

INDIVIDUAL EXPERT REPORT OF DR RENZO TONIN

17 AUGUST 2016



COURT DETAILS

Court	Land and Environment Court of New South Wales
Class	1
Case number	2016/159652 (formerly 2015/10898) & 2016/157848 (formerly 2015/10951)

TITLE OF PROCEEDINGS

PROCEEDINGS 2016/159652

Applicant	Liverpool City Council
First respondent	Moorebank Recyclers Pty Ltd
Second respondent	Minister for Planning

PROCEEDINGS 2016/157848

First applicant	Benedict Industries Pty Limited
Second applicant	Tanlane Pty Limited
First respondent	Minister for Planning
Second respondent	Moorebank Recyclers Pty Limited

PREPARATION DETAILS

Prepared for	Moorebank Recyclers Pty Ltd, First respondent in proceedings 2016/159652 and Second respondent in proceedings 2016/157848
Legal representative	Mark Gerard McDonald, Mark McDonald & Associates Lawyers Pty Ltd
Legal representative reference	MGM 01/246
Contact name and telephone	Mark Gerard McDonald, (02) 9293 2519
Contact email	mgmcdonald@ozemail.com.au

LIVERPOOL CITY COUNCIL V MOOREBANK RECYCLERS PTY LTD & ORS AND BENEDICT INDUSTRIES PTY LTD & ORS V MINISTER FOR PLANNING & ORS

**L&EC Proceedings No 2016/159652 and
2016/157848 | Expert Evidence of Renzo Tonin |
Acoustics**

17 August 2016

Moorebank Recyclers Pty Ltd

TH925-01F03 Expert Report of Renzo Tonin in Acoustics (r0)

Document details

Detail	Reference
Doc reference:	TH925-01F03 Expert Report of Renzo Tonin in Acoustics (r0)
Prepared for:	Moorebank Recyclers Pty Ltd
Address:	14 Thackeray Street CAMELLIA NSW 2142
Attention:	Mr Brent Lawson

Contents

1	Introduction	6
1.1	The proposal the subject of the appeal	6
1.2	My instructions	6
1.3	My qualifications and experience	8
1.4	Expert witness code of conduct	8
2	Description of the environment and the PAC approved proposal	9
2.1	The site	9
2.2	Location of nearest potentially affected receivers	9
2.3	Description of the PAC approved proposal	10
3	Noise contentions	15
3.1	Council's further amended contentions	15
3.2	Benedict Industries and Tanlane amended contentions	15
3.3	The proposed Marina Development	16
3.4	Residential development as part of the proposed Marina Development	17
3.5	The proposed Tanlane Development	17
3.6	Reassessment of background noise levels	19
4	Measured ambient noise levels	20
4.1	Background information	20
4.2	Selection of noise monitoring locations, description of methodology and instrumentation	20
4.3	Results of ambient noise survey	23
4.4	Results of supplementary short term attended noise survey	26
5	Noise criteria and project specific noise levels	27
5.1	NSW Industrial Noise Policy INP	27
5.2	NSW EPA Road Noise Policy (RNP)	30
6	Predicted industrial noise levels and assessment of noise impact	34
6.1	Site plant source noise levels	34
6.2	Truck source noise levels	39
6.3	Noise modelling methodology	40
6.4	Predicted industrial noise levels	43
6.5	Predicted industrial noise level at the proposed Tanlane Development	47
6.6	Comparison of results with Wilkinson Murray Report	47
7	Predicted road traffic noise levels and assessment of noise impact	48
8	Recommended noise mitigation measures	51
8.1	Acoustic mitigation requirements for the Site	51
8.2	Acoustic mitigation for No 71 Horizon Circuit and Elouera Crescent Park	52
8.3	Mitigation measures required in the proposed Tanlane Development	52

9	Response to contentions	54
9.1	Council's further amended contentions	54
9.2	Benedict Industries and Tanlane amended contentions	55
10	Response to Ishac and Greer statement of evidence	57
11	Conclusion	59
APPENDIX A	Brief	61
APPENDIX B	Glossary of terminology	62
APPENDIX C	Curriculum vitae of Renzo Tonin	64
APPENDIX D	Liverpool City Council Zoning Map	68
APPENDIX E	Equipment NATA calibration certificates	69
APPENDIX F	Noise logger graphs	70
APPENDIX G	Supplementary operator attended short term noise survey observations and results	71
APPENDIX H	Perspective view of ramp acoustic wall treatment	75
APPENDIX I	Calculation of road noise levels	84

List of tables

Table 1	Measured RBL background noise levels at each receiver location	24
Table 2:	INP Amenity Criteria - Recommended LAeq noise levels from industrial noise sources [NSW INP Table 2.1]	28
Table 3	Applicable INP project specific noise levels LAeq (free field)	30
Table 4:	Road traffic noise assessment criteria for residential land uses (façade level)	31
Table 5	Road traffic noise assessment criteria for non-residential land uses affected by proposed road projects and traffic generating developments (free field level)	31
Table 6	Applicable RNP assessment criteria	33
Table 7	Measured source noise levels (PWL re 10 ⁻¹² watts, SPL re 20uPa)	38
Table 8	Sound Reduction Index 0.6mm Roof Cladding Trimclad (dB)	41
Table 9	Predicted industrial noise levels and compliance with noise criteria	44
Table 10	Calculated traffic noise levels at No 71 Horizon Circuit (M8A) and Elouera Crescent Park	49
Table 11	Calculated traffic contribution noise levels at residences on Elouera Crescent	50

List of figures

Figure 1:	General view of the subject site and surrounding area	11
Figure 2	PAC approved ramp and acoustic walls	12
Figure 3:	PAC approved detailed site plan	13
Figure 4	Detailed view of the subject site and noise monitoring locations	21
Figure 5	Site noise model configuration	35
Figure 6	Predicted industrial noise levels for 3m/s wind at 135 degrees (from the South-East)	36
Figure 7	Predicted industrial noise levels for 3m/s wind at 270 degrees (from the West)	37

Figure 8	Height and location of ramp acoustic walls	42
Figure 9	Predicted LAeq(15min) industrial noise levels in the proposed Tanlane Development area	46

1 Introduction

1.1 The proposal the subject of the appeal

1. I am retained by Moorebank Recyclers Pty Ltd to assess potential noise impact arising from a proposal to construct and operate a demolition and construction waste recycling facility (**Development**) at Newbridge Road, Moorebank on land known as Lot 6 DP 1065574 (the **Site**).
2. The Development comprises a waste recycling facility with a processing capacity of 500,000 tonnes of masonry construction and demolition waste per year and would receive concrete, brick, asphalt, sandstone and sand.
3. On 11 September 2015, the Planning Assessment Commission (**PAC**) approved the Development subject to conditions (including a number of noise conditions) (**PAC Approval**). In October 2015 Liverpool City Council, Benedict Industries Pty Ltd and Tanlane Pty Ltd lodged objector appeals with this Court.
4. The salient issues in respect of noise are noise impacts from the Development potentially affecting existing nearby residential dwellings (Georges Fair to the West and on the other side of Georges river to the East in Milperra), proposed future residential dwellings in the Tanlane subdivision to the north, a proposed marina immediately to the north and a number of recreational areas situated around the Site. In particular, the noise sources identified are trucks on Brickmakers Drive, trucks on the access road and ramps, and fixed and mobile plant on the Site itself.
5. Whilst the PAC approval required the Development to incorporate mounds on the perimeter of the Site and acoustic fencing on the ramps, it is contended that these measures are insufficient to result in acceptable noise impacts at the sensitive receptor locations identified in the previous paragraph. It is alleged that this is due, in part, to the ambient noise levels at the sensitive receptor locations being lower now than was forecast in the acoustic report submitted to the PAC.

1.2 My instructions

6. I am retained by Moorebank Recyclers Pty Ltd to assess the PAC approved Development, to identify any deficiencies in the acoustic reports submitted to the PAC, to remeasure ambient noise levels if necessary, to respond to the contentions of each of the applicants and to make any recommendations to this Court as I see appropriate. Annexed hereto in APPENDIX A is a copy of my instructions.
7. I was engaged as an expert witness in the 2013 proceedings in this Court relating to an application to secure access to the Site via Brickmakers Drive by way of easements over adjoining land. In those proceedings, I produced a statement of evidence and joint report, both of which are listed in the next paragraph.

8. The following pertinent documents have been supplied to me:
- i. Moorebank Recycling Facility Noise Impact Assessment prepared by Wilkinson Murray dated 27 November 2012
 - ii. Environmental Assessment prepared by Nexus dated 19 February 2013 (**Environmental Assessment**)
 - iii. Submission regarding Moorebank Waste Facility prepared by EMGA Mitchell McLennan dated 5 April 2013
 - iv. Correspondence EPA to Planning & Infrastructure dated 2 May 2013
 - v. Statement of evidence of Renzo Tonin "Moorebank Recyclers Pty Ltd v Liverpool City Council - L&EC Proceedings No 30141 of 2013 - Materials Recycling Facility at Newbridge Road, Moorebank - Response to Cooper Affidavit" dated 14 May 2013 (**Tonin 2013 Report**)
 - vi. Joint report of the acoustics experts - Tonin & Cooper dated 17 May 2013
 - vii. Statement of evidence of Neil Gross "Moorebank Recyclers Pty Ltd v Liverpool City Council & Tanlane Pty Ltd - Land & Environment Court Proceedings No 30141 of 2013" dated 15 May 2013
 - viii. Moorebank Recycling Facility Noise Impact Assessment prepared by Wilkinson Murray dated 5 August 2013 Report 03124-DA Ver D (**Wilkinson Murray Report**)
 - ix. Preferred Project Report prepared by Nexus Environmental Planning dated 15 August 2013
 - x. Correspondence EPA to Planning & Infrastructure dated 16 May 2014
 - xi. Planning proposal - LEP amendment at 146 Newbridge Road, Moorebank prepared by EMGA Mitchell McLennan dated 6 January 2015
 - xii. Secretary's Environmental Report "Major Project Assessment - Materials Recycling Facility, Moorebank (05-0157)" dated 22 April 2015 prepared by NSW Planning & Environment
 - xiii. "Submission to Planning Assessment Commission - Materials Recycling Facility, Moorebank" dated 29 May 2015 prepared by EMGA Mitchell McLennan
 - xiv. Proposed Georges Cove Marina - Noise Impact Assessment dated 21 July 2015 prepared by EMGA Mitchell McLennan
 - xv. Environmental Impact Statement - Georges Cove Marina, Moorebank dated 30 July 2015 prepared by EMGA Mitchell McLennan
 - xvi. Determination Report - Resource Recovery Facility, Moorebank (05-0157) dated 11 September 2015 issued by Planning Assessment Commission of NSW (**PAC Determination Report**)
 - xvii. Project Approval dated 11 September 2015 issued by the Planning Assessment Commission of NSW

- xviii. Council's Amended Statement of Facts and Contentions dated 24 June 2016
 - xix. Tanlane's Amended Statement of Facts and Contentions dated 24 June 2016
 - xx. Correspondence from Swaab Attorneys to Mark McDonald & Associates re "Liverpool City Council ats Moorebank Recyclers and Minister for Planning & Environment - NSWLEC Proceedings" dated 13 July 2016
 - xxi. Expert Report of Najah Ishac dated 21 July 2016
 - xxii. Expert Report of Gayle Greer dated 4 August 2016
 - xxiii. Division 2 of Part 31 of the Uniform Civil Procedure Rules 2005 (UCPR) and the Expert Witness Code of Conduct in Schedule 7 of the UCPR
9. I have visited the site on many occasions both in the 2013 proceedings and this year in 2016. During those visits I set up or supervised the setting up of unattended noise logging equipment and conducted attended monitoring to familiarise myself with the existing noise sources in the environment.
10. A glossary of acoustic terms used in this statement of evidence is annexed hereto in APPENDIX B.

1.3 My qualifications and experience

11. I have practised as a consulting engineer in acoustics for 38 years, 34 years as managing director of Renzo Tonin & Associates. I am now a consultant to the company. I was awarded a B.Sc. (Hons) in 1973 and a PhD in acoustics in 1976 (specialising in vibration). My curriculum vitae is annexed hereto in APPENDIX C.

1.4 Expert witness code of conduct

12. I have read Division 2 of Part 31 of the Uniform Civil Procedure Rules 2005 and the Expert Witness Code of Conduct in Schedule 7 of the Uniform Civil Procedure Rules 2005) and I agree to be bound by the terms of those documents. My evidence in this statement is within my area of expertise, except where I state that I am relying upon the evidence of another person.

2 Description of the environment and the PAC approved proposal

13. This section deals with the location of the Site, the location of the nearest potentially affected receivers and a description of the PAC approved proposal.

2.1 The site

14. The Site is Lot 6 in DP 1065574 located within the Liverpool City Council (**Council**) local government area (see Figure 1). The Site occupies approximately 20.5 hectares and is approximately rectangular in shape and flat, and also includes the 'panhandle' access road that is 810 metres long and 10 metres wide. The east boundary follows the banks of the Georges River.
15. As shown in Figure 1, there is an 18 metre wide strip of land at the northern end of the 'panhandle' owned by Council on which is to be constructed a bridge and ramps which will provide access to the Site from Brickmakers Drive.

2.2 Location of nearest potentially affected receivers

16. The nearest existing potentially affected residential receivers are:
- a. To the west, the residential estate in Georges Fair which is now fully constructed; and,
 - b. To the east, the residential area of Milperra in the Bankstown local government area.
17. The nearest existing potentially affected recreation areas are:
- a. To the south, the New Brighton Golf Course;
 - b. To the east on the other side of Georges River, a recreational area zoned RE1 and RE2 in the Bankstown local government area; and,
 - c. To the north, a small recreational area at the eastern end of Elouera Crescent adjacent Brickmakers Drive zoned RE1 Public Recreation containing a playground and grassed area.
18. To the immediate north of the Site is Lot 7 DP 1065574, land owned by Tanlane Pty Ltd (**Tanlane**). Benedict Industries Pty Ltd (**Benedict**) currently uses Lot 7 for sand extraction, dredging and recycling operations, a use which apparently is coming to a closure. Benedict proposes to construct a marina and related facilities on the southern portion of this land. In 2008, Lot 7 was rezoned in the Liverpool Local Environmental Plan 2008 (**LEP**) in three parts:
- a. In the far northern part of Lot 7 adjacent Newbridge road, Business Enterprise (B6);
 - b. In the central part of Lot 7, Medium Density Residential (R3) (**proposed Tanlane Development**);

- c. In the southern part of Lot 7, Private Recreation (RE2) (**proposed Marina Development**); and,
 - d. A slither of land at the eastern edge of Lot 7 fronting Georges River, Public Recreation (RE1).
19. Annexed hereto in APPENDIX D is a copy of Liverpool City Council zoning map for the area which I have extracted from the PAC Determination Report.
20. For reasons to be explained in the next section, I am advised that the proposed Tanlane Development is not to be considered as a noise sensitive receiver because its approval is not imminent. However, the proposed Marina Development is imminent and I am advised that it should be considered as a commercial land use.

2.3 Description of the PAC approved proposal

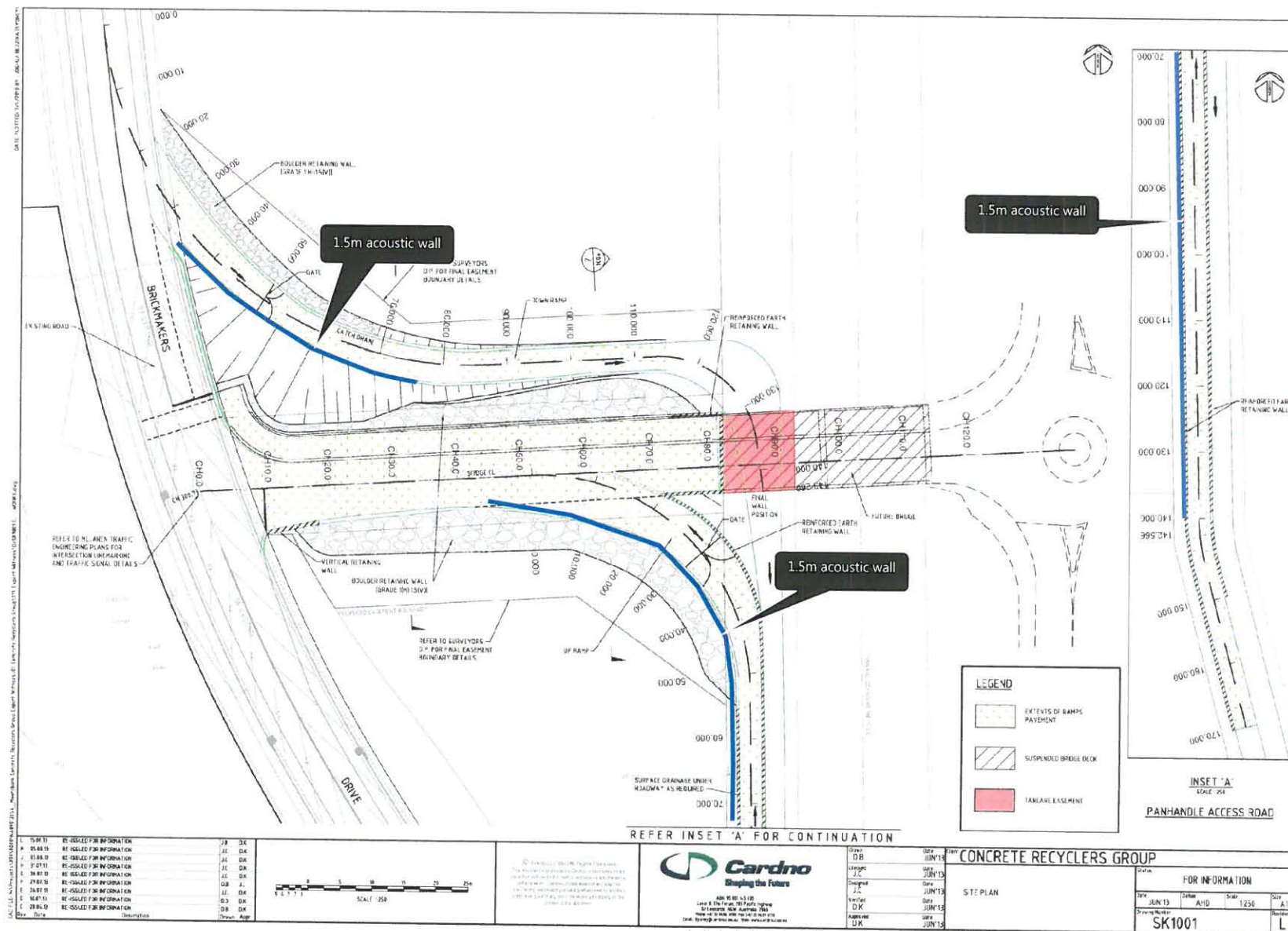
21. Details of the approved development are shown in Figure 2 (the bridge and access ramps) and Figure 3 (the Site). The Site is a materials recycling facility with an intended capacity of 500,000 tonnes per annum.
22. The proposed facility would receive concrete, brick, asphalt, sandstone and sand from the building and construction industry in the Sydney metropolitan area. No domestic loads would be received at the facility. Materials received would be stockpiled and then processed by crushing the material into different sizes depending on the market demand for the end product. Crushed material would be stockpiled according to size prior to transport to the marketplace. The proposed facility would operate in accordance with an Environment Protection Licence obtained from the NSW Environment Protection Authority (EPA).
23. Trucks would enter and leave the Site via the bridge and ramps shown in Figure 2. The maximum number truck movements per day is 324 (in and out) and the maximum hourly truck movements is 38 (19 in and 19 out).¹ 1.5m high acoustic walls are proposed in the locations shown in the figure to reduce noise from trucks emitted to the Georges Fair residences.
24. The PAC approved hours of operation are:
- | | |
|---------------------------|-------------|
| Monday-Friday | 7am to 6 pm |
| Saturday | 8am to 1 pm |
| Sunday or Public Holidays | Nil |
25. Two weighbridges are located at the Site entrance, one for incoming vehicles and one for outgoing vehicles. A wheel wash facility is to be provided for outgoing vehicles.

¹ Environmental Assessment Tables 2-2 and 2-3

Figure 1: General view of the subject site and surrounding area



Figure 2 PAC approved ramp and acoustic walls



AREA 1

AREA 2

LEGEND

- MH - METRES HIGH
- - - - - EXISTING CONTOURS

250 000 L STORMWATER TANKS

PERIMETER MOUND

TOP OF MOUND 4 M HIGH

TOP OF MOUND 6 METRES HIGH

TOP OF MOUND 8 M HIGH

TOP OF MOUND 1 M HIGH

LIMIT OF SURPLUS FILL

BATTER

BOUNDARY

DRAINAGE PIT 1000 X 1000

RUBBER BOLLARDS @ 3M CTS

NEW CONCRETE MEDIAN

NEW FENCE AND GATES

ACCESS DRIVEWAY

WORKSHOP SHED 8MH

UNCRUSHED STOCKPILE 7MH

BRICK RUBBLE 7MH

CONCRETE RUBBLE 7MH

TOILETS

STAFF LUNCH ROOM

PRIMARY CRUSHING SHED 10MH

SECONDARY CRUSHING SHEDSCREEN 8MH X 10M

WHEEL WASH

OFFICE

WEIGH BRIDGE A

WEIGH BRIDGE B

STOCK PILE 4MH

STOCK PILE 4.5MH

STOCK PILE 4.5MH

STOCK PILE 4.5MH

STOCK PILE 4.5MH

18 PARALLEL PARKING SPACES 7.5 X 6.0 METRES

CAR PARK

250 000 L STORMWATER TANKS

PERIMETER MOUND

TOP OF MOUND 4 M HIGH

TOP OF MOUND 6 METRES HIGH

TOP OF MOUND 8 M HIGH

TOP OF MOUND 1 M HIGH

LIMIT OF SURPLUS FILL

BATTER

BOUNDARY

DRAINAGE PIT 1000 X 1000

RUBBER BOLLARDS @ 3M CTS

NEW CONCRETE MEDIAN

NEW FENCE AND GATES

ACCESS DRIVEWAY

WORKSHOP SHED 8MH

UNCRUSHED STOCKPILE 7MH

BRICK RUBBLE 7MH

CONCRETE RUBBLE 7MH

TOILETS

STAFF LUNCH ROOM

PRIMARY CRUSHING SHED 10MH

SECONDARY CRUSHING SHEDSCREEN 8MH X 10M

WHEEL WASH

OFFICE

WEIGH BRIDGE A

WEIGH BRIDGE B

STOCK PILE 4MH

STOCK PILE 4.5MH

STOCK PILE 4.5MH

STOCK PILE 4.5MH

STOCK PILE 4.5MH

18 PARALLEL PARKING SPACES 7.5 X 6.0 METRES

CAR PARK

250 000 L STORMWATER TANKS

PERIMETER MOUND

TOP OF MOUND 4 M HIGH

TOP OF MOUND 6 METRES HIGH

TOP OF MOUND 8 M HIGH

TOP OF MOUND 1 M HIGH

LIMIT OF SURPLUS FILL

BATTER

BOUNDARY

DRAINAGE PIT 1000 X 1000

RUBBER BOLLARDS @ 3M CTS

NEW CONCRETE MEDIAN

NEW FENCE AND GATES

ACCESS DRIVEWAY

WORKSHOP SHED 8MH

UNCRUSHED STOCKPILE 7MH

BRICK RUBBLE 7MH

CONCRETE RUBBLE 7MH

TOILETS

STAFF LUNCH ROOM

PRIMARY CRUSHING SHED 10MH

SECONDARY CRUSHING SHEDSCREEN 8MH X 10M

WHEEL WASH

OFFICE

WEIGH BRIDGE A

WEIGH BRIDGE B

STOCK PILE 4MH

STOCK PILE 4.5MH

STOCK PILE 4.5MH

STOCK PILE 4.5MH

STOCK PILE 4.5MH

18 PARALLEL PARKING SPACES 7.5 X 6.0 METRES

CAR PARK

250 000 L STORMWATER TANKS

PERIMETER MOUND

TOP OF MOUND 4 M HIGH

TOP OF MOUND 6 METRES HIGH

TOP OF MOUND 8 M HIGH

TOP OF MOUND 1 M HIGH

LIMIT OF SURPLUS FILL

BATTER

BOUNDARY

DRAINAGE PIT 1000 X 1000

RUBBER BOLLARDS @ 3M CTS

NEW CONCRETE MEDIAN

NEW FENCE AND GATES

ACCESS DRIVEWAY

WORKSHOP SHED 8MH

UNCRUSHED STOCKPILE 7MH

BRICK RUBBLE 7MH

CONCRETE RUBBLE 7MH

TOILETS

STAFF LUNCH ROOM

PRIMARY CRUSHING SHED 10MH

SECONDARY CRUSHING SHEDSCREEN 8MH X 10M

WHEEL WASH

OFFICE

WEIGH BRIDGE A

WEIGH BRIDGE B

STOCK PILE 4MH

STOCK PILE 4.5MH

STOCK PILE 4.5MH

STOCK PILE 4.5MH

STOCK PILE 4.5MH

18 PARALLEL PARKING SPACES 7.5 X 6.0 METRES

CAR PARK

250 000 L STORMWATER TANKS

PERIMETER MOUND

TOP OF MOUND 4 M HIGH

TOP OF MOUND 6 METRES HIGH

TOP OF MOUND 8 M HIGH

TOP OF MOUND 1 M HIGH

LIMIT OF SURPLUS FILL

BATTER

BOUNDARY

DRAINAGE PIT 1000 X 1000

RUBBER BOLLARDS @ 3M CTS

NEW CONCRETE MEDIAN

NEW FENCE AND GATES

ACCESS DRIVEWAY

WORKSHOP SHED 8MH

UNCRUSHED STOCKPILE 7MH

BRICK RUBBLE 7MH

CONCRETE RUBBLE 7MH

TOILETS

STAFF LUNCH ROOM

PRIMARY CRUSHING SHED 10MH

SECONDARY CRUSHING SHEDSCREEN 8MH X 10M

WHEEL WASH

OFFICE

WEIGH BRIDGE A

WEIGH BRIDGE B

STOCK PILE 4MH

STOCK PILE 4.5MH

STOCK PILE 4.5MH

STOCK PILE 4.5MH

STOCK PILE 4.5MH

18 PARALLEL PARKING SPACES 7.5 X 6.0 METRES

CAR PARK

250 000 L STORMWATER TANKS

PERIMETER MOUND

TOP OF MOUND 4 M HIGH

TOP OF MOUND 6 METRES HIGH

TOP OF MOUND 8 M HIGH

TOP OF MOUND 1 M HIGH

LIMIT OF SURPLUS FILL

BATTER

BOUNDARY

DRAINAGE PIT 1000 X 1000

RUBBER BOLLARDS @ 3M CTS

NEW CONCRETE MEDIAN

NEW FENCE AND GATES

ACCESS DRIVEWAY

WORKSHOP SHED 8MH

UNCRUSHED STOCKPILE 7MH

BRICK RUBBLE 7MH

CONCRETE RUBBLE 7MH

TOILETS

STAFF LUNCH ROOM

PRIMARY CRUSHING SHED 10MH

SECONDARY CRUSHING SHEDSCREEN 8MH X 10M

WHEEL WASH

OFFICE

WEIGH BRIDGE A

WEIGH BRIDGE B

STOCK PILE 4MH

STOCK PILE 4.5MH

STOCK PILE 4.5MH

STOCK PILE 4.5MH

STOCK PILE 4.5MH

18 PARALLEL PARKING SPACES 7.5 X 6.0 METRES

CAR PARK

250 000 L STORMWATER TANKS

PERIMETER MOUND

TOP OF MOUND 4 M HIGH

TOP OF MOUND 6 METRES HIGH

TOP OF MOUND 8 M HIGH

TOP OF MOUND 1 M HIGH

LIMIT OF SURPLUS FILL

BATTER

BOUNDARY

DRAINAGE PIT 1000 X 1000

RUBBER BOLLARDS @ 3M CTS

NEW CONCRETE MEDIAN

NEW FENCE AND GATES

ACCESS DRIVEWAY

WORKSHOP SHED 8MH

UNCRUSHED STOCKPILE 7MH

BRICK RUBBLE 7MH

CONCRETE RUBBLE 7MH

TOILETS

STAFF LUNCH ROOM

PRIMARY CRUSHING SHED 10MH

SECONDARY CRUSHING SHEDSCREEN 8MH X 10M

WHEEL WASH

OFFICE

WEIGH

26. Trucks laden with uncrushed raw material would be directed to the stockpiles at the southern end of the Site where they tip their load and materials separated into relevant stockpiles such as a brick stockpile and a concrete stockpile using a front end loader.
27. The primary crusher shed is 10m in height and has a 5m wide by 4.5m high opening 5m off the ground on the southern side of the building. All other doors to the building will be kept closed at all times other than for momentary access. The discharge from the building will have an 3m wide and 3m high opening on the western side which will be acoustically treated with conveyor belt curtains and acoustic screens to control noise. All other conveyors in and out of the crusher and screening sheds will be enclosed and acoustically treated.
28. Raw materials would be fed into the crusher infeed hopper by an excavator operating on top of a 4m high stockpile located adjacent the southern side of the building. The excavator uses its bucket to pull up material from ground level. The front end loader transports material to this area to maintain a steady source of supply. Inside the crusher building, raw material is then crushed to a more manageable size and foreign material, such as metal, is loosened and separated from the stock.
29. Material crushed in the primary crusher is transported by conveyor to the picking shed where metal objects are removed using a purpose built magnet and other foreign materials are removed by hand. All metal and foreign materials are deposited in bins which are transported from the Site to recycling facilities where appropriate or to landfill in the case of material which cannot be recycled
30. Material would be transported by conveyor from the picking shed to the secondary crusher which is located in a purpose built shed 8 metres in height. The material is crushed into smaller sizes, transported over a second picking station to recover any additional foreign material, then to the primary screen within the building where crushed materials are separated into product sizes and stockpiled.
31. Any material which does not meet a required product size is transported by conveyor to the secondary screen building 8 metres in height, which further separates the product materials. Material which is not crushed to a product size is transported back to the crusher for further processing.
32. Crushed and screened product is transported by front end loader from the primary stockpiles to the permanent stockpiles located at the northern end of the Site from where the material is loaded to trucks for delivery to the marketplace.
33. As shown in Figure 3, there are acoustic barriers around the perimeter of the site varying in height from 4m to 8m as approved.

3 Noise contentions

34. This section of the report addresses how I propose to deal with the applicants' noise contentions (as amended), in particular the proposed Tanlane Development and the proposed Marina Development.

3.1 Council's further amended contentions

35. Council's further amended contentions in respect of noise are:

Noise

- 4 a. *The Development proposes a 1.5 m acoustic barrier adjacent to the Site access road, above the relevant ramps, in accordance with C.13(b), C.14 and Appendix D of the PAC Approval dated 11 September 2015. This is insufficient to mitigate noise given the height of trucks with engines as high as 1.5 m above ground and exhausts as high as 3.6 m above ground.*
- b. *The acoustic mitigation measures required by the PAC Approval dated 11 September 2015 do not address the likely impact of the Development on that part of the adjacent Tanlane Land to the north of the Site (lot 7 DP 1065574) which is zoned R3 Medium Density Residential. A barrier is required on the eastern side of the access road of 5-6 m in height. A Rezoning Application for the Tanlane Land is currently being assessed (RZ-2/2015), which aims to allow residential development as part of the proposed marina in the southern part of the Tanlane Land. No information has been provided in relation to the noise impacts of the Development on that proposed residential development or any noise mitigation measures.*
- c. *Recent background noise measurements completed by EMM at 14 Cotter Lane indicate that the criteria detailed in C11 of the PAC Approval dated 11 September 2015 are not appropriate for residential receivers at this location. Based on the EMM measurements the criterion applicable to this location is 46 dB(A). Additional noise mitigation measures to those currently documented will be required to meet this criterion.*
36. In other words, there are three primary contentions:
- that the 1.5m acoustic barriers shown in Figure 2 are insufficient;
 - that there was no assessment of noise impacts on the proposed Tanlane Development; and,
 - condition C11 of the PAC Approval does not appropriately address the recently recorded low background noise levels at 14 Cotter Lane in the Georges Fair subdivision and therefore additional noise mitigation measures will be required.

3.2 Benedict Industries and Tanlane amended contentions

37. Benedict Industries and Tanlane amended contentions in respect of noise are:

Noise

3 The Development will have unacceptable acoustical impacts.

Particulars

- a. As approved the noise impacts from the proposed Development to existing and future residences, particularly from trucks on the access road, will be excessive and will not satisfy established noise criteria

As approved the noise impacts from the proposed Development to the planned marina precinct will be excessive and will not satisfy established noise criteria

To protect future residences and the planned marina precinct from excessive noise the Development will need to be substantially redesigned and would require:

- i. The enclosure of the ramps on the access road and Brickmakers Drive intersection and noise barriers to protect future residences from noise impacts; and
- ii. The site access road to be fully enclosed in the vicinity of the marina land to protect it from excessive noise and would also require that all noise generating activities within the Material Recycling Facility be fully enclosed.

38. I assume that by "future residences" is meant the proposed Tanlane Development. I understand that there has been a rezoning request lodged by Tanlane with Council to allow residential uses within the proposed Marina Development. I therefore assume that "future residences" also means future residences in the proposed Marina Development.

39. In other words, the contentions are:

- a. Noise impacts from the Site and from trucks on the access road will be excessive and not satisfy established noise criteria:
 - i. at existing residences;
 - ii. at future residences in the proposed Tanlane Development;
 - iii. at future residences in the proposed Marina Development and,
 - iv. at the proposed Marina Development.
- b. As a consequence, additional noise mitigation measures will be required.

3.3 The proposed Marina Development

40. On the 12 August 2014 the Sydney West Joint Regional Planning Panel (JRPP) approved DA-846/2012, the proposed Marina Development. I understand that the consent was subsequently challenged and declared invalid by this Court. I further understand that a revised development application for the proposed Marina Development is currently being assessed by Council for determination by the JRPP.

41. I am advised by the Respondent's planner that there has been no indication from either the Council or the JRPP when that application might come before the JRPP and, as such, it is his opinion that the determination of that application is not imminent. On the basis of that advice, I have assumed the proposed Marina Development is not imminent and therefore it should not be classified as a sensitive receiver. Nevertheless, in this report, I have assessed noise impact at the proposed Marina Development in the event that it becomes imminent.
42. In its advice to the NSW Department of Planning & Infrastructure (now NSW Planning and Environment), the NSW Environment Protection Authority in its letter dated 2 May 2013 advised as follows:

EPA is aware that an application has been submitted for a marina development in the vicinity of this development. It has not been considered in preparing this advice; however, this proposal is not likely to be significant because the marina would be considered a commercial land use and not a noise sensitive receiver.

43. It is therefore appropriate, in my opinion, where I am to assess noise impact at the proposed Marina Development, it should be regarded as a commercial land use.

3.4 Residential development as part of the proposed Marina Development

44. I understand that any use of the proposed Marina Development site for residential development is prohibited. As such, any such proposal is subject to the rezoning of that land to permit residential development. As previously stated, whilst there has been a rezoning request lodged with Council, the Respondent's planner advises me as follows:
 - a. that the planning proposal has not proceeded to a point where it has been assessed by Council and placed before a meeting of Council to determine if Council is of the opinion that the rezoning has merit;
 - b. that in reviewing the planning website of the NSW Planning and Environment, there has been no gateway application submitted to the department for rezoning; and,
 - c. therefore, in his opinion, the use of the marina land for residential development is not imminent and it remains a prohibited development.
45. As the proposed residential development as part of the proposed Marina Development is not imminent (and is currently a prohibited use), in my opinion, it is inappropriate to assess noise impact from the Development on that future use.

3.5 The proposed Tanlane Development

46. As previously discussed, the northern section of the Tanlane land is zoned to allow residential development. The Respondent's planner advises me as follows:

- a. according to his review of the Council web site, he concludes that there is no development application before Council for any development of that land for residential purposes;
- b. in his opinion, having regard to the contamination on that land, any development application on that site is subject to remediation (as described in the Douglas Partners report which accompanied the rezoning of that land to residential use); and,
- c. accordingly, in his opinion, the use of that part of the Tanlane land for residential purposes is not imminent.

47. I also have regard to advice from the NSW Environment Protection Authority (EPA) to NSW Planning & Infrastructure in two letters, the first dated 2 May 2013 and the second dated 16 May 2014.

48. In the EPA letter dated 2 May 2013, it stated as follows:

The area to the north of the proposed facility, described as "Tanlane" in the Noise Impact Assessment Appendix and elsewhere as the Benedict Sands site does not, however, have any residences existing or being constructed on it and appears currently to be still operating as an industrial activity. It too is zoned R3 Residential in the Liverpool LEP and the EPA understands that there is an eighteen month sunset clause on the existing industrial activity. However, if residential development is not yet approved for this site then it would be unreasonable for EPA to not support the proposed facility because approval for residential development is not guaranteed or may not occur for some time in the future. In addition, conceivably there are options such as setbacks, roadside barriers or building layout and design measures that are still available for noise mitigation measures that could be incorporated in any residential development approval.

49. In his decision in the matter of **Moorebank Recyclers Pty Ltd v Liverpool City Council (No 2) [2013] NSWLEC 93 (27 June 2013)**, at paragraph 82, His Honour Bisco J said:

82. *In May 2013 the Environment Protection Authority made a submission to the Department, with which I agree, that "if residential development is not yet approved for this [Tanlane] site then it would be unreasonable for EPA to not support the proposed [MRF] facility because approval for residential development is not guaranteed or may not occur for some time in the future. In addition ... noise mitigation measures ... could be incorporated in any residential approval".*

50. In the EPA letter dated 16 May 2014, it stated as follows:

Neither Liverpool Council or Department of Planning have not confirmed that consent for residential development of Tanlane could include requirements for noise mitigation measures to ensure an acceptable noise amenity for future residents. However, we consider that measures are available and could reasonably be incorporated in any consent. We reiterate our previous advice that it would be unreasonable for EPA to not support the proposed facility because residential development of Tanlane is not guaranteed or may not occur for some time and, in addition because there are measures that can be incorporated within any future residential development. We have therefore considered the Tanlane area as an existing industrial use and not considered it as a noise sensitive receiver.

51. I therefore conclude that the proposed Tanlane Development is not imminent. At such time as the proposed Tanlane Development becomes imminent, then I agree with the NSW Environment Protection Authority (with the concurrence of His Honour Bisco J) that there are engineering measures which can be incorporated within any future residential development on that site. Accordingly, the proposed Tanlane Development land is to be considered in this report as an existing industrial use and not as a noise sensitive receiver. Nevertheless, in this report, I have assessed noise impact at the site of the proposed Tanlane Development and discuss relevant engineering measures for noise control.

3.6 Reassessment of background noise levels

52. In Council's contention 4c at paragraph 35 above, it states that a noise measurement undertaken by EMM Consulting Pty Ltd at the front of 14 Cotter Lane in the Georges Fair subdivision revealed a low background noise level which would result in a criterion of 46dB(A) at this location. I assume this is the measurement Mr Ishac refers to in his expert report.
53. The specific location is at or close to location 4M in Figure 3-1 of the Wilkinson Murray Report. In condition C11 of the PAC Approval, the noise criterion for location 4M is 52dB(A), which is 6dB(A) higher than noise criterion in contention 4c.
54. As the Wilkinson Murray Report did not undertake a noise measurement at location 4M (but instead inferred a background noise level based on Location 4S which is also adjacent Brickmakers Drive but located further to the south), it is therefore important to include this location in the updated noise monitoring program outlined in this report.

4 Measured ambient noise levels

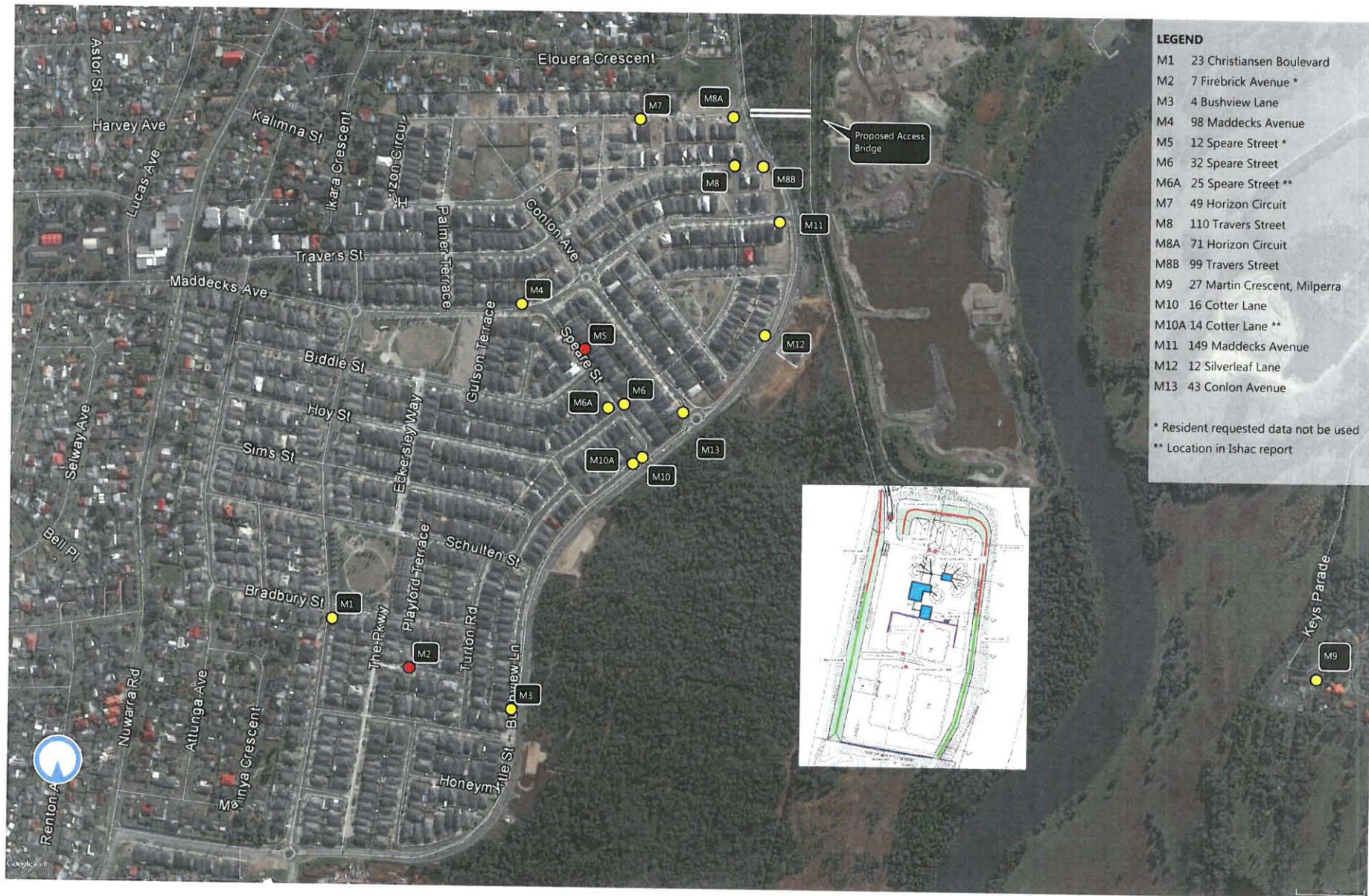
4.1 Background information

55. A detailed noise monitoring program was undertaken to update the ambient noise level data in the Wilkinson Murray Report conducted in 2007 and 2013. At that time, the Georges Fair residential area was still under development and, it was contended in the Wilkinson Murray Report, that ambient noise levels would increase above the then existing levels once the area had developed to its full capacity.
56. However, in August 2013, Council imposed a 5 tonne load limit along the full length of Brickmakers Drive between Newbridge Road and Nuwarra Road, Moorebank thereby prohibiting the use of almost all heavy vehicles on that road (other than those with a destination in the local area). This would have had an effect of reducing ambient noise levels.
57. By early 2016, the residential development in Georges Fair was all but complete with only the last stages of construction occurring at the northern end of the site. Therefore, ambient noise levels would have stabilised and therefore an updated noise monitoring program would resolve any remaining issues about the ambient noise levels in the study area.

4.2 Selection of noise monitoring locations, description of methodology and instrumentation

58. I conducted noise measurements in two rounds, in February-March 2016 and June-July 2016. The measurement locations are shown in Figure 4 below, with the specific addresses shown in the legend.
59. The purpose of the first survey in February-March 2016, was to update ambient noise levels at the measurement locations shown in Figure 3-1 of the Wilkinson Murray Report. The locations M1, M2, M3, M4, M5, M6, M7, M8 and M9 were selected for this purpose, being more extensive than the noise survey in the Wilkinson Murray Report.

Figure 4 Detailed view of the subject site and noise monitoring locations



60. The equipment used for noise measurements was a fleet of RTA Technology RTA05/06/07 noise loggers based on an NTi Audio Type XL2 precision sound level analyser which is a class 1 instrument having accuracy suitable for field and laboratory use. The instruments were calibrated prior and subsequent to measurements using a Bruel & Kjaer Type 4231 calibrator. No significant drift in calibration was observed. All instrumentation complies with IEC 61672 (parts 1-3) '*Electroacoustics - Sound Level Meters*' and IEC 60942 '*Electroacoustics - Sound calibrators*' and carry current NATA certification (or in the case of the RTA07 loggers which are less than 2 years old, manufacturers certification).
61. Annexed hereto in APPENDIX E is a copy of the NATA certificates for each logger and calibrator used and the manufacturers certification for the RTA07 instruments.
62. The unattended noise loggers were installed in the front yards of each property at 1.5m above ground level at a location which would not unduly be influenced by acoustic reflections from nearby surfaces. The locations were representative of the worst affected location at each property for assessment of noise impact from the Development.
63. It was intended to leave the loggers for at least one week at each location. Towards the completion of the first survey, one of the residents requested the noise logger be removed from their property and the data not be used. Soon afterwards, a second resident requested the same and then a third resident requested their noise logger be removed (but gave no instructions as to using the data). As a consequence, the noise measurements at M2 and M5 (marked in red in Figure 4) cannot be reported and the measurement at M8 was cut short. Attempts were then made to find alternative locations but every resident approached declined to allow a noise logger to be placed on their property. The survey was then put on hold.
64. Between March and June, attempts were made via Council's solicitors to assist with persuading residents to rescind their objection to using the data at M2 and M5 and to assist with persuading other residents to permit the placement of loggers on their properties. In the end, residents' permission was not forthcoming and therefore a new method was adopted.
65. On the 17 June 2016 the experts met in conclave to discuss the results of the noise measurements and whether there were any other locations which should be included. Mr Ishac reported that he had conducted a noise measurement at location M10A (see Figure 4, 14 Cotter Lane) in March and April 2016 where he had obtained a Rating Background Level (RBL) of 41dB(A). This would result in an intrusive criterion of $(41+5=) 46\text{dB(A)}$ which is 6dB(A) lower than that for the equivalent position "4M" of 52dB(A) in condition C11 of the PAC Approval.
66. I then carried out the second round of the noise survey in June and July 2016 but, because of the difficulties explained in paragraph 63 regarding access to residential properties, I decided to employ attended monitoring over the entire day (or in the case of Saturdays, the operating hours). This involved the placement of attended noise loggers on the footpath at or near the boundary of each property. The first part of the attended survey involved

locations M8, M8A, M8B and M10. The second part involved locations M10, M11, M12 and M13.

67. At location M10, No 16 Cotter Lane, nine days of monitoring was able to be obtained. By way of explanation, No 16 was selected rather than No 14 because there was a street pole nearby to which the logger could be chained.
68. With the exception of M10, at each location, the number of days surveyed varied between three and four. Ideally, one week's worth of valid data is required, however, as explained in the NSW Industrial Noise Policy (INP), in cases where nearby traffic has a regular daily pattern, three days of data may be sufficient.²

Typically, one week's worth of valid data covering the days and times of operation of the proposed development is required to meaningfully determine the existing noise environment. However, the duration of monitoring should be determined by taking into account the circumstances of the particular situation. The cyclic or random nature of ambient noise levels can affect the duration required.

In areas where the background noise levels are affected significantly by nearby road traffic with regular daily pattern, three days' worth of valid data may be sufficient. However, care should be exercised in assuming a pattern of noise levels in an area. It is recommended that, where any doubt exists, the full week's monitoring should be performed. In those cases where there appears not to be a regular daily pattern to ambient noise, and/or the dominant ambient noise sources are some significant distance from the measurement location, one week's valid data is likely to be required. There will also be some circumstances where more than one week of valid data will be required to gain a good understanding of the variation in ambient noise (for example, where there is a wide variability in daily assessment background levels). Any variations from the specified monitoring duration in Table 3.1 should be fully justified in the noise assessment report.

69. Locations M8A and M8B were selected to be at the same distance to Brickmakers Drive as the front façade of the respective dwelling. M8A at No 71 Horizon Circuit, in particular, is the nearest dwelling potentially affected by noise from trucks on Brickmakers Drive and the bridge.

4.3 Results of ambient noise survey

70. The resulting measured noise levels of both surveys are shown in APPENDIX F. The logger noise data was analysed in day, evening and night periods in accordance with Appendix B of the INP. Data during adverse weather conditions was excluded from the measurements in accordance with the INP. Meteorological data was sourced from nearby Bankstown Airport AWS.
71. Table 1 below is a summary of the results obtained.

² Section 3.5, NSW EPA Industrial Noise Policy, Jan 2000

Table 1 Measured RBL background noise levels at each receiver location

Location	Address		RBL			LAeq			LAeq RNP	
			Day	Evening	Night	Day	Evening	Night	Day	Night
M1	23 Christiansen Boulevard	Weekday	38.6	41.9	39.4	59.6	56.7	53.3	61.2	55.4
		Saturday	41.3	39.9	36.8	65.2	60.4	51.2	66.9	53.6
		Mon-Sat	38.9			61.2			62.6	
M3	4 Bushview Lane	Weekday	49.3	45.3	38.7	60.4	59.1	55.4	62.5	57.5
		Saturday	48.2	44.1	38.9	58.4	57.1	53.9	60.6	56.6
		Mon-Sat	49.2			60.1			62.3	
M4	98 Maddecks Avenue	Weekday	39.2	38.6	35.3	59.6	63.1	52.9	63.9	55.4
		Saturday	36.7	38.3	34.7	59.9	59.7	51.0	62.3	53.1
		Mon-Sat	38.6			59.7			63.7	
M6	32 Speare Street	Weekday	37.9	36.8	33.5	53.7	51.5	44.9	60.6	47.4
		Saturday	39.9	-	30.6	50.1	-	43.0	52.2	45.1
		Mon-Sat	38.1			53.4			60.2	
M7	49 Horizon Circuit	Weekday	42.4	42.7	35.8	57.3	51.3	44.9	59.1	47.4
		Saturday	36.8	-	34.6	53.1	-	43.5	54.7	45.8
		Mon-Sat	41.9			56.9			58.8	
M8	110 Travers Street	Weekday	45.3	43.1	41.1	58.0	54.1	48.8	59.0	51.3
		Saturday	43.2	41.2	38.1	55.0	52.7	48.7	57.0	51.5
		Mon-Sat	44.5			57.6			58.8	
M8	110 Travers Street	Weekday	45.0			58.5			61.0	
Repeat		Saturday	46.0			63.3			65.9	
		Mon-Sat	45.5			60.3			62.9	
M8A	71 Horizon Circuit	Weekday	52.0			61.6			64.1	
		Saturday	50.4			60.1			62.6	
		Mon-Sat	50.4			61.2			63.8	
M8B	99 Travers Street	Weekday	51.4			60.8			63.3	
		Saturday	49.6			60.3			62.8	
		Mon-Sat	50.9			60.7			63.2	

Location	Address		RBL			LAeq			LAeq RNP	
			Day	Evening	Night	Day	Evening	Night	Day	Night
M9	27 Martin Crescent, Milperra	Weekday	37.5	40.1	38.5	51.7	48.5	44.5	53.7	47.0
		Saturday	35.6	38.9	-	50.7	45.0	-	52.2	45.6
		Mon-Sat	37.5			51.5			53.6	
M10	16 Cotter Lane	Weekday	44.1			59.3			61.8	
		Saturday	46.4			58.4			60.9	
		Mon-Sat	44.4			59.2			61.7	
M11	149 Maddecks Avenue	Weekday	50.5			63.6			66.1	
		Saturday	-			-			-	
		Mon-Sat	-			-			-	
M12	12 Silverleaf Lane	Weekday	44.2			58.1			60.6	
		Saturday	-			-			-	
		Mon-Sat	-			-			-	
M13	43 Conlon Avenue	Weekday	44.9			62.9			65.4	
		Saturday	-			-			-	
		Mon-Sat	-			-			-	

72. In this table, the results for weekdays and Saturdays are presented separately and together. However, on detailed review of the data, I have concluded that Saturday is not a special day and may be agglomerated into the week.
73. In respect of the results at 16 Cotter Lane M10, the RBL for Mon-Sat is 44.4dB(A) which lies between the RBL of 41dB(A) determined by Mr Ishac at 14 Cotter Lane M10A (the *Ishac data*) and an RBL of 47dB(A) on which condition C11 of the PAC Approval is based. However, on review of the *Ishac data*, it included the Easter weekend which should be excluded in accordance with Section 3.1.2 of the INP. The corrected *Ishac* RBL for Mon-Sat is 42.2dB(A) which is not dissimilar to the value of 44.4dB(A) which I measured at M10.
74. The high RBLs measured of 50.4dB(A) at M8A and 50.9dB(A) at M8B are clearly due to the influence of noise from Newbridge Road and Brickmakers Drive at those locations. Similarly, the high background noise level of 49.2dB(A) at 4 Bushview Lane (M3) is due to contribution of noise from Brickmakers Drive and the M5 motorway, passing vehicles on the M5 motorway being clearly visible in the distance from that area.
75. Therefore, in summary, the RBLs range from 50.4-50.9dB(A) at the northern end of Brickmakers Drive to 49.2dB(A) at the southern end. In between, they are about 44-45dB(A) at M10, M13 and M12 and 42.2-44.4dB(A) at M10A and M10.

76. In my opinion, having regard to the discussion in paragraph 68 above, the data in Table 1 is valid for the assessment of noise impacts at each reported location.

4.4 Results of supplementary short term attended noise survey

77. I conducted three supplementary attended short term noise surveys at selected locations in February, March and June 2016 to gain an appreciation of the quality and nature of the noise environment. Annexed hereto in APPENDIX G are the observations and results of these short term attended noise surveys.
78. As a general observation, ambient noise in the Georges Fair residential precinct is principally a result of distant traffic (particularly Newbridge Road and M5) and local traffic on Brickmakers Drive and the other residential roads within the precinct. Non-traffic sounds include cicadas on some occasions and momentary aircraft noise (including helicopters). Noise from the current operations at the Benedict site was insignificant. Occasional residential noise was observed including lawnmowers and barking dogs. At M9 in Milperra, ambient noise comprised mostly the sound of distant traffic and birds.
79. The results in these surveys are not meant to correlate with the long term noise measurements but only to show evidence that I have a firsthand appreciation of the noise environment.

5 Noise criteria and project specific noise levels

80. This section deals with the development of project specific noise levels for site noise in accordance with the Environment Protection Authority's NSW Industrial Noise Policy (INP) and for road traffic noise in accordance with the Environment Protection Authority's Road Noise Policy (RNP).
81. Both the INP and the RNP are non-mandatory guidelines.

5.1 NSW Industrial Noise Policy INP

82. The INP assessment has two components:³
- Controlling intrusive noise impacts in the short-term for residences; and
 - Maintaining noise level amenity for particular land uses for residences and other land uses.
83. The intrusiveness criteria is applicable to residential premises only. According to the INP, the intrusiveness of a noise source may generally be considered acceptable if the equivalent continuous (energy-average) A-weighted level of noise from the source (represented by the LAeq descriptor) does not exceed the background noise level measured in the absence of the source (measured using the LA90 descriptor) by more than 5dB(A).
84. The intrusiveness criterion is summarised as follows:

$$LA_{eq}(15min) \leq \text{Rating Background Level (RBL) plus 5dB}$$

where, the RBL is the median of the background noise levels measured over all the days surveyed.

85. The INP amenity criteria are designed to maintain noise level amenity for particular land uses, including residential and other land uses. The INP recommends base acceptable noise levels for various receivers, including residential, commercial, industrial receivers and other sensitive receivers in Table 2.1 of the INP which is replicated in Table 2.

³ 1st paragraph page 14, INP

Table 2: INP Amenity Criteria - Recommended LAeq noise levels from industrial noise sources
[NSW INP Table 2.1]

Type of receiver	Indicative Noise Amenity Area	Time of day	Recommended LAeq(Period) noise level	
			Acceptable	Recommended maximum
Residence	Rural	Day	50	55
		Evening	45	50
		Night	40	45
	Suburban	Day	55	60
		Evening	45	50
		Night	40	45
	Urban	Day	60	65
		Evening	50	55
		Night	45	50
	Urban/Industrial Interface - for existing situations only	Day	65	70
		Evening	55	60
		Night	50	55
School classrooms - internal	All	Noisiest 1 hour period when in use	35	40
Hospital ward	All	Noisiest 1 hour period		
- internal			35	40
- external			50	55
Place of worship - internal	All	When in use	40	45
Area specifically reserved for passive recreation (e.g. National Park)	All	When in use	50	55
Active recreation area (e.g. school playground, golf course)	All	When in use	55	60
Commercial premises	All	When in use	65	70
Industrial premises	All	When in use	70	75

Note:

Daytime 7.00 am to 6.00 pm; Evening 6.00 pm to 10.00 pm; Night-time 10.00 pm to 7.00 am

On Sundays and Public Holidays, Daytime 8.00 am - 6.00 pm; Evening 6.00 pm - 10.00 pm; Night-time 10.00 pm - 8.00 am.

The LAeq index corresponds to the level of noise equivalent to the energy average of noise levels occurring over a measurement period.

86. In respect of the existing Georges Fair residences to the west of the Site and the existing Moorebank residences to the East of the Site, the applicable land use would be Suburban which is described in the INP as follows: ⁴

Suburban—an area that has local traffic with characteristically intermittent traffic flows or with some limited commerce or industry. This area often has the following characteristics:

—decreasing noise levels in the evening period (1800–2200); and/or

—evening ambient noise levels defined by the natural environment and infrequent human activity.

This area may be located in either a rural, rural-residential or residential zone, as defined on an LEP or other planning instrument.

87. In respect of the existing park area at the eastern end of Elouera Crescent, I note there is playground equipment installed in the park with seating adjacent the playground and no other seating. I have assumed this park is more likely to be used as a playground rather than akin to a national park and is therefore an active recreation area.
88. I note that in paragraph 77 of my Tonin 2013 Report, I categorised this park area as passive. Having regard to the wording in Table 2, I do not now believe that was a correct assumption.
89. Similarly, the existing RE1 and RE2 zoned area on the eastern side of Georges River in the Bankstown municipality is possibly too small to be classified as a national park and I have therefore assumed it to be an active recreation area. On inspecting the area, I note that most of the park is not easily accessible to the public and therefore conclude it is not used for recreation. There is, however, a golf range at the eastern end of this park which would be classified as an active recreation area.
90. The use of the proposed RE1 zoned park at the eastern end of the proposed Marina Development is unknown. I have assumed the area would be used for family recreation activities and as such it would therefore be classified as an active recreation area when and if the proposed Marina Development is constructed.
91. The New Brighton Golf Course south of the Site is classified by definition as an active recreation area.
92. For reasons concluded in paragraph 43 above, the proposed Marina Development is classified as a commercial premises and for reasons concluded in paragraph 51 above, the proposed Tanlane Development is classified as industrial premises.
93. Therefore the criteria (called Project Specific Noise Levels) in Table 3 apply to the various receivers identified above. If these Project Specific Noise Levels are complied with then noise levels will also be complied with at any other sensitive receiver.

⁴ Page 18, INP

Table 3 Applicable INP project specific noise levels LAeq (free field)

Land use	Intrusiveness Criterion LAeq(15min) ¹	Acceptable Amenity Criterion LAeq(day) 7am-6pm
M1-M13	RBL+5	55
Existing park at the eastern end of Elouera Crescent		55
Existing RE1 and RE2 zoned area on the eastern side of Georges River		55
Proposed RE1 zoned park at the eastern end of the proposed Marina Development		55
New Brighton Golf Course		55
Proposed Marina Development		65
Proposed Tanlane Development		70

Note 1: During operating hours of the development

5.2 NSW EPA Road Noise Policy (RNP)

94. Noise from trucks associated with the Development travelling on the ramps and access road is treated as industrial noise in the INP.⁵ Noise from trucks associated with the Development travelling on the bridge and on Brickmakers Drive is treated as road noise in the RNP.
95. Table 4 below sets out the assessment criteria for residences to be applied to particular types of project, road category and land use. In Table 4, freeways, arterial roads and sub-arterial roads are grouped together and attract the same criteria. The assessment criteria in Table 4 are measured at 1m from the most affected façade of the dwelling and are therefore termed a "façade level".
96. In relation to the subject development, I am instructed by the Respondent's traffic expert that Brickmakers Drive is appropriately categorised as a sub-arterial road and therefore Category 3 applies in Table 4.

⁵ Addressing privately owned haul roads. Application notes - NSW industrial noise policy.
<http://www.epa.nsw.gov.au/noise/applicnotesindustnoise.htm>

Table 4: Road traffic noise assessment criteria for residential land uses (façade level)

Road category	Type of project/land use	Assessment criteria – dB(A)	
		Day 7:00am-10:00pm	Night 10:00pm-7:00am
Freeway/ arterial/ sub-arterial roads	1. Existing residences affected by noise from new freeway/arterial/sub-arterial road corridors	L _{Aeq} (15 hour) 55 (external)	L _{Aeq} (9 hour) 50 (external)
	2. Existing residences affected by noise from redevelopment of existing freeway / arterial / sub-arterial roads	L _{Aeq} (15 hour) 60 (external)	L _{Aeq} (9 hour) 55 (external)
	3. Existing residences affected by additional traffic on existing freeways / arterial / sub-arterial roads generated by land use developments	L _{Aeq} (15 hour) 60 (external)	L _{Aeq} (9 hour) 55 (external)
Local roads	4. Existing residences affected by noise from new local road corridors	L _{Aeq} (1 hour) 55 (external)	L _{Aeq} (1 hour) 50 (external)
	5. Existing residences affected by noise from redevelopment of existing local roads		
	6. Existing residences affected by additional traffic on existing local roads generated by land use developments		

Note: Land use developers must meet internal noise goals in the Infrastructure SEPP (Department of Planning NSW 2007) for sensitive developments near busy roads (see Appendix C10).

97. The RNP also sets guidelines for the assessment of traffic noise on sensitive land uses such as recreation areas. The applicable road traffic noise criteria are presented in Table 5:

Table 5 Road traffic noise assessment criteria for non-residential land uses affected by proposed road projects and traffic generating developments (free field level)

Existing sensitive land use	Assessment Criteria, dB(A)		Additional considerations
	Day (7am-10pm)	Night (10pm-7am)	
1. Open space (active use)	L _{Aeq} , (15 hour) 60 (external) when in use	–	Active recreation is characterised by sporting activities and activities which generate their own noise or focus for participants, making them less sensitive to external noise intrusion.
2. Open space (passive use)	L _{Aeq} , (15 hour) 55 (external) when in use	–	Passive recreation is characterised by contemplative activities that generate little noise and where benefits are compromised by external noise intrusion, e.g. playing chess, reading. In determining whether areas are used for active or passive recreation, the type of activity that occurs in that area and its sensitivity to noise intrusion should be established. For areas where there may be a mix of passive and active recreation, e.g. school playgrounds, the more stringent criteria apply. Open space may also be used as a buffer zone for more sensitive land uses.

Note:

Land use developers must meet internal noise goals in the Infrastructure SEPP (Department of Planning NSW 2007) for sensitive developments near busy roads. See Appendix C10.

98. The assessment criteria in Table 5 are measured away from reflective surfaces such as buildings and are therefore termed a "free-field level".
99. Consistent with my discussion at paragraph 87, in respect of the existing park area at the eastern end of Elouera Crescent, I have assumed this area is more likely to be used as a playground rather than an area for playing chess or reading and it would therefore be classified as an active recreation area.
100. I note that in paragraph 77 of my Tonin 2013 Report, I categorised this park area as passive. Having regard to the wording in Table 5, I do not now believe that was a correct assumption.
101. In situations where existing traffic noise levels exceed the criteria recommended in the tables above, section 3.4 of the RNP states as follows:

Where existing traffic noise levels are above the noise assessment criteria, the primary objective is to reduce these through feasible and reasonable measures to meet the assessment criteria. A secondary objective is to protect against excessive decreases in amenity as the result of a project by applying the relative increase criteria.

In assessing feasible and reasonable mitigation measures, an increase of up to 2 dB represents a minor impact that is considered barely perceptible to the average person.

102. The following steps are recommended *inter-alia*:

Step 1: Identify the study area

Step 2: For each assessment location in the study area affected by additional traffic on existing roads generated by land use developments, identify where the total traffic noise level from existing roads and the traffic generating development exceed the 'traffic generating development' criterion for residences in Table 4 or the criteria for non-residential land uses in Table 5.

Step 3: For each assessment location in the study area where exceedances are identified in Step 2, identify feasible and reasonable mitigation measures in the following order of priority:

- i. road design and traffic management
- ii. quieter pavement surfaces
- iii. in-corridor noise barriers/mounds
- iv. at-property treatments or localised barriers/mounds

to achieve the controlling criteria in Step 2 for (in this case) the day-time period.

Assessment locations exceeding the external noise criteria in Step 2 that already incorporate at-property treatment should identify feasible and reasonable mitigation measures in the priority order of (i) to (iii) above to address those external exceedances.

Step 4: For each assessment location in the study area, if the controlling criteria identified in Step 2 are not achievable in Step 3, justification should be provided that all feasible and reasonable mitigation has been applied.

103. For existing residences and other sensitive land uses affected by additional traffic on existing roads generated by land use developments, any increase in the total traffic noise level should be limited to 2dB(A) above that of the corresponding 'no build option'.

104. In summary, the applicable RNP noise criteria are as follows:

Table 6 Applicable RNP assessment criteria

Sensitive land use	Assessment criteria
Residents on Brickmakers Drive	LAeq,(15 hour) 60 (external façade level)
Existing park at the eastern end of Elouera Crescent	LAeq,(15 hour) 60 (external free field)

6 Predicted industrial noise levels and assessment of noise impact

105. A noise model was constructed of the Site, the access road and the bridge ramps as shown in Figures 5-7. The software used was CadnaA developed by Datakustik which is approved for use by the NSW Environment Protection Authority.
106. This section describes the methodology used to obtain the noise source data input information, the prediction assumptions and the results obtained. This section only pertains to industrial noise emitted from the Development. The next section deals with road traffic noise.

6.1 Site plant source noise levels

107. The acoustic model requires, as an input, the source noise levels for each item of fixed and mobile plant. In the case of noise sources in the open, the source noise level is expressed in terms of the Sound Power Level (PWL). In the case of noise sources enclosed within a building, the source noise level can either be expressed as a PWL or as a Sound Pressure Level (SPL) measured inside the building with the noise source operating.
108. Source noise levels were presented in Table 5-2 of the Wilkinson Murray Report. I intended to verify that data and therefore conducted my own measurements on 3rd August 2016 at the Concrete Recycling plant at Thackeray Street, Camellia. The equipment used for noise measurements was an NTi Audio Type XL2 precision sound level analyser as described in paragraph 60 above. The meter was calibrated before and after measurements with no significant drift in calibration occurring. At the time of measurements, there was a drizzle, however, this did not affect the measurement at the microphone. The relevant NATA calibration certificate for the meter and calibrator are shown in APPENDIX E.

Figure 5 Site noise model configuration

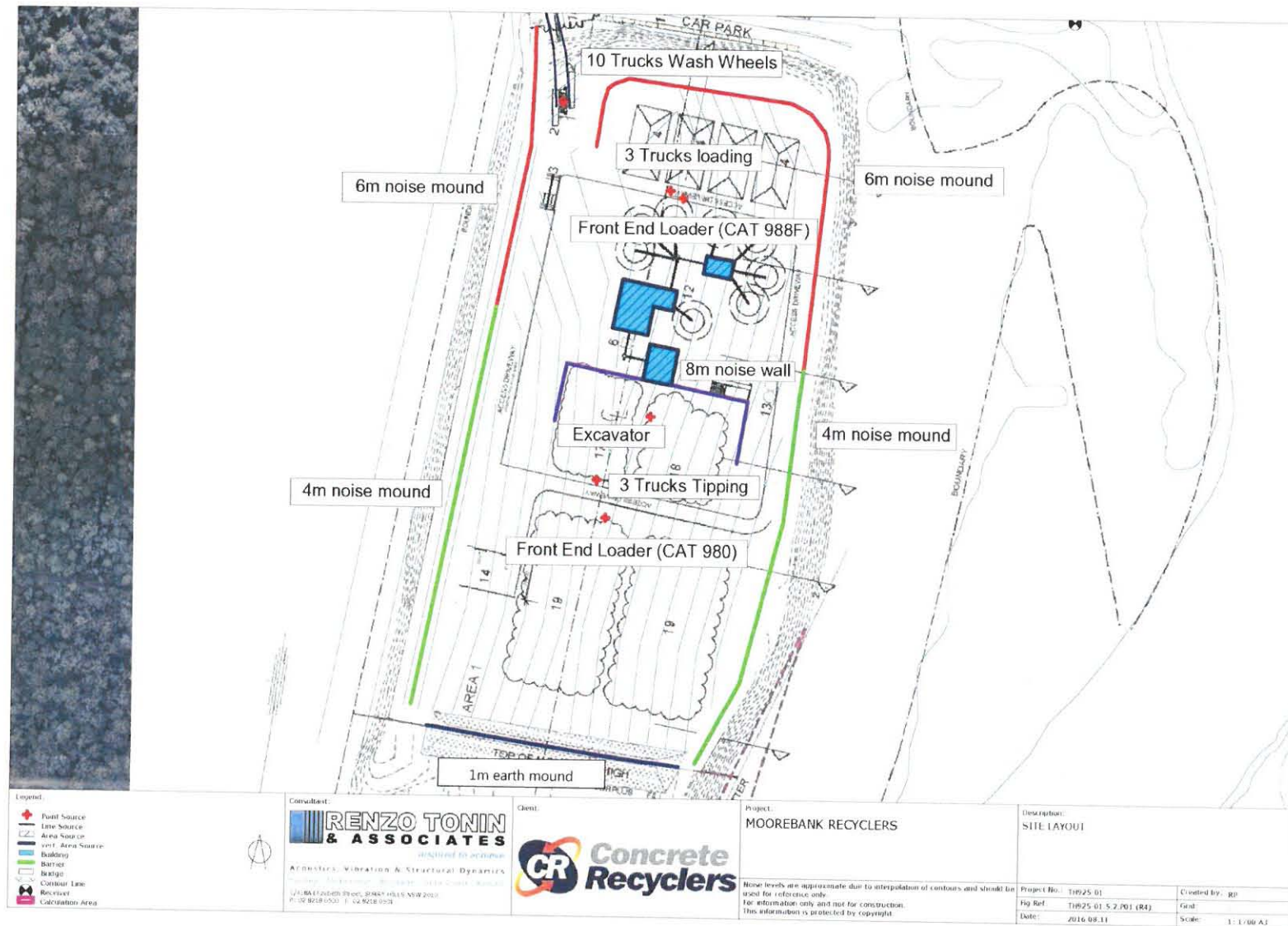


Figure 6 Predicted industrial noise levels for 3m/s wind at 135 degrees (from the South-East)

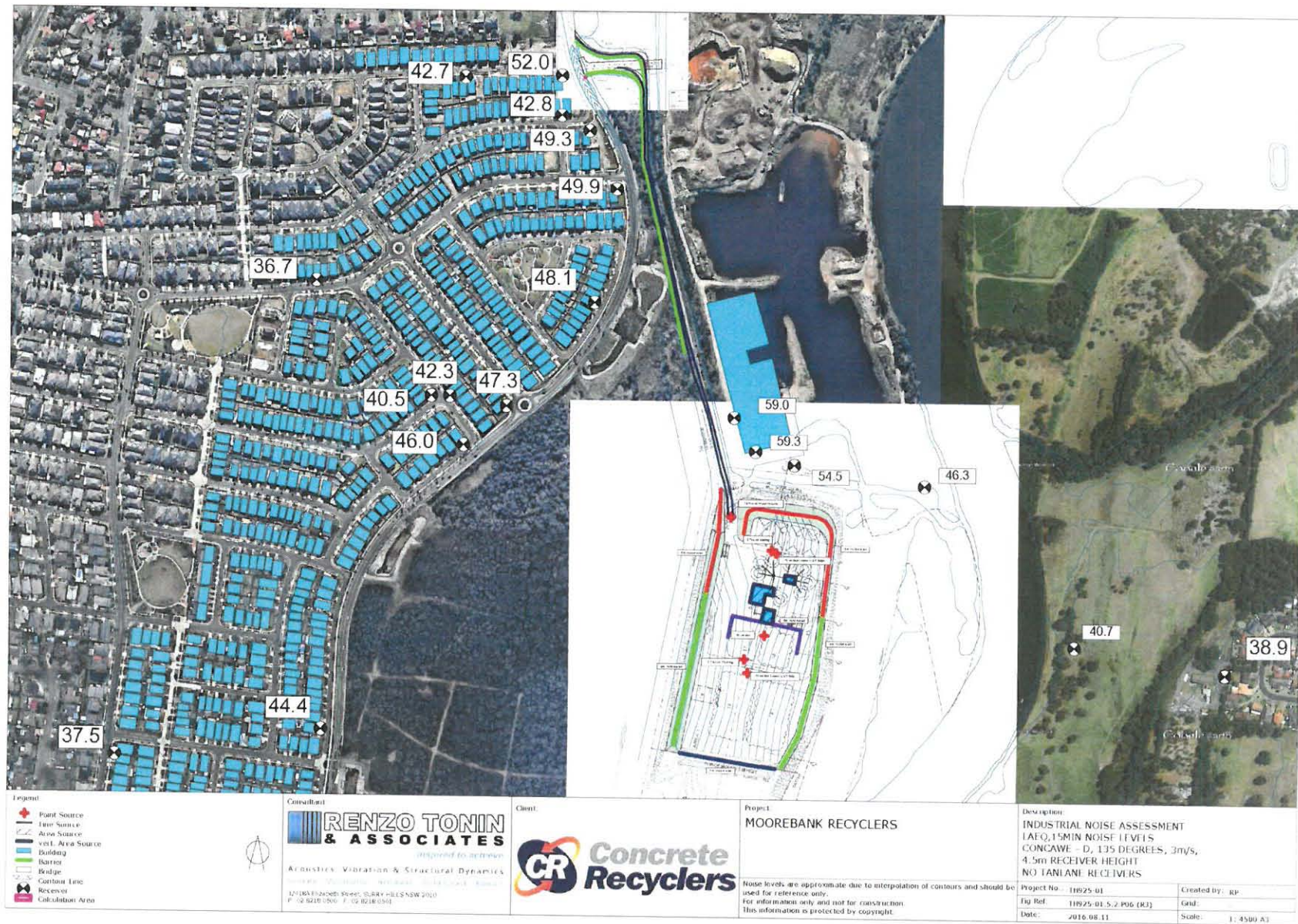
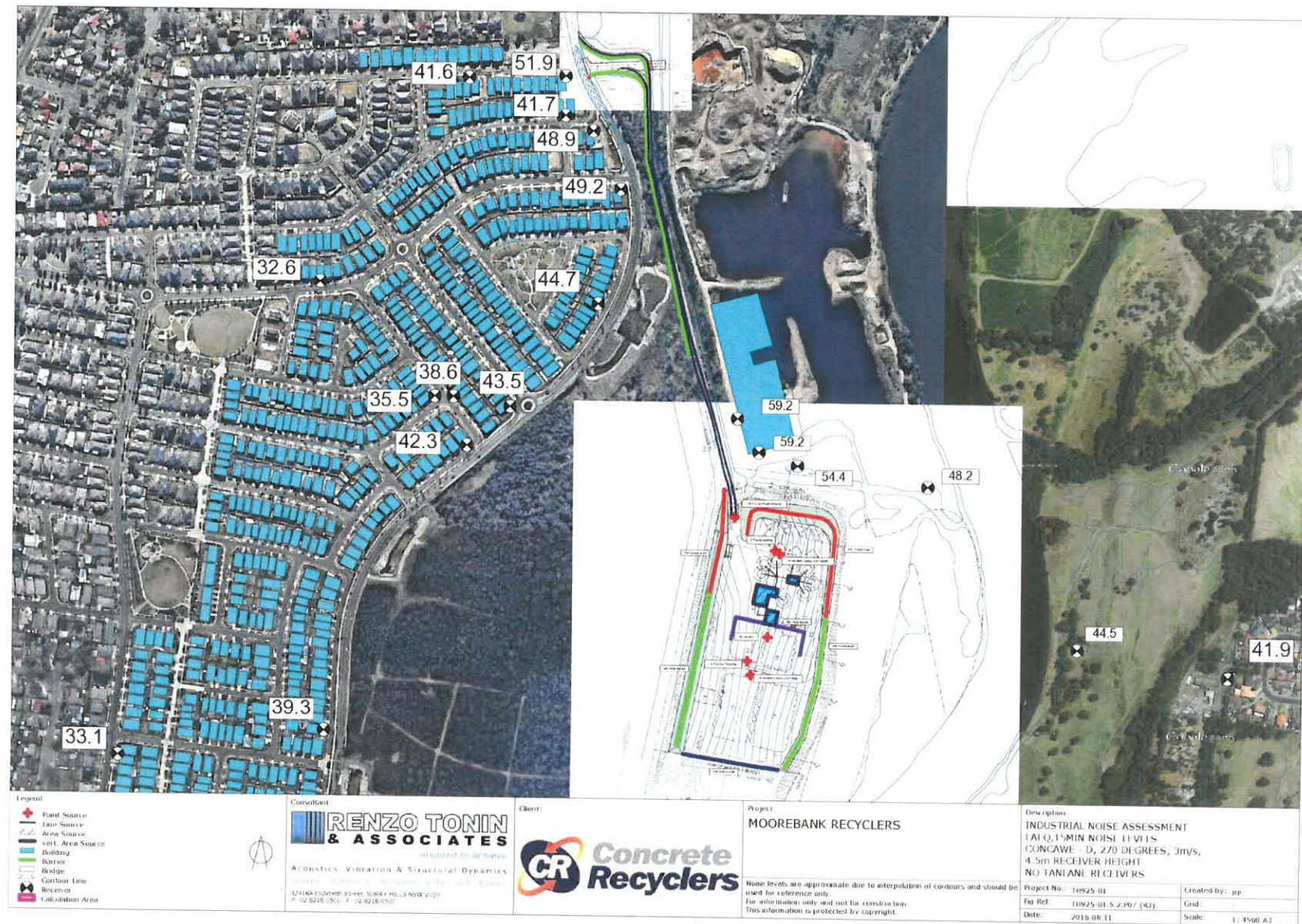


Figure 7 Predicted industrial noise levels for 3m/s wind at 270 degrees (from the West)



109. The PWL was determined from the SPL measured at a fixed distance from the plant. During the measurement period for each item of plant (which varied between 1-2 minutes), the equipment was performing a number of cycles of its normal operation. During the measurement period, where necessary, other equipment in the area was stopped momentarily so as not to contaminate the measurement. Where the SPL occurred momentarily, for example when the truck was tipping or being loaded, the LAeq was calculated over a period of 15 minutes and the PWL derived for that time period. The following results were obtained:

Table 7 Measured source noise levels (PWL re 10^{-12} watts, SPL re 20uPa)

Plant	PWL(15min)/	
	SPL	LAeq
Measured by Tonin		
Excavator	PWL	110.0
Front End Loader Cat 980H at Crusher	PWL	110.3
Front End Loader CAT 988F at Loading Station	PWL	114.9
Truck Tipping (per truck)	PWL	102.4
Truck Loading (per truck)	PWL	88.6
Inside crusher building	SPL	93.7
Inside screen building	SPL	94.1
Wilkinson Murray Report		
Excavator	PWL	108
Front End Loaders	PWL	110
Truck Tripping (per truck)	PWL	97
Inside crusher building	SPL	98
Inside screen building	SPL	90
Wheel Wash (per truck)	PWL	93

110. There are differences between my measured levels and those reported in the Wilkinson Murray Report.
111. In respect of the front end loaders (FEL), the Wilkinson Murray Report assumed the FEL at the crusher is identical to that at the loading station. However, my observations at the Camellia plant is that the FEL at the loading station has a greater engine capacity than the FEL at the crusher. This is reflected in the higher PWL of the former in Table 7.
112. In respect of the noise levels inside the crusher and screen buildings, these are also different and I have therefore taken the higher value in the noise model.
113. Noise from trucks idling or moving at very low speed, conveyor noise and the sound of product falling on the stock piles was observed to be insignificant during my survey in comparison to the items listed in Table 7 and were therefore not included in the model.

6.2 Truck source noise levels

114. In addition to the sources of noise on the Site, there is also an industrial noise contribution from trucks using the access road and the ramps. In my Tonin 2013 Report at paragraphs 108-110 I described how the truck source noise levels were measured.

108. *In determining the noise impact from new truck traffic associated with the Moorebank Site, it is important to determine the truck sound levels for each manoeuvre. There are three truck sound levels to be determined:*

- i) **Intersection:** *Noise from trucks entering and leaving the intersection of Brickmakers Drive and the new bridge;*
- ii) **Access Road:** *Noise from trucks on the access road at grade travelling at the designated 25kph limit; and,*
- iii) **Up-Ramp:** *Noise from trucks on the 8% grade up-ramp.*

I have adopted the conservative position that noise level for trucks on the down-ramp will be no greater than on the access road.

109. *In order to acquire realistic truck sound levels, I conducted measurements on roads near the Concrete Recyclers Pty Ltd Camellia plant at which identical trucks operate as proposed at the Moorebank Site. The following measurement sites were selected:*

- i) **Intersection:** *The intersection of Thackeray Street and Grand Ave, Camellia. At this location, departing trucks come to a stop at the intersection and accelerate right into Grand Ave. Trucks on arrival on Grand Ave slow down, change gear and enter Thackeray Street. These are similar manoeuvres to what is expected at Brickmakers Drive with the exception that a signalised intersection is proposed.*
- ii) **Access Road:** *At a distance of approximately 100m from the Thackeray Street and Grand Ave intersection, trucks are travelling at approximately 25kph (as measured using a radar gun) and are accelerating. This manoeuvre would produce a higher noise level than trucks on the access road travelling at a constant 25kph and therefore the measured noise levels will be conservatively high.*
- iii) **Up-Ramp:** *The up-ramp of the bridge on Grand Ave over the railway line has a grade of 9-10% which is greater than the 8% proposed at the subject site and therefore the measured noise levels will be conservatively high.*

110. *The results of noise measurements are shown in Annexures RTA8-RTA10. In respect of intersection noise, the Sound Exposure Level (SEL) was determined for each truck manoeuvre. The LAeq may then be determined from the SEL. In respect of access*

road and up-ramp noise, the maximum LAeq(1sec) was measured for each truck passby.

115. In respect of modelling the industrial noise emitted from the Development, of the three measurements described above, the pertinent truck source noise levels are those for the "Access Road" and for the "U-Ramp" identified above. The "Intersection" source noise level is of relevance only in the assessment of RNP road noise which is discussed in the following section.

6.3 Noise modelling methodology

116. Noise levels were predicted using Datakustik software CadnaA configured with the CONCAWE algorithm. This algorithm was chosen because it enables a fixed wind speed in any direction to be specified. The model accounts for noise level enhancement due to wind blowing from source to receiver including acoustic reflections from barrier walls and buildings. The following input assumptions were used:
- Temperature: 20degC
 - Humidity: 70%
 - Ground Absorption: 0.5
 - Default Wind Speed: 3m/sec in three principal directions, 135deg to address the sensitive receivers to the north-west and 270deg to address the sensitive receivers to the east and the Tanlane land, 0deg for the Brighton Golf Course.
 - Pasquill Stability Category: D (neutral conditions)
 - Number of reflections: 3
 - Earth mounds on the perimeter of the site are assumed to be partly absorptive (4dB loss on reflection)
 - Topographical and building information: Sourced from Land & Property Information (2m contour intervals), Cardno plan SK104 dated Feb 2013 for Brickmakers Drive road alignment, Lyle Marshall & Associates project plans dated 25 July 2013 including regraded contour plans for the Site and John M Daly bulk earthworks plan for the proposed Tanlane Development dated 18 March 2015
 - Receiver heights above ground: 4.5m for dwellings (except M6A which is at 1.5m to compare with the Ishac data), 4.5m for the commercial building façade within the proposed Marina Development and 1.5m at the southern boundary, 1.5m for parks
117. As shown in Figure 5 above, the mobile plant was located in the centre of the Site where they are most exposed. The height of the earth mounds around the perimeter of the Site have been adjusted with respect to the PAC approved mounds. There are now 4m and 6m high mounds proposed in the locations shown in Figure 5 but with the addition of one new 8m high acoustic wall adjacent to the primary crusher building to attenuate noise from the excavator working in that area. Clearly, the effectiveness of that acoustic wall will depend

upon the excavator working in and around the point shown in the figure and not further southwards. This is discussed further in my recommendations.

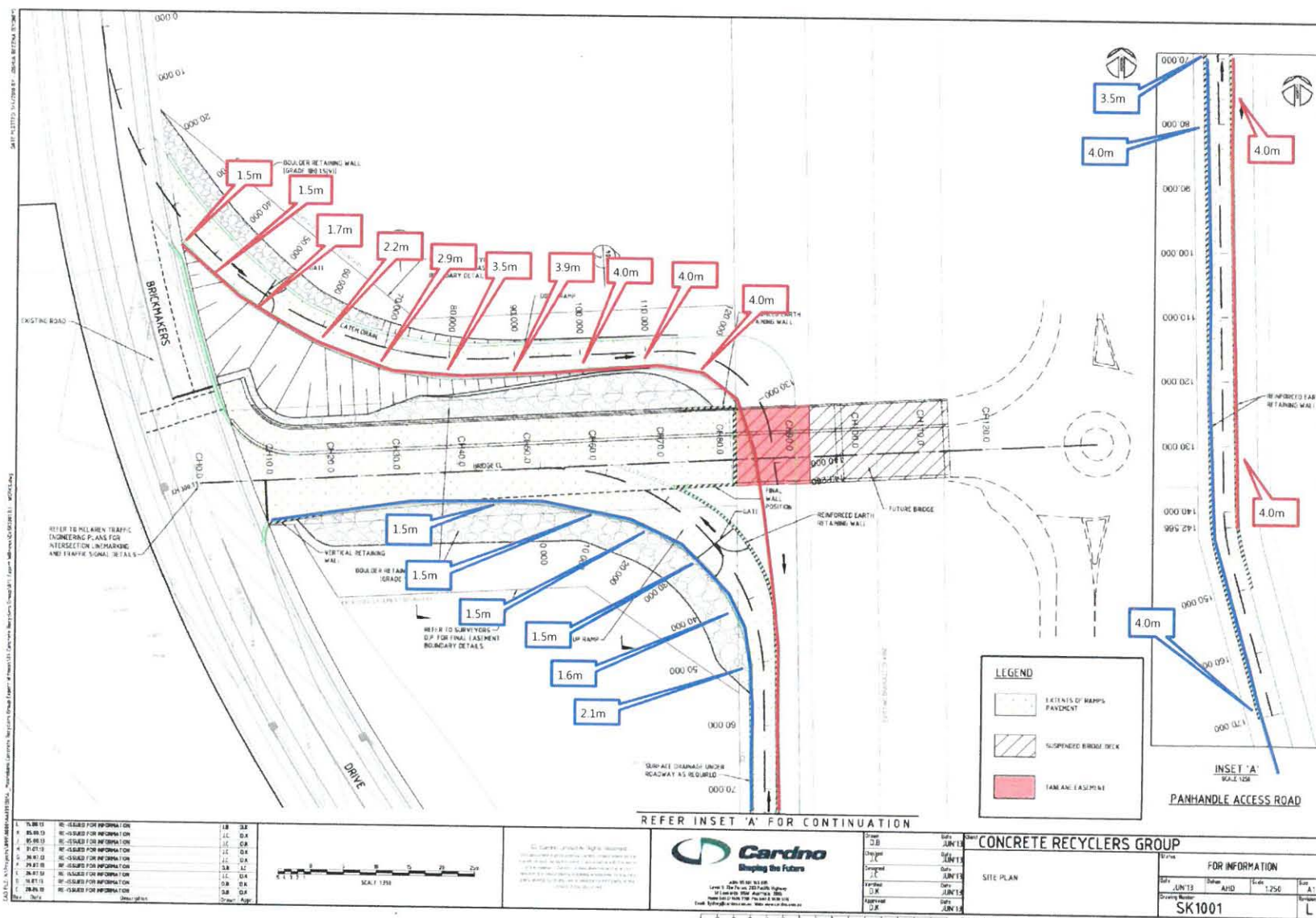
118. As an alternative, the 4m and 6m high mounds can be replaced with a combination of earth mound and noise barrier wall.
119. Noise emission from the crusher and screening buildings were modelled by reference to the SPL inside and the sound transmission properties of the building cladding material and includes sound radiation from all walls and roof. A typical cladding material was sourced from the INSUL sound insulation prediction program with a Sound Reduction Index as shown in Table 8.

Table 8 Sound Reduction Index 0.6mm Roof Cladding Trimclad (dB)

Frequency Hz							
63	125	250	500	1k	2k	4k	8k
9	12	16	20	21	19	20	20

120. Whilst this specific material has been used for modelling, there are a range of materials which are equivalent or better and the final selection can be made at the detailed design stage.
121. Trucks on the access road and the ramp were modelled in CadnaA as moving point sources with a PWL of 111dB(A) for the up ramp and 108dB(A) for the down ramp and the flat portion of the access road (as derived from the measurements described in section 6.2 above). The PWL was split into two components, an engine component at a height of 1.5m above the road pavement and an exhaust component (with 7dB(A) attenuation) at a height of 3.6m above the road pavement. A speed of 25kph was adopted for both ramps and the access road. A peak of 38 movements per hour (total in both directions split equally) was used.
122. The ramp acoustic walls are located on the western side of the ramps and access road as shown in Figure 8 below. The ramp acoustic walls start at 1.5m in height at the bridge with the top RL of the walls remaining constant at that level as one travels down the ramps, with the end result that the height of the walls increases as one proceeds towards the Site. The maximum height of the acoustic walls is 4m at the bottom of the ramps. The ramp walls are acoustically absorptive (NRC 0.6) on the side facing the centre of the ramp on which they are constructed. Part of the down ramp acoustic wall (at the bottom of the ramp where it also faces the up ramp acoustic wall) should be acoustically absorptive on both sides.
123. Annexed hereto in APPENDIX H are perspective views of the acoustic wall design.

Figure 8 Height and location of ramp acoustic walls



6.4 Predicted industrial noise levels

124. The predicted noise levels and the relevant noise criteria are shown in Table 9 below and illustrated in Figure 6 and Figure 7 above.
125. By way of explanation, in this table:
- Column 3, RBL is the Rating Background Level which is the value shown for Mon-Sat in Table 1. In respect of M11-M13, these were attended measurements on weekdays. I have assumed the RBL to apply to Saturday as well, because Saturday is not a special day.
 - Column 4 is the intrusiveness criterion equal to $RBL+5$.
 - Column 5 is the predicted $LA_{eq}(15min)$ from the computer modelling.
 - Column 6 is the exceedence of the predicted $LA_{eq}(15min)$ above the intrusiveness criterion. A negative value means the predicted level is below the criterion.
 - Column 7 is the acceptable amenity limit derived from Table 3.
 - Column 8 is the predicted amenity noise level $LA_{eq}(day)$ which takes into account the average of all the $LA_{eq}(15min)$ over the day. This is discussed further in the next paragraph.
 - Column 9 is the exceedence of the predicted $LA_{eq}(day)$ above the amenity limit. A negative value means the predicted level is below the criterion.
126. In respect of column 8, this represents the $LA_{eq}(15min)$ levels averaged over the whole day. The $LA_{eq}(15min)$ intrusive noise level in column 5 is calculated as the worst case condition likely to occur at any time of the day. There will be times in the day when not all plant is operating and when there are less than 38 truck movements per hour. Therefore, the LA_{eq} calculated over the whole day in column 8 will be less than the highest $LA_{eq}(15min)$.
127. It is difficult to predict the $LA_{eq}(day)$ from the $LA_{eq}(15min)$ because it is site specific. In the Wilkinson Murray Report, it adopts a value of $2dB(A)$ as being the difference $LA_{eq}(15min) - LA_{eq}(day)$. I have used the same value for the conversion in the table below. However, even if a value of zero were to be adopted, as is clear from the last column 9, there would still be no exceedence of the amenity criteria.

Table 9 Predicted industrial noise levels and compliance with noise criteria

1	2	3	4	5	6	7	8	9
		Intrusive				Amenity		
Location	Address	RBL	Intrusive Criterion	Predicted LAeq(15min)	Exceedence Note 3	Acceptable Limit	Predicted LAeq(day) Note 4	Exceedence Note 3
Residential Dwellings								
M1	23 Christiansen Boulevard	38.9	43.9	37.5	-6.4	55.0	35.5	-19.5
M3	4 Bushview Lane	49.2	54.2	44.4	-9.8	55.0	42.4	-12.6
M4	98 Maddecks Avenue	38.6	43.6	36.7	-6.9	55.0	34.7	-20.3
M6	32 Speare Street	38.1	43.1	42.3	-0.8	55.0	40.3	-14.7
M6A	25 Speare Street ^{Note 1}	36.4	41.4	40.5	-0.9	55.0	38.5	-16.5
M7	49 Horizon Circuit	41.9	46.9	42.7	-4.2	55.0	40.7	-14.3
M8	110 Travers Street	44.5	49.5	42.8	-6.7	55.0	40.8	-14.2
M8A	71 Horizon Circuit	50.4	55.4	52	-3.4	55.0	50.0	-5.0
M8B	99 Travers Street	50.9	55.9	49.3	-6.6	55.0	47.3	-7.7
M9	27 Martin Crescent, Milperra	37.5	42.5	41.9	-0.6	55.0	39.9	-15.1
M10	16 Cotter Lane	44.4	49.4	46	-3.4	55.0	44.0	-11.0
M10A	14 Cotter Lane	42.2	47.2	46	-1.2	55.0	44.0	-11.0
M11	149 Maddecks Avenue ^{Note 2}	50.5	55.5	49.9	-5.6	55.0	47.9	-7.1
M12	12 Silverleaf Lane ^{Note 2}	44.2	49.2	48.1	-1.1	55.0	46.1	-8.9
M13	43 Conlon Avenue ^{Note 2}	44.9	49.9	47.3	-2.6	55.0	45.3	-9.7