Lend Lease (Millers Point) Pty Limited

Barangaroo South - R8 & R9 Residential Buildings

Waste Management Plan - Project Application

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Arup
Arup Pty Ltd ABN 18 000 966 165

Arup
Level 10 201 Kent Street
PO Box 76 Millers Point
Sydney 2000
Australia
www.arup.com

ARUP

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1 Introduction

This report supports a Project Application (MP11_0002) submitted to the Minister for Planning pursuant to Part 3A of the Environmental Planning and Assessment Act 1979 (EP&A Act). The Application seeks approval for construction of two residential flat buildings (known as Buildings R8 and R9) and associated works at Barangaroo South as described in the Overview of Proposed Development section of this report.

1.1 Overview of Proposed Development

The R8 and R9 Project Application seeks approval for the construction and use of two residential flat buildings comprising 159 apartments, ground floor retail, allocation of car parking spaces from the Bulk Excavation and Basement Car Parking Project Application, and the construction of the surrounding ancillary temporary public domain and landscaping.

1.2 Site Location

Barangaroo is located on the north western edge of the Sydney Central Business District, bounded by Sydney Harbour to the west and north, the historic precinct of Millers Point (for the northern half), The Rocks and the Sydney Harbour Bridge approach to the east; and bounded to the south by a range of new development dominated by large CBD commercial tenants.

The Barangaroo site has been divided into three distinct redevelopment areas (from north to south) – the Headland Park, Barangaroo Central and Barangaroo South.

The R8 and R9 Project Application Site area is located within Barangaroo South as shown in Figure 1. The Project Application Site extends over land generally known and identified in the approved Concept Plan as Block X.

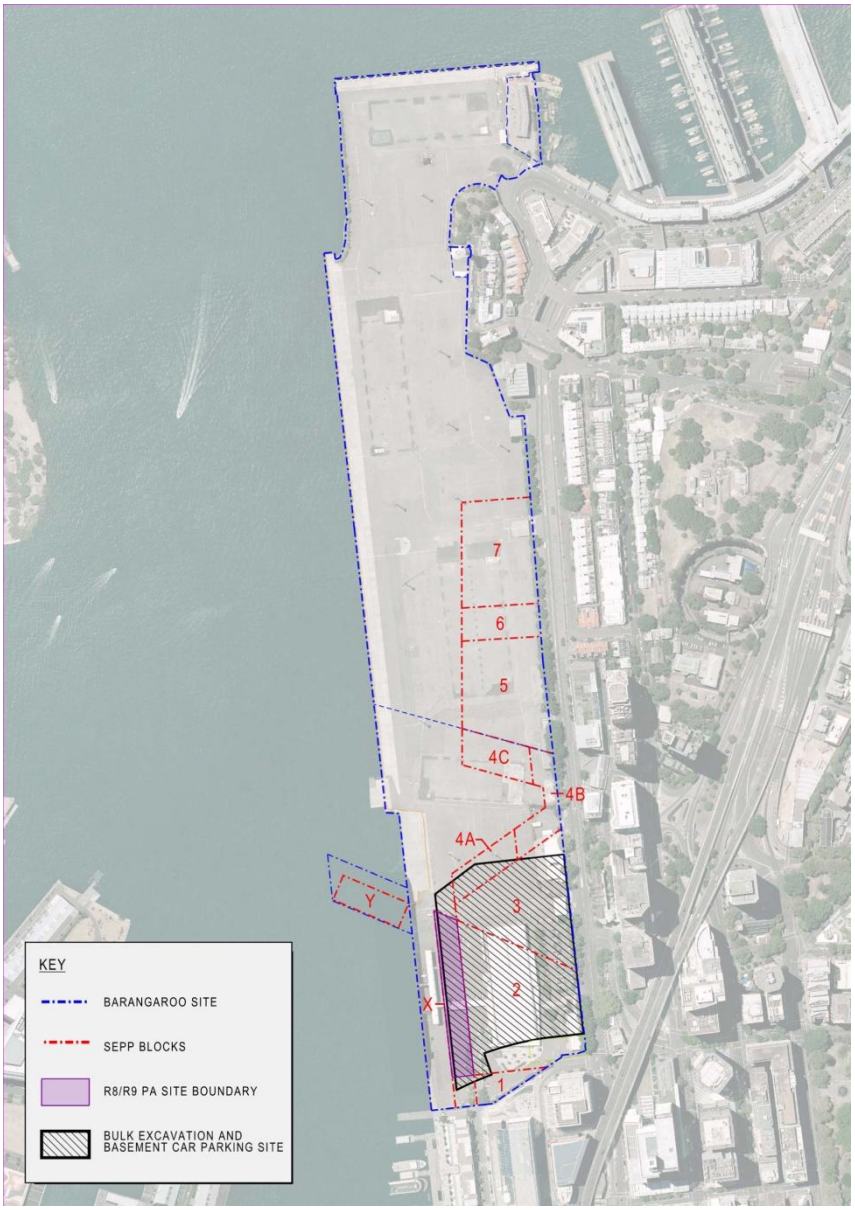


Figure 1: R8 and R9 Residential Building Project Application (MP11_0002) Aerial Site Location Plan

1.3 Purpose of this Report

This report has been prepared to accompany the Project Application for the R8 & R9 Residential Buildings and associated works at Barangaroo South. It addresses the relevant Director-General Requirements for the project.

The Waste Management Plan (WMP) identifies waste sources during construction and operation and proposes measures to manage waste in a way that generally satisfies all legislative requirements.

The WMP is provided in a format which can assist with the completion of a Construction Waste Management Plan which will be required by the contractor prior to the construction of the development.

In summary, the key purposes of the WMP are to:

- Address the waste management requirements for the proposal to a standard suitable for approval under Part 3A of the EP&A Act;
- Provide guidance for the project in waste minimisation from construction activities;
- Nominate effective waste separation, recycling and re-use measures; and
- Develop management requirements for construction and operation.

1.4 Assumptions and Limitations

The principles outlined in this WMP will be incorporated into the building design and submitted with the Project Application for the R8 & R9 Residential Buildings.

All figures and calculations are based on the building layout as set out in the R8 & R9 Residential Building drawings included in the Project Application. Waste generation estimations have been made using industry estimates and where appropriate devised from the waste estimation tables contained within City of Sydney's Policy for Waste Minimisation in New Developments 2005 (CoS Waste Policy).

All waste facilities and equipment will be designed and constructed in accordance with City of Sydney requirements as outlined in their Waste Policy where appropriate, the BCA, and Australian Standards.

2 Legislative Requirements

2.1 NSW State Legislation

2.1.1 The Protection of the Environment Operations Act 1997

The Protection of the Environment Operations Act 1997 covers the requirements for waste generators in terms of storage and correct disposal of waste and establishes the waste generator as having responsibility for the correct management of waste, including final disposal.

2.1.2 Waste Avoidance and Resource Recovery Act 2001

The object of the Waste Avoidance and Resource Recovery Act 2001 is to encourage the most efficient use of resources, to reduce environmental harm, and to provide for the continual reduction in waste generation in line with the principles of ecologically sustainable development (ESD).

This Waste Management Plan relates to a new development in NSW and is therefore written with reference to the NSW Waste Avoidance and Resource Recovery Strategy 2003, made under the Act.

The following hierarchy for managing waste, from most desirable to least desirable, meets the objectives of the Act:

- Avoid unnecessary resource consumption;
- Recover resources (including reuse, reprocessing, recycling and energy recovery); and
- Dispose (as a last resort).

2.1.3 The NSW Waste Reduction and Purchasing Policy (WRAPP) 1999

The NSW Waste Reduction and Purchasing Policy (WRAPP) requires all state government agencies and state owned corporations to develop and implement a WRAPP plan to reduce waste in four scheduled areas:

- Paper products;
- Office equipment and components;
- Vegetation material; and
- Construction and demolition materials.

The WRAPP is not directly applicable to the project, but has been used as a suitable guiding document for waste initiatives.

2.2 City of Sydney Council Policy

2.2.1 City of Sydney Council Policy for Waste Minimisation in New Developments 2005

The Council of the City of Sydney Policy for Waste Minimisation in New Developments 2005 (CoS Waste Policy) supports the Department of Environment, Climate Change and Water's (DECCW) NSW Waste Avoidance and Resource Recovery Strategy 2003. This Waste Policy is the guiding document for many of the waste initiatives and requirements for the Barangaroo development.

3 Green Star Requirements

The Green Star tool rates buildings on all relevant aspects of their environmental performance, with the rating divided into nine separate environmental categories:

- Management;
- Indoor Environment Quality;
- Energy;
- Transport;
- Water;
- Materials;
- Land Use and Ecology;
- Emissions; and
- Innovation.

These categories are further divided into credits, each addressing an initiative that improves or has the potential to improve a design, project or building's environmental performance.

3.1 Construction Waste – Residential

Within the Management category of Green Star, Waste Management (Man-7) indicator addresses construction waste management and is worth a possible 2 points.

The maximum of 2 points is awarded for achieving 80% reuse or recycling of construction materials by weight, with 1 point awarded for achieving 60%.

The Man-7 indicator is the only directly applicable Green Star indicator to be influenced by the Construction Waste Management Plan.

3.2 Operational Waste – Residential

Within the Material category of Green Star Multi Unit Residential (V1), Recycling Waste Storage (Mat-1) indicator allows up to a possible 2 points for inclusion of storage space that facilitates the recycling of resources used within buildings to reduce waste going to landfill.

Up to two points are awarded as follows:

- One point is awarded where any three of the five initiatives below are implemented; and
- Two points are awarded where all of the four initiatives below are implemented.

Dedicated storage area - Dedicated storage area for the separation, collection and recycling of waste is provided and it:

- Can be easily accessed by all building occupants;

- Has suitable access for recycling companies; and
- Is sufficiently sized to accommodate the storage equipment for the following recyclables, as a minimum:
    - cardboard;
    - glass;
    - plastics - mixed containers;
    - plastics - soft plastics;
    - plastics - polystyrene;
    - metals; and
    - batteries.

Convenience of recycling - Disposal of recycling is at least as convenient as disposal of general waste, for example where waste chutes are provided for general waste, chutes are also provided for recycling.

Waste Chutes - Recycling and general waste chutes are provided on each floor in close proximity to each other.

Compost Facilities - Facilities are provided for on-site disposal and re-use of compost and green waste.

Facilities for over-sized household items - Space is provided in common areas for the collection of over-sized household items to facilitate re-use within the building and it must be:

- Large enough to contain a $2m^3$ cage;
- Clearly labelled for items for re-use;
- Separated from the general waste and recycling area; and
- Its existence and location must be communicated to tenants.

4 Construction Waste

During construction it is anticipated that a significant volume and variety of waste will be generated.

Figure 2 shows an overview of the major waste streams to be expected from the project.

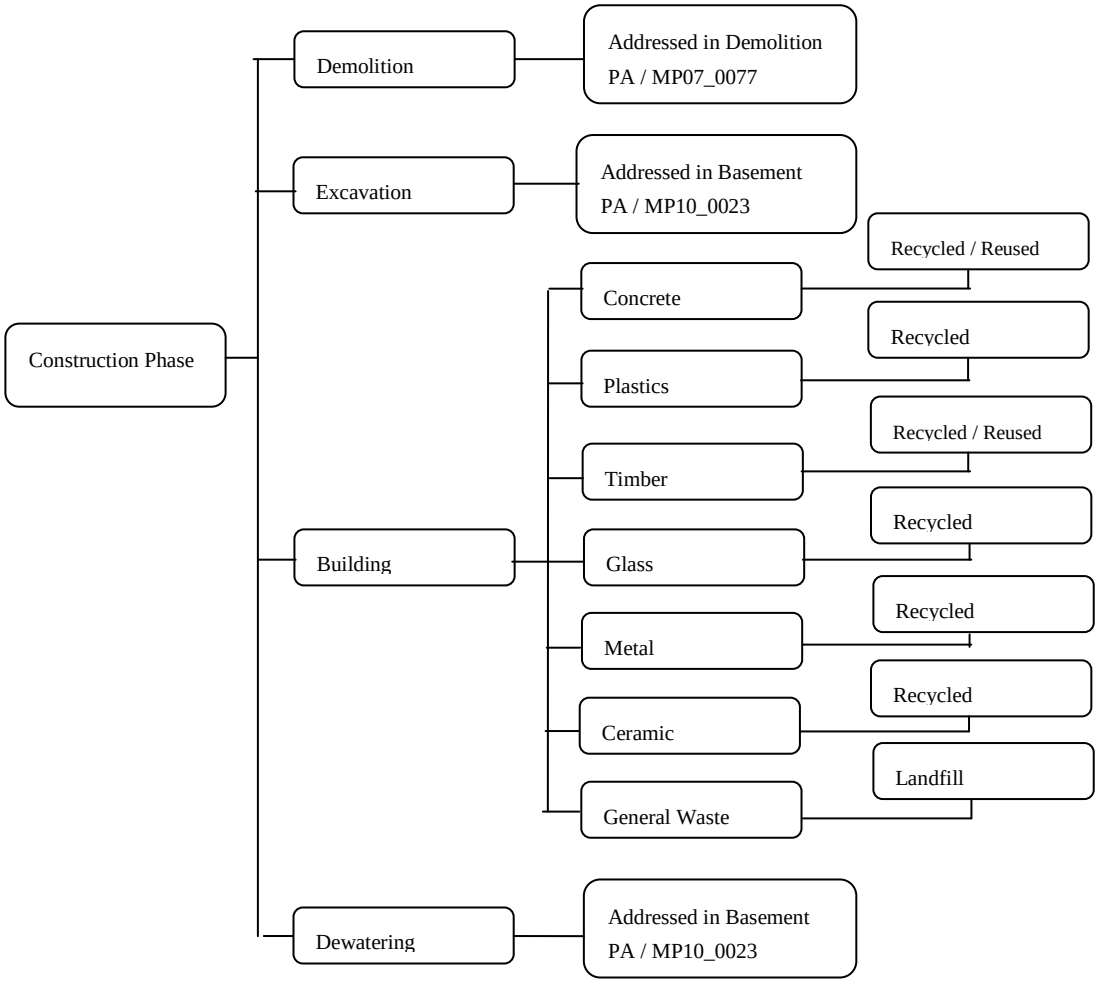


Figure 2: Overview of major waste streams expected from the project

4.1 Demolition & Excavation

Waste management of the site during demolition and excavation is addressed by the following two separate Planning Applications and relevant WMP's:

- Demolition of structures is addressed in the WMP for the Demolition of Existing Structures, East Darling Harbour Planning Application, which was approved by The Minister for Planning in November 2007(MP07_0077); and
- Excavation is addressed in the WMP for the Bulk Excavation and Basement Car Parking Planning Application (MP10_0023). There is likely to be a small amount of additional excavation for the slab which extends beyond the basement footprint, and an additional row of foundation piles. The

management of this excavated material will be as per the WMP for the Bulk Excavation and Basement Car Parking PA.

Waste management during demolition and excavation was detailed under these WMP's in terms of types waste generated and the management strategies. Emphasis was on reuse and recycling.

4.2 Building / Construction

The first goal for construction waste management is the reduction of waste generated. Waste reduction is the responsibility of all on site, as it relates to materials procurement, handling, storage and use. Any residual waste generated during construction will be reused, recycled, or as a last resort disposed to landfill.

While waste reduction is the goal, effective recycling of the waste that is generated will also be undertaken on site.

Waste collection during construction of the building will be appropriately managed through the staged nature of construction and the use of known quantities of materials. The majority of recyclable material that can be recovered during construction is likely to be off cuts and discards of glass, pipe, timber, steel, flooring, tiles and plasterboard. Waste material is also expected from construction packaging materials.

If material is required to be disposed of off-site, it will be classified for off-site disposal and disposed of in accordance with the DECCW's Waste Classification Guidelines 2008.

4.3 Goals / Targets

4.3.1 Overall Project Commitments

Lend Lease are committed to minimising waste to landfill and greenhouse gas emissions associated with waste generation and movement of waste from the site.

The target for construction waste is:

- Greater than 97% reduction of construction waste to landfill.

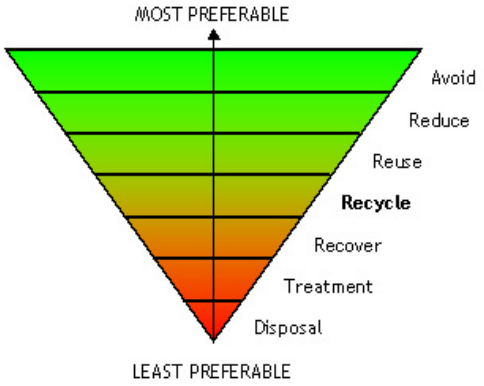
4.3.2 Green Star Credit

Up to two points are sought for the Man-7 Waste Management credit under the Green Star Multi Unit Residential (V1). To obtain these points the contractor must:

- Implement a Construction Waste Management Plan (CWMP), retain waste records and quarterly reports to the building owner; and
- Reuse or recycle a percentage (by mass) of all demolition and construction waste as follows:
  - One point for 60% of the waste
  - Two points for 80% of the waste

4.4 General Waste Management Measures

The main goal in the construction phase will be to reduce the total volume of waste produced, which is to be achieved by effective materials procurement, management and supply.



Project managers, engineers, builders and subcontractors will play a key role in achieving on-site waste reduction targets on a day-to-day basis.

The waste management measures that will be implemented during the construction are generally outlined below. Actual strategies and management measures will be refined as the construction program and phasing is defined. This will be documented in the Construction Waste Management Plan (CWMP) for the project.

4.4.1 Waste Management Hierarchy

Waste that cannot be reused or recycled will be disposed in a licensed landfill.

4.4.2 Waste Avoidance and Reduction

Strategies to reduce the actual amount of waste generated during construction may include:

- Use of pre-cut and prefabricated materials where possible;
- Purchasing in bulk;
- Requesting metal straps rather than shrink wrap;
- Using returnable packaging such as delivery and storage pallets and reels;
- Returning packaging to suppliers or bring unpacked goods to site;
- Educating site workers in avoidance procedures;
- Ensuring that subcontractors use new purchasing guidelines;
- Materials being delivered by suppliers only when needed. This reduces the opportunity for waste through error in estimates. It also permits orders to be made from on-site measurements rather than from drawings, and it provides for any modifications that the client may request; and
- Appropriate storage arrangements established to protect products from damage due to weathering or moisture.

4.4.3 Resource Recovery

The 90% resource recovery target will be delivered through an on-site waste segregation solution with all waste streams arising that cannot be reused on-site, being transported to an appropriately licensed facility for recycling, reuse or disposal.

Waste collected from bins around the site will be consolidated into larger bulk bins located in docks around the site. This process will dramatically reduce the processing required to enable this waste to feed into recycled resources production processes.

Separated wastes are a more valuable resource. Waste streams will be separated on site where possible to save double handling and time and labour intensive sorting. On-site solutions will involve setting up waste handling systems, including a bin coding system on site, to segregate the waste into separate streams as it is produced.

The provision of waste skips or bins at the site (or separation off site) will be made for the following materials (as outlined by Man-7 of the Green Star Manual) as relevant and appropriate to the phase of construction;

- Cardboard;
- Timber;
- Metal;
- Soft Plastic;
- Polystyrene;
- Insulation;
- Concrete;
- Glass; and
- Bricks.

Note that recyclables may be combined in a skip so long as evidence is provided that the waste contractor will separate these materials off-site.

4.4.4 Training

Waste education will be included in site inductions to provide a better understanding of the development from a sustainability and environmental perspective.

All contractors, sub contractors and employees are to be informed of the waste management measures to be enforced during the construction, and given appropriate training in performing their duties so as to achieve the set waste minimisation goals.

Through the site induction training process, site staff will be made aware of the placement of the bins and their responsibility to separate materials.

4.4.5 Waste Utilisation on Alternate Sites

If possible it is desirable to co-ordinate with other construction jobs occurring at the time. Waste from the Barangaroo Buildings R8 & R9 project may find an immediate use as a construction material on other parts of the site and/or on another site, and hence save on some costs of collection and disposal.

4.4.6 Good Housekeeping

Litter management will be implemented on site to reduce air borne litter and litter entering the storm water system or Harbour.

4.4.7 Monitoring and Reporting

Documentation of waste removal, deliveries and final disposal is required for confirmation of waste recycling targets under the Green Star rating system. This documentation requirement relates to all three processes of demolition, excavation and construction.

A Waste Tracking Form to assist in the monitoring and reporting process for demolition and construction waste can be obtained from the City of Sydney Council Waste Code. This sheet (or similar) is to be used and regularly updated to document the progress towards the 97% target.

Records must be kept by the contractor to demonstrate the actual percentage of waste recycled, including weight and volume of all wastes leaving the site and destination and name of the recycler/waste hauler, in accordance with legal and the Green Star Man-7 requirements. All documentation of materials disposed, including landfill receipts, contracts and waste plans, will be kept and maintained.

4.4.8 Materials and Procurement

A number of other initiatives will be incorporated to reduce the impact associated with material use during the construction phase of the project. These include:

- Use of off-site pre-assembly wherever possible – building components made off site using more efficient practices that minimise resource consumption, energy, water and waste to landfill; and
- Procurement and re-use of materials from a waste partner or approved waste manager/operator. The approved waste manager/operator can provide materials including recycled aggregates and glass fines that can be reused into new materials on site.

4.4.9 Transportation of Waste

Transportation of construction waste is discussed in the Construction Traffic Management Plan.

5 Operational Waste

The importance of both minimising the generation of waste and importantly the value of waste as a resource is reflected in the commitments for the Barangaroo project and this WMP. The Barangaroo integrated waste strategy is based on the principles of reduce, reuse, recycle and recover. It is designed to deliver the following outcome for operational waste;

- Greater than 80% diversion of operational waste to landfill.

This target involves various third parties and authorities, and will need partnerships and commitments to work with and toward this target. This ambition will be evaluated, measured and reviewed progressively throughout the project life.

The aim is to secure owner and occupant commitment to the following key strategies:

- **Sustainable consumption and waste minimisation** through education and awareness raising, information and monitoring systems, active intervention and assistance and a focus on product stewardship and extended producer responsibility.
- **Source segregation, storage and collection –** simple, easy to use systems will be applied across the precinct to maximise source segregation. Waste collection processes will be improved through precinct wide collection of separated waste streams
- **Resource recovery of recyclable waste** through the engagement of an approved waste manager/contractor with a Material Recycling Facility achieving 90-95% recovery of co-mingled recyclables.
- **Resource recovery and green power generation** using mixed solid waste through approved waste manager/operator's Mixed Waste Processing Facility. Biological treatment can produce inert organic material and methane that is used to power an off-site co-generation plant.

5.1 Waste Estimation

Waste volumes for R8 & R9 Residential Buildings have been estimated in order to determine the waste storage area and waste storage bins which will be required. Each of the residential buildings are served by 4 waste chutes leading to dedicated storage rooms in the basement (a total of 8 rooms). From there the waste will be transferred and combined into the precinct wide waste management and collection systems which has been detailed in the Project Applications for the large commercial buildings.

All waste estimates are based on the waste generation rates for residential and retail development provided in the CoS Waste Policy. The waste storage area required is calculated based on the Plan Area Bin sizes provided in the CoS Waste Policy:

Table 1: Bin Sizes

Bin Capacity (L)	Plan Area Bin (m^2)
240	0.43
660	0.96

Only 240L and 660L bins have been considered as practical for these buildings given the need to transfer the waste readily to the central facility.

The breakdown of the area for R8 & R9 Residential Buildings is presented in the table below. These estimates have been used for the waste calculations presented in this WMP.

Table 2: Barangaroo R8 & R9 Areas

Description	Unit	Waste generation rate source
R8 Residential	81 apartments	CoS Waste Policy generation rate for residential
R8 Retail	~1,000m^2 GFA	CoS Waste Policy generation rates for retail
R9 Residential	77 apartments	CoS Waste Policy generation rate for residential
R9 Retail	~1,200m^2 GFA	CoS Waste Policy generation rates for retail

Waste Estimation for R8 & R9 Residential Buildings is described in the tables below. The different generation rates for retail are shown for information and have not been used in the total waste estimation as the breakdown of different types of retail has not yet been determined. All estimates are based on the applicable waste generation rates in the CoS Waste Policy. Waste generation is calculated using the total figures from Table 2.

Table 3: Barangaroo R8 & R9 Residential Building General Waste Estimation

Description	General Waste Generation Rate		General Waste (L/day) (Rounded Up)
R8 Residential	1.2	kg/unit/day	750
R8 Retail	17	kg/100m^2/day	1,300
R9 Residential	1.2	kg/unit/day	750
R9 Retail	17	kg/100m^2/day	1,600
TOTAL			**4,400**

Table 4: Barangaroo R8 & R9 Residential Building Recyclables Estimation

Description	**General Waste Generation Rate**		**General Waste (L/day) (Rounded Up)**
R8 Residential	0.5	kg/unit/day	350
R8 Retail	11	kg/100m^2/day	850
R9 Residential	0.5	kg/unit/day	300
R9 Retail	11	kg/100m^2/day	1,000
TOTAL			**2,500**

5.2 Waste Storage

The provisions included within the Council of the City of Sydney Policy for Waste Minimisation in New Developments 2005 (Section A, All Developments - Construction) will generally be followed for Waste Storage Design where appropriate.

The waste storage areas will be located at the base of each residential waste chute (4 in each building) in the Basement. The retail areas have access to 2 good lifts within each building for the transfer of waste to the basement.

The appropriate space allocation has been made in the Basement for the R8 & R9 Residential Buildings based on the waste generation figures presented above and the associated bin requirements presented below.

The waste storage area figures are based on daily collection for both residential and retail waste, consistent with the precinct wide collection strategy;

Table 5: Residential Waste Storage Options (collection daily - all figures rounded up to nearest m^2)

Bin Capacity Options (L)	No. bins: General Waste	No. bins: Paper & Card	No. bins: Other Recyclables	Plan Area Bin (m^2)	Total Plan Area: General Waste (m^2)	Total Plan Area: Recyclables (m^2)
240	7	3	1	0.43	3	2
660	3	1	1	0.96	3	2

The above figures are to be distributed across 8 storage rooms however to allow flexibility for collection, a strategy of 1 660L bin for General Waste and 1 660 L bin for Recyclables in each room is proposed.

Using 660L bins with a plan area of 2 m^2 would require each waste storage areas to have at least twice this amount of floor area (e.g. x 4 m^2). This is to allow for access to the waste room and movement of bins, cleaning etc. This does not allow for space for a compactor(s).

Table 6: Retail Waste Storage Options (daily collection with 2:1 compaction on general waste and paper/cardboard) (all figures rounded up to nearest m^2)

Bin Capacity Options (L)	No. bins: General Waste	No. bins: Paper & Card	No. bins: Other Recyclables	Plan Area Bin (m^2)	Total Plan Area: General Waste (m^2)	Total Plan Area: Recyclables (m^2)
240	12	3	5	0.43	6	4
660	5	1	2	0.96	5	3

Given that waste is to be transported via goods lift, 240L bins are considered the most feasible option. The above figures need to be distributed across 4 goods lifts. The expected minimum space requirement for each retail stream via goods lift is;

- General waste – 3 x 240L bins
- Recyclables – 2 x 240L bins

Using 240L bins with plan area of 3m^2 would require each waste storage area to have at least twice this amount of floor area (e.g. 6m^2). This is to allow for access to the waste room and movement of bins, cleaning etc. This does not allow for space for a compactor(s).

5.2.1 Compactors

It is unlikely that dedicated compactors will be provided for the R8 & R9 Residential buildings however they may be shared with the larger commercial/retail developments for Barangaroo South.

5.3 Waste Management Responsibility

The General, Space, Access and Amenity requirements detailed in Section A (All Developments) and Section D (Mixed Use Developments) in the CoS Waste Policy have generally been followed in determining waste management and

storage requirements for Barangaroo. Green Star requirements on waste management and waste storage have also been addressed (see Section 3).

5.3.1 Residential Waste Management

The following waste management measures are proposed to be adopted for the R8 & R9 residential buildings. The exact arrangements will be subject to further design development:

- Occupants from each unit will place their general and recyclable waste down a waste chute which will automatically segregate the general waste from recyclable waste based on a selection made by the resident at the chute entry point. The waste will be collected in waste storage rooms within the basement;
- For the purposes of this assessment, waste & recyclables collection has been assumed to be by City of Sydney or an approved waste manager/operator (operating under a precinct waste management agreement) occurring daily as part of the same collection for the large commercial buildings.

The final management requirements will be subject to design development.

5.3.2 Retail Waste Management

The following is likely to be adopted for retail waste management within the R8 & R9 buildings:

- Waste will be segregated into 240L bins within the retail store and then taken via the goods lift to a dedicated waste storage area;
- For the purposes of this assessment, waste & recyclables collection has been assumed to be by City of Sydney or an approved waste manager/operator (operating under a precinct waste management agreement) occurring daily as part of the same collection for the large commercial buildings.

The final management requirements will be subject to design development.

5.3.3 Waste Management Responsibility

The following measures outline the general responsibilities associated with waste management at the Barangaroo South development;

- The responsibility for cleaning the waste storage area will be on the building manager;
- Removal of waste to the central waste storage rooms is the responsibility of building management;
- Labelling of the bins will be the responsibility of the building manager. This includes adequate signage identifying the waste and recycling area, and instructions outlining how to use the waste management system and what materials are acceptable for recycling;
- Transfer of bins from the storage area to the collection truck will be carried out by the waste collection contractors. After emptying the bins the contractors will return them immediately to the waste storage room within the premises;

- The final allocation of responsibilities will be subject to design development.

6 Conclusion

The purpose of this Waste Management Plan is to inform and accompany the Project Application for R8 & R9 Residential Buildings for Barangaroo South under Part 3A of the Environmental Planning and Assessment Act (EP&A Act).

The Waste Management Plan concludes that waste management practices can be implemented under the proposal to achieve a significant reduction in waste going to landfill during construction and operation, and that adequate storage and handling facilities for the project waste streams from the R8 & R9 development are catered for within the central basement facility below.