SYDNEY PORTS CORPORATION

Green Port Guidelines

Sustainable strategies for port developments and operations

SYDNEY PORTS
FIRST PORT, FUTURE PORT

Contents

Cover image: Foreshore Beach (Port Botany) will be upgraded as part of the Port Botany expansion.

Introduction

Companies seeking a competitive advantage or wanting to enhance their environmental credentials have much to gain by proactively pursuing sustainable business practices.

Sydney Ports Corporation has a significant role to play in the management of two of Sydney's most precious natural resources, Sydney Harbour and Botany Bay. We are active in protecting these community assets and are committed to minimising impacts on the environment.

In creating these Green Port Guidelines, our aim is to encourage port developers and operators to adopt sustainable business approaches and to encourage innovation in design and operation.

The Guidelines and accompanying Checklist provide some simple strategies and practices to demonstrate how developments can be both environmentally friendly and commercially viable. They have been designed to incorporate additional marketable outcomes such as potential Green Star accreditation.

By taking a proactive approach to simple environmental solutions such as reducing energy consumption and careful material selection we can manage impacts on local communities and together contribute to making our ports a 'greener' place.

About this guide

These Green Port Guidelines have been developed by Sydney Ports Corporation to improve the environmental sustainability of new developments and to encourage continuous environmental improvement of existing activities on the port.

When to use these guidelines

Developers will be asked to incorporate suggestions from the Green Port Guidelines during the planning and application stages of a new project, operation or activity at the port. Applicants will be asked to demonstrate this by completing the associated Green Port Guidelines Checklist. Sydney Ports will in turn assess the extent to which the Guidelines have been addressed in each proposal.

In addition to the design stage, the Guidelines can also be applied to construction, fit out and ongoing operational stages of a project and therefore Sydney Ports may request that the Checklist is submitted at the time of preparing a Construction EMP or Operational EMP, for example.

How to use these guidelines

The Green Port Guidelines identify ten key environmental issues that concern most port operations and facilities:

1. Resource consumption

- 1.1 Materials selection
- 1.2 Waste management
- 1.3 Water consumption
- 1.4 Energy use
- 1.5 Transportation

2. Environmental quality

- 2.1 Indoor environment
- 2.2 Emissions
- 2.3 Water quality
- 2.4 Land use
- 2.5 Environmental management

Under each of these headings are a series of goals in the form of criteria to be considered or addressed. Measures are suggested to address each of these criteria.

It should be noted that these suggested measures are not the only ones that can be implemented – applicants are particularly encouraged to suggest alternative and innovative measures that may be more specific or relevant to their facility or operation.

Green Star

Green Star is a voluntary rating scheme developed by the Green Building Council of Australia. Green Star is currently only available for use on commercial buildings (offices), while other tools for education, health and retail facilities are under development. As such many items from Green Star are not relevant to port operations and developments. Where possible, aspects that address Green Star requirements have been included and highlighted (as indicated below) in the Green Port Guidelines so that, if achieved, this may assist the tenant/applicant in achieving Green Star certification as well. Further information on the Green Star scheme is available from www.gbcaus.org.

★ Modified from Green Star – Office Design, v1

Stages of development

Each recommended measure has been flagged according to the project stage(s) to which it applies:

D Design of a new facility, building or major alterations

F Fit out (interior)

C Construction activity

O Operation

This will assist in prioritising which issues to address and judging which are not applicable. This approach recognises that sustainability should be integrated at all stages of a development and seeks to encourage continual improvement.

Benefits

The final three columns of the Guidelines summarise the business case in terms of the following:

– Benefits (environmental, social and/or health)

– Ease of use/implementation (availability and/or required expertise)

– Return on investment (capital cost, maintenance, payback period and/or cost savings)

These three categories are intended to assist in prioritising areas to be addressed and in identifying appropriate measures.

A three tiered rating system has been implemented across the three categories:

Symbol	General definition
✓✓✓	Good
✓✓	Moderate
✓	Minimal

Using this system, an assessment was made of each of the suggested measures with the corresponding rating (minimal, moderate or good) provided for each category (benefits, ease of use and return on investment). For example a suggested measure with good benefits, good ease of use and good return on investment might be prioritised over a suggested measure with minimal benefits, minimal ease of use and minimal return on investment – in effect this means the more tick symbols the better!

Abbreviations and definitions

A glossary is provided to define acronyms or technical words used in the Guidelines.

Checklist

A Checklist has been provided at the end of the Guidelines. The completed Checklist is to accompany all applications for new developments or activities submitted to Sydney Ports, or when requested by Sydney Ports, for example when an Operational EMP is submitted.

An electronic version of the Guidelines and Checklist is available at www.sydneyports.com.au.

Resource consumption

1.1 Materials selection

Materials require lots of energy and water during extraction, manufacture and transportation. Materials from non-renewable resources also destroy valuable natural resources, such as trees and woodlands.

By using building materials efficiently and increasing the use of recycled materials and materials with a high recycled content, we can reduce waste, natural resource consumption and emissions. Materials should be sourced locally where possible to further lower the embodied energy of port facilities, developments and operations.

Item no	Purpose/criteria	Suggested measures
R1	Reduce the quantity of new materials being used by reducing or reusing materials or by utilising recycled materials.	Set targets to promote the reduction of materials use (such as % of building to be constructed from recycled materials).
		★ Reuse elements of the existing building/ facility where possible (such as the façade or structure).
		Purchase furniture and other office/facility items that are reused or contain recycled content.
		★ Use recycled materials in the building/ facility construction (such as recycled concrete for roadbase, recycled steel, recycled concrete or timber).
R2	Encourage environmentally friendly production of materials.	★ Use timber and composite timber products from recycled or sustainably managed sources.
		★ Avoid or minimise the use of PVC plastic where possible.
		Give preference to suppliers with EMSs (preferably externally certified) and environmentally friendly supply chains.

	Stages of development	Environmental/social/ health benefits	Ease of use/ implementation	Return on investment
	D F C O	✓✓ Reductions in new material production and use can be achieved.	✓✓✓ Can be easily achieved – depending on the targets and strategy implemented.	✓✓ Depending on the strategy/target, cost savings can occur through reduced material use.
	D	✓✓ Reductions in new material production and use can be achieved. May also preserve cultural heritage/identity.	✓ Dependent on the building condition/facilities. Engineering factors need to be considered during design.	✓✓ Depending on the extent of reuse, cost savings can occur through reduced material use and labour costs.
	F	✓✓ Environmental benefits can be achieved by avoiding the purchase of new fixtures and fittings.	✓✓ Can be easily achieved and implemented through purchasing policy, although requires research.	✓✓ Costs may be lower for secondhand items or comparable/slightly higher for items with recycled content – depending on local supplier availability.
	D C	✓✓ Reductions in new material production and use can be achieved.	✓✓ Some effort required to identify appropriate materials to satisfy engineering specifications. However these are generally available e.g. ship breakers recover large quantities of steel.	✓✓ Cost savings can be achieved by avoiding the purchase and transportation of new materials – especially if sourced locally.
	D F C	✓✓✓ Significant environmental benefits from preserving old growth forests and rainforests as CO_2 sinks, ecology habitat and public parks.	✓✓ Can be readily achieved – alternatives are easily available.	✓ Recycled/sustainably produced timber may be comparable in cost or slightly higher.
	D F C	✓ Reduced emission of chlorine in manufacturing process.	✓✓ Alternatives are readily available for some applications (sewage pipes) but not for others (electrical wiring sheaths and conduit).	✓ Alternative materials may be slightly higher in cost.
	D F C O	✓✓ Indirect environmental benefits can be achieved by improving supply chain performance in this area.	✓✓ Can be achieved and implemented through purchasing policy. Suppliers may struggle initially to provide the required information.	✓ Costs may be comparable or higher as choice of suppliers is limited and research is required.

1.1

Materials selection
continued

Item no	Purpose/criteria	Suggested measures
R3	Specify materials that have minimal embodied energy and environmental impact.	Undertake Life Cycle Assessment (LCA) of building materials – considering the embodied energy.
		Specify low maintenance and durable materials.
		Specify and procure locally available materials to reduce transportation requirements.
R4	Consider the end of life of materials and the whole building, design for deconstruction.	Consider the potential recyclability and reuseability of the building/facility and its components at end of life.

Resource consumption

	Stages of development	Environmental/social/ health benefits	Ease of use/ implementation	Return on investment
	D	✓✓ Environmental benefits through reduced embodied energy and hence greenhouse gas emissions.	✓ Requires a detailed study and assessment.	✓ Additional cost required for study, will not necessarily lead to cost savings.
	D F C	✓✓ Expected life span of material is increased and maintenance requirements decreased, leading to a reduction in waste generation.	✓✓✓ Can be easily achieved and implemented through purchasing policy.	✓✓ Capital costs may be higher due to fewer product choices, but life costs are lower through reduced maintenance and replacement costs.
	D F C	✓✓ Brings economic benefits to local industries and minimises greenhouse gas emissions through reduced transportation requirements.	✓✓ Depending on location and local availability, may be easily achieved.	✓✓ Introduces new supply options, but costs depend on product selection and terms. Reduced transportation component may result in savings.
	D	✓✓ Environmental benefits by avoiding significant waste in the future.	✓✓ Can be readily achieved if the input into the design is considered upfront.	✓✓ Cost savings will result if building/facility is required to be dismantled and/or removed at end of life.

1.2

Waste management

The availability of suitable land for landfill is decreasing while concern about the environmental and health impacts of landfill sites is increasing. We can reduce the amount of waste going to landfill by minimising the generation of waste in the first place and then reusing or recycling as much as possible.

This has the added advantage of preserving natural resources, reducing energy requirements (with associated greenhouse gas emissions) and cutting costs.

Item no	Purpose/criteria	Suggested measures
W1	Minimise the generation of wastes.	★ Implement a waste management plan, including identification of opportunities to reduce the amount of waste being disposed of at landfill.
		Use prefabricated materials rather than those constructed on-site. Use standard sizing for materials to avoid generating waste from off cuts.
		Instruct contractors and suppliers to minimise packaging and select materials with less packaging.
W2	Facilitate recycling to reduce the amount of waste going to landfill.	★ Provide a dedicated storage area for the separation, collection and recycling of waste with good access for all building occupants and for collection by recycling companies.
		Recycle timber, concrete, bricks, cardboard and aluminium.

Stages of development	Environmental/social/ health benefits	Ease of use/ implementation	Return on investment
D F C O	✓✓✓ Significant environmental benefits by avoiding and reducing the generation of waste and minimising the volume of waste going to landfill.	✓✓ Some design and investigation required. Ease of implementation is dependent on plan.	✓✓ Small cost to create plan, but should result in cost savings from reduced disposal of waste to landfill.
D F C	✓✓ This will result in a reduction of material use and production of less waste.	✓✓ Some preplanning required during design and operation. Materials should be readily available.	✓✓ May result in cost saving by reducing waste disposal and labour costs, but there may potentially be increased costs for transportation and specific material requirements.
F C O	✓✓ Potential to reduce waste on-site and improve the environmental performance of the supply chain.	✓✓ Negotiation and discussions required with contractors and suppliers.	✓✓✓ Not costly to implement and should result in cost saving through reduced waste disposal and landfill costs.
D O	✓✓✓ Significant environmental benefits by making it easy to separate and recycle wastes. For example every tonne of paper recycled saves over 12 trees plus considerable amounts of oil, electricity, water and landfill space *(Visy)*.	✓✓ Some design and infrastructure required. Space needs to be dedicated for sorting and storage.	✓✓ Cost associated with construction and space requirements, however costs of disposing waste to landfill will decrease.
F C	✓✓✓ Significant environmental benefits through reduced material use, energy and water savings for production, and reduced landfill space. Construction and demolition waste accounts for 40% of waste disposed to landfill *(EcoRecycle Victoria)*.	✓✓✓ Most waste contractors will recycle construction waste. Contract clauses and on-site verification require minimal additional management effort.	✓✓ Cost to recycle should be equivalent to disposing. May be some cost saving if recycled on-site and reused.

1.2

Waste management
continued

Item no	Purpose/criteria	Suggested measures
		Recycle paper/cardboard, glass, PET plastic and aluminium cans.
		Recycle green waste (for example by chipping and mulching on-site).
		Monitor quantities (volume and/or weight) of waste recovery.
		Make provisions for likely future required increase in recycling storage area.
W3	Ensure the safe storage and handling of hazardous wastes.	Identify hazardous wastes and secure appropriate licences/approvals. Ensure correct handling and storage of hazardous wastes and removal/disposal by licenced contractor to approved facility.

	Stages of development	Environmental/social/ health benefits	Ease of use/ implementation	Return on investment
	C O	✓✓✓ Significant environmental benefits through reducing waste that would be disposed of as landfill. It is often more energy efficient to recycle – for example recycled aluminium can cut energy costs by up to 95 per cent *(DITR)*.	✓✓✓ Most waste contractors will recycle these wastes.	✓ Cost to recycle should be equivalent to disposal.
	C O	✓ Environmental benefits through avoiding waste to landfill and enhancing soil quality.	✓✓ Most waste contractors will recycle green waste or can be recycled on-site.	✓✓ Cost benefits from reusing waste as mulch for landscaping.
	F C O	✓ Allows waste reduction to be monitored and quantified. Benefits are realised through setting targets.	✓✓✓ Most waste contractors will provide this information.	✓✓ Minimal additional time cost involved.
	D	✓ Benefits may be reaped in the future as technology progresses to increase recycling opportunities.	✓✓ Some design and infrastructure required.	✓✓ Cost associated with construction and space requirements, however likely to be offset by planning now for future requirements.
	F C O	✓✓✓ Significant environmental and health and safety benefits. Compliance with legislative requirements.	✓✓ Dependent on type and quantity of hazardous waste.	✓✓ Cost will be dependent on type and quantity. Costs will reduce if demonstrating compliance with legislation.

1.3

Water consumption

Water is a precious resource. Sydney's water supplies are under increasing pressure from factors including drought, catchment location, population increase and rising demand. By reducing our water consumption, we can make better use of existing water resources and maintain water availability.

Developers, owners and tenants will further benefit from implementing the suggested measures through cost savings from reduced consumption and early identification of leaks.

Item no	Purpose/criteria	Suggested measures
H1	Reduce the consumption of potable water used internally.	★ Install water efficient fixtures and fittings (AAA rating system or above) such as toilets, urinals, showerheads, taps, hoses and basins. Infrared or waterless urinals could also be considered.
		Purchase water efficient appliances (AAA rating system or above) such as dishwashers and washing machines.
		★ Reduce potable water demand through the efficient use/avoidance of evaporative or water cooling tower systems. Alternatively recycled water (treated rainwater) could be used for the cooling tower make up.
		Ensure that the water source is suitable and that the sustainable yield has been calculated for any water extracted from the ground.
H2	Manage and monitor water usage and any leaks.	★ Install water sub-meters for all major water uses in the building, such as cooling towers, irrigation and washdown and hot water services plus separate tenancies. Monitor main and sub-meters to detect leaks.

	Stages of development	Environmental/social/ health benefits	Ease of use/ implementation	Return on investment
	D F C	✓✓ Reduction in potable water consumption will be dependent on the size of the facility.	✓✓✓ Easily and readily available. Installation and use equivalent to non-water efficient fittings.	✓✓✓ Capital cost is comparable to non-water efficient fittings. Cost benefits associated with the reduction in use of potable water and energy for hot water use.
	D F O	✓✓ Reduction in potable water consumption – AAA-rated dishwashers use as little as 18 litres of water per cycle as opposed to 40 litres *(Sydney Water)*.	✓✓✓ Easily and readily available. Installation and implementation equivalent to non-water efficient fittings.	✓✓✓ Capital cost is comparable to non-water efficient appliances. Cost benefits associated with the reduction in use of potable water and energy for hot water use.
	D O	✓✓ Reduction in potable water consumption (water cooling towers can use 30% of a commercial building's total water consumption). Reduced risk of *legionella* if no cooling towers are used. However energy may increase as a result of using alternative cooling.	✓✓ Needs to be considered and incorporated upfront. Readily available – conventional design approach.	✓ Reduced costs in water consumption. However additional energy costs will be incurred when air cooled equipment is used instead of water cooled.
	D C O	✓✓✓ Significant environmental benefits by protecting scarce water supplies. Compliance with legislative requirements.	✓✓ Information should be readily available. Monitoring may be required.	✓✓ Requires investment upfront and costs to monitor. However there may be cost savings in reduced potable water consumption.
	D F C O	✓✓ Allows easy and quick identification of leaks and rapid response. Also monitoring of water use. One leaking tap can waste more than 2,000 litres a month of water *(Sydney Water)*.	✓✓ Systems readily available, but requires monitoring.	✓✓ Requires investment upfront and costs to monitor. However if a leak is identified, there may be significant cost savings.

1.3

Water consumption
continued

Item no	Purpose/criteria	Suggested measures
H3	Reduce the quantity of potable water used for landscape irrigation.	Use native (local) plants for landscaping and xeriscaping to reduce irrigation water demand.
		★ Source irrigation water from on-site rainwater collection or recycled site water (such as greywater).
		★ Provide and maintain a water efficient irrigation system comprising subsoil drip systems and automatic timers with rainwater or soil moisture sensor override systems.
H4	Treat water on-site and reuse the treated water to reduce demand on the local potable water supply and the demand on the local infrastructure.	★ Provide a rainwater harvesting system (rainwater tank) and use rainwater to reduce consumption of potable water.
		★ Provide a greywater collection and treatment system. Reuse treated greywater.
		★ Provide on-site blackwater treatment where appropriate and reuse a substantial proportion of treated water.

	Stages of development	Environmental/social/ health benefits	Ease of use/ implementation	Return on investment
	D C O	✓✓ Reduction in potable water consumption and ecological benefits by encouraging native fauna.	✓✓✓ Easily and readily available. Native plants also require less maintenance in most cases.	✓✓✓ Capital cost is comparable to non-native plants. Cost benefits associated with the reduction in use of potable water and increased longevity.
	D C O	✓✓✓ Significant reduction in potable water consumption.	✓✓ Easily and readily available. Design is required prior to installation but use is similar to conventional systems.	✓✓ Capital cost is higher – depending on the system chosen. Cost benefits over time associated with the reduction in use of potable water.
	D O	✓✓ Reduction in potable water consumption by only irrigating when necessary and minimising evaporation.	✓✓ Easily and readily available. Design is required prior to installation but use may be easier than conventional systems.	✓✓ Capital cost is higher – depending on the system chosen. Cost benefits over time associated with the reduction in use of potable water.
	D C O	✓✓✓ Significant reduction in potable water consumption through reuse of rainwater that would otherwise go to stormwater.	✓✓ Easily and readily available. Design is required prior to installation but use can be set up to be similar to conventional systems.	✓✓ Capital cost is higher – depending on the system chosen. Cost benefits over time associated with the reduction in use of potable water. There may be rebates available to offset the cost of rainwater tanks.
	D C O	✓✓✓ Significant reduction in potable water consumption through reuse of wastewater that would otherwise go to sewer.	✓✓ Treatment systems are becoming readily available in small package systems. Design is required prior to installation, but use is similar to conventional systems.	✓ Capital cost can be considerably higher than a conventional system – depending on the system chosen. Cost benefits over time associated with the reduction in use of potable water, however the payback period is generally 12+ years *(Davis Langdon)*.
	D C O	✓✓ Reduction in potable water consumption through reuse of wastewater that would otherwise go to sewer, however can only be used outside so benefits depend on external water requirements.	✓ Package systems are available. Design is required prior to installation and significant ongoing maintenance and monitoring is required.	✓ Capital cost and maintenance costs are significantly higher – depending on the system chosen. Some cost benefits over time associated with the reduction in use of potable water.

1.4

Energy use

Energy use has possibly the greatest environmental impact on port lands. Burning non-renewable fossil fuels to generate electricity leads to greenhouse gas emissions and global warming.

The suggested measures promote more efficient use of energy to reduce consumption, which will in turn save costs. Switching to renewable energy sources such as solar and wind is one way to mitigate the effects of global warming.

Item no	Purpose/criteria	Suggested measures
E1	Reduce energy consumption and hence greenhouse gas emissions.	★ Obtain a minimum (predicted) ABGR rating of four stars (this is applicable to office buildings only at this stage).
		Incorporate passive solar and microclimate design through building orientation, shading, natural ventilation, natural lighting and insulation.
		Provide shading and insulation for refrigerated containers. 'Heat stop' paint could also be used to coat the refrigerated containers.
		Use and maintain low energy and energy efficient terminal and operational equipment (may require retrofits such as diesel oxidation catalysts) and ensure equipment turns off when not required.
		Use and maintain low energy and energy efficient appliances (such as fridges, fans and printers) and ensure appliances turn off when not required.
		Use energy efficient light bulbs or compact fluorescent lights.

	Stages of development	Environmental/social/ health benefits	Ease of use/ implementation	Return on investment
	D	✓✓✓ Significant environmental benefits through reduced energy use.	✓✓ Needs to be incorporated throughout building design.	✓✓ Some investment is required but will result in cost savings during operation.
	D	✓✓✓ Significant environmental benefits through reduced energy use required to heat, cool and light buildings/ facilities.	✓✓ To be considered and incorporated upfront in design stage. Difficult to incorporate later.	✓✓✓ Depending on the design there may be additional capital costs, but pay back can be achieved relatively quickly through reduced energy costs.
	D O	✓ Environmental benefits in terms of reduction of energy required to cool containers.	✓✓✓ Does not need to be a complex system. Simple shading and insulation can result in large benefits. 'Heat stop' paint is commercially available.	✓✓ Small capital cost but cost savings may be achieved in the operation of refrigerated containers.
	D C O	✓✓ Reduction in energy use and associated greenhouse gas emissions.	✓✓ Energy efficient machinery and equipment available, but may need research.	✓✓ Capital cost should be comparable and there will be cost benefits associated with the reduction in use of energy.
	D F C O	✓✓✓ Significant reduction in energy consumption dependent on scale of facilities and use of equipment.	✓✓✓ Easily and readily available. Installation and use equivalent to non-energy efficient equipment.	✓✓ Capital cost should be comparable and there will be cost benefits associated with the reduction in use of energy.
	D F C O	✓✓✓ Significant reduction in energy consumption. Fluorescent lights, including compact fluoros generate only 1/5 as much greenhouse gas as ordinary globes but produce the same amount of light *(DEUS)*.	✓✓✓ Easily and readily available. Installation and implementation equivalent to non-energy efficient equipment.	✓✓ Higher capital cost, but cost savings during operation – high efficiency globes use about 1/5 the electricity of normal incandescent globes reducing energy use by 80% plus they have a much longer life than the incandescent globe, however they can cost up to 10 to 20 times as much to buy (*DITR*).

1.4

Energy use
continued

Item no	Purpose/criteria	Suggested measures
		★ Maintain low power densities for lighting workspaces.
		★ Provide clearly labelled and accessible individually switched lighting zones, dimmers, automatic timers and sensors (inside and out).
E2	Manage the use of energy to minimise consumption.	★ Perform comprehensive pre-commissioning, commissioning and quality monitoring of building services performance.
		★ Provide electrical sub-metering for separate energy uses such as car parks, chillers, air handling fans, lifts and common area lighting and power plus separate tenancies. Monitor main and sub-meters.
		Provide gas sub-metering for separate gas uses plus gas sub-metering for separate tenancies.
		★ Install peak energy demand reduction systems (such as distributed energy systems or energy and thermal storage systems).
		Investigate using water source heat rejection (e.g. via the harbour) instead of dry air coolers.

	Stages of development	Environmental/social/ health benefits	Ease of use/ implementation	Return on investment
	D O	✓✓ Moderate reduction in energy consumption.	✓✓✓ Easily and readily available.	✓✓✓ No additional cost outlay. Cost benefits associated with the reduction in use of energy (most work spaces are overlit).
	D F	✓✓ Moderate reduction in energy consumption. Extended lamp life.	✓✓✓ Systems are readily available and easy for occupants to use.	✓✓ Requires some initial investment and planning. Cost benefits associated with the reduction in use of energy and extended lamp life. Payback period is generally 4+ years *(Davis Langdon)*.
	C O	✓✓ Identification of any energy inefficiencies allows corrective action.	✓✓ Requires engagement of a professional for testing.	✓✓ Can be time-consuming and require consultancy services. However can save money if inefficiencies are detected early on and addressed.
	D O	✓✓ Allows better management of energy usage and identification and rectification of inefficiencies.	✓✓ Easier if installed at construction. Monitoring required.	✓✓ Requires additional capital outlay. However can save money if inefficiencies are detected early on and addressed – potential payback period is two years *(DEH)*.
	D	✓ Benefits are realised in the case of a leak and allows better management of gas usage.	✓✓ Easier if installed at construction. Monitoring required.	✓ Requires additional capital outlay. However can save money if inefficiencies are detected early on and addressed.
	D	✓ Social benefits in terms of reduced load on the infrastructure to allow use by others.	✓ Integration and control issues need to be resolved.	✓✓ Additional upfront costs, but cost savings can be achieved through purchase of off-peak electricity.
	D O	✓✓ Can have environmental benefits by reducing energy consumption, but must be balanced against potential impacts on aquatic ecology.	✓ Requires investigation and design.	✓✓ Requires investment upfront, but can have short payback period through reduction in energy required for cooling.

1.4

Energy use
continued

Item no	Purpose/criteria	Suggested measures
E3	Source energy from renewable sources.	Generate renewable energy on-site and return excess to the grid (e.g. solar power).
		Purchase renewable or 'green' energy for use on-site.
E4	Source energy from alternate energy sources and use less greenhouse intensive fuels (in particular limit diesel use).	Use on-site energy supply (e.g. Combined Heat and Power (CHP)).
		Use alternative cleaner and less greenhouse intensive fuels for cargo handling equipment, vehicles and other operational requirements (e.g. liquefied propane gas (LPG), liquefied natural gas (LNG), compressed natural gas (CNG), fuel cells and biofuel).
		Provide shore-to-ship power connections (cold ironing).

	Stages of development	Environmental/social/ health benefits	Ease of use/ implementation	Return on investment
	D	✓✓✓ Significant environmental benefits through avoiding fossil fuel sources. Energy is generated at point of use so less transport is required and energy losses are reduced.	✓✓ Upfront design and installation work, plus some ongoing maintenance.	✓ High capital cost. Payback period depends on the system chosen, the cost of the connection to the grid, the price of local electricity and amount required. For example the payback period for solar photovoltaics is generally 10+ years *(Davis Langdon)*. Rebates and/or renewable energy certificates may also be available.
	C O	✓✓✓ Significant environmental benefits through avoiding use of fossil fuels which contribute to the greenhouse effect.	✓✓✓ Easily and readily available from energy supplier.	✓ 'Green' electricity is usually sold at a premium.
	D C O	✓✓ Moderate environmental benefits through reuse of energy that would otherwise be wasted.	✓ Design, infrastructure and maintenance required.	✓✓ Additional capital cost, but ongoing cost savings through reduced energy use.
	D C O	✓✓ Moderate environmental benefits through reducing greenhouse gas emissions.	✓✓✓ Generally easily and readily available from energy supplier.	✓ Costs are comparable to other fuels.
	D O	✓✓✓ Significant environmental benefits from providing clean power from shore instead of generators on board the vessel – hotelling emissions from ships at berth can be the largest source of emissions within Port boundaries *(Port of Los Angeles)*.	✓ Absence of standard vessel requirements and other feasibility issues for ports.	✓ High costs associated with new infrastructure and ship retrofitting, however these are expected to reduce as this practice becomes more commonplace.

1.5

Transportation

Motor cars, trucks and other vehicles contribute to global warming through the high amounts of energy used in their production and the CO_2 they release in exhaust emissions. They also generate many other forms of air and noise pollution.

Reducing the number of vehicles on the road not only reduces pollution, but also congestion, stress and accidents and can lead to economic and health benefits for people using other forms of transport.

Item no	Purpose/criteria	Suggested measures
T1	Encourage the use of alternative modes of transport by employees, in order to reduce the amount of inefficient/ individual car travel and therefore greenhouse gas emissions.	★ Limit the number of car parking spaces available.
		★ Provide cyclist facilities including secure bicycle storage, showers and changing facilities.
		Improve or provide cycle paths and/or footpaths within the site and connect with existing paths.
		Provide a bus (or other) link to nearby train/bus/ ferry stations.
		Implement a car share plan for employees/contractors.
		Provide facilities to reduce business travel such as videoconferencing/teleconferencing.

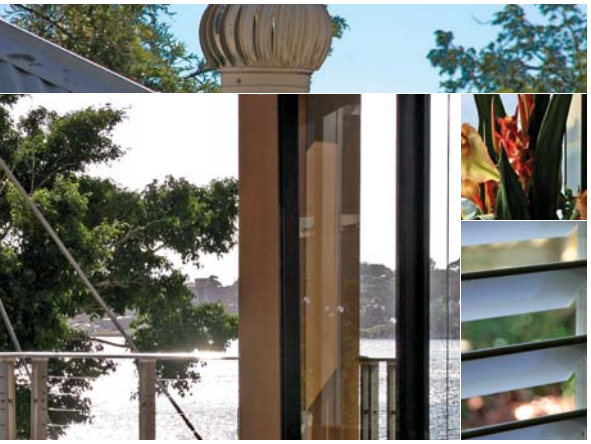
	Stages of development	Environmental/social/ health benefits	Ease of use/ implementation	Return on investment
	D C	✓✓✓ Encourages people to take public transport or pool cars and hence reduces greenhouse gas emissions and air pollution.	✓✓✓ Can be easily achieved and implemented.	✓✓ There may be cost savings from freeing up space for other uses and reduced construction costs.
	D C	✓✓ Environmental benefits by reducing the number of cars on the road. Social and health benefits for workers.	✓✓✓ Can be easily achieved and implemented.	✓ Additional cost for infrastructure and maintenance, plus increase in water use.
	D	✓✓ Environmental benefits by reducing the use of motorised transport, plus health and safety benefits.	✓✓ Can be easily achieved and implemented.	✓ Additional cost in infrastructure and maintenance – dependent on extent of facilities.
	C O	✓✓ Environmental benefits by encouraging people to use public transport and hence reducing the number of cars on the road.	✓ Can be easily achieved and implemented.	✓ Ongoing costs for operation (employment of driver and vehicle maintenance).
	C O	✓✓ Environmental benefits by reducing the number of cars on the road. Social benefits for workers.	✓✓✓ Can be easily achieved and implemented.	✓✓ Simple to set up and operate – requires minimal time commitment. May also lead to cost savings through reduced space requirements for parking.
	F O	✓✓ Reduced travel requirements and associated environmental impacts such as greenhouse gas emissions.	✓✓ Can be easily achieved and implemented.	✓✓ Additional cost for facilities, but significant cost savings for many organisations through reduced air travel and other forms of transport to meetings.

1.5 Transportation continued

Item no	Purpose/criteria	Suggested measures
T2	Reduce greenhouse gas emissions from operational vehicles and equipment.	Select environmentally friendly fuels (such as LPG or hybrid) and/or energy efficient vehicles and equipment.
		Coordinate trucks to avoid unnecessary truck movements and idling.
		Investigate opportunities to maximise the transport of freight via rail (intermodal – on-dock or near-dock) or water (rather than by road).

	Stages of development	Environmental/social/ health benefits	Ease of use/ implementation	Return on investment
	C O	✓✓✓ Significant environmental benefits can be achieved through minimising the use of petrol and diesel.	✓✓ Alternative fuels or hybrid vehicles are available.	✓ Depends on fuels and vehicles selected. The payback period for hybrid cars is 7 – 10.5 years *(ACEEE)*.
	O	✓✓ Moderate environmental benefits through reduced greenhouse gas emissions, air and noise pollution.	✓✓ Requires upfront planning and coordination. Implementation and management of truck drivers may be challenging.	✓✓ Time cost for coordination and enforcement, but otherwise minimal cost and potential savings from reduced fuel use.
	D C O	✓✓✓ Significant social and environmental benefits can be achieved through reduced traffic congestion and greenhouse gas emissions.	✓✓ Dependent on facilities available.	✓✓ Dependent on available facilities, but may result in long-term cost savings.

Environmental quality



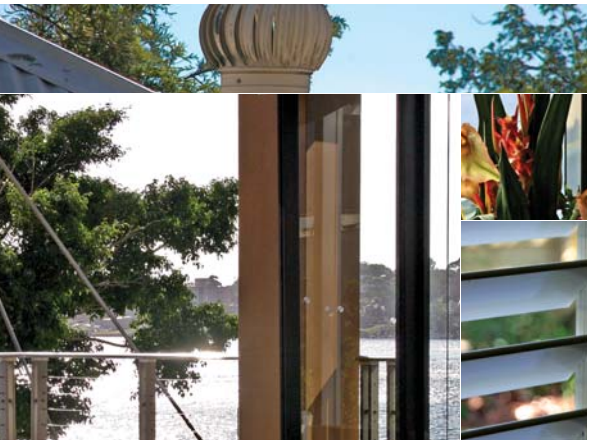
2.1 Indoor environment

Poor quality indoor air and other internal environmental conditions can result in 'sick building syndrome'. This in turn can decrease productivity and increase absenteeism, employee turnover and even litigation.

Healthy, pleasant working environments are essential for worker satisfaction and wellbeing, leading to reduced costs and added value for employers.

Item no	Purpose/criteria	Suggested measures
IE1	Improve the quality of indoor air to protect the health of employees and enhance productivity.	★ Increase the outside air inflow rates in excess of the requirements of AS1668.2-1991 for mechanical ventilation or employ natural ventilation in accordance with AS1668.2-2002.
		★ Use low-VOC paints (or no paints), low-VOC carpets (or no carpets), low-VOC sealants/adhesives (or no sealants/adhesives) and low-formaldehyde wood composite (or no wood composite).
		★ Provide external exhausts for equipment rooms/areas such as those used for photocopying/printing.
		★ Control humidity in workspaces and ductwork.
		Introduce living plants in workspaces.
		Minimise the use of cleaning and maintenance chemicals and pesticides and use low-irritant or non-chemical versions.

	Stages of development	Environmental/social/ health benefits	Ease of use/ implementation	Return on investment
	D	Health benefits from increased fresh air, however more energy may be required for mechanical ventilation.	Needs to be considered in design phase.	Capital cost should not be high, however there will be increased energy costs if mechanical ventilation is used. May save costs through reduced risk of litigation and increased worker productivity of up to 6% *(CSIRO)*.
	D F	Health benefits and increased satisfaction of occupants – helps avoid 'sick building syndrome'.	Alternatives readily available.	Some products may be slightly higher in cost or require more research during the selection process. Cost savings can be realised through a reduction in staff sick days, along with increased productivity. May also reduce risk of litigation in the future.
	D	Health benefits and increased satisfaction of occupants.	Exhaust systems readily available.	Small capital cost required.
	D O	Health benefits in terms of reduced mould, fungi and dust mites.	Systems readily available, monitoring required.	Requires monitoring equipment and time, but can bring cost savings through a reduction in staff sick days, along with reduced maintenance costs. May also reduce risk of litigation in the future.
	D F O	Health benefits in terms of reduced toxins and workplace amenity.	Suitable indoor plants readily available for sale or lease. Some maintenance required.	Additional cost and ongoing maintenance – depends on number of plants. May be offset by increased staff morale and productivity.
	D F C O	Health benefits through reduced toxins as well as environmental benefits when chemicals enter the water system and soil strata.	Alternatives readily available.	Alternative products may cost slightly more, although savings will be achieved by minimising chemical use.



2.1

Indoor environment
continued

Item no	Purpose/criteria	Suggested measures
		Provide separate dedicated areas with monitoring and exhaust systems for quarantine gases.
		Carry out an asbestos survey (and where necessary remove asbestos) and avoid the use of synthetic mineral fibres.
IE2	Optimise daylighting and make best use of artificial lighting to assist eye health and productivity.	★ Design windows to maximise daylighting and views to provide a connection with the outside environment.
		★ Provide occupant controlled blinds/screens.
		★ Install high frequency ballasts.
		★ Keep lighting levels in workspaces low and provide variable lighting controls (such as dimmer switches and mobile task lighting).
IE3	Provide optimum acoustical environment for productivity and to prevent ear damage.	★ Minimise sound disturbance in workspaces from internal equipment/systems.

	Stages of development	Environmental/social/ health benefits	Ease of use/ implementation	Return on investment
	D O	✓✓ Health and safety benefits by avoiding inhalation and poisoning. This will also help to avoid risk of litigation.	✓✓ System does not need to be complicated.	✓✓ Additional cost in design and infrastructure. Savings can be made by avoiding heath and safety incidents.
	D F C	✓✓✓ Avoids potential health and liability issues. Must be disposed of in accordance with regulations.	✓✓ Dependent on extent of potential asbestos.	✓✓ Dependent on extent of asbestos. Reduces risk of costs associated with workers compensation, sickness and liability.
	D	✓ Health benefits through reduced eye strain and feeling of well being.	✓✓ Dependent on building design.	✓✓ If considered at design stage, no additional costs are expected. May bring financial benefits through increased productivity and reduced lighting requirements.
	D F	✓ Health benefits through reduced eye strain.	✓✓ Systems readily available.	✓ Product purchase, installation and maintenance costs. May be partly offset by increased worker productivity.
	D O	✓✓ Health benefits through reduced eye strain and significant reduction in energy use.	✓✓✓ Systems readily available.	✓✓ Additional costs can be minimised if included at design stage, plus short payback period due to significant energy savings and prolonged lamp life.
	D F O	✓ Eye health benefits as well as reduced energy consumption.	✓✓ Systems readily available.	✓✓ Any supplementary lighting solutions will attract an additional cost, but cost savings will be achieved through reduced energy usage.
	D O	✓ Health benefits, increased comfort and productivity.	✓✓ Dependent on building design.	✓✓ Dependent on building, but costs will be minimised if considered during design stage. Likely to lead to increased productivity which in turn will result in cost savings.

2.2 Emissions

There are many sources of emissions from port operations which affect environmental and human health. On a local level, dust and other airborne particles can lead to community complaints and respiratory diseases, while light spill into the night sky can adversely disrupt birds and animals. On a global level refrigerants and other gases can damage the ozone layer (leading to increased instances of skin cancer) and also contribute to global warming.

The suggested measures will help mitigate these potential local and global risks whilst also avoiding financial and reputational penalties for non-compliance.

Item no	Purpose/criteria	Suggested measures
EM1	Protect the ozone layer and reduce the potential for global warming.	★ Avoid using Ozone Depleting Substances (ODS) such as refrigerants or insulants.
		★ Minimise the Global Warming Potential (GWP) for refrigerants and other chemicals.
		Implement a refrigerant and/or vapour leak detection system in high-risk areas and/or contain refrigerants/vapours in an airtight enclosure.
		Implement a vapour recovery system.
EM2	Limit the generation of air pollutants and ensure that they are emitted away from sensitive receptors.	Implement dust (and other airborne particle) mitigation measures during construction and operation. Include earthworks, site haul roads and public roads. Employ measures for the clean up of any spills.
		Consider potential sources of air pollution from operations and implement measures to control these (such as scrubbers). Ensure any emission stacks are located away from sensitive receptors.
		Monitor dust levels and other air pollutants during construction and operation (such as dust during construction and CO_2 for closed car parks).

	Stages of development	Environmental/social/ health benefits	Ease of use/ implementation	Return on investment
	D F C O	✓✓✓ Significant environmental benefits through protection of the ozone layer and lowering risk of skin cancer.	✓✓✓ Alternatives readily available.	✓ Costs are comparable.
	D F C O	✓✓✓ Significant environmental benefits from lowering the risk of climate change.	✓✓✓ Alternatives readily available.	✓ Costs are comparable.
	D C O	✓✓✓ Significant environmental benefits through reduced air pollution and ozone depletion.	✓ Design and infrastructure required. Monitoring also required.	✓✓ Additional cost – dependent on system. However if a leak is detected this can result in monetary savings as leakages can result in up to 40% loss of efficiency *(Green Star)*.
	D C O	✓✓ Moderate environmental benefits depending on the type and quantity of vapour loss.	✓ Design and infrastructure required. Monitoring and training also required.	✓✓ Initial investment required, but there may be cost savings through recovery of product that would otherwise be wasted. May also avoid environmental non-compliance penalties.
	F C O	✓✓ Environmental and health benefits through reduced air pollution.	✓✓ Simple measures (such as watering) are often most effective.	✓✓ Limited additional cost. May avoid environmental non-compliance penalties.
	D C O	✓✓✓ Significant environmental benefits dependent on the type and quantity of air pollutants.	✓✓ Some investigation required.	✓✓ Cost is dependent on type and quantity of emission and the measures required. May avoid environmental non-compliance penalties.
	C O	✓✓ Allows better management of air emissions, thereby reducing air pollution.	✓✓ Dependent on type of emission.	✓✓ Dependent on type of emission, but will attract ongoing monitoring cost and may require specialist consultant. May avoid environmental and health and safety non-compliance penalties.

2.2 Emissions continued

Item no	Purpose/criteria	Suggested measures
		Implement a maintenance schedule for plant and equipment to ensure that they are operating to appropriate standards.
EM3	Minimise odours.	Prevent odour pollution from construction and operations. Monitor odours regularly.
EM4	Minimise noise nuisance.	Implement noise reduction measures for forklifts, ships, trucks and other vehicles/ machinery (such as insulation, alternative reversing alarms, back loading, on-site queuing and 'engine off' policies).
		Monitor noise levels during construction and operation.
EM5	Avoid light spill into night sky or neighbouring properties/areas.	★ Ensure that no direct beam of light is directed beyond the site boundaries or upwards without falling directly on a surface with the explicit purpose of illuminating that surface. Use enclosed light fittings designed to minimise the spread of light above the horizontal.
EM6	Avoid accidental contact with hazardous or poisonous goods.	Separate hazardous goods and poisons during construction and operation.

	Stages of development	Environmental/social/ health benefits	Ease of use/ implementation	Return on investment
	C O	✓ May have environmental benefits through identifying and correcting issues early on.	✓✓ Should be part of usual operating system.	✓✓ Should be part of normal operating system and can save costs through early identification of issues.
	D C O	✓ Health and company image benefits.	✓✓ Dependent on type of odour and measure.	✓ Cost is dependent on extent of pollution and on the measures required. Monitoring may require specialist consultants.
	C O	✓✓ Environmental and social benefits through reduction in noise emissions and improved relations with community. However OH&S issues need to be taken into consideration.	✓✓ Products and systems readily available. Management of truck drivers and ship owners may be more challenging.	✓ Cost is dependent on measures – for example $5,000 for one forklift *(Sydney Ports)*. Some measures will attract cost savings (e.g. from reduction of vehicle idling).
	C O	✓ Monitoring and management of noise. Avoidance of complaints from community.	✓✓ Spot checks of equipment can be undertaken easily. Background noise monitoring may require specialist consultant.	✓ Dependent on extent of monitoring. Acoustics experts may need to be engaged.
	D C O	✓✓ Environmental benefits through not disturbing breeding and migration patterns of birds. Avoid complaints from neighbouring properties.	✓✓ Design required upfront.	✓✓ Cost is dependent on measures. Cost savings associated with reduced lighting costs.
	D C O	✓✓ Health and safety benefits for employees and community. Avoid risk of litigation.	✓✓ Management and training required.	✓✓ Should be part of normal procedures. May avoid environmental and health and safety non-compliance penalties.

2.3 Water quality

The quality of our waterways is essential for human and aquatic health. This is a critical issue for port operations given their close proximity to Sydney Harbour and Botany Bay and the nature of their activities.

Water pollution can be avoided by incorporating the suggested preventative measures and dealing efficiently with any leaks or spills.

Item no	Purpose/criteria	Suggested measures
HQ1	Manage stormwater to reduce peak stormwater flows and protect water quality.	★ Use water sensitive urban design measures such as permeable surfaces, swales and wetlands.
		★ Design, provide and maintain appropriate drainage so rainwater runoff does not flow directly to surface waterbody. Implement a stormwater treatment system.
HQ2	Manage water quality to protect the harbour and other water bodies.	Identify potential sources of land-based water pollution such as truck washing, waste and cargo/oil transfers. Implement and maintain measures to minimise these (e.g. oil separators and gross pollutant traps).
		Provide containment for any spillage, including bunding and appropriate storage of liquid materials.
		Provide emergency spill kits (including bunds and clean up material) and provide training in how to use them.
		Implement a water quality monitoring program.

	Stages of development	Environmental/social/ health benefits	Ease of use/ implementation	Return on investment
	D	✓✓✓ Significant environmental benefits through reducing the quantity of stormwater runoff and improving water quality by filtration.	✓✓ Design required upfront. Some maintenance required.	✓✓ Cost is dependent on measures, but should not be excessive. Cost benefits by reducing requirements to treat stormwater.
	D C O	✓✓✓ Significant environmental benefits through protection of water quality.	✓✓ Design required upfront. Some maintenance required.	✓✓ Drainage systems factored in at design stage should not constitute an additional cost burden. However stormwater treatment will require additional investment. May avoid environmental non-compliance penalties.
	D F C O	✓✓✓ Significant environmental benefits through protection and enhancement of water quality.	✓✓ Design required upfront. Some maintenance required.	✓✓ Cost is dependent on measures implemented, but will not be extensive. May avoid environmental non-compliance penalties.
	D C O	✓✓✓ Significant environmental benefits in case of spill.	✓✓ Products readily available.	✓✓ Cost is dependent on measures implemented but not likely to be extensive. Cost savings in terms of liability and compliance with legislation, and avoidance of clean up costs.
	C O	✓✓✓ Significant environmental benefits in case of spill.	✓✓ Products readily available.	✓✓ Cost is dependent on measures implemented but not likely to be extensive. Cost savings in terms of liability and compliance with legislation, and avoidance of clean up costs.
	C O	✓✓ Moderate environmental benefits through early identification and correction of water quality issues.	✓✓ Design required upfront and ongoing monitoring.	✓✓ Cost is dependent on monitoring program and testing requirements. May require the engagement of external consultants. May avoid environmental non-compliance penalties.

2.3 Water quality continued

Item no	Purpose/criteria	Suggested measures
		Manage ballast water discharge to avoid introducing non-indigenous aquatic organisms.
		Avoid dumping rubbish, chemicals or untreated sewage, greywater and oily bilge at sea and ensure high standard marine sanitation devices are used and maintained. Avoid toxic anti-fouling paints.
HQ3	Prevent damage from potential flood events and water table changes.	Assess the site for flood risk and potential water table changes. Implement appropriate mitigation measures.

	Stages of development	Environmental/social/ health benefits	Ease of use/ implementation	Return on investment
	O	✓✓✓ Introduced aquatic organisms can cause severe risks to seafood industries, marine environments and human health.	✓ Current ballast water exchange practices are considered far less effective than emerging ballast water technologies.	✓✓ There are costs associated with vessel diversion and possible structure damage from ballast water exchange, and the introduction of new ballast water technologies, however penalties apply for non-compliance.
	O	✓✓✓ Waste from ships carries bacteria and toxins harmful to marine and human life.	✓ Requires specialist technology and regular maintenance.	✓✓ There are costs associated with proper treatment and disposal, however penalties apply for non-compliance.
	D C O	✓✓✓ Significant environmental and social benefits through reduction of flood risk and harm.	✓ Investigations and design required upfront.	✓ Cost is dependent on scale of assessment and measures implemented. Cost savings depend on extent of risk.

2.4 Land use

Trees and shrubs play a vital role in removing air pollution and helping Sydney 'breathe'. We also need to protect the wide variety of native flora and fauna – many species of which are not found anywhere else in the world – along with our valuable heritage items.

Remediation of contaminated land can improve the quality of the land and associated flora and fauna and also improve human health and safety, while appropriate landscaping can enhance biodiversity and also amenity for workers and the neighbouring community.

Item no	Purpose/criteria	Suggested measures
L1	Encourage the redevelopment of sites that have previously been developed and remediate contaminated land.	★ Assess the site for potential contamination and propose and implement a remediation strategy as appropriate.
		Identify whether there may be acid sulphate soils present on the site and implement appropriate control measures.
L2	Use landscaping to enhance biodiversity and conserve and create habitat for flora and fauna.	Use local native species for landscaping which are adapted to the local climate and encourage native fauna.
		Identify important habitats or areas supporting key species of flora and fauna and implement measures for their preservation and enhancement or where necessary their restoration or recreation.
		Incorporate existing topsoil and subsoil into the development (where of suitable quality).
		Incorporate existing vegetation into the development (where appropriate).
		Use environmentally friendly landscape products (such as recycled and untreated timber).

	Stages of development	Environmental/social/ health benefits	Ease of use/ implementation	Return on investment
	D C	✓✓ Environmental benefits associated with remediation of contaminated land and avoidance of developing a greenfield site.	✓ Dependent on extent and type of contamination.	✓ Cost is dependent on remediation required. Will require external consultants. Site may possibly be cheaper than greenfield land.
	D C	✓✓✓ Significant environmental benefits in preventing and managing PASS.	✓✓ Dependent of extent of PASS. Expert input will be required.	✓ Cost is dependent on extent of PASS. Will require external consultants.
	D O	✓✓ Significant environmental benefits through enhanced habitat and reduced maintenance and water consumption.	✓✓✓ Local flora species and expert landscape advice are readily available.	✓✓✓ Cost of native plants should be comparable to exotics, with costs savings from increased durability and lifespan, plus reduced water requirements.
	D C O	✓✓✓ Significant environmental benefits through protection and enhancement of habitat.	✓✓ Dependent on the extent of habitat or protection level.	✓✓ Dependent on measures required. May require the engagement of external consultants. May avoid environmental non-compliance penalties.
	D C	✓✓ Environmental benefits by retaining valuable micro-organisms in topsoil.	✓✓ Storage space required for stockpiles.	✓✓✓ Cost savings from reducing the amount of topsoil that needs to be purchased and transported to site.
	D C	✓✓ Environmental benefits by protecting established vegetation and avoiding waste.	✓✓✓ Dependent on the extent, type and location of vegetation.	✓✓ Cost savings from reducing the amount of vegetation that needs to be purchased and transported to site.
	D C O	✓✓ Environmental and health benefits through avoidance of toxin transfer.	✓✓✓ Products should be readily available.	✓ Costs likely to be comparable/slightly higher depending on supplier availability.

2.4 Land use continued

Item no	Purpose/criteria	Suggested measures
		Contain and remove any noxious plants prior to site development and during operation.
		Use non-chemical/poison control measures for weeds and pests.
L3	Enhance visual amenity.	Design landscaping to enhance the existing amenity (using trees, shrubs, green space etc) and take the surrounding landscape character into consideration.
		The final design and exterior finishes of the building/facility should blend in with surrounding area and not cause an adverse visual impact.
L4	Avoid impact on identified heritage items.	Identify any protected heritage items on the site and ensure their protection or relocation.

	Stages of development	Environmental/social/ health benefits	Ease of use/ implementation	Return on investment
	C O	✓✓ Environmental and safety benefits. Compliance with regulatory requirements.	✓✓ Requires effort but has to be done under regulations.	✓✓ Costs associated with setting up and maintaining landscaped areas. May avoid environmental non-compliance penalties.
	C O	✓✓ Environmental and health and safety benefits by avoiding the introduction of toxins into ecosystems.	✓✓✓ Products and alternatives should be readily available.	✓✓ Alternative measures may be more expensive, but may also result in reduced maintenance costs.
	D	✓✓ Environmental and social benefits through creation of habitat and improved visual/ landscape amenity.	✓✓✓ Dependent on the extent, type and location of landscaping.	✓✓ Costs should be comparable/slightly higher. There may be financial benefits from increased worker morale leading to increased productivity and reduced absenteeism.
	D	✓✓ Enhanced amenity by not conflicting with existing landscape.	✓✓ Consideration required at design stage.	✓ Should not be an additional cost if considered at design stage, however unlikely to bring cost benefits.
	D C O	✓✓✓ Protection of heritage items for continued appreciation by future generations and compliance with legislation.	✓✓ Dependent on heritage item(s) and measures required.	✓✓ Dependent on-site requirements. May avoid regulatory non-compliance penalties.

2.5

Environmental management

Sustainability is about identifying the risks and also the opportunities resulting from economic, social and environmental factors. By thinking about these issues early on and integrating them into core planning and activities we can add value and cut costs.

The suggested measures will help developers, owners and tenants involve the appropriate stakeholders and maximise the benefits of sustainability.

Item no	Purpose/criteria	Suggested measures
M1	Maintain good relationships with stakeholders and respond to any complaints.	Identify and consult with stakeholders about environmental issues.
		Implement a formal public complaints procedure.
		Prepare a Traffic Management Plan (TMP) to minimise impacts on vehicle and pedestrian traffic.
M2	Provide a framework for identifying, managing and minimising environmental impacts, and maximising environmental benefits.	★ Implement a site specific Environmental Management Plan (EMP).
		★ Implement an Environmental Management System (EMS) accredited to ISO 14001.
		Comply with relevant planning and environmental legislation.
		Encourage innovation in environmental management across all aspects of planning, development and operations.

	Stages of development	Environmental/social/ health benefits	Ease of use/ implementation	Return on investment
	D F C O	✓✓ Establish good relations with stakeholders.	✓✓ Easy to identify and consult but depends on number of stakeholders and complexity of issues.	✓ Considerable time investment required.
	C O	✓✓ Good relations with community and quick response to complaints before they escalate.	✓✓ Easy to set up and implement but ability to take action depends on nature of issues raised.	✓✓ Considerable time investment required. May avoid risk of escalation by complainants which may save costs.
	C O	✓✓ Health, safety, amenity and company image benefits.	✓✓ Dependent on extent of TMP and nature of logistical issues.	✓ Requires time investment and may need external advice. Cost is also dependent on measures implemented.
	D F C O	✓✓✓ Documents environmental controls on-site.	✓✓ Dependent on the extent of EMP.	✓ Small additional time cost.
	C O	✓✓✓ Establishes and documents environmental management system, acts as a communication tool and clarifies roles and responsibilities for environmental management.	✓✓ Dependent on the extent of the EMS. Is strengthened by external accreditation such as ISO 14001.	✓✓ Cost associated with establishing and updating EMS, however can lead to cost savings through improved environmental efficiency and risk management.
	D F C O	✓✓✓ Avoids financial and reputational penalties, improves relationship with authorities.	✓✓ Dependent on the extent of obligations, commitments and issues.	✓✓ Requires investment, but compliance will avoid penalties and fines.
	D F C O	✓✓✓ Can have significant benefits depending on the type and scale of innovation.	✓✓ Ease of implementation also depends on the type and scale of innovation.	✓✓✓ Can bring a positive return on investment, again depending on the type and scale of innovation.

Item no	Purpose/criteria	Suggested measures
M3	Educate developers, tenants and employees about ESD and how to improve sustainability.	★ Include a Green Star/ESD professional in design and construction teams.
		★ Provide a facilities/building guide and training for occupants on minimising environmental impacts.

2.5 Environmental management continued

	Stages of development	Environmental/social/ health benefits	Ease of use/ implementation	Return on investment
	D F C	✓ Maximises the environmental, social and financial benefits of ESD initiatives.	✓✓✓ GBCA keeps a register of Green Star accredited professionals.	✓✓ Additional cost for professional time. However expert ESD input at design stage may result in cost benefits.
	O	✓✓ Documents environmental controls on-site for easy reference. Enables environmental benefits to be realised and maximised through education.	✓✓ Document/training should not be exhaustive.	✓✓ Small additional upfront cost, but will help ensure cost benefits from improved environmental performance are maximised.

Abbreviations and definitions

AAA Rating	The National Water Conservation Rating and Labelling Scheme is a certification program that awards an appropriate A-rating on a scale of 1 to 5 to water efficient products (the more As a product has the more water efficient it is)
ABGR	Australian Building Greenhouse Rating scheme
ACEEE	American Council for an Energy Efficient Economy
ASS	Acid Sulphate Soils
Blackwater	Wastewater discharged from toilets, urinals and bidets
BMS	Building Management System
CHP	Combined Heat and Power
CO_2	Carbon Dioxide
CSIRO	Commonwealth Scientific and Industrial Research Organisation
Davis Langdon	Davis Langdon is a consultancy providing multidisciplinary services to the engineering, mining and construction industries
DEH	Department of Environment and Heritage
DEUS	Department of Energy, Utilities and Sustainability
DITR	Department of Industry, Tourism and Resources
EcoRecycle Victoria	EcoRecycle Victoria is funded by the landfill levy and works with business and industry, community, schools and government to reduce waste
Embodied Energy	The collective amount of energy that is used to produce a product – including all the energy used to make the raw material into the finished product and the transportation used to carry it through the manufacturing process and to its final place of sale or use (which also indicates the amount of resulting pollution)
EMP	Environmental Management Plan
EMS	Environmental Management System
ESD	Ecologically Sustainable Development
Formaldehyde	Used primarily as adhesive in the manufacture of particle board, fibreboard and plywood
Green Star	National voluntary rating system which evaluates the environmental performance of buildings

Abbreviations and definitions

Greywater	Wastewater discharged from household appliances and fixtures such as showers, baths, sinks, washing machines and dishwashers (excludes water discharged from toilets)
GPT	Gross Pollutant Trap
GWP	Global Warming Potential
Harbour Heat Rejection	Using the natural temperature of harbour water to keep cooling plants cool
LCA	Life Cycle Analysis
LPG	Liquid Petroleum Gas
ODS	Ozone Depleting Substance
OH&S	Occupational Health and Safety
Potable Water	Water of drinking quality
PASS	Potential Acid Sulphate Soils
Passive solar design	Design that does not require mechanical heating or cooling – buildings take advantage of natural energy flows to maintain thermal comfort and the design is influenced by the local climate (microclimate)
PET	Poly Ethylene Terephthalate (often used in plastic bottles and containers)
PVC	Poly Vinyl Chloride
Sydney Ports	Sydney Ports Corporation
Sustainable yield	The groundwater extraction regime, measured over a specified planning timeframe, that allows acceptable levels of stress and protects dependent economic, social, and environmental values *(DEH)*
TMP	Traffic Management Plan
Xeriscape	A term referring to landscapes or gardens that are characterised by the use of little water – these landscapes rely totally on the natural rainfall of the area and gardening using this technique requires a careful choice of plant species and an understanding of the soil and local environment
Visy	Visy is one of the world's largest privately owned packaging and recycling companies
VOC	Volatile Organic Compound

Checklist

The completed Checklist is to accompany all applications for new developments/activities submitted to Sydney Ports, or when requested by Sydney Ports.

A web version is available at www.sydneyports.com.au.

The Checklist has the following features:

- The Headings (shaded in blue), Item numbers and Purpose/Criteria descriptions directly correspond to those in the Green Port Guidelines. This allows easy reference between this Checklist and the Guidelines.
- Applicants are to state whether each item has been addressed, not addressed or whether it is not applicable to the specific development. The Stages of Development indicators in the Green Port Guidelines may assist in this assessment.
- Applicants are then to explain how each item has been addressed, why it hasn't been addressed or why it is not applicable. Applicants are directed to the Suggested Measures provided in the Green Port Guidelines for guidance on how to address each item although alternative and innovative measures that may be more specific or relevant to the individual facility or operation are also encouraged.
- Supporting documentation (such as a Waste Management Plan, Environmental Management Plan or Design Specifications) may be referenced or attached to the Checklist.
- The Checklist can be filled out either electronically or by hand and sent back to Sydney Ports for review.

Applicant details

Name _____

Company _____

Address _____

City/Town _____ State _____ Postcode _____

Telephone _____ Mobile _____

Email _____

Project details

Location of proposed development _____

Description of proposed development _____

_____

_____

_____

_____

The details on this form are the provisions and intentions for maximising the environmental sustainability of this development.

Name _____

Signature _____ Date _____

	Item No	Purpose/criteria	Has this been addressed? (Yes, No, N/A)	How has it been addressed? Or, why has it not been addressed?	Provide details of supporting documentation/reference material
Materials selection	R1	Reduce the quantity of new materials being used by reusing materials or by utilising recycled materials.			
	R2	Encourage environmentally friendly production of materials.			
	R3	Specify materials that have minimal embodied energy and environmental impact.			
	R4	Consider the end of life of materials and the whole building, design for deconstruction.			
Waste management	W1	Minimise the generation of wastes.			
	W2	Facilitate recycling to reduce the amount of waste going to landfill.			
	W3	Ensure the safe storage and handling of hazardous wastes.			

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Water consumption	H1	Reduce consumption of potable water internally.			
	H2	Manage and monitor water usage and any leaks.			
	H3	Reduce the quantity of potable water used for landscape irrigation.			
	H4	Treat water on-site and reuse the treated water to reduce demand on the local potable water supply and the demand on the local infrastructure.			
Energy use	E1	Reduce energy consumption and hence greenhouse gas emissions.			
	E2	Manage the use of energy to minimise consumption.			

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Energy use continued	E3	Source energy from renewable sources.			
	E4	Source energy from alternate energy sources and use less greenhouse intensive fuels (in particular limit diesel use).			
Transportation	T1	Encourage the use of alternative modes of transport by employees, in order to reduce the amount of inefficient/ individual car travel and therefore greenhouse gas emissions.			
	T2	Reduce greenhouse gas emissions from operational vehicles and equipment.			
Indoor environment	IE1	Improve the quality of indoor air to protect the health of employees and enhance productivity.			
	IE2	Optimise daylighting and make best use of artificial lighting to assist eye health and productivity.			

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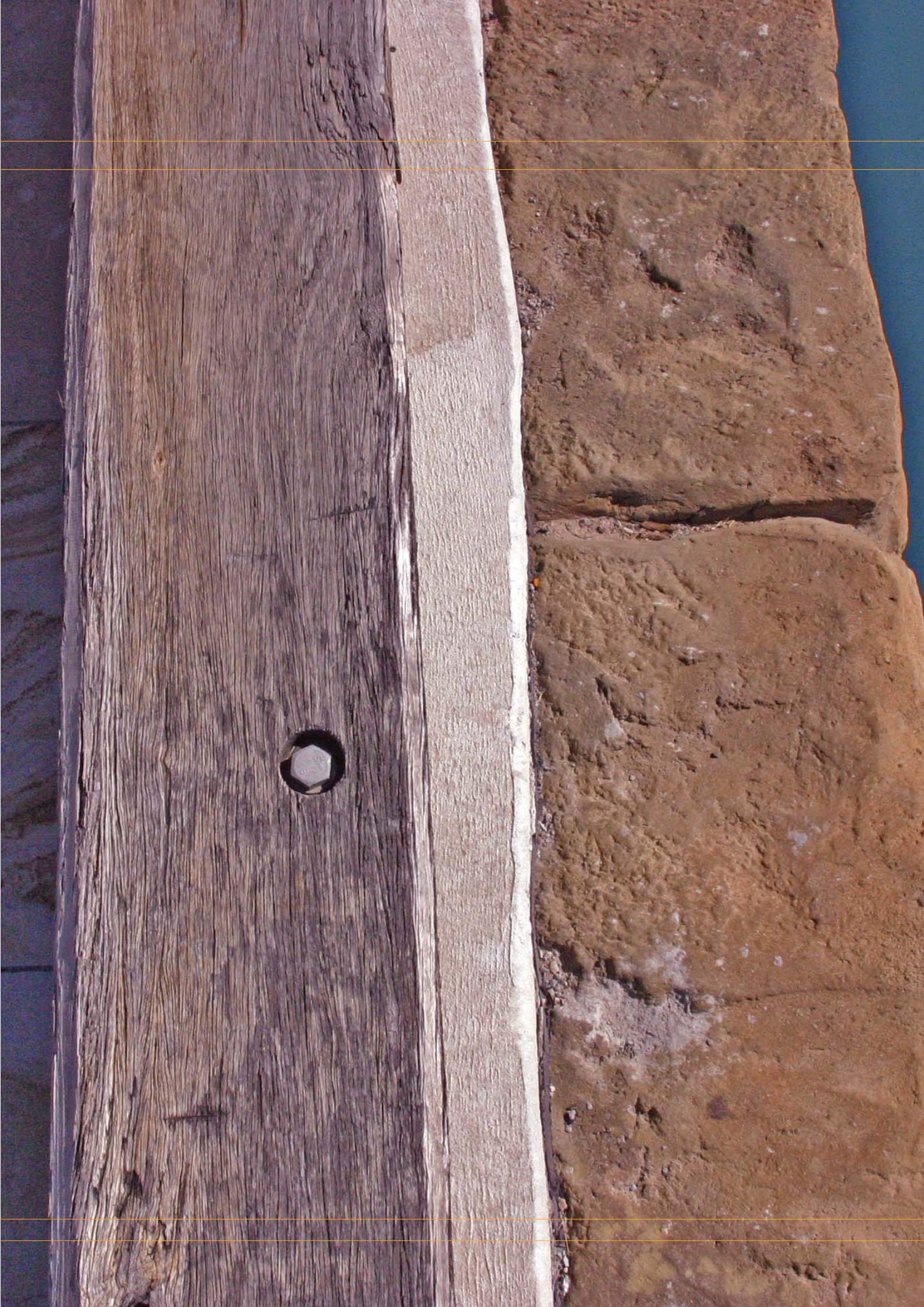
	IE3	Provide optimum acoustical environment for productivity and to prevent ear damage.			
Emissions	EM1	Protect the ozone layer and reduce the potential for global warming.			
	EM2	Limit the generation of air pollutants and ensure that they are emitted away from sensitive receptors.			
	EM3	Minimise odours.			
	EM4	Minimise noise nuisance.			
	EM5	Avoid light spill into night sky or neighbouring properties/areas.			
	EM6	Avoid accidental contact with hazardous or poisonous goods.			

	Item No	Purpose/criteria	Has this been addressed? (Yes, No, N/A)	How has it been addressed? Or, why has it not been addressed?	Provide details of supporting documentation/reference material
Water quality	HQ1	Manage stormwater to reduce peak stormwater flows and protect water quality.			
	HQ2	Manage water quality to protect the harbour and other water bodies.			
	HQ3	Prevent damage from potential flood events and water table changes.			
Land use	L1	Encourage the redevelopment of sites that have previously been developed and remediate contaminated land.			
	L2	Use landscaping to enhance biodiversity and conserve and create habitat for flora and fauna.			
	L3	Enhance visual amenity.			
	L4	Avoid impact on identified heritage items.			

	Item No	Purpose/criteria	Has this been addressed? (Yes, No, N/A)	How has it been addressed? Or, why has it not been addressed?	Provide details of supporting documentation/reference material
Environmental management	M1	Maintain good relationships with stakeholders and respond to any complaints.			
	M2	Provide a framework for identifying, managing and minimising environmental impacts, and maximising environmental benefits.			
	M3	Educate developers, tenants and employees about ESD and how to improve sustainability.			

Notes



Level 8, 207 Kent Street
Sydney NSW 2000, Australia

PO Box 25
Millers Point, NSW 2000, Australia

Telephone 61 2 9296 4999
Facsimile 61 2 9296 4742

enquiries@sydneyports.com.au
www.sydneyports.com.au

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