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Additional Noise Assessment

Oakdale Estate

Report Number 630.10297 R3

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Goodman Property Services Pty Ltd
Level 10, 60 Castlereagh Street
Sydney NSW 2000

Version: Revision 1

Additional Noise Assessment

Oakdale Estate

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630.10297 R3	Revision 1	18 October 2012	John Cotterill	Nathan Archer	John Cotterill
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1 INTRODUCTION

SLR Consulting Australia Pty Ltd (SLR Consulting) has been commissioned by Goodman Limited (Goodman) to supply additional information for construction activities being undertaken on Lot 1 A, 1B and 1C to support a Section 75W application for the Oakdale Estate, Horsley Park NSW.

Broadly, the objectives of the assessments are to identify the potential impacts of noise from the proposed bulk earth works at the site and provide advice with regard to effective mitigation strategies where necessary.

The NIA has been be prepared with reference to Australian Standard AS 1055:1997 *Description and Measurement of Environmental Noise* Parts 1, 2 and 3 and in accordance with NSW Industrial Noise Policy (INP), Interim Construction Noise Guideline (ICNG) and the Road Noise Policy (RNP). Where issues relating to noise are not addressed in the INP, such as sleep disturbance, reference has been made to the NSW Environmental Noise Control Manual (ENCM),

2 PROJECT DESCRIPTION

The additional construction work proposed for the site includes the following:

- Bulk earthworks incorporating cut to fill and imported filling to:
  - Construct the Estate Road extension.
  - Raise the level of Lot 1C to match the pad level of Lot 1B.
- Construction of earth retaining walls to the perimeter of Lot 1C.

These works will require a number of heavy vehicle movements to and from the site. A summary of these heavy vehicle movements is contained within **Table 1.**

Table 1 Total Projected Truck Numbers

Material / Purpose	No./ Area / Volume	Truck Size	Total No. Trucks
Importation of Fill	286,800 tonnes	25t tipper	11,472
Road Base and Sub-Base Material	10,560 tonnes	25t tipper	422
Asphalt	1,050 tonnes	12t bogie	88
Stormwater Pipes	667 pipes	12t hiab	56
Stormwater Culverts	50 culverts	12t hiab	17
Retaining Walls Keystone Blocks	1,590 tonnes	12t hiab	133
Pipe sand bedding / backfill	760 tonnes	12t bogie	63
Landscape topsoil, plants & materials	3,260 tonnes	25t truck	130
Total	n/a	n/a	12,381

The overall timeframe for the works is a 162 day period.

It is estimated that peak heavy vehicle numbers will occur during the importation of fill at a level of 20 vehicle movement per hour over an eight (8) hour day (reference Construction Traffic Management Plan – Traffix 12.250r01 V3 dated 18/10/2012).

A plan of the Oakdale site is given in **Figure 1.**

Figure 1 Site Plan

3 RECEIVER LOCATIONS

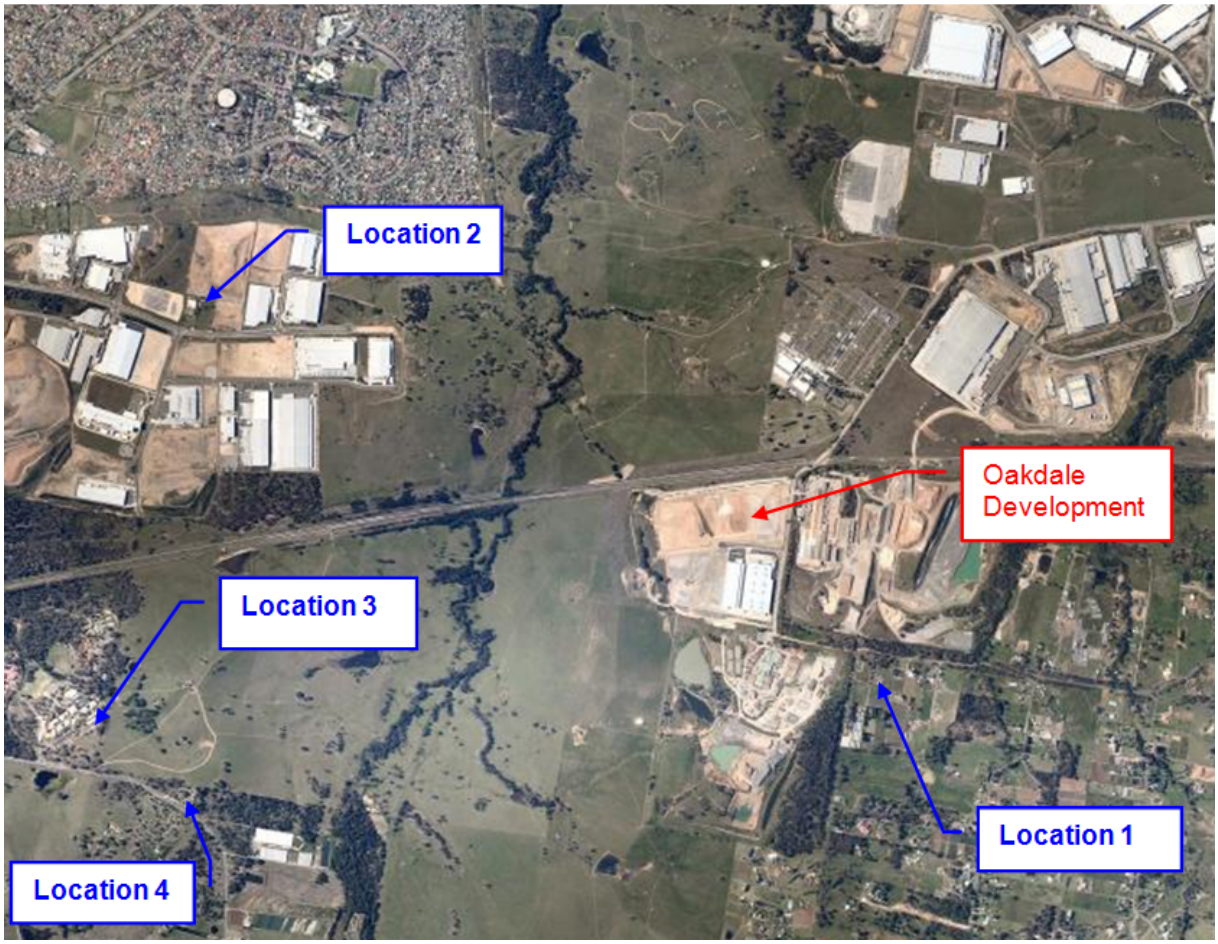
The site is situated on Old Wallgrove Road in the suburb of Horsley Park located west of Campbelltown. The warehouse site is bounded primarily by industrial land areas to the east and south and Crown land areas to the north and west.

The area around the proposed site is sparsely populated with residences. The nearest sensitive receivers potentially affected by the proposed development are:

- Residences located on Burley Road, Horsley Park (approximately 890 m east of the site).
- Residence on Lenore Lane Erskine Park (approximately 2.4 km north-west of the site).
- Emmaus College located at Erskine Park (approximately 2.8 km west of the site).
- Residences located on Aldington Road, Kemps Creek (approximately 2.6 km west of the site).

Figure 2 illustrates the locality of the proposed development in relation to the nearest sensitive receivers.

Figure 2 Receiver Locations



4 PROJECT SPECIFIC NOISE CRITERIA

4.1 Concept Plan Approval

As part of the Concept Plan Approval for Oakdale Central noise limits were established as given below:

NOISE LIMITS

6. The proponent shall ensure that the noise generated by the project does not exceed the noise impact assessment criteria in Table 1.

Table 1: Project Noise Limits (dB(A))

Location	Day		Evening		Night		
	L_{Aeq}	L_{Aeq} (15 min)	L_{Aeq}	L_{Aeq} (15 min)	L_{Aeq}	L_{Aeq} (15 min)	L_{Aeq} (1 min)
A	55	39	45	39	40	39	49
B, C, D and E	50	39	45	39	40	39	49

Notes:

- *Noise emission limits apply under meteorological conditions of wind speeds up to 3 m/s at 10 metres above ground level or temperature inversions conditions of 3°C/100m and wind speed up to 2 m/s at 10 metres above the ground. To determine compliance with this condition, noise from the development must be measured at the most affected point within the residential boundary, or at the most affected point within 30 metres of the dwelling where the dwelling is more than 30 metres from the boundary.*
- *However, where it can be demonstrated that direct measurement of noise from the development is impractical, the EPA may accept alternative means of determining compliance (see Chapter 11 of the NSW Industrial Noise Policy). The modification factors in Section 4 of the NSW Industrial Noise Policy shall also be applied to the measured noise levels where applicable.*
- *The noise limits do not apply if the Proponent has an agreement with the relevant owner of lands within these locations to generate higher noise levels and the Proponent has advised the Department in writing of the terms of this agreement.*

Table 2: Location of Sensitive Receiver

Location	Address
A	North – Erskine Park Residents
B	West – Emmaus College and Retirement Village, Bakers Lane, Kemps Creek
C	South – 20 Bakers Road, Kemp Creek
D	South-East – 27 Greenway Place, Horsley Park
E	East – Burley Road Residents, Horsley Park

4.2 Construction Noise Criteria

The Concept Plan Approval does not explicitly define construction noise limits in relation to the development. Consequently, and as the guideline for construction noise has changed since the Concept Plan Approval was obtained, construction noise criteria were derived as part of a previous Noise Impact Assessment for the site (refer SLR Consulting report 630.10297R1 *Oakdale Industrial Estate - Building 1B Noise Impact Assessment*). The project specific construction noise goals are presented in **Table 2** and would be applicable for the proposed construction activities.

Table 2 Construction Noise Goals – Potentially Affected Residential Areas

Location	Construction $L_{Aeq(15minute)}$ Noise Goal (dBA)	
	Noise Affected	Highly Noise Affected
Location1 315-321 Burley Road	47	75
Location 2 Lenore Lane	46	
Location 3 Emmaus College	47	
Location 2 32 Aldington Road	43	

Note: Recommended standard hours: Monday to Friday 7am to 6pm, Saturday 8am to 1pm and no work Sundays or public holidays

4.3 Road Traffic Noise Criteria

The site is located on land to the west of the M7 on Old Wallgrove Road.

Traffic accessing the site will use Old Wallgrove Road and Wallgrove Road via the M7.

These roadways fall in the category of "Freeway/arterial" road in the Road Noise Policy and hence the noise criteria outlined in **Table 3** have been adopted.

Table 3 Road Noise Policy

Type of Development	Descriptor	Traffic Noise Goal
Existing residences affected by additional traffic on existing freeways/arterial/sub-arterial roads generated by land use developments	LAeq(15hour) Daytime LAeq(9hour) Night-time	60 dBA 55 dBA

5 COMPLIANCE NOISE MONITORING

SLR Consulting has conducted monthly operator attended construction and operational noise monitoring surveys for the Oakdale development since August 2010. **Appendix A** provides the summary of the operator attended monthly construction noise monitoring surveys. The attended noise survey results indicate that noise from road traffic, surrounding industry and noise associated with the general ambient environment are the main contributors to the acoustic environment during each monitoring survey. Noise monitoring was conducted at the four (4) monitoring locations surrounding the Oakdale site shown in **Figure 2**.

All attended noise survey results presented in **Appendix A** show that the construction activities associated with the Oakdale development comply with the relevant Concept Plan Approval noise limits presented in **Section 4.1** at all monitoring assessment locations. During the period of this noise monitoring approximately 300,000 m^3 of fill was transported to the Oakdale Estate. As the Concept Plan Approval noise limits are more stringent than the proposed construction noise goals, noise measurements of activities onsite would comply with the proposed construction noise goals.

6 CONSTRUCTION NOISE IMPACT ASSESSMENT

6.1 Construction Noise Assessment

As part of a previous Noise Impact Assessment for the site (refer SLR Consulting report 630.10297R1 *Oakdale Industrial Estate - Building 1B Noise Impact Assessment*) the following acoustically significant plant and equipment were assumed to operate during the construction period:

Earthworks

- Scraper (3 off).
- Compactor.
- Dozer (2 off).
- Articulated dump truck (2 off).

Building Construction

- Concrete agitators.
- Concrete boom pump.
- Cranes.
- Hand tools (various).
- Delivery trucks.
- Genset.

6.1.1 Equipment Sound Power Levels

The sound power levels of the major noise generating plant and equipment to be used in the construction of the development are given in **Table 4**. Sound power levels for equipment used in the assessment have been obtained from a SLR Consulting database of similar equipment. Details of these levels are given in **Appendix B**.

Table 4 Acoustically Significant Equipment Sound Power Levels

Building Construction Equipment	Sound Power Level (dBA re 10^{-12} W)
Earthworks	
Scraper	111
Compactor	110
Dozer	110
Articulated dump truck	102
Building Construction	
Concrete transit mixer	111
Concrete boom pump	107
Mobile Cranes	104
Hand tools	up to 104
Delivery truck	92
Genset	107

It has been assumed that the equipment specified for the earthworks will operate over Lot 1A, 1B and 1C. In addition to this equipment it has been assumed that during importation of fill an additional three (3) delivery trucks (10 per hour peak) will be onsite during each 15 minute period.

6.1.2 Noise Modelling Parameters

A computer model was used to predict noise emissions from the proposed construction activities. SoundPLAN V7.1 with CONCAWE algorithm has been used to calculate the noise emissions from the site. A three-dimensional digital terrain map giving all relevant topographic information was used in the modelling process. The model used the following parameters to predict noise levels at the nearest potentially affected receivers:

- The topographic map.
- The noise source data, which was compiled from a SLR Consulting database.
- Ground cover.
- Shielding by barriers and/or adjacent buildings.
- Atmospheric information. Prediction of operational noise under calm and prevailing meteorological condition (temperature inversion) was conducted.
- Atmospheric parameters under which noise predictions were made are given in **Table 5**. Prevailing conditions were determined as part of the previous noise assessment.

Table 5 Meteorological Parameters for Noise Predictions

	Temperature	Humidity	Wind Speed	Wind Direction	Temperature Gradient
Calm (day)	20^0C	70%	N/A	N/A	N/A

6.1.3 Construction Noise Modelling Results

The noise levels from the proposed construction, with additional delivery of fill material, were predicted at the nearest potentially affected receivers. A summary of the results of these predictions are contained within **Table 6**.

Table 6 Predicted Construction Noise Levels (including additional fill material)

		Construction LAeq(15minute) Design Goal (dBA)		
Location	**Period**	**Calm**	**Noise Affected**	**Highly Noise Affected**
Location1 315-321 Burley Road	Day	39	47	75
Location 2 Lenore Lane	Day	32	46	
Location 3 Emmaus College	Day	<30	47	
Location 4 32 Aldington Road	Day	<30	43	

The construction noise predictions contained in **Table 6** show that compliance with the design goals will be achieved at all receiver locations surrounding the development. The predicted noise levels are also compliant with the existing Concept Plan Approval for the site. The additional truck movements on site increase the predicted construction noise level by less than 1 dBA at all sites.

6.2 Road Traffic Noise Assessment

As previously stated, access to the site will be via Old Wallgrove Road, Wallgrove Road and the M7. No residential receivers are located on the route between the M7 Motorway and the Oakdale site. As a result there is no traffic noise impact between the M7 Motorway and the site.

There is expected to be a peak flow of heavy vehicles to the site, during the delivery of fill material, of approximately 20 vehicle movements per hour over a 8 hour period (ie 160 vehicle per day). Traffic volumes along the M7 are reported to be approximately 136,000 vehicles per day (AADT 2010). The increase in traffic noise levels from the M7 Motorway due to additional traffic from the Oakdale Estate will be insignificant.

7 CONCLUSION

SLR Consulting has undertaken a noise impact assessment for construction activities proposed for the Oakdale Estate.

Noise Compliance Measurements

Monthly noise monitoring of construction operations, which included periods when approximately 300,000 m^3 fill was being imported to the site, showed compliance with the Concept Plan Approval and proposed construction noise limits for the development.

Construction Noise Assessment

Computer noise modelling has been carried out to predict the noise level, from the facility, at the nearest affected receiver locations. Construction noise levels from the proposed development are predicted to comply with the construction noise goals established in accordance with the ICNG. The noise levels were also predicted to comply with the current Concept Plan Approval for the development.

Road Traffic Noise Assessment

No residential receivers are located on the route between the M7 Motorway and the Oakdale site. As a result there is no traffic noise impact between the M7 Motorway and the site. The increase in traffic noise levels from the M7 Motorway due to additional traffic from the development will be insignificant.

Operator Attended Construction Noise Monitoring Results

Location	Time (hours)	Noise Descriptor (dBA)				Description of Noise Emission, Typical L_{Amax} and Weather Conditions
		Measured $L_{A90(15minute)}$ Noise Level [1]	Measured $L_{Aeq(15minute)}$ Noise Level [1]	Estimated $L_{Aeq(15minute)}$ GPS Works Contribution[2]	Concept Plan Approval Noise Limit $L_{Aeq(15minute)}$	
August 2010						
BG1 315-321 Burley Road, Horsley Park	1259	38	48	<30	39	Traffic 58-64 dBA, Birds 54-57 dBA, Trail Bike 64 dBA **GPS works not discernible** Wind to 3 m/s with a clear sky
BG2 206 Lenore Lane, Erskine Park	1517	41	43	<31	39	Traffic 62 dBA, Surrounding Industrial 44-47 dBA, Plane 54-58 dBA **GPS works not discernible** Wind gusts to 4 m/s with a clear sky
BG3 32 Aldington Road, Kemps Creek	1333	30	47	<30	39	Traffic 54-57 dBA, People 66 dBA, Birds 53-56 dBA **GPS works not discernible** Wind gusts to 4 m/s with a clear sky
BG4 Emmaus College, Erskine Park	1413	37	45	<30	39	Traffic 52-58 dBA, Birds 54 dBA, Plane 58 dBA **GPS works not discernible** Wind to 3 m/s with a clear sky
September 2010						
BG1 315-321 Burley Road, Horsley Park	857	42	49	<32	39	Traffic 57-60 dBA, Birds 54-57 dBA, Dog 58 dBA Wind in trees 51 dBA **GPS works not discernible** Wind to 3 m/s with a clear sky
BG2 206 Lenore Lane, Erskine Park	1036	44	50	<34	39	Traffic 60-63 dBA, Surrounding Industrial 46-51 dBA, Plane 52-54 dBA **GPS works not discernible** Wind gusts to 3 m/s with a clear sky
BG3 32 Aldington Road, Kemps Creek	934	46	55	<36	39	Traffic 54-68 dBA, Birds 53-56 dBA **GPS works not discernible** Wind gusts to 3 m/s with a clear sky

Operator Attended Construction Noise Monitoring Results

Location	Time (hours)	Noise Descriptor (dBA)				Description of Noise Emission, Typical L_{Amax} and Weather Conditions
		Measured $L_{A90(15minute)}$ Noise Level [1]	Measured $L_{Aeq(15minute)}$ Noise Level [1]	Estimated $L_{Aeq(15minute)}$ GPS Works Contribution[2]	Concept Plan Approval Noise Limit $L_{Aeq(15minute)}$	
BG4 Emmaus College, Erskine Park	1003	45	49	<35	39	Traffic 52-58 dBA, Birds 54 dBA, People 52-60 dBA **GPS works not discernible** Wind to 3 m/s with a clear sky
October 2010						
BG1 315-321 Burley Road, Horsley Park	1127	41	51	<31	39	Traffic 57-67 dBA, Birds 47-56 dBA, Trail Bike 52-58 dBA **GPS works not discernible** Calm with a cloudy sky
BG2 206 Lenore Lane, Erskine Park	1302	43	52	<33	39	Traffic 52-61 dBA, Surrounding Industrial 47-53 dBA **GPS works not discernible** Wind gusts to 5 m/s with a cloudy sky
BG3 32 Aldington Road, Kemps Creek	1204	44	53	<34	39	Traffic 50-61 dBA, Birds 53-56 dBA, Wind in Trees 42-44 dBA **GPS works not discernible** Wind gusts to 3 m/s with a cloudy sky
BG4 Emmaus College, Erskine Park	1232	44	50	<34	39	Traffic 50-58 dBA, Birds 47-51 dBA, People 60-64 dBA, **GPS works not discernible** Wind to 3 m/s with a cloudy sky
November 2010						
BG1 315-321 Burley Road, Horsley Park	921	37	48	<37	39	Helicopter 52-62 dBA, Birds 51 dBA, Plane 64 dBA, Frogs 42-43 dBA, Dogs 53-64 dBA GPS reversing alarms faintly discernible <37 dBA No other GPS works discernible Calm with a cloudy sky
BG2 206 Lenore Lane, Erskine Park	1051	44	52	<34	39	Traffic 52-61 dBA, Surrounding Industrial 47-53 dBA **GPS works not discernible** Wind gusts to 2 m/s with a cloudy sky

Operator Attended Construction Noise Monitoring Results

Location	Time (hours)	Noise Descriptor (dBA)				Description of Noise Emission, Typical L_{Amax} and Weather Conditions
		Measured $L_{A90(15minute)}$ Noise Level [1]	Measured $L_{Aeq(15minute)}$ Noise Level [1]	Estimated $L_{Aeq(15minute)}$ GPS Works Contribution[2]	Concept Plan Approval Noise Limit $L_{Aeq(15minute)}$	
BG3 32 Aldington Road, Kemps Creek	954	35	49	<30	39	Traffic 76 dBA, Helicopter 52-62 dBA, Birds 46 dBA, Insects 39-40 dBA **GPS works not discernible** Wind gusts to 2 m/s with a cloudy sky
BG4 Emmaus College, Erskine Park	1020	37	50	<30	39	Traffic 68-73 dBA, Birds 45-51 dBA, Insects 42 dBA **GPS works not discernible** Wind to 2 m/s with a cloudy sky
January 2011						
BG1 315-321 Burley Road, Horsley Park	1251	40	45	<30	39	Dogs 50-61, Birds 50-54 dBA, Wind in Trees 43-44 dBA **GPS works not discernible** Wind to 3 m/s with a cloudy sky
BG2 206 Lenore Lane, Erskine Park	1431	46	50	<36	39	Traffic 65-75 dBA, Surrounding Industrial 49-59 dBA **GPS works not discernible** Wind to 3 m/s with a cloudy sky
BG3 32 Aldington Road, Kemps Creek	1334	39	44	<30	39	Traffic 70-76 dBA, Plane 51-60 dBA, Insects 39-40 dBA, Wind in Trees 45 dBA **GPS works not discernible** Wind to 3 m/s with a cloudy sky
BG4 Emmaus College, Erskine Park	1350	40	50	<30	39	Traffic 63-70 dBA, Birds 45-63 dBA, Wind in Trees 43-45 dBA **GPS works not discernible** Wind to 3 m/s with a cloudy sky
February 2011						
BG1 315-321 Burley Road, Horsley Park	1301	46	53	<36	39	Dogs 56-61, Wind in Trees 46-50 dBA **GPS works not discernible** Wind to 5 m/s with a cloudy sky
BG2 206 Lenore Lane, Erskine Park	1428	48	55	<38	39	Traffic 60-74 dBA, Wind 50 dBA **GPS works not discernible** Wind to 5 m/s with a cloudy sky

Operator Attended Construction Noise Monitoring Results

Location	Time (hours)	Noise Descriptor (dBA)				Description of Noise Emission, Typical L_{Amax} and Weather Conditions
		Measured $L_{A90(15minute)}$ Noise Level [1]	Measured $L_{Aeq(15minute)}$ Noise Level [1]	Estimated $L_{Aeq(15minute)}$ GPS Works Contribution[2]	Concept Plan Approval Noise Limit $L_{Aeq(15minute)}$	
BG3 32 Aldington Road, Kemps Creek	1336	49	52	<39	39	Traffic 72 dBA, Wind in Trees 52 dBA **GPS works not discernible** Wind to 5 m/s with a cloudy sky
BG4 Emmaus College, Erskine Park	1359	48	50	<38	39	Traffic 66-70 dBA, Wind in Trees 47-49 dBA **GPS works not discernible** Wind to 5 m/s with a cloudy sky
March 2011						
BG1 315-321 Burley Road, Horsley Park	1328	39	42	<39	39	Plane 45-50 dBA, Birds 43-52 dBA Wind in Trees 39-45 dBA Comments GPS reversing alarms faintly discernible L_{Amax} < 39 dBA No other GPS works discernible Wind to 2 m/s with a cloudy sky
BG2 206 Lenore Lane, Erskine Park	1523	42	55	<32	39	Traffic 82 dBA, Birds 43-46 dBA Comments **GPS works not discernible** Wind to 3 m/s with a cloudy sky
BG3 32 Aldington Road, Kemps Creek	1403	37	53	<37	39	Traffic 79 dBA, Wind in Trees 38-43 dBA, Birds 39-52 dBA Comments GPS reversing alarms faintly discernible L_{Amax} < 37 dBA No other GPS works discernible Wind to 3 m/s with a cloudy sky
BG4 Emmaus College, Erskine Park	1428	39	53	<30	39	Traffic 68-74 dBA, Plane 42-45 dBA, Insects 40-42 dBA, Birds 49 dBA, Wind in Trees 40-42 dBA Comments **GPS works not discernible** Wind to 3 m/s with a cloudy sky
April 2011						

Operator Attended Construction Noise Monitoring Results

Location	Time (hours)	Noise Descriptor (dBA)				Description of Noise Emission, Typical L_{Amax} and Weather Conditions
		Measured $L_{A90(15minute)}$ Noise Level [1]	Measured $L_{Aeq(15minute)}$ Noise Level [1]	Estimated $L_{Aeq(15minute)}$ GPS Works Contribution[2]	Concept Plan Approval Noise Limit $L_{Aeq(15minute)}$	
BG1 315-321 Burley Road, Horsley Park	1530	46	56	<36	39	Plane 49-60 dBA, Birds 51-55 dBA Crickets 46-49 dBA, Helicopter 51 -57 dBA, Local Traffic 72-79 dBA, People 54-58 dBA Comments GPS reversing alarms faintly discernible, but not measurable; No other GPS works discernible Wind to 2 m/s with a cloudy sky
BG2 206 Lenore Lane, Erskine Park	1650	50	53	<40[3]	39	Traffic 57 dBA, Surrounding Industry 50-80 dBA Animals 53 dBA, Plane 59 dBA Comments **GPS works not discernible** Wind to 2 m/s with a cloudy sky
BG3 32 Aldington Road, Kemps Creek	1610	45	57	<35	39	Traffic 79 dBA, Birds 47-51 dBA, Crickets 45-48 dBA, People 56-58 dBA Surrounding Residential 59-66 dBA Comments **GPS works not discernible** Wind to 3 m/s with a cloudy sky
BG4 Emmaus College, Erskine Park	1630	47	52	<37	39	Traffic 47-73 dBA, Insects 48-49 dBA, Birds 50 dBA, People 53-57 dBA Comments **GPS works not discernible** Wind to 3 m/s with a cloudy sky
May 2011						

Operator Attended Construction Noise Monitoring Results

Location	Time (hours)	Noise Descriptor (dBA)				Description of Noise Emission, Typical L_{Amax} and Weather Conditions
		Measured $L_{A90(15minute)}$ Noise Level [1]	Measured $L_{Aeq(15minute)}$ Noise Level [1]	Estimated $L_{Aeq(15minute)}$ GPS Works Contribution[2]	Concept Plan Approval Noise Limit $L_{Aeq(15minute)}$	
BG1 315-321 Burley Road, Horsley Park	1450	57	63	<47[3]	39	Reverse squawker 62-67 dBA Backhoe 61-64 dBA, Roller 63-68 dBA, Local Traffic 71 dBA, Dogs 62 dBA 1x backhoe and 1x roller were operating within 100m of monitoring location Comments; **GPS works not discernible** Wind to 6 m/s with a cloudy sky
BG2 206 Lenore Lane, Erskine Park	1620	40	61	<30	39	Traffic 77-80 dBA, Surrounding Industry 50-80 dBA Animals 53 dBA, Plane 59 dBA Comments **GPS works not discernible** Wind to 2 m/s with a cloudy sky
BG3 32 Aldington Road, Kemps Creek	1525	40	61	<30	39	Traffic 77-80 dBA, Birds 47-57 dBA, Crickets 42-47 dBA, People 64-84 dBA Surrounding Residential 59-66 dBA Plane 63-67 dBA, Comments **GPS works not discernible** Wind to 2 m/s with a cloudy sky
BG4 Emmaus College, Erskine Park	1545	44	63	<34	39	Helicopter 59 dBA, Insects 55-63 dBA, Birds 59-64 dBA, Local traffic 57-75 dBA Wind 59 dBA Comments **GPS works not discernible** Wind to 2 m/s with a cloudy sky
June 2011						

Operator Attended Construction Noise Monitoring Results

Location	Time (hours)	Noise Descriptor (dBA)				Description of Noise Emission, Typical L_{Amax} and Weather Conditions
		Measured $L_{A90(15minute)}$ Noise Level [1]	Measured $L_{Aeq(15minute)}$ Noise Level [1]	Estimated $L_{Aeq(15minute)}$ GPS Works Contribution[2]	Concept Plan Approval Noise Limit $L_{Aeq(15minute)}$	
BG1 315-321 Burley Road, Horsley Park	1210	48	53	<38	39	Bird: 51-54 dBA ; Saw: 51-56.7 dBA; Plane: 62-64 dBA; Dogs 62 dBA; Wind : 47-59 dBA; Local noise detectable; Circular saw in use; Comments **GPS works discernible**; Wind to 7 m/s (gusts to 12m/s) with minimally cloudy sky.
BG2 206 Lenore Lane, Erskine Park	1345	49	53	<39	39	Traffic 54-55 dBA; Animals 53 dBA; Comments **GPS works not discernible**; Some noise from surrounding industry; Wind to 8 m/s (gusts to 15 m/s) with a minimally cloudy sky.
BG3 32 Aldington Road, Kemps Creek	1255	50	57	<40[3]	39	Traffic: 77 dBA; Frogs:51 dBA; Wind: 57-65 dBA; Comments **GPS works not discernible**; Wind to 8-15 m/s with a minimally cloudy sky.
BG4 Emmaus College, Erskine Park	1320	52	57	<42[3]	39	Bird: 59 dBA; Local Traffic: 72-73dBA; Wind: 55-67 dBA; Comments **GPS works not discernible**; Wind to 9-18 m/s with a cloudy sky.
July 2011						

Operator Attended Construction Noise Monitoring Results

Location	Time (hours)	Noise Descriptor (dBA)				Description of Noise Emission, Typical L_{Amax} and Weather Conditions
		Measured $L_{A90(15minute)}$ Noise Level [1]	Measured $L_{Aeq(15minute)}$ Noise Level [1]	Estimated $L_{Aeq(15minute)}$ GPS Works Contribution[2]	Concept Plan Approval Noise Limit $L_{Aeq(15minute)}$	
BG1 315-321 Burley Road, Horsley Park	1430	41	49	<31	39	Bird: 48-58dBA; Plane: 52-61 dBA; Dog Barking 53-62 dBA; Local Traffic: 54 -56 dBA. Comments Local noise detectable; **GPS works discernible**, not detectable; Wind calm with cloudy sky.
BG2 206 Lenore Lane, Erskine Park	1600	47	53	<37	39	Plane 53-70 dBA; Surrounding Industrial:51-54 dBA; Comments **GPS works not discernible**; Some noise from surrounding industry; Wind calm with cloudy sky
BG3 32 Aldington Road, Kemps Creek	1315	34	52	<30	39	Local Traffic: 47-74 dBA; Bird:48-49 dBA; Plane: 49-57 dBA; Comments **GPS works not discernible**; Wind calm with cloudy sky
BG4 Emmaus College, Erskine Park	1530	37	50	<30	39	Bird: 41-55 dBA; Plane:43-65dBA; Comments **GPS works not discernible**; Wind calm with cloudy sky
August 2011						

Operator Attended Construction Noise Monitoring Results

Location	Time (hours)	Noise Descriptor (dBA)				Description of Noise Emission, Typical L_{Amax} and Weather Conditions
		Measured $L_{A90(15minute)}$ Noise Level [1]	**Measured $L_{Aeq(15minute)}$ Noise Level [1]**	**Estimated $L_{Aeq(15minute)}$ GPS Works Contribution[2]**	**Concept Plan Approval Noise Limit $L_{Aeq(15minute)}$**	
BG1 315-321 Burley Road, Horsley Park	1150	37	43	<30	39	Bird: 38-42dBA; Local Traffic: 42 dBA Construction Noise: 42-51 dBA Comments Local noise detectable; **GPS works discernible**, Wind calm with moderately cloudy sky.
BG2 206 Lenore Lane, Erskine Park	1320	44	49	<34	39	Plane 53-58 dBA; Surrounding Industrial:45-47 dBA; Truck: 59 dBA Comments **GPS works not discernible**; Some noise from surrounding industry; Wind calm with moderately cloudy sky
BG3 32 Aldington Road, Kemps Creek	1230	36	47	<30	39	Bird:38-40 dBA; Plane: 43-58 dBA; Comments **GPS works not detectable**, discernible; Wind calm with moderately cloudy sky
BG4 Emmaus College, Erskine Park	1255	33	54	<30	39	Bird: 40-46 dBA; Traffic: 63-79 dBA; Comments **GPS works not discernible**; Wind calm with moderately cloudy sky
September 2011						

Operator Attended Construction Noise Monitoring Results

Location	Time (hours)	Noise Descriptor (dBA)				Description of Noise Emission, Typical L_{Amax} and Weather Conditions
		Measured $L_{A90(15minute)}$ Noise Level [1]	Measured $L_{Aeq(15minute)}$ Noise Level [1]	Estimated $L_{Aeq(15minute)}$ GPS Works Contribution[2]	Concept Plan Approval Noise Limit $L_{Aeq(15minute)}$	
BG1 315-321 Burley Road, Horsley Park	1240	37	46	<30	39	Bird: 39-44 dBA; Car Pass-by: 43-66 dBA; Dog Barking: 49 dBA Comments Local traffic noise detectable; **GPS works not discernible or detectable**; Wind light with no clouds.
BG2 206 Lenore Lane, Erskine Park	1400	47	50	<37	39	Wind: 48-62 dBA; Industrial Noise: 45-47 dBA; Road Traffic: 53-57 dBA. Comments **GPS works not discernible**; Some noise from surrounding industry; Wind moderate with gusts, minimally cloudy sky
32 Aldington Road, Kemps Creek	1305	36	54	<30	39	Bird: 38-42 dBA; Local Traffic: 82 dBA. Wind Gust: 44 dBA Comments **GPS works not discernible**; Wind moderate with no clouds in sky
BG4 Emmaus College, Erskine Park	1330	40	57	<30	39	Bird: 40-54 dBA; Local Traffic: 72-76 dBA; Wind in Trees: 44-51 dBA. Comments **GPS works not discernible**; Wind Moderate with no clouds in sky
October 2011						
BG1 315-321 Burley Road, Horsley Park	1530	39	65	<30	39	Bird: 49-61 dBA; Car Pass-by: 43-66 dBA; Dog Barking: 58 dBA; Insects: 59 dBA; Road Traffic: 48-55 dBA. **Comments** Local traffic noise detectable; Beepers discernable, not measurable;

Operator Attended Construction Noise Monitoring Results

Location	Time (hours)	Noise Descriptor (dBA)				Description of Noise Emission, Typical L_{Amax} and Weather Conditions
		Measured $L_{A90(15minute)}$ Noise Level [1]	Measured $L_{Aeq(15minute)}$ Noise Level [1]	Estimated $L_{Aeq(15minute)}$ GPS Works Contribution[2]	Concept Plan Approval Noise Limit $L_{Aeq(15minute)}$	
						Wind light with some clouds.
BG2 206 Lenore Lane, Erskine Park	1645	43	47	<33	39	Bird: 55-57 dBA; Road Traffic: 49 dBA. **Comments** GPS works not discernable; Some noise from surrounding industry; Wind light, minimally cloudy sky
32 Aldington Road, Kemps Creek	1605	40	66	<30	39	Bird: 48 dBA; Local Traffic: 71-81 dBA; Local tractor: 50-61dBA. **Comments** GPS works not discernable; Wind light with some clouds in sky
BG4 Emmaus College, Erskine Park	1622	37	53	<30	39	Bird: 52dBA; Local Traffic: 48-75 dBA; **Comments** GPS works not discernable; Wind Moderate with some clouds in sky
November 2011						
BG1 315-321 Burley Road, Horsley Park	1500	39	45	<30	39	Bird: 38-50 dBA; Comments; **GPS works not discernible**; Wind Moderate with some clouds in sky
BG2 206 Lenore Lane, Erskine Park	1635	34	44	<30	39	Bird: 37-52 dBA; Comments; **GPS works not discernible**; Wind light with some clouds.
BG3 32 Aldington Road, Kemps Creek	1530	46	57	<36	39	Bird: 37-50 dBA; Local Traffic: 65-80dBA; Local lawn mowing: 50-59dBA. Comments **GPS works not discernible**; Wind light with some clouds in sky

Operator Attended Construction Noise Monitoring Results

Location	Time (hours)	Noise Descriptor (dBA)				Description of Noise Emission, Typical L_{Amax} and Weather Conditions
		Measured $L_{A90(15minute)}$ Noise Level [1]	Measured $L_{Aeq(15minute)}$ Noise Level [1]	Estimated $L_{Aeq(15minute)}$ GPS Works Contribution[2]	Concept Plan Approval Noise Limit $L_{Aeq(15minute)}$	
BG4 Emmaus College, Erskine Park	1600	35	50	<30	39	Bird: 36-52dBA; Local Traffic: 68-75 dBA; Comments **GPS works not discernible**; Wind Moderate with some clouds in sky
December 2011						
BG1 315-321 Burley Road, Horsley Park	1315	37	42	<30	39	Bird: 42dBA; Comments; **GPS works not discernible**; Wind Moderate with some clouds in sky
BG2 206 Lenore Lane, Erskine Park	1530	41	47	<31	39	Traffic: 51-67 dBA; Industry: 51; Comments; **GPS works not discernible**; Wind light with some clouds.
BG3 32 Aldington Road, Kemps Creek	1350	37	59	<30	39	Bird: 55 dBA; Plane: 53-70 dBA; Local Traffic: 79-86dBA; Local lawn mowing: 46-48dBA; Wind: 54 dBA; Comments **GPS works not discernible**; Wind light with some clouds in sky
BG4 Emmaus College, Erskine Park	1430	35	50	<30	39	Bird: 46 dBA; Local Traffic: 71-79 dBA; Plane: 50-74dBA; Comments **GPS works not discernible**; Wind Moderate with some clouds in sky
January 2012						
BG1 315-321 Burley Road, Horsley Park	1630	40	44	<30	39	Comments; GPS works not discernible; Wind Moderate with some clouds in sky

Operator Attended Construction Noise Monitoring Results

Location	Time (hours)	Noise Descriptor (dBA)				Description of Noise Emission, Typical L_{Amax} and Weather Conditions
		Measured $L_{A90(15minute)}$ Noise Level [1]	Measured $L_{Aeq(15minute)}$ Noise Level [1]	Estimated $L_{Aeq(15minute)}$ GPS Works Contribution[2]	Concept Plan Approval Noise Limit $L_{Aeq(15minute)}$	
BG2 206 Lenore Lane, Erskine Park	1745	42	52	<32	39	Traffic: 48-74 dBA; Comments; **GPS works not discernible**; Wind Moderate with some clouds.
BG3 32 Aldington Road, Kemps Creek	1700	40	57	<30	39	Traffic: 74-80 dBA; Comments **GPS works not discernible**; Wind Moderate with some clouds in sky
BG4 Emmaus College, Erskine Park	1715	37	53	<30	39	Traffic: 76-80 dBA; Comments **GPS works not discernible**; Wind Moderate with some clouds in sky
March 2012						
BG1 315-321 Burley Road, Horsley Park	1630	40	44	<30	39	Comments; **GPS works not discernible**; Wind Moderate with some clouds in sky
BG2 206 Lenore Lane, Erskine Park	1745	42	52	<32	39	Traffic: 48-74 dBA; Comments; **GPS works not discernible**; Wind Moderate with some clouds.
BG3 32 Aldington Road, Kemps Creek	1700	40	57	<30	39	Traffic: 74-80 dBA; Comments **GPS works not discernible**; Wind Moderate with some clouds in sky
BG4 Emmaus College, Erskine Park	1715	37	53	<30	39	Traffic: 76-80 dBA; Comments **GPS works not discernible**; Wind Moderate with some clouds in sky
April 2012						

Operator Attended Construction Noise Monitoring Results

Location	Time (hours)	Noise Descriptor (dBA)				Description of Noise Emission, Typical L_{Amax} and Weather Conditions
		Measured $L_{A90(15minute)}$ Noise Level [1]	Measured $L_{Aeq(15minute)}$ Noise Level [1]	Estimated $L_{Aeq(15minute)}$ GPS Works Contribution[2]	Concept Plan Approval Noise Limit $L_{Aeq(15minute)}$	
BG1 315-321 Burley Road, Horsley Park	1130	41	51	<31	39	Traffic: 45-61 dBA; Plane: 42-69 dBA; Comments; **GPS works not discernible**; Wind Moderate with some clouds in sky
BG2 206 Lenore Lane, Erskine Park	1245	45	49	<35	39	Traffic: 48-74 dBA; Comments; **GPS works not discernible**; Wind Moderate with some clouds.
BG3 32 Aldington Road, Kemps Creek	1200	40	50	<30	39	Traffic: 46-80 dBA; Comments **GPS works not discernible**; Wind Moderate with some clouds in sky.
BG4 Emmaus College, Erskine Park	1230	35	53	<30	39	Traffic: 49-80 dBA; Comments **GPS works not discernible**; Wind Moderate with some clouds in sky.
May 2012						
BG1 315-321 Burley Road, Horsley Park	1430	33	45	<30	39	Plane: 42-69 dBA; Comments; **GPS works not discernible**; Wind light with no clouds
BG2 206 Lenore Lane, Erskine Park	1545	44	64	<34	39	Traffic: 81-84 dBA; Comments; **GPS works not discernible**; Wind light with no clouds. truck
BG3 32 Aldington Road, Kemps Creek	1500	28	58	<30	39	Traffic: 46-80 dBA; Comments **GPS works not discernible**; Wind Moderate with some clouds in sky.

Operator Attended Construction Noise Monitoring Results

Location	Time (hours)	Noise Descriptor (dBA)				Description of Noise Emission, Typical L_{Amax} and Weather Conditions
		Measured $L_{A90(15minute)}$ Noise Level [1]	Measured $L_{Aeq(15minute)}$ Noise Level [1]	Estimated $L_{Aeq(15minute)}$ GPS Works Contribution[2]	Concept Plan Approval Noise Limit $L_{Aeq(15minute)}$	
BG4 Emmaus College, Erskine Park	1515	36	56	<30	39	Traffic: 49-80 dBA; Comments **GPS works not discernible**; Wind Moderate with some clouds in sky.

Note 1: The measured overall ambient (Ambient) noise levels include contributions from all noise sources which may include traffic, animals, birds, insects, domestic activity, aircraft and drill operation.

Note 2: The GPS Works emission levels are the overall ambient noise levels adjusted to remove (as far as practical) the noise contribution from extraneous noise sources.

Note3: The GPS construction activities were inaudible during the operator attended noise survey. As such, it is likely that estimated noise levels did not exceed the concept plan approval noise limit.

Equipment Sound Power Levels

Equipment Description	1/1 Octave Band LAeq Sound Power Levels (dB)										Overall (dBA)
	31.5	63	125	250	500	1k	2k	4k	8k	16k	
Truck departure/arrival	100	95	93	88	88	88	85	81	76	72	92
Genset	109	112	113	110	101	102	99	93	84	76	107
Concrete Transit mixer	103	108	108	105	106	107	105	99	94	86	111
Concrete boom pump	100	106	113	110	104	98	97	92	88	88	107
Delivery truck	96	104	106	99	100	98	92	85	77	77	102
Mobile Crane	103	109	99	99	102	100	96	92	90	90	104
Hand tools (grinder)	63	67	65	67	75	84	95	100	100	95	104
Scraper	103	108	108	105	106	107	105	99	94	86	111
Compactor	61	74	84	91	97	100	101	101	99	93	110
Dozer	61	74	84	91	97	100	101	101	99	93	110
Articulated dump trucks	96	104	106	99	100	98	92	85	77	77	102