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One Central Park

Extended Hours Construction Noise Assessment

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EXECUTIVE SUMMARY

A construction noise assessment has been carried out for the proposed extension of construction hours associated with the internal fitout of the Block 2 podium levels as part of the One Central Park development. The potential impacts from these activities have been assessed against the requirements of the Council of the City of Sydney.

This report addresses the potential for noise impact on sensitive receivers in the vicinity of the One Central Park development from internal construction works during the night time period. It is proposed to extend the construction hours for internal fitout works only to the following:

- 24 hour operation Monday to Friday;
- 7:00am to 10:30pm on Saturday and Sunday.

Noise predictions presented in this report indicate that internal construction works can operate within the proposed extended hours and comply with the requirements of the Council of the City of Sydney.

This assessment outlines the procedures that would be adopted by the contractor during the internal fitout phase.

1 INTRODUCTION

This report presents the assessment of noise impacts associated with the proposed extended hours for internal fitout construction works to be carried out on the retail podium levels of Block 2 as part of the One Central Park development. Internal works are proposed to be conducted on lower ground, ground and levels one to three.

This report addresses noise impacts associated with internal fitout works during the night time period (Category 4) in compliance with the Council of the City of Sydney's "Construction Hours/Noise Within the Central Business District" Code of Practice (1992).

The proposed construction hours associated with this assessment involve an extension from the approved construction period to 24 hour operation Monday to Friday and up to 10:30pm on Saturdays and Sundays. The proposed internal works will be generally associated with contractors completing:

- Internal partitioning;
- Cable runs, termination etc;
- Floor and wall finishes; and
- Painting.

ALC confirms that noise impacts during the extended construction hours period can comply with the Sydney City Council construction noise criteria and will not result in an additional noise impact above the ambient acoustic environment. Furthermore, ALC notes that with the extension of construction hours, the overall noise exposure for residents surrounding the site will be reduced due to the shortening of the construction program.

Noise impacts have been assessed using the SoundPlan noise modelling software which provides a detailed assessment model for evaluating noise associated with the internal fitout works.

2 SITE DESCRIPTION

The proposed works are to be conducted within Block 2 of Frasers Broadway development located on the Corner of Broadway, Kent Road and Central Park Road (to be constructed) as part of the Central Park development (Refer to Figure 1). Works are to be limited to internal areas as part of the lower ground, ground and levels one to three.

2.1 SENSITIVE RECEIVERS

The nearest sensitive receivers in the vicinity of the site which will be in use during night time hours are as follows:

- Receiver 1 (R1) – Blackfriars Green, 21 Abercrombie Street located approximately 165m to the South-West;
- Receiver 2 (R2) – 65 O'Connor Street approximately 140m to the South.
- Receiver 3 (R3) – Multi story residential building at 1 Dwyer Street approximately 60m to the East of the site.

These buildings will be used as a basis for this night time assessment as they represent the nearest most potentially affected receivers during the period of operation.

Note: Terrace houses along Goold Street will be generally shielded via structures on Kensington Street. Apartment blocks along Goold Street will represent the worst case direct noise from construction works.

LEGEND

Block 2 – Internal Works	
Potentially Affected Residential Receivers	
Commercial Premises	
Unattended Noise Monitor	★

Figure 1: Site Survey and Sensitive Receivers

3 PROPOSED WORKS TO BE CARRIED OUT

This study includes works associated with the internal fitout of the podium levels of Block 2 only. Internal lifts will be utilised for the transportation of materials and personnel during the extended hours period.

3.1 EXTENSION OF CONSTRUCTION HOURS PROPOSAL

The existing approved construction hours for the site are as per the modification of major project approval document (ref: MP09_0078 MOD 4) as detailed below.

1. Between 7:00 am and 10:30 pm, Mondays to Fridays inclusive;
2. Between 7:00 am and 5:00 pm, Saturdays;
3. No work on Sundays and public holidays unless otherwise approved by the City of Sydney Council.

Extended construction hours were approved as it was demonstrated that internal works within Block 2 of the One Central Park development would have negligible acoustic impact on surrounding sensitive receivers. In this regard, ALC note the following:

- It is the understanding of ALC that there has been no complaint associated with the approved extended hours works up to 10:30pm which also included the use of external hoists in addition to internal works within the podium and residential towers;
- On the basis that the works associated with this proposed will include internal works only (no external hoist operation), it is expected that noise impacts will be less than that associated with the previous application.

On this basis, it is proposed to extend these construction hours to include:

1. 24 hour construction on Monday to Friday;
2. 7:00am to 10:30pm on Saturday and Sunday.

Construction works during the extended hours period, that being 10:30pm to 7:00am, will be limited to internal fitout of the podium levels as part of the development. No external construction activities are proposed during this period and materials and personnel shall utilise the internal lifts via the basement carpark levels.

External hoist operation on the western façades of the residential will be limited to 7:00am to 10:30pm Monday to Friday inclusive and 7:00am to 5:00pm Saturdays in accordance with the existing approval.

3.2 FITOUT WORKS

The construction activities which will be assessed in this document are internal fitout and finishes works to podium retail tenancies within the Block 2 building of the One Central Park development. Specific works are as described below.

3.2.1 Internal Fitout and Finishes Works

This involves all internal fitout work from the installation of plasterboard ceilings, services installation, painting and joinery. All work covered under this section, will be contained within the building, with the completed facade providing a barrier to the direct transmission of noise to the exterior.

The proposed works associated with the fit out of the residential development are described below.

Activity	Task Description	Noise Sources
Fitout	Interior fitout including new ceilings and partition walls, surface finishes and services	Power tools, hand tools

3.2.2 Deliveries

All material deliveries are to be conducted during the normal construction period of 7:00am to 7:00pm. There are to be no deliveries to the site during extended hours.

3.3 SOUND POWER LEVELS

Noise impact will be determined from all processes and equipment, which are involved in the activities outlined above by defining the levels of sound, which they generate.

The A-weighted sound power levels for all the component parts of the above-described activities are outlined in the tables below.

Table 1 – Construction Activities – Sound Power Levels

Construction Activity	Equipment / Process	Noise Level – dB(A)
1- Fitout	Hammering	110 SWL
	Drilling	94 SWL
	Impact drill	112 SWL
	Electric Saw	94 SWL
	Angle Grinders	114 SWL

The noise levels presented in the above table are derived from the following sources, namely:

1. On-site measurements
2. Table D2 of Australian Standard 2436-1981
3. Data held by this office from other similar studies.

3.4 CONSTRUCTION METHODOLOGY

Fitout works will be conducted using the following strategy:

1. Contractors constructing partitions, lining, joinery and the like. These teams will be using power and hand tools and the like and will generate high noise levels internally within Block 2 of the Central Park development. (noise levels as detailed above).

2. It should be noted that the majority of works within the podium level will be associated with partition sheeting, finishes, painting, electrical wiring, flooring and installation of electrical and lighting fittings which are significantly quieter.

4 CONSTRUCTION NOISE OBJECTIVES

4.1 CONSTRUCTION NOISE

Criteria relating to construction noise within the City of Sydney are outlined in the City of Sydney "Construction Hours/Noise Within the Central Business District" Code of Practice (1992). Construction noise during all periods of the day as detailed in the code are as follows:

Table 2 - Categories of Working Hours and Noise Criteria

Day	Time Zone	Category	Noise Criteria
Monday to Friday	00.00 – 07.00	4	Background + 0dB(A)
	07.00 – 08.00	1	Background + 5dB(A)
	08.00 – 19.00	1	Background + 5dB(A) + 5dB(A)
			To be determined on a site basis
	19.00 – 23.00	2	Background + 3dB(A)
	23.00 – 24.00	4	Background + 0dB(A)
Saturday	00.00 – 07.00	4	Background + 0dB(A)
	07.00 – 08.00	1	Background + 5dB(A)
	08.00 – 17.00	1	Background + 10dB(A)
	17.00 – 23.00	2	Background + 3dB(A)
	23.00 – 24.00	4	Background + 0dB(A)
Sundays and Public Holidays	00.00 – 07.00	4	Background + 0dB(A)
	07.00 – 17.00	3	Background + 3dB(A)
	17.00 – 24.00	4	Background + 0dB(A)

In addition, the following requirements are adopted.

- Australian Standard 2436-1981 "Guide to Noise Control on Construction Maintenance and Demolition Site". The requirements stipulated in Section 3 of the standard will be followed.

Section 3 of AS 2436 states that care shall be taken in applying criteria that normally would be used to regulate noise emitted from industrial, commercial and residential premises to construction, particularly for those activities which are transitory and of short duration. For the control and regulation of noise from construction sites AS2436 nominates the following:

- That reasonable suitable noise criterion is established.

- That all practicable measures be taken on the building site to regulate noise emissions, including the siting of noisy static processes on parts of the site where they can be shielded, selecting less noisy processes, and if required regulating construction hours.

- The undertaking of noise monitoring where non-compliance occurs to assist in the management and control of noise emission from the building site.

Based on these criteria the following procedure will be used to assess noise emissions:

- Predict noise levels produced by typical construction activities at the sensitive receivers.

- Noise emissions during the night time period at residential locations should achieve the background + 0dB(A) criteria for Category 4 hours.

4.2 BACKGROUND NOISE MONTIORING

Background noise levels during extended construction hours have been determined from monitoring on site conducted during the development application phase of the project. It is noted that the receivers closer to Broadway are likely to have higher background noise levels, meaning the assessment noise objectives used in this assessment are conservative at these locations.

4.2.1 Measurement Equipment

Unattended noise monitoring was conducting using Acoustic Research Laboratories Pty Ltd noise logger. The logger was programmed to store 15-minute statistical noise levels throughout the monitoring period. The equipment was calibrated at the beginning and the end of the measurement using a Rion NC-73 calibrator; no significant drift was detected. All measurements were taken on A-weighted fast response mode.

4.2.2 Measurement Location

The unattended monitor was installed on along the Southern boundary of the site adjacent to 9 Wellington Street. This location will typically exhibit the lowest background noise levels in the vicinity of the site in the absence of traffic noise from Broadway, Abercrombie and Regent Street.

4.2.3 Measurement Period

The unattended monitor was installed from the 17 November 2008 to 24 November, 2008.

4.2.4 Background Noise Levels

The background noise levels established from the unattended noise monitoring are detailed in the Table below.

Table 3 – Measured Background Noise Level

Time of Day	Background Noise Level dB(A) L_{90}
Day	50
Evening	48
Night	45

4.3 CONSTRUCTION NOISE OBJECTIVES

The construction noise objectives for this assessment have been established from the background noise monitoring in conjunction with the requirements of City of Sydney Council guidelines.

Table 4 – Construction Noise Objectives

Category	Background Noise Level dB(A) L_{90}	Construction Noise Objective dB(A) $L_{Av\ max}$
4	45	45

5 CONSTRUCTION NOISE MODELLING

Construction noise emissions associated with internal activities have been predicted using the SoundPlan noise modeling software. Hand calculations were incorporated to ratify predicted noise levels established from the SoundPlan noise model.

5.1 SOUNDPLAN NOISE PREDICTIONS

Modelling was conducted to investigate the potential for noise impact from internal fitout works during the extended hour's period of the surrounding receivers for One Central Park.

Input information which has been used in the development of the model included the following:

1. The model assumed that the loudest typical works were being conducted in all retail tenancies on each floor of the Block 2 podium. This assumes that an angle grinder is being used on each floor simultaneously. As noted previously, this is unlikely to occur as:
    - The majority of works will be associated with sheeting and internal finishes;
    - Stud work will also be carried out during the day and would not be continuous throughout the construction period (ie once stud work is constructed, the only activities remaining will be finishes which will be inherently quieter etc).

2. The sound power levels in detailed in Table 1 have been used to calculate internal sound pressure levels impacting on the façade based on:

    a. The size and room characteristics of the general podium area under construction. The model was conducted assuming the high noise generating activities mentioned above were impacting in each separate tenancy.

    b. The calculated sound pressure level was then assumed to occur consistently across the entire façade area.

3. Noise modelling was conducted over the podium levels to investigate noise impact on the potentially worst case locations of the neighbouring receivers. Details of the noise modelling are included in Appendix A.

4. The ISO9613-3:1996 method was used in Soundplan to calculate noise propagation.

5. The transmission loss of the residential façade used was Rw 31 for 6.38mm laminated glazing. It should be noted that in most circumstances glazing exceeds this rating (I.e. Rw 31).

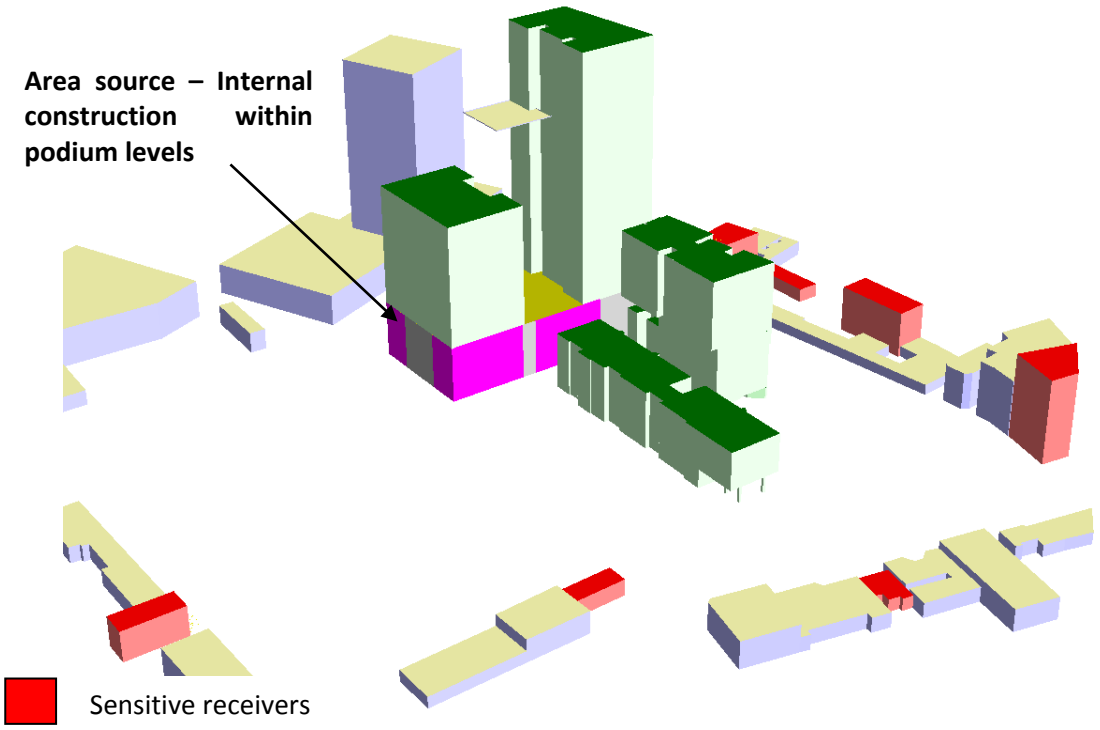


Figure 2: SoundPlan Base 3D Model - South-West View

5.2 NOISE MODELLING SCENARIO ONE – INTERNAL FITOUT OF THE BUILDING WITH INSTALLED FAÇADE

Internal noise levels during the fitout have been based on the worst case internal noise level from the loudest piece of plant.

- The worst case sound power level of 114dB(A) based on an angle grinder within each retail tenancy;
- Internal construction works within the building have been conservatively based from the ground floor to the top of the podium.
- The building façade is closed and constructed as per the project acoustic and structural requirements. This constitutes a minimum glazing specification of 6.38mm laminated glazing suites.

5.3 PREDICTED NOISE LEVELS

Noise emissions from internal construction activities and the use of the external hoist have been modelled using the SoundPlan noise modelling software. Predicted noise levels are presented at the nearest potentially affected residential receivers.

Table 5 – Predicted Construction Noise Levels *(Category 4)*

Activity	Receiver Location	Predicted Noise Level dB(A) $L_{av\ max}$ 15min	Construction Noise Criteria dB(A) $L_{av\ max}$ 15min	Complies
Internal Fitout	1	36	45	Yes
	2	38	45	Yes
	3	43	45	Yes

6 SAMPLE NOISE CALCULATIONS

In addition to the noise modelling detailed in the section above a sample calculation has been presented in this section of the report.

Sample calculations of the potentially worst case noise level sources associated with the fitout works and resulting noise levels at receivers are detailed below:

The following is a sample calculation used to predict the noise level at the worst affected residential boundary surrounding the site.

1.	Noise source (Angle Grinder):	114 dB(A) SPL
2.	Room Absorption:	-13 dB
3.	Area correction:	+15 dB
4.	Façade noise reduction of One Central Park (6.38mm Laminated):	-36 dB
5.	Distance Correction (60m):	-44 dB
	Resultant Noise level at receiver façade:	36 dB(A)

Note: SoundPlan predicted noise levels include all retail tenancies being worked on simultaneously over all podium levels.

7 DISCUSSION

Noise associated with internal fitout works during extended construction hours have been assessed against a worst case scenario of an angle grinder operating in each retail tenancy within the podium levels simultaneously.

It should be noted that the assessment scenario is unlikely to occur in practice as it is unlikely that all retail tenancies would be worked on at any one time with the loudest plant item associated with the fitout works. In reality, the majority of fitout works would produce noise levels significantly lower than that used as a basis for this assessment.

Construction noise emissions to commercial premises (including UTS) surrounding the site will be significantly less than that experienced during normal working hours. On this basis, noise associated with the extended hours works will have no additional noise impact on that experienced during the day time construction hours.

On this basis, internal fitout works will comply with the Sydney City Council noise emission criteria on the proviso that all works are conducted behind a closed façade and will have no acoustic impact on surrounding residential receivers.

8 CONCLUSION

This report presents the assessment of construction noise impacts associated with the proposed extension of construction hours for internal works within the podium levels of Block 2 of the One Central Park development.

Predicted noise levels from the worst case internal construction works indicate that noise emissions will comply with the Council of the City of Sydney's "Construction Hours/Noise Within the Central Business District" Code of Practice (1992).

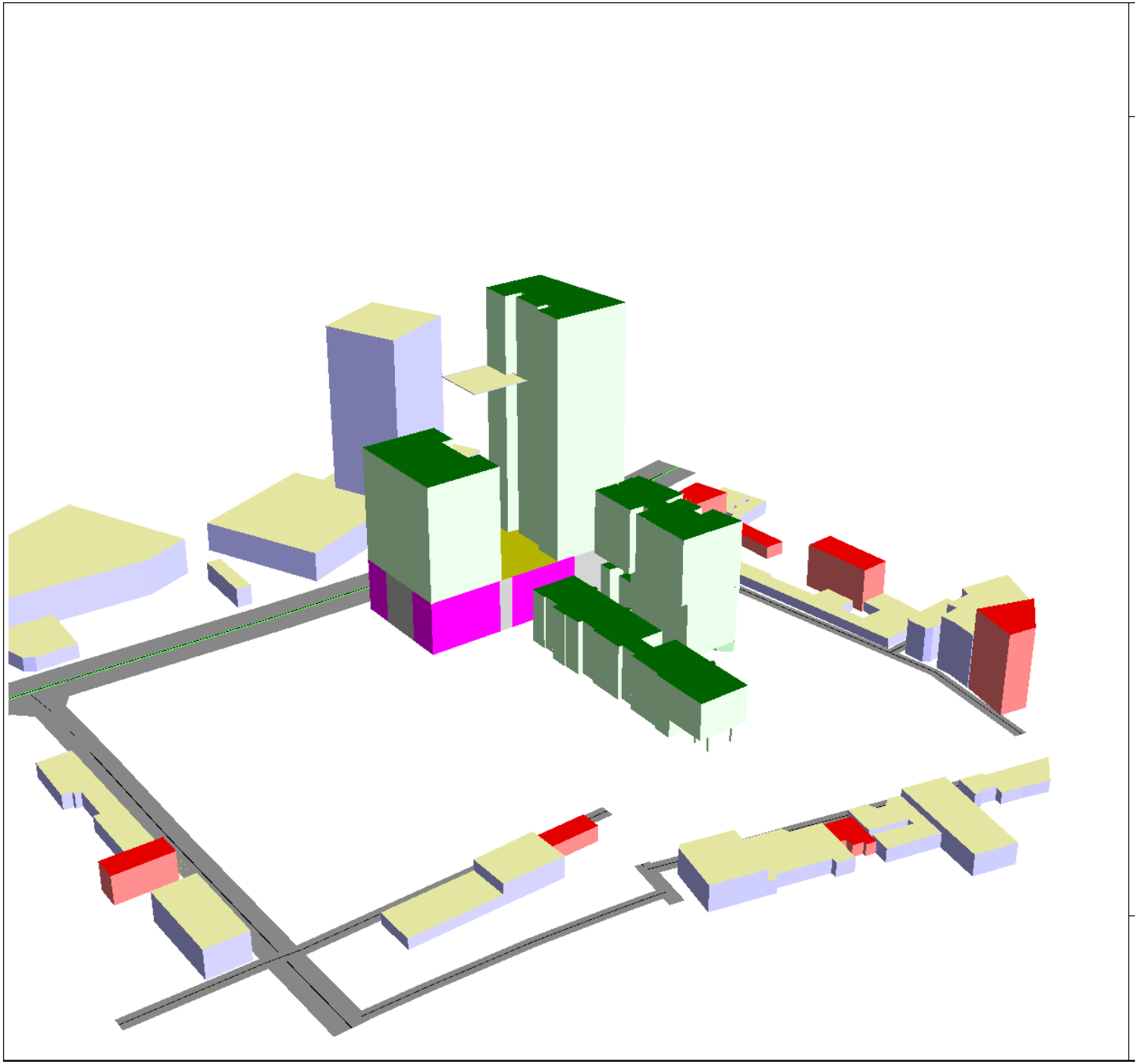
We trust this information is satisfactory. Please contact us should you have any further queries.

Yours faithfully,

Acoustic Logic Consultancy Pty Ltd
James Small

APPENDIX ONE

SOUNDPLAN NOISE MODELS



One Central Park
Podium Retail Fitout

SoundPlan Noise Model

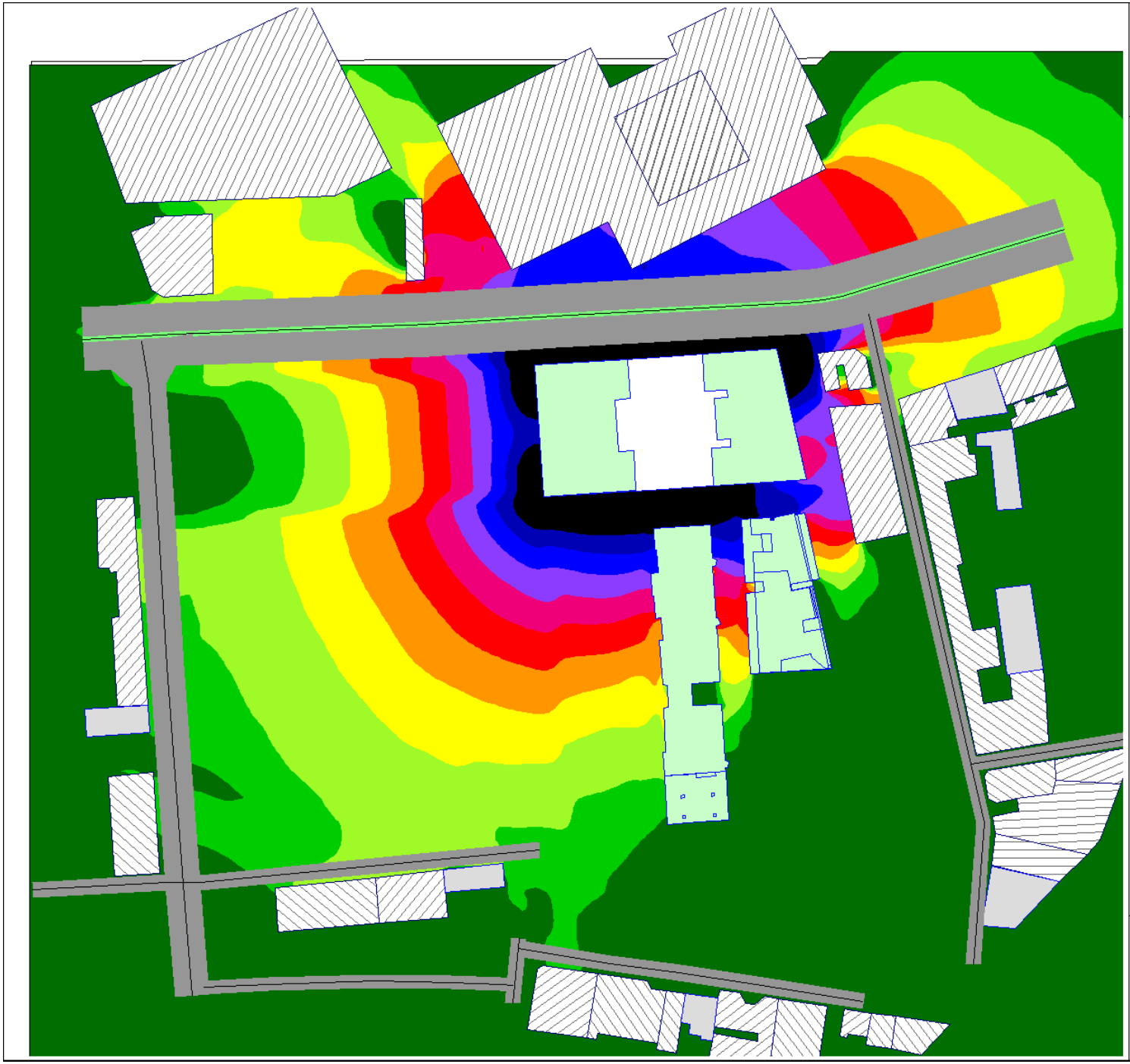
- Podium Retail Fitout

Prepared by: J. Small
Date: 03/06/2013

Signs and symbols

- Surface
- Receiver Locations
- Area source
- Wall
- Future Residential - Blocks 2 & 5

ACOUSTIC LOGIC



One Central Park
Podium Retail Fitout

Construction Noise Prediction

- Construction over all podium levels
- Minimum external glazing 6.38mm laminated.

Contours at 1.5m height
Includes facade reflection

Prepared by: J. Small
Date: 04/06/2013

Noise Level
$L_{Av\ max}$
in dB(A)

< 35
35 - 37
37 - 39
39 - 41
41 - 43
43 - 45
45 - 47
47 - 49
49 - 51
51 - 53
53 - 55
>= 55

Signs and symbols

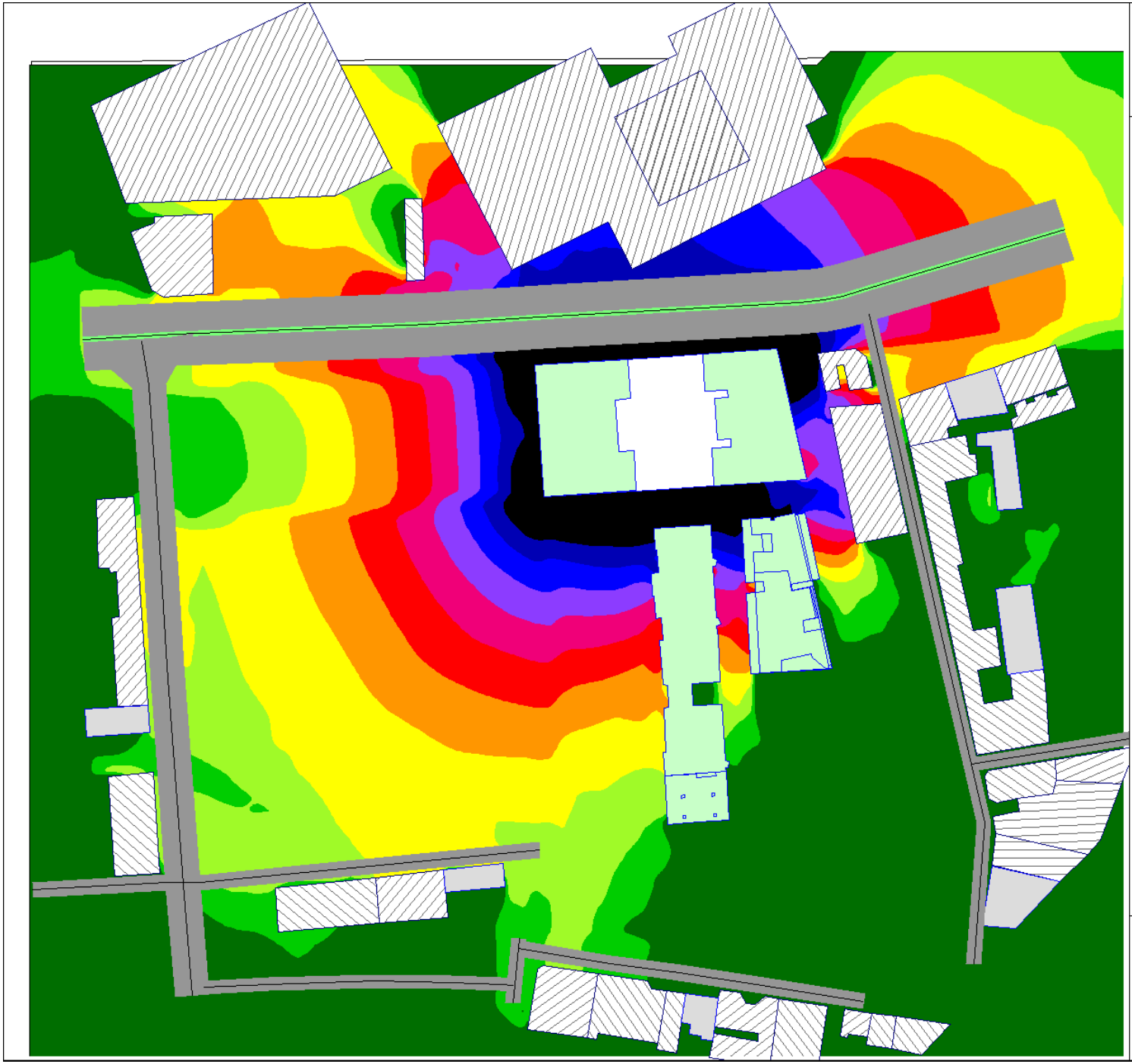
- Surface
- Surrounding Buildings
- Receiver Locations
- Point source
- Area source
- Internal Fitout Area
- Podium Level
- Point receiver
- One Central Park Buildings

Length scale 1:2000

0 10 20 40 60 80 m

N

ACOUSTIC LOGIC



One Central Park
Podium Retail Fitout

Construction Noise Prediction

- Construction over all podium levels
- Minimum external glazing 6.38mm laminated.

Contours at 5m height
Includes facade reflection

Prepared by: J. Small
Date: 04/06/2013

Noise Level
$L_{Av\ max}$
in dB(A)

< 35
35 - 37
37 - 39
39 - 41
41 - 43
43 - 45
45 - 47
47 - 49
49 - 51
51 - 53
53 - 55
>= 55

Signs and symbols

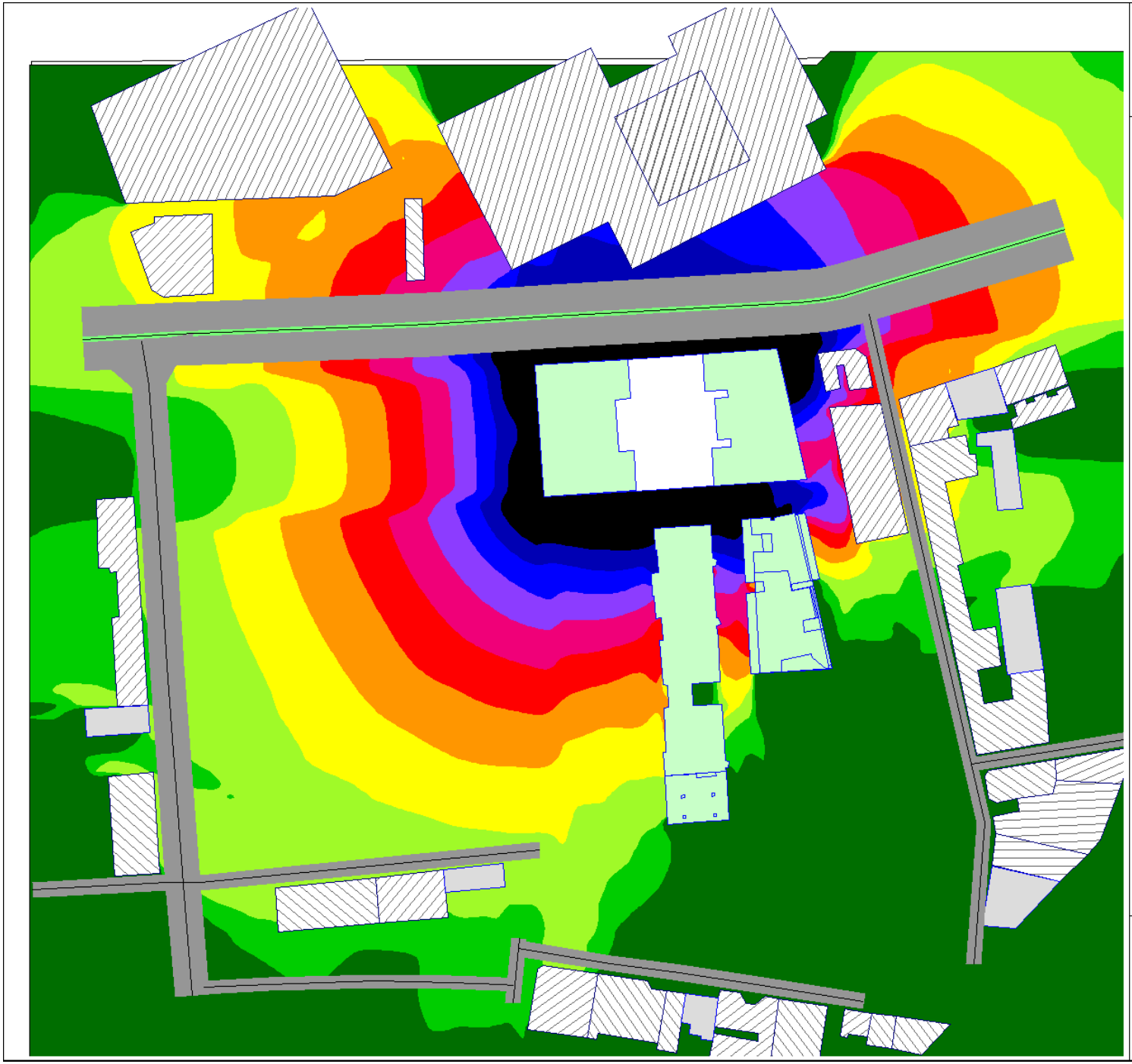
- Surface
- Surrounding Buildings
- Receiver Locations
- Point source
- Area source
- Internal Fitout Area
- Podium Level
- Point receiver
- One Central Park Buildings

Length scale 1:2000

0 10 20 40 60 80 m

N

ACOUSTIC LOGIC



One Central Park
Podium Retail Fitout

Construction Noise Prediction

- Construction over all podium levels
- Minimum external glazing 6.38mm laminated.

Contours at 10m height
Includes facade reflection

Prepared by: J. Small
Date: 04/06/2013

Noise Level
$L_{Av\ max}$
in dB(A)

< 35
35 - 37
37 - 39
39 - 41
41 - 43
43 - 45
45 - 47
47 - 49
49 - 51
51 - 53
53 - 55
>= 55

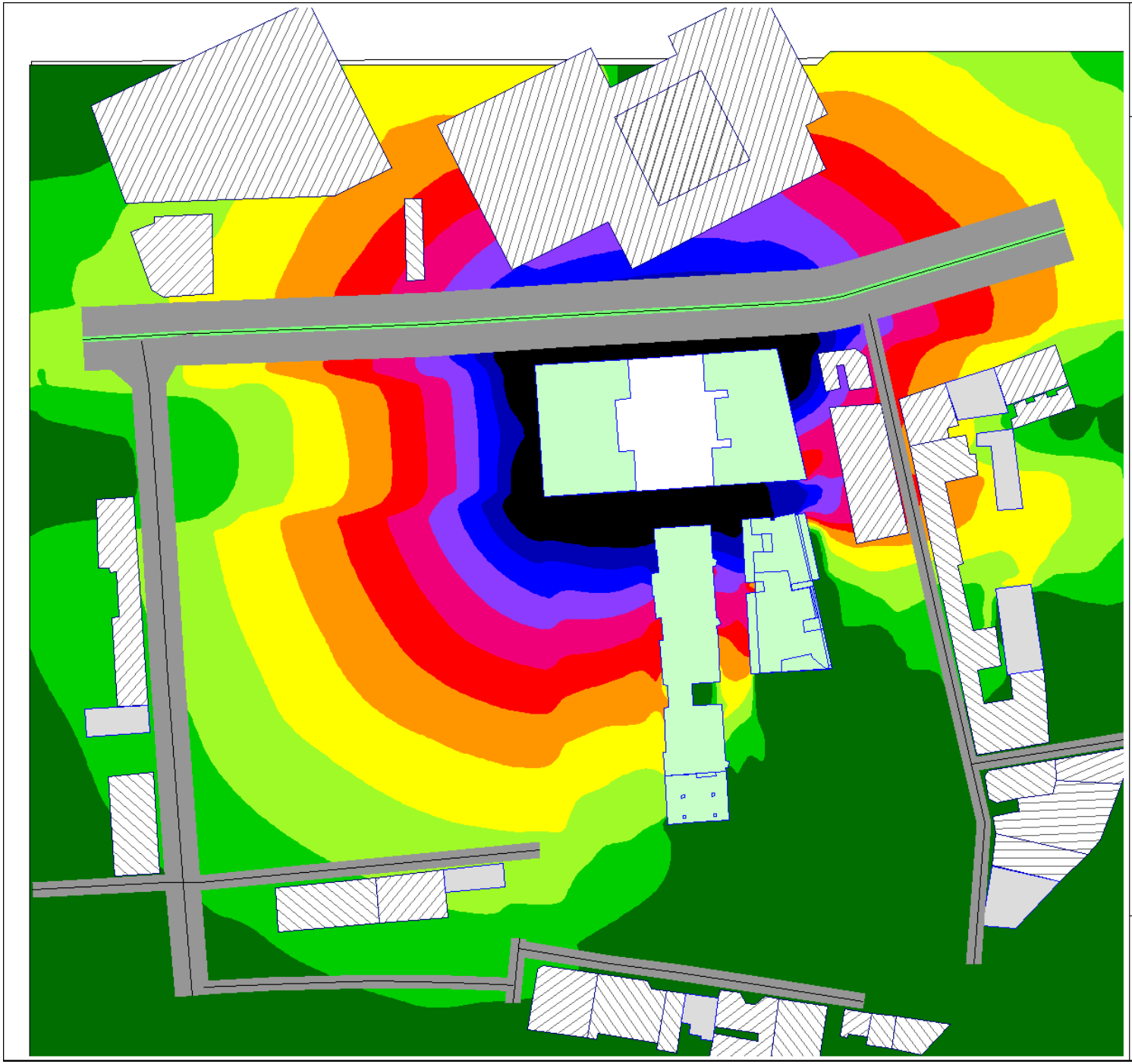
Signs and symbols

- Surface
- Surrounding Buildings
- Receiver Locations
- Point source
- Area source
- Internal Fitout Area
- Podium Level
- Point receiver
- One Central Park Buildings

Length scale 1:2000
0 10 20 40 60 80 m

N

ACOUSTIC LOGIC



One Central Park
Podium Retail Fitout

Construction Noise Prediction

- Construction over all podium levels
- Minimum external glazing 6.38mm laminated.

Contours at 20m height
Includes facade reflection

Prepared by: J. Small
Date: 04/06/2013

Noise Level
$L_{Av\ max}$
in dB(A)

< 35
35 - 37
37 - 39
39 - 41
41 - 43
43 - 45
45 - 47
47 - 49
49 - 51
51 - 53
53 - 55
>= 55

Signs and symbols

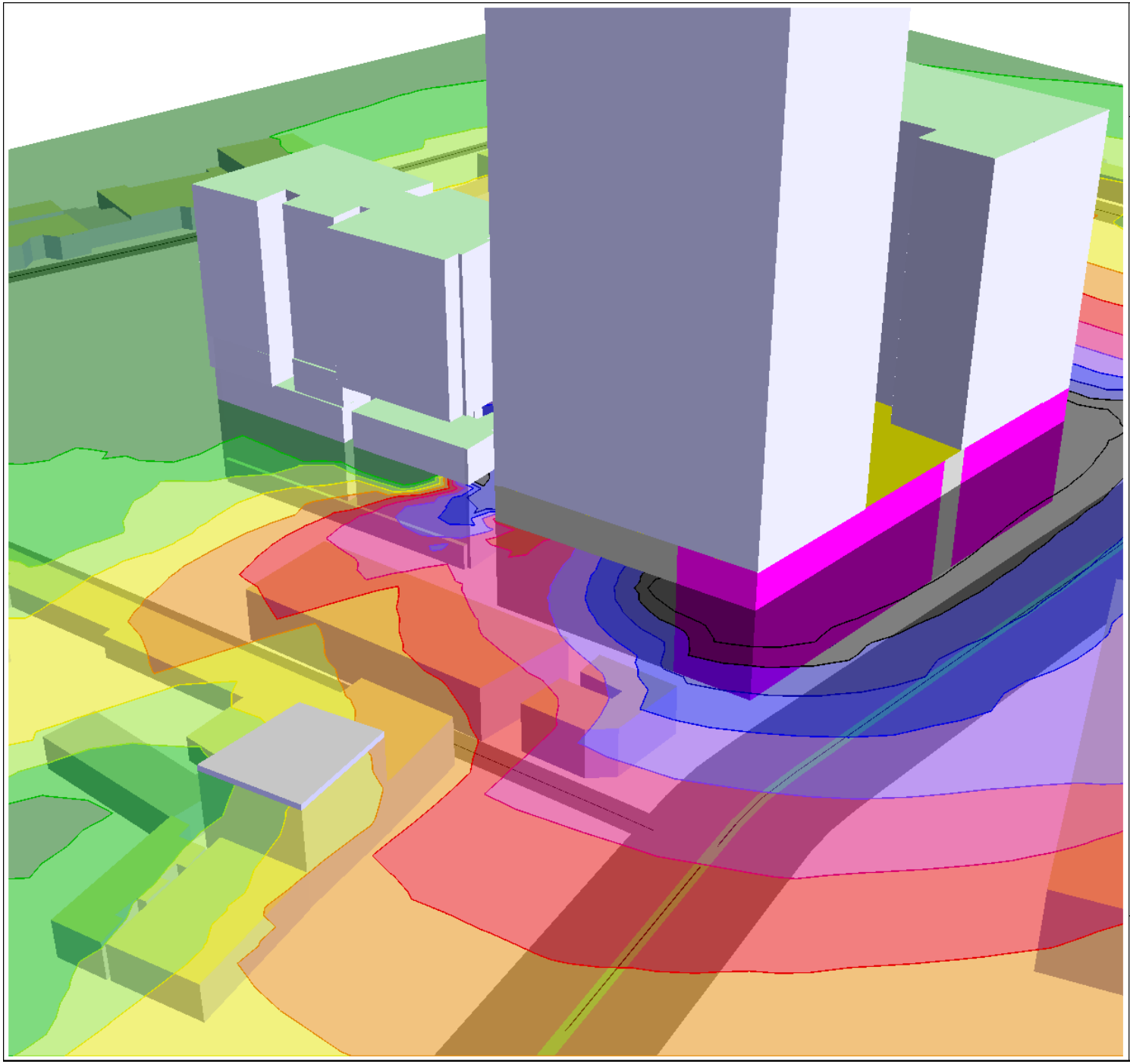
- Surface
- Surrounding Buildings
- Receiver Locations
- Point source
- Area source
- Internal Fitout Area
- Podium Level
- Point receiver
- One Central Park Buildings

Length scale 1:2000

0 10 20 40 60 80 m

N

ACOUSTIC LOGIC



One Central Park
Podium Retail Fitout

Construction Noise Prediction

- Construction over all podium levels
- Minimum external glazing 6.38mm laminated.

Contours at 20m height
Includes facade reflection

Northeast elevation (Broadway)
Worst case receiver

Prepared by: J. Small
Date: 04/06/2013

Noise Level
$L_{Av\ max}$
in dB(A)

< 35
35 - 37
37 - 39
39 - 41
41 - 43
43 - 45
45 - 47
47 - 49
49 - 51
51 - 53
53 - 55
>= 55

Signs and symbols

- Surface
- Surrounding Buildings
- Receiver Locations
- Point source
- Area source
- Internal Fitout Area
- Podium Level
- Point receiver
- One Central Park Buildings

Length scale 1:2000

0 10 20 40 60 80 m

N

ACOUSTIC LOGIC