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Sustainability Management Plan

Sigma Oakdale South

Report Number 610.15608

6 September 2016

Goodman Property Services
Level 17, 60 Castlereagh Street
Sydney 2000

Version: 2

Sustainability Management Plan

Sigma Oakdale South

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DOCUMENT CONTROL

Reference	Status	Date	Prepared	Checked	Authorised
610.16262	V2	06 September 2016	Neihad Al-Khalidy	Horatio Cai	Neihad Al-Khalidy
610.16262	V1	26 August 2016	Neihad Al-Khalidy	Horatio Cai	Neihad Al-Khalidy

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1 INTRODUCTION

SLR Consulting Australia Pty Ltd (SLR Consulting) has been engaged by Goodman Property Limited (Goodman) to provide a Sustainability Management Plan (SMP) for Lots 3, Sigma Warehouse 3A Oakdale South at Horsley Park.

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

2 OBJECTIVES

The principal objective of this Sustainability Management Plan is to identify all potential energy savings that may be realised during the operational phase of the Project, including a description of likely energy consumption levels and options for alternative energy sources such as solar power in accordance with Penrith City Council (Council) requirements.

The specific objectives of this plan are as follows:

- To encourage energy use minimisation through the implementation of energy efficiency measures.
- To promote improved environmental outcomes through energy management.
- To ensure the appropriate management of high energy consumption aspects of the Project.
- To identify energy savings procedures for overall cost reduction, greenhouse gas emission reduction and effective energy management.
- To assist in ensuring that any environmental impacts during the operational life of the development comply with Council's development consent conditions and other relevant regulatory authorities.
- To ensure the long term sustainability of resource use through more efficient and cost effective energy use practices for the life of the development.

3 SUSTAINABILITY MANAGEMENT GUIDELINES AND LEGISLATION

3.1 Building Code of Australia

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 outlines energy efficiency provisions required for BCA class buildings (including Class 7b Warehouses and Class 5 Offices). There are eight (8) Deemed-to-Satisfy subsections, J1 to J8, that focus on separate aspects of energy efficiency as follows:

- J1 - Building Fabric (i.e. the ability of the roof, walls and floor to resist heat transfer)
- J2 - External Glazing (i.e. the resistance to heat flow and solar radiation of the glazing)
- J3- Building Sealing (i.e. how well parts of a building are sealed to ensure comfortable indoor environments are efficiently maintained)
- J4 - Air Movement (i.e. the provision of air movement for free cooling, in terms of opening and breeze paths)
- J5 - Air Conditioning and Ventilation Systems (i.e. the efficiency and energy saving features of heating, ventilation and air-conditioning systems)
- J6 - Artificial Lighting and Power (i.e. power allowances for lighting and electric power saving features)
- J7 - Hot Water Supply (i.e. the efficiency and energy saving features of hot water supply)
- J8 - Access for Maintenance (i.e. access to certain energy efficiency equipment for maintenance purposes)

3.2 Development Consent Conditions

The SEARs of the Oakdale South Project Approval states:

- **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.

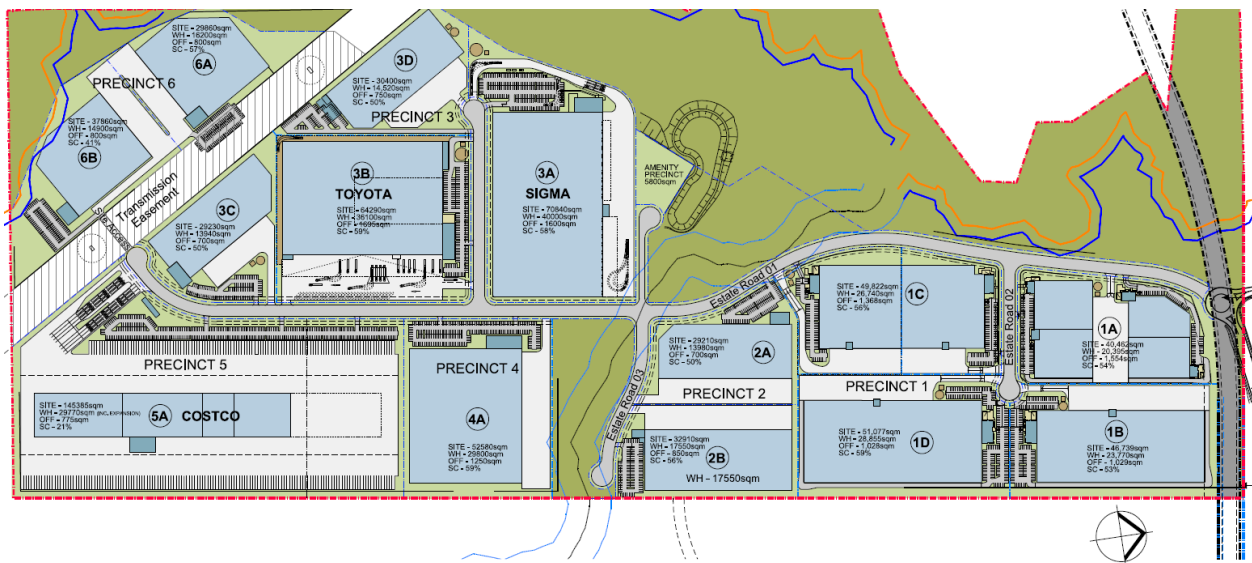
4 PROJECT DESCRIPTION

The development site which is known as Oakdale South Estate (OSE), Horsley Park is located on Lot 3A of Estate Road, Eastern Creek, approximately 3.5 km west of the M7 Motorway. The primary access route to the site is via Old Wallgrove Road.

The Development Site is located within the Penrith Local Government Area (LGA) in the Western Sydney Employment Area (WSEA). It is situated within an approved Concept Plan area (Oakdale South Concept Plan), which forms part of the broader Oakdale Industrial Precinct. There are six (6) industrial precincts are proposed to be developed as new warehouse, distribution and freight transport centers between Milner Avenue and Estate Road. The OS master plan is shown in **Figure 1**.

This report has been prepared to inform a State Significant Development Application (SSDA) for the staged development of the Sigma Facility. The current study covers the sustainability management plan and greenhouse gas reduction for the Sigma facility.

Figure 1 Oakdale South Masterplan

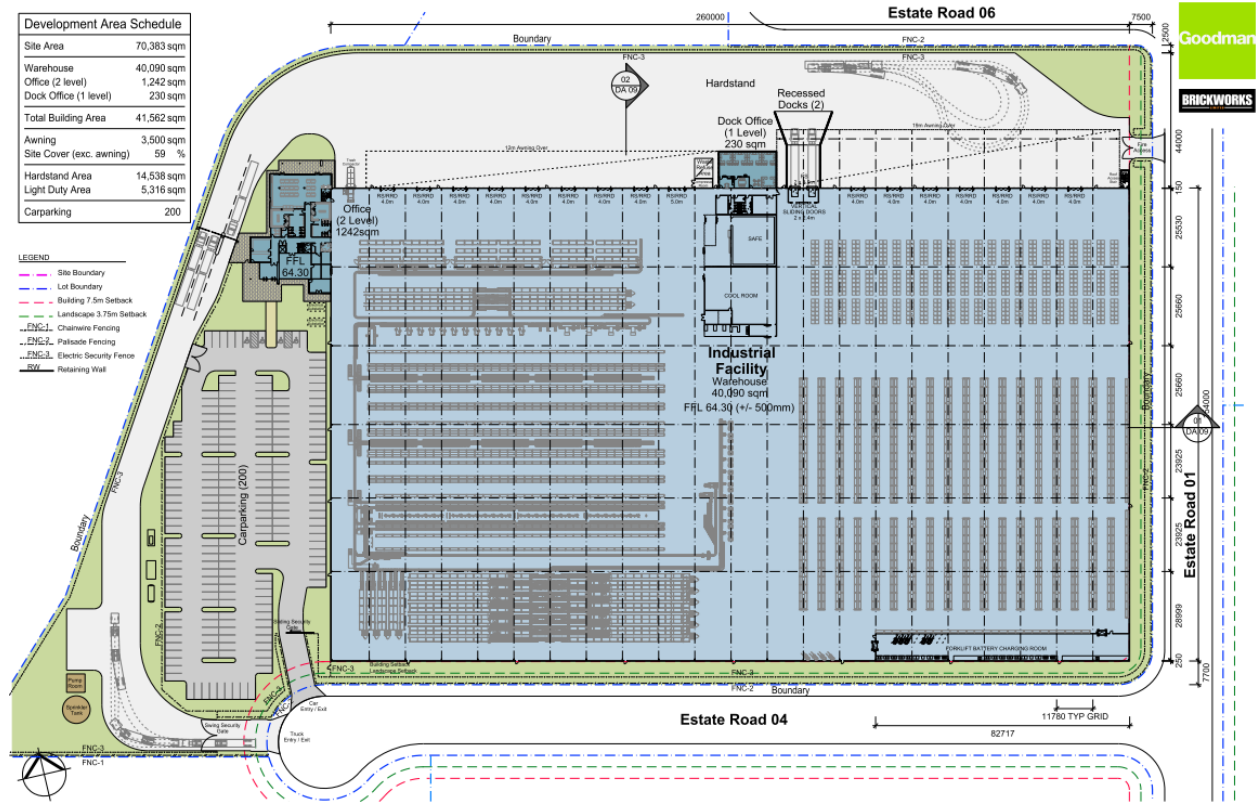


When completed the Warehouse 3A (Sigma Facility) will consist of:

- Warehouse of 40,040 m²;
- 1,600 m² two level main office and amenities area;
- 190 m² two level warehouse (dock) office; and
- 200 outside parking spaces.

The development site is illustrated in **Figure 2** to **Figure 5**.

Figure 2 Sigma Development Site



Source: SBA Architects, 09 August 2016

The development provides a new distribution warehouse for with office to house their Pharmaceutical products and delivered to pharmacies throughout New South Wales. Operational activities are 24/7 and include the following:

- Pharmaceutical products, including prescription and over the counter medicines
- Expected number of vehicle movement per day per vehicle type is summarised in below table:

	Inbound	Outbound
Courier vans	30	162
3-tonne trucks	14	
10-tonne trucks	30	4
Semi & B-double trucks	20	6

Figure 3 Ground Floor Area – Main Office

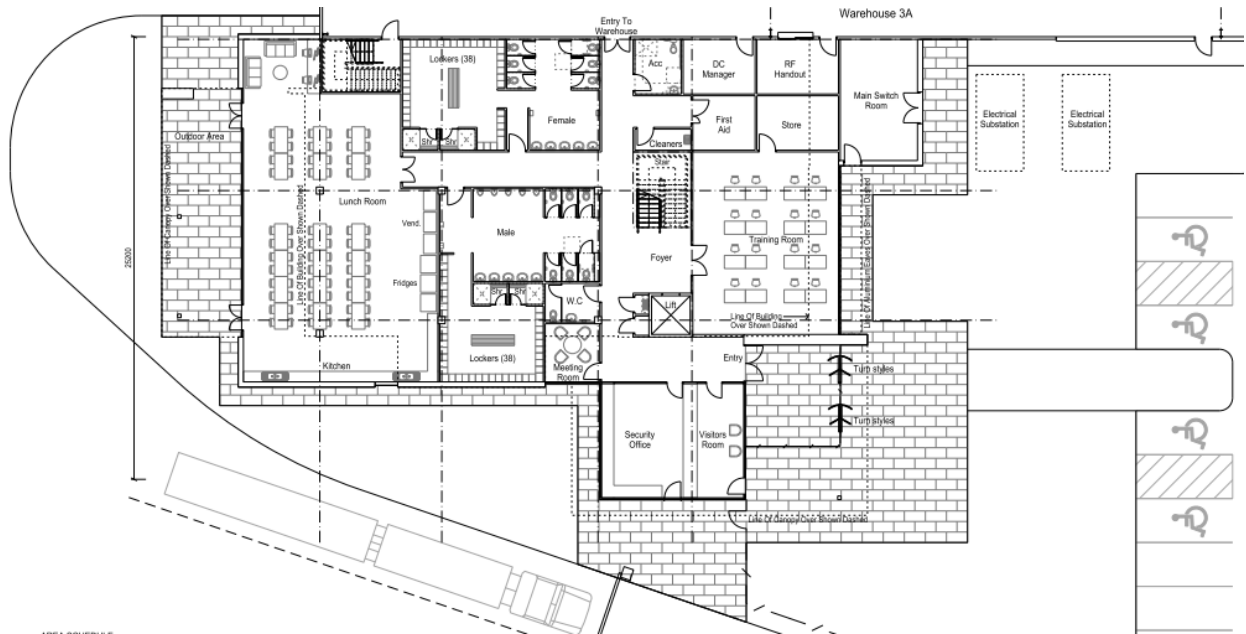


Figure 4 First Floor Plan – Main Office

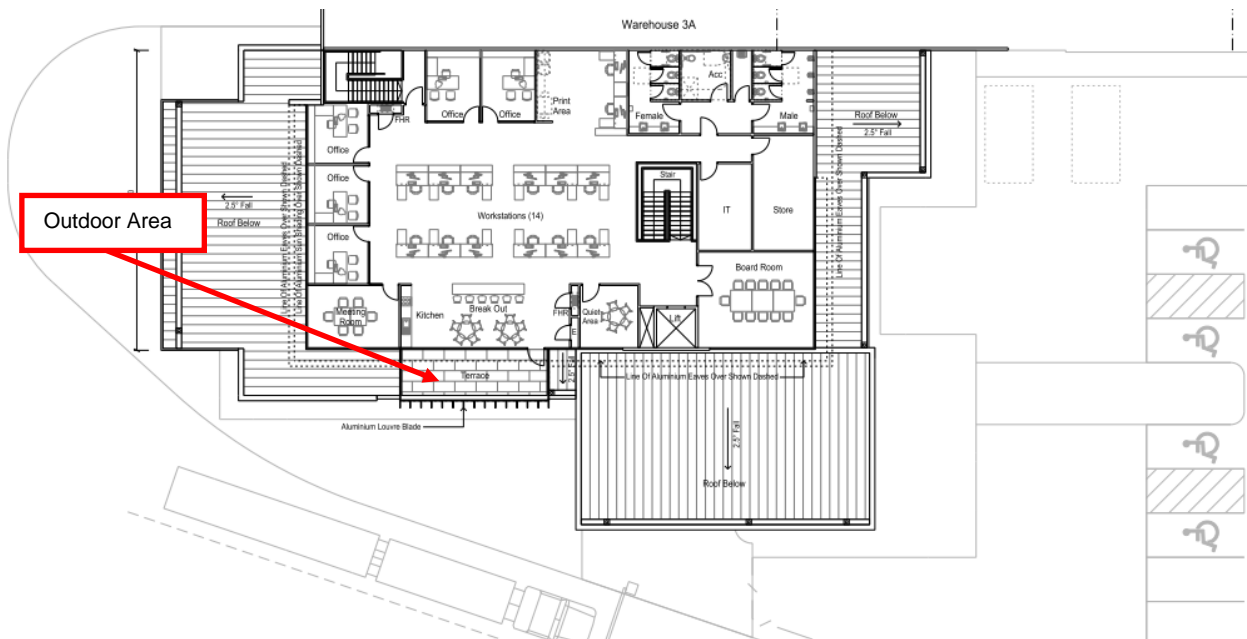
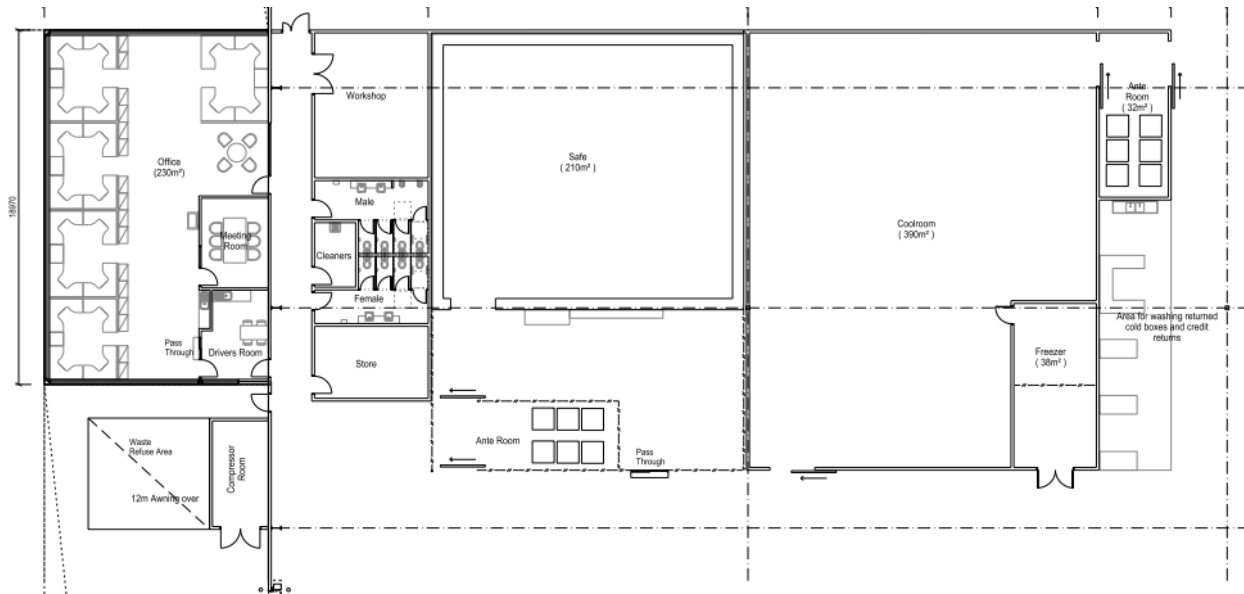


Figure 5 Dock Office



5 OPERATIONAL ENERGY MANAGEMENT

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.

5.1 Identified Major Energy Use Components

Major energy use components of the Project Site have been identified below based on information available within the Project Design Brief.

- Lighting (include natural and artificial lighting and shading).
- Air Conditioning.
- Power.

5.2 Energy Sources

The main source of energy for the proposed site is electricity, but it is also proposed to have gas available at the site as required.

6 PROPOSED SUSTAINABLE MEASURES

The following ESD initiatives and Energy Efficiency measures are recommended and assessed regarding project implementation.

The following documentations are used in this report.

Document Type	Document Number	Issue Date
Architectural Drawing – Warehouse Plan	OAK 3A DA 02_K	09/09/2016
Office Plan - Ground	OAK 3A DA 04_G	09/09/2016
Office Plan – Level 1	OAK 3A DA 05_F	25/08/2016
Dock Office Plan	OAK 3A DA 06_G	09/09/2016
Design Brief – Extract	SIGMA Development Application Details Roofing and Walls Extract Materials and Finishes Extract Mechanical Services	10 May 2016

Table 1 Summary of Assessment

Objective	Proposed Target	Proposed Strategy	Project Implementation	Comments
<p>Design and Management</p> <ul style="list-style-type: none"> Documentation of design intent and expected outcomes. Appropriate commissioning. 	<ul style="list-style-type: none"> Communicate sustainability initiatives and operation to building users. Commissioning and building tuning required by contractors and reviewed for 12 months after completion. 	<ul style="list-style-type: none"> Provision of Building Users Guide. Investigate costs and viability of commissioning and building tuning requirements and appointing an independent commissioning agent. Independent consultant to perform quarterly tuning of fire, mechanical, electrical, hydraulic services. 	<p>✓</p> <p>✓</p> <p>✓</p>	<p>SLR recommends the preparation of Building User Guide that enables building users to optimise the building's environmental performance.</p> <p>A sub-contractor will be engaged to maintain the facility in accordance with the operations and maintenance manuals during the 12 month defects liability period</p>
<p>Façade Performance</p> <ul style="list-style-type: none"> Optimised façade performance. 	<ul style="list-style-type: none"> Achieve minimum performance requirements under NCC Section J1 and J2. Reduce heat gain through the warehouse façade. 	<ul style="list-style-type: none"> Meet or exceed NCC Section J1 and J2 façade performance for conditioned spaces. Light coloured roofing with high reflectivity and appropriate insulation to reduce solar heat gain into the warehouse. Performance glazing in office spaces appropriate to the window size and orientation. 	<p>✓</p> <p>✓</p> <p>✓</p>	<p>NCC Section J compliance report will be submitted with the application for a Construction Certificate</p> <p>Goodman Basic Specification</p> <p>All glazing will be designed in accordance with NCC Section J requirement. SLR recommends double Glazing to all offices</p>

Objective	Proposed Target	Proposed Strategy	Project Implementation	Comments
<p>Social sustainability</p> <ul style="list-style-type: none"> Consider design with due regard to occupant satisfaction in accessibility, usability, Indoor air quality and public space utility. 	<ul style="list-style-type: none"> High level of occupant satisfaction. Provide external as well as internal comfort. 	<ul style="list-style-type: none"> Flexibility of space for potential future configurations. Promote Passive Solar design. Use of Low VOC paints, carpets and sealants Warehouse 3A - Consider using dense planting to screen the outdoor areas from the docks to increase visual and acoustic amenity. Consider occupant user control eg A/C systems, glare reducing strategies, lighting etc. 	<p style="text-align: center;">✓</p> <p style="text-align: center;">✓</p> <p style="text-align: center;">✓</p> <p style="text-align: center;">✓</p> <p style="text-align: center;">✓</p>	<p>The design incorporates open plan workspaces, offices, meeting rooms, lunch room, cool room and outdoor area- Refer Architectural Drawings</p> <p>The design incorporates a large canopy over the north façade - Refer Figure 1 and Architectural Drawings</p> <p>SLR recommend low VOC paints, carpets and sealants</p> <p>SLR recommend the selection of endemic and low maintenance landscaping species</p> <p>Refer Mechanical Service Specification and Material and Finishes Specification</p>

Objective	Proposed Target	Proposed Strategy	Project Implementation	Comments
<p>Minimising Transport Impact</p> <ul style="list-style-type: none"> Consider location with links to public transport and employee services. Consider location to reduce operational transport. Consider the impact of industrial trucks on local traffic. 	<ul style="list-style-type: none"> Reward drivers of fuel efficient vehicles by providing spaces for small cars and or motorbikes. Provide alternatives to single-occupancy vehicles. Reduce operational fuel consumption through close proximity to major arterial roads Reduce the impact of operational traffic on local communities. 	<ul style="list-style-type: none"> Due to the location of the site, it is considered that staff bicycle riding will be unlikely, although if staff surveys indicate a preference for cycling, consider appropriate amenities. The site is located within close proximity (<5km) to both the M7 and M4 motorways. The roads linking the site to the motorways are predominantly used for industrial traffic; as such the traffic is unlikely to impact on local areas. 	<p style="text-align: center;">-</p> <p style="text-align: center;">✓</p> <p style="text-align: center;">✓</p>	<p>Car park numbers and provision for disabled parking are provided in accordance with Consent Authority requirements. The car park is exclusively for warehouse, office team members and some visitors. None of our truck drivers require car parking.</p>

Objective	Proposed Target	Proposed Strategy	Project Implementation	Comments
<p>Optimising IEQ</p> <ul style="list-style-type: none"> • Optimise natural light to work environment. • Optimise fresh air ventilation. • Consider Thermal Comfort of occupants. • Consideration of noise transference in space planning. • Minimise use of materials that emit volatile organic compounds. • Create a pleasant working environment. 	<ul style="list-style-type: none"> • Daylight: Daylight Factor (DF) of at least 2% at finished floor level under a uniform sky for at least 60% of the GLA. • Thermal comfort: 95% of office areas have PMV levels between -1 and +1 for 98% of the year; Warehouse spaces include passive thermal comfort strategies. • Finishes: 95% of all paints, adhesives & sealants and all carpet and flooring to be low-VOC finishes; use low-formaldehyde wood products. • Electric lighting levels: 95% of GLA has a lighting system that is flicker free and has a maintained illuminance of no more than 25% above those recommended in AS1680.2.4, 2.1 and 0.1. • Reduce visual glare. 	<ul style="list-style-type: none"> • Daylight: rationalised glazing to offices; high performance glass. • Daylight: evenly spaced translucent roof sheeting to warehouses areas. • Thermal comfort: Office envelope, Warehouse Distribution, Lunch rooms and meeting rooms. HVAC system designed to meet thermal comfort requirements; • Efficient Lighting System • Provide R1.5 roof insulation to the warehouse and consider insulation to the inside face of the warehouse walls. • Finishes: Specify and track correct finishes and wood products. • Provide pleasant indoor and outdoor breakout spaces with sufficient daylight and plants. • Lighting: Good light fixtures and well-designed layout. 	<p style="text-align: center;">✓</p> <p style="text-align: center;">-</p> <p style="text-align: center;">✓</p> <p style="text-align: center;">✓</p> <p style="text-align: center;">✓</p> <p style="text-align: center;">✓</p> <p style="text-align: center;">✓</p> <p style="text-align: center;">✓</p> <p style="text-align: center;">✓</p>	<p>Refer Architectural drawings</p> <p>Warehouse is air conditioned in area where medicinal products are stored / handled. Translucent roof sheeting to warehouses areas is not provided to reduce the heat gain for the building</p> <p>Refer Mechanical Service Specification and Section 6.3.1 of this study</p> <p>Energy Efficient LED lighting installed throughout the Distribution center (internal and external)</p> <p>The facility will have 0.48 mm Base Metal Thickness with R3.4 thermal insulation and minimum R2.5 wall insulation.</p> <p>Material and Finishes specification</p> <p>Refer Figure 4 and Architectural Drawing</p> <p>Separately switched lighting zones</p>

Objective	Proposed Target	Proposed Strategy	Project Implementation	Comments
<p>Minimising Energy Use</p> <ul style="list-style-type: none"> Consider passive design to minimise energy use such as orientation, ventilation, shading and floor plate design. Appropriate sizing of plant and equipment in heating and cooling, lighting, control systems, Building management systems and renewable energy sources. Reduce reliance on connection to grid electricity and gas. 	<ul style="list-style-type: none"> Target a 20% reduction in Greenhouse gas emissions. Energy sub-metering for all major uses greater than 100kVa; linked to monitoring system. High efficiency warehouse lighting and controls. Reduce energy for water heating. Integrated building management. Consider renewable energy generation for a portion of energy consumption and/or consider future-proofing the building for future installation. Reduce urban heat island effect and heat load through the roof by providing a highly reflective roof. Reduce office equipment load from 20W/m² to 15W/m². Optimise insulation for energy and thermal comfort. 	<ul style="list-style-type: none"> Predominantly north facing office and warehouse, consider additional shading or solar controlled glazing to reduce heat transfer into the office space. Consider office/warehouse/cool room air conditioning temperature set-points for an increased comfort band. Provide energy efficient T5 lighting, with zoning and automatic controls where reasonable. Consider LED lighting strategies and advanced controls. Consider a solar PV system Sub-metering: install appropriate metering; develop metering and tracking strategy to allow for self-assessment, problem solving and ongoing improvements during operations Use roofing material that has a high Solar Reflective Index Investigate current insulation design and determine proposed options. 	<p>✓</p> <p>✓</p> <p>✓</p> <p>✓</p> <p>✓</p> <p>✓</p>	<p>Awning is provided to the North Elevation (Refer Architectural Drawing). All external windows will be provided with Aluminium sunscreens</p> <p>Mechanical Specification f sets the temperature - Specification Section 9.4</p> <p>LED lighting to warehouse and lighting controls to warehouse and offices – Specification Section 1.9</p> <p>250 kW solar power proposed</p> <p>Refer Section 8.2 of this study</p> <p>Refer Architectural Drawings</p>

Objective	Proposed Target	Proposed Strategy	Project Implementation	Comments
<p>Choosing Materials</p> <ul style="list-style-type: none"> • With consideration to energy inputs in manufacture. • Toxicity. • Consequential impacts – rain forest timbers. • Regional or local manufacturer employment support. 	<ul style="list-style-type: none"> • Reduce steel and cement in internal slab (10% reduction in embodied energy). • Reduce embodied energy in concrete and plasterboard elements. • Consider 95% of timber to be AFS or FSC certified. • Reduce emissions associated with insulation and refrigerant. • Reduce environmental impact of materials for tiling, awning. 	<ul style="list-style-type: none"> • Joint less fibre reinforced slab. • Use pre-cast concrete panels with recycled content. • Re-use material during the construction stage. 	<p style="text-align: center;">✓</p> <p style="text-align: center;">✓</p>	<p>To minimise the environmental impacts of materials used by encouraging the use of materials with a favourable lifecycle assessment based on the following factors:</p> <ul style="list-style-type: none"> - Fate of material - Recycling / re-use - Embodied energy - Biodiversity - Human health - Environmental toxicity - Environmental responsibility.

Objective	Proposed Target	Proposed Strategy	Project Implementation	Comments
<p>Minimising Waste</p> <ul style="list-style-type: none"> • By clever design. • Contracted to builder as a requirement on site for construction waste. • During the life of the building. • And in dealing with building end of life options. 	<ul style="list-style-type: none"> • Reduce construction waste going to landfill by 90%. • Reduce operational waste going to landfill. • Consider a design that can be disassembled at the end of the building's life. 	<ul style="list-style-type: none"> • Contractor is to develop and implement a Waste Management Plan and track all waste going offsite to show that 90% of all construction waste is re-used or recycled. • Waste storage and recycling facilities to be provided for different operational recycling streams such as paper, glass, plastics, metals, food waste etc. Consider operational waste plans and training for staff to provide incentive to reduce waste. 	<p>-</p> <p>-</p>	<p>RLS recommends more than 70% of the predicted construction waste arising from development can be re-used (on-site or at another development) or recycled off-site. Refer project Waste Management Plan.</p> <p>The following waste avoidance measures are recommended in the Waste Management Plan for the Project:</p> <ul style="list-style-type: none"> - Provision of take back services to clients to reduce waste further along the supply chain; - re-work/re-packaging of products prior to local distribution to reduce waste arising; - review of packaging design to reduce waste but maintain 'fit for purpose'; and - investigating leased office equipment and machinery rather than purchase and disposal.

Objective	Proposed Target	Proposed Strategy	Project Implementation	Comments
<p>Water Conservation and Reuse</p> <ul style="list-style-type: none"> Monitoring of meters to track use. Timely maintenance of fixtures and fittings. Water sensitive landscape design. Source potable water alternatives such as rain water harvesting, grey and black water treatment. 	<ul style="list-style-type: none"> Reduce potable water in internal fixtures. Reduce potable water for irrigation. Water efficient operation of appliances. Utilise rainwater and/or recycled water. 	<ul style="list-style-type: none"> Water efficient sanitary taps and toilets. Water efficient and drought tolerant landscaping. Water and energy efficient dishwasher. Rainwater collection for toilets, irrigation and truck wash down. 	<p>✓</p> <p>-</p> <p>✓</p> <p>✓</p>	<p>Refer Section 7 of this study</p> <p>Selection of endemic and low maintenance landscaping species is recommended</p> <p>SLR recommends water efficient dishwashers with minimum 4 star to be used for the project.</p> <p>40,000 L rainwater tank for rainwater harvesting and re-use for landscape irrigation and flushing of toilet</p>
<p>Land Use and Ecology Impact</p> <ul style="list-style-type: none"> Consider local biodiversity impacts of flora and fauna. Look to specialist advice on land in development. 	<ul style="list-style-type: none"> Encourage biodiversity. Reduce light pollution from the site. Consider reducing impact of stormwater flows off the site into the natural watercourses including Ropes Creek adjacent to the site. 	<ul style="list-style-type: none"> Install indigenous planting appropriate to the area and the adjacent biodiversity lots. Design external lighting to avoid emitting light into the night sky or beyond the site boundary. Consider integrated stormwater management to minimise the impact on receiving waters of flow volumes and pollution content, eg bioswales, bio retention, OSD tanks and treatment. 	<p>✓</p> <p>✓</p> <p>✓</p>	<p>Selection of endemic and low maintenance landscaping species</p> <p>LED lights are proposed to avoid emitting light</p> <p>The Sigma warehouse sustainability objectives include:</p> <ul style="list-style-type: none"> Reduce the impact of stormwater run off and improve quality of stormwater run off Achieve best practice stormwater quality outcomes Incorporate water sensitive urban design principles

6.1 Baseline and Proposed Energy Consumption

A BCA Sections J Deem-to-Satisfy compliant building is used as the baseline building for energy consumption savings. BCA Section J provides the minimum requirement for energy efficiency and it is expected that the proposed development will have more than 30% energy reduction via:

- Upgrade of warehouse roof structure to accommodate 250 kW Solar Array.
- Improved daylight under inbound and despatch awnings with translucent sheeting.
- Daylight controlled LED lighting for the warehouse instead of metal halide, resulting in a considerable energy reduction and reduced maintenance. LED lights within the warehouse and offices.
- High efficient roof mounted package units equipped with variable speed compressors to provide the cooling in the distribution centre and control the compressor usage based on the exact cooling need.
- Warehouse cooling controlled by an Environmental Monitoring System – accurately monitors and controls the required cooling.
- High efficiency glazing and shading for the offices.
- High efficient air conditioning system.

All building information and associated parameters are listed in the following sections of this report.

6.2 Artificial Lighting

In Section J6 of the BCA, the requirement for the total lighting power load within the proposed spaces of a building is to be no greater than a maximum illumination power load, 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 purpose of the space within the building (refer to Table J6.2a of BCA 2016 Volume One).

For artificial lighting, the aggregate design illumination power load must not exceed the sum of the allowances. This may be obtained by multiplying the area of each space by the maximum illumination power density (as found in Table J6.2a of the BCA 2016 Volume One). The maximum illumination density for a storage warehouse is 10 W/m² as per Table J6.2a of the BCA 2016 Volume One. The energy load (in MWh) is estimated by multiplying the power load by the hours of consumption (24hrs/day).

The proposed warehouses may adopt the following energy efficiency measures to reduce the lighting energy consumptions:

Office lighting

- Provide LED or T5 fitting for offices.
- Occupancy sensors to low occupancy areas eg office, toilets, stairwells and kitchens.

Warehouse lighting

- Provide LED or T5 fitting for warehouse.
- Occupancy sensors to low occupancy areas.

Outside lighting

- Provide LED external lighting for all outside areas.

Electrical lighting is the major energy reduction component for warehouse with a large footprint.

By implementing above energy efficiency measures, the project is likely to achieve a 78% lighting energy reduction when compared with BCA reference building. Detailed calculation is shown in Appendix A.

The lighting calculation for BCA reference building is based on the maximum illumination power density specified within BCA Table J6.2A as below:

- Warehouse 10 W/m²
- Offices 9 W/m²

The illumination power density adjustment factor for the control device is based on BCA Table J6.2b as below:

- Motion detector adjustment factor is 0.9.
- Daylight sensor adjustment factor is 0.6.

From above, the annual lighting energy consumption per square meter has been estimated to be 78.5 kWh/m² for BCA reference building.

The electrical lighting layout of warehouse 3A is not provided at the time of preparing this report, so similar warehouse (warehouse 1C) within the Oakdale Central development has been utilised to represent warehouse 3A. Both warehouses are under the same Goodman's design concept and requirements.

The lighting energy density of warehouse 1C has been previously estimated to be 17.3 kwh/m².

Therefore, the warehouse 3A is likely to achieve a 78% lighting energy reduction when compared with BCA reference building.

6.3 Mechanical Air-Conditioning and Ventilation

Mechanical air conditioning and ventilation will be provided to the following areas:

- Warehouse air conditioning systems designed to achieve uniform temperature distribution of $\pm 3^{\circ}\text{C}$ across the warehouse in areas where medicinal products are stored / handled (excludes space above AHUs / below roof). The HVAC for the warehouse, including cool rooms, will run continuously.
- Main office and dock office areas. The HVAC for offices and amenities shall operate from 6.00am to 7.00pm (adjustable). 'After Hours' push buttons shall be provided in office areas to allow continued operation of the respective HVAC system for two hours during out of hours periods.
- Air conditioning to lunchrooms
- Mechanical exhaust to bathrooms and shower rooms

As per the mechanical specification of the proposed warehouse and associated offices, air conditioning to be designed to the BCA/NCC section J and other statutory authorities and applicable Australian standards using one of the following options:

- Option 1: HVAC systems served by central chilled water / heating hot water systems, excluding cool rooms.
- Option 2: Roof mounted DX packaged unit system

The proposed development will implement the following the following sustainability initiative:

- The HVAC systems will be controlled by a Building Management System (BMS). The BMS will be provided to control, maintain and monitor the various operations and conditions for all mechanical services equipment and plant, as necessary to provide a fully operational distribution center.
- Warehouse cooling is controlled by an Environmental Monitoring System (EMS) to accurately monitors and controls the required cooling. The EMS will be independent of the BMS.

6.3.1 Air-conditioning Temperature Control and Set point

Table 2 AC Units Temperature Control Range

Space Type	Temperature Control Range (°C)
Offices	22.0 ± 2°CBD
Warehouse	20.0 ± 3°CBD
Cool Room	5.0 ± 3°CBD

6.3.2 Air-conditioning energy efficiency requirements

2016 BCA Section J5.2e has specified the minimum energy efficiency ratios requirements for package air conditioning equipment.

Table 3 BCA Unitary Plant Requirement

Equipment	Minimum energy efficiency ratio	
	65 kW to 95 kW capacity	More than 95 kw capacity
Air-conditioner - Cooling	2.7	2.8
Heat pump - Cooling	2.6	2.7

SLR recommends using AC packaged units or HVAC systems served by central chilled water with minimum of EER/COP of 3.0 for both heating and cooling.

Details or NCC Section J5 certification demonstrating compliance will need to be submitted with the application for a Construction Certificate.

6.4 Building Fabric requirements

Part J1 to J3 of the 2016 BCA Section J contains the requirements of the Deemed-to-Satisfy compliance of the building fabric. The purpose of this subsection is to ensure that the 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 fabrics of the proposed warehouse 3A shall comply with 2016 BCA Section J. A compliance report will need to be submitted with the application for a Construction Certificate.

6.5 Domestic Hot Water (DHW)

The BCA specifies the thermal efficiency for hot water systems to be at least 80%. SLR recommends using solar electric boost hot water reticulation system to all faucets' fittings, equipment and apparatus within the development. Hot water will be generated from the roof mounted solar water packaged plant.

With the installation of water efficient fixture, the hot water consumption will be decreased and thus the domestic hot water usage will also decrease. Therefore, there will be less energy consumption for DHW.

7 POTABLE WATER CONSUMPTION

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

- Rainwater reuse and reticulation system – 40,000 L rainwater will be harvested from the roof and reuse for irrigation system and flushing of toilets. The reticulation will be a separate system to the domestic cold water with domestic water top up in the event of insufficient rainfall.
- Use of water saving plumbing devices.
- Water sensitive landscape design.
- Water used in monthly fire pump tests is recycled back into the water storage tanks

Further to above sustainable water measures, the following items are considered during the detailed design stage:

- Water efficient sanitary taps and toilets – install higher WELS Rating sanitary fixtures such as 4 stars for water taps, urinals and toilet.
- Water and energy efficient dishwashers with minimum 4 star WELS water rating.

By installing 4 star rated toilets, urinals and taps and the proposed rainwater harvesting facility the proposed development will reduce its potable water demand by approximately 30%.

8 MONITORING AND REPORTING

All sustainable measures will be implemented into the project need to be commissioned and tuned once the project completed, to ensure all services operate to their full potential and as designed.

The building tuning will be provided by service contractors and overseen by an independent assessor, at least once a month within the Defects Liability Period (DLP) period to ensure that services are operating effectively and efficiently. Monthly reports to be provided to the tenant for DLP.

8.1 Energy Review and Audit

An energy usage review will be undertaken within the first few months of operation to ensure the Energy Management Plan is sufficient for the development's needs. A breakdown of energy usage per month at the Project Site will help to measure the development's baseline energy use and assess what appliances, equipment and processes are consuming energy.

An energy review will be conducted for the assessment of energy utilisation to further identify opportunities for improvement. Energy usage data obtained during the review process may be used to establish key performance indicators and annual energy targets for the Project.

Energy usage to be included in the review should include all purchased electricity and energy which is consumed by stationary equipment on site. Energy consumed by mobile equipment (e.g. forklifts) should also be examined as this will identify variations in warehouse operation efficiency. (Refer to '*Guidelines for Energy Savings Action Plans*' (2005) (as developed by the former Department of Energy, Utilities and Sustainability) for reporting templates and further information.)

An energy audit and management review will be undertaken on a yearly basis to ensure employees are following energy savings procedures correctly. Where audits show that energy savings procedures are not carried out effectively, additional employee training should be undertaken and signage and procedures re-examined.

The Energy Management Plan shall be progressively improved and updated on an annual basis, to reflect changes to the Energy Management System and to promote continual improvement of energy management at industry best practice over time.

8.2 Energy Metering and Monitoring

To enable effective review of energy usage by the project, sub-metering should be implemented for all major energy consuming processes or items of equipment including sub-metering for all loads greater than 100 kVA.

Electrical equipment should be maintained to Australian Standards to ensure unnecessary energy wastage is minimised. Roof access system is proposed for third party access to roof for carry out necessary maintenance as required.

The proposed development will implement the following the following sustainability initiatives:

- Separate energy meters for lighting, power and mechanical services connected to the Building Management System to provide accurate energy consumption data

In accordance with the Goodman's general Industrial Building Specification, a Building Users' Guide is to be prepared for the Project. The Building Users' Guide provides details regarding the everyday operation of a building and should include energy minimisation initiatives such as natural ventilation strategies, user comfort control, maintenance of air conditioning units and other electrical devices to ensure maximum operating efficiency, and lighting zoning strategies.

An effective Building Users' Guide will ensure that:

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

8.3 Roles and Responsibilities

It is the responsibility of the facility manager to routinely check energy savings procedures are undertaken correctly (i.e. lighting turned off while areas of the development are not in use). The facility manager should also ensure all monitoring and audit results are well documented and carried out as specified in the Energy Management Plan.

Senior management should also be involved in energy management planning as an indication of the organisation's commitment to the Energy Management Plan.

9 PROJECT COMMITMENTS

The commitments list in this section should be incorporated to ensure the development will be designed, constructed and operated in an ecologically sustainable and energy efficient manner.

Energy Efficiency

- 250 kW PV Solar Installation to significantly reduce the carbon footprint for the proposed facility;
- Solar hot water system;
- LED lighting for the warehouse (internal and external) instead of metal halide, resulting in a considerable energy reduction and reduced maintenance;
- Separately switched lighting zones in the warehouse to permit lights to be on only in the areas work is occurring;
- Separate energy meters for lighting, power and mechanical services connected to the Building Management System to provide accurate energy consumption data;
- Roof Cladding Material (0.48 mm Base Metal Thickness) with a minimum R3.4 insulation and external wall with minimum R2.5 insulation;
- Achieve the Deem-to-satisfy/performance requirements under NCC Section J.
- Passive solar design for internal and external outdoor areas;
- All external windows are provided with Aluminium sunscreens;
- Efficient air conditioning system;
- Lighting, power and mechanical services sub-metering connected to the Building Management System to enable continued review of power consumption for the main office, warehouse, dock office and external areas; and
- Commissioning and building tuning will be conducted and reviewed at least 12 month after completion.

Ecologically Sustainable Development

- 40 kL rainwater tank for rainwater harvesting and re-use for landscape irrigation and flushing of toilets;
- Low flow fixtures and fittings including taps and shower heads;
- Water used in monthly fire pump tests is recycled back into the water storage tanks;
- Project team will prepare the Building User Guide that enables building users and facility managers to optimise the building's environmental performance;
- Flexibility of space for potential future configurations;
- Use of Low VOC paints, carpets and sealants for better health and air quality;
- Use low maintenance and indigenous landscaping species to increase visual amenity and reduce the water consumption;
- Provide sufficient parking space for small cars, motorbikes and bicycles;
- Air conditioning system should be designed and installed to maintain good thermal comfort level for occupants during working hours;
- Provide pleasant indoor and outdoor breakout spaces with sufficient daylight and plants;
- Waste Management plan should be developed by project team;
- Waste storage and recycling facilities to be provided for different operation recycling streams such as paper, glass, plastics, metals, food waste etc;
- Design external lighting to avoid emitting light into the night sky or beyond the site boundary;
- Minimise the ecology impact and improve the quality of stormwater runoff;
- Achieve best practice stormwater quality outcomes; and
- Incorporate water sensitive urban design principles.

10 CONCLUSION

SLR Consulting Australia Pty Ltd (SLR Consulting) has been engaged by Goodman Property Limited (Goodman) to provide a Sustainability Management Plan (SMP) for Lots 3, Sigma Warehouse 3A Oakdale South at Horsley Park.

The SMP has been prepared in accordance with the 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.

The principal objective of this Sustainability Management Plan is to identify all potential energy savings that may be realised during the operational phase of the Project, including a description of likely energy consumption levels and options for alternative energy sources such as solar power in accordance with Penrith City Council (Council) requirements.

BCA Section J provides the minimum requirement for energy efficiency and it is predicted that the proposed development will have more than 30% energy reduction via the commitments in section 9.

By implementing the recommended energy efficiency measures in **Section 6.2**, the project is likely to achieve a 78% lighting energy reduction when compared with BCA reference building.

By installing a 250 kW roof-mounted solar power system, the building achieves a significant energy reduction in the order of 346.8 MWhr per annum. The proposed solar system will generate up to 20% of annual electricity usage and will save up to 340 tonnes of CO₂ per annum.

By installing 4 star rated toilets, urinals and taps and the proposed rainwater harvesting facility the proposed development will reduce its potable water demand by approximately 30%.

Building tuning will be conducted by builder and SLR Consulting recommends that a quarter reviews of actual building energy and water consumption be carried out once the warehouses are operational to check the actual energy usage and energy savings and verify that all systems are performing at their optimum efficiency. This will provide an opportunity for the systems to be tuned to optimise time schedules to best match occupant needs and system performance while satisfying the sustainability target for the project.

11 CLOSURE

This report has been prepared by SLR Consulting Australia Pty Ltd with all reasonable skill, care and diligence, and taking account of the manpower and resources devoted to it by agreement with the client. Information reported herein is based on the interpretation of data collected and has been accepted in good faith as being accurate and valid.

This report is for the exclusive use of Goodman Property Services. No warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from SLR Consulting.

SLR Consulting disclaims any responsibility to the client and others in respect of any matters outside the agreed scope of the work.

LIGHTING CALCULATION

BCA Comply Building	BCA Requirements		Area	Operating Hrs (24/7)	Lighting Control	Total Annual Energy Consumption (kWh)		
	W/m ²							
	Warehouse W/m ²	10	40040	8,760	Motion Detector, Daylight Sensor ^{1,2}	0.9	1	3156754
	Offices W/m ²	9	1600	8,760	Motion Detector	0.9	1	113530
	Dock Office W/m ²	9	190	87,60	Motion Detector	0.9	1	13482
Note 1: Warehouse is air conditioned in area where medicinal products are stored / handled. Note 2: Translucent roof sheeting and daylight sensors to warehouses areas is not provided to reduce the heat gain for the building								
			41830				Total	3283765
							kWh/m²	78.50