WOOD & GRIEVE ENGINEERS

Fifteenth Avenue Commercial Precinct, West Hoxton

Sustainable Design Report

Revision 2

Prepared for:

Western Sydney Parklands Trust
c/o – Luke Wilson

Date:
25 May 2016

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Project No. 29744-SYD-G
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Revision

REVISION	DATE	COMMENT	APPROVED BY
1	25/05/2016	Draft for Client Review	ALK
2	**25/05/2016**	**For Issue**	**ALK**

Contents

1. Executive Summary

This Ecological Sustainable Design Report has been prepared for Western Sydney Parklands Trust for the proposed commercial precinct at 185 & 195 Fifteenth Ave, West Hoxton, NSW. This report is intended to provide an overview of the proposed ecologically sustainable development (ESD) principles and efficiency measures. This is a design response to the ESD components of the *Secretary's Environmental Assessment Requirements (SEARs) 6407*. The report further addresses the relevant components of the Liverpool City Council Development Control Plan 2008 and Local Environmental Plan 2008.

This report includes:

- An overview of the sustainability drivers for the project (both regulatory & identified project drivers)
- Detail regarding specific ecological sustainable development initiatives through all phases of the project.
- Initiatives that would minimise the consumption of resources, water and energy.

Information contained within this report has been prepared in direct response to:

- Relevant State & Local Government Controls 2008;
- The Request for Secretary's Environmental Assessment Requirements (SEARs) 6407, by Mckenzie Group; and
- Industry recognised best practice in sustainability

In coordination with the above, the project will implement a number of sustainable design principles and includes initiatives designed to mitigate the environmental impact of the following:

- Energy – including improved energy efficiency across the buildings and its associated sources.
- Water Efficiency – including reduced potable water demand and improved stormwater quality.
- Passive Design Principles – reducing the development's overall requirement for building services.
- Ecology - Maintaining ecology through landscaping where practical
- Materiality – Considering the whole of life impact of materials and considering their selection to minimise harm to the environment, including efficiency and construction.

The following sections detail the development's specific sustainable design response in more detail.

2. Introduction

The proposed commercial precinct development at Fifteenth Ave, West Hoxton, NSW is envisaged to be a development in Liverpool to compliment the growing residential areas. Spread across 45.5 hectares, the site has 288m of frontage to Fifteenth Avenue, and consists of approximately:

- 400m2 of fast food outlet
- 250m2 service station
- 1,500m2 supermarket
- 1,500m2 large format retail space
- 1,200m2 retail/commercial space
- 500m2 childcare facility and secure outdoor play area.
- 6,000m2 car parking
- New access roads throughout the site
- New vegetated landscaping throughout the site setback region
- Bulk earthworks to establish building pads for the proposed estate allotments and cut/fill to level the site
- A stormwater detention basin

The below image shows the proposed site and spatial breakdown:

Figure 1 Overview of the site

GROSS FLOOR AREA		
-	Service Station:	250sqm
-	Fast Food Pad Site:	400sqm
-	Supermarket:	1,500sqm
-	Large Format Retail:	1,500sqm
-	Retail/commercial:	1,200sqm
-	Child Care:	500sqm
	TOTAL:	**5,350sqm**

Figure 2 Spatial breakdown

Introduction

This report addresses the Ecologically Sustainable Development and Efficiency aspects in response to the *SEARs 6407* for the project. It uses best practice sustainable design principals and borrows elements from external sustainability tools to develop a set of metrics for the site.

2.1 Sustainable Design Initiatives

In pursuit of the ecological design principles, the Fifteenth Ave development will pursue excellence benchmarked from a number of sources. These include best practice design initiatives from:

- Liverpool DCP, 2008
- Liverpool Local Environmental Plan (LEP) 2008, &
- *Secretary's Environmental Assessment Requirements (SEARs)* 6407 item 5 for this development.

2.1.1 SEARs 6407 Requirements

SEARs 6407 item 5 outlines requirements for this development that must be addressed as part of the Environmental Impact Statement. These are:

- **Ecologically Sustainable Development principles –** show how ESD principles (as defined in clause 7(4) of Schedule 2 of the Environmental Planning and Assessment Regulation 2000) will be incorporated in the design, construction and ongoing operation phases of the development.
- **Efficiency measures** – Include a description of the measures that would be implemented to minimise consumption of resources, water and energy, including an Integrated Water Management Plan which details any proposed alternative water supplies, proposed end uses of potable and non-potable water and demonstrates water sensitive urban design and any water conservation measures.

The Integrated Water Management Plan and WSUD principals are by others, but their overarching affects are discussed within this report.

Clause 7(4) of Schedule 2 of the Environmental Planning and Assessment Regulation 2000 is written below for reference.

7(4) The principles of ecologically sustainable development are as follows:

*(a) the **precautionary principle**, namely, that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. In the application of the precautionary principle, public and private decisions should be guided by:*

(i) careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment, and

(ii) an assessment of the risk-weighted consequences of various options,

*(b) **inter-generational equity**, namely, that the present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations,*

*(c) **conservation of biological diversity and ecological integrity**, namely, that conservation of biological diversity and ecological integrity should be a fundamental consideration,*

*(d) **improved valuation, pricing and incentive mechanisms**, namely, that environmental factors should be included in the valuation of assets and services, such as:*

(i) polluter pays, that is, those who generate pollution and waste should bear the cost of containment, avoidance or abatement,

(ii) the users of goods and services should pay prices based on the full life cycle of costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste,

(iii) environmental goals, having been established, should be pursued in the most cost effective way, by establishing incentive structures, including market mechanisms, that enable those best placed to maximise benefits or minimise costs to develop their own solutions and responses to environmental problems.

Introduction

This report directly addresses these key issues in the *SEARs* requirements for the site, re-issued on 11 February, 2016 by *The Department of Planning and Environment* (DPE). This report is intended to form part of the Environmental Impact Statement (EIS) for the SSD 6407.

2.1.2 Liverpool City Council Development Control Plan 2008 (DCP)

The Liverpool area has a DCP developed in February 2008. The ESD elements associated with this report are replicated below:

2.0 Tree Preservation
3.0 Landscaping and Incorporation of Exiting Trees
4.0 Bushland and Fauna Habitat Preservation
19.0 Used Clothing Bins
22.0 Water Conservation
23.0 Energy Conservation
24.0 Landfill
25.0 Waste Disposal & re-use Facilities

These controls are considered in this development, with a number of the elements outlined in this report.

2.1.3 Liverpool Local Environment Plan 2008 (LEP)

The Liverpool LEP falls under the Environmental Planning and Assessment Act, 1979. The particular aims of the plan include:

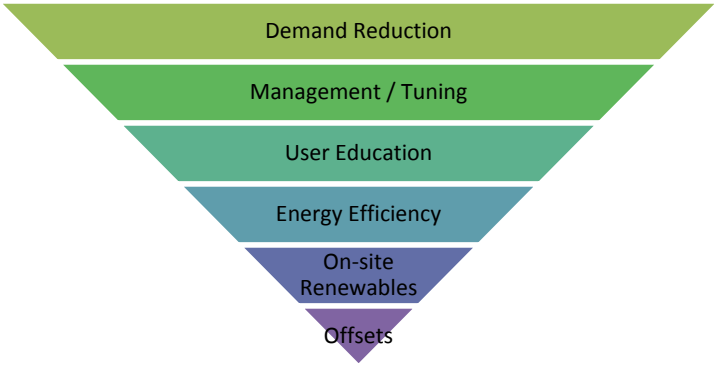
a) to encourage a range of housing, employment, recreation and services to meet the needs of existing and future residents of Liverpool,
b) to foster economic, environmental and social well-being so that Liverpool continues to develop as a sustainable and prosperous place to live, work and visit,
c) to provide community and recreation facilities, maintain suitable amenity and offer a variety of quality lifestyle opportunities to a diverse population,
d) to strengthen the regional position of the Liverpool city centre as the service and employment centre for Sydney's south west region,
e) to concentrate intensive land uses and trip-generating activities in locations most accessible to transport and centres,
f) to promote the efficient and equitable provision of public services, infrastructure and amenities,
g) to conserve, protect and enhance the environmental and cultural heritage of Liverpool,
h) to protect and enhance the natural environment in Liverpool, incorporating ecologically sustainable development,
i) to minimise risk to the community in areas subject to environmental hazards, particularly flooding and bush fires, and
j) to promote a high standard of urban design that responds appropriately to the existing or desired future character of areas.

This development considers all of the above elements by its very nature. This report particularly highlights how item (h) above has been addressed. The LEP also refers to the DCP which has been demonstrated throughout this report.

3. Energy Efficiency

A variety of energy efficiency measures are applicable to the proposed commercial precinct and its individual buildings. These energy efficiency measures may form the part of the final in finalising the design and operation of the spaces. The final strategy will always be a combination of sustainability, operational feasibility, architectural intent and site-specific appropriateness.

The Energy efficiency strategy follows the hierarchy pyramid below. Best practice energy conservation dictates that in the first instance demand is reduced. This has a much greater benefit to the overall long-term sustainability of the site compared to efficiency measures or renewables/offsets. As such, the focus will be on the elements that provide the greatest return on investment.



3.1 Site-wide Strategies

Energy efficiency measures to be considered across the entire site to reduce its energy consumption include:

- Designed exterior lighting layout. This ensures safety and security lighting is maintained across the site, but allows minimum lighting to be included only as required. The demand and cost is reduced through appropriate design levels
- Efficient car park/street lighting e.g. LEDs. This will further reduce the electrical load on the grid for the same electrical output. Further, LED globes have a longer life, reducing replacement periods which demands less maintenance, as well as reducing landfill of precious materials
- Daylight sensors for street lighting, which will reduce the demand on the system.
- Street lighting on timers.
- Shading in the carpark to reduce the consumption of energy by car air conditioning systems. It also provides a passive method of reducing any heat island effect. Dark roads absorb significant heat, which acts as a radiant heater across the entire site and may provide significant discomfort. By providing shading elements to the parking, energy consumption, localised heat gains and occupant comfort will benefit.
- Use of recycled building waste in the road base to reduce energy consumption in production of the road base

Figure 3 Left to Right: Shading, efficient outdoor lighting and daylight Sensors

3.2 Building Specific Energy Strategies

Each building has a unique energy consumption profile. There is no single "one-size-fits-all" approach in creating an energy efficiency plan for a mixed-use precinct. This project is comprised of a variety of buildings including retail, supermarket, service station, fast food outlets, and a childcare centre. Whilst it may be appropriate for the retail centres to install a water-cooled system to reduce their energy consumption, the childcare centre would not be large enough for this to be an energy efficient solution. Further, the benefits of reducing energy must be considered against the increase in potable water consumption.

The majority of the buildings in the commercial precinct are conceptually retail outlets, and an energy consumption profile typical of a retail centre would be weighted towards heating, ventilation and air conditioning (HVAC) and lighting. Figure 4 is a graph of the typical ratios of energy end uses in a retail store in Sydney. Since the greatest energy consumption within the design control is lighting and HVAC, these present the greatest opportunity for energy reduction. Energy efficiency measures integrated by the project will focus on these two energy end uses.

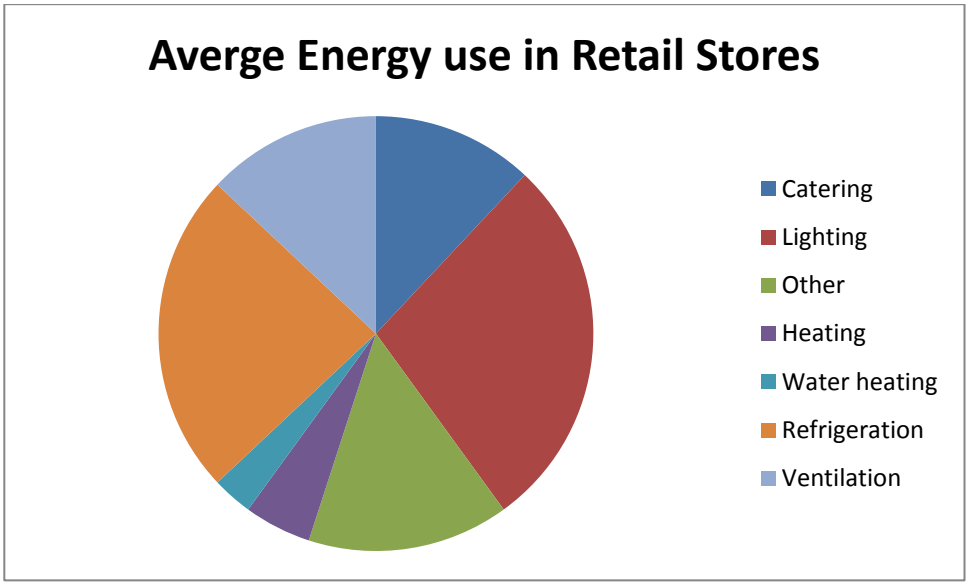
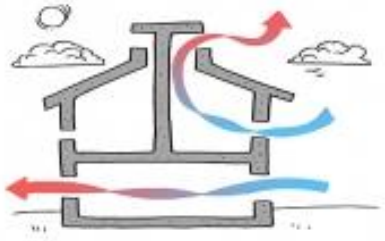


Figure 4 Typical retail store energy usage.

Energy efficiency measures which could be applied to individual buildings to reduce their energy consumption include:

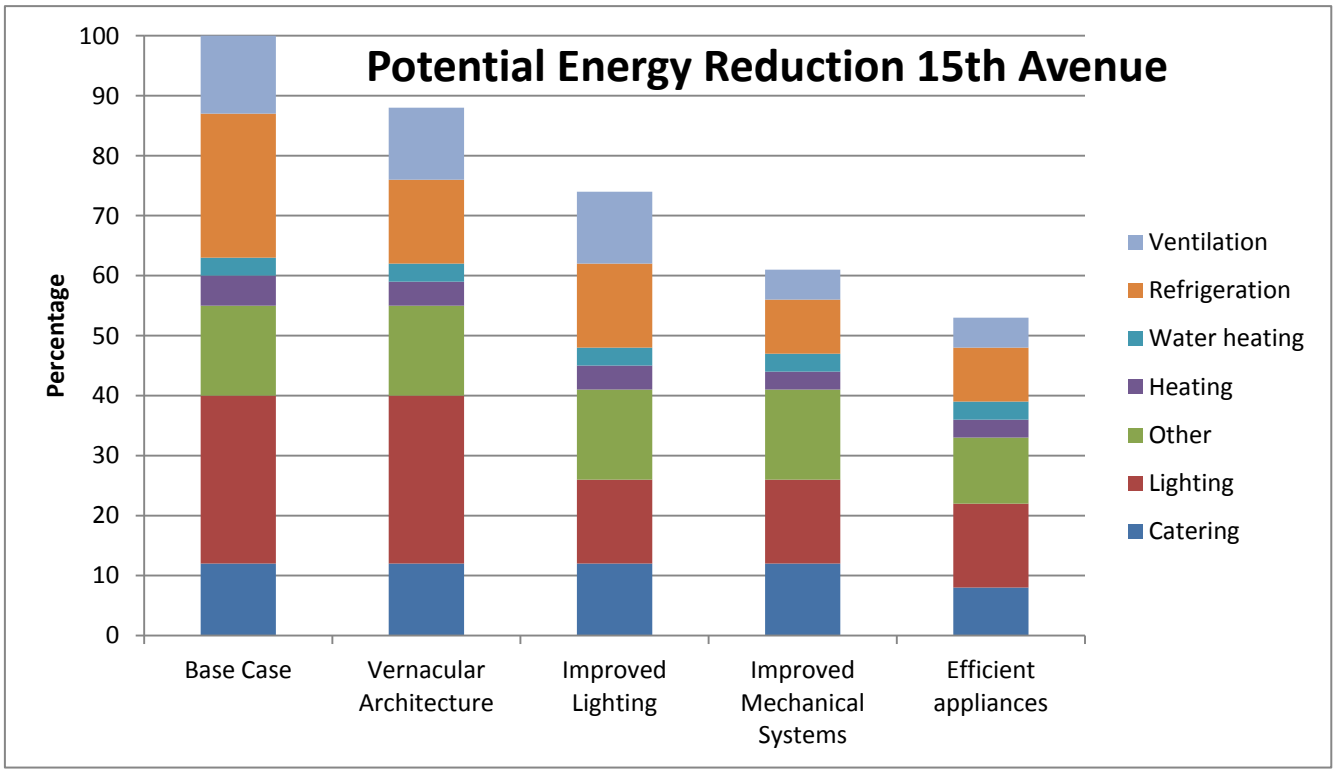
- Vernacular architecture, designed to maximise the specific needs of all occupants and users of the building. The buildings will be designed to deliver comfort, practicality, daylight, views and energy conservation through its architectural design intent.
- Shading, which reduces direct solar gains and increases comfort without compromising the connection to the outside. Shading allows larger glazed areas.
- Consideration of Natural Ventilation or Mixed mode where practicality allows. Acoustic, operation and other requirements may impact this practicality, but this has the ability to deliver high levels of fresh air to a space and reduce the energy consumption associated with HVAC.
- Solar passive design which maximizes north and south facing windows, and minimizes east-west glazing.



Energy Efficiency

- High performance glazing, to meet or exceed the requirements of the Building Code of Australia.
- Thermally efficient construction, including consideration of thermal mass, insulation where required and the lack of insulation where beneficial.
- Efficient HVAC systems with high COPs, appropriately designed to meet the needs of the system.
- Bespoke mechanical design systems sized appropriately for the development. These systems will have adequate efficiency, possible measures include economy cycles, CO2 monitoring or temperature band fluctuation control to promote energy efficiency in the design.
- Energy and water efficient appliances
- Roof lights or translucent glazing. This increases the natural light in the space, reducing the need for artificial lighting and potentially reducing the heating demand in winter.
- Air-lock doors will be considered, which reduce infiltration rates, providing a higher quality seal for the building
- Lighting controls including timing, occupancy and daylight sensors to reduce the demand on the lighting system.
- Efficient lighting systems. Using T8 or T5 fluorescent bulbs has been found to reduce consumption by 17% across a typical retail facility.
- Potential for Ceiling fans

Figure 5 Roof lighting (above) and shading design.



4. Water Efficiency

A variety of water efficiency measures are applicable to the proposed commercial precinct and its individual buildings. These water efficiency suggestions are intended to influence the architecture in finalising the design and operation of the spaces. Due to design constraints as the design progresses, not all of the below efficiency measures will be implemented in the final design.

The following chart describes the typical water consumption of a shopping centre. It can be seen that the largest uses are shops, cooling towers, amenities and leakage. While shop's water use is generally out of the control of the design, there are a number of strategies that can be implemented to reduce the overall potable water consumption of the development

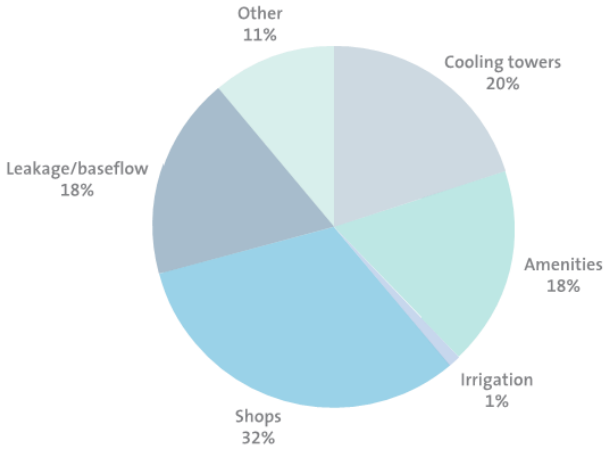


Figure 6 Typical Shopping Centre Water Consumption [source: Sydney Water

Water efficiency measures which could be applied to reduce water consumption include:

- Water efficient fixtures and fittings. By implementing low-flow water fixtures, the consumption associated with amenities and shops can be reduced.
- Water monitoring systems, which can identify leaks and amend losses before greater loss occurs.
- Rainwater collection and reuse, which can offset irrigation and cooling tower water consumption
- Cooling tower management strategies and design. Any water-based heat rejection systems serving larger demand items such as the supermarket will be carefully designed to ensure optimal energy and water use in its operation. Through correct sizing as well as commissioning and tuning, the
- Methods to reduce water consumption in landscaped areas. These could include drip-system irrigation for trees and larger plants. Consideration for the use of moisture sensors and the use of native plants in the landscaping plan. Natives are designed to thrive in the Australian environment and are typically more resilient than their exotic counterparts.
- Water education plan to provide information to users regarding their water consumption

Figure 7 Left to Right: Efficient Fittings, Drip irrigation, Waterless Urinals

5. Resource Efficiency

Other resources besides water and energy are consumed by a development. These include the building materials in the initial builds, the goods bought and sold through the stores, through to the food eaten by the building occupants. The following resource efficiency measures are intended to influence the architecture in finalising the design and operation of the spaces. Due to design constraints which enter as the design progresses, not all of the below efficiency measures will be implemented in the final design.

5.1 Construction materials

Construction materials are a highly carbon intensive component of any development. They often involve very energy intensive production processes, large amounts of raw materials including water and energy, and long transport distances to reach the location of the development. However there are a number of environmentally friendly practices starting to become accepted by the construction industry. Depending on the materials selected for the constructions, and the options available in the area, the following may be adopted for material selections.

- Recycled content in steel, concrete, or road base.
- Minimisation of excess wasted material.
- Quantification of materials in the planning stages to reduce the risk of over ordering materials.

5.2 Operational materials

Previous case studies have shown that shopping centres have a significant influence over the recycling rates and diversion to landfill of waste. Simple measures such as providing recycling bins with each general waste bin have been demonstrated to treble the recycling volumes of certain materials [Veolia, 2012]. Recycling will be encouraged by both the day-to-day users and the tenants of the centre.

The commercial precinct will provide operational waste facilities in accordance with Liverpool waste removal guidelines. A detailed recycling plan will be developed to encourage tenants and shoppers to recycle their waste. This will installed as appropriate to each element of the commercial precinct.

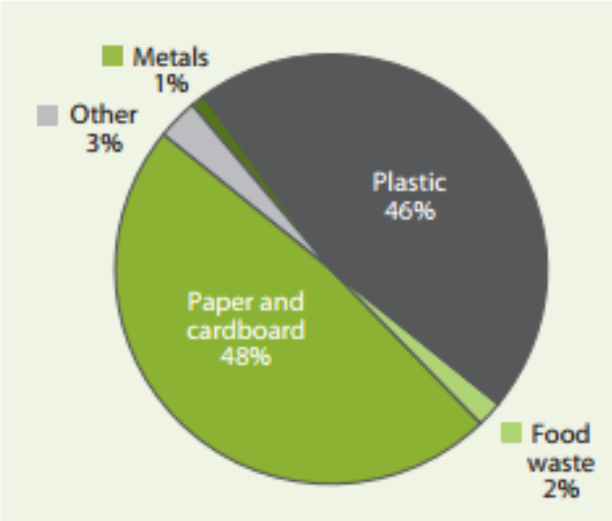


Figure 8 Typical Composition of Retail Waste Bins [Source: NSW EPA]

6. ESD Opportunities & Initiatives

The following section identifies Ecological Sustainable Development opportunities and initiatives for potential inclusion within the project. The following examples are to be viewed in response to the conceptual design prepared by LFA (Pacific). WGE note the design is in its infancy, and the following concepts will be considered going forward. As the design progresses, a number of documented elements may prove unfeasible, as well as undocumented initiatives proving attainable.

As clause 7(4)(a) of the Environmental Planning and Assessment Regulation 2000 has been considered, and no precautions to avoid threats of serious or irreversible environmental damage are required for this project, the following sub-clauses 7(4)(b-d) are assessed.

Inter-generational equity is realized in the use of energy and water efficiency measures which aim to reduce the consumption of limited resources, preserving these for future generations. In addition, the design principles outlined in the following sections are for buildings which will be occupied by the next generation. The healthy interior environments which they create will benefit occupants up to 60 years from today.

Conservation of biological diversity and ecological integrity is demonstrated on the project through the significant landscaping throughout, and bordering the commercial precinct. Greater detail is provided in the Flora and Fauna Assessment by Lesryk Environmental.

Improved valuation, pricing and incentive mechanisms are used to ensure rubbish is disposed of correctly on the site, and appropriate activities are undertaken by the future tenants who have limited environmental impacts in the vicinity of the commercial precinct. A polluting tenant is a risk to the economic viability of other tenants and the project itself, therefore polluting and other unwanted tenant activities are written clauses in contractual agreements.

6.1 Design Overview

Fundamental to the success of improving the ESD outcome for the project is the adoption of strong design philosophy.

Passive thermal design features have the ability to:

- Improve building occupant comfort;
- Lower operational energy demand via improved thermal performance;
- Promote greater indoor environmental quality;
- Reduce the requirements for artificial lighting & power;
- Reduce the buildings' reliance on HVAC systems; and
- Improve the project's ability to deliver a responsible development.

The design will attempt to include several passive design options and provide a robust and environmentally sensitive framework.

6.2 Liverpool Council DCP Requirements

The following Ecologically Sustainable initiatives will be considered in the design, to align with the controls and objectives of the Liverpool DCP 2008, and Liverpool LEP 2008, and the Environmental Planning and Assessment Regulation 2000.

- **Landscaping and tree preservation:** The site offers many landscaped areas, with vegetation throughout. This includes screen planting in a set-back around the border. A mix of native and exotic planting is planned for the landscaping. This will help to provide habitat for fauna around the commercial precinct.

- **Water and energy conservation:** Refer to Sections 3 and 4.

- **Landfill and used clothing bins:** Used clothing bins provide an effective means for clothing to be reused instead of going straight to landfill. A shopping centre or service station is a good location for a used clothing bin to be located. An operational waste plan will outline the predicted size and types of waste produced in the business district, and the best way to deal with these in the Liverpool Council area.

6.3 Environmental & Building Management

Via the implementation of industry recognised best practice frameworks, the project design and built form will seek to respond to the ongoing environmental challenges of urban development and ensure the project implements a range of ESD initiatives aimed at improving ongoing building management.

Through specific contractual commitments and documented design intent the project will seek to address environmental management & building operational performance through the following initiatives.

- **Building Commissioning & Tuning Procedures –** (prior to practical completion / 12 months post practical completion). By implementing this via project contract documents the project ensures operational efficiency & building operation is optimised in accordance with the intended building design.

- **Energy Metering –** sub-metering will provide real-time data for the use & management of building staff. Ensures operational efficiency is maintained.

- **Waste provisions –** appropriate waste provisions are to be included within the project to ensure recycling rates & reduced waste to landfill is optimised.

6.4 Indoor Environmental Quality (IEQ)

Improved indoor environment quality is a significant by-product of sustainable building design. The architectural design by LSA will give significant consideration to the incorporation elements within the project intent to improve indoor environment quality.

The following design features are considered with the intent to improve indoor environmental quality.

- Childcare centre plate design has focused on **maximising daylight access**. By maximizing daylighting opportunities, the building will inherently lower energy demand and GHG emissions via reduced lighting demand & improved passive thermal performance. This also increases occupant connection to the space. This is achieved by significant north facing glazed areas.

- **Thermal comfort** is provided through maintaining the internal temperature between 21 and 24degC for the occupied periods. This is applicable to all indoor conditioned areas – not back of house or warehouse spaces. Comfort will be achieved through providing adequate insulation in line with the NCC to all envelope elements and reducing draft by designing the indoor air velocity to a maximum of 0.25m/s. This will be achieved through the mechanical design criteria.

- **Glare and radiant temperature control** through the use of operable blinds on each window.

- **Artificial Lighting Design –** will be zoned & designed appropriately to ensure the optimum lighting comfort is achieved. This includes general illuminance and glare reduction in accordance with best practice standards, optimised surface illuminance for building users and localised occupant lighting controls.

- **Acoustic comfort –** will be optimised to ensure building internal noise levels, reverberation levels and appropriate acoustic separation levels are achieved in accordance with best practice standards. Examples include optimised internal materials and finishes to reduce reverberation improved building facades in order to ensure appropriate acoustic separation is achieved.

- **Material Selections –** will focus on reducing volatile organic compounds (VOC) levels and minimise formaldehyde impacts. Paints, sealants, adhesives, carpets, floor and material finishes will all comply with best practice VOC criteria via the architectural specification and design intent.

6.5 Potable Water Reduction

Reduced potable water demand is a key ESD initiative identified within industry best practice standards. The development will reduce potable water demand via the following initiatives.

- **Utility meters** will be designed to meet metering guidelines under the weights and measurement legislation, as outlined under the current National Measurement Regulations.

An automatic monitoring system which records both consumption and demand will be considered, capable of producing quarter hour, hourly, daily, monthly and annual use for all meters.

- **Sanitary Fixtures -** All sanitary fixtures are to be provided to the WELS ratings identified below:
  - Taps – 5 Star WELS
  - Urinals – 5 Star WELS
  - Toilet – 4 Star WELS
  - Showers – 3 Star WELS
  - Dishwashers (where included) – minimum 3.5 Star WELS

- **Rainwater Reuse -** A rainwater tank will be designed and implemented as appropriate. Further feasibility is to be completed regarding the ideal end-use for any non-potable water uses on site. Rainwater on this site is particularly advantageous given the significant collection area across the supermarket and retail roofs. There are also ample reuse opportunities including toilets and the landscaping.

- **Landscape Irrigation -** Landscape irrigation supply may be sourced from on-site rainwater system resulting in a net lower potable water demand. In the event additional potable supply is to be connected, a drip irrigation system with moisture sensor override is to be installed.

7. Summary

Ecologically Sustainable Design continues to be a driving consideration in the ongoing development of the Fifteenth Avenue commercial precinct. The commercial precinct will incorporate a number of ESD initiatives to complement the initiatives undertaken to reduce the Greenhouse Gas emissions, potable water consumption and material resources of the site. These have been developed around a response to the *Secretary's Environmental Assessment Requirements* by Department of Planning and Environment.

The ESD initiatives outlined in this report are intended to be used as a design guide for the commercial precinct and buildings on site. The specific initiatives that will be installed across the precinct will be determined throughout the development application stage for each individual lot and will be subject to feasibility analysis, including that of the final use and layout. The initiatives will comply with the guidelines set out by the relevant authorities.

The development's commitment to reducing the overall environmental impact is evident of the holistic approach taken to long-term sustainability. Documented initiatives cover a range of categories including:

- Energy & Greenhouse Gas Emissions
- Potable water reduction
- Minimising waste to landfill
- The Indoor Environment
- Occupant amenity and comfort
- Land Use & Ecology
- Emissions and
- Building Management

We trust this report provides sufficient overview of the project commitment to environmentally sustainable design and the sustainability vision for the Fifteenth Avenue development.