S4

Air Quality Report

NEXTDC

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1 Preface

1.1 Executive Summary

This Air Quality Report has been prepared by *Aurecon* on behalf of NEXTDC Limited to accompany a detailed State Significant Development Application (SSDA) for the S4 data centre development at 16 Johnston Crescent, Horsley Park. The site is legally described as Lot 305 in Deposited Plan 1275011.

This report has been prepared to address the Secretary's Environmental Assessment Requirements (SEARs) issued for the project (SSD-63741210). This report concludes that the proposed data centre development is suitable and warrants approval subject to the implementation of the following mitigation measures:

- Management of construction activities including:
  - Communications: Develop and implement a stakeholder communications plan that includes community engagement.
  - Dust Management Plan (DMP): Develop and implement a DMP, interacting with the stakeholder communications plan, and includes procedures with respect to complaints, incidents, inspections, site management, dust suppression, surface/stockpile stabilisation, storage management, water supply, trackout measures, and so forth.
  - Vehicle/machinery:
    - All on-road vehicles shall comply with relevant vehicle emission standards.
    - When stationary, vehicles are to switch off engines.
    - Use of diesel or petrol-powered generators to minimised, in preference to mains electricity or battery powered equipment where practicable.
  - Waste: Avoid burning of waste materials on site.
  - Otherwise as detailed in Enclosure A Appendix D Table D10

Following the implementation of the above mitigation measures, the remaining impacts are appropriate.

No mitigation measures were identified as being required for operations.

1.1.1 Air Quality Assessment

This report was prepared to address SEAR Item 11, which required assessment of air quality impacts associated with construction works and predicted operation.

The Proposal site does not contain any existing structures and is situated within an IN1 – General Industrial zone according to the Fairfield Local Environment Plan 2013 (Fairfield LEP 2013). The land use surrounding the Proposal site contains a mix of RU4 – Primary Production Small Lots and C2 – Environmental Conservation land uses pursuant to the zoning provisions under the Fairfield LEP 2013. The closest identified residence is noted to be located 26m to the east of the Proposal site on Burley Road, Horsley Park.

The Proposal will be a data centre with mission critical high availability requirements. Accordingly, the Proposal has negotiated to be served directly from the Sydney West Bulk Supply Point Substation (Sydney West BSP). Sydney West BSP is operated by Transgrid and is located approximately 1.5km north of the Proposal, a supply point with Category 2 level of redundancy requirements under NSW Transmission Reliability and Performance Standard 2017 (NSW 2017). Sydney West BSP has maintained 100% uptime since 2005 per panel analysis of Australian Energy Market Operator (AEMO) data outlined in Australian Energy Market Commission (AEMC) Reliability Panel Annual Report (AEMC, 2022), significantly better than its obligations under NSW 2017 to ensure loss of customer supply (unserved energy) does not exceed one (1) minute per year.

The Sydney West BSP connection to the Proposal Site will comprise two (2) dual redundant 330kV feeders, primary and backup, each sized to supply the full site load. These will connect via four (4) 330/33kV transformers with four (4) independent 33kV busbars to achieve reticulation around site with N-1 redundancy across all development stages of the Proposal such that the loss of one redundant utility supply to the site does not disrupt site operations. The Proposal includes 98 off generators that serve as an emergency protection against complete failure of the entire utility supply.

1.1.1(a) Construction Activities

The construction-phase impacts associated with the Proposal have been assessed using a risk-based assessment procedure adapted from Guidance on the Assessment of Dust from Demolition and Construction developed in the United Kingdom by the Institute of Air Quality Management (IAQM, 2024), which uses a six-step process for assessing dust impact risks from construction activities as a function (product) of receptor sensitivity and potential impact magnitude and identifies key activities for control.

Based upon that assessment, the potential dust soiling and human health risks were assessed as being manageable through appropriate implementation of the recommended mitigation measures. These measures were summarised in at the start of this summary section and are detailed in Enclosure A Appendix D Table D10.

1.1.1(b) Predicted Operation

Operational on-site emissions from the data centre on a day-to-day basis are anticipated to be negligible, with the exception of potential emissions from diesel-fuelled back-up generators during periodic maintenance testing or during a power outage event.

The Proposal is anticipated to install back-up generators as summarised in Table 1.1 (refer to Enclosure A Section 2, Section 5, and Appendix E for further information):

Table 1.1 Proposal Generator Configuration

Building	Generator Information		Quantity	Exhaust Stack Height
	Capacity	Reference Model		
Building A	2 MW	MTU model 16V 4000 G84F Fuel-consumption Optimized	10	33.5 m
Building B	3 MW	MTU model 20V 4000 G94LF NEA Singapore for ORDE	20	38.5 m
Building C	3 MW	MTU model 20V 4000 G94LF NEA Singapore for ORDE	20	38.5 m
Building D	3 MW	MTU model 20V 4000 G94LF NEA Singapore for ORDE	20	38.5 m
Building E	3 MW	MTU model 20V 4000 G94LF NEA Singapore for ORDE	28	38.5 m

Over a typical year, the nominal maintenance testing regime is summarised in Table 1.2 below.

Table 1.2 Maintenance Testing Schedule

Parameter	Value
Number of generators	98
Test frequency per generator	4 standard tests per year
Run time per test	2 tests run for 20 minutes, 1 test runs for 40 minutes, 1 test runs for 90 minutes. Total runtime of 170 minutes per year)
Number of generators per test	Up to 2 generators per standard test
Number of tests per day	Up to approximately 33 tests could be run in a single day. Dependant on the test, personnel efficiency, etc
Testing schedule	07:00am and 06:00pm (Monday to Saturday or Public Holidays) or 08:00am and 06:00pm on Sundays
Total testing time for all generators	153 hours per year

The prediction of potential impacts associated with operational activities has been performed in general accordance with the requirements of the NSW Environment Protection Authority Approved Methods (NSW EPA 2022), using an approved and appropriate dispersion modelling technique, under two operating scenarios as follows:

- Scenario 1 – Justified worst-case: Emergency operation with all generators operating at 100% load.
- Scenario 2 – Realistic operations (annual testing): Maximum of two (2 no.) generators operating simultaneously at up to 100% per the generator maintenance testing regime.

Each of the above scenarios were modelled for each stage of the Proposal (Stage 1 to 3) as described by Table 1.3.

Table 1.3 Modelling Scenarios

Stage	Buildings	Modelling Scenario Description	
		1 – Justified worst-case	2 – Realistic operations
1	A, B, and C	Emergency operation with 50 no. generators (40 no. 3 MW generators and 10 no. 2 MW generators) operating at 100% load continuously for all hours over the simulation.	Two (2) 3 MW generators located on the south-western side of Building C operating at 100% between the hours of 7 am and 6 pm for the entire simulation.
2	A, B, C, and D	Emergency operation with 70 generators (60 no. 3 MW generators and 10 no. 2 MW generators) operating at 100% load continuously for all hours over the simulation.	Two (2) 3 MW generators located on the south-western side of Building D operating at 100% between the hours of 7 am and 6 pm for the entire simulation.
3	A, B, C, D, and E	Emergency operation with 98 generators (88 no. 3 MW generators and 10 no. 2 MW generators) operating at 100 % load continuously for all hours over the simulation.	Two (2) 3 MW generators located on the south-western side of Building D operating at 100% between the hours of 7 am and 6 pm for the entire simulation.

Under the justified worst-case emergency back-up generator operational scenario with all generators operating at the same time at full (100 %) load, a number of additional exceedances of the air quality criteria for a number of pollutants are predicted for each stage. The number of exceedances increases with each stage, such that Stage 3 has the greatest number.

This scenario only occurs would require the catastrophic loss of both primary and redundant supply feeders or outage at the Sydney West BSP. While such an event has not been recorded for this supply point, using the minimum unserved energy requirement for Sydney West BSP under NSW 2017 (≤ 1 minute per year) the assessment considered the power interruptions probability at approximately of p = 0.000002. With consideration of the probability of exceedances for relevant air quality criteria indicated in the dispersion modelling, it was found that probability of exceedance conditions coinciding with a catastrophic power outage event occurring is correspondingly rare.

Predicted incremental concentrations for a realistic emissions scenario during routine maintenance of the back-up generators show that no exceedances are predicted to occur at any surrounding receptors for all assessed pollutants. The predicted incremental concentrations for all assessed pollutants are shown to be below the relevant criteria under realistic operations where the emergency generators are appropriately operated under the testing schedule.

It follows that the assessment of operational impacts indicated that they do not occur under realistic operations and have a rare occurrence under the justified worst-case.

2 Introduction

2.1 Purpose of this Report

This report has been prepared to accompany a detailed SSDA for the proposed S4 data centre development at 16 Johnston Crescent, Horsley Park (the Proposal).

The application seeks consent for construction and operation of a data centre development and includes site preparation works, bulk earthworks and infrastructure, and construction of the buildings, ancillary facilities, and associated site works.

Specifically, the Proposal comprises the redevelopment of the site as summarised below:

- Site preparation works including bulk earthworks.
- Staged construction and operation of five data centre buildings comprising a total gross floor area (GFA) of 63,654m² including 52,916m² of technical data hall floor space and 10,738m² of ancillary office and innovation floor space, including 'front of house' meeting and function spaces, and a café.
- Associated and ancillary on-site facilities on-site parking for 200 cars, business identification signage (pylon and elevation signage), civil and stormwater works and 9,900m² of deep soil landscaping.
- Delivery of 232 megawatts of power, including a 330kV substation and a 33kV switching station, plus above ground diesel storage tanks and above ground water tanks for industrial water and fire water.

The Project will be delivered in three construction stages as follows:

- Stage 1 = Buildings A to C and Substation
- Stage 2 = Building D
- Stage 3 = Building E

This report has been prepared as a preliminary response to the requirements contained within the Secretary's Environmental Assessment Requirements (SEARs) dated 27 October 2023 issued for the SSDA (SSD-63741210). Specifically, this report is a preparation in response to the SEARS requirement issued below.

Table 2.1 SEARs Compliance

Item	Description of Requirement	Section Reference (this Report)
11. Air Quality	▪ Provide an assessment of air quality impacts, prepared in accordance with the relevant NSW Environment Protection Authority (EPA) guidelines. The assessment must address construction works and include modelling of emissions and air pollutants from predicted operations (including testing of the back-up power system) and a peak emission and air pollutant scenario, and outline the proposed mitigation, management and monitoring measures that would be implemented.	▪ Statutory Basis: Enclosure A Section 3 ▪ Methodology and Assessment Criteria: Enclosure A Section 3.3 & Enclosure A Section 5 ▪ Site Conditions: Enclosure A Section 4, Enclosure A Appendix B, & Enclosure A Appendix C ▪ Sensitive Receptors: Enclosure A Section 4.2 ▪ Assessment: Enclosure A Section 2.3, and – Construction- Enclosure A Section 6 & Enclosure A Appendix D – Operation- Enclosure A Section 7 & Enclosure A Appendix E ▪ Mitigation, management, and monitoring measures: – Construction- Enclosure A Section 8.1 & Enclosure A Appendix D – Operation- Enclosure A Section 8.2

The air quality impact assessment (AQIA) is provided as Enclosure A, with relevant cross references provided in Table 2.1 above.

2.2 Proposal Overview

2.2.1 The Site

The site is located at 16 Johnston Crescent, Horsley Park within the Fairfield Local Government Area (LGA). The site is legally described as Lot 305 in Deposited Plan 1275011.

An aerial photograph of the site is provided at Figure 2.1. The site comprises vacant land which has been cleared of vegetation and does not contain any existing built form structures. Bulk earthworks approved under DA-893-201 are currently underway on the site.

The site will be well serviced by infrastructure. The signalised intersection of Lenore Drive and Old Wallgrove Road at Eastern Creek is approximately 2 kilometres to the north, providing access to Wallgrove Road and the Westlink M7 Motorway to the east and Erskine Park Road and Mamre Road to the west. Each of these roads provides access to the M4 Motorway to the north and M5 Motorway to the south. A utilities and site services report will accompany the EIS.

The site is located approximately 35 kilometres west of the Sydney Central Business District (CBD), 17 kilometres west of the Parramatta CBD and 10 kilometres north-east of the future Western Sydney International (WSI) airport.

The site is within a developing employment precinct, including the ESR Horsley Logistics Park, Oakdale Central, Oakdale South and Horsley Park Employment Precinct. It is also close to other established and emerging employment-generating precincts, including Eastern Creek to the north, Huntingwood to the north-east, Wetherill Park and Mamre Road West to the north-west and Wetherill Park to the east.

Figure 2.1 Site Aerial Photograph

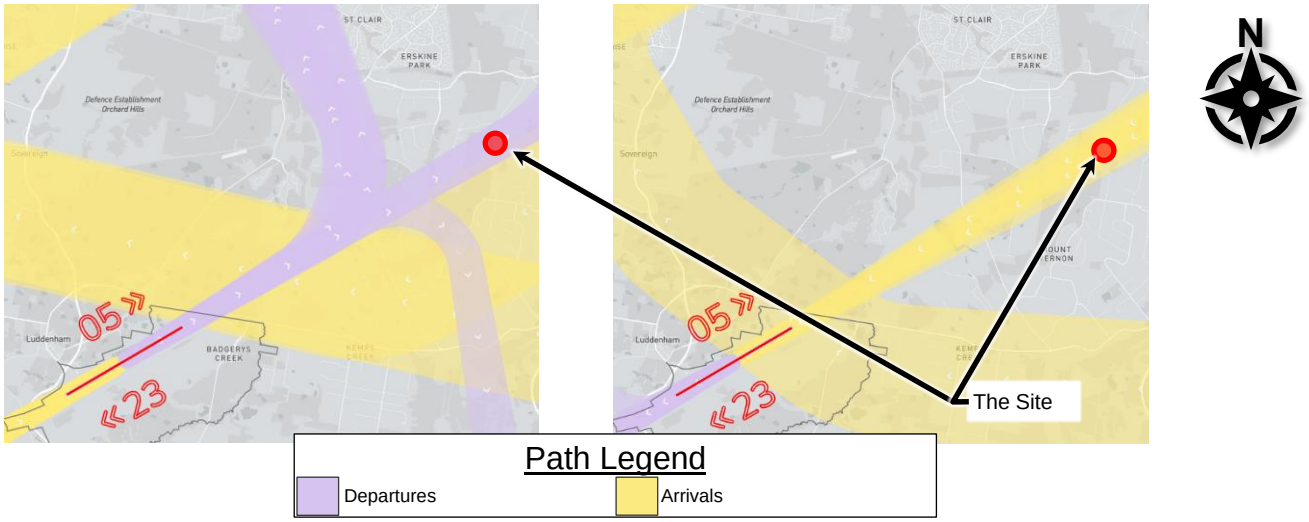
Source: Nearmap (2023)

2.2.1(a) Flight path and OLS

While not a direct factor on the air quality study, the site position relative to flight paths and Obstacle Limitation Surfaces (OLS) were reviewed to determine if they might impact likely stack heights.

As identified in the Shiraz 4 Site Appraisal, Due Diligence, Capacity Feasibility and Risk Assessment Study (S4 Due Diligence Report) the proposed site is likely within the flightpath of WSI. Based on predicted flight paths current as of January 2024 as shown in Figure 2.2. Runway level is 260 feet (80 m) above sea level.

Figure 2.2 Western Sydney International Flight Paths from Runway 05 (left) and Runway 23 (right)

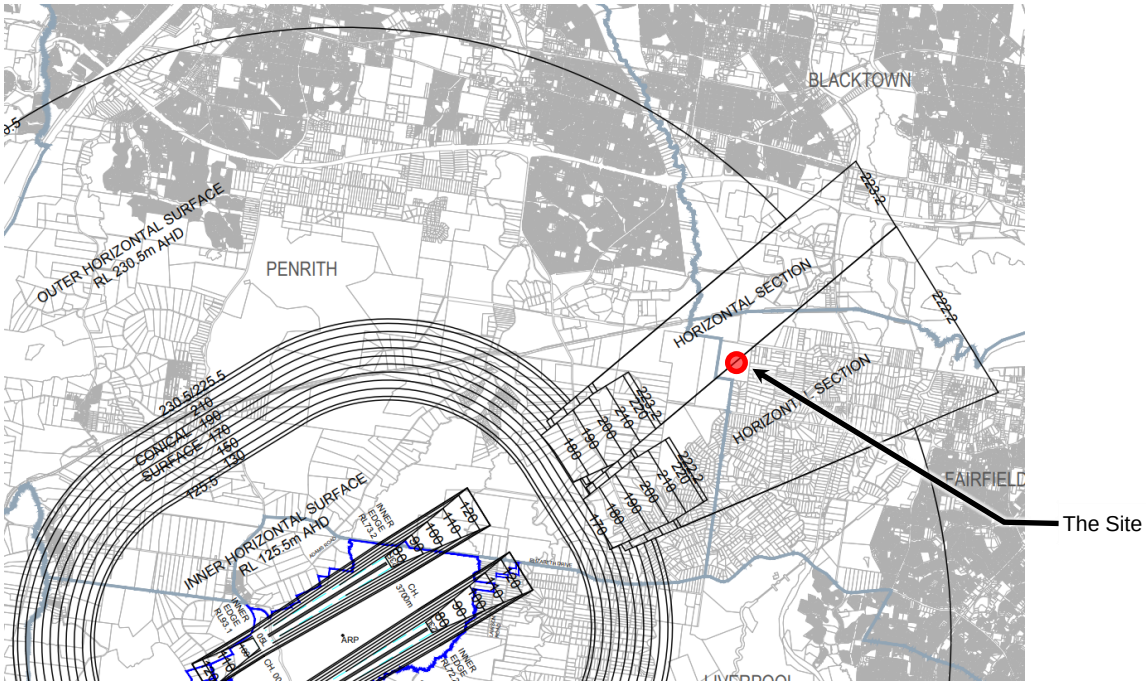


Source: Western Sydney International (Nancy-Bird Walton) Airport Aircraft Overflight Noise Tool https://wsiflightpaths.aerlabs.com/

Flights using Runway 23 mode, on approach to arrive, have the lowest nominal overfly above runway level of 750 to 2500 feet (228 to 762m). The site elevation is ~84m above sea level, nominally matching the runway level.

The OLS for Western Sydney Airport current as of time of writing (Figure 2.3) are set at 222.2m/223.2m AHD over the Site. It follows that the height difference from the OLS between site ground level and highest floor level is on the order of 135m and 95m respectively.

Figure 2.3 Western Sydney Airport OLS



Source: Western Sydney Airport Obstacle Limitation Surfaces June 2019 https://westernsydney.com.au/sites/default/files/2019-06/OLS_chart.pdf

It is anticipated that for expected stack heights (Refer to Enclosure A Table 12) that there is sufficient separation from the OLS. However, this shall be reviewed as the design progresses via a combination of numerical and detailed desktop methods.

2.2.2 The Project

The key components of the Project are listed in Table 2.2 below.

Table 2.2 Project Details

Descriptor	Project Details
Project Area	The site has a total area of 8.206 hectares. The entire site will be disturbed by the Project.
Use and Activities	Data centre with ancillary office and innovation floor space and café.
Project Summary	The Project includes construction and operation of a data centre comprising: ■ Site preparation works including bulk earthworks. ■ Staged construction and operation of five data centre buildings comprising a total gross floor area (**GFA**) of 63,654m^2 including 52,916m^2 of technical data hall floor space and 10,738m^2 of ancillary office and innovation floor space, including 'front of house' meeting and function spaces, and a café. ■ Ancillary development including on-site parking for 200 cars, business identification signage (pylon and elevation signage), civil and stormwater works. ■ Delivery of 232 megawatts of power, including a 330kV substation and a 33kV switching station, plus above ground diesel storage tanks and above ground water tanks for industrial water and fire water.
Gross Floor Area (GFA)	Total GFA of 63,654m², broken down as follows: ■ Data halls/technical: 52,916m². ■ Mission critical (MCX) office, innovation, and admin floor space: 10,738m². ■ Total number of data houses: 34 data houses.
Floor Space Ratio	0.78:1
Deep Soil Area	9,900m² (12.1% of site area)
Car Parking	200 car spaces including 6 DDA spaces and 10 EV spaces
Motorbike Parking	5 spaces
Bicycle Parking	24 spaces
Utilities	Provision of required utilities: ■ Building A Utilities including: – Above ground diesel storage tanks (10 x 25kL each) – Above ground water tanks for industrial water (4 x 170kL each) ■ Building B Utilities including: – Above ground diesel storage tanks (10 x 65kL each) – Above ground water tanks for industrial water (4 x 580kL each) ■ Building C Utilities including: – Above ground diesel storage tanks (10 x 65kL each) – Above ground water tanks for industrial water (4 x 580kL each) ■ Building D Utilities including: – Above ground diesel storage tanks (10 x 65kL each) – Above ground water tanks for industrial water (4 x 580kL each) ■ Building E Utilities including: – Above ground diesel storage tanks (14 x 65kL each) – Above ground water tanks for industrial water (6 x 580kL each) ■ Fire Water Storage Tanks: – Above ground water tanks for fire water (6 x 340kL each) ■ Substation: – On site 330kV substation plus 33kV switching station
Power Consumption	232 megawatts

Descriptor	Project Details
Operations and Management	The facility will be constructed and operated by NEXTDC. The site will be operated on a 24-hour, 7 day a week basis.
Existing Services and Infrastructure	Existing services and infrastructures will be extended, adapted, and augmented to meet the demands of the Project.
Staging/Phasing	There will be 3 construction stages: ▪ Stage 1 = Buildings A to C and Substation ▪ Stage 2 = Building D ▪ Stage 3 = Building E

2.2.2(a) Site power infrastructure

The Proposal will be served by a new 330kV substation, located in the southeast corner of the site. This substation will be directly fed from the Sydney West Bulk Supply Point Substation (Sydney West BSP) via two (2) dual redundant, primary and backup, 330kV feeders, each sized to supply the full site load, stepping voltages down to 33kV via four (4) 330/33kV transformers with four (4) independent 33kV busbars allowing for dedicated 33kV supplies reticulation around site with N-1 redundancy across all development stages of the Proposal. This configuration ensures extremely high availability and reliability for distribution of mains power supply for the site, such that the loss of one redundant utility supply to the site does not trigger any generators to run.

Sydney West BSP is operated by Transgrid and is located approximately 1.5km north of the Proposal. This infrastructure is subject to a Category 2 level of redundancy under NSW Transmission Reliability and Performance Standard (2017) and has a maximum allowable unserved energy (USE) of one (1) minute per year. However, it is highlighted that Sydney West BSP has maintained 100% uptime since 2005 per panel analysis of Australian Energy Market Operator (AEMO) data outlined in Australian Energy Market Commission (AEMC) Reliability Panel Annual Report (AEMC, 2022).

These reliability characteristics and associated impacts on expected generator emergency operation are presented in Enclosure A Section 8.2.

2.2.2(a)(i) Maintenance Testing Schedule

The nominal routine testing of the Proposal's emergency generators is summarised in Table 2.3 below.

Table 2.3 Maintenance Testing Schedule

Parameter	Value
Number of generators	98
Test frequency per generator	4 standard tests per year
Run time per test	2 tests run for 20 minutes, 1 test runs for 40 minutes, 1 test runs for 90 minutes. Total runtime of 170 minutes per year)
Number of generators per test	Up to 2 generators per standard test
Number of tests per day	Up to approximately 33 tests could be run in a single day. Dependant on the test, personnel efficiency, etc
Testing schedule	07:00am and 06:00pm (Monday to Saturday or Public Holidays) or 08:00am and 06:00pm on Sundays
Total testing time for all generators	153 hours per year

This information is replicated in Enclosure A Section 2.3.2, however, the provided schedule is arranged to show the tabulation of testing time for each scenario. While arranged differently the information and thus basis is the same as Table 2.3.

2.2.2(a)(ii) Generator Greenhouse Gas Emissions

The Proposal's generators are intended for operation only during routine testing or during emergency events. The fraction of time operating in either scenario over a typical year is not significant, thus, the generator

greenhouse gas (GHG) emissions will represent an insignificant faction of the Proposal's annual GHG relative to the normal operation grid electricity consumption Scope 2 GHG emissions.

Holistic reduction of the Proposal's GHG emissions are discussed in the Sustainable Development Plan provided elsewhere in the EIS.

Enclosure A– Air Quality Impact Assessment

The Air Quality Impact Assessment undertaken for the proposed S4 data centre development at 16 Johnston Crescent, Horsley Park (SSD-63741210).

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