SSDA Sustainability and GHG Emissions Statement

Macquarie Park Data Centre Campus IC3 Super West

17-23 Talavera Road, Macquarie Park, NSW 2113

Date:	26 October 2022	**Issue:**	07
Reference:	10314934	**Status:**	Revised SSDA
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Edited by:	Simon Dormer	**Date:**	26 October 2022
Authorised by:	David McKay	**Date:**	26 October 2022
Issuing office:	Sydney, AUS		

DOCUMENT CONTROL

Issue	Date	Status	HPF Author	HPF Approval	Notes
00	24 August 2021	Draft	24/08/21_JK		Initial Draft for Planning
01	8 October 2021	Issue	08/10/21_JK		Final
02	25 October 2021	Issue	25/10/21_JK		Final Updated Location Map
03	04 November 2021	Issue	04/11/21_JK		Update Image Water Use Section
04	05 November 2021	Issue	05/11/21_JK		Updated GHG section with comments regarding State and National emissions
05	21 February 2022	Issue	24/02/22_JK	24/02/21_DH	Updated generator usage time and landscaping area
06	25 October 2022	Final	21/10/22_SD	21/10/22_DM	Revised SSD
07	26 October 2022	Final	26/10/22_SD	26/10/22_DM	Revised SSD

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1.0 INTRODUCTION

HDR have been appointed by Macquarie Data Centres (MDC) to undertake the Sustainability and GHG Emission Statement for the proposed development of the Macquarie Park Data Centre Campus IC3 Super West site at 17-23 Talavera Road, Macquarie Park.

This Sustainability and GHG Emission Statement serves to support the State Significant Development Application (SSDA) relating to the proposed development.

1.1 Executive Summary

This Sustainability and GHG Emission Statement has been prepared by HDR on behalf of Macquarie Data Centres (MDC) C/- GIDDIS Project Management.

The following Sustainability and GHG Emission Statement has been produced to support the Environmental Impact Statement (EIS) prepared by Willowtree Planning PTY Ltd (Willowtree Planning).

The EIS has been submitted to the New South Wales (NSW) Department of Planning, Industry and Environment (DPIE), in support of an application for State Significant Development (SSD), for the construction and operation of a data centre, involving earth works, provision of infrastructure and expansion of an existing data centre at 17 – 23 Talavera Road, Macquarie Park (Lot 527 DP 752035).

The proposal represents an extension to the approved data centre (LDA/2018/0322) to allow for additional data storage capacity at the subject site, improving the overall operational efficiencies and provision of technology services to customers and the wider locality.

The proposal involves the construction and operation of an expansion to an existing data centre located at 17-23 Talavera Road, Macquarie Park (Lot 527 in DP 752035), comprising:

(i) a seven (7) storey building plus ground floor

(ii) ancillary office space and staff amenities

(iii) a back-up power system

(iv) associated infrastructure, car parking, loading docks and landscaping

The subject site is located within the City of Ryde Local Government Area (LGA). The proposal seeks to operate 24 hours per day, seven (7) days per week.

The particulars of this proposal are summarised below:

(i) Minor earthworks involving cut and fill works

(ii) Infrastructure comprising civil works and utilities servicing

(iii) Construction of a seven (7) storey building plus ground floor extension, comprising up to:

- 15 data halls
- 20 back up generators
- Fitout of the building for use as a data centre (on an as-needs basis)

1.2 Site Description

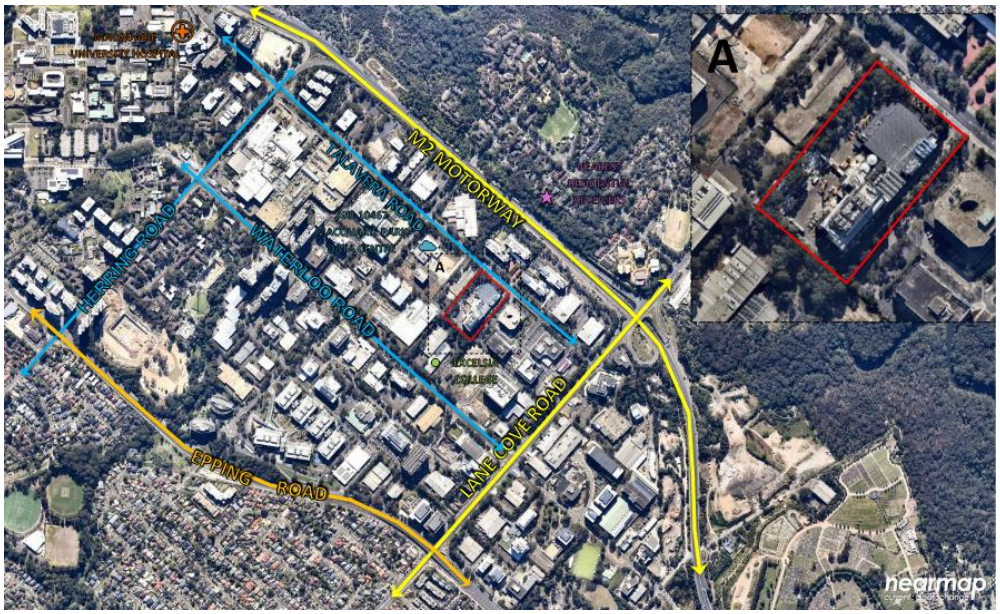
The site is described as Lot 527 DP 752035, commonly known as 17–23 Talavera Road, Macquarie Park. The site has a total area of approximately 20,000m2, with access achieved via Talavera Road.

The site forms part of the Macquarie Park Corridor, which is the strategic centre of Macquarie Park, being a health and education precinct and an important economic and employment powerhouse in Sydney's North District.

The site is described through its current commercial setting as an existing Data Centre (LDA/2018/0322), adjoining surrounding commercial premises along Talavera Road, and forming part of the wider Macquarie Park Corridor.

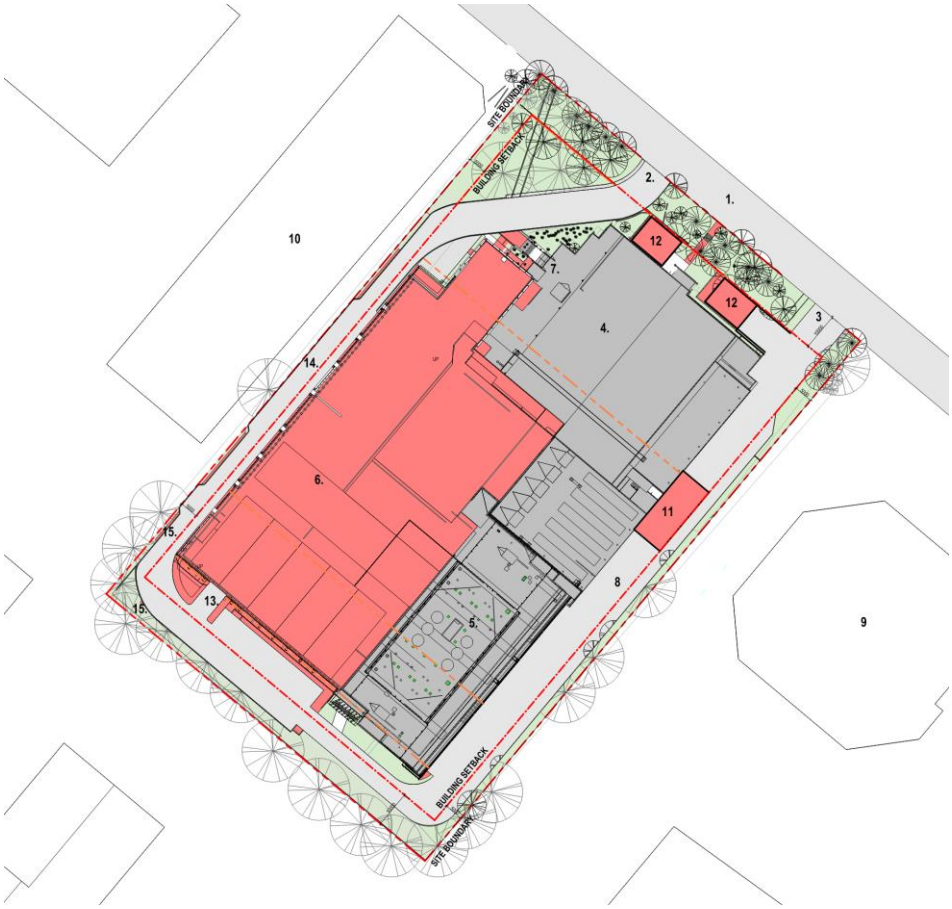
The site is situated approximately 12.5 km northwest of the Sydney CBD and 11.3 km northeast of Parramatta. It is within close proximity to transport infrastructure routes (predominantly the bus and rail networks), as well as sharing direct links with the wider regional road network, including Talavera Road, Lane Cove Road, Epping Road and the M2 Motorway.

These road networks provide enhanced connectivity to the subject site and wider locality. Additionally, the site is located within close proximity to active transport links, such as bicycle routes, providing an additional mode of accessible transport available to the subject site.



1.3 Site Location

The site 17 – 23 Talavera Road, Macquarie Park, being Lot 527 DP 752035.



1.4 Secretary's Environmental Assessment Requirements

This Sustainability and GHG Emission Statement is prepared in accordance with the Secretary's Environmental Assessment Requirements (SEARs). The SEARs for the proposal outline Key Issues to be addressed as part of this EIS and includes:

HDR have been appointed by Macquarie Data Centres (MDC) to undertake the Sustainability and GHG Emission Statement for the proposed development of the Macquarie Park Data Centre Campus IC3 Super West site.

The following Secretaries Environmental Assessment Requirements (SEARS) are addressed within Table 1 of this report.

Table 1

SEARs Items	Secretary's Environmental Assessment Requirements (SEARs)	Response
Key Issue	The following SEARS requirements are to be addressed within this document **Ecologically sustainable development** – including: • a description of how the proposal will incorporate the principles of ecologically sustainable development in the design. • construction and ongoing operation of the development consideration of the use of green walls, green roofs and/or cool roofs in the design of the development. • a description of the measures to be implemented to minimise consumption of resources, especially energy and water. **Greenhouse gas and energy efficiency** – including: • an assessment of the energy use of the proposal and all reasonable and feasible measures that would be implemented on site to minimise the proposal's greenhouse gas emissions (reflecting the Government's goal of net zero emissions by 2050).	*This report* *Section 2.0* *Section 3.0* *Section 3.0*

2.0 ESD INTRODUCTION

This statement has been produced to identify how the design, construction and ongoing operation of the proposed Macquarie Park Data Centre Campus IC3 Super West (IC3w) located on 17-23 Talavera Road, Macquarie Park, will meet requirements relevant to ecologically sustainable development (ESD).

The proposed Development would represent an extension with respect to the Data Centre approved under LDA/2018/0322. The proposed Development would allow for additional data storage capacity on-site improving the overall operational efficiencies able to be explored and provided to customers and the wider locality. This statement supports the State Significant Development Application (SSDA) submitted to the Department of Planning, Infrastructure and Environment (DPIE).

2.1 Proposed Development Description

The proposed Data Centre would operate on a 24/7 basis over seven (7) storey building plus ground floor, include 15 No. data halls, electrical switchrooms and substations to house 4 No. 33 to 11kV power transformers and 24 No 11 to 415V distribution transformers for distribution of power within the premises, 4 No. diesel fuel bulk storage tanks, plant and equipment.

The Data Centre Building would be a maximum height of 45 m with approximate 16,142m^2 Gross Floor Area (GFA) across the Site.

The data centre building will also accommodate approximately 2,759m^2 GFA of potential office space.

Additionally, the Proposal includes provisions for internal access roads providing safe ingress and egress throughout the Site, including appropriate directional access and vehicular movement across the Site. 2,978 m^2 of deep soil landscaping has been proposed for the Site, which equates to 14.8% of the Site being landscaped, with a 15.25% canopy cover.

71 car parking spaces have been provided for the proposed development including four (4) accessible spaces and three (3) spaces suitable for electric vehicles.

2.2 ESD Approach

Greenhouse gas (GHG) emissions attributable to the Project have been estimated over its lifecycle taking into account decarbonisation of the grid. Adoption of a formal ESD rating or assessment tool is not proposed for the project. However, sustainability and resilience has been considered throughout the design process.

The following ESD initiatives are detailed in this statement:

- Indoor Air Quality
- Biodiversity
- Waste
- Transport
- Energy
- Water
- Materials

3.0 GHG EMISSIONS ESTIMATE

3.1 Emissions Scope and Coverage

For this assessment, the following emissions scope has been assessed:

- Scope 1 related to direct emissions from sources within the boundary of the Project.
- Scope 2 related to the emissions resulting from the consumption of imported electricity from the local electricity grid; and
- Scope 3 related to the indirect emissions attributable to losses through the electricity transmission and distribution network.

Sources of emissions estimated in this assessment include the following:

- Imported electricity consumed in the operation of the facility; and
- On-site diesel fuel consumption consumed in the monthly testing of backup diesel generators.

Emissions have been estimated on an annual basis under assumption of full and ultimate operational capacity over a 50-year period.

3.2 Input Data

Data used for the estimation of GHG emissions has been taken from the *National Greenhouse Accounts Factors* (August 2021), published by the Australian Government Department of the Environment and Energy. At the time of writing, this was the latest revision of these accounts factors and it is assumed that they are applicable to the estimates at commencement of operation.

Emissions factors associated with relevant sources for the Project are outlined in Table 1.

Source	Emissions Factors
Grid Electricity (for NSW)	Scope 2: 0.78 kg CO2-e/kWh
	Scope 3: 0.07 kg CO2-e/kWh
Diesel Fuel	Scope 1: CO2: 69.9 kgCO2-e/GJ CH4: 0.1 kg CO2-e/GJ N2O: 0.2 kgCO2-e/GJ
Biodiesel Fuel (assumed for use 2050)	Scope 1: CO2: 0.0 kgCO2-e/GJ CH4: 0.08 kg CO2-e/GJ N2O: 0.2 kgCO2-e/GJ

Table 1 - National Greenhouse Accounts Factors (2021) inputs used to estimate ICw3 GHG emissions

With respect to estimating emissions of an assumed facility life of 50 years, the decarbonisation of the electricity grid has been estimated based on linear interpolation and extrapolation of publicly announced government commitments related to renewable energy targets. Emission for the generation of electricity is projected to decline with increased renewable energy supply while emissions for distribution losses are held constant (as a conservative assumption, although likely also to decline) up to the net zero carbon target of 2050. The proposed generators are capable of using biodiesel when a suitable supply becomes available in Sydney, therefore conservatively estimated the changeover from diesel to biodiesel to be 2050. Figure 1 illustrates the assumed changes to these factors notionally between 2022 and 2072.

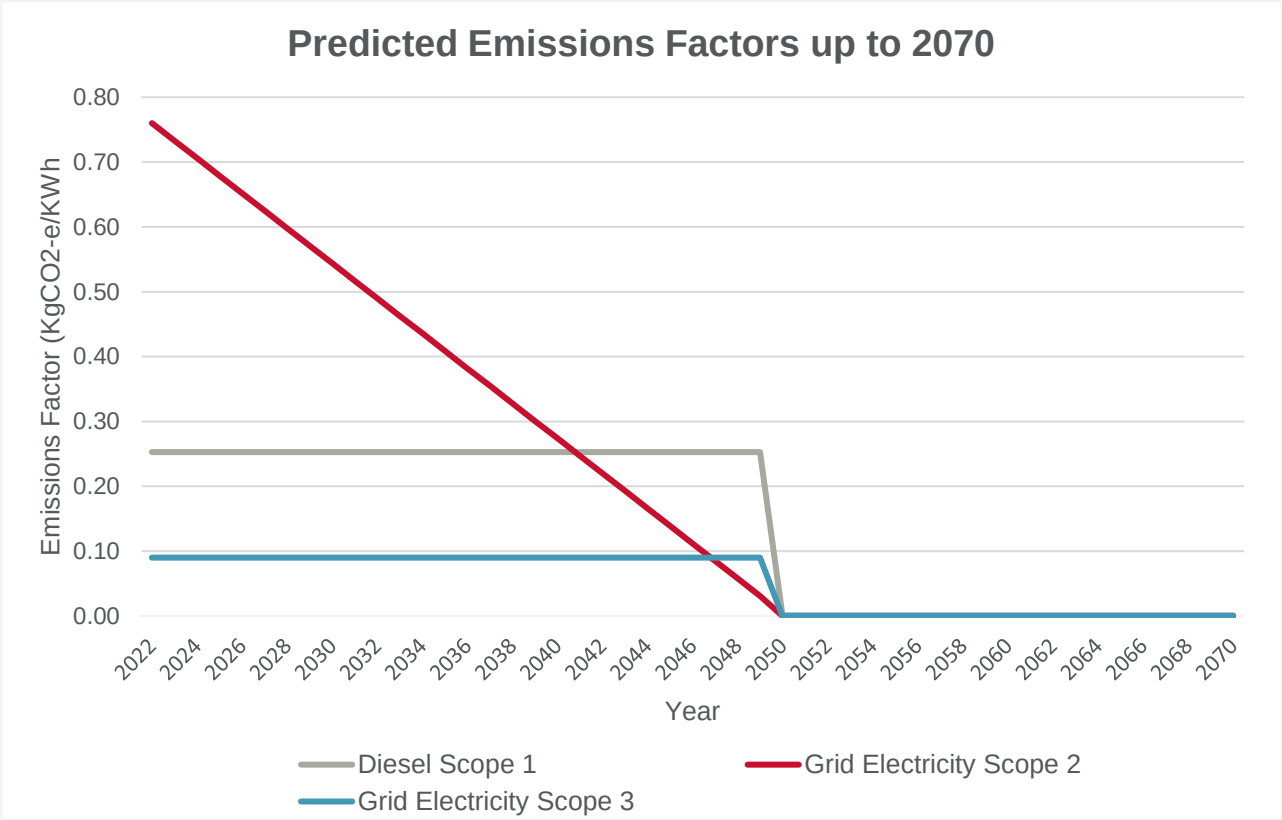


Figure 1 - Projected emissions factor for grid electricity and diesel for the life of the asset

3.3 GHG Emission Estimation methods

Emissions arising from diesel fuel consumption

01 Source of scope 1 emissions within the facility are the diesel generators which provide a backup source of electricity for the facility. In total, 20 x 3100kW/3850 kVA generators will produce scope 1 emissions as a result of monthly generator testing. Generators are tested for operational readiness for 20 minutes each per month (total 6 hours and 40 minutes per month) at an assumed load of 0% (no load on the generators). Each generator fuel consumption at no load is 50kg/hr (or 59 L/hr) resulting in 4.71 kL diesel fuel consumption used for testing annually.

In the first year of operation, based on the predicted 2022 emissions factors, diesel consumption will result in 0.0460 tonnes of CO_2.

Emissions arising from consumption of imported grid electricity

Scope 2 and 3 emissions are produced through the consumption of imported electricity from the national grid. Electrical energy consumption estimate is based on the maximum power usage for the facility operating at 100%, 365 days a year. The annual energy consumption calculation:

- Maximum Site IT Load / Power Consumption: 38MW.
- Average annualized Site PUE: 1.30.
- Maximum Total Site Load / Power Consumption: 49.4MW.
- Maximum Annual Energy Consumption for IT Load: 38 x 24 x 365.25 = 333.10GWhr.
- Maximum Annual Energy Consumption for Total Site Load: 49.4 x 24 x 365.25 = 433.04GWhr.

In the first year of operation based on the predicted 2022 emissions factors, Electricity consumption will result in 368,084 tonnes of CO_2.

3.4 GHG Emissions Over Life of Asset

Figure 2 shows the total annual emissions for the predicted 50-year life of the asset, using the predicted emissions factors shown in figure 1.

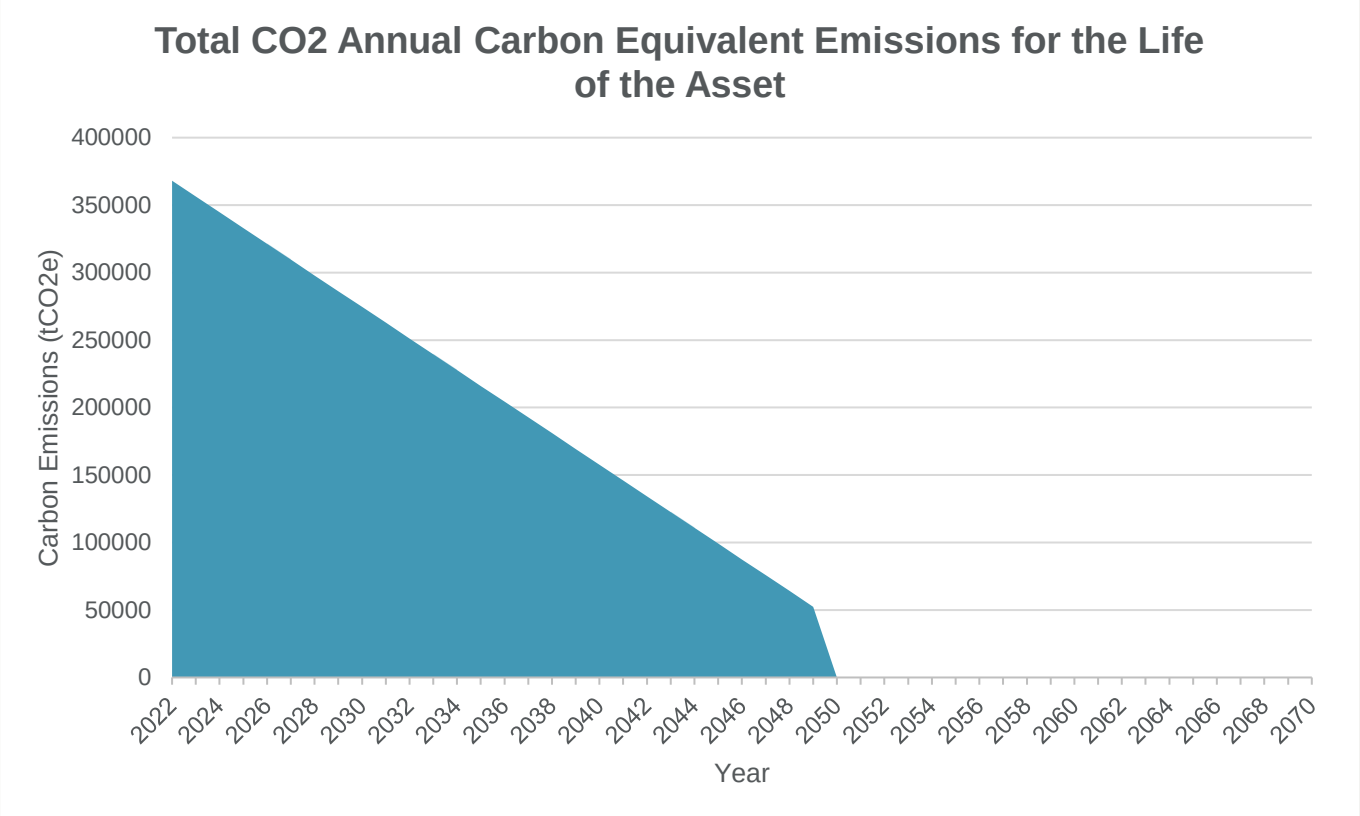


Figure 2- Annual CO2 eqv. over the life of the asset

The total GHG emissions for life of the asset is predicted to be **5,886,747** tonnes CO_2 equivalent.

The total GHG emissions for the first year of operations is predicted to be 368,084 tonnes CO_2 equivalent.

The total GHG emissions for the last year of operations is predicted to be **0** tonnes CO_2 equivalent.

The average annual GHG emissions for the life of the asset is precited to be 115,426 CO_2 equivalent.

3.5 State and territory greenhouse gas inventories

The State and territory greenhouse gas inventories emissions show that New South Wales total GHG emissions for 2019 were 136.6 Mt CO2-e. Emissions have declined 17.2% on 2005 levels, mainly due to reductions in emissions from stationary energy (mostly electricity) and the land sector.

The proposed development is predicted to contribute 368,084 tonnes CO2 equivalent to the 2022/2023 State and territory greenhouse gas inventories. As shown above the predicted GHG emissions will fall year on year in line with the decarbonisation of grid electricity. The proposed generators are capable of using biodiesel when a suitable supply becomes available in Sydney, therefore conservatively estimated the changeover from diesel to biodiesel to be 2050. Through the combination of a decarbonised grid and the use of biodiesel the proposed development is predicted to have 0 GHG contributions by 2050.

Digital infrastructure assets have a central role to play in the transition to a low-carbon economy and sustainable cities and can improve the states GHG emissions per GDP.

4.0 ESD INITIATIVES

The following provides a summary of project ESD initiatives.

4.1 Indoor Air Quality

Ductwork will be protected during construction to minimise contamination with debris and moisture prior to occupation. In order to minimise indoor air contamination and promote occupant health, preference will be given to paints, adhesives, sealants and floor coverings which have low Volatile Organic Compound (VOC) emissions and engineered wood products with low formaldehyde emissions.

4.2 Biodiversity

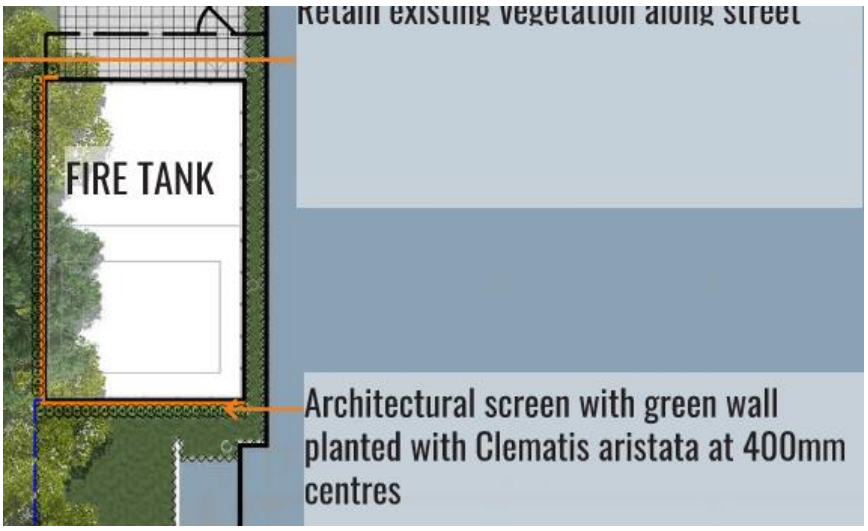
The site is considered to be of low ecological value as assessed by Cumberland Ecology.

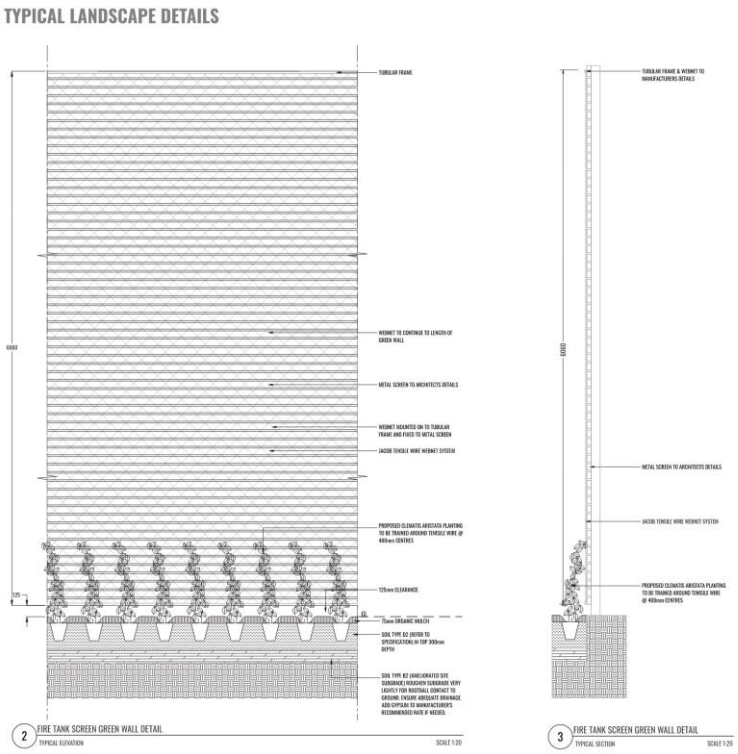
A separate biodiversity development assessment report waiver request has been submitted as part of the planning application. A carefully selected landscape setting will be chosen for the site, comprising a mix of native and endemic plant species, shrubs, trees and grasses, enhancing the biodiversity of the site. 3,426m^2 of landscaping has been proposed for the site, which equates to approximately 15% of the site, with a 12% canopy cover.

4.3 Landscaping Green Wall Screening

The development considered a number of options to supplement the landscaping. Green walls were considered for the main undercroft areas and southern boundary, however due to shading, were considered to be unviable. A green screening wall has been adopted around the northern fire tank area. The Fire tank facade will incorporate a webnet grid to be planted with a green wall of Clematis aristate.

Limited opportunity for landscape exists onsite due to vehicular access requirements around the building and the maintenance of overland flow paths. Roof equipment areas prohibit the use of a green roof due to safety and practicality.





4.4 Management Practices

Construction contractors will be required to operate to Australian Environmental Standards. Building commissioning and tuning undertaken against internationally recognised standards such as ASHRAE.

An Operational Management Plan has been submitted separately as part of the planning Application

4.5 Waste

A Waste Minimisation Plan has been prepared by SLR and submitted separately as part of the planning application.

4.6 Transport

The site is within close proximity to transport infrastructure routes (predominantly the bus and rail networks). 71 car parking spaces have been provided for the proposed Development including three (3) accessible spaces. The Site is located within close proximity to active transport links, such as bicycle routes. Up to 8 cycle spaces are proposed for the site.

A separate transport impact assessment has been prepared by TTPP and submitted as part of the planning application.

4.7 Energy

Data centres consume significant amounts of power, and energy efficiency is generally considered to be the single most important sustainability feature of any data centre design.

The National Australian Built Environment Rating System (NABERS) provide a star rating system for energy usage within data centres. Three type of rating systems are available – IT Equipment, Infrastructure and Whole Facility. The Infrastructure rating is used within this statement. The two other rating types take IT equipment efficiency, which will be part of end customer fit-out and is unknown, into account and hence is not appropriate for this assessment. The rating ranges from 4 star to 6 stars. For comparison purpose, the NABERS key principle indicates that an average facility would perform equivalent to 2 to 3 energy stars level.

The NABERS Data Centres Infrastructure rating assesses the efficiency by comparing the followings:

- Infrastructure Energy Consumption (i.e., exclusive of IT Equipment)
- IT Energy

We have converted the above to Power Usage Efficiency (PUE) and tabulated the maximum permissible PUE with respect to each NABERS energy star rating as follows:

NABERS Energy Stars	Maximum PUE
3	1.88
4	1.61
4.5	1.48
5	**1.34**
5.5	**1.2**
6	1.07

Table 2 – NABERS energy stars with permissible PUE

The Climate Neutral Data Centre Pact (CNDCP) has the following PUE target: By January 1, 2025 new data centres operating at full capacity in cool climates will meet an annual PUE target of 1.3, and 1.4 for new data centres operating at full capacity in warm climates.

The proposed design is highly energy efficient. A maximum PUE of 1.3 (using ASHRAE Recommended conditions) is expected, which place the proposed development at NABERS Energy Stars rating between 5 and 5.5 stars and meeting the CNDCP's target of 1.3.

This high efficiency design is achieved through a combination of the following:

- High efficiency chilled water-cooling system
- VSD drives will be used on fans and pumps allowing turndown and energy savings at part load
- High efficiency electrical drives will be used on the various systems
- All lighting to be LED
- Sub-metering throughout the facility to help monitor and interpret energy consumption in operation and enable optimisation year-on-year

4.8 Water

Water Usage Efficiency (WUE) is a measure of water efficiency for a data centre and can be defined at a high level as:

$$WUE = \frac{\text{Annual Site Water Usage}}{\text{IT Equipment Energy}}$$

WUE, a site-based metric that is an assessment of the water used on-site for operation of the data center. This includes water used for humidification and water evaporated on-site for energy production or cooling of the data centre and its support systems (similar to carbon Scope 1).

The lower the WUE the more water efficient a data centre is. However, it is important to consider WUE in the context of PUE, for example an air sourced cooling system would have a WUE of zero but could be less energy efficient resulting in a higher PUE.

The WUE has been calculated in accordance with "*The Green Grid, Water Usage Effectiveness (WUEtm): A green Grid Data Center Sustainability Metric" to be 1.79 L/Kwhr.*

There are no recognised WUE benchmarks or targets set as yet, however it is considered current best practice for data centres to calculate and consider the WUE when designing a data centre. It is anticipated that the CNDCP are to confirm a WUE target in 2022.

The calculated annual water used on-site for operation of the new data center is 597,000m^3.

The total annual water usage for existing and new data centres (i.e., IC3e, IC3w and IC2) on site has been calculated as approximately 854,500m^3 as per table 3, below.

Building	Estimated Annual water usage (m3)
IC2 (built)	31,500
IC3e (built)	196,000
IC3w (unbuilt)	597,000
Total Water Usage	824,500

Table 3 - Calculated water usage

The proposed design will utilise open circuit cooling towers for heat rejection. This cooling system is highly efficient, contributing to the low PUE value noted above, but will consume significant volume of water. In order to minimise water consumption, the cooling towers will be selected and controlled as follows:

- Towers will be selected to provide no more than 0.002% drift coefficient
- The system will be controlled to operate with no less than 6 cycles of concentration

The above is in line with Green Building Council of Australia (GBCA) good practice for water efficiency and in accordance with AS/NZS3666.1 – Air Handling and Water Systems of buildings – Microbial Control.

The proposed water-cooled heat rejection system benefits from free cooling and is more energy and GHG efficient than an air-cooled chiller system. Air-cooled systems still use some water albeit, off site, as part of the cooling required for fossil fuel powered electricity generation.

As grid electricity becomes decarbonised there will become a point where an air-cooled system could result in low GHG emissions and low water consumption however the most effective option at present from an energy consumption and GHG emissions perspective is the proposed system.

Whilst most of the water used on site will be for the operation of the data centre some will be used for the welfare area. To minimise the potable water usage in the welfare area all sanitary wares will achieve a minimum WELS – 5-star rating.

4.9 Materials

Preference will be given to materials responsibly sourced as per the table below.

Material	Responsible sourcing label
Fabricated structural Steelwork	Environmental Sustainability charter of the Australian Steel Institute (ASI)
Steel	ISO 14001 / World Steel Associates Climate Action Programme
Timber	Reused / FSC / AFC/ PEFC
PVC	Best practice PVC
Other	ISO 14001

Table 4 – Material responsible sourcing label preference

Precast concrete will be used to expedite construction and reduce the embodied carbon of the development.

5.0 CONCLUSION

This Sustainability and Greenhouse Gas Emissions Statement demonstrates the proposed Data Centre located on 17-23 Talavera Road, Macquarie Park, known as IC3w aims to meet the Secretary's Environmental Assessment Requirements (SEARs) as a state significant development. Through the implementation of the initiatives noted within this statement the project clearly demonstrates the commitment to ESD principles throughout the design, construction, and operation. Additionally, the project design team has worked to optimise energy performance and address key climate related risks posed to the site, work that will continue to be developed throughout the detailed design