NORTHROP

SSDA ESD REPORT

Cleanaway Material Recycling Facility

600 Woodstock Avenue, Rooty Hill NSW 2766

PREPARED FOR
Charter Hall
Level 20, No. 1 Martin Place
Sydney, NSW 2000

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SSDA ESD Report

Revision Schedule

Date	Revision	Issue	Prepared By	Approved By
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1. Introduction

Northrop has been commissioned by Charter Hall to prepare this Ecologically Sustainable Design (ESD) and Greenhouse Gas Assessment in support of a development application SSD-29999239 for Cleanaway Material Recycling Facility, located on 600 Woodstock Avenue, Rooty Hill, NSW 2766.

This report is intended to provide an overview of the ESD principles and greenhouse gas and energy efficiency measures that will be implemented and is intended to form part of the Environmental Impact Statement (EIS) for the State Significant Development Application (SSDA).

Specific sustainability initiatives proposed for the facility include, but are not limited to:

- Space efficient building layout
- Water sensitive urban design principles
- High efficiency equipment and lighting
- On-site renewable energy generation in the form of a rooftop solar array
- Incorporation of good daylighting to reduce lighting power usage.
- Installation of a rainwater capture and reuse systems
- Natural ventilation to open spaces. And
- Waste storage spaces to promote recycling and sortation.

Through the implementation of the initiatives noted in this report, the project addresses, and endeavors to mitigate against negative environmental, social, and economic impacts associated with the project. Overall, the project will also exceed the targets set out in the SEARs having set a five (5) star (Australian Excellence) Green Star Design and As Built rating target for the project.

1.1 Response to Secretaries Environmental Assessment Requirements (SEARs)

This report addresses how the proposed project addresses the SEARs. These requirements are outlined below alongside where the response to each can be found within this report;

Key Issue No. & Description	Issue & Assessment Requirements	How It Is Addressed	Location Within This Report
Ecologically Sustainable Development	Identify how ESD principles (as identified in clause 7(4) of Schedule 2 of the EP&A Regulation) are incorporated in the design and ongoing operation of the development	This ESD report details how the project aims to address ESD Principles and their incorporation into the design and ongoing operation of the project.	Section 3
	Demonstrate how the development will meet or exceed the relevant industry recognised sustainability and environmental performance standards.	The project is targeting a 5 Star Green Star Design and As Built Rating, reflective of Australian Excellence in sustainability. This rating will be certified following project completion by the Green Building Council of Australia (GBCA).	Section 5
	Demonstrate how the development minimises greenhouse gas emissions (reflecting the Government's goal of net zero emissions by 2050) and consumption of energy, water (including water sensitive urban design) and material resources.	This report outlines how the project aims to reduce energy, water, and materials use. Section 3.1.10 notes how the project will remove onsite fossil fuel use and in concert with the other measures outlined in section 3 align to the NSW Governments goals of net zero emissions by 2050.	Section 3.1 (Energy) Section 3.6 (Water) Section 3.4 & 3.8 (Materials/Waste)

1.2 Limitations

Due care and skill have been exercised in the preparation of this report.

No responsibility or liability to any third party is accepted for any loss or damage arising out of the use of this report by any third party. Any third party wishing to act upon any material contained in this report should first contact Northrop for detailed advice, which will consider that party's requirements.

All simulations and performances noted within this report are estimations only. They are based on the existing design of the facility and best practice estimation techniques. These figures are indicative only and should not be used for cost or other analysis purposes.

2. The Proposal

2.1 Project Details

Component	Description
Project Name	Cleanaway Material Recycling Facility
Address and Legal Description	600 Woodstock Avenue, Rooty Hill 2766 Lot 67, DP 804292
Site Area	Total existing site area of 19,700m^2
Current Use	The current use onsite is general industrial

The site is in Rooty Hill, located approximately 42km west of the Sydney CBD, within the local government area of the City of Blacktown and is part of the Greater Western Sydney region. The site has frontages to Woodstock Avenue and Kellogg Road to the west. The east and south of this site are bounded by other industrial manufacturing facilities.

2.2 Proposed Development

The proposed development comprises the works outlined in the following table:

Element	Proposed
Site Preparation	▪ Demolition of existing structures. ▪ Associated earthworks and upgrades to existing on-site infrastructure.
Development summary	▪ Construction of a Materials Recycling Facility with ancillary office space and facilities, docking areas, onsite parking and associated works including excavation and landscaping.
Hours of Operation	▪ The facilities will operate 24 hours per day, seven days per week.

3. Ecologically Sustainable Development

The following section describes how ESD principals (as defined in clause 7(4) of Schedule 2 of the Environmental Planning and Assessment Regulation 2000) are being incorporated in the design, construction, and operation phases of the project. These initiatives illustrate how the project addresses the following;

- The precautionary principle – through the implementation of environmental management and an assessment of the building's operational maintainability, the project attempts to incorporate adaptability and resilience into the project design. The concept behind the precautionary principle is to create spaces that can both; accommodate for changes, which may eventuate in the future, and avoid the risk of serious or irreversible damage to the environment.
- Inter-generational equity to ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations – through the inclusion of zero ozone depleting refrigerants, best practice PVC and low impact paints, sealants and adhesives, alongside a focus on providing greater vegetation and support for the buildings connection with nature, the project demonstrates a strong commitment to the preservation of environmental health, diversity and productivity of the local area.
- Conservation of biological diversity and ecological integrity – through the planting of native vegetation, improvement of stormwater runoff from the site and use of integrated landscaping, the project will act to improve, conserve and support the local biological diversity and integrity.
- Improved valuation, pricing and incentive mechanisms - the design process should involve significant input from the Quantity Surveyor who will be involved ensure that the project both remains on budget and effectively considers environmental factors in the valuation of assets and services. Furthermore, the project will look at maintainability and the operational costs associated with individual design initiatives and the overall design.

Through the inclusion of the above and the sustainability initiative outlined within this report the project clearly addresses the ESD Principles into the design, construction and operation of the building as defined in clause 7(4) of schedule 2 of the Environmental Planning and Assessment Regulation 2000. Further detail of the general sustainability initiatives is outlined below.

3.1 Energy Efficiency:

Energy efficiency will be considered throughout the design development process with the following improvements specifically considered by the design team. It is expected that the measures outlined in the following section will reduce the site's grid electricity demands when compared to a standard practice building.

The project will also minimise the use of fossil fuels, in line with Charter Hall's commitment to becoming net-zero emissions by 2030. This will be supported by a transition plan and power purchase agreements, resulting in the expected elimination of Greenhouse Gas Emissions from the facility 20 years ahead of the NSW Government's goal of net zero emissions by 2050.

3.1.1 Improved building fabric and glazing performance.

The building envelope comprises of several façade types, with the proposed scheme looking to implement a combination of metal finishes, prefabricated concrete and glazing aimed at minimising heat gains throughout summer and reducing the overall demand for artificial lighting through the integration of good daylighting throughout the building.

The use of well-designed roofing and building materials will also assist the projects targets for energy efficiency, acoustic performance, and thermal comfort.

3.1.2 Integration of Cool roofs

To address the urban heat island effect across the site and greater area, this project will look to incorporate a cool roofing system to minimize the buildup of heat within the building materials and therefore, reduce the energy demands on the HVAC system. This can be achieved through the use of Colorbond Surfmist roof sheeting with a natural reflective tone Solar Reflectance Index (SRI 82) reducing heat gains for the building through the roofing system.

3.1.3 Ventilation of Tertiary Spaces

This site is characterized by significant logistic areas requiring additional circulation measures to ensure adequate air quality is maintained for the occupants. Adequate circulation systems will enable temperatures to be more comfortable within the warehouse, assist with the dissipation of odours and carbon dioxide and the venting of general dust and particulate emissions associated with material unloading and material sorting within the facility. Central circulation spaces such as bathrooms and stairs will incorporate natural ventilation and the use of spill air from adjacent spaces to provide passive temperature control.

3.1.4 High Volume Low Speed (HVLS) Fans:

The incorporation of HVLS Fans within the warehouse design will reduce the load on the HVAC systems through their ability to circulate high volumes of air within large spaces whilst operating at low speeds. This will create an evaporative cooling effect comparable to the results of an air conditioning system through the wind chill effect resulting in enhanced indoor thermal comfort for occupants within the warehouses.

3.1.5 HVAC System Control

The proposed HVAC system will provide thermal comfort and acceptable indoor air quality to specific areas of the site. The project will select a HVAC system with a higher seasonal energy efficiency ratio (SEER) rating. This will likely be a variable refrigerant flow (VRF) energy efficiency system to provide individual comfort control and simultaneous heating and cooling within different zones, to ensure that the system does not use more energy than require at any given time. This system is also well suited to this type of development where occupancy levels fluctuate significantly throughout the day.

3.1.6 Energy Metering and Monitoring

An energy metering and monitoring strategy will be implemented to effectively monitor the main energy uses within the building, including lighting and small power use. This aims to provide detection of energy anomalies across systems, fault detection and the opportunity to reduce energy consumption as well as costs, allowing for the optimization of the energy efficiency across the building. This will be connected to Charter Halls portfolio monitoring system with data reported and tracked to achieve their overarching energy and water performance targets.

3.1.7 Improved Outdoor Air Provision

The project will aim to improve the outdoor air provided to regularly occupied spaces. This will minimise CO_2 build up within the office areas and improve comfort for the building occupants.

To address energy use concerns the design will also look to incorporate on an outdoor air economy cycle which will allow the building to exploit periods where the buildings external conditions can effectively provide thermal comfort in the space reducing the run times of the air-conditioning system.

3.1.8 Highly efficient lighting system

Efficient lighting systems including LED lighting throughout the building will reduce the overall energy consumption of the building. LED lights are up to 80% more efficient than traditional fluorescent lights and are characterized by an extended lifespan contributing to a reduction in carbon emissions. They are also efficient in dissipating heat and therefore reduce the heat load experienced within conditioned spaces. Additionally, the implementation of occupancy sensors and timers, networked lighting controls and lighting zones will collectively serve to optimize the energy efficiency of the building.

3.1.9 Electric-Only Building

All building systems and appliances will be electric, avoiding the use of gas and diesel on-site. This helps to futureproof the building and ensures that it is aligned with the NSW Government's commitment to carbon neutrality by 2050.

3.2 Energy Generation:

With the above energy efficiency measures, the energy load of the facility will be significantly reduced, allowing a larger portion of the sites electrical energy demand to be met through onsite renewable energy generation from a PV array. This will assist to both offset the sites energy use and minimise the sites daytime peak demand from the grid.

3.3 Indoor Environment Quality

Indoor environment quality is always an important consideration in spaces that are regularly occupied such as the offices and warehouse areas. The following considerations have been considered as part of the building design:

3.3.1 Daylight Access

The well-designed glazing present on the office façades will provide strong daylight penetration into the office spaces. This integrated daylight approach will improve the wellbeing of the building occupants by creating a visually stimulating and productive environment. The provision of daylight will reduce the overall energy consumption of the building as the natural light will alleviate the need for artificial lighting whilst the direct sunlight through the glazing systems will enhance thermal comfort during cooler months aligning with Charter Hall's Industrial Design Standards for optimized daylight and thermal comfort.

3.3.2 Indoor Air Quality

Material recycling facilities generate significant amounts of dust containing micro-particulates of plastics, glass, biohazards, toxic substances such as silica and asbestos and other respiratory irritants which have serious health consequences. Maintaining adequate indoor air quality within the warehouse and office areas is vital to the health and wellbeing of all occupants. The implementation of indoor air quality monitoring systems will assist in the detection of pollutant build- up whilst ensuring areas such as the warehouses meet air quality standards devised by both council and Cleanaway. Additionally, efficient exhausting systems and the adoption of regulatory systems such as Dock Scheduling Software will limit truck idling and waiting times within the carpark and loading areas allowing for the reduction of micro-particulate matter and atmospheric Carbon Dioxide (CO_2) levels within the facilities. The incorporation of efficient electric door systems within the loading docks will also minimize air infiltration, limiting the exposure of indoor areas to outdoor pollutants.

3.3.3 Interior noise level control

Internal noise levels will be actively considered with the building layout and systems design with a focus on managing internal noise levels and reverberation within the facility. The use of acoustic insulation and sound isolation will ensure that interior noise levels to be maintained below acceptable limits.

3.4 Material selection

Materials selection for the project aims to improve the internal environment of the site with materials with low volatile organic compound and formaldehyde content preferred to help minimise respiratory issues for building occupants.

3.4.1 Environmentally Friendly Refrigerants

Where required, the use of Environmentally friendly refrigerants, such as hydrofluorocarbons (HFC's), will be considered within the project to minimise global warming potential and ozone depletion potential.

3.4.2 Low Impact

Embodied energy will be reduced by avoiding unnecessary use of materials and procuring materials with a low carbon footprint where appropriate. This will be managed in line with Charter Hall's Embodied Carbon standards for industrial projects.

3.5 Water Efficiency

A strong focus has been put on the effective management of water within the building with the following initiatives being included in the design in all areas throughout the project. It is expected that these initiatives will reduce the sites potable water demand by more than 50% compared to a standard practice building.

3.5.1 Water efficient fixtures and fittings

Water Efficient fixtures and fitting will reduce the water consumption of the site. As an indication, the following should be targeted:

- Wash hand basin taps 6-star WELS
- General taps 6-star WELS
- Toilets dual flush 5-star WELS
- Urinals 0.8 L per flush 6-star WELS
- Shower heads 7-9 L per minutes 5-star WELS

3.5.2 Water Sensitive Urban Design

The project will incorporate a focus on water sensitive urban design with the external landscape design incorporating canopy and screening tree planting, mass planting beds and formal bands of green foliage. The inclusion of a well-designed landscaped area along the north, west and southern boundaries of the design will also assist in the reduction of industrial runoff containing high levels of accumulated particulate matter, chemical additives, lubricants and other pollutants associated with recycling facilities whilst also assisting in the management of the projects broader impact on urban stormwater flows.

3.5.3 Rainwater capture and reuse

A rainwater capture and reuse system is required for installation to offset the sites water usage for washdown, toilet flushing and irrigation. This system would have the ability to offset most of the sites potable water usage.

3.6 Improved Ecology

The project design encompasses well designed landscape areas along the boundaries of the site which will feature a selection of native vegetation including shrubs, grasses, screening trees and medium to large canopy trees to reduce industrial noise and promote the biodiversity of insects and native birds through habitat provisioning. Consequently, the design will actively contribute to conservational efforts within the urban environment, encourage positive interactions between people and nature whilst also minimizing the ongoing environmental impact of the project.

3.7 Waste Management

Effective waste management throughout construction and operation of the site will help to promote resource efficiency and minimise the adverse environmental impacts of the project. The following are being considered as part of the design process.

3.7.1 Waste Management Plan

A Waste Management Plan will be prepared with the following key objectives:

1. To minimise the environmental impacts of the operations of the development
2. To minimise the impact of the management of waste within the development
3. To ensure waste is managed to reduce the amount landfilled and to minimise the overall quantity generated

These objectives will be achieved through strategies such as the integration of recycling bins and back-of-house separation areas, which will encourage recycling and separation of cardboard/paper waste, glass, food waste and comingled recycling and general waste.

3.7.2 Separated Waste and Recycling Streams

The provision of separated waste and recycling streams could allow for more effective recycling of the project's operation waste. Providing separate bins for cardboard/paper waste, glass, food wastes, comingled recycling and general waste will improve the buildings operational efficiency and result in significant environmental benefits.

3.7.3 Construction Waste Minimisation

The project should minimise the construction waste associated with the project and can aim to divert over 90% of waste from landfill to recycling or reuse facilities.

4. Climate Change Projections

As part of the design review the project has completed a risk assessment for the sites climate adaption risks based on the CSIRO climate change projections for Sydney. This high level assessment reviewed the following three elements:

- Consequence: what will be the effect of the development should the impact occur?
- Likelihood: how likely is it that the impact will occur?
- Risk Rating: what is the associated risk of the development when the likelihood of it happening is measured against the possible consequence of the impact?

Key risks posed to the site which will be addressed as part of this process and high-level issues are outlined below with comment on how these are addressed within the current design; further detail will be developed within the projects detailed design development stages.

- Changing Surface Temperatures represent a high risk to the project and should be addressed through the following.
    - Use of high reflectivity roofing to minimise heat gain and heat island impacts.
    - Installation of rooftop solar panels to provide shading to the roof and provide increased power to the site when peak energy use for cooling is required.
    - Incorporation of heating, ventilation, air conditioning (HVAC) systems designed to modulate in the event of changing outside air temperatures. Equipment should be rated to continue operating during higher temperatures.
- An increase in rainfall intensity should be managed through the following.
    - Inclusion of rainwater and stormwater storage systems to modulate flows exiting the site.
    - Ability to provide increased finished floor level (FFL) designed to be 0.30 m above freeboard requirement to account for increased flooding potential at the site.
    - Inclusion of awnings to the entry access points to promote allow continued operation during adverse conditions.
- An increase to wind speed intensity should be addressed through the following.
    - The metal roof design incorporating roof bracing to fasten the roof onto the building structure to account for increasingly strong winds on site and prevent damage to the roof due to prevailing winds.
    - Improved structural strenght to ensure that the building is not significantly impacted in the event of high intensity wind loads. This includes wind loading on loading dock awnings and doors.
- Decrease in humidity and increased drought conditions will be addressed through the following.
    - Increased capacity within the fire safety systems to assist in the management of bushfire risk associated with dryer conditions.
    - Additional non potable water supply for irrigation needs and the integration of native and drought tolerant vegetation.

Overall, the current design incorporates significant measures to address key projections for climate change in the near term. The project will consider further initiatives to address all high and extreme risks posed to the site as per the Climate Adaption Credit within the targeted Green Star rating.

5. Green Star Design & As-Built v1.3

5.1 Overview

The Green Building Council of Australia's provides an internationally recognised system to assess sustainable outcomes throughout the life cycle of the built environment. It was developed by the Australian Building Industry through the Green Building Council of Australia (GBCA), which is now the nation's leading authority on sustainable buildings and communities.

This section provides a summary of elements drawn from the Green Star tool that may be applied at the proposal.

The Green Star system incorporates ESD principals across nine major categories:

- Management
- Indoor Environment Quality
- Energy
- Transport
- Water
- Materials
- Land Use and Ecology
- Emissions
- Innovation

It is noted that a **Certified Five (5) Star Green Star Design & As-Built v1.3 Rating** is being targeted for this project under the Charter Hall Volume Certification Agreement.

5.2 Management

The credits within the Management category promote the adoption of environmental principles from project inception, design, and construction phase, to commissioning, tuning and operation of the building and its systems. The following credits are currently being targeted:

- 1.1 Green Star Accredited Professional
- 2.0 Environmental Performance Targets
- 2.1 Services & Maintainability Review
- 2.2 Building Commissioning
- 2.3 Building Systems Tuning
- 2.4 Independent Commissioning Agent
- 3.1 Implementation of a Climate Adaptation Plan
- 4.1 Building Information
- 5.1 Environmental Building Performance
- 5.2 End of Life Waste Performance
- 6.0 Metering
- 6.1 Monitoring Systems
- 7.0 Environmental Management Plan
- 7.1 Formalised Environmental Management System
- 7.2 High Quality Staff Support
- 8B Operational Waste

5.2.1 Green Star Accredited Professional

Northrop has been engaged with as the Green Star Accredited Professional to provide advice, support and information related to sustainability principles and processes, at all stages of the project.

5.2.2 Environmental Performance Targets

The project team will set and document environmental performance targets for the project. This will involve the detailed targeting of energy and water consumption at a minimum, which will be measured through the metering and monitoring system.

5.2.3 Services and Maintainability Review

The project team will perform a comprehensive services and maintainability review led by the head contractor or the owner's representative (or the Independent Commissioning Agent) during the design stage and prior to construction.

The services and maintainability review will include input from the design team, the facilities manager and operations staff, and any relevant suppliers and subcontractors. The review looks to address the following aspects of the project:

- Commissionability;
- Controllability;
- Maintainability;
- Operability, including ‘Fitness for Purpose’; and
- Safety.

5.2.4 Building Commissioning

The project team will demonstrate that the pre-commissioning and commissioning activities have been performed based on the approved standards and guidelines. This will involve an air permeability test by a suitably qualified practitioner, ensuring compliance with AS/NZS 9972:2015 Thermal Performance of Buildings. This process will also involve the development and implementation of a commissioning plan.

5.2.5 Building Systems Tuning

The project will include a commitment to a tuning process for all nominated building systems. At a minimum, this includes quarterly adjustments and measurement for the first 12 months of occupation.

5.2.6 Independent Commissioning Agent

An Independent Commissioning Agent (ICA) should be appointed to advise, monitor, and verify the commissioning and tuning of the nominated building systems throughout the design, tender, construction, commissioning and tuning phases.

5.2.7 Implementation of a Climate Adaptation Plan

The project team will develop a project-specific Climate Adaptation Plan regarding the impacts of climate change on the project, by identifying and addressing all high and extreme risks posed over the expected lifecycle of the project based on two time scales, relevant to the project’ anticipated lifespan.

5.2.8 Building Information

The project design will look to incorporate an array of monitoring and metering systems regarding the energy and water usage of the building. Relevant building information regarding the operation and maintenance of the building and all nominated building systems to deliver best practice will be

provided to the building facilities management team and all relevant stakeholders to optimize building performance and meet environmental targets.

5.2.9 Environmental Building Performance

The project will commit to set targets, measure, and report on the environmental performance of the building covering metrics such as greenhouse gas emission, potable water usage, operational waste and indoor environment quality.

5.2.10 End of Life Waste Performance

The project will also commit to reducing demolition waste at the end of life of an interior fitout or base building components.

5.2.11 Metering

Energy and water metering systems will be provided, at minimum, on a floor-by-floor basis depending on the use of the floor. Independent metering will be required where single item energy loads exceed 5% of the total energy use of the building, or 100kW and where common water use consumes 10% of the project's water use.

5.2.12 Monitoring Systems

The project will incorporate energy and water monitoring systems capable of capturing and processing data produced by the energy and water meters. The monitoring system will provide detailed information regarding energy anomalies across systems, fault and wasteful leak detection and the opportunity to reduce energy and water usage and associated costs, to optimize building performance outcomes.

5.2.13 Environmental Management Plan

The project will develop and implement a best practice environmental management plan to assist the Head Contractor and its service providers to manage environment performance, conditions and impacts associated with of demolition, excavation, and construction works.

5.2.14 Environmental Management System

A formalised systematic and methodical approach to planning, implementing and auditing will be in place during construction, to ensure compliance with the Environmental Management Plan. An Environmental Management System will be in place and independently certified to a recognised standard, such as AS/NZS ISO 14001.

5.2.15 High Quality Staff Support

High quality staff support practices will be in place that promote positive mental and physical health outcomes of site activities and culture of site workers. Training will be provided to enhance site workers' knowledge on sustainable practices through on-site, off-site, or online education programs.

5.2.16 Operational Waste

The building design should provide bins and storage areas to ensure the efficient collection and separation of general waste into appropriate waste streams by the building occupants and waste collection contractors. The waste storage area design considers safe accessibility for collection vehicles including driveway access and appropriate height clearances which are to be assessed and signed off by a waste specialist or contractor.

5.3 Indoor Environment Quality

The credits within the Indoor Environmental Quality category promote the provision of high-quality interior spaces within projects. These spaces are recognised based upon their Air Quality, Lighting, Acoustic and Thermal Comfort. The following credits are currently being targeted:

- 9.1 Ventilation System Attributes
- 9.2 Provision of Outdoor Air
- 9.3 Exhaust or Elimination of Pollutants
- 10.1 Internal Noise Levels
- 10.2 Reverberation
- 10.3 Acoustic Separation
- 11.1 General Illuminance & Glare Reduction
- 12.0 Glare Reduction
- 13.1 Paints, Adhesives, Sealants & Carpets
- 14.1 Thermal Comfort

5.3.1 Ventilation System Attributes

The entry of outdoor air pollutants will be mitigated – building services will be designed to comply with ASHRAE standard 62.1:2013 regarding minimum separation distances between pollution sources and outdoor air intakes. To ensure easy maintenance efforts of the air distribution system adequate access to both sides of the moisture and debris-catching components of the mechanical ventilation systems will be provided.

5.3.2 Provision of Outdoor Air

The project design should either provide outdoor air at a rate 100% greater than the minimum required by AS 1668.2:2012, or ensure the CO_2 concentrations are maintained below 700ppm.

5.3.3 Exhaust or Elimination of Pollutants

The project team will demonstrate that pollutants from cooking processes and equipment and vehicle exhaust as well as dust and particulate matter generated within material recycling facilities will be exhausted directly to the outside of the project in accordance with recognised standards. Specifically, all pollutants from vehicles within an enclosed space will be exhausted to a dedicated exhaust rise or directly to the outside in accordance with AS 1668.2-2012.

5.3.4 Internal Noise Levels

A qualified acoustic consultant will provide internal ambient noise level measurements and documentations in accordance with AS/NZS 2107:2016.

5.3.5 Reverberation

The project will look to limit the reverberation time below the maximum recommended reverberation set out within the AS/NZ 2107:2016 standard.

5.3.6 Acoustic Separation

The project design will address noise transmission within enclosed spaces, such as the mezzanine warehouse offices through compliance with relevant industry best practice standards and guidelines.

5.3.7 General Illuminance and Glare Reduction

Interior lighting will be flicker free with a minimum Colour Rendering Index (CRI) of 80. The project will meet standards for best practice general illuminance in accordance with AS/NZS1680.2.2 for office spaces and AS/NZS1680.2.4 for industrial tasks and processes. Baffles, louvers, translucent diffusers, and ceiling design will eliminate glare and obscure direct light sources from all viewing angles of occupants.

5.3.8 Glare Reduction

The project will look to reduce glare using blinds, screens, or fixed shading devices where appropriate.

5.3.9 Paints, Adhesives, Sealants and Carpets

At least 95% of all internally applied paints, adhesives, sealants and carpets will meet the below stipulated 'Total VOC Limits' (TVOC).

Table 1: Maximum TVOC Limits for Paints, Adhesives and Sealants

Product Category	Max TVOC content in grams per litre (g/L) of ready to use product
General purpose adhesives and sealants	50
Interior wall and ceiling paint, all sheen levels	16
Trim, varnishes and wood stains	75
Primers, sealers and prep coats	65
One and two pack performance coatings for floors	140
Acoustic sealants, architectural sealant, waterproofing membranes and sealant, fire retardant sealants and adhesives	250
Structural glazing adhesive, wood flooring and laminate adhesives and sealants	100

To demonstrate compliance for the use of carpets all products will be certified under a recognised Product Certification Scheme or other recognised standards.

5.3.10 Thermal Comfort

The project design will look to ensure indoor conditioned spaces will be thermally comfortable for occupants, with at least 80% of all occupants being satisfied in the space.

5.4 Energy

The 'Energy' category aims to facilitate reductions in greenhouse gas emissions by facilitating efficient energy usage and encouraging the utilisation of energy generated by low-emission sources. The project is targeting the following credits:

- 15E.2 Greenhouse Gas Emissions Reduction - Comparison to a Reference Building Pathway

- 16B Peak Electricity Demand Reduction – Performance Pathway

5.4.1 Greenhouse Gas Emissions – Comparison to a Reference Building Pathway

The design target will be a 20% reduction in the predicted energy consumption and GHG emissions compared to a 2019 National Construction Code Section J compliant building.

Prediction of the building performance against this benchmark will be confirmed using building performance modelling that assesses potential energy use for base building services systems including:

- Mechanical Services
- Electrical Services
- Communications, AV and security systems
- Hydraulic Services
- Vertical Transportation Systems

5.4.2 Peak Electricity Demand Reduction – Reference Building

The design target will be a reduction in the annual peak electricity demand by at least 20% compared to a 2019 National Construction Code Section J compliant building.

5.5 Sustainable Transport

Sustainable transport criteria aim to provide design and operational measures that reduce the carbon emissions arising from occupant travel to and from the project, when compared to a benchmark building. In addition, it also promotes the health and fitness of commuters, and the increased accessibility of the location. The project is targeting the following credits:

- 17A Performance Pathway

A Travel Plan will be developed by a qualified transport professional to demonstrating an increased use of active and low emissions travel, based on the Sustainable Transport Calculator. Although bicycle parking facilities are not incorporated within the current project design, the travel plan will look to promote ease of access to public transport and adequate walking footpaths to encourage sustainable transport.

5.6 Water

The aim of this category is to encourage building design that minimises potable water consumption in operations. For this credit area, the performance pathway is currently being targeted, however, the following initiatives will be included in the final development.

5.6.1 Sanitary Fixture Efficiency

Water use flow and flush fixtures, and appliances will achieve WELS ratings within one star of those stated in the table below.

Table 2: Sanitary Fixture Efficiency

Fixture / Equipment Type	WELS Rating
Taps	6 Star
Urinals	6 Star
Toilet	5 Star
Showers	3 Star (> 4.5 but <= 6.0)
Clothes Washing Machines	5 Star
Dishwashers	6 Star

5.6.2 Landscape Irrigation

The landscaping system will be designed to reduce the consumption of potable water required for irrigation through use of subsoil drip irrigation with a moisture sensor controls.

5.6.3 Fire Protection System Test Water

The fire protection system will look to include temporary storage for 80% of the routine fire protection system test water and maintenance drain-downs for reuse on-site calculated on the basis that any single zone is drained down annually. In the case that sprinkler systems are installed, each floor will be fitted with isolation valves or shut-off points for system-by-system testing.

5.7 Materials

The materials category recognizes the use of building materials that are responsibly sourced or have a sustainable supply chain. The following credits are targeted:

- 19B.1 Life Cycle Impacts – Concrete
- 19B.2 Life Cycle Impacts – Steel
- 20.1 Structural & Reinforcing Steel
- 20.2 Timber Products
- 20.3 Permanent Formwork, Pipes, Flooring, Blinds and Cables
- 21.1 Product Transparency & Sustainability
- 22B Construction & Demolition – Percentage Benchmark

5.7.1 Life Cycle Impact - Concrete

The project will look to ensure that at least 50% of the mix water used for all concrete are either captured or reclaimed water, and at least 40% of coarse aggregate in the concrete will be crushed slag aggregate or another alternative material, or at least 25% of fine aggregate (sand) inputs in the concrete will be manufactured sand or other alternative materials.

5.7.2 Life Cycle Impacts - Steel

The project team will reduce the mass of steel framing used within concrete reinforcement by at least 5% when compared to standard practice.

5.7.3 Structural and Reinforcing Steel

95% of the building's steel (by mass) will be sourced from a Responsible Steel Maker; and at least 60% (by mass) of all reinforcing bar and mesh will be produced using energy-reducing processed in its manufacture (measured by average mass by steel maker annually).

5.7.4 Timber Products

At least 95% (by cost) of all timber used in the building and construction works will be certified by a forest certification scheme that meets the GBCA's 'Essential' criteria for forest certification or will be from a reused source.

5.7.5 Permanent Formwork, Pipes, Flooring, Blinds and Cables

Of all permanent formwork, pipes, flooring, blinds, and cables, 90% (by cost) will not contain PVC or will meet GBCA's Best Practice Guidelines.

5.7.6 Product Transparency & Sustainability

At least 3% of all materials used in the project will meet transparency and sustainability requirements under one of the following initiatives: A. Reused Products; B. Recycled Content Products; C. Environmental Product Declarations; D. Third-Party Certification; or E. Stewardship Programs.

5.7.7 Construction and Demolition Waste – Percentage Benchmark

This project will target 90% of the waste generated during construction and demolition being diverted from landfill, excluding special waste and excavation waste.

5.8 Land Use and Ecology

The 'Land Use & Ecology' category aims to reduce the negative impacts on sites' ecological value as a result of urban development and reward projects that minimise harm and enhance the quality of local ecology. The following credits are currently being targeted:

- 24.0 Conditional Requirement
- 25.0 Heat Island Effect Reduction

5.8.1 Conditional Requirement

The project site also did not include old growth forest, prime agricultural land, wetland of ‘High National Importance’, and did not impact on ‘Matters of National Significance’.

5.8.2 Heat Island Effect Reduction

At least 75% of the total site area will comprise of one or a combination of vegetation; green roofs; light coloured roof SRI >64.

5.9 Emissions

The 'Emissions' category aims to assess the environmental impacts of 'point source' pollution generated by projects. Negative impacts commonly associated with buildings include damage to the environment through refrigerant leaks or disturbances to native animals and their migratory patterns as a result of light pollution. The following credits are currently being targeted by the project:

- 26.1 Stormwater Peak Discharge
- 26.2 Stormwater Pollution Targets
- 27.1 Light Pollution to Night Sky

5.9.1 Stormwater Peak Discharge

The project is aiming to achieve a post-development peak event discharge from the site which does not exceed the pre-development peak event discharge using the design Average Recurrence Interval (ARI) that corresponds to the associated flooding risk identified in the Climate Change and Adaption Assessment.

5.9.2 Stormwater Pollution Targets

All stormwater discharged from the site will meet the pollution reduction targets in the table below.

Table 3: Minimum Pollution Reduction Targets

Pollutant	Reduction Target (% of the Typical Urban Annual Load)
Total Suspended Solids (TSS)	90%
Gross Pollutants	95%
Total Nitrogen (TN)	60%
Total Phosphorus (TP)	70%
Total Petroleum Hydrocarbons	90%
Free Oils	98%

5.9.3 Light Pollution to Night Sky

Outdoor lighting will be designed to achieve control of upward light output ratio (ULOR) by demonstrating that no external luminaire on the project has a ULOR that exceeds 5%, relative to its actual mounted orientation.

5.10 Innovation

The 'Innovation' category aims to recognise the implementation of innovative practices, processes and strategies that promote sustainability in the built environment. The following credits are currently being targeted for the project:

- 30A Innovative Technology or Process – On-site Renewable Energy
- 30C Improving on Green Star Benchmarks – Stormwater Pollution Targets and Bicycle Maintenance Station
- 30D Innovation Challenge – Financial Transparency

5.10.1 On-site Renewable Energy

The installation of a large-scale PV solar array on site will significantly reduce energy consumption of the development past Green Star benchmarks and is considered innovative.

5.10.2 Improving on Green Star Benchmarks

The project will achieve additional points for exceeding the stringent requirements for credit achievement in several areas. The project will achieve additional points for achieving additional reductions in pollution load targets through the stormwater systems.

5.10.3 Innovation Challenge

The project is also looking to innovate on current construction methods and will be targeting points for meeting challenges set out by the Green Star Framework. The project will be looking to provide financial transparency, by providing to the GBCA extensive details regarding the costs of construction and management of the project. Furthermore, the project will also look to ensure that the temporary site office is high performance, minimising operational energy usage during construction and reducing the carbon footprint of the project.

6. Conclusion

This report has addressed the ESD and Greenhouse Gas requirements to support the SSDA for the Development of the 600 Woodstock Ave development.

Specific sustainability initiatives proposed for the building include, but are not limited to:

- Space efficient building layout.
- Water Sensitive urban design principles
- High efficiency electrical systems
- On-site renewable energy generation
- Increased use of daylighting and lighting control systems
- Installation of a rainwater capture and reuse system
- Energy Efficient heating, ventilation and air conditioning including natural ventilation to open spaces.
- Waste Minimisation strategies.

Overall, through the implementation of the initiatives noted within this report the project clearly demonstrates the site's commitment to ESD principles throughout the design, construction, and operation. Additionally, the project design team has worked to optimise the sites energy performance, address key climate related risks posed to the site, and align to the NSW Government's commitment to carbon neutrality by 2050.

Furthermore, through the project's commitment to achieving a 5 Star Green Star rating and an outcome focused approach to sustainability, the project commitments exceed the required ESD measures required under the site-specific SEARs and demonstrate Australian Leadership in sustainability.