ARCADIS Design & Consultancy for natural and built assets

MINTO WAREHOUSE AND LOGISTICS HUB

Sustainability Management Plan

20 APRIL 2016

Incorporating Hyder

MINTO WAREHOUSE AND LOGISTICS HUB

Sustainability Management Plan

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REVISIONS

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DRAFT	08/04/2016	Draft issued for comments	KW	DS
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CONTENTS

1 SUMMARY

Qube is preparing a State Significant Development Application (SSDA) in relation to the proposed development of 5 and 9 Culverston Road, Minto, being legally described as Lot 3 in DP 817793 and Lot 400 in DP 875711 (the Site), for the purpose of a Warehouse and Logistics Hub (the Proposal).

Arcadis has been engaged by Qube to provide a Sustainability Management Plan (SMP) for the development. The objective of this Sustainability Management Plan is to investigate and identify all potential Ecological sustainability initiatives with a focus on energy savings and recommendations for possible heating and cooling systems to be used on site.

The information used in this report is based on:

- Architectural Drawings by Reid Campbell – Preliminary issue 24/03/2016
- Consultants Briefing Document – 22/02/2016
- Concept Design Master Plan by Reid Campbell from 24/03/2016

1.1 Project Description

The Site is located in Minto and is bound by Airds Road, Rose Payten Drive and Main Southern Railway. Culverston Road crosses the development as outlined in Figure 1. The development is approximately 29.36 hectares in area and is planned to accommodate warehouses with a total building area of 112,000 m^2.

The existing site comprises an industrial area hardstand, shade structures and a warehouse building.

Figure 1 Site location

1.2 Proposed Development & Approval Conditions

This report has been prepared as part of an SSDA and in accordance with the Secretary's Environmental Assessment Requirements (SEARs) (ref: SSD 7500, File: 16/03046 and dated 10/03/2016). The SEARs which are addressed in this report are presented in Table 1.

Table 1: Secretary's Environmental Assessment Requirements

SEARs Reference	Key Assessment Requirement	Where addressed
Greenhouse Gas and Energy Efficiency	Including an assessment of the energy use on site, and demonstrate what measures would be implemented to ensure the proposal is energy efficient.	Section 4 of this Report includes strategies to address Greenhouse Gas and Energy Efficiency

SEARs Reference	Key Assessment Requirement	Where addressed
Ecological Sustainable Development	Including an assessment of how the development will incorporate ecologically sustainable development principles in all phases of the development.	Section 5, 6, 7 and 8 of this Report include strategies to address Ecological Sustainable Development
Infrastructure Requirements	A detailed written and/or geographical description of the existing infrastructure required on-site; Identification of any infrastructure upgrades required to facilitate the development, and describe any arrangements to ensure that the upgrades will be implemented in a timely manner and maintained; and A detailed description of cooling/heating systems to be installed on-site.	Section 4.8 -4.11 of this Report include recommendations for cooling/heating system to be installed on site only.

2 SUSTAINABILITY MANAGEMENT GUIDELINES

The Building Code of Australia (BCA) is produced and maintained by the Australian Building Codes Board (ABCB) on behalf of the Australian Government with the aim of achieving nationally consistent, minimum necessary standards of relevant health and safety, amenity and sustainability objectives efficiently.

The BCA contains mandatory technical provisions for the design and construction of BCA class buildings.

Volume 1, Section J of the BCA deals with energy efficiency requirements for BCA class 3 to 9 buildings (including Class 7b Warehouses and Class 5 Offices),

Section J include eight subsections, J1 to J8, for the Deemed-to-Satisfy (DTS) provisions. Each subsection focuses on separate aspects of energy efficiency as follows:

- J1 - Building Fabric, J2 - External Glazing, J3 - Building Sealing
  - Include provisions on how the building must be constructed to improve energy efficiency in areas that are air-conditioned or likely to be air conditioned in the future.
  - Section J1include assessment of the insulation of roofs, walls and floors as well as an assessment of the glazing and the requirements to building sealing to prevent loss of conditioned air.
  - The section aims to improve the buildings passive performance and lower the air conditioning requirements through good construction and good building practice.
- J4 - Air Movement
  - The provision of air movement for free cooling, in terms of opening and breeze paths
  - Note: This subsection has been removed from the current version of the BCA, BCA 2015.
- J5 - Air Conditioning and Ventilation Systems
  - The efficiency and energy saving features of heating, ventilation and air-conditioning systems
  - Include provisions for efficiency of mechanical systems such as fans, air conditioners, water chillers and pumps.
- J6 - Artificial Lighting and Power
  - Power allowances for lighting and electric power saving features
  - The sections sets parameters on both the layout and the efficiency of the fittings used.
- J7 - Hot Water Supply
  - The efficiency and energy saving features of hot water supply
- J8 - Access for Maintenance
  - Access to certain energy efficiency equipment for maintenance purposes
  - Outlines the requirements that must be allowed for or put in place for maintenance of all of the services in the building.
  - This is to ensure that all services can continue to operate at their maximum efficiency by being regularly maintained.

3 BASELINE AND PROPOSED ENERGY CONSUMPTION

It is estimated that at present, buildings in Australia contribute as much as one third of total global greenhouse gas emissions, this is primarily through the use of fossil fuels during their operational phase.

Ineffective energy management for commercial premises can lead to unnecessary growth in greenhouse gas emissions and consumption of natural resources. Effective energy management reduces costs through the use of energy efficiency measures and improves environmental outcomes locally, regionally and globally.

Effective energy management is achieved through the implementation of an SMP for the operational life of the Project. A BCA Sections J Deem-to-Satisfy (DTS) compliant building is used as the baseline building for energy consumption savings.

BCA Section J provides the minimum requirement for energy efficiency. This section outlines the minimum BCA requirements, as the design progresses it is estimated that a substantial reduction of annual consumption will be achieved compared to BCA practices.

3.1 Identified Major Energy Use Components

Major energy use components of the Project have been estimated to be:

- Lighting – For warehouse office and external purposes
- Air Conditioning.
  - Warehouse – Unconditioned with natural ventilation
  - Office – Conditioned space with mechanical ventilation
- Power – The energy load by the facility will be reduced by naturally condition and ventilating the warehouses.

3.2 Building Fabric Requirements

Part J1 to J3 of the 2015 BCA Section J contains the requirements of the DTS compliance of the building fabric.

Building fabric will provide sufficient thermal insulation to minimise heating and cooling loads placed on the building and the commensurate energy consumption HVAC systems servicing internal building spaces.

All building fabric within the development will meet the 2015 BCA Section J1 requirements.

3.3 Glazing

Windows are the weakest thermal point in any building as they have a low resistance to heat transfer. Areas of low performance glass will have a significant negative impact on the performance of a building's energy use. All glazing is to comply with the BCA.

3.4 Shading

Shading is crucial to reduce heat gains in summer. Shading can also assist during the winter months to prevent user discomfort from glare issues.

Provision of shading to all north facing windows will be investigated, shading to the north façade in order to block out the summer sun and reduce heat build-up while still allowing the winter sun to enter and heat up the building.

3.5 Domestic Hot Water

The thermal efficiency for hot water systems is to be at least 80% as specified by the BCA section J7.

As per the Campbelltown Development Control plan 2014 all new buildings are encouraged to provide a solar hot water system. Where a site is connected to a gas main, the solar hot water system is encouraged to be gas boosted.

The heating of water for domestic hot water use at the Minto development will be relatively small in comparison to other energy uses; however, hot water heating offers one of the most cost effective technologies for harvesting solar energy on buildings.

A gas-boosted solar hot water system will be considered at the design development stage where feasible and practical. Solar hot water should be used as a preheat system to a gas-fired boiler to heat water for potential showers and other hot water applications.

All fittings and fixtures are proposed to be of the highest or within 1 star of the highest available star rating. The installation of water efficient fixtures will also reduce the hot water usage for the development refer to section 4.1 Demand Management.

3.6 Natural light

Evenly spaced translucent roof sheeting to warehouse areas is proposed to optimise natural light and reduce the energy requirement for artificial lighting.

3.7 Artificial Lighting

Lighting constitutes a major component of running expenses of most buildings, yet it offers some of the simplest ways to reduce energy consumption. Lighting represents approximately 25% of greenhouse gas emissions from the commercial sector, and accounts for approximately 67% of the average commercial tenant's direct energy costs. In addition, inefficient lighting increases the heat load on a building, which can result in increased cooling load.

Efficient lighting can be described as minimising energy consumption while still maintaining suitable illumination on an economically satisfactory basis.

Significant drivers of sustainable lighting include:

- Financial benefits: Companies can save between 40 and 80% of their lighting energy costs by adopting efficient lighting practices;
- Future proofing: Adopting sustainable lighting practices can allow you to hedge against future rises in energy costs; and
- Increased productivity for office staff: Research has demonstrated that good lighting design with optimum lighting levels can significantly enhance staff productivity and wellbeing. The improvement in staff productivity is difficult to quantify, however the productivity costs can be multiple times of the lighting solution cost.

Technologies that will assist in the reduction of lighting energy consumption should be considered in the detailed design phase.

Lighting load

Section J6 of the BCA provides a benchmark ofthe total lighting power load allowed within the different spaces within a building. The total lighting power load shall be limited to be no greater than the maximum illumination power load listed in the BCA, measured in Watts (W).

The maximum allowable building illumination power load is based on the total illumination power load calculated for each space. The maximum illumination power density for each space will be dependent on the usage (refer to Table J6.2a of BCA 2015 Volume One).

For artificial lighting, the aggregate design illumination power load must not exceed the sum of the allowances. This sum of allowances is obtained by:

- Multiplying the area of each space by the maximum illumination power density (as found in Table J6.2a of the BCA 2015 Volume One).
- The energy load (in kWh) is estimated by multiplying the power load by the hours of consumption (24hrs/day).
- The illumination power density adjustment factor for the control device is based on BCA Table J6.2b for each space type:

Estimated maximum office lighting load

The energy consumption of the office lighting load is summarised in Table 1. This has been estimated from:

- The BCA standard maximum illumination density for an office
    - 9W/m² as per Table J6.2a of the BCA 2015 Volume One.
- The development is to be operating on a 24 hour, 7 day basis
- The illumination power density adjustment factor 0.9 (motion sensors)

Table 1 Estimated annual energy consumption from the office lighting

Office	Office (m^2)	Maximum allowable lighting load (kW)	Estimated Annual Energy Consumption (kWh)
Warehouse 1A	2,000	18	141,523
Warehouse 1B	1,000	9	70,762
Warehouse 1C	2,300	21	162,752
Warehouse 1D	1,000	9	70,762
Total	6,300		445,798

Estimated maximum warehouse lighting load

The energy consumption of the warehouse lighting load is summarised in Table 2. This has been estimated from:

- BCA standard maximum illumination density for an office
  - 10W/m² as per Table J6.2a of the BCA 2015 Volume One.
- The development is to be operating on a 24 hour, 7 day basis
- The illumination power density adjustment factor 0.9 (motion sensors) and 0.6 (Daylight, PE sensors)

Table 2 Estimated annual energy consumption from warehouse lighting

Warehouse	Warehouse (m^2)	Maximum allowable lighting load (kW)	Estimated Annual Energy Consumption (kWh)
Warehouse 1A	40,000	400	1,886,976
Warehouse 1B	22,000	220	1,037,837
Warehouse 1C	22,000	220	1,037,837
Warehouse 1D	23,000	230	1,085,011
Total	107,000		5,047,661

The above calculations is used to derive total annual energy consumption for the reference building. The reference load is calculated at 71kWh/m^2 for the office area and 47kWh/m^2 for the warehouse area. This load represents the maximum load acceptable by the BCA.

Incorporating energy efficient light globes, like LEDs, can significantly lower electrical load and running cost of a building. Choosing the right type of lighting requires an understanding of the facilities lighting needs and the types of lighting available.

The following measures are to be considered during the design stage to reduce the lighting load of the proposal:

Office

When designing the office lighting consideration should be given to suitability to the task, ease of maintenance, lifespan of luminaire, energy efficiency and capital and lifetime cost. It is recommended for LED to be used throughout the office space.

The following lighting is to be considered during the design phase:

- Provide efficient LED lighting throughout
- Daylight sensors to all areas with natural daylight.
- Occupancy sensors to low occupancy areas e.g. office, toilets, stairwells, lift lobbies and kitchens.
- Occupancy sensor controls: Motion detectors can be installed in rooms, supplying light only when required.
- Dimming Devices: Dimming devices allow light levels to be reduced where required. This may be to allow for daylight, or to compensate for reduced light levels over time.

Warehouse

High Bay Luminaires are recommended for the warehouse lighting. High Bay Luminaires will ideally be used with an LED fittings, Fluorescent or Metal Halide in order of preference.

In addition to efficient light fittings the following lighting controls should be implemented:

- Daylight sensors to all areas with natural light.
- Occupancy sensor controls: Motion detectors can be installed in sections of the warehouse, supplying light only when required. Sensors need to be positioned accurately to avoid significant blind spots
- Photo-electric sensors: Photo-sensors sense ambient light conditions, to determine the level of artificial lighting required for an area. The unique daylight dimming enables the lighting to react to changes in ambient lighting levels contributing to significant reductions in base load

Outside lighting

- Provide LED external lighting for all outside areas.
- External lighting will be controlled via time clock and daylight sensors.

The above initiatives are estimated to reduce the lighting consumption by 40-50% below that of the reference building. The project team is to further assess this reduction once the lighting design has been completed. The following section includes recommendations for an energy efficient lighting design.

The external lighting is to meet Australian Standard AS4282 obtrusive lighting design.

Lighting Design

Good lighting designs are essential to ensure that the available technologies reach their full potential in a given environment. This must take into consideration; available lighting technology, design constraints of the building, and the needs of the user.

Areas to consider include:

- Colour of walls and ceilings: Light colours reflect more light and reduce the need for artificial lighting; and
- Lighting layouts should also take into consideration different lighting zones within the facility.
- The optimum lighting levels vary for different activities as outlined by the Australian Standards. Efficient lighting programs implemented should achieve the recommended luminance levels for the given tasks.
- In summary, lighting densities should be considered for all areas in relation to the task to be performed.

3.8 Mechanical Air-Conditioning and Ventilation strategy

It is recommended to select an HVAC solution with high ongoing efficiencies and high levels of fresh air. This configuration will promote a healthy and productive work and recreational indoor environment, with improved life cycle cost benefits.

A number of approaches are available to efficiently heat and cool the Proposal. Some possible HVAC considerations are:

Variable Refrigerant Volume (VRV) System with heat recovery on outside air

A VRV ducted split system with heat recovery would be well suited to cool and heat the Development. A VRV system can allow multiple fan coil units with a single condenser unit externally mounted. The system can have supply and return air ductwork, grilles and programmable controllers for each zone. A VRV system differs from a standard DX system in that the refrigerant volume supplied to the fan coil units is modulated based on the conditioning demand in the space.

Hydronic Systems – Chilled beams or underfloor heating

A Hydronic System uses small diameter pipe-work to move energy, as hot and chilled water, around a building. The provision of cooling through Hydronic would not be practical for an office of this size however hydronic could be further explored with the building services engineer.

Reverse cycle split units

Efficient Air-cooled reverse cycle split AC units are proposed for double storey offices and warehouse dock offices with individual controls. Air cooled rooftop packaged unit are proposed for Temperature Control Store areas. Adiabatic cooling should be considered to improve rooftop efficiency.

Mixed mode systems

Mixed mode systems use a combination of passive design, natural ventilation and supplementary mechanical systems. This type of system could offer significant benefits when used in combination with good passive solar design, building insulation, glazing and outside air controls.

CO_2 based control of Outside air supply should be considered to improve efficiency and indoor environment quality to office areas.

All air-conditioning equipment is to be designed to the BCA Section J and other statutory authorities and applicable Australian standards.

3.9 Air-conditioning temperature control and set point

Table 3 AC unit's temperature control range

Space Type	Temperature Control Range (°C)
Offices	22.5±1.5°CBD
Temperature Control Store	23±1.0°CBD

3.10 Air-conditioning energy efficiency requirements

2015 BCA Section J5.2e has specified the minimum energy efficiency ratios requirements for package air conditioning equipment.

Table 4 BCA Unitary Plant Requirement

Equipment	Minimum Energy Efficiency Ratio	
	65 kW to 95 kW capacity	More than 95kW capacity
Air-conditioner – Cooling	2.7	2.8
Heat pump – Cooling	2.6	2.7

It is recommended for the facility to use AC units with a minimum of EER/COP of 3.0 for both heating and cooling.

3.11 Ventilation Strategy

Buildings that are purely mechanically ventilated or air conditioned can suffer from a number of problems including; high energy consumption, poor indoor air quality, and low thermal comfort.

Natural ventilation s is proposed for the warehouses of the Minto development.

Mechanical ventilation will be used for the office areas. During detailed design mixed mode ventilation will be investigated, and it needs to be carefully selected with respect to proximity to truck operation area.

The factors that improve the performance of a natural ventilation system include:

- Performance of the building façade; size of windows, type of glass and shading system, the insulation R-value;
- Building form factors and orientation to take advantage of prevailing breezes;
- Depth of building and distance between openings for cross flow ventilation and floor to ceiling heights (the taller the space the deeper it can be naturally ventilated);
- Maximise exposed thermal mass (masonry) to the interior of the occupied spaces to absorb heat gains in to the structure, which may reduce the peak cooling load. This heat gain can be purged from the structure, using a night ventilation strategy;
- Energy efficient lighting, flat screen monitors and energy efficient office equipment to reduce the operational heat load; and
- Occupant involvement so that the system is understood and easy to operate in its different modes.

4 POTABLE WATER CONSUMPTION

The project is proposed to have a number of sustainable water saving measures, including:

- Use of water saving fittings and fixtures.
- Rainwater harvesting will be explored where practical and feasible during detailed design
- Low water use landscape design.

4.1 Demand Management

The development is proposed to use the highest or one star below the best available sanitary fixtures under the Water Efficiency Labelling and Standards (WELS) rating scheme; these have been selected as follows;

- 5-6 WELS rated Taps, (5-3.5 L/min)
- 4 WELS rated Toilets, (average flush of 3.5L)
- 3 WELS rated showerheads (7.5L/min)
- 6 WELS rated Urinals
- 4 WELS rated dishwashers

By installing the above proposed fittings and fixtures the warehouse facility is estimated to reduce its potable water demand by approximately 20%.

4.2 Rainwater harvesting

The site includes over 100,000m^2 of roof area available for rainwater harvesting. Rainwater harvesting is to be explored during detailed design. Its size and implementation will be provided where practical and feasible.

4.3 Landscape irrigation

The development's plant selection and configuration should endeavour to select drought resistant species.

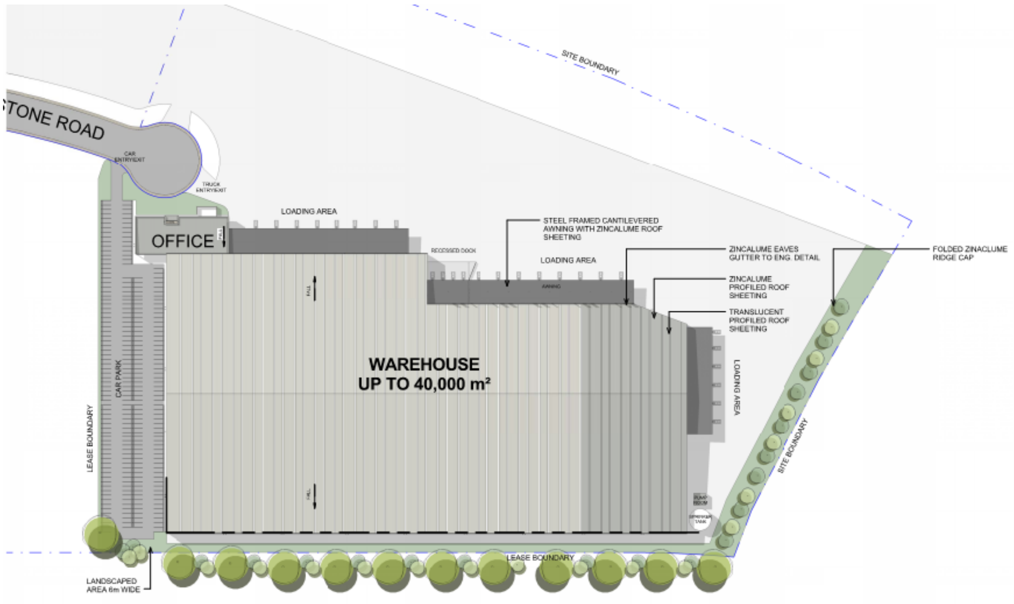

Figure 2 Landscape area proposed to be drought resistant planting

5 MONITORING AND REPORTING

All incorporated initiatives should be monitored, commissioned and tuned to ensure all services operate to their full potential and as designed.

5.1 Metering and Monitoring

Effective monitoring, measurement and reporting of resource use in buildings is required to support successful sustainability outcomes.

Providing building users and facilities managers with relevant information will highlight wasteful behaviour and identify areas for improvement. It can act as a meaningful deterrent to wasteful behaviour and raise awareness of the financial benefits of reducing consumption of electricity and water, as well as waste generation.

To enable effective review of resource use it is proposed for the project to incorporate energy and water sub-metering.

Water

Water metering should be considered during detailed design and implemented where practical and feasible.

Energy

The following energy uses (where present) are encouraged to be metered separately:

- Lighting;
- Power;
- Overall site electricity consumption (i.e. duplicating the utility meter).

5.2 Building information

Information on sustainable design features is paramount to ensure the long term intended operability of the building. Likewise, buildings can be used as learning resources through a number of methods aimed at disseminating their sustainable design attributes and initiatives, as well as factual data demonstrating environmental performance.

The building user's guide should ensure that:

- Facility managers understand in detail their responsibilities for the efficient operation of the facility and any additional building tuning necessary to continuously improve resource management
- Maintenance contractors understand how to service the particular systems to maintain reliable operations and maximum efficiency
- Employees understand energy minimisation procedures and working limitations required to maintain design performance for energy efficiency
- Future fit-out / refurbishment designers understand the design basis for the building and the systems so that these are not compromised in any changes.

6 WASTE MANAGEMENT

6.1 Importance of Minimising Waste

One of the major imperatives of sustainable design is to use the waste hierarchy of avoid, reduce, recycle and reuse.

The *NSW Waste Avoidance and Resource Recovery Strategy 2014-21* targets an 80% recovery rate of construction and demolition waste. Ideally, this project should at least be able to achieve this recovery rate. It is likely that the target could be achieved by reusing and recycling at least the following waste streams:

- Vegetation
- Asphalt
- Virgin Excavated Natural Material (VENM) and Excavated Natural Material (ENM)
- Concrete
- Bricks / pavers / tiles
- Metals – ferrous and non-ferrous.

The benefits in such a strategy accrue not only to the environment but also to the client and contractor by providing savings in transport costs, savings in landfill fees, a potential increase in revenue through salvage resale and higher recycling rates.

6.2 Optimising Waste Minimisation

Waste minimisation involves a diligent approach to documentation and project management in order to minimise the amount of waste produced on site during demolition and construction. It also recognises the potential of some materials to be reused or recycled rather than allowing them to contribute to waste volumes going to landfill. The focus of this should be a more efficient use of finite resources.

The environmental opportunities of waste management include the reduction of demolition and construction waste streams, as well as those resulting from ongoing operational waste during the lifecycle of the building.

6.3 Construction Environmental Management Plans

A site specific Construction Environmental Management Plan (CEMP) should be formulated for each stage to indicate the approach that will be taken to managing the immediate environmental impacts of construction.

Measures to mitigate the effect of the construction waste streams would be incorporated into the Proposal's Construction Environmental Management Plan (CEMP) as highlighted in the Proposals Waste Management Assessment R-0001-AA009069-AAR-02.

6.4 Operational Environmental Management Plans

An Operational Environmental Management Plan (OEMP) should be developed at an appropriate time to provide a structure for the ongoing management of the facility in operation. It is proposed to include information on purchasing of building consumables, waste centralisation and collection systems and cleaning regimes. Chemical cleaning products in particular may create health concerns, and a green cleaning programme should be developed at a later stage.

6.5 Operational Waste Management

Measures to mitigate the effect of waste arising during operation of the facility would be incorporated into the Proposal's environmental policy for operations, within the OEMP. This policy would include measures to encourage recycling behaviour and increase the diversion of waste into recycling streams. These would include requirements such as:

- Addressing waste management requirements and goals in staff inductions
- Providing staff access to documentation outlining the facility's waste management requirements
- Locating recycling bins in kitchen areas beside general waste bins to prevent contamination of recycling
- Positioning paper recycling bins close to printer/photocopying equipment
- Minimising general waste bins at desks but providing adequate container and paper recycling to encourage sorting of recyclables
- Providing adequate bin storage for the expected quantity of waste.

Waste arising from maintenance would be dealt in part by the asset management strategy and the overarching environmental policy which adheres to the waste hierarchy. Where feasible from a safety and cost perspective, assets would be refurbished; if a replacement is required the maintenance contractor would be responsible for ensuring any waste is recycled; if this is not possible arrangements for disposal at an appropriately licenced facility would be made.

Used spill kit material will be disposed of at an appropriately licensed facility.

Mitigation and quality control measures would be incorporated into the OEMP, including:

- Appropriate areas shall be provided for the storage of waste and recyclable material
- Standard signage on how to use the waste management system and what materials are acceptable in the recycling will be posted in all waste collection and storage areas
- All waste shall be collected regularly and disposed of at licensed facilities
- An education programme and on-going monitoring will to be implemented for training personnel to allow for the proper sorting of waste into the right components and transportation of waste to the appropriate destinations.

For further details refer to Waste Management Assessment R-0001-AA009069-AAR-02.

7 MATERIALS

The environmental impacts of material usage in buildings are numerous and include the depletion of natural resources, the degradation and pollution of the environment in their extraction, production, use, and health impacts associated with off-gassing of pollutants in production and use.

7.1 Materials Selection

The following performance criteria should be considered for specified materials:

- Materials that promote indoor air quality (eliminate or minimise materials containing Volatile Organic Compounds (VOC's);
- Materials that reduce material use (e.g. recycled materials) and which have low impact disposal;
- Low embodied energy materials (to be assessed on a life cycle basis);
- Materials that are durable and fit for purpose;
- Materials from sustainable sources i.e. renewable sources, no rainforest timber;
- Materials that do not contain chlorine (e.g. PVC use to be reduced); and
- Local materials with low embodied transport energy.

The intention will be to target environmentally friendly floor and ceiling finishes, materials for workstations, framing components, cabling, hydraulic services, low VOC paints where appropriate.

Resources such as EcoSpecifier (www.ecospecifier.org) provide a helpful source of information relating to the environmental credentials of a material/supplier to assist in a more informed and positive material selection.

7.2 Construction Materials

There are a number of materials that are now being recycled and made readily available. Below is a summary of some of the more sustainable options available for common building materials to be assessed for use during detailed design.

Cement

Cement manufacture is highly energy consuming and depleting of non-renewable resources. Almost one tonne of CO2 is produced for every tonne of cement produced plus other harmful greenhouse gases.

The cement content in concrete can be reduced by adding recycled waste products such as blast furnace slag, pulverized fuel ash and bauxite. Dry rather than wet-process cement manufacture is lower in embodied energy.

Steel

Steel is high in embodied energy. Two tonnes of CO_2 are produced for every one tonne of steel, as well as other harmful greenhouse gases. Steel is a highly reusable and recyclable material. Steel with recycled content should be considered where practical and feasible.

Aluminium

Practically all aluminium products that are not composites are recycled back into the same product. The durability of aluminium products is excellent, with guarantees on roofing and cladding products of 20-40 years not uncommon. The expected lifetime of many aluminium products is in excess of 100 years. The recycled content of aluminium produced in Australia is expected to increase to 50% in next few years as more aluminium becomes available for recycling. The energy required to produce semi-fabricated products such as sheet or extrusions is about 15% that of primary material. Recycling can save 95% of energy required in production processes.

Aluminium is not necessarily preferable to steel, rather the proportion of recycled content should be the deciding factor when choosing between the two options.

Timber

When purchasing timber and raw forest products the following should be confirmed, the products:

- Are certified or verified as recycled, salvaged or reclaimed
- Are sourced from plantations, woodlots or agro/farm enterprises
- Are treated with non-toxic preservatives
- Do not contain toxic adhesives, formaldehyde or chlorines
- They are sourced from lawfully harvested trees
- Are not sourced from uncertified sources

PVC

Due to chlorine and VOCs inclusion in PVC , the use of PVC products should be minimised or avoided where deemed practical and feasible.

HDPE

High density polyethylene (HDPE) is commonly used in trade waste applications due to the ability to completely seal joints. HDPE should be considered during detailed design where feasible and practical.

7.3 Fitout Materials

Due to increased demand, the availability of sustainable fitout materials is increasing. Following is a summary of some of the more sustainable options available for fitout materials:

Wool Insulation

Wool is a renewable resource, and is available in batts or loose-fill. Wool has minimal environmental or health impacts compared with other products.

Medium-density Fibreboard (MDF)

All Australian companies manufacturing MDF are certified by the Australian Wood Panels Association (AWPA) and meet low formaldehyde emission (LFE) standards. E0 and E1 MDF are preferred products.

Floor Covering Materials

Carpet represents a major component of landfill in Australia. While nylon and wool carpets are both capable of being recycled at end of life, there are currently no recycling schemes in Australia. However, recycling schemes are in operation in the US and may operate in Australia in the future.

For this reason, all carpet should be specified to enable it to be recycled at end of life and wool/nylon mix carpets should be avoided.

On a typical site, 20% of the carpet receives 80% of the wear. Therefore, waste can be minimised by selecting modular carpets that facilitate the replacement of selective worn areas

8 CONCLUSION

The SMP has been prepared in accordance with the following State Significant Development – Secretary's Environmental Assessment Requirements (SEARs) Section 78A(8A) of the Environmental Planning and Assessment Act 1979, issued in March 2016.

- Greenhouse Gas and Energy Efficiency – including an assessment of the energy use on site, and demonstrate what measures would be implemented to ensure the proposal is energy efficient.
- Ecologically Sustainable Development – including an assessment of how the development will incorporate ecologically sustainable development principles in all phases of the development.
- Infrastructure Requirements - including a description of cooling/heating systems to be installed on-site.

The principal objective of this Sustainability Management Plan is to identify potential energy savings that may be realised during the operational phase of the Project, including a description of likely energy consumption levels.

BCA Section J provides the minimum requirement for energy efficiency and it is predicted that the proposed development will achieve a reduction of these levels by implementing some of the initiatives highlighted within this report. The reduction relative to the BCA requirements will be further analysed and quantified throughout the design phase.

Some of the initiatives proposed include:

- Improved daylight to warehouse by incorporating translucent sheeting
- Lighting technologies and controls
- High energy efficient air conditioning systems
- Investigation of natural and mixed mode ventilation where possible
- High efficiency glazing and shading for the offices
- Solar hot water system
- Other measures are detailed in this report.

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