

# schedule 5

## piip

# background & growth assumptions



### (A) Background

- 1) Historically, prior to the sale of the airport on 11 December 2008, the airport land (then strategic port land) was controlled by the *Transport Infrastructure Act 1994* and infrastructure charges were not due or paid to the local government.
- 2) The need for the priority infrastructure interface plan arises from the following facts:
  - a) development on airport land has to be serviced by trunk infrastructure;
  - b) the trunk infrastructure that services the airport land is provided by the local government; and
  - c) in the normal course of events the local government will charge development within its local government area for the provision of trunk infrastructure to developments according to the local government's Priority Infrastructure Plan (**PIP**) and Infrastructure Charges Schedule (**ICS**).
- 3) Prior to the sale of the airport, most State-provided regional facilities such as schools, universities, hospitals, etc including the airport, were not assessable under the provisions of the local government's planning scheme. Consequently no ability existed for a local government to impose headworks charges or infrastructure contributions as conditions on development. The local government provided the trunk infrastructure necessary to service the airport. This was considered the local government's community contribution to the provision of the regional facility in order to realise the significant benefits of the regional facility to the community, local government and the region.
- 4) Through ongoing liaison with the local government in preparing this PIIP, agreement in principle has determined that this historic policy direction continues to be acceptable for development defined as "core airport infrastructure" under Schedule 2 of the AAA08.

### (B) Non Applicable Trunk Infrastructure Classes

- 1) The following infrastructure classes have not been applied to the Mackay Airport PIIP. These infrastructure classes can not be considered with respect to planned development demand determination.
- 2) **Stormwater Drainage:** Mackay Airport land is not located within any of the stormwater catchments for which the local government currently has a Stormwater Drainage ICS charge. By agreement, MAPL will be responsible for stormwater and water quality related infrastructure on airport, and will not be subject to local government infrastructure charges.
- 3) **Public Transport:** There is no local government policy with respect to this class of infrastructure. At the time of the preparation of this PIIP the local government has no planning for such infrastructure (e.g. dedicated bus ways or light rail systems). Public transport in Mackay is currently handled by bus operations. The buses utilise the road network, and allowance for the requirement of buses using the road network (e.g. links to create bus route loops, widenings, bus stops, etc) are included in the local government ICS for roads.

- 4) **Roads:** Although not stated under AAA08, there is a further infrastructure charge under the broad area of roads and transport infrastructure; this is the charge for the local function of State-controlled roads. The local government will be required by the *Sustainable Planning Act 2009 (SPA)* and its relevant regulations to levy this charge under the ICS for expenditure on infrastructure that will reduce the traffic loadings on State-controlled roads. Should this charge be introduced, it will become a component of the applicable road network ICS under LUP.
- 5) Should the local government introduce any of the above mentioned charges in the PIP/ICS in the future, the airport lessee will be subject to charges for development (where other than core airport infrastructure) similar to all other developments in the local government area. The local government will include the airport lessee as one of the developer stakeholders in any planning with respect to this infrastructure in the future.

### **(C) Purpose**

- 1) This section outlines the interface provided by the PIIP being the information necessary to allow the application of the local government's PIP/ICS to the airport land.
- 2) The preparation of the PIIP has determined the demands on trunk infrastructure, so that the local government is enabled to plan the trunk infrastructure networks to serve the demands anticipated from development on airport land;
- 3) The PIIP enables the local government to prepare revisions to their plans for trunk infrastructure (**PFTIs**) incorporated in their PIP to reflect the trunk infrastructure required to service airport land;
- 4) The local government can prepare revisions to their ICS incorporated in their PIP to reflect:
  - a catchment charge rate calculated on the basis of the cost of the trunk infrastructure required in the catchment that includes the airport; and
  - apportioned over the beneficiaries (according to the required distribution procedures); and
- 5) The preparation of the PIIP can determine the infrastructure charges due to the local government from development (other than core airport infrastructure) on airport through application of the local government's ICS;
- 6) Development growth information<sup>100</sup> is provided for the local government to determine:
  - the network capacity requirements;
  - the need for any infrastructure upgrades in the catchments containing the airport; and
  - the implementation staging for the upgrades, so as to update the local government PIP/ICS accordingly; and
- 7) The timing of development growth is given by:
  - the annual anticipated growth of the core airport infrastructure; and
  - five (5) year cohorts for development (other than core airport infrastructure).

### **(D) Growth On Airport**

- 1) Historically, the airport has functioned largely independent of the local government under the *Transport Infrastructure Act 1994*, without coordinated land use or infrastructure planning between the airport and the local government.
- 2) AAA08 requires that the airport lessee provide the necessary information to the local government via a priority infrastructure interface plan (**PIIP**) which is included as Chapter 6 of this LUP. This allows the local government to include the airport land into the infrastructure planning of the local government area.
- 3) To inform the local government's planning for infrastructure under its priority infrastructure plan (**PIP**), the local government must have a clear understanding of the airport lessee's proposed planning at the airport, and how this will impact on the local government's trunk infrastructure networks.

<sup>100</sup> Refer Sections D-G in this Schedule.

- 4) The infrastructure planning of the PIIP follows an engineering planning process whereby:
  - i) growth is projected;
  - ii) future land use scenarios to accommodate the growth are determined;
  - iii) demands on the trunk infrastructure due to the future scenario are determined; and
  - iv) the infrastructure is planned to accommodate the demands.
- 5) The infrastructure planning at the airport is complicated by the delineation of airport development as (a) core airport infrastructure (defined by Schedule 2 AAA08), or (b) otherwise. This implies that for the purposes of infrastructure charging, the two types of airport development must be considered separately from the earliest planning stages.
- 6) This schedule covers the parameters driving the growth at the airport, and the airport lessee's strategic planning to accommodate that growth, culminating in a land use model defining the projected land requirements for development (whether core airport infrastructure, or otherwise).

## **(E) Growth Projections - Core Airport Infrastructure**

### **E1 Growth Drivers**

Core airport infrastructure (refer Schedule 2 of AAA08) is directly related to the air transportation activities projected for the airport. Air transportation activities are themselves a reflection of the economic conditions of the region, and in the context of Mackay are a response to the level of mining, tourism, agricultural, and other business activities prevailing at any particular time.

The Mackay Port Authority (the former owners of the airport) commissioned studies in 2006 that investigated projections of the drivers of air transportation activity, which reflected:

- analysis of historic trends (smoothed for such things as the pilots dispute, mining downturns, 9/11, and the Ansett collapse); and
- a rational projection of growth into the future based on economic trend projections;
- changes in aircraft and passenger handling technologies; and
- proportions of domestic and regional flights, etc.

These drivers are reflected in projected passenger growth rates in **Table EI**, and are utilised for the planning of core airport infrastructure as outlined below.

### **Passenger Terminals**

The size and layout of a passenger terminal is related to the facilitation of both departing and arriving passengers (**pax**) as well as visitors to the terminal and the level of service required.

Actual terminal capacity is related to peak passenger flows (i.e. pax per busy hour) at an agreed level of service. These peak hour flow figures can be influenced by operational issues such as aircraft size and the frequency of aircraft arrivals and departures, which are generally not evenly distributed throughout the day.

The pax per annum figure is also widely utilised for the strategic sizing of the airport passenger terminal and related facilities.

For planning purposes, it is assumed that any future requirement for the facilitation of international operations would be by conversion of the existing passenger terminal into a "swing gate" operation. A swing gate operation is accommodated by partitioning a suitably sized portion of the terminal off to process the international flights, with that section of the terminal reverting to domestic passenger operations when international flights are not scheduled (similar to the Adelaide Airport model).

The passenger numbers in **Table EI** are projections prepared by CAPA in 2010 and accepted by Mackay Airport Pty Limited.

### **Mixed Aviation Land Use**

The mixed aviation land uses (including general, regional and others) allow for numerous core activities that require airside access (i.e.: where the activity deals directly with aircraft, and is inside the security perimeter). These include operation of air charters utilising both fixed and rotary wing (helicopter) aircraft, fly-in/fly-out operations, reef charters and tours, military applications, aircraft

maintenance, and support facilities such as catering and provisioning, fuel, emergency services, flight and other aviation-related training etc.

The requirements for these activities contribute to the overall regional economic performance, and therefore for strategic planning purposes, are also related to the pax/annum growth projections of **Table E1**.

### **Air Freight Facilities**

Core airport infrastructure is also related to the air freight handled by the airport, expressed as tonnes/annum.

The freight handling facilities required are highly variable depending on the actual freight operations at the airport, such as the proportions of freight carried on regular public transport aircraft as additional cargo, and the proportion on dedicated cargo aircraft, type of goods (including possibly live animals), quarantine/ fumigation, temporary storage, refrigeration, mode change requirements etc.

The freight projections of **Table E1** are consistent with the Mackay Port Authority studies and the 2009 CAPA growth rates.

### **E2 Strategic Provision Rates**

At a strategic level, the existing core airport infrastructure is considered indicative of the provision of future core facilities, because the existing facilities are representative of satisfactory configurations for handling the constraints prevailing at Mackay Airport.

This assumes therefore, that future airport growth will not include significantly different configurations (e.g. terminal fingers supporting multiple gates such as at large airports), as these more efficient configurations are not compatible with the existing site.

**Table E1** growth projections are translated to requirements for core airport infrastructure capacity upgrades by use of the strategic provision rates shown in **Table E2**.

These Mackay-specific provision rates are consistent with existing airport development and its ability to cope with the air transportation demands.

### **E3 Projected Upgrade Requirements**

Utilising the projected growth in core airport infrastructure in **Table E1** and the core land use provision rates of **Table E2**, the requirements for core airport infrastructure are shown in **Table E3**

Core airport infrastructure upgrade requirements are summarised graphically in **Figure E1** for convenient reference.

**TABLE E1: Mackay Airport Pax and Freight Projections**

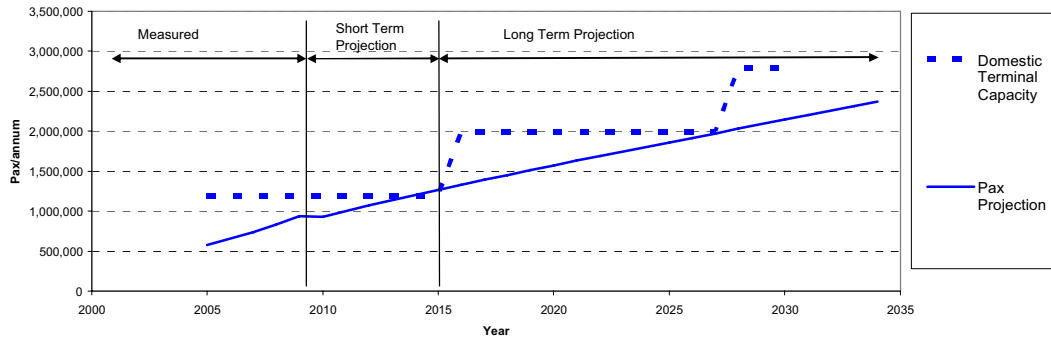
Year	Projected Growth Rate	Pax Projections (pax/annum)	Freight Projections (t/annum)
2005	na	580,315	2,100
2006	13.10%	656,326	2,319
2007	12.87%	740,787	2,558
2008	12.32%	832,072	2,809
2009	12.99%	940,137	3,100
2010	-0.92%	932,000	3,077
2011	7.81%	1,004,000	3,269
2012	7.00%	1,075,000	3,451
2013	6.07%	1,140,000	3,619
2014	5.65%	1,204,000	3,782
2015	5.29%	1,268,000	3,941
2016	4.98%	1,331,000	4,098
2017	4.56%	1,392,000	4,247
2018	4.33%	1,452,000	4,394
2019	4.14%	1,512,000	4,539
2020	3.96%	1,572,000	4,682
2021	3.81%	1,632,000	4,824
2022	3.50%	1,689,000	4,959
2023	3.38%	1,746,000	5,093
2024	3.27%	1,803,000	5,226
2025	3.17%	1,860,000	5,358
2026	3.08%	1,918,000	5,489
2027	2.93%	1,974,000	5,618
2028	2.85%	2,030,000	5,746
2029	2.78%	2,087,000	5,873
2030	2.71%	2,143,000	6,000
2031	2.64%	2,200,000	6,126
2032	2.58%	2,256,000	6,252
2033	2.52%	2,313,000	6,378
2034	2.45%	2,370,000	6,503

**TABLE E2: Core Airport Infrastructure - Provision Rates**

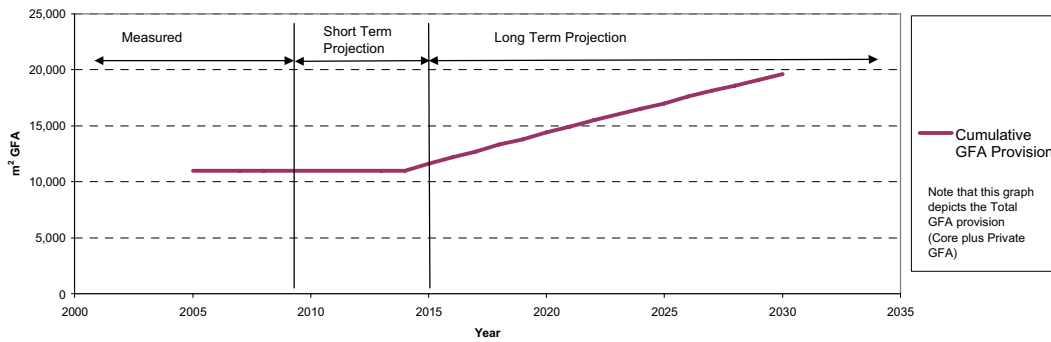
CAI Type	Unit of Provision	Provision Rate
Domestic Terminal	m <sup>2</sup> per pax/annum	0.00543
General Aviation Facilities	m <sup>2</sup> per pax/annum	0.00915
Air Freight Facilities	m <sup>2</sup> per ton/annum	0.07736

**FIGURE EI: Core Airport Infrastructure Upgrade Requirements**

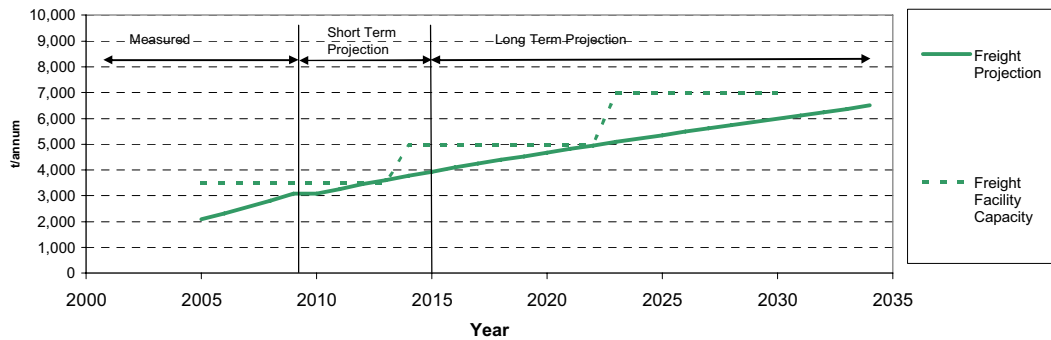
**Mackay Airport Pax Projections and Passenger Terminal Capacity Upgrade Requirements**



**Mackay Airport General Aviation GFA Provision Projection**



**Mackay Airport Freight Projections and Freight Facility Capacity Upgrade Requirements**



**TABLE E3: Mackay Airport CAI Requirements**

Year	CAI Capacity Requirements		CAI Capacity Implementation		
	Terminal Capacity (Pax/annum)	Freight Facility Capacity (t/annum)	Cumulative Terminal Development Implementation (m2 GFA)	Cumulative Freight Facility Implementation (m2 GFA)	Cumulative Core General Aviation Facilities Provision (m2 GFA) *
2005	1200000	3500	6500	270	11000
2006	1200000	3500	6500	270	11000
2007	1200000	3500	6500	270	11000
2008	1200000	3500	6500	270	11000
2009	1200000	3500	6500	270	11000
2010	1200000	3500	6500	270	11000
2011	1200000	3500	6500	270	11000
2012	1200000	3500	6500	270	11000
2013	1200000	3500	6500	270	11000
2014	1200000	5000	6500	390	11000
2015	1200000	5000	6500	390	11250
2016	2000000	5000	10900	390	11500
2017	2000000	5000	10900	390	11650
2018	2000000	5000	10900	390	11900
2019	2000000	5000	10900	390	12050
2020	2000000	5000	10900	390	12300
2021	2000000	5000	10900	390	12450
2022	2000000	5000	10900	390	12700
2023	2000000	7000	10900	540	12850
2024	2000000	7000	10900	540	13000
2025	2000000	7000	10900	540	13150
2026	2000000	7000	10900	540	13400
2027	2000000	7000	10900	540	13550
2028	2800000	7000	15200	540	13700
2029	2800000	7000	15200	540	13850
2030	2800000	7000	15200	540	14000

**Note:**

\* The growth in General Aviation (GA) facilities reflects only CAI. There will be an additional projected 5,600m2 of private General Aviation Facilities on the airport land by 2030. The total GA capacity projection (Core plus Private) is derived from a capacity growth reflecting pax growth of Table E1 and the GA provision rate in this table.

**(F) Growth Projections - Development (Other than Core Airport Infrastructure)**

- 1) Where development is not listed in Schedule 2 of AAA08, it is considered non-core airport infrastructure. As such, development (other than core airport infrastructure) is subject to infrastructure charges.
- 2) Development (other than core airport infrastructure) is not directly related to aviation transport or the passenger numbers handled by the airport. Development (other than core airport infrastructure) needs to be commercially viable, and can be expected to respond to economic trends and the commercial opportunities of the day.
- 3) Development (other than core airport infrastructure) and the possible extent of development proposed in the LUP are shown in **Table FI** below.

- 4) **Table FI** details the type, and anticipated timing of development (other than core airport infrastructure), and is the primary determinant of development (other than core airport infrastructure) consistent with the airport planning. As such, anticipated development and uses have been clustered into broad types rather than specific use definitions.
- 5) The location of development is shown on **Figure EI**.

**(G) Land Use Model**

- 1) From the projections of all airport development (whether core airport infrastructure, or otherwise) outlined in Sections B and C, the overall land use was modelled as shown in **Table GI**.
- 2) **Table GI** contains the source land use zone/ precinct and proposed development information for the determination of the demands on the local government's trunk infrastructure networks in Chapter 7 Section 7.5.

**TABLE FI: PIIP Cohorts of Development**

Land Use Type			Land Area (ha)	Development Implementation (m <sup>2</sup> GFA)					Planned Development (Cumulative) as at 2030 <sup>4)</sup>
Location (by Airport Quadrant)	Zone / Precinct (see Fig 7.1)	NCAI		PIIP Cohorts of Development <sup>2),3)</sup>					
			2010-2011	2012-2016	2017-2021	2021-2026	Beyond 2026		
East (Casey Ave)	East Aviation	NA						0.0	
	East Mixed Aviation & Commercial	Light Industries, many with synergies with the Airport (eg: storage and warehousing, transport hub activities)	0	500	1000	1000	0	2500	
North (Milton Street)	North Aviation	NA						0	
	Milton Mixed Aviation & Commercial	Big Box Retail and Showrooms		1000	4000	0	0	5000	
		Business Park to provide general employment to surrounding residential areas		1000	1000	1000	2000	5000	
West	West Aviation	Light Industries mostly air freight related		0	600	600	1800	3000	
Terminal	Airport Terminal	NA						0	
	Terminal Commercial	Airport Hotel and Tavern		1500	1000	0	0	2500 <sup>1)</sup>	
		Leisure and entertainment		1000	500	500	500	2500	
<b>Airport NCAI Landuses Totals</b>			<b>0</b>	<b>2500</b>	<b>6600</b>	<b>2600</b>	<b>3800</b>	<b>15500</b>	

**Notes:**

- 1) Assumption: Tavern of 500m<sup>2</sup> and rooms at 20m<sup>2</sup> each.
- 2) No. of rooms = 100 (50 rooms in 2012-16, and 50 rooms in 2017-21).
- 3) There is no column for existing developments in this table because there is currently no non-core development at Mackay airport.
- 4) Cohorts are based on Census periods.
- 5) Planned Development relates to the extent of Land Uses planned to be developed by the planning horizon (i.e. 2030) under this Land Use Plan. Please note that the Airport Land will not be "full" at this time, and future Airport Land Use Plans can be expected to include further development beyond the 2030 horizon.

**TABLE GI: Mackay Airport Land Uses Model at Planned Development (2030)**

Land Use Type		Existing Airport Land Uses					Planned Development (2030) Land Use Parameters					Planned Development (2030) Development Parameters				
Location (By Airport Quadrant)	LUP Predict (see Fig 6.9.2) Area of Land Developed Use (ha)	Existing Developed (Dev lots / Total land) (%)	Existing Undeveloped Lots (ha)	Existing GFA (m <sup>2</sup> )	Existing Plot Ratio (%)	Notional split between Core and Non-Core Uses			GFA at Planned Development (m <sup>2</sup> )			Planned Development Non-Core GFA Site Coverage (%)	Refer to Note No			
						Maximum Development by 2030 (Dev lots / Total Land) (%)	Maximum Developed Area by 2030 (ha)	Core Airport Infrastructure at Planned Development (%)	Non-Core Airport Infrastructure at Planned Development (%)	Area of Core Airport Infrastructure at Planned Development (ha)	Area of Non-Core Airport Infrastructure at Planned Development (ha)			Core GFA at Planned Development (m <sup>2</sup> )	Non-Core GFA at Planned Development (m <sup>2</sup> )	Planned Development Core GFA Site Coverage (%)
East (Casey St)																
Total	7.4	5.8	1.6	7270	13%	88%	6.4	na	na	5.5	1.0	15,000	2,500	27%	26%	1
East Mixed Aviation & Commercial	4.3	4.0	0.3	5656	15%	93%	4.0	100%	0%	4.0	0.0	11,000	-	27%	0%	2
North (Milton St)																
Total	37.5	1.3	36.2	2179	16%	20%	7.5	na	na	3.7	3.8	4,000	10,000	11%	26%	4
North Aviation Mixed Aviation & Commercial	15.1	0.0	16.1	0	0%	20%	3.2	100%	0%	3.2	0.0	3,000	-	9%	0%	5
West																
Total	21.8	6.6	15.2	2071	3%	35%	7.7	na	na	9.8	4.7	1,000	10,000	23%	26%	6
West Terminal Commercial	5.4	0.6	7.8	266	4%	20%	1.7	0%	100%	0.0	1.7	-	5,000	0%	30%	8
West Aviation	13.4	6.0	7.4	1805	3%	45%	6.0	50%	50%	3.0	3.0	1,000	3,000	3%	10%	9
Terminal																
Airport Terminal	11.9	6.8	5.1	6511	10%	57%	6.8	100%	0%	6.8	0.0	16,200	-	22%	0%	10
Airport Total	78.6	20.5	58.1	18031	6%	38%	28.5			25.7	9.5	35,200	20,500	14%	22%	11

**Notes:**

- 1) The bulk of new developments occur first at the Casey St Quadrant to maximise utilisation of existing infrastructure.
- 2) No new lots. Increase the coverage on the existing lots.
- 3) Develop unutilised lots leaving 20% for roads etc. Increase coverage on all lots.
- 4) Substantial internal infrastructure investment is required. Only proceed when other lower cost development opportunities have been exhausted.
- 5) Allow new ventures to commence here when East Aviation fully developed.
- 6) Includes retail outlets, and business park.
- 7) Accommodate Freight Facilities and key place making/leisure/entertainment hub.
- 8) Inclusive of airport hotel, tavern, and support businesses such as eateries for airport workers and local residents.
- 9) No new lots. Increase the coverage on the existing lots. All Freight handling facilities are located here, with other non-core freight businesses, commercial car storage, etc.
- 10) 230% increase in Terminals consumes only 57% of the zoned land at Planned Development, allowing for substantial continued expansion long term.

# schedule 6 land use plan policies sustainability building policy



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## 1.1 Introduction

North Queensland Airports Limited (NQA) has adopted a Sustainable Buildings Policy for development at Mackay and Cairns Airports. The LUP governing development on airport land at these sites also include requirements for sustainability. The purpose of this policy and land use plan code is to achieve a high standard of ecologically sustainable development on the airport sites, with high regard to the cost effectiveness of solutions.

This User's Guide to Sustainable Development on Airport Land has been prepared by Arup for NQA to provide lessees and development proponents with guidance on strategies and solutions that will achieve the outcomes described in the policy and codes. The guide is organised into the following themes:

- Energy reduction
- Water conservation
- Reduced emissions
- Quality indoor environment
- Materials efficiency
- Alternative transport.

## Part A: Policy

### 2.1 Sustainable Buildings Policy

#### 1) Intent

To encourage buildings on airport land that demonstrate best practice in sustainable design.

#### 2) Objectives

- All new buildings exceed minimum statutory requirements for water and energy efficiency.
- All new buildings have on-site sub-metering to assist with demand management.
- All new buildings provide facilities to encourage cyclists and active transport modes.
- All new buildings provide a high quality indoor environment for staff and users.

#### 3) Scope

The policy applies to all new Class 4, 5,6,7,8 and 9 buildings constructed on airport land. The policy also applies to the new work component of extensions and refurbishments/fit-outs.

Commitment to achieving a certified Green Star rating is considered an alternative solution for compliance with the policy. A design rating must be attained prior to final approval being given completion/occupation of the constructed works. If the Green Star rating is not attained by this time applicant will be required to demonstrate compliance with the Intent and Objectives of this policy in order for the completed works to be certified.

#### 4) Structure

The policy uses a performance based approach similar to the LUP. A number of Performance Targets are identified. Acceptable solutions are provided that can be used to achieve the target, however alternative solutions may be submitted for assessment. Further information is provided in the NQA's "Users Guide to Sustainable Development on Airport Land".

Where any provisions within the Sustainable Buildings Policy conflicts with State or Federal legislative requirements for sustainable buildings the legislative requirements shall prevail.

#### 5) Assessment

The proponent shall provide drawings, specifications, manufacturer's data, calculations and other information necessary to demonstrate to the assessment manager that the requirements of the policy have been met.

## 6) Performance Criteria

Performance Target	Acceptable Solutions	Documentation Requirements
<b>PT1 Lighting is energy efficient.</b>	AS1.1 Average lighting power density is 10% lower than the requirements of BCA Section J appropriate to the building type/class.	Calculations/ specification to demonstrate compliance, in accordance with Section J requirements.
<b>PT2 Lighting controls are provided to enable individual control of areas.</b>	AS2.1 Lighting is designed in separately switched zones with a maximum area of 150m <sup>2</sup> , and each zone is fitted with occupancy sensors such that lighting is switched off when the area is not in use. AS2.2 All enclosed meeting rooms and offices are fitted with individual motion sensors and switches.	Drawings demonstrating lighting and switching layout.
<b>PT3 Indoor work environments have access to natural light.</b>	AS3.1 The building includes windows, skylights and wall lights that admit natural light to at least 75% of offices and open work areas. (Extent of natural light is assessed as being floor areas within 8m of a glazed area)	Plans and elevations marked up to demonstrate coverage of windows and skylights.
<b>PT4 Air conditioning systems are energy efficient.</b>	AS4.1 Air-conditioning systems are designed to achieve: i) 10% improvement on MEPS Energy Efficiency Ratio requirements for air conditioners and heat pumps; and ii) 10% improvement on current BCA requirements for Maximum Pump Power (W/m <sup>2</sup> ); and iii) 10% improvement on current BCA requirements for Minimum Energy Efficiency Ratio for Packaged Air Conditioning Equipment (W <sub>r</sub> /W <sub>input</sub> power); and iv) 10% improvement on current BCA requirements for Minimum Energy Efficiency Ratio for Refrigerant Chillers (W <sub>r</sub> /W <sub>input</sub> power). AS4.2 Air conditioning units are fitted with timer switches programmed to switch the system off outside usual hours of building occupancy, with manual override. AS 4.3 Offices and work areas are fitted with ceiling fans to augment air-conditioning systems.	Manufacturer's certification/energy rating data and/or engineering calculations.  Electrical layout drawings demonstrating timer switches and ceiling fans.

Performance Target	Acceptable Solutions	Documentation Requirements
<p><b>PT5 Hot water systems are energy efficient and minimise greenhouse gas emissions.</b></p>	<p>AS5.1 Hot water supply systems, excluding instantaneous tea/coffee boilers, must be:</p> <ul style="list-style-type: none"> <li>i) a gas hot water system with an energy rating of at least five stars; or</li> <li>ii) a solar hot water system or heat pump eligible to receive a minimum RECS as set out below: <ul style="list-style-type: none"> <li>• REC/litre for units up to 180 litres capacity</li> <li>• 0.09 REC/litre for units up to 700 litres capacity</li> <li>• A minimum of 250 RECS for commercial systems exceeding 700 litres capacity</li> </ul> </li> </ul> <p>AS5.2 Instantaneous tea/coffee boilers must be fitted with auto shut-off and sleep mode.</p>	<p>Provide manufacturers certification/energy rating data</p>
<p><b>PT6 Energy is sub-metered within each site.</b></p>	<p>AS6.1 In addition to the requirements of Section J8.3 of the BCA, the following energy uses shall be separately sub-metered:</p> <ul style="list-style-type: none"> <li>i) substantive uses greater than 100kVA for all building regardless of building type, class or size;</li> <li>ii) lights and power for buildings larger than 500m<sup>2</sup> in area.</li> </ul>	<p>Provide metering layout diagrams</p>
<p><b>PT7 Buildings have water efficient plumbing fittings</b></p>	<p>AS7.1 All internal plumbing fixtures have a certified AAA rating as follows:</p> <ul style="list-style-type: none"> <li>i) toilets suites have cisterns with average 4 litre flush (when calculated in accordance with Australian/New Zealand Standard AS/NZS 6400:2003) and matched pans; and</li> <li>ii) tap sets are minimum 4 star; and</li> <li>iii) shower roses are a minimum 3 star; and</li> <li>iv) urinals are minimum 5 star.</li> </ul>	<p>Provide schedule of plumbing fixtures and evidence of WELS rating</p>
<p><b>PT8 Buildings supplied with water from the reticulated town supply have an alternative water source connected to suitable uses.</b></p>	<p>AS8.1 Buildings have alternative water supply connections on site as follows:</p> <ul style="list-style-type: none"> <li>i) rainwater storage tanks connected to the roof drainage system, with a capacity 20% greater than the minimum stipulated in the QDC, connected to fixtures as nominated in the QDC; or</li> <li>ii) rainwater tanks sized in accordance with the minimum requirements of QDC and augmented by a recycled water supply which is connected to vehicle wash-down bays and/or irrigation system.</li> </ul>	<p>Provide hydraulics and landscape drawings showing location of tanks and connections to fixtures.</p>

Performance Target	Acceptable Solutions	Documentation Requirements
<p><b>PT9</b> Water meters are installed to monitor water consumption and provide leak detection</p>	<p>AS9.1 The following major water uses are separately metered:</p> <ul style="list-style-type: none"> <li>i) Staff amenities;</li> <li>ii) Public toilets (where more than 4 pedestal equivalent);</li> <li>iii) Water based cooling systems;</li> <li>iv) Industrial cleaning or processes, including vehicle wash down;</li> <li>v) Irrigation systems; and</li> <li>vi) Rainwater storage</li> </ul>	<p>Provide hydraulics drawings showing location of meters.</p>
<p><b>PT10</b> All buildings include provision for cyclists.</p>	<p>AS10.1 All buildings shall include provisions for cyclists in accordance with the requirements set out in the Queensland Development Code, and including the following minimum provisions:</p> <ul style="list-style-type: none"> <li>i) at least one shower accessible by all staff (and additional showers where required by the QDC); and</li> <li>ii) at least two lockers with adequate height for hanging of work clothes (and additional lockers where required by the QDC); and</li> <li>iii) at least two covered, secure bike racks (and additional racks where required by the QDC).</li> </ul> <p>AS10.2 Development includes safe access to site for cyclists and pedestrians, connected to pedestrian and cycle paths or lanes where they are available or with provision for future connection.</p>	<p>Provide building plans showing relevant information</p>

## Part B: Guidance Notes

### 3.1 Energy Conservation

#### 1) Lighting

Lighting is a significant source of electricity consumption within a building. The use of energy efficient fittings and demand management measures can reduce this consumption by as much as 80%, with significant cost benefits. Some strategies to reduce energy consumption from lighting are described below.

- Incandescent and halogen lights are the most inefficient forms of lighting and are shown to radiate heat which can potentially add to air-conditioning loads. As an alternative, use fluorescent fittings such as compact fluorescent lamps and T5 tubes which have the ability to deliver lighting much more efficiently while having a longer life. LEDs perform even more efficiently and have the greatest expected life. LEDs can be used for both interior as well as exterior (car park and street lighting) purposes.
- Lighting power density is a measure of the amount of energy used per square metre to provide required lighting levels. A recommended maximum lighting power density is 2.5W/m<sup>2</sup>. Lower levels can be achieved with effective design and use of T5 or other efficient fittings.
- In addition to the choice of bulb, the design of the light fitting has a significant impact on lighting efficiency as not all light emitted from the bulb may be utilised. Select light fittings which maximise light emissions while being suited to the location and task.
- Many work spaces are over-lit. Consider using a combination of background lighting and task lighting. This results in a lower level of overall lighting (and energy demand) in the overall space (still compliant with safety requirements) with task-specific lighting in work areas activated by users when required. In addition to reducing energy consumption, this approach reduces eye strain and glare.
- Spaces that have good natural daylight may not require as much lighting on sunny days. Consider switching perimeter lighting separately and fitting it with sensors that automatically switch lights off when there is enough daylight.
- Plan the lighting as a series of smaller zones that are separately switched, so that lighting is only provided to areas that are in use. This includes separate switching in all offices and individual rooms and zones of 100-150 square metres in larger worker spaces. Movement sensors can be used to automatically turn off lights when a space is not in use, or activate lights when a user enters a space. This improves efficiency and safety.

#### Further Guidance:

- ABGR, *Tenant Energy Management Handbook*, Sustainable Energy Development Authority (2000)
- *Electric lighting – emerging technologies and their intrinsic control* [http://www.yourbuilding.org/library/1\\_TEC09.pdf](http://www.yourbuilding.org/library/1_TEC09.pdf)
- *A range of lighting products and their associated energy requirements* <http://www.energyrating.gov.au/appsearch/download.asp>
- *Green Star rating Tools and Design Manuals* <http://www.gbca.org.au>

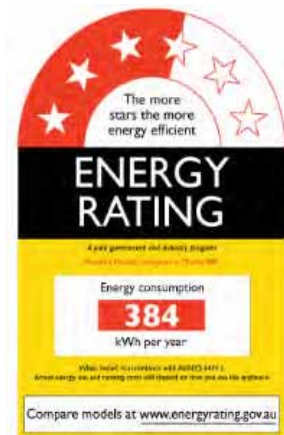
## 2) Power and Appliances

The operational energy consumption of a building can vary dramatically as a result of the type of appliances and equipment used, as well as how they are configured and operated. All domestic (and some semi-commercial) appliances such as refrigerators, freezers, laundry and dish washers have an associated energy rating which should be visible at the time of purchase. The more stars an appliance has the more energy efficient it is.

Manufacturers of commercial appliances should be able to provide data about the expected energy consumption or relative energy efficiency of their products.

In addition to selecting energy efficiency of the appliance, the following strategies can reduce energy consumption:

- Ensure that the appliance is appropriately sized for the intended use. An over-sized appliance will use too much energy and may not last as long due to the poor efficiency of the motor.
- Ensure the appliance is turned off when not in use.
- Avoid applying unnecessarily high loads on the appliance, e.g. set the air conditioning systems at 23-26°C in cooling mode and 18-20°C in heating mode.
- Provide energy saving power boards at work stations and other areas where a number of appliances are in use (these boards are designed to shut down linked stand-by devices).



### Further Guidance:

- *Energy rating*  
<http://www.energyrating.gov.au/>

## 3) Passive Design

Passive design refers to principles that optimise the inherent performance of the building within its climate. It incorporates considerations such as shading/sun protection, orientation, cross ventilation, thermal mass and insulation. Good passive design reduces the reliance on mechanical ventilation in temperate months and reduces heating and cooling requirements when the air-conditioning is in use.

The Mackay region has a tropical climate, with includes high sun exposure and UV, high volume summer rains, high tropical temperatures with high humidity, high evaporation rates (which can exceed rainfall in winter), strong hot and drying northerly winds, and destructive cyclones between January and April. The extremes of this environment are expected to be exaggerated as Climate Change occurs. Some passive design strategies suited to the region include:

- Orientate the building to reduce the area of walls and windows exposed to low angle sun (east and west).
- Use roof overhangs, eaves, awnings, planting and screen walls to shade walls and windows from direct sunlight, particularly in winter. For north and south faces this can be achieved via shading devices in the horizontal plane, however vertical louvers and screens or plants may be required to the east and west due to the low angle sun.
- Maximise the area of windows and openings oriented to prevailing breezes.
- Install insulation to reflect radiant heat in walls and roofs.
- Ventilate the roof cavity with ventilators, gable louvers etc.

- Avoid thermal mass (concrete, brick, stone), or ensure it is fully shaded from summer sun. Insulated light weight buildings generally perform better in tropical conditions as they do not store heat and re-radiate it into internal spaces. However air-conditioned spaces required some mass or effective insulation to retain the cooler air inside.
- Plant shade trees in car parking areas to maximise shade and minimise the absorption of heat.
- Consider incorporating planted courtyards and/or water features to create a cooling effect on internal spaces.

#### Further Guidance:

- Orientation - Climate and Building Design  
<http://reg.bom.gov.au/lam/climate/levelthree/cpeople/build1.htm>
- Shading – Sun Control and Shading Devices  
<http://www.wbdg.org/resources/suncontrol.php>
- Solar heating – Passive Solar Heating  
<http://www.wbdg.org/resources/psheating.php>
- Natural ventilation/cooling sources – Natural Ventilation in Passive Design  
[http://www.yourbuilding.org/library/1\\_TEC02.pdf](http://www.yourbuilding.org/library/1_TEC02.pdf)
- Glazing – Advanced Glazing Systems in Commercial Buildings  
[http://www.yourbuilding.org/library/1\\_PRO19.pdf](http://www.yourbuilding.org/library/1_PRO19.pdf)
- Insulation – Yourhome Insulation Guide  
<http://www.yourhome.gov.au/technical/pubs/fs47.pdf>
- Thermal mass – Thermal Mass in Building Design  
<http://www.yourbuilding.org/library/DES04.pdf>

#### 4) Energy Efficient Air Conditioning

Air conditioning systems generally account for the largest portion of energy used in a building. A number of strategies can be applied to reduce this, resulting in significant energy and cost savings, and often improved comfort for staff.

- Install plant that demonstrates to have high efficiencies (COP or EER) and is suited to tropical environments.
- The air conditioned plant should be strategically zoned so that air-conditioned spaces can be turned off when unoccupied.
- Consider using carbon dioxide (CO<sub>2</sub>) sensors that modulate outside air requirements according to internal CO<sub>2</sub> loads. This can increase the performance of the plant by controlling the amount of outside air introduced to the space.
- Heat recovery applications should be considered to reclaim energy from waste air. This allows outside air to be pre-conditioned by the old air that is being exhausted from the building, thus reducing overall energy demand.
- The use of ceiling fans in conjunction with air conditioning allows the temperature setting to be raised, reducing the energy use and costs. The ceiling fan won't reduce the temperature in a room, but the moving air increases the amount of evaporation from an occupant's skin and helps to cool them.

#### Further Guidance:

- EER of a range of common air-conditioning units  
<http://www.energyrating.gov.au/appsearch/download.asp>
- Fresh air economy cycles  
[http://www.seav.vic.gov.au/manufacturing/sustainable\\_manufacturing/resource.asp?action=show\\_resource&resourcetype=2&resourceid=32](http://www.seav.vic.gov.au/manufacturing/sustainable_manufacturing/resource.asp?action=show_resource&resourcetype=2&resourceid=32)

## 5) Sub-Metering

Energy sub-metering provides improved monitoring and visibility of energy consumption in real-time, enabling ongoing management of energy consumption. Consider metering different functional areas and/or tenancies separately, and separately metering large loads (for example > 100kVa). Consider also providing a user interface for easy monitoring of metering outputs.

### Further Guidance:

- Electricity sub-metering  
<http://www.dip.qld.gov.au/sustainable-housing/electricity-submetering.html>

## 4.1 Water Conservation

### 1) Efficient Fittings and Appliances

Potable water consumption for in-occupant amenities, such as bathrooms and tea rooms, accounts for about 40% of a typical office building's consumption. The use of water efficient fittings and appliances has the potential to greatly reduce consumption.

The Australian Government has implemented a Water Efficiency Labelling and Standards (WELS) Scheme which covers most fittings and appliances such as showerheads, taps, toilets, urinals, washing machines and dishwashers. The system mirrors the 6-star Energy Star rating system for energy efficiency. The use of high efficiency fittings and appliances is encouraged and is beneficial from a cost and consumption perspective.



Note: The definition of 'most efficient' in terms of number of stars differs by product category. (E.g. the maximum stars in the shower category is 3 stars while the scale for urinals ranges between 1 and 6)

### Further Guidance:

- Water Efficiency Labelling and Standards (WELS) Scheme  
<http://www.waterrating.gov.au/>
- Save water  
<http://www.savewater.com.au>

### 2) Metering

Water meters allow for the monitoring of water consumption and can help with diagnosis of leaks. It is recommended that major water uses throughout the property be separately metered to improve the efficacy of monitoring. These may include bathrooms, showers, evaporative heat rejection systems, irrigation systems, wash-down systems, recycled water supply, rainwater supply and humidifiers. It is recommended the metering information be displayed via an easily accessible monitoring system.

### Further Guidance:

- Save water  
<http://www.savewater.com.au>
- DERM information on water metering  
<http://www.derm.qld.gov.au/water/use/index.html>

### 3) Landscape and Site Works

Reducing potable water demand of landscape irrigation requires consideration of plant species selection, placement and the requirement for irrigation. Integration of water harvesting and water sensitive urban design (**WSUD**) techniques can minimise run-off and evaporation, reducing the need for irrigation and completely negating the need for access to the potable water supply. The use of these design techniques will also have positive downstream benefits.

Some principles include:

- use a thick and regularly replenished layer of organic and inorganic mulch to reduce evaporative loss on planted areas;
- use native species appropriate for the climate and situation and removing lawns and turf;
- position plants with similar watering needs together;
- plan for passive irrigation of planting areas (i.e. using stormwater to irrigate, includes WSUD techniques);
- utilise water efficient irrigation systems such as drip irrigation and rainfall sensors for harvested water use.

Other consideration for landscape selection will include the use of non-flowering/ fruiting plants in accordance with airport guidelines and selection of species that can withstand high winds and saturated ground.

#### Further Guidance:

- *Stormwater Harvesting*  
<http://waterbydesign.com.au/stormwaterharvesting-2/>
- *Sustainable buildings and tropical design*  
<http://www.dip.qld.gov.au/regional-planning/regional-plan-3.html> (4.5 Sustainable buildings and tropical design, p86)
- *Cairns Region Botanical Gardens*  
[http://www.cairnsregionalbotanicgardens.com.au/what\\_can\\_i\\_learn/central\\_queensland\\_coast\\_bioregion](http://www.cairnsregionalbotanicgardens.com.au/what_can_i_learn/central_queensland_coast_bioregion)

## 5.1 Reduced Emissions

### 1) Waste Recycling

Australians generate almost 180 tonnes of waste per person per year. Many items such as paper, plastics, cardboard, bottles and organic waste can be recycled or composted to avoid disposal to landfill. Recycling waste can also save energy associated with the manufacture and transport of materials.

The inclusion of a conveniently located area/s within the property reserved for storage of a variety of recycling bins will encourage better occupant behaviours in relation to recycling. The provision of an adequately sized storage area for the collection of recyclable materials can also facilitate the reduction of waste to landfill.

The space should allow for separate storage of paper, glass, plastics, metals and organic materials. As a guide, the Green Star Office Design and Office As-Built V3 tool recommends the following area be provided for waste and recyclables collection.

Gross Floor Area (m2)	Minimum Area of Storage Space (% GFA)
500	1.5%
1,000	0.80%
5,000	0.35%

**Further Guidance:**

- Council of the City of Sydney, *Policy for Waste Minimisation in New Developments*  
<http://www.cityofsydney.nsw.gov.au/development/documents/PlansAndPolicies/Policies/WasteCodeForNewDevelopments.pdf>

**2) Stormwater**

Storm water has the potential to carry harmful contaminants, litter and nutrients into waterways where they can cause adverse impacts. In addition the release of large quantities of water at high velocity has negative impacts on drainage systems and waterways. Given the proximity of the airport to sensitive marine environments the effective management of stormwater on site is an important priority.

The desired outcome, as promoted by Water Sensitive Urban Design practices and guides such as the Queensland Urban Drainage Manual, is to detain stormwater on site and slow its release to the receiving environment, and treat or filter water to remove gross pollutants and contaminants. Current best practice is to plan for two drainage systems to deal with different rain events, namely:

- A system of piped drains, or formed swales, traps and detentions devices that are sized to handle water from general rain events and achieve the desired level of detention and treatment.
- A planned overland flow path, sized to manage the velocity and quantity of water leaving the site in more extreme storm events.

This best practice approach has been adopted for new projects at the airport. The provision of a rainwater and stormwater harvesting system that diverts stores and treats stormwater runoff for re-use in feature landscape areas can contribute to this outcome and reduce potable water use in landscaping.

Other strategies to manage stormwater impacts include:

- reduce hard surfaces;
- use of landscape areas, riparian buffer zones and vegetated filter strips;
- oil and sediment arresters;
- gross pollutant traps;
- sand filters, grassed swales, porous/permeable pavements; and
- pollution control ponds.

### Further Guidance:

- *Water sensitive urban design: Design objectives for urban stormwater management:*  
<http://www.dip.qld.gov.au/resources/guideline/final-wsud-guideline-pdf-11-11-09.pdf>
- *Stormwater Harvesting*  
<http://waterbydesign.com.au/stormwaterharvesting-2/>
- *CSIRO Water sensitive urban design:*  
[www.publish.csiro.au/samples/UrbanStorm.pdf](http://www.publish.csiro.au/samples/UrbanStorm.pdf)

### 3) Light Spill

Indoor and outdoor lighting can cause nuisance to nearby properties, disturb wildlife, pollute the night sky and create glare that affects the safety of road users or aircraft. Lighting should be designed such that:

- no light beam, indoor or outdoor is directed at any point in the sky hemisphere without falling directly onto a non-transparent surface;
- no flashing or sodium lights are included;
- outdoor lighting design complies with AS4282 “Control of the Obtrusive Effects of Outdoor Lighting”; and
- 95% of outdoor spaces do not exceed the minimum requirements of AS1158 “Lighting for Roads and Public Spaces” for luminance levels.

### Further Guidance:

- *International Dark Sky Association*  
<http://www.darksky.org>

## 6.1 Quality Indoor Environment

### 1) Access to Natural Light

Studies show that natural light has a positive impact on the health and well-being and therefore productivity of building occupants. The amount of natural light available is influenced by factors such as the design of the floor plan, the location of skylights and windows, the presence of partitions and walls, shadowing from external plants and structures as well as the reflectance values of internal wall, floor and ceiling colours.

The following general principles will achieve greater access to natural lighting internally:

- ample provision of windows and glazing on the north and south faces;
- a narrower floor plate;
- open planned floor space,
- locating partitioned spaces away from the building perimeter and use of glazing in partitions; and
- the use of lighter shades of colour which enhance internal reflectance.

Natural light can increase internal glare for building users. Glare can be controlled through:

- using external shades or screens; or
- providing manually controllable blinds; and
- using plants to filter glare and reflection.

### Further Guidance:

- *AS1680.1-2006: Interior and workspace lighting – General principles and recommendations*
- *Daylighting of Buildings*  
<http://www.yourbuilding.org/library/DES06.pdf>

## 2) Harmful Materials

Some materials used in building interiors can impact negatively on the health and wellbeing of occupants. Harmful materials commonly associated with existing buildings include asbestos, lead and polychlorinated biphenyls (PCBs) (found in fluorescent lighting ballasts). The use of these materials is now illegal in Australia. Where they are found on a site, they must be removed under acceptable methods defined under Australian regulations.

### Further Guidance:

- *Asbestos - Asbestos in Australia*  
<http://www.asbestosaustralia.com.au/>
- *Asbestos - Code of Practice for Safe Removal of Asbestos 2nd Edition [NOHSC:2002(2005)]*  
<http://www.safeworkaustralia.gov.au/NR/rdonlyres/1A198A7C-D0A7-40AD-964E-31673C695E92/0/AsbestosCode.pdf>
- *Lead – AS4361 ‘Guide to Lead Paint Management’*
- *PCBs – ANZECC Polychlorinated Biphenyls Management Plan*
- *General - Exposure standards for atmospheric contaminants in the occupational environment:*  
<http://www.safeworkaustralia.gov.au/swa/HealthSafety/HazardousSubstances/Standards+and+Codes+of+Practice/ExposureStandards.htm>

## 3) Volatile Organic Compounds

Volatile organic compounds (VOCs) are found in many internal finishes, including paints, adhesives, carpets, sealants, reconstituted wood products and new furniture. They emit noxious particles into the air that have a detrimental effect on indoor air quality and can cause health problems. Alternative products with lower VOC content are now readily available. The improvement in air quality in indoor environments where these products are used is immediately noticeable.

The measure of the total VOC (TVOC) in a product is measured as grams per litre (g/l) of ready-to-use product. The TVOC values for products can normally be found in manufacturer-supplied datasheets. Recommended limits of VOCs for common products are provided in the Green Star Office Design and Office As-Built V3 tool and are becoming widely accepted as an Australian benchmark. The following table reproduces that information.

Product Type	Sub Category	Max TVOC (g/l)
<b>Paint</b>	Walls and ceilings – interior semi gloss	16
	Walls and ceilings – interior low sheen	16
	Walls and ceilings – interior flat washable	16
	Ceilings – interior flat	14
	Trim – gloss, semi-gloss, satin, varnishes and wood stains	75
	Timber and binding primers	30
	Latex primer for galvanized iron and zincalume	60
	Interior latex undercoat	65
	Interior sealer	65
	One and two pack performance coatings for floors	150
	Any solvent based coatings whose purpose is not covered in this table	200
	<b>Adhesives and Sealants</b>	Indoor carpet adhesive
Carpet pad adhesive		50
Wood flooring and laminate adhesive		100
Rubber flooring adhesive		60
Sub-floor adhesive		50
Ceramic tile adhesive		65
Cove base adhesive		50
Dry wall and panel adhesive		50
Multipurpose construction adhesive		70
Structural glazing adhesive		100
Architectural sealants		250

Carpet VOCs are measured differently. The levels recommended in the Green Star suite of tools are as follows.

Emission	mg/m2 per hour
Total VOC limit	0.5
4-PC (4-Phenylcyclohexene)	0.05

## Further Guidance:

- *Guidance Note on the Interpretation of Exposure Standards for Atmospheric Contaminants in the Occupational Environment NOHSC 3008(1995) 3rd Edition*  
<http://www.safeworkaustralia.gov.au/swa/AboutUs/Publications/NationalStandards/GuidanceNoteontheInterpretationofExposureStandardsforAtmosphericContaminantsintheOccupationalEnviron.htm>
- *Air toxics and indoor air quality in Australia*  
<http://www.environment.gov.au/atmosphere/airquality/publications/sok/chapter6.html>
- *Good Environmental Choice product register*  
<http://www.geca.org.au/productsregister.htm>
- *Australian Voluntary Environmental Labelling Standard, GECA 23-2005: Architectural and Protective Coating:*  
[http://www.geca.org.au/standards/GECA%2023-2005%20-%20Architectural%20&%20Protective%20Coatings\\_current%201%20april%202010.pdf](http://www.geca.org.au/standards/GECA%2023-2005%20-%20Architectural%20&%20Protective%20Coatings_current%201%20april%202010.pdf)
- *Ecospecifier*  
<http://www.ecospecifier.org/>

## 4) Formaldehyde

Composite timber products such as plywood and MDF board contain formaldehydes, which, like VOCs, off-gas into the indoor environment and impact on air quality and occupant health. Low or zero formaldehyde products are commonly available as an alternative.

- *Air toxics and indoor air quality in Australia*  
<http://www.environment.gov.au/atmosphere/airquality/publications/sok/formaldehyde.html>

## 5) Fresh Air

The amount of clean air in buildings has a direct influence on occupant health and productivity. The lack of clean air is a known cause of sick building syndrome, a condition whereby building occupants repeatedly suffer illnesses and losses in productivity due to the continual presence of air-borne pollutants and bacteria. These pollutants are generated by occupants, VOCs, mould and emissions from equipment such as photocopiers. A regular rate of replacement of vitiated air with clean air is an effective means of preventing sick building syndrome.

The ASHRAE Standard 129-1997: 'Measuring Air Change Effectiveness' provides a method for measuring air-change effectiveness (ACE) which is the measure of how well polluted air is exchanged with fresh air. Improving ACE involves designing ventilation and air-conditioning configurations to promote natural air intake and expulsion of polluted air.

Some strategies to improve fresh air quantities and air change effectiveness are discussed below. It is recommended that advice is also sought from a mechanical engineer or ESD consultant.

- Avoid the use of split system air-conditioning systems that do not introduce fresh air. If using them provide an additional source of fresh air.
- Plan the location of fresh air outlets and return grilles to use effective distribution of air.
- Design air-conditioning systems to introduce more fresh air than the minimum required by Australian Standards.
- Consider floor displacement systems that provide a superior quality of air because it circulates through the space once only.
- Introduce openings that can be used to admit fresh air in favourable conditions.
- Use plants throughout the building to improve air quality.

## Further Guidance:

- Fresh air the cure for sick buildings:  
<http://www.csiro.au/files/mediaRelease/mr1999/SickBuildings.htm>
- ASHRAE  
<http://www.ashrae.org>
- Air toxics and indoor air quality in Australia  
<http://www.environment.gov.au/atmosphere/airquality/indoorair/index.html>

## 7.1 Materials Efficiency

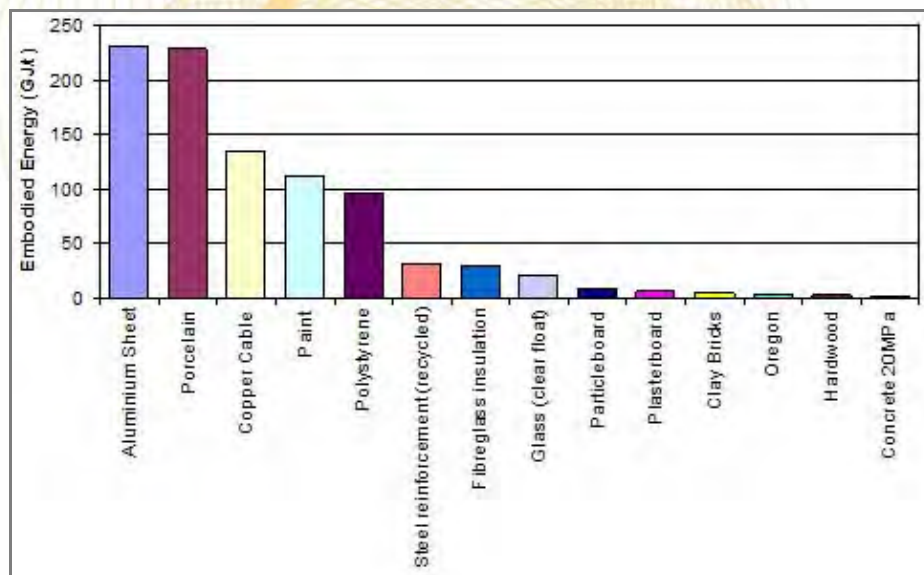
The construction industry consumes a significant quantity of Australia's raw materials, energy and resources, and construction waste accounts for a significant portion of all waste generated. Careful planning during design, construction and operation can reduce these impacts. Common strategies are summarised below.

### 1) Materials with Lower Embodied Energy

Manufacturing processes for many building materials are highly energy intensive; this is increased by freight costs where products are not locally made, and by the costs of mining or extracting raw materials. The embodied energy of different materials is shown in **Figure 1** below.

Some of the more energy intensive materials include concrete, steel and other metal products. Options to reduce embodied energy of these common products include:

- reducing the cement content in concrete mixes, the addition of industrial waste products such as fly ash can achieve this;
- using recycled aggregate in concrete;
- using post-consumer recycled steel in place of virgin steel;
- using other metal products with recycled content, such as aluminium.



**FIGURE 1: Embodied Energy of Common Building Materials, Source: CSIRO, 2007**

## 2) Materials with Recycled Content

The use of recycled materials, or materials with recycled content, in the construction of buildings and landscaping can divert materials from landfill and at the same time reduce the embodied energy/emission content of the construction. There are an increasing number of products that have such content, including wall lings, ceiling tiles, composite board, flooring, steel, decking and furniture.

## 3) Sustainably Manufactured Products

In response to market demand, materials manufacturers are implementing improved processes to reduce the environmental impact of manufacturing. A number of independent product certifications can inform product choices. Look for the following accreditation systems, with more schemes expected to appear on the market in the coming year.

- Forest Stewardship Certified (FSC). The Australian FSC scheme and similar international initiatives certify that timber is sourced from sustainably managed forests.
- Good Environmental Choice Australia (GECA). GECA certifies the environmental design and manufacturing credentials of Australian furniture, fittings, furnishings and panel boards.
- Carpet Institute of Australia Limited, Environmental Certification Scheme (ECS) v1.1.
- Ecospecifier GreenTag Green Rate v2.4.
- Australasian Furnishing Research and Development Institute (AFRDI). Sustainability Standard for Commercial Furniture - AFRDI Standard 150 -June 2010.

## 4) Materials that can be Recycled at End of Life

The content of a product, and the way it is designed or manufactured, influences whether the product can be easily recycled or reused at the end of its life. The ability to recycle materials when a building is refurbished or demolished reduces the load to landfill significantly. Some manufacturers will provide advice on end of life recycling. Think also about designing components in a modular form so they can be re-arranged and re-used, and about marking and labelling components, particularly structural members.

## 5) Waste Reduction During Construction

Changes to onsite management of construction waste can achieve reductions in waste to landfill as high as 80%. This includes strategies to reduce waste and off-cuts in the first instance, and separation of waste on site to maximise the quantity of waste sent for recycling rather than landfill. Consider locating recycling bins in prominent locations on the building site to improve these practices.

### Further Guidance:

- ASHRAE  
<http://www.ashrae.org>
- Assessing Embodied Energy  
<http://www.yourhome.gov.au/technical/fs52.html>
- Greening the building lifecycle  
<http://buildlca.rmit.edu.au/decisiontool/embodiedenergy.html>
- Green Building Council of Australia  
<http://www.gbca.org.au/green-star/materials-category/>

## 8.1 Alternative Transport

### 1) Fuel Efficient Transport

Using a smaller, more fuel efficient vehicle can assist in reducing air pollution and greenhouse gas emissions. Limiting the number of larger parking spaces, and therefore making it easier to travel in and park smaller cars can influence behavioural change.

The AS/NZS2890.1:2004 specifies that a small car space shall be physically limited to 2.3m by 5.0m.

#### Further Guidance:

- *Green Vehicle Guide*  
<http://www.greenvehicleguide.gov.au/>

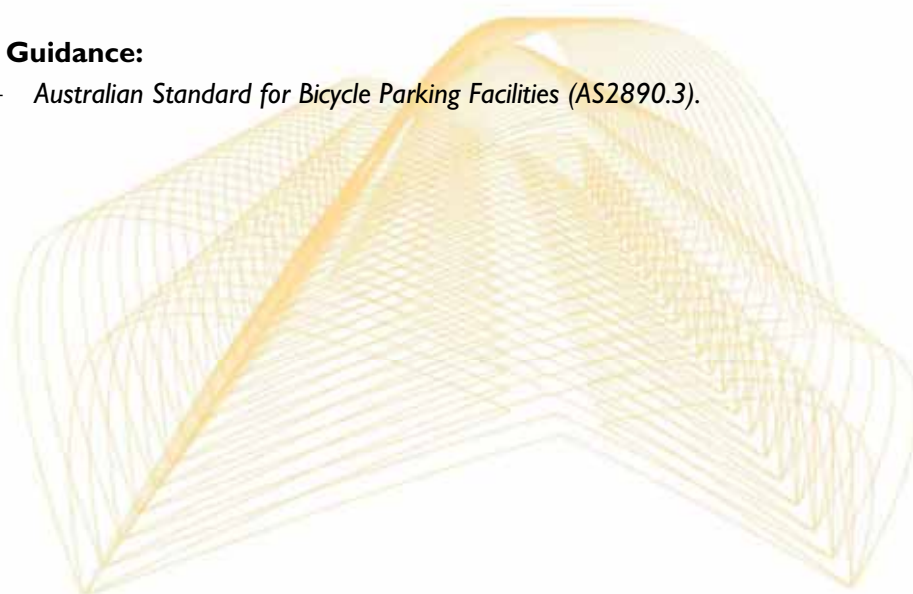
### 2) Cyclist Facilities

The provision of bicycle facilities such as secure storage, showers, changing facilities and lockers can encourage the use of bicycles by occupants and visitors,

- Secure storage could comprise covered bicycle racks located in visible and accessible positions to which the bike frame can be locked, or a secured staff-only locked bicycle shed.
- Showers should be adequately sized for dry storage of personal belongings whilst showering and include space for changing.
- Lockers should be sized adequately for office clothing and not smaller than 80cm x 25 cm for box lockers or 180cm x 40cm for L-shaped double lockers.

#### Further Guidance:

- *Australian Standard for Bicycle Parking Facilities (AS2890.3).*



# appendix I

## index & glossary of abbreviations & acronyms



ABBREV.		ABBREV.	
<b>AAA08</b>	Airport Assets (Restructuring And Disposal) Act 2008 (Qld)	<b>LUP</b>	Land use plan
<b>AEP</b>	Annual Exceedance Probability	<b>MAPL</b>	Mackay Airport Pty Ltd
<b>AES</b>	Airport Environmental Strategy	<b>MCU</b>	Material Change Of Use
<b>ANEC</b>	Australian Noise Exposure Concept	<b>NCAI</b>	Non Core airport infrastructure (i.e. Development Other Than Core airport infrastructure)
<b>ANEF</b>	Australian Noise Exposure Forecast	<b>NLA</b>	Net Lettable Area
<b>ARFF</b>	Airport Rescue & Fire Fighting Services	<b>NQA</b>	North Queensland Airports Ltd
<b>AS</b>	Australian Standards	<b>OLS</b>	Obstacle Limitation Surfaces
<b>BCA</b>	Building Code Of Australia	<b>PANS-OPS</b>	Procedures For Air Navigation Services – Aircraft Operations
<b>Bd</b>	Business Day	<b>PAX</b>	Passengers
<b>BLE</b>	Building Lot Envelope	<b>PIIP</b>	Priority Infrastructure Interface Plan
<b>CAI</b>	Core airport infrastructure	<b>PIP</b>	Priority Infrastructure Plan
<b>CASA</b>	Civil Aviation Safety Authority	<b>PSA</b>	Public Safety Areas
<b>CBD</b>	Central Business District	<b>QDC</b>	Queensland Development Code
<b>CPTED</b>	Crime Prevention Through Environmental Design	<b>QPP</b>	Queensland Planning Provisions
<b>DEO</b>	Desired Environmental Outcomes	<b>RESA</b>	Runway End Safety Area
<b>DERM</b>	Department Of Environment And Resource Management	<b>ROL</b>	Reconfiguring A Lot
<b>EMP</b>	Environmental Management Plan	<b>RPT</b>	Regulated Public Transport
<b>ESD</b>	Ecologically Sustainable Development	<b>RSTEL</b>	Recommended Storm Tide Event Level
<b>GFA</b>	Gross Floor Area	<b>SPA</b>	Sustainable Planning Act 2009 (Qld)
<b>HES</b>	High Ecological Significance	<b>SPP</b>	State Planning Policy
<b>IATA</b>	International Air Transport Association	<b>TIA</b>	Transport Infrastructure Act 1994 (Qld)
<b>ICS</b>	Infrastructure Charges Schedule	<b>TOD</b>	Transit Oriented Development
<b>IDAS</b>	Integrated Development Assessment System	<b>WHAM</b>	Whitsundays, Hinterland and Mackay
<b>IPA</b>	Integrated Planning Act 1997 (Qld) (Repealed)		