Table 3.2: Site Locational Data (as per AS 2021-2000)

SITE LOCATIONAL DATA (Clause 3.4 of AS2021-2000)		
DS	DL	DT
420	6550	9650

AS 2021-2000 considers noise levels generated by numerous types of aircraft that are active in Australia. The noise level at the subject site of aircraft that use the Brisbane Airport was calculated as per *Tables 3.4* to *3.13* and *3.17* to *3.18* of *AS 2021-2000* using the locational data detailed in **Table 3.2** above. The predicted noise levels are outlined in **Table 3.3** below:

Table 3.3: Predicted Future Aircraft Noise Levels (as per AS 2021-2000)

Aircraft Type	Predicted Future Aircraft Noise Level - dB(A)	
	Takeoff	Landing
Boeing 747-200B	88 (long range)	79
	80 (short range)	
Boeing 727 (Hush Kitted)	84	73
Boeing 747-400	83 (long range)	78
	77 (short range)	
Boeing 737-300, -400, and Airbus A320	72	71
BAe146	70	68

Many of the noisier aircraft considered in *AS 2021-2000* use the Brisbane Airport relatively infrequently and thus have a much lesser potential to result in a loss of acoustic amenity. It is thus considered that as a realistic approach to providing for a reasonable level of internal noise amenity that the more prevalent Boeing 747-400, Boeing 737-300, -400, Airbus A320 and Bae146 should be used as a planning tool for acoustic ratings on the building components for the proposed Building 6 development.

As such, the design external aircraft noise level at the site as per **Table 3.3** is taken as 83 dB(A) for assessment purposes.

Based upon the 83 dB(A) aircraft noise level, building componentry calculations shall be performed in accordance with *Appendix F* of *AS 2021-2000* to determine the minimum Weighted Sound Reduction Index (R_w) of typical building components in order to achieve the appropriate internal noise levels. It is recommended that at the Building Approval stage when construction drawings are available that the calculations be conducted to ensure appropriate acoustic elements are incorporated for the final design.

MWA Environmental's involvement with the Portside Wharf development dictates that the required Rw ratings can be achieved with available glazing elements and other standard residential construction materials. In some cases thicker glazing may be required to the most affected external façade elements.

Indicative building componentry requirements are provided in ***Section 4.0***.

The effect of the noisier but less frequent aircraft on general living amenity is assessed with respect to their potential to result in sleep disturbance, assessed in accordance with the **FICAN (Sleep Awakenings due to Aircraft)** methodology of the Brisbane City Council NIAPSP Noise Management Guidelines. The appropriate criteria are:

C.2 Noise Limits

NIAPSP has adopted the FICAN 1997 curve in relation to aircraft noise. This curve is:

Percentage Awakenings = 0.0087(L_{AE} – 30)$^{1.79}$*

*Where L_{AE} is the indoor sound exposure level (see AS1055.1 for a definition of this parameter). NIAPSP uses the **5% awakening level** as the maximum allowable L_{AE}. As a result the maximum allowable L_{AE} is 65 dB(A).*

With the L_{AE} typically 2 to 5 dB(A), nominally 3 dB(A), below the L_{max} (observed values of aircraft flyover noise), then the maximum aircraft noise level of 88 dB(A) L_{max} from **Table 3.3** above, would approximate an L_{AE} of 85 dB(A) (external).

Given that the R_w ratings shall be designed to achieve a noise reduction of 33 dB(A) within sleeping areas (83 dB(A) external to 50 dB(A) internal), then an internal noise level of 52 dB(A) L_{AE} will result from an external noise level of 85 dB(A) L_{AE}. Thus, internal noise levels due to the noisiest aircraft using the Brisbane Airport will satisfy the 65 dB(A) L_{AE} *FICAN* criterion within sleeping areas. Sleep disturbance potential should thus be minimal.

3.2 Traffic Noise Impact Assessment

3.2.1 Traffic Noise Criteria

The EPP (Noise) includes criteria levels of external traffic noise exposure. This requires that a criteria traffic noise exposure level of 63 dB(A) L_{10} (18 hour) be achieved at the facade of the most exposed part of a residential dwelling nearest the subject roadway(s), and should otherwise be achieved for at least one outdoor recreation area. This criterion has been used as an assessment methodology.

Additionally, the Brisbane City Council NIAPSP requires that the design of residential developments in locations adjacent to roadways with over 15,000 vehicles per day (vpd) to consider internal noise levels as contained in Australian Standard AS2107:2000[2], determined in accordance with AS3671–1989[3].

Table 1 of AS2107:2000 includes for houses and apartments near major roads the following:

[2] Australian Standard *AS2107:2000 Acoustics – Recommended design sound levels and reverberation times in building interiors*

[3] Australian Standard *AS3671 –1989 Acoustics – Road traffic noise intrusion – Building Siting and construction*

This Standard requires the following Design Sound Levels (L_{Aeq} (dB(A)):

Type of occupancy/activity	*Recommended design sound level, L_{Aeq}, dB(A)*	
	Satisfactory	*Maximum*
7 RESIDENTIAL BUILDINGS Houses and apartments near major roads-		
Living areas	*35*	*45*
Sleeping areas	*30*	*40*
Work areas	*35*	*45*
Apartment common areas (e.g. foyer, lift lobby)	*45*	*55*

For external noise amenity the following is taken from the BCC NIAPSP Guidelines as the relevant criteria:

> *B.2.3 Special Notes about Outdoor Recreation Areas*
>
> *AS2107 does not include limits for outdoor recreation areas. A reasonable level of outdoor amenity must be maintained for residential and other similar uses in areas where outdoor recreation may occur. In such areas the maximum L_{eq} in any one hour period should not exceed 60 dB(A) and the L_{eq} averaged over a 24 hour period should not exceed 55 dB(A).*

3.2.2 Traffic Data

Existing and ultimate traffic data for Kingsford Smith Drive, Hercules Street and Remora Road past the subject site was supplied by Brisbane City Council City Design Transport, Structures and Survey in 2003.

The proposed development includes provision for traffic calming on Harbour Road to reduce the number of heavy vehicles that use Harbour Road as a connection to Kingsford Smith Drive. Under the proposed changes, trucks would access the Caltex service station on Hercules Street from Remora Road then exit to Remora Road. If approved, these traffic changes would significantly reduce the level of traffic noise experienced at the Harbour Road boundary of the subject site and also reduce traffic noise levels at the Brett's Wharf residential development. As a worst-case the traffic noise assessment assumes that the surrounding roadways will remain as currently exists.

Existing and ultimate data was supplied as 45,000 vehicles per day (vpd) in 2003 and 62,000 vpd in 2013 for Kingsford Smith Drive. The commercial vehicle content was provided as 13%. The annual growth rate was determined to be 3.26% from the supplied data. This growth rate was used to calculate an ultimate traffic volume for Year 2020 of 77,610 vpd.

Existing and ultimate traffic data for Hercules Street and Remora Road past the subject site was supplied as volumes of 2,000 vpd in 2003 and 3,000 vpd in 2013 for both roadways. A commercial vehicle content of 17% was supplied for Hercules Street and 18% for Remora Road. The annual growth rate was determined to be 4.14% from the supplied data. This growth rate was used to calculate an ultimate traffic volume for Year 2020 of 3,985 vpd for both roadways.

The daily traffic flow data has been scaled by a factor 0.94 to represent the 18 hour traffic flow data necessary to make the L_{10} (18 hour) traffic noise prediction. Traffic flow data for the surrounding roadways is displayed in **Table 3.4** below.

Table 3.4: Existing and 10 Year Design Horizon Traffic Volumes

Roadway	VPD			VP18hr		%CV
	2003	2013	2020	2003	2020	
Kingsford Smith Drive	45000	62000	77610	42300	72953	13.00
Hercules Street	2000	3000	3985	1880	3746	17.00
Remora Road	2000	3000	3985	1880	3746	18.00

3.2.3 Traffic Noise Model Validation

The first step in the predictive traffic noise process is to validate the model to the recorded noise levels, i.e. the aim being to predict the to within ±2dB of the recorded level, with selected parameters used in the future traffic (ten year horizon) noise modelling scenarios.

The model used in the traffic noise modelling process was SoundPLAN 7.0. This model uses the CoRTN methodology for traffic noise prediction, a method accepted by regulatory bodies in Queensland.

As discussed in **Section 2.1**, the results of long-term noise monitoring conducted at the Hercules Street frontage of the site included a maximum recorded L_{10} (18 hour) of 61.0 dB(A). This monitoring location had line of sight to traffic on Hercules Street and Remora Road.

The model prediction for the monitoring location was an L_{10} (18 hour) of 61.1 dB(A), hence within the 2dB(A) tolerance applied to demonstrate validation of predicted to modelled flows.

The model layout and results of the SoundPLAN validation model are provided in ***Attachment 4***.

3.2.4 Predicted Future Traffic Noise Levels

In order to determine the traffic noise amelioration measures that are required for the proposed development, 10-year design horizon traffic noise predictions have been made external to the proposed development building. The future traffic noise modelling has considered the proposed building location and floor levels as per the Cottee Parker Architects drawings included in ***Attachment 1***. The topography of the site and surrounding areas was modelled to be flat.

The SoundPLAN 7.0 model was setup to predict the external L_{10} (18 hour) traffic noise levels under Year 2020 traffic conditions. A table of the results, predicting Year 2020 L_{10} (18 hour) noise levels (including façade reflection) at each level of the proposed Building 6 development was produced. See ***Attachment 5*** for the model layouts and modelling results.

Based upon ultimate traffic flow data for the adjacent roadways, as provided by BCC, the following **Table 3.5** contains Year 2020 traffic noise level predictions for the proposed residential Building 6.

Table 3.5: Year 2020 Predicted Traffic Noise Levels for Proposed Residential Building 6 – dB(A) (including façade correction)

Units	Façade	Floor Level	L_{10} 18hr	L_{eq} (1hr) 7am - 10pm	L_{eq} (1hr) 10pm - 7am	L_{eq} (24hr)
			dB(A)	dB(A)	dB(A)	dB(A)
Podium Units	North	1	69.8	73.2	73.1	66.3
		2	69.8	73.2	73.1	66.3
Apartment Building Units	East	3	60.4	63.8	63.7	56.9
		4	61.6	65.0	64.9	58.1
		5	61.8	65.2	65.1	58.3
		6	61.8	65.2	65.1	58.3
		7	61.7	65.1	65.0	58.2
		8	61.7	65.1	65.0	58.2
		9	61.5	64.9	64.8	58.0
		10	61.4	64.8	64.7	57.9
		11	61.3	64.7	64.6	57.8
		12	61.2	64.6	64.5	57.7
		13	61.2	64.6	64.5	57.7
		14	61.8	65.2	65.1	58.3
	North	3	69.5	72.9	72.8	66.0
		4	69.4	72.8	72.7	65.9
		5	69.3	72.7	72.6	65.8
		6	69.2	72.6	72.5	65.7
		7	69.2	72.6	72.5	65.7
		8	69.1	72.5	72.4	65.6
		9	69.1	72.5	72.4	65.6
		10	69.1	72.5	72.4	65.6
		11	69.1	72.5	72.4	65.6
		12	69.1	72.5	72.4	65.6
		13	69.1	72.5	72.4	65.6
		14	69.2	72.6	72.5	65.7
	South	3	39.8	43.2	43.1	36.3
		4	39.9	43.3	43.2	36.4
		5	40.3	43.7	43.6	36.8
		6	41.3	44.7	44.6	37.8
		7	43.9	47.3	47.2	40.4
		8	47.2	50.6	50.5	43.7
		9	49.0	52.4	52.3	45.5
		10	50.2	53.6	53.5	46.7
		11	51.2	54.6	54.5	47.7
		12	52.1	55.5	55.4	48.6
		13	53.3	56.7	56.6	49.8
		14	56.4	59.8	59.7	52.9
	West	3	63.5	66.9	66.8	60.0
		4	64.1	67.5	67.4	60.6
		5	64.4	67.8	67.7	60.9
		6	64.6	68.0	67.9	61.1
		7	64.8	68.2	68.1	61.3
		8	65.0	68.4	68.3	61.5
		9	65.1	68.5	68.4	61.6
		10	65.3	68.7	68.6	61.8
		11	65.4	68.8	68.7	61.9
		12	65.5	68.9	68.8	62.0
		13	65.7	69.1	69.0	62.2
		14	66.1	69.5	69.4	62.6

The above noise levels demonstrate the likely noise levels external the Building 6 residential facades, based on indicative drawings included as ***Attachment 1***. While exceedance of the 63 dB(A) L_{10} (18 hour) criterion does occur at the northern and western façades, it should be noted that the above predictions take no account of noise amelioration measures at the receiver in the form of solid balcony balustrades or possible full height balcony sides (i.e. side wall between unit balconies – not total enclosure of balcony). Under these conditions, attenuation of up to 8 dB(A) can be expected, such that the 63 dB(A) L_{10} (18 hour) criterion should be readily achievable at all external balcony areas if required. The southern and eastern building facades are predicted to experience traffic noise levels satisfying the 63 dB(A) criterion.

The predicted traffic noise levels indicate exceedance of the BCC external traffic noise criteria. It is considered that potential balcony balustrade elements will reduce traffic noise levels at balcony areas. In addition, the common outdoor recreation areas between buildings and also the public walkway and Portside Wharf areas are well removed from the noise of road traffic and are also shielded by the proposed building structures such that the 60 dB(A) L_{eq} (1 hour) and the 55 dB(A) L_{eq} (24 hour) traffic noise criteria of BCC will readily be satisfied. As such, all future residents will have access to common outdoor recreation areas satisfying the external traffic noise criteria of the BCC.

As Kingsford Smith Drive carries more than 15,000 vehicles per day, the BCC criteria states (***Section 3.2.1***) that it will be necessary to conduct an internal noise assessment. It is recommended that at the Building Approval stage when construction drawings are available that the calculations be conducted to ensure appropriate acoustic elements are incorporated for the final design.

The internal traffic noise calculations should be based on predicted Year 2020 maximum 1 hour L_{Aeq} noise levels with the design objective of providing suitable internal amenity for living areas during the daytime period and for sleeping areas during the night-time period:

Living Area:	45 dB(A) Maximum L_{Aeq} (1hr) 7am to 10pm
Sleeping Area:	40 dB(A) Maximum L_{Aeq} (1hr) 10pm to 7am

Using the noise levels predicted in the modelling and following the methodology of AS3671 in considering traffic noise exposure, indicative Weighted Sound Reduction Indices (R_W's) will be identified for the building components as required for traffic noise attenuation to achieve the above internal traffic noise levels.

MWA Environmental's involvement with the Portside Wharf development dictates that the required Rw ratings can be achieved with available glazing elements and other standard residential construction materials. In some cases thicker glazing may be required to the most affected external façade elements.

Indicative building componentry requirements are provided in ***Section 4.0***.

3.3 Port Activities Noise Impact Assessment

3.3.1 Port Activities Noise Criteria

The Brisbane City Council NIAPSP outlines assessment methodologies that should be used based on the noise source(s) characteristics and the time of day at which they occur. The noise sources associated with the surrounding land uses as considered for the assessment of the noise of port activities are the following:

- Plant and equipment noise, e.g. ship generator, air-conditioner noise;
- Loading / unloading noise, e.g. loading banging, noise of cranes and hydraulic buckets;
- Site vehicle noise, e.g. truck and vehicle movements on site, forklifts;

- Communications, e.g. alarms, PA system, beepers;
- Noise of ships arriving / leaving port, e.g. engine / propeller noise, noise of horns.

The range of noise sources and the potential for noise impact from the on-site and adjoining port operations to occur over a 24-hour per day period dictates that several noise assessment methodologies are required. The following paragraphs contain assessment methodologies in ***bold & italic*** type that are taken from titled assessment methodologies in the Brisbane City Council NIAPSP and the accompanying *NIAPSP Guidelines*.

3.3.1.1 Plant and Equipment Noise Criteria

For plant and equipment noise, an appropriate assessment is using Australian Standard ***AS2107***, *AS2107:2000 Acoustics – Recommended Design Sound Levels and Reverberation Times for Building Interiors* as a basis for determining the potential for noise intrusion into adjacent habitable dwellings from steady-state noise sources that operate during all hours of the day.

The noise limits are:

> *The maximum recommended design sound levels stated in Table 1 of AS2107.*

Table 1 of AS2107:2000 is as follows:

Type of occupancy/activity	***Recommended design sound level, L_{Aeq}, dB(A)***	
	Satisfactory	***Maximum***
7 RESIDENTIAL BUILDINGS		
Houses and apartments near major roads-		
Living areas	*35*	*45*
Sleeping areas	*30*	*40*
Work areas	*35*	*45*
Apartment common areas (e.g. foyer, lift lobby)	*45*	*55*

As such, the appropriate criteria for the assessment of the noise of plant and equipment associated with the adjoining port use is a maximum level of 40 dB(A) within sleeping areas and 45 dB(A) within living areas.

3.3.1.2 Loading Noise and Port Vehicle Noise Criteria

The noise from ships entering / leaving the port, loading / unloading activities at the port (cranes, loading banging etc.) and from port vehicles (trucks, cars, forklifts etc.) are typically noise events of a short duration and are best assessed using a comparison of like parameters or ***Descriptors***, with the criteria as follows:

> *The chosen parameter for assessing the impact of the development does not exceed the corresponding parameter describing the ambient noise by more than 3 dB(A).*

Such an assessment applies for the periods 7am to 6pm (Daytime) and 6pm to 10pm (Evening). As there is the likelihood for port related activities in the period 10pm to 7am (Night-time) potential for noise amenity impacts uses an assessment of ***Sleep Disturbance due to Sources Other than Aircraft***,

which also considers the resultant internal noise level at the nearest future habitable dwellings from the intrusive source. This criteria is as follows:

> *Research adopted by the World Health Organisation (WHO), concludes that for short duration variable noise sources the onset of sleep disturbance commences at internal L_{max} noise levels of between 45 dB(A) and 50 dB(A).*
>
> *Accordingly, for these noise sources measured internal maximum noise levels in area categories:*
>
> - *R1-R3* ***must not regularly exceed 45 dB(A)*** *&*
> - *R4-R6 must not regularly exceed 50 dB(A)*
>
> *Here "regularly" refers to the likelihood the noise levels would be exceeded by certain events (e.g. passing trucks) throughout the night.*

From AS1055.2–1997[4], which contains the 'R' noise area category rating (Appendix A), and the ambient recorded noise levels at the centre of the site on Tuesday 8th April, 2003 when there were minimal port activities, the location would be described as an R3 to R4 noise area category. The average background ($L_{A90,T}$) A-weighted sound pressure levels from AS1055.2–1997 for an R3 noise area category are 50, 45 and 40 dB(A) and for an R4 noise area category are 55, 50 and 45 dB(A) for the Daytime, Evening and Night-time periods respectively, compared with the recorded levels of 48, 46 and 44 dB(A) (**Table 2.4**) for the corresponding periods.

As such, the appropriate criteria for the assessment of the noise of loading / unloading activities and vehicles associated with the adjoining port use is a maximum internal noise level of 45 dB(A).

3.3.2 Noise of Adjoining Port Operations

Noted noise levels at the site from plant and equipment associated with the adjoining port was limited to a noise level of 60 dB(A) at a distance of 85 metres from a generator on the 'Alblasgracht' which was docked at Hamilton 1 wharf.

The noise of a ship leaving port under its own power was recorded when the 'Alblasgracht' left the Hamilton 1 wharf on Thursday 10 April, 2003. The ship had been unloaded and the propeller was thus high in the water, generating higher than average noise at the propeller / water interface. The noise level of this ship leaving port was recorded as approximately 73 dB(A) at a distance of 75 metres. The noise impact was noticeable for a period of approximately 6 minutes.

The noise of fertiliser and metal pipe unloading activities at the Hamilton 2 wharf was audible at most locations throughout the subject site. Noise sources noted included the noise of cranes, hydraulic buckets, small and large forklifts, a dozer and general loading banging noise. Additionally, there was occasional noise from reversing beepers, alarms and from the PA system. The noise peaks from these activities at the site were generally below 60 dB(A), with occasional louder noise up to 68.2 dB(A) from banging associated with the loading of metal pipes. These activities, as conducted at Hamilton 2 wharf would have generated higher noise levels at the subject site if conducted at the Hamilton 1 wharf, nearest to the subject site.

Scrap metal is loaded for export at the adjoining port facility. Previous noise monitoring conducted has measured the noise level of scrap metal loading at the port to be approximately 63 dB(A) at a distance of 50 metres.

[4] Australian Standard *AS 1055.2-1997 Acoustics – Description and measurement of environmental noise, Part 2: Application to specific situations*

The typical noise of slow-speed passenger vehicles has been previously recorded by MWA Environmental as approximately 75 dB(A) at a distance of 3 metres. Similarly, trucks of the type generally used at the port have been previously measured as producing a noise level of approximately 85 dB(A) at a distance of 3 metres. The recorded noise level of trucks on the adjoining port at the eastern boundary of the subject site were below 60 dB(A) and generally in the range 45 to 55 dB(A). These trucks were operating approximately 200 metres from the noise monitoring location at Hamilton 2 wharf. The noise of trucks and passenger vehicles at the adjoining wharf would have been higher if activities were focussed at the Hamilton 1 wharf which is nearer to the subject site.

The existing terminal and apartment building located on the eastern extent of the site provide substantial shielding of noise from any of the P&O Ports facility at the proposed Building 6 component of the Portside Wharf site.

3.3.3 Predicted Port Activities Noise Levels at Development

3.3.3.1 Plant and Equipment Noise

During the noise monitoring the noise level of two ship generators was recorded as 54.5 dB(A) at 75 metres and 60 dB(A) at 85 metres. The assessment of the noise from ship generators at the adjoining port use is a worst-case assessment assuming that the loudest recorded ship generator noise source is operating at the Hamilton 1 wharf (nearest to the subject site). These worst case assumptions related to a maximum ship generator noise level external to the most potentially affected building façade of 57 dB(A). Thus, in order to achieve the required internal plant and equipment noise levels of 40 dB(A) within bedrooms and 45 dB(A) within living areas, the eastern and southern facades of Building 6 will be required to achieve a maximum noise attenuation of 12 to 17 dB(A). This level of noise attenuation will be readily achieved using standard residential grade building components.

The existing Terminal and apartment building, up to 10 storeys in height, along the eastern site boundary provides substantial shielding of the noise of P&O Ports activities, particularly at the ground level outdoor areas and at the lower and middle levels of the residential Building 6. Thus, the ground level outdoor areas are shielded from the adjoining port and will have satisfactory noise environments. As such, the noise of port related plant and equipment is not predicted to adversely impact on amenity at the proposed Building 6 development.

3.3.3.2 Noise of General Port Activities

The noise monitoring conducted identified distinct noise levels from port activities such as truck and forklift movements, cranes, loading banging noise and others as detailed above. The assessment of the noise from loading / unloading and site vehicles at the adjoining port use is a worst-case assessment assuming that the loudest recorded port activity noise source is operating at the Hamilton 1 wharf (nearest to the subject site). These worst case assumptions related to a maximum port activity noise level external to the potentially most affected building facade (i.e. not shielded by the Terminal Building) of 74 dB(A). Thus, in order to achieve the required internal peak noise level of 45 dB(A), the affected facades of the upper levels of Building 6 will be required to achieve a noise attenuation of up to 29 dB(A). This level of required noise attenuation will necessitate the provision of acoustically rated building components to the eastern and southern facades of the proposed Building 6.

The existing Terminal and apartment building, up to 10 storeys in height, along the eastern site boundary provides substantial shielding of the noise of P&O Ports activities, particularly at the ground level outdoor areas and at the lower and middle levels of the development building. Thus, the lower levels of Building 6 and ground level outdoor areas and shielded from the noise of port activities by the proposed building structures such that they will be exposed to lower external peak noise levels than that detailed in the above paragraph.

It is considered that the noise of general port activities has the potential to only impact upon eastern and southern building facades of the upper levels (i.e. above Level 10) of proposed Building 6. As such, it is recommended that at the Building Approval stage, when construction drawings are available, that building componentry calculations of the required Rw values for the eastern and southern facades of Level 10 and above of Building 6 be conducted to ensure appropriate acoustic elements are incorporated for the final design.

MWA Environmental's involvement with the Portside Wharf development dictates that the required Rw ratings can be achieved with available glazing elements and other standard residential construction materials. In some cases thicker glazing may be required to the most affected external façade elements.

Lower levels of Building 6 are sufficiently shielded from the adjoining port by the existing Terminal and apartment building located on the eastern portion of the site and will thus require a lower acoustic standard for building components to achieve the criteria internal noise level from port activities. It is considered that the noise of port activities on lower levels (and also the northern and western building facades) will also be attenuated on the account of traffic noise and aircraft noise Rw ratings. As such, with the provision of appropriate acoustic design and acoustically rated building components, the noise of port related activities is not predicted to adversely impact on amenity at the proposed residences.

Indicative building componentry requirements are provided in ***Section 4.0***.

3.4 Surrounding Land Uses Noise Impact Assessment

3.4.1 Surrounding Land Uses Noise Criteria

The Brisbane City Council NIAPSP outlines assessment methodologies that should be used based on the noise source(s) characteristics and the time of day at which they occur. The noise sources associated with the surrounding land uses (other than the port activities) as considered for the assessment are the following:

- Plant and equipment noise, e.g. air-conditioning, refrigeration, exhaust vents;
- Service noise, e.g. truck, forklift and vehicle movements;
- Car parking and associated vehicle noise;
- Bus activity noise.

Surrounding existing land uses (other than Port land uses) that have the potential to impact on noise amenity at the site are limited to Sammys Girl Seafood with respect to plant and equipment noise. All other sites are currently under redevelopment or form part of the Portside Wharf Masterplan development.

The Caltex service station (24-hour truck stop) located to the north, across Hercules Street has little potential to impact on the site considering that the proposed residences will receive louder and more frequent noise peaks from trucks on Hercules Street than those at the service station. Plant and equipment associated with the

service station was minimal and was not audible at the subject site during site inspections.

The range of noise sources and the potential for noise impact from the surrounding land uses to occur over a 24-hour per day period dictates that several noise assessment methodologies are required. The following paragraphs contain assessment methodologies in ***bold & italic*** type that are taken from titled assessment methodologies in the Brisbane City Council NIAPSP and the accompanying *NIAPSP Guidelines*.

3.4.1.1 Plant and Equipment Noise Criteria

For plant and equipment noise, an appropriate assessment is using Australian Standard ***AS2107***, *AS2107:2000 Acoustics – Recommended Design Sound Levels and Reverberation Times for Building Interiors* as a basis for determining the potential for noise intrusion into adjacent habitable dwellings from steady-state noise sources that operate during all hours of the day.

The noise limits are those defined in ***Section 3.3.1.1*** above for plant and equipment associated with the adjoining port uses.

3.4.1.2 Car Parking, Site Vehicle and Bus Activity Noise Criteria

The noises from vehicle related activities and from general car park activity are typically noise events of a short duration and are best assessed using a comparison of like parameters or ***Descriptors***, with the criteria as follows:

> *The chosen parameter for assessing the impact of the development does not exceed the corresponding parameter describing the ambient noise by more than 3 dB(A).*

Such an assessment applies for the periods 7am to 6pm (Daytime) and 6pm to 10pm (Evening). As there is potential for vehicle related activities in the period 10pm to 7am (Night-time) potential for noise amenity impacts uses an assessment of ***Sleep Disturbance due to Sources Other than Aircraft***, which also considers the resultant internal noise level at the nearest future habitable dwellings from the intrusive source. This criterion is as defined in ***Section 3.3.1.2*** above for night-time noise associated with the loading and vehicles activities at the adjoining port uses.

3.4.2 Noise of Surrounding Land Uses

Plant and equipment associated with Sammys Girl was not generally distinguishable above the ambient background noise level at any point on the subject site.

3.4.3 Predicted Surrounding Land Use Noise Levels at Development

PLANT AND EQUIPMENT NOISE

Previous reporting and monitoring conducted at the site, identified a maximum noise level from surrounding fixed plant and equipment of approximately 55 dB(A) from Sammy's Girl plant and equipment at the nearest proposed building facade. Thus, in order to achieve the required internal plant and equipment noise levels of 40 dB(A) within bedrooms and 45 dB(A) within living areas, the proposed Building 6 residential facades will be required to achieve a maximum noise attenuation of 15 dB(A). This level of noise attenuation will be readily achieved using standard residential grade

building components. As such, the noise of fixed plant and equipment is not predicted to adversely impact on amenity at the proposed residences.

CAR PARKING AND SERVICE VEHICLE NOISE

MWA Environmental and others have previously recorded general car park and slow vehicle drive-by noise levels as typically 75 dB(A) at three metres. The assessment of car parking noise has considered car parking activities and slow speed traffic on access driveways and car parking areas surrounding Building 6.

This noise source is typified by short-term events, and so an appropriate like parameter for ***Descriptors*** assessment is the L_1 noise level. From the noise monitoring undertaken, the minimum ambient L_1 during the daytime and evening periods when car parking will generally occur was 48.0 dB(A), for which a criterion noise level would be 51 dB(A).

The shortest distance from adjoining car parking to a proposed residential façade is approximately 12 metres.

The likely maximum resultant car parking / slow speed vehicle noise level at the Building 6 is 63 dB(A), calculated as follows:

Source noise level (L_{p1}): 75 dB(A) at 3 metres (r_1)

Distance from source to residential facade: 12 metres (r_2)

Resultant noise level at receiver (L_{p2}): $L_{p2} = L_{p1} - 20 \log (r_2/r_1)$
$= 75 - 20 \log (12/3)$
$= 63$ dB(A)

This level is above the adopted criterion noise level, but it should be noted that the ambient L_1 noise levels ranged 48.0 to 79.0 dB(A) at the centre of the site noise logger during the daytime and evening periods. Given that ambient L_1 noise levels currently exceed the maximum predicted car parking noise level; it is judged that the noise of adjoining car parking does not have the potential to impact on future residential amenity. Furthermore, the required Rw ratings to attenuate traffic noise, aircraft noise and port activity noise sources shall also attenuate the noise of car parking activities at internal residential areas.

3.5 Noise Impact of Terminal and Commercial Precinct at On-Site Residences

3.5.1 Noise of Ships at Port

The use of the cruise wharf is primarily for one ship per week on average during the cruise season.

Noise sources associated with the ships berthing at the Portside wharf include:

- Ship engine noise and/or tug boat engine when arriving and departing;
- Auxiliary engine and generator noise when at dock;
- Any on-board amplified entertainment noise; and,
- Noise of on-board patrons.

The level of noise from engines and generators on passenger cruise ships would be expected to be lower than from commercial ships due to the requirement to provide a suitable level of amenity for on-board guests.

Inspection of recent cruise ships docked at Portside Wharf demonstrates that noise from the ships is apparent on the site. The acoustic design of future apartments

requires consideration of existing traffic and aircraft noise in addition to port operation noise.

Based upon the noise monitoring at the subject site and observations, the noise level of a typical passenger cruise ship at the dock (i.e. the noise of auxiliary engines and generators) is taken as 50 dB(A) at 75 metres for assessment purposes. Considering that Building 6 is located approximately 170 metres from a docked cruise ship, a noise level of approximately 43 dB(A) external to the nearest proposed on-site residential façade is adopted.

Thus, in order to achieve the required internal noise levels of 40 dB(A) within bedrooms, the most exposed southern façade of Building 6 will be required to achieve a minimum noise attenuation of 3 dB(A). This level of noise attenuation will be readily achieved using standard residential grade building components, however, as noted above, much higher acoustic design requirements are imposed on the external façade due to transportation noise constraints. As such, the noise of cruise ships berthed at the Portside wharf is not predicted to adversely impact on amenity at the proposed Building 6 residences.

3.5.2 Noise of Terminal Building and Commercial Precinct

The existing terminal building and associated commercial uses, along with existing restaurant uses at ground level throughout the site have the potential to generate noise at the Building 6 on-site residences.

The existing commercial uses at Portside Wharf, located to the east and south of Building 6, incorporate restaurants, cinemas, function rooms and markets. Retail uses are also proposed to be located at the ground level of future residential buildings at the site, including Buildings 4 and 6. The exact nature or future tenants of the retail tenancies are not known at this stage, however, it is considered that the uses would be similar to the existing uses at Portside Wharf.

Typical noise sources associated with the commercial and retail uses are likely to include:

- Amplified entertainment noise;
- Noise of outdoor dining / patrons;
- Noise of fixed plant and equipment;
- Noise of service vehicles and service activities;
- Noise of car parking; and,
- Noise of persons exiting / entering berthed ship.

It is considered that, with appropriate design and amenity controls, the noise of ground level retail uses (including the Building 4 and 6 sites) and also the noise of the surrounding commercial precinct and the operation of the terminal building would not cause adverse impacts on residential amenity at proposed Building 6. Furthermore, the required Rw ratings to attenuate traffic noise, aircraft noise and port activity noise sources would also attenuate the noise of any potential amplified entertainment and outdoor dining activities at internal residential areas.

To further clarify this and to provide a quantitative assessment, MWA Environmental have recently conducted additional noise measurements at the site to identify any entertainment and outdoor dining noise impacts from the existing commercial and retail precinct. The monitoring was conducted on Saturday 3 March 2008 during a period of what is considered to be busy dining time. As such the results are considered appropriate for the assessment of entertainment and outdoor dining noise from the existing Portside Wharf commercial precinct. It should be noted that a majority of the existing restaurant uses at Portside are located towards the southern portion of the site and thus separated from Building 6. The short-term statistical noise levels recorded by sound level meter are listed below in **Table 3.6**.

Table 3.6: Recorded Short-Term Noise Levels – dB(A)
3 March 2008

#	LOCATION	TIME	RECORDED STATISTICAL NOISE LEVEL - dB(A)					COMMENTS
			L_1	L_{10}	L_{50}	L_{90}	L_{eq}	
1	South of Building 3. At cruise terminal wharf. 15m to nearest restaurant.	2030 – 2040	62.9	59.9	57.7	56.1	50.2	Outdoor dining noise at Building 3 & 7 restaurants
2	Southeast of Building 4 site. Adjacent to existing restaurant uses. 10m to nearest restaurant.	2050 – 2100	67.2	63.0	60.5	58.8	61.3	Outdoor dining noise at Building 3 & 7 restaurants Background music at some restaurants – not influential
3	East of Building 4 site To north of existing restaurant uses. 20m to nearest restaurant.	2105 – 2115	61.9	59.3	57.0	55.3	57.5	Outdoor dining noise at Building 7 restaurants Background music at some restaurants – not influential

The short-term noise monitoring was undertaken with a Rion NL-21 Precision Sound Level Meter, internally pre-calibrated to 94 dB at 1kHz. There was no deviation from this level at post-calibration.

The monitoring undertaken indicates that the noise of amplified entertainment noise at the existing commercial and retail precinct located to the east and south of the Building 6 site was not noted to be influential on ambient noise levels. It was noted that some of the restaurants were playing light background music, however the noise impact was very minimal in comparison to more frequent noise sources such as traffic noise, car parking noise and outdoor dining noise. As such, it is not considered necessary to assess the existing impact of entertainment noise from the commercial precinct. It will be, however, necessary to provide further acoustic assessment if significant entertainment noise, i.e. Nightclub uses, were proposed at the Portside Wharf site.

Additionally, the monitoring undertaken indicates that there was some noise impacts associated with outdoor dining activities (more so at the southern portion of the site) at existing restaurants surrounding the site. The noise impact, however, is noted to be fairly minimal and it is not considered that it would cause any adverse impacts upon future residential amenity (especially considering the future design of proposed Building 6 to mitigate traffic noise, aircraft noise and port activity noise). This notwithstanding, further assessment has been carried out for outdoor dining noise impacts upon proposed Building 6 residential facades to ensure residential amenity is not adversely impacted.

3.5.3 Outdoor Dining Noise Impacts

The nearest existing offsite restaurant uses are at Building 7 to the east. The shortest distance from an existing restaurant to a proposed Building 6 residential façade is approximately 25 metres.

Assessment of daytime and evening period (7am to 10pm) outdoor dining noise impacts using the comparison of like parameters or descriptors methodology is considered to be best determined using the statistical noise parameter L_{10}. The L_{10} parameter is considered appropriate given the nature of outdoor dining noise.

The applicable criteria are that the chosen parameter for assessing the impact of the development does not exceed the corresponding parameter describing the ambient noise by more than 3 dB(A). From ***Section 2.1.2***, the average recorded L_{10} noise level at the datalogger located on the centre of the Portside Wharf site (see **Table 2.4**) was 51.4 dB(A) during the evening period. Thus, the appropriate design outdoor dining noise criterion is **54 dB(A)** external to proposed Building 6 residential facades.

As some outdoor dining may occur during the night-time period (10pm to 7am), the assessment has also considered the Brisbane City Council NIAPSP **Sleep Disturbance due to Noise Sources Other than Aircraft** methodology. The criteria from the NIAPSP Guidelines are as follows:

> *Research adopted by the World Health Organisation (WHO), concludes that for short duration variable noise sources the onset of sleep disturbance commences at internal L_{max} noise levels of between 45 dB(A) and 50 dB(A).*
>
> *Accordingly, for these noise sources measured internal maximum noise levels in area categories:*
>
> - ***R1-R3 must not regularly exceed 45 dB(A)&***
> - *R4-R6 must not regularly exceed 50 dB(A).*
>
> *Here "regularly" refers to the likelihood the noise levels would be exceeded by certain events (e.g. passing trucks) throughout the night.*

Hence, given the area is defined as an R3-R4 category area as per AS1055.2-1997, the internal noise level not to be exceeded is **45 dB(A)** L_{max} internally at the proposed Building 6 residential units.

The noise of a loud group of dining patrons has previously been recorded by MWA Environmental to be approximately 55 dB(A) at a distance of 30 metres (85 dB(A) at 1 metre). This corresponds well with the noise measurements recorded at the site (see **Table 3.6**).

The resultant noise level of ground level outdoor dining patron noise affecting the nearest proposed Building 6 residential facade is calculated to be 57 dB(A), as follows:

Source noise level (L_{p1}): 55 dB(A) at 30 metres (r_1)

Distance from source to residential facade: 25 metres (r_2)

Resultant noise level at receiver (L_{p2}): L_{p2} $= L_{p1} - 20 \log (r_2/r_1)$
$= 55 - 20 \log (25/30)$
$= 57$ dB(A)

Thus, the noise of outdoor dining is predicted to slightly exceed the external noise criteria at the nearest proposed Building 6 residential facade. However, to achieve the internal sleep disturbance 45 dB(A) criteria, a maximum 12 dB(A) of noise attenuation is required. This would be comfortably achieved when considering that all Building 6 residential facades are proposed to be air-conditioned and acoustically treated to attenuate traffic noise, aircraft noise and port activity noise sources as required. Furthermore, the 12 dB(A) noise reduction would be achieved with standard residential grade building components. All other proposed Building 6 residential façades are further separated and/or shielded from the existing restaurants and outdoor dining areas and will thus not be adversely impacted.

The above calculations demonstrate that outdoor dining noise associated with the existing commercial and retail uses at the Portside Wharf site shall not adversely impact on proposed Building 6 residential amenity. This assessment further clarifies the observations of the recent site inspection and noise monitoring conducted at the site.

It is also important to note that the management of the any licensed premises has a "duty of care" under licensing provisions to ensure that the behaviour of patrons entering and leaving a licensed premises does not cause undue annoyance or disturbance to persons living, working or doing business in the neighbourhood. Management will be required to act to ensure that patrons are supervised whilst on site to minimise noise from external areas.

It is also considered that any future outdoor dining noise impacts associated with future retail areas at Building 6 and at other surrounding buildings would similarly not have an adverse impact upon the acoustic amenity of Building 6 on-site residences.

3.6 Noise Impact of Subject Site on Adjacent Residential Land Uses

3.6.1 Noise of Ground Level Retail

The ground level retail uses are well separated from the only nearby off site residences and are shielded by the proposed intervening residential building structures. Thus, measures taken to ensure compliance with the appropriate noise limits from the ground level retail uses at on-site residences will ensure that the same noise limits are also achieved at the surrounding off-site residences. As such, the noise of the ground level retail uses is not predicted to adversely impact on surrounding residential amenity.

Any fixed plant and equipment associated with the ground level retail uses will be selected, located and/or acoustically treated to achieve the appropriate limits external to surrounding on-site and off-site residential facades.

3.6.2 Noise of Residential Building

Any fixed plant and equipment associated with residential Building 6 will be selected, located and/or acoustically treated to achieve the appropriate limits external to neighbouring on-site and surrounding off-site residential facades. It is likely that main air-conditioning equipment will be roof mounted and can incorporate appropriate acoustic control measures.

3.6.3 Noise of Loading Activities

Considering the nature of the proposed ground level retail tenancies, it is likely that servicing would occur during the daytime and evening periods only (7am to 10pm) when ambient traffic noise peaks are highest. Servicing for the proposed retail premises would also be anticipated to be relatively infrequent due to the small nature of the tenancies. Additionally, delivery vehicles are generally relatively quiet small trucks or vans for retail tenancies of the size proposed. The smaller delivery vehicles will typically use the proposed loading area located at ground level on the western portion of Building 6 in an enclosed area which will be well shielded and/or sufficiently separated to on site and surrounding residential areas.

Thus, the servicing requirements for the proposed ground level retail tenancies will be minimal with no potential to adversely impact on amenity at on-site or surrounding residential facades.

3.6.4 Noise of Car Parking Activities

Building 6 car parking is proposed to be located within a basement level and also within 2 levels of above podium car parking.

The noise of basement car parking activities will generally be contained to within the basement structure with little potential to adversely impact on surrounding land uses.

As some car parking may occur during the night-time period (10pm to 7am), the assessment has also considered the Brisbane City Council NIAPSP **Sleep Disturbance due to Noise Sources Other than Aircraft** methodology. The criteria from the NIAPSP Guidelines are as follows:

> *Research adopted by the World Health Organisation (WHO), concludes that for short duration variable noise sources the onset of sleep disturbance commences at internal L_{max} noise levels of between 45 dB(A) and 50 dB(A).*
>
> *Accordingly, for these noise sources measured internal maximum noise levels in area categories:*
>
> - ***R1-R3 must not regularly exceed 45 dB(A)&***
> - *R4-R6 must not regularly exceed 50 dB(A).*
>
> *Here "regularly" refers to the likelihood the noise levels would be exceeded by certain events (e.g. passing trucks) throughout the night.*

Hence, given the area is defined as an R3-R4 category area as per AS1055.2-1997, the internal noise level not to be exceeded is **45 dB(A)** L_{max} at surrounding existing and proposed residential facades.

MWA Environmental and others have previously recorded general car park and slow vehicle drive-by noise levels as typically 75 dB(A) at three metres. The shortest distance from a podium level car park to a surrounding existing or proposed residential façade is approximately 20 metres.

The likely maximum resultant car parking noise level, external to the nearest surrounding residential building façade is 59 dB(A), calculated as follows:

Source noise level (L_{p1}): 75 dB(A) at 3 metres (r_1)

Distance from source to residential facade: 20 metres (r_2)

Resultant noise level at receiver (L_{p2}):

$$L_{p2} = L_{p1} - 20 \log (r_2/r_1)$$
$$= 75 - 20 \log (20/3)$$
$$= 58.5 \text{ dB(A)}$$

As such, to achieve the 45 dB(A) internal noise criterion noise level, the surrounding existing and proposed residential facades will need to achieve a maximum 14 dB(A) noise attenuation at sleeping areas. All nearby surrounding residential facades form part of the Portside Wharf development and are proposed to be air-conditioned and acoustically treated to attenuate traffic noise, aircraft noise and port activity noise sources as required. Considering that standard residential construction materials will achieve a noise reduction of between 15 and 20 dB(A), the 45 dB(A) internal noise criterion shall be satisfied at the nearest existing or proposed surrounding residential façade.

Thus, the noise of car activities at Building 6 are not predicted to adversely impact upon amenity at surrounding existing and proposed residential facades.

As the podium level car park is partially open and naturally ventilated, the following noise control measures should be considered and implemented at the detailed design stage of the development:

- Avoid the use of noise-generating traffic control devices in proximity to adjoining residential land uses;
- Use car park surface with an appropriate coefficient of friction to ensure that tyre squeal noise is minimised.

4.0 BUILDING COMPONENTRY RECOMMENDATIONS

As the site is affected by aircraft noise, road traffic noise and noise from the adjoining port operation, it is recommended that at the Building Approval stage, when construction drawings are available, Rw calculations be conducted for each of the noise sources to ensure appropriate acoustic elements are incorporated for the final design and that satisfactory internal residential amenity is achieved.

An outline of the building componentry calculation requirements required for the Building 6 development are outlined below in **Table 4.1**:

Table 4.1: Building Componentry Calculation Requirements

Noise Source	Assessment Methodology	Maximum External Noise Level dB(A)	Internal Noise Criteria – Bedrooms dB(A)	Internal Noise Criteria – Living Areas dB(A)	Facades Affected
Aircraft	*AS 2021-2000*	83 L_{max}	50 L_{max}	60 L_{max}	All
Traffic	AS 3671 *AS 2021-2000*	As per Table 3.5	40 L_{eq}	45 L_{eq}	All
Port	*AS 2021-2000*	74 L_{max}	45 L_{max}	50 L_{max}	East and South, Levels 10 and above

It is recommended that the development approval conditions require design of acoustic treatments for the building at the detailed design stage to ensure appropriate internal amenity is achieved. The Rw calculations should be conducted for aircraft, traffic and port activity noise sources with the maximum Rw value as calculated from the three noise sources being assigned to each building component. The assessment methodologies, maximum external noise predictions, internal noise criteria and affected facades for each noise source are outlined above in **Table 4.1**.

MWA Environmental's involvement with the Portside Wharf development dictates that the required Rw ratings can be achieved with available glazing elements and other standard residential construction materials. In some cases thicker glazing may be required to the most affected external façade elements.

From experience, the following indicative building componentry requirements are provided in **Table 4.2** below. Note that these are indicative only and should only be used as a general guide to what shall be required for the final design.

Table 4.2: Indicative Building Componentry Requirements

Element	Typical Rw Range
Wall	30 to 41
Window	33 to 42
Sliding Glass Door	32 to 42

It is considered that the provision of building components achieving the R_w ratings specified at the detailed design stage will ensure satisfactory internal noise amenity within the proposed Building 6 units.

5.0 LIGHTING

5.1 Lighting Criteria

The appropriate design standard for fixed site lighting with respect to impact upon amenity is Australian Standard AS4282-1997-"Control of Obtrusive Effects of Outdoor Lighting".

An extract from Table 2.1 of AS4282-1997 is provided below:

Table 2.1 (Part only from AS4282)

Light Technical Parameter	Application or Calculation conditions (see also Figure 2.1 and Section 5)	Recommended Maximum Values		
		In commercial areas or at boundary of commercial and residential areas	Residential Areas	
			Light Surrounds	Dark Surrounds
Illuminance in vertical plane (Ev)	Pre-curfew*	25lx	10lx	10lx
	Crewed hours+	4lx	2lx	1lx

NOTE:
*Pre - curfew – Limits apply at relevant boundaries of nearby residential properties, in a vertical plant parallel to the relevant boundary, to a height commensurate with the height of the potentially affected dwellings. Values given are for direct component of illuminance.

+Curfew hours – Limits apply in the plane of the windows of habitable rooms of dwellings on nearby residential properties. In the absence of development (i.e. vacant allotment), the limits apply on the potentially affected property, in a vertical plane parallel to the relevant boundary, at the minimum setback permitted for a dwelling, to a height commensurate with land use zoning provisions. Values given are for the direct component of illuminance.

Based upon the significant development that has occurred as part of the Portside Wharf at the immediate surrounding areas, including multi storey residential buildings, retail development and the terminal and wharf itself, the subject site is considered to be best described as 'light surrounds' as AS4282 1997. As such, the appropriate maximum permissible vertical illuminance at the surrounding residential facades is 2 lux during curfew hours.

5.2 Headlight Glare

The impact of glare from vehicular headlights utilising the proposed podium level car parking areas is to be considered at surrounding residential facades. Vehicles accessing the podium car parking levels during the more sensitive curfewed hours are considered to be minor when compared to the more frequent vehicle movements during non-curfew hours. The headlight glare from cars utilising the podium car parking levels will be largely contained by the appropriate louvre elements such that unacceptable impact is not caused at surrounding residential facades.

The head lighting from vehicular movements within Building 6 proposed podium car parking levels will be contained on site with appropriate louvre screening elements. The potential for adverse glare from vehicle head lighting at surrounding residential facades is considered minimal and will not result in unacceptable impact upon amenity of existing residential areas.

6.0 AIR QUALITY IMPACT ASSESSMENT

The proposed development locates new residential uses in proximity to surrounding land uses with the potential to impact upon air quality. These surrounding land uses include cruise ships docked at the cruise terminal to the south and container and general cargo ships at the Hamilton Wharfs to the east. Air pollutant emissions from these sites include combustion engine emissions from ships and fugitive emissions from bulk cargo handling at the Hamilton Wharfs.

MWA Environmental has previously conducted detailed assessments considering the air quality impacts on existing residential uses at the Portside Wharf site. The assessments conducted demonstrated that the relevant air quality criteria and guidelines of the Brisbane City Council are satisfied at Portside Wharf residences. As such, it is considered that the relevant air quality criteria and guidelines of the Brisbane City Council would be satisfied at proposed Building 6.

Thus, it is considered that air pollutant emissions from surrounding commercial and industrial land uses have no potential to cause any adverse impacts at the proposed Building 6 development.

7.0 CONCLUSIONS

This report is an Environmental Amenity Impact Assessment for the proposed residential Building 6 of the 'Portside Wharf' development at Hamilton (see **Figure 1**).

The Portside Wharf development is anchored by the Brisbane Cruise Ship Terminal and incorporates a range of uses including residential, retail and commercial uses as part of the overall Masterplan.

Building 6 is a proposed mixed use development, incorporating retail and residential uses in a multi storey building, and is located on the northern portion of the Portside Wharf site.

This report considers the noise impact of surrounding land uses on the development and the potential for reverse amenity impacts of the development upon existing surrounding land uses.

This report is prepared in support of an application for a Development Approval submission to the Urban Land Development Authority. The report has been prepared in accordance with the requirements of applicable Australian Standards and with the requirements of the Brisbane City Council (BCC) *Brisbane City Plan 2000*, *Noise Impact Assessment Planning Scheme Policy* (NIAPSP).

The report has been prepared from detailed field surveys and data acquisition from Brisbane City Council, the Environmental Protection Agency and surrounding land occupiers including P&O Ports and DPI Food Research.

As the site is affected by aircraft noise, road traffic noise and noise from the adjoining port operation, it is recommended that at the Building Approval stage, when construction drawings are available, Rw calculations be conducted for each of the noise sources to ensure appropriate acoustic elements are incorporated for the final design and that satisfactory internal residential amenity is achieved. Given substantial experience with the Portside Wharf development, it is considered that the required Rw ratings can be achieved with available glazing elements and other standard residential building components. In some cases thicker glazing may be required to the most affected external façade elements.

Additionally, the report has determined that noise of ships at port, servicing activities and from the proposed on-site restaurants and car parking will be within appropriate limits internally given the requirement to achieve a high level of aircraft, traffic and port noise attenuation at the proposed residences.

The assessment concluded that any external plant and equipment associated with the proposed development can be located and/or acoustically treated to provide satisfactory noise levels at on-site and surrounding residential premises.

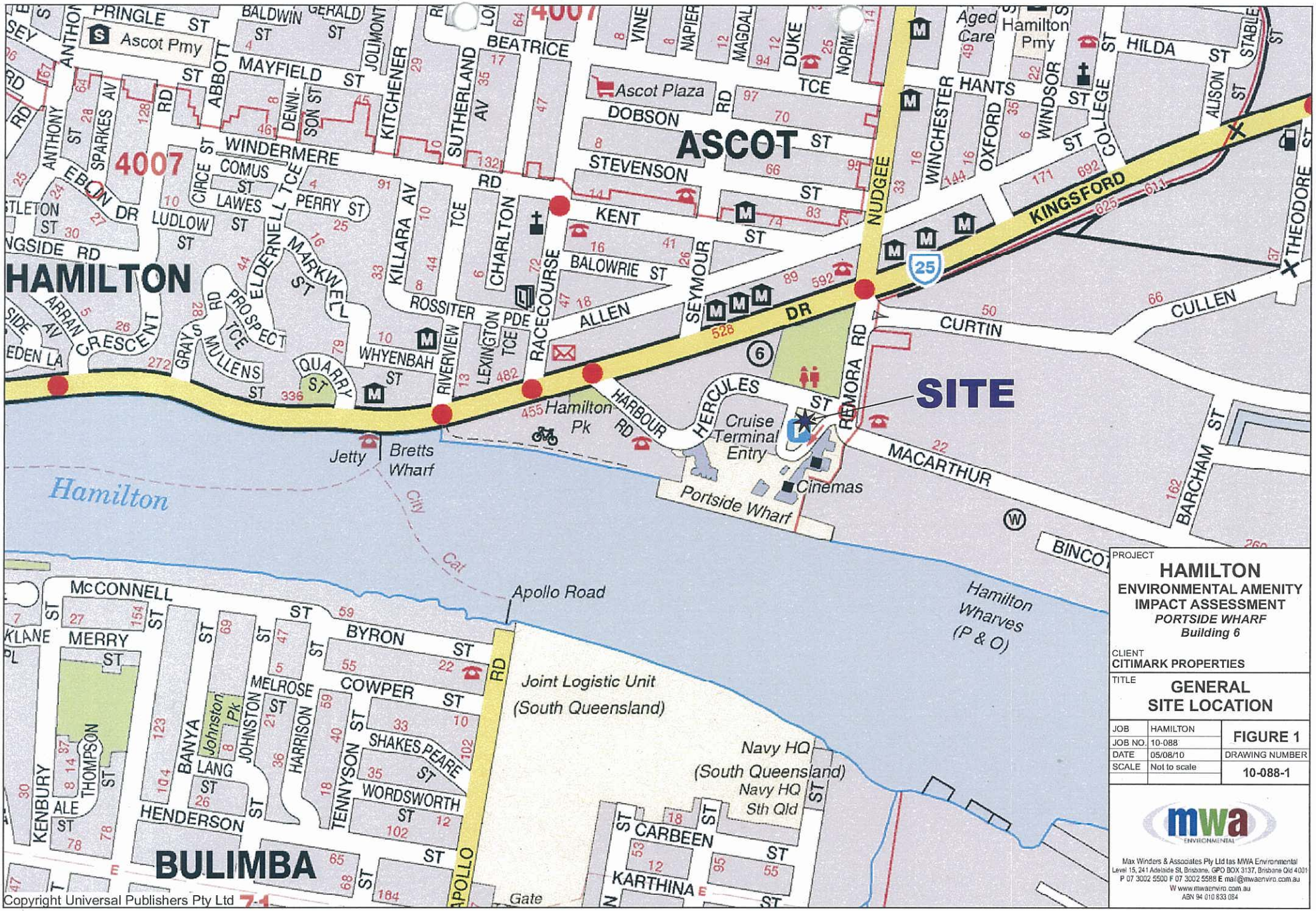
An assessment of both noise and lighting impacts from the proposed podium car parking levels has also been conducted. It is considered that the noise and lighting impacts of the podium car parking shall not adversely impact upon amenity at surrounding existing or future residential facades.

The assessment has also concluded that air pollutant emissions from surrounding commercial and industrial land uses have no potential to cause any adverse amenity impacts at the proposed development.

In summary, our experience dictates that the development can be constructed to readily comply with relevant acoustic and lighting design standards and that future residential amenity will be of an appropriate standard.

MWA Environmental
5 August 2010

FIGURES



PROJECT
HAMILTON
ENVIRONMENTAL AMENITY IMPACT ASSESSMENT
PORTSIDE WHARF
Building 6

CLIENT
CITIMARK PROPERTIES

TITLE
GENERAL SITE LOCATION

JOB	HAMILTON	**FIGURE 1**
JOB NO.	10-088	
DATE	05/08/10	DRAWING NUMBER
SCALE	Not to scale	**10-088-1**

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LEGEND

D Noise dataloggers (2)

8 Short term noise monitoring locations (8)

DRAWING REFERENCES

Cadastral - QLD Govt. DERM GIS 2010.
Aerial - Google Earth Pro, Apr 2007.
Aerial is not orthorectified, cadastral overlay is best fit.

0 25 50 75 100m

PROJECT

HAMILTON
ENVIRONMENTAL AMENITY IMPACT ASSESSMENT
PORTSIDE WHARF
Building 6

CLIENT
CITIMARK PROPERTIES

TITLE
NOISE MONITORING LOCATIONS

JOB	HAMILTON	FIGURE 2
JOB NO.	10-088	
DATE	05/08/10	DRAWING NUMBER
SCALE	1:4,000 (A4)	10-088-2

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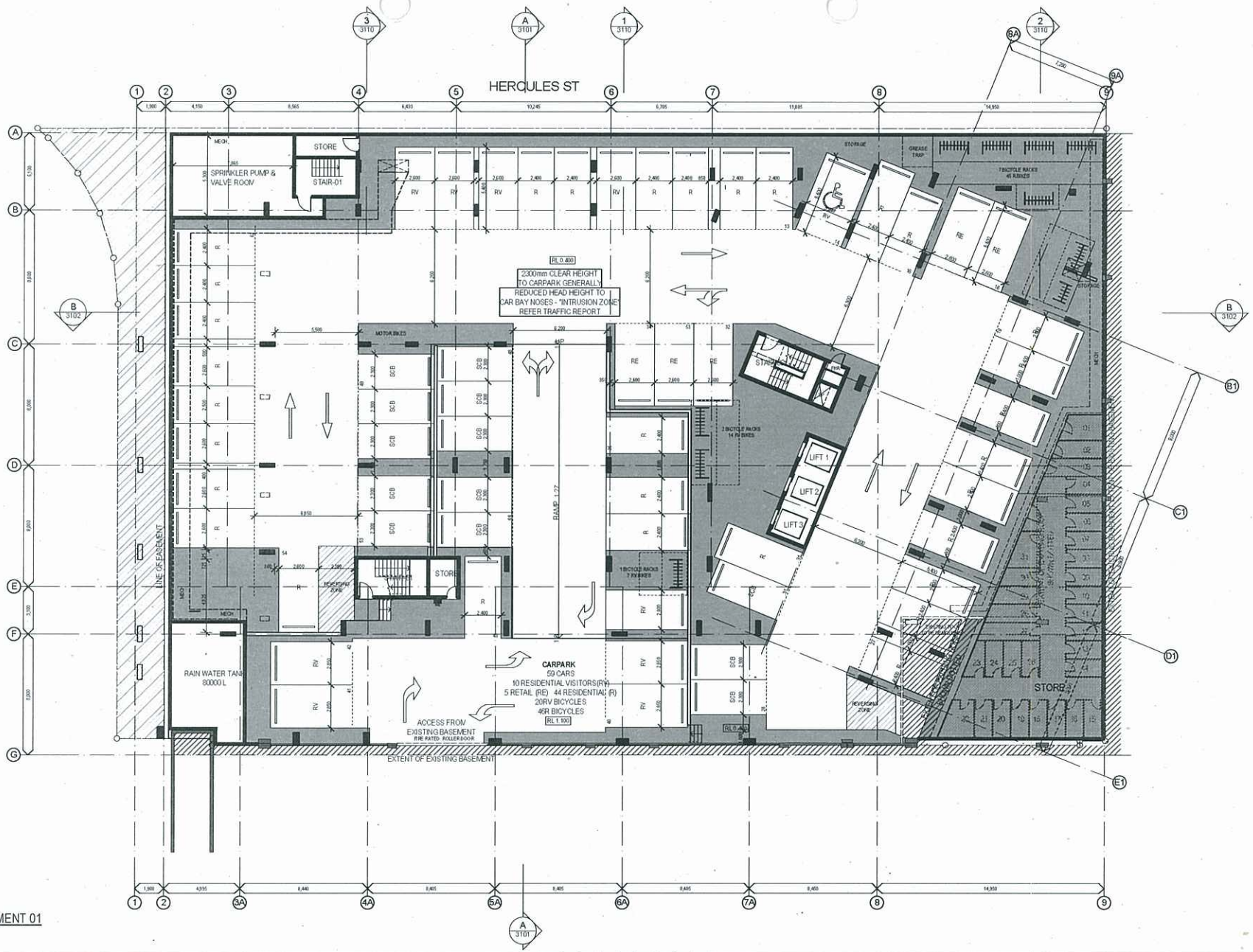
ATTACHMENT 1

Indicative Design Drawings



1 / - FLOOR PLAN - BASEMENT 01
SCALE 1:125 @ A1
SCALE 1:250 @ A3

0 1.25 2.5 3.75 5 6.25 7.5 8.75 10 11.25 12.5 metres

Schematic

BUILDING 6 PORTSIDE HAMILTON

CITIMARK

Issue	Revision	Date	In.
C	FINAL DA CO-ORDINATION	09/08/2010	LIV
B	PRELIMINARY ISSUE	27/07/2010	LIV
A	PRELIMINARY ISSUE	22/06/2010	LIV

Amendments

Client: CITIMARK

Project Name and Location: BUILDING 6 PORTSIDE HAMILTON, HERCULES ST, HAMILTON

Drawing Title: FLOOR PLAN - BASEMENT 01

Scale	Date	Job no.
As Shown	MAY 2010	09004025
Drawn	Checked	Approved
LM	ND	ND

Drawing no.: SD 2001

Issue: C

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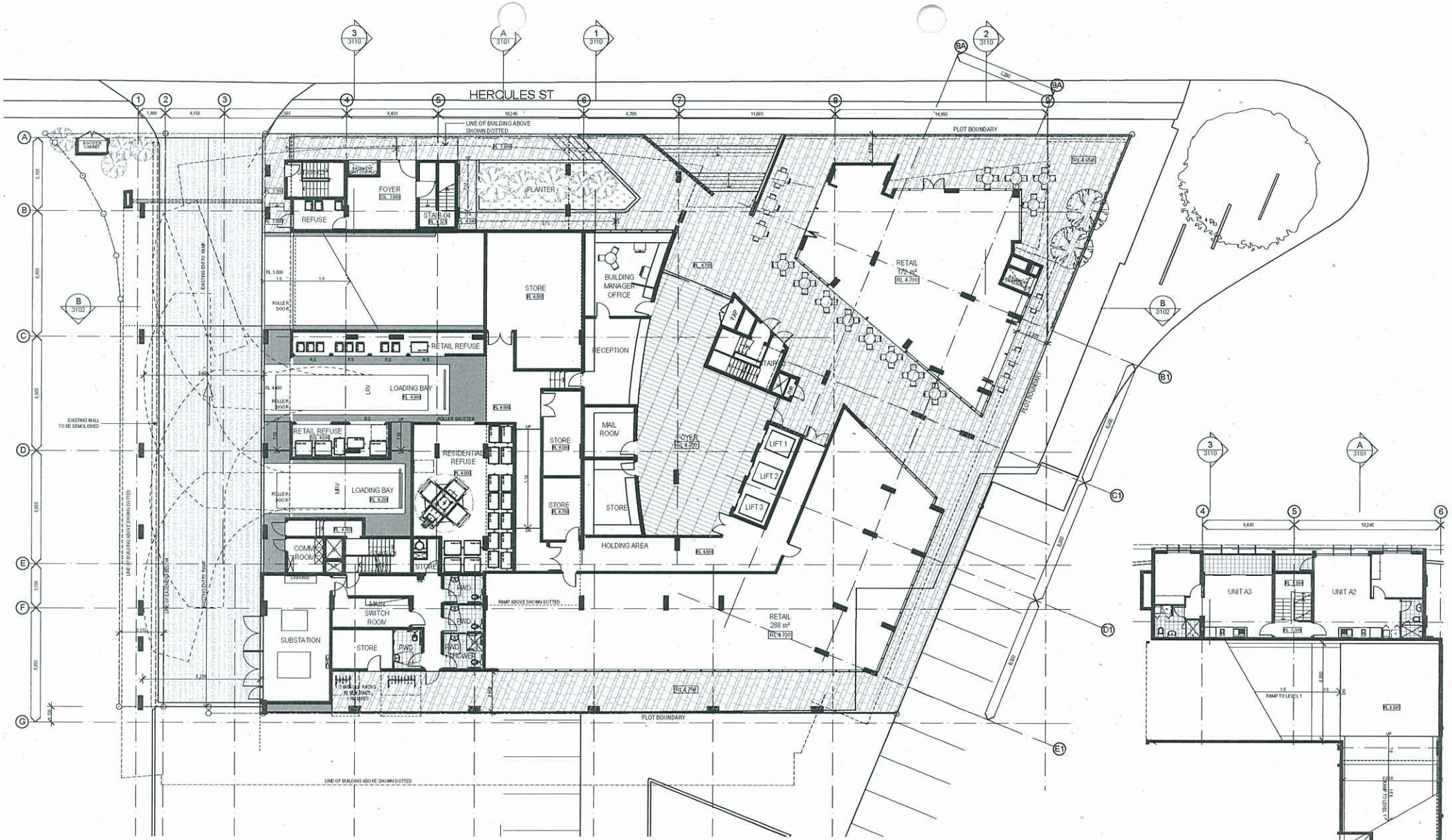

1 - FLOOR PLAN - GROUND FLOOR
SCALE 1:125 @ A1
SCALE 1:250 @ A3

2 - FLOOR PLAN - GROUND FLOOR MEZZ
SCALE 1:125 @ A1
SCALE 1:250 @ A3

0 1.25 2.5 3.75 5 6.25 7.5 8.75 10 11.25 12.5 metres

Schematic

BUILDING 6 PORTSIDE HAMILTON

CITIMARK

Issue	Revision	Date	In.
E	FINAL DA CO-ORDINATION	09.08.2010	LM
D	PRELIMINARY ISSUE	27.07.2010	LM
C	PRELIMINARY ISSUE	12.07.2010	LM
B	PRELIMINARY ISSUE	02.07.2010	LM
A	PRELIMINARY ISSUE	23.06.2010	LM

Amendments

Client	Scale	Date	Job no.
CITIMARK	As Shown	MAY 2010	09004025
Project Name and Location	Drawn	Checked	Approved
BUILDING 6 PORTSIDE HAMILTON, HERCULES ST, HAMILTON	LM	ND	ND
Drawing Title	Drawing no.		Issue
FLOOR PLAN - GROUND FLOOR	SD 2002		E

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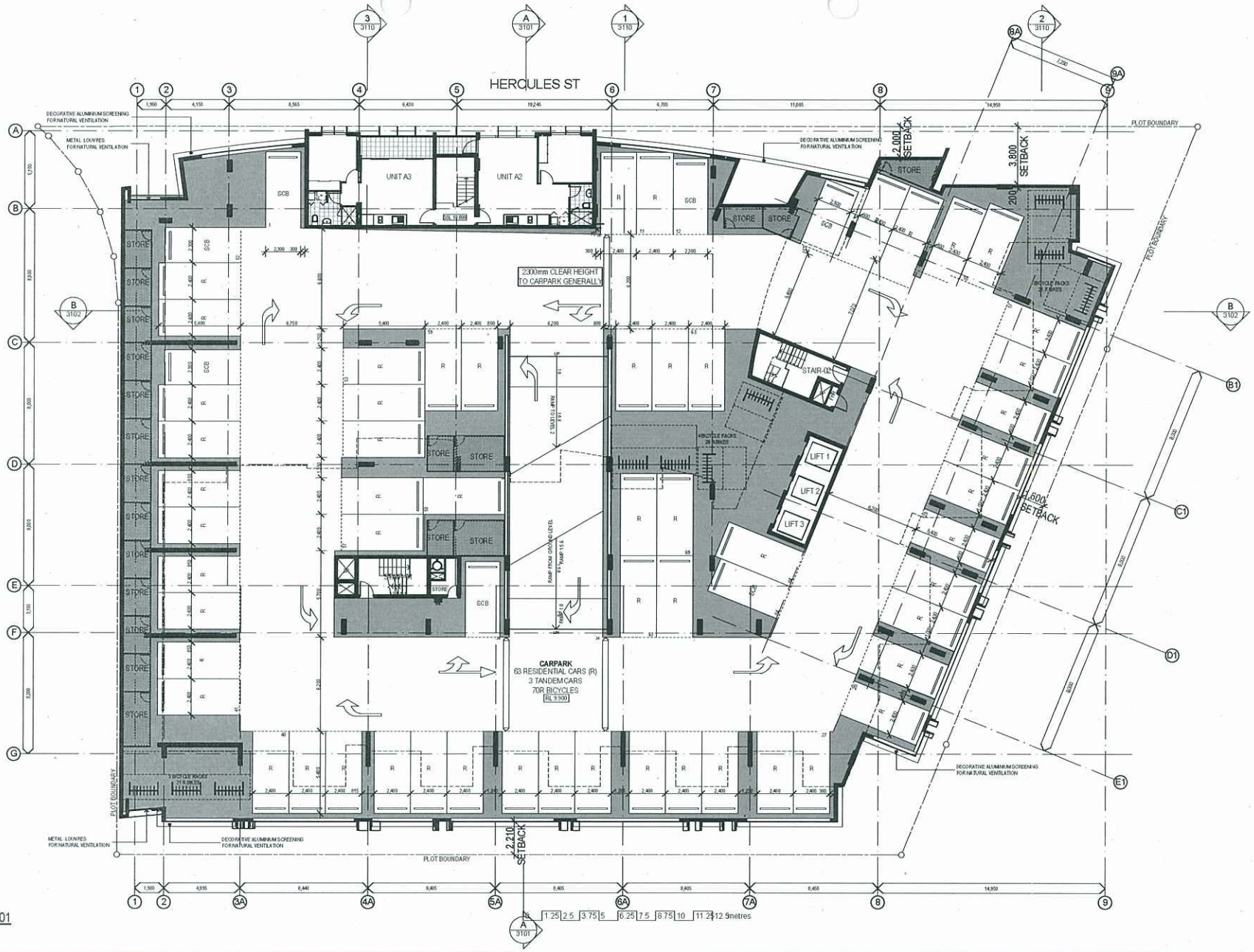

1 / - FLOOR PLAN - LEVEL 01
SCALE 1:125 @ A1
SCALE 1:250 @ A3

Schematic

BUILDING 6 PORTSIDE HAMILTON

CITIMARK

Issue	Revision	Date	In.
C	FINAL DA CO-ORDINATION	09/08/2010	LM
B	PRELIMINARY ISSUE	27/07/2010	LM
A	PRELIMINARY ISSUE	23/06/2010	LM

Amendments

Client: CITIMARK	Scale: As Shown	Date: MAY 2010	Job no.: 09004025
Project Name and Location: BUILDING 6 PORTSIDE HAMILTON, HERCULES ST, HAMILTON	Drawn: LM	Checked: ND	Approved: ND
Drawing Title: FLOOR PLAN - LEVEL 01	Drawing no.: SD 2003		Issue: C

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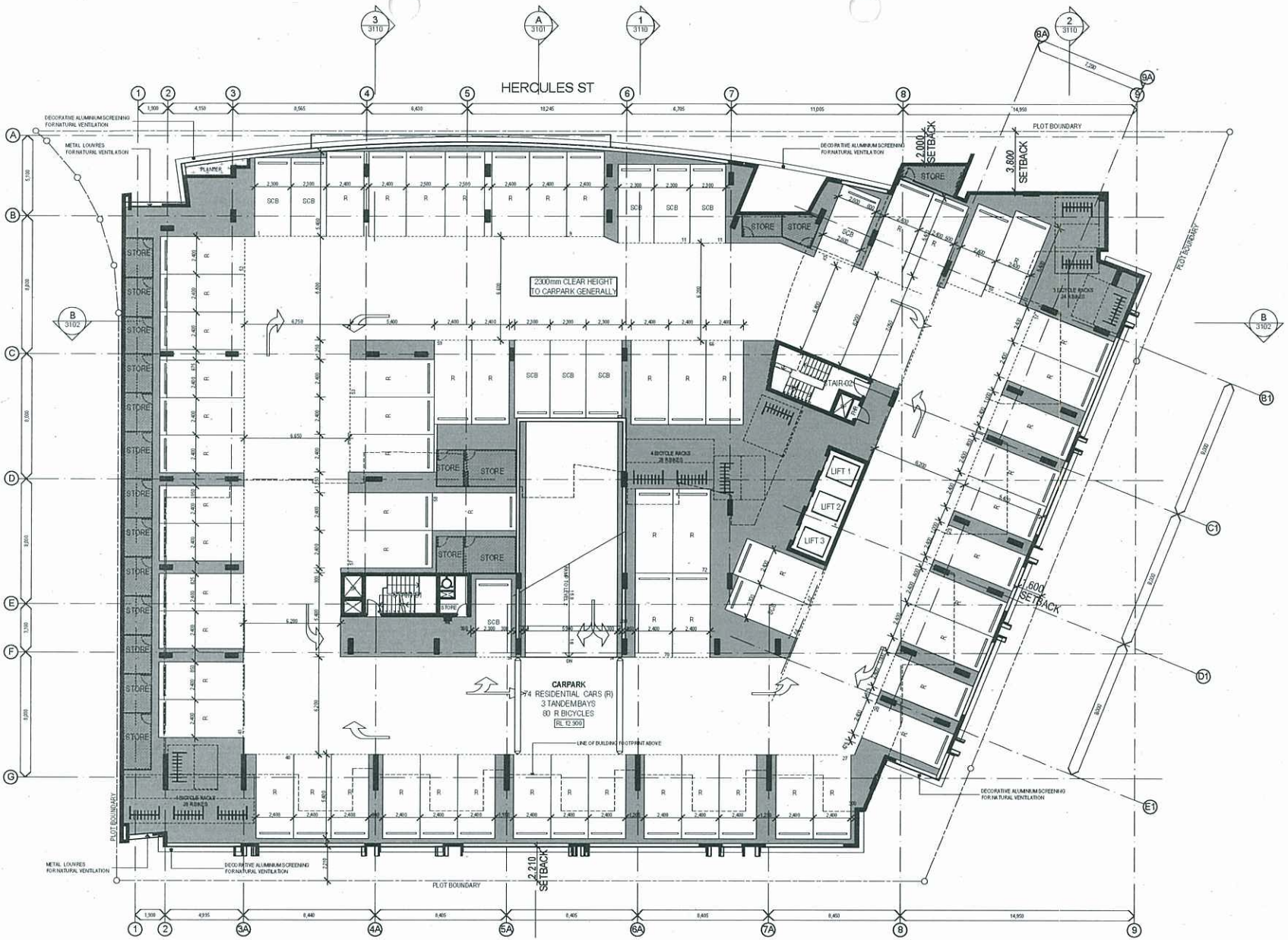

1 / - FLOOR PLAN - LEVEL 02
SCALE 1:125 @ A1
SCALE 1:250 @ A3

0 1.25 2.5 3.75 5 6.25 7.5 8.75 10 11.25 12.5 metres

Schematic

BUILDING 6 PORTSIDE HAMILTON

Issue	Revision	Date	In.
C	FINAL DA CO-ORDINATION	09.08.2010	LM
B	PRELIMINARY ISSUE	27.07.2010	LM
A	PRELIMINARY ISSUE	23.06.2010	LM
Amendments			

CITIMARK

Client: CITIMARK
Project Name and Location: BUILDING 6 PORTSIDE HAMILTON, HERCULES ST, HAMILTON
Drawing Title: FLOOR PLAN - LEVEL 02

Scale	Date	Job no.
As Shown	MAY 2010	09004025
Drawn	Checked	Approved
LM	ND	ND
Drawing no.		Issue
SD 2004		C

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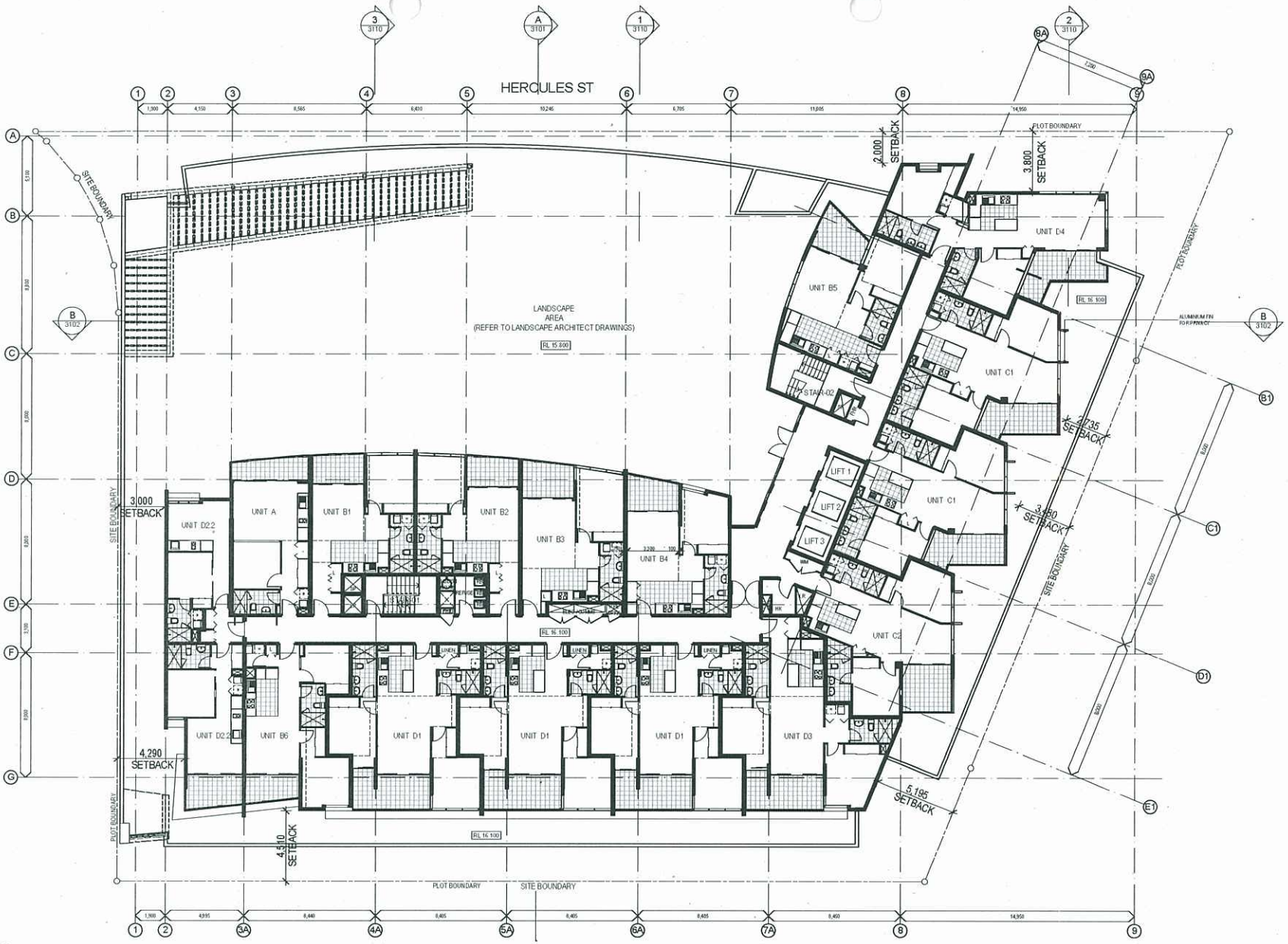

1 / - FLOOR PLAN - LEVEL 03
SCALE 1:125 @ A1
SCALE 1:250 @ A3

Schematic

BUILDING 6 PORTSIDE HAMILTON

CITIMARK

0 1.25 2.5 3.75 5 6.25 7.5 8.75 10 11.25 12.5metres

Issue	Revision	Date	In.
D	FINAL DA CO-ORDINATION	09.08.2010	LV
C	PRELIMINARY ISSUE	27.07.2010	LV
B	DESIGN UPDATED	12.07.2010	LV
A	PRELIMINARY ISSUE	22.06.2010	LV

Amendments

Client: CITIMARK	Scale: As Shown	Date: MAY 2010	Job no.: 09004025
Project Name and Location: BUILDING 6 PORTSIDE HAMILTON, HERCULES ST, HAMILTON	Drawn: LM	Checked: ND	Approved: ND
Drawing Title: FLOOR PLAN - LEVEL 03	Drawing no.: SD 2005		Issue: D

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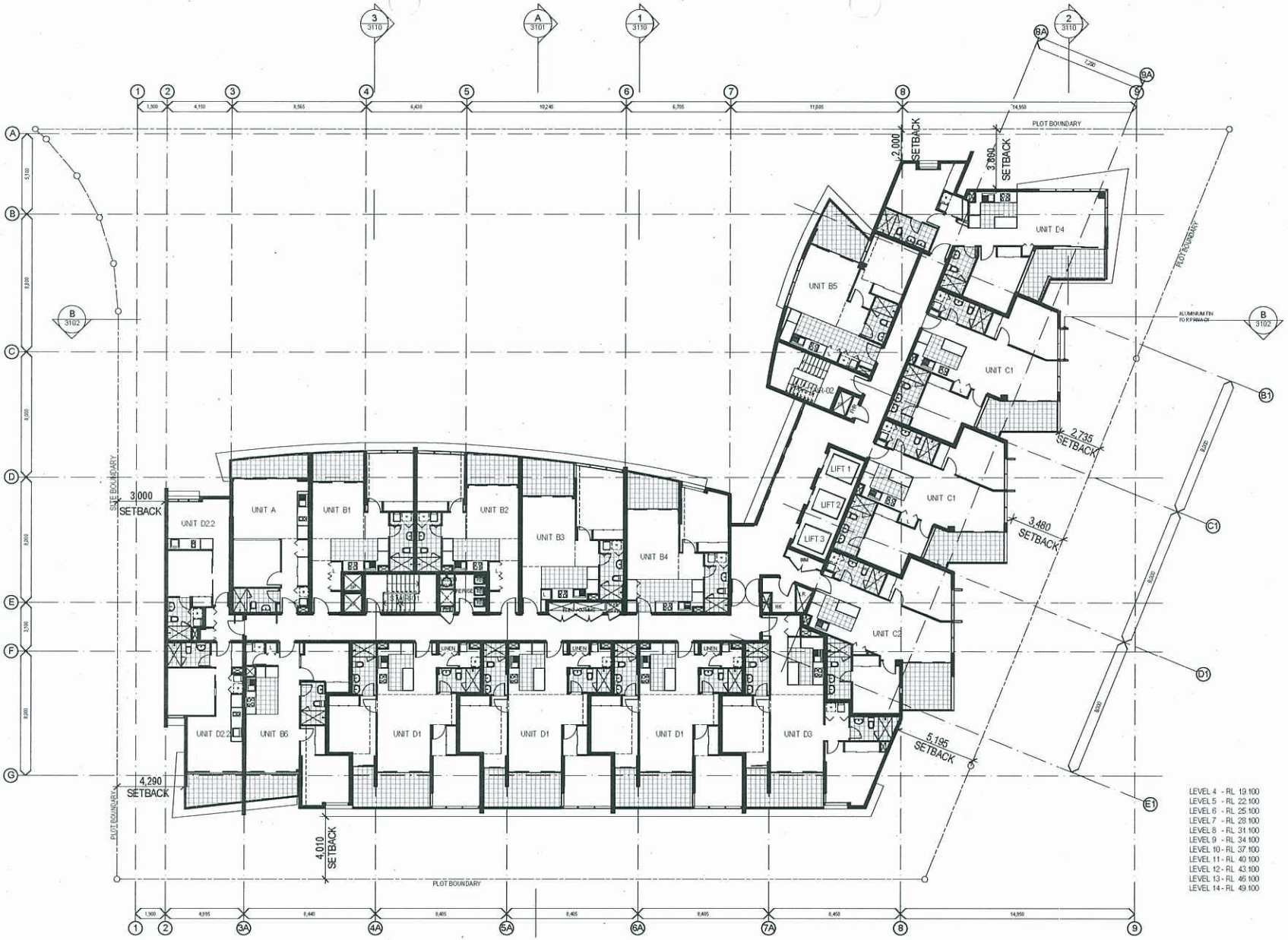

1 / - TYPICAL RESIDENTIAL FLOOR LEVEL 04 TO LEVEL 14

SCALE 1:125 @ A1

SCALE 1:250 @ A3

0 1.25 2.5 3.75 5 6.25 7.5 8.75 10 11.25 12.5 metres

Schematic

BUILDING 6 PORTSIDE HAMILTON

CITIMARK

Issue	Revision	Date	In.
C	FINAL DA CO-ORDINATION	05/08/2010	LM
B	REVISED ISSUE	04/08/2010	SO
A	PRELIMINARY ISSUE	27/07/2010	LM

Amendments

Client	CITIMARK		
Project Name and Location	BUILDING 6 PORTSIDE HAMILTON, HERCULES ST, HAMILTON		
Drawing Title	FLOOR PLAN - LEVEL 04		
Scale	As Shown	Date	MAY 2010
Job no.	09004025		
Drawn	LM	Checked	ND
Approved	ND		
Drawing no.	SD 2006	Issue	C

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ATTACHMENT 2

Peak Noise Level Summary