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Ardex Warehouse and Manufacturing Facility

Greenhouse Gas and Energy Efficiency Assessment

Addressee(s):	**The Trust Company (Australia) Limited**
Report Reference:	**21.1137.FR2V2**
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Quality Control

Study	Status	Prepared	Checked	Authorised
INTRODUCTION	Final	Northstar	GCG	MD
THE PROPOSAL	Final	Northstar	GCG	MD
LEGISLATION, REGULATION AND GUIDANCE	Final	Northstar	GCG	MD
METHODOLOGY	Final	Northstar	GCG	MD
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Report Status

Northstar References		Report Status	Report Reference	Version
Year	Job Number	(Draft: Final)	(R*x*)	(V*x*)
21	1137	Final	R2	V2
Based upon the above, the specific reference for this version of the report is:				**21.1137.FR2V2**

Final Authority

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

Martin Doyle **5th November 2021**

Non-Technical Summary

Northstar Air Quality Pty Ltd was engaged by The Trust Company (Australia) Limited, to perform a greenhouse gas and energy efficiency assessment, to support State Significant Development 25725029. State Significant Development 25725029 seeks approval to construct, fit out and operate a manufacturing facility and associated warehouse facility at 657-769 Mamre Road, Kemps Creek (proposed Lot 12) which will be occupied and operated by Ardex (the Proposal).

The Proposal site is located within the broader Kemps Creek Warehouse, Logistics and Industrial Facilities Hub at 657-769 Mamre Road, Kemps Creek, NSW (approved as State Significant Development 9522).

This greenhouse gas and energy efficiency assessment presents an assessment of the potential greenhouse gas emissions which may result during the operation of the proposed warehouse and manufacturing facility and provides measures which are proposed to be adopted, and will minimise energy use and maximise energy efficiency.

This report meets the requirements of the Secretary's Environmental Assessment Requirements for the proposed warehouse and manufacturing facility, as identified below.

Issue	Requirement	Addressed
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).	Section 5

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Units Used in the Report

All units presented in the report follow International System of Units (SI) conventions, unless derived from references using non-SI units. In this report, units formed by the division of SI and non-SI units are expressed as a negative exponent, and do not use the solidus (/) symbol. *For example*, 0.8 kilograms per kilowatt hour would be presented as 0.8 kg·kWh^{-1} and not 0.8 kg/kWh.

Common Abbreviations

Abbreviation	Term
AGL	above ground level
CO_2-e	carbon dioxide equivalent
DoEE	Department of Environment and Energy
EPA	Environmental Protection Authority
ESS	Energy Savings Scheme
DoEE	Department of Energy & Environment
DP&E	Department of Planning and Environment
GHG	greenhouse gas
kWh	kilowatt hour
m^2	square metre
NGA	National Greenhouse Accounts
NGER	National Greenhouse and Energy Reporting
OEH	NSW Office of Environment and Heritage
PV	photovoltaic
SEARs	Secretary's Environmental Assessment Requirements
SEPP	State Environmental Planning Policy
SSD	State Significant Development
tpa	tonnes per annum
WRI	World Resources Institute
WSEA	Western Sydney Employment Area

1. INTRODUCTION

The Trust Company (Australia) Limited has engaged Northstar Air Quality Pty Ltd (Northstar) to perform a greenhouse gas and energy efficiency assessment (GHG Assessment), to support a State Significant Development (SSD 25725029). SSD 25725029 seeks approval to construct, fit out and operate a manufacturing facility and associated warehouse facility at 657-769 Mamre Road, Kemps Creek (proposed Lot 12) which will be occupied and operated by Ardex (the Proposal).

The Proposal site is located within the broader Kemps Creek Warehouse, Logistics and Industrial Facilities Hub at 657-769 Mamre Road, Kemps Creek, NSW (approved as SSD 9522).

This GHG Assessment adopts a consistent approach to that presented in the supporting documentation for the Kemps Creek Warehouse, Logistics and Industrial Facilities Hub (SSD 9522) and presents an assessment of the potential GHG emissions which may result during the operation of the Proposal, and provides measures which when adopted will minimise energy use and maximise energy efficiency.

1.1. Assessment Requirements

NSW Department of Planning, Industry and Environment (DPIE) issued the Secretary's Environmental Assessment Requirements (SEARs) for the Proposal on 3 September 2021. Those requirements related to GHG and energy efficiency are presented in **Table 1** which also includes the relevant sections of the report in which they have been addressed.

Table 1 SEARs requirements for GHG and Energy Efficiency (SSD 25725029)

Issue	Requirement	Addressed
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).	Section 5

2. THE PROPOSAL

Ardex is a manufacturer and supplier of products which include renders, screeds, floor levelling and adhesive products, decorative surface finishes, mortars used in repair applications, tile adhesives, grouts, silicone products, waterproofing membranes, primers, bonding agents and additives, sealants, sealers, sound proofing systems, a range of "natural stone" products, and a range of tools used for flooring and wall applications. Ardex sells to wholesalers, tilers and other building trades as well as into the retail market, in particular under the Dunlop brand. No sale of products is proposed from the subject Site.

The subject Site will include offices, research and development laboratory, warehouse storage of raw materials and packaging, distribution of packed products, and manufacturing of powder and liquid products. Powder manufacturing will involve the use of dry powder batching, mixing and bagging processes where most batching is completed via an automated process with some manual dosing into industrial mixers, and then followed by semi-automatic bagging and palletising. The activities will primarily consist of mixing non-flammable and non-combustible powdered chemicals (including cement, limestone and sand) to produce saleable products for the construction industry.

Liquid manufacturing will involve the use of liquid batching, mixing and filling processes, where most batching is completed via a semi-automated process with manual dosing into various industrial mixers. The activities will primarily consist of mixing and filling water dispersed polymers (emulsion/latex) with or without non-combustible fillers, silicon packing, as well as water dispersion of epoxy resins to produce saleable products for the construction industry. There will be some limited batching of flammable goods under controlled conditions, including use and mixing of solvents which will be below SEPP 33 thresholds.

2.1. Powder Manufacturing

Powder manufacturing will involve the use of dry powder batching, mixing and bagging processes where most batching is completed via an automated process with some manual dosing into industrial mixers, then followed by semi-automatic bagging and palletising. The activities will primarily consist of mixing non-flammable and non-combustible powdered chemicals (including cement, limestone and sand) to produce saleable products for the construction industry. The design of the new powder manufacturing facility will include a state-of-the-art production process based on a uniquely designed vertical tower plant layout, that utilises the force of gravity in the production cycle. The proposed process incorporates an innovative design to improve quality, productivity, process reliability and energy efficiency. Maximum capacity of the plant will be 48 000 tonnes per annum (tpa) based on a 24/7 operation.

Tower heights of 22 metres (m) and 38 m above ground level (AGL) for the vertical powder plant has been proposed rather than the older, less efficient horizontal powder plants or "Split-tower" plants, which are around 12 m – 25 m AGL in height. Vertical tower plants are now standard for Ardex's facilities across the world. There are significant advantages in using the vertical powder plant as opposed to the horizontal powder plant, including:

- More energy efficient – the horizontal powder plant uses more than double the electricity for the same production output when compared to the vertical powder plant. This results in significant reductions in carbon emissions, and a significantly reduced load on local electrical transmission infrastructure.
- Reduced noise & dust emissions – the improved design of the vertical plant results in reduced noise & dust emissions from the powder plant line.
- The vertical powder plant also requires less cleaning and less maintenance than the horizontal powder plant, and overall is considered the superior plant option.
- Reduced manufacturing footprint by way of a consolidated footprint.

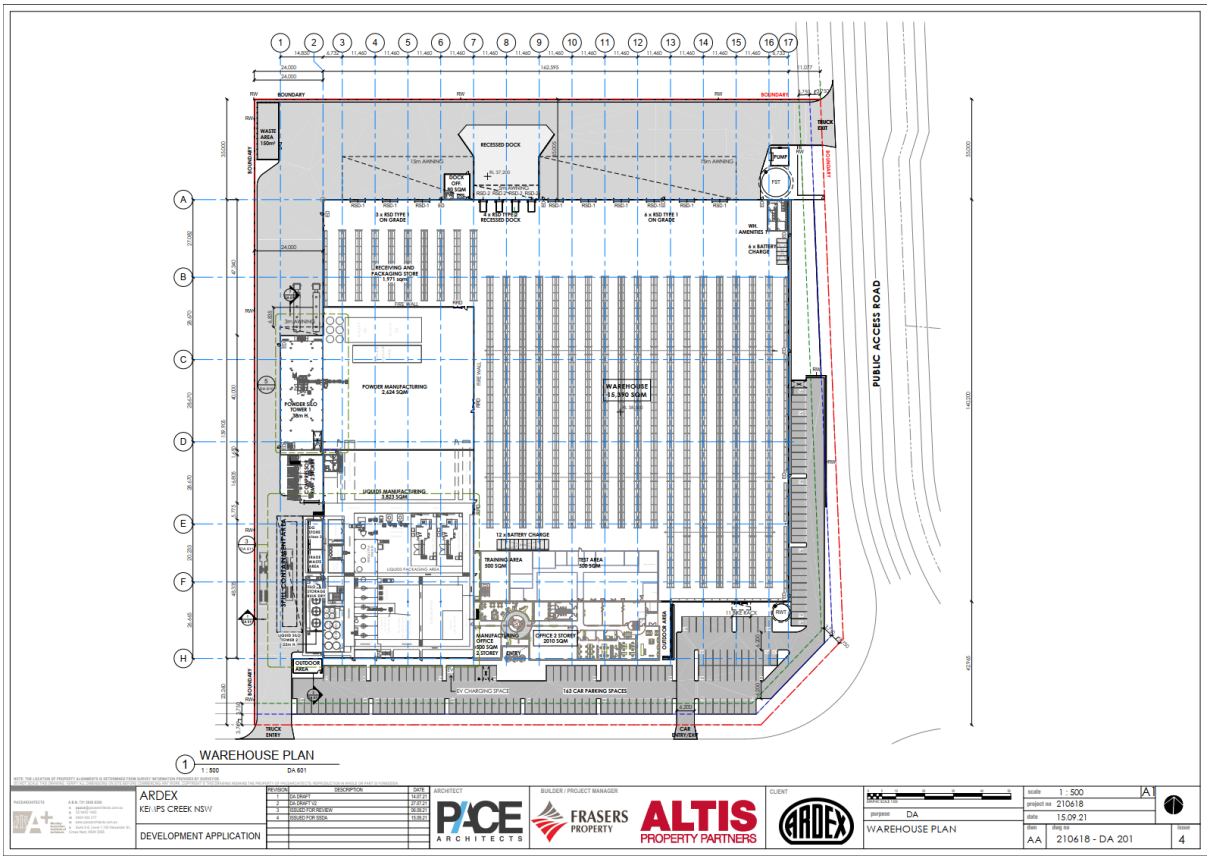
2.2. Liquids Manufacturing

A new liquid mixing and packing plant is proposed that will produce 25 000 tpa, operating on a 24/7 basis.

Liquid manufacturing will involve the use of liquid batching, mixing and filling processes, where most batching is completed via a semi-automated process with manual dosing into various industrial mixers. The activities will primarily consist of mixing and filling water dispersed polymers (emulsion/latex) with or without non-combustible fillers, silicon packing, as well as water dispersion of epoxy resins to produce saleable products for the construction industry. The new manufacturing facility is designed to achieve high efficiency, increased production volumes, high quality standards, and the ability to manufacture more complex product formulations.

A layout of the Proposal Site is provided in **Figure 1**.

Figure 1 Proposal Site layout



Source: PACE Architects

3. LEGISLATION, REGULATION AND GUIDANCE

3.1. Federal Legislation

The Australian Government Clean Energy Regulator administers schemes legislated by the Australian Government for measuring, managing, reducing or offsetting Australia's carbon emissions.

The scheme administered by the Clean Energy Regulator of most relevance to this Proposed Modification is the National Greenhouse and Energy Reporting (NGER) Scheme, under the *National Greenhouse and Energy Reporting Act* (2007) (NGER Act).

The NGER scheme, established by the NGER Act, is a national framework for reporting and disseminating company information about greenhouse gas emissions, energy production, energy consumption and other information specified under NGER legislation.

The objectives of the NGER scheme are to:

- inform government policy;
- inform the Australian public;
- help meet Australia's international reporting obligations;
- assist Commonwealth, state and territory government programmes and activities; and,
- avoid duplication of similar reporting requirements in the states and territories.

Further information on the NGER scheme, specifically the definitions of various scopes and types of GHG emissions, which have also been adopted for the purposes of this assessment, is provided in **Section 4** (on P17 of this report).

3.2. Relevant State Legislation

There is no specific GHG legislation administered within NSW. The NGER scheme is the applicable legislation within NSW.

The NSW Government is working to deliver economically efficient and environmentally effective policies and programs that do not duplicate initiatives of the Australian Government. They include:

- understanding NSW emissions;
- providing financial support through the Climate Change Fund;
- promoting energy efficiency (e.g. through the Energy Savings Scheme [ESS]); and,
- promoting soil carbon sequestration.

3.3. Relevant State Policy Framework

The NSW Government Net Zero Plan Stage 1: 2020-2030 is the foundation for NSW's action on climate change and goal to reach net zero emissions by 2050. It outlines the NSW Government's plan to grow the economy, create jobs and reduce emissions over the next decade.

The plan aims to enhance the prosperity and quality of life of the people of NSW, while helping the state to deliver a 35 % reduction in emissions by 2030 compared to 2005 levels. The plan supports a range of initiatives targeting electricity and energy efficiency, electric vehicles, hydrogen, primary industries, coal innovation, organic waste and carbon financing.

Under the plan, businesses will be supported to modernise their plant and increase productivity.

3.4. Guidance

The GHG accounting and reporting principles adopted, within this GHG assessment, are based on the following financial accounting and reporting standards:

- Australian Government Department of the Environment, Australian National Greenhouse Accounts, National Greenhouse Accounts Factors, August 2019 (DoEE, 2019a);
- The World Resources Institute (WRI) and the World Business Council for Sustainable Development (WBCSD) GHG Protocol: A Corporate Accounting and Report Standard (WRI, 2004);
- ISO 14064-1:2006 (Greenhouse Gases – Part 1: Specification with guidance at the organisation level for quantification and reporting of GHG emissions and removal;
- ISO 14064-2:2006 (Greenhouse Gases – Part 2: Specification with guidance at the project level for quantification, monitoring and reporting of GHG emission reductions or removal enhancements); and,
- ISO 14064-3:2006 (Greenhouse Gases – Part 3: Specification with guidance for the validation and verification of GHG assertions) guidelines (internationally accepted best practice).

Further detail is provided in **Section 4**.

4. METHODOLOGY

4.1. Emission Types

The Australian Government Department of the Environment (DoE) document, "National Greenhouse Accounts Factors" Workbook (NGA Factors) (DISER, 2021), defines two types of GHG emissions (see **Table 2** below), namely 'direct' and 'indirect' emissions. This assessment considers both direct emissions and indirect emissions resulting from the operation of the Proposal.

Table 2 Greenhouse gas emission types

Emission Type	Definition
Direct	Produced from sources within the boundary of an organisation and as a result of that organisation's activities (e.g. consumption of fuel in on-site vehicles)
Indirect	Generated in the wider economy as a consequence of an organisation's activities (particularly from its demand for goods and services), but which are physically produced by the activities of another organisation (e.g. consumption of purchased electricity).

Note: Adapted from NGA Factors Workbook (DISER, 2021)

4.2. Emission Scopes

The NGA Factors (DISER, 2021) identifies three 'scopes' of emissions for GHG accounting and reporting purposes as shown in **Table 3**.

Table 3 Greenhouse gas emission scopes

Emission Scope	Definition
Scope 1	Direct (or point-source) emission factors give the kilograms of carbon dioxide equivalent (CO_2-e) emitted per unit of activity at the point of emission release (i.e. fuel use, energy use, manufacturing process activity, mining activity, on-site waste disposal, etc.). These factors are used to calculate Scope 1 emissions.
Scope 2	Indirect emission factors are used to calculate Scope 2 emissions from the generation of the electricity purchased and consumed by an organisation as kilograms of CO_2-e per unit of electricity consumed. Scope 2 emissions are physically produced by the burning of fuels (coal, natural gas, etc.) at the power station.
Scope 3	Indirect emissions which are not included in scope 2, occurring within an organisation's value chain. The majority of a company's value chain greenhouse gas emissions may lie outside their own operations. Emissions from a company's value chain occurring externally to their operations within Australia may be estimated using the available scope 3 emission factors

Note: Adapted from NGA Factors Workbook (DISER, 2021)

4.3. Emission Source Identification

The geographical boundary set for this GHG assessment covers the Proposal and does not include the transport of materials to and from the site. Emissions associated with Proposal construction and all associated mobile plant and equipment, are not included in this assessment. This is because their usage is not quantifiable at the current time. The ongoing energy efficiency of the Proposal's operation has been considered the main focus of this assessment.

The GHG emission sources associated with the operation of the Proposal have been identified through the review of the proposed broad activities as described in **Section 2**.

The activities/operations being performed, as part of the Proposal, which have the potential to result in emissions of GHG, are presented in **Table 4** below.

Table 4 Greenhouse gas emission sources

Proposal Component	Scope	Emission Source Description
Consumption of purchased electricity	2	Emissions associated with the generation of electricity from fossil fuel combustion
Consumption of liquified petroleum gas (LPG)	1, 3	Emissions from combustion of fuel (scope 1) Emissions associated with extraction and processing of fuel (scope 3)

4.4. Emissions Estimation

Emissions of GHG from the source identified in **Table 4** have been calculated using activity data for the source per annum (i.e. per kilowatt-hour (kWh) of electricity) and the relevant emission factor for each source.

The assumptions used in the calculation of activity data for the emission source and emission factors, are presented below.

4.4.1. Activity Data

Information relating to the quantities of electricity and LPG fuel used as part of the Proposal have been provided by the Proponent. These data are outlined in **Table 5**. No diesel or unleaded fuel is anticipated to be used.

Table 5 Calculated activity data

Project Component	Assumptions	Activity	Units
Consumption of LPG in processing operations	Information provided by the Proponent indicates the LPG use to be 19.6 kL (10 000 kg) per annum	19.6	kL·annum^{-1}
Consumption of electricity	Information provided by the Proponent indicates the electricity consumption to be 3 500 MWh per annum	3 500	MWh·annum^{-1}

4.4.2. Emission Factors

Emissions factors used for the assessment of GHG emissions associated with existing operations and the operation of the Project have been sourced from the NGA Factors (DISER, 2021) (refer to **Table 6**).

Table 6 Greenhouse gas emission factors

Scope	Emission source	Emission factor per unit energy	Energy content factor	Emission factor per unit activity
1	Liquified petroleum gas	51.53 kg CO_2-e GJ^{-1}	25.3 GJ·kL^{-1}	1 303.7 kg CO_2-e kL^{-1}
2	Electricity consumption (NSW)	0.78 kg CO_2-e kWh^{-1}	-	0.78 kg CO_2-e kWh^{-1}
3	Liquified petroleum gas	3.6 kg CO_2-e GJ^{-1}	25.3 GJ·kL^{-1}	91.1 kg CO_2-e kL^{-1}
	Electricity consumption (NSW)	0.07 kg CO_2-e kWh^{-1}	-	0.07 kg CO_2-e kWh^{-1}

5. ASSESSMENT OUTCOMES

5.1. Quantification of Greenhouse Gas Emissions

Based on the activity data for the operation of the Proposal and the emission factors outlined in **Section 4.4**, annual GHG emissions have been calculated and are presented in **Table 7**.

Direct (Scope 1) emissions associated with the Proposal are anticipated to be 25.6 t CO_2-e per annum, with indirect (Scope 2) emissions anticipated to be 2 730 t CO_2-e per annum. Indirect (Scope 3) emissions are calculated to be 246.8 t CO_2-e per annum.

Table 7 Calculated proposal GHG emissions

Scope		Activity Rate	Units	Emission Factor		CO_2 (t·yr^{-1})
1	LPG in operational activities	19.6	kL·year^{-1}	1 303.7	kg CO_2-e·kL^{-1}	25.6
					Scope 1 (subtotal)	**25.6**
2	Electricity consumption	3 500 000	kWh·year^{-1}	0.78	kg CO_2-e·kWh^{-1}	2 730.0
					Scope 2 (subtotal)	**2 730.0**
3	LPG in operational activities	19.6	kL·year^{-1}	91.1	kg CO_2-e·kL^{-1}	1.8
	Electricity consumption	3 500 000	kWh·year^{-1}	0.07	kg CO_2-e·kWh^{-1}	245.0
					Scope 3 (subtotal)	**246.8**
					TOTAL	**3 002.3**

5.2. Greenhouse Gas Emissions in Context

A comparison of the calculated direct (Scope 1) GHG emissions associated with the Proposal against Australian (DISER, 2020a) and NSW (DISER, 2020b) total emissions in 2018 is presented in **Table 8**.

These data indicate that the operation of the Proposal, in its entirety, would contribute < 0.001 % of NSW and Australian total GHG emissions.

Table 8 Proposal GHG emissions in context

Emissions (t CO_2-e per annum)		
Proposal	NSW (2018)	Australia (2018)
	Total 131 685 000	Total 537 446 000
25.6	< 0.001 %	< 0.001 %

5.3. Management of GHG Emissions

The above assessment indicates that direct GHG emissions resulting from the operation of the Proposal are anticipated to be minimal. However, the applicant proposes to implement a number of measures to ensure that the consumption of fuels and electricity are minimised to reflect the Government's goal of net zero emissions by 2050. These measures include:

- Installation of a 200 kW solar photovoltaic (PV) system at the Proposal site. This system would be expected to produce in Sydney, on average, approximately 720 kWh per day, or 262.8 MWh per annum. This represents approximately 7.5 % of the annual electricity consumption of the Proposal site and would result in GHG emissions reductions of 205 t CO_2-e per annum (Scope 2) and 18.4 t CO_2-e per annum (Scope 3).
- Measures have been implemented in the design of the facility to increase energy efficiency during the manufacturing process. These measures include the use of a vertical powder plant, which uses half of the electricity of the older less efficient horizontal powder, or 'split tower' plants.
- Emissions generated during the operation of the Proposal will be further minimised by the introduction of a number of energy efficiency measures. The Trust Company (Australia) Limited are implementing a Six-Star Green Star Design and an As-Built V1.1 rating, as defined by the Green Building Council of Australia, for the Proposal. The key initiatives that relate to the sustainability performance of the Proposal Site are outlined in **Table 9**.
- All vehicles/plant and machinery at the Proposal site would be turned off when not in use and would be regularly serviced to ensure efficient operation.
- A 'no-idling' policy would be implemented at the Proposal site, to reduce fuel consumption in site and delivery vehicles, and reduce emissions of air pollutants.

Table 9 Key initiatives for six-star Green Star Proposal

Energy	
Building fabric	10 % improvement on BCA – double glazing, increased façade and roof insulation
Translucent sheeting	10 % of warehouse roof
Hot water system	Heat pump (air source or geothermal)
Office heating and cooling	Geothermal – reverse cycle ducted
Office outside air	Min 50 % increase on OA
Lighting – office	LED with individual control
Lighting – warehouse	LED with daylight control
Lighting – external	LED with time clock control
Renewable energy	Solar PV system (200 kW)
Energy storage	Customer dependent
Electric vehicle charging	Included

Water	
Water fixtures	5- & 6-star WELS rated
Recycled water	Rainwater for 80 %+ irrigation and toilet flushing
Fire test water recycling	80 %+ of fire test water recycled
Sub-metering	Electricity and water with web-based monitoring system
Commissioning	Commissioning manager and plan

6. CONCLUSION

The Trust Company (Australia) Limited has engaged Northstar to perform a GHG assessment, to support a State Significant Development (SSD 25725029). SSD 25725029 seeks approval to construct, fit out and operate a manufacturing facility and associated warehouse facility at 657-769 Mamre Road, Kemps Creek (proposed Lot 12) which will be occupied and operated by Ardex (the Proposal).

The Proposal site is located within the broader Kemps Creek Warehouse, Logistics and Industrial Facilities Hub at 657-769 Mamre Road, Kemps Creek, NSW (approved as SSD 9522).

This GHG assessment presents an assessment of the potential GHG emissions which may result during the operation of the Proposal and provides measures which are proposed to be adopted and will minimise energy use and maximise energy efficiency for the Proposal.

7. REFERENCES

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