assessment of qualitative and quantitative health outcomes, ensuring the Amended design for the Mamre Road Data Centre Campus Project is evaluated for its potential to protect and promote human health, consistent with the WHO definition of health as a state of physical, mental and social wellbeing.

2.1 Purpose of the HIA and EHRA

The purpose of this HIA and EHRA is to evaluate potential health impacts associated with the Mamre Road Data Centre Campus Project during both construction and operation. The assessment has been prepared in accordance with the enHealth Environmental Health Risk Assessment Guidelines (2012) and Health Impact Assessment Guidelines (2017) and supports the Environmental Impact Statement (EIS) prepared for the NSW Department of Planning, Housing and Infrastructure.

This EHRA & HIA has been based on findings and data from existing technical studies, including, but not limited to

- Revised Air Quality Impact Assessment, Mamre Road Data Centre Campus Data Centre (SSD-92743706) – Main report dated 29 June 2026, prepared by Northstar (hereafter referred to as AQIA)
- MAMRE ROAD DATA CENTRE CAMPUS, KEMPS CREEK Noise and Vibration Impact Assessment (Amend design) – Report dated 22 June 2026, prepared by Renzo Tonin & Associates (RTA) (hereafter referred to as NVIA).
- Remedial Action Plan, 706 – 752 Mamre Rd Kemps Creek, NSW – Revision 3, dated 22 June 2026, prepared by JBS&G, (hereafter referred to as RAP)

A combined quantitative and qualitative approach has been adopted:

- The quantitative assessment estimates population-level health outcomes associated with long-term exposure to changes in air quality and noise, using project-specific modelling (AQIA and NVIA), baseline health data and established exposure–response relationships.
- The qualitative assessment considers short-term and receptor-specific impacts not captured in modelling, including temporary emissions during construction and generator operation, with particular focus on sensitive populations such as schools and aged care facilities.

The assessment considers a range of environmental health determinants relevant to the Proposal, including:

- Air quality and odour
- Noise and vibration
- Soil and land contamination
- Urban Heat Island (UHI) effects

By integrating quantitative modelling with qualitative evaluation of exposure patterns, duration and sensitivity, this HIA provides a robust and policy-aligned assessment of both chronic (long-term) and acute (short-term) health risks associated with the Proposal.

2.2 Project Description

The Mamre Road Data Centre Campus is a proposed State Significant Development located at 706–752 Mamre Road, Kemps Creek NSW, within the Mamre Road Precinct and Western Sydney Employment Area. The site is legally described as Lot 10 in DP 1280592 and has an area of approximately 52 hectares. The development site is currently largely vacant

and includes an existing residential dwelling and vegetation that would be removed as part of the proposed works. The location of the site is illustrated in Figure 1.



Figure 1: Proposal Site location (AQIA, 2026)

The site is proposed for development under a State Significant Development Application (SSDA) as a data centre campus comprising:

- Approximately 12 shells across four-storey data centre buildings (3x four shells), including six technical office buildings, plus a campus office.
- Incoming and internal electrical substations and associated infrastructure
- Site preparation, including earthworks, stormwater, sewer, roads, and associated infrastructure..

2.3 Site Context and Sensitive Surroundings

The Proposal site is located within land zoned IN1 General Industrial under the SEPP (WSEA) Mamre Road Precinct and is situated within a predominantly industrial and emerging logistics corridor. Surrounding land uses include industrial facilities, warehouses, logistics hubs and data centres, with limited residential presence buffered by intervening industrial lots. Three residential properties are located approximately 60 m north of the site along Mamre Road and Bakers Lane; however, these are expected to transition to industrial uses over time. Key sensitive receptors in proximity include Mamre Anglican School (relocating in 2029), Trinity Catholic Primary School, Emmaus Catholic College and the Emmaus Retirement Village, all located to the north and accessed via Bakers Lane.

The broader area is characterised by low population density and a mix of agricultural land, large industrial allotments and dispersed rural-residential properties, with higher-density residential areas located further afield, including St Clair, Erskine Park, Abbotsbury, Bossley Park and Luddenham. Immediately surrounding the site are IN1 zoned lands and SP2 infrastructure (classified road), with additional nearby zones including C2 Environmental Conservation, RE1 Public Recreation, RE2 Private Recreation and ENZ Environment and Recreation. The site comprises gently undulating terrain that has been extensively modified by historical agricultural activities, including the presence of constructed dams and remnants of former residential use. Localised areas of soil contamination have been identified and will require remediation to support the proposed development.

2.4 Construction staging and operational Program

The construction impact assessment has been undertaken in accordance with the proposed staging approach, providing a realistic representation of how potential impacts may influence nearby sensitive receptors over time. A summary of the staging program is provided in Table 1 and Figure 2.

2.5 Electrical Supply and Redundancy

To support the high and continuous power requirements of the data centre campus, a new 500/132 kilovolt (kV) substation will be constructed in the south-west corner of the site. The substation would be supplied from a switching station via three redundant 500 kV feeders, arranged in an N-1 configuration. This design ensures that the full site load can be maintained using any two of the three feeders, allowing uninterrupted operation in the event that one feeder is out of service.

Incoming electricity supply would be stepped down through three 500/132 kV transformers and distributed via 132 kV gas-insulated switchgear arranged in a breaker-and-a-half configuration. This configuration allows dedicated 132 kV supplies to be reticulated around the site with a high degree of redundancy across all stages of the Proposal. The AQIA describes this arrangement as providing very high availability and reliability for the distribution of mains power supply, such that the loss of one redundant utility supply would not generally trigger full-site emergency generator operation.

The switching station would be operated by Transgrid and would be subject to Category 2 redundancy under the NSW Transmission Reliability and Performance Standard. The AQIA notes that this level of redundancy is intended to reduce the likelihood of unserved energy and minimise reliance on standby generation during normal network events.

Standby generators would therefore not represent a routine operational power source. Their use would primarily be limited to scheduled maintenance testing, commissioning activities and emergency operation where required to maintain electricity supply during relevant supply interruptions or abnormal network conditions. The AQIA states that the site includes 842 standby generators at full build-out and identifies the anticipated number of generators required to operate under one-, two- and three-feeder failure scenarios. During a single feeder outage, generator operation may occur temporarily while load transfer and medium-voltage network reconfiguration occur, with the AQIA indicating a typical transition period of approximately 15 to 20 minutes.

The AQIA generator assumptions are staged as follows:

Stage 1A

- 1 feeder failure: 141 generators
- 2 feeder failures: 282 generators
- 3 feeder failures: 282 generators

Stage 1B

- 1 feeder failure: 281 generators
- 2 feeder failures: 422 generators

- 3 feeder failures: 562 generators

Stage 2 / full build-out

- 1 feeder failure: 281 generators
- 2 feeder failures: 562 generators
- 3 feeder failures: 842 generators

These generator numbers are used as the basis for the AQIA emergency air-emissions modelling scenarios for one-, two- and three-feeder outages.

From a health impact assessment perspective, the electrical supply arrangement is important because it directly affects the likelihood, duration and scale of standby generator operation, which is the principal operational air-emissions pathway of potential health relevance. Under normal operating conditions, emissions associated with electricity supply are expected to be negligible because the data centre campus would draw power from the grid and the standby generators would not operate continuously.

Emergency generator operation during feeder failure is assessed as rare, short-duration but potentially high-consequence air-quality pathway. The assessment recognises that the AQIA has modelled different portions of the standby generator fleet depending on outage scale and project stage, including up to 842 generators under the full build-out three-feeder outage scenario. Residual risk characterisation in later sections should therefore be interpreted against those modelled generator numbers, event duration assumptions, receptor occupancy and meteorological conditions.

Table 1 Description of Proposal Staging (construction and operation)

Timing (indicative)	Stage	Land parcel	Description	
			Construction	Operation
0 to 2 years	0		• Site establishment for western and eastern portion of the site Cut/fill to finished levels • Drainage basins • Initial road connection to GPT	• No operations
1 –4 years	1A	A	• Permanent access road connection to Yiribana Logistics Estate • Emergency access to Bakers Lane • Transgrid lead in high voltage • Trunk watermain along Bakers Lane and Mamre Road frontage. • Sewerage connection • Parcel A building construction and fit out	• Commissioning on Parcel A
2 –5 years	1B	B	• Drainage basins • Construction of the NAR fronting the site • Parcel B building construction and fit out	• Operation of Parcel A • Commissioning of Parcel B
2-10 years	2	C	• Sydney Water trunk drainage channel • Final services connection to Stage 2 • Construction of permanent roundabout and Road 02 • Construction of Road 01 north of Roundabout • Parcel C building and fit out	• Operation of Parcel A and B. • Commissioning of Parcel C
10+ years	-	All	-	• Operation of Parcel A, B and C.

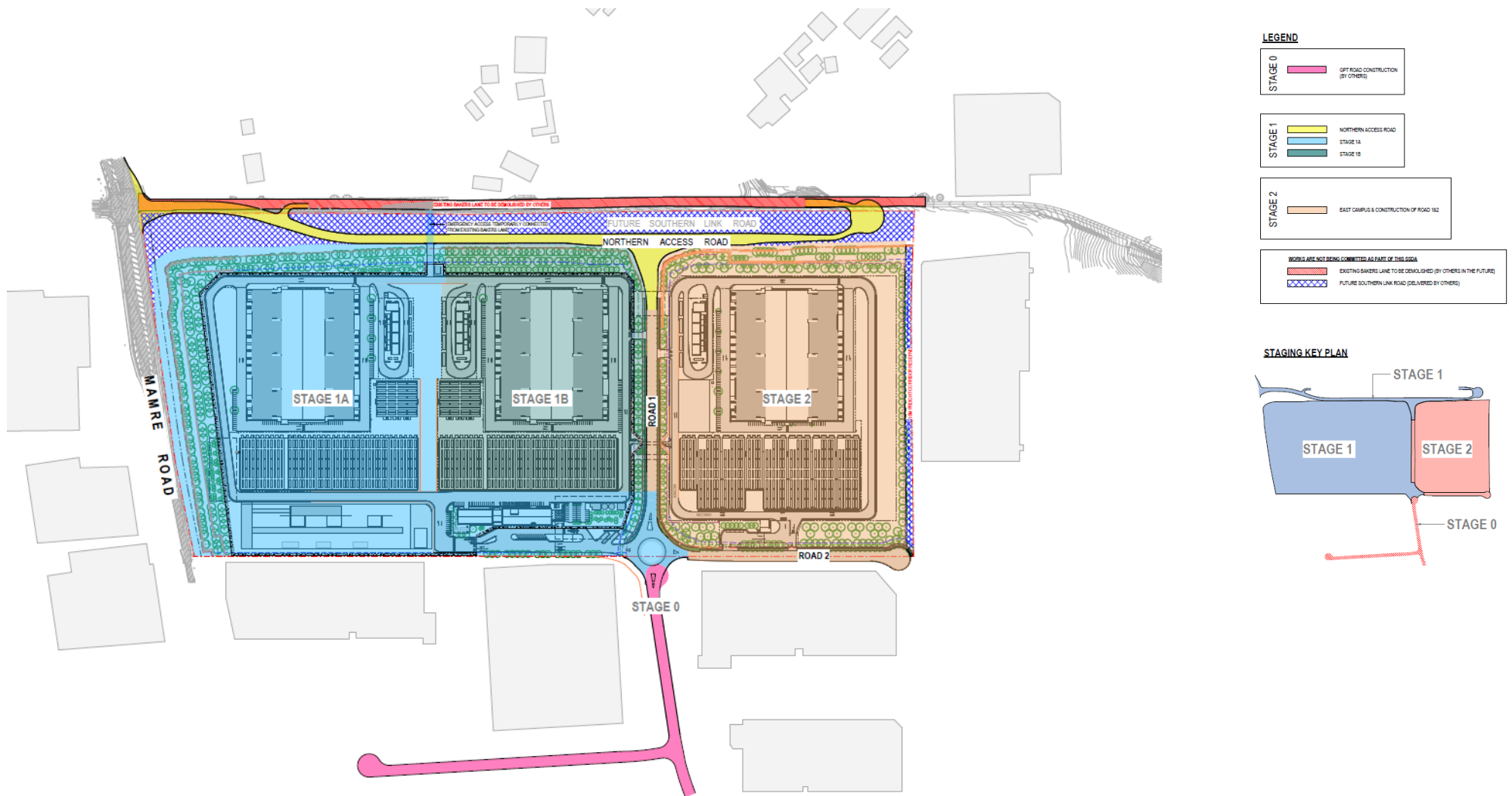


Figure 2 Overall Stage and Phasing Diagram (Source: Woolpert, 2026)

2.6 Agency Submissions

Submissions were received from the Nepean Blue Mountains Local Health District (BMLHD) / NSW Health, the Penrith City Council and the NSW Environment Protection Authority (EPA). These requirements have been addresses in this report and are summarised Table 2

Table 2 Summary of responses to the issues raised by the Agency's comments

Issue/content from the document	Matters Raised /Feedback	Where addressed and Summary of How Addressed
Penrith City Council.		
Penrith City Council – 1(e) The heavy reliance on water and the extensive footprint of the proposed data centre, including required infrastructure, will contribute to the urban heat island effect. This would also be contrary to the zone objectives referenced above. The proposal includes removal of 215 trees. While replacement tree planting is proposed, it will be a long period of time before new trees achieve the growth and canopy spread required to provide shading and contribute to cooling the environment. In addition, the Environmental Health Risk Assessment submitted with the application refers to additional landscaping to help reduce urban heat island effect. However, it is unclear whether the proposed development has or can address this recommendation, particularly given the large site coverage.	-	Resolved in Sections 1.1.4, 1.2.4 and 9. The report now includes a dedicated urban heat and microclimate assessment addressing increased hardstand, building mass, tree removal and thermal storage. It confirms that the Project adopts a predominantly air-cooled chillers system rather than conventional open cooling towers, reducing water-based cooling risks. Urban heat mitigation is addressed through high-albedo materials, landscaping, tree canopy, shading, permeable or lower-heat-absorption surfaces and building design measures. The residual urban heat risk is managed through design refinement, implementation and maintenance of the proposed mitigation measures.
Penrith City Council – 4. Air Quality (a) The EIS states that regular maintenance and testing of the diesel generators will occur. It goes on to say that “Quarterly testing occurs with generators connected to mobile load banks at each sub-parcel. Only one generator per sub-parcel is tested at any time during daytime hours between 7:00am and 6:00pm. Testing procedures will not exceed the 200-hour exemption limit prescribed under Schedule 1, Clause 17 of the POEO Act.” Schedule 1 of the POEO Act states that internal combustion engines for emergency stand-by plant operations are exempt from the requirements provided they do not operate for more than 200 hours per year.		Resolved in Sections 2.5, 6.4, 6.5 and 6.9. The report clarifies that standby generators are not a routine operational power source and are limited to commissioning, scheduled maintenance testing and emergency use. The assessment records that generator testing procedures are restricted to daytime testing and are to remain within the POEO Act emergency standby exemption threshold of 200 hours per year. Generator operating records, including duration, purpose, timing and number of generators tested, are required so compliance with the operating assumptions and exemption threshold can be verified.
Penrith City Council – 4. Air Quality (b-c) The regular maintenance schedule is based on one generator per sub parcel being tested. The sub parcels are set out as per the table below taken from the EIS. There is a total of 30 sub-parcels, meaning that a minimum of 30 generators will be tested each quarter. Based on this, there are 120 instances of generators being tested over a 12-month period. No information has been provided on how long each generator is tested for; however, they have determined that they will be tested during the daytime, between 7am and 6pm. More information should be		Resolved in Sections 2.5, 6.4, 6.5 and 6.9. The report now describes the staged generator assumptions and the operational restrictions for routine maintenance testing. The operational TARP and generator operating records require the number of generators, load, duration, timing and purpose of each test to be documented, reviewed and available for compliance verification.

obtained as to how long each diesel-powered generator is operated for during each test.		
NSW EPA		
NSW EPA – 1. Air Quality (j) Presentation of results does not comply with the Approved Methods for Modelling The presentation of results is limited to the impacted sensitive receptor according to the receptor type classifications. Two contour plots for operations have been included for: Predicted maximum incremental 1-hour NO₂ impacts – Scenario M6; Predicted maximum incremental 24-hour PM_{2.5} impacts – Scenario M6. The EPA have very limited insight into the full impact of the Proposal. From the contours presented in Figure 20 for the maximum 1-hour average NO₂ concentration predictions, it is clear that the plume goes beyond the extent of the modelling domain. The creates uncertainty that there may be impacts beyond the extent of the model domain. Recommendation: The Proponent provide additional transparency in the presentation of results, this includes the presentation of contour plots which show the maximum extent of the plume and the identification of the impacted receptors.		Resolved through the revised AQIA and reflected in Sections 6.4, 6.5, 6.8 and 6.9. Amendments have been made based on the revised AQIA modelling outputs and receptor-based interpretation, including additional contour information and clearer discussion of the spatial extent of predicted maximum 1-hour NO₂ and 24-hour PM_{2.5} impacts. The HIA/EHRA uses the revised AQIA outputs to identify affected sensitive receptors, interpret exposure pathways and support the residual air quality risk conclusions. This provides greater transparency for EPA review of plume extent, receptor impacts and health risk characterisation.
NSW EPA – 1. Air Quality (n) The Health Impact Assessment does not adequately address the predicated health impacts under a worst-case scenario Table 9 of the Health Impact Assessment (the HIA) states that under an emergency generator operation (during feeder failures), sensitive receptors may potentially be exposed to acute elevated concentrations of fine particles, NO_x, and CO. The HIA states that due to network redundancy and short expected outage durations, that the residual risk is considered low. However, the HIA does not consider or address potential consequences and associated health impacts under a potential worst-case scenario i.e. when all 846 generators are operational for a significant period, as described in table 131 of the AQIA. The EPA advise that the impacts associated with worst-case emergency scenarios exceed the relevant impact assessment criteria by significant margins. Therefore, the EPA would benefit from understanding the predicted health impacts which are associated with a worst-case emergency scenario. Recommendation: The Health Impact Assessment be updated to assess a worst-case emergency generator scenario (consistent with the AQIA worst-case assumptions) to ensure that the predicted health impacts of the Proposal are transparently presented.		Resolved in Sections 2.5, 6.4, 6.5, 6.8 and 6.9. The report now identifies the AQIA emergency generator assumptions for each project stage and feeder-failure scenario, including full build-out operation of up to 842 standby generators under the three-feeder outage scenario. The HIA/EHRA assesses the associated acute exposure pathways for NO₂, PM₁₀, and PM_{2.5} at sensitive receptors, recognises the conservative worst-case nature of the emergency modelling and retains a conservative residual risk interpretation. Operational controls include electrical redundancy, emergency operating procedures, generator operating records, post-event review, operational TARP, complaints response and adaptive management.
Nepean Blue Mountains Local Health District		

AQIA -General		
Dispersion Modelling has methodological limitations NSW EPA identified several methodological issues in their advice on the exhibited EIS (Ref: DOC26/139195-10) which may have resulted in the AQIA underestimating modelled air pollutant concentrations and exceedances of IAC. As these modelled calculations underpin the HIA/EHRA, the public health risks posed by the project may have also been underestimated. The methodological issues identified by NSW EPA include: - the selection of 2021 as a reference year for background air quality - without adequate justification - the use of meteorological conditions that may not be representative of calm winds characteristic of the site the lack of consideration of cumulative air quality impacts from Western Sydney Airport.	The AQIA should be amended to correct the methodological issues identified by the NSW EPA (Ref: DOC26/139195-10) and <u>the HIA/EHRA should be updated accordingly to ensure that the health risks posed by the project are appropriately characterised.</u>	Addressed in Sections 4.7, 4.9, 6.4, 6.5, 6.8 and 6.9. The HIA/EHRA now identifies modelling uncertainty, cumulative sources including Western Sydney International Airport (WSIA). The HIA/EHRA has been updated to rely on the revised AQIA and to transparently describe the modelling basis, exposure metrics, receptor sensitivity, cumulative assessment approach and uncertainty. Long-term quantitative health risk characterisation has been undertaken for annual PM_{2.5} and NO₂ increments using exposure–response functions and NSW baseline health rates. Short-term 1-hour NO₂ and 24-hour PM₁₀ pathways are addressed qualitatively because the available health-response evidence is not directly compatible with sub-daily peak metrics. The revised report therefore addresses NSW Health's concern by updating the health risk assessment to reflect the revised AQIA and by explaining where quantitative and qualitative methods are appropriate.
AQIA -Construction		
Construction activities predicted to causes increases in PM10 levels that may impact health The AQIA predicts that construction activities will cause increases in annual average PM10 and 24-hour average PM10. While these increases mostly remain below IAC, they are of a magnitude that could be expected to impact health, and measures should be taken to mitigate exposures. For Construction Stage 1: - The maximum predicted percent increase in annual average PM10 relative to IAC for residential receptors (22.6% or 5.7 µg/m3) and educational receptors (37.2% or 9.3 µg/m3) are high. - The percent increase in maximum 24-hour average PM10 relative to IAC for residential (32.6% or 16.3 µg/m3), educational (41.8% or 20.9 µg/m3) and industrial receptors (30.6% or 15.3 µg/m3) are high. Days of such high increases in exposure to PM10 should be minimised. Table 120 has increases of >17 µg/m3 on 10 of 10 maximum 24-hour average incremental PM10 concentration days for educational Receptor 2. For Construction Stage 2, the percent increase in maximum 24-hour average PM10 relative to IAC for educational (21.7% or 10.9 µg/m3) and industrial receptors (32.2% or 16.1 µg/m3) are high Days of such high increases in exposure to PM10 should be minimised. Table 123 has increases of ≥ 12 µg/m3 on 10 of 10 maximum 24-hour average incremental PM10 concentration days for industrial Receptor 41.	As per our comment (AQ11), The EHRA/HIA should quantitatively assess the health risks associated with the predicted increases in air pollutants from construction and consider additional mitigation measures during construction to lower the increase in exposure to annual average PM10 and maximum 24-hour average PM10 and decrease the number of high-PM10.	Resolved in Sections 6.4, 6.5, 6.6, 6.8 and 6.9. Construction PM₁₀ and PM_{2.5} pathways have been assessed using the revised AQIA and the HIA/EHRA now clearly identifies the sensitive receptors most affected by construction dust, including schools, rural-residential receptors and the Emmaus Retirement Village. Short-term construction PM₁₀ impacts are assessed qualitatively because the available exposure–response evidence is not suitable for direct quantification of discrete 24-hour peak construction episodes. The report considers a CAQMP, real-time particulate monitoring, dust suppression, progressive stabilisation, haul-route controls, construction TARP, adaptive management and the ability to modify or pause works where triggers or visible dust indicate elevated risk. These measures directly respond to the request to reduce exposure during high-PM₁₀ construction periods.

AQIA -Operations (Maintenance testing)		
Substantial increases in average 1-hour NO₂ from generator maintenance testing when all 842 generators operational Under Maintenance Scenario M6, when all diesel generators have been installed on completion of construction, generator testing could maximally increase 1-hour NO₂ by 36.2 to 64.0 µg/m³ across the different receptor types from regional background levels of 2.1 to 4.1 µg/m³. Although these increases would result in 1-hour NO₂ levels remaining below IAC, they are substantial increases in air pollution that may impact health.	As per our comment (AQ11), the EHRA/HIA should quantitatively assess the health risks associated with the predicted increases in air pollutants from generator maintenance testing and the AQIA should consider alternative technologies or additional mitigation measures to lower the increase in exposure to average 1-hour NO₂.	Resolved in Sections 2.5, 6.4, 6.5, 6.6, 6.8 and 6.9. Generator maintenance testing is now described as a controlled, scheduled and intermittent source rather than routine continuous operation. Emergency generator operation has been assessed as a conservative contingency scenario rather than a routine operational activity. The Proposal's multiple-feeder electricity supply arrangement provides substantial redundancy, such that widespread generator operation would only be required following a significant interruption to electricity supply. A probability assessment further confirms that the combination of such an outage with the particular adverse meteorological and background air quality conditions required to produce elevated short-term impacts is unlikely. Short-term NO₂ impacts are assessed qualitatively because robust quantitative health functions are not directly applicable to sub-daily peak testing events.
EHRA/HIA - Air Quality		
A quantitative assessment of the health risks associated with air pollution should be undertaken The EHRA/HIA provides qualitative assessment of the health impacts of air quality with categorical risk levels. To be able to properly assess the degree of health risk associated with air pollution emissions of the project, there should be a quantitative risk assessment. For example, this could be done for incremental increases in air pollution and hospital admissions and deaths using concentration-response functions from high quality studies in the peer-reviewed scientific literature. The SEARs require the EHRA/HIA to comply with the enHealth Environmental Health Risk Assessment Guidelines (2012). This document describes a tiered approach in which escalation to quantitative risk characterisation is required where sensitive populations may be affected, health effects may be irreversible, and dose-response relationships for the relevant pollutants are available. All three conditions are met here.	The EHRA/HIA should be amended to include a quantitative assessment of the health risks associated with air pollution emissions from the project or to justify why this is not required.	Resolved in Sections 4.3, 4.5, 6.6, 6.7, 6.8 and 6.9. A quantitative air quality health assessment has been added for long-term annual average PM_{2.5} and NO₂ exposure increments. The assessment applies established exposure-response relationships, NSW baseline health rates and current and future population scenarios. The estimated incremental health burden is substantially less than one additional case per year, with approximately 0.008 premature deaths/year and 0.004 respiratory hospital admissions/year under the current scenario, and approximately 0.05 premature deaths/year and 0.02 respiratory hospital admissions/year under the future scenario. Short-term peak pathways are retained in the qualitative assessment with clear justification.
Factual error that there were no exceedances of air quality criteria The EHRA/HIA states that "Modelling demonstrates compliance with relevant EPA and NEPM criteria under both construction and operational scenarios" (page 7). This is a significant factual error given that the AQIA modelling demonstrated significant exceedances across both scenarios and may have affected the characterisation of health risks from emergency generator operations in Table 9.	The EHRA/HIA should be amended to transparently and clearly describe the exceedances of air quality impact assessment criteria found in the AQIA.	Resolved in Sections 6.4, 6.5, 6.8 and 6.9. The previous statement that all scenarios complied with relevant criteria has been corrected and replaced with a more transparent description of the AQIA findings. The revised report now distinguishes between routine long-term annual average impacts, construction PM₁₀ increments, short-term generator testing impacts and worst-case emergency generator scenarios. Where exceedances or substantial short-term increments are identified in the AQIA, these are now carried through into the HIA/EHRA risk characterisation, receptor sensitivity discussion and residual risk interpretation.

Number of standby generators activated unknown The report states that standby generators will be activated for approximately 15 – 20 minutes during a feeder failure to ensure continuous electrical supply to the Mamre Road Data Centre Campus during a brief transition while the medium-voltage network reconfigures.	There are significant concerns regarding the air emissions from diesel generator use. NSW Health recommends that the report is revised to specify the number of generators that will be activated to ensure continuous electrical supply in the case the feeder fails. The number of generators to be activated should be considered when modelling for air emissions.	Resolved in Sections 2.5, 6.5 and 6.9. The report now specifies the number of standby generators assumed to operate during emergency feeder-failure scenarios by stage. Stage 1A assumes 141 generators for one feeder failure and 282 generators for two or three feeder failures. Stage 1B assumes 281, 422 and 562 generators for one-, two- and three-feeder failures respectively. Stage 2 / full build-out assumes 281, 562 and 842 generators for one-, two- and three-feeder failures respectively. These staged generator numbers are used in the AQIA emergency air-emissions modelling and are carried into the HIA/EHRA risk characterisation.
Methodological limitations with qualitative risk assessment of the health risks of the health risks of air quality impacts The EHRA/HIA qualitative risk assessment of the health risks associated with the project's air quality impacts, provided in Table 9, has some significant limitations and was not conducted in accordance with enHealth Health Impact Assessment Guidelines (2017) and the enHealth Environmental Health Risk Assessment Guidelines (2012), as required by the SEARs. The limitations are: • The AQIA found exceedances of IAC among sensitive educational and residential receptors. However, the EHRA/HIA does not consider receptor sensitivity in its characterisation of health risks and further makes the factual error that the four schools and retirement village on the northern boundary of the site are more than 3km away, excluding them from the assessment. • The health consequences of the modelled air quality impacts are given only a cursory assessment. For example, the significant exceedances in emergency scenarios are described only as "potential acute exposure" (page 26) with no evidence-based assessment of the potential health consequences. • The AQIA modelling predicted annual average PM10 exceedance for educational receptors for Stage 1 of construction lasting two years. The EHRA/HIA qualitative health risk assessment only characterises these air quality impacts as "temporary" and the health consequences as "short-term respiratory symptoms". Given the two-year duration of exposure among school age children, the EHRA/HIA should assess the risk of chronic health impacts. • A categorical severity level for each predicted health consequence is not provided. As this underpins the inherent and residual risk assessment, the risk assessment is incomplete. The EHRA/HIA concludes there is a 'Medium' inherent health risk associated with air quality impacts from construction and maintenance testing of generators and a 'High' inherent health risk associated with air quality impacts from emergency generator operation. Following the application of a range of mitigation measures, the residual risk across all these scenarios is concluded to be 'Low'. However, there is no detailed	If the qualitative risk assessment of the health risks of air quality impacts is retained in the EHRA/HIA, it should be amended to provide a full and evidence-based assessment of health risks, in accordance with the enHealth Health Impact Assessment Guidelines (2017) and the enHealth Environmental Health Risk Assessment Guidelines (2012).	Resolved in Sections 4.2, 4.3, 4.5, 4.7, 4.8, 4.9, 5, 6.3, 6.5, 6.8 and 6.9. The qualitative air quality assessment has been revised to align with enHealth HIA and EHRA guidance by explicitly identifying source–pathway–receptor linkages, sensitive receptors, consequence, likelihood, uncertainty, mitigation effectiveness and residual risk. The report now corrects receptor distances, considers schools and the Emmaus Retirement Village as sensitive receptors while occupied, recognises construction exposure duration, distinguishes controls already included in modelling from additional controls, and explains why quantitative assessment is applied to long-term annual average PM_{2.5} and NO₂ while short-term peak pathways are assessed qualitatively with health-based interpretation and management controls.

analysis to demonstrate how and to what extent the mitigation measures will reduce the health risks. Furthermore, many of the listed mitigation measures may have been accounted for in the AQIA modelling used to derive the inherent risk (see AQIA 5.4.1. Emissions controls – Construction phase) and therefore cannot be applied again to reduce the residual risk. As per our comment (AQ8), the AQIA should be amended to model the effects of the application of mitigation measures on IAC exceedances and the EHRA/HIA qualitative risk classifications updated accordingly.		
Noise and Vibration		
Inconsistent information regarding distance of sensitive receptors Use of inconsistent information regarding the distance of sensitive receptors from proposed site. The EHRA and HIA use a GIS-based spatial assessment that states that the nearest public facilities (schools, childcare, healthcare) are located >3km from the site, outside immediate receptor zones. However, in the Noise and Vibration Impact Assessment report (p.14), there are 3 schools and a retirement village within 500m of the proposed site.	NSW Health recommends that the EHRA and HIA is revised to accurately reflect the distance of sensitive receptors from the proposed site and is consistent with the NVIA.	Resolved in Sections 2.3, 5.3, 5.6, 7.3 and 7.4. The report has been revised to align the HIA/EHRA with the NVIA receptor information. Nearby sensitive receptors are now identified as being within approximately 170–480 m for Emmaus Catholic College, Trinity Catholic Primary School and the Emmaus Retirement Village, with Mamre Anglican School recognised as a very close receptor while occupied. The assessment no longer relies on the previous statement that key public facilities are more than 3 km away, and the receptor framework now consistently reflects the NVIA distances and sensitivity classifications.
Additional Concerns		
Contaminated soil Site investigations identified asbestos (bonded and friable), mixed waste and isolated hydrocarbon contamination	NSW Health agrees that a Remedial Action Plan and Asbestos Management Plan should be developed. All mitigation strategies should be implemented throughout the construction stages of the precinct. Additionally, strategies to reduce worker exposure and continued occupational health monitoring throughout construction should be implemented.	Addressed in Sections 5.4 and 8. The RAP, asbestos management, unexpected finds protocol, waste classification, compliant disposal and WHS controls are included. Section 8 now confirms worker exposure reduction measures, including occupational hygiene controls, exclusion zones, controlled excavation, dust suppression, PPE/RPE, hygiene and decontamination facilities, asbestos air monitoring where asbestos disturbance is possible, targeted worker exposure monitoring, stop-work and review triggers, and worker health monitoring / health surveillance where required under applicable WHS and asbestos regulations throughout remediation and construction.
Urban Heat Island Effect Modelling indicates that while there will be no increase in daytime peak temperatures, there will be increases in minimum daily temperatures and nighttime temperatures due to increased thermal mass.	The report does not indicate what the increase in nighttime temperatures will be or for how long they will persist over a 12-month period. Additionally, the report does not consider the potential health effects of consistent increased nighttime temperature will have on the population, including sleep disturbance. This may be of great concern particularly during peak summer months when	Resolved in Sections 1.1.4, 1.2.4 and 9. The revised report includes a dedicated urban heat and microclimate health assessment addressing hardstand, building mass, night-time heat retention, minimum daily temperature changes, heat stress and sleep-related considerations. The assessment recognises that increased night-time temperatures are relevant during summer and for vulnerable populations, particularly where electricity supply disruptions could affect access to

	there is potential for disruptions to the electricity grid and residents are unable to access air conditioners. NSW Health recommends further analysis is required to predict what the increase in nighttime temperatures will be and explore the potential health impacts in relation to heat stress and sleep disturbance	cooling. Mitigation measures include high-albedo roofing and materials, tree canopy, landscaping, shaded outdoor areas, permeable or lower-heat-absorption surfaces and building design measures. Residual risk is managed through implementation, maintenance, design refinement and review of heat mitigation measures.
Further Comments The construction timeline of the Mamre Road Data Centre Precinct is approximately 10 years, which includes periods where multiple concurrent development projects will occur across the Mamre Road Data Centre Precinct. The report does not account for the cumulative effects of the potential health impacts caused by air pollution, noise pollution, and the urban heat island effect over the construction period. The report is heavily reliant on the assumption that a number of sensitive receptors are short-term and will relocate over the construction period. This assumption has led to a number of exceedances in air pollution, noise and heat being discounted.	The Mamre Road Data Centre Precinct has the potential to present unacceptable risks to human health. The EHRA/HIA should be revised to include an analysis for the cumulative health impacts over the 10-year construction period and accounts for all current sensitive receptors that are in close proximity to the precinct, regardless if there is potential for the receptors to relocate during the construction period. NSW Health strongly recommends an independent expert is engaged to review the revised EIS to ensure all errors are corrected and all health recommendations have been taken into consideration.	Resolved across Sections 2.4, 4.10, 5.6, 6.5, 6.9, 7.9, 7.10, 9 and 10. The report now assesses the approximately 10-year staged construction and operational transition period, including cumulative air quality, noise, vibration and urban heat pathways. Current sensitive receptors are assessed while present, including nearby schools, the Emmaus Retirement Village and existing rural-residential properties, rather than being discounted on the basis of possible future relocation. Cumulative risk is managed through construction and operational management plans, monitoring, TARPs, generator testing controls, communication and complaints procedures, record keeping, post-event review and adaptive management. The report also identifies that independent expert review is a project governance action outside the technical HIA/EHRA scope, while the HIA/EHRA has been revised to address the health-related agency comments.

3 Policy, Legislation and Technical Framework

3.1 Integration within the SEARs Framework

The HIA functions as a key decision-support tool within the Environmental Impact Assessment (EIA) and SEARs framework, ensuring that the Mamre Road Data Centre Campus is developed and operated in a manner that:

- Protects and promotes public health;
- Reduces inequities and exposure risks;
- Enhances local environmental quality; and
- Contributes to sustainable and resilient outcomes for the Western Sydney community.

The Health Impact Assessment (HIA) for the Mamre Road Data Centre Campus Project has been prepared within the framework of the New South Wales (NSW) legislative, policy, and technical guidance documents that govern the consideration of human health in environmental and planning assessments.

3.2 NSW Legislative Framework

The HIA is consistent with the requirements of the Environmental Planning and Assessment Act 1979 (EP&A Act), which establishes the statutory framework for assessing environmental and social impacts of State Significant Developments (SSD) in NSW.

Under the EP&A Act, the Secretary's Environmental Assessment Requirements (SEARs) identify the need to assess potential health impacts where developments may influence environmental or socio-economic determinants of health. The Mamre Road Data Centre Campus Project has therefore incorporated a standalone Health Impact Assessment to address these SEARs obligations.

The assessment also aligns with other relevant state instruments and policies, including:

- **Protection of the Environment Operations Act 1997 (POEO Act)** – governing pollution control, noise, and air quality management;
- **Work Health and Safety Act 2011 (WHS Act)** – ensuring the protection of worker health, safety, and welfare;
- **Public Health Act 2010 (NSW)** – regulating public and environmental health, water quality, and sanitation standards; and
- **State Environmental Planning Policies (SEPPs)** – covering infrastructure, industrial land use, and environmental management controls.

3.3 National and Technical Guidance

This HIA has been prepared in accordance with the following key Australian health and environmental frameworks:

- **enHealth Guidelines for Assessing Human Health Risks from Environmental Hazards (EHRA, 2012)** – providing the national risk assessment framework for exposure, uncertainty, and risk characterisation;
- **enHealth Health Impact Assessment Guidelines (HIA, 2018)** – establishing the principles and stages for integrating health within environmental and planning processes;
- **enHealth Guidance: The Health Effects of Environmental Noise (2018)** – defining health endpoints and evidence for community noise exposure;
- **National Environment Protection (Ambient Air Quality) Measure (NEPM, 2016)** – providing pollutant standards and exposure thresholds for criteria air pollutants (PM_{2.5}, NO₂, SO₂, CO, O₃);
- **NSW EPA Noise Policy for Industry (2017)** – outlining acceptable noise limits and measurement methodologies for construction and operation; and
- **CSIRO and NSW Planning Urban Heat Island (UHI) Guidance (2021)** – informing evaluation of local heat stress, waste heat dispersion, and mitigation design in Western Sydney contexts.

- **Mamre Road Precinct Development Control Plan 2021 (DCP)** - It provides detailed planning controls for development in the Mamre Road Precinct within the Western Sydney Employment Area, supporting industrial land use and growth.

3.4 Integration with the SEARs Process

Within the SEARs issued for the Mamre Road Data Centre Campus Project, the HIA ensures that health is considered as a cross-cutting element across environmental, social, and economic domains.

The integration of this HIA within the Environmental Impact Statement (EIS) enables decision-makers to evaluate not only environmental compliance but also the potential influence of the project on population health, community amenity, and quality of life.

The legislative and policy framework therefore provides a robust foundation for ensuring that the Mamre Road Data Centre Campus is planned, constructed, and operated in a manner that protects public health, reduces inequities, and promotes sustainable, resilient outcomes for the Western Sydney community.

In addition, this HIA references the following regulatory and technical standards relevant to the assessment of data centres in Western Sydney:

- National Environment Protection (Ambient Air Quality) Measure (NEPM, 2016) – for assessment of key air pollutants (PM_{2.5}, NO₂, CO, SO₂, and O₃).
- NSW Environment Protection Authority (EPA) Noise Policy for Industry (2017) – for criteria and measurement methods to assess construction and operational noise.
- NSW Planning / CSIRO Urban Heat Island (UHI) Guidance (2021) – for assessment of microclimate and waste heat impacts in the Western Sydney region.
- NSW Work Health and Safety Act (2011) – to ensure occupational health and psychosocial well-being are integrated into the project's management systems.

4 Environmental Health Risk Assessment (EHRA) and Health Impact Assessment (HIA) Methodology

4.1 Assessment Approach

A quantitative Health Impact Assessment (HIA) has been undertaken to estimate potential population health impacts associated with incremental changes in air quality and noise arising from the Proposal. The assessment applies a standard exposure–response framework consistent with enHealth and World Health Organization (WHO) guidance, integrating locally derived baseline health data with internationally validated exposure–response coefficients.

The assessment focuses on chronic exposure metrics, particularly annual average pollutant concentrations and long-term noise exposure, as these provide the most appropriate basis for estimating population-level health outcomes. Short-term exposure metrics have been considered qualitatively to characterise potential acute effects but are not incorporated into quantitative calculations.

4.2 Qualitative Risk Assessment Method

The qualitative risk assessment provides a structured, evidence-informed method for identifying, describing and prioritising potential health risks where impacts are not readily quantified, where exposure is intermittent or short-term, or where the available evidence supports categorical rather than numerical assessment. The method is consistent with the enHealth Health Impact Assessment process, which emphasises screening, scoping, profiling, appraisal, reporting, management and monitoring, and with the enHealth Environmental Health Risk Assessment framework, which supports a tiered approach beginning with issue identification and qualitative screening before progressing to quantitative assessment where warranted.

For this assessment, the qualitative method is applied to health pathways where numerical exposure–response analysis is not appropriate or is not sufficient on its own, including short-term air quality events, construction dust episodes, generator maintenance and emergency scenarios, construction and operational noise effects, vibration perception, soil and contamination exposure pathways, urban heat, cumulative disturbance and psychosocial impacts. Where quantitative assessment is available, the qualitative method is used to interpret receptor sensitivity, exposure context, uncertainty, mitigation effectiveness and residual risk, rather than to replace quantitative health risk characterisation.

4.2.1 Qualitative Assessment Process

The qualitative assessment follows a source–pathway–receptor model. For each environmental health determinant, the assessment identifies the source or activity, determines whether a complete or plausible exposure pathway exists, identifies the exposed population or receptor group, describes the relevant health endpoint, and evaluates the consequence and likelihood of that endpoint occurring. This assessment is undertaken for both inherent risk, before project-specific mitigation, and residual risk, after feasible and reasonable controls have been applied and their expected effect on exposure has been justified.

The process comprises the following steps:

- **Issue and hazard identification:** identify project activities, environmental conditions or cumulative pressures that may affect health, including dust, combustion emissions, odour, noise, vibration, contaminated soil, asbestos, heat exposure, disruption and community concern.
- **Exposure pathway assessment:** determine whether a complete or plausible pathway exists through inhalation, dermal contact, incidental ingestion, auditory exposure, vibration perception, heat exposure, sleep disturbance, learning interference or psychosocial pathways.
- **Receptor sensitivity assessment:** identify receptors with increased vulnerability, including children, elderly people, people with respiratory or cardiovascular conditions, nearby residents, school communities, aged-care residents, workers undertaking intrusive works and receptors with limited capacity to avoid exposure.
- **Health consequence assessment:** describe the plausible health outcome and its severity, including respiratory irritation or exacerbation, sleep disturbance, learning disruption, annoyance, stress responses, heat stress, injury, asbestos-related disease pathways or chronic disease mechanisms.

- **Likelihood assessment:** evaluate the probability of the consequence occurring, considering exposure duration, frequency, proximity, meteorology, project staging, activity intensity, receptor occupancy, cumulative exposure and the effectiveness of embedded controls.
- **Risk characterisation:** combine likelihood and consequence ratings to determine inherent and residual risk levels and identify whether additional mitigation, monitoring, adaptive management or quantitative assessment is required.

4.2.2 Likelihood and Consequence Ratings

Likelihood ratings are assigned based on the probability, frequency and duration of exposure during the relevant project phase. Consequence ratings are assigned based on the plausible health outcome for the most sensitive reasonably exposed receptor, rather than the average receptor. This approach ensures that nearby schools, aged-care facilities, rural-residential receptors, construction workers and people with pre-existing respiratory or cardiovascular conditions are appropriately represented in the assessment.

The assessment distinguishes between acute, short-term, repeated and chronic exposure pathways. Acute and short-term events, such as generator testing, emergency generator operation, high-dust construction activities or vibration-generating works, are assessed with regard to peak exposure, duration, timing, receptor sensitivity and reversibility of effects. Repeated or longer-term exposures, such as staged construction dust, operational plant noise, cumulative construction activity, low-frequency noise or urban heat effects, are assessed with regard to persistence, cumulative burden, availability of respite and potential for chronic or recurring health effects.

Where the qualitative rating depends on technical modelling, the assessment explicitly records whether the rating is based on incremental impacts, cumulative impacts, modelled exceedances of assessment criteria, receptor-specific exposure, or professional judgement supported by published health evidence. This transparency is necessary so that the basis for each rating can be reviewed and updated if modelling assumptions, receptor information or project staging changes.

4.2.3 Mitigation and Residual Risk

Inherent risk is assessed before the application of additional project-specific mitigation, while recognising baseline regulatory obligations and embedded design assumptions that are already included in technical assessments. Residual risk is assessed only after feasible and reasonable mitigation measures have been defined, including construction environmental management plans, dust suppression, monitoring and trigger-action response procedures, noise and vibration controls, staging optimisation, remediation controls, asbestos management, operational restrictions, emergency procedures and community communication protocols.

A residual risk rating is reduced only where the mitigation measure demonstrably interrupts the source, pathway or exposure duration, or otherwise reduces receptor exposure. Controls already included in modelling or assumed in the inherent scenario are not counted again as additional mitigation. Where the effect of a mitigation measure is uncertain, the residual rating remains conservative and the uncertainty is carried into monitoring, adaptive management or further assessment recommendations.

4.2.4 Treatment of Uncertainty

Uncertainty is recorded for each assessed risk to identify where confidence is limited by assumptions, incomplete design information, variability in meteorology, background conditions, future staging, receptor occupancy, cumulative development timing, exposure duration or limitations in modelling inputs. Uncertainty is classified qualitatively as low, moderate or high. Where uncertainty is moderate or high, the assessment adopts conservative assumptions and identifies monitoring, trigger-action responses, adaptive management or further assessment to verify the residual risk.

4.2.5 Escalation to Quantitative Assessment

Where a plausible exposure pathway exists, sensitive populations may be affected, health effects may be material, persistent or irreversible, and suitable exposure–response relationships or health-based criteria are available, the assessment progresses to quantitative analysis. This approach has been applied to air quality and noise pathways where modelled exposure increments can be linked to health outcomes or health-based criteria. For soil and contamination, quantitative evaluation is undertaken through comparison with adopted investigation, remediation and validation criteria, supported by pathway completeness, asbestos management requirements, occupational exposure controls and post-remediation validation.

4.2.6 Qualitative Risk Matrix and Management Criteria

The likelihood, consequence and qualitative risk matrix presented below support the qualitative assessment method described in Sections 4.2.1 to 4.2.5. These tables are used to assign categorical inherent and residual risk ratings for hazards that cannot be robustly quantified, for pathways requiring screening and prioritisation, or for receptor-specific effects that are not adequately represented by population-level quantitative calculations.

Consistent with the enHealth HIA and EHRA processes, the qualitative matrix is applied after screening, scoping, receptor profiling and pathway assessment have identified a plausible source–pathway–receptor linkage. The matrix does not replace quantitative health risk characterisation where suitable exposure data, baseline health data and exposure–response functions are available; instead, it complements quantitative assessment by documenting receptor sensitivity, uncertainty, mitigation effectiveness and residual risk management requirements.

The qualitative risk matrix in Table 3 to Table 6 is a project-specific decision-support tool developed to support the enHealth HIA and EHRA processes. It is not intended to replace source–pathway–receptor assessment, exposure assessment, receptor sensitivity analysis, uncertainty evaluation, or quantitative assessment where suitable exposure data and exposure–response evidence are available. Consequence and likelihood ratings are assigned using technical evidence, receptor sensitivity, exposure duration and frequency, uncertainty, and professional judgement.

Table 3 Categories for Health Consequence Severity

Severity	Health consequence description	Application to this HIA/EHRA
Catastrophic	Multiple fatalities, widespread serious illness, permanent disability, or a major population health burden requiring urgent intervention.	Not expected for the Project under assessed scenarios; would indicate an unacceptable health outcome requiring redesign or avoidance.
Major	Serious or persistent health effects affecting sensitive receptors or a defined population group, including hospitalisation, clinically significant exacerbation of disease, serious sleep disturbance, or sustained exceedance of health-based criteria.	Relevant to worst-case emergency generator events, substantial short-term NO ₂ or PM exposure, or prolonged noise impacts at schools, aged-care or closest residences.
Moderate	Measurable or repeated health effects that may require management, including respiratory symptoms, asthma exacerbation, sleep disturbance, learning interference, cardiovascular stress, heat stress, or repeated nuisance affecting wellbeing.	Relevant where modelled impacts approach or exceed criteria, where exposure recurs over months or years, or where sensitive receptors such as children or elderly people are affected.
Minor	Short-term, reversible symptoms or amenity effects that do not require medical treatment, including transient irritation, annoyance, odour perception, minor dust deposition or temporary disruption of outdoor activity.	Relevant to controlled construction, generator maintenance testing, odour and amenity pathways where exposure is brief and criteria are met with adequate margin.
Negligible	No discernible health effect, or only a trivial and reversible change in exposure or amenity with no material consequence for health or wellbeing.	Relevant where the pathway is incomplete, exposure is negligible, or modelled impacts are well below relevant criteria with low uncertainty.

Table 4 Likelihood Categories for Health Impact Assessment

Likelihood	Descriptor	Application to this assessment
Rare	May occur only in exceptional circumstances.	Relevant to highly infrequent emergency events, accidental spills or incomplete pathways where exposure is not expected during normal project conditions.
Unlikely	Could occur, but is not expected under normal operating or construction conditions.	Relevant to controlled emissions, short-duration testing or pathways dependent on adverse meteorology, equipment failure or unusual activity timing.
Possible	May occur during the project where a complete exposure pathway exists and conditions are favourable for exposure.	Relevant to intermittent construction dust, diesel exhaust, generator testing, vibration perception, odour or cumulative exposure during overlapping works.
Likely	Expected to occur during one or more project phases unless active controls are implemented.	Relevant where modelling indicates exceedances or substantial increments, where activities are repeated, or where sensitive receptors are close to the source.
Almost certain	Expected to occur frequently or repeatedly under the assessed scenario.	Relevant to routine or persistent exposures where receptor presence and source activity coincide regularly over the assessment period.

Table 5 Qualitative Health Risk Matrix

Likelihood	Consequence severity				
	Negligible	Minor	Moderate	Major	Catastrophic
Almost certain	Low	Medium	High	Extreme	Extreme
Likely	Low	Medium	Medium	High	Extreme
Possible	Very Low	Low	Medium	High	Extreme
Unlikely	Very Low	Low	Low	Medium	High
Rare	Very Low	Very Low	Low	Medium	High

Table 6 Risk Management Response Criteria

Risk rating	Required management response
Extreme	Potentially unacceptable health risk. Avoidance, redesign or major change to construction method, operation or staging is required. Approval should not rely on management controls alone unless further assessment demonstrates risk reduction to an acceptable level.
High	Substantial mitigation, monitoring and adaptive management are required. Quantitative assessment should be undertaken where suitable exposure–response evidence or health-based criteria are available. Residual risk must be explicitly justified.
Medium	Targeted mitigation, monitoring or trigger-action controls are required. Further assessment is required where sensitive receptors are affected, exceedances are predicted, cumulative impacts are material, or uncertainty is moderate to high.
Low	Routine mitigation and environmental management controls are generally sufficient, provided receptor sensitivity and uncertainty are low and controls are implemented as assumed. Monitoring or review may be required for sensitive receptors.
Very Low	No additional assessment is required beyond routine compliance, provided the pathway remains incomplete or exposure remains negligible. Reassess if project design, receptor occupancy or modelling assumptions change.



4.3 Quantitative Health Risk Assessment Method

The quantitative health risk assessment method is applied where modelled environmental exposure increments can be linked to measurable health outcomes using established exposure–response or dose–response relationships. The method is consistent with the enHealth Health Impact Assessment Guidelines, which require health impacts to be assessed through screening, scoping, profiling, appraisal, management and monitoring, and with the enHealth EHRA framework, which includes issue identification, hazard assessment, exposure assessment, dose–response assessment, risk characterisation, uncertainty evaluation and risk management.

For this Project, quantitative assessment is used primarily for air quality and noise pathways, where project-specific modelling outputs are available and health effects can be characterised using recognised exposure–response evidence. Soil and contamination are assessed quantitatively through comparison with adopted investigation, remediation and validation criteria, supported by pathway completeness and risk management controls, rather than population-level epidemiological calculations.

4.3.1 Quantitative Assessment Pathways

The quantitative assessment is applied to the following pathways where sufficient data are available:

- **Air quality:** annual average and short-term concentration increments for relevant pollutants including PM_{2.5}, PM₁₀ and NO₂, derived from the Air Quality Impact Assessment.
- **Noise:** modelled construction, operational, maintenance testing and emergency noise levels, including metrics relevant to annoyance, sleep disturbance, learning disturbance and cardiovascular stress.
- **Soil and contamination:** comparison of contaminant concentrations, remediation outcomes and validation results against adopted health-based criteria, supported by the site conceptual model and pathway analysis.

4.4 Conceptual Site Model

A conceptual site model was implemented to systematically describe the potential health impact pathways associated with the proposal, following a **Source–Pathway–Exposure–Health Outcome–Population Impact** framework. This model identifies the origin of hazards (sources), the mechanisms by which contaminants or stressors are transported through the environment (pathways), and the ways in which receptors may come into contact with these hazards (exposure). The nature and magnitude of exposure inform the assessment of potential health outcomes, taking into account the severity and type of effects associated with the hazard. Finally, the model considers the scale and distribution of impacts across the exposed population, including sensitive groups. This structured approach ensures a transparent and comprehensive linkage between environmental conditions and potential health risks, and provides the foundation for subsequent quantitative risk assessment in accordance with enHealth guidance.

4.5 Exposure Assessment

Exposure assessment combines project-specific modelling outputs with receptor locations, receptor sensitivity, exposure duration, frequency and population assumptions. Air quality exposure inputs are taken from the AQIA, including incremental and cumulative pollutant concentrations for construction, generator maintenance testing, emergency operation and relevant cumulative scenarios. Noise exposure inputs are taken from the NVIA, including predicted levels at sensitive receptors, timing of exposure, duration of construction stages and operational noise scenarios.

The assessment distinguishes between chronic exposure, short-term exposure and acute peak events. Chronic exposure is assessed using long-term average metrics where those metrics are compatible with available exposure–response functions

For short-term and acute peak events, such as 1-hour NO₂ peaks, 24-hour PM₁₀ episodes, or discrete generator emission events, a qualitative health impact assessment is considered more methodologically robust and defensible than a fully quantitative approach. While there is high confidence evidence linking short-term air pollutant exposure (hours to days) with acute health outcomes, the underpinning exposure–response functions are predominantly derived from time-series epidemiological studies using daily averaged concentrations rather than sub-daily peak metrics. This temporal misalignment introduces material uncertainty when attempting to directly quantify impacts from short-duration peaks. Furthermore, standard HIA functions do not adequately capture transient, high-intensity exposure events, which may be substantially attenuated when expressed as 24-hour averages, thereby reducing

the validity of quantitative estimates. In addition, short-duration emissions typically exhibit high spatial and temporal variability, limiting confidence in population exposure characterisation and increasing the risk of exposure misclassification. In this context, a qualitative assessment, supported by comparison to health-based guidelines, toxicological evidence, and established knowledge of acute exposure pathways, provides a more transparent, precautionary, and policy-aligned evaluation of potential health risks without overstating analytical precision

Exposure–Response Assessment

Exposure–response functions are selected only where there is sufficient epidemiological evidence for a causal or strongly supported association between exposure and health outcome, and where the exposure metric used in the technical assessment is compatible with the exposure metric in the epidemiological evidence. For air quality, this may include long-term PM_{2.5} and NO₂ associations with mortality or respiratory morbidity. For noise, this may include long-term environmental noise associations with annoyance, sleep disturbance and cardiovascular outcomes, where appropriate metrics are available.

Where a pollutant or stressor has a health-based guideline or impact assessment criterion but no suitable project-specific exposure–response function, the quantitative assessment is limited to comparison with that criterion and interpretation of the margin of change, frequency of exceedance, affected receptor type and uncertainty. This ensures that quantitative results are not overstated where the evidence base does not support numerical health outcome estimation.

4.6 Risk Characterisation

Risk characterisation combines the conceptual site model (Source – Pathway – Exposure – Health Outcome – Population Impact) with exposure - response functions to ensure a clear and transparent linkage between environmental changes and predicted populations health impacts. Where sufficient data are available, the assessment estimates incremental health outcomes using the following health impact function:

$$\Delta Y = Y_0 \times \beta \times \Delta X \times P$$

Where:

ΔY = change in number of cases

Y_0 = baseline incidence rate

β = exposure–response coefficient

ΔX = change in exposure

P = population

The health impact function incorporates an exposure–response coefficient (β), which represents the relationship between changes in exposure and associated changes in health outcomes. While β defines the exposure–response relationship, the full equation applies this relationship to estimate population-level health impacts.

Quantitative health impact estimates (ΔY) are used to characterise the magnitude of potential health effects at the population level. These outcomes are subsequently classified using a qualitative risk matrix (Table 7, Table 8 and Table 9), which considers both the severity of the health outcome and the scale of the affected population. This approach enables clear communication of risk levels while maintaining consistency with the underlying quantitative assessment.

Table 7 Define Consequence (Based on Health Outcome + ΔY)

Consequence Level	Health Outcome Severity	Population Impact (ΔY guide)
Negligible	No measurable health effect	$\Delta Y \approx 0$ or <1 case
Minor	Mild, reversible effects (e.g. irritation)	Small increase (1–5 cases)
Moderate	Illness requiring medical attention	Noticeable increase (5–20 cases)
Major	Serious illness or hospitalisation	Significant increase (>20 cases)
Severe	Mortality or long-term disease burden	Large or widespread impact

Table 8 Define Likelihood (based on exposure evidence)

Likelihood	Description
Rare	Exposure unlikely or highly controlled
Unlikely	Possible under certain conditions
Possible	Intermittent exposure occurs
Likely	Regular exposure expected
Almost certain	Continuous or unavoidable exposure

Table 9 Risk Matrix

Consequence / Likelihood	Rare	Unlikely	Possible	Likely	Almost Certain
Negligible	Very Low	Very Low	Low	Low	Low
Minor	Very Low	Low	Moderate	Moderate	Moderate
Moderate	Low	Moderate	Moderate	High	High
Major	Moderate	Moderate	High	High	Very High
Severe	Moderate	High	High	Very High	Very High

4.7 Population and Sensitive Receptor Considerations

The quantitative assessment considers both population-level burden and receptor-specific vulnerability. Sensitive receptors are not treated as average receptors where their health susceptibility, occupancy pattern or exposure pathway differs materially from the general population. This is particularly relevant for school communities, aged-care residents, nearby rural-residential receptors, workers involved in intrusive activities and people with pre-existing respiratory or cardiovascular conditions.

Where population-level calculations are undertaken, the assessment clearly states the adopted population, baseline health rates, exposure duration and whether the estimate represents current conditions, future precinct development, or a conservative sensitivity scenario. Receptor-specific risks that cannot be adequately represented in population calculations are carried forward into the qualitative assessment and risk management recommendations.

4.8 Treatment of Uncertainty and Sensitivity

Uncertainty is explicitly considered in relation to model inputs, meteorology, background conditions, receptor occupancy, future staging, population assumptions, exposure duration, baseline health rates and transferability of epidemiological coefficients. Where uncertainty is material, the assessment applies conservative assumptions, presents sensitivity scenarios where useful, and explains how uncertainty affects confidence in the results.

The assessment avoids false precision. Numerical health estimates are reported as indicative estimates of potential population health burden rather than precise predictions of individual outcomes. Where the calculated health impact is materially less than one case per year, the result is interpreted qualitatively as negligible, very low or low in the context of receptor sensitivity and cumulative burden.

4.9 Interface with Mitigation and Residual Risk

Quantitative results are used to inform the need for mitigation, monitoring and adaptive management. Where modelling predicts exceedances of health-based or environmental criteria, the assessment identifies the affected receptor groups, likely health pathways, duration of exposure and the mitigation measures needed to reduce exposure. Residual risk is characterised only after the mitigation measures have been defined and, where possible, reflected in the controlled modelling scenario.

Mitigation measures are not double-counted. If a control has already been incorporated into the technical modelling used to estimate exposure, it is treated as part of the modelled scenario and is not relied on again to justify further reduction in residual risk unless a separate controlled scenario or monitoring commitment demonstrates additional exposure reduction.

4.10 Cumulative Impact Approach

The assessment of cumulative environmental health impacts has considered both air quality and environmental noise in accordance with NSW EPA and relevant guideline frameworks. For air quality, quantitative dispersion modelling includes emissions from surrounding approved and proposed data centre developments, with consideration of overlapping construction and generator maintenance testing scenarios. A supplementary screening-level assessment has also been undertaken for broader regional sources, including Western Sydney International Airport (WSIA), to evaluate their potential contribution to local air quality.

For noise, cumulative impacts have been assessed through the Noise and Vibration Impact Assessment (NVIA), which accounts for existing background noise levels and predicted contributions from concurrent industrial and infrastructure developments within the surrounding precinct. The NVIA incorporates operational constraints, including testing limits and spatial zoning, to manage potential cumulative noise exposure at sensitive receptors such as nearby schools, residential properties and the Emmaus Retirement Village.

This combined approach provides an integrated evaluation of cumulative exposure, recognising that potential health impacts may arise from the interaction of multiple environmental stressors. It also accounts for uncertainties associated with future development timing, background conditions and meteorological variability, ensuring a conservative and comprehensive assessment of cumulative environmental health risk.

5 Sensitive Receptors and Population profile

5.1 Air Quality Receptors

The Air Quality Impact Assessment (AQIA) identified several discrete receptors representing the main land use types within the study area, including residential, educational, industrial (such as data centres and substations), medical, and recreational receptors, as well as boundary receptors (for PAH, benzene, and formaldehyde).

The sensitive receptors identified in the AQIA report within a 10 km radius are as follows:

- Nearest rural-residential dwelling: ~60 m to the north of the site boundary.
- Nearest high-density residential zone:
 - St Clair: ~3-4 km north-northwest
 - Erskine Park: ~3.3 km northeast
 - Abbotsbury: ~6-7 km southeast
 - Cecil Park: ~5-6 km east-southeast
- Nearest Semi-urban residential areas
 - Luddenham: ~2-3 km southwest
 - Orchard Hills: ~2.5 - 3 km northwest
 - Mount Vernon: ~2.5 - 3 km west- northwest
 - Horsley Park: ~3 -4 km east-northeast
- Nearest sensitive ecological receptor:
 - South Creek: connected downstream via internal drainage lines and dams, generally >1.5–2 km.
- Nearest Educational facilities: ~670 m -6 km
- Nearest healthcare facilities: ~3.7 km
- Nearest recreation facilities: ~2.4 km

A total of 128 discrete receptor locations have been identified in the AQIA with the intention to be representative of their broader surroundings and these can reasonably be assumed to reflect conditions in the immediate vicinity. Details can be found in Appendix B of the AQIA.

A detailed list of the receptors included in the AQIA assessment is provided in Appendix A. A map showing the location of these sensitive receivers are shown in Figure 3 and Figure 4 below.

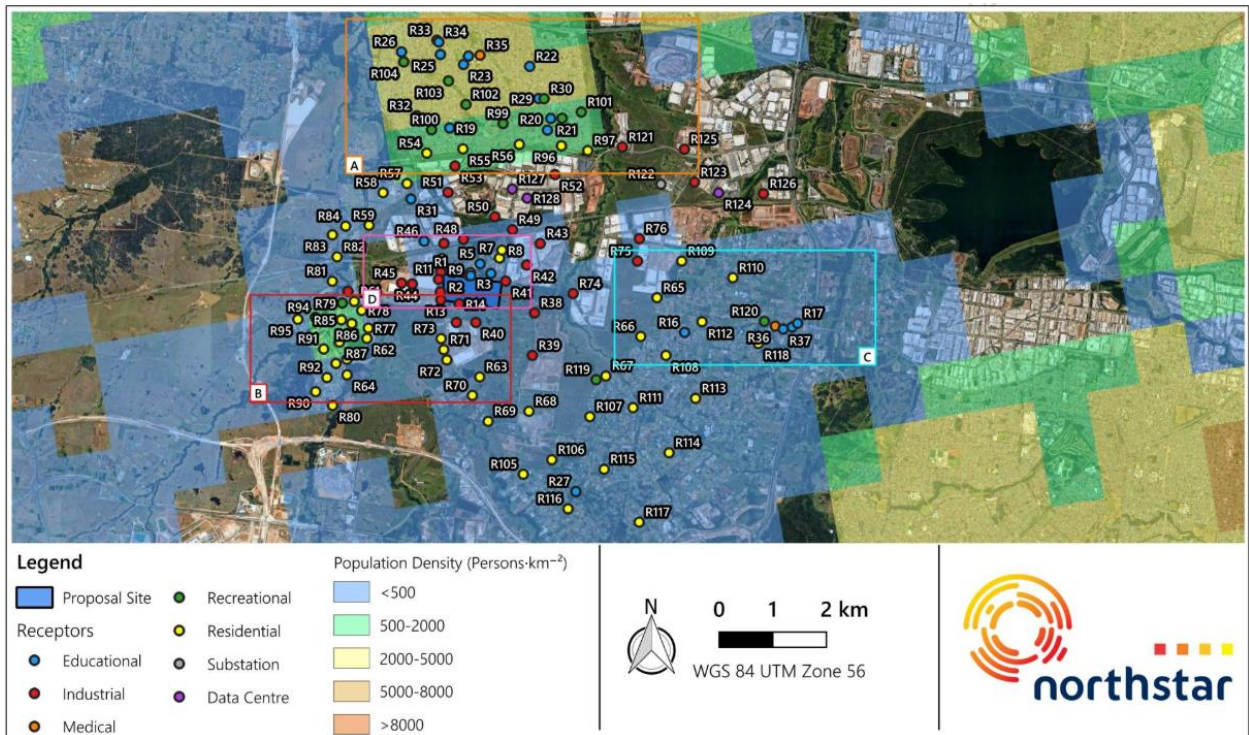


Figure 3 Sensitive Receptor surrounding the proposal site and population density (Part 1) (Source: Northstar, 2026)

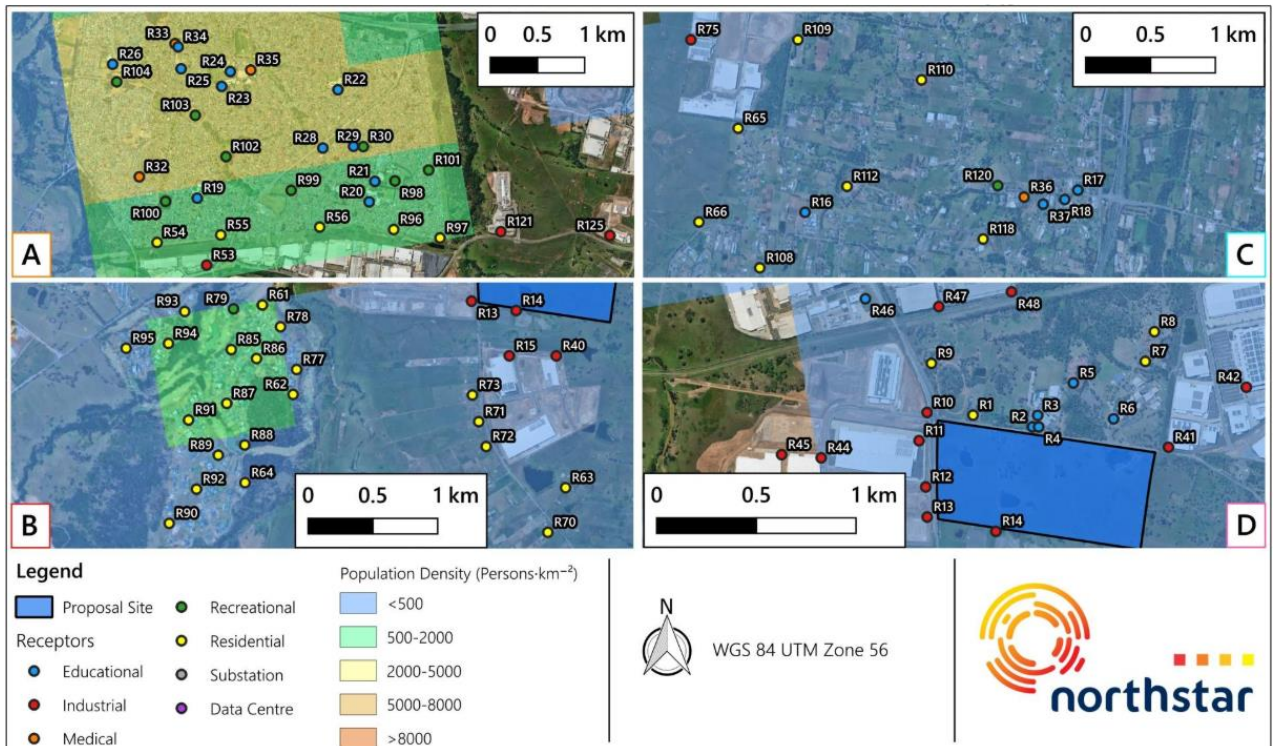


Figure 4 Sensitive Receptor surrounding the proposal site and population density (Part 2) (Source: Northstar, 2026)



5.2 Receptor Distribution of Air Quality Risk

The distribution of air quality risk is not uniform across the study area and is primarily influenced by proximity to emission sources, local meteorological conditions and receptor sensitivity. The highest relative risks are associated with receptors located to the north of the site, where sensitive land uses including schools and the Emmaus Retirement Village are situated closest to the main emission sources. These receptors experience the greatest potential exposure to short-term pollutant increments during construction activities and generator operation scenarios.

Educational and aged-care receptors are considered the most sensitive due to the presence of vulnerable populations, including children and older adults, who are more susceptible to respiratory and cardiovascular effects of air pollution. In addition, schools represent locations of repeated daytime exposure, increasing the potential for cumulative short-term impacts during construction and operational phases.

Nearby rural-residential receptors are also relevant, particularly in relation to amenity and exposure to intermittent dust and diesel emissions. While modelled pollutant concentrations at these locations generally remain within applicable criteria under routine conditions, they may experience perceptible short-term impacts under adverse meteorological conditions or during higher-intensity activities.

Industrial and commercial receptors are generally less sensitive from a health perspective due to lower occupancy duration and workforce characteristics and therefore represent a lower relative health risk despite similar potential exposure levels.

Overall, the air quality risk is spatially localised and receptor-dependent, with the highest potential impacts occurring at the nearest sensitive receptors under specific short-term scenarios. In contrast, the broader surrounding population is subject to very low incremental exposure, consistent with the negligible long-term health impact estimates.

This spatial pattern of risk is reflected in Table 17, which summarises the key exposure pathways, sensitive receptor groups and corresponding inherent and residual risk ratings. The table demonstrates that higher risks are confined to short-term, activity-specific scenarios at the nearest sensitive receptors, while risks to the broader population remain low.

5.3 Noise and Vibration Receptors

The Noise and Vibration Impact Assessment (NVIA) identify a diverse and highly sensitive receptor environment, including:

Critical Receptors (Highest Health Sensitivity), inside the MRP (long-term receivers); located within 170–480 m of the project:

- Emmaus Catholic College (~170 m)
- Trinity Catholic Primary School (~320 m)
- Emmaus Retirement Village (~480 m)

These receptors are critical due to Continuous occupancy, exposure during sensitive periods (learning, sleep) and vulnerable populations (children, elderly)

Secondary Receptors - inside the MRP (short-term receivers)

- Mamre Anglican School (~60 m; relocating by 2029)
- Childcare centre (>1.5 km)
- Nearby rural residences (30–1,000 m)

Regional Receptors - outside the MRP,

- Luddenham, Orchard Hills, Kemps Creek and Mount Vernon (~1.4–2 km)

These receptors experience lower exposure but contribute to cumulative population health burden.

The NVIA identified a range of sensitive activity areas within nearby receptors that are directly relevant to potential health outcomes. Within educational facilities, these include classrooms, libraries, assembly halls and outdoor learning areas, which are used across extended periods including core teaching hours and extracurricular activities.

At the Emmaus Retirement Village, sensitive areas include independent living units, care facilities and outdoor communal spaces, where occupants may be particularly vulnerable to sleep disturbance and stress-related health effects. These environments have been characterised based on their use, occupancy and sensitivity, enabling direct linkage between predicted exposures and health outcomes.

Buildings are generally air-conditioned with intermittent use of operable windows, and an external-to-internal noise attenuation of approximately 10 dB(A) has been adopted. This enables estimation of internal exposures and assessment against health-based guideline values, including WHO indoor noise thresholds relevant to learning and sleep. This assumption enables the estimation of internal noise levels at receptors and facilitates assessment against health-based guideline values, including the World Health Organization's recommended indoor noise thresholds (e.g. 35 dB(A) for learning and sleep-related outcomes).

As the existing acoustic environment varies at the nearby residential receivers, these residential receivers have been grouped into Noise Catchment Areas (NCAs) based upon areas with similar acoustic environments, and similar grouping of receivers considering when impacts may occur.

This has been done to logically group the receivers to assist with the assessment and allocate the appropriate project noise trigger levels or management levels to each receiver. The locations of these noise catchment area boundaries are also shown in Figure 5 and Figure 6.

A screening assessment was undertaken to identify receptors and structures potentially affected by construction vibration, based on their proximity to the minimum working distances associated with the most vibration-intensive plant. Using conservative assumptions reflecting the most sensitive receiver types, receptors located within these worst-case distances were flagged as potentially impacted. The indicative minimum working distances, measured from the boundaries of active construction zones, are shown in Figure 7 below.

5.3.1 Sensitive Activity Areas

Detailed NVIA consultation identified critical activity spaces:

- Schools
 - Classrooms (most sensitive)
 - Libraries, chapels, assembly halls
 - Outdoor teaching and recreation areas
- Aged Care
 - Living units
 - Memory support and palliative care
 - Outdoor communal spaces

These spaces are directly linked to specific health endpoints, including:

- Learning outcomes
- Sleep quality
- Cardiovascular stress

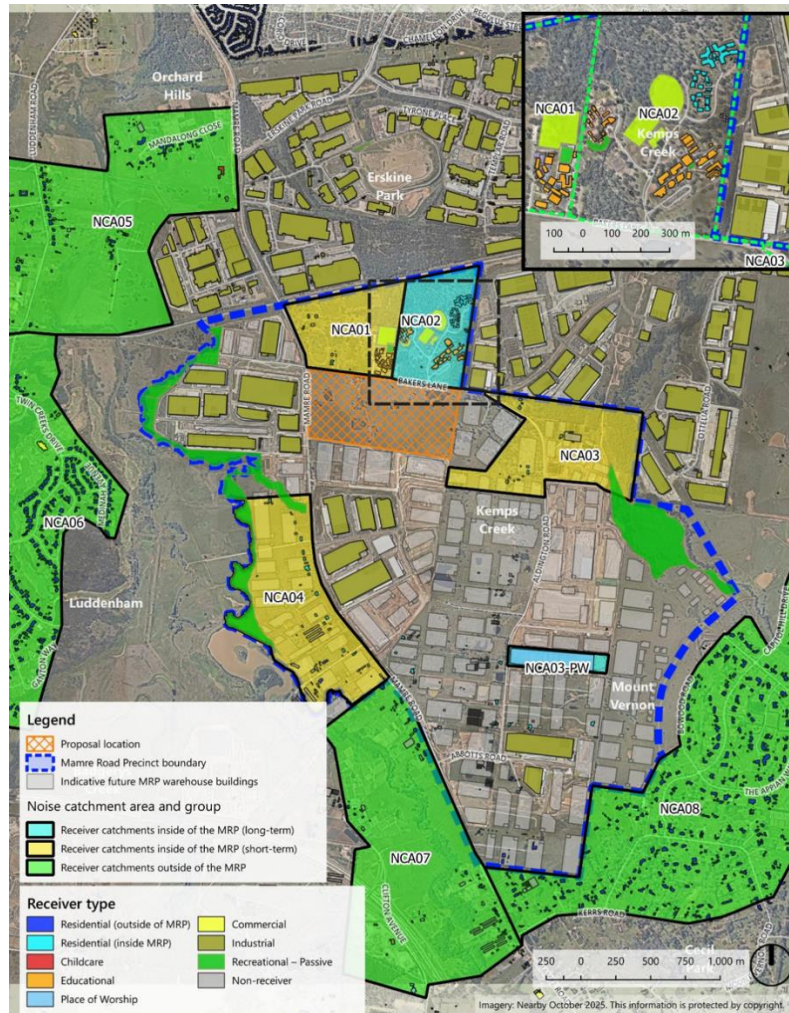


Figure 5 Site Location, nearby noise sensitive receivers, land uses and NCAs (Source: NVIA (amended), 2026)

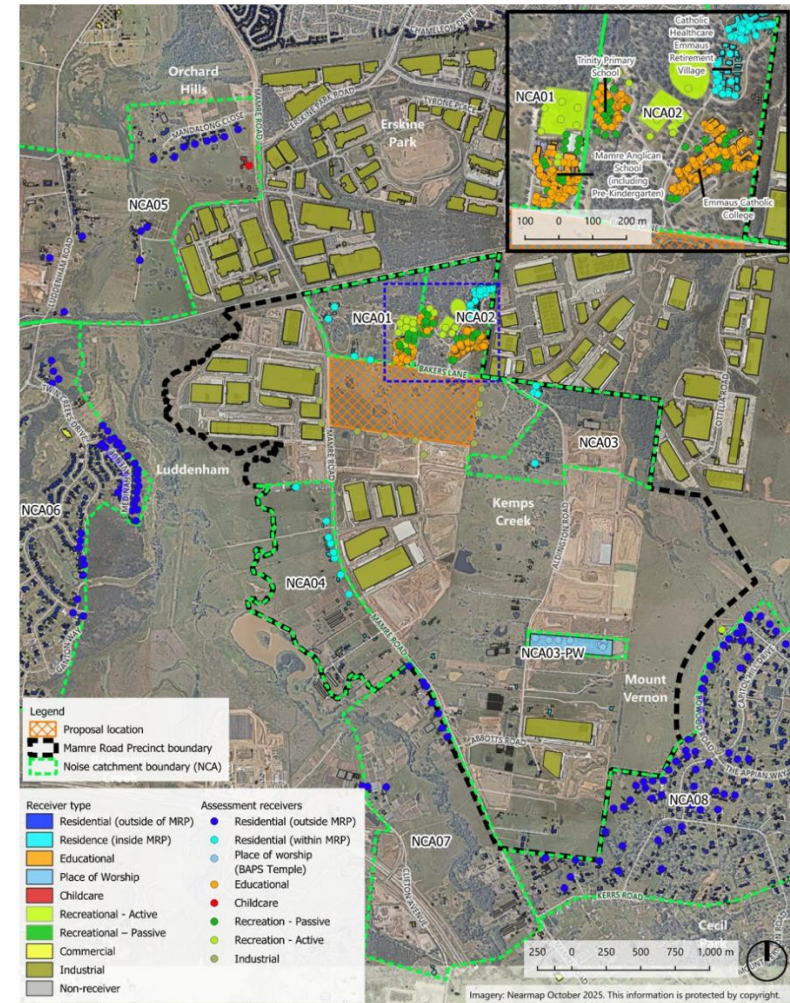


Figure 6 Site location, assessment noise sensitive receivers, land uses and NCA's (Source: NVIA (amended), 2026)

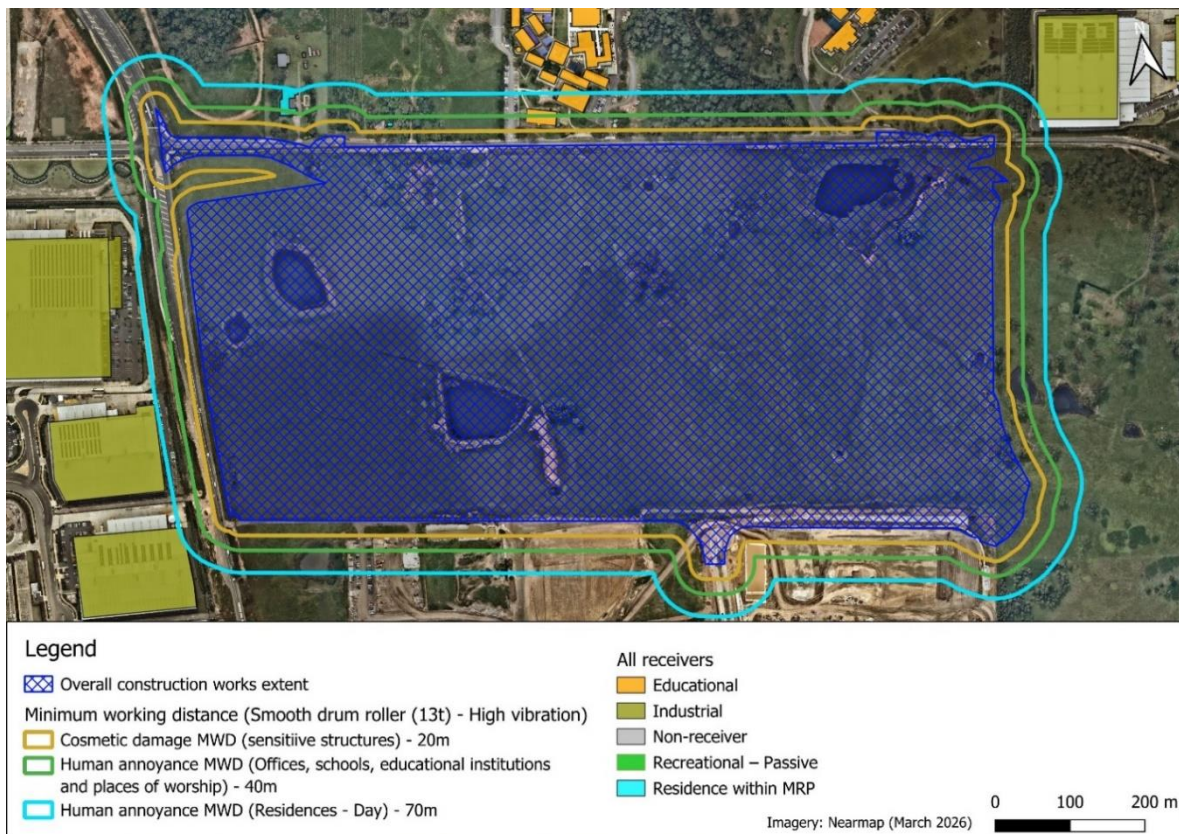


Figure 7 Minimum working distances (MWD) for cosmetic damage from the construction area extents (most vibration intensive plant) (Source: NVIA (amended), 2026)

5.4 Soil and Contamination Receptors

The site is underlain by Wianamatta Group Ashfield Shale and Bringelly Shale, with natural soils predominantly comprising firm red, brown, and yellow silty clays. Localised fill materials have been encountered across the site, generally consisting of reworked natural clays with isolated anthropogenic inclusions such as scrap metal, asphalt, plastic conduits, bricks, concrete, and demolition waste. Acid sulfate soils are considered unlikely due to the site's elevation, and groundwater is saline and not considered a potable resource.

Investigations identified that contaminant concentrations in soil, sediment, surface water, and groundwater are generally below applicable human health criteria, with the exception of several isolated areas associated with historical site activities. These include asbestos-containing materials (ACM), asbestos fines and fibrous asbestos (AF/FA), hydrocarbon-impacted soils beneath a former petroleum drum, building and demolition waste, anthropogenic fill, and infrastructure such as a former septic tank and maintenance bore. The principal contaminants of concern are therefore asbestos-related materials and limited hydrocarbon contamination rather than widespread chemical contamination.

Potential receptors that may be exposed to contaminated soil or associated media include:

- Construction and remediation workers, who may come into direct contact with contaminated soils or inhale dust and asbestos fibres during excavation and earthworks.

Worker exposure during contaminated soil disturbance will be managed through occupational hygiene controls, task-specific risk assessments, exclusion zones, controlled excavation methods, dust suppression, personal protective equipment and respiratory protective equipment where required, hygiene and decontamination facilities, and ongoing supervision by competent environmental and Work, Health and Safety (WHS) personnel.

Occupational hygiene monitoring will be undertaken during intrusive works where contaminated soil, asbestos-containing material, asbestos fines, fibrous asbestos or hydrocarbon-impacted material may be disturbed. Monitoring should include asbestos air monitoring where asbestos disturbance is possible, dust monitoring where visible dust or PM-generating activities occur, and targeted worker exposure monitoring where task conditions indicate a potential for elevated exposure.



Where monitoring identifies action-level exceedances or visible uncontrolled dust, works will be stopped or modified, controls will be reviewed and strengthened, affected work areas will be re-assessed before recommencement, and records will be retained to demonstrate implementation of the Remedial Action Plan, Asbestos Management Plan, Unexpected Finds Protocol and relevant WHS procedures throughout construction.

Worker health monitoring and health surveillance will be implemented where required under applicable WHS and asbestos regulations, including for workers undertaking licensed asbestos removal, asbestos-related work or other tasks with potential exposure to airborne asbestos fibres or hazardous contaminants. Records of training, fit testing, PPE/RPE issue, monitoring results, incident response, decontamination and waste tracking will be maintained and reviewed throughout the remediation and construction program.

- Worker exposure during contaminated soil disturbance will be managed through occupational hygiene controls, task-specific risk assessments, exclusion zones, controlled excavation methods, dust suppression, personal protective equipment and respiratory protective equipment where required, hygiene and decontamination facilities, and ongoing supervision by competent environmental and WHS personnel.
- Future site occupants and visitors, who could potentially be exposed to contaminants through direct contact with residual contaminated soils, surface waters, sediments, or airborne dust if remediation is not appropriately completed.
- Maintenance workers, particularly during future subsurface works that may disturb buried contaminated materials or infrastructure.
- Adjacent sensitive land uses, including nearby educational facilities, childcare centres, residential areas, and retirement living developments, although the existing vegetative cover and the predominantly low-permeability clay soils reduce the potential for off-site contaminant migration under current conditions.

5.5 Sensitive Sub-Populations

The following groups are considered more vulnerable:

- Children (schools and childcare facilities within ~500–700 m)
- Elderly residents (e.g. retirement village)
- Individuals with pre-existing respiratory or cardiovascular conditions
- Construction workers (occupational exposure)

The receptors have been categorised according to their relative sensitivity and likelihood of exposure. The table below outlines the receptor hierarchy used in this HIA, along with the rationale for each sensitivity level.

Table 10 Receptors Hierarchy

Hierarchy Level	Receptor Category	Rationale
High Sensitivity	Offsite rural-residential properties; vulnerable individuals (children, elderly)	Fixed occupancy, home-based exposure, potential long-duration exposure windows.
Moderate Sensitivity	Construction and remediation workers; future staff; transient site users	Potential for direct contact with hazards; exposure controlled by Work Health and Safety protocols.
Low Sensitivity	Broader residential communities (>3 km away), visitors, industrial neighbours	Distance and dispersion reduce exposure potential; generally controlled environments.

5.6 Consolidated Receptor Framework

For the purposes of this Health Impact Assessment (HIA), sensitive receptors have been identified based on their proximity to the site, potential exposure pathways, and inherent vulnerability. Receptors include on-site workers, neighbouring rural residents, future site occupants, and downstream ecological environments linked to the site's surface water flows. These receptor groups exhibit varying levels of sensitivity, and a hierarchy has been applied to ensure that the assessment appropriately reflects the risks to more vulnerable populations.

An overview of the identified sensitive receptors is provided in Table 11. To support a consistent assessment of potential health impacts, receptors identified within the air quality and acoustic technical studies have been reviewed and integrated into a combined receptor framework. This approach provides a unified representation of receptors while retaining distinctions in sensitivity where relevant to specific environmental exposures. It enables clear

comparison of receptor susceptibility across different impact pathways and supports a comprehensive evaluation of potential health effects.

Table 11 Overview Sensitive Receptors

Receptor Type / Group	Location / Proximity	Description and Occupancy	Air Quality Sensitivity	Noise and Vibration Sensitivity	Key Exposure Pathways / Health Considerations
Critical educational receptors	Emmaus Catholic College (~170 m), Trinity Catholic Primary School (~320 m) and other nearby school facilities north of the site.	Schools with classrooms, libraries, halls and outdoor learning or recreation areas. Occupancy occurs during teaching hours, with children and staff present for repeated daily exposure periods.	High — children are a sensitive sub-population for particulate matter, NO ₂ and construction dust. During construction, PM ₁₀ increments at educational receptors require explicit consideration.	Very high — learning, speech intelligibility, concentration and outdoor teaching areas are sensitive to construction and operational noise. Classroom and library spaces are priority activity areas.	Inhalation of construction dust and diesel-related pollutants; noise interference with learning and communication; annoyance, stress and reduced outdoor activity during high-noise or high-dust periods.
Aged care / retirement receptor	Emmaus Retirement Village (~480 m north of the project).	Residential aged-care and retirement living environment with prolonged occupancy, including living units, care areas and outdoor communal spaces.	High — older people and people with cardiovascular or respiratory conditions may be more susceptible to particulate matter and NO ₂ .	Very high — sleep, rest, recovery, stress and cardiovascular pathways are sensitive to night-time, low-frequency and intermittent noise events.	Inhalation of dust and combustion emissions; sleep disturbance, annoyance and cardiovascular stress pathways; potential reduced use of outdoor communal areas during noisy or dusty works.
Short-term school receptor within MRP	Mamre Anglican School (~60 m; identified as relocating by 2029).	Educational receptor within the Mamre Road Precinct and very close to construction areas. Although relocation is anticipated, the receptor is assessed while present.	High while occupied — proximity increases potential for construction dust, for particulate matter and diesel emissions from plant and traffic.	Very high while occupied — closest educational receptor, with potential for speech masking, learning interference and outdoor activity disruption during high-noise works.	Construction dust inhalation, nuisance dust deposition, construction noise, vibration perception, disruption of teaching and recreation, and psychosocial concern during the transition period.
Nearby rural-residential receptors	Nearby rural dwellings and residential properties within approximately 30 m to 1 km, including properties along Mamre Road and Bakers Lane.	Fixed residential occupancy with potential for day, evening and night exposure. Some receptors may transition over time, but are assessed as existing receptors while occupied.	High for closest dwellings — potential exposure to construction dust, particulate matter, NO ₂ , and cumulative construction emissions.	High — residential amenity, sleep, annoyance and vibration perception pathways are relevant, particularly for the closest receptors and out-of-hours works.	Dust and combustion inhalation; construction and operational noise; sleep disturbance potential; vibration perception; annoyance, stress and cumulative construction disturbance.
Regional residential communities	St Clair, Erskine Park, Luddenham, Orchard Hills, Mount Vernon, Horsley Park and surrounding suburbs generally ~1.4 km to >6 km from the site.	Broader residential communities contributing to population-level exposure and cumulative burden but generally located further from the project than the nearest receptors.	Moderate — distance reduces direct exposure, but cumulative air quality and regional background changes remain relevant to population health assessment.	Low to moderate — direct project noise exposure is lower, but cumulative traffic and precinct noise may contribute to broader amenity outcomes.	Cumulative air quality exposure, traffic-related emissions, broader environmental noise, and long-term population health burden under future precinct development scenarios.
Construction and remediation workers	Onsite and within active construction, remediation and excavation areas.	Workers undertaking excavation, remediation, asbestos management, soil handling, plant operation, maintenance and construction tasks.	Moderate to high — direct occupational exposure to dust, asbestos fibres, diesel exhaust and contaminated soil may occur without controls.	Moderate — exposure to construction noise and vibration is managed primarily through WHS controls, hearing protection, exclusion zones and work planning.	Dust inhalation, asbestos fibres, dermal and incidental ingestion contact with soils or sediments, occupational noise, vibration, heat and fatigue pathways.
Future site occupants, maintenance staff and visitors	Onsite after redevelopment as a data centre campus.	Operational workforce, maintenance personnel, contractors and visitors with controlled access and generally short-duration exposure outside maintenance roles.	Low to moderate — exposure is generally controlled, but maintenance tasks may involve diesel exhaust, residual dust or contaminated material disturbance.	Low to moderate — exposure to plant noise is managed through design, operational controls and workplace procedures.	Controlled occupational exposure to operational plant, generator testing, residual soil contact, maintenance-related disturbance and heat exposure in outdoor work areas.
Industrial and data centre neighbours	Adjoining and nearby industrial lots within the Mamre Road Precinct.	Industrial workers and operational facilities, including sensitive equipment in some data centre or infrastructure settings.	Moderate — worker exposure to dust and emissions is generally managed, but cumulative precinct emissions and high-activity construction periods remain relevant.	Moderate — construction noise and vibration may affect amenity, work tasks or sensitive equipment but are less health-sensitive than schools, aged care and residences.	Dust, diesel emissions, construction noise, vibration perception, effects on work amenity and potential equipment sensitivity.
Downstream ecological receptors	South Creek catchment, connected through onsite dams, drainage lines and ephemeral flow paths.	Surface water, sediment, riparian habitat and downstream ecological environments. Included to identify indirect public health and environmental protection pathways.	Not applicable to direct human inhalation exposure; relevant to indirect environmental health where dust, sediment or runoff transport contaminants.	Low for direct noise health assessment; ecological disturbance is addressed through environmental management rather than human noise sensitivity.	Sediment transport, contaminated runoff, erosion, surface water contamination and downstream ecological exposure pathways.

6 Air Quality Health Assessment

Northstar Air Quality Pty Ltd prepared an Air Quality Impact Assessment (AQIA) for Plan Project Management Pty Ltd in support of a State Significant Development Application (amended) (SSDA 92743706) for the Mamre Road Data Centre Campus Data Centre Campus at 706–752 Mamre Road, Kemps Creek NSW.

This assessment evaluates the potential air quality and odour impacts of the proposed development on surrounding sensitive receptors during both construction and operation. Given the extensive development occurring within the Mamre Road Precinct, concurrent earthworks across multiple sites may contribute to cumulative air quality impacts in the area. NSW DPHI and NSW EPA have advised that these risks are best identified and managed through a quantitative assessment, ensuring that appropriate and effective mitigation measures are applied.

6.1 Existing Background Air Quality

The area surrounding the Proposal site includes a number of facilities currently undergoing approval or development which have been considered within the AQIA.

To assess the Proposal's impacts, existing background air quality conditions were characterised using 2021 monitoring data, consistent with the selected meteorological modelling year, from the nearest Automatic Weather Station (AWS) at Horsley Park Equestrian Centre, along with air quality measurements from the St Marys and Prospect Air Quality Monitoring Stations (AQMS). In addition, several pollutants not routinely monitored in NSW; polycyclic aromatic hydrocarbons (PAHs), benzene (C₆H₆), toluene (C₇H₈), xylene (C₈H₁₀), and formaldehyde (CH₂O), were considered as part of the AQIA. Background concentrations of these pollutants were assumed to be negligible, consistent with standard practice.

The maximum recorded background pollutant concentrations were all below the relevant impact assessment criteria specified in the NSW Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales (EPA, 2022), except for one 24-hour PM_{2.5} and PM₁₀ exceedance attributed to burns in the Sydney region.

6.2 Sources, Hazards and Exposure Pathways

This section identifies the air-emission sources, health-relevant hazards and complete or plausible exposure pathways considered in the air quality health assessment. It is structured using the source–pathway–receptor approach required by the qualitative and quantitative assessment methods in Sections 4.2 and 4.3. The focus is on pollutants and exposure circumstances that may affect nearby schools, aged-care receptors, rural-residential receptors, workers and future site occupants.

The main air quality hazards are particulate matter, combustion gases and diesel-related toxic air pollutants. The primary exposure pathway is inhalation. Secondary exposure pathways include dust deposition on outdoor surfaces, nuisance dust affecting outdoor amenity, odour perception and potential psychosocial concern where visible dust, diesel exhaust or generator operation is observed by nearby communities.

- **Construction dust sources:** topsoil stripping, excavation, cut-and-fill earthworks, grading, material handling, haulage, loading and unloading, exposed stockpiles, unsealed surfaces, wind erosion and vehicle movements.
- **Construction combustion sources:** diesel-powered construction plant, heavy vehicles, mobile equipment and construction traffic using internal and external haul routes.
- **Operational combustion sources:** standby diesel generators during scheduled maintenance testing and rare emergency operation following power-supply interruption.
- **Fuel storage and handling sources:** diesel storage, refuelling, filling and dispensing, with potential for minor fugitive VOCs or odour and accidental spill-related emissions if not controlled.
- **Cumulative sources:** concurrent construction, operational traffic, industrial development, operation of Western Sydney International Airport (WSIA) and other data centre or logistics projects within the Mamre Road Precinct and surrounding growth area.

During construction, the pollutants of concern are total suspended particulates, deposited dust, PM₁₀, PM_{2.5} and diesel combustion emissions from plant and vehicles. Health-relevant effects include respiratory irritation, asthma exacerbation, cardiovascular stress in susceptible people, nuisance dust deposition, reduced outdoor amenity and community concern during high-dust periods.



During normal operation conditions air emissions are expected to be limited, with the principal health-relevant source being diesel generator operation during maintenance testing or emergency power events. The pollutants of concern from diesel combustion include PM₁₀, PM_{2.5}, NO₂, CO, SO₂, PAHs, VOCs including benzene, toluene and xylene, and formaldehyde.

- **Inhalation pathway:** breathing of suspended particulates and NO₂ by nearby receptors during construction, generator testing or emergency operation.
- **Dust deposition pathway:** deposition of larger particles on outdoor surfaces, school play areas, residential outdoor spaces, vehicles or landscaping, potentially affecting amenity and perceived cleanliness.
- **Odour and amenity pathway:** diesel exhaust odour or fuel-related odour during generator operation, refuelling or accidental spills, potentially contributing to annoyance, concern or reduced outdoor activity.
- **Occupational exposure pathway:** worker exposure to dust, diesel exhaust, contaminated dust or fuel vapours during construction, remediation, maintenance and generator-related activities, managed primarily through WHS controls.
- **Cumulative exposure pathway:** combined exposure to project emissions and other precinct sources over the construction program and future operational period.

The likelihood and significance of exposure depend on activity type, duration, emission intensity, meteorology, receptor proximity, receptor sensitivity and the effectiveness of embedded mitigation. Sensitive receptors include nearby schools, the Emmaus Retirement Village, nearby rural-residential receptors and workers undertaking construction, remediation or maintenance activities. These receptors are considered explicitly in Sections 6.3 to 6.8.

Short-term exposure pathways, including 24-hour PM₁₀ and PM_{2.5} during construction and 1-hour NO₂ during generator testing or emergency operation, are assessed for acute health relevance and receptor sensitivity. Long-term exposure pathways, including annual average PM₁₀, PM_{2.5} and NO₂, are considered where they are suitable for quantitative health risk characterisation.

Odour has been considered as part of the broader air quality assessment for both the construction and operational phases of the project. During construction, potential odour-generating activities include accidental fuel spills associated with plant and machinery use. In the operational phase, periodic testing and maintenance of the diesel-fuelled standby generators may also generate odorous emissions. Air emissions of volatile organic compounds (VOCs) from generator exhaust, specifically benzene (C₆H₆), with anticipated contributions from toluene (C₇H₈) and xylene (C₈H₁₀), have been assessed against applicable odour impact criteria.

Odour and toxic air pollutants are considered as supporting pathways rather than the primary drivers of health risk. Where modelled or assumed concentrations are below relevant criteria, they are interpreted as low-risk pathways; however, they remain relevant to perception, amenity and community confidence where generator operation or fuel handling is visible or noticeable.

6.3 Receptors and Sensitive Populations Relevant to Air Quality

The air quality assessment uses the consolidated receptor framework in Section 5 as the primary receptor register. Air quality sensitivity is highest for nearby educational, residential and aged-care receptors where inhalation exposure to PM₁₀, PM_{2.5}, NO₂ and diesel-related pollutants may occur. The detailed receptor locations and receptor-type classifications are therefore not repeated here; this section focuses on how those receptors are affected by the air quality pathways assessed in Sections 6.4 to 6.7.

6.4 Air Quality Assessment (Construction and Operational Phase)

Given the nature and location of the Proposal, both quantitative modelling and qualitative assessment have been applied to characterise potential air quality impacts during the construction and operational phases. The quantitative assessment considers incremental impacts attributable to the Proposal in isolation, as well as cumulative impacts in combination with existing and reasonably foreseeable emission sources in the surrounding area. This is complemented by a qualitative review of factors such as local meteorological conditions, site context, and the spatial relationship to sensitive receptors, providing additional interpretive context to the modelling results.

The modelling has adopted the worst-case operational characteristics from three generators ("candidate generators"). This approach provides maximum flexibility for final equipment selection (i.e. highest emission rate,

lowest emission temperature, lowest emission velocity). This ensures that the assessment remains protective of environmental and human health while maintaining flexibility in final equipment selection.

A series of modelling scenarios has been developed to capture emissions and potential impacts across all phases and modes of operation. These scenarios incorporate variations in operating conditions, duration, and frequency of activities, enabling a comprehensive evaluation of both routine and infrequent events. The scenario identifiers correspond to distinct phases and activities, including construction, emergency operation, and maintenance testing. A summary of these scenarios is provided in Table 8.

Table 12 Summary of modelling scenarios (Source: Northstar,2026)

Scenario		Stage	Phase
Construction			
C1	Construction	Stage 0	Proposal
C2			Cumulative (Proposal + surrounding activities)
Operation - emergency			
E1A	Justified worst case	Stage 1A	Includes assessment of one, two, and three feeder outages
E1B		Stage 1B	Includes assessment of one, two, and three feeder outages
E2		Stage 2	Includes assessment of one, two, and three feeder outages
Operation – maintenance testing			
M1A	Maintenance testing	Stage 1A	Includes assessment of no-load and 100 % load testing
M1B		Stage 1B	Includes assessment of no-load and 100 % load testing
M2		Stage 2	Includes assessment of no-load and 100 % load testing

Short-term exposure impacts have been considered qualitatively to address potential acute health risks, in response to NSW Health requirements.

The AQIA identifies that short-term increases in pollutant concentrations may occur under specific scenarios, including:

- Temporary increases in 1-hour NO₂ concentrations during generator testing
- Elevated 24-hour particulate matter concentrations during construction activities
- Higher pollutant concentrations under low wind or adverse meteorological conditions

These short-term impacts are intermittent, time-limited, and subject to operational controls, including generator testing restrictions and implementation of a Trigger Action Response Plan (TARP).

Short-term exposure is not expected to result in major health impacts. Temporary and minor effects such as respiratory irritation may occur in sensitive individuals but it is not expected due to mitigation measures that are to put in place.

Such exposures are not considered representative of long-term population exposure and are therefore not incorporated into the quantitative assessment. Based on the AQIA, the likelihood of sustained short-term exceedances is low (i.e. none have been predicted in any stage of operation), and associated acute health risks are considered manageable with appropriate mitigation measures in place.

The AQIA includes consideration of potential cumulative air quality impacts associated with the operation of Western Sydney International Airport (WSIA). A review of predicted WSIA emissions indicates that incremental contributions are relatively small, and the likelihood of coincident peak impacts with the Proposal at sensitive receptors is low. On this basis, WSIA impacts were assessed qualitatively through a screening approach and were not explicitly incorporated into the dispersion modelling. The assessment concludes that material cumulative air quality impacts between the Proposal and WSIA are unlikely.

Based on this assessment, the potential impacts to the sensitive receptors are as follows:

- Short-term increases in particles especially PM₁₀ and elevated NO₂ during dust-generating construction activities or emergency generator operation can contribute to:
 - Respiratory effects (e.g. irritation of the airways, coughing, and shortness of breath).
 - Exacerbation of existing respiratory conditions such as asthma and shortness of breath

Children are particularly vulnerable because their lungs are still developing and they breathe more air per body weight.

Elderly individuals are also at higher risk due to age-related declines in lung function and higher prevalence of chronic respiratory disease.

- Exposure to elevated particulate matter (PM₁₀ and PM_{2.5}), even where standards are largely met, may still:
 - Trigger cardiovascular stress
 - Increase the likelihood of heart attacks or hospital admissions in vulnerable individuals

This risk is most relevant for older adults, particularly those with pre-existing heart conditions.

- Nuisance impacts (e.g. visible dust deposition) near the site during construction if dust is not adequately controlled. Even where compliance with long-term criteria is achieved, dust deposition may:
 - Reduce outdoor amenity (e.g. at schools, homes, recreational spaces)
 - Lead to discomfort, stress, and reduced outdoor activity

This potential short term air quality impact could have indirect implications for outdoors activities at nearby sensitive receptors, including schools (R2 and R4) and elderly populations, who may already experience limited mobility and rely on local outdoor environments.

Long-term health risk from chronic exposure is considered low, as operational emissions under normal generator testing are limited in duration and predicted annual average concentrations comply with relevant NSW EPA and NEPM criteria.

Health risk from toxic air pollutants (BTEX, PAH, formaldehyde), are assessed as negligible with concentrations predicted and conservatively assessed to be at near background levels and below relevant guideline values.

Fugitive emissions from fuel storage are expected to be minimal due to very low emission potential and control measures. As such, the likelihood of any off-site impacts is negligible, and the associate risk is considered very low.

6.5 Summary Air Quality Qualitative Assessment

The following qualitative assessment summarises the key air quality exposure pathways, sensitive receptors, plausible health consequences and residual risks associated with construction, generator operation and cumulative precinct emissions.

Table 13 Summary of Air Quality Qualitative Health Risk assessment, Mitigation Measures and Residual Risk

Source / Hazard and Exposure Pathway	Sensitive Receptors and Exposure Context	Plausible Health Consequence and Severity	Likelihood	Inherent Risk	Uncertainty	Mitigation / Evidence for Residual Risk	Residual Risk
Construction phase air quality — scenarios C1 and C2							
Construction dust from earthworks, haulage, loading/unloading, exposed surfaces and wind erosion. Primary pathway is inhalation of PM ₁₀ , PM _{2.5} and TSP; secondary pathway is dust deposition affecting amenity and outdoor activity.	Highest sensitivity applies to nearby schools, including Emmaus Catholic College, Trinity Catholic Primary School and Mamre Anglican School while occupied, together with nearby rural-residential receptors and the Emmaus Retirement Village. AQIA results indicate construction PM ₁₀ increments and criterion exceedances at educational receptors, requiring assessment of both short-term and repeated exposure over the construction period.	Moderate for short-term peak events; Low to Moderate for annual exposure. Plausible effects include respiratory irritation, asthma exacerbation, increased symptoms in susceptible children and older adults, nuisance dust, reduced outdoor activity and community concern. Because exposure may recur over construction works at educational receptors, the consequence is not limited to a minor temporary nuisance effect.	Likely during high-dust activities; Possible overall. Likelihood depends on activity location, dry and windy conditions, exposed surface area, traffic intensity and effectiveness of active controls.	Medium to High	Moderate. Confidence is affected by weather variability, exact construction sequencing, cumulative nearby works, receptor occupancy, and whether modelling assumptions fully represent peak dust-generating periods.	Residual risk reduction is justified only where controls demonstrably reduce source strength or receptor exposure. Required controls include a CAQMP, water carts and sprays, stabilisation of exposed areas, covering loads, haul-road management, speed limits, minimised drop heights, progressive rehabilitation, real-time PM monitoring at representative sensitive receptors, trigger-action response procedures, investigation of exceedances, temporary cessation or modification of works during adverse conditions, and communication with schools and nearby residents during high-dust periods. Controls already embedded in AQIA modelling are not double-counted; additional reduction relies on monitoring, adaptive management and trigger responses.	Low to Medium for educational and closest residential receptors while exceedance potential remains; Low for more distant receptors.
Diesel combustion emissions from construction plant, heavy vehicles and mobile equipment. Primary pathway is inhalation of diesel exhaust, PM _{2.5} , NO ₂ and related combustion pollutants.	Nearby schools, aged-care residents, rural-residential receptors and construction workers are most relevant. Worker exposure is managed primarily through WHS controls, while offsite exposure depends on equipment intensity, haul routes, proximity and meteorology.	Minor to Moderate. Potential effects include respiratory irritation, asthma exacerbation and cardiovascular stress in susceptible receptors, particularly where emissions coincide with high-dust periods.	Possible. Exposure is intermittent and activity-dependent but may recur throughout construction.	Medium	Moderate. Uncertainty relates to final plant fleet, engine standards, idling behaviour, haulage intensity and cumulative construction activity.	Use low-emission and well-maintained plant, avoid unnecessary idling, plan haul routes away from sensitive receptors where practicable, maintain equipment, stage high-emission activities, and include complaint and monitoring triggers in the CAQMP. Worker controls include WHS risk assessment, plant separation, ventilation for enclosed work areas where relevant and respiratory protection where required.	Low to Medium for closest sensitive receptors during intensive works; Low for other receptors.
Cumulative air quality impacts from concurrent construction and precinct development. Pathway is combined inhalation exposure to project and non-project emissions over the construction program.	Schools, the retirement village, nearby rural-residential receptors and broader residential communities may experience cumulative exposure where multiple construction programs overlap over the 10-year precinct development period.	Moderate. Potential consequences include repeated respiratory symptoms, cumulative nuisance dust, reduced outdoor amenity, stress and concern about long-duration precinct disturbance, particularly where sensitive receptors remain in place.	Possible. Likelihood depends on overlapping programs, meteorology, road use, regional background conditions and future precinct activity.	Medium	Moderate to High. Future development timing, intensity and background air quality are uncertain and partly outside the control of the Project.	Coordinate construction staging with precinct projects where practicable, use shared communication protocols, maintain monitoring at representative locations, and apply adaptive management where monitored PM levels or complaints indicate cumulative burden.	Low to Medium
Operational air quality — emergency generator operation scenarios E1A, E1B and E2							
Emergency diesel generator operation during feeder failure or grid interruption. Primary pathway is short-term inhalation of NO ₂ , PM ₁₀ , PM _{2.5} , TSP and diesel combustion products during rare emergency operation.	Most relevant receptors are nearby schools, including Emmaus Catholic College, Trinity Catholic Primary School and Mamre Anglican School while occupied, the Emmaus Retirement Village, nearby rural-residential receptors and workers or maintenance staff onsite. Exposure is expected to be short duration but may occur during periods when receptors are occupied. The AQIA specifies the anticipated number of standby generators operating under feeder-failure scenarios and uses these generator numbers in the emergency air-emissions modelling.	Moderate to Major for worst-case emergency scenarios. Plausible effects include acute respiratory irritation, asthma exacerbation, shortness of breath and cardiovascular stress in susceptible children, older adults and people with respiratory or cardiovascular disease. The consequence is elevated where modelled short-term criteria are approached or exceeded, or where multiple generators operate simultaneously under adverse meteorology.	Rare to Unlikely.	Medium to High under worst-case emergency assumptions.	Moderate. Uncertainty remains regarding event duration, emergency timing, meteorology, receptor occupancy and final operating response; however, the AQIA identifies the generator numbers modelled for one-, two- and three-feeder outage scenarios by stage, including full build-out operation of up to 842 generators under the three-feeder outage scenario.	Residual risk reduction depends on maintaining electrical redundancy, limiting generator operation to the duration needed for emergency response and load-transfer requirements, using low-emission generators where practicable, maintaining engines to manufacturer specifications, restricting non-essential generator operation, implementing emergency operating procedures, recording actual generator numbers and run times, and reviewing post-event air-quality performance where events occur. The AQIA emergency scenarios model different portions of the standby generator fleet according to feeder-outage scale and project stage; controls already incorporated into the AQIA modelling are not double-counted. Residual risk should remain conservative unless the controlled scenario demonstrates lower concentrations at sensitive receptors.	Low to Medium for closest and sensitive receptors, recognising that the AQIA has modelled emergency feeder-outage scenarios using the staged generator numbers identified above; for more distant receptors where criteria are met.

Operation – Maintenance testing Realistic (Scenarios M1A, M1B and M2)							
Scheduled maintenance testing of diesel generators. Primary pathway is intermittent inhalation of NO ₂ , PM _{2.5} , PM ₁₀ and diesel exhaust during scheduled test runs.	Nearby schools, aged-care residents, rural-residential receptors and onsite workers are relevant. Testing may occur during school hours or daytime residential occupancy with up to four or six concurrent generators depending on stage	Minor to Moderate. Potential effects include transient respiratory irritation, asthma exacerbation, odour-related concern and cardiovascular stress in susceptible receptors. Consequence is higher where testing produces substantial short-term NO ₂ increments, even if criteria are not exceeded.	Possible. Testing is scheduled and recurring, but exposure at any receptor depends on test frequency, duration, number of simultaneous generators, timing and meteorology.	Medium	Moderate. Uncertainty relates to the final maintenance testing regime, fleet size, simultaneous testing assumptions, receptor occupancy and meteorological conditions during testing.	Controls include limiting simultaneous generator testing, scheduling tests outside sensitive school and aged-care periods where practicable, avoiding testing during adverse dispersion conditions, maintaining engines and after-treatment systems, using low-emission equipment where practicable, logging test duration and operating load, and implementing complaints and trigger-action response procedures. Residual risk reduction should be based on the controlled testing regime, not on controls already assumed in the modelling.	Low to Medium for closest sensitive receptors under full-fleet testing scenarios. Low where controlled scheduling and modelling confirm criteria are met with adequate margin.
Toxic air pollutants from diesel combustion, including BTEX, PAHs and formaldehyde. Primary pathway is inhalation during generator operation; secondary pathway is perception and concern where diesel exhaust is visible or odorous.	Sensitive receptors include schools, aged-care residents, nearby residences and maintenance workers. Exposure is intermittent and generally linked to generator testing or emergency operation.	Minor. Where concentrations remain below adopted health-based criteria, direct toxicological health risk is low. Perceived risk, odour, irritation and community concern remain relevant health-related pathways.	Unlikely. Exposure is intermittent and expected to occur only during generator operation or fuel-related incidents.	Low	Low to Moderate. Uncertainty relates to final engine selection, emission factors, operating load, fuel quality and frequency of generator operation.	Controls include EPA-compliant equipment, engine maintenance, fuel quality management, spill prevention, periodic review of emission factors, restricted run times and investigation of complaints or odour events. Additional monitoring may be required if generator operating frequency materially exceeds assumptions.	Very Low to Low
Odour and amenity impacts from diesel exhaust, fuel handling or accidental spills. Pathways include odour perception, irritation, reduced outdoor activity, complaints and psychosocial concern.	Nearby schools, aged-care residents, rural-residential receptors, onsite workers and outdoor activity areas are relevant. Odour sensitivity varies between individuals and may be heightened where visible exhaust, generator noise or fuel handling occurs concurrently.	Minor. Expected health consequences are generally annoyance, transient irritation, stress or reduced outdoor amenity rather than clinically significant health effects, provided spills are controlled and odour criteria are met.	Unlikely to Possible. Diesel odour may occur during generator operation; spill-related odour should be rare with appropriate controls.	Low to Medium	Low to Moderate. Odour perception is variable and emergency operating duration is uncertain.	Controls include spill prevention, banded storage, spill kits, rapid response procedures, refuelling controls, restricted generator operating hours, complaints investigation and communication with nearby receptors where noticeable generator testing is scheduled.	Very Low to Low
Cumulative air quality contribution from Western Sydney International Airport (WSIA). Pathway is combined regional background exposure to airport-related combustion emissions, aircraft activity, ground support equipment, traffic and associated regional development, in combination with project emissions and other Mamre Road Precinct sources.	Relevant receptors include nearby schools, the Emmaus Retirement Village, nearby rural-residential receptors and broader Western Sydney communities. Direct project-related exposure remains localised, while WSIA is treated as a regional cumulative source influencing background conditions and long-term exposure context.	Minor to Moderate. Potential consequences include incremental contribution to respiratory and cardiovascular burden, increased community concern regarding cumulative growth-related air quality, and reduced confidence where airport, precinct and project activities overlap. Based on the screening assessment, WSIA increments are expected to be low and are unlikely to materially change project-only health risk conclusions.	Unlikely to Possible. The likelihood of coincident peak WSIA emissions, project emissions and adverse meteorological conditions at the closest sensitive receptors is considered low, but regional cumulative contribution remains plausible over the long term.	Low to Medium	Moderate. Uncertainty relates to future WSIA operating intensity, airport-related traffic, regional development timing, background air quality trends and the degree of temporal overlap with project construction and generator operation.	Residual risk reduction relies on retaining WSIA in the cumulative assessment narrative, reviewing updated regional air quality information where available, maintaining conservative background assumptions, implementing project-level dust and generator controls, and using monitoring and complaints data to identify any unexpected cumulative burden.	Low to Medium
Cumulative operational air quality from the project and other precinct developments. Pathway is combined inhalation exposure to operational emissions, generator testing, traffic and background regional air pollution over time.	Nearby schools, aged-care residents, rural-residential receptors and broader future communities within and around the Mamre Road Precinct may experience cumulative exposure as the precinct develops over the 10-year program.	Minor to Moderate. Potential consequences include incremental respiratory and cardiovascular burden, recurring irritation or concern, and cumulative community burden where multiple sources overlap.	Possible. Likelihood depends on future development timing, generator testing schedules, traffic growth, regional background conditions and other precinct emission sources.	Medium	Moderate to High. Future precinct timing, WSIA influence, background air quality, generator testing regimes and cumulative traffic assumptions are uncertain.	Residual risk reduction requires coordination of generator testing and construction activities where practicable, precinct-level monitoring where available, review of background conditions, and adaptive management if monitoring or complaints indicate cumulative burden.	Low to Medium

6.6 Quantitative Air Quality Assessment

The quantitative air quality assessment focuses on annual average pollutant concentrations, as these provide the most appropriate basis for estimating long-term population health outcomes using established exposure–response evidence. Short-term exposure metrics, including 1-hour NO₂ and 24-hour PM₁₀, have been considered qualitatively to characterise potential acute impacts and exposure variability, particularly for sensitive receptors; however, these short-term metrics are not directly incorporated into the quantitative health calculations where robust long-term exposure–response relationships are not available or are not applicable.

Air quality exposure estimates are derived from the Revised Air Quality Impact Assessment (AQIA) – Main Report – Northstar (2026); and Project design, staging and operational assumptions relevant to air emissions.

The air quality exposure metrics used for quantitative health risk characterisation are summarised below.

Table 14 Air Quality exposure metrics

Pathway	Metric	Basis
Air quality	PM _{2.5} , PM ₁₀ (µg/m ³)	AQIA dispersion modelling for construction, operation and cumulative scenarios.
Air quality	NO ₂ (µg/m ³)	Generator, construction plant, traffic and cumulative combustion emissions represented in the AQIA.

6.6.1 Air Quality Conceptual Model

The quantitative assessment follows a standard environmental health model **Source → Pathway → Exposure → Health Outcome → Population Impact**

- **Sources:** construction dust, diesel generators, construction plant and traffic-related combustion emissions.
- **Pathways:** inhalation of particulate matter, NO₂ and diesel-related pollutants.
- **Receptors:** nearby schools, aged-care receptors, rural-residential receptors, workers and broader population groups defined in Section 5.
- **Outcomes:** mortality and respiratory morbidity where suitable exposure–response evidence is available.

This framework ensures clear linkage between environmental changes and measurable health impacts.

The combined use of local baseline rates and internationally derived exposure–response coefficients is consistent with established environmental health risk assessment methodology. This approach aligns with enHealth guidance, which recommends integrating local population health data with the best available epidemiological evidence to estimate health impacts (enHealth, 2012), and reflects standard practice applied in WHO burden-of-disease assessments (WHO, 2021). Accordingly, this methodology ensures that the assessment is both locally relevant and scientifically robust. Health impacts are estimated using standard HIA function $\Delta Y = Y_0 \times \beta \times \Delta X \times P$.

Baseline health characteristics are assumed to reflect Western Sydney population averages, which generally include, higher prevalence of Cardiovascular disease, Respiratory conditions (e.g., asthma) and Socioeconomic variability associated with rapid urban growth

6.6.2 Exposure Scenarios

The following scenarios are assessed:

- **Construction phase:** dust and equipment emissions
- **Operation (typical):** background plant + limited generator testing

Conservative assumptions have been adopted to represent upper-bound exposure levels.

6.6.3 Exposure Inputs

Predicted changes in air quality exposures have been derived from the project-specific AQIA. Dispersion modelling indicates that long-term average project increments are small at surrounding sensitive receptors; however, short-

term and acute peak events for PM₁₀ and NO₂ increments remain relevant to qualitative risk characterisation, particularly for schools, aged-care receptors and nearby rural-residential receptors.

Maximum incremental annual average concentrations are:

- PM_{2.5}: ≤ 0.1 µg/m³
- NO₂: ≤ 0.1 µg/m³

These values represent the upper range of modelled impacts at sensitive receptors and are substantially below relevant NSW EPA criteria. For the purposes of quantitative health modelling, these upper-bound values have been conservatively adopted.

6.6.4 Scenario Definition

The assessment considers the construction and operational phases, the cumulative exposures within the Mamre Road Precinct and two population scenarios to reflect both current conditions and future development within the Mamre Road Precinct.

- **The current population (~1,800 people)** is derived from Australian Bureau of Statistics (ABS) Census data for Kemps Creek and surrounding statistical areas (ABS, 2021).
- **The future population (~10,000 people)** reflects projected growth associated with the Western Sydney Aerotropolis and Mamre Road Precinct planning framework, including increased workforce and supporting residential development, as identified in NSW Government strategic planning documents (NSW DPHI, 2020; NSW Government, 2018). This future scenario represents a conservative assumption within the range of population growth anticipated for the Western Sydney Employment Area and is consistent with assumptions adopted in comparable environmental impact assessments.

6.6.5 Health Outcome Selection

The selection of health outcomes assessed in this HIA is based on established environmental epidemiological evidence, particularly from the World Health Organization (WHO) and large-scale cohort studies, which demonstrate consistent associations between environmental exposures (air pollution and noise) and specific health endpoints. The outcomes selected; premature mortality, respiratory hospital admissions, and cardiovascular effects (hypertension), are widely recognised as core indicators of population health burden in environmental health risk assessments.

- **Premature mortality** is the most robust and widely used endpoint in quantitative health impact assessments of air pollution. Numerous large-scale epidemiological studies demonstrate a consistent association between exposure to fine particulate matter (PM_{2.5}) and increased all-cause mortality, even at relatively low concentrations.
 - The WHO Global Air Quality Guidelines (2021) establish that there is no safe threshold for PM_{2.5} exposure, with mortality risk increasing linearly with concentration.
 - Long-term exposure to PM_{2.5} is associated with increased risk of Cardiovascular disease, Respiratory disease, Lung cancer

Premature mortality is included as a key outcome as it represents the most robust and widely applied indicator of long-term health impacts associated with exposure to air pollution, particularly PM_{2.5}. Epidemiological evidence demonstrates a consistent association between incremental increases in PM_{2.5} and all-cause mortality risk, with no identified safe exposure threshold (WHO, 2021; Cohen et al., 2017).

- **Respiratory hospital admissions** are selected because they represent short- to medium-term health impacts, are sensitive to changes in air pollutant concentrations, particularly, NO₂, PM₁₀ and PM_{2.5}
 - The WHO and multiple meta-analyses confirm that increases in NO₂ and particulate matter are associated with asthma exacerbation, Bronchitis, Chronic obstructive pulmonary disease (COPD). These effects are more pronounced in children and elderly populations, which are present in the study area (schools and aged care facilities)

Respiratory hospital admissions are included to capture acute and short-term morbidity associated with exposure to air pollutants such as NO₂ and particulate matter. These outcomes are strongly supported by epidemiological evidence linking air pollution to increased rates of asthma exacerbation, bronchitis and

hospitalisation, particularly among vulnerable populations including children and the elderly (WHO, 2021; Atkinson et al., 2014).

For the purpose of quantitative modelling, the following NSW-average baseline rates are applied:

- All-cause mortality rate: 0.0075 per person/year
- Respiratory hospitalisation rate: 0.01 per person/year

Parameters are derived from international epidemiological literature (WHO and peer-reviewed studies):

Table 15 β Coefficient

Exposure	Outcome	β Coefficient
PM _{2.5}	Mortality	0.006 per $\mu\text{g}/\text{m}^3$
NO ₂	Respiratory Admissions	0.002 per $\mu\text{g}/\text{m}^3$

6.7 Quantified Air Quality Exposure Health Impacts

The following results summarise the estimated incremental air-quality-related health outcomes for the current and future population scenarios, based on the exposure inputs and assumptions.

Table 16 Air Quality Health Outcome Estimates for Current and Future Population Scenarios

Air quality health outcome	Current population scenario	Future population scenario
Premature mortality associated with PM _{2.5}	0.008/year	0.05/year
Respiratory hospital admissions associated with NO ₂ and particulate matter	0.004/year	0.02/year

6.8 Health Risk Characterisation

The air quality health risk characterisation in this section focuses on long-term population-level exposure and the quantitative air quality health impact estimates presented in Sections 6.6 and 6.7. It characterises the likely significance of chronic health outcomes associated with annual average PM_{2.5} and NO₂ exposure increments from the Proposal. Short-term exposure pathways, including construction dust episodes, generator maintenance testing and emergency generator operation, are addressed qualitatively elsewhere in the report and are not the focus of this section.

The quantitative assessment indicates that predicted annual average incremental concentrations of PM_{2.5} and NO₂ are very small, with maximum adopted increases of approximately $\leq 0.1 \mu\text{g}/\text{m}^3$. Application of established exposure–response relationships together with NSW baseline health rates results in estimated changes of approximately 0.008 premature deaths per year under the current population scenario and approximately 0.05 premature deaths per year under the future population scenario. For respiratory hospital admissions, the estimated incremental burden is approximately 0.004 cases per year under the current population scenario and approximately 0.02 cases per year under the future population scenario.

These values are substantially less than one additional case per year for each assessed health outcome. On this basis, the Proposal's long-term contribution to population-level health burden from annual average PM_{2.5} and NO₂ exposure is characterised as negligible to very low. The estimated changes are small in both absolute terms and relative to baseline population health rates, indicating that the Proposal is not expected to result in a measurable increase in chronic air quality-related mortality or respiratory hospital admissions at a population level.

The quantitative findings should be interpreted as population-level estimates rather than predictions of individual health events. The assessment is consistent with the enHealth environmental health risk assessment framework by combining exposure magnitude, exposure duration, baseline health rates, exposure–response evidence and uncertainty to evaluate the likely significance of chronic health outcomes. While individual susceptibility varies across the population, the very small annual average exposure increments and very low estimated health burden indicate that long-term population health risk associated with the Proposal is negligible to very low.

6.9 Mitigation, Monitoring and Residual Risk

The Air Quality Impact Assessment identifies that potential health-related air quality risks would be managed through a combination of design controls, operational restrictions, best practice construction controls, management plans and Trigger Action Response Plans.

During construction, the key potential air quality risk relates to particulate matter generated by bulk earthworks, material handling, vehicle movements on unsealed surfaces, wind erosion of exposed areas and stockpiles, and diesel-fueled plant and equipment. Construction impacts are proposed to be managed through a Construction Air Quality Management Plan and a construction-phase Trigger Action Response Plan. These would include best practice dust controls, real-time air quality monitoring, response triggers, and escalation measures to reduce construction-related particulate matter emissions where required.

Construction controls identified in the assessment include water application, management of haulage routes, vehicle speed controls, careful handling of materials, management of exposed areas, reduction or pausing of activities where required, and staged responses informed by monitoring outcomes. The assessment notes that, where additional controls or reduced activity rates are applied, construction-related air quality impacts can be managed so that criteria are achieved. Bulk earthworks are proposed to occur in one stage and prior to operation of the data centre campus, reducing the potential for cumulative construction and operational emissions.

During operation, emissions would primarily arise from standby diesel generator maintenance testing and emergency operation during electricity supply interruption. The Proposal would be supplied by multiple electricity feeders, providing redundancy and reducing the likelihood that widespread standby generator operation would be required. The AQIA identifies 842 standby generators at full build-out and specifies the staged generator numbers assumed for emergency feeder-failure scenarios. For Stage 1A, one feeder failure assumes 141 generators, while two or three feeder failures assume 282 generators. For Stage 1B, one, two and three feeder failures assume 281, 422 and 562 generators respectively. For Stage 2 / full build-out, one, two and three feeder failures assume 281, 562 and 842 generators respectively. These numbers are used in the AQIA emergency air-emissions modelling for one-, two- and three-feeder outage scenarios. The data centre is not proposed to use generators for grid firming, and routine operation of generators would be limited to scheduled maintenance testing, commissioning and emergency use.

Operational mitigation measures include:

- limits on the number of generators that may be tested concurrently;
- generator testing generally limited to daytime hours between 8:00 am and 6:00 pm;
- annual at-load testing and shorter no-load testing periods;
- integration of air quality management with noise management zones and generator testing constraints;
- consideration of publicly available air quality and meteorological information when scheduling testing, where practicable;
- coordination with nearby data centre operators where practicable to reduce the likelihood of coincident generator testing;
- operating records for generator testing and emergency operation;
- complaint response procedures;
- communication procedures; and
- implementation of an operational Trigger Action Response Plan.

For fuel storage, mitigation measures include dedicated and appropriately sized on-site fuel storage, double-walled tanks, tertiary bunding, automated leak detection, compliance with relevant Australian and New Zealand Standards, and spill containment at tank fill connections, pumps and filters where required. These measures would reduce the likelihood of fugitive emissions, spills and off-site odour impacts.

6.9.1 Monitoring and Management

Monitoring and management measures would be implemented during both construction and operation.

For construction, the Construction Air Quality Management Plan and Trigger Action Response Plan would provide the framework for monitoring and responding to dust risks. The TARP would include real-time air quality monitoring,

defined trigger levels, response actions, record keeping, communication requirements and review mechanisms. Monitoring outcomes would guide the application of additional controls, including increased dust suppression, reduced activity rates, modification of work practices or temporary cessation of dust-generating activities where required.

For operation, the operational Trigger Action Response Plan would provide a structured framework for managing air quality risks associated with scheduled testing and operation. The operational TARP would include:

- objectives and scope;
- application of the TARP to scheduled testing and emergency operation;
- integration with noise management requirements;
- cascading trigger levels and corresponding response actions;
- consideration of meteorological and background air quality conditions where practicable;
- communication procedures;
- complaint response procedures;
- operational monitoring and review;
- auditing and review; and
- record keeping.

The operational TARP would not prevent emergency generator operation where required to maintain power supply, electrical safety or critical operations. Rather, it would provide a framework to minimise potential impacts where practicable, support escalation and communication, and ensure generator operating events are recorded and reviewed.

Generator operating records would be maintained, including the number of generators operated, operating duration, testing or emergency purpose, timing and relevant response actions. Post-event review would be undertaken following significant generator operating events to confirm whether additional management actions are required.

6.9.2 Summary of Air Quality Quantitative Health Risks, Mitigation Measures and Residual Risk

The table below summarises key exposure pathways, associated health risks, mitigation measures and the resulting residual risk following implementation of proposed management controls.

Table 17 Summary of Air Quality Quantitative Health Risks, Mitigation Measures and Residual Risk

Scenario / pathway	Key pollutant or stressor	Most sensitive receptors	Quantified Health Outcome	Consequence	Likelihood	Inherent risk	Key Management controls	Residual risk with controls
Long-term population exposure - current population scenario	Annual PM _{2.5} and NO ₂ exposure increments	Broader exposed population, including nearby schools, Emmaus Retirement Village, rural-residential receptors and people with pre-existing respiratory or cardiovascular disease	Approximately 0.008 premature deaths/year and 0.004 respiratory hospital admissions/year.	Negligible	Unlikely	Very Low	- Limited generator operation, with routine use restricted to scheduled maintenance testing, commissioning and emergency operation only. - Multiple electricity feeders and N-1 redundancy reducing the likelihood that widespread standby generator operation would be required. - Data centre generators not proposed for grid firming. - Generator operating records maintained for testing and emergency operation, including number of generators, operating duration, timing and purpose. - Operational TARP and monitoring framework to support review and adaptive management where operating assumptions change.	Very Low
Long-term population exposure – future population scenario	Annual average PM _{2.5} and NO ₂ exposure increments	Future exposed population within the surrounding precinct, including sensitive sub-populations where present	Approximately 0.05 premature deaths per year and 0.02 respiratory hospital admissions per year	Negligible	Unlikely	Very Low	Ongoing operational management, review of generator operating hours, compliance with modelled assumptions, air quality management procedures and adaptive management where monitoring or operational changes identify increased exposure	Very Low
Chronic air quality health burden from annual average PM_{2.5}	Long-term incremental PM _{2.5} exposure	Children, older adults and people with respiratory or cardiovascular conditions, considered within the population-level assessment	Contributes to the quantified premature mortality and respiratory hospital admission estimates; total incremental burden remains substantially less than one additional case per year	Negligible	Unlikely	Very Low	Minimise routine combustion emissions, limit standby generator use to testing and emergency purposes, maintain equipment, apply operating procedures and review emissions assumptions if generator use materially changes	Very Low
Chronic air quality health burden from annual average NO₂	Long-term incremental NO ₂ exposure	Nearby schools, aged-care residents, rural-residential receptors and people with asthma or other respiratory conditions, considered within the population-level assessment	Contributes to the quantified health impact estimates; total incremental burden remains substantially less than one additional case per year	Negligible	Unlikely	Very Low	Operational controls for generator testing, maintenance scheduling, operating records, compliance with AQIA assumptions and review if operating frequency or duration changes	Very Low

6.9.3 Air Quality Residual Risk Interpretation

Following implementation of the proposed mitigation and monitoring measures, the residual long-term population health risk associated with the Proposal is considered negligible to very low.

The quantitative assessment demonstrates that long-term exposure to incremental concentrations of PM_{2.5} and NO₂ would result in a negligible to very low population health burden, with estimated increases in mortality and respiratory hospital admissions well below one additional case per year. These findings indicate that chronic health risks associated with the Proposal are not expected to materially affect population health outcomes.

The predicted annual average incremental concentrations of PM_{2.5} and NO₂ are very small, with maximum adopted increases of approximately $\leq 0.1 \mu\text{g}/\text{m}^3$. When these increments are applied to established exposure–response relationships and NSW baseline health rates, the estimated additional health burden remains substantially less than one additional case per year for both assessed outcomes. The current population scenario results in approximately 0.008 premature deaths per year and 0.004 respiratory hospital admissions per year, while the future population scenario results in approximately 0.05 premature deaths per year and 0.02 respiratory hospital admissions per year. These results indicate that, after implementation of the proposed operational air quality controls, generator testing restrictions, monitoring, record keeping and adaptive management measures, the Proposal is not expected to result in a measurable increase in chronic air quality-related mortality or respiratory hospital admissions at a population level. On this basis, the residual risk from long-term exposure to annual average PM_{2.5} and NO₂ increments is characterised as Very Low.



7 Noise and Vibration Health Assessment

Renzo Tonin & Associates (RTA) provided acoustic and vibration advice for the concept design development stage of the proposed Mamre Road Data Centre Campus.

7.1 Existing Acoustic Environment

The proposal site is within the Mamre Road Precinct (MRP), an area transitioning from predominantly rural land (rural dwellings, grazing land, farm dams and scattered vegetation) to a large-scale industrial/logistics precinct associated with Western Sydney Airport.

Surrounding land now includes a mix of remaining rural-residential properties and increasingly, approved and under-construction industrial estates.

Background noise varies over time; therefore, it's been assessed separately for the daytime, evening and night time period. The rating background environmental noise levels (RBLs) at representative monitoring locations generally range from about 36–48 dB(A) by day, 33–46 in the evening and 30–37 dB(A) at night, influenced mainly by traffic on Mamre Road and other roads.

These monitored RBLs are used to derive construction noise management levels (NMLs) for each noise catchment area (NCA).

To address the MRP DCP and SEARs requirements the receivers surrounding the development were grouped into three categories, described below. A detailed list of the receivers' locations has been included in Appendix B.

7.2 Sources, Hazards and Exposure Pathways

This section identifies the noise and vibration sources, health-relevant hazards and complete or plausible exposure pathways considered in the noise and vibration health assessment. It is structured using the source–pathway–receptor approach required by the qualitative and quantitative assessment methods in Sections 4.2 and 4.3. The focus is on noise and vibration circumstances that may affect nearby schools, aged-care receptors, rural-residential receptors, industrial neighbours, construction workers and future site occupants.

The main noise and vibration hazards are airborne construction noise, operational mechanical plant noise, generator maintenance testing noise, emergency generator noise, construction traffic noise, low-frequency noise, ground-borne vibration and cumulative precinct noise. The primary exposure pathway is auditory exposure. Secondary pathways include vibration perception, sleep disturbance, speech masking, learning interference, annoyance, stress responses, reduced outdoor amenity and concern regarding building damage or sensitive equipment performance.

- **Construction noise sources:** excavators, trucks, compactors, road saws, rock hammers, piling or hammer attachments, generators, pumps, mobile plant, bulk earthworks, roadworks, building construction and material handling across staged works areas.
- **Construction vibration sources:** smooth drum rollers, jackhammers, excavators with hammer attachments, compaction equipment and heavy vehicle movements, with potential for perceptible vibration and concern regarding cosmetic damage or sensitive equipment response.
- **Construction traffic sources:** heavy vehicles, light vehicles, haulage, deliveries and site access movements on Mamre Road and designated construction routes, including potential out-of-hours movements where approved.
- **Operational mechanical plant sources:** chillers, transformers, reactor or capacitor banks, building cooling units, PFC rooms, SBU systems, condenser fans, pump house equipment, ventilation plant and car park vehicle movements.
- **Generator sources:** containerised generator units, exhaust flue outlets and load banks during scheduled maintenance testing and rare emergency operation.
- **Cumulative sources:** overlapping construction phases, other Mamre Road Precinct developments, operational traffic, industrial facilities and future precinct activity that may increase the frequency, duration or perceived persistence of noise exposure.

During construction, the health-relevant hazards include intermittent high-noise events, repeated daytime construction noise, out-of-hours works, construction traffic and perceptible vibration. Potential health effects include annoyance, stress responses, speech interference, reduced concentration, disturbance to teaching and outdoor recreation, sleep disturbance where night-time works occur, and vibration-related concern or discomfort.

During operation, routine noise is expected to be associated with continuous or semi-continuous mechanical plant and intermittent vehicle movements. Generator maintenance testing and rare emergency generator operation are assessed as discrete intermittent sources because they may produce higher short-term noise levels, different acoustic character and increased community noticeability compared with routine plant noise.

- **Auditory exposure pathway:** exposure to airborne construction, operational plant, traffic and generator noise at indoor and outdoor receptor locations.
- **Learning and communication pathway:** speech masking, reduced listening conditions and interference with classroom, library, assembly and outdoor learning activities at nearby schools.
- **Sleep and rest pathway:** potential sleep disturbance, rest disruption and stress responses at residences and aged-care receptors, particularly for night-time or intermittent high-noise events.
- **Annoyance and amenity pathway:** repeated or noticeable noise, low-frequency components, generator operation and cumulative construction activity may contribute to annoyance, perceived loss of amenity, reduced outdoor use and community concern.
- **Vibration perception pathway:** perceptible vibration, rattling or ground-borne vibration may cause annoyance, concern about property damage or concern about sensitive equipment, even where structural damage criteria are not exceeded.
- **Occupational exposure pathway:** construction and maintenance workers may be exposed to higher noise and vibration levels during plant operation, managed primarily through WHS controls, hearing protection, exclusion zones and work planning.
- **Cumulative exposure pathway:** combined exposure to project noise and other precinct noise sources over the 10-year construction and operational transition period.

The likelihood and significance of exposure depend on activity type, noise source level, duration, timing, frequency, receptor proximity, receptor sensitivity, existing background noise, shielding, meteorological conditions, construction staging and the effectiveness of embedded mitigation. Sensitive receptors include nearby schools, the Emmaus Retirement Village, rural-residential receptors, industrial neighbours, workers and future site occupants. These receptors are considered explicitly in Sections 7.3 to 7.8.

Short-term exposure pathways include construction phases involving high-noise equipment, out-of-hours works, generator maintenance testing, emergency generator operation and discrete vibration-generating activities. These events are assessed for acute relevance, receptor sensitivity, timing, duration, noticeability and reversibility of effects.

Longer-term exposure pathways include repeated construction noise over staged works, continuous operational plant noise, cumulative precinct activity and low-frequency operational noise where it is persistent or noticeable. These pathways are relevant to annoyance, stress, sleep, learning, cardiovascular and wellbeing outcomes, particularly where sensitive receptors remain in place during the transition of the Mamre Road Precinct.

7.3 Receptors and Sensitive Populations Relevant to Noise

The noise and vibration assessment uses the consolidated receptor framework in Section 5 as the primary receptor register. Noise sensitivity is highest for nearby educational, residential and aged-care receptors where exposure to construction noise, operational plant noise, generator testing, emergency generator operation and vibration may affect learning, sleep, rest, communication, amenity and wellbeing. The detailed receptor locations and receptor-type classifications are therefore not repeated here; this section focuses on how those receptors are affected by the noise and vibration pathways assessed in Sections 7.4 to 7.8.



7.4 Noise and Vibration Assessment

7.4.1 Construction Phase

Construction activities will generate intermittent increases in airborne noise levels particularly those within the MRP short-term zones (e.g., NCA01, NCA03 and NCA04) with the greatest impacts expected during high-noise tasks such as rock-hammering, saw-cutting, and heavy earthworks occurring close to the site boundary.

During typical single-phase construction, noise at schools in NCA01 and NCA02 is generally predicted to remain below NMLs. However, where two phases overlap, cumulative noise may increase generally up to ~3 dB(A) during bulk earthworks, subject to works location and concurrent activities. Phase 0 has the greatest potential for overlapping activities (bulk earthworks, road construction, Parcel A + COSH construction, Parcel B construction).

The schools in NCA01 and NCA02 are predicted to experience exceedances of approximately 7–14 dB(A) above NMLs during the bulk earthworks or road construction (Phase 7) stages, and between 1 dB(A) up to 13 dB(A) above the NML during the parcel construction stages.

For all other residences or during typical construction activities, due to the substantial distance from the construction works, the construction noise levels are predicted to be below the standard hours NMLs.

The adjacent industrial facilities may experience construction noise levels above the noise management level when works are close to the shared boundary.

During out-of-hours works, predicted noise levels for typical construction activities remain below the night-time Noise Management Levels and sleep-disturbance screening criteria; however, any unavoidable impulsive or tonal high-noise events may momentarily disturb sleep for the nearest residents. In the unlikely event that this happens, these impacts are expected to be short-lived and reversible due to the staged, mobile nature of the works.

Vibration generated by heavy plant, particularly smooth drum rollers and excavators fitted with hammer attachments, may be perceptible at nearby dwellings, schools and industrial premises, leading to short-term annoyance or concern regarding potential building damage and structural safety. However, modelling indicates that distances to all receptors exceed the cosmetic damage screening thresholds, meaning structural damage is unlikely. Vibration exposures are therefore expected to be limited to human-perception effects, such as temporary rattling of household items or awareness of ground vibration, rather than physical harm.

Cumulative effects arising from concurrent construction within the wider Mamre Road Precinct may increase construction noise levels but will also increase the frequency and duration of construction noise events, potentially prolonging periods of annoyance for some receptors. Nevertheless, when feasible and reasonable noise and vibration mitigation measures are applied, including equipment selection, acoustic shielding, scheduling controls and monitoring, residual health impacts are predicted to remain low to moderate, predominantly characterised by temporary annoyance, short-term disturbance and minimal risk of long-term or severe health outcomes.

Table 18 Approximate construction phases and duration of works

Stage	Construction phase / works	Works area (Figure 8)	Construction activities	Approximate duration
Stage 0	Site establishment	Entire of Stage 1A/ Stage 1B / Stage 2	Site establishment and early works Establishment of construction facilities	Year 0 4 months construction period
	Bulk Earthworks & Temporary Access	Entire of Stage 1A/ Stage 1B / Stage 2	Cut/fill to finished levels (western and eastern portion of the site), including bulk earthworks, excavation works and retaining wall works Drainage basins	Year 0–1 1 year construction period
		Entire of Stage 1A/ Stage 1B / Stage 2	Initial road connection to GPT Remaining civil excavation works and retaining wall works Utilities related works, including drainage formation, and installation of early service conduits, temporary power and water connections	Year 1–2 1 year construction period
Stage 1A	Construction of Parcel A and COSH buildings, and associated works	Stage 1A	Permanent access road connection to Yiribana Logistics Estate Sewerage connection Emergency access to Bakers Lane Remaining civil, utilities and in-ground works Campus and Parcel road works and carparking (all part of the parcel) Landscaping	Year 1–4 3 year construction period
		Along Bakers Lane and Mamre Road frontage	Trunk watermain along Bakers Lane and Mamre Road frontage.	
		Stage 1A building extents	Parcel A building construction, including electrical substation. Construction of COSH buildings and associated works Incoming electrical switching station and Statcom construction. Building fitout (including chillers and associated infrastructure, and associated works) Commissioning	
Stage 1B	Construction of Parcel B and associated works	Stage 1B	Drainage basins Civil, utilities and in-ground works Campus and Parcel road works and carparking Landscaping	Year 2–5 3 year construction period



		Stage 1B building extents	Parcel B building construction, including electrical substation, chillers and associated infrastructure, and associated works. Building fitout Commissioning	
	Northern Access road	Northern Access road (NAR)	Construction of the NAR fronting the site	Year 5 1 year construction period
Stage 2	Construction of Parcel C and associated works	Stage 2	Civil, utilities and in-ground works Campus and Parcel road works and carparking Landscaping Sydney Water trunk drainage channel Final services connection to Stage 2	Year 2-10 3 year construction period
		Stage 2 building extents	Parcel C building construction, including electrical substation, chillers and associated infrastructure, and associated works. Building fitout Commissioning	
		Road 01 and Road 02	Construction of permanent roundabout and Road 02 Construction of Road 01 north of Roundabout	

Notes

1. In most cases, multiple construction phases will be occurring concurrently. As such there are overlaps between the various works and the approximate duration of construction phases.
2. Timeframes are indicative and may change.



Figure 8 Key construction work assessment and modelling areas (NVIA (amended), 2026)

7.4.2 Operational Phase

During routine operation, the data centre will generate continuous noise emissions from cooling systems, air handling units, transformers, fans, and associated mechanical plant. Noise modelling indicates that several short-term residential receptors within the Mamre Road Precinct (MRP), particularly in NCA01, NCA03, and NCA04 may experience residual noise levels up to 5 dB(A) above the Project Noise Trigger Levels (PNTLs) after feasible and reasonable mitigation has been applied. These exceedances are classified as “Marginal” under the NSW Noise Policy for Industry (NPfI), noting the noise levels are also below the NPfI recommended amenity noise level.

Marginal exceedances are perceptible and may contribute to:

- Low-level annoyance
- Reduced outdoor or indoor acoustic amenity
- Perceived loss of environmental quality in transitioning industrial areas

Given that these receptors are expected to remain only in the short term, the duration of potential health effects is limited. Long-term residential and educational receptors are not expected to experience exceedances due to incorporated design mitigation.

Scheduled generator testing constitutes the primary intermittent noise source during daytime operational periods. Under worst-case scenarios, up to six generators may run concurrently, producing temporary noise levels that exceed PNTLs by 1–5 dB(A) at a small number of educational and short-term residential receptors.

These rare temporary increases may lead to:

- Short-term annoyance or disruption
- Reduced speech intelligibility outdoors
- Mild stress responses among noise-sensitive individuals (e.g., children, elderly residents)

However, this events exposures occur infrequently, during daytime only, and for limited durations.



In the rare event of a mains power failure, all backup generators may operate simultaneously. This represents the loudest potential operational noise condition, but would be an extremely rare occurrence due to the redundancy in the design.

Modelling of maximum instantaneous noise levels (LA_{max}) confirms that no residential receivers are predicted to exceed sleep-disturbance screening criteria, and awakening reactions are not expected.

Emergency noise events may still produce:

- Acute startle or stress responses
- Temporary concern among residents or facility users

However, these reactions would be short-lived, infrequent, and unlikely to result in meaningful health impacts.

Low-Frequency Noise (LFN) assessment identified instances where low-frequency components exceed recommended C–A weighted levels and low-frequency thresholds at specific short-term and industrial receptors. While these exceedances do not present a direct health hazard, LFN can be perceived as vibration-like or “rumbling.”

Potential impacts include:

- Increased annoyance relative to equivalent broadband noise levels
- Sensations of discomfort for particularly sensitive individuals

LFN effects are expected to be limited to a small number of transitional receptors within the MRP.

Operational traffic, including staff vehicles and occasional service or delivery trucks, is predicted to increase road noise levels by less than 1 dB(A). Such a change is below the threshold of perceptibility for most individuals.

- No measurable change to community noise exposure
- No anticipated effects on sleep, annoyance, or wellbeing

Operational vibration from fixed mechanical plant is negligible. No exceedances of human comfort or structural vibration criteria are predicted.

- No health impacts expected
- No risk to sensitive equipment or structural integrity

While the facility will introduce continuous and intermittent noise sources typical of an industrial data centre, the majority of sensitive long-term receptors are not expected to experience adverse health effects due to the significant mitigation incorporated into the design. Minor, short-term impacts may occur for transitional residential receivers within the Mamre Road Precinct, primarily in the form of annoyance, reduced amenity, or temporary stress responses during generator testing or emergency scenarios. These impacts are limited in duration, scope, and intensity, and do not pose significant long-term health risks.

7.5 Summary Noise and vibration Qualitative Assessment

The following qualitative assessment summarises the key noise and vibration exposure pathways, receptor sensitivities, potential health consequences and residual risks for construction and operational scenarios.

Table 19 Noise and vibration - Health Risk Assessment

Source / Hazard and Exposure Pathway	Sensitive Receptors and Exposure Context	Plausible Health Consequence and Severity	Likelihood	Inherent Risk	Uncertainty	Mitigation / Evidence for Residual Risk	Residual Risk
Construction phase noise and vibration							
Daytime construction noise from bulk earthworks, roadworks, building construction and high-noise plant. Primary pathway is auditory exposure at indoor and outdoor receptor locations, with secondary annoyance, speech interference and reduced amenity pathways.	Most relevant receptors are nearby schools, including Emmaus Catholic College, Trinity Catholic Primary School and Mamre Anglican School while occupied, together with nearby rural-residential receptors, the Emmaus Retirement Village and industrial neighbours. Receptor sensitivity is highest where construction noise affects classrooms, libraries, outdoor learning areas, residences or aged-care rest areas.	Moderate. Plausible effects include annoyance, stress responses, speech masking, reduced concentration, temporary disruption to learning or outdoor recreation, and reduced amenity. Severity is higher for schools and aged-care receptors where exposure coincides with sensitive activities or repeated high-noise periods.	Likely during high-noise works; Possible overall. Likelihood depends on works location, plant type, duration, shielding, construction sequencing, school timing and whether phases overlap.	Medium to High	Moderate. Confidence is affected by final construction methodology, exact staging, concurrent works, receptor occupancy, weather, shielding and the variability of high-noise activities.	Residual risk reduction relies on a CNVMP, standard construction hours, quieter plant and methods, temporary acoustic screens or barriers where effective, optimised worksite layout, separation from sensitive receptors, respite periods for sustained high-noise work, monitoring at representative sensitive receptors, trigger-action responses, complaints investigation and advance communication with schools, aged-care receptors and nearby residents. Controls already assumed in acoustic modelling are not double-counted when assigning residual risk.	Low to Medium for closest schools, residences and aged-care receptors during high-noise works; Low for more distant receptors where predicted levels remain below management levels.
Construction traffic noise on Mamre Road and designated access routes. Pathway is auditory exposure to heavy vehicle movements, deliveries, haulage and site access activity.	Nearby rural-residential receptors, schools, road-fronting properties and road users are relevant. Exposure is most likely during peak construction traffic periods and where traffic routes pass close to existing dwellings or school access areas.	Minor to Moderate. Potential effects include increased annoyance, perceived traffic disturbance, intermittent speech interference outdoors and reduced amenity during peak movements. Health significance increases where traffic occurs during sensitive periods or repeatedly over long durations.	Possible. Likelihood depends on final haul routes, traffic volumes, timing, road gradient, vehicle behaviour and traffic-management controls.	Low to Medium	Moderate. Uncertainty relates to construction traffic volumes, route timing, overlap with other projects and final construction traffic management arrangements.	Controls include approved haul routes, restricted delivery timing where practicable, avoidance of sensitive night-time periods, speed management, vehicle maintenance, avoidance of unnecessary idling and engine braking, delivery coordination, driver induction and community notification for unusual traffic peaks.	Low where traffic is managed and incremental change remains minor; Low to Medium during peak construction traffic periods close to sensitive receptors.
Construction vibration from rollers, compactors, jackhammers, excavators with hammer attachments and heavy vehicle movements. Pathway is ground-borne vibration perception, rattling and concern about building damage or sensitive equipment effects.	Nearby residences, schools, industrial facilities and workers may perceive vibration during vibration-intensive works. The health pathway is primarily annoyance, concern and stress rather than direct physical injury where cosmetic damage criteria are not exceeded.	Minor to Moderate. Effects may include perceptible vibration, rattling, temporary discomfort, interruption to concentration and concern about structural damage. Severity is higher where repeated vibration occurs near sensitive receptors or equipment-sensitive industrial uses.	Possible. Likelihood depends on plant selection, ground conditions, distance to receptors, duration and whether works occur within human-comfort minimum working distances.	Medium	Moderate. Uncertainty relates to ground conditions, actual plant type, operating locations, receptor sensitivity and equipment vulnerability.	Controls include minimum working distances, selection of lower-vibration methods where practicable, vibration trials at commencement of intensive works, monitoring with alert thresholds, buffer zones, work-hour restrictions, dilapidation surveys, communication with nearby receptors and responsive changes to plant or methodology if vibration complaints or trigger levels occur.	Low to Medium where vibration remains perceptible but below damage criteria; Low where monitoring confirms low levels at receptors.
Out-of-hours construction works	Night-time or evening construction noise and potential sleep disturbance	Nearby residential receivers, aged care residents and other sensitive night-time receptors	Potential sleep disturbance, reduced rest and increased annoyance if works occur during evening or night periods.	Medium to High	Moderate	Limit out-of-hours works to justified and necessary activities; obtain appropriate approvals; undertake targeted notification and consultation; apply stricter scheduling controls; use quieter methods and equipment; monitor noise during approved out-of-hours works; implement complaints and corrective action procedures.	Low to Moderate. Residual sleep and amenity risk depends on frequency, duration and timing of works, but should be manageable where out-of-hours works are limited and actively controlled.
Cumulative construction noise and vibration from the Project and other Mamre Road Precinct developments. Pathway is combined auditory exposure and vibration perception over the 10-year precinct transition period.	Schools, the retirement village, rural-residential receptors and industrial neighbours may experience increased frequency and duration of construction disturbance where several projects overlap.	Moderate. Potential consequences include prolonged annoyance, reduced respite, stress, reduced outdoor amenity, learning disruption during high-noise periods and cumulative community concern about long-duration construction activity.	Possible. Likelihood depends on overlap between construction programs, timing of high-noise works, precinct traffic, receptor occupancy and coordination between projects.	Medium	Moderate to High. Future project timing, intensity and mitigation by other developments are uncertain and partly outside the control of this Project.	Controls include precinct coordination where available, construction staging optimisation, communication protocols, shared complaint review, monitoring at representative sensitive receptors, respite planning for repeated high-noise periods and adaptive management where cumulative complaints or monitoring indicate increased burden. Residual risk should not be reduced below Low–Medium unless monitoring confirms effective cumulative control.	Low to Medium until cumulative monitoring and coordination demonstrate lower exposure.
Operational phase noise and vibration							
Continuous operational mechanical plant noise from chillers, transformers, ventilation plant, condenser fans, pump house equipment and associated infrastructure.	Relevant receptors include nearby rural-residential receptors, short-term receivers within the Mamre Road Precinct, schools while present, the Emmaus Retirement Village and industrial neighbours. Sensitivity is higher where continuous plant noise is noticeable at night or includes low-frequency or tonal characteristics.	Minor to Moderate. Potential effects include ongoing annoyance, reduced amenity, stress response and sleep or rest disturbance if night-time levels are noticeable or exceed relevant criteria. Consequence is higher for aged-care and	Possible to Likely for closest short-term receptors; Unlikely to Possible for long-term receptors after mitigation.	Medium	Low to Moderate. Uncertainty relates to final plant selection, operating load, low-frequency characteristics, façade attenuation assumptions, receptor occupancy and commissioning performance.	Controls include embedded acoustic design, plant selection to meet sound-power limits, enclosures, silencers, barriers, orientation of louvres and vents away from sensitive receptors, low-frequency noise review, post-commissioning compliance monitoring, corrective actions if PNTLs are exceeded, and at-property	Low to Medium for short-term receptors while present; Low for long-term receptors where monitoring confirms compliance and low-frequency characteristics are controlled.

Pathway is long-term auditory exposure, including annoyance, amenity and stress pathways.		residential receptors where exposure is continuous.				mitigation or agreements for short-term receptors where required.	
Operational road traffic and site vehicle movements	Road traffic noise from staff vehicles, deliveries, loading dock activity and site access	Nearby residential receivers, schools and other receptors along access routes	Potential minor amenity impact from increased traffic or loading activity, particularly if movements occur during sensitive periods.	Low to Medium	Moderate	Manage site access routes; design loading docks and car parking to minimise noise; manage delivery timing where practicable; maintain smooth traffic flow; review traffic noise if actual volumes materially differ from assumptions.	Low. Residual risk is expected to be low where traffic increases remain minor and operational management is implemented.
Loading dock and delivery operations	Intermittent loading noise, vehicle manoeuvring, reversing alarms, truck movements and delivery activity	Nearby residential receivers, schools and sensitive uses near loading areas	Potential short-term amenity disturbance from intermittent events, particularly if audible during quieter periods.	Medium	Moderate	Locate and design loading areas to maximise shielding; manage delivery timing; minimise unnecessary idling; use broadband reversing alarms where feasible; maintain loading dock equipment; monitor and respond to complaints.	Low. Residual impacts are expected to be minor and intermittent with appropriate operational management.
Scheduled generator maintenance testing. Pathway is intermittent auditory exposure to higher short-term generator noise during daytime testing.	Nearby schools, aged-care residents, rural-residential receptors and onsite workers are relevant. Testing may affect classroom activities, outdoor learning, rest periods or amenity if undertaken during sensitive times or if several generators operate concurrently.	Minor to Moderate. Potential effects include short-term annoyance, speech interference outdoors, disruption to teaching or rest, and stress responses in noise-sensitive individuals. Consequence is higher if testing occurs during school teaching, examination or aged-care rest periods.	Possible. Testing is scheduled and recurring, but exposure depends on test frequency, duration, number of generators, timing, receptor occupancy and acoustic controls.	Medium	Moderate. Uncertainty relates to final testing regime, simultaneous generator assumptions, full-fleet staging, acoustic character and sensitivity of nearby school or aged-care activities.	Controls include limiting simultaneous testing, scheduling testing outside sensitive school and aged-care periods where practicable, restricting unnecessary testing duration, maintaining generator acoustic enclosures and exhaust attenuators, advance notification, complaints response, monitoring during representative tests and review of the testing program if exceedances or complaints occur. Residual reduction should be based on the controlled testing regime, not controls already assumed in modelling.	Low to Medium for closest sensitive receptors under full-fleet testing scenarios; Low where controlled scheduling and monitoring confirm acceptable levels.
Emergency generator operation during mains power failure or feeder interruption. Pathway is rare, short-term auditory exposure to simultaneous generator operation, including possible startle, stress and sleep-disturbance pathways.	Nearby residences, the Emmaus Retirement Village, schools and onsite workers are relevant. Night-time emergency operation is particularly relevant to sleep and rest pathways, although modelling indicates sleep-disturbance screening thresholds are not expected to be exceeded.	Minor to Moderate. Potential effects include temporary annoyance, startle, concern and short-term stress. Consequence would increase if night-time events were prolonged or repeated, or if low-frequency or tonal components were prominent.	Rare to Unlikely. Emergency use is not routine and depends on feeder reliability, grid conditions, redundancy and duration of the event.	Low to Medium	Moderate. Uncertainty relates to actual event duration, number of generators operating, emergency timing, acoustic character and receptor occupancy.	Controls include maintaining electrical redundancy, confirming emergency operating logic, limiting generator run time to the minimum required for continuity of supply, maintaining acoustic enclosures and attenuators, recording actual emergency run times, reviewing noise performance after events and communicating with affected receptors where repeated events occur.	Low where events remain rare, short duration and below sleep-disturbance criteria; Low to Medium if repeated or prolonged events occur.
Low-frequency noise and tonal or intermittent acoustic character from operational plant or generator operation. Pathway is auditory perception, rumble, annoyance and potential sleep or rest disturbance where low-frequency components are noticeable.	Closest residences, aged-care receptors, schools and industrial neighbours are relevant. Low-frequency noise may be more noticeable indoors and may contribute to disproportionate annoyance compared with broadband levels.	Minor to Moderate. Potential effects include annoyance, perceived vibration-like rumble, reduced rest, stress and complaints. Direct physical health effects are not expected where criteria are met, but wellbeing effects may be material for affected individuals.	Possible. Likelihood depends on final plant selection, acoustic enclosure performance, operating load and receptor building characteristics.	Medium	Moderate. Uncertainty relates to equipment acoustic spectra, façade attenuation, tonal penalties and subjective sensitivity to low-frequency components.	Controls include equipment sound-power specifications, low-frequency design review, acoustic treatment of plant, attenuators, enclosure testing, operational verification monitoring, applying annoying-characteristic corrections and corrective actions where tonal or low-frequency components are identified.	Low to Medium until commissioning monitoring confirms low-frequency and tonal components are controlled; Low once verified.
Operational vibration from fixed plant and equipment. Pathway is vibration transmission through structures or ground to occupied spaces or sensitive equipment.	Future site occupants, maintenance staff and industrial neighbours are the main receptors. Offsite residential and institutional receptors are not expected to experience material operational vibration.	Negligible to Minor. Direct health effects are not expected. Potential effects are limited to awareness, annoyance or equipment concern if isolation systems are not maintained.	Unlikely. Operational vibration is expected to be controlled through equipment isolation and installation requirements.	Low	Low. Uncertainty is limited where equipment isolation and commissioning checks are implemented.	Controls include vibration isolation, equipment balancing, commissioning checks, maintenance inspections, investigation of complaints and corrective action if perceptible vibration or equipment concerns arise.	Very Low to Low
Cumulative operational noise from the Project and other future precinct sources. Pathway is combined long-term auditory exposure to operational plant, traffic, industrial activity and future precinct development.	Nearby residences, schools, aged-care receptors, future communities and industrial neighbours may experience cumulative amenity effects as the Mamre Road Precinct develops.	Minor to Moderate. Potential consequences include cumulative annoyance, reduced perceived respite, sleep or rest concerns for residential and aged-care receptors, and broader wellbeing impacts where multiple sources overlap.	Possible. Likelihood depends on future precinct development timing, operational loads, traffic growth and cumulative industrial activity.	Medium	Moderate to High. Future precinct source timing and performance are uncertain and partly outside Project control.	Controls include cumulative acoustic design allowances, compliance with PNTLs and precinct amenity criteria, post-commissioning verification, ongoing complaints review, adaptive management and coordination with precinct planning where practicable. Residual risk should remain conservative where future cumulative sources are uncertain.	Low to Medium until cumulative operational conditions are verified; Low where monitoring confirms compliance and low complaint burden.

7.6 Quantitative Noise Assessment

The quantitative noise assessment focuses on long-term and repeated noise exposure metrics that can be linked to established health outcomes, particularly annoyance, sleep disturbance and cardiovascular stress. Short-duration events, including generator maintenance testing, emergency generator operation and discrete high-noise construction activities, are interpreted using health-based criteria, receptor sensitivity and the qualitative risk assessment in Section 7.5 where numerical exposure–response functions are not suitable.

Noise exposure estimates are derived from the Noise and Vibration Impact Assessment (NVIA), including modelled construction, operational, maintenance testing and emergency noise levels at representative receptors, together with timing, duration, receptor occupancy and adopted internal noise assumptions where relevant.

Table 20 Noise exposure metrics

Pathway	Metric	Basis
Noise	L _{Aeq} and relevant period-average noise levels, dB(A)	NVIA acoustic modelling for construction, operation and cumulative scenarios.
Noise	L _{Amax} , sleep disturbance screening levels and internal classroom/rest assumptions	NVIA assessment of generator events, construction activity, façade attenuation and sensitive activity areas.

7.6.1 Noise Conceptual Model

The quantitative assessment follows the same standard environmental health model (Source → Pathway → Exposure → Health Outcome → Population Impact) and HIA Function ($\Delta Y = Y_0 \times \beta \times \Delta X \times P$) as the air quality assessment.

- **Sources:** construction plant, construction traffic, operational mechanical plant, generator maintenance testing, emergency generator operation and cumulative precinct noise.
- **Pathways:** auditory exposure, sleep and rest disturbance, learning and communication interference, annoyance, stress response and vibration perception.
- **Receptors:** nearby schools, Emmaus Retirement Village, rural-residential receptors, industrial neighbours, onsite workers and future occupants defined in Section 5.
- **Outcomes:** annoyance, sleep disturbance, learning interference and cardiovascular stress where exposure duration and evidence support assessment.

Baseline health characteristics for the noise assessment are assumed to reflect Western Sydney population averages, including variability in baseline cardiovascular health, prevalence of sleep disturbance and stress-related conditions, and socioeconomic variability associated with rapid urban growth. These factors are relevant because they may influence community sensitivity to environmental noise, particularly among children, older adults, shift workers and people with pre-existing cardiovascular or mental health conditions.

7.6.2 Exposure Scenarios

The following noise and vibration exposure scenarios are assessed:

- **Construction phase:** airborne construction noise, construction traffic noise and vibration from earthworks, roadworks, piling/hammering, compaction, building construction and concurrent staged works.
- **Operation (typical):** continuous or semi-continuous mechanical plant noise from chillers, transformers, cooling equipment, ventilation systems and ancillary operational plant.
- **Low-frequency noise** scenario: operational plant and generator noise with potential low-frequency or tonal components that may increase annoyance or perceived vibration-like effects at sensitive receptors.

Conservative assumptions have been adopted to represent upper-bound exposure levels, particularly for nearby schools, the Emmaus Retirement Village, rural-residential receptors and other sensitive receivers where exposure may coincide with learning, rest, sleep or outdoor activity periods.



7.6.3 Exposure Inputs

Predicted changes in noise exposure have been derived from the NVIA. Operational noise increases at surrounding sensitive receptors are generally limited and controlled through design and operational measures. For the purposes of quantitative health impact assessment, an upper-bound long-term noise increase of approximately 4 dB(A) has been adopted where this is consistent with the modelled receptor exposure and where the exposure duration is sufficient to support population-level interpretation.

7.6.4 Scenario Definition

The scenario definition for the quantitative noise assessment adopts the same current and future population scenarios used for the air quality assessment in Section 6.6.4, enabling consistent comparison of population-level health outcomes across environmental determinants.

7.6.5 Noise Health Outcome Selection

Noise-related health outcomes are selected based on the strength of available evidence and compatibility with the project's exposure metrics. Annoyance and sleep disturbance are considered qualitatively and quantitatively where suitable metrics are available. Cardiovascular effects, represented by hypertension, are included as an indicative long-term outcome because chronic environmental noise can contribute to stress-response pathways and cardiovascular burden. Learning interference is assessed qualitatively for schools because classroom activity, speech intelligibility and internal noise conditions are highly receptor-specific.

Hypertension has been selected as the principal cardiovascular endpoint for the long-term noise assessment because it is biologically plausible, clinically important and supported by a substantial epidemiological evidence base linking chronic environmental noise exposure with cardiovascular stress pathways. Long-term noise exposure can activate autonomic and endocrine stress responses, disturb sleep and reduce physiological recovery time, which may contribute to sustained elevations in blood pressure over time. While the strongest evidence base is for transport noise, particularly road traffic noise, the same stress, sleep-disturbance and annoyance pathways are relevant when assessing persistent or repeated operational plant, generator testing and cumulative precinct noise where exposure may recur over extended periods.

The World Health Organization systematic review supporting the Environmental Noise Guidelines identified cardiovascular and metabolic outcomes, including hypertension and ischaemic heart disease, as key health endpoints for environmental noise assessment. The review reported high-quality evidence for an association between road traffic noise and ischaemic heart disease, with a relative risk of 1.08 per 10 dB Lden, and noted that many studies also examined hypertension, although the certainty of the hypertension evidence varied by study design and noise source. More recent cohort-based meta-analysis evidence indicates a statistically significant association between long-term traffic noise exposure and incident hypertension, with pooled estimates around HR 1.03 per 10 dB for continuous exposure metrics and HR 1.07 for higher versus lower exposure categories.

For this Project, hypertension is therefore used as a conservative long-term cardiovascular indicator rather than as a prediction of individual disease causation. It is most relevant for receptors with prolonged or repeated exposure windows, including nearby residential receptors, the Emmaus Retirement Village and school communities where staff may experience repeated occupational-day exposure. Children are not assessed for hypertension as the primary endpoint; for schools, learning interference, speech masking, annoyance and stress pathways remain the more relevant health endpoints. However, the presence of children, older adults and people with pre-existing cardiovascular disease increases the importance of managing noise exposure and maintaining adequate respite.

Project-area relevance is supported by the Western Sydney health context. HealthStats NSW provides local population health data for the Western Sydney Local Health District, and the Australian Bureau of Statistics reports that hypertension prevalence increases strongly with age, with approximately 11.6% of Australians reporting hypertension in 2022 and much higher prevalence among older age groups. These data support the assumption that older adults and people with pre-existing cardiovascular risk factors may be present within the broader Western Sydney receptor population. Project-specific baseline hypertension prevalence data for Kemps Creek or the immediate Mamre Road Precinct were not identified; therefore, NSW and Western Sydney population health datasets have been used as the most appropriate local evidence base, supplemented by international exposure-response literature.

For the purpose of quantitative modelling, the following NSW-average baseline rates are applied:

- Hypertension incidence: 0.02 per person/year

Parameters are derived from international epidemiological literature (WHO and peer-reviewed studies):

Table 21 β Coefficient

Exposure	Outcome	β Coefficient
Noise	Hypertension	0.01 per dB

7.7 Quantified Noise Health Impacts

The following results summarise the estimated incremental noise-related health outcomes for the current and future population scenarios, based on the exposure inputs and assumptions.

Table 22 Noise Health Outcome Estimates for Current and Future Population Scenarios

Noise health outcome	Current population scenario	Future population scenario
Hypertension associated with long-term noise exposure	1–2/year	8/year

The quantified noise outcome is interpreted as an indicative population-level estimate rather than a precise prediction of individual cases. The estimate is more sensitive to population assumptions than the air-quality estimate because the adopted noise increment is larger and may persist where operational plant noise is continuous or where cumulative precinct noise increases over time. Receptor-specific effects at schools and aged-care receptors remain primarily addressed through the qualitative assessment because timing, internal noise levels, activity type and vulnerability strongly influence health relevance.

7.8 Health Risk Characterisation

The quantitative noise health risk characterisation integrates the exposure inputs and quantified health outcome estimates presented in Sections 7.6 and 7.7 with the receptor sensitivity, exposure duration and qualitative noise pathways identified in Sections 7.3 to 7.5. The assessment is consistent with the enHealth environmental health risk assessment framework and considers exposure magnitude, timing, frequency, receptor vulnerability, baseline population health and uncertainty. The purpose of this section is to characterise the likely significance of noise-related health outcomes associated with the Proposal, rather than to predict individual health events.

For long-term exposure, the quantitative noise assessment indicates that the estimated population-level burden associated with project-related environmental noise is low. The health outcomes considered include annoyance, sleep disturbance, learning interference and cardiovascular stress where suitable exposure-response evidence or health-based guideline values are available. The calculated outcomes are interpreted as indicative estimates of population health burden and are not intended to represent deterministic predictions for individual receptors.

The quantitative results indicate that project-related noise is unlikely to result in a material increase in long-term population health burden when assessed across the current and future population scenarios. Predicted changes in population-level outcomes are expected to be small and are likely to be concentrated among receptors located closest to construction activities, operational plant and generator testing sources. For the broader population, noise exposure increments are generally below levels expected to produce measurable changes in health outcomes.

Notwithstanding the low population-level burden, health outcomes are not uniformly distributed. The most sensitive receptors include nearby schools, the Emmaus Retirement Village, rural-residential receptors and people with heightened sensitivity to noise, including children, older adults, people with existing cardiovascular conditions and people with limited ability to control their exposure environment. These receptors may experience greater sensitivity to short-term or intermittent noise events, even where broader population-level risk remains low.

Construction noise represents the primary pathway of concern. The Noise and Vibration Impact Assessment identifies potential exceedances of construction Noise Management Levels at nearby educational receptors during bulk earthworks, road construction and periods where multiple construction activities overlap. Associated health effects may include annoyance, temporary stress responses, speech interference, reduced outdoor amenity and disruption to learning activities. These effects are expected to be most relevant during high-noise works occurring close to sensitive receptors and during periods of cumulative construction activity within the Mamre Road Precinct.

Operational plant noise is expected to be managed through embedded acoustic design, including plant selection, screening, enclosures and site layout. Residual operational noise impacts are primarily associated with marginal exceedances at a small number of short-term transitional receptors within the Mamre Road Precinct. These



exceedances may be perceptible and may contribute to low-level annoyance or reduced amenity; however, based on the available assessment, they are unlikely to result in significant long-term health effects for long-term educational, residential or aged-care receptors.

Low-frequency noise and vibration are secondary pathways that may influence perceived amenity and community response. Low-frequency components may be more noticeable than broadband noise at some receptors and may contribute to annoyance where persistent or tonal characteristics are present.

Overall, the quantitative noise assessment indicates that the Proposal is unlikely to result in a significant adverse population health impact. Long-term population-level risks are characterised as very low to low. The primary residual risks are short-term, localised and receptor-specific, particularly construction noise at nearby schools, generator testing at the closest sensitive receptors, and cumulative precinct disturbance during overlapping works. With implementation of mitigation, monitoring and adaptive management measures, residual noise-related health risks are expected to be acceptable, subject to verification through monitoring and ongoing management.

7.9 Mitigation, Monitoring and Residual Risk

The Noise and Vibration Impact Assessment identifies a range of mitigation and management measures to reduce potential health, amenity, learning and sleep-related impacts associated with construction and operational noise and vibration from the Mamre Road Data Centre Campus. The assessment has considered nearby residential receivers, existing schools, an aged care facility, places of worship and other sensitive land uses, with particular attention to prolonged construction exposure, cumulative impacts, generator testing, and the progressive staging of the development.

7.9.1 Construction noise and vibration mitigation

Construction noise and vibration impacts are to be managed through a combination of planning, engineering controls, work scheduling, consultation and monitoring. Key mitigation measures include:

- Preparation and implementation of a Construction Noise and Vibration Management Plan or equivalent construction environmental management documentation prior to works commencing.
- Use of standard construction hours wherever practicable, with out-of-hours works limited to activities that are justified, necessary and appropriately managed.
- Further planning of construction staging and phasing to minimise cumulative impacts on nearby schools, aged care and residential receivers.
- Consolidation of bulk earthworks where practicable to reduce the overall duration of high-noise construction activities.
- Investigation of construction sequencing that enables partially completed structures to provide acoustic shielding to sensitive receivers.
- Selection of quieter plant and equipment where feasible and reasonable.
- Regular maintenance of plant and equipment to avoid unnecessary noise from poorly maintained machinery.
- Use of temporary acoustic barriers, hoarding, earth bunds, localised screens or other shielding where practicable, particularly around stationary or high-noise equipment.
- Strategic positioning of noisy plant, such as rock crushers, away from sensitive receivers and/or behind terrain, bunds or structures.
- Management of diesel tower crane operations, including consideration of their number, height, location, operational characteristics and cumulative contribution to construction noise.
- Avoidance of unnecessary simultaneous operation of high-noise plant where this would materially increase impacts.
- Use of respite, scheduling controls or activity rotation where extended exposure or noise fatigue risks are identified.
- Consultation with affected schools, aged care operators and sensitive receivers to identify particularly sensitive times, spaces and activities.

- Consideration of the full range of school uses, including classrooms, libraries, chapels, assembly areas, outdoor learning areas, co-curricular activities, weekend use and other activities beyond core teaching hours.
- Development of site-specific management measures for school receivers, recognising that impacts may depend on the timing, duration and nature of activities in affected spaces.
- Use of complaints and enquiry management procedures to respond to community concerns and implement corrective actions where required.
- Application of vibration management measures, including minimum working distances for vibration-intensive plant, pre-start checks and vibration monitoring where works are close to sensitive structures or vibration-sensitive equipment.

7.9.2 Operational noise mitigation

Operational noise mitigation has been incorporated into the amended design and is intended to reduce long-term noise exposure from mechanical plant, cooling systems, electrical infrastructure, loading activities, vehicle movements and generator testing. Key measures include:

- Reduction in the overall scale of the development compared with the previous design, including a reduction in the number of parcels and building height.
- Revised site layout to improve acoustic shielding and reduce potential exposure at nearby sensitive receivers.
- Use of buildings and structures to shield key operational noise sources from critical receiver locations.
- Incorporation of acoustic design treatments to mechanical plant and building services where required.
- Use of acoustic barriers, screens, enclosures, acoustic absorption, silencers, attenuators or louvres where feasible and reasonable.
- Design management of air-cooled chillers, cooling plant, low-voltage and high-voltage electrical equipment, generators, fire pump rooms and other mechanical services.
- Inclusion of in-principle building services and mechanical plant mitigation requirements for detailed design development.
- Management of loading dock and delivery activities to minimise unnecessary noise, particularly during more sensitive periods.
- Management of staff vehicle movements, car parking and access arrangements to minimise operational road traffic noise increases.
- Implementation of generator testing management measures, including controls on testing locations, concurrent generator numbers and testing scenarios.
- Consideration of worst-case operational scenarios, including typical operations, generator maintenance testing, staged development operation and emergency critical power failure operations.
- Review of annoying noise characteristics, including tonality, intermittency and low-frequency noise, with adjustments applied where relevant.
- Consideration of sleep disturbance impacts from maximum noise events during the night period.

7.9.3 Mitigation for sensitive receivers

Additional mitigation considerations have been identified for schools and the aged care facility due to their potential sensitivity to noise impacts. These include:

- Detailed identification of sensitive activity areas within schools and aged care uses.
- Use of receiver-specific assessment locations for sensitive school spaces.
- Consideration of health, learning and amenity impacts on children, including reference to health-based guidance such as the World Health Organization Guidelines for Community Noise and guidance for educational facilities.



- Review of internal noise levels using outside-to-inside noise reduction assumptions, including consideration of classroom construction, window types, ventilation and typical operating conditions.
- Adoption of conservative assumptions where spaces have multiple uses.
- Potential confirmation of outside-to-inside noise reduction during detailed design or operational verification where required.
- Ongoing consultation with school and aged care stakeholders to manage high-impact or extended-duration construction activities.

7.9.4 Monitoring

Monitoring is required to confirm that mitigation measures are effective, identify any exceedances or emerging impacts, and support adaptive management during both construction and operation.

7.9.4.1 Construction monitoring

Construction monitoring should include:

- Attended and/or unattended noise monitoring during representative high-noise activities, particularly where works occur near sensitive receivers.
- Monitoring during periods of concurrent construction activities or overlapping construction stages where cumulative impacts may occur.
- Targeted noise monitoring at the most affected school, aged care or residential receivers where predictions indicate potential exceedances or where complaints are received.
- Vibration monitoring where vibration-intensive works occur within relevant minimum working distances of structures, heritage items, buried services, sensitive equipment or occupied buildings.
- Review of plant and equipment noise levels against assumed sound power levels used in the assessment.
- Regular review of construction staging and activity scheduling to identify opportunities to reduce exposure duration.
- Monitoring of out-of-hours works, where approved or required, to verify compliance with relevant noise management objectives.
- Recording of complaints, enquiries, monitoring results, exceedances and corrective actions.
- Regular review of mitigation effectiveness and updating of controls where monitoring indicates higher than expected impacts.

7.9.4.2 Operational monitoring

Operational monitoring should include:

- Noise compliance monitoring after commencement of operation, including representative assessment of typical operational scenarios.
- Monitoring of staged operations as each development stage or parcel becomes operational.
- Verification monitoring of generator maintenance testing scenarios, particularly where multiple generators are tested concurrently.
- Review of operational noise levels during day, evening and night periods against applicable project noise trigger levels and cumulative noise criteria.
- Assessment of low-frequency, tonal or intermittent characteristics where relevant.
- Monitoring or verification of sleep disturbance-related maximum noise events where required.
- Review of operational road traffic noise changes where traffic volumes materially differ from assessment assumptions.
- Ongoing review of complaints and operational performance to identify the need for further mitigation or management.

7.9.4.3 Adaptive management

Where monitoring identifies exceedances, complaints or materially greater impacts than predicted, additional management actions should be implemented. These may include:

- Review and adjustment of construction methods, plant selection, staging or work hours.
- Additional acoustic screening or localised barriers.
- Additional respite or scheduling controls for high-impact works.
- Further consultation with affected sensitive receivers.
- Review of generator testing arrangements, including number, timing and location of concurrent tests.
- Refinement of operational plant settings, maintenance practices or acoustic treatments.
- Follow-up monitoring to confirm the effectiveness of corrective actions.

7.9.5 Noise Residual Risk interpretation

Following implementation of the proposed mitigation and management measures, most construction and operational noise and vibration impacts are expected to be reduced to reasonable and practical level. However, residual risks remain due to the scale, duration and staged nature of the development, the proximity of sensitive receivers and the cumulative noise environment within the Mamre Road Precinct.

7.9.5.1 Construction residual risk

Residual construction risks include:

- Temporary exceedances of construction noise management levels may occur during high-noise activities, particularly earthworks, use of heavy plant, tower crane operations and other difficult-to-mitigate sources.
- Noise fatigue may occur where receivers are exposed to construction noise over extended periods, even where individual noise events are managed.
- Sensitive school receivers may experience temporary disturbance to learning, concentration, communication or amenity during higher-noise construction periods.
- Aged care and residential receivers may experience temporary amenity impacts, particularly during prolonged or concurrent construction activities.
- Residual construction risk is expected to be highest where high-noise works occur close to sensitive receivers or where works are prolonged, concurrent or undertaken outside standard construction hours.

Overall, with implementation of construction mitigation, monitoring and adaptive management, residual construction health risks are expected to be **low to moderate**, depending on the activity, location, duration and receiver sensitivity. Residual amenity and disturbance impacts may remain for some sensitive receivers, but these should be manageable through consultation, scheduling, respite and responsive mitigation.

7.9.5.2 Operational (typical) residual risk

Residual operational risks include:

- Some residual noise impacts may remain at short-term receivers within the Mamre Road Precinct, particularly where the future acoustic environment is transitioning from rural/residential to industrial.
- Sensitive school and aged care receivers may remain sensitive to intermittent, tonal or low-frequency components if not adequately controlled through detailed design and verification.
- Sleep disturbance risk from routine operations is expected to be limited where maximum noise events are controlled and operational noise criteria are achieved.

With incorporated design mitigation, operational management and compliance monitoring, residual operational health risk is expected to be **low**, with some **low to moderate amenity risk** for short term receivers located within or close to the Mamre Road Precinct during the transition to an industrial land use setting.



7.9.5.3 Overall residual risk statement

The assessment indicates that the amended design and proposed mitigation measures materially reduce potential adverse noise and vibration impacts. Residual risks relate primarily to temporary construction disturbance, cumulative exposure during overlapping stages, potential noise fatigue, and operational generator testing. These risks can be managed through detailed construction planning, consultation with sensitive receivers, compliance monitoring, complaints management and adaptive mitigation.

The residual health risk associated with the Proposal is therefore considered acceptable, provided the recommended mitigation, monitoring and ongoing management measures are implemented and reviewed throughout construction and operation.

7.9.6 Summary of Noise Quantitative Health Risks, Mitigation Measures and Residual Risk

The table below summarises key long term and repeated noise exposure pathways, associated health risks, mitigation measures and the resulting residual risk following implementation of proposed management controls.

Table 23 Summary of Noise Quantitative Health Risks, Mitigation Measures and Residual Risk

Scenario / pathway	Key pollutant or stressor	Most sensitive receptors	Quantified Health Outcome	Consequence	Likelihood	Inherent risk	Key Management controls	Residual risk with controls
Long-term operational noise exposure	Continuous environmental noise from mechanical plant, cooling systems, electrical infrastructure and site operations	Nearby residents, aged care residents, schools, children, older adults, people with pre-existing cardiovascular disease	Hypertension associated with long-term noise exposure: 1–2 cases/year (current population); 8 cases/year (future population)	Minor	Possible	Moderate	Acoustic design, plant enclosures, barriers, shielding, site layout optimisation, compliance monitoring	Low
Population-level health burden	Total long-term environmental noise exposure attributable to the proposal	Future population within the study area	Hypertension: 1–2 cases/year (current population); 8 cases/year (future population)	Minor	Possible	Moderate	Integrated operational noise mitigation and compliance verification	Very Low - Low



7.10 Cumulative Noise Assessment

The Noise and Vibration Impact Assessment identifies cumulative noise as a key issue for the Mamre Road Data Centre Campus because the Proposal is located within the Mamre Road Precinct, an area transitioning to industrial and employment land uses. The cumulative assessment considers both:

- operational industrial noise from the Proposal in combination with other existing, approved and proposed developments within the Mamre Road Precinct and adjoining areas; and
- construction noise from overlapping Proposal stages, nearby external construction projects, and the potential overlap between construction and early operational activities.

Cumulative exposure may affect amenity, learning, communication, rest, sleep and community wellbeing, particularly where sensitive receivers experience prolonged or repeated exposure.

7.10.1 Operational cumulative industrial noise

The operational assessment applies the NSW Noise Policy for Industry approach to cumulative industrial noise. The assessment establishes project noise trigger levels that account for clustering of noise-generating industry within the Mamre Road Precinct, appropriate amenity noise levels, and the changing acoustic environment as the area transitions from a more rural/residential setting to industrial land use.

Cumulative operational noise has been addressed through:

- assessment of cumulative industrial noise in accordance with the NSW Noise Policy for Industry;
- consideration of clustering of noise-generating industry within the Mamre Road Precinct;
- adoption of project noise trigger levels that account for cumulative noise contributions from the broader industrial precinct;
- consideration of long-term and short-term receiver contexts within the Mamre Road Precinct;
- assessment of progressive operational stages of the Proposal, including each stage in isolation and combined operation;
- consideration of operational noise during day, evening and night periods;
- assessment of typical operations, generator maintenance testing, emergency critical power failure scenarios and other worst-case operational scenarios; and
- consideration of annoying characteristics, including tonality, intermittency and low-frequency noise.

Cumulative operational noise is expected to be an important issue for short-term receivers within the Mamre Road Precinct during the transition period. Although the area is planned for industrial development, some sensitive receivers may remain during the transition and may experience changes in acoustic amenity before land use change is complete.

7.10.2 Cumulative construction noise

Cumulative construction noise can potentially be an issue because construction of the Proposal may occur over an extended period and may overlap with other development within the Mamre Road Precinct. The construction program is expected to be staged and may be influenced by market demand and tenant requirements. As a result, some construction activities may overlap across Proposal stages, and other external projects may also be constructed concurrently.

The document identifies the following cumulative construction noise considerations:

- potential overlap between Proposal construction stages;
- potential overlap between construction of the Proposal and other nearby external projects;
- cumulative construction noise impacts from concurrent projects within or near the Mamre Road Precinct;
- cumulative impacts from construction and operational noise where early operational stages overlap with later construction stages;
- potential for prolonged construction exposure and noise fatigue;

- potential cumulative impacts on schools, aged care and residential receivers;
- the need to consider duration of exposure at affected school receivers, rather than predicted noise levels alone; and
- the need to assess difficult-to-mitigate sources, including diesel tower cranes and high-noise plant such as rock crushers.

Cumulative construction noise should be interpreted as a potential temporary but prolonged stressor. Even where individual construction events are short-term, repeated or overlapping activities may increase annoyance, reduce perceived respite, affect learning conditions, and contribute to fatigue **over time**.

7.10.3 Overlap between construction and operation

Distinguishes between construction noise from operational noise have been assessed under separate NSW guidelines; however, from a health and wellbeing perspective, receivers may experience the combined acoustic environment regardless of regulatory classification.

This means the cumulative noise assessment should consider the lived experience of affected receivers, including:

- construction noise from active works;
- operational noise from completed stages;
- generator maintenance testing;
- loading, vehicle and mechanical plant noise;
- cumulative exposure duration; and
- the availability of respite between noisy activities.

Although construction and operational noise are assessed separately for compliance purposes, their combined contribution may be relevant to perceived amenity, annoyance and **fatigue**.

7.10.3.1 Noise fatigue and prolonged exposure

The document identifies noise fatigue and long-term construction impacts as important considerations. This is particularly relevant where construction occurs over multiple years or where sensitive receivers experience repeated exposure from several sources.

Noise fatigue may arise where:

- construction activity is prolonged;
- several construction stages overlap;
- external projects contribute additional noise;
- high-noise activities occur frequently;
- operational noise begins before construction is complete;
- respite periods are limited; or
- communication with affected receivers is insufficient.

Noise fatigue is considered as a health and wellbeing pathway associated with chronic annoyance, stress, reduced perceived control and disruption to daily activities.

7.10.3.2 Generator testing and cumulative operational contribution

Backup generator maintenance testing is identified as a key operational noise scenario. The NVIA considers generator testing location management, worst-case concurrent generator testing scenarios, and operational management measures.

Generator testing is considered as a cumulative noise contributor because it may occur in addition to typical mechanical plant operation and other industrial noise sources. While testing is intermittent, it may be noticeable due to its character, potential tonality, low-frequency content or short-duration intensity.

Relevant cumulative considerations include:

- number of generators tested concurrently;
- timing and frequency of tests;
- location of tested generators relative to sensitive receivers;
- whether testing overlaps with school activities or sensitive periods;
- whether testing occurs during periods of other construction or operational noise; and
- effectiveness of management measures to reduce testing impacts.

7.10.4 Health interpretation

From a health impact perspective, cumulative noise from the Proposal and broader precinct may contribute to:

- annoyance and reduced acoustic amenity;
- interference with communication and learning;
- disturbance to rest and sleep, particularly during night-time maximum noise events;
- stress or concern associated with prolonged construction activity;
- reduced enjoyment of outdoor areas;
- increased sensitivity or fatigue where exposure is repeated over time; and
- potential cumulative burden for receivers already exposed to road traffic, aircraft, industrial or construction noise.

The most relevant health pathways are expected to be annoyance, learning and communication disturbance, sleep disturbance, stress and reduced wellbeing. The greatest cumulative health sensitivity is likely to occur at schools, aged care uses, residential receivers and short-term sensitive receivers within the Mamre Road Precinct.

7.10.5 Management and mitigation relevant to cumulative noise

The document identifies several mitigation and management measures relevant to cumulative noise, including:

- revising the scale and layout of the Proposal to reduce operational noise exposure;
- using buildings and structures to improve acoustic shielding;
- incorporating design mitigation for mechanical plant, cooling systems, generators and other building services;
- managing generator testing locations and the number of concurrent generators tested;
- assessing staged operational scenarios;
- consolidating bulk earthworks where practicable to reduce the overall duration of high-noise construction activity;
- reviewing construction staging and phasing to minimise cumulative impacts on schools and other sensitive receivers;
- investigating staging that enables partially completed structures to provide acoustic shielding;
- strategically locating noisy plant such as rock crushers;
- managing difficult-to-mitigate sources such as diesel tower cranes;
- consulting with schools, aged care facilities and affected receivers;
- monitoring construction and operational noise where required;
- managing complaints and enquiries; and
- applying adaptive management where exceedances, complaints or higher-than-predicted impacts occur.

7.10.6 Monitoring and adaptive management

Cumulative noise impacts should be monitored and reviewed throughout both construction and operation. Monitoring should focus on periods where cumulative effects are most likely, including:

- overlapping Proposal construction stages;
- overlapping external construction projects;
- transition periods where early operational stages coincide with later construction stages;
- generator testing periods;
- high-noise construction activities;
- out-of-hours works, if undertaken;
- school-sensitive periods; and
- periods where complaints are received.

Where monitoring identifies higher-than-expected impacts, further controls should be implemented. These may include changes to staging, scheduling, respite, plant selection, acoustic screening, generator testing arrangements or consultation procedures.

7.10.7 Residual cumulative risk

Following implementation of mitigation and management measures, the residual cumulative noise risk is expected to be manageable, but not fully eliminated. Residual risk remains because:

- the Proposal is located within a transitioning industrial precinct;
- construction may occur over an extended period;
- overlapping stages and external projects may occur;
- some sensitive receivers may remain within or near the Mamre Road Precinct during the transition period;
- generator testing and operational plant may be noticeable at some receivers; and
- prolonged exposure may contribute to annoyance or fatigue even where individual noise criteria are managed.

For the HIA, residual cumulative noise risk can be characterised as:

- **Low** for most sensitive receivers following implementation of mitigation, monitoring and adaptive management measures;
- **Low to moderate** for schools, aged care and residential receivers during periods of overlapping construction activity, prolonged exposure or limited respite; and
- **Low** for routine long-term operations where cumulative operational criteria are achieved and generator testing is effectively managed.

Overall, cumulative noise impacts are considered manageable with appropriate design, staging, consultation, monitoring and adaptive management. The principal residual risks relate to temporary construction disturbance, cumulative exposure during overlapping construction stages, and potential noise fatigue among sensitive receivers. Long-term operational noise risks are expected to remain low and are unlikely to result in significant adverse population-level health outcomes. Nevertheless, cumulative exposure, duration and receiver sensitivity remain important health-relevant considerations, particularly for schools, aged care facilities and other sensitive receivers within the Mamre Road Precinct.

Table 24 Noise - Health Risk Assessment

Scenario / pathway	Key pollutant or stressor	Most sensitive receptors	Health interpretation	Inherent risk	Key Management controls	Residual risk with controls
Construction phase						
Construction noise at nearest receptors	Daytime construction noise from bulk earthworks, roadworks, plant, heavy vehicles and high-noise activities	Nearest residences in NCA01/NCA03, nearby schools and childcare facilities	Short-term annoyance, irritation, reduced amenity, difficulty concentrating, speech interference and transient stress responses may occur during high-noise activities. Effects are localised, activity-specific and most relevant where works occur close to sensitive receptors.	Medium to High	- Adopt standard construction hours wherever practicable. - Prioritise quiet plant selection and maintain plant to minimise noise emissions. - Use acoustic enclosures, temporary barriers or screening where effective. - Optimise worksite layout, haul routes and traffic flow to increase separation from sensitive receivers. - Implement the Construction Noise and Vibration Management Plan (CNVMP), including monitoring, notification, complaint response and adaptive management.	Low to Medium for nearest residences during high-noise works. Low for more distant receivers where predicted levels are below NMLs.
Construction noise affecting schools and childcare facilities	Daytime construction noise during overlapping construction phases, bulk earthworks and road construction	Mamre Anglican School while occupied, nearby schools, childcare facilities and outdoor learning/play areas	Intermittent interference with speech communication, teaching, learning, concentration and outdoor play may occur during high-noise activities or overlapping phases. Impacts are expected to be short-term and manageable with scheduling and communication controls.	Medium	- Schedule highest-noise works away from key teaching, examination and outdoor activity periods where practicable, in consultation with schools and childcare facilities. - Maintain plant as far as practicable from school boundaries and use acoustic barriers or screens where effective. - Use quieter methods and equipment, and throttle down or switch off plant when idle. - Provide advance notification so schools can plan indoor activities during short high-noise periods. - Review monitoring and complaints to adjust work methods where disruption occurs.	Low to Medium. Short-term disruption may occur during high-noise periods, but long-term health consequences are not anticipated with controls.
Construction traffic noise	Heavy vehicle movements, deliveries, haulage and increased construction traffic on Mamre Road and access routes	Residences along Mamre Road and construction access routes; schools and childcare facilities where routes pass nearby	Slight increases in perceived traffic noise and annoyance may occur during peak construction traffic periods. Conversation interference may occur in outdoor areas, but incremental change is expected to be small relative to the existing road-influenced baseline.	Low to Medium	- Use agreed haul routes and delivery times. - Avoid sensitive night-time periods where practicable. - Apply construction traffic management measures, including speed control, route management and vehicle maintenance. - Coordinate deliveries to reduce clustering of heavy vehicles, particularly where out-of-hours works are approved. - Review traffic volumes and complaints during peak construction periods.	Low. Incremental change is expected to be mainly noticeable during peak construction periods and not a significant long-term health burden.
Construction vibration	Ground-borne vibration from rollers, compactors, excavators with hammers, jackhammers and heavy plant	Nearby residences, schools, childcare facilities, industrial buildings and potentially vibration-sensitive equipment	Vibration may be perceptible and may cause rattling, concern about property damage, annoyance, discomfort, interference with concentration and short-term stress. Health impacts are primarily perception, annoyance and anxiety rather than direct physical injury.	Medium	- Apply minimum working distances and vibration screening criteria. - Adjust plant type, location or operating method where required. - Undertake vibration testing at the start of vibration-intensive activities. - Implement on-site vibration monitoring with alert thresholds where required. - Conduct pre-construction dilapidation surveys for relevant properties. - Implement a clear vibration complaint procedure and responsive mitigation, including buffer zones, method changes and time restrictions.	Low. Vibration may still be perceptible at times, but residual health risk is expected to be an occasional annoyance and short-term stress rather than long-term morbidity or structural harm.
Cumulative construction noise	Combined construction noise from the Proposal and other Mamre Road Precinct projects	Nearby residences, schools, childcare facilities, Emmaus Retirement Village and other sensitive receptors within or near the Mamre Road Precinct	Overlapping works may increase the frequency and duration of noisy periods, potentially reducing perceived respite and contributing to prolonged annoyance for some receptors. Cumulative increases may be around 3 dB(A) where works overlap.	Medium	- Use the Mamre Road Precinct Working Group or equivalent coordination mechanism to identify cumulative construction noise issues. - Coordinate staging and high-noise works with nearby developments where practicable. - Apply all feasible and reasonable noise mitigation measures consistently across the Proposal. - Consider cumulative effects when planning high-noise tasks. - Maintain ongoing communication with affected receptors. - Prepare and implement a detailed Construction Staging Plan.	Low to Medium. Some persistent annoyance may occur for a small subset of nearest receivers, but significant or long-term health impacts are not expected with coordinated management.
Operational phase						
Long-term operational plant noise at external residential and institutional receivers	Continuous or long-term noise from cooling systems, chillers, transformers, ventilation plant and rooftop equipment	Long-term residential receivers outside the MRP, nearby schools, Emmaus Retirement Village and other institutional receptors	Continuous operational plant noise may contribute to annoyance, reduced outdoor amenity, communication interference and modest long-term stress responses if levels are above or close to project noise trigger levels.	Medium to High without mitigation	- Set and apply Project Noise Trigger Levels (PNTLs) for all NCAs, derived from the Noise Policy for Industry and MRP DCP amenity criteria, including cumulative industrial noise. - Apply design-embedded acoustic mitigation, including plant selection, acoustic screening, enclosures, barriers and layout optimisation. - Ensure transformers meet AS60076.10 limits and orient vents and louvres away from sensitive receivers where practicable. - Apply annoying-characteristic corrections, including tonality, low-frequency noise and intermittency, in design and assessment. - Undertake noise compliance monitoring after commissioning and implement corrective actions if PNTLs are exceeded.	Low. Residual health risk is expected to be limited to low-level annoyance potential, not significant morbidity.

Operational noise at short-term receivers within the MRP	Operational plant noise, including residual marginal exceedances during development staging	Existing residences within the rezoned MRP and Mamre Anglican School while occupied	Existing residential and school receivers inside the rezoned MRP may experience mild to moderate temporary annoyance, reduced outdoor amenity and potential interference with teaching and learning. These impacts are expected to be limited to a small number of short-term receivers and managed through feasible and reasonable mitigation measures.	Medium to High	- Maintain and enforce design-embedded mitigation for all operational plant. - Use negotiated at-property mitigation, such as façade upgrades, acoustic glazing, ventilation enhancements or agreements, where required for short-term receptors. - Review residual impacts during detailed design and once tenant loads are known. - Refine plant selection, acoustic screening and operational controls if monitoring shows higher than predicted levels. - Monitor receptor status and update management measures while sensitive uses remain.	Low to Medium Impacts are expected to be limited to a small number of short-term receptors, with primary residual effects being annoyance and reduced amenity while those uses remain.
Night-time operational events and sleep disturbance	Intermittent night-time maximum noise events, including vehicle movements, air-brake events, loading activity and plant changes	Nearby residences and aged-care receptors, particularly bedrooms and rest areas	Intermittent night-time events could cause sleep disturbance, including awakening or difficulty maintaining sleep. However, the NVIA indicates predicted maximum levels are below screening and awakening criteria at residential NCAs for the fully developed campus.	Medium due to potential consequence, but probability is low where criteria are met	- Design and operate plant so that PNTLs are met, supporting compliance with LAeq-based sleep disturbance criteria. - Ensure predictable LAmax events remain below screening and awakening thresholds. - Minimise noisy truck manoeuvres at night near sensitive receivers. - Manage loading docks, carparks and reversing or braking events to reduce late-night noise. - Maintain an operational noise management plan with monitoring and complaint-response mechanisms.	Low. Sleep disturbance impacts are not predicted where modelled LAmax values remain below screening and awakening criteria.
Low-frequency and tonal operational noise	Low-frequency noise, tonal noise, intermittency and annoying characteristics from plant and equipment	Nearby residences, schools, aged-care receptors and receptors with high sensitivity to tonal or low-frequency noise	Low-frequency or tonal components may increase noticeability and annoyance, and may contribute to sleep disturbance, perceived vibration, headaches, stress-related symptoms or community concern if not controlled.	Medium	- Require low-frequency noise assessment during detailed design. - Apply tonality, low-frequency and intermittency penalties in accordance with relevant guidance. - Specify plant and operating modes that minimise tonal or low-frequency characteristics. - Use acoustic enclosures, silencers, barriers and vibration isolation where required. - Undertake commissioning noise measurements, including spectral checks, and implement corrective actions if annoying characteristics are identified	Low to Medium. Some noticeability may remain at closest receptors, but significant health effects are not expected if annoying characteristics are controlled.
Operational road traffic noise	Staff, service, delivery and heavy vehicle movements on Mamre Road and new access roads	Residences along Mamre Road and connecting access routes; nearby institutional receptors where routes pass nearby	Increased road traffic may incrementally increase roadside noise exposure, contributing to annoyance, communication interference and, if large enough, potential sleep disturbance. NVIA indicates predicted changes are less than 2 dB(A), generally not perceptible and compliant with RNP expectations.	Low to Medium	- Design site access and internal roads to minimise heavy vehicle movements near existing residences where practicable. - Use the modelled roundabout and access configuration. - Implement traffic management measures, including routing, speed control and scheduling of heavy vehicle movements outside sensitive night-time periods where practicable. - Periodically review traffic volumes and complaints. - Revisit road traffic noise assessment if traffic assumptions materially change.	Low. Incremental traffic noise changes from the Proposal are expected to be below perceptible levels and within relevant criteria.
Generator maintenance testing and emergency generator operation	Short-duration elevated noise from generator testing, load banks, exhausts, enclosures and emergency generator operation	Nearby schools, Emmaus Retirement Village, nearby residences, outdoor learning areas and receptors sensitive to sudden or noticeable noise events	Short, elevated noise events may interrupt teaching, concentration, rest or outdoor activity. Potential effects include startle response, temporary discomfort, annoyance, short-term stress and speech interference. Emergency operation is rare but may be more noticeable due to the number of generators and timing.	Medium	- Limit generator testing to daytime periods where practicable. - Coordinate testing with acoustic constraints and air quality testing restrictions. - Limit concurrent generator testing where required by the NVIA and operational procedures. - Use acoustic walls, generator enclosures, mufflers and silencers. - Maintain generator equipment to minimise noise emissions. - Provide advance notification for scheduled testing where appropriate. - Maintain operational records for testing and emergency events, including number of generators, duration and timing. - Implement complaint response and post-event review procedures.	Low to Medium at closest sensitive receptors during scheduled testing or rare emergency operation. Low for broader population exposure.
Cumulative operational noise within the Mamre Road Precinct	Combined operational plant, industrial activity, road traffic and generator testing from the Proposal and other precinct developments	Nearby residences, schools, Emmaus Retirement Village, short-term MRP receptors and future precinct workforce	Cumulative operational noise may contribute to increased frequency, persistence and noticeability of environmental noise. The health relevance is primarily annoyance, reduced amenity, learning interference and potential stress responses, particularly where multiple sources overlap.	Medium	- Apply cumulative industrial noise criteria through PNTLs and MRP DCP amenity requirements. - Design plant and buildings to comply with cumulative noise allowances. - Coordinate generator testing with nearby data centre operators where practicable. - Undertake commissioning and compliance monitoring. - Maintain complaint-response procedures and adaptive management. - Review cumulative noise assumptions if nearby developments materially change.	Low to Medium. Residual cumulative risk remains conservative due to uncertainty in future development timing and operating patterns.

7.10.8 Noise Residual Risk Interpretation

Following implementation of the mitigation and monitoring measures summarised in Table 19, residual noise and vibration health risks are considered to be low at a population level and low to medium at the closest sensitive receptors during specific short-term or intermittent exposure scenarios. The residual risk profile is driven primarily by construction noise at nearby residences, schools and childcare facilities; intermittent generator maintenance testing and rare emergency generator operation; and cumulative construction or operational noise within the Mamre Road Precinct.

For long-term operational noise, the quantitative assessment indicates that predicted residual exposure can be managed to acceptable levels through embedded acoustic design, compliance with Project Noise Trigger Levels, plant selection, acoustic screening, enclosures, commissioning noise verification and ongoing operational management. Where residual exceedances are predicted at a small number of short-term receivers within the Mamre Road Precinct, the associated health effects are expected to be limited to annoyance, reduced amenity and potential learning or communication interference while those receptors remain in place, rather than significant long-term morbidity.

Construction noise remains the main residual pathway requiring active management. High-noise activities, overlapping construction phases and works close to sensitive receptors may continue to cause temporary annoyance, speech interference, reduced concentration and disruption to teaching or outdoor activities, particularly at nearby schools and the closest residences. With implementation of the Construction Noise and Vibration Management Plan, standard construction hours, quiet plant selection, acoustic screening, staging optimisation, notification, monitoring and adaptive management, residual construction noise risk is expected to reduce to low to medium at the nearest receptors and low for more distant receivers.

Construction vibration is expected to result primarily in perceptible vibration, rattling or concern regarding potential property damage rather than direct physical injury or structural harm. The residual risk is considered low where minimum working distances, vibration screening, vibration monitoring, pre-construction dilapidation surveys, complaints response procedures and responsive mitigation are implemented. Some vibration may remain noticeable during vibration-intensive works, but effects are expected to be short-term, localised and reversible.

Generator maintenance testing and emergency generator operation represent intermittent but more noticeable residual pathways. Scheduled testing can be managed through daytime operation, limits on concurrent testing, generator enclosures, mufflers, acoustic walls, coordination with air quality and noise constraints, record keeping, notification where appropriate and complaint response procedures. Emergency operation is expected to be extremely rare and short duration, and the NVIA indicates that sleep-disturbance screening and awakening criteria are not predicted to be exceeded at residential locations. Residual risk is therefore considered low to medium at the closest sensitive receptors and low for the broader population.

Cumulative noise exposure remains the main area of uncertainty because multiple developments within the Mamre Road Precinct may overlap over the 10-year transition period. While individual project controls are expected to be effective, combined construction activity, operational plant, traffic and generator testing may increase the frequency and perceived persistence of disturbance at nearby receptors. Residual cumulative noise risk is therefore conservatively characterised as low to medium until precinct coordination, monitoring and complaints data confirm that exposure remains within acceptable levels.

Overall, Table 19 demonstrates that the proposed management framework reduces most noise and vibration pathways from medium or medium to high inherent risk to low or low to medium residual risk. Residual effects are expected to be temporary, localised, receptor-specific and manageable through the proposed mitigation, monitoring, communication and adaptive management measures. On this basis, residual noise and vibration health risks are considered acceptable, provided the controls identified in Table 19 and the broader construction and operational management framework are implemented and reviewed as the precinct develops.

8 Soil and Contamination Health Assessment

JBS&G Australia Pty Ltd (JBS&G) prepared a remedial action Plan (RAP) for the proposed Mamre Road Data Centre Campus project. Multiple environmental investigations have identified localised contamination across the site, including bonded and friable asbestos in shallow soils, areas of mixed household and anthropogenic waste, and isolated hydrocarbon-impacted soils beneath a disused petroleum drum. Additional potential contamination was noted near existing infrastructure such as the septic tank and man-made bore, requiring further inspection and validation.

The RAP has been developed in accordance with relevant NSW EPA guidelines, the National Environment Protection (Assessment of Site Contamination) Measure (NEPC, 2013), and the requirements of the State Environmental Planning Policy (Resilience and Hazards) 2021. Completion of the remediation works will ensure the site is suitable and safe for its intended development.

8.1 Existing Soil conditions

The subject site has historically been used for rural residential, pastoral, and light agricultural purposes and is currently largely vacant, with limited cattle grazing activities. Previous investigations have identified that historical land uses and associated infrastructure have resulted in isolated areas of contamination requiring remediation prior to redevelopment. The majority of the site, however, does not exhibit widespread contamination and has been assessed as being capable of being made suitable for the proposed development through implementation of the recommended remedial measures.

The site is underlain by Wianamatta Group Ashfield Shale and Bringelly Shale, with natural soils predominantly comprising firm red, brown, and yellow silty clays. Localised fill materials have been encountered across the site, generally consisting of reworked natural clays with isolated anthropogenic inclusions such as scrap metal, asphalt, plastic conduits, bricks, concrete, and demolition waste. Acid sulfate soils are considered unlikely due to the site's elevation, and groundwater is saline and not considered a potable resource.

Investigations identified that contaminant concentrations in soil, sediment, surface water, and groundwater are generally below applicable human health criteria, with the exception of several isolated areas associated with historical site activities. These include asbestos-containing materials (ACM), asbestos fines and fibrous asbestos (AF/FA), hydrocarbon-impacted soils beneath a former petroleum drum, building and demolition waste, anthropogenic fill, and infrastructure such as a former septic tank and maintenance bore. The principal contaminants of concern are therefore asbestos-related materials and limited hydrocarbon contamination rather than widespread chemical contamination.

8.2 Sources, Hazards and Exposure Pathways

Historical investigations indicate that the site has predominantly been used for rural residential, pastoral, and light agricultural purposes. Potential sources of contamination are associated with former residential and maintenance activities rather than broad-scale industrial operations.

Identified sources of contamination include:

- Asbestos-containing materials (ACM) associated with former buildings, demolition debris, and stockpiled fill materials.
- Asbestos fines and fibrous asbestos (AF/FA) identified within isolated surface soils in the former residential area.
- Building and demolition waste, including bricks, concrete, asphalt, and other anthropogenic materials present in stockpiles and dam embankments.
- Hydrocarbon contamination associated with a former petroleum drum and a maintenance/workshop area, including an open man-made bore where a hydrocarbon sheen was observed.
- A partially buried septic tank and associated subsurface infrastructure with the potential for localised contamination.
- General anthropogenic waste, including scrap metal, tyres, timber, household refuse, and other debris.
- Reworked fill materials and ephemeral drainage lines that may have accumulated contaminants from historical agricultural activities.



Previous investigations concluded that, aside from these isolated areas, concentrations of contaminants in soil, sediment, surface water, and groundwater generally comply with applicable human health assessment criteria.

8.2.1 Hazards

The principal hazards identified for the proposed development are:

- Asbestos exposure, particularly from friable asbestos and bonded ACM present within shallow soils and demolition materials. Disturbance during excavation or construction could release airborne fibres.
- Hydrocarbon-impacted soils, limited to isolated locations beneath former petroleum storage areas, presenting potential aesthetic and occupational health concerns if disturbed.
- Construction dust generation, including dust containing naturally occurring soil particles or contaminants associated with impacted fill materials.
- Physical hazards associated with buried waste materials and demolition debris encountered during earthworks.
- Potential contaminant transport through surface water runoff and drainage channels if contaminated materials are left unmanaged during construction activities.

The investigations determined that widespread contamination has not been identified and that contamination is generally localised and manageable through remediation.

8.2.2 Exposure Pathways

Potential exposure pathways include:

Direct human exposure

- Dermal contact with contaminated soil during excavation or site works.
- Incidental ingestion of contaminated soil or dust by construction workers.
- Inhalation of airborne dust and asbestos fibres generated through disturbance of impacted soils or demolition materials.

Environmental transport pathways

- Surface water runoff transporting suspended sediments or contaminants through interconnected farm dams and ephemeral drainage lines.
- Limited infiltration through fill materials and shallow soils, with relatively low groundwater migration due to the site's predominantly low-permeability clay and shale geology.
- Windborne transport of dust from exposed or disturbed ground surfaces, particularly during construction activities if dust suppression measures are not implemented.

Ecological exposure

- Uptake of contaminants by vegetation established on the site.
- Migration of contaminants to downstream ecological receptors, including South Creek, via stormwater runoff and drainage networks.

8.3 Receptors and Sensitive Populations Relevant to Soil contamination

The primary receptors potentially affected through these exposure pathways above are detailed in Section 2.3

- Construction, remediation, and maintenance workers.
- Future site occupants and visitors.
- Nearby sensitive land uses, including schools, childcare facilities, residential areas, and retirement living communities.
- Terrestrial vegetation and local ecological communities.
- Downstream aquatic environments, including South Creek.

8.4 Soil Assessment

The site has a history of rural residential, pastoral, and light agricultural land uses and has not been subject to extensive industrial activities. Contamination investigations undertaken across the site identified that, with the exception of several isolated areas, soil quality is generally suitable for redevelopment following targeted remediation.

The principal soil-related hazards identified include localised occurrences of asbestos-containing materials (ACM), asbestos fines and fibrous asbestos (AF/FA), hydrocarbon-impacted soils, building and demolition waste, anthropogenic fill, and isolated buried infrastructure (including a former septic tank and maintenance bore). The majority of these impacts are confined to the former residential area and stockpiled fill materials within the site.

From a human health perspective, the greatest potential risk is associated with disturbance of asbestos-impacted soils during construction activities. Excavation, earthworks, or demolition could generate airborne asbestos fibres or contaminated dust, resulting in inhalation exposure for construction workers and, if not adequately controlled, nearby receptors. Direct dermal contact with contaminated soils and incidental ingestion of soil or dust also represent potential exposure pathways during site works.

Localised hydrocarbon contamination beneath a former petroleum drum presents a limited occupational health risk if disturbed but is not considered widespread. Anthropogenic waste materials, including scrap metal, tyres, timber, and demolition debris, may present physical hazards and aesthetic issues but are not considered to pose a significant ongoing health risk following appropriate management.

The site's environmental setting reduces the potential for contaminant migration. Underlying low-permeability clay soils and shale bedrock limit groundwater movement, while groundwater is saline and not considered a potable resource. Nevertheless, interconnected farm dams and ephemeral drainage lines provide a potential pathway for transport of suspended sediments or contaminants during heavy rainfall events if disturbed soils are left unmanaged.

A Remedial Action Plan has been prepared to address the identified contamination. The proposed remediation includes excavation and off-site disposal of friable asbestos and bonded ACM, removal or management of anthropogenic waste, remediation of hydrocarbon-impacted soils, inspection and validation of affected areas, and implementation of appropriate environmental and occupational health controls during construction. Following completion and validation of these remediation measures, the site is expected to be suitable for its intended future use, with residual risks to human health and the environment considered low.

Overall, provided the recommended remediation and standard construction environmental management measures are implemented, the potential for adverse health impacts associated with soil contamination is expected to be negligible during operation and effectively managed during the construction phase.

8.5 Soil Qualitative Assessment

The following qualitative assessment summarises the key air quality exposure pathways, sensitive receptors, plausible health consequences and residual risks associated

Table 25 Soil - Health Risk Assessment

Source / Hazard and Exposure Pathway	Sensitive Receptors and Exposure Context	Plausible Health Consequence and Severity	Likelihood	Inherent Risk	Uncertainty	Mitigation / Evidence for Residual Risk	Residual Risk
Asbestos-containing materials (ACM) and asbestos fines/fibres (AF/FA) in surface soils and fill. Exposure via inhalation of airborne fibres during excavation or disturbance, and direct contact with contaminated soils.	Construction workers are the primary receptors during earthworks. Nearby workers or the public could be exposed if dust controls are inadequate. Future occupants are unlikely to be exposed following remediation.	Inhalation of asbestos fibres may increase the risk of chronic respiratory disease and cancers (e.g. mesothelioma and lung cancer). Severity is High due to the serious nature of long-term health effects.	Possible during construction without controls; unlikely during operation.	High	Moderate – extent of contamination has been characterised, but additional isolated ACM may be encountered during excavation.	Implementation of the Remedial Action Plan (RAP), excavation and off-site disposal of friable asbestos and bonded ACM, asbestos management procedures, dust suppression, licensed removal contractors, validation sampling, and unexpected finds protocols.	Low
Hydrocarbon-impacted soils associated with former petroleum storage and maintenance activities. Exposure via dermal contact, inhalation of vapours or dust, and incidental ingestion during excavation.	Construction and maintenance workers undertaking excavation in affected areas.	Short-term irritation and nuisance effects; prolonged occupational exposure may pose chronic health risks. Severity is Moderate due to the limited extent of contamination.	Unlikely due to localised nature of impacts.	Moderate	Low to Moderate – contamination appears confined to a small area.	Excavation and management of impacted soils under the RAP, segregation of contaminated material, worker PPE, and environmental supervision during remediation.	Low
Building and demolition waste, anthropogenic fill, scrap metal, timber, tyres, and buried debris. Exposure through direct physical contact during earthworks.	Construction workers and maintenance personnel during excavation activities.	Minor injuries (cuts, punctures) and indirect health impacts from contact with contaminated debris. Severity is Low to Moderate.	Possible during construction.	Moderate	Low – waste locations have been generally identified but additional isolated material may be encountered.	Removal or controlled management of anthropogenic waste during remediation, waste classification and disposal, site inspections, and occupational health and safety procedures.	Low
Contaminated dust generated during excavation and earthworks, including dust from disturbed fill materials. Exposure via inhalation.	Construction workers and potentially nearby receptors under adverse weather conditions.	Temporary respiratory irritation and nuisance dust impacts; increased concern where asbestos-contaminated soils are disturbed. Severity is Moderate.	Possible during construction.	Moderate	Moderate – dependent on weather conditions and construction practices.	Dust suppression (water carts, covering stockpiles, minimising exposed surfaces), monitoring where required, and implementation of construction environmental management measures.	Low
Potential migration of contaminants through surface water runoff and sediments into drainage lines and farm dams.	Downstream ecological receptors and workers interacting with affected surface water; limited direct human exposure expected.	Indirect impacts to environmental quality with limited human health implications. Severity is Low to Moderate.	Unlikely under managed construction conditions.	Low to Moderate	Moderate – dependent on rainfall events and erosion control effectiveness.	Erosion and sediment controls, stormwater management, stabilisation of disturbed areas, and implementation of the RAP and Construction Environmental Management Plan (CEMP).	Low
Residual contaminated soils remaining after remediation. Exposure through future disturbance during maintenance or utility works.	Future maintenance workers undertaking subsurface excavation.	Potential contact with isolated residual contamination if encountered. Severity is Low following validation.	Rare.	Low	Low – validation will confirm remediation objectives have been achieved.	Validation sampling, documentation of remediation outcomes, site records, unexpected finds procedures, and ongoing management where required.	Very Low

9 Urban Heat and Microclimate Health Assessment

9.1 Existing Microclimate Context

The site located at Mamre Road, Kemps Creek, NSW, is situated within the Western Sydney Basin, an area characterised by a warm temperate climate with distinct seasonal variation. The region typically experiences hot, dry summers and mild winters, with average maximum summer temperatures often exceeding 30°C and winter minimums averaging around 6–8°C. The site's inland position, combined with limited coastal influence, contributes to higher diurnal temperature ranges compared to coastal Sydney areas.

Local topography is generally flat to gently undulating, with minimal elevation change across the site. This terrain allows for relatively uniform wind distribution but limits the potential for natural ventilation driven by topographic effects. Prevailing winds are predominantly from the east during warmer months and from the west to northwest during cooler months, influencing both daytime heat exposure and nighttime cooling potential. Summer and winter wind rose profiles are shown in Figure 9. The absence of significant topographic shelter also exposes the site to solar radiation throughout most of the day, contributing to elevated surface temperatures during peak summer periods.

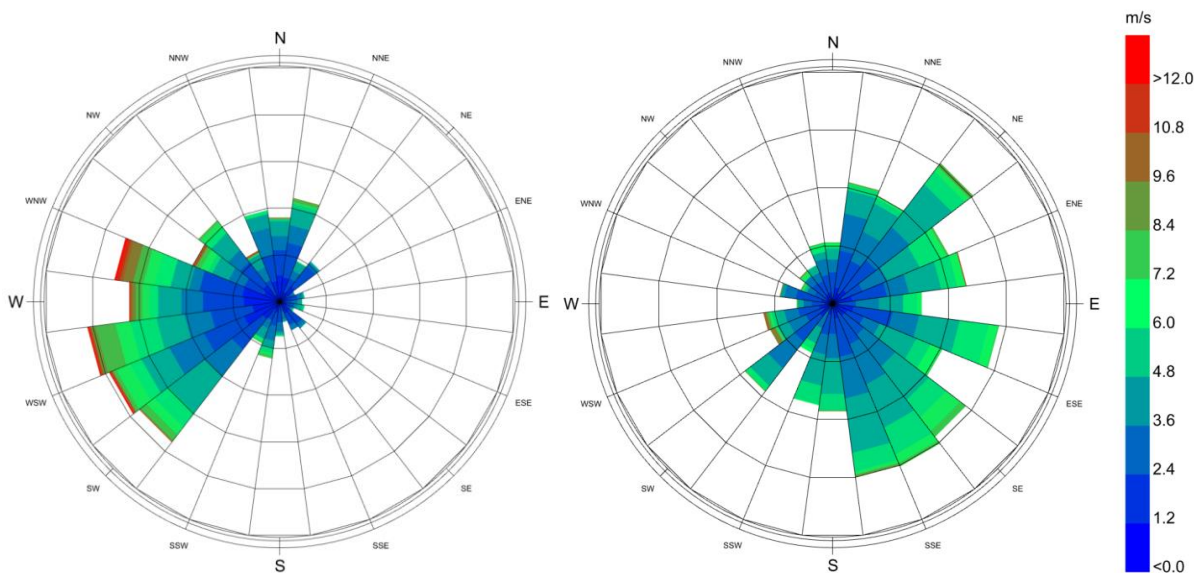


Figure 9 Winter (Left) & Summer (Right) Wind Rose

The existing land use within and surrounding the site is primarily industrial and semi-rural, with large impervious areas such as roads, hardstands, and warehouse roofs interspersed with sparse vegetation. This pattern contributes to localised heat retention and reduced evapotranspiration. Vegetative cover is limited mainly to boundary plantings and remnant grassland, providing minimal shading or cooling effect. The limited presence of water bodies or green infrastructure further restricts local microclimatic moderation. Overall, the baseline microclimate of the Mamre Road site reflects a heat-prone environment with limited natural mitigation capacity.

9.2 Urban Heat Island Assessment

The Urban Heat Island Effect (UHIE) refers to the phenomenon where urbanised areas experience higher ambient temperatures than surrounding rural or vegetated regions. This temperature difference arises primarily from the prevalence of heat-absorbing materials such as concrete, asphalt, and metal, coupled with reduced vegetation and limited evapotranspiration. The retention and slow release of heat by these surfaces lead to elevated nighttime temperatures, which can exacerbate cooling energy demand, impact local microclimates, and affect occupant comfort and environmental quality. For large-scale developments, particularly those incorporating extensive hardstand and building coverage such as data centres, the potential contribution to the UHIE warrants detailed assessment to inform mitigation strategies through design.

To evaluate the potential UHI impact of the proposed Mamre Road Data Centre Campus development, a site-specific analysis was undertaken using the Dragonfly plugin for Grasshopper. Dragonfly enables microclimate simulation by integrating site geometry, building typology, material properties, and meteorological data to estimate localised temperature variations. The assessment involves developing a digital model of the site incorporating building forms, surface materials, and landscape elements, subsequently modifying a baseline weather file to reflect the anticipated surface heat fluxes and radiative balance associated with the proposed development. The Badgerys Creek Airport TMW 2009–2023 weather file was used for the assessment due to its close proximity to the site. The modelled site geometry and spatial details are shown in Figure 10 and Table 26 respectively.



Figure 10 Dragonfly Model Site Geometry

Table 26 Dragonfly Model Details

Aspect	Value
Datacentre Program	Large Data Centre w/ high IT load density
Footprint Density	31%
Façade to Site Ratio	20%
Vegetation Cover	31%

9.3 Mathematical Basis for Urban Heat Island Calculation

The Dragonfly UHIE simulation process is founded on the energy balance and heat flux relationships that govern surface–atmosphere interactions within an urban domain. The model modifies a baseline weather file by adjusting hourly air temperatures based on changes in surface characteristics, radiative exchange, and convective heat transfer using the following empirical relationships:

Surface Energy Balance

At each surface node, Dragonfly resolves the fundamental energy balance:

$$Q^* = QH + QE + QG + \Delta QS$$

where:

Q^* = net all – wave radiation (shortwave + longwave)

QH = sensible heat flux (convective exchange with air)

QE = latent heat flux (evapotranspiration)

QG = ground (conductive) heat flux

ΔQS = heat storage in built surfaces (thermal mass)

Material parameters such as albedo (α), emissivity (ϵ), and thermal conductivity (k) are derived from the geometry inputs and material libraries to define the magnitude of these terms. Impervious surfaces (roads, roofs) increase QH and ΔQS , while vegetated surfaces enhance QE .

Air Temperature Adjustment

Dragonfly integrates these surface fluxes over time using a simplified urban canopy layer model derived from the Surface Urban Energy and Water Balance Scheme (SUEWS) and EnergyPlus formulations. The change in near-surface air temperature (ΔT) between the baseline and the developed site is computed as:

$$\Delta T = (\Sigma(QH + QG + \Delta QS) - \Sigma(QE)) / (\rho a * Cp * h)$$

where:

ρa = air density

Cp = specific heat of air

h = effective mixing height of the boundary layer

Positive ΔT indicates net warming relative to the rural baseline. This adjustment is applied hourly to generate a modified EPW weather file representing the urbanised microclimate.

Temporal Averaging and Output

The modified weather data are then aggregated to derive diurnal temperature patterns and exceedance frequencies (e.g. number of days above 25°C, 30°C, and 35°C). The model outputs both the maximum daily and minimum daily temperature differences, reflecting the daytime shading and nighttime heat release dynamics inherent to the UHIE.

Simplified Conceptual Relationship

At the macroscale, the temperature differential between urban and rural zones can be approximated by the empirical relationship:

$$\Delta TUHI = a + b \ln(PD) + c(1 - V)$$

where:

- PD* = population or building density
- V* = vegetation fraction
- a, b, c* = empirically derived coefficients from calibration datasets

Dragonfly effectively replaces these empirical constants with physically derived surface parameters from the model geometry, enabling site-specific and design-responsive UHIE predictions.

9.4 Urban Heat Island Analysis

The analysis of the site using the modified weather file generated through Dragonfly indicates that maximum daily air temperatures across the development remain largely unchanged, if not slightly reduced, compared to baseline, as illustrated in Figure 11. In contrast, the minimum daily temperatures post development are consistently higher than in the baseline case. This pattern is characteristic of the UHIE and reflects the influence of increased thermal mass associated with the proposed buildings and hardstand surfaces. Heat absorbed by surfaces such as roofs, pavement, and other impervious areas during the day is gradually released overnight, reducing the rate of cooling and resulting in elevated nighttime temperatures. The increased thermal mass, however, helps to slightly reduce the midday peak temperature.

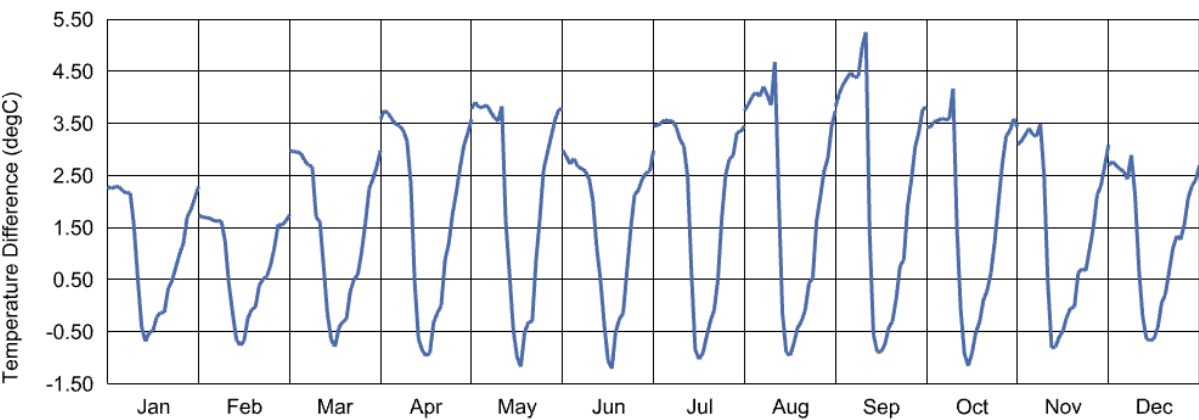


Figure 11 Average Daily Temperature Difference

The site specific UHIE adjusted weather file indicated a reduction in days above 25°C and 30°C when compared to the predevelopment baseline, as shown in Table 27 due to the thermal inertia discussed above. Both conditions resulted in 9 days exceeding 35°C. Hourly ambient temperature however, as illustrated in Figure 12 and Figure 13, remains elevated above 30°C for longer post development.

Table 27 Number of Days Exceeding Criteria

Criteria	Baseline	UHIE Adjusted
Days above 25°C	127	123
Days above 30°C	38	35
Days above 35°C	9	9



Figure 12 Annual Ambient Temperature above 30°C - Baseline

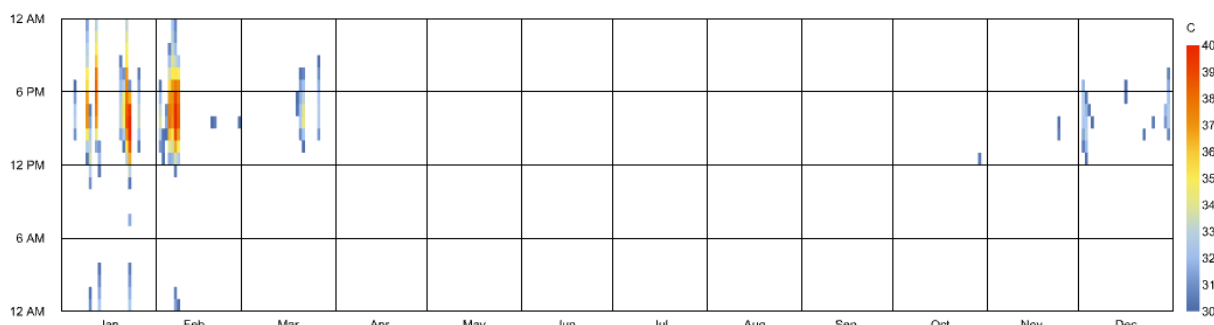


Figure 13 Annual Ambient Temperature above 30°C - UHIE Adjusted

The development in its current design is therefore likely to lead to slightly elevated nighttime temperatures localised to the site whilst not exacerbating daytime peak temperatures, though localised hotspots may still occur on specific surfaces, particularly those with low reflectivity or limited shading. These results provide a quantitative basis for considering mitigation strategies such as increased vegetation, highly reflectivity roofs, and shaded areas, which can help reduce heat retention and improve local thermal comfort during night-time periods.

9.5 Urban Thermal Climate Index

To understand the impact of the development on human thermal comfort and identify where mitigation strategies would be most effective, a Universal Thermal Climate Index (UTCI) assessment was conducted using the Honeybee plugin for Grasshopper. UTCI integrates air temperature, humidity, wind, and radiant exposure to predict how the human body will perceive temperature under varying environmental conditions.

The same digital model was used, distinguishing between differing surface types; asphalt road, concrete, hardstand, vegetation, and building materials to represent differences in heat absorption and radiation exchange. A grid of analysis points was created across the site, with spatially resolved UTCI values calculated at 1.75 m above ground level. The assessment was conducted at 12pm on a typical summer day, including the sites predicted UHIE, to highlight areas where perceived thermal stress is highest.

Views of the output UTCI temperature gradient are illustrated in Figure 14, Figure 15, and Figure 16, indicating that areas around the data centres and beneath trees show a reduced perceived temperature due to overshadowing. Areas of hardstand that have little shading, as in the northwestern corner of the site result in an increased perceived temperature. Introducing permeable or lighter coloured paving materials and shading structures for areas with high pedestrian activity will both improve both human comfort and local microclimate conditions in these areas.

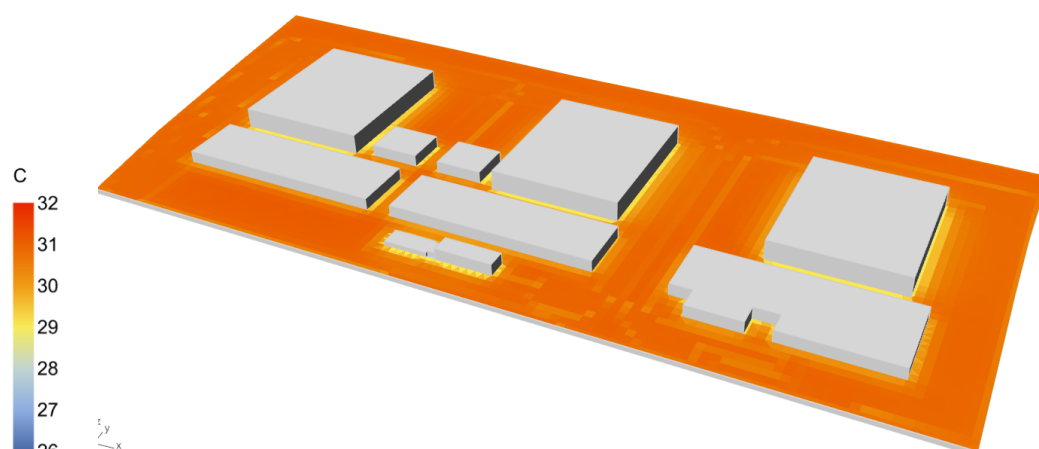


Figure 14 Typical Summer Midday UTCI Output - View 1

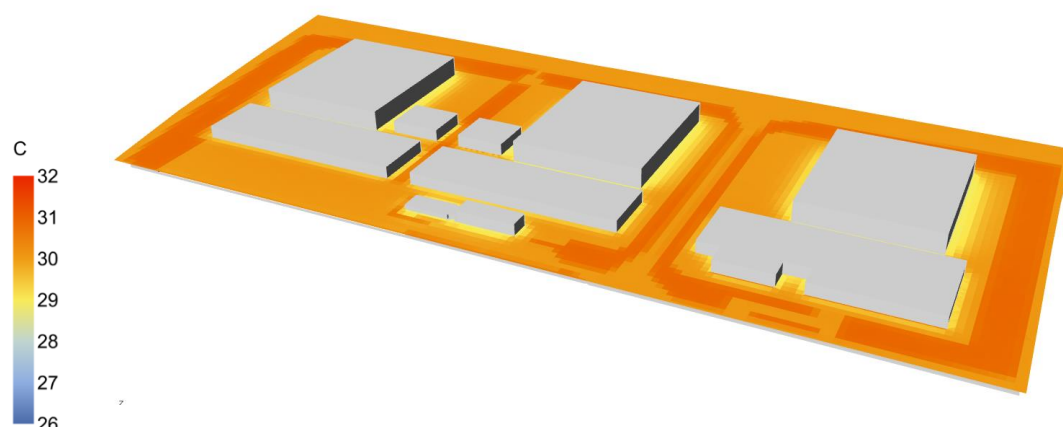


Figure 15 Typical Summer Midday UTCI Output - View 2

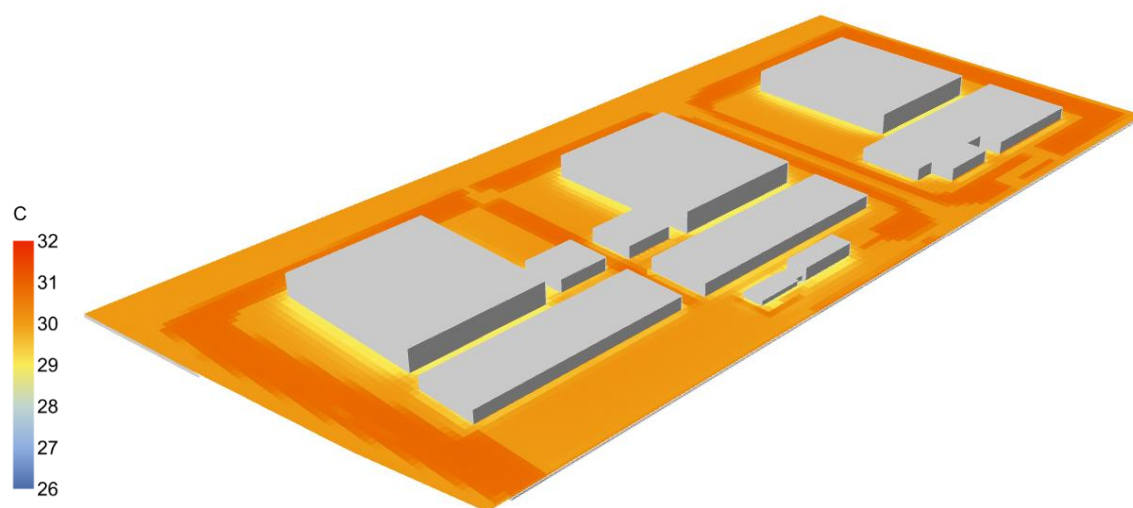


Figure 16 Typical Summer Midday UTCI Output - View 3

9.6 Urban Heat Island Mitigation Measures

Based on the outcomes of the UHIE and UTCI analysis, mitigation measures can be integrated into the design to minimise the project's contribution to local heat build-up. Strategies include:

- Incorporation of high reflectance roofing materials to reduce surface heat gain.
- Utilisation of permeable and lighter-coloured paving materials for roads and hardstand areas.
- Providing shading structures in high activity outdoor zones.

Implementation of these measures will assist in improving local thermal comfort and reducing the development's overall UHI impact, supporting long-term environmental and operational performance objectives.



10 Conclusions

This Health Impact Assessment and Environmental Health Risk Assessment has assessed the potential human health impacts associated with the amended Mamre Road Data Centre Campus during construction, staged commissioning and operation. The assessment has considered air quality, noise and vibration, soil and contamination, urban heat and microclimate, sensitive receptors, cumulative impacts and the proposed mitigation, monitoring and adaptive management framework.

The assessment has adopted a combined qualitative and quantitative approach consistent with the enHealth Environmental Health Risk Assessment and Health Impact Assessment frameworks. Quantitative assessment has been applied where suitable exposure data and exposure–response evidence are available, particularly for long-term air quality and noise-related population health outcomes. Qualitative assessment has been used to characterise short-term, intermittent, receptor-specific and cumulative pathways, including construction dust, generator testing, emergency generator operation, construction noise, vibration, low-frequency noise, soil contamination and urban heat.

10.1 Construction Phase

During construction, the main health-relevant pathways are construction dust, diesel emissions from plant and vehicles, construction noise, construction traffic, vibration, potential exposure to contaminated soil and asbestos, and cumulative disturbance from overlapping precinct works.

Construction air quality impacts are primarily associated with earthworks, material handling, vehicle movements, exposed surfaces and wind erosion. The assessment identifies construction particulate matter, particularly PM_{10} and $PM_{2.5}$, as the principal short-term air quality pathway of concern for nearby sensitive receptors, including schools, rural-residential receptors and the Emmaus Retirement Village. With implementation of the Construction Air Quality Management Plan, real-time monitoring, dust suppression, progressive stabilisation, construction Trigger Action Response Plan and adaptive management controls, residual construction air quality risks are expected to be reduced to low at the closest sensitive receptors and very low for the broader population.

Construction noise represents the main short-term amenity and wellbeing pathway during the construction phase and will be managed through the Construction Noise and Vibration Management Plan. The construction methodology will be planned to avoid or minimise high-noise activities near sensitive receptors wherever practicable, including through staging, standard construction hours, quiet plant selection, acoustic screening, monitoring, community notification and complaints response procedures. Where noisier activities are unavoidable, they are expected to be temporary, localised and activity-specific, with controls implemented to mitigate potential disturbance such as annoyance, speech interference, reduced concentration or disruption to teaching and outdoor activities. With these measures in place, residual construction noise risks are expected to be low to medium at the nearest sensitive receptors and low for more distant receptors.

Construction vibration is not expected to cause structural damage where minimum working distances and vibration management controls are implemented. Residual effects are expected to be limited to perceptible vibration, rattling, concern about potential property damage, short-term annoyance or discomfort. These effects are expected to be temporary, localised and manageable through vibration screening, monitoring, pre-construction dilapidation surveys, responsive mitigation and complaints management.

10.2 Operational Phase

During operation, the principal health-relevant pathways are operational plant noise, generator maintenance testing, rare emergency generator operation, fuel storage and handling, operational traffic, cumulative precinct emissions and noise, and urban heat effects associated with the built form.

The quantitative air quality assessment indicates that long-term population health impacts associated with annual average $PM_{2.5}$ and NO_2 increments are negligible (substantially less than one additional case per year) under both current and future population scenarios. As such, chronic population-level air quality health risks are considered low.

Short-term air quality risks remain relevant for generator maintenance testing and rare emergency generator operation. These events may produce temporary increases in NO_2 and particulate matter, particularly where multiple generators operate concurrently or where dispersion conditions are unfavourable. The proposed management framework, including limits on concurrent generator testing, daytime scheduling, operational Trigger Action Response Plan, operating records, communication procedures, complaints response, post-event review and coordination with noise management requirements, is expected to reduce residual generator-related air quality risks to low to medium at the closest sensitive receptors and low for the broader population. Emergency generator operation is expected to occur infrequently (rare) and therefore represents a very low-likelihood residual risk. Any such events should continue to be managed through operational procedures, record keeping and post-event review.

Operational noise is expected to be managed through embedded acoustic design, plant selection, acoustic screening, enclosures, layout optimisation, compliance with Project Noise Trigger Levels, commissioning verification and ongoing operational management. Long-term operational noise risks are generally expected to be low. Where marginal residual exceedances are predicted at a small number of short-term receivers within the Mamre Road Precinct, the likely health effects are expected to be limited to annoyance, reduced amenity and potential communication or learning interference while those receptors remain in place, rather than significant long-term morbidity.

Generator maintenance testing and rare emergency generator operation are intermittent but noticeable noise pathways. Potential effects include temporary annoyance, startle response, interruption to teaching, communication interference or short-term stress. The Noise and Vibration Impact Assessment indicates that sleep disturbance screening and awakening criteria are not predicted to be exceeded at residential locations during emergency generator operation. With daytime testing, limits on concurrent testing, acoustic enclosures, mufflers, acoustic walls, operating records and

complaints response, residual generator noise risks are expected to be low to medium at the closest sensitive receptors and low for the broader population.

Low-frequency and tonal noise are secondary operational pathways that may increase noticeability and annoyance if not controlled. These risks are expected to be managed through detailed design, low-frequency noise assessment, application of annoying-characteristic penalties, plant selection, acoustic treatment, commissioning measurements and corrective actions where required.

Operational traffic noise is expected to result in changes below perceptible levels at nearby sensitive receivers and within relevant road traffic noise expectations. Residual operational traffic noise health risk is therefore considered low.

Urban heat and microclimate impacts are expected to be managed through design measures including high-albedo materials, landscaping, tree canopy, shading, permeable or lower-heat-absorption surfaces and building design measures that reduce local heat retention. Residual urban heat health risks are expected to be low where these mitigation measures are implemented and maintained. Further attention should be given to night-time heat, sleep disturbance and heat stress during future design refinement and monitoring, particularly during summer conditions and for vulnerable populations.

10.3 Cumulative Impacts and Sensitive Receptors

The assessment recognises that the Mamre Road Precinct will transition over an extended period, with potential for overlapping construction activity, traffic growth, cumulative air emissions, cumulative operational noise, generator testing from multiple facilities and broader regional sources such as Western Sydney International Airport. While the Proposal's individual contribution to long-term population health burden is generally low, cumulative impacts remain an important source of uncertainty.

Sensitive receptors, including nearby schools, Mamre Anglican School while occupied, Emmaus Catholic College, Trinity Catholic Primary School, the Emmaus Retirement Village, nearby rural-residential receptors, construction and remediation workers, and people with existing respiratory or cardiovascular conditions, have been assessed as relevant receptors while they remain present. The assessment does not rely solely on assumed relocation of short-term receptors; instead, conservative residual risk ratings have been adopted where receptor occupancy or relocation timing remains uncertain.

Cumulative risks are expected to be manageable with precinct coordination, construction staging, cumulative monitoring, air quality and noise Trigger Action Response Plans, complaints response procedures, communication with sensitive receptors, review of generator testing schedules and adaptive management as the precinct develops. Residual cumulative risks are generally characterised as low to medium until monitoring, updated modelling and precinct coordination confirm lower exposure levels.

10.4 Soil Assessment

The available contamination investigations and Remedial Action Plan indicate that the site has a history of predominantly rural residential, pastoral, and light agricultural land uses, with no evidence of widespread or significant industrial contamination. Site investigations identified isolated areas of contamination associated with historical activities, principally including asbestos-containing materials (ACM), asbestos fines and fibrous asbestos (AF/FA), limited hydrocarbon-impacted soils, building and demolition waste, and anthropogenic fill.

The primary human health risks relate to the potential disturbance of asbestos-contaminated soils and contaminated dust during construction and remediation activities. Construction workers represent the most likely receptors due to their potential exposure through inhalation of airborne fibres and dust, direct dermal contact with contaminated soils, and incidental ingestion. Potential risks to nearby receptors and future site users are considered low provided appropriate remediation and environmental management measures are implemented.

The Remedial Action Plan proposes targeted remediation measures, including excavation and off-site disposal of friable asbestos and bonded ACM, management of hydrocarbon-impacted soils, removal or appropriate management of anthropogenic waste, validation sampling, and implementation of asbestos management and dust suppression controls. These measures are consistent with current NSW contaminated land management requirements and are intended to eliminate or minimise exposure pathways before redevelopment proceeds.

The site's natural setting, including the predominance of low-permeability clay soils and shale bedrock, limits contaminant migration through groundwater. Although surface water pathways exist via farm dams and ephemeral drainage lines, appropriate erosion, sediment, and stormwater controls during construction are expected to minimise off-site transport of contaminants.

Overall, the evidence indicates that soil contamination is localised, well characterised, and capable of being effectively managed through the proposed remediation strategy. Subject to successful implementation of the Remedial Action Plan and standard construction environmental controls, the residual risks to construction workers, future occupants, neighbouring communities, and the environment are expected to be low. Consequently, soil contamination is not anticipated to present a significant constraint to the proposed development or result in unacceptable health impacts.

10.5 Overall Risk Assessment

Overall, the assessment concludes that the Proposal is unlikely to result in significant adverse population health impacts, provided the mitigation, monitoring and adaptive management measures identified in this HIA/EHRA and supporting technical assessments are implemented.

The quantitative air quality assessment indicates negligible to very low long-term population health burden. The quantitative and qualitative noise assessment indicates that residual noise and vibration risks are generally low at a population level and low to medium at the closest sensitive receptors during specific short-term or intermittent scenarios.



Soil and contamination risks are manageable through remediation, asbestos controls, validation and occupational health measures. Urban heat impacts are expected to be manageable through design mitigation, although night-time heat and vulnerable population considerations should remain subject to review.

Residual health risks are primarily short-term, localised, receptor-specific and linked to construction dust, construction noise, generator testing, rare emergency generator operation and cumulative precinct activity. These risks are not expected to be unacceptable where the proposed controls are implemented, verified and reviewed over time.

On this basis, the Mamre Road Data Centre Campus is considered capable of proceeding without unacceptable risk to human health, subject to implementation of the recommended environmental health management framework, including construction and operational management plans, monitoring, Trigger Action Response Plans, communication protocols, complaints response, record keeping, post-event review and adaptive management throughout the construction and operational life of the project.

Appendix A Discrete sensitive receptor Locations – Air Quality Assessment (Source: Northstar, 2025)

Receptor ID	Location	Land use	Coordinates (UTM)	
			mE	mS
R1	1 Bakers Lane, Kemps Creek	Residential	294844	6254331
R2	Mamre Anglican School, Kemps Creek	Educational	295142	6254273
R3	Mamre Christian College, Kemps Creek	Educational	295169	6254330
R4	Little Smarties Early Learning Centre, Kemps Creek	Educational	295174	6254272
R5	Trinity Catholic Primary School, Kemps Creek	Educational	295348	6254492
R6	Emmaus Catholic College, Kemps Creek	Educational	295550	6254313
R7	Emmaus Retirement Village, Kemps Creek	Residential	295709	6254600
R8	Catholic Healthcare Emmaus Retirement Village, Kemps Creek	Residential	295755	6254749
R9	Mamre Road, Kemps Creek	Residential	294635	6254591
R10	The Yards, Kemps Creek	Industrial	294614	6254345
R11	The Yards, Kemps Creek	Industrial	294573	6254203
R12	The Yards, Kemps Creek	Industrial	294607	6253972
R13	The Yards, Kemps Creek	Industrial	294614	6253821
R14	Yiribana Logistics Estate, Kemps Creek	Industrial	294959	6253749
R15	Aspect Industrial Estate, Kemps Creek	Industrial	294906	6253400
R16	St Narsai Assyrian Christian College, Horsley Park	Educational	299164	6253214
R18	Marion Catholic Primary School, Horsley Park	Educational	301169	6253313
R17	Horsely Park Public School, Horsley Park	Educational	301270	6253384
R19	Blackwell Public School, St Clair	Educational	294779	6257025
R20	Erskine Park High School, Erskine Park	Educational	296604	6256986
R21	James Erskine Public School, Erskine Park	Educational	296665	6257203
R22	Clairgate Public School, St Clair	Educational	296273	6258174
R23	St Clair Public School, St Clair	Educational	295039	6258209
R24	St Clair High School, St Clair	Educational	295130	6258366
R25	Holy Spirit Primary School, St Clair	Educational	294607	6258396
R26	Banks Public School, St Clair	Educational	293881	6258444
R27	Do-Re-Mi Early Learning Centre, Mount Vernon	Educational	297134	6250248
R28	Kidzspot Early Learning Centre – Dilga, Erskine Park	Educational	296112	6257556
R29	Kidzspot Early Learning Centre – Lima, Erskine Park	Educational	296438	6257575
R30	Phoenix Reserve, Erskine Park	Recreational	296542	6257571
R31	Old MacDonalds Childcare Centre, Orchard Hills	Educational	294057	6255701
R32	Dutt Medical Centre, St Clair	Medical	294164	6257251



R33	Melville Road Family Medical Centre, St Clair	Medical	294543	6258661
R34	Kindana Children's Centre, St Clair	Educational	294577	6258628
R35	Provincial Medical Centre, St Clair	Medical	295347	6258382
R36	Horsely Park Medical Centre, Horsley Park	Medical	300854	6253331
R37	Horsley Kids Early Childhood Centre, Horsley Park	Educational	301002	6253277
R38	Kemps Creek Industrial Estate, Kemps Creek	Industrial	296363	6253578
R39	Kemps Creek Industrial Estate, Kemps Creek	Industrial	296323	6252786
R40	Aspect Industrial Estate, Kemps Creek	Industrial	295268	6253400
R41	Emporium Avenue, Kemps Creek	Industrial	295825	6254170
R42	Amazon Fulfillment Centre, Emporium Avenue, Kemps Creek	Industrial	296216	6254471
R43	Coles ADC (Automated Distribution Centre), Emporium Avenue, Kemps Creek	Industrial	296469	6254871
R44	The Yards, Kemps Creek	Industrial	294082	6254117
R45	The Yards, Kemps Creek	Industrial	293884	6254133
R46	Fire and Rescue NSW Emergency Services Academy, Distribution Drive, Orchard Hills	Educational	294304	6254914
R47	Warehouse, Sarah Andrews Cl, Erskine Park	Industrial	294673	6254875
R48	Woolworths DC, Sarah Andrews Cl, Erskine Park	Industrial	295037	6254949
R49	DHL Supply Chain, Templar Road, Erskine Park	Industrial	295952	6255129
R50	Templar Road, Erskine Park	Industrial	295624	6255371
R51	Erskine Park Road, Erskine Park	Industrial	294748	6255827
R52	Grady Crescent, Erskine Park	Industrial	296744	6256156
R53	Erskine Park Road, Erskine Park	Industrial	294879	6256316
R54	Kasie Place, St Clair	Residential	294353	6256556
R55	Coowarra Drive, St Clair	Residential	295028	6256635
R56	Dunstaffnage Place, Erskine Park	Residential	296079	6256719
R57	Mandalong Close, Orchard Hills	Residential	293985	6255988
R58	Mandalong Close, Orchard Hills	Residential	293537	6255820
R59	Mamre Road, Orchard Hills	Residential	293276	6255212
R60	Twin Creeks Drive, Luddenham	Industrial	292882	6253980
R61	Medinah Avenue, Luddenham	Residential	292999	6253792
R62	Medinah Avenue, Luddenham	Residential	293237	6253103
R63	Mamre Road, Kemps Creek	Residential	295340	6252384
R64	Ganton Way, Luddenham	Residential	292865	6252423
R65	Greenway Place, Horsley Park	Residential	298647	6253861
R66	Capitol Hill Drive, Mount Vernon	Residential	298344	6253139
R67	Bowood Road, Mount Vernon	Residential	297694	6252401
R68	Aldington Road, Kemps Creek	Residential	296259	6251744
R69	Mamre Road, Kemps Creek	Residential	295497	6251556
R70	Mamre Road, Kemps Creek	Residential	295203	6252040
R72	Mamre Road, Kemps Creek	Residential	294727	6252701
R71	Mamre Road, Kemps Creek	Residential	294670	6252893
R73	Mamre Road, Kemps Creek	Residential	294621	6253098
R74	Imperata Close, Kemps Creek	Industrial	297083	6253940
R75	Johnston Crescent, Horsley Park	Industrial	298283	6254543

R76	Millner Avenue, Horsley Park	Industrial	298318	6254962
R77	Medinah Avenue, Luddenham	Residential	293264	6253295
R78	Medinah Avenue, Luddenham	Residential	293139	6253624
R79	Twin Creeks Golf & Country Club, Luddenham	Recreational	292776	6253762
R80	Farmingdale Court, Luddenham	Residential	292596	6251851
R81	Comargo Lane, Luddenham	Residential	292591	6254168
R82	Luddenham Road, Orchard Hills	Residential	292680	6254624
R83	Luddenham Road, Orchard Hills	Residential	292593	6255034
R84	Luddenham Road, Orchard Hills	Residential	292839	6255196
R85	Crystal Downs Close, Luddenham	Residential	292759	6253448
R86	Pennard Crescent, Luddenham	Residential	292954	6253379
R87	Woodhall Place, Luddenham	Residential	292724	6253034
R88	Woodhall Place, Luddenham	Residential	292863	6252713
R89	Twin Creeks Drive, Luddenham	Residential	292659	6252635
R90	Bridport Place, Luddenham	Residential	292280	6252110
R91	Ventana Court, Luddenham	Residential	292429	6252905
R92	Humewood Place, Luddenham	Residential	292491	6252373
R93	Portrush Crescent, Luddenham	Residential	292400	6253741
R94	Portrush Crescent, Luddenham	Residential	292274	6253495
R95	Portrush Crescent, Luddenham	Residential	291948	6253458
R96	Libra Place, Erskine Park	Residential	296865	6256693
R97	Cetus Place, Erskine Park	Residential	297356	6256604
R98	Peppertree Reserve, Erskine Park	Recreational	296877	6257207
R99	Erskine Park Netball Courts, Erskine Park	Recreational	295776	6257108
R100	Corio Reserve, St Clair	Recreational	294442	6256991
R101	Sennar Reserve, Erskine Park	Recreational	297236	6257322
R102	Shakespeare Drive Reserve, St Clair	Recreational	295084	6257465
R103	Saunders Park, St Clair	Recreational	294759	6257903
R104	Peter Kearns Memorial Oval, St Clair	Recreational	293924	6258257
R105	Mamre Road, Mount Vernon	Residential	296153	6250570
R106	Mount Vernon Road, Mount Vernon	Residential	296685	6250841
R107	Bowood Road, Mount Vernon	Residential	297396	6251644
R108	Garfield Road, Horsley Park	Residential	298815	6252786
R109	Burley Road, Hosley Park	Residential	299109	6254543
R110	Barwar Close, Horsley Park	Residential	300063	6254234
R111	The Appian Way, Mount Vernon	Residential	298201	6251812
R112	Delaware Road, Horsley Park	Residential	299488	6253414
R113	Lincoln Road, Horsley Park	Residential	299367	6251984
R114	Selkirk Avenue, Cecil Park	Residential	298873	6250971
R115	Mount Vernon Road, Mount Vernon	Residential	297662	6250662
R116	Cressy Road, Mount Vernon	Residential	296988	6249926
R117	Warana Road, Cecil Park	Residential	298316	6249676
R118	Horsley Road, Horsley Park	Residential	300539	6253008
R119	Bowood Road, Mount Vernon	Recreational	297512	6252333
R120	Arundel Road, Horsley Park	Recreational	300652	6253420
R121	ETP Precast Facility, Lenore Drive, Eastern Creek	Industrial	298001	6256671
R122	TransGrid Sydney West Substation & Switchyard, Eastern Creek	Substation	298721	6255977



R123	Warehouse, Old Wallgrove Road, Eastern Creek	Industrial	299347	6256015
R124	CDC Data Centre, Eastern Creek	Data Centre	299797	6255817
R125	Warehouse, Telopea Place, Eastern Creek	Industrial	299160	6256629
R126	Coca-Cola Europacific Partners Eastern Creek, Eastern Creek	Industrial	300634	6255800
R127	Digital Realty Data Centre SYD11, Templar Road, Erskine Park	Data Centre	295946	6255888
R128	Digital Realty Data Centre SYD 14, Lockwood Road, Erskine Park	Data Centre	296226	6255717

Appendix B Noise Assessment Receiver locations (NVIA, (amended), 2026)

Residential noise catchment area (NCA)	Receiver reference	Address	Receiver type	Approximate distance to the Proposal, metres ⁴
NCA01	N1_R01	654-674 Mamre Road, Kemps Creek	Residential	360
NCA01	N1_R02	676-702 Mamre Road, Kemps Creek	Residential	270
NCA01	N1_R03	1 Bakers Lane, Kemps Creek	Residential	30
NCA01	N1_R04	21 Bakers Lane, Kemps Creek	Residential	30
NCA01	N1_E01	Mamre Anglican School ³	Educational ¹	60
NCA01	N1_P01		Passive Rec	
NCA01	N1_A01		Active Rec (School)	
NCA02	N2_R01	Emmaus Retirement Village	Residential	480
NCA02	N2_E01	Emmaus Catholic College	Educational	170
NCA02	N2_P01		Passive Rec	
NCA02	N2_A01		Active Rec (School)	
NCA02	N2_E02	Trinity Primary School	Educational	320
NCA02	N2_P02		Passive Rec	
NCA02	N2_A02		Active Rec (School)	
NCA03-PW	N3_PW01	BAPS Temple and Cultural Precinct	Place of worship	1,520
NCA03	N3_R01	20 Aldington Road, Kemps Creek	Residential	430
NCA03	N3_R02	53 Aldington Road, Kemps Creek	Residential	490
NCA04	N4_R01	799-803 Mamre Road, Kemps Creek	Residential	520
NCA04	N4_R02	819 Mamre Road, Kemps Creek	Residential	700
NCA04	N4_R03	833A Mamre Road, Kemps Creek	Residential	810
NCA04	N4_R04	833B Mamre Road, Kemps Creek	Residential	850
NCA04	N4_R05	845A Mamre Road, Kemps Creek	Residential	920
NCA04	N4_R06	845-857 Mamre Road, Kemps Creek	Residential	950
NCA04	N4_R07	859-869 Mamre Road, Kemps Creek	Residential	1,070
NCA04	N4_R08	885-899 Mamre Road, Kemps Creek	Residential	1,200
NCA05	All ¹	Orchard Hills	Residential	1,500
NCA05	N5_CC1	Old MacDonald's Child Care	Childcare	1,510
NCA06	All ¹	Luddenham	Residential	1,400
NCA07	All ¹	Kemps Creek	Residential	1,600
NCA08	All ¹	Mount Vernon	Residential	2,200
IND	I01	East	Industrial	Adjacent
	I02	South	Industrial	Adjacent
	I03	West	Industrial	Adjacent
Notes:	Multiple receiver locations within the noise catchment have been assessed as identified in Error! Reference source not found. as Proposal noise levels at receivers may vary across the			

Reference List

- Australian Bureau of Statistics 2023, [Hypertension and high measured blood pressure, 2022](#), ABS, Canberra, viewed 22 June 2026.
- Australian Bureau of Statistics 2023, [National Health Survey, 2022](#), ABS, Canberra, viewed 22 June 2026.
- Australian Bureau of Statistics 2024, [National Health Survey: State and territory findings, 2022](#), ABS, Canberra, viewed 22 June 2026.



- enHealth 2018, [The health effects of environmental noise](#), Environmental Health Standing Committee, Australian Government Department of Health, Canberra.
- NSW Health 2026, [HealthStats NSW](#), Centre for Epidemiology and Evidence, NSW Ministry of Health, Sydney, viewed 22 June 2026.
- NSW Health 2026, [Western Sydney Local Health District – HealthStats NSW](#), Centre for Epidemiology and Evidence, NSW Ministry of Health, Sydney, viewed 22 June 2026.
- van Kempen, E, Casas, M, Pershagen, G & Foraster, M 2018, '[WHO Environmental Noise Guidelines for the European Region: A systematic review on environmental noise and cardiovascular and metabolic effects: A summary](#)', *International Journal of Environmental Research and Public Health*, vol. 15, no. 2, article 379.
- World Health Organization Regional Office for Europe 2019, [Environmental noise guidelines for the European Region](#), WHO Regional Office for Europe, Copenhagen.
- Xia, Y, Yang, Z, Xia, H, Ma, X, Li, C, Guo, Q, Lu, J, Zhang, M & Xia, Y 2026, '[Long-term exposure to traffic noise and the incidence of hypertension: a systematic review and meta-analysis of prospective cohort studies](#)', *Frontiers in Cardiovascular Medicine*, vol. 13, article 1834139.
- Hu, D, et al. 2023, '[Long-term exposure to traffic noise and risk of incident cardiovascular diseases: a systematic review and dose-response meta-analysis](#)', *Journal of Urban Health*.

