5.4.6 Air Emissions Inventory Summary

Table 5-9 summarises the air emission sources and emission rates to be utilised for the air dispersion modelling.

Table 5-9: Summary of Air Emission Sources and Emission Rates

Emission Sources	Emission Rates (g/s)		Reference Source for the Emission Factor Used in Air Dispersion Modelling
	PM_{10}	TSP	
Vehicle Travel Emissions • Truck Travel • Staff Vehicle Travel	 6.56×10^{-2} 9.84×10^{-2}	 1.29×10^{-2} 1.93×10^{-2}	Parrett 1992
Loading, Unloading and Material Handling	1.12×10^{-1}	6.17×10^{-1}	NPI Database
Wind Erosion Emissions From Stockpiles	3.08×10^{-6}	6.04×10^{-6}	Parrett 1992
Crushing Process Screening Process	2.08×10^{-2} 1.19×10^{-2}	5.42×10^{-2} 3.47×10^{-2}	USEPA AP42
Excavation Process	1.57×10^{-3}	3.31×10^{-3}	NPI Database

5.5 Modelling Methodology

5.5.1 Air Dispersion Model Utilised

The CALPUFF PRO (Version 6.0.306) Gaussian plume dispersion model was used to predict potential off-site impacts. The meteorological data discussed in Section 5.1 is considered to be representative of the wind climate at the subject site and study region in general. A total of 8,760 individual temperature, wind speed and wind direction events were obtained for the meteorological input file. This was to ensure that sufficient meteorological data was available so as to guarantee that worst-case conditions were adequately represented in the air dispersion model predictions.

5.5.2 Modelling Scenarios and Assumptions

The scenarios considered in the air dispersion modelling are shown in Table 5-10.

Table 5-10: Modelling Scenarios Considered

Scenario No.	Description
1	No dust suppression controls used for any activities on site.
2	Dust suppression controls used for the following activities: • Excavation process • Crushing and Screening works • Loading, Unloading and Material Handling activities

The following reduction controls, which are referenced from the NPI guidelines "*Emission Estimation Technique Manual (EETM) for Mining*" (NPI DEH December 2001), were applied to the air dispersion model for Scenario 2:

Table 5-11: Dust Suppression Control Factors

Control Method	Reduction
Water sprays in Excavations	70%
Water sprays in Crushing and Screening	70%
Water sprays in Loading, Unloading and Material Handling Activities	70%

The following assumptions were used in CALPUFF:

- Constant emission rates were used in the model for all emission sources. Emissions outside operational hours were also assessed and hence and hence impact results would be conservative. Wind erosion emissions from stockpiles storage emissions would not be conservative, since stockpiles are stored on site 24 hours per day, 7 days per week.

- All vehicle travel paths were assumed to release emissions, which is a more conservative approach in assessing wheel-generated emissions. Excavation, loading, unloading, material handling and stockpile storage emissions are released from the entire allocated area for each corresponding activity and can be considered to be a more conservative method in assessing emissions compared to how emissions would be released in reality (which would be from a much smaller area).

5.6 Modelling Results

The Ground Level Concentration (GLC) results from CALPUFF are summarised in Table 5-12. A sample control file has been attached as Attachment 1. Concentration isopleths for Scenario 2 have been provided as Figure 5-5, Figure 5-6, Figure 5-7, and Figure 5-8.

Table 5-12: Summary of Ground Level Concentration Impact Results from CALPUFF

Scenario ID	Impact Type	Pollutant	Averaging Time	Ground Level Concentration Impacts at Receptors (mg/m³)												Criteria	Units
				1	2	3	4	5	6	7	8	9	10	11	12		
1	Incremental	PM10	24-hour	0.002	0.003	0.011	0.017	0.004	0.006	0.010	0.008	0.011	0.015	0.015	0.023	0.050	mg/m³
			1-year	0.000	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.001	0.001	0.001	0.002	0.030	mg/m³
		TSP	1-year	0.000	0.000	0.001	0.004	0.001	0.001	0.001	0.001	0.003	0.002	0.004	0.006	0.090	mg/m³
		Dust Dep.	1-year	0.001	0.000	0.003	0.009	0.001	0.002	0.003	0.003	0.006	0.005	0.008	0.013	2	g/m²/month
	Cumulative	PM10	24-hour	0.002	0.003	0.011	0.017	0.004	0.006	0.010	0.008	0.011	0.015	0.015	0.023	0.050	mg/m³
			1-year	0.000	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.001	0.001	0.001	0.002	0.030	mg/m³
		TSP	1-year	0.000	0.000	0.001	0.004	0.001	0.001	0.001	0.001	0.003	0.002	0.004	0.006	0.090	mg/m³
		Dust Dep.	1-year	0.001	0.000	0.003	0.009	0.001	0.002	0.003	0.003	0.006	0.005	0.008	0.013	2	g/m²/month
2	Incremental	PM10	24-hour	0.002	0.003	0.007	0.012	0.003	0.005	0.007	0.007	0.007	0.011	0.015	0.018	0.050	mg/m³
			1-year	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.001	0.001	0.001	0.002	0.030	mg/m³
		TSP	1-year	0.000	0.000	0.001	0.003	0.000	0.000	0.001	0.001	0.002	0.001	0.002	0.004	0.090	mg/m³
		Dust Dep.	1-year	0.000	0.000	0.002	0.006	0.001	0.001	0.001	0.002	0.003	0.003	0.005	0.009	2	g/m²/month
	Cumulative	PM10	24-hour	0.002	0.003	0.007	0.012	0.003	0.005	0.007	0.007	0.007	0.011	0.015	0.018	0.050	mg/m³
			1-year	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.001	0.001	0.001	0.002	0.030	mg/m³
		TSP	1-year	0.000	0.000	0.001	0.003	0.000	0.000	0.001	0.001	0.002	0.001	0.002	0.004	0.090	mg/m³
		Dust Dep.	1-year	0.000	0.000	0.002	0.006	0.001	0.001	0.001	0.002	0.003	0.003	0.005	0.009	2	g/m²/month

Note: Cells marked in black highlights are exceedances to the corresponding criteria.

Figure 5-5: Isopleth for PM_{10} Impacts Under 24-Hour Averaging Time (Scenario 2)

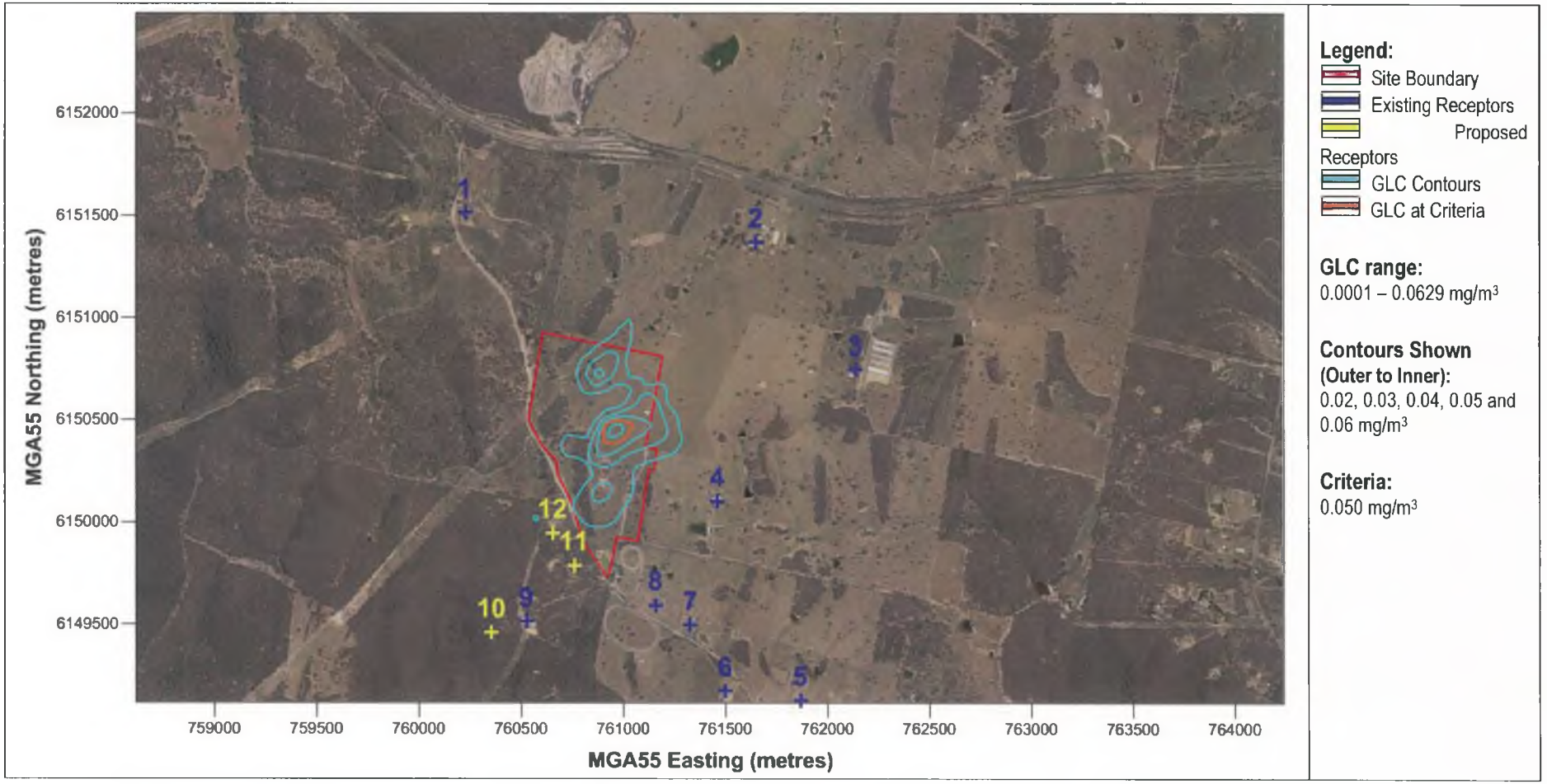


Figure 5-6: Isopleth for PM_{10} Impacts Under 1-Year Averaging Time (Scenario 2)

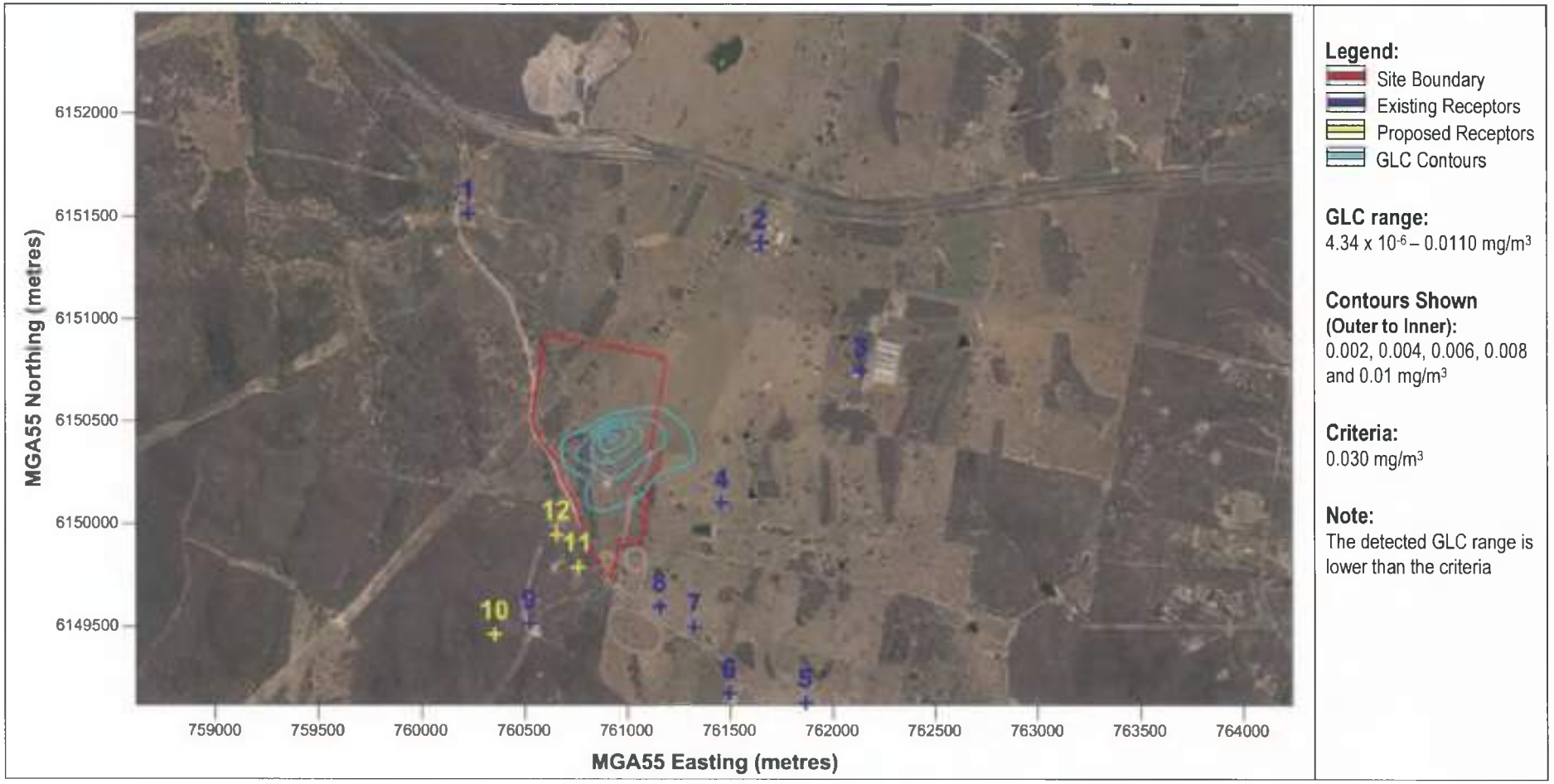


Figure 5-7: Isopleth for TSP Impacts Under 1-Year Averaging Time (Scenario 2)

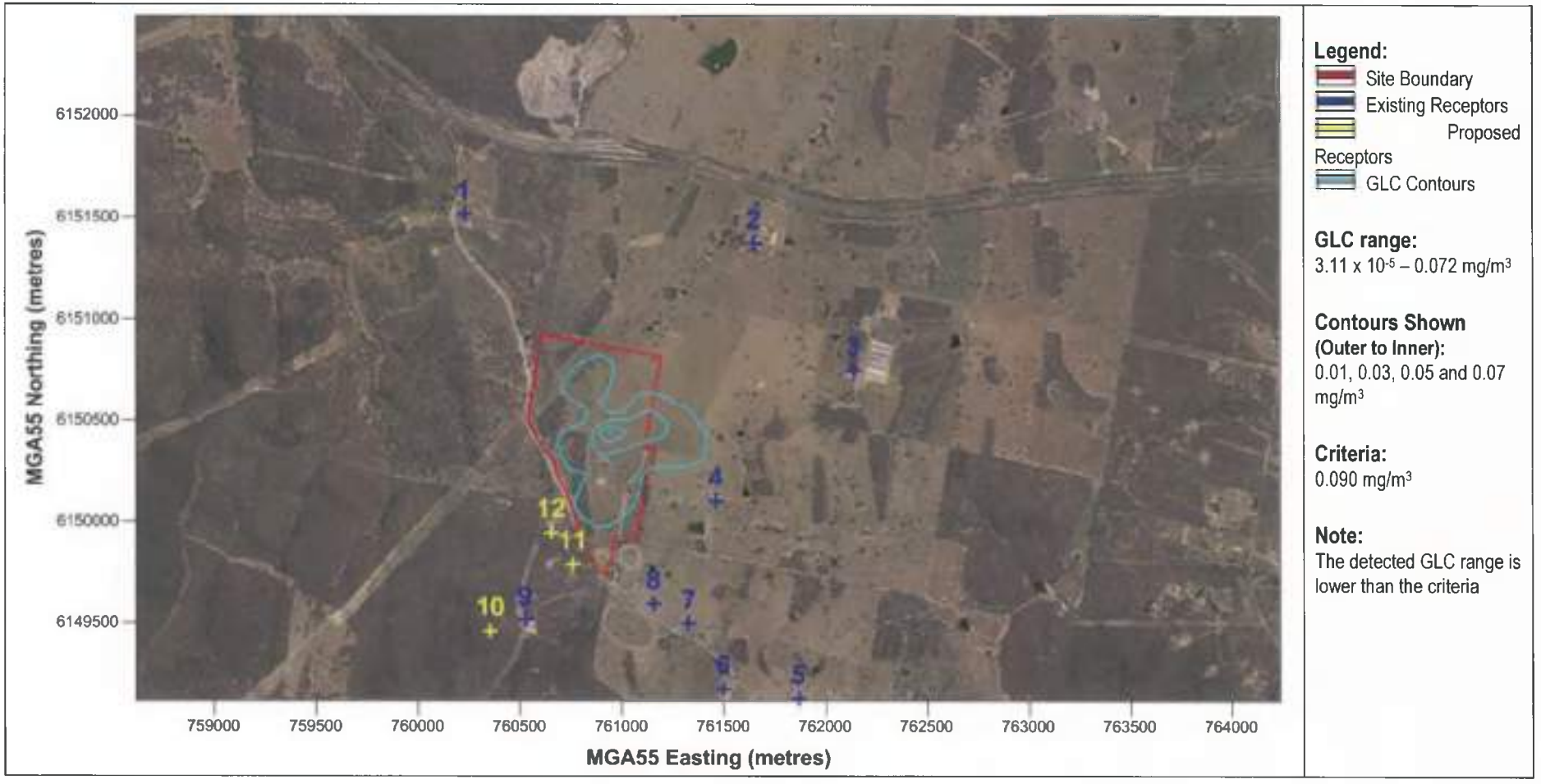
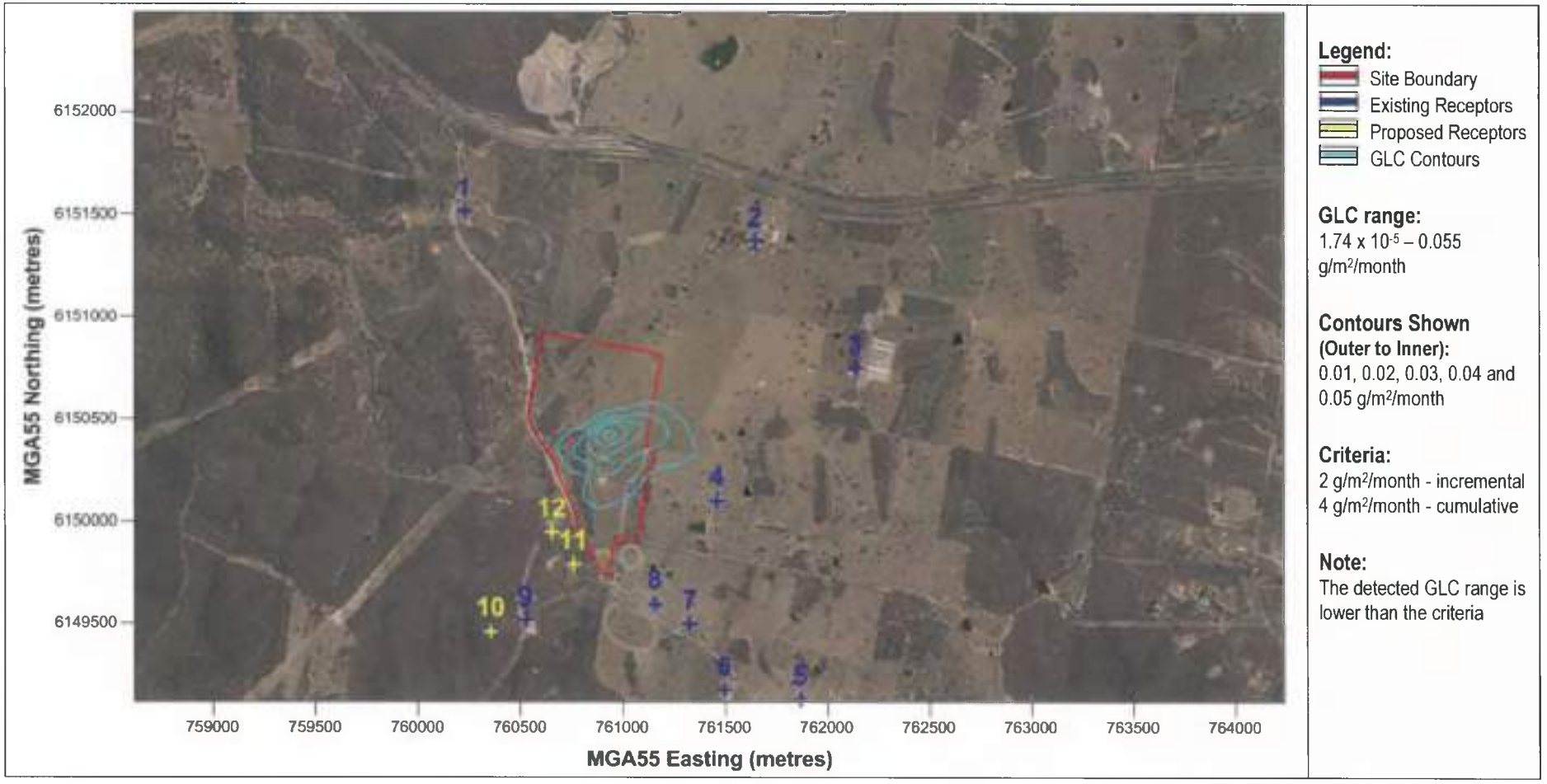


Figure 5-8: Isopleth for Dust Deposition Impacts Under 1-Year Averaging Time (Scenario 2)



5.7 DISCUSSIONS

No exceedances were found for both scenarios except for the PM_{10} 24-hour averaging time impacts under Scenario 1. However, it has been found that the implementation of controls for the excavation, crushing, screening, loading, unloading and material handling eliminates the exceedances measured from Scenario 1.

The outcomes suggest that controls are compulsory in order to satisfy the assessment criteria. Other than this, it is expected that the proposed development would comply with the requirements listed in the DECC NSW approved guidelines.

6. CONCLUSION

The document "Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales" has been closely followed in preparing and conducting this quantitative air assessment. The assessment also involved the review and analysis of the site-specific operational parameters and activities relevant in assessing the environmental dust impacts that the subject site can potentially establish, especially upon the nearest receptors – may it be existing or proposed.

Air dispersion modelling outcomes suggest that controls are required in order to minimise the dust particulate impacts. It is suggested that controls, which are water sprays for dust suppression, be applied during excavation, crushing, screening, loading, unloading and material handling activities on site.

Provided that these controls are established, it is the opinion of Benbow Environmental that the proposed development satisfies the requirements of air quality compliance.

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7. REFERENCES

1. DEC NSW 2005
Department of Environment and Conservation, New South Wales, "Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales", August 2005

2. NPI DEH 2001
National Pollutant Inventory (NPI) Guidelines, "Emission Estimation Technique Manual (EETM) for Mining", Version 2.3, 5 December 2001

3. Parrett 1992
Parrett F.W. 1992, "Dust Emissions"- a review, Applied Environmetrics, 1992

4. USEPA 2004
U.S. Environment Protection Agency, "Chapter 11.19 – Introduction to Construction and Aggregate Processing, Section 2 – Crushed Stone Processing and Pulverized Mineral Processing", August 2004

8. BIBLIOGRAPHY

1. "Good Practice Guide for Atmospheric Dispersion Modelling", Prepared by the National Institute of Water and Atmospheric Research, Aurora Pacific Limited and Earth Tech Incorporated for the Ministry for the Environment (New Zealand), June 2004

9. LIMITATIONS

Our services for this project are carried out in accordance with our current professional standards for site assessment investigations. No guarantees are either expressed or implied.

This report has been prepared solely for the use by Marian Vale Pastoral Co Pty Ltd and Figtree Reserve Pty Ltd, as per our agreement for providing environmental assessment services. Although all due care has been taken in the preparation of this study, no warranty is given, nor liability accepted (except that required by law) in relation to the information contained within this document.

Marian Vale Pastoral Co Pty Ltd and Figtree Reserve Pty Ltd are entitled to rely upon the findings in the report within the scope of work described in this report. No responsibility is accepted for the use of any part of the report in any other context or for any other purpose.

Opinions and judgements expressed herein, which are based on our understanding and interpretation of current regulatory standards, should not be construed as legal opinions.

O. Noise Assessment by Benbow Environmental incorporating:

a. Revised Noise Assessment May 2016.

b. Noise Monitoring Report May 20160.

NOISE MONITORING PLAN
FOR ARGYLE (NSW) PTY LTD
TIYCES LANE, BOXERS CREEK

Prepared for: Argyle (NSW) Pty Ltd
Peter Miller – Director and Secretary

Prepared by: Emma Hansma, Acoustical Engineer
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Report No: 161048-03_NMP_REV2
May 2016
(Released: 9 May 2016)

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DOCUMENT REVISION RECORD

Revision	Date	Description	Checked	Approved
1	09-05-2016	Draft / Rev1	Daniele Albanese	R T Benbow
2	09-05-2016	Draft / Rev2	Daniele Albanese	R T Benbow

DOCUMENT DISTRIBUTION

Revision	Issue Date	Issued To	Issued By
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2	09-05-2016	Argyle (NSW) Pty Ltd	Benbow Environmental

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Contents

Tables

Figures

1. INTRODUCTION

Benbow Environmental (BE) was commissioned by Laterals Planning to prepare a Noise Monitoring Plan for the construction and operational phase of a proposed quarry in Tiyces Lane, Towrang.

The proposed development includes construction an office building and machinery storage shed, and operation of an extractive area, access road off Hume Hwy and on-going rehabilitative and site screening involving tree planting. The site is used to perform open pit excavation of material which is to be transported off-site on demand. The extracted material is crushed and screened to provide a range of products for use in construction.

This noise monitoring plan outlines the methodologies for the undertaking of noise compliance monitoring in order to review the noise performance of construction and operational activities at the site.

This noise monitoring plan will be revised to reflect any requirement of the Development Conditions of Consent.

1.1 SCOPE OF WORKS

The following scope of work has been adopted:

- Identify the noise monitoring location;
- Outline the noise monitoring methodology;
- Determine criteria at sample locations; and
- Provide guidance on noise monitoring timing and procedures.

2. NOISE MONITORING LOCATIONS

The EPA Proposed Draft Condition L3.2 states the follows:

"Noise from the premises is to be measured at the nearest sensitive receiver to determine compliance with this condition"

Given the nature of the site's operations, Benbow Environmental considers more appropriate to undertake noise monitoring at four locations.

Based on Benbow Environmental's experience at the subject site it is concluded that access to residential properties is not always possible during daytime.

The ambient noise is dominated by road traffic at several locations and this would result in difficulties in determine the noise contribution from the construction and operations of the quarry.

Based on the reasons above, a number of monitoring locations have been strategically selected at the site's boundary and conservative noise limits at these locations were determined.

Results of monitoring at these key locations can be utilised also to determine the noise levels back at the nearest residences. This methodology is also presented in the NSW EPA Industrial Noise Policy and it is often utilised for assessment of noise from quarries and mining sites.

The monitoring locations are presented in the figure below:

Figure 2-1: Noise Monitoring Locations Site Map

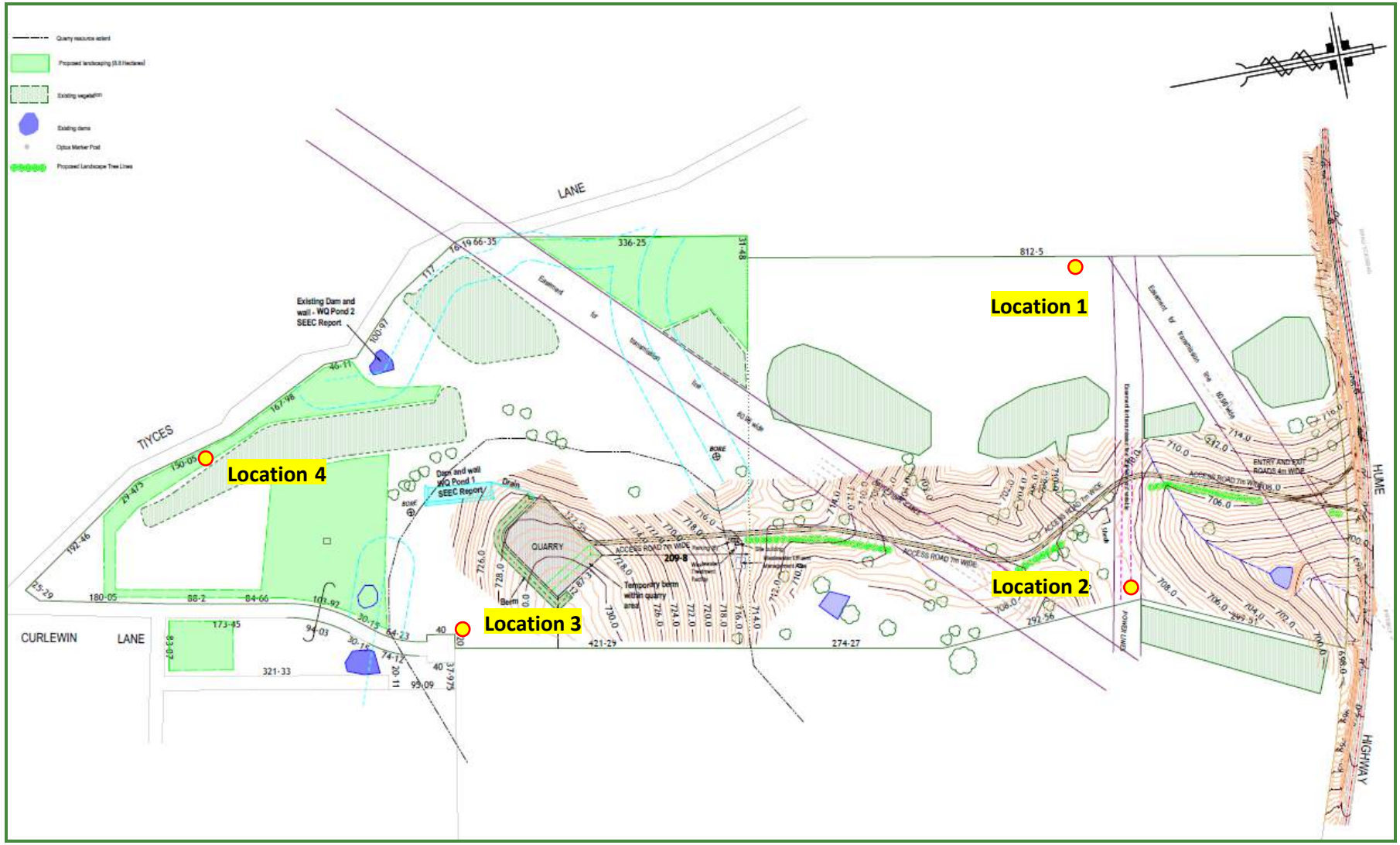
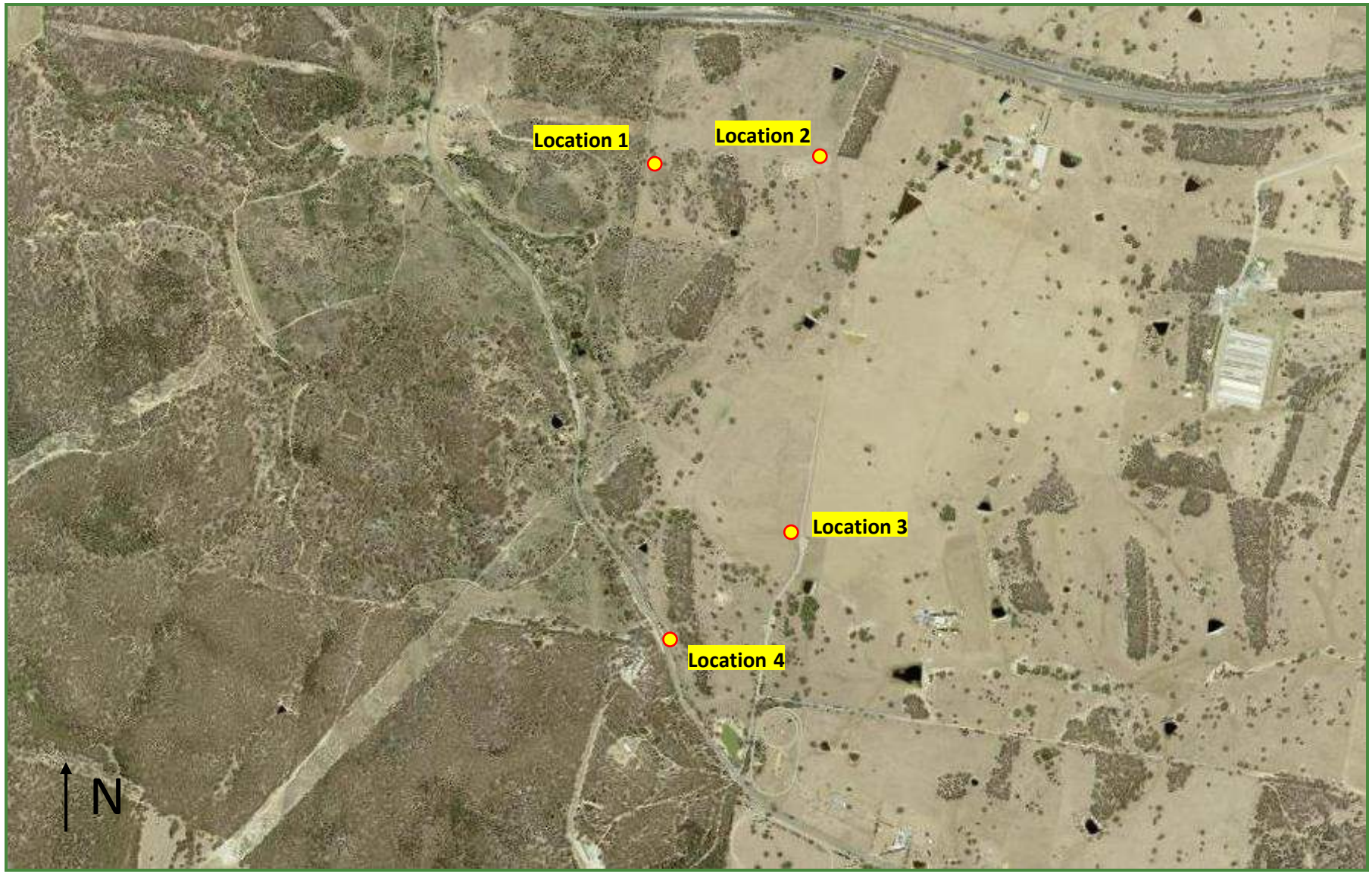


Figure 2-2: Noise Monitoring Locations Aerial



3. NOISE MONITORING CRITERIA

Based on the Noise Impact Assessment conducted by Benbow Environmental for the subject site the following noise limits are required to ensure there are no exceedances at residential locations.

The limits have been calculated based on the expected worst case noise impact that is when the construction works are at their closest to the monitoring locations.

Table 3-1: Noise Limits

Location	Construction Noise Limit ($L_{AEeq15min}$)	Operational Noise Limit ($L_{Aeq15min}$)
Location 1	53	47
Location 2	56	45
Location 3	52	47
Location 4	44	39

The achievement of compliance with the above limits at the key boundary locations would ensure compliance with the noise criteria derived for each residence and presented in the Noise Impact Assessment 161048_NIA_rev1. The project specific noise levels were derived in accordance with the NSW EPA Industrial Noise Policy and based on the recent long-term background noise monitoring carried out in May 2016.

Note the $L_{Aeq\ 15\ min}$ applies to site operations, not total background noise. In the case where measured $L_{Aqe\ 15\ min}$ exceeds the values in the above table the $L_{Aeq\ 15\ min}$ may be an exceedance due to background noise rather than site-specific noise.

4. NOISE MONITORING TIMING AND MAIN NOISE SOURCES

As the nature of the noise generated at the site would vary significantly for different operations it is important to coordinate with the site manager to measure noise during those operations which generate the most noise.

4.1 FREQUENCY OF NOISE MONITORING

During construction operations fortnightly noise monitoring is recommended.

During operations of the quarry noise monitoring is recommended every 3 months during the initial phase of the quarry lifetime. This would end once a pit depth of 3 metre is reached.
From this point onwards annual performance review is recommended.

4.2 CONSTRUCTION NOISE MONITORING

A summary of equipment likely to be used during the construction phase is presented below:

Table 4-1: Construction Noise Sources dB(A) Sound Power Levels

Noise Source	Overall
Rock Hammer	**117**
Grader	**110**
Water Cart	**110**
Chain Saw	**107**
Excavator	**107**
Tip Truck	**107**
Reversing Alarm	**105**
Vibratory Roller	**103**

The equipment in the table above is listed from most noise generating to least. The acoustic consultant responsible for noise compliance monitoring must coordinate with the site manager such that the measurements are taken when the noisiest equipment is operating. Due to the mobile nature of operations noise monitoring is to be taken at the location (chosen from noise monitoring locations) closest to the noisiest equipment. If the operations are fairly consistent for some time, it is recommended that measurements are taken at as many different locations as possible, starting from the most affected location to the least affected.

4.3 OPERATIONAL NOISE MONITORING

A summary of equipment likely to be used during the operation phase is presented in Table 4-2.

Table 4-2: Operational Noise Sources dB(A) Sound Power Levels

Noise Source	Overall
Crusher and Screen	**111**
Excavator	**109**
Backhoe	**105**
Articulated Dump Truck	**104**
Front End Loader Cat 966C	**104**
Komatsu Bulldozer (DA55A)	**104**

The equipment in the table above is listed from most noise generating to least. The acoustic consultant responsible for noise compliance monitoring must co-ordinate with the site manager such that the measurements are taken when the noisiest equipment is operating. The location most affected by operational noise is location 4, so this measurement location should be given priority. If the operations are fairly consistent for some time, it is recommended that measurements are taken at as many different locations as possible, starting from the most affected location to the least affected.

4.4 NOISE COMPLAINTS RESPONSE

Where a noise complaint from a resident is received, noise monitoring shall be undertaken at the complainant residence.

A suitably qualified acoustic consultant shall carry out the monitoring and must identify the following:

- Date/time of noise complaint;
- Nature and description of the noise complaint;
- Determine noise contribution from construction and/or operational activities;
- Compare results with relevant noise criteria and determine status of compliance;
- Identify the cause of the exceedance (if any is found); and
- Recommend noise management strategies in order to mitigate the noise impacts.

5. NOISE MONITORING INSTRUMENTATION AND PROCEDURE

All noise monitoring must be conducted by a suitably qualified acoustic consultant.

Monitoring shall be carried out in accordance with the NSW EPA Industrial Noise Policy – Chapter 11 – Reviewing Performance and the Australian Standard AS 1055-1997 - "Acoustics – Description and Measurement of Environmental Noise".

5.1 ATTENDED NOISE MONITORING

All attended measurements must be undertaken with a Class 1 Sound Level Meter. The instrument must have been calibrated by a NATA accredited laboratory within two years of the measurement period. The instrument settings must comply with AS IEC 61672.1-2004 and shall be configured for A-weighted, fast response measured over 15-minute statistical intervals. The microphones shall be fitted with windsocks and positioned between 1.2 metres and 1.5 meters above ground level.

To ensure accuracy and reliability in the results, field reference checks must be both before and after the measurement period with an acoustic calibrator. There must be no excessive variances observed in the reference signal between the pre-measurement and post-measurement calibration for a measurement to be considered valid. This difference shall not exceed 0.5 dB.

The attended noise measurements must be carried out in accordance with Australian Standard AS 1055–1997 "Acoustics – Description and Measurement of Environmental Noise".

The noise emission limit applies for prevailing meteorological conditions (winds up to 3m/s), except under conditions of temperature inversions.

5.2 INVESTIGATION PROCEDURES

All investigative procedures must be conducted in accordance with AS 1055.1-1997 *Acoustics – "Description and Measurement of Environmental Noise (Part 1: General Procedures)"*.

The following information must be recorded and kept for reference purposes:

- Type of instrumentation used and measurement procedure conducted;
- Description of the time aspect of the measurements, ie. measurement time intervals; and
- Positions of measurements.

As per AS 1055.1-1997, all measurements must be carried out at least 3.5 m from any reflecting structure other than the ground. A measurement height of 1.2 m above the ground is recommended. A sketch of the area should be provided by the consultant identifying positions of measurement and the approximate direction and distance of noise sources.

Modifying factor corrections would need to be applied for tonal or impulsive noise in accordance with the NSW EPA Industrial Noise Policy requirements.

5.3 REPORTING

The following items shall be included in the report showing the noise monitoring results:

- Type of monitoring methodology and scope of work;
- Details of instruments and calibration certificated;
- Applicable noise criteria;
- Monitoring locations;
- Weather conditions during monitoring;
- Time, date and duration of monitoring;
- Results of noise monitoring and site noise contribution;
- Statement of compliance with noise limits; and
- Where exceedances are found, reasons for the exceedances and strategies to manage the noise.

5.4 MANAGEMENT OF NOISE EXCEEDANCES

Where exceedances of the noise levels are found, further investigation will be necessary. This would include measurement or calculation of noise levels at the affected residences and comparison with relevant noise criteria being made.

Where exceedance at the residential location is found, a noise mitigation strategy shall be implemented in order to minimize and mitigate the noise impacts.

6. CONCLUDING REMARKS

Benbow Environmental prepared a Noise Monitoring Plan for the construction and operational phase of the Argyle Quarry located at in Tiyces Lane, Towrang.

This noise monitoring plan outlines the methodologies for the undertaking of noise compliance monitoring in order to review the noise performance of construction and operational activities at the site.

The objectives of the Noise Monitoring Plan are as follows:

- Identify the noise monitoring location;
- Outline the noise monitoring methodology;
- Determine criteria at sample locations; and
- Provide guidance on noise monitoring timing and procedures.

This concludes the report.

Emma Hansma	Daniele Albanese	R T Benbow
Acoustic Engineer	Senior Acoustical Consultant	Principal Consultant

7. LIMITATIONS

Our services for this project are carried out in accordance with our current professional standards for site assessment investigations. No guarantees are either expressed or implied.

This report has been prepared solely for the use of Argyle (NSW) Pty Ltd, as per our agreement for providing environmental services. Only Argyle (NSW) Pty Ltd is entitled to rely upon the findings in the report within the scope of work described in this report. Otherwise, no responsibility is accepted for the use of any part of the report by another in any other context or for any other purpose.

Although all due care has been taken in the preparation of this study, no warranty is given, nor liability accepted (except that otherwise required by law) in relation to any of the information contained within this document. We accept no responsibility for the accuracy of any data or information provided to us by Argyle (NSW) Pty Ltd for the purposes of preparing this report.

Any opinions and judgements expressed herein, which are based on our understanding and interpretation of current regulatory standards, should not be construed as legal advice.

NOISE IMPACT ASSESSMENT
FOR ARGYLE (NSW) PTY LTD
TIYCES LANE, BOXERS CREEK

Prepared for: Argyle (NSW) PTY LTD
Peter Miller – Director and Secretary

Prepared by: Emma Hansma, Acoustic Engineer
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Report No: 161048_NIA_rev2
May 2016
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DOCUMENT REVISION RECORD

Revision	Date	Description	Checked	Approved
1	09-05-2016	Draft / Rev1	D Albanese	R T Benbow
2	10-05-2016	Rev2	D Albanese	R T Benbow

DOCUMENT DISTRIBUTION

Revision	Issue Date	Issued To	Issued By
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2	10-05-2016	Argyle (NSW) Pty Ltd	Benbow Environmental

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Contents Page

Tables Page

Figures

Page

Attachments

1. INTRODUCTION

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The proposed development includes construction of an office building, machinery storage shed, extractive area and access road off Hume Hwy, and on-going rehabilitative and site screening involving tree planting. The site will be used to perform open pit excavation of material is transported off-site on demand. The extracted material will be crushed and screened to provide a range of products for use in construction.

A noise impact assessment was prepared in 2009 by Benbow Environmental, but this earlier assessment did not account for the construction or operation of the access road. The current report aims to update the previous assessment to include the construction of an access road in the noise impact analysis. Long-term background noise monitoring was undertaken at the proposed site for the purpose of this update, as the data collected in 2009 was considered obsolete.

In the compilation of this update, Benbow consultants modelled only the noise impact of the construction and operation of the access road, and the results of these calculations were added to the results of the 2009 modelling of the other aspects of the development.

1.1 SCOPE OF WORKS

This noise impact assessment has been limited to the following scope of works:

a) Site inspection and review of the proposed site operations;
b) Long term and short term ambient and background noise monitoring in accordance with relevant NSW guidelines;
c) Establish project specific noise levels;
d) Determine all potential noise sources associated with the proposed development;
e) Collect representative noise source data;
f) Predict potential noise impacts at the nearest potentially affected receptors;
g) Assess potential noise impacts against relevant legislation and guidelines;
h) Recommend general ameliorative measures/control solutions (where required); and
i) Compile this report with concise statements of potential noise impact.

To aid in the review of this report, supporting documentation has been included within the Attachments.

2. SITE DESCRIPTION

2.1 SITE LOCALITY

The site is located in the Southern Highlands about 1 km south of the Hume Highway on Tiyces Lane, Towrang, NSW, 2580. The resource covers an area of approximately 12.64 ha on a 44 ha site. The population of Towrang has just exceeded the mark of 400, where 90% of the population lived in the Northern direction from the site, divided by Hume Highway. The site is surrounded by rural land and occupying residences.

Figure 2-1 shows a topographical site plan and Figure 2-2 shows an aerial view of the site as prepared by Laterals Planning in 2009.

Figure 2-1: Topographical Site Plan

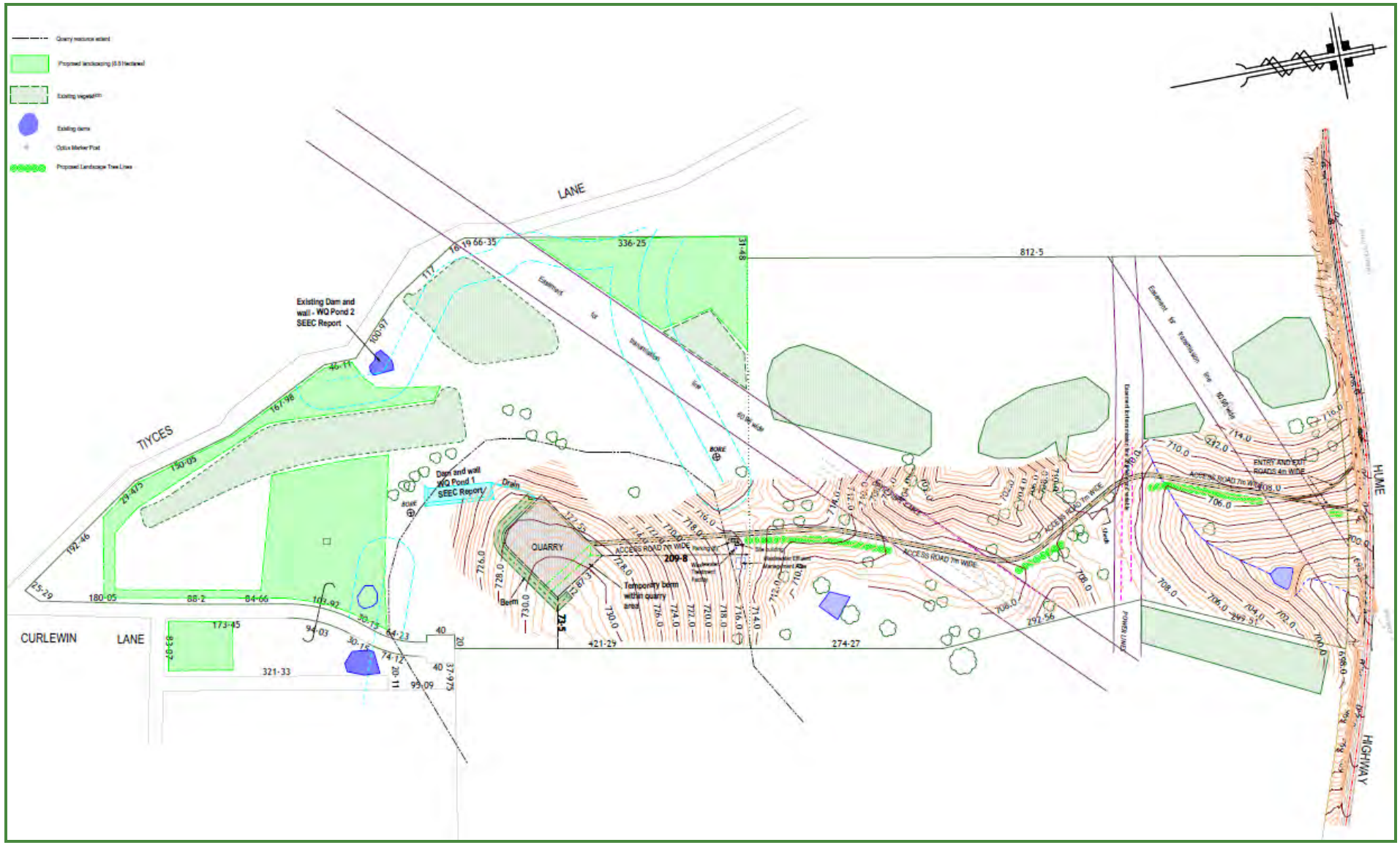
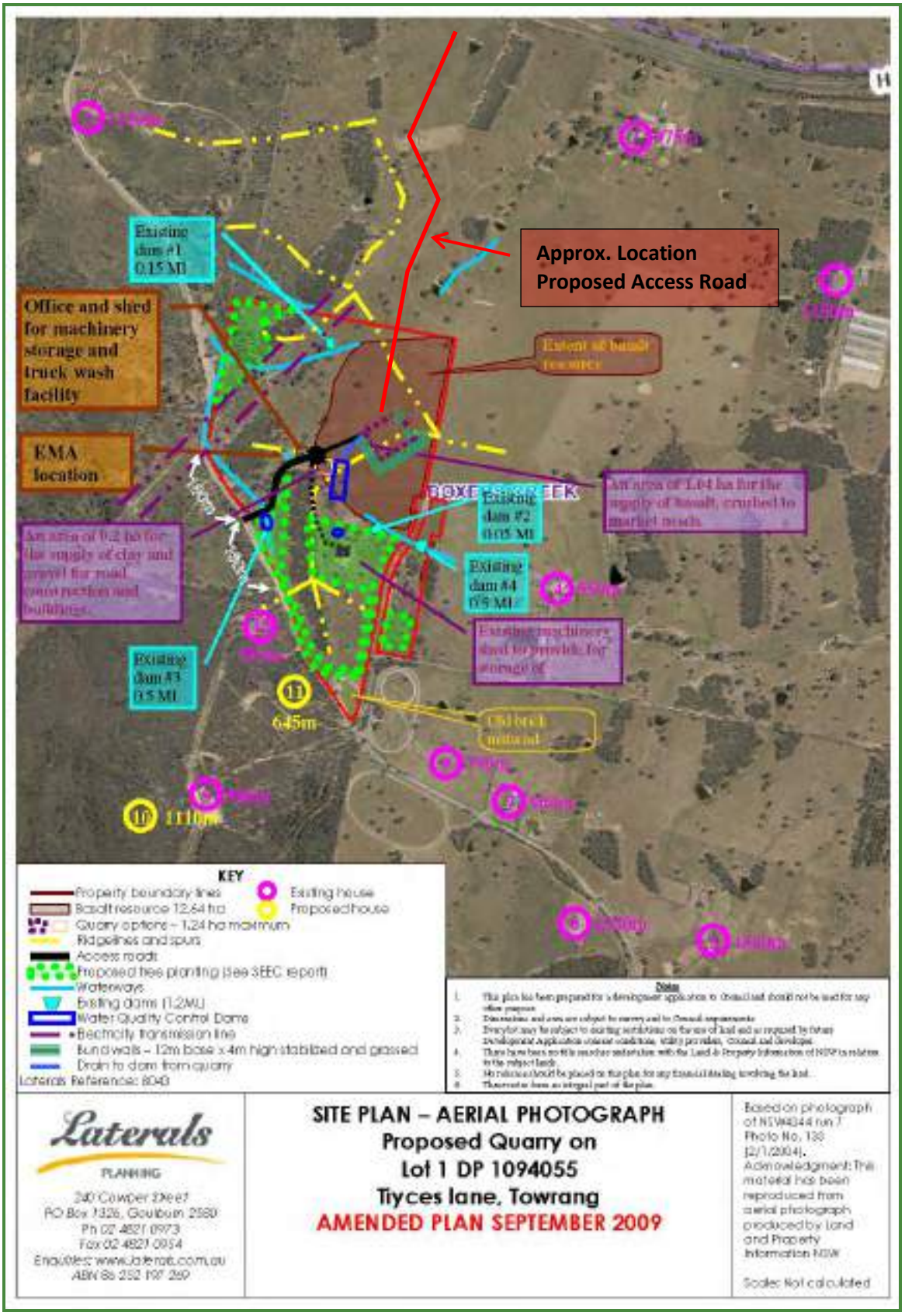


Figure 2-2: Aerial Site Plan



2.2 DESCRIPTION OF SITE AND SURROUNDS

The site is currently zoned Rural Landscape RU2 under Goulburn Mulwaree Local Environmental Plan 2009. The site is surrounded by rural land with housing on several lots.

In the western direction of the proposed site, lies the forest region of Mount Towrang and Mount Towrang itself, while to the immediate east, the lands are semi-forest for approximately 2 km, followed by the forest region.

To the west is Towrang Creek, providing bore water supply together with Narambula Creek that runs along the proposed site. Towrang and Narambula Creeks are located perpendicular with the western and eastern site boundaries respectively.

To the north lies Osborne Creek, running at a perpendicular axis to the northern site border. From the south, Jerrara Creek runs along the perpendicular axis of the southern site border.

Electrical easement is located to the north-west of the proposed site. This would be the main electrical power supply for the proposed site.

2.3 NOISE SENSITIVE RECEIVERS

The nearest noise sensitive receivers are tabulated in Table 2-1 and shown in Figure 2-2 (see items labelled 'Existing and Proposed house' in the key).

Table 2-1: Potentially Sensitive Receptors

Receptors	Address	Direction	Distance from Site Boundary (m)
1	51 Tiyces Lane, Boxers Creek 2580 Lot 21 DP 621540	NW	1140
2	16987 Hume Highway, Boxers Creek 2580 Lot 3 DP 10904055	NE	1000
3	Boxers Creek 2580 Lot 2 DP 247200	ENE	1240
4	249 Tiyces Lane, Boxers Creek 2580 Lot 72 DP 750038	SE	610
5	Tiyces Lane, Boxers Creek 2580 Lot 16 DP 1018643	SE	1600
6	328 Tiyces Lane, Boxers Creek 2580 Lot 16 DP 1018643	SE	1400
7	289 Tiyces Ln, Boxers Creek 2580 Lot 2 DP 1008397	SE	1040
8	287 Tiyces Lane, Boxers Creek 2580 Lot 1 DP 1008397	SE	900
9	244 Tiyces Lane, Towrang 2580 Lot 3 DP 1087071	SW	1070
10	244 Tiyces Lane, Towrang 2580 Lot 4 DP 1087071	SW	1220

Table 2-1: Potentially Sensitive Receptors

Receptors	Address	Direction	Distance from Site Boundary (m)
11	Tiyces Lane, Towrang 2580 Lot 2 DP 1087071	SW	730
12	Tiyces Lane, Towrang 2580 Lot 1 DP 1087071	SW	640
Not Defined (13)	Tiyces Lane, Towrang 2580 Lot 4 DP 1094055	E	220

The application for a proposed dwelling on Lot 4 DP 1094055 (R13) has not identified a particular location for the dwelling. Thus the highest point (which is quite close to the quarry) has been chosen for worst case purposes during the modelling process in order to ensure compliance. The best way to view the noise impact for this land owner is to look at the whole of Lot 4 DP 1094055.

Once the construction phase is complete (and thus the noise controls are in place) Figure 4-7 and Figure 4-8 show the noise isopleths that are indicative of the noise impact for the local area as well as for Lot 4 DP 1094055 in particular. It must be noted that the limit line shown in these figures are only for R5–R12. The limit for this proposed dwelling on Lot 4 DP 1094055 is 43 dB(A), the reasoning for which is shown in Section 4.5.

2.4 OPERATIONS REVIEW

The operating hours are from 7am to 5pm Monday-Friday and 7am to 1pm Saturday. The quarry will not operate on Sundays or Public Holidays.

The equipment list for the site is presented below and site layout presented in the following figures.

- **Machinery List For Extractive Activity**
  - Mobile Crusher (1);
  - Material sizing screen (1);
  - Bulldozer (1);
  - Front end loader (1);
  - Backhoe (1);
  - Trucks; and
  - Water truck (1).

- **Site Infrastructure**
  - Office (including staff amenities) (1);
  - Machinery shed (1);
  - Equipment shed;
  - On site waste water management facility;
  - Access roads to office site (@ 6m width) and central quarry (@ 4m width);
  - Security compound fencing around infrastructure (including lockable access gate to Tiyces Lane);
  - Electricity extension to security compound;
  - Telephone extension to security compound;
  - Water supply – existing dams on site; and
  - Bore (proposed).

Figure 2-3: Site Plan

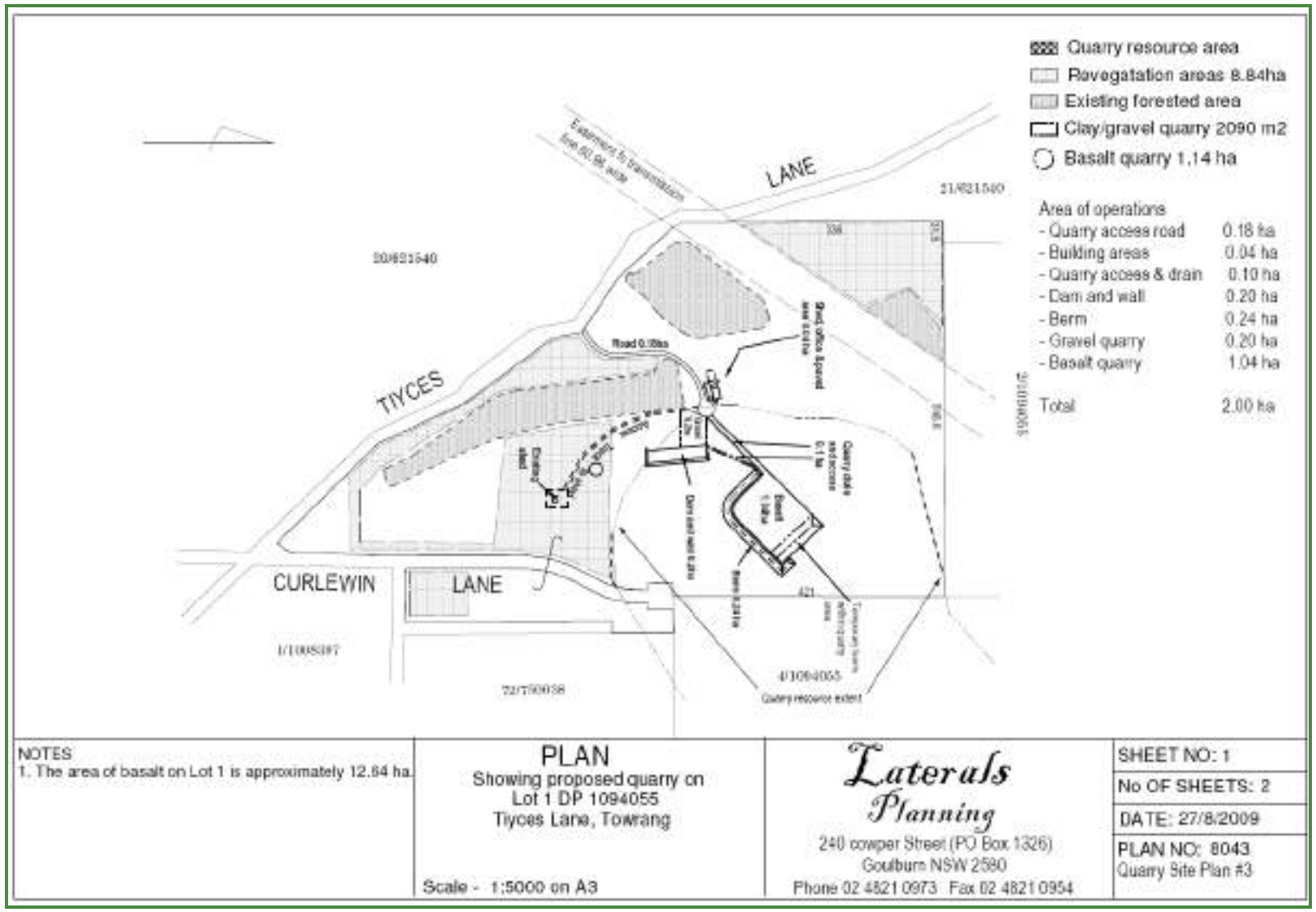


Figure 2-4: Detailed Site Plan

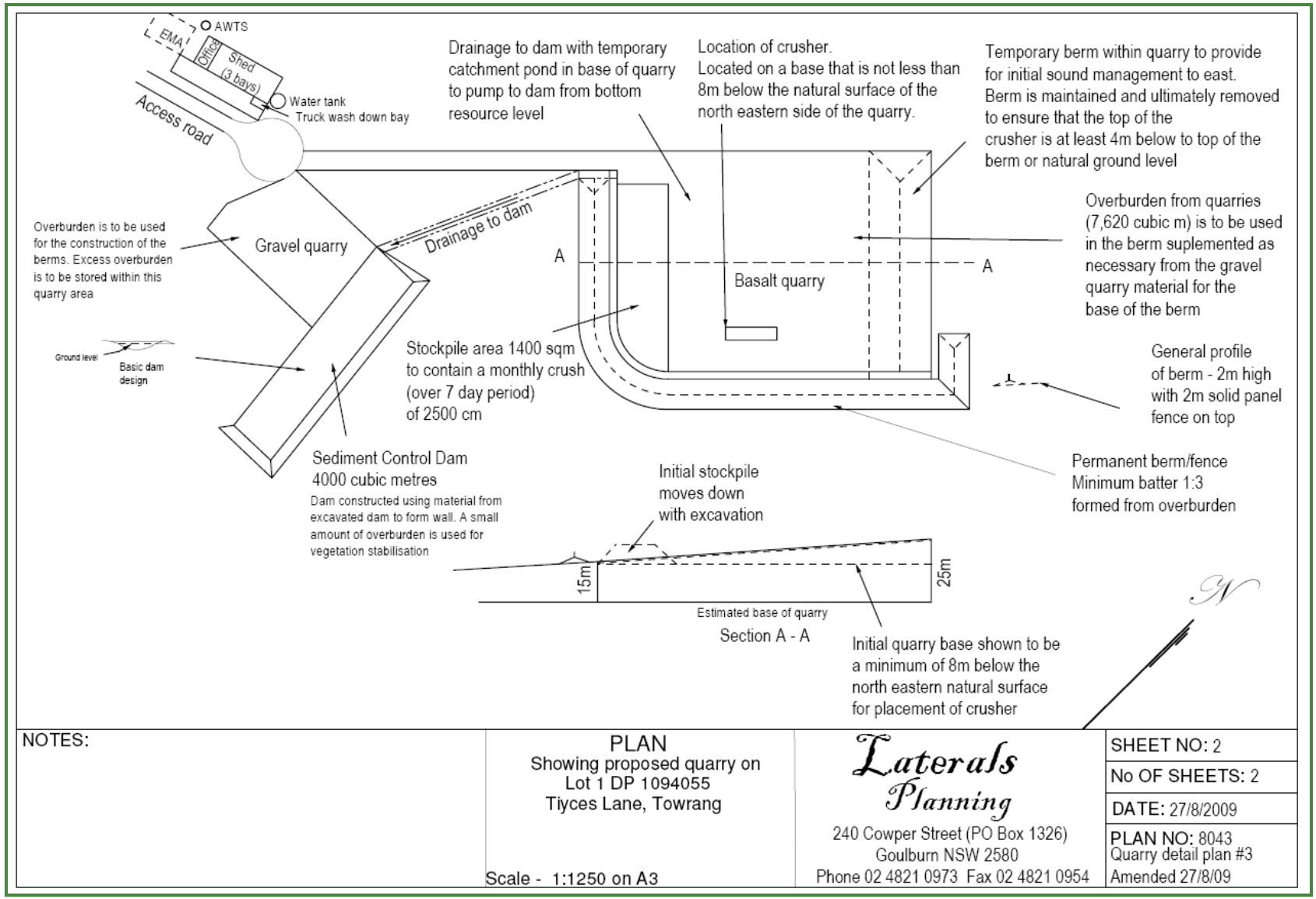
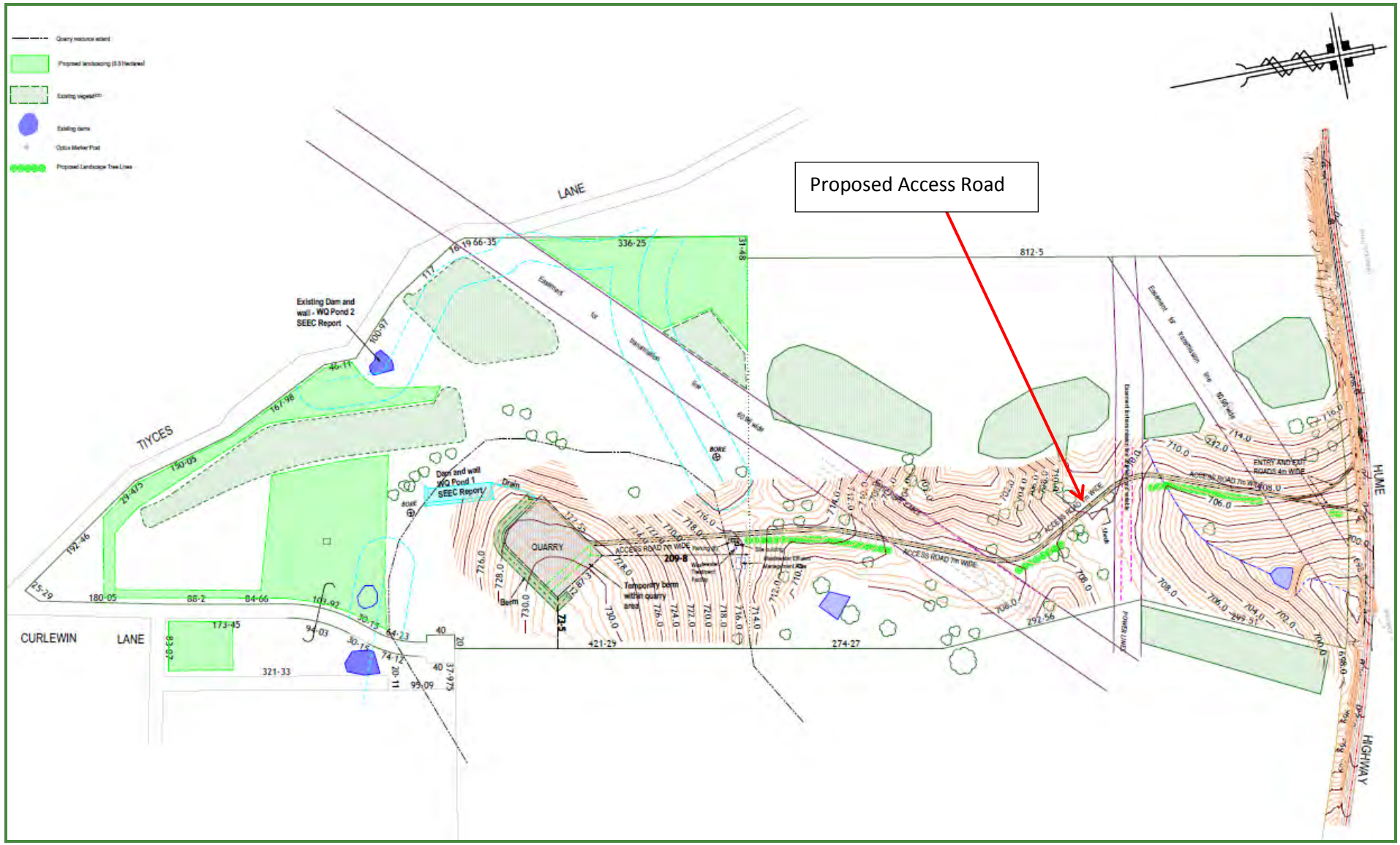


Figure 2-5: Showing the New Road



3. EXISTING ACOUSTIC ENVIRONMENT

The level of background noise varies over the course of any 24 hour period, typically from a minimum at 3.00am to a maximum during morning and afternoon traffic peak hours. Therefore the NSW EPA *Industrial Noise Policy* (INP) requires that the level of background and ambient noise be assessed separately for the daytime, evening and night time periods. The INP defines these periods as follows:

- **Day** is defined as 7.00am to 6.00pm, Monday to Saturday and 8.00am to 6.00pm Sundays and Public Holidays;
- **Evening** is defined as 6.00pm to 10.00pm, Monday to Sunday and Public Holidays; and
- **Night** is defined as 10.00pm to 7.00am, Monday to Saturday and 10.00pm to 8.00am Sundays and Public Holidays.

3.1 NOISE MONITORING EQUIPMENT AND METHODOLOGY

Background noise level measurements were carried out using a Svantek SVAN 957 Precision Sound Level Meter (attended noise monitoring) and three (3) Acoustic Research Laboratories statistical Environmental Noise Loggers, type EL-215 (unattended noise monitoring). The instrument sets were calibrated by a NATA accredited laboratory within two years of the measurement period. Calibration certificates have been included in Attachment 1.

To ensure accuracy and reliability in the results, field reference checks were applied both before and after the measurement period with an acoustic calibrator. There were no excessive variances observed in the reference signal between the pre-measurement and post-measurement calibration. The instruments were set on A-weighted Fast response and noise levels were measured over 15-minute statistical intervals. QA/QC procedures applied for the measurement and analysis of noise levels have been presented in Attachment 2. The microphones were fitted with windsocks and were positioned between 1.2 metres and 1.5 meters above ground level.

In assessing the background noise levels, any data affected by adverse weather conditions has been discarded according to the requirements of the NSW EPA Industrial Noise Policy (INP). The weather data was sourced from the Bureau of Meteorology from the Automatic Weather Station (AWS) located at Goulburn Airport (ID 070330).

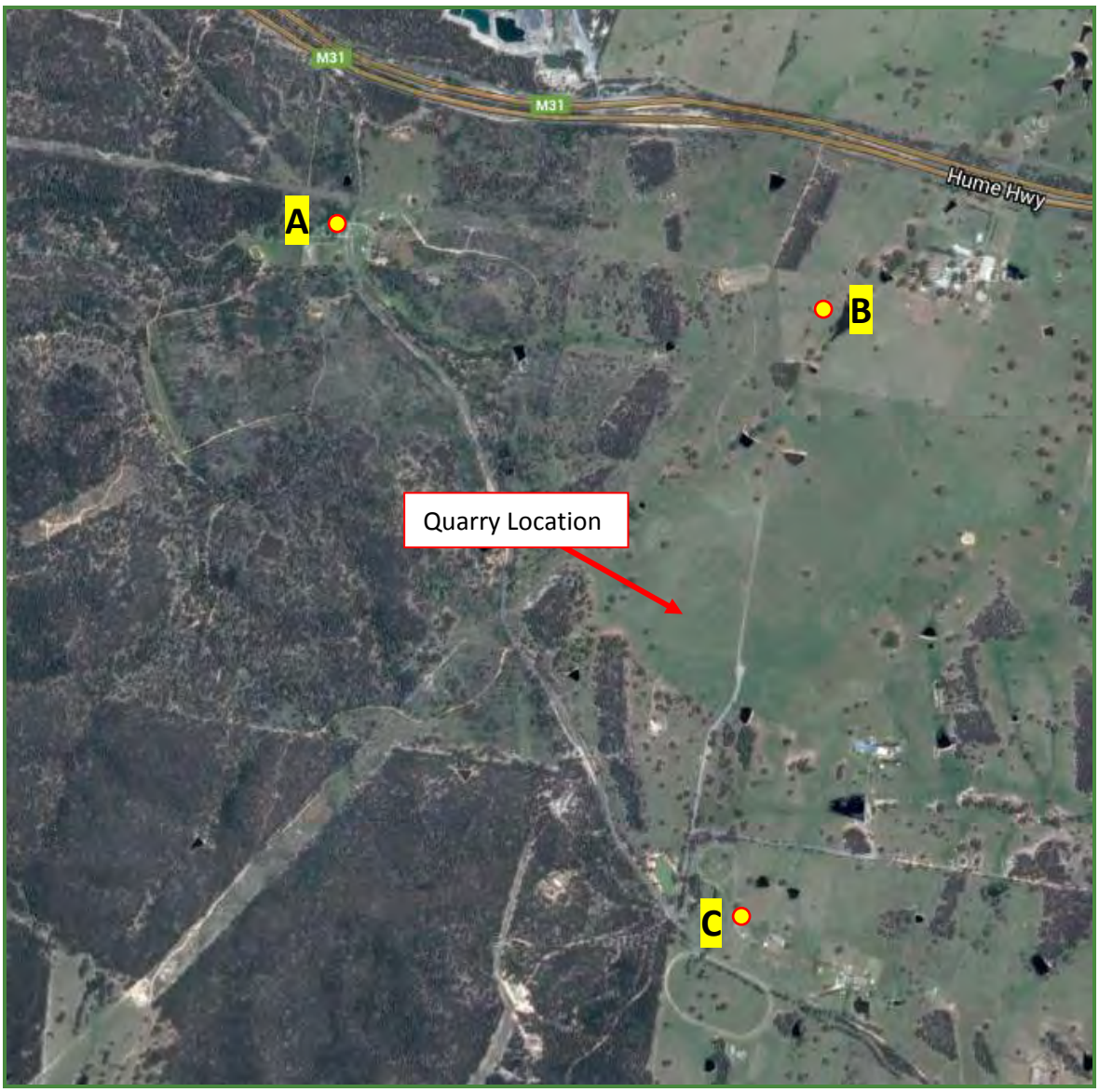
3.2 MEASUREMENT LOCATION

Unattended long-term noise monitoring was undertaken from 2nd May 2016 to 7th May 2016 at three (3) residential locations. Additional attended noise monitoring was undertaken on 2nd May 2016. The noise logger locations are listed in Table 3-1 and shown in Figure 3-1. Noise Logger Charts are presented in Attachment 3.

Table 3-1: Noise Monitoring Locations

Monitoring Location	Address
A	51 Tiyces Lane, Boxers Creek
B	16987 Hume Hwy, Boxers Creek
C	287 Tiyces Lane, Boxers Creek

Figure 3-1: Noise Monitoring Locations



In accordance with the NSW EPA INP, measured noise data obtained from the above monitored locations has been considered representative of the various potentially affected areas surrounding the project site. The relevant information, found in Section 3.1.2 on page 24 of the NSW INP has been reproduced below.

> ***"Most affected location(s)**—locations that are most affected (or that will be most affected) by noise from the source under consideration as per Note 2 in Section 2.2.1. In determining these locations, the following need to be considered: existing background levels, noise source location/s, distance from source/s (or proposed source/s) to receiver, and any shielding (for example, building, barrier) between source and receiver. Often several locations will be affected by noise from the development. In these cases, locations that can be considered representative of the various affected areas should be monitored."*

Table 3-2 identifies the various considered receptor locations that have been associated with the three (3) noise logger locations and will therefore utilise the noise criteria derived from the measurement data obtained from the respective noise logger.

Table 3-2: Associated Residential Receptors

Monitoring Location	Associated Residential Receptor Locations
A	R1
B	R2, R3, R13
C	R4-R12

3.3 MEASURED NOISE LEVELS

3.3.1 Long-Term Unattended Noise Monitoring Results

The data was analysed to determine a single assessment background level (ABL) for each day, evening and night time period, in accordance with the NSW EPA INP. That is, the ABL is established by determining the lowest tenth-percentile level of the L_{A90} noise data over each period of interest. The background noise level or rating background level (RBL) representing the day, evening and night assessment periods is based on the median of individual ABL's determined over the entire monitoring period. The results of the long-term unattended noise monitoring are displayed in Table 3-3, Table 3-4 and Table 3-5 for the respective locations A, B and C.

Daily noise logger graphs have been included in Attachment 3.

Table 3-3: Unattended Noise Monitoring Results at Location A, dB(A)

Date	Average L_1			Average L_{10}			ABL (L_{90})			L_{eq}		
	Day	Evening	Night	Day	Evening	Night	Day	Evening	Night	Day	Evening	Night
2/05/2016	62	55	51	48	44	43	38	35	35	52	48	45
3/05/2016	63	-	54	52	-	44	38	-	35	54	-	47
4/05/2016	62	58	50	44	49	44	34	36	35	53	48	43
5/05/2016	64	53	50	45	44	43	35	36	35	52	46	44
6/05/2016	60	60	50	43	52	43	33	38	33	51	53	44
7/05/2016	58	-	54	44	-	47	35	-	32	50	-	46
Average	**61**	**57**	**51**	**46**	**47**	**44**	*	*	*	*	*	*
Median (RBL)	*	*	*	*	*	*	**35**	**36**	**35**	*	*	*
Logarithmic Average	*	*	*	*	*	*	*	*	*	**52**	**50**	**45**

Note: - indicates values that has not been considered due to adverse weather conditions
# indicates noise measurements were not undertaken during this period
* Indicates values that are not relevant to that noise descriptor
Value in bold indicates most relevant noise descriptor

Table 3-4: Unattended Noise Monitoring Results at Location B, dB(A)

Date	Average L_1			Average L_{10}			ABL (L_{90})			L_{eq}		
	Day	Evening	Night	Day	Evening	Night	Day	Evening	Night	Day	Evening	Night
2/05/2016	55	52	51	49	48	47	41	39	38	47	45	44
3/05/2016	-	-	53	-	-	49	-	-	38	-	-	46
4/05/2016	51	54	53	46	50	49	38	39	38	43	47	46
5/05/2016	51	53	52	46	50	48	40	41	34	44	47	45
6/05/2016	49	57	53	45	53	48	37	41	36	44	51	45
7/05/2016	52	-	56	47	-	52	36	-	37	47	-	49
Average	**52**	**54**	**53**	**47**	**50**	**49**	*	*	*	*	*	*
Median (RBL)	*	*	*	*	*	*	**38**	**40**	**38**	*	*	*
Logarithmic Average	*	*	*	*	*	*	*	*	*	**45**	**48**	**46**

Note: - indicates values that has not been considered due to adverse weather conditions
# indicates noise measurements were not undertaken during this period
* Indicates values that are not relevant to that noise descriptor
Value in bold indicates most relevant noise descriptor

Table 3-5: Unattended Noise Monitoring Results at Location C, dB(A)

Date	Average L_1			Average L_{10}			ABL (L_{90})			L_{eq}		
	Day	Evening	Night	Day	Evening	Night	Day	Evening	Night	Day	Evening	Night
2/05/2016	50	48	46	43	41	41	33	34	34	41	40	39
3/05/2016	-	-	51	-	-	44	-	-	36		-	44
4/05/2016	47	44	49	40	38	42	29	30	31	38	39	44
5/05/2016	51	48	44	43	43	38	31	34	29	44	41	37
6/05/2016	47	43	46	39	37	40	28	28	31	39	35	38
7/05/2016	48	-	40	40	-	34	31	-	28	41	-	34
Average	**49**	**46**	**46**	**41**	**40**	**40**	*	*	*	*	*	*
Median (RBL)	*	*	*	*	*	*	**31**	**32**	**31**	*	*	*
Logarithmic Average	*	*	*	*	*	*	*	*	*	**41**	**39**	**41**

3.3.2 Short-Term Attended Noise Monitoring Results

Given that the results of the unattended noise monitoring are affected by all ambient noise sources such as local fauna, road traffic and industrial sources, it is not possible to determine with precision the exact existing industrial noise contribution based on unattended monitoring alone. Therefore, the attended noise monitoring allows for a more detailed understanding of the existing ambient noise characteristics and a more meaningful final analysis to be undertaken. The results of the short-term attended noise monitoring are displayed in Table 3-6.

Table 3-6: Attended Noise Monitoring Results, dB(A)

Location / Time Period	Noise Descriptor				Comments
	L_{Aeq}	L_{A90}	L_{A10}	L_{A1}	
Location A 51 Tiyces Lane, Boxers Creek 2/5/2016 13:11	49	38	45	63	*Traffic < 47 dB(A)* *Wind gusts < 48 dB(A)* *Distant aeroplane < 44 dB(A)* *Car passing < 74 dB(A)* *Insects < 40 dB(A)* *Birds < 43 dB(A)* *No industrial noise audible* *Noise dominated by traffic and insects*
Location B 16987 Hume Hwy, Boxers Creek 2/5/2016 14:24	47	42	49	54	*Traffic < 54 dB(A)* *Wind gusts < 65 dB(A) – according to resident strong wind gusts are typical of the area* *Reverse beepers – barely audible* *Bird < 52* *Insects < 40* *No industrial noise audible* *Noise dominated by wind and traffic*
Location C 287 Tiyces Lane, Boxers Creek 2/5/2016 15:14	45	38	46	51	*Traffic < 54 dB(A) – on Tiyces Ln* *Wind gusts < 62 dB(A)* *Aeroplane < 40 dB(A)* *Bird < 39dB(A)* *Impulse noise from neighbour's shed< 50 dB(A)* *No industrial noise audible* *Noise dominated by wind and traffic*

3.4 PHOTOGRAPHS

Figure 3-2 and Figure 3-3 show the locations of the noise monitoring instrumentation at location A and B respectively.

Figure 3-2: Noise Logger Location A – 51 Tiyces Lane, Boxers Creek

Figure 3-3: Noise Logger Location B – 16987 Hume Hwy, Boxers Creek

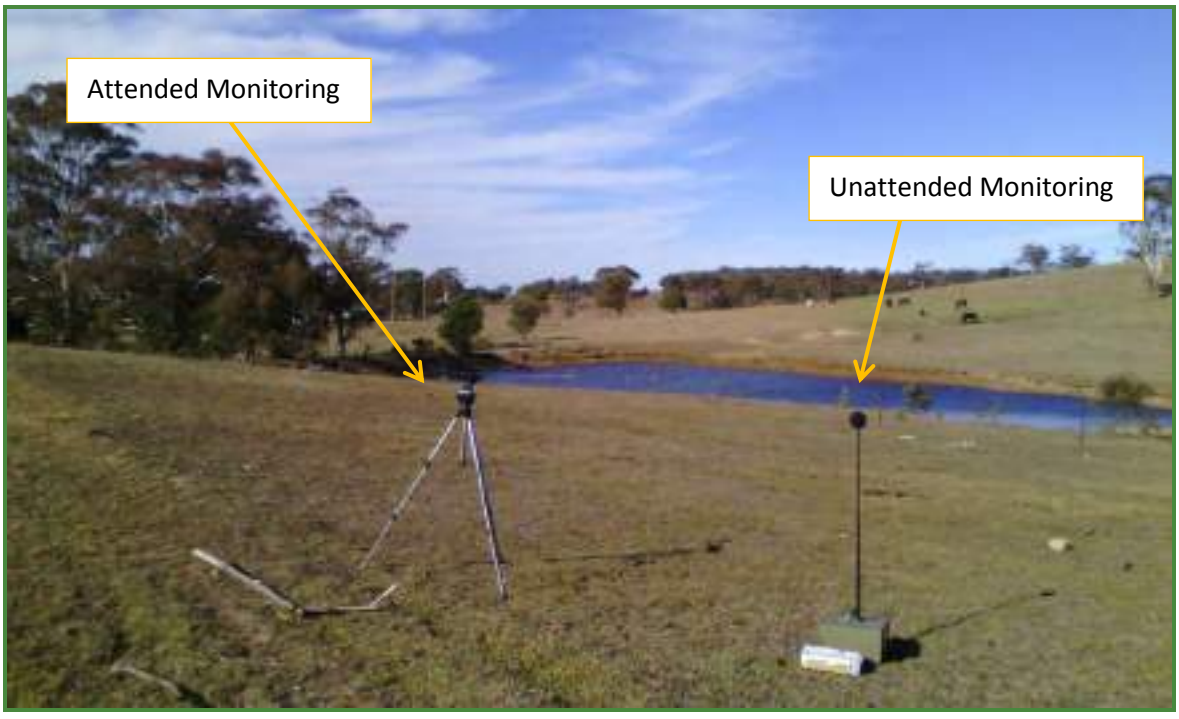
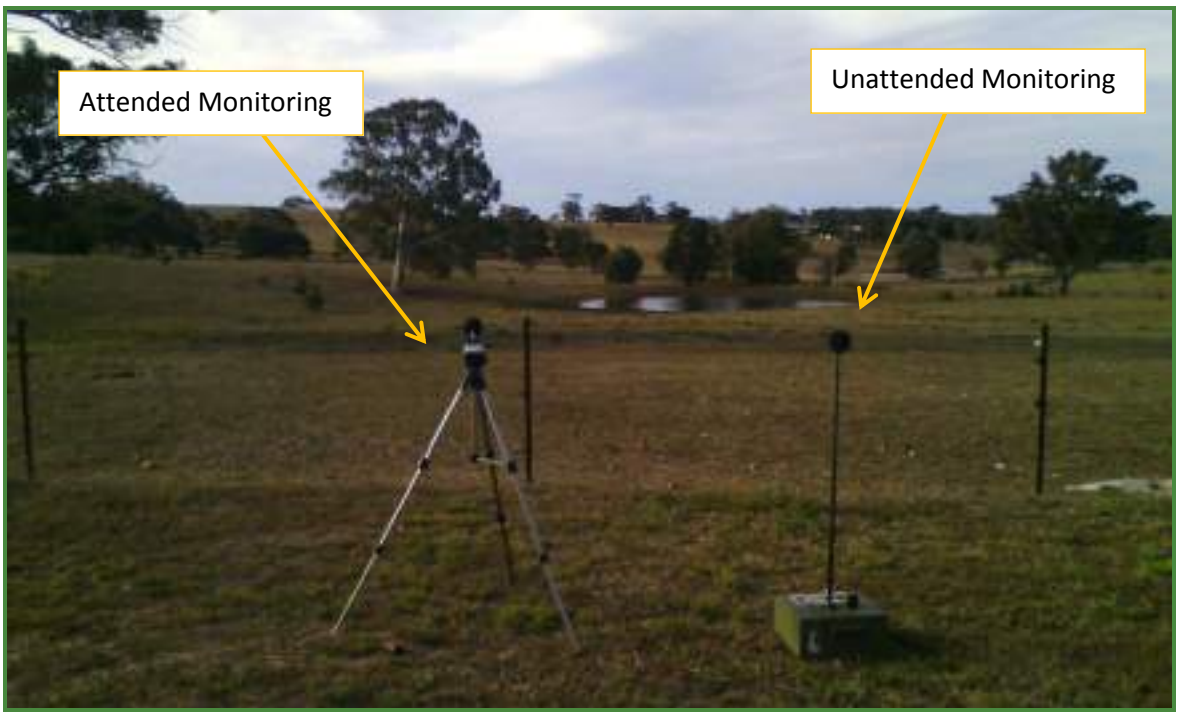


Figure 3-4: Noise Logger Location C – 287 Tiyces Lane, Boxers Creek



4. CURRENT LEGISLATION AND GUIDELINES

4.1 NSW INTERIM CONSTRUCTION NOISE GUIDELINE

4.1.1 Airborne noise

Residential Criteria

Table 4-1 sets out management levels for noise at residences and how they are to be applied. Restrictions to the hours of construction may apply to activities that generate noise at residences above the 'highly noise affected' noise management level.

Table 4-1: Management Levels at Residences Using Quantitative Assessment

Time of Day	Management Level $L_{Aeq(15\ minute)}$	How to Apply
Recommended standard hours: Monday to Friday 7am – 6pm Saturday 8am – 1pm No work on Sundays or Public Holidays	Noise Affected RBL + 10 dB	The noise affected level represents the point above which there may be some community reaction to noise. • Where the predicted or measured $L_{Aeq(15\ minute)}$ is greater than the noise affected level, the proponent should apply all feasible and reasonable work practises to meet the noise affected level. • The proponent should also inform all potentially affected residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
	Highly Noise Affected 75 dB(A)	The highly noise affected level represents the point above which there may be strong community reaction to noise. • Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account: 1. times identified by the community when they are less sensitive to noise (such as before and after school, or mid-morning or mid-afternoon for works near residents. 2. if the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.

Table 4-1: Management Levels at Residences Using Quantitative Assessment

Time of Day	Management Level $L_{Aeq(15\ minute)}$	How to Apply
Outside recommended standard hours	Noise Affected RBL + 5 dB	• A strong justification would typically be required for works outside the recommended standard hours. • The proponent should apply all feasible and reasonable work practices to meet the noise affected level. • Where all feasible and reasonable practices have been applied and noise is more than 5 dB(A) above the noise affected level, the proponent should negotiate with the community. • For guidance on negotiating agreements see section 7.2.2 (RNP)

Noise levels apply at the property boundary that is most exposed to construction noise, and at a height of 1.5 m above ground level. If the property boundary is more than 30 m from the residence, the location for measuring or predicting noise levels is at the most noise-affected point within 30 m from the residence.

Other Sensitive Land Uses

There are no other sensitive land uses in the area.

4.2 NSW EPA Industrial Noise Policy

4.2.1 Introduction

The NSW Industrial Noise Policy was developed by the NSW EPA primarily for the assessment of noise emissions from industrial sites regulated by the NSW EPA. However, the policy can also be used by NSW Planning and Infrastructure and local government to assist in their assessment of potential noise issues.

An important point to note in the policy is presented in Section 1.4.1. This section states:

> "*The industrial noise source criteria set down in Section 2 are best regarded as planning tools. They are not mandatory, and an application for a noise-producing development is not determined purely on the basis of compliance or otherwise with the noise criteria. Numerous other factors need to be taken into account in the determination. These factors include economic consequences, other environmental effects and the social worth of the development.*"

The policy sets out two criteria that are used to assess potential site-related noise impacts. The first criterion aims at controlling intrusive noise impacts in the short-term for residences. This criterion is therefore called the intrusiveness criterion.

The second criterion aims at maintaining a suitable amenity for particular land uses including residences in the long-term. This criterion is called the amenity criterion.

4.2.2 Intrusiveness Criterion

The intrusiveness criterion can be summarised as:

$L_{Aeq,(15minute)} \leq$ rating background level + 5 dB(A)

Where the $L_{Aeq,(15minute)}$ is the predicted or measured L_{Aeq} from noise generated within the project site over a fifteen minute interval at the receptor.

This is to be assessed at the most affected point on or within the residential property boundary or if that is more than 30 m from the residence, at the most affected point within 30 m of the residence.

4.2.3 Amenity Criterion

To limit continuing increases in noise levels, the maximum ambient noise level within an area from industrial noise sources should not normally exceed the acceptable noise levels specified in Table 2.1 of the NSW INP, the applicable parts of which are reproduced in Table 4-2.

Table 4-2: NSW EPA Amenity Criteria – Recommended L_{Aeq} noise levels from industrial noise sources

Type of Receptor	Indicative Noise Amenity Area	Period	Recommended L_{Aeq} noise level (dB(A))	
			Acceptable	Recommended Maximum
Residence	Rural	Day	50	55
		Evening	45	50
		Night	40	45

The existing industrial noise levels are compared to the acceptable level and Table 4-3 is then used to derive the applicable amenity criteria.

Table 4-3: Modification to Acceptable Noise Level (ANL[1]) to Account for Existing Levels of Stationary Noise

Total Existing L_{Aeq} Noise Level From Industrial Sources	Maximum L_{Aeq} Noise Level for Noise from New Sources Alone
≥ ANL + 2	If existing noise level is likely to decrease in future: ANL – 10 If existing noise level is unlikely to decrease in the future: Existing level – 10
ANL + 1	ANL – 8
ANL	ANL – 8
ANL –1	ANL – 6
ANL – 2	ANL – 4
ANL – 3	ANL – 3
ANL – 4	ANL – 2
ANL – 5	ANL –2
ANL – 6	ANL – 1
< ANL - 6	ANL

Source: Table 2.2 NSW EPA INP
Note: [1]ANL is the recommended acceptable L_{Aeq} noise level for the specific receptor, area and time of day.

4.3 NSW EPA Road Noise Policy

The NSW Road Noise Policy has been adopted to establish the noise criteria for the potential noise impact associated with the off-site road traffic generated by the proposed development. The NSW Road Noise Policy was developed by the NSW EPA primarily to identify the strategies that address the issue of road traffic noise from:

- Existing roads;
- New road projects;
- Road redevelopment projects; and
- New traffic-generating developments.

4.3.1 Road Category

Based on the RNP road classification description, Hume Hwy would be classified as a Freeway or motorways/arterial road.

4.3.2 Noise Assessment Criteria

Section 2.3 of the RNP outlines the criteria for assessing road traffic noise. The relevant sections of Table 3 of the RNP are shown in Table 4-4.

Table 4-4: Road Traffic Noise Assessment Criteria For Residential Land Uses, dB(A)

Road Category	Type of Project/Land Use	Assessment Criteria, dB(A)*	
		Day (7 am-10 pm)	Night (10 pm-7 am)
Freeway/ arterial/ sub-arterial roads	1. Existing residences affected by noise from new freeway/arterial/sub-arterial road corridors.	$L_{Aeq\ (15\ hour)}$ 55 dB	$L_{Aeq\ (9\ hour)}$ 50 dB
	2. Existing residences affected by noise from redevelopment of existing freeway/arterial/subarterial roads 3. Existing residences affected by additional traffic on existing freeways/arterial /sub-arterial roads generated by land use developments	$L_{Aeq\ (15\ hour)}$ 60 dB	$L_{Aeq\ (9\ hour)}$ 55 dB

* measured at 1 m from a building façade.

4.4 VIBRATION CRITERIA

The extraction operations will not employ blasting of the rock. Therefore blasting criteria will not be considered.

The Department of Environment and Climate Change's "*Assessing Vibration: A Technical Guideline*" provides guidance for acceptable levels of vibration. The guide indicates that intermittent vibration should have a different criterion to continuous and impulsive vibration and the vibration should be measured on three axes – vertical, transverse and longitudinal. The criteria are in terms of m/s^2 for continuous vibration and $m/s^{1.75}$ for intermittent vibration. The criteria also have preferred and maximum values.

The day time preferred and maximum weighted vibration values are presented in Table 4-5.

Table 4-5: Vibration Criteria for Residences During Day Time

Vibration	Preferred		Maximum	
	Z	X and Y	Z	Z and Y
Continuous (m/s^2)	0.010	0.0071	0.020	0.04
Impulsive (m/s^2)	0.3	0.21	0.6	0.42
Intermittent ($m/s^{1.75}$)	0.20 (vector sum)		0.40 (vector sum)	

4.5 PROJECT SPECIFIC NOISE LEVELS

Construction Noise

Table 4-6: Site Project Specific Noise Limits (PSNL) for Construction noise, dB(A)

Receiver Location	Period	RBL $L_{Aeq(15\ minute)}$	Noise Affected $L_{Aeq(period)}$	Highly Noise Affected	Site PSNL $L_{Aeq(15\ minute)}$
R1	Day	35	45	75	45
R2, R3, R13	Day	38	48	75	48
R4-R12	Day	31	41	75	41

Operational Noise

Noise limits for the site have been established in accordance with the principles and methodologies of the NSW INP, the measured background noise levels and the existing industrial operational noise levels of the area.

According to the NSW INP, it is recommended that the more stringent noise limits be applied to protect the existing acoustic amenity from deteriorating.

The selected On-Site Project Specific Noise Limits associated with operational activities are presented in Table 4-7 below.

Table 4-7: Site Project Specific Noise Limits (PSNL) for Operational Activities, dB(A)

Receiver Location	Period	Intrusive Criterion $L_{Aeq(15\ minute)}$	Amenity Criterion $L_{Aeq(period)}$	Site PSNL $L_{Aeq(15\ minute)}$
R1	Day	40	50	40
R2, R3, R13	Day	43	50	43
R4-R12	Day	36	50	36

Note: - indicates not applicable

In all, 13 receivers were chosen as noise assessment locations for modelling. As a means to achieve a conservative result, the assessment locations that were not monitored were assigned the lowest criteria based on their proximity to the nearest monitoring site.

It should be noted that different time periods apply for the above criteria as the intrusive criterion considers a 15 minute assessment period while the amenity criterion requires assessment over the total length of time that a site is operational within each day, evening or night period.

The most stringent criterion between intrusive and amenity criterion has been selected.

Road Traffic Noise

The traffic produced by the site is minimal and this is expected to have negligible impact on the noise generated by Hume Hwy. An assessment of road traffic noise is not considered warranted.

4.6 METEOROLOGICAL FACTORS

Wind may affect the noise emission from the site and are to be assessed when these are considered to be a feature of the area.

This section of the report presents the analysis undertaken on the 2008-2012 weather data in order to establish whether wind is a features of the area. 5 year data provides a representative sample for a detailed analysis of the seasonal wind trends of the area.

Temperature inversion generally occurs on cloudless nights with little wind and prevalently during winter.

Temperature inversion is not considered in this assessment as the site would operate during daytime only and, as defined in the NSW EPA INP, assessment of temperature inversion impact is confined to the night noise assessment period.

4.6.1 Wind Effects

Wind is considered to be a feature where source-to-receiver wind speeds (at 10 m height) of 3 m/s or below occur for 30% of the time or more in any assessment period in any season.

4.6.2 Wind rose plots

Wind rose plots show the direction that the wind is coming from, with triangles known as “petals”. The petals of the plots in the figures summarise wind direction data into 8 compass directions i.e. north, north-east, east, south-east, etc. The length of the triangles, or “petals”, indicates the frequency that the wind blows from that direction. Longer petals for a given direction indicate a higher frequency of wind from that direction. Each petal is divided into segments, with each segment representing one of two wind speed classes.

Thus, the segments of a petal show what proportion of wind for a given direction falls into each class. The proportion of time for which wind speed is less than 0.5 m/s, when speed is negligible, is referred to as calm hours or “calms”. Calms are not shown on a wind rose as they have no direction, but the proportion of time consisting of the period under consideration is noted under each wind rose.

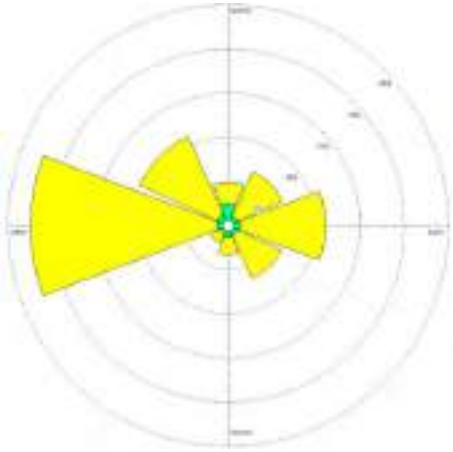
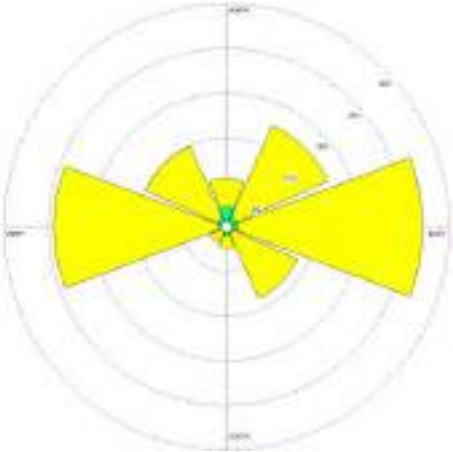
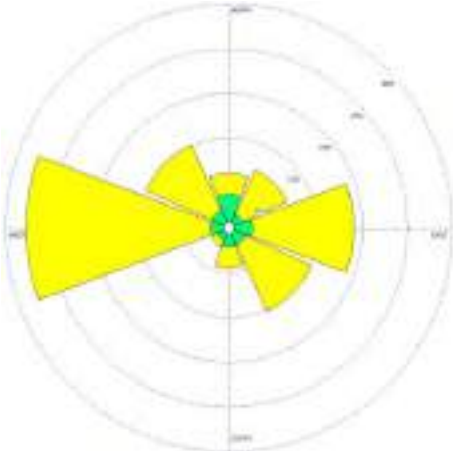
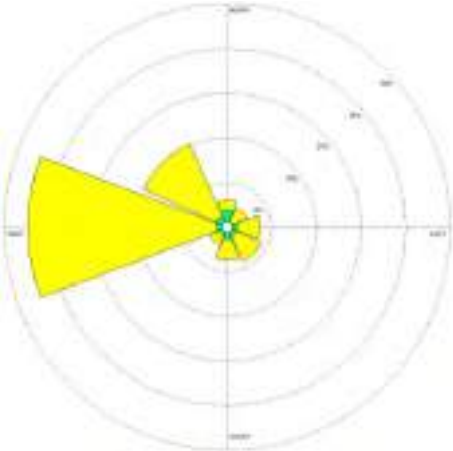
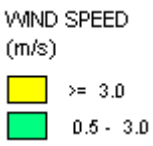
The concentric circles in each wind rose are the axis, which denote frequencies. In comparing the plots it should be noted that the axis varies between wind roses, although all wind roses are similar in size. The frequencies denoted on the axes are indicated beneath each wind rose.

Wind is considered to be a feature where source-to-receptor wind speeds (at 10 m above ground) of 3 m/s or below occur for 30% or more of the time in any assessment period in any season.

The meteorological data was obtained from the BOM weather data from Goulburn Airport AWS ID 070330.

Seasonal wind rose plots for the site-representative meteorological file have been included in Figure 4-1, based on the BOM data received.

Figure 4-1: Wind Rose Plots – BOM Goulburn Airport AWS ID 070330 2015 – Day time

All Seasons	Summer Season (December – February)
	
Average Wind Speed: 5.40m/s Axis Frequencies: 7%, 14%, 21%, 28%, 35%	Average Wind Speed: 5.61m/s Axis Frequencies: 6%, 12%, 18%, 24%, 30%
Autumn Season (March – May)	**Winter Season (June – August)**
	
Average Wind Speed: 4.56m/s Axis Frequencies: 6%, 12%, 18%, 24%, 30%	Average Wind Speed: 5.54m/s Axis Frequencies: 9%, 18%, 27%, 36%, 45%
Spring Season (September – November)	**Legend**
	
Average Wind Speed: 5.91m/s Axis Frequencies: 8%, 16%, 24%, 32%, 40%	

Based on the information presented from the weather data, source-to receiver wind speeds of 3 m/s or below are present for less than 30% of the time therefore wind effects have not been included in the assessment.

4.6.3 Weather Conditions Considered in the Assessment

The following conditions will be considered in this noise impact assessment considered:

- Condition A: Neutral Weather Conditions.

Details of the considered meteorological conditions have been displayed in Table 4-8.

Table 4-8: Meteorological Conditions Assessed in Noise Propagation Modelling

Condition	Classification	Ambient Temp.	Ambient Humidity	Wind Speed	Wind Direction (blowing from)	Temperature Inversion	Affected Receiver	Applicability
A	Neutral	10 °C	70%	0 m/s	-	No	All	All periods

5. NOISE IMPACT ASSESSMENT

An outline of the predictive noise modelling methodology and operational noise modelling scenarios have been provided in this section of the report.

5.1 MODELLING METHODOLOGY

Predictive Noise Modelling was carried out using the Concawe algorithm within SoundPLAN v7.3. This model has been extensively utilised by Benbow Environmental for assessing noise emissions for numerous sites, and is recognised by regulatory authorities throughout Australia. The model allows for the prediction of noise from a site, at the specified receptor, by calculating the contribution of each noise source.

The noise sources as well as the topographical features of the subject area and receiver locations, were all input into the noise model to determine the noise emissions of the proposed development at the nearest potentially affected residences. Based on inspection, the local topography for the area appears to be consistent with levels as printed on the topographic map.

The modelling scenario has been carried out using the L_{Aeq} descriptor. Using this descriptor, noise emission levels were predicted at the nearest potentially affected sensitive receivers to determine the noise impact against the project specific noise levels and other relevant noise criteria in accordance with the NSW EPA Industrial Noise Policy.

5.2 NOISE SOURCES

The sound power levels for the identified noise sources associated with the construction activities and operational activities have been calculated from measurements of sound pressure levels undertaken by acoustic engineers from Benbow Environmental during operations at similar facilities.

Due to the heavily fractured nature of the basalt, clearly apparent in the drilling cores, it is unlikely that a rock breaker will be required. All material will be winnable with a bulldozer and loader.

A-weighted third octave band centre frequency sound power levels have been used and are presented in Table 5-1 and Table 5-2 below. The noise sources utilised as part of this assessment comprise of the primary noise generating activities associated with the effective operation of the proposed development.

Table 5-1: A-weighted Sound Power Levels Associated with Road Construction Noise, dB(A)

Noise Source	Overall
Tip Truck	**107**
Vibratory Roller	**103**
Grader	**110**
Excavator	**107**
Water Cart	**110**
Chain Saw	**107**
Rock Hammer	**117**
Reversing Alarm	**105**

Table 5-2: A-weighted Sound Power Levels Associated with Operational Activities, dB(A)

Noise Source	Overall
Komatsu Bulldozer (DA55A)	**104**
Front End Loader Cat 966C	**104**
Crusher and Screen	**111**
Articulated Dump Truck	**104**
Excavator	**109**
Backhoe	**105**

5.2.1 Modelling Scenarios

The following table details the scenarios included in the SoundPLAN noise model.

Table 5-3: Scenario Details

Scenario Number	Construction /Operation	Description	Sources	Figure
Scenario 1	Construction	Construction of road at the northern end and construction of quarry (north and south)	**Road Construction** Tip Truck Vibratory Roller Grader Excavator Water Cart Chain Saw Rock Hammer Reversing Alarm **Quarry Construction** Komatsu Bulldozer (DA55A) Front End Loader Cat 966C Articulated Dump Truck Excavator Backhoe	Figure 5-1 Figure 5-6 Figure 5-7

Table 5-3: Scenario Details

Scenario Number	Construction /Operation	Description	Sources	Figure
Scenario 2	Construction	Construction of road at the southern end and construction of quarry (north and south)	**Road Construction** Tip Truck Vibratory Roller Grader Excavator Water Cart Chain Saw Rock Hammer Reversing Alarm **Quarry Construction** Komatsu Bulldozer (DA55A) Front End Loader Cat 966C Articulated Dump Truck Excavator Backhoe	Figure 5-2 Figure 5-6 Figure 5-7
Scenario 3	Construction	Construction of road at the northern end	**Road Construction** Tip Truck Vibratory Roller Grader Excavator Water Cart Chain Saw Rock Hammer Reversing Alarm	Figure 5-3
Scenario 4	Construction	Construction of road at the southern end	**Road Construction** Tip Truck Vibratory Roller Grader Excavator Water Cart Chain Saw Rock Hammer Reversing Alarm	Figure 5-4
Scenario 5	Construction	Construction of quarry (north and south)	**Quarry Construction** Komatsu Bulldozer (DA55A) Front End Loader Cat 966C Articulated Dump Truck Excavator Backhoe	Figure 5-5 Figure 5-6 Figure 5-7
Scenario 6	Operational	Quarry operating with equipment operating at the southern side of the quarry site	Komatsu Bulldozer (DA55A) Front End Loader Cat 966C Crusher and Screen Articulated Dump Truck Backhoe	Figure 5-8

Table 5-3: Scenario Details

Scenario Number	Construction /Operation	Description	Sources	Figure
Scenario 7	Operational	Quarry operating with equipment operating at the northern side of the quarry site	Komatsu Bulldozer (DA55A) Front End Loader Cat 966C Crusher and Screen Articulated Dump Truck Backhoe	Figure 5-9

The following figures show the locations of the noise sources.

Figure 5-1: Construction Noise Sources Location – Scenario 1

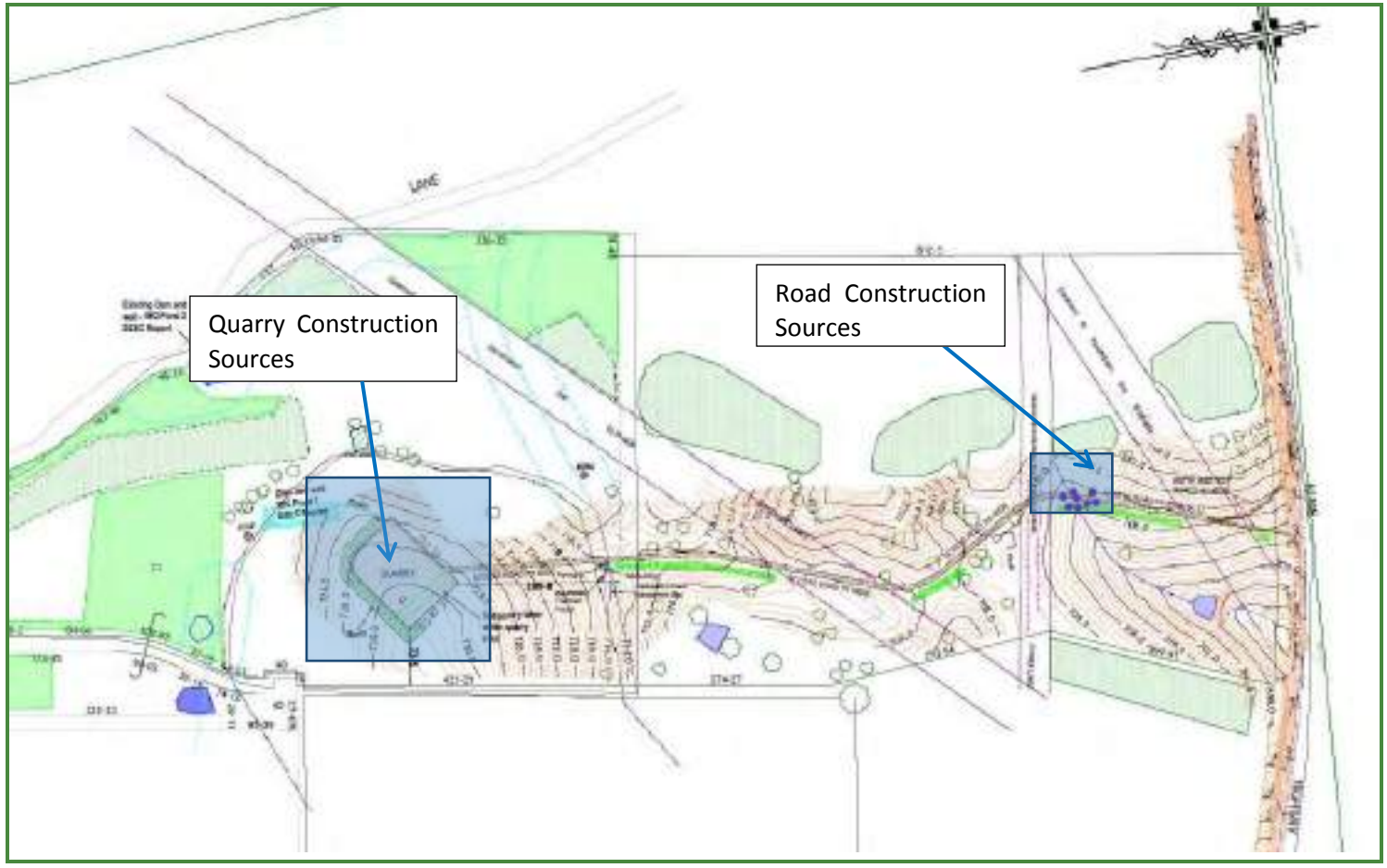


Figure 5-2: Construction Noise Sources Location – Scenario 2

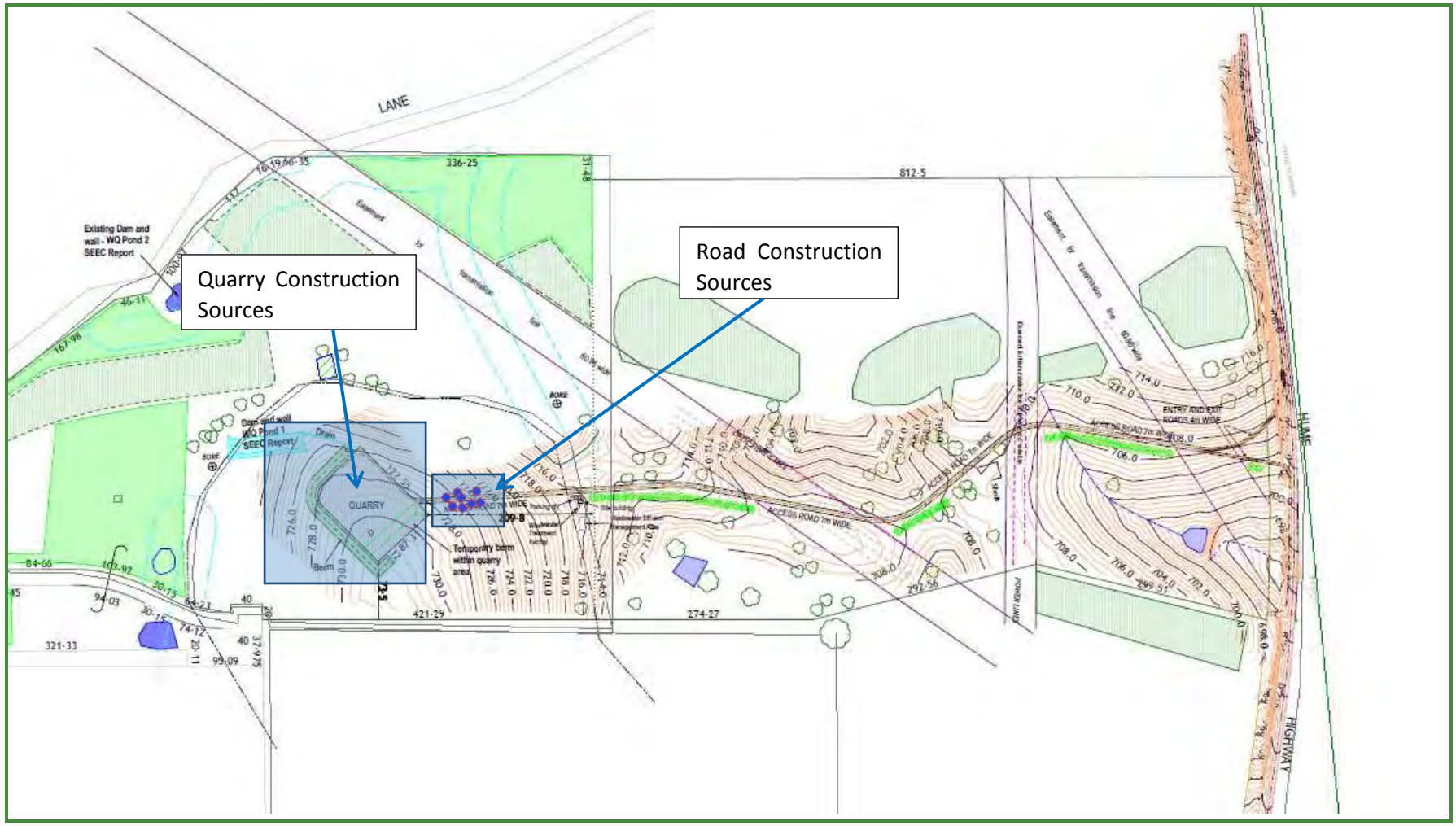


Figure 5-3: Construction Noise Sources Location – Scenario 3

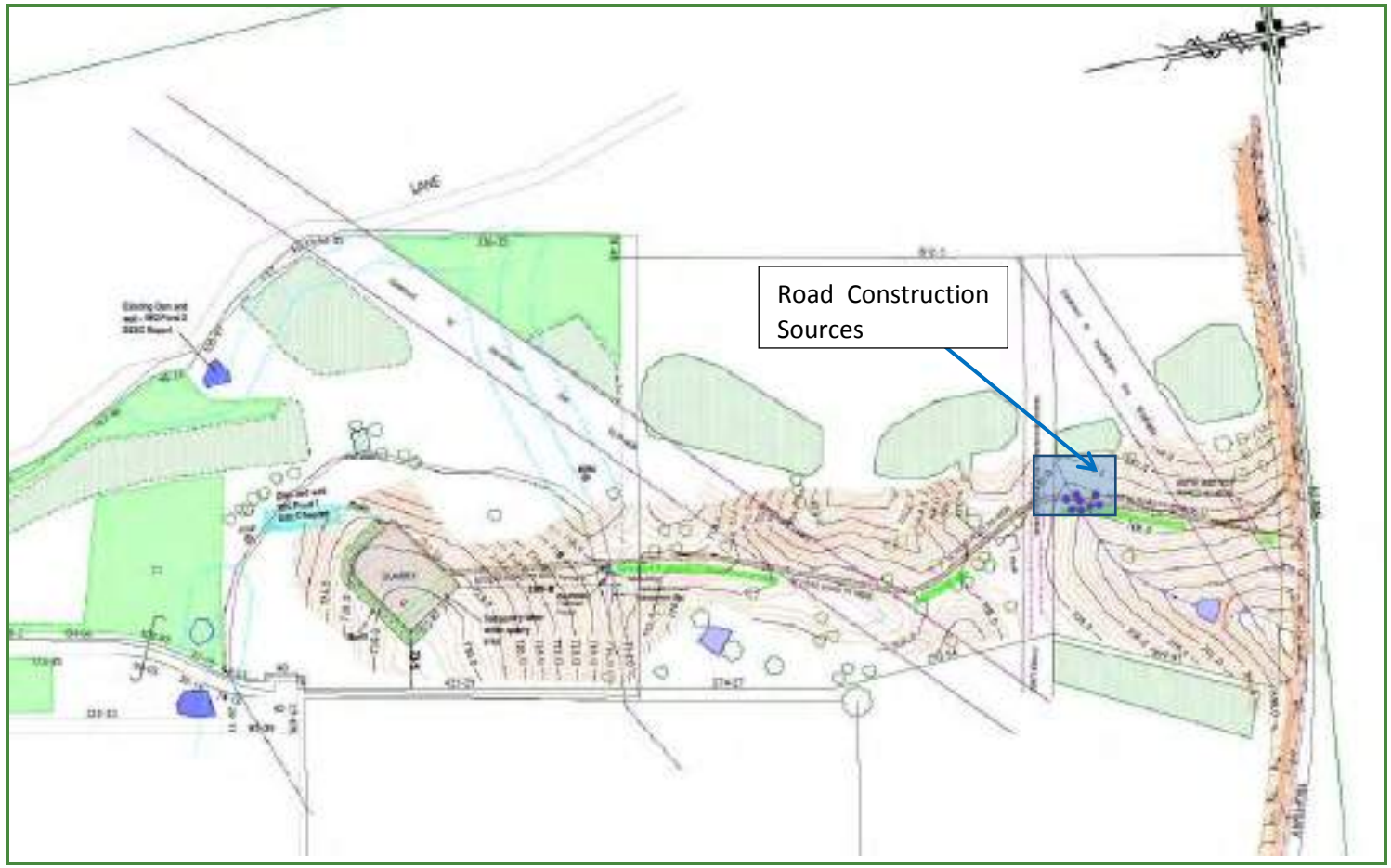


Figure 5-4: Construction Noise Sources Location – Scenario 4

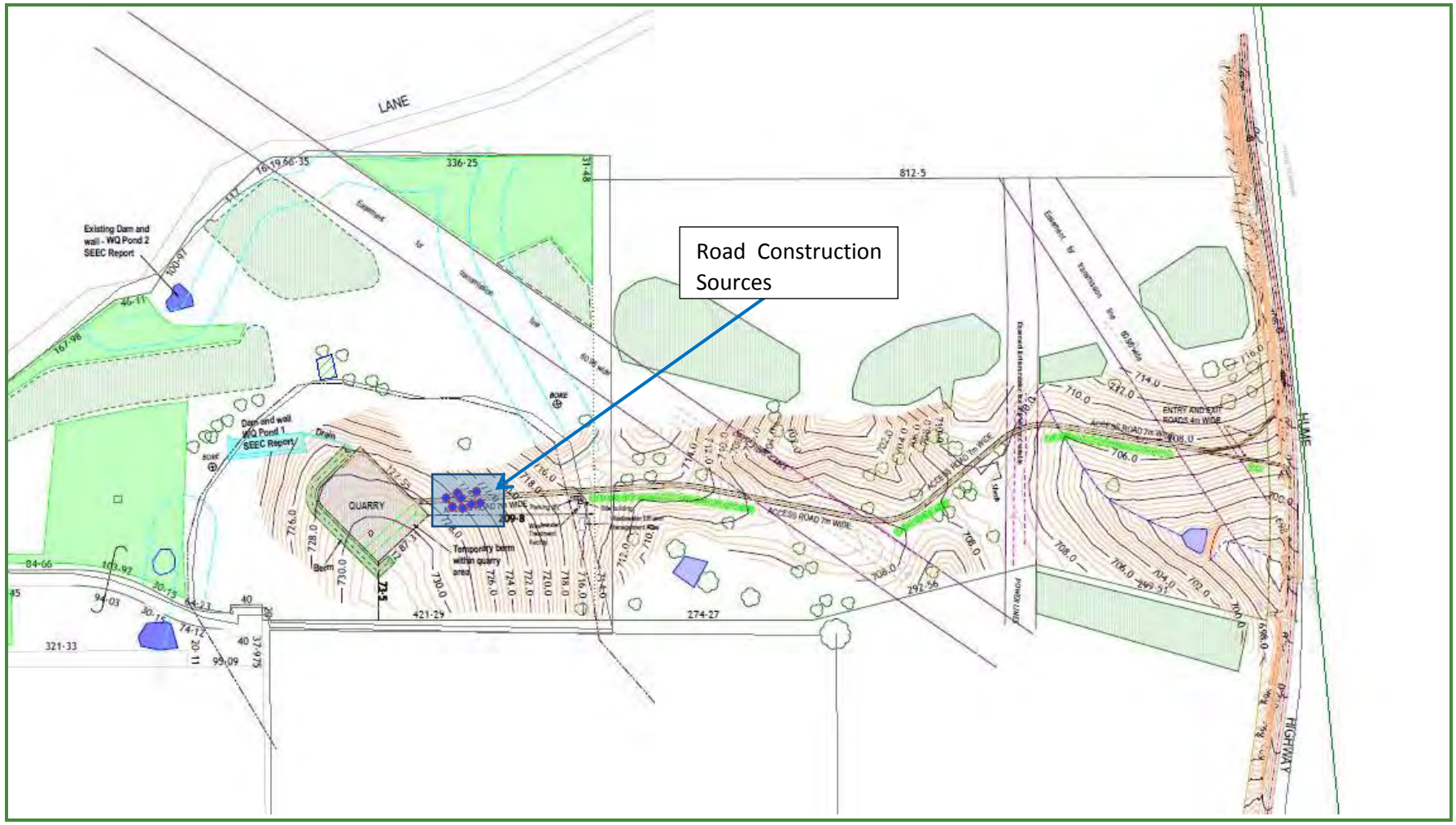


Figure 5-5: Construction Noise Sources Location – Scenario 5

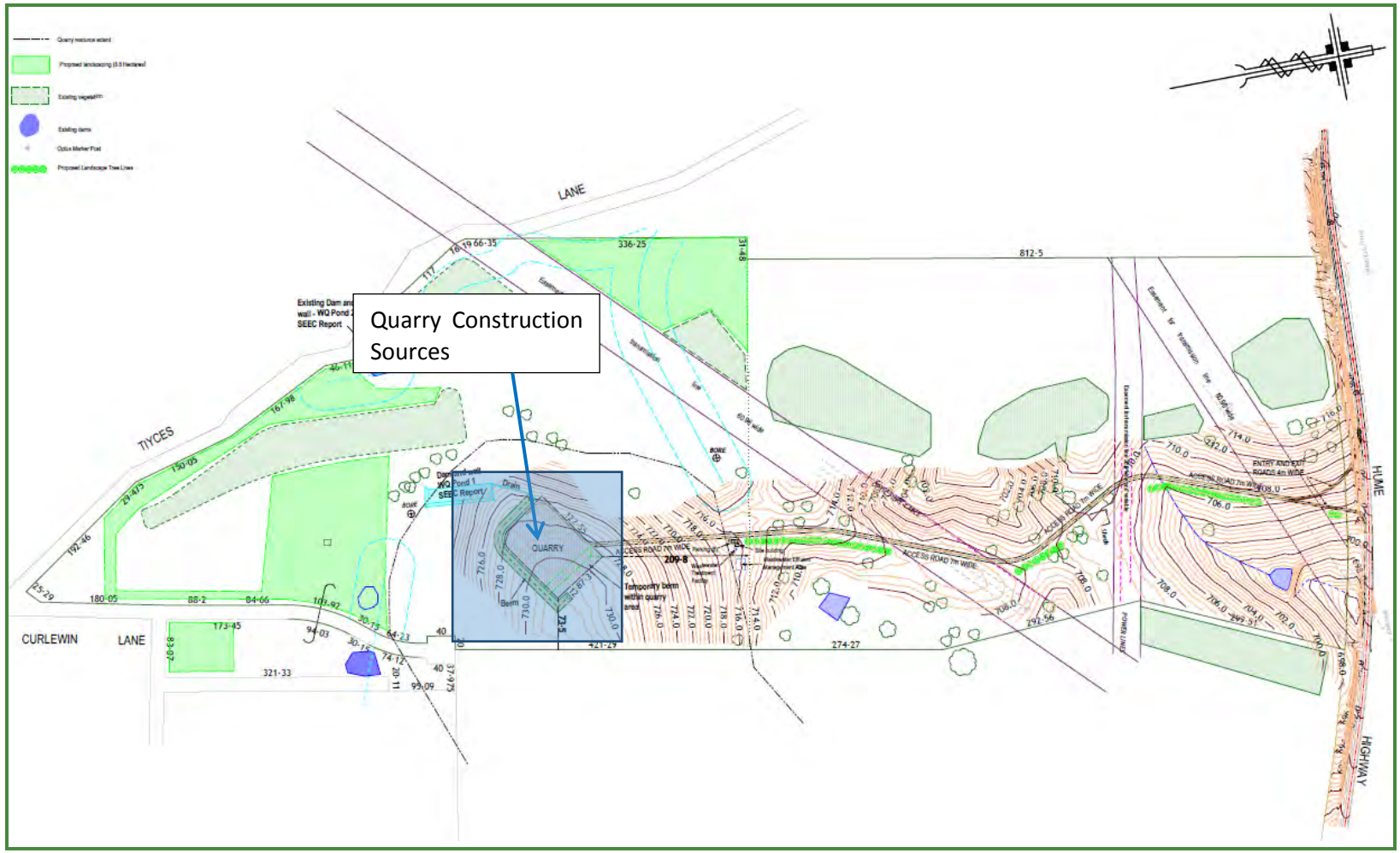
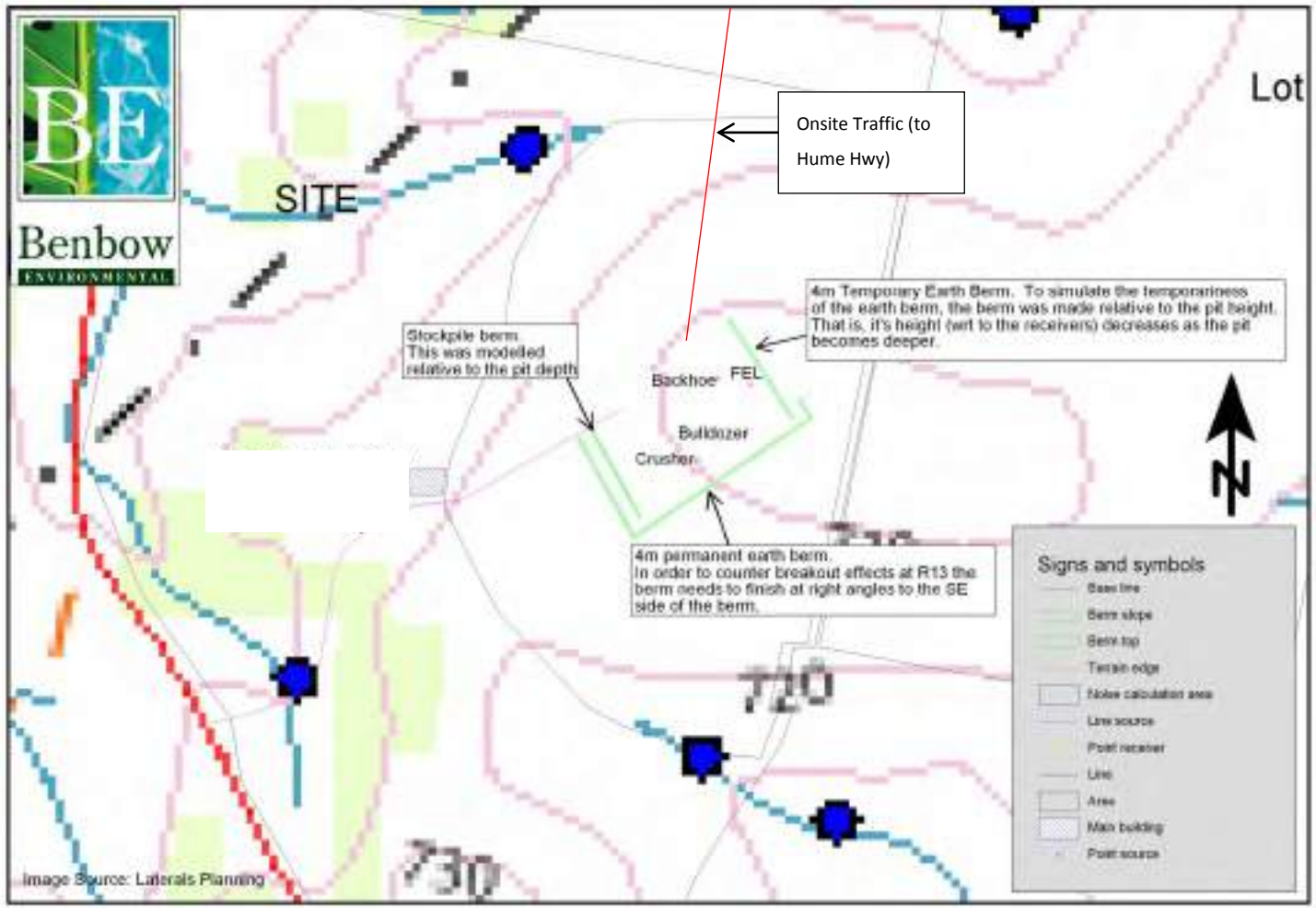


Figure 5-6: Construction Noise Sources Location – Quarry North (Scenario 1,2,5)

Figure 5-7: Construction Noise Sources Location – Quarry South (Scenario 1,2,5)

Figure 5-8: Operational Noise Sources Location – Scenario 6

Figure 5-9: Operational Noise Sources Location – Scenario 7



5.2.2 Modelling Assumptions

The relevant assessment period for operational noise emissions is 15 minutes when assessing noise levels against the Intrusive Criterion; therefore noise source durations detailed throughout the following assumptions section should be considered per 15 minute period in view of potential noise impacts under worst-case scenarios. Each assessment-specific assumption has been detailed below:

- Off-site topographical information has been obtained from Land and Property Information topographic map and implemented in SoundPLAN v.7.3.
- On-site topography has been obtained from the site survey plans provided by the client.
- All ground areas surrounding the subject site and the nearest nominated occupancies have been modelled considering different ground factors ranging from 0 to 1.
- All residential receivers were modelled at 1.5 m above ground level at the most noise-affected point within 30 m of the residence and also at the residence façade.
- The proposed facility will operate from 7.00am to 5.00pm, therefore only the day time period has been assessed.

5.2.2.1 Construction Noise

- All equipment have been modelled as operating simultaneously over the assessment period.
- Reverse beeper has been considered to be audible 25% of the time over a 15 minute period from operating vehicles.
- All road construction sources have been model at 1m operating 100% of the time.

5.2.2.2 Operational Noise

- Pit depth is measured from the highest point on the original surface level within the pit;
- Mobile plant sources have been modelled as point sources and road trucks have been modelled as line sources;
- All equipment associated with the operations of the quarry have been considered to be operating 100% of the time over any 15 minute assessment period

5.3 PREDICTED NOISE LEVELS – CONSTRUCTION

The construction is modelled at the existing ground level with no earth berms. These are built during the construction phase.

The crusher will not operate until the temporary and permanent noise barriers reach a height 4 m. Therefore the crusher is not considered in the construction noise prediction. An excavator has been added as a noise source to the construction scenarios only.

Table 5-4: Predicted Noise Levels – Construction Noise Scenario 1 – dB(A)

Receiver	Criteria	Predicted Noise levels at Receivers			
		Surface Level – no noise barriers		2 m down + 3 x 4 m noise barriers	3 m down + 3 x 4 m noise barriers
		Sources to South	Sources to the North	Sources to the North	Sources to the North
1	45	40	40	40	40
2	48	45	45	45	45
3	48	36	36	36	36
4	41	37	37	28	27
5	41	29	29	28	27
6	41	30	30	30	28
7	41	34	34	32	31
8	41	35	35	34	32
9	41	33	33	33	33
10	41	32	31	31	31
11	41	27	27	26	24
12	41	39	38	38	38

Table 5-5: Predicted Noise Levels – Construction Noise Scenario 2 – dB(A)

Receiver	Criteria	Predicted Noise levels at Receivers			
		Surface Level – no noise barriers		2 m down + 3 x 4 m noise barriers	3 m down + 3 x 4 m noise barriers
		Sources to South	Sources to the North	Sources to the North	Sources to the North
1	45	38	38	38	38
2	48	40	40	39	39
3	48	36	36	35	35
4	41	39	39	35	35
5	41	28	28	27	26
6	41	31	31	30	29
7	41	34	34	33	32
8	41	36	36	35	34
9	41	37	37	37	37
10	41	35	35	35	35
11	41	29	29	29	28
12	41	43	43	43	43

Note Greyed areas indicate an exceedance of the criteria.

Table 5-6: Predicted Noise Levels – Construction Noise Scenario 3 – dB(A)

Receiver	Criteria	Predicted Noise levels at Receivers
		Surface Level – no noise barriers
1	45	40
2	48	45
3	48	36
4	41	22
5	41	27
6	41	27
7	41	30
8	41	31
9	41	30
10	41	29
11	41	18
12	41	33

Table 5-7: Predicted Noise Levels – Construction Noise Scenario 4 – dB(A)

Receiver	Criteria	Predicted Noise levels at Receivers
		Surface Level – no noise barriers
1	45	38
2	48	39
3	48	35
4	41	35
5	41	25
6	41	28
7	41	31
8	41	33
9	41	36
10	41	34
11	41	27
12	41	42

Table 5-8: Predicted Noise Levels – Construction Noise Scenario 5 – dB(A)

Receiver	Criteria	Predicted Noise levels at Receivers			
		Surface Level – no noise barriers		2 m down + 3 x 4 m noise barriers	3 m down + 3 x 4 m noise barriers
		Sources to South	Sources to the North	Sources to the North	Sources to the North
1	45	30	30	30	26
2	48	31	32	21	18
3	48	28	29	20	15
4	41	37	37	27	25
5	41	25	25	23	16
6	41	27	27	26	21
7	41	31	31	28	22
8	41	33	32	30	23
9	41	31	30	30	30
10	41	29	28	28	28
11	41	26	26	25	23
12	41	37	36	36	36

Exceedance of 2dB(A) was predicted for Scenario 2 at receptor R12. Therefore construction of the southern half (50%) of the access road must not occur at the same time as construction of the quarry. Construction noise levels are predicted to comply with project specific noise levels at all other considered residential receptors.

5.4 Predicted Noise Levels – Operational

Initial modelling showed that the quarry would not comply with the project-specific noise levels. Thus noise controls were investigated and modelled. After many model runs it was seen that 3 earth berms, each 4 m in height were needed to the NE, SE and SW in order to reduce the noise levels. In reality these 4 m noise barriers will consist of 2 metres of earth berm with a 2 m solid panel fence constructed on top. However even with these noise controls it was found that the criteria were still not met. The cause of the exceedance is associated with the crusher operations during the early stage of the development.

The local topography of the area poses particular problems. It is undulating in all directions and produces a particular noise impact on R12 due to this location being on the side of a hill and not quite behind it.

Thus it was decided to delay the operating of the crusher screen until the pit reached a depth at which the noise impact would be screened by the walls of the pit. As a result, the crusher screen was removed as a noise source from the construction noise modelling and for the 1st stage of pit excavation. The crusher was then added as a noise source at different pit depths until acceptable noise levels were predicted to be achieved at the residential receivers.

A mid-point model (at a pit depth of 10 m) was also run to show the predicted noise levels at this depth.

The predicted noise levels at the receivers when the berms are 4 m in height, with the pit 2 m deep and with the crusher operating are shown in Table 5-9.

Table 5-9: Modelling Results – with crusher operating, 3 x 4 m berms, 2 m pit depth, L_{eq}

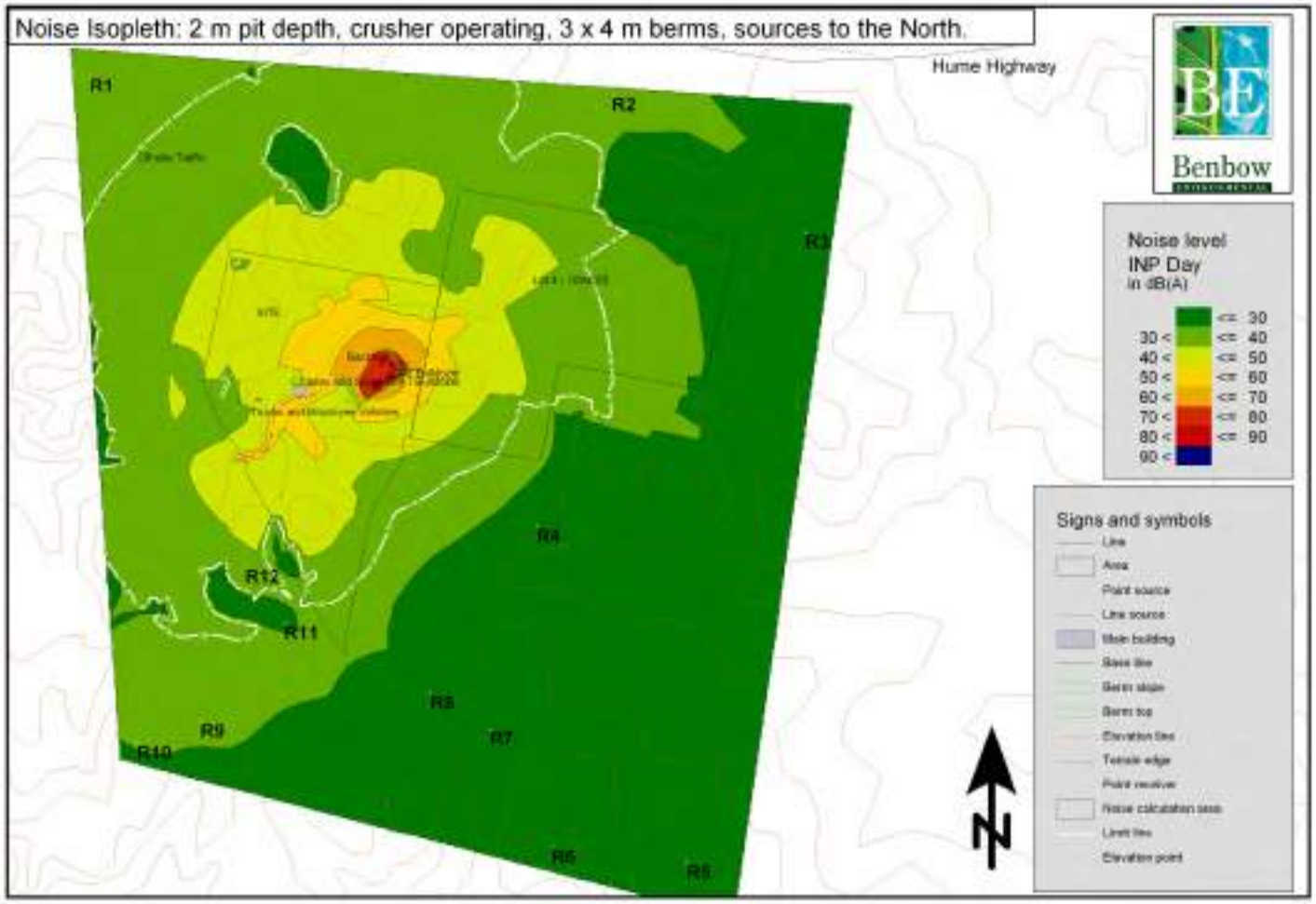
Receiver	Modelled Noise Level For Each Scenario (dB(A))		
	Criteria	Sources South	Sources North
1	40	31	31
2	43	31	32
3	43	28	30
4	36	29	28
5	36	20	20
6	36	25	23
7	36	26	25
8	36	27	27
9	36	32	31
10	36	30	30
11	36	25	23
12	36	39	39

Note Greyed areas indicate an exceedance of the criteria.

A noise isopleth of this model is shown Figure 5-10.

The criterion is not met by between 3 dB at this pit depth and berm height for Location 12. Therefore the major noise contributors were identified at these locations and controls investigated. A scenario was run with the crusher not operating at this depth, shown in Section 5.4.1.1.1.

Figure 5-10: Noise Isopleth for 2 m pit depth, crusher operating with 4 m berms, sources N



5.4.1.1.1 Without crusher operating and with 4m earth berms, 2 - 3 m pit depth

Table 5-10: Modelling Results – without crusher operating and with 3 x 4 m berms, 2 m pit depth

Receiver	Modelled Noise Level For Each Scenario (dB(A))				
	Criteria	Pit – 2 m deep		Pit – 3 m deep	
		Sources South	Sources North	Sources South	Sources North
1	40	29	29	28	27
2	43	21	21	19	17
3	43	25	19	17	15
4	36	27	26	23	23
5	36	19	20	14	14
6	36	24	23	18	18
7	36	24	24	20	19
8	36	26	26	21	21
9	36	30	28	23	27
10	36	29	28	21	26
11	36	22	23	16	21
12	36	37	36	28	33

Note – Greyed areas indicate an exceedance of the criteria.

Non-compliance has been reduced to within 1 dB of the criteria for Location R12. This is considered to be a negligible exceedance.

At a pit depth of 3 m noise compliance is met at all locations, with the crusher not operating.

5.4.1.1.2 Crusher begins operating

In order for the site to comply with the project-specific noise limits, the crusher can only begin operating when:

- The 3 berms have reached a height of 4 m;
- The floor of the pit is at least 3 m in depth from the highest elevation on the surface; and
- The crusher is placed in a hole 5 m deep (below the 3 m pit depth) and positioned in the middle of the south-eastern berm.

Operating within these conditions gives the predicted noise levels shown in Table 5-11.

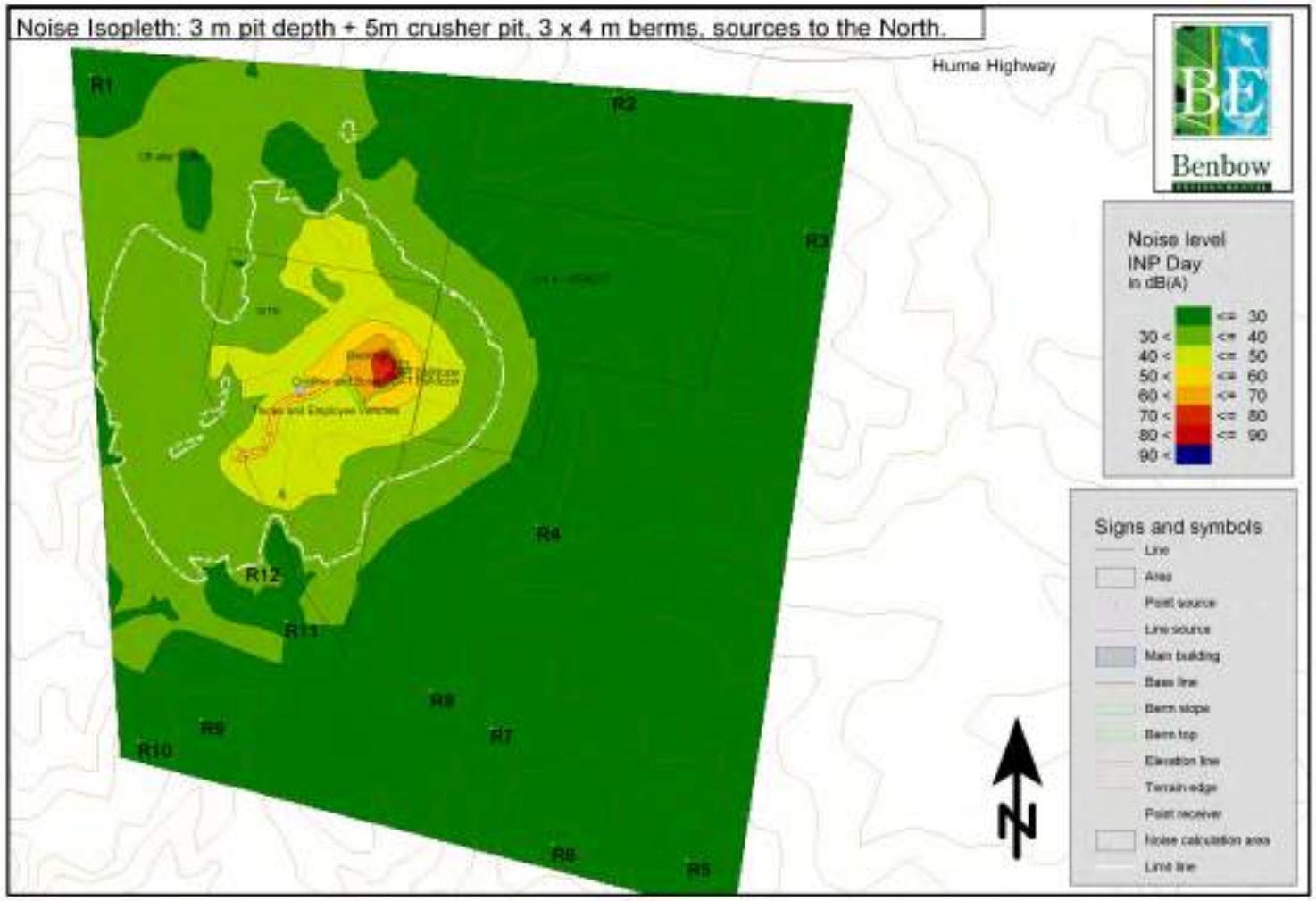
Table 5-11: Modelling Results - When crusher begins operating:
Berms 4 m, crusher in a 5 m pit, pit floor 3 m below highest elevation from the surface.

Receiver	Modelled Noise Level For Each Scenario (dB(A))	
	Criteria	Sources N, 3 m pit depth
1	40	29
2	43	22
3	43	17
4	36	25
5	36	16
6	36	20
7	36	21
8	36	23
9	36	27
10	36	27
11	36	22
12	36	34

A graphical representation of the noise impact on the surrounding environment is shown as noise isopleths in Figure 5-11.

With the crusher in a 5 m pit below a pit depth of 3 m and with two 4 m earth berms compliance is achieved with the crusher operating. The noise reduction achieved can be seen visually by comparing Figure 5-10 and Figure 5-11.

Figure 5-11: Noise Isopleth – 3 m pit depth + 5m crusher pit, 3 x4 m berms, sources to the North.



5.4.1.1.3 Mid-point Noise (10m depth)

Table 5-12 shows the mid-point noise levels that are predicted at each of the nearest receivers. This assumes a pit depth of 10 m, no crusher pit and the two permanent berms at a height of 4 m above the original ground level. The temporary berm has been modelled to be below the pit walls at this depth and is therefore considered to be removed.

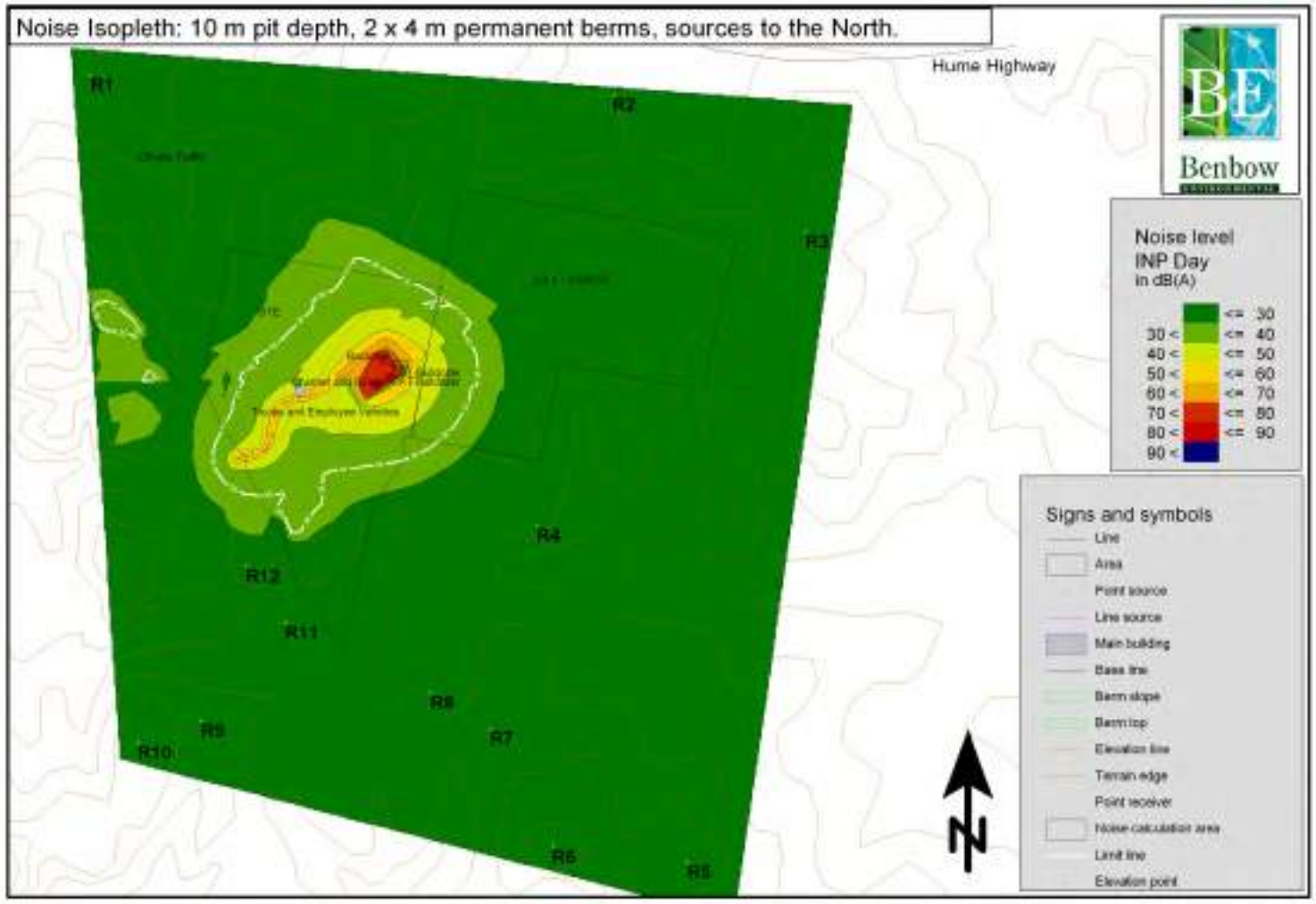
Table 5-12: Modelling Results – Mid-Point, L_{eq}, 2 x 4 m earth berms

Receiver	Modelled Noise Level For Each Scenario (dB(A))		
	Criteria	Sources South	Sources North
1	40	20	19
2	43	22	21
3	43	18	16
4	36	22	21
5	36	11	10
6	36	13	12
7	36	16	15
8	36	18	17
9	36	18	22
10	36	17	24
11	36	14	14
12	36	26	27

Compliance is predicted to be met at all locations at this depth and is expected at all depths below this level.

The noise isopleth at a depth of 10 m is shown in Figure 5-12.

Figure 5-12: Noise Isopleth at a pit depth of 10 m



5.4.2 Vibration

The level of vibration would not be perceptible at site boundaries based on numerous observations at similar operating quarries studied by Benbow Environmental. Thus, further assessment is not considered warranted.

5.4.3 Traffic Noise

It is expected that an average of 120 m^3 will be extracted per day (assuming 250 days of operation per annum). This quantity is expected to be exported with a fleet of 37 tonne trucks. Thus it has been estimated that there will be 7 truck loads per day leaving the site. Employee and delivery vehicles have been assumed at 4 vehicles per hour. Thus, the total vehicle movements per day are estimated at 22 movements. The vehicles have a speed limit of 60km/hr on the off-site road. It has been assumed that 4 truck movements in 1hr will predict the worst case noise levels for the respective receivers.

As the proposed access road connects to Hume Hwy the vehicles are not expected to access any local roads in the area. The impact of 4 vehicles per hour on the Hume Hwy existing traffic noise is expected to be negligible. Further assessment is not considered warranted

5.5 NOISE CONTROL MEASURES

Construction of the southern half (50%) of the access road must not occur at the same time as construction of the quarry site itself. Construction noise levels are predicted to comply with project specific noise levels at all other considered residential receptors.

Compliance has been predicted to be expected during normal quarrying operations under the following operating conditions:

- Operations can begin when the noise barrier/ earth berm height reaches 4 m and the pit depth is 3 m, as long as the crusher is not operating. These conditions result in predicted noise compliance at all locations.

- The crusher can begin operating under the following conditions:
  - The permanent noise barrier / earth berm has reached a height of 4 m;
  - The floor of the pit is at least 3 m in depth from the highest elevation on the original surface; and
  - The crusher is placed in a hole 5 m deep (below the 3 m pit depth) and positioned in the middle of the south-eastern berm.

  If these operating conditions are followed the site is predicted to comply at all locations under full quarrying operations.

With the above noise controls implemented during the construction and operational stages of the quarry development, it is predicted that the noise impact on the local environment will be minimal and in line with what is currently experienced from the Carrick Quarry.

6. CONCLUDING REMARKS

Benbow Environmental (BE) was commissioned by Laterals Planning to conduct a Noise Impact Assessment for a proposed quarry located at Tiyces Lane, Towrang.

A noise impact assessment was prepared in 2009 by Benbow Environmental and did not account for the construction or operation of the access road. This report updates the previous assessment to include the construction of an access road in the noise impact analysis.

Long-term background noise monitoring was undertaken at the proposed site for the purpose of this update, as the data collected in 2009 was considered obsolete.

In the compilation of this update, Benbow consultants modelled only the noise impact of the construction and operation of the access road, and the results of these calculations were added to the results of the 2009 modelling of the other aspects of the development.

The locations of nearby noise sensitive receivers have been identified with their approximate distance from the pit.

Detailed predictive noise modelling showed that by developing a 4 m permanent noise berm on the SW and SE and NE sides of the quarry (as shown in Figure 5-9) during construction; combined with specific operating conditions for the crusher, will result in minimal noise impact on the local noise environment.

This concludes the report.



Emma Hansma	Daniele Albanese	R T Benbow
Acoustic Engineer	Senior Acoustical Consultant	Principal Consultant

7. LIMITATIONS

Our services for this project are carried out in accordance with our current professional standards for site assessment investigations. No guarantees are either expressed or implied.

This report has been prepared solely for the use of Argyle (NSW) Pty Ltd, as per our agreement for providing environmental services. Only Argyle (NSW) Pty Ltd is entitled to rely upon the findings in the report within the scope of work described in this report. Otherwise, no responsibility is accepted for the use of any part of the report by another in any other context or for any other purpose.

Although all due care has been taken in the preparation of this study, no warranty is given, nor liability accepted (except that otherwise required by law) in relation to any of the information contained within this document. We accept no responsibility for the accuracy of any data or information provided to us by Argyle (NSW) Pty Ltd for the purposes of preparing this report.

Any opinions and judgements expressed herein, which are based on our understanding and interpretation of current regulatory standards, should not be construed as legal advice.

ATTACHMENTS

Attachment 1: Calibration Certificates

CERTIFICATE OF CALIBRATION

CERTIFICATE NO: 17824

EQUIPMENT TESTED: Sound Level Calibrator

Manufacturer: B & K
Type No: 4230 **Serial No:** 565912
Owner: Benbow Environmental
13 Daking Street
North Parramatta NSW 2151

Tests Performed: Measured output pressure level was found to be:

Parameter	Pre-Adj	Adj Y/N	Output: (db re 20 μPa)	Frequency: (Hz)	THD&N (%)
Level 1:	NA	N	93.44	988.70	0.32
Level 2:	NA	N	NA	NA	NA
Uncertainty:			±0.11 dB	±0.05 Hz	±0.2 %

Uncertainty (at 95% c.l.) k=2

CONDITION OF TEST:
Ambient Pressure: 990 hPa ±1.5 hPa **Relative Humidity:** 42% ±5%
Temperature: 24 °C ±2° C
Date of Calibration: 03/09/2015 **Issue Date:** 03/09/2015
Acu-Vib Test Procedure: AVP02 (Calibrators)
Test Method: AS IEC 60942 - 2004
CHECKED BY: ...AN **AUTHORISED SIGNATURE:** ....
Per. Jack Kielt

Accredited for compliance with ISO/IEC 17025
The results of the tests, calibration and/or measurements included in this document are traceable to Australian/national standards.

NATA
WORLD RECOGNISED ACCREDITATION
Accredited Lab. 9262
Acoustic and Vibration Measurements

ACU-VIB
ELECTRONICS
HEAD OFFICE
Unit 14, 22 Hudson Ave. Castle Hill NSW 2154
Tel: (02) 96808133 Fax: (02) 96808233
Mobile: 0413 809806
Web site: www.acu-vib.com.au

Page 1 of 1 End of Calibration Certificate
AVCERT02 Rev.1.3 11.02.14

Certificate Of Calibration

Certificate No.: **SLM 41048 & FILT 0932**

Equipment Description:	Sound & Vibration Analyser		
Manufacturer:	Svantek		
Model No:	Svan-957	**Serial No:**	15336
Microphone Type:	7052E	**Serial No:**	47869
Filter Type:	1/3 Octave	**Serial No:**	15336
Comments:	All tests passed for type 1. (See over for details)		
Owner:	Benbow Environmental 13 Daking Street North Parramatta 2151		
Ambient Pressure:	1018 hPa ±1.5 hPa		
Temperature:	24 °C ±2° C	**Relative Humidity:**	42% ±5%
Date of Calibration:	21/07/2015	**Issue Date:**	23/07/2015

Acu-Vib Test Procedure: AVP05 (SLM) & AVP06 (Filters)

Checked by: RL **Authorised Signature:** .... Jack Kutt

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NATA

Accredited Lab. No. 9262
Acoustic and Vibration Measurements

ACU-VIB
ELECTRONICS

HEAD OFFICE
Unit 14, 22 Hudson Ave. Castle Hill NSW 2154
Tel: (02) [illegible] Fax: (02) [illegible]
Mobile: [illegible]
web site: www.acu-vib.com.au

Page 1 of 2
AVCERT05 Rev.1.1 [illegible]

Acoustic Research Labs Pty Ltd
Level 7 Building 2 423 Pennant Hills Rd
Pennant Hills NSW AUSTRALIA 2120
Ph: +61 2 9484 0800 A.B.N. 65 160 399 119
www.acousticresearch.com.au

Sound Level Meter

AS 1259.1:1990 - AS 1259.2:1990

Calibration Certificate

Calibration Number C15346

Client Details Benbow Environmental
13 Daking St
North Parramatta NSW 2151

Equipment Tested/ Model Number : ARL EL-215
Instrument Serial Number : 194441
Microphone Serial Number : N/A
Pre-amplifier Serial Number : N/A

Atmospheric Conditions
Ambient Temperature : 21.8°C
Relative Humidity : 44%
Barometric Pressure : 99.21kPa

Calibration Technician : Dennis Kim
Calibration Date : 16/07/2015
Secondary Check: Kate Alchin
Report Issue Date : 17/07/2015
Approved Signatory : Ken Williams

Clause and Characteristic Tested	Result	Clause and Characteristic Tested	Result
10.2.2: Absolute sensitivity	Pass	10.3.4: Inherent system noise level	Pass
10.2.3: Frequency weighting	Pass	10.4.2: Time weighting characteristic F and S	Pass
10.3.2: Overload indication	Pass	10.4.3: Time weighting characteristic I	Pass
10.3.3: Accuracy of level range control	Pass	10.4.5: R.M.S performance	Pass
8.9: Detector-indicator linearity	Pass	9.3.2: Time averaging	Pass
8.10: Differential level linearity	Pass	9.3.5: Overload indication	Pass

Least Uncertainties of Measurement -

Acoustic Tests
31.5 Hz to 8kHz: ±0.170dB
12.5kHz: ±0.165dB
16kHz: ±0.245dB

Electrical Tests
31.5 Hz to 20 kHz: ±0.098dB

Environmental Conditions
Temperature ±0.3°C
Relative Humidity ±4.1%
Barometric Pressure ±0.1kPa

All uncertainties are derived at the 95% confidence level with a coverage factor of 2.

This calibration certificate is to be read in conjunction with the calibration test report.

Acoustic Research Labs Pty Ltd is NATA Accredited Laboratory Number 14172.
Accredited for compliance with ISO/IEC 17025

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/National standards.

Acoustic Research Labs Pty Ltd
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Sound Level Meter

AS 1259.1:1990 - AS 1259.2:1990

Calibration Certificate

Calibration Number C15347

Client Details Benbow Environmental
13 Daking St
North Parramatta NSW 2151

Equipment Tested/ Model Number : ARL EL-215
Instrument Serial Number : 194552
Microphone Serial Number : N/A
Pre-amplifier Serial Number : N/A

Atmospheric Conditions
Ambient Temperature : 21.6°C
Relative Humidity : 45%
Barometric Pressure : 99.1kPa

Calibration Technician : Dennis Kim
Calibration Date : 16/07/2015
Secondary Check: Kate Alchin
Report Issue Date : 17/07/2015
Approved Signatory : Ken Williams

Clause and Characteristic Tested	Result	Clause and Characteristic Tested	Result
10.2.2: Absolute sensitivity	Pass	10.3.4: Inherent system noise level	Pass
10.2.3: Frequency weighting	Pass	10.4.2: Time weighting characteristic F and S	Pass
10.3.2: Overload indications	Pass	10.4.3: Time weighting characteristic I	Pass
10.3.3: Accuracy of level range control	Pass	10.4.5: R.M.S performance	Pass
8.9: Detector-indicator linearity	Pass	9.3.2: Time averaging	Pass
8.10: Differential level linearity	Pass	9.3.5: Overload indication	Pass

Least Uncertainties of Measurement -

Acoustic Tests
31.5 Hz to 8kHz ±0.170dB
12.5kHz ±0.181dB
16kHz ±0.216dB

Electrical Tests
31.5 Hz to 20 kHz ±0.098dB

Environmental Conditions
Temperature ±0.2°C
Relative Humidity ±4.1%
Barometric Pressure ±0.1kPa

All uncertainties are derived at the 95% confidence level with a coverage factor of 2.

This calibration certificate is to be read in conjunction with the calibration test report.

Acoustic Research Labs Pty Ltd is NATA Accredited Laboratory Number 14372.
Accredited for compliance with ISO/IEC 17025.

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/National standards.

Acoustic Research Labs Pty Ltd
Level 7 Building 2 423 Pennant Hills Rd
Pennant Hills NSW AUSTRALIA 2120
Ph: +61 2 9484 0800 A.B.N. 65 260 393 119
www.acousticresearch.com.au

Sound Level Meter

AS 1259.1:1990 - AS 1259.2:1990

Calibration Certificate

Calibration Number C15348

Client Details Benbow Environmental
13 Daking Street
North Parramatta NSW 2151

Equipment Tested/ Model Number : ARL EL-215
Instrument Serial Number : 194593
Microphone Serial Number : N/A
Pre-amplifier Serial Number : N/A

Atmospheric Conditions

Ambient Temperature : 20.8°C
Relative Humidity : 50.9%
Barometric Pressure : 99.8kPa

Calibration Technician : Calvin Stapfendorfer
Secondary Check: Kate Alchin
Calibration Date : 24/07/2015
Report Issue Date : 27/07/2015
Approved Signatory : Ken Williams

Clause and Characteristic Tested	Result	Clause and Characteristic Tested	Result
10.2.2: Absolute sensitivity	*Pass*	10.3.4: Inherent system noise level	*Pass*
10.2.3: Frequency weighting	*Pass*	10.4.2: Time weighting characteristic F and S	*Pass*
10.3.2: Overload indications	*Pass*	10.4.3: Time weighting characteristic I	*Pass*
10.3.3: Accuracy of level range control	*Pass*	10.4.5: R.M.S performance	*Pass*
8.9: Detector-indicator linearity	*Pass*	9.3.2: Time averaging	*Pass*
8.10: Differential level linearity	*Pass*	9.3.5: Overload indication	*Pass*

Total Uncertainties of Measurement -

Acoustic Tests
31.5 Hz to 8kHz: ±0.12dB
12.5kHz: ±0.16dB
16kHz: ±0.24dB

Electrical Tests
31.5 Hz to 20kHz: ±0.89dB

Environmental Conditions
Temperature ±0.3°C
Relative Humidity ±4.1%
Barometric Pressure ±0.1kPa

All uncertainties are derived at the 95% confidence level with a coverage factor of 2.

This calibration certificate is to be read in conjunction with the calibration test report.

Acoustic Research Labs Pty Ltd is NATA Accredited Laboratory Number 14372.
Accredited for compliance with ISO/IEC 17025.

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/National standards.

Attachment 2: QA/QC Procedures

Calibration of Sound Level Meters

A sound level meter requires regular calibration to ensure its measurement performance remains within specification. Benbow Environmental sound level meters are calibrated by a National Association of Testing Authority (NATA) registered laboratory or a laboratory approved by the NSW Environment Protection Authority (EPA) every two years and after each major repair, in accordance with AS 1259-1990.

The calibration of the sound level meter was checked immediately before and after each series of measurements using an acoustic calibrator. The acoustic calibrator provides a known sound pressure level, which the meter indicates when the calibrator is activated while positioned on the meter microphone.

The sound level meters also incorporate an internal calibrator for use in setting up. This provides a check of the electrical calibration of the meter, but does not check the performance of the microphone. Acoustical calibration checks the entire instrument including the microphone. Calibration certificates for the instrument sets used have been included as Attachment 1.

Care and Maintenance of Sound Level Meters

Noise measuring equipment contains delicate components and therefore must be handled accordingly. The equipment is manufactured to comply with international and national standards and is checked periodically for compliance. The technical specifications for sound level meters used in Australia are defined in Australian Standard AS 1259 – 1990 "*Sound Level Meters"*.

The sound level meters and associated accessories are protected during storage, measurement and transportation against dirt, corrosion, rapid changes of temperature, humidity, rain, wind, vibration, electric and magnetic fields. Microphone cables and adaptors are always connected and disconnected with the power turned off. Batteries are removed (with the instrument turned off) if the instrument is not to be used for some time.

Investigation Procedures

All investigative procedures were conducted in accordance with AS 1055.1-1997 *Acoustics – "Description and Measurement of Environmental Noise (Part 1: General Procedures)"*.

The following information was recorded and kept for reference purposes:

- type of instrumentation used and measurement procedure conducted;
- description of the time aspect of the measurements, ie. measurement time intervals; and
- positions of measurements and the time and date were noted.

As per AS 1055.1-1997, all measurements were carried out at least 3.5 m from any reflecting structure other than the ground. The preferred measurement height of 1.2 m above the ground was utilised. A sketch of the area was made identifying positions of measurement and the approximate location of the noise source and distances in meters (approx.).

Unattended Noise Monitoring

NOISE MONITORING EQUIPMENT

ARL noise loggers type Ngara and EL-215 were used to conduct the long-term unattended noise monitoring. This equipment complies with Australian Standard 1259.2–1990 "Acoustics – Sound Level Meters" and is designated as a Type 1 and Type 2 instrument suitable for field use.

The measured data is processed statistically and stored in memory every 15 minutes. The equipment was calibrated prior and subsequent to the measurement period using a Rion NC-73 sound level calibrator. There were no significant variances observed in the reference signal between the pre-measurement and post-measurement calibrations. Instrument calibration certificates have also been included in Attachment 1.

METEOROLOGICAL CONSIDERATION DURING MONITORING

For the long-term attended monitoring, meteorological data for the relevant period were provided by the Bureau of Meteorology, which was considered representative of the site for throughout the monitoring period.

DESCRIPTORS & FILTERS USED FOR MONITORING

Noise levels are commonly measured using A-weighted filters and are usually described as dB(A). The "A-weighting" refers to standardised amplitude versus frequency curve used to "weight" sound measurements to represent the response of the human ear. The human ear is less sensitive to low frequency sound than it is to high frequency sound. Overall A-weighted measurements quantify sound with a single number to represent how people subjectively hear different frequencies at different levels.

Noise environments can be described using various descriptors depending on characteristics of noise or purpose of assessments. For this survey the L_{A90} was used to analyse the monitoring results. The statistical descriptors L_{A90} measures the noise level exceeded for 90% of the sample measurement time, and is used to describe the “Background noise”. Background noise is the underlying level of noise present in the ambient noise, excluding extraneous noise or the noise source under investigation.

Measurement sample periods were fifteen minutes. The Noise -vs- Time graphs representing measured noise levels at the noise monitoring location are presented in Attachment 3.

ATTENDED NOISE MONITORING

NOISE MONITORING EQUIPMENT

The attended short-term noise monitoring was carried out using a SVANTEK SVAN957 Class 1 Precision Sound Level Meter. The instrument was calibrated by a NATA accredited laboratory within two years of the measurement period. The instrument sets comply with AS 1259 and was set on A-weighted, fast response.

The microphone was positioned at 1.5 metres above ground level and was fitted with a windsock. The instrument was calibrated using a Rion NC-73 sound level calibrator prior and subsequent to the measurement period to ensure the reliability and accuracy of the instrument sets. There were no significant variances observed in the reference signal between the pre-measurement and post-measurement calibrations. Instrument calibration certificates have also been included in Attachment 1.

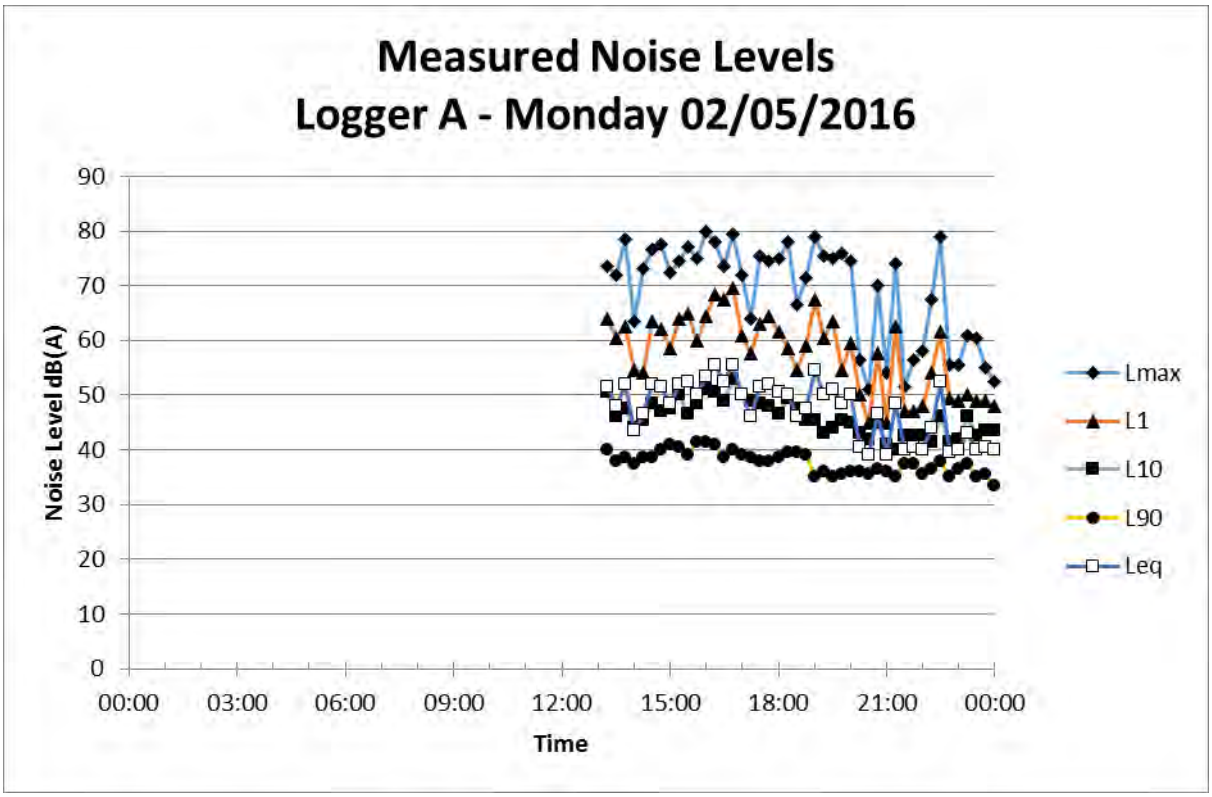
WEATHER CONDITIONS

It was partially cloudy, find without significant breeze.

METHODOLOGY

The attended noise measurements were carried out generally in accordance with Australian Standard AS 1055–1997 "Acoustics – Description and Measurement of Environmental Noise".

Attachment 3: Daily Noise Logger Charts


Measured Noise Levels
Logger A - Monday 02/05/2016
Noise Level dB(A)
90
80
70
60
50
40
30
20
10
0
00:00
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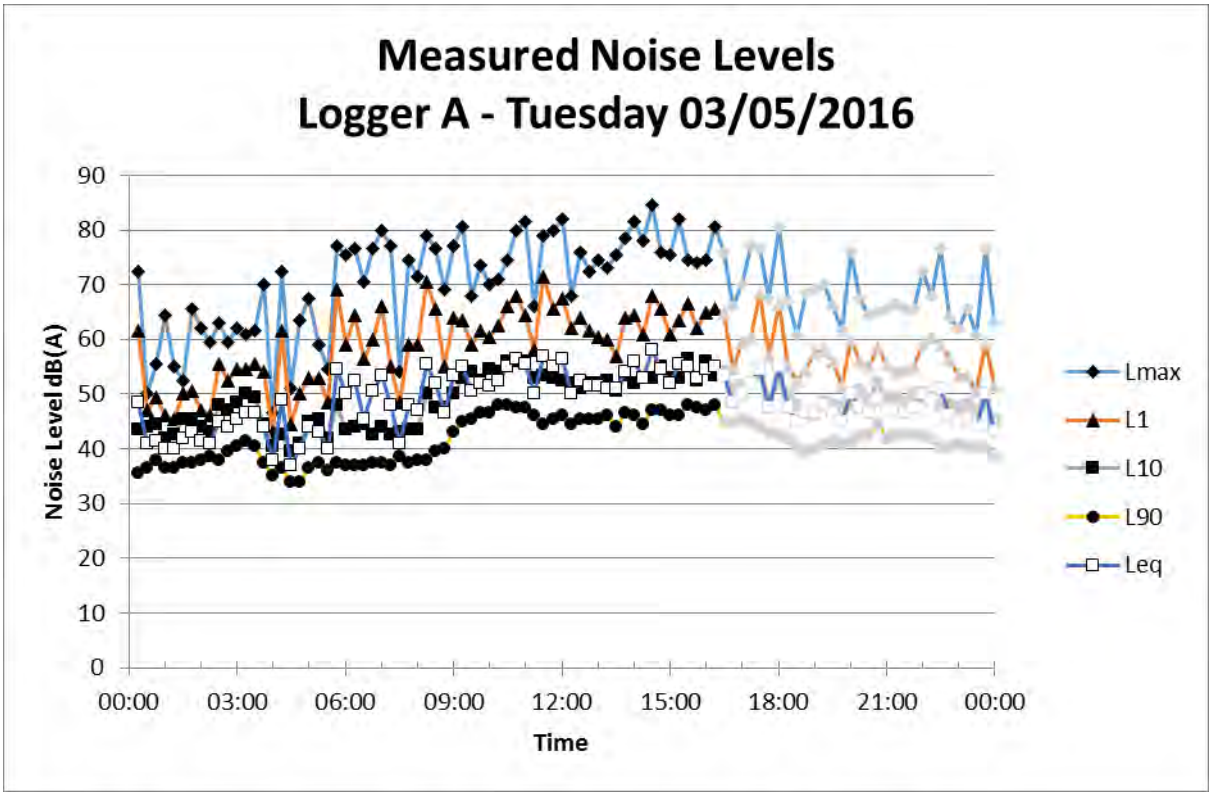
06:00
09:00
12:00
15:00
18:00
21:00
00:00
Time
Lmax
L1
L10
L90
Leq


Measured Noise Levels
Logger A - Tuesday 03/05/2016
Noise Level dB(A)
90
80
70
60
50
40
30
20
10
0
00:00
03:00
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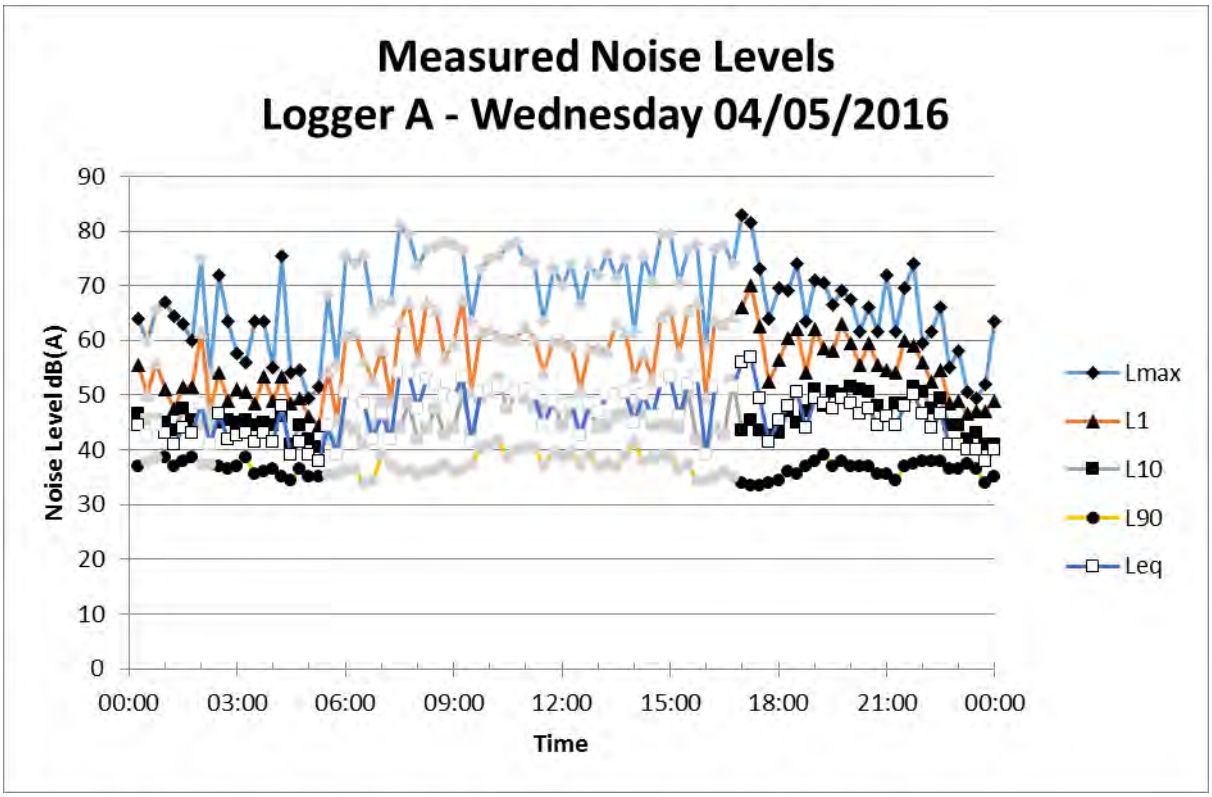
12:00
15:00
18:00
21:00
00:00
Time
Lmax
L1
L10
L90
Leq


Measured Noise Levels
Logger A - Wednesday 04/05/2016
Noise Level dB(A)
90
80
70
60
50
40
30
20
10
0
00:00
03:00
06:00
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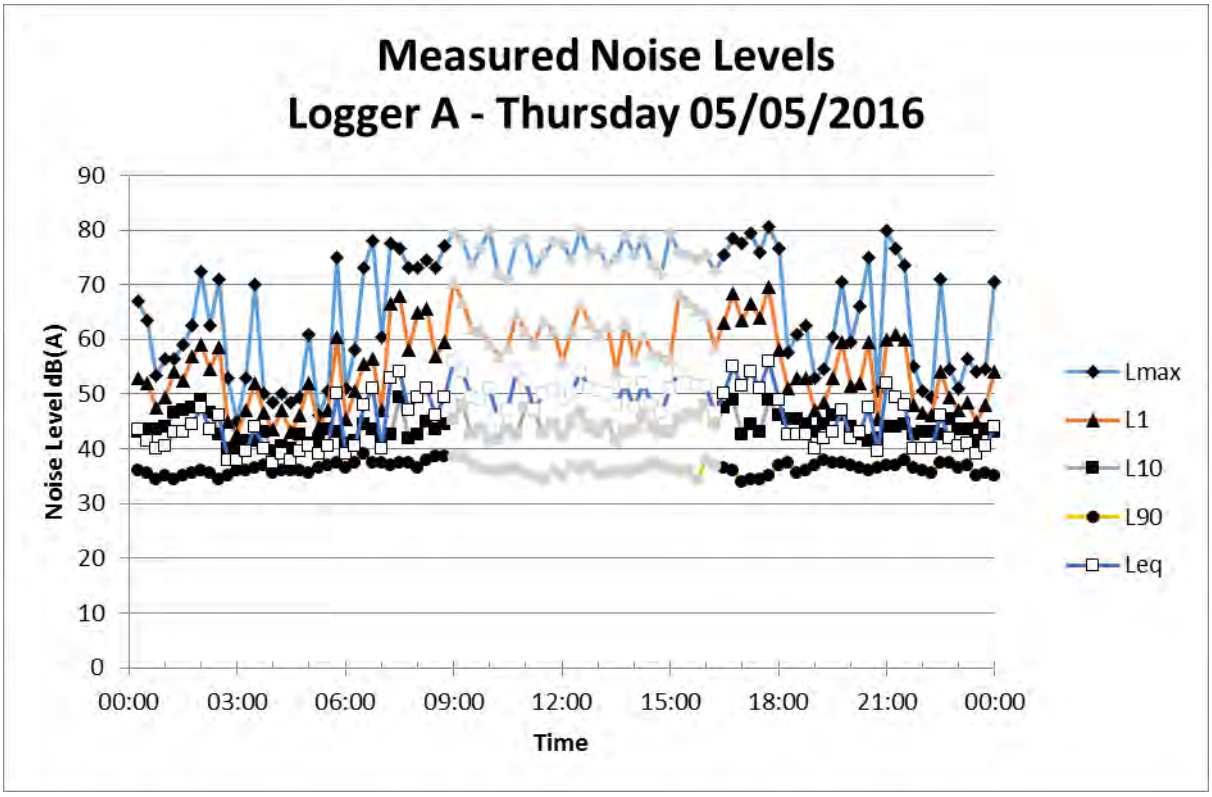
12:00
15:00
18:00
21:00
00:00
Time
Lmax
L1
L10
L90
Leq


Measured Noise Levels
Logger A - Thursday 05/05/2016
Noise Level dB(A)
90
80
70
60
50
40
30
20
10
0
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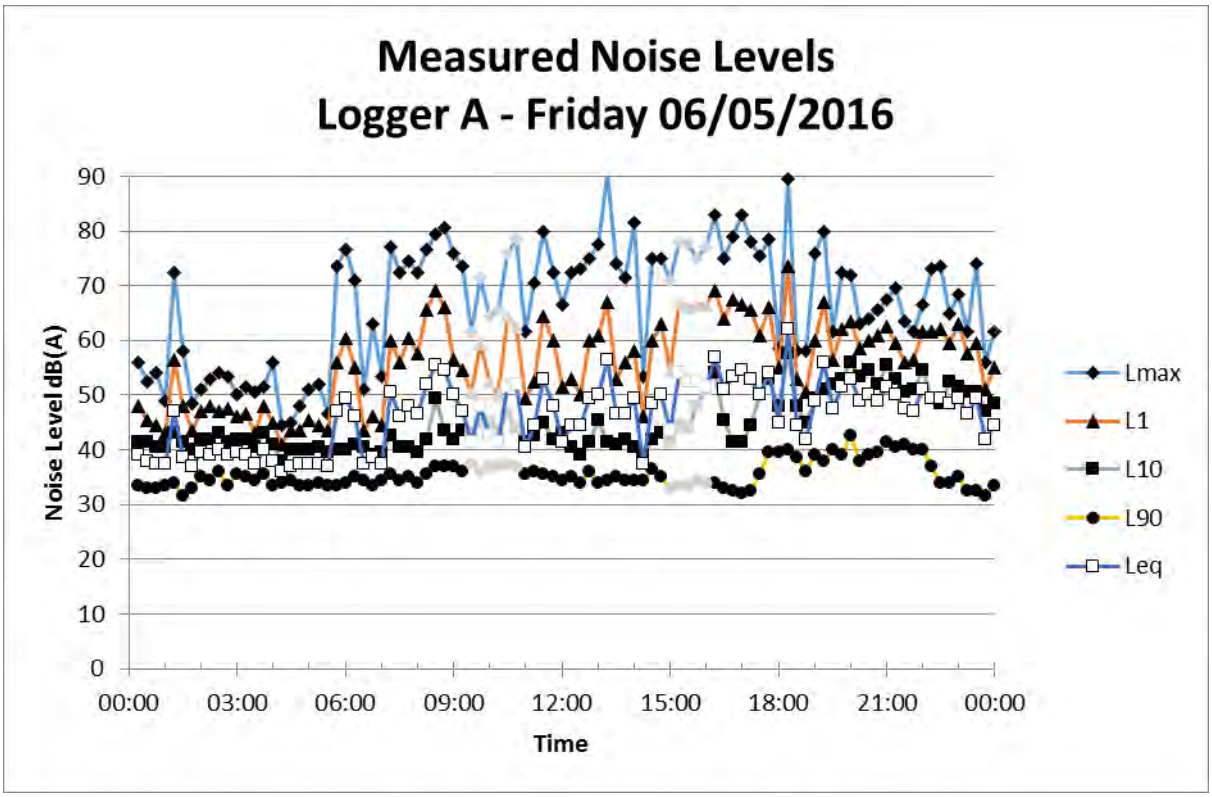
15:00
18:00
21:00
00:00
Time
Lmax
L1
L10
L90
Leq


Measured Noise Levels
Logger A - Friday 06/05/2016
Noise Level dB(A)
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80
70
60
50
40
30
20
10
0
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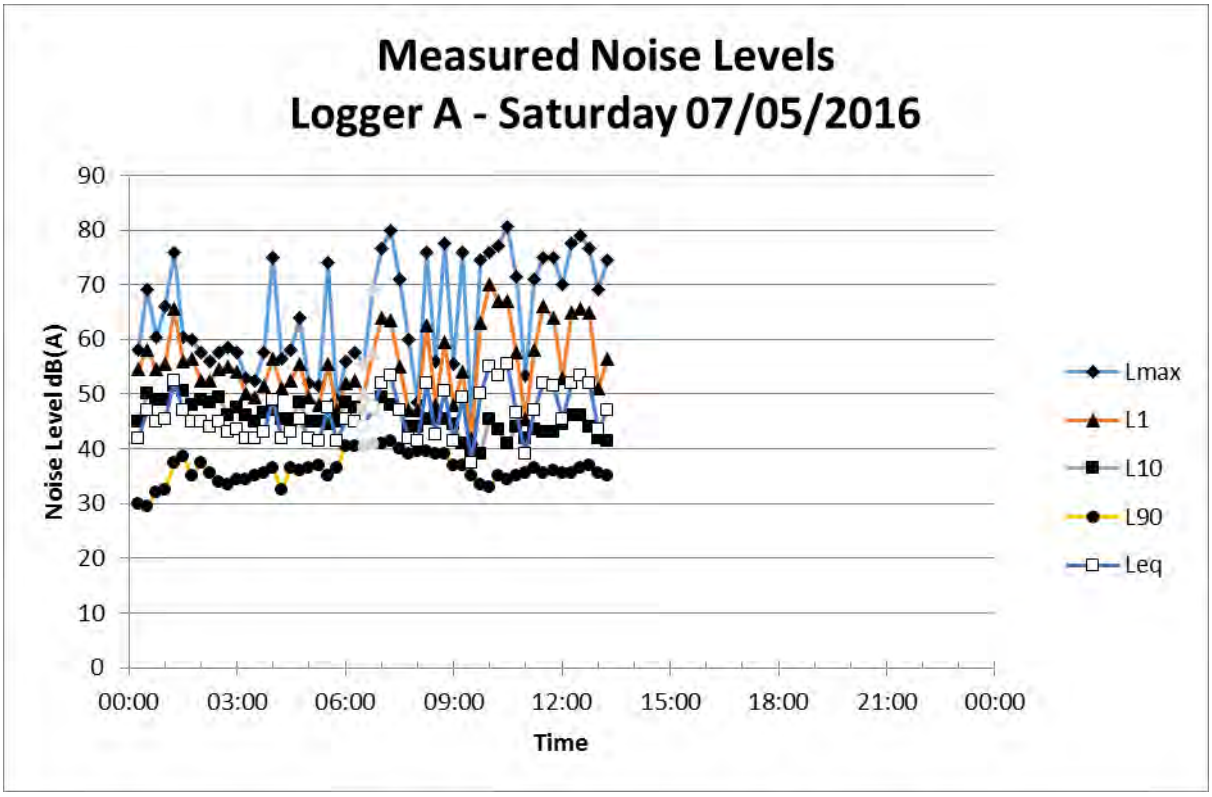
00:00
Time
Lmax
L1
L10
L90
Leq


Measured Noise Levels
Logger A - Saturday 07/05/2016
Noise Level dB(A)
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70
60
50
40
30
20
10
0
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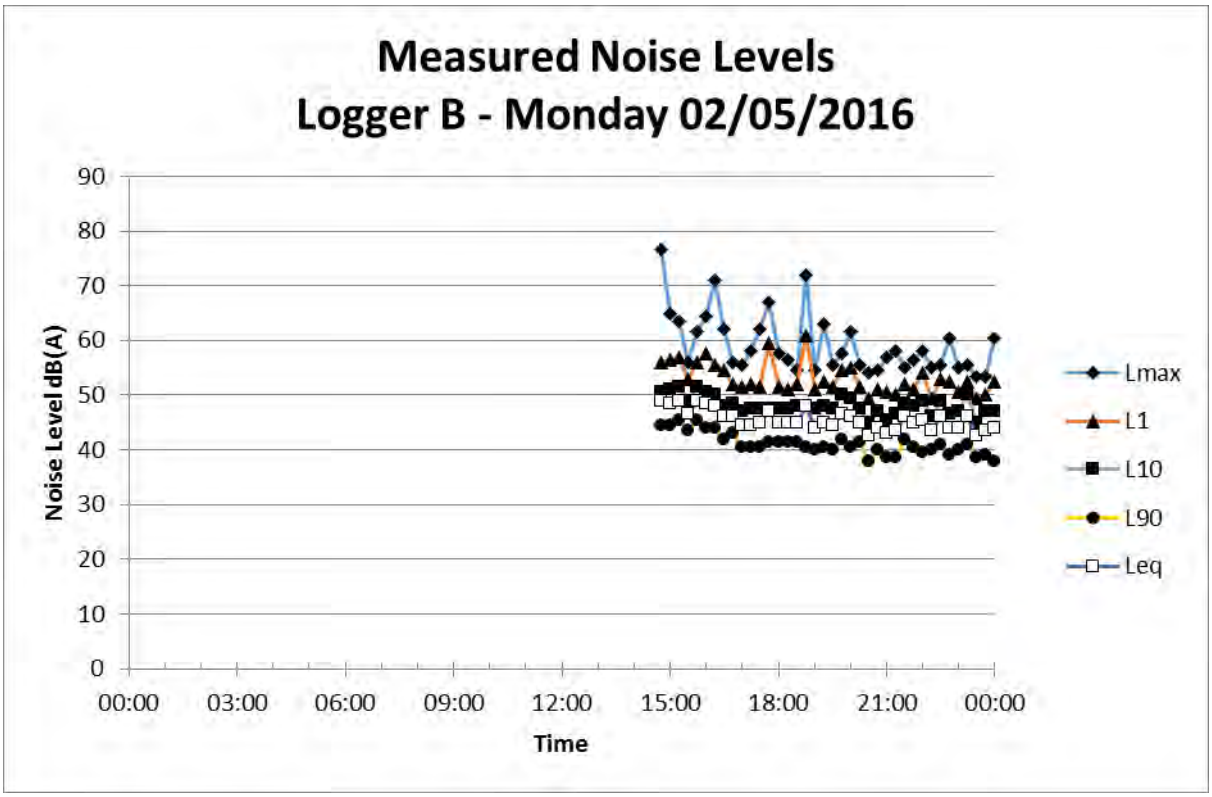
00:00
Time
Lmax
L1
L10
L90
Leq


Measured Noise Levels
Logger B - Monday 02/05/2016
Noise Level dB(A)
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70
60
50
40
30
20
10
0
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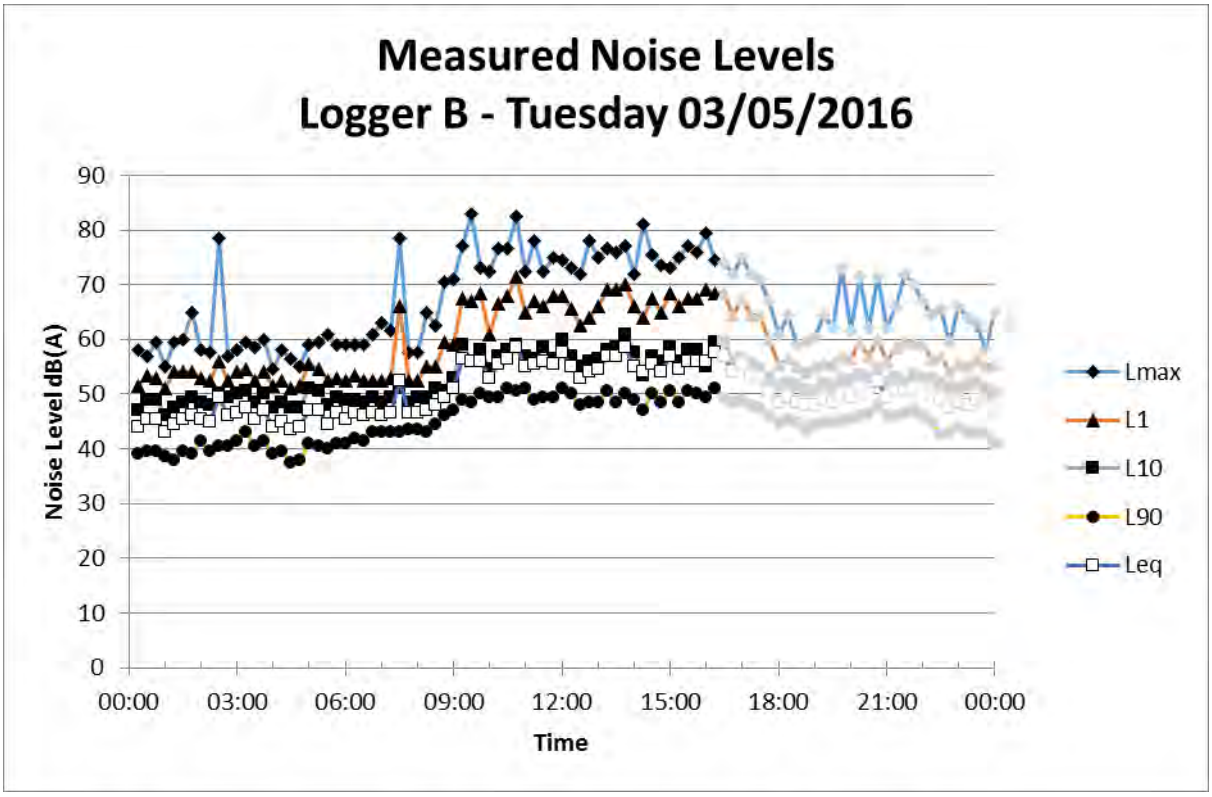
00:00
Time
Lmax
L1
L10
L90
Leq


Measured Noise Levels
Logger B - Tuesday 03/05/2016
Noise Level dB(A)
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80
70
60
50
40
30
20
10
0
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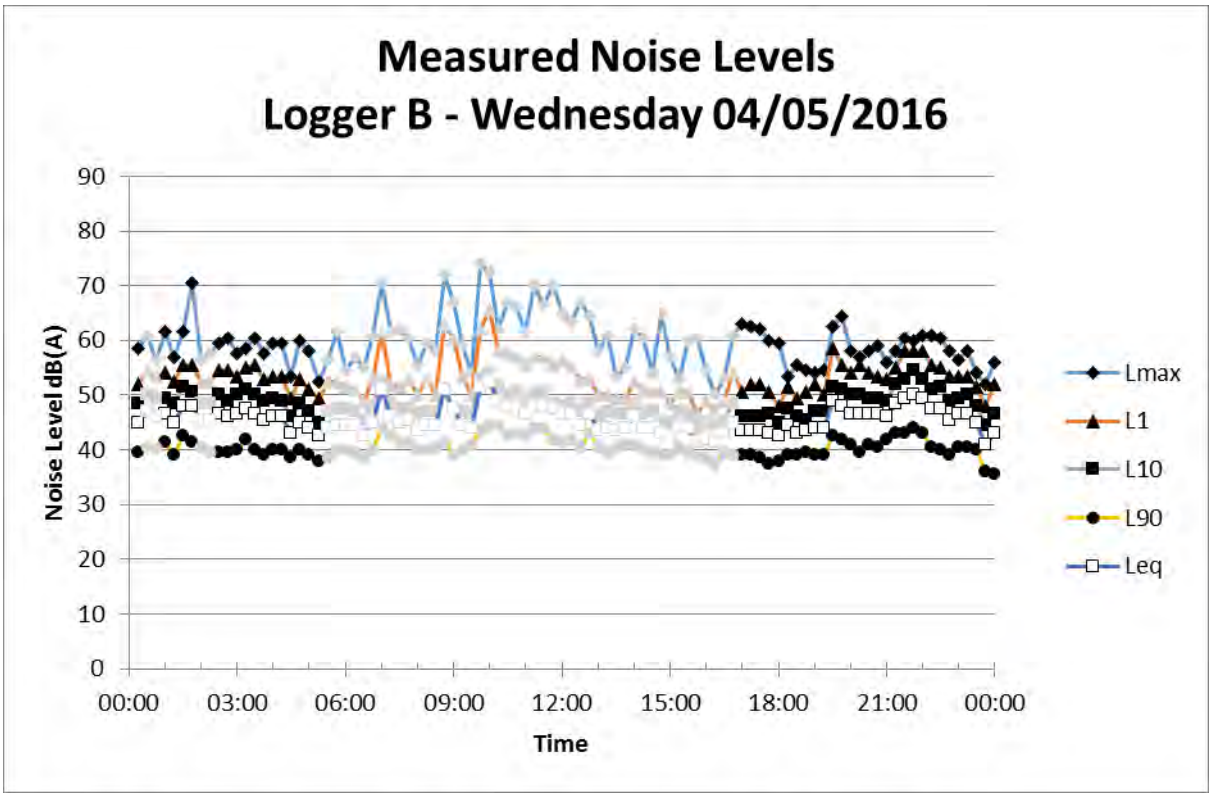
00:00
Time
Lmax
L1
L10
L90
Leq


Measured Noise Levels
Logger B - Wednesday 04/05/2016
Noise Level dB(A)
90
80
70
60
50
40
30
20
10
0
00:00
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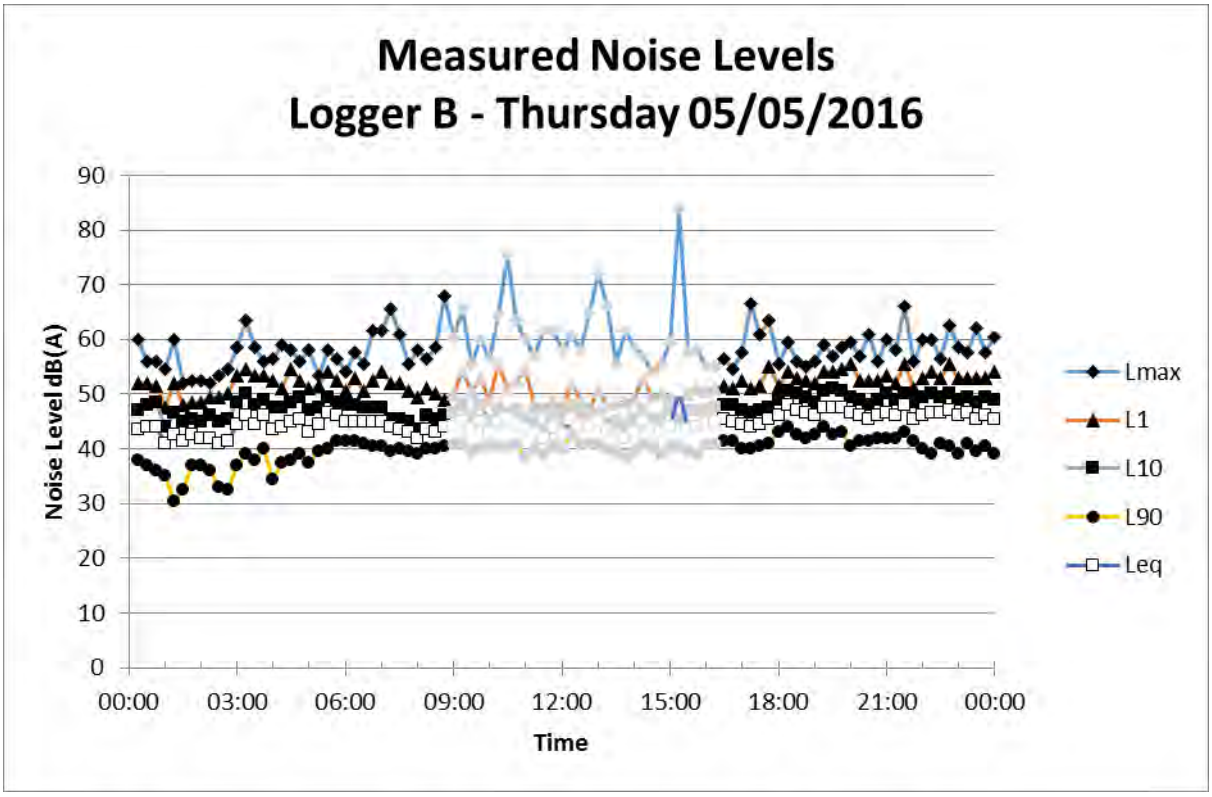
00:00
Time
Lmax
L1
L10
L90
Leq


Measured Noise Levels
Logger B - Thursday 05/05/2016
Noise Level dB(A)
90
80
70
60
50
40
30
20
10
0
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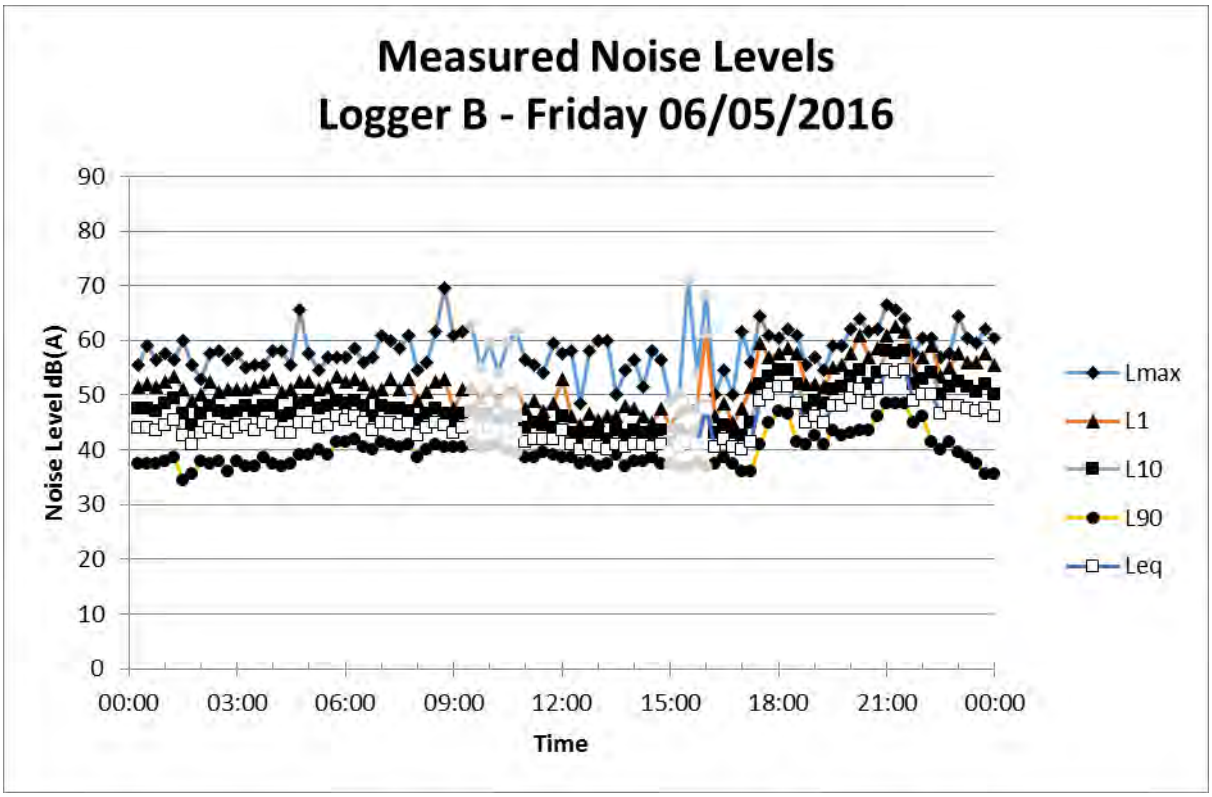
00:00
Time
Lmax
L1
L10
L90
Leq


Measured Noise Levels
Logger B - Friday 06/05/2016
Noise Level dB(A)
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80
70
60
50
40
30
20
10
0
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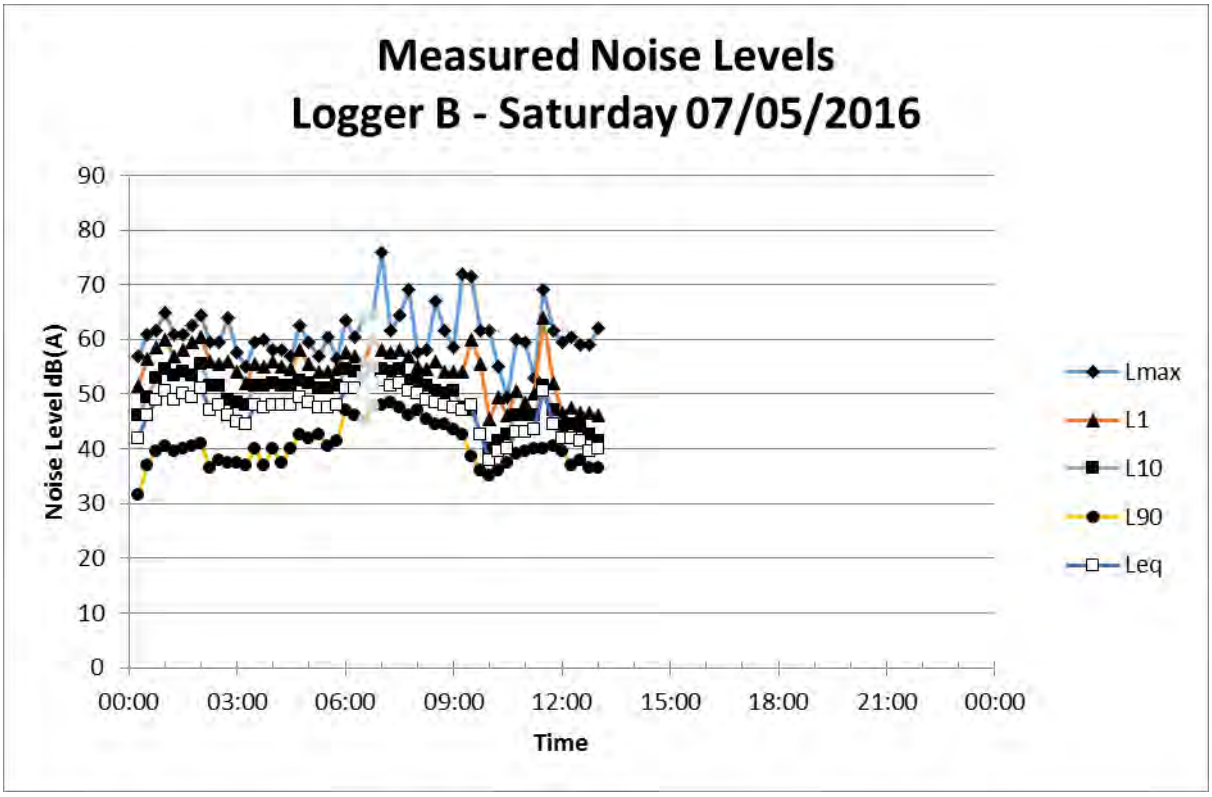
00:00
Time
Lmax
L1
L10
L90
Leq


Measured Noise Levels
Logger B - Saturday 07/05/2016
Noise Level dB(A)
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70
60
50
40
30
20
10
0
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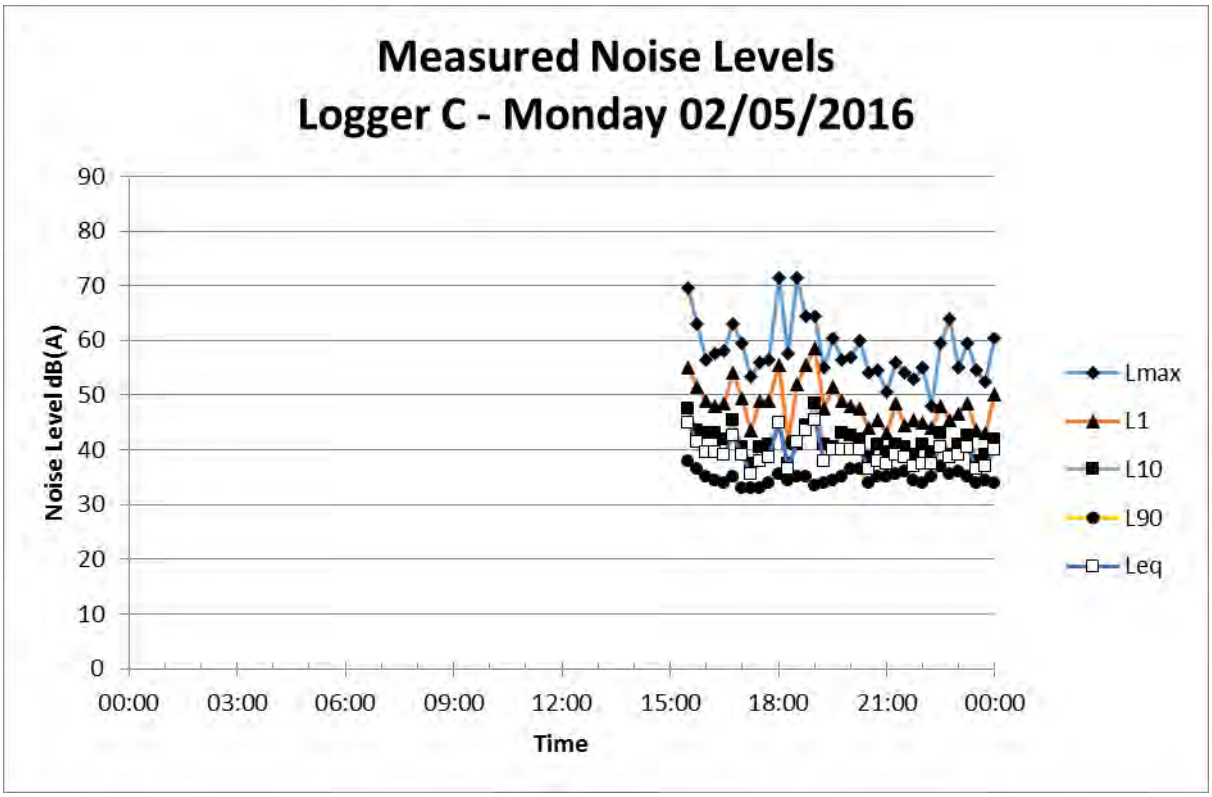
18:00
21:00
00:00
Time
Lmax
L1
L10
L90
Leq


Measured Noise Levels
Logger C - Monday 02/05/2016
Noise Level dB(A)
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50
40
30
20
10
0
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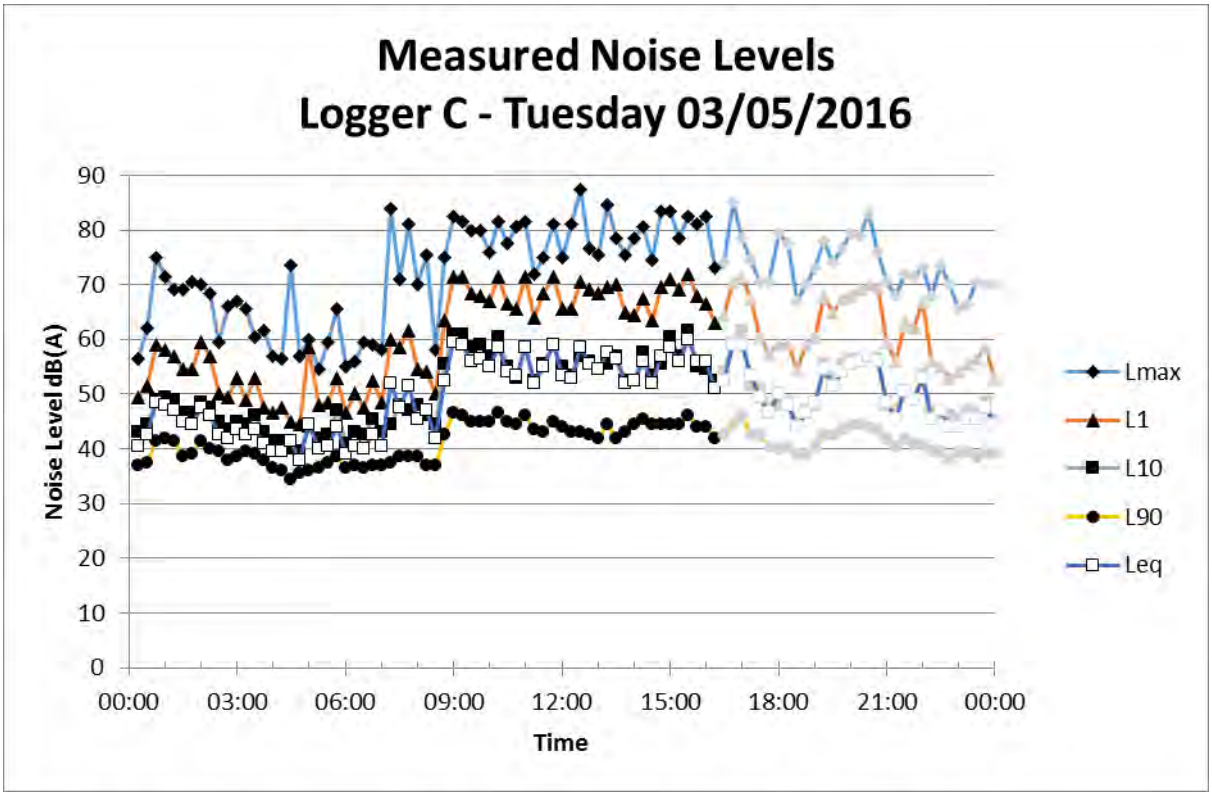
00:00
Time
Lmax
L1
L10
L90
Leq


Measured Noise Levels
Logger C - Tuesday 03/05/2016
Noise Level dB(A)
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30
20
10
0
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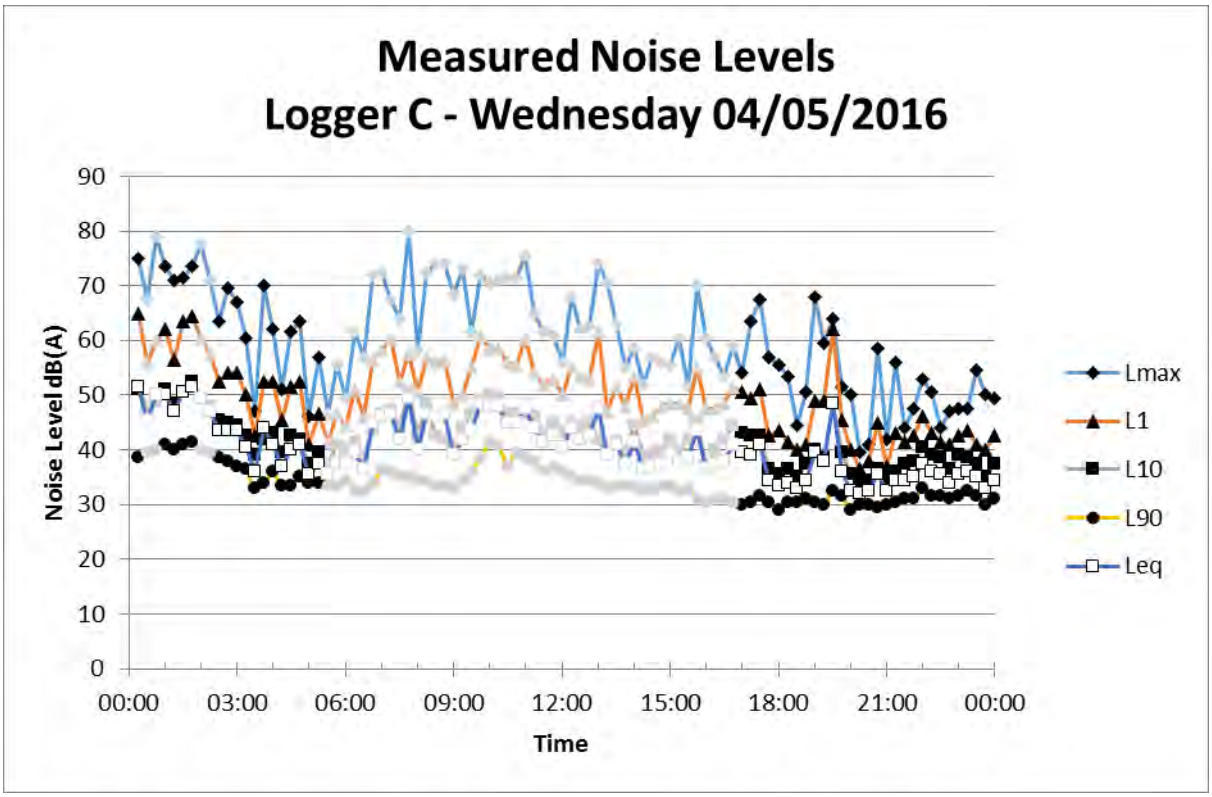
00:00
Time
Lmax
L1
L10
L90
Leq


Measured Noise Levels
Logger C - Wednesday 04/05/2016
Noise Level dB(A)
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80
70
60
50
40
30
20
10
0
00:00
03:00
06:00
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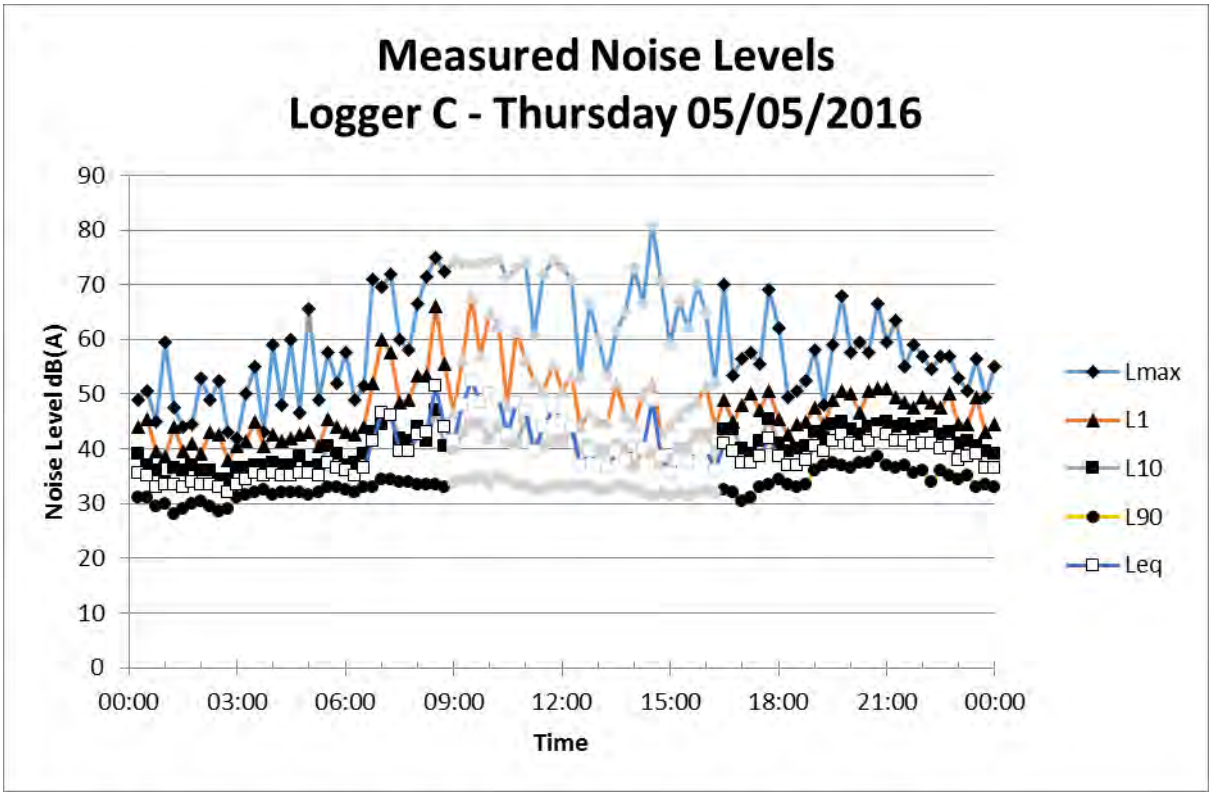
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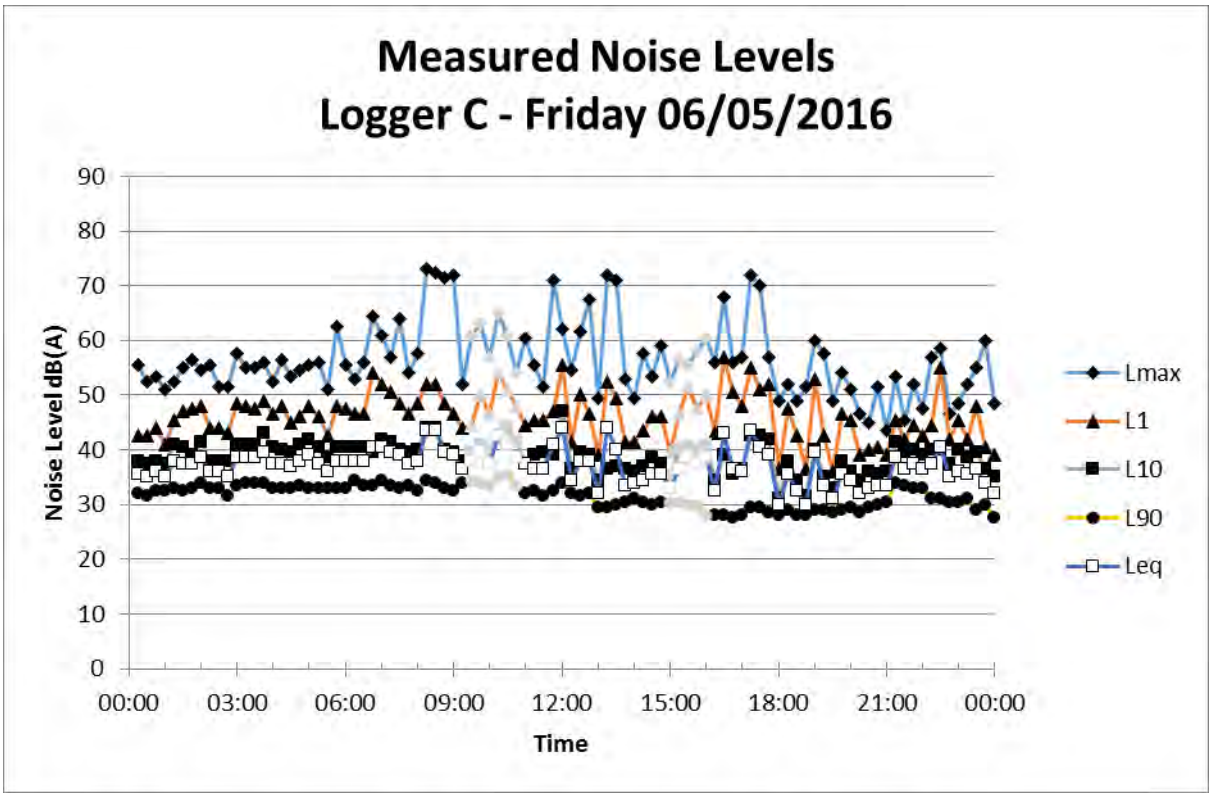
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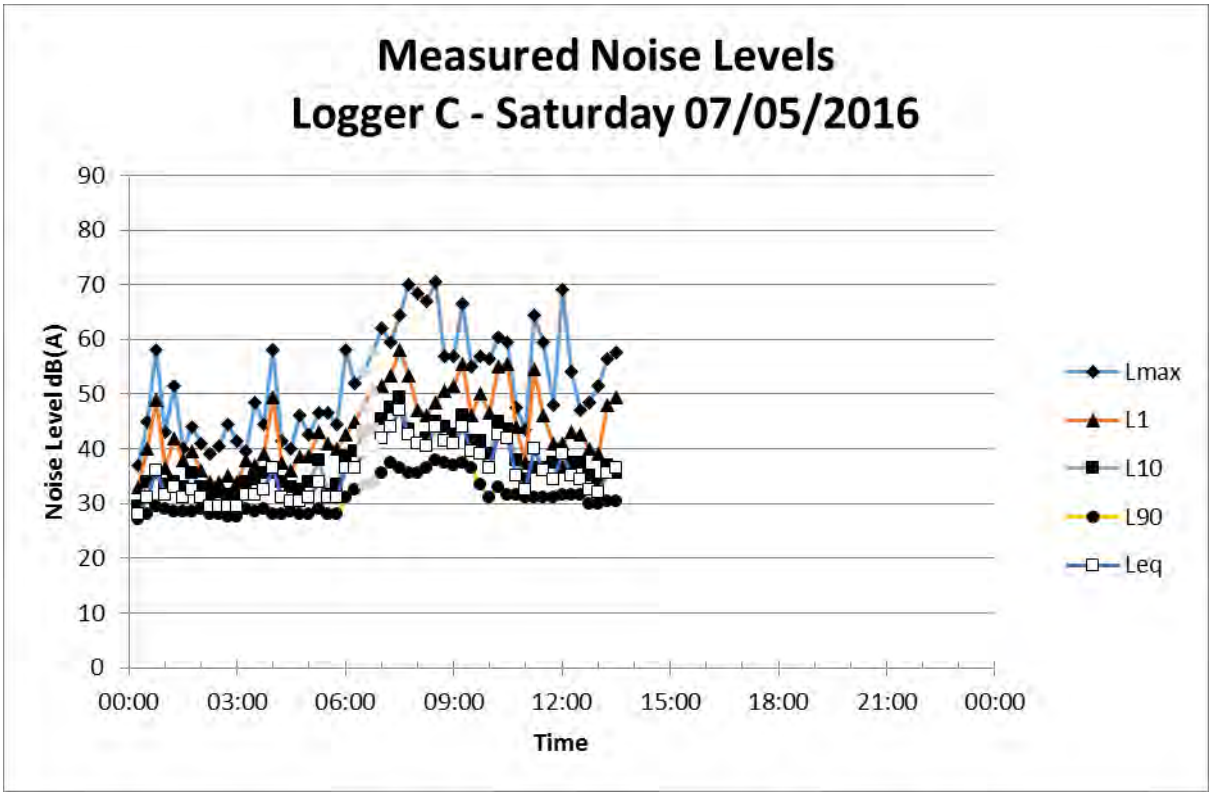
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P. Water Cycle Management Study by SEEC incorporating:

a. Water Cycle Management Study April 2017.

b. Waste Water Assessment 23/3/2015.

The General Manager
Goulburn Mulwaree Shire Council
Locked Bag 22
Goulburn NSW 2580

SEEC

STRATEGIC ENVIRONMENTAL
& ENGINEERING CONSULTING

www.seec.com.au

Our reference: 15000087-L-01
Your reference:

23rd March 2015

Dear Sir/Madam

Re: Onsite Wastewater Management
Proposed Site Amenities
Lot 1 DP 1094055, Tiyces Lane, Towrang, NSW, 2580

SEEC have been commissioned by Argyle (NSW) Pty Ltd to prepare this revision to an existing On-site Wastewater Management Study for this site prepared by Laterals Planning and Environmental. That report is attached to this letter.

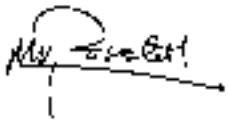
The Laterals Report identified a location for an onsite wastewater management system to serve the proposed amenities for a quarry development. It identified a potential load of 150 L/day and recommended wastewater be treated in an Aerated Wastewater Management System, with treated effluent disposed by irrigation.

It is now proposed to change the method of wastewater treatment and disposal to a septic tank to absorption trench system. Assuming the same design load (150L/d) and a clay loam subsoil, the required length of trench (600 mm wide) is 150/10/0.6 = 25 m. The permissible maximum length of trench is 20 m so two trenches would be built each 0.6 m x 12.5 m. A splitter box will be used to evenly dose each trench. The septic tank will have a capacity of 3,000L and be fitted with an outlet filter, which will require periodic cleaning. The system would be located in the same area shown in Figure 3 of the Laterals Report. The trenches would be built along the contour, end-to-end.

Suites 7 and 8
68-70, Station Street, Bowral
PO Box 1098
Bowral NSW 2576

Tel. 02 4862 1633
Fax. 02 4862 3088
reception@seec.com.au

Yours sincerely



Mark Passfield
Director
SEEC

Principals: Mark Passfield CPESC and Andrew Macleod CPSS CPESC ABN 97 155 426 289

Laterals

Planning
Engineering & Management
Environmental

On-site Wastewater Management Study

Lot 1 DP 1094055, Tiyces Lane, Towrang, NSW, 2580.

November 2008
Project 8043

Prepared by:
John Chapple
Laterals Environmental
240 Cowper Street, Goulburn, NSW, 2580
Ph: (02) 4821 0973
Fax: (02) 4821 0954
Email: chapple@laterals.com.au
Date: 16/12/2008

Document Certification

I certify that I have prepared this report following the standards and guidelines set out in:

(i) Environment and Health Protection Guidelines: Onsite Sewage Management for Single Households (Department of Local Government, 1998);

(ii) AS/NZS 1547: *On-site Domestic Wastewater Management* (Standards Australia/Standards New Zealand, 2000);

(iii) SCA (2006). Neutral or Beneficial Effect on Water Quality Assessment Guidelines.

This report has been developed based on agreed requirements as understood by Laterals at the time of the investigation. It applies only to the specific task on the nominated lands. Other interpretations should not be made, including changes in scale or application to other projects.

Any recommendations contained in this report are based on an honest appraisal of the opportunities and constraints that existed at the site at the time of the investigation, subject to the limited scope and resources available.

Should the conditions encountered on site during subsequent works appear to differ from those anticipated by this report, the company requests that it be notified immediately and given an opportunity to review any recommendations.

Conditions might vary because both natural processes and human activities affect surface and subsurface features.

Geotechnical consultants cannot always anticipate unexpected variations in the surface or subsurface conditions – the potential for this will depend partly on any soil/water sampling location and/or frequency.

Within the confines of the above statements and to the best of my knowledge, this report does not contain any incomplete or misleading information.

John Chapple BAgr
Environmental Consultant
Laterals Environmental

16/12/2008

1 Introduction

Laterals Environmental have been commissioned by Mr to provide this On-site Wastewater Management Study (OWMS). It is required to accompany a development application for the construction of a quarry on Lot 1 DP 1094055, Tiyces Lane, Towrang, NSW, 2580.

Figure 1 Property layout on topographic map. Topographic map copyright LPI Australia.

2 Proposed Development

It is proposed to construct a quarry on the site with a proposed amenities and storage shed, as shown in Figure 1. A new road or right-of-carriageway is proposed for the lot with access to Tiyces Lane.

A proposed amenities has been identified on the lot and an assessment of that sites suitability for onsite wastewater management has been compiled. The site is not serviced by reticulated water, so we anticipate that domestic supply will come from rainwater tanks, used to collect roof runoff from houses or sheds.

3 The Site

3.1 General Conditions

The site is located on a side slope, off Tiyces Lane, Towrang. The proposed amenities and storage shed is located on lands that appear to be above the geomorphic level of the 1% AEP.

There are numerous drainage depressions that run through the site.

3.2 Catchments

Numerous drainage depressions traverse this site. When siting the potential disposal area, appropriate buffer distances of 100m must be maintained to the creeks and 40m to drainage depressions.

3.3 Climate

Goulburn has a temperate climate, with warm summers and temperatures below 15ºC in winter. According to the Australian Bureau of Meteorology (BOM), Goulburn receives a mean annual rainfall of 650mm and experiences 1,277mm mean annual evaporation. Rainfall is evenly distributed throughout the year, but with a peak in November and trough in July; evaporation is greater in late spring and summer. Evaporation exceeds rainfall for most of the year and so the climate is considered a minor limitation to onsite effluent disposal.

Table 1 Monthly rainfall and evaporation for Goulburn Progress St (BOM, 2006)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
mean rainfall (mm)	61	59	56	51	48	46	45	58	50	57	66	54
mean evaporation (mm)	195	154	127	78	50	33	37	59	84	118	150	192

3.4 Soils and Geology

3.4.1 Soil Landscape Mapping

1:100,000 Soil Landscape mapping by the Department of Land and Water Conservation (DLWC), now the Department of Natural Resources (DNR) and the Sydney Catchment Authority (SCA) (2002) identifies two soil landscapes at this site.

i. Tarrawarra Soil Landscape consists of undulating low hills and rises on meta-sediments. Poor acidic, saline and sodic soils. Severe erosion problems. Originally from the Braidwood 1:100 000 sheet this landscape occurs within the Bungonia Hills physiographic region.

ii. Durran Durra Soil Landscape consists of rolling to steep hills on meta-sediments. Infertile stony landscape often left under timber. Often 40 % or greater surface cobbles and stones. The landscape is commonly found within the Bungonia Hills Physiographic Region, with occurrences also in the Canyonleigh Hills, and Wollondilly Physiographic Regions.

iii. Jaqua Soil Landscape consists of Long foot-slopes and Undulating low rises on Ordovician meta-sediments, Devonian Granite and Permian sediments in the Marulan district. Slopes are gentle (2-7%) and relief is very minor (<30 m). Gully erosion is common in drainage lines and open depressions.

3.4.2 Tarrawarra Soil Landscape

SCA/DLWC (2002) found the Tarrawarra Soil Landscape to have the following characteristics and limitations:

- Localised poor drainage;
- Localised seasonal waterlogging;
- Localised high run-on;
- Localised shallow soils and non-cohesive soils;
- Localised high foundation hazard;
- Localised gully erosion;
- Localised potential saline recharge zone and discharge zone;
- Localised salinity hazard and seepage scalds and
- Widespread sheet erosion hazard.

3.4.3 Durran Durra Soil Landscape

SCA/DLWC (2002) found the Durran Durra Soil Landscape to have the following characteristics and limitations:

- Localised steep slopes and mass movement;
- Localised poor drainage and permanently high watertables;
- Localised seasonal waterlogging;
- Widespread shallow soils and non-cohesive soils;
- Localised rock outcrop;
- Localised high foundation hazard and groundwater pollution hazard;
- Widespread potential saline recharge zone;
- Localised saline discharge zone;
- Localised salinity hazards and seepage scalds;
- Widespread gully and sheet erosion hazard and
- Localised poor moisture availability.

3.4.4 Jaqua Soil Landscape

SCA/DLWC (2002) found the Jaqua Soil Landscape to have the following characteristics and limitations:

- Localised poor drainage and seasonal waterlogging;
- Localised flood hazard;
- Localised permanently high watertables;
- Widespread high run-on;
- Localised high foundation hazard;
- Localised groundwater pollution hazard;
- Localised gully erosion hazard;
- Widespread sheet erosion hazard;
- Localised potential saline recharge zone and saline discharge zone and
- Localised salinity hazard and seepage scalds.

The limitations, identified in the Soil Landscape mapping do not present significant constraints for the proposed development of the site; however the buildings will need to be suited so that they avoid drainage depressions located on site.

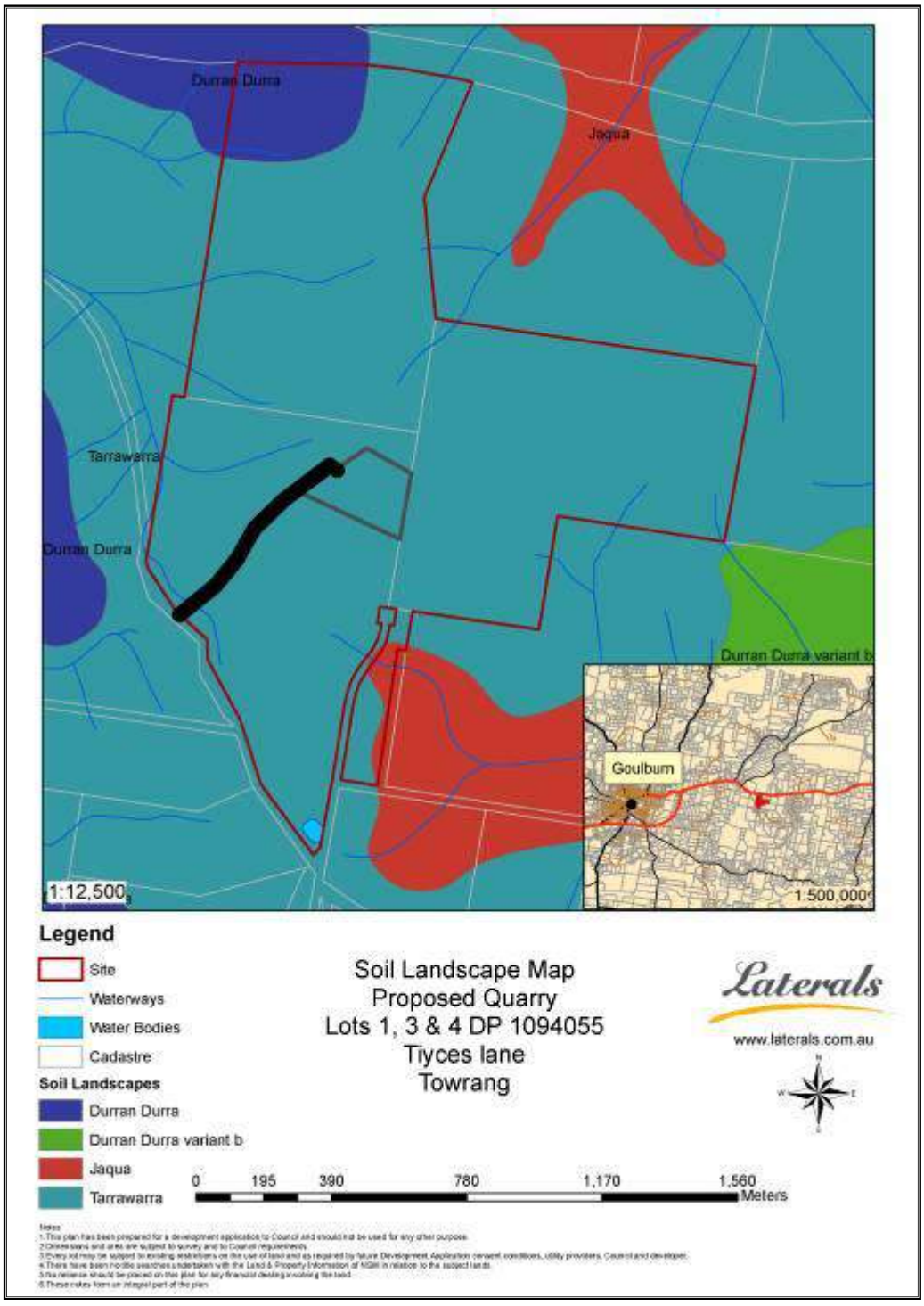


Figure 2 Lot 1, 3 & 4, DP 1094055, Tiyces Lane, Towrang, NSW, 2580. Soil Landscapes across the site (SCA/DLWC, 2002).

3.4.5 Site-Specific Investigations

A soil profile was excavated on site. The site investigation results provided in Section 7.1, Appendix 1 of this report contains the full profile descriptions. The soils on the lot on which the proposed buildings are to be located are as follows:

Layer 1: 0-300 mm. Light brown sandy loam. Minimal coarse fragments.

Layer 2: 500->800 mm. Yellow brown clay loam. Minimal coarse fragments.

3.4.6 Soil Testing

Soil samples from the lot were assessed for a suite of tests relevant to onsite effluent management. The most relevant results from this testing are in Table 2, and the full list of results are included in Appendix 3.

Table 2 Soil Test Results

Sample	EC (dS/m)	pH	CEC	Psorp (mg/kg)	Texture	EAT
0-300mm	0.01	5.4	7.0	266	SL	3(2)
500->800mm	<0.01	5.5	12.8	640	CL	5

In summary the testing shows:

i. All soils are non-saline.

ii. Soils are moderately acidic to be ameliorated with lime.

iii. Soils are moderately structured and suitable for surface irrigation.

iv. The *in situ* P-sorption value for these soils is 2057kg/ha.

3.5 Bore Search

A bore search was conducted at www.nratlas.nsw.gov.au on 16 December 2008. No registered bores were identified on site or within 250m of the proposed new building site.

4 Onsite Wastewater Management

4.1 Method of Investigation

Site and soil inspections were undertaken at the proposed site and a summary of the findings for the lot is given in Section 7.1, Appendix 1. Slope, aspect, grass cover, rock outcrop, soil profile and, most importantly, distances to creeks/dams were all noted in the field. All soil investigations were done by hand-excavation using an auger.

4.2 Wastewater Treatment Options

This study has identified a proposed wastewater system based on site-specific site and soil conditions and the proposed built environment. If the effluent management area is to be relocated in the future, soils will need to be assessed and the OWMS (On-site Wastewater Management Study) amended.

- Effluent disposal via spray irrigation from an Aerated Wastewater Treatment System (AWTS) will be suitable for this site.

4.3 Design Wastewater Loading

It is assumed that an amenities building will be built on the lot. Therefore, based on 10 employees (Tea rooms with restroom facilities as per AS/NZS 1547:2000); 150l/day of wastewater will be produced.

4.4 Sizing of Irrigation Areas

The sizing of the irrigation areas are determined by undertaking hydraulic and nutrient balances. In the relatively dry climate of this area, the nutrient balances are the determining factor and they are limited by the nitrogen uptake potential of the pasture grasses and the P-sorption potential of the soils.

Based on the laboratory results, in section 3.4.5, P-sorption is moderate due to moderate amounts of clay within the subsoils with an *in situ* value of 2057kg/ha.

Using:

- These site specific phosphorus sorption rates;
- Standard nitrogen and phosphorus concentrations in effluent derived from an AWTS and
- Standard nutrient uptake values for vegetation

The required irrigation area for a loading of 150L/day is 120**m^2** for nitrogen and 141**m^2** for phosphorous, therefore phosphorus will be the limiting factor for determining the size of the irrigation area on this lot.

4.5 General Requirements for Irrigation Areas

4.5.1 Buffer Distances

Irrigation areas must be positioned where the risk of effluent runoff into watercourses is minimised. To ensure this the Sydney Catchment Authority (SCA) requires the following buffers:

- 40m to drainage depressions and farm dams
- 100m to perennial and intermittent water courses
- 150m to the Wollondilly River.

4.5.2 Irrigation Type

There are two main types of irrigation:

i. Semi – fixed surface spray irrigation (the most economical); and

ii. Subsurface irrigation

Surface spray irrigation may only be used on lands where the slope is less than 10%, otherwise subsurface irrigation is required. Slope gradient is given in the lot description. This lot has a slope gradient of less than 10% therefore surface spray irrigation is permissible.

N.B. Surface spray irrigation cannot be used within 15 m of any building. And subsurface irrigation can be used within 3-6m of a building.

4.5.3 Vegetative Cover

Surface and subsurface irrigation areas must be well vegetated before they are commissioned, to prevent possible runoff and erosion.

Vegetation is also required to promote nutrient uptake. Pasture grass is the most suitable form of vegetation. The site will need vegetation improvement to ensure suitable pasture cover is available across the effluent management area (EMA).

Council should inspect the EMA at the site before they issue an approval to occupy the dwelling. This will ensure they are well prepared and ready for commissioning. Acidity in topsoil's can be remediated using an application of lime. This will help encourage the establishment of appropriate pasture grasses.

Pasture species that may be considered are O'Connor strawberry clover, ryegrass and tall fescue. Pasture species with maximized growth during the cooler months are ideally suited to this climate.

4.5.4 Detailed Drainage Diagram

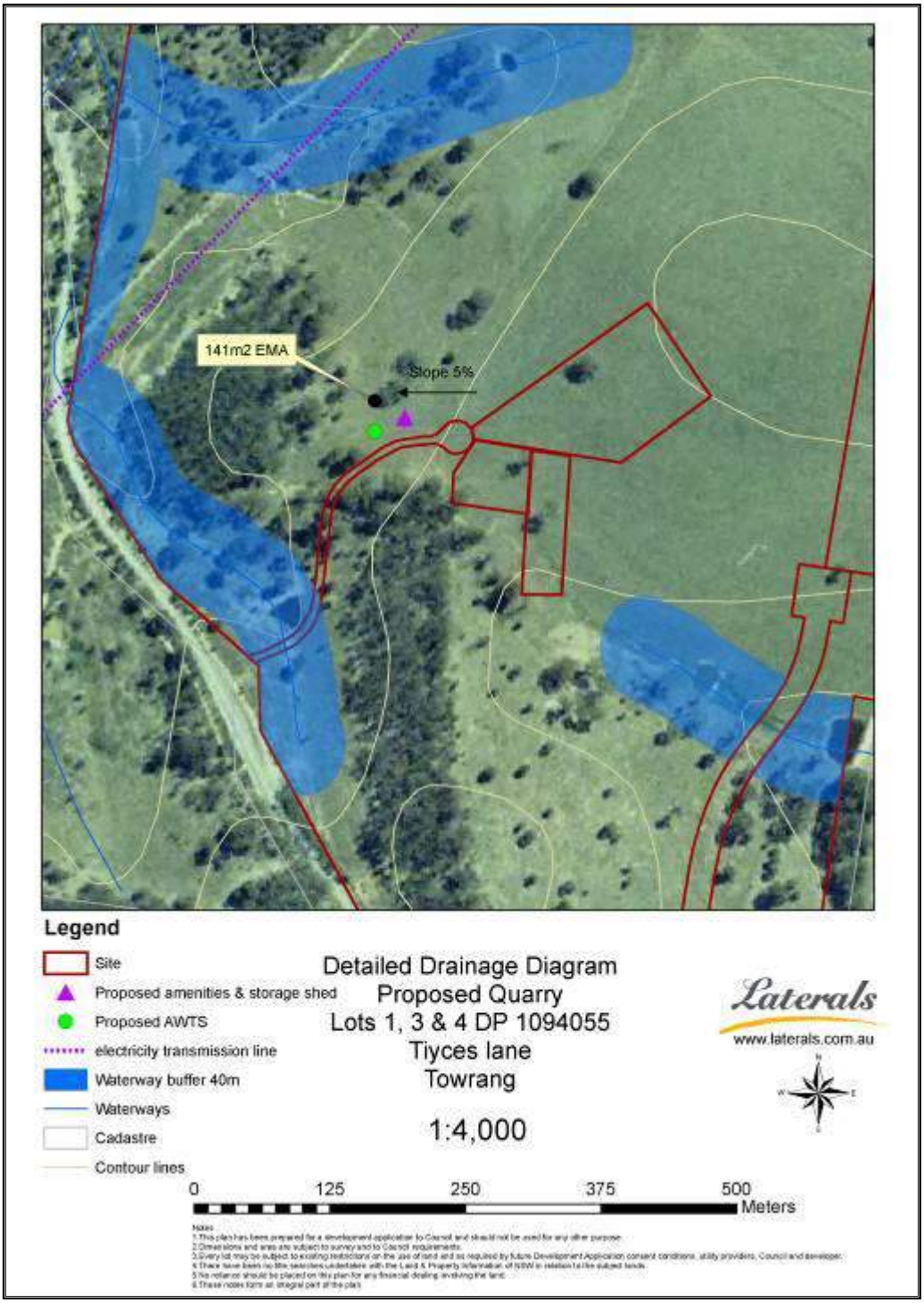


Figure 3 Lot 1, 3 & 4, DP 1094055, Tiyces Lane, Towrang, NSW, 2580. Detailed drainage diagram (SCA/DLWC, 2002).

4.5.5 Remediation Measures

Some mitigation measures are required:

- The new building will require the establishment of appropriate pasture grasses across the entire EMA;
- Surface irrigation is suitable for this lot due to a minimal slope gradient;
- EMA's must be fenced off to livestock;
- Contour banks or diversion berms are not required for this lot due to a low potential of run on from up slope (Due to positioning of dwelling with respect to the EMA);
- An application of lime is required to raise the soil pH over the EMA.
- It is advised that an agricultural drain be positioned upslope of the EMA to divert possible run on water away from the site.

5 Conclusion

In conclusion, site and soil conditions on this lot are considered suitable or can be made suitable for an aerated wastewater treatment system (AWTS) (or similar) with subsequent disposal of treated effluent via surface irrigation.

Appendix 1 provides details of the proposed lot, including specific management requirements.

Providing the general and site-specific mitigation measures contained in this report are adhered to we consider that the risk of pollution to receiving waters is minimal.

Based on a 10 employees (Tea rooms with restroom facilities as per AS/NZS 1547:2000), an irrigation area of 141**m^2** is required.

6 References

1. Department of Local Government (1998). Environment and Health Protection Guidelines: *Onsite Sewage Management for Single Households*

2. Landcom (2004). *Managing Urban Stormwater: Soils and Construction*. 4th Edition. NSW Government.

3. SCA/DLWC (2002). Soil Landscapes of the Sydney Catchment Authority Hydrological Catchments. Version 1, June 2002. Sydney Catchment Authority and the Department of Land and Water Conservation (DNR), Sydney.

4. Standards Australia / Standards New Zealand (2000). AS/NZS 1547:2000 *On-site Domestic Wastewater Management.*

7 Appendices

7.1 Appendix 1: Site Descriptions

Lot:	1	**GPS Reference:**	0760590E	6150351N
Slope Position:	Minimal slope.		**Slope:**	2-5%
Run-on:	Minimal run on due to positioning of EMA and installation of agricultural drain.			
Exposure/Aspect:	North western aspect, with a moderate to good exposure to sun and wind.			
Erosion:	Minimal erosion potential.			
Vegetation Suitability:	Good cover of native and introduced pasture grasses however needs to be maximized prior to being commissioned.			
Proximity to watercourses:	Numerous drainage depressions or watercourses affect this site.			
Rock Outcrop:	Nil	**Soil Landscape:**	Tarrawarra	
Soil Profile:	**Depth (mm)**	**Colour, texture pedality, mottles, fragments**		
Layer 1:	0-300	Light brown sandy loam. 10% coarse fragments.		
Layer 2:	500->800	Yellow brown clay loam. Minimal coarse fragments.		

Photos, comments etc: *Insitu* P-sorption = 2057kg/ha

7.2 Appendix 2: Nutrient Balance Sheets

Lot 1 DP 1094055, Tiyces Lane, Towrang, NSW, 2580.

Nutrient Balances

Expected Wastewater Quantity: 150L/day

Nitrogen Balance

The formula used to determine the area requirements based on organic matter and nutrient loads is as follows:

$$A = \frac{C \times Q}{L_x}$$

Where:

A = Land area (m^2)

C = Concentration of nutrient or BOD (mg/l)

= 20mg/l

Q = Treated wastewater flow rate (l/d)

=150l/d

L_x = Critical loading rate of nutrient or BOD ($mg/m^2/d$)

= $25mg/m^2/d$

Nitrogen Loading

A = $120m^2$ minimum area for total nitrogen

Trench Length Design

The formula used to design the trench length based on design daily flow, Design Loading Rate (DLR) and width is as follows:

$$L = \frac{Q}{DLR \times W}$$

Where:

L = Length in m

Q = design daily flow in L/day

= 150L/day

DLR = Design Loading Rate in mm/day

= 5mm/day (Clay Loam)

W = Width in m

= 0.6m

Trench Length

L = 50m

Phosphorus Loading

Determine the amount of phosphorous that can be absorbed without reaching over 50 years.

$P_{absorbed}$ = calculated from laboratory data

= 2057kg/ha

= $0.2057kg/m^2$

Determine the amount of vegetation uptake over 50 years.

P_{uptake} = 3×365×50

= 54 750 mg/m^2

= $0.055kg/m^2$

Determine the amount of phosphorus generated over that time.

C = Concentration of phosphorous (mg/l)

= 12mg/l

$P_{generated}$ = total phosphorous concentration × volume of wastewater

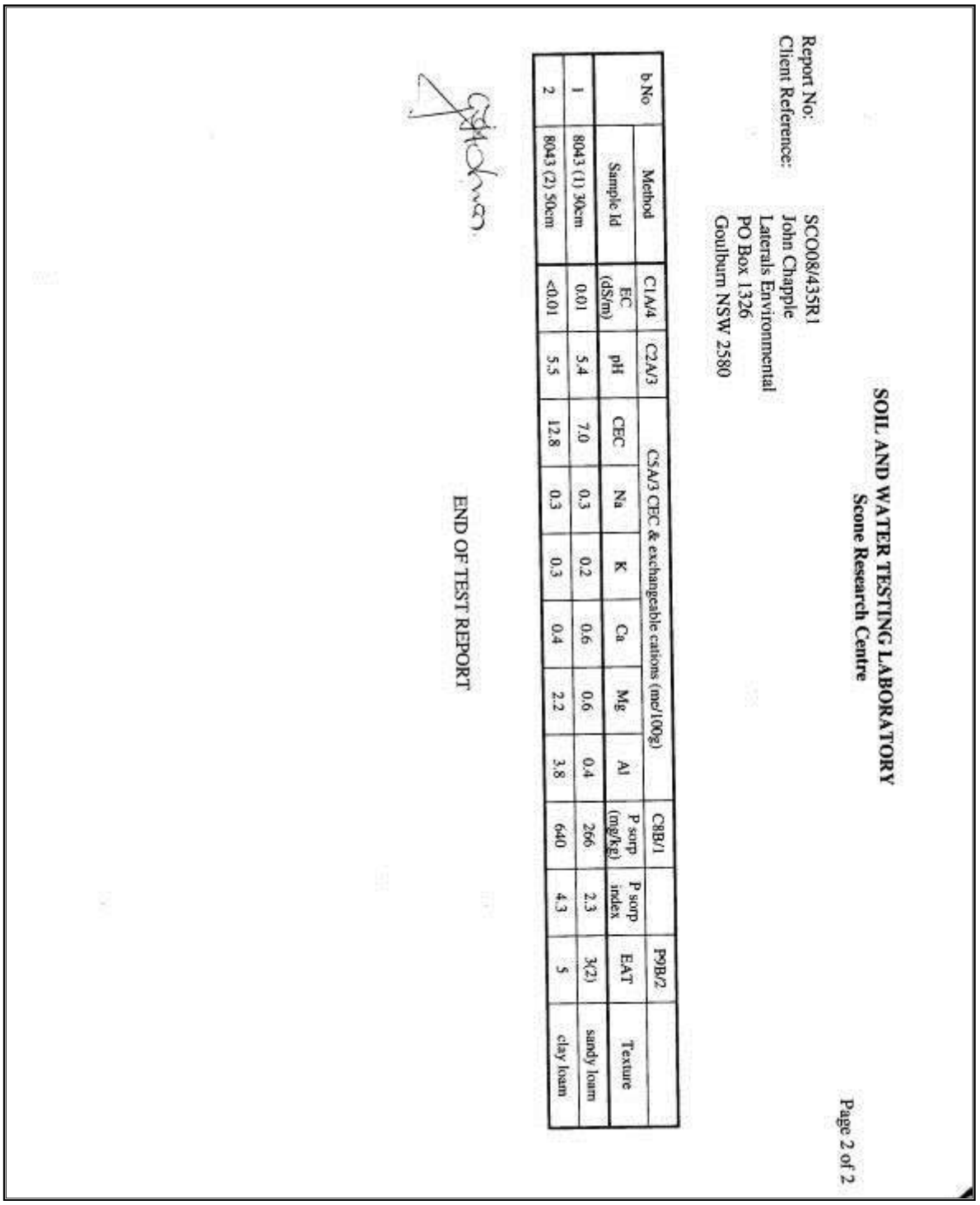
= 12×150×365×50

= 32.85kg

Irrigation area = $P_{generated}/(P_{absorbed} + P_{uptake})$

= $141m^2$

7.3 Appendix 3: Soil Laboratory Test Results



SOIL AND WATER TESTING LABORATORY

Scone Research Centre

Page 2 of 2

Report No: SCO08/435R1
Client Reference: John Chapple
Laterals Environmental
PO Box 1326
Goulburn NSW 2580

b No	Method	C1A/4	C2A/3	C5A/3 CEC & exchangeable cations (me/100g)					C8B/1		P9B/2	
	Sample Id	EC (dS/m)	pH	CEC	Na	K	Ca	Mg	Al	P sorp (mg/kg)	P sorp index	EAT	Texture
1	8043 (1) 30cm	0.01	5.4	7.0	0.3	0.2	0.6	0.6	0.4	266	2.3	3(2)	sandy loam
2	8043 (2) 50cm	<0.01	5.5	12.8	0.3	0.3	0.4	2.2	3.8	640	4.3	5	clay loam

END OF TEST REPORT

From the Department of Lands, Scone Research Station Laboratory.

Q. Archaeological assessments incorporating:

a. Towrang Survey Report – Aboriginal site survey and assessment by Stedinger Associates March 2009.

b. Lot 1 AHIMS search 17/5/2016.

c. Lot 2 AHIMS search 17/5/2016.

d. PLALC Report 15/8/2016.

Introduction

Robert Mowle from Laterals Planning Engineering & Management contacted the Pejar Local Aboriginal Land Council (Pejar LALC) to carry out an Aboriginal Heritage inspection on 22 July 2016, for the purpose of a proposed Quarry located at Hume Highway/65 Curlewin Lane, Boxers Creek. The area inspected is approximately 8.8 hectares.

It is located within an area where there is potential to contain Aboriginal Sites.

In accordance with the Goulburn Mulwaree Council Local Environmental Plan (LEP), an area that is proposed for subdivision/Development must have an Aboriginal Heritage inspection carried out prior to Development Application.

The purpose of the inspection is to:

- Determine if there is evidence that Aboriginal people had occupied the area, and to
- Identify whether there are any constraints for the development proceeding.

Survey Area Details

An overall description of the survey area is as follows:

Study Area Environment	
Visibility ★ Percentage ★ Coverage type	5% - visibility was poor in the majority of areas, although in some areas it was good. Grass, Rocks
Vegetation	Grass, Shrubs
Soil Description	Rocky soil

Findings

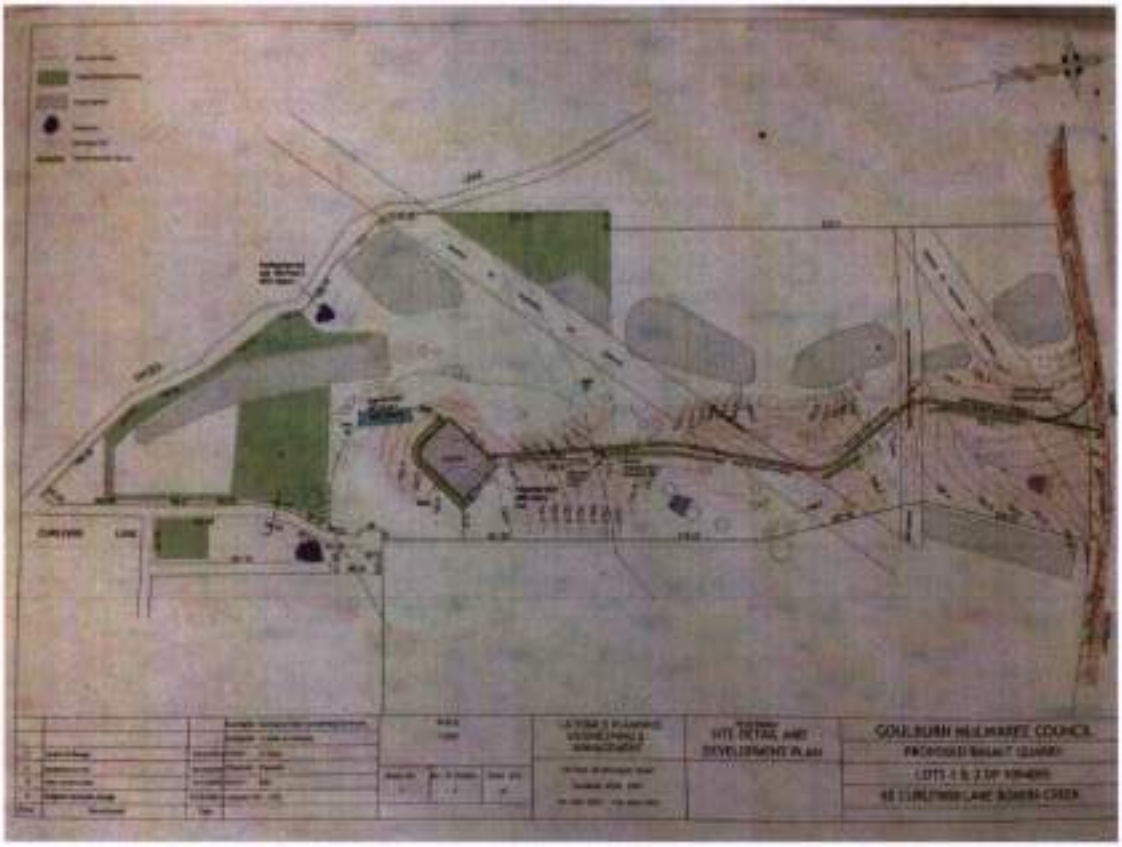
Our Sites Officers, Jessica Plumb and Chris McAlister carried out the inspection. During this inspection 0 Aboriginal Sites were located. However, this does not rule out the fact that the area may contain artefacts that could be located under the ground.

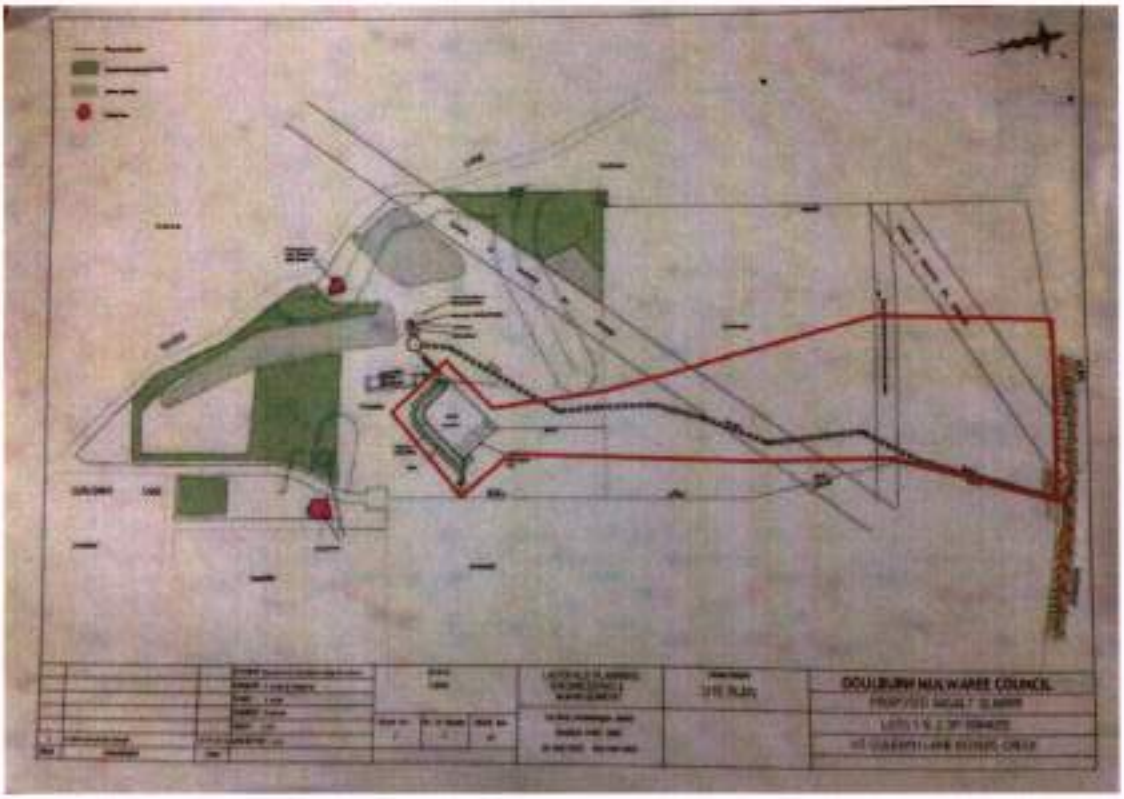
Recommendations

- *If any previously undetected Aboriginal site or relic is uncovered or unearthed during any activity, work at that location must cease immediately and advice on appropriate action be obtained from the Pejar LALC in conjunction with NSW Office of Environment and Heritage*
- *A Representative from Pejar LALC should be present during the initial earthworks.*

Responsibilities

- ***Under Section 90 (1) of the National Parks and Wildlife Act 1974, it is an offence to destroy, deface, damage or desecrate, or cause or permit the destruction, defacement, damage, or desecration of, an Aboriginal Object or Place without first obtaining a consent to destroy from the Director-General of the National parks and Wildlife service (NSW Office of Environment and Heritage)***




GOULBURN MULWAREE COUNCIL

AHIMS Web Services (AWS)
Search Result

Purchase Order/Reference : 1315 Argyle

Client Service ID : 225513

Argyle NSW Pty Ltd

Date: 17 May 2016

PO Box 4
Mittagong New South Wales 2575

Attention: Keith Allen

Email: keith@laterals.com.au

Dear Sir or Madam:

AHIMS Web Service search for the following area at Lot : 2, DP:DP1094055 with a Buffer of 50 meters, Additional Info : The assessment of the potential impact of a development, conducted by Keith Allen on 17 May 2016.

The context area of your search is shown in the map below. Please note that the map does not accurately display the exact boundaries of the search as defined in the paragraph above. The map is to be used for general reference purposes only.

A search of the Office of the Environment and Heritage AHIMS Web Services (Aboriginal Heritage Information Management System) has shown that:

0	Aboriginal sites are recorded in or near the above location.
0	Aboriginal places have been declared in or near the above location. *

If your search shows Aboriginal sites or places what should you do?

- You must do an extensive search if AHIMS has shown that there are Aboriginal sites or places recorded in the search area.
- If you are checking AHIMS as a part of your due diligence, refer to the next steps of the Due Diligence Code of practice.
- You can get further information about Aboriginal places by looking at the gazettal notice that declared it. Aboriginal places gazetted after 2001 are available on the NSW Government Gazette (http://www.nsw.gov.au/gazette) website. Gazettal notices published prior to 2001 can be obtained from Office of Environment and Heritage's Aboriginal Heritage Information Unit upon request

Important information about your AHIMS search

- The information derived from the AHIMS search is only to be used for the purpose for which it was requested. It is not be made available to the public.
- AHIMS records information about Aboriginal sites that have been provided to Office of Environment and Heritage and Aboriginal places that have been declared by the Minister;
- Information recorded on AHIMS may vary in its accuracy and may not be up to date .Location details are recorded as grid references and it is important to note that there may be errors or omissions in these recordings,
- Some parts of New South Wales have not been investigated in detail and there may be fewer records of Aboriginal sites in those areas. These areas may contain Aboriginal sites which are not recorded on AHIMS.
- Aboriginal objects are protected under the National Parks and Wildlife Act 1974 even if they are not recorded as a site on AHIMS.
- This search can form part of your due diligence and remains valid for 12 months.

3 Marist Place, Parramatta NSW 2150
Locked Bag 5020 Parramatta NSW 2220
Tel: (02) 9585 6380 Fax: (02) 9873 8599

ABN 30 841 387 271
Email: ahims@environment.nsw.gov.au
Web: www.environment.nsw.gov.au

AHIMS Web Services (AWS)
Search Result

Purchase Order/Reference : 1315 Argyle

Client Service ID : 225512

Argyle NSW Pty Ltd

Date: 17 May 2016

PO Box 4
Mittagong New South Wales 2575

Attention: Keith Allen

Email: keith@laterals.com.au

Dear Sir or Madam:

AHIMS Web Service search for the following area at Lot : 1, DP:DP1094055 with a Buffer of 50 meters, Additional Info : The Assessment of potential impact of a development, conducted by Keith Allen on 17 May 2016.

The context area of your search is shown in the map below. Please note that the map does not accurately display the exact boundaries of the search as defined in the paragraph above. The map is to be used for general reference purposes only.

A search of the Office of the Environment and Heritage AHIMS Web Services (Aboriginal Heritage Information Management System) has shown that:

0	Aboriginal sites are recorded in or near the above location.
0	Aboriginal places have been declared in or near the above location. *

If your search shows Aboriginal sites or places what should you do?

- You must do an extensive search if AHIMS has shown that there are Aboriginal sites or places recorded in the search area.
- If you are checking AHIMS as a part of your due diligence, refer to the next steps of the Due Diligence Code of practice.
- You can get further information about Aboriginal places by looking at the gazettal notice that declared it. Aboriginal places gazetted after 2001 are available on the NSW Government Gazette (http://www.nsw.gov.au/gazette) website. Gazettal notices published prior to 2001 can be obtained from Office of Environment and Heritage's Aboriginal Heritage Information Unit upon request

Important information about your AHIMS search

- The information derived from the AHIMS search is only to be used for the purpose for which it was requested. It is not be made available to the public.
- AHIMS records information about Aboriginal sites that have been provided to Office of Environment and Heritage and Aboriginal places that have been declared by the Minister;
- Information recorded on AHIMS may vary in its accuracy and may not be up to date .Location details are recorded as grid references and it is important to note that there may be errors or omissions in these recordings,
- Some parts of New South Wales have not been investigated in detail and there may be fewer records of Aboriginal sites in those areas. These areas may contain Aboriginal sites which are not recorded on AHIMS.
- Aboriginal objects are protected under the National Parks and Wildlife Act 1974 even if they are not recorded as a site on AHIMS.
- This search can form part of your due diligence and remains valid for 12 months.

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Web: www.environment.nsw.gov.au

An Aboriginal
Site Survey and Assessment.
Lot 1 (DP 1094055) Tyces Lane, Towrang.

March 2009

STEDINGER ASSOCIATES PTY LTD

65 Broughton Street, CAMDEN, NSW 2570
PO Box 1206, CAMDEN, NSW 2570
Tel (02) 4657 2480

www.stedinger.com.au

For

Marian Vale Pastoral Company
c/- Laterals Planning
PO Box 1326, GOULBURN, NSW 2580

CONTENTS.

1. INTRODUCTION.

1.1. Application Details.

This report was commissioned by the Marian Vale Pastoral Company on the 30th of January 2009. The survey area, Lot 1 (DP1094055) Tiyces Lane in Towrang, is a proposed quarry and revegetation area. This study of Aboriginal heritage was required in preparation for the proposed development of the subject land. The investigation identifies existing and potential Aboriginal archaeological sites and places within the specified survey area.

1.2. Study Brief and Objectives.

This report details the archaeological assessment of Aboriginal heritage within the specified survey area and the impact of proposed works upon this heritage. The aims of the study were to:

1. locate and record any Aboriginal objects (also referred to as sites) or places within the area designated by the client;[1]
2. assess the potential for archaeological sites within the defined survey area;
3. comment upon the probable extent, nature and integrity of Aboriginal objects sites identified;
4. assess the significance of any objects sites or places identified;
5. assess the impact, both direct and indirect, of the proposed quarry and revegetation program on any objects sites or places if located in the survey area;
6. present recommendations for the further conservation and management of Aboriginal heritage if located in the survey area having regard to significance and statutory requirements; and
7. address issues of concern to the Aboriginal community representatives participating in this project and/or having registered an interest in the area surveyed.

This report includes:

1. consultation with local Aboriginal community representatives.

[1] Aboriginal archaeological objects and places are defined in Part 1, Section 5 of the National Parks and Wildlife Act (1974).

2. the results of a recent search of the Aboriginal Heritage Information Management System;
3. a review of previous archaeological work in the area; and
4. field survey and recording.

1.3. The Study Area and its Location.

Situated in Towrang, the survey area is located in the Goulburn Mulwaree Local Government Area and the territory administered by the Pejar Local Aboriginal Land Council.

Tiyces Lane lies 10 kilometres northeast of Goulburn along the Hume Highway, west of Winlarthing Road. The survey area lies some 2.2 kilometres along Tiyces Lane off Curlewin Lane. It consists of allotment 1 (D.P.1094055) and is bounded by Tiyces Lane to the southwest and Curlewin Lane in part to the east (Figures 1.1 and 1.2). Private farming land lies further along the east boundary and to the north and west. The subject land is the property of Marian Vale Pastoral Company and incorporates an estimated area of 10 hectares.

1.4. Community Consultation.

Consultation practices in this project follow the Interim Community Guidelines issued by the Department of Environment and Climate Change.[2] The following efforts were made to identify and contact Aboriginal individuals or groups wishing to register their interest in the survey and to be consulted about the project with regards to matters concerning Aboriginal objects, sites and places.

- Written notification of the project was provided to:
  1. The Registrar of Aboriginal Owners (dated 10th February 2009); and
  2. NSW Native Title Services (dated 10th February 2009);
- Written notification and an outline of the proposed works, site plans and study methodology were provided to the Pejar Local Aboriginal Land Council (Ms Delise Freeman, on the 10th and 13th of February 2009.

[2] Department of Environment and Conservation (NSW). December 2004. *Interim Community Consultation Requirements for Applicants*.

- Also, as representatives of the Aboriginal community, between the 11th and 13th the following people and/or groups were provided with written notification and an outline of the proposed works, site plans and the present study methodology:
  - Ngunawal Heritage Aboriginal Corporation (Ms Melinda Tuholec);
  - Konanggo Consultancy (Mr Robert Young);
  - Yurwang Gundana Consultancy Cultural Heritage Services (Mr Dean Bell);
  - Buru Ngunawal Aboriginal Corporation (Mr Wally Bell);
  - Gundungurra Aboriginal Heritage Association Inc. (Ms Sharyn Hall);
  - Ngunnawal Elders Corporation (Mr Arnold Williams);
  - King Brown Tribal Group Pty Ltd (Ms Tina Brown);
  - Peter Falk Consultancy (Mr Peter Falk); and
  - Ms Kerry Sheehan.

  Ms Antoinette House was provided with this information on the 24th February 2009 having contacted us at this time.
- The Department of Environment and Climate Change (NSW), was contacted in writing about this project on the 10th February 2009 and discussions held by telephone with DECC on the 12th of February 2009.
- The proposed survey was advertised in the *Goulburn Post* for publication on the 13th February 2009 (page 17). A copy of this advertisement is included in Appendix 2.

One Native Title claim includes the study area and another claim extends towards Goulburn, Gundungurra Tribal Council Aboriginal Corporation #6 is a large claim that has been registered over the study area. The Ngunawal People (NSW) is another large claim south of Goulburn.. Claimant summaries are included in Appendix 3.

The Pejar Local Aboriginal Land Council, the Ngunawal Heritage Aboriginal Corporation, Konanggo Consultancy, Yurwang Gundana Consultancy Cultural Heritage Services, the Buru Ngunawal Aboriginal Corporation, Gundungurra Aboriginal Heritage Association Inc., Ngunnawal Elders Corporation, King Brown Tribal Group Pty Ltd, Peter Falk Consultancy Ms Kerry Sheehan and Ms Antoinette House have been identified as Aboriginal persons/organizations wishing to be consulted with on matters relating to the management of Aboriginal sites in the area. Mr David Pope from the

Pejar Local Aboriginal Land Council and Mr Wally Bell from the Buru Ngunawal Aboriginal Corporation accompanied Dr. Louise Steding and Mr Gerald Steding of Stedinger Associates Pty Ltd on the survey of the specified land. All the above persons/organizations have been provided with a draft copy of this report for comment. A separate report has been received from the Pejar Local Aboriginal Land Council detailing their assessment of and interest in the survey area and the findings of this report (refer to Appendix 1).

1.5. Author Identification.

Site survey was carried out by Dr. Louise Steding and Mr Gerald Steding of Stedinger Associates Pty Ltd together with Mr Dean Pope from the Pejar Local Aboriginal Land Council and Mr Wally Bell from the Buru Ngunawal Aboriginal Corporation on the 26th of February 2009. This report was written by Dr. Louise Steding. It has been prepared in accordance with the standards and Guidelines for Archaeological Practice in Aboriginal Heritage Management and for Archaeological Survey Reporting as set out in the *Aboriginal Cultural Heritage Standards & Guidelines Kit* by the Department of Environment and Climate Change (National Parks & Wildlife Service). This work also supports the principals and practices of the ICOMOS Burra Charter.[3]

[3] NSW National Parks & Wildlife Services. 1997. *Aboriginal Cultural Heritage Manual Standards & Guidelines Kit.* NSW NPWS, Hurstville.
Australia ICOMOS. 1999. *The Burra Charter. The Australia ICOMOS Charter for Places of Cultural Significance.* Australia ICOMOS Inc.

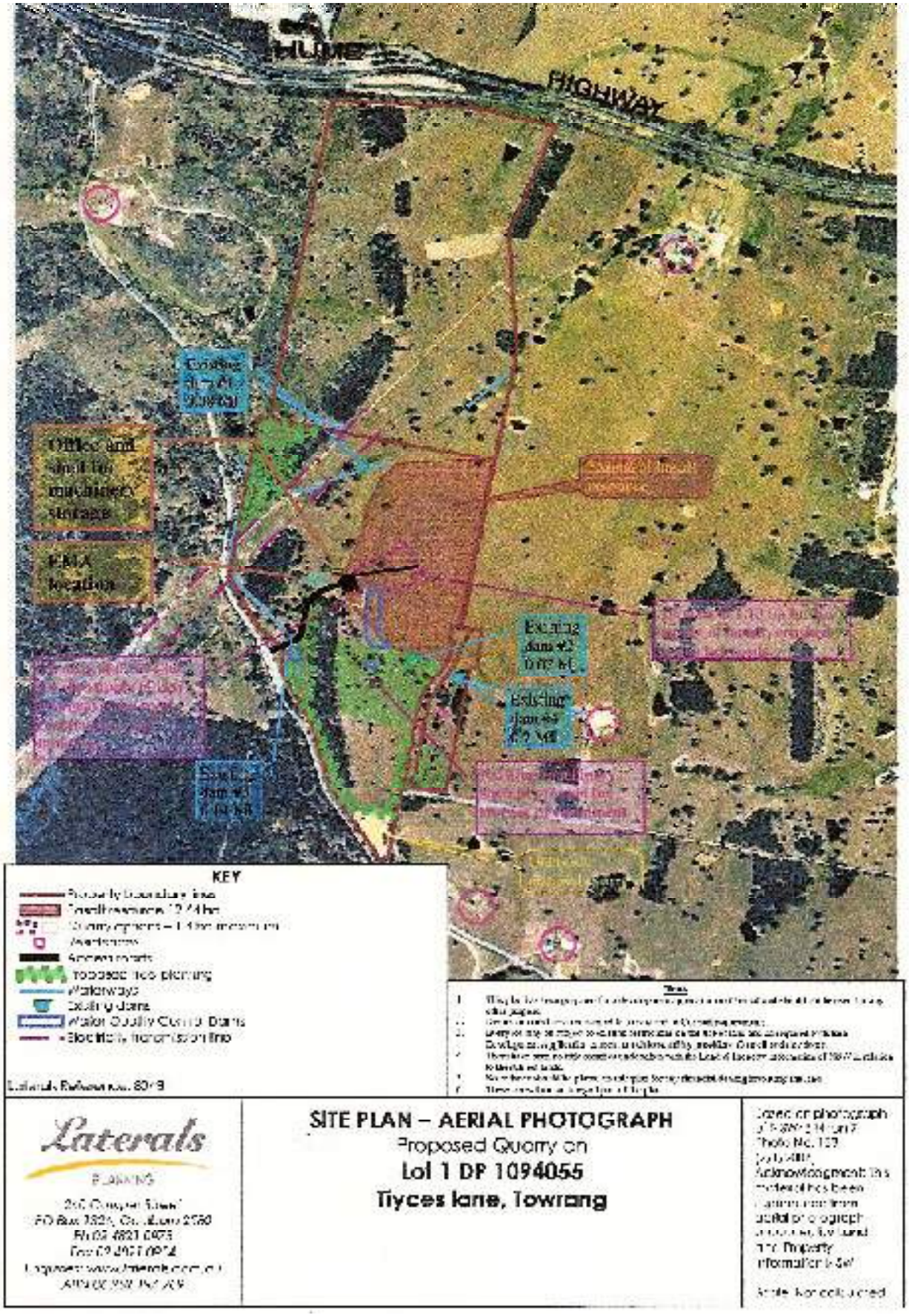

Figure 1.1. Plan showing the location of Lot 1 (DP 1094055) Tiyces Lane, Towrang, NSW. Plan by Laterals Planning, 2009.

Figure 1.2. Plan showing the proposed quarry on Lot 1 (DP 109/055) Tiyces Lane, Towrang, NSW. Plan by Laterals Planning, 2009.

2. PROPOSED WORKS.

2.1. Quarry and Revegetation Program.

A basalt quarry is to be excavated on the northeast portion of Lot 1 (DP1094055) Tiyces Lane, Towrang (refer to Figure 1.2). The following proposed works are associated with this project:

The proposed work includes:

1. Excavation of basalt in the Quarry Resource Area (12.64 hectares).
2. Excavation of the Clay gravel quarry (2694 m^2).
3. Construction of an office and machinery shed at site centre, at the southwest edge of the basalt resource, and
4. Revegetation of 8.84 hectares to north and south.

The existing forested areas to the north, west and southwest are to remain.

2.2. Description of Impact.

The future works for the development will include quarrying and earthworks in preparation for construction of the office and machinery shed associated with the quarry. The revegetation area will also involve tree planting. These works will involve ground disturbance that will directly impact heritage sites, if present, within the specified location resulting in their disturbance and/or destruction.

3. ENVIRONMENTAL CONTEXT.

The environment has a direct relationship with the type, location and density of Aboriginal sites or places that could be expected to occur in the survey area. Environmental factors such as geology, topography, hydrology, associated soils and vegetation affect the availability of food sources, water, raw materials for tool manufacture, the location of camping places, ceremonial grounds and burials and surfaces suitable for grinding or the application of rock art. Such factors also influence subsequent European land use and the degree to which cultural materials have survived both natural and human impacts. The following discussion places the present study area within its environmental and cultural contexts.

3.1. Vegetation.

Much of the survey area has been cleared of vegetation. Stands of trees survive to the north, west and central southwest of the site. The original vegetation was open eucalypt woodland with little understorey and the ground cover dominated by grasses. The dominant tree species in this area is Stringybark (Eucalyptus macrorhyncha and Eucalyptus agglomerate). Other tree species include Red Gum (E. tereticornis) as well as White Gum, Ironbark and Box Wood. The shrub stratum of the woodland is generally sparse, consisting some grass tree (Xanthorrhoea australis) and acacia scrub.

With the arrival of Europeans the soils of the region were considered to be sufficiently fertile for cultivation and sheep and cattle raising. As a consequence much of the district was cleared for farming in the nineteenth century. No mature vegetation remains in the survey area. Today the vegetation consists of a mixture of secondary Eucalypt bushland and scrub, exotic species and invasive weeds. Introduced grasses cover much of the pastoral land.

3.2. Soils.

Soils of the study area are generally from the Midgee soil landscape. These soils are predominantly yellow, as occur in the low-lying portions of the study area to the west in Yellow-brown soils extend across the hill slopes, though soils over the higher basalt resource to the northeast are orange. The soils are associated with Ordovician and some

Devonian and Lower Silurian sediments and metasediments in hilly terrain. They are characteristically stony and acidic.[4] To a lesser extent the Bullamallta soil landscape of Soloths Soils occurs. This soil landscape is limited to areas around Goulburn. These soils are associated with Upper Silurian and Lower Devonian sediments where they occur in conjunction with footslopes and valley floors.[5]

3.3. Topography.

The study area is a hilly landscape on the basal slopes of Mt Towrang. Mt Towrang itself rises 889 metres above sea level 2 kilometres west of the survey area. Within the subject survey area the topography is raised to the north and northeast with elevations rising 733 metres above sea level. In particular, the basalt resource proposed for quarrying is located on the highest part of the site to the northeast. The ridgeline to the north slopes down to low lying areas to the west and south.

Several major creeks are located in the vicinity of the survey area. However, only Towrang Creek is located in the survey area, briefly cutting though the northwest edge (on a north to south orientation). Towrang Creek is not a permanent water source. It joins Deep Creek about 2 kilometres to the northwest and Boxer's Creek 4 kilometres to the west. The substantial Osborne's Creek lies 2 kilometres to the north narrowing at Curlewin. Jerrara Creek lies 1.5 kilometres to the south. All of these creeks are tributaries of the Wollondilly River which runs through Towrang some 3 kilometres to the north. This river runs southwest, becoming Boxers Creek. No alluvial terraces or rivers occur in the study area.

3.4. Geology.

Lithic materials suitable for artefact manufacture, including silcrete, chert, quartz and quartzite, occur in a variety of geological formations in the region. Silcrete is the most common raw material used. It is found widely distributed over the Southern Tablelands. Quartz and silcrete, for example, were obtained from outcrops at Towrang (G05,

[4] Hird, C. 1991. *Soil Landscapes of Goulburn.* 1:250 000 Sheet. Soil Conservation Service of NSW, Sydney. p 174.
[5] Hird, C. 1991. *Soil Landscapes of Goulburn.* 1:250 000 Sheet. Soil Conservation Service of NSW, Sydney. p.43.

recorded 1989. Refer to Chapter 5). Within the subject survey area, lumps of quartz are scattered across the landscape.

The Southern Tablelands occur as part of the Lachlan Fold Belt. This belt is characterised by Ordovician, Silurian and Devonian sedimentary units and Early Silurian volcanic that have subsequently been subject to periods of more orogenic activity. Quaternary sedimentary deposition has occurred in the Goulburn area of the Lachlan Fold Belt.[6]

[6] Bramagar, D.F. and Packham, G.H. 2000. Filed Geology of New South Wales. Department of Mineral Resources, NSW, Sydney. pp.6-20.

4. CULTURAL BACKGROUND.

This chapter describes the historical and cultural context of the study area within Acacia Gardens and its wider placement within the Blacktown region. It identifies the underlying historical and cultural influences which have shaped existing and potential Aboriginal archaeological sites. Environmental context and previous archaeological studies are examined, in conjunction with consultation, to predict the types, likely survival and location of Aboriginal archaeological sites and facilitate the interpretation and assessment of existing relics in this area.

4.1. Cultural Background.

At the time of European settlement, the Goulburn-Marulan areas were on the boundary of three Aboriginal groups. These groups were the Wandandian people to the southeast, the Gandangara to the north and the Ngun[n]awal to the south.[7] Derived from the ethnographic research of Tindale in 1974, the territory of the Wandandian extended from Ulludulla to Nowra and west to the mountains. Lands of the Gandangara reached from south of Marulan northwards to Camden. The territory of the Ngun[n]awal extended from Canberra to Yass and north to Goulburn.[8]

Their land custodianship and ownership was based on small extended family groups that were a part of a larger family group.[9] Family members were usually united by a common dialect, their descent, history, and a shared 'Dreamtime' ancestor. The Wandandian, the Gandangara and the Ngun[n]awal people had similarities in their languages.

Aboriginal occupation of the region appears to have focused on major water courses including the Wollondilly River to the north and the Shoalhaven River further east as well as perennial and ephemeral tributaries. The local Aboriginal communities relied on the natural resources of these rivers and their wider environments, exploiting both

[7] Kayandel Archaeological Services. 2005. *Hume Highway Intersection Improvements at Towrang and Carrick Roads (north of Goulburn) NSW.* For RTA Environmental Technology. p.12.
[8] Umwelt Environmental Consultants. 2005. *Aboriginal Archaeological Assessment Proposed Tynwood Quarry, Marulan.* For Readymix Holdings Pty Ltd. p.3.4.
[9] Biosis Research Pty Ltd (Hardy, V.) 2003. *An Archaeological Assessment of a Proposed School Site, Glenwood, New South Wales.* For S. Hillers. pp.9-10.

terrestrial and riverine resources. They hunted a variety of land mammals, such as kangaroo, wallaby, possum, echidna, and bandicoot. Most Australian land mammals are non-migratory and so would have been available all year round as part of an abundant food resource.[10] They would also have hunted birds and lizards and the creeks and swamplands of the region would have provided them with fish, eels and shellfish. Aboriginal groups also gathered insects and edible roots and harvested fruit and seeds from various plants and grasses, using some plants for medicinal purposes.[11]

It is evident from the recorded artefact sites that local Aboriginal family groups camped in the wider region (refer to Chapter 5). They made and worked with a variety of tools, including digging sticks, boomerangs, shields, spears and spear throwers. They made many of these tools and weapons from wood, tree roots and local deposits of lithic materials. The Aboriginal groups also used sharpened animal bones and shells (for fish-hooks, spearheads and cutting tools), natural fibres and hair twisted into string (for belts, nets and bags), reeds for basket weaving and bark (for canoes and water containers). They cut bark from trees to make shelters and stitched animal furs together for warmth in the winter months.[12]

In particular, a variety of blades, scrapers, adzes and other stone tools were made from locally available lithic materials suitable for stone tool manufacture, such as silcrete and quartz. In what has become known as the Eastern Regional Sequence, late Pleistocene and early Holocene assemblages are characterised by large stone cores and core tools. The earliest phase is known as Capertian and consists of large heavy artefacts, uniface pebble tools, core tools, denticulate saws, scrapers, hammerstones and some bipolars and burins.[13] A variety of small finely chipped stone implements called backed blades [including geometric microliths, Bondi points and eloueras] began to occur after 5000 years BP as an additional component to the older tool industry. In this Bondaian phase backed implements and ground edge implements are introduced between c.5000 and

[10] Biosis Research Pty Ltd (Hardy, V.) 2003. *An Archaeological Assessment of a Proposed School Site, Glenwood, New South Wales*. For St Hilliers. pp.7-8.

[11] after Stedinger Associates. 2006. *Heritage Study, Kennedy Creek, Appin. An Aboriginal and European Site Survey*. Wollondilly Shire Council. p.12.

[12] after Stedinger Associates. 2006. *Heritage Study, Kennedy Creek, Appin. An Aboriginal and European Site Survey*. Wollondilly Shire Council. p.12-13.

[13] McDonald, J. 1993. *Archaeological survey of the Rouse Hill Infrastructure Project (Stage 1) Works along Caddies, Smalls and Second Ponds Creeks, Rouse Hill, NSW*. For Rouse Hill Joint Venture. p.7.

2800BP. The presence of Bondai points continues to increase as does the use of quartz until 1600BP. From about 1500BP to 1000BP to the time of European settlement, backed blades gradually disappeared from assemblages and other finely retouched pieces and quartz bipolar pieces increase in number, becoming the dominant artefact type. There was also an associated proportional increase in the use of undifferentiated small tools and quartz as well as organic less-enduring raw materials such as bone, wood and shell for tool making.[14] The introduction of shell fishhooks in the last 1,000 years was a major technological innovation.[15]

4.2. European Settlement.

On reaching Mount Towrang, according to John Wilson on an exploration expedition in 1798 there was no evidence of Aboriginal people in the area. Similar observations were made by subsequent expeditions, though Joseph Wild in 1820 and Charles Throsby-Smith in 1820 noted the presence of camp fires.[16] Written accounts of early settlers also describe large numbers of over 3000 Aboriginal people gathering at ceremonies in the Goulburn district. Newspapers also reported early conflicts between Aboriginal groups. For example, in January 1851 the Sydney Morning Herald reported 100 armed Aboriginal people travelling from Carcoar to the Crookwell area to take revenge for family deaths at the hands of another group. [17]

Aboriginal people, it seems, initially avoided contact with Europeans. However, this was not too last. With the arrival of European settlers in the district, farms were soon established and fences erected. Cultural conflict increased as Aboriginal access to resources was severely curtailed. In later years much of the Aboriginal traditional food economy was replaced, as many Aboriginal people were employed by European farmers or sold their traditional food items for European goods.[18]

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[14] Brayshaw, H. 1992. *Warragamba Dam EIS – Spillway. Archaeological Survey for Aboriginal Sites.* For the Water Board through Mitchell McCotter & Associates Pty Ltd. p.5.

[15] McDonald, J. 1993. *Archaeological survey of the Rouse Hill Infrastructure Project (Stage 1) Works along Caddies, Smalls and Second Ponds Creeks, Rouse Hill, NSW.* For Rouse Hill Joint Venture. p.1.

[16] Umwelt Environmental Consultants. 2005. *Aboriginal Archaeological Assessment Proposed Lynwood Quarry, Moruben.* For Readymix Holdings Pty Ltd. p.3.4.

[17] Kayandel Archaeological Services. 2005. *Hume Highway Intersection Improvements at Towrang and Carrick Roads (north of Goulburn) NSW.* For RTA Environmental Technology. p.12.

[18] In Navin, K. 1997. Archaeological Survey for the Macarthur Water Quality Project. For Mitchell McCotter & Associates Pty Ltd. p.6. (after Hassell 1902; Jervis 1935, 1949).

The lives of the Aboriginal people began to change, however, even before Europeans arrived in the region. When Europeans settled in other areas they brought with them their own tools and implements. Many of their goods, especially those made from iron and glass, became items of trade between Aboriginal groups, making their way to the Goulburn region. Cattle and feral animals also passed from European settlements into Aboriginal territory as did knowledge of the Europeans' firearms. Particularly devastating, was the rapid transmission of disease.[9]

[9] Stedinger Associates. 2002. *Smith's Creek Bypass Corridor, Airds, N.S.W. Survey for Aboriginal and European Archaeological Sites*. Scott Carver Pty Ltd., section 4.1.

5. PREVIOUS ARCHAEOLOGICAL WORK.

Previous archaeological studies indicate the types of Aboriginal archaeological sites, their survival potential and earlier activities in the area. Together environmental factors and previous archaeological studies provide information that is used in this report to predict the types, likely survival and location of Aboriginal archaeological sites and facilitate the interpretation and assessment of existing relics in the survey area.

5.1. Search of the Aboriginal Heritage Information Management System.

The DECC Aboriginal Heritage Information Management System (AHIMS) was searched to locate any previously recorded Aboriginal objects and Aboriginal places in or near the specified site at Tiyces Lane. This search was completed to within five kilometres of the survey area and was carried out by the NSW Department of Environment & Climate Change (NPWS) on 12th of February 2009. The register search revealed no previously recorded Aboriginal sites in the specified study area. However, 24 Aboriginal sites have been previously recorded within five kilometres of the subject land. The two sites closest to the subject land are (51-6-0443 and 51-6-0444) located 1.5 kilometres to the east. Nearby, 2 kilometres to the northwest, is a cluster of eight sites (51-6-0069, 51-6-0115, 51-6-0350, 51-6-0351, 51-6-0352, 51-6-0353, 51-6-0354 and 51-6-0355). Another sit stands alone a further 1.5 kilometres northwest (51-6-0058). Two additional sites, (51-6-0093 and 51-6-0095), are located 4 kilometres to the east, three sites (51-6-0065, 51-6-0067 and 51-6-0113), lie along the transmission line about 4 kilometres to the northeast and a cluster of eight sites (51-6-0356, 51-6-0357, 51-6-0358, 51-6-0359, 51-6-0360, 51-6-0361, 51-6-0362 and 51-6-0363) were found a further kilometre northeast along the transmission line.

By far most site types are open campsites. Sites within 5 kilometres of the survey area include sixteen open campsites, six isolated finds, a quarry and a potential archaeological deposit (discussed below). Most occur along creeks or other watercourses.

5.2. *Aboriginal Archaeological Context*

Sites in the Vicinity

Within five kilometres of the survey area at Towrang, a number of sites have been recorded (refer to Figure 5.1.).[29] These sites were registered as a result of some seven archaeological investigations undertaken in the surrounding Goulburn area since 1989. Most were associated with infrastructure projects, such as the installation of the Moss Vale to Goulburn 132kV electricity line by the Electricity Commission of NSW in 1989 and the Sydney to Melbourne Optic Fibre Cable by Pacific Power in 1999, the development of a crown road easement in 1990 and improvements to the Hume Highway intersection of Towrang and Carrick Roads in 2004 by the RTA. Other sites were found during a survey for a proposed rural subdivision. These studies provide a view of Aboriginal site types, locations, frequencies and distributions that have shaped current understandings of the local archaeological record.

Site No.	Site Name	Recorded	Site Type
51-6-0058	Boxer Creek Tributary	R. Wellington, 1990	Open Campsite
51-6-0065	G07	S. McIntyre, 1989	Open Campsite
51-6-0067	G08	S. McIntyre, 1989	Open Campsite
51-6-0069	G05: Towrang	S. McIntyre, 1989	Quarry
51-6-0093	MF1: Winfarthing Road	Charles Dentige, 1997	Isolated Find
51-6-0095	MF2: Winfarthing Road	Charles Dentige, 1997	Isolated Find
51-6-0113	G7: Osburn's Creek	V. Edmonds, 1999	Open Campsite
51-6-0115	Wollondilly	V. Edmonds, 1999	Open Campsite
51-6-0350	TC1-1 (Towrang Creek 1 – Locale 1)	Lance Syme, 2004	Open Campsite
51-6-0351	TC1-2 (Towrang Creek 1 – Locale 2)	Lance Syme, 2004	Open Campsite
51-6-0352	TC1-3 (Towrang Creek 1 – Locale 3)	Lance Syme, 2004	Open Campsite
51-6-0353	TC1-4 (Towrang Creek 1 – Locale 4)	Lance Syme, 2004	Isolated Find
51-6-0354	TC1-5 (Towrang Creek 1 – Locale 5)	Lance Syme, 2004	Open Campsite
51-6-0355	TC1PAD1	Lance Syme, 2004	PAD
51-6-0356	LA1	Archaeological Heritage Surveys, 2005	Open Campsite
51-6-0357	LA2	Archaeological Heritage Surveys, 2005	Open Campsite
51-6-0358	LA3	Archaeological Heritage Surveys, 2005	Open Campsite
51-6-0359	LA4	Archaeological Heritage Surveys, 2005	Isolated Find
51-6-0360	LA5	Archaeological Heritage Surveys, 2005	Open Campsite

[29] For site protection and conservation, registered site co-ordinates are not provided in this report. Only the general locations of those closest to the study area are shown in Figure 5.1.

51-6-0361	LA6	Archaeological Heritage Surveys, 2005	Open Campsite
51-6-0362	LA7	Archaeological Heritage Surveys, 2005	Isolated Find
51-6-0363	LA8	Archaeological Heritage Surveys, 2005	Open Campsite
51-6-0443	Tiyces 1	Pejar Local Aboriginal Land Council, 2006	Isolated Find
51-6-0444	Tiyces 2	Pejar Local Aboriginal Land Council, 2006	Isolated Find

Table 5.1. Summary of previously recorded sites located within 5 kilometres of the present survey area at Towrang.

In 1989 Sue McIntyre recorded two open campsites and a quarry at Towrang (51-6-0065, 51-6-0067 and 51-6-0069). The campsite G07 consisted of two artefacts located in a marshy area 20 metres from a dam and 25 metres from Osborn's Creek. The artefacts were an orange-brown silcrete bipolar flake blade and a large quartz core. Nearby, in a similar physical situation, another two artefacts were identified as G08. These artefacts included a dark grey broken blade from an unidentified material and a cream chert blade. G05 is described as a large quarry site and work floor overlooking Towrang Creek. Sited on the eastern bank of the creek, the site included artefacts of silcrete quartz, indurated mudstone and chert, with both silcrete and quartz having been quarried at this location.

The following year, R. Wellington recorded an open campsite along the east bank of Boxer Creek. This site contained five grey silcrete flakes, a silcrete core and a quartz flake. The site 51-6-0058 has since been destroyed. In 1997 Charles Dealing recorded two isolated finds (quartz flakes) along Winfarthing Road, each being 900 metres from a water course. (51-6-0093 and 51-6-0095). Two years later, two campsites were identified by Vanessa Edmonds (51-6-0113 and 51-6-0115). The site G7 Osborn's Creek was only a small site situated on a terrace 200 metres from a watercourse. It consisted of three artefacts; a silcrete flake, a quartz core and a quartz flake. The site Wollondilly River 1, however, was extensive, containing over 200 mostly quartz artefacts. Some silcrete and chert artefacts were also present. This site was located on a river terrace beside the Wollondilly River.

Four open campsites, an isolated find and a potential archaeological deposit were recorded by Lance Syme in 2004. The isolated find was a white chert flake exposed on

a terrace 10 metres from a creek (51-6-0353). Similarly the potential archaeological deposit occurred along the side of a creek (51-6-0355). At TC1-1 Syme located 10 flakes or flaked pieces and a core (51-6-0350). Raw materials included red, grey, white and mottled silcrete and a fine grained brown siliceous material. This site was in an elevated position some 75 metres from Towrang Creek. TC1-2 consisted of six flakes and a core situated along the west bank of Towrang Creek (51-6-0351). Again, the materials present included red, grey and white silcrete as well as banded orange silcrete. Another seven artefacts were recorded at TC1-3, within 10 metres of Towrang Creek (51-6-0352). Here, three silcrete flakes, two silcrete cores and two quartz flakes were recorded. The colour of the silcrete was red, white and mottled. Three silcrete flakes, quartz flake, a quartz blade and a silcrete core were identified at TC1-5 elevated on an access road 70 metres from Towrang Creek (51-6-0354). The stone material varied in colour from red and grey to white and mottled.

Then in 2005, six open campsites and two isolated finds were recorded by Archaeological Heritage Surveys. The isolated finds, LA4 and LA7, were a quartz flake and a quartz core (51-6-0359 and 51-6-0362). The flake occurred on the eroded east bank of Osborn's Creek and the core on a ridge some 100 metres east of the creek. No details were located for the site LA1 (51-6-0356). The open campsite at LA2 (51-6-0357) included some 50 to 100 artefacts exposed on a rise 30 metres west of Osborn's Creek. Most of these artefacts were silcrete and quartz flakes and cores. At LA3 (51-6-0358) 74 stone artefacts were visible. These flakes, flaked pieces, cores and flaked pebbles occurred on the northern bank of Osborn's Creek. Their raw material was identified as silcrete, quartz, quartzite, chert and tuff. The open campsites LA5, LA6, LA8 were low density stone artefact scatters. At LA5 only two quartz flakes were exposed along a minor tributary of Osborn's Creek (51-6-0360). At LA 6, five silcrete, quartz and chert flakes and flaked pieces were recorded 140 metres from the creek (51-6-0351). LA8 consisted of 2 unidentified stone artefacts along a minor tributary of Osborn's Creek.

Two isolated finds were recorded by the Pejar Local Aboriginal Land Council in 2006 (51-6-0443 and 51-6-0444). That at Tiyces Lane 1 is a small waste flake and that at Tiyces 2 is a core. Both appear to be of red silcrete.

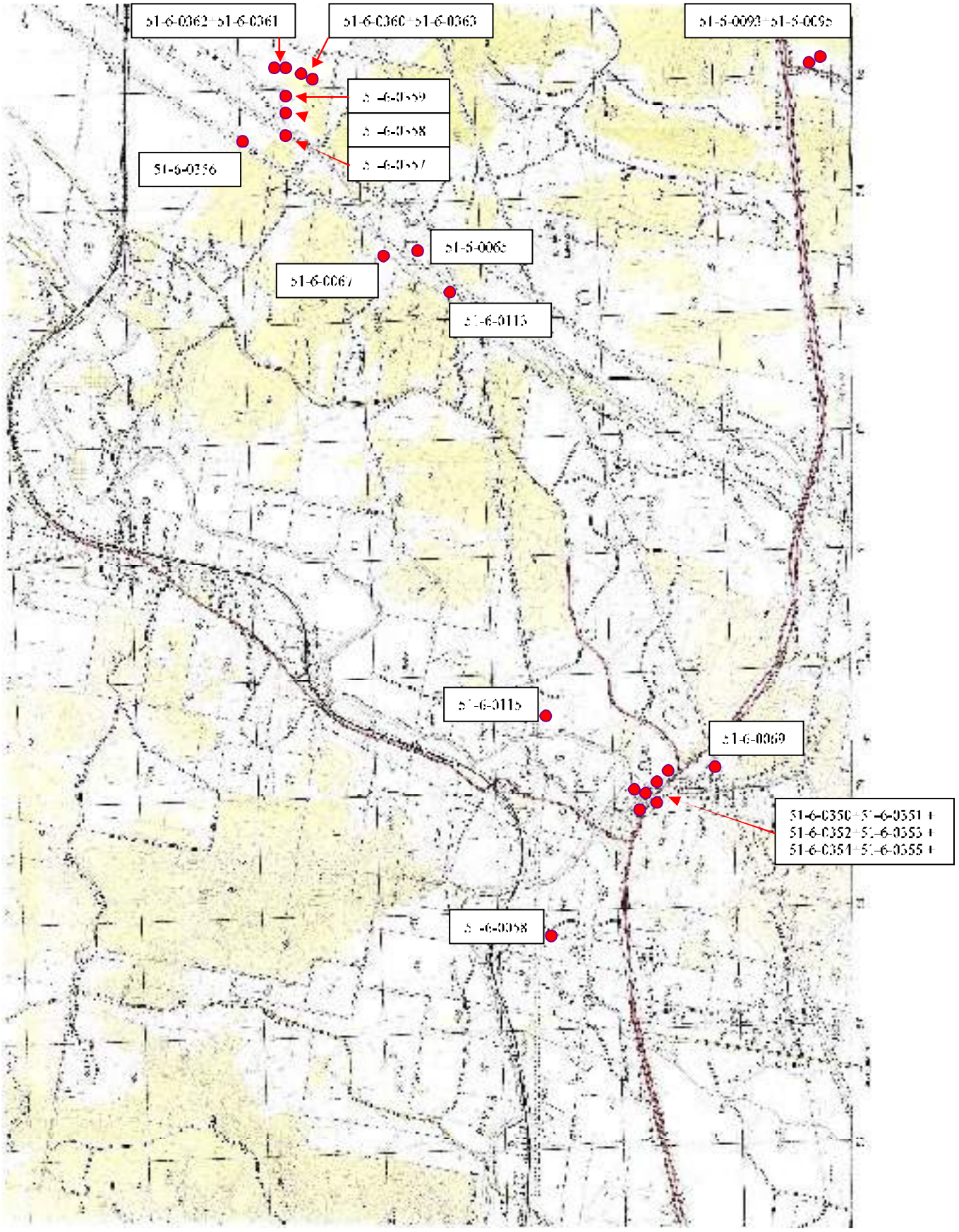

Figure 4.1. Previously recorded sites within 5km of the survey area (For site protection and conservation the locations presented are general). (see also Figure 4.2).

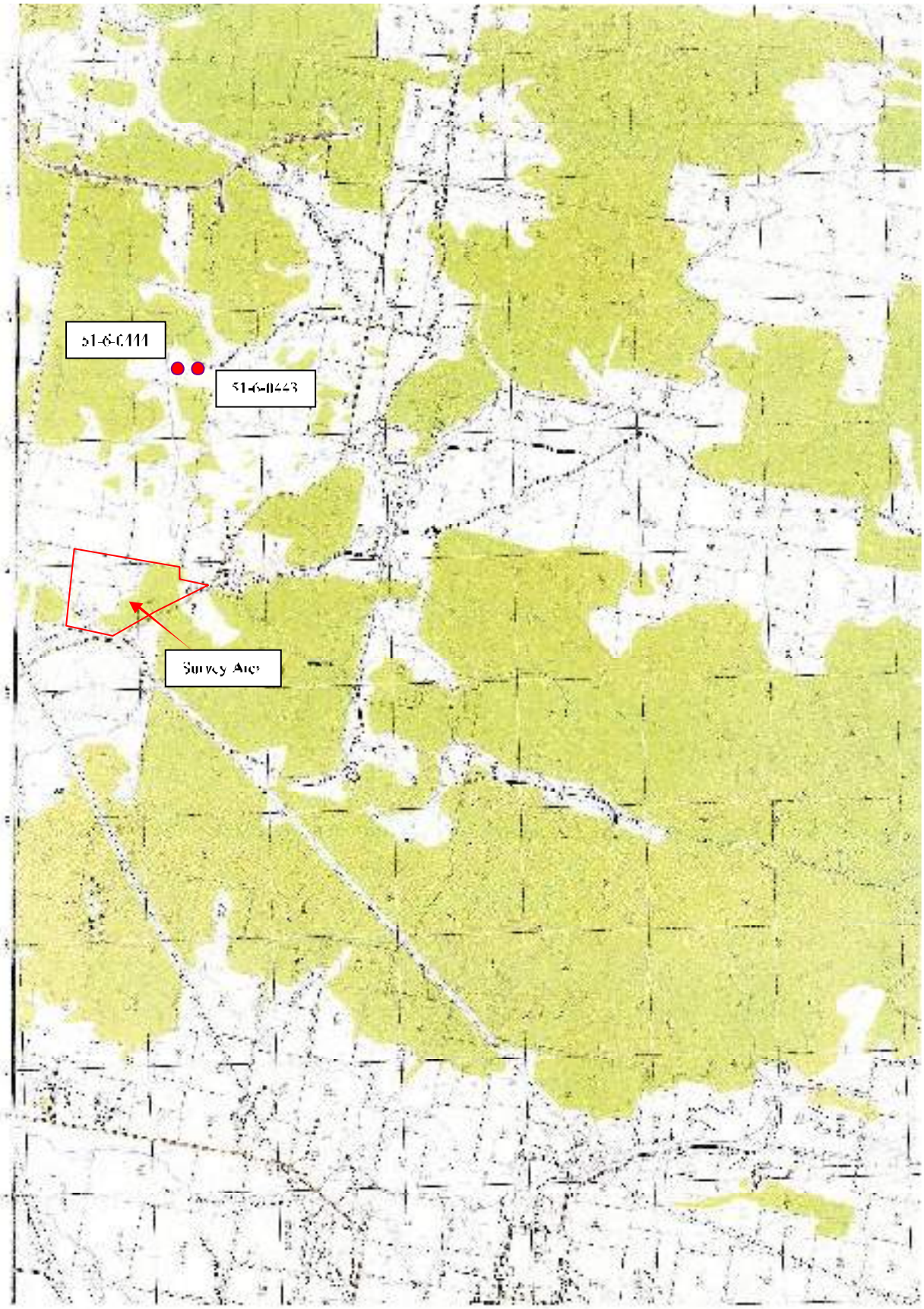

Figure 4.2. Previously recorded sites closest to the survey area (For site protection and conservation the locations presented are general).

The Wider Area.

For at least 20,000 years, Aboriginal people have occupied the Sydney Region. Archaeological excavations at, for example, Shaw's Creek KII in the Blue Mountains, and Burrill Lake on the south coast, provide the earliest evidence for occupation at 13,000BP [years before present] and 20,000BP respectively.[21] McDonald notes that at the time of occupation of Burrill Lake, the sea would have been some 16 kilometres further east from today's coastline.[22] At this time it seems that occupation of many areas including the Shoalhaven, Goulburn and Illawarra regions was sporadic and the population fairly low. Attenbrow argues that it was not until 5 000 years ago that generally "an increasing and continued use of [sites] began, or was frequent enough to be archaeologically visible".[23]

Over the last 20 000 years, and particularly the last 5 000 to 8 000 years, changes in stone tool types have been recorded as temporal markers. As argued by Kohen (1986) there was a more intensive use of open campsites during the last 1,500 years and that most sites, therefore, will date to this late Bondaian period.[24] However, while Kohen's classifies sites as falling into the late Bondaian period due to, for example, the absence of backed blades, McDonald suggests that the absence of backed blades on many sites is a consequence of small sample size, rather than there being a real absence of backed blades as a temporal marker.[25] Backed blades were not identified during those surveys discussed in this report.

Regional Models.

According to many regional models of site types and distribution, sites are more likely to occur along ridgelines and both major and minor tributaries of rivers. Indeed, permanent water sources like the Wollondilly River or seasonally reliable sources like

[21] McDonald, J. 1993. *Archaeological survey of the Rouse Hill Infrastructure Project (Stage 1) Works along Caddies, Smalls and Second Ponds Creeks, Rouse Hill, NSW.* For Rouse Hill Joint Venture. p.7.
[22] McDonald, J. 1992. 'The Archaeology of Angophora Reserve Rock Shelter'. *Environmental Heritage Monograph Series No 1.* National Parks and Wildlife Service.
[23] Attenbrow (1981:169), in J. McDonald, 1993, *Archaeological survey of the Rouse Hill Infrastructure Project (Stage 1) Works along Caddies, Smalls and Second Ponds Creeks, Rouse Hill, NSW.* For Rouse Hill Joint Venture. p.8.
[24] McDonald, J. 1993, *Archaeological survey of the Rouse Hill Infrastructure Project (Stage 1) Works along Caddies, Smalls and Second Ponds Creeks, Rouse Hill, NSW.* For Rouse Hill Joint Venture. p.9, 11-12.
[25] McDonald, J. 1993, *Archaeological survey of the Rouse Hill Infrastructure Project (Stage 1) Works along Caddies, Smalls and Second Ponds Creeks, Rouse Hill, NSW.* For Rouse Hill Joint Venture. p.12.

Osborn's and Towrang Creeks were necessary for occupation to occur. Focussing on the Southern Tablelands region, it is predicted that sites will most often occur near watercourses, such as rivers and creeks and on high ground near water. In addition to the availability of water in influencing the distribution of sites across the landscape, other factors which appear to be important in site placement are the proximity to a diversity of economic resources such as food and lithic materials and suitable landforms for occupation to occur.

While archaeological evidence may occur in various landforms and circumstances across the Southern Tablelands, most sites are likely to be associated with creeklines or waterways and occur in elevated positions above water. There is also a higher potential for sites on ridges and low ridge tops. Ethnographic reports, McDonald notes, and archaeological results in various regions across Australia, indicate that open campsites tend to be located in elevated positions, including knolls, flat parts of hill slopes, high creek banks, and saddles.[26] The density and complexity of archaeological sites will vary according to permanence of water, the landscape type and proximity to lithic resources.[27]

In their general predictive model for the Southern Tablelands, Koettig and Lance argue that larger more dense sites will be found on alluvial flats along major water courses and represent focal points of Aboriginal activity.[28] Smaller sites they continue are found on undulating hills. Site frequency and size decrease the further their distance from water and sites also become fewer in number where ground is steeply sloping, like hillsides or ridges. According to Hillary duCross, however, ridge tops are also thought to have formed significant movement corridors.[29]

[26] McDonald, J. 1993. *Archaeological survey of the Rouse Hill Infrastructure Project (Stage 1) Works along Caddies, Smalls and Second Ponds Creeks, Rouse Hill, NSW.* For Rouse Hill Joint Venture. p.11.
[27] Jo McDonald Cultural Heritage Management Pty Ltd. 2002b. *Rouse Hill Infrastructure Project (Stage 3) Development Areas 2, 5, 20, 22 and 24B, Second Ponds Creek Area Indigenous & European Heritage Issues.* For RHJ Pty Ltd. p.15.
[28] Koettig, M. and A. Lance. 1986. *Aboriginal Resources Planning Study for the City of Goulburn, NSW.* For Goulburn City Council.
[29] duCross in Hagund 1986. p.4.

5.3. *Potential Site Types.*

Based on discussions with Aboriginal community representatives, previous land-use history, and previous studies that indicate site types, their location, and density in similar environmental settings, the sites most likely to occur throughout the study area are open campsites and isolated finds.

Open Campsites:

As the most common site type in the wider area, open campsites appear to be the most likely Aboriginal site type that might occur in the survey area. Open artefact scatters may occur almost anywhere that indigenous people have travelled and are associated with hunting or gathering activities, domestic camps, or the manufacture or maintenance of stone tools. These sites would be likely to occur on most topographic units, on high ground between creeks, on ridge tops and particularly along creek banks, or at confluences of creeks. As such, in the present survey, stone artefacts in open situations were considered the most likely site type to be identified.

Archaeological evidence in open campsites or artefact manufacturing sites usually consists of stone artefact scatters and sometimes hearths, exposed on and buried beneath the ground surface. Neighbouring archaeological studies examined in this report suggest that, in the Goulburn area, such sites would be small shallow surface scatters of stone artefacts which do not possess deeply stratified deposits. However, even in some instances where no surface artefacts are visible, dense artefact sites may occur beneath the surface. In the Goulburn area, both surface and sub-surface sites would be recognisable by concentrations of flaked stone material, particularly red, grey and or white silcrete and quartz.

Isolated Finds:

Isolated Finds are generally described as single artefacts located more than 50 metres from any other artefact. They can occur almost anywhere in the landscape and may represent the random loss or deliberate abandonment of artefacts, or the remains of dispersed artefact scatters. Generally, areas further from water sources sites would tend to have low artefact numbers, with most being isolated artefacts.

Quarries:

Quarries for stone appropriate for tool manufacture are likely to occur near a source of the raw material. For the area being examined, this may have been the Towrang creek bed. The alluvial terraces of the Wollondilly River, where fine-grained siliceous and volcanic rocks would have provided stone with excellent flaking qualities, are located some 5 kilometres to the north. While a silcrete quarry site was recorded by McIntyre within 2 kilometres of the subject survey at Towrang, no outcrops of silcrete were found in the survey area. An abundance of scattered naturally occurring quartz, however, was observed on the surface.

Scarred or Carved Trees:

Although not found in the specific survey area, in the wider Goulburn region, trees have been recorded which bear scars of wood removal for the manufacture of bowls, shields, spear throwers and other wooden artefacts. Scars may also be the result of making footholds in a tree to collect foodstuffs or to facilitate the removal of bark. Unless a tree is at least 150 years old, scarring is not likely to be of Aboriginal origin. Given the extent of land clearance that has occurred in the subject study area, the potential for mature scarred trees is considered to be low.

Middens:

No shell middens have been recorded within 5 kilometres of the survey area. Towrang is not an area in which shellfish are abundant, unlike coastal areas. Middens are usually found on the coast and on the shorelines of estuaries, lakes and inland rivers. Sites along dunes are typically middens and open camps, with sparse scattering of archaeological material along the ridgelines of the dunes.[30]

Middens result from seasonal camping and exploitation of cockles, oysters and other shellfish. They are distinguishable from a natural shell layer where they include, for example, burnt shell, faunal remains, charcoal, hearth stones and/or stone artefacts. The durability of shell, like stone, gives it a better probability of survival than most other remains.

[30] McCardle Cultural Heritage Pty Ltd. 2003. *Proposed Tourist Development at Anna Bay, Port Stephens. Indigenous Cultural Heritage Assessment.* For Monin and Stephens. p.46.

Middens will only be found in association with major water sources where there are appropriate conditions for shellfish habitation. No such water sources exist within the survey area.

Rock Shelter Sites:

The immediate survey area contains no rock overhangs or shelters, nor are they common in the wider area. It was therefore considered not possible that painting and engraving sites, or sheltered occupation deposits could be found.

Axe Grinding Grooves:

Ground edge axes or hatchets were important traditional Aboriginal tools. Axe grinding grooves result from the preparation or maintenance of the working edge of a stone axe or hatchet. Grinding grooves are often 150 to 300 millimetres long by 50 to 80 millimetres wide. They are usually located on suitable sandstone or conglomerate rock platforms around rock pools or in creek beds where water is used to facilitate the grinding process. Grinding sites have not been recorded within 5 kilometres of the survey area. No suitable surfaces for axe grinding occur within the survey area. No such sites were found during the present survey or have been previously recorded. While this may be a reflection of the small size of the area surveyed, the small outcrops of sandstone noted by Syme notes that along Towrang Creek were described as boulders rather than flat rocks and are not of the type consistent with grinding groove sites.

Burials:

In the Goulburn area burials are generally found in dry soft sediments such as sand or alluvial silts, in the hollows of trees or on rocky slopes.[3] Burials may also occur in middens, rock shelters, or overhangs. Rock shelter burials usually do not survive due to both animal and human disturbances. Tree burials, marked by scarring on the trees, are rare due to logging and land clearance. Some people were cremated on platforms, also often marked by scarred trees. Burials also occur within raised earth or stone mounds. These graves were sometimes lined with grass and the deceased wrapped in paperbark prior to being placed in the grave. Successive layers of grass, bark and earth were placed over the deceased forming a mound. Although factors such as land clearance,

[3] Koettig, M. and A. Lance. 1986. *Aboriginal Resources Planning Study for the City of Goulburn, NSW.* For Goulburn City Council. p.20.

erosion and acid soils reduce the chance of burials surviving intact, bone is durable and commonly survives in many environments. No have burials been reported in the immediate area and would be rare in the immediate area. The terrain and soils in the study area are not typical contexts in which burials might be expected to occur. Syme notes that burial sites are more likely to occur to the north nearer the margins of the Wollondilly River.[32]

Predictive Model.

Previous studies of site types, their location, and density in similar environmental settings, indicate that the sites most likely to occur throughout the survey area are open campsites and isolated finds. The surrounding area contains several creeks and, hence, a relatively high number of smaller campsites sites. According to regional models, if present, archaeological sites in the study area would be small and less dense occurring within 10 to 20 metres of the portion of Towrang Creek to the northwest. Isolated finds may occur further from the creek.

Like most sites in the area, artefacts that may be found in the survey area are likely to be predominantly red, grey and or white silcrete. Reinforcing this, the survey area is located within 2 kilometres of the Towrang silcrete source and contains an abundance of quartz scattered across the site.

The subject survey area also contains elevated ground overlooking the water source and surrounding landscape. While some archaeologists like duCross have argued that there is a high likelihood for artefacts to occur on ridgelines, according to Koettig and Lance, in the Goulburn region campsites are less likely to be found on ridges. In agreement with both lines of thought, ridgelines as major travel routes or viewing platforms during hunting are less likely to contain occupational campsites. The possibility of isolated finds and general discard remains high as people moved across the landscape.

Archaeological evidence if present in the survey area will reflect less permanent and transient occupation. The present survey area occurs 2 kilometres from Mt Towrang and 3 kilometres from the Wollondilly River, a major watercourse. These places are more likely to have dense archaeological site potential.

[32] Kayandel Archaeological Services. 2005. *Hume Highway Intersection Improvements at Towrang and Carrick Roads (north of Goulburn) NSW*. For RTA Environmental Technology. p.19.

6. SITE SURVEY.

Site survey was carried out on the 26th of February 2009. The subject area was surveyed by Dr. Louise Steding and Mr Gerald Steding of Stedinger Associates Pty Ltd together with local Aboriginal representatives Mr David Pope (Pejar Local Aboriginal Land Council) and Mr Wally Bell (Buru Ngunawal Aboriginal Corporation). A report from the Pejar Local Aboriginal Land Council expressing their interest in the land and the proposed development are included as Appendix One of this report.

6.1. Field Methods and Survey Strategy.

The following archaeological investigation involved a field survey of the specified survey area at Lot 1 (1094055), Towrang. This survey was carried out on foot by the archaeologist, one field assistant and two representatives of the local Aboriginal community. The designated area measures 40 hectares. The survey of the area was generally carried out according to the following five landform units:

1. Basalt resource ridge;
2. Slopes;
3. Forested areas;
4. High land (other than the basalt resource ridge); and
5. Low-lying land.

While walking over the survey area, exposures were inspected for artefacts and possible worked features. Principal areas of exposure were found around the bases of trees, in areas of surface erosion, along the banks of dams and the old clay-brick quarry, sparse grass cover and where grading had occurred. Larger trees were examined for evidence of scarring.

Maps used in this study include.

- Bungonia 8828-11-N Topographic Map. Central Mapping Authority of NSW (CMA), 1983. Scale 1: 25 000.
- Towrang 8828-1-S Topographic Map. Central Mapping Authority of NSW (CMA), 1983. Scale 1: 25 000.

6.2. The Survey Area.

The survey area covers about 40 hectares at Lot 1 (1094055), Towrang. It consists of elevated land to the north descending to the west and south. This area to the north overlooks the surrounding landscape. As a low-lying landform, the northwest portion is likely to be an area into temporary water sources drain. Here, a portion of Towrang Creek can be found. No permanent water source occurs in the survey area. Also in a low-lying area, to the south two dams and a quarry for clay suitable for brick-making have been excavated. Another dam has been excavated between the hills near the northern boundary.

Much of the survey area has been cleared with small stands of tree surviving on hills to the north, west and southwest. The area is now open grazing land. This bushland however, appears to be secondary regrowth with little understorey.

No sandstone platforms, boulders or exposed rock faces occur in the survey area. Yellow-tan sandy soil occurs on the creek flat to the northwest, tan-brown soil on the slopes and red soil upon the basalt resource area. Roads run along the west and part east sides of the property.

6.3. Visibility.

Visibility was generally moderate to high during the survey. However, levels of exposure varied according to landform units and other variables.

Open campsites and isolated finds are unobtrusive and can be difficult to locate when covered by vegetation. Effective survey coverage is an estimate of the extent of ground examined taking into account constraints on site discovery such as vegetation and soil cover. It is estimated that about 50 percent of the surface area was examined during the subject survey.

Many areas of high visibility existed, for example, where erosion has occurred or where recent disturbance has taken place in the form of the excavation of dams and the clay quarry. On the basalt resource landform limited rainfall has resulted in relatively sparse ground cover with exposures. The recent slashing of grass has improved visibility. The

same can be said of the central slopes and hills to the north. Here, however, surface gravels introduced a high level of visual interference. In particular, a large amount of surface quartz lies across the slopes. This is a raw material with common conchoidal fractures that make it difficult to identify artefacts in the absence of secondary retouch.

Low-lying areas also contained patched of surface pebbles, particularly to the south. To the west the light yellow-tan sands of the creek allowed clear visibility up to 80 percent. While in forested areas sparse grass cover occurs beneath trees, dense leaf and tree litter has obscured much of the surface. Here, surface visibility was reduced to less than 30 percent. Surface visibility will have affected the chances of locating archaeological evidence in more obscured areas.

6.4. *Disturbance.*

The survey area has been variously disturbed from previous and current landuse. Most of the area has been cleared for farming use. Several small dams have been built and land levelled for the erection of a machinery shed. At the far south end of the survey area, the land has been excavated for clay causing considerable disturbance in the early-mid twentieth century. Other works that have caused ground disturbance to underlying deposits include the excavation of service trenches for telecommunications and electricity cables. The Telstra cable lies along the western boundary following Tiyces lane. The electricity cable has been laid in the creek flat and its 'warning plastic' is now partially exposed due to erosion. In more level areas or less sloping areas that have been ploughed, artefactual material that may have been present will have been both vertically and horizontally displaced. On the hills and slopes, the downward movement of soils will have displaced artefactual material if present.

6.5. *Results and Discussion.*

No previously unrecorded or recorded Aboriginal archaeological sites were located within the specified survey area. As indicated in previous archaeological studies, the most common sites and their situations in the wider area are small campsites near a temporary water source and isolated finds on various landforms at various distances though generally further from water.

The lack of Aboriginal sites may be a consequence of a lack of resources in the immediate environment, such as sandstone outcrops suitable for grinding purposes, rock shelters suitable for occupation, permanent water sources and the varied food resources associated with a riverine environment. Instead, it is likely that people passed through rather than camped in the area as they made their way to the richer resources of the Wollondilly River and the prominent landmark Mount Towrang. These features would each have been a significant focus of human activity in the region. In the survey area the resources of Towrang Creek may have been exploited on a seasonal and transient basis.

The lack of sites may also be partially due to land clearance, grazing and other activities during the nineteenth and twentieth centuries resulting in the burial, displacement and/or destruction of heritage sites. Likewise, reduced surface visibility may have resulted in the lack of Aboriginal sites being located. It is possible that additional Aboriginal sites may have obscured by grass, soil and leaf cover.

6.6. *Photographs.*

Image 1. View from the Basalt hill resource across the subject landscape to the north boundary. Facing north. Stedinger Associates Pty Ltd, File 4101.

Image 2. View from the Basalt hill resource across the subject landscape to the southwest. Facing southwest. Stedinger Associates Pty Ltd, File 4103.

Image 3. View along the northern boundary fence showing red soil exposures and sparse grass coverage. Facing west. Stedinger Associates Pty Ltd, File 4104.

Image 4. View to the Basalt hill resource from the approximate centre of the survey area. Facing northeast. Stedinger Associates Pty Ltd, File 4110.

Image 5. Right: Detailed view of ground exposure and sparse grass coverage in the northeast portion of the survey area. Stedinger Associates Pty Ltd, File 4109.

Image 6. Below: Rocky surface inhibiting view of possible artefacts in the southern portion of the survey area. Facing west. Stedinger Associates Pty Ltd, File 4112

Image 7. Exposed ground surface to the southeast. Facing southeast towards Curlewin Lane. Stedinger Associates Pty Ltd, File 4111.

Image 8. Sparse ground cover with the machinery shed in the background. Facing south. Stedinger Associates Pty Ltd, File 4113.

Image 9. Sparse ground cover littered with stones in the southern portion of the survey area. Facing south southwest. Stedinger Associates Pty Ltd, File 4114.

Image 10. Small dam in the central southern portion of the survey area. Facing east. Stedinger Associates Pty Ltd, File 4115.

Image 11. The clay quarry for brick-making at the southern extent of the survey area. Facing south. Stedinger Associates Pty Ltd, File 4118.

Image 12. View along the southwest boundary of the survey area with Tiyces Lane to the left. Facing north northwest. Stedinger Associates Pty Ltd, File 4119.

Image 13. Path of the proposed access route leading from Tiyces Lane to the Basalt Resource. A dam is situated to the left. Facing southwest. Stedinger Associates Pty Ltd, File 4120.

Image 14. Low-lying land to the west along the course of Towrang Creek. Facing north. Stedinger Associates Pty Ltd, File 4125.

Image 15. View from the northwest across the survey area to a stand of trees in the west. Facing south. Stedinger Associates Pty Ltd, File 4128.

Image 16. A dense stand of trees with little understorey. Located near the centre of the survey area. Facing south. Stedinger Associates Pty Ltd. File 4129.

Image 17. View of the grassland across the higher ground to the north and northwest. Facing east. Stedinger Associates Pty Ltd, File 4130.

Image 18. View from the north across a dam towards the basalt resource hill,. Facing northeast. Stedinger Associates Pty Ltd, File 4132.

Image 19. An open grassed slope runs alongside the central stand of trees. Facing south. Stedinger Associates Pty Ltd, File 4135.

Image 20. Dense tree and leaf litter covers much of the ground surface in forested areas. Facing northeast. Stedinger Associates Pty Ltd, File 4136.

7. CONCLUSIONS AND RECOMMENDATIONS.

7.1. Cultural and Archaeological Significance.

Cultural Significance.

Sites of cultural significance are those that define Aboriginal values, provide links with the past and are a symbol of Aboriginal identity. They may be natural landscape features or archaeological evidence of past human activity.

Within the present survey area there is no material evidence of occupation and activities. In the wider area however, stone artefact scatters and isolated finds represent tangible and meaningful links with the lives of the community ancestors. As such the local Aboriginal community has interest in the identification and preservation of sites in the region. In previous site surveys of the wider area, the Pejar Local Aboriginal Land Council and other community representatives have indicated that open campsites and isolated finds are considered to be of cultural significance. Indeed, in their identification of isolated finds as being significant, the Pejar Local Aboriginal Land Council appears to indicate that all Aboriginal objects or sites are considered to be significant by local Aboriginal people. Many Aboriginal sites have been destroyed or disturbed with increasing quarrying, infrastructure projects and development in the area. They are 'non renewable' in what is already a depleted heritage resource.

Archaeological Significance.

Scientific or archaeological significance refers to research potential of the artefactual material occurring within a place or site. Several criteria are commonly used by consultants when assessing the archaeological significance of Aboriginal sites. These criteria are:

- the potential of a site and its artefacts to provide information on questions relevant to archaeology and Aboriginal heritage (*criterion: scientific*);
- the potential of a site and its artefacts to provide information not available from other sources or sites previously known from an area (*criterion: rarity*);
- The potential of a site to provide an example of a site type that is not already being conserved in a similar landscape in the general area (*criterion: representativeness*);

- The intactness or state of preservation of a site relative to other sites of the same type previously known from the area (criterion: integrity); and
- The inclusion of the site within a complex of the other sites that may give it greater potential for answering research questions (*criterion: site inter-relatedness*)

The lack of archaeological sites in the specific landscape is itself valuable information contributing to a view of the occupation of sites in the Goulburn area and the movement of Aboriginal people across the landscape.

7.2. Conclusions.

During this survey of the proposed area for the excavation of a quarry and implementation of a revegetation program at Towrang, no Aboriginal archaeological sites were found within the survey area and no previously recorded sites have been registered by the NSW Department of Environment and Climate Change. However, dense ground cover may have obscured surface artefacts in some parts of the survey area.

It is concluded that:

- The present archaeological survey indicates that Aboriginal heritage sites are not likely to exist in the subject survey area;
- Dense ground cover may have obscured archaeological sites or isolated artefacts in some parts of the survey area.

7.3. Relevant Legislation.

Under section 5(1) of the National Parks and Wildlife Act 1974 (as Amended), an Aboriginal object is defined as

> 'any deposit, object or material evidence (not being a handicraft made for sale) relating to the Aboriginal habitation of the area that comprises New South Wales, being habitation before or concurrent with (or both) the occupation of that area by persons of non-Aboriginal extraction, and includes Aboriginal remains'.

The National Parks and Wildlife Act 1974 (as Amended) states under section 90 that it is illegal to knowingly destroy, deface, or damage, or to knowingly cause or permit the destruction or defacement of or damage to, an Aboriginal object or Aboriginal place in

New South Wales without prior consent of the Director General of the NSW Department of Environment and Climate Change (National Parks and Wildlife Service).[33]

7.4. Recommendations.

The following recommendations are based on discussions in this report, consultation with the Pejar Local Aboriginal Land Council and other community representatives (refer to Chapter 1), background research, site survey and statutory requirements of the *National Parks & Wildlife Act 1974*. It is recommended that:

- Aboriginal heritage sites should not prevent the proposed quarry and revegetation program in the specified survey area. No archaeological sites were found during the recent survey of the area and no sites are known to be located in the specified study area.

- No further archaeological survey work for Aboriginal heritage sites is required prior to the excavation of the quarry and implementation of the revegetation program.

- Section 91 of the NPW Act 1974 requires that the accidental discovery of Aboriginal relics should be reported to the Director-General of the NSW Department of Environment & Conservation (National Parks and Wildlife Service). As such, during any works in the area surveyed the accidental discovery of Aboriginal objects or sites should be reported immediately to the Department of Environment & Climate Change (NPWS). Representatives of the Local Aboriginal community should also be informed of any such discovery and management strategies formulated and implemented.

[33] The Environmental Planning and Assessment Act 1979, requires that environmental impacts are considered in land use planning, including impacts on indigenous and non-indigenous heritage.
The Aboriginal and Torres Strait Islander Heritage Protection Act 1984, protects areas and/or objects which are of significance to Aboriginal people and which are under threat of destruction. A significant area or object is defined as one that is of particular importance to Aboriginal people according to Aboriginal tradition.

- Although no Aboriginal archaeological sites were found during the recent survey of the area or are known to be located in the specified survey area, during any works in the survey area, contractors and project personnel should be requested to work with caution and informed of the requirements outlined in Section 91 (1) of the NPW Act 1974.

Three copies of this report should be forwarded to:

Department of Environment and Climate Change (NPWS)
Southern Aboriginal Heritage Unit
PO Box 2115
QUEANBEYAN,
NSW 2620.

One copy of this report should be forwarded to the following organization:

Ms Delise Freeman
Pejar Local Aboriginal Land Council
PO Box 289
GOULBURN
NSW 2580

7.5. Independent Review.

The findings and recommendations of this survey and assessment will be independently reviewed by the NSW Department of Environment and Climate Change and relevant Aboriginal community. Formal approval for all actions outlined should be sought from the relevant authority prior to the commencement of works. Automatic approval of the management recommendations stated above should not be assumed.

REFERENCES.

DEPARTMENT OF ENVIRONMENT & CONSERVATION. SITE REPORTS:

Card 51-6-0058, Boxer Creek Tributary, Welingron.
Card 51-6-0065, G07, McIntye.
Card 51-6-0067, G08, McIntye.
Card 51-6-0069, G05 (Towrang), McIntye.
Card 51-6-0093, MF1 – Winfarthing Road, Charles Dearling.
Card 51-6-0095, MF2 – Winfarthing Road, Charles Dearling.
Card 51-6-0113, G7 Osborne's Creek, Edmonds.
Card 51-6-0115, Wollondilly River, Edmonds.
Card 51-6-0350, TC1-1 (Towrang Creek 1 – Locale 1), Syme.
Card 51-6-0351, TC1-2 (Towrang Creek 1 – Locale 2), Syme.
Card 51-6-0352, TC1-3 (Towrang Creek 1 – Locale 3), Syme.
Card 51-6-0353, TC1-4 (Towrang Creek 1 – Locale 4), Syme.
Card 51-6-0354, TC1-5 (Towrang Creek 1 – Locale 5), Syme.
Card 51-6-0355, TCPAD1 (Towrang Creek 1, PAD 1), Syme.
Card 51-6-0356, LA1, Archaeological Heritage Surveys.
Card 51-6-0357, LA2, Archaeological Heritage Surveys.
Card 51-6-0358, LA3, Archaeological Heritage Surveys.
Card 51-6-0359, LA4, Archaeological Heritage Surveys.
Card 51-6-0360, LA5, Archaeological Heritage Surveys.
Card 51-6-0361, LA6, Archaeological Heritage Surveys.
Card 51-6-0362, LA7, Archaeological Heritage Surveys.
Card 51-6-0363, LA8, Archaeological Heritage Surveys.
Card 51-6-0443, Tiyces 1, Pejar Local Aboriginal Land Council.
Card 51-6-0444, Tiyces 2, Pejar Local Aboriginal Land Council.

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APPENDICES.

1. Letters and Reports.

OFFICE OF THE REGISTRAR

Dr Louise Stedinger
Stedinger Associates Pty Ltd
PO Box 1206
Camden NSW 2570

Dear Louise

Re: Request - Search for Registered Aboriginal Owners

I refer to your fax dated 10 February 2009 regarding an archaeological survey at Tiyces Lane, Towrang, NSW.

I have searched the Register of Aboriginal Owners and the subject land does not have Registered Aboriginal Owners pursuant to Division 3 of the *Aboriginal Land Rights Act* 1983 (NSW)

I note you are already in contact with the Pejar Local Aboriginal Land Council regarding this project.

Yours sincerely

per Kylie McLeod
Project Officer
Aboriginal Land Rights Act 1983

10 February 2009

PEJAR LOCAL ABORIGINAL LAND COUNCIL

[illegible] (PO Box [illegible]) Goulburn NSW 2580
Phone (02) 4822 3552 • Fax (02) [illegible]
email address: pejar1@[illegible]
ABN 72 502 [illegible] 151

7 April 2009

Dr Louise Stedding
Stedinger Associates Pty Ltd
PO Box 1205
Camden NSW 2570

Dear Louise

Re: Aboriginal Site Inspection – Towrang

In reference to an inspection carried out by a representative from this organisation on 26 February 2009. The Pejar LALC agrees with the recommendations stated in your report dated March 2009, and are as follows

The following recommendations are based on discussions in this report, consultation with the Pejar Local Aboriginal Land Council and other community representatives (refer to Chapter 1), background research, site survey and statutory requirements of the National Parks & Wildlife Act 1974. It is recommended that

- *Aboriginal heritage sites should not prevent the proposed quarry and revegetation program in the specified survey area. No archaeological sites were found during the recent survey of the area and no sites are known to be located in the specified study area.*

- *No further archaeological survey work for Aboriginal heritage sites is required prior to the excavation of the quarry and implementation of the revegetation program.*

- *Section 91 of the NPW Act 1974 requires that the accidental discovery of Aboriginal relics should be reported to the Director-General of the NSW Department of Environment & Conservation (National Parks and Wildlife Service). As such, during any works in the area surveyed the accidental discovery of Aboriginal objects or sites should be reported immediately to the Department of Environment & Climate Change (NPWS). Representatives of the Local Aboriginal community should also be informed of any such discovery and management strategies formulated and implemented.*

- *Although no Aboriginal archaeological sites were found during the recent survey of the area or are known to be located in the specified survey area, during any works in the survey area, contractors and project personnel should be requested to work with caution and informed of the requirements outlined in Section 91 (1) of the NPW Act 1974.*

If there is any further information that you may require or wish to discuss this further, then please do not hesitate to contact me on the above numbers

Yours sincerely

[signature]

Delise Freeman
CEO

2. *Advertisement.*

TOWRANG ARCHAEOLOGICAL SURVEY NOTIFICATION

In accordance with the Interim Community Consultation Requirements by DECC, we would like to notify any interested parties of a proposed archaeological survery for Aboriginal sites on Lot 1, DP1094055, Tiyces Lane, Towrang. A quarry is proposed for development at this location. If you wish to be consulted about this project please register your interest with Stedinger Associates Pty Ltd by Friday 6th March 2009. Our contact details are: PO Box 1206, CAMDEN, NSW 2570. Tel. (02)4657-2480 or 0408-649-484.

3. *Native Title Claimants.*

NATIONAL NATIVE TITLE TRIBUNAL

Claimant Application Summary

Application numbers	Federal Court number: NSD6003/98 NNTT number: NC98/7
Application name	Gundungurra Tribal Council Aboriginal Corporation #6
Name of body where application lodged	National Native Title Tribunal
Date application lodged	29/04/1997
Current stage(s)	Notification Complete, In Mediation
Applicants	Ms Rose Stockwell, Mr Pamela Stockwell
Address for service	Mr Eduard Neumann Craddock Murray and Neumann Level 5 255 Castlereagh Street SYDNEY NSW 2000 Phone: 02 9261 4755 Fax: 02 9283 4180
Persons claiming to hold native title	The members of the Gundungurra Tribal Council Aboriginal Corporation.
Native title rights and interests claimed	1. Subject to (2) - (3) below, the full and free enjoyment of the following native title rights and interests are claimed in relation to the land and waters the subject of the application: a. A right to possess, occupy, use and enjoy the claim area; b. A right to make decisions about the use and enjoyment of the claim area; c. A right of access to the claimed area. d. A right to control the access of others to the claimed area. e. The right to control the use and enjoyment of others of resources of the claimed area; f. The right to trade in resources of the claimed area; g. The right to receive a share of any resources taken by others from the claimed area. h. The right to maintain, protect and prevent the misuse of cultural knowledge of the common law holders associated with the claimed area. 2. With respect to those parts of the area the subject of the application which are, or have been, the subject of a previous non-exclusive possession act within the meaning of s 23F of the Native Title Act 1993, the native title rights and interests are set out in (1) are claimed subject to the rights and interests created in the said exclusive possession act which are not inconsistent with the rights and interests claimed, subject to any extinction of the native title rights and interests which those inconsistent rights and interests cause. 3. With respect to those parts of the area the subject of the application which are, or have been, the subject of

Document Prepared: 19/06/2014 14:34 NC98/7 - 1 -

a. a category B intermediate period act within the meaning of s253C of the Native Title Act 1993;

b. a category C intermediate period act within the meaning of s253D of the Native Title Act 1993;

c. a category D intermediate period act within the meaning of s253E of the Native Title Act 1993;

the native title rights and interests claimed are those set out in (1) above subject to the rights and interests created in the non-exclusive possession act which are not inconsistent with the rights and interests claimed and, in the case of any rights granted which are inconsistent with the rights and interests claimed, subject to any extinguishment or suspension of the native title rights and interests which those inconsistent rights and interests cause.

4. With respect to those parts of the area of the application which are, or have been, the subject of:

a. a category B past act within the meaning of s238 of the Native Title Act 1993;

b. a category C past act within the meaning of s239 of the Native Title Act 1993;

c. a category D past act within the meaning of s232 of the Native Title Act 1993;

the native title rights and interests claimed are those set out in (1) above subject to the rights and interests existing in the non-exclusive possession act which are not inconsistent with the rights and interests claimed and, in the case of any rights granted which are inconsistent with the rights and interests claimed, subject to any extinguishment or suspension of the native title rights and interests which those inconsistent rights and interests cause.

5. The native title rights and interests identified above do not extend to ownership of any minerals, petroleum or gas which are wholly owned by the Crown.

6. The native title rights and interests identified above do not include a claim for exclusive occupation and use in relation to areas claimed by s253 of the Native Title Act 1993.

Area

Jurisdiction: New South Wales
Location: Land and waters in the area to the Blue Mountains south to Goulburn, following the Lachlan River west to Neville and then north to Mt Davidson.
Local government region(s): Bathurst City Council, Blayney Shire Council, Blue Mountains City Council, Boorowa Shire Council, Cowra Council, Campbelltown City Council, Cowra Shire Council, Upper Lachlan Council, Evans Shire Council, Goulburn City Council, Lithgow City Council, Gunning Shire Council, Liverpool City Council, Molonglo Shire Council, Oberon Council, Penrith City Council, Tallaganda Shire Council, Wingecarribee Shire Council, Wollondilly Shire Council
ATSIC region(s): Bland Plains Regional Council, Sydney Regional Council, Queanbeyan Regional Council
Representative A/TSI body(s): NSW Native Title Services Ltd
Land/water and/or sea: Land/Water

Area covered by the claim (as detailed in the application):
(a) Commencing at 150.52997 east longitude and 34.591536 south latitude, approximately 7.5 kilometres east south east of Moss Vale, the application traverses the boundary starting in a generally northerly direction, passing through points 2 to 36,755 of the following geographic coordinates. They are in decimal degrees and referenced to Australian Geodetic Datum 1984 (AGD84). These coordinates are based on the position of spatial reference data sourced by Land Information Centre, Department of Information Management and Technology, New South Wales as of 18 May 1999.

(b) Subject to clauses (d) and (e) the area covered by the application excludes any land or waters covered by:

(i) a scheduled interest;
(ii) freehold estate;
(iii) a commercial lease that is neither an agricultural lease nor a pastoral lease;
(iv) an exclusive agricultural lease or an exclusive pastoral lease;
(v) residential lease;
(vi) a community purposes lease;
(vii) a lease dissected from a mining lease as referred to in s23B.2)(vii);
(viii) any lease (other than a mining lease) that confers a right of exclusive use over particular land or waters;

which was validly vested or granted on or before 23 December 1996.

(c) Subject to clauses (d) and (e) the area covered by the application excludes any area covered by the valid construction or establishment of any public work, where the construction or establishment of the public work commenced on or before 23 December 1996.

(d) Where the act specified in (b) and (c) falls within the provisions of

(i) s23B(2) - Exclusion of acts benefiting Aboriginal peoples or Torres Strait Islanders;
(ii) s23B (9A) - Establishment of a national or state park;
(iii) s23B (9B) Acts where legislation provides for non extinguishment;
(iv) s23B (9C) Exclusion of Crown to Crown grants; and
(v) s23B (10) Exclusion by agreement,

the area covered by the act is not excluded from this application.

(e) Where an act referred to in clauses (b) and (c) covers land or waters referred to in

s47 Pastoral leases held by native title claimants;
s47A Reserves etc covered by claimant applications; and
s47B Vacant crown land covered by claimant applications,

the area covered by the act is not excluded from the application.

(f) Where an area is covered by a previous exclusive possession act (s 23B) the native title claim group does not claim possession, occupation, use and enjoyment to the exclusion of all others.

(g) The area covered by the application excludes land where native title has been extinguished at common law.

(h) The area covered by the application excludes areas covered by prior Federal applications filed with the National Native Title Tribunal being NC96/7, NC96/27, NC96/30, NC96/36 and 97/4.

Registration information	*Please refer to the Register of Native Title Claims/National Native Title Register (as appropriate) for registration details of this application.* **Date claim entered on Register of Native Title Claims:** 29/04/1997 **Registration test result:** Accepted for registration **Registration history:** Registered from 25/01/1997.
Attachments	1. Claimed Application Area, Attachment A of the Application, 1 page A4, Attached 29/04/1997

Document created 15/05/2006 14:36 NC0/99 - 3 -

NNTT contact details		
	Case manager:	Nicole Maher
	Address:	National Native Title Tribunal Level 25 25 Bligh Street SYDNEY NSW 2000 GPO Box 9973 SYDNEY NSW 2001
	Phone:	(02) 9235 6300 Freecall: 1800 640 501
	Fax:	(02) 9233 5613
	Web page:	www.nntt.gov.au

NATIONAL NATIVE TITLE TRIBUNAL.

Application Information and Extract from the Register of Native Title Claims

Application Information

Application numbers:	Federal Court number:	NG6060/98
	NNTT number:	NC97/7
Application name:	Guncungunna #6	
Registration history:	Registered from 29/04/1997.	

Register Extract (pursuant to s.186 of the *Native Title Act 1993*)

Application lodged with:	National Native Title Tribunal
Date application lodged:	29/04/1997
Date claim entered on Register:	29/04/1997
Applicants:	Ms Elsie Stockwell, Ms Pamela Stockwell
Address for service:	Mr Richard Neumann Craddock Murray and Neumann Level 7 255 Castlereagh Street SYDNEY NSW 2000 Phone: 02 9283 4755 Fax: 02 9283 4183

Area covered by the claim:

(a) Commencing at 150.52997 east longitude and 34.501636 south latitude, approximately 15.5 kilometres east south east of Moss Vale, the application traverses clockwise starting in a south-westerly direction, passing through points 2 to 38.765 of the following geographic coordinates [forming part of Attachment "B" of the application]. They are in decimal degrees and referenced to Australian Geodetic Datum 1984 (AGD84). These coordinates are based on the position of spatial reference data sourced by Land

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Information Centre, Department of Information Management and Technology, New South Wales as of 18 May 1999.

(b) Subject to clauses (d) and (e) the area covered by the application excludes any land or waters covered by:

(i) a scheduled interest;
(ii) freehold estate;
(iii) a commercial lease that is neither an agricultural lease nor a pastoral lease;
(iv) an exclusive agricultural lease or an exclusive pastoral lease;
(v) residential lease;
(vi) a community purposes lease;
(vii) a lease dissected from a mining lease as referred to in s23B(2)(vii);
(viii) any lease (other than a mining lease) that confers a right of exclusive use over particular land or waters;

which was validly vested or granted on or before 23 December 1996.

(c) Subject to clauses (d) and (e) the area covered by the application excludes any area covered by the valid construction or establishment of any public work, where the construction or establishment of the public work commenced on or before 23 December 1996.

(d) Where the act specified in (b) and (c) falls within the provisions of:

(i) s23B(9) - Exclusion of acts benefiting Aboriginal peoples or Torres Strait Islanders;
(ii) s23B (9A) - Establishment of a national or state park;
(iii) s23B (9B) - Acts where legislation provides for non-extinguishment;
(iv) s23B (9C) - Exclusion of Crown to Crown grants, and
(v) s23B (10) - Exclusion by regulation,

the area covered by the act is not excluded from this application.

(e) Where an act referred to in clauses (b) and (c) covers land or waters referred to in:

s47 - Pastoral leases held by native title claimants,
s47A - Reserves etc covered by claimant applications, and
s47B - Vacant crown land covered by claimant applications,

the area covered by the act is not excluded from the application.

(f) Where an area is covered by a previous non-exclusive possession act (s 23F) the native title claim group does not claim possession, occupation, use and enjoyment to the exclusion of all others.

(g) The area covered by the application excludes land where native title has been extinguished at common law.

(h) The area covered by the application excludes areas covered by prior Gundungurra claims filed with the National Native Title Tribunal being NC96/7, NC96/21, NC96/31, NC96/36 and 97/4.

Persons claiming to hold native title:

The members of the Gundungurra Tribal Council Aboriginal Corporation

Registered native title rights and interests:

The following Native Title Rights & Interests were entered on the Register on 23/06/2000:
1. Subject to (2) - (5) below, the full and free enjoyment of the following native title rights and interests area are claimed in relation to the land and waters the subject of the application.

a. A right to possess, occupy, use and enjoy the claim area;

b. A right to make decisions about the use and enjoyment of the claim area;

c. A right of access to the claimed area;

d. A right to control the access of others to the claimed area;

e. The right to control the use and enjoyment of others of resources of the claimed area.

2. With respect of those parts of the area the subject of the application which are, or have been, the subject of a previous non-exclusive possession act within the meaning of s 23F of the Native Title Act 1993, the native title rights and interests area set out in (1) are claimed subject to the rights and interests created in the 'non-exclusive possession act' which are not inconsistent with the rights and interests claimed and, in the case of rights granted which are inconsistent with the rights and interests claimed, subject to any suspension of the native title rights and interests which those inconsistent rights and interests cause.

3. With respect to those parts of the area the subject of the application which are, or have been, the subject of:

a. a category A intermediate period act within the meaning of s232C of the Native Title Act 1993;

b. a category C intermediate period act within the meaning of s232D of the Native Title Act 1993,

c. a category D intermediate period act within the meaning of s232F of the Native Title Act 1993;

the native title rights and interests claimed are those set out in (1) above subject to the rights and interests created in the non-exclusive possession act which are not inconsistent with the rights and interests claimed and, in the case of any rights granted which are inconsistent with the rights and interests claimed, subject to any suspension of the native title rights and interests which those inconsistent rights and interests cause.

4. With respect to those parts of the area of the application which are, or have been, the subject of:

a. a category B past act within the meaning of s230 of the Native Title Act 1993;

b. a category C past act within the meaning of s231 of the Native Title Act 1993;

c. a category D past act within the meaning of s232 of the Native Title Act 1993,

the native title rights and interests claimed area those set out in (1) above subject to the rights and interests created in the non-exclusive possession act which are not inconsistent with the rights and interests claimed

and, in the case of any rights granted which are inconsistent with the rights and interests claimed, subject to any extinguishment or suspension of the native title rights and interests which those inconsistent rights and interests cause.

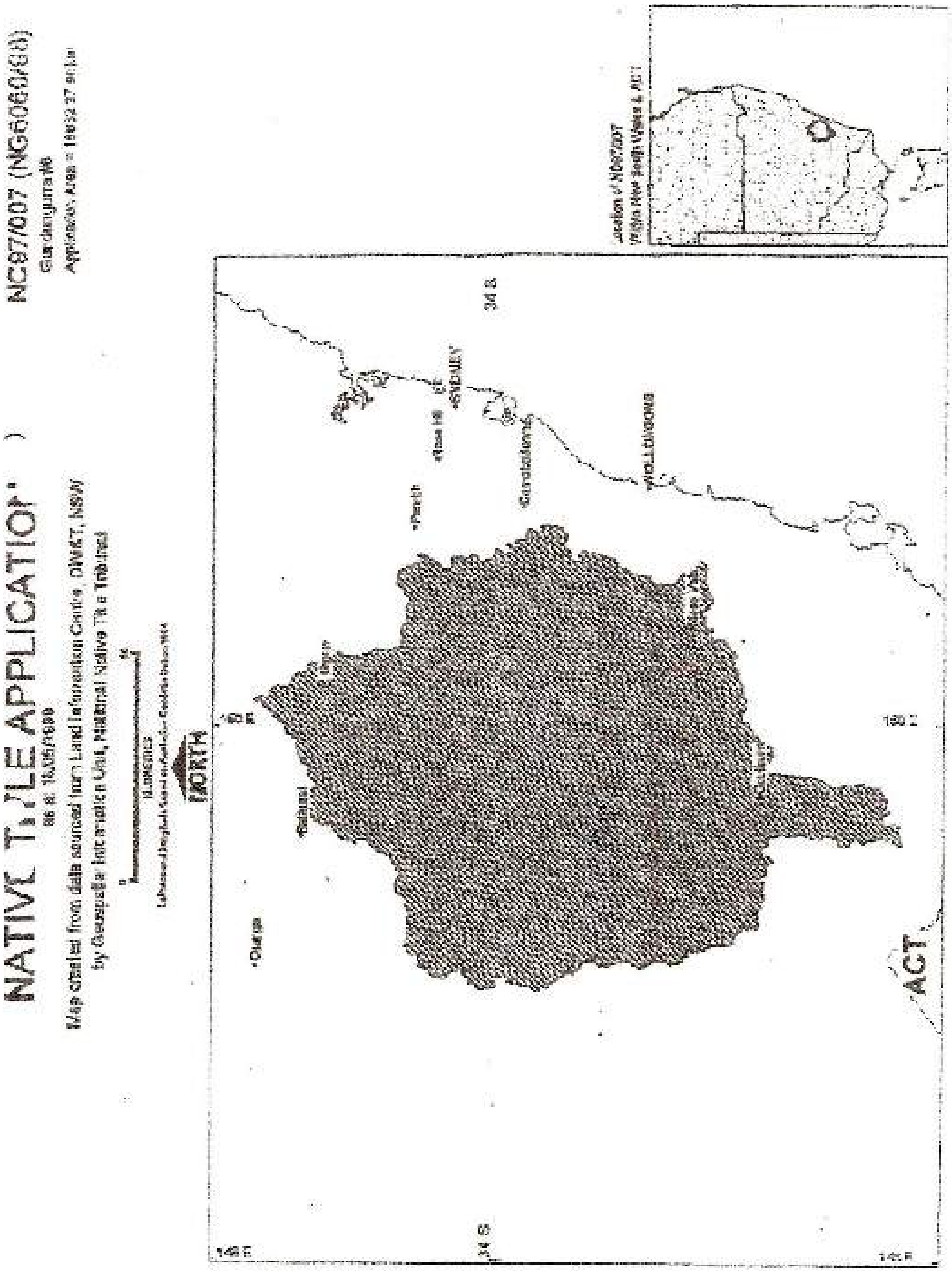
5. The native title rights and interests identified above do not extend to ownership of any minerals, petroleum or gas which are wholly owned by the Crown.

6. The native title rights and interests identified above do not include a claim for exclusive occupation and use of offshore areas as defined by s253 of the Native Title Act 1993.

Register attachments:

1. Attachment "A" Map of Application Area, 1 page - A4, Attached 23/06/2000.

Note: The Register may, in accordance with s.168 of the Native Title Act 1993, contain confidential information that will not appear on the Extract.


NATIVE TITLE APPLICATION
NC97/007 (NG6060/98)
Map created from data sourced from Land Information Centre, DWAT, NSW
by Geospatial Information Unit, National Native Title Tribunal
NORTH
SYDNEY
WOLLONGONG
Penrith
Orange
Bathurst
ACT

NATIONAL NATIVE TITLE TRIBUNAL

Claimant Application Summary

Application numbers	Federal Court number: N6001/00 NNTT number: NC00/1
Application name	Donald Thomas Bell on Behalf of the Ngunawal People (Ngunawal People (NSW))
Name of body where application filed	Federal Court of Australia
Date application filed	02/08/2000
Current stage(s)	Notification Complete, In Mediation
Applicants	Mr Donald Thomas Bell
Address for service	Dean Bell 11 Berger Street SOUTH WINDSOR NSW 2756
Persons claiming to hold native title	The claim is brought on behalf of the people listed below and their children, Donald Thomas Bell, Erin Bell, Dean Bell, Merkesi Bell, Demeka Bell, Tiara Biggs, Raymond Brydon, Caitlin Brydon, Darrell Brydon, Robert Brydon, Cindy Brydon, Leesa Brydon, Jacob Brydon, Jordanne Brydon, Jeremy Brydon, Joshua Brydon, Samantha Brydon, Dawn Brydon, Deborah Brydon, Gavin Brydon, Angela Brydon, [illegible] Brydon, Andrew Brydon, Amanda Brydon, Malcolm Brydon, Dorothy Carroll, Darrell Charles Tighe, Phyllis Gertrude Carroll, Nicole Hall, Mitchell Hall, Barry Honeysett, Pamela Honeysett, Kaniah Honeysett, Curtis Honeysett, Daryl Honeysett, Lucille Honeysett, Dean Honeysett, Dennis Honeysett, Dwayne Honeysett, James Honeysett, Angela Honeysett, Gordon Honeysett, Colleen Honeysett, Lyle Honeysett, Isobella Honeysett, Hilary Honeysett, Annika Honeysett, Teresa Honeysett, Shaun Honeysett, Jessica Honeysett, Yvonne Honeysett, Wayne Honeysett, Leticha Honeysett, Shiana Honeysett, Cameron Honeysett, Rhiana Honeysett, Craig Honeysett, Damien James Denny, Tyronne James Bell, Rebecca Jane Denny, Akira Jasmine Burton Young, Phillip John Young, Ruth Josephine Bell, Tegan Maree Denny, Karen Rebecca Denny, Wayne Taylor, Nicholas Taylor, Joshua Taylor, Nicollette Taylor, Lucianna Taylor, Pamela Tighe, Darroll Tighe Jnr, Anne Tighe, Alex Tighe, Evelyn Tighe, Craig Vincent Honeysett, Pamela Young
Native title rights and interests claimed	The native title rights and interests claimed are the rights to the possession, occupation, use and enjoyment as against the whole world (subject to any native title rights and interests which may be shared with any others who establish that they are native title holder(s) of the area, and in particular comprise: a) rights to possess, occupy, use and enjoy the area; b) the right to make decisions about the use and enjoyment of the area; c) the right of access to the area; d) the right to control the access of others to the area; e) the right to use and enjoy resources of the area; f) the right to control the use and enjoyment of others of resources of the area; g) the right to trade in resources of the area; i) the right to maintain and protect places of importance under traditional laws, customs and practices in the area; and j) the right to maintain, protect and prevent the misuse of cultural knowledge of the common law holders associated with the area. Subject to: 1. To the extent that any minerals, petroleum or gas within the area of the claim are

wholly owned by the Crown in the right of the Commonwealth or the state of New South Wales, they are not claimed by the applicants.

2. The claim area does not include any offshore place.

3. The applicants do not make a claim to native title rights and interests which confer possession, occupation, use and enjoyment to the exclusion of all others in respect of any areas in relation to which a previous non-exclusive possession act, as defined in s.23F of the NTA, was done in relation to an area, and, either the act was an act attributable to the Commonwealth, or the act was attributable to the state of New South Wales and a law of that State has made provision as mentioned in s 23I in relation to the act;

4. Paragraph 3 above is subject to such of the provisions of s 47, s47A and s47B of the Act as apply to any part of the area contained within this application, particulars of which will be provided prior to the hearing.

5. The said native title rights and interests are not claimed to the exclusion of any other rights or interests validly created by or pursuant to the common law, a law of the State or a law of the Commonwealth.

Area

Jurisdiction: New South Wales
Local government region(s): Boorowa Shire Council, Cooma Monaro Shire Council, Crookwell Shire Council, Upper Lachlan Council, Goulburn City Council, Gundagai Shire Council, Gunning Shire Council, Harden Shire Council, Mulwaree Shire Council, Queanbeyan City Council, Snowy River Shire Council, Tallaganda Shire Council, Yarrowlumla Shire Council, Yass Shire Council
ATSIC region(s): Binaal Billa Regional Council, Queanbeyan Regional Council
Representative A/TSI body(s): NSW Native Title Services Ltd
Land/water and/or sea: Land/Water

Area covered by the claim (as detailed in the application).

EXTERNAL BOUNDARY

Commencing at Longitude 149.471[illegible] east, Latitude 36.[illegible] south being a point approximately 5km north west of Umaralla Mountain, the application boundary traverses generally north westerly, crossing the Monaro Highway and the Bredbo [illegible] Creek until Longitude 148.726600 east, Latitude 35.78[illegible] south, being a point approximately 6km to the east of the southern end of the Tantangara Reservoir. Points 1 to 22 reference this section of the boundary as listed on Attachment "B" - Geographic Coordinates.

From here the boundary traverses generally northerly through the Kosciusko National Park until Longitude 148.604674 east, Latitude 35.23[illegible]5 south, then traverses generally north westerly until Longitude 148.543060 east, Latitude 35.090910 south, being a point south of the Bungongo State Forest. The boundary then traverses generally westerly, south of Paddy's Rock Hill, across the Serpentine Ridge and the Tumut River until Longitude 148.151500 east, Latitude 35.039421 south. From this point the boundary traverses generally north westerly until Longitude 148.144585 east, Latitude 35.000621 south being a point approximately located on the Murrumbidgee River. From here the boundary traverses northerly over the Murrumbidgee River again, until Latitude 148.132133 east, Longitude 34.977345 south, being a point approximately on the northern side of the Hume Highway. The boundary then traverses generally north easterly to the east of Nimby until Longitude 148.3[illegible] east, Latitude 34.548250 south, being a point approximately on the eastern side of the town of Harden. Points 23 - 50 reference this section of the boundary as listed on Attachment "B" - Geographic Coordinates.

From here the boundary traverses generally east south easterly crossing the Galong Boorowa Railway, then through the Midgee Range until Longitude 149.145523 east, Latitude 34.657445 south. From here the boundary traverses generally north easterly crossing the Lachlan River until Longitude 149.[illegible] east, Latitude 34.[illegible]30505 south. From this point the boundary traverses generally south easterly, north of Lake Sooley and across the Oberon Goulburn Road until Longitude 149.742200 east, Latitude 34.737230 south, being a point approximately on the south eastern outskirts of Goulburn. From here the boundary traverses generally southerly, approximately 2.75km to the west of Blacks Peak until Longitude 149.[illegible]6438 east, Latitude 35.503131 south, approximately 7km south of Braidwood. From here the boundary traverses generally south westerly through the Feeland, Tallaganda and Badja State Forests back to the commencement point. Points 51 - 136 reference this section of the boundary as listed on Attachment "B" - Geographic

Coordinates.

Geographic coordinates are referenced to Australian Geodetic Datum (AGD) 84, in decimal degrees and are based on the spatial reference data acquired from the various custodians at the time.

Use of Coordinates: Where coordinates are used within the description to represent cadastral or topographic boundaries or the intersection with such, they are intended as a guide only. As an outcome to the custodians of cadastral and topographic data continuously recalculating the geographic position of their data based on improved survey and data maintenance procedures, it is not possible to accurately define such a position other than by detailed ground survey.

INTERNAL BOUNDARIES

1. The application excludes the area covered by the Australian Capital Territory.
2. The applicants exclude from the claim any areas covered by valid acts on or before 23 December, 1996, comprising such of the following as are included as extinguishing acts within the Native Title Act 1993, as amended, or the Native Title (New South Wales) Act 1994, as amended, at the time of the Registrar's consideration:

i) Category "A" Past Acts, as defined in NTA s.228 and s.229;
ii) Category "A" Intermediate Period Acts as NTA s.232A and s.232B.

3. The applicants exclude from the claim any areas in relation to which a previous exclusive possession act, as defined in section 23B of the NTA, was done in relation to an area, and, either the act was an act attributable to the Commonwealth or the state of New South Wales and a law of that State has made provision as mentioned in section 23E in relation to the act.

4. The applicants exclude from the claim areas in relation to which native title rights and interests have otherwise been extinguished, including areas subject to:-

a) an act authorised by legislation which demonstrates the exercise of permanent adverse dominion in relation to native title; or
b) actual use made by the holder of a tenure other than native title which is permanently inconsistent with the continued existence of native title.

To avoid any uncertainty, the applicants exclude from the claim area any of the areas contained within the following descriptions or tenures which have been validly granted, set out in Schedule B1.

== SCHEDULE B1 ==

B1.1) Any former or current unqualified grant of an estate in fee simple and all other freehold land.
B1.2) A permanent public work and "the land or waters on which a public work is constructed, established or situated" within the meaning given to that phrase by the Native Title Act 1993 (Cth) s 251D.
B1.3) An existing public road or street used by the public, or dedicated road.

5. Paragraphs 2 to 4 above are subject to such of the provisions of sections 47, 47A and 47B of the Act as apply to any part of the area contained within this application, particulars of which will be provided prior to the hearing but which include such areas as may be listed in Schedule L.

Registration information

Please refer to the Register of Native Title Claims / National Native Title Register (as appropriate) for registered details of this application.
Date claim entered on Register of Native Title Claims:
04/07/2000

Registration test status:
Accepted for registration

Registration history:
Registered from 14/07/2000

Attachments	1. Map of Claim Area showing External Boundary, Attachment A of the Application, 1 page - A0, Attached 02/03/2001 2. Table of Geographical Co-ordinates of the External Boundary, Attachment B of the Application, 4 pages - A4, Attached 02/03/2000. NNTT map attached.	
NNTT contact details	**Case manager:**	Nicole Maher
	Address:	National Native Title Tribunal Level 25 25 Bligh Street SYDNEY NSW 2000 GPO Box 9973 SYDNEY NSW 2001
	Phone:	(02) 9235 6300 Freecall 1800 640 501
	Fax:	(02) 9233 5613
	Web page:	www.nntt.gov.au

NATIONAL NATIVE TITLE TRIBUNAL

Application Information and Extract from the Register of Native Title Claims

Application Information

Application numbers:	Federal Court number: NNTT number:	NG6001/2000 NC00/1
Application name:	Donald Thomas Bell on Behalf of the Ngunawal People (Ngunawal People (NSW))	
Registration history:	Registered from 04/07/2000.	

Register Extract (pursuant to s.186 of the *Native Title Act 1993*)

Application filed with:	Federal Court of Australia
Date application filed:	02/03/2000
Date claim entered on Register:	04/07/2000
Applicants:	Mr Donald Thomas Bell
Address for service:	Dean Bell 11 Berget Street SOUTH WINDSOR NSW 2756

Area covered by the claim:

EXTERNAL BOUNDARY

Commencing at Longitude 149.371904 east, Latitude 36.182838 south being a point approximately 3km north west of Umaralla Mountain, the application boundary traverses generally north westerly, crossing the Monaro Highway and the Reynolds Barkersdale Creek until Longitude 148.726600 east, Latitude 35.783503 south, being a point approximately 6km to the east of the southern end of the Tantangara Reservoir. Points 1 to 22 reference this section of the boundary as listed on Attachment "B" - Geographic Coordinates.

From here the boundary traverses generally northerly through the Kosciusko National Park until Longitude 148.694374 east, Latitude 35.234315 south, then traverses generally north westerly until Longitude 148.543050 east, Latitude 35.090910 south, being a point south of the Bongongo State Forest. The boundary then traverses generally westerly, south of Paddy's Rock Hill, across the Serpentine Ridge and the Tumut River until Longitude 148.161500 east, Latitude 35.039421 south. From this point the boundary traverses generally north westerly until Longitude 148.141685 east, Latitude 35.030631 south being a point approximately located on the Murrumbidgee River. From here the boundary traverses northerly over the Murrumbidgee River again, until Latitude 148.162133 east, Longitude 34.977345 south, being a point approximately on the northern side of the Hume Highway. The boundary then traverses generally north easterly to the east of Nimby until Longitude 148.376766 east, Latitude 34.548290 south, being a point approximately on the eastern side of the town of Harden. Points 23 - 50 reference this section of the boundary as listed on Attachment "B" - Geographic Coordinates.

From here the boundary traverses generally east south easterly crossing the Galong Boorowa Railway, then through the Midgee Range until Longitude 149.145529 east, Latitude 34.667445 south. From here the boundary traverses generally north easterly crossing the Lachlan River until Longitude 149.374453 east, Latitude 34.530505 south. From this point the boundary traverses generally south easterly, north of Lake Sooley and across the Oberon Goulbourn Road until Longitude 149.742200 east, Latitude 34.737239 south, being a point approximately on the north eastern outskirts of Goulbourn. From here the boundary traverses generally southerly, approximately 2.75km to the west of Blacks Peak until Longitude 149.805458 east, Latitude 35.505121 south, approximately 7km south of Braidwood. From here the boundary traverses generally south westerly through the Bolland, Tallaganda and Badja State Forests back to the commencement point. Points 51-116 reference this section of the boundary as listed on Attachment "B" - Geographic Coordinates.

Geographic coordinates are referenced to Australian Geodetic Datum (AGD) 84, in decimal degrees and area based on the spatial reference data acquired from the various custodians at the time.

Use of Coordinates. Where coordinates are used within the description to represent cadastral or topographic boundaries or their intersection with such, they are intended as a guide only. As an outcome to the custodians of cadastral and topographic data continuously recalculating the geographic position of their data based on improved survey and data maintenance procedures, it is not possible to accurately define such a position other than by detailed ground survey.

INTERNAL BOUNDARIES

1. The application excludes the area covered by the Australian Capital Territory.
2. The applicants exclude from the claim any areas covered by valid acts on or before 23 December, 1996, comprising such of the following as are included as extinguishing acts within the Native Title Act 1993, as amended, or the Native Title (New South Wales) Act 1994, as amended, at the time of the Registrar's consideration:

i) Category "A" Past Acts, as defined in NTA s.228 and s.229;
ii) Category "A" Intermediate Period Acts in NTA s.232A and s.232B.

3. The applicants exclude from the claim any areas in relation to which a previous exclusive possession act, as defined in section 23B of the NTA, was done in relation to an area, and, either the act was an act attributable to the Commonwealth or the state of New South Wales and a law of that State has made provision as mentioned in section 23E in relation to the act.

4. The applicants exclude from the claim areas in relation to which native title rights and interests have otherwise been extinguished, including areas subject to:-

a) an act authorised by legislation which demonstrates the exercise of permanent adverse dominion in relation to native title, or
b) actual use made by the holder of a tenure other than native title which is permanently inconsistent with the continued existence of native title.

To avoid any uncertainty, the applicants exclude from the claim area any of the areas contained within the following descriptions of tenures which have been validly granted, set out in Schedule B1.

== SCHEDULE B1==

B1.1) Any former or current unqualified grant of an estate in fee simple and all other freehold land.
B1.2) A permanent public work and "the land or waters on which a public work is constructed, established or situated" within the meaning given to that phrase by the Native Title Act 1993 (Cth) s.251D.
B1.3) An existing public road or street used by the public, or dedicated road.

5. Paragraphs 2 to 4 above are subject to such of the provisions of sections 47, 47A and 47B of the Act as apply to any part of the area contained within this application, particulars of which will be provided prior to the hearing but which include such areas as may be listed in Schedule L.

Persons claiming to hold native title:

The claim is brought on behalf of the people listed below and their children:, Donald Thomas Bell, Erin Bell, Dean Bell, Merekai Bell, Danicka Bell, Tiara Biggs, Raymond Brydon, Caitlin Brydon, Darrell Brydon, Robert Brydon, Emily Brydon, Leesa Brydon, Jacob Brydon, Jordanne Brydon, Jeremy Brydon, Joshua Brydon, Samantha Brydon, Dawn Brydon, Deborah Brydon, Gavin Brydon, Angela Brydon, Brett Brydon, Andrew Brydon, Amanda Brydon, Malcolm Brydon, Dorothy Carroll, Darroll Charles Tighe, Phyllis Gertrude Carroll, Nicole Hall, Mitchell Hall, Barry Honeysett, Pamela Honeysett, Kaeleh Honeysett, Curtis Honeysett, Darryl Honeysett, Lucille Honeysett, Dean Honeysett, Donna Honeysett, Dwayne Honeysett, James Honeysett, Angela Honeysett, Gordon Honeysett, Colleen Honeysett, Lyle Honeysett, Isobella Honeysett, Hilary Honeysett, Amilia Honeysett, Tracey Honeysett, Shaun Honeysett, Jessica Honeysett, Maxine Honeysett, Wayne Honeysett, Latisha Honeysett, Shaun Honeysett, Cameron Honeysett, Rhiana Honeysett, Craig Honeysett, Damien James Denny, Tyronne James Bell, Rebecca Jane Denny, Aaine Jasmine Burton Young, Phillip John Young, Ruth Josephine Bell, Tegan Maree Denny, Karen Rebecca Denny, Wayne Taylor, Nicholas Taylor, Jasmin Taylor, Nicollette Taylor, Lorraine Taylor, Pamela Tighe, Darrell Tighe jnr, Aaron Tighe, Alex Tighe, Evelyn Tighe, Craig Vincent Honeysett, Pamela Young

Registered native title rights and interests:

The following Native Title Rights & Interests were entered on the Register on 04/07/2000:
The native title rights and interests claimed are the rights to the possession, occupation, use and enjoyment as against the whole world (subject to any native title rights and interests which may be shared with any others who establish that they are native title holders) of the area, and in particular comprise:
a) rights to possess, occupy, use and enjoy the area;
b) the right to make decisions about the use and enjoyment of the area;
c) the right of access to the area;
d) the right to control the access of others to the area;
e) the right to use and enjoy resources of the area;
f) the right to control the use and enjoyment of others of resources of the area;
g) the right to trade in resources of the area;

i) the right to maintain and protect places of importance under traditional laws, customs and practices in the area; and
j) the right to maintain, protect and prevent the misuse of cultural knowledge of the common law holders associated with the area
Subject to:

1. To the extent that any minerals, petroleum or gas within the area of the claim are wholly owned by the Crown in the right of the Commonwealth or the state of New South Wales, they are not claimed by the applicants.

2. The claim area does not include any offshore place

3. The applicants do not make a claim to native title rights and interests which confer possession, occupation, use and enjoyment to the exclusion of all others in respect of any areas in relation to which a previous non exclusive possession act, as defined in s.23F of the NTA, was done in relation to an area, and, either the act was an act attributable to the Commonwealth, or the act was attributable to the state of New South Wales and a law of that State has made provision as mentioned in s.231 in relation to the act;

4. Paragraph 3 above is subject to such of the provisions of s.47, s47A and s.47B of the Act as apply to any part of the area contained within this application, particulars of which will be provided prior to the hearing.

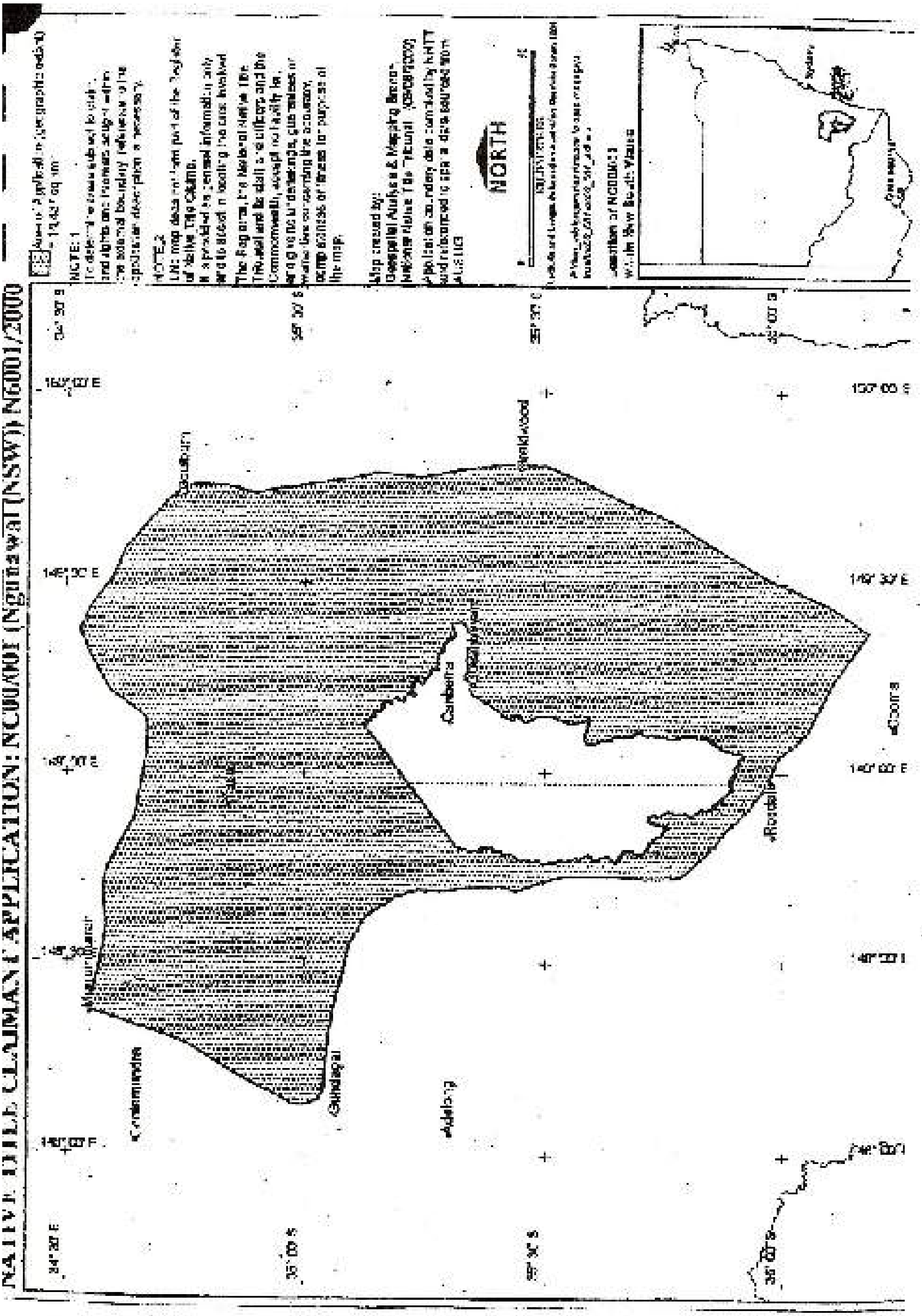
5. The said native title rights and interests are not claimed to the exclusion of any other rights or interests validly created by or pursuant to the common law, a law of the State or a law of the Commonwealth.

Register attachments:

1. Table of Geographical Co-ordinates of the External Boundary, Attachment B of the Application, 4 pages - A4, Attached 02/03/2000.

There is an AO size map of the application area which is too large to be included. This map can be viewed at the Sydney Registry of the National Native Title Tribunal.

Note: The Register may, in accordance with s.165 of the Native Title Act 1993, contain confidential information that will not appear on the Extract.


NATIVE TITLE CLAIMANT APPLICATION: NC00/001 (Ngunawal (NSW)) N6001/2000
NORTH
Goulburn
Canberra
Queanbeyan
Cooma
Gundagai
Cootamundra
Adelong

R. RMS Advice dated 13/02/17.

Our Ref: STH05/00270/25&26
Contact: Melissa Steep 4221 2771
Your Ref: DA/0350/1314

Transport Roads & Maritime Services

13 February 2017

Keith Allen
Laterals Planning
keith@laterals.com.au

Cc: council@goulburn.nsw.gov.au
cnovati@ncengineers.com.au

DEVELOPMENT APPLICATION DA/0350/1314 – LOT 1 DP 1094055, 288 TIYCES LANE, GOULBURN, ARGYLE QUARRY

Dear Keith,

Roads and Maritime Services (RMS) refers to correspondence from Claudia Novati of Novati Consulting Engineers dated 6 February 2017 (referring to the attached concept deceleration lane plans, Project no: 16039, DA01, 02, dated 21/12/16) and correspondence from yourself, dated 8 February 2017 (referring to the attached concept acceleration lane plans, Ref: 1315, dated 8/2/17), regarding the subject development application.

RMS has reviewed the information provided and notes the following:

- The developer proposes access to the subject development via a deceleration lane from the Hume Highway, direct to the development via a Right of Carriageway over adjoining Lot 2 DP 1094055 (see attached plan) and access from the development to the Hume Highway via Tiyces Lane, to be facilitated by construction of an acceleration lane (see attached plan).
- The proposed access arrangements, supported by a code of conduct for all heavy vehicle drivers, restrict all heavy vehicle manoeuvres to/from the Hume Highway to left in/left out.
- RMS has reviewed the provided information and is generally satisfied that the proposed deceleration and acceleration lanes can be constructed, to AUSTROADS standards (for light vehicles) and generally in accordance with the attached plans.

RMS will not object to the development application subject to the following comments being included in the conditions of development consent:

- Prior to the issuing of the construction certificate, the developer must enter into a Works Authorisation Deed (WAD) with the RMS for all works on the Hume Highway.
- Prior to any operations, the developer must provide a southbound left turn deceleration lane on the Hume Highway, at the location shown in the attached plans. The deceleration lane must be designed as a sealed Rural Auxiliary Left Turn Treatment (AUL) in accordance with Section 8.2.3 of Austroads Guide to Road Design Part 4a: Unsignalised and Signalised Intersections.

- Prior to any operations, the developer must provide a southbound left turn acceleration lane from Tiyces Lane, onto the Hume Highway, generally as shown in the attached concept. The acceleration lane must be designed to comply with Austroads Guide to Road Design Part 4a: Unsignalised and signalised intersections and the relevant RMS Supplement for a design speed of 110km/h, for light vehicles.

- Quarry trucks must not undertake any right turn movements between Tiyces Lane and the Hume Highway. Instead, all vehicles wishing to exit Tiyces Lane and travel north must do so by travelling south along the Hume Highway and undertaking a U-turn at the Southern Gouburn Interchange. Similarly, all heavy vehicles northbound wishing to enter the development must travel north along the Hume Highway and undertake a U-turn at the interchange south of Marulan and enter via the deceleration lane. The developer must implement and enforce a code of conduct for all drivers which require heavy vehicles to use this route.

- Access arrangements to/from the Hume Highway to Lot 2 DP 1094055 must be maintained.

- All access to Lots 1 & 2 DP 1094055 must be via a "Right of Way" legally certified on the titles of the burdened lots prior to an occupation certificate being issued by way of a Section 88B Instrument under the Conveyancing Act, 1919.

- All pavement design on the State road network must be in accordance with Austroads standards. It **should be noted that pavement investigations need to consider the suitability of the existing shoulder to accommodate new loadings and if necessary, the developer must upgrade the existing shoulder.**

- Where required, the developer must upgraded/provided lighting in accordance with Australian Standard AS/NZS1158.

- Any new services or modifications to existing services associated with this development application that involve works on, over or under the Hume Highway must be incorporated into, and managed under, the Works Authorisation Deed for the project. Note: It is the developer's responsibility to identify these works to RMS project manager.

- All roadworks, traffic control facilities and other works associated with this development, including any modifications required to meet RMS standards, will be at no cost to RMS. All works must be completed prior to occupation.

- All roadworks and traffic control facilities must be undertaken by a pre-qualified contractor. A copy of pre-qualified contractors can be found on the RMS website at:

  http://www.rta.nsw.gov.au/doingbusinesswithus/tenderscontracts/prequalifiedcontractors.html

- RMS will be exercising its powers under Section 64 of the Roads Act, 1993 to become the roads authority for works on the Hume Highway. Given this, Section 138 consent under the Roads Act, 1993 must be obtained from the RMS prior to construction.

  Note: It is requested that the consent authority advise the applicant that conditions of development consent do not guarantee RMS final consent to the specific road work, traffic control facilities and other structures and works on the classified road network. In this regard, prior to undertaking any such work, the applicant is required to submit detailed design plans and all relevant additional information prior to commencing work on the State road network. The developer will need to pay all RMS fees and charges associated with works. In the first instance, to progress the post consent process, the applicant should email the conditions of development consent to: WAD southern@rms.nsw.gov.au

- The developer must apply for, and obtain a Road Occupancy Licence (ROL) from the RMS Traffic Operations Unit (TOU) prior to commencing roadworks on a State Road or any other works that impact a travel lane of a State Road or impact the operation of traffic signals on

any road. The application will require a Traffic Management Plan (TMP) to be prepared by a person who is certified to prepare Traffic Control Plans. Should the TMP require a reduction of the speed limit, a Speed Zone Authorisation will also be required from the TOU. The developer must submit the ROL application 10 business days prior to commencing work. It should be noted that receiving an approval for the ROL within this 10 business day period is dependent upon RMS receiving an accurate and compliant TMP.

Notes: An approved ROL does not constitute an approval to commence works until an authorisation letter for the works has been issued by RMS Project Manager.

Conditions of development consent relating to road work, traffic control facilities and other structures on the classified road network contrary to those outlined above are unlikely to receive RMS consent under the Roads Act, 1993.

RMS highlights that in determining the application under Part 4 of the Environmental Planning and Assessment Act, 1979, it is the consent authority's responsibility to consider the environmental impacts of any road works which are ancillary to the development. This includes any works which form part of the proposal and/or any works which are deemed necessary to include as requirements in the conditions of development consent. Depending on the level of environmental assessment undertaken to date and nature of the works, the consent authority may require the developer to undertake further environmental assessment for any ancillary road works.

Upon determination of this matter, it would be appreciated if Council could email a copy of the Notice of Determination to RMS via development.southern@rms.nsw.gov.au.

Yours faithfully,

Chris Millet
A/Network & Safety Manager
Network Management, Southern Region

S. Water supply matters incorporating:
a. Water Supply Review by Hydroilex.
b. WAL 35518 – Edition 3 - 50M 20/3/2015.

BOX 1W
(AJ251865)

NEW SOUTH WALES

CERTIFICATE OF TITLE

WATER MANAGEMENT ACT, 2000

WAL35518	
3	20/3/2015
2DG2-Z4-RSKG	

This certificate is issued under s87B of the Water Management Act, 2000

WARNING NOTE: INFORMATION ON THIS REGISTER IS NOT GUARANTEED

TENURE TYPE: CONTINUING

HOLDER(S):

ARGYLE GRAVEL & CONCRETE PTY LIMITED (R AH662193)

ENCUMBRANCES
---
1. SECURITY INTERESTS IN THE WATER ENTITLEMENT REPLACED BY THIS ACCESS LICENCE THAT WERE REGISTERED OR CAPABLE OF BEING REGISTERED WITH LPI OR ASIC BEFORE THE COMMENCEMENT DATE OF THIS LICENCE 18/10/2012 MAY BE RECORDED ON THIS LICENCE WITHIN THREE YEARS FROM THE COMMENCEMENT DATE. SEE NOTES.
2. TERM TRANSFER: NIL

ACCESS LICENCE DETAILS

CATEGORY: AQUIFER

SHARE COMPONENT:
SHARE - 50 UNITS
WATER SOURCE - GOULBURN FRACTURED ROCK GROUNDWATER SOURCE
WATER SHARING PLAN - GREATER METROPOLITAN REGION GROUNDWATER SOURCES

EXTRACTION COMPONENT:
TIMES/RATES/CIRCUMSTANCES - SUBJECT TO THE CONDITIONS OF THE WATER ACCESS LICENCE
EXTRACTION FROM - AQUIFER
EXTRACTION ZONE - WHOLE WATER SOURCE

NOMINATED WORKS:
WORK APPROVAL NUMBER(S: - 10CA117967
INTERSTATE TAGGING ZONE - NIL

CONDITIONS

LICENCE CONDITIONS FORM A PART OF THIS LICENCE AND AFFECT THE SHARE AND EXTRACTION COMPONENTS. CONDITION STATEMENTS ARE AVAILABLE FROM THE NSW OFFICE OF WATER (NOW).

NOTES

A WATER LICENCE INFORMATION SHEET IS AVAILABLE FROM THE NSW OFFICE OF WATER (NOW) AND SHOULD BE REFERRED TO IN INTERPRETING THIS LICENCE.
NOW WEBSITE WWW.WATER.NSW.GOV.AU, PHONE 1800 353 104, EMAIL INFORMATION@WATER.NSW.GOV.AU
NOW REFERENCE NUMBER: 10AL117966

END OF PAGE 1 CONTINUED OVER

399933

BOX 1W
(AJ251865)

NEW SOUTH WALES

CERTIFICATE OF TITLE

WATER MANAGEMENT ACT, 2000

FOLIO TITLE REFERENCE	
WAL35518	
EDITION	DATE OF ISSUE
3	20/3/2015
CERTIFICATE AUTHENTICATION CODE	
2DG2-Z4-RSKG	

This certificate is issued under s878 of the Water Management Act, 2000.

NOTES (CONTINUED)

PREVIOUS WATER ACT LICENCE NUMBER(S): 10PT90222s, 10BL604804.

**** END OF CERTIFICATE ****

399934

Department of Primary Industries
Office of Water

File No: RD-0000460

Dear Sir/Madam

Re: Water Access Licence (WAL) Certificate of Title

Enclosed please find a water access licence (WAL) Certificate of Title. This certificate is a valuable legal document similar to a Certificate of Title for land and should be stored in a safe area with other legal documents.

The certificate was generated from information held in the WAL Register administered by Land and Property Information (LPI) on behalf of the Minister for Natural Resources, Land and Water.

This certificate has been forwarded to you because you are the nominated contact person for the WAL or you hold a security interest (such as a mortgage) in the WAL. If it is lost or damaged, you can apply to Land and Property Information for a replacement certificate.

This certificate must be presented at the Land and Property Information office to register any dealings (such as transfer, mortgage, subdivision or other changes to the WAL) on the WAL Register. The next edition, or a new WAL Certificate, is then issued.

Up-to-date information on a WAL can be obtained through an online search of the WAL Register at any time using the Land and Property Information website www.lpi.nsw.gov.au

Additional information is also available on the NSW Office of Water (NOW) website at www.water.nsw.gov.au. Some of the information and documents available on this website include:

- Information on all Water Sharing Plans
- A Guide to the conversion of water licences to water access licences and approvals.
- A Guide to water access licences and certificates.
- Licensing and compliance information.
- Information on security interests and dealings, as well as a Register of Water Approvals and a number of registers providing licensing and trading statistics.

Copies of these documents can also be viewed at the local NOW offices.

Yours sincerely

Garry Hodson
Deputy Commissioner, Water Regulation
NSW Department of Primary Industries, Office of Water

LAND AND PROPERTY INFORMATION NSW - INTEGRATED TITLING SYSTEM

CERTIFICATES OF TITLE DELIVERED

on 23/3/2015 8:33:48 AM

1W PETER MILLER
PO BOX 4
MITTAGONG 2575

Dealing	Certificate(s) of Title		Lodging Party Reference	Invoice
AJ251865 WQ	WAL35518	*	NO REFS	C576771
	WAL36982			

CERTIFICATE(S) OF TITLE: 2

MULTI PAGE CERTIFICATE(S) OF TITLE: 1

NEW SOUTH WALES

CERTIFICATE OF TITLE

WATER MANAGEMENT ACT, 2000

WAL TITLE REFERENCE	WAL35518
EDITION	3
DATE OF ISSUE	20/3/2015
CERTIFICATE AUTHENTICATION CODE	2DG2-Z4-RSKG

This certificate is issued under s87B of the Water Management Act, 2000.

NOTES (CONTINUED)

PREVIOUS WATER ACT LICENCE NUMBER(S): 10PT902225, 10BL604324.

**** END OF CERTIFICATE ****

BOX 1W
(AJ251865)

NEW SOUTH WALES

CERTIFICATE OF TITLE

WATER MANAGEMENT ACT, 2000

WAL TITLE REFERENCE	
WAL36982	
EDITION	DATE OF ISSUE
2	20/3/2015
CERTIFICATE AUTHENTICATION CODE	
CQTT-QG-GVPK	

This certificate is issued under s87B of the Water Management Act, 2000.

WARNING NOTE: INFORMATION ON THIS REGISTER IS NOT GUARANTEED

TENURE TYPE: CONTINUING

HOLDER(S):

BRAD - LEIGH INTERNATIONAL PTY LTD

ENCUMBRANCES
---
1. TERM TRANSFER: NIL

ACCESS LICENCE DETAILS

CATEGORY: AQUIFER

SHARE COMPONENT:
SHARE - 30 UNITS
WATER SOURCE - GOULBURN FRACTURED ROCK GROUNDWATER SOURCE
WATER SHARING PLAN - GREATER METROPOLITAN REGION GROUNDWATER SOURCES

EXTRACTION COMPONENT:
TIMES/RATES/CIRCUMSTANCES - SUBJECT TO THE CONDITIONS OF THE WATER ACCESS LICENCE
EXTRACTION FROM - AQUIFER
EXTRACTION ZONE - WHOLE WATER SOURCE

NOMINATED WORKS:
WORK APPROVAL NUMBER(S) - 10WA118959, 10WA119030
INTERSTATE TAGGING ZONE - NIL

CONDITIONS

LICENCE CONDITIONS FORM A PART OF THIS LICENCE AND AFFECT THE SHARE AND EXTRACTION COMPONENTS. CONDITION STATEMENTS ARE AVAILABLE FROM THE NSW OFFICE OF WATER (NOW..

NOTES

A WATER LICENCE INFORMATION SHEET IS AVAILABLE FROM THE NSW OFFICE OF WATER (NOW) AND SHOULD BE REFERRED TO IN INTERPRETING THIS LICENCE. NOW WEBSITE WWW.WATER.NSW.GOV.AU, PHONE 1300 353 104, EMAIL INFORMATION@WATER.NSW.GOV.AU
NOW REFERENCE NUMBER: 10AL119092

**** END OF CERTIFICATE ****

Department of Primary Industries
Office of Water

File No: RD-0000460

Dear Sir/Madam

Re: Water Access Licence (WAL) Certificate of Title

Enclosed please find a water access licence (WAL) Certificate of Title. This certificate is a valuable legal document similar to a Certificate of Title for land and should be stored in a safe area with other legal documents.

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- Licensing and compliance information.
- Information on security interests and dealings, as well as a Register of Water Approvals and a number of registers providing licensing and trading statistics.

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Yours sincerely

Garry Hodson
Deputy Commissioner, Water Regulation
NSW Department of Primary Industries, Office of Water

LAND AND PROPERTY INFORMATION NSW - INTEGRATED TITLING SYSTEM

CERTIFICATES OF TITLE DELIVERED

on 23/3/2015 8:33:48 AM

1W PETER MILLER
PO BOX 4
MITTAGONG 2575

Dealing	Certificate(s) of Title		Lodging Party Reference	Invoice
AJ251865 WC	WAL35518	*	NO REFS	CS76771
	WAL36982			

CERTIFICATE(S) OF TITLE: 2

MULTI PAGE CERTIFICATE(S) OF TITLE: 1

Land & Property Information

1 Prince Albert Rd
Sydney NSW 2000
Ph. 1300 052 637
Fax (02) 9233 4357
www.lpi.nsw.gov.au

MR. PETER FRANCIS MILLER
PO BOX 4
MITTAGONG 2575

Date: 20/3/2015

REGISTRATION NOTICE

THE UNDERMENTIONED DEALING(S) WERE REGISTERED/RECORDED ON 20/3/2015

DEALING NUMBERS: AJ344994 WX
AJ251865 WC

LODGMENT INVOICE NUMBER: C591579

LODGING PARTY REFERENCE: NO REFS

TITLE REFERENCE(S): WAL35518
WAL36032

REGISTRAR GENERAL

NSW GOVERNMENT

Department of Primary Industries
Office of Water

ARGYLE GRAVEL & CONCRETE PTY LIMITED
PO BOX 4
MITTAGONG NSW 2575

04 February 2015
Application No: 01008791
Your Ref: WAL35518

Dear Peter.

Application under the Water Management Act 2000

This letter is to inform you that your application for a water access licence dealing has been granted.

The Notice of Determination is attached. The Notice comprises the details of the determination on the front page and attaches the conditions that will apply to the relevant water access licence once the dealing is registered.

Please note that the dealing will only be legally effective once it is registered on the Water Access Licence Register administered by Land and Property Information (LPI). It is the responsibility of the applicant or their agent to complete this step. For further information regarding this step and applicable fees, you will need to contact LPI on telephone 02 9228 6666.

For further information about this determination, please contact Richard Meares by email Richard.Meares@dpi.nsw.gov.au or by telephone .

Your sincerely

Richard Meares
for

Wayne Conners
Senior Water Regulation Officer (South)

Department of Primary Industries
Office of Water

Notice of Determination

Issued under Water Management Act 2000

Application details

Application number 10008791

Application contact ARGYLE GRAVEL & CONCRETE PTY LIMITED
PO BOX 4
WITTAGONG NSW 2575

Determination

Application type Assign share component between water access licences (s71Q)

Determination Granted

Date of determination 04 February 2015

Registration expiry date 03 August 2015

Access Licence(s) Schedule 1

Attachment Instruction details

Determining officer

Signature

Name Wayne Connors

by delegation from the Minister for Water

Right of appeal
If you are dissatisfied with this decision, section 368(1) of the Water management Act gives you the right to appeal to the Land and Environment Court within 28 days after the date of determination.

Schedule 1 - Access licence(s)

WAL number 45516

Reference number 10AL117966

Holder(s)

Name(s) ARGYLE GRAVEL & CONCRETE PTY LIMITED

Access licence details

Water sharing plan GREATER METROPOLITAN REGION GROUNDWATER SOURCES

Water source GOULBURN FRACTURED ROCK GROUNDWATER SOURCE

Management zone Whole Water Source

Category AQUIFER

Share component 50

Tenure type Continuing

Nominated Works 10CA117967

Conditions

Part A: Plan conditions

No plan conditions applicable

Part B: Other conditions

No other conditions applicable

General Notes

All conditions on a water access licence require compliance. An appeal to the Land and Environment Court against a decision to impose certain conditions on a water access licence can be made. Conditions identified with the first letter 'a' are those that can be appealed.

Certain dealings and other matters relating to this water access licence or a holding in this water access licence must be registered in the Access Register in accordance with section 71A of the Water Management Act 2000. For information about the Access Register, contact Land and Property Information (http://www.lpi.nsw.gov.au).

Schedule 1 - Access licence(s)

WAL number 36992

Reference number 10AL119092

Holder(s)

Name(s) SEAD - LEIGH INTERNATIONAL PTY LTD

Access licence details

Water sharing plan GREATER METROPOLITAN REGION GROUNDWATER SOURCES

Water source GOULBURN FRACTURED ROCK GROUNDWATER SOURCE

Management zone Whole Water Source

Category AQUIFER

Share component 33

Tenure type Continuing

Nominated Works 10WA118950;10WA119030

Conditions

Part A: Plan conditions

No plan conditions applicable

Part B: Other conditions

No other conditions applicable

General Notes

All conditions on a water access licence require compliance. An appeal to the Land and Environment Court against a decision to impose certain conditions on a water access licence can be made. Conditions identified with the first letter "D" are those that can be appealed.

Certain dealings and other matters relating to this water access licence or a holding in this water access licence must be registered in the Access Register in accordance with section 71A of the Water Management Act 2000. For information about the Access Register, contact Land and Property Information (http://www.lpi.nsw.gov.au).

END OF NOTICE

NOTIFICATION

WATER MANAGEMENT ACT 2000

ALL HANDWRITING MUST BE IN BLOCK CAPITALS.

LEAVE THIS SPACE CLEAR FOR LPI USE

PRIVACY NOTE: THE WATER MANAGEMENT ACT 2000 AUTHORISES THE COLLECTION OF THE INFORMATION REQUIRED BY THIS FORM FOR THE ESTABLISHMENT AND MAINTENANCE OF THE WATER ACCESS LICENCE REGISTER. THAT ACT ALLOWS FOR PUBLIC ACCESS TO THE LICENCE REGISTER AND FOR MINISTERIAL DISCLOSURE OF INFORMATION CONTAINED IN THE LICENCE REGISTER.

CODE	DETAILS OF THE PERSON OR FIRM LODGING THIS FORM FOR REGISTRATION AT LPI			
WA	(A) DOCUMENT COLLECTION BOX	(B) NAME, ADDRESS OR DX, TELEPHONE, AND CUSTOMER ACCOUNT NUMBER IF ANY	(C) REFERENCE	(D) DEALING of

(E) WATER ACCESS LICENCE NUMBER	(F) LICENCE TENURE TYPE
35518 (Reduce) 36982 (Increase)	Continuing

(G) APPLICANT

ARGYLE GRAVEL & CONCRETE PTY LIMITED

(H) APPLICATION NUMBER	(I) REGISTRATION EXPIRY DATE	(J) NUMBER OF WAL FOLIOS TO ISSUE
D1008791	03 August 2015	0

The Minister responsible for the Water Management Act 2000, having granted the above application for a water access licence dealing, the applicant hereby requests the Registrar General to give effect to the instructions contained in annexure "A" hereto.
[NOTE: Annexure "A" will be forwarded separately to Land and Property Information by the New South Wales Office of Water.]

DATE

I certify that the applicant whose signature appears opposite, with whom I am personally acquainted or as to whose identity I am otherwise satisfied, signed this notice in my presence

Certified correct for the purposes of the Water Management Act 2000 by the applicant.

SIGNATURE OF WITNESS

SIGNATURE OF APPLICANT

NAME OF WITNESS

ADDRESS OF WITNESS (LINE 1)

ADDRESS OF WITNESS (LINE 2)

Department of Primary Industries
Office of Water

Instruction details

Application number: D1008791 **Date:** 04 February 2015

Transaction type: Assign share component between water access licences (s71Q)

REDUCING WAL 35518

Field	Current values	Amended values
WAL number	35518	No Change
Holder name(s):	ARGYLE GRAVEL & CONCRETE PTY LIMITED	No Change
Commencement Date		No Change
Tenure type	Continuing	No Change
Reference number	10AL117966	No Change
Category	AQUIFER	No Change
Share Component		
Template	1	No Change
Quantity (units/ML)	80	50
Water source	GOULBURN FRACTURED ROCK GROUNDWATER SOURCE	No Change
Water sharing plan	GREATER METROPOLITAN REGION GROUNDWATER SOURCES	No Change
Extraction Component		
Template	1	No Change
Times/rates	2	No Change
Water type	AQUIFER	No Change
Zone	Whole Water Source	No Change
Nominated Works		
Approval number	10CA117967	10CA117967
Tagging Zone	NIL	NIL

Instruction details

Application number: D1008791 **Date:** 04 February 2015

Transaction type: Assign share component between water access licences (s71Q)

INCREASING WAL 36982

Field	Current values	Amended values
WAL number	36982	No Change
Holder name(s)	BRAD - LEIGH INTERNATIONAL PTY LTD	No Change
Commencement Date		No Change
Tenure type	Continuing	No Change
Reference number	10AL119092	No Change
Category	AQUIFER	No Change
Share Component		
Template	1	No Change
Quantity (units/ML)	0	30
Water source	GOULBURN FRACTURED ROCK GROUNDWATER SOURCE	No Change
Water sharing plan	GREATER METROPOLITAN REGION GROUNDWATER SOURCES	No Change
Extraction Component		
Template	1	No Change
Times/rates	2	No Change
Water type	AQUIFER	No Change
Zone	Whole Water Source	No Change
Nominated Works		
Approval number	10WA118950,10WA119030	10WA118950,10WA119030
Tagging Zone	NIL	NIL

Instruction details

Application number:	D1006791	**Date:**	04 February 2016
Transaction type:	Assign share component between water access licences (s71Q)		

APPLICANT DETAILS

Application contact	ARGYLE GRAVEL & CONCRETE PTY LIMITED PO BOX 4 MITTAGONG NSW 2575

Department of Primary Industries
Office of Water

File No: RD-0000460

Dear Sir/Madam

Re: Water Access Licence (WAL) Certificate of Title

Enclosed please find a water access licence (WAL) Certificate of Title. This certificate is a valuable legal document similar to a Certificate of Title for land and should be stored in a safe area with other legal documents.

The certificate was generated from information held in the WAL Register administered by Land and Property Information (LPI) on behalf of the Minister for Natural Resources, Land and Water.

This certificate has been forwarded to you because you are the nominated contact person for the WAL or you hold a security interest (such as a mortgage) in the WAL. If it is lost or damaged, you can apply to Land and Property Information for a replacement certificate.

This certificate must be presented at the Land and Property Information office to register any dealings (such as transfer, mortgage, subdivision or other changes to the WAL) on the WAL Register. The next edition, or a new WAL Certificate, is then issued.

Up-to-date information on a WAL can be obtained through an online search of the WAL Register at any time using the Land and Property Information website www.lpi.nsw.gov.au

Additional information is also available on the NSW Office of Water (NOW) website at www.water.nsw.gov.au. Some of the information and documents available on this website include:

- Information on all Water Sharing Plans.
- A Guide to the conversion of water licences to water access licences and approvals.
- A Guide to water access licences and certificates.
- Licensing and compliance information.
- Information on security interests and dealings, as well as a Register of Water Approvals and a number of registers providing licensing and trading statistics.

Copies of these documents can also be viewed at the local NOW offices.

Yours sincerely

Garry Hodkin
Deputy Commissioner, Water Regulation
NSW Department of Primary Industries, Office of Water

LAND AND PROPERTY INFORMATION NSW - INTEGRATED TITLING SYSTEM

CERTIFICATES OF TITLE DELIVERED

on 8/12/2014 7:19:01 AM

1W HYDROILEX P/L
38 GIBBS STREET
MIRANDA 2228

Dealing	Certificate(s) of Title	Lodging Party Reference	Invoice
AJ90459 WA	WAL36982	NO REF	C553437

CERTIFICATE(S) OF TITLE: 1

MULTI PAGE CERTIFICATE(S) OF TITLE: 0

BOX 1W
(AJ90459)

NEW SOUTH WALES

CERTIFICATE OF TITLE

WATER MANAGEMENT ACT, 2000

WAL TITLE REFERENCE	
WAL36982	
EDITION	DATE OF ISSUE
1	5/12/2014
CERTIFICATE AUTHENTICATION CODE	
7P4Z-FY-9QGW	

This certificate is issued under s87B of the Water Management Act, 2000.

WARNING NOTE: INFORMATION ON THIS REGISTER IS NOT GUARANTEED

TENURE TYPE: CONTINUING

HOLDER(S)

BRAD - LEICH INTERNATIONAL PTY LTD

ENCUMBRANCES
---
1. TERM TRANSFER: NIL

ACCESS LICENCE DETAILS

CATEGORY: AQUIFER

SHARE COMPONENT:
SHARE 0 UNITS
WATER SOURCE - GOULBURN FRACTURED ROCK GROUNDWATER SOURCE
WATER SHARING PLAN - GREATER METROPOLITAN REGION GROUNDWATER SOURCES

EXTRACTION COMPONENT:
TIMES/RATES/CIRCUMSTANCES - SUBJECT TO THE CONDITIONS OF THE WATER ACCESS LICENCE
EXTRACTION FROM - AQUIFER
EXTRACTION ZONE - WHOLE WATER SOURCE

NOMINATED WORKS:
WORK APPROVAL NUMBER(S) - 10WA119950, 10WA119030
INTERSTATE TAGGING ZONE - NIL

CONDITIONS

LICENCE CONDITIONS FORM A PART OF THIS LICENCE AND AFFECT THE SHARE AND EXTRACTION COMPONENTS. CONDITION STATEMENTS ARE AVAILABLE FROM THE NSW OFFICE OF WATER (NOW).

NOTES

A WATER LICENCE INFORMATION SHEET IS AVAILABLE FROM THE NSW OFFICE OF WATER (NOW) AND SHOULD BE REFERRED TO IN INTERPRETING THIS LICENCE. NOW WEBSITE WWW.WATER.NSW.GOV.AU. PHONE 1800 353 104, EMAIL INFORMATION@WATER.NSW.GOV.AU
NOW REFERENCE NUMBER: 10AL119082

**** END OF CERTIFICATE ****

Department of Primary Industries
Office of Water

File ref: WS11/756

Dear Sir/Madam

I have enclosed a Water Access Licence (WAL) Certificate of Title. This certificate is a valuable legal document similar to a Land Certificate of Title and should be stored in a safe area with other legal documents.

The certificate was generated from information held in the WAL Register, which is administered by Land and Property Information on behalf of the Minister for Primary Industries.

This certificate has been forwarded to you because you are the nominated contact person for the WAL or you hold a security interest (such as a mortgage) in the WAL. If it is lost or damaged, you can apply to Land and Property Information for a replacement certificate.

This certificate must be presented at the Land and Property Information office to register any dealings (such as transfer, mortgage, subdivision or other changes to the WAL) on the WAL Register. The next edition, or a new WAL Certificate, is then issued.

If you would like up-to-date information on a WAL, you can undertake an online search of the WAL Register at any time using the Land and Property Information website www.lpi.nsw.gov.au

More information is also available on the NSW Office of Water (NOW) website at www.water.nsw.gov.au. Some of the information and documents available on this website include:

- Information on all Water Sharing Plans.
- A Guide to the conversion of water licences to water access licences and approvals.
- A Guide to water access licences and certificates.
- Licensing and compliance information.
- Information on security interests and dealings, as well as a Register of Water Approvals and a number of registers providing licensing and trading statistics.

Copies of these documents can also be viewed at the local NOW offices.

Yours sincerely

David Harriss

LAND AND PROPERTY INFORMATION NSW - INTEGRATED TITLING SYSTEM

CERTIFICATES OF TITLE DELIVERED

on 25/7/2013 8:03:04 AM

1W JAMES SEYMOUR MILLER
C/-ARGYLE GRAVEL & CONCRETE PTY LTD
PO BOX 4
MITTAGONG 2575

Dealing	Certificate(s) of Title	Lodging Party Reference	Invoice
AH662183 R	WAL35518	* -	C319869

CERTIFICATE(S) OF TITLE: 1

MULTI PAGE CERTIFICATE(S) OF TITLE: 1

Land & Property Information
A division of the Department of Finance & Services

1 Prince Albert Rd
Sydney NSW 2000
Ph 1300 052 637
Fax (02) 9233 4357
www.lpi.nsw.gov.au

MR JAMES SEYMOUR MILLER FOR ARGYLE GRAVEL AND
P O BOX 4
MITTAGONG NSW 2575

Date: 24/7/2013

REGISTRATION NOTICE

THE UNDERMENTIONED DEALING(S) WERE REGISTERED/RECORDED ON 24/7/2013

DEALING NUMBERS: AH662183 R

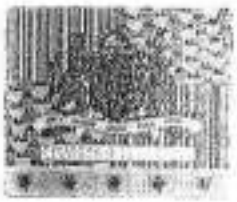
LODGMENT INVOICE NUMBER: C319869

LODGING PARTY REFERENCE: -

TITLE REFERENCE(S): WAL35518

REGISTRAR GENERAL

BOX 1W
(AH662183)



NEW SOUTH WALES

CERTIFICATE OF TITLE

WATER MANAGEMENT ACT, 2000

WAL TITLE REFERENCE	
WAL35518	
EDITION	DATE OF ISSUE
2	24/7/2013
CERTIFICATE AUTHENTICATION CODE	
MPRT-CM-G26V	

This certificate is issued under s87B of the Water Management Act, 2000

WARNING NOTE: INFORMATION ON THIS REGISTER IS NOT GUARANTEED

TENURE TYPE: CONTINUING

HOLDER(S)

ARGYLE GRAVEL & CONCRETE PTY LIMITED (R AH662183)

ENCUMBRANCES
---
1. SECURITY INTERESTS IN THIS WATER ENTITLEMENT REPLACED BY THIS ACCESS LICENCE THAT WERE REGISTERED OR CAPABLE OF BEING REGISTERED WITH LPI OR ASIC BEFORE THE COMMENCEMENT DATE OF THIS LICENCE 18/10/2012 MAY BE RECORDED ON THIS LICENCE WITHIN THREE YEARS FROM THE COMMENCEMENT DATE. SEE NOTES.
2. TERM TRANSFER: NIL

ACCESS LICENCE DETAILS

CATEGORY: AQUIFER

SHARE COMPONENT:
SHARE - 80 UNITS
WATER SOURCE - GOULBURN FRACTURED ROCK GROUNDWATER SOURCE
WATER SHARING PLAN - GREATER METROPOLITAN REGION GROUNDWATER SOURCES

EXTRACTION COMPONENT:
TIMES/RATES/CIRCUMSTANCES - SUBJECT TO THE CONDITIONS OF THE WATER ACCESS LICENCE
EXTRACTION FROM - AQUIFER
EXTRACTION ZONE - WHOLE WATER SOURCE

NOMINATED WORKS:
WORK APPROVAL NUMBER(S) - 10CA117967
INTERSTATE TAGGING ZONE - NIL

CONDITIONS

LICENCE CONDITIONS FORM A PART OF THIS LICENCE AND AFFECT THE SHARE AND EXTRACTION COMPONENTS. CONDITION STATEMENTS ARE AVAILABLE FROM THE NSW OFFICE OF WATER (NOW).

NOTES

A WATER LICENCE INFORMATION SHEET IS AVAILABLE FROM THE NSW OFFICE OF WATER (NOW) AND SHOULD BE REFERRED TO IN INTERPRETING THIS LICENCE.
NOW WEBSITE WWW.WATER.NSW.GOV.AU, PHONE 1800 353 104, EMAIL INFORMATION@WATER.NSW.GOV.AU
NOW REFERENCE NUMBER: 10AL117966

END OF PAGE 1 CONTINUED OVER

276571

BOX 1W
(AH662183)

NEW SOUTH WALES

CERTIFICATE OF TITLE

WATER MANAGEMENT ACT, 2000

WAL TITLE REFERENCE	
WAL35518	
EDITION	DATE OF ISSUE
2	24/7/2013
CERTIFICATE AUTHENTICATION CODE	
MPRT-CM-G26V	

This certificate is issued under s878 of the Water Management Act, 2000.

NOTES (CONTINUED)

PREVIOUS WATER ACT LICENCE NUMBER(S): 10PT902225, 10BL604804.

**** END OF CERTIFICATE ****

376572

HYDROILEX PTY LTD ABN 57 003 372 834

HYDROILEX **GEOLOGICAL CONSULTANTS**

38 GIBBS STREET, MIRANDA 2228 SYDNEY: (02) 9540 1029
FAX: (02) 9540 1002
5-7 WILLIAM STREET, MOLONG 2866: (02) 6366 8877
338 JERRARA RD, MARULAN 2579

Groundwater
Environmental
Petroleum & Mineral
Geosciences

Email johnlee@hydroilex.com.au
www.hydroilex.com.au
Mobile 0428 401 280

Mr Peter Miller
PO Box 4
MITTAGONG.2575

Attention: Mr Peter Miller
Director, Argyle (NSW) Pty Limited

Re: Determination of Water Supply Requirements for Tiyces Lane Proposed Basalt Quarry (Hydroilex Report HG16.1.4GO)

BACKGROUND

A review of the necessary water requirements to satisfy water needs for a 30,000 m^3 proposed basalt quarry on Lot 1 DP 1094055, located at 63 Curlewin Lane Towrang 2580 has been undertaken for a number of reasons, principally:

1. To determine what volume of the existing groundwater entitlement assigned to WAL35518 and should be eventually assigned for an 'industrial' purpose.
2. To clarify the necessary water requirements necessary for quarrying purposes.
3. To provide the necessary application process with *NSW Office of Water (NOW)* to endorse the existing entitlement for the relevant purpose.

Reference is made to the various studies conducted by *Hydroilex* at the site, particularly in relation to investigations for groundwater supply and securing of licenses during the period 2011 to 2012.

Hydroilex has been associated with the design of numerous water supply projects in the region, and elsewhere in NSW for mining, agricultural and domestic supplies. We are most familiar with procedures for legal, licensing and hydrogeological certification of groundwater supplies, and can provide any necessary support in respect of the objectives being sought with Council.

WATER REQUIREMENTS FOR QUARRYING OPERATIONS

Water requirements are generally determined by the following factors where the rock material is crushed on-site:

1. Competency of the material being crushed i.e. brittleness, composition.
2. Amount of dust generation. (e.g. limestone compared to basaltic and volcanic rock).
3. Size fraction of crushing.
4. Moisture content of the rock.
5. Wetting requirement for transportation.
6. Numbers of truck movements.
7. Road maintenance, road composition, road length.
8. Need for washing the product.

Table 1 summarises the necessary water required, at the time, when the studies were conducted by SEEC in 2008.

Table 1. Summary of Water Requirements for Proposed Tiyces Lane Quarry (Reference [1] SEEC Water Cycle Management Study, 2008)

TRUCK MOVEMENTS PER DAY	THROUGHPUT Tonnes/annum tpa	ACCESS ROAD (m)	DUST SUPRESSION AT CRUSHER ML/yr	DUST SUPPRESSION ON ACCESS ROAD ML/yr	TOTAL REQUIRED ML	TOTAL AVAILABLE ML
14	60,000	260m + 200m	3 L/tonne	Determined on basis of rainfall & evapotranspiration		
			0.18	**0.75 – 1.0**	**1.2 ML**	**50 ML**

A review of other operations have been conducted within local and regional NSW, and it is determined on a pro-rata basis for volume-comparison purposes that the estimated water requirements are in the range of 2 to 5 ML/yr for a 60,000 tpa production operation. On that basis, we recommend that 5 ML be assigned for 'industrial' purposes out of the 50 ML assignment.

It has been proposed that potable water for the project is sourced by rainwater.

NSW OFFICE OF WATER REQUIREMENTS

The existing WAL 35518, having a share component of 50 units (50 ML) is currently linked to production bores GW111826 & GW111827. These bores were drilled, tested and certified by *Hydroilex*.

The existing WAL is currently assigned to a number of purposes (recreation, irrigation, stock, & domestic). An application to assign a relatively small component of the WAL for 'industrial' purposes will be triggered by issue of the Development Approval for the proposed operation, being processed as a 'designated development'.

An application for a variation in water use with *NOW* for the proposed quarrying operation is a simple matter of lodging an application, and may subsequently be issued simultaneously with project approval.

SUMMARY

The following summarises the matters determined in this report:

- The project water demands for the project are easily catered for within the available groundwater license entitlement, where it is recommended that 5 ML of the available 50 ML (i.e.10%) is assigned for the purpose of 'industrial' use.
- The assignment of (5 ML) for the appropriate purpose can be triggered by the issue of a Project Approval, and endorsed by *NOW* by variation in water use.

- The necessary application for variation of the usage purposes of WAL 35518 is a matter of lodging an '*Application for approval for water supply works, and/or water use'*.
- We do not see the need for any specific groundwater level monitoring for the low volume of water required for the project; there are no issues which would impact on other users, or identified environmentally sensitive sites in the region.
- The operation will not necessitate any requirements for compliance with 'aquifer interference policy', since the water supply aquifer is not in hydraulic communication with the basalt material being proposed for quarrying.
- It is recommended that water assigned for 'recreation' purposes, be utilised for the development of irrigation needs for vegetation barriers associated with development.
- *Hydroilex* can provide significant supporting documentation to support the recommendations and advice provided in this review.

John Lee

Geoscientist

30.1.16

T. NSW Office of Water advice 18/12/2015.

On Friday 18 December, 2015 Richard Meares wrote:

Hi Peter,

To answer your earlier enquiry:

The access licences held by Argyle Gravel and Concrete Pty Limited are:

WAL 35518 for 50 units, linked to approval 10CA117967

WAL 37325 for 100 units, not currently linked to any approval.

The access licence(s) now held by Argyle are in the general category Aquifer. These access licences may be utilised for any purpose and this may include the proposed extraction of water supply for industrial purposes for the quarry. There are no current restrictions in purpose with this category of access licence.

There are, however restrictions in purpose with the approval.

The approval 10CA117967 is currently held by Argyle Gravel and Concrete Pty Limited and has purposes Recreation- Low security; Irrigation, Stock and Domestic listed on the approval.

If the approval is to be used for the extraction of bore water for industrial purposes, you can lodge an application for an amended approval, to amend the purpose of the approval. The outcome of this step is that the approval will now include industrial purposes on the approval in addition to the existing purposes.

The application for this process is attached. The fee for administration, advertising, and basic assessment is $1286.30. If there are any other assessment requirements, additional special assessment fees may apply.

You currently have an access licence linked to the approval and an access licence not linked to any approval.

If you decide to link the WAL 37325 to the same approval, you will need to lodge a separate do a separate dealing, called a change in Nominated Works, or 71W dealing. (You will need to complete the section for 71W on the form).The outcome of this dealing process is that WAL37325 will then be linked to approval 10CA117967.
The fee for the dealing processing charges is $758.84.

A basic annual water service charge for an access licence is approximately $105 per annum and then increases incrementally, depending on how many ML is held on the access licence(s), and how much water is used in the water year.

Please note that even though WAL 37325 is not linked to an approval, you will still need to pay charges.

For further clarity on potential annual water charges for the different areas, I would suggest you check the charges on the website site for groundwater management charges at:

http://www.water.nsw.gov.au/water-management/fees-and-charges

I hope this helps with your enquiry.

Regards

Richard Meares

Richard Meares | Water Regulation Officer
Hunter, Sydney & South Coast
Water Regulation Group
NSW Department of Primary Industries | Water
Level 11 | 10 Valentine Avenue | Parramatta NSW 2150
Locked Bag 5123 | Parramatta NSW 2124
T: 02 8838 7527 | F: 02 8838 7554
E: richard.meares@dpi.nsw.gov.au
W: www.dpi.nsw.gov.au | www.water.nsw.gov.au

U. Geos Ripability Assessment Revised Memorandum.

GEOS MINING
MINERALS CONSULTANTS

Suite 301,
68 Alfred Street,
Milsons Point NSW 2061
Australia

T 61 2 9929 6868
F 61 2 9923 1112
E info@mineralgeos.com
www.mineralgeos.com

MINERALS EXPLORATION | INDUSTRIAL MINERALS | ENERGY RESOURCES | TENEMENTS MANAGEMENT

REVISED MEMORANDUM

SUBJECT **Rippability Potential Assessment for Curlewin Lane Basalt, Marian Vale.**

DATE 1/03/2016

FROM: Alison Cole

TO **Peter Miller**

Rippability Assessment of two basalt cores, Curlewin Lane

Geos Mining has been asked to assess the rippability potential of basalt at Curlewin Lane proposed quarry, Marian Vale, for the production of coarse aggregate. The assessment is based on the qualitive and semiquantitive analysis of core from two diamond drillholes.

For this project the Rock Quality Designation (RQD) is considered to be a suitable way to assess the potential rippability of the Curlewin Basalt as it reflects the number and frequency of natural joints and breaks in the core.

RQD is a semi-quantitative measure of rock competency used in engineering geology assessment, mainly for the purposes of tunneling and foundation work, to determine what reinforcement is required. RQD is a method of evaluating of the joints, fractures and discontinuities of cored rock.

It is calculated by

RQD % = (sum of all 'sound' core pieces >10cm/ total length of the core run)*100

Only natural breaks in largely solid core are considered, for example joints, thin bedding partings, voids due to dissolution.

Values of <25%RQD are classified as very poor rock mass quality , Figure 1. In general a very poor rating in RQD will indicate a high proportion of breaks which will correlate in general with good rippability potential.

No	RQD%	Rock quality
1	<25	Very poor
2	25-50	Poor
3	50-75	Fair
4	75-90	good
5	90-100	Excellent

Figure 1 The correlation between RQD and rock mass quality (Deere 1968)

Rippability assessment prior to actual ground breaking is a semi-quantitative relative indication of the ripping potential of the rock, and actual ground testing with a suitably rated bulldozer/digger should be carried out to confirm the estimated ease of rippability.

NB. This RQD rating will not necessarily correlate with or reflect on the use of the rock as a source of aggregate. Independent testing has confirmed the suitability of the material for this purpose.

The assessment of the Tertiary basalt at Curlewin Lane, Marian Vale has been carried out on two cores: MVDDH6 drilled in 2006 and Curlewin Basalt Core 2 drilled in 2008. The distance between the two holes is approximately 60m, Table 1.
A third hole was drilled and the material used for aggregate testing and was not used for this rippability assessment. Figure 2 shows the location of the drill holes.

Core	drilled	easting	northing	Basalt thickness (m)
MVDDH6	2006	761075	6150462	17.5
Curlewin Basalt Core2 (BH2)	2008	761014	6150447	17.3
Curlewin Basalt Core3 (BH3)	2008	761089	6150428	n/a

Table 1 Location details of the two cores from the Tertiary basalt (MGA94 zone 55)

Figure 2 Location of drill holes

The basalt is described as an olivine basalt, with an average 15% secondary minerals. Its mineral composition is:

49% feldspar
21% pyroxene
9% olivine
6% magnetite, ilmenite
15% secondary minerals (clays and altered olivine)

The alteration producing the secondary minerals occurred around the time of the flow itself as surface water affected the basalt and the material is present as interstitial patches in the groundmass.
The basalt shows evidence of slight superficial weathering along joints, indicated by limonitic coatings.
Trenching carried out during the initial exploration stages suggests the occurrence of weathered coarse grained gabbro as dykes and veins in the basalt.

In this project a rippability potential assessment is given based on RQD and supported by a range of geological factors observed in the core and aggregate sample. The factors include:

- Rock type: olivine basalt
- Grainsize: fine to medium grained, 0.1mm to 1.5mm
- Rock fabric: crystalline, porphyritic, interlocked phenocrysts,tough
- Weathering: slight to moderate weathering is evident on joints
- Jointing/fracturing: very jointed throughout, a slight decrease in number with depth
- Coatings : joint coatings are limonitic, <1mm on the majority, up to 5mm on vertical joints
- Ease of break: joints readily open and unhealed, or broken with hammer tap
- Calculated RQD from core: see separate section below

The cores have high density fracturing and jointing in vertical & horizontal orientation, with greater frequency of jointing in horizontal and low angle orientations. Joints are typically lightly coated with orangey yellow limonite, and show tendency to open easily.

RQD Results

MVDDH6 was drilled in 2006 and logged (see Appendix 2 for the original lithology log). The second core (Curlewin Basalt Core 2) was drilled in 2008 and not geologically logged at the time. Both drillholes were vertical. Vertical orientation of the drilling is considered suitable for this rippability assessment.

The cores have been stored under cover in a shed with minimal disturbance and a comparison has been made with the original core photos to confirm the integrity of the current measurements (i.e. no further significant breaking of the core has occurred and the current measurements are representative). See Appendix 1 for photos of MVDDH6, comparing the core condition from 2006 with 2015.

Results of the RQD measurements for the two cores are presented in Table 2 and Table 3.
In both cores the rock is rated as very poor quality for engineering purposes. The joints are generally open and otherwise easily broken by a hand held hammer.

Typical joint coatings are less than 1mm thick on the horizontal and low angle joint facings. The coating material is limonitic (iron oxide material). The joint spacing for the horizontal and low angle sets ranges from approximately 1cm to 15cm.

It is thought that the jointing is the result of the cooling process when the lava was extruded. Vertical joints are typical of the columnar pattern of cooled basalt flows. The horizontal jointing with the thin coatings indicates that water travelled along the fracture faces but has not penetrated into the rock to any significant extent.

Figure 3 Thin limonitic coating on joint facing, typical for the horizontal and low angle joint sets

Figure 4 Thicker weathering zone along vertical joints

The vertical joints are more weathered and open, Figure 4. The thickness of the weathered material is slightly irregular, averaging 5mm. The vertical joint spacing is unknown at this stage.

In drillhole MVDDH6 the RQD classification 1 is rated as very poor rock mass quality and is therefore assessed as potentially rippable.

DATE: 8/10/15		**PROJECT:ARGYLE QUARRY**		core diameter: 43mm				MVDDH6 drilled 2006
RUN	**From (m)**	**To (m)**	**drill**	**Recovery (m)**	**total length pieces core>10cm (m)**	**RQD**	**RQD grade**	**comments**
1	0	2		2		0	1	overburden, not available
2	2.1	3		0.9	0	0	1	
3	3	3.3		0.3	0	0	1	
4	3.3	3.55		0.25	0	0	1	3 sets: nearly vertical fracture + horizontal +angled
5	3.55	5.55		2	0	0	1	in general fracture spacing is increasing with depth
6	5.55	6.4		0.85	0	0	1	
7	6.4	8.1		1.7	0	0	1	
8	8.1	10.05		1.95	0	0	1	
9	10.05	11.5		1.45	0	0	1	
10	11.5	13.4		1.9	0	0	1	
11	13.4	16.5		3.1	0.02	0.6	1	2 pieces 10cm each
12	16.5	19.25		2.75	0.01	0.4	1	1 piece
13	19.25	20.5		1.25	0	0.0	1	into the underlying clay @~19.50m

Table 2 RQD for MVDDH6, October 2015

In general the jointing frequency decreases with depth, particularly at depths greater than 13m, but the material still is classified as RQD grade 1 and is potentially rippable.

DATE: 8/10/15			PROJECT: ARGYLE QUARRY		core diameter: 50mm			Curlewin basalt core 2 drilled 2008
RUN	**From (m)**	**To (m)**	**drill**	**Recovery (m)**	**total length pieces core>10cm (m)**	**RQD**	**RQD grade**	**Comments on core pieces**
1	0	1.9		1.9	0	0.0	1	
2	1.9	2		0.1	0	0.0	1	
3	2	2.99		0.99	0	0.0	1	
4	3	3.93		0.93	0	0.0	1	
5	4	4.97		0.97	0.023	2.5	1	10cm +13cm
6	5	5.94		0.94	0.052	5.4	1	15cm+24cm+13cm
7	6	6.96		0.96	0.01	1.1	1	
8	7	7.97		0.97	0.01	1.0	1	
9	8	8.99		0.99	0	0.0	1	
10	9	9.99		0.99	0.023	2.3	1	13cm+10cm
11	10	11		1	0.01	1.0	1	
12	11	11.98		0.98	0.034	3.4	1	10cm+10cm+14cm
13	12	12.99		0.99	0.01	1.0	1	
14	13	13.98		0.98	0.023	2.3	1	10cm+13cm
15	14	14.97		0.97	0.037	3.8	1	12cm+15cm+10cm
16	15	15.94		0.94	0.022	2.3	1	10cm+12cm
17	16	16.95		0.95	0.047	4.9	1	10cm+15cm+11cm+11cm
18	17	17.93		0.93	0.023	2.5	1	13cm+10cm
19	18	18.93		0.93	0.032	3.4	1	10cm+12cm+10cm
20	19	19.9		0.9	0	0.0	1	into clay ~19.20m

Table 3 RQD for Curlewin Basalt Core 2, October 2015

In drillhole Curlewin Basalt Core 2 the RQD classification 1 is rated as very poor rock mass quality and is therefore assessed as potentially rippable. Overall this core had fewer fractures than MVDDH6, and the frequency further decreased at a depth of around 12m down core but the RQD grade remains poor throughout.

Conclusions

Assessment of the RQD of the two drill cores from the proposed quarry at Curlewin Lane Marian Vale indicates that the basalt has a **very poor rock mass quality**. There has been no significant deterioration in the physical state of the core since it was drilled so the measurements taken are representative. It is therefore considered that the basalt has high potential for extraction by ripping throughout its full thickness as proposed, negating the need for any blasting.