GALES-KINGSCLIFF

PTY LTD
ABN: 75 093 540 080

Environmental Assessment
for the
Modification of PA 05_0103

1 INTRODUCTION

This Environmental Assessment (EA) has been prepared on behalf of Gales-Kingscliff Pty Ltd ("the Proponent") to accompany a Section 75W modification under the *Environmental Planning and Assessment Act 1979* to Project Approval 05_0103 granted for the Cudgen Lakes Sand Quarry. The following sections provide a summary of the proposed modification and review the potential environmental effects resulting from the modification.

2 PROPOSED MODIFICATION

2.1 PROPOSED MODIFICATION TO APPROVAL CONDITIONS

Schedule 2, Condition 3 of PA 05_0103 requires that the project be carried out generally in accordance with the EA[1], statement of commitments and conditions of the approval. The proposed modification would require this condition be modified to include reference to this EA. It is considered that no other approval conditions or the statement of commitments would require modification.

2.2 PROPOSED MODIFIED ACTIVITIES

The Proponent proposes to utilise an initial processing area located within the northwestern corner of the approved Southern Extraction Area prior to the use of the permanent processing area (see **Figure 1**). The initial processing area would consist of a pad approximately 100m by 100m and constructed to a height of approximately 1m above current ground level. A further 2m of bunding would be constructed adjacent to the southern and southeastern boundary of the initial processing area. Approximately 11 000m^3 of fill material would be required which would be sourced from the existing sand stockpile immediately south of the initial processing area (see **Figure 1**) and imported surfacing material. Landscaping would then be undertaken along the southern and eastern boundary of the initial processing area to enhance the appearance of the area.

[1] Environmental Assessment prepared by RWC and dated May 2008.

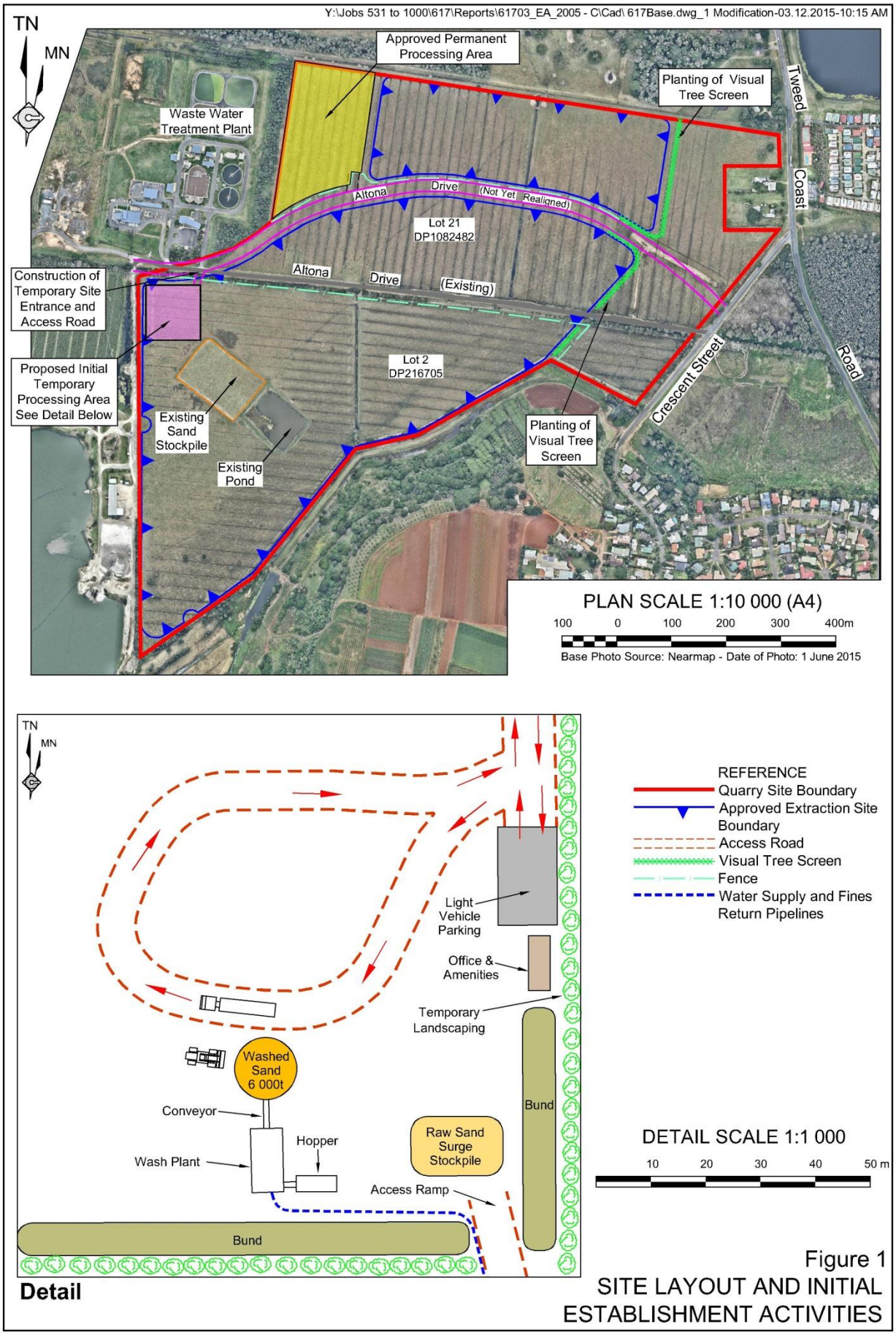


Figure 1
SITE LAYOUT AND INITIAL ESTABLISHMENT ACTIVITIES

The initial processing area would include a small sand wash plant, namely a Terex FM200BW (see **Plate 1**) which includes two bucket wheels and two hyrocyclones. The wash plant requires a footprint of approximately 8.6m by 4.6m (including walkway). The sand wash plant would have a capacity of up to approximately 200t per hour (compared to 250tpa for the currently approved plant). The plant would be fed either by a 15m^3 capacity hopper (for excavated sand) or directly from the sand dredge with washed sand discharged via a short conveyor to a product stockpile (see **Figure 1**). The wash plant and conveyor would be powered by a 200kW diesel generator set housed within an acoustic and weather protected enclosure.

Plate 1 – Sand Wash Plant (Terex FM200BW)

A raw sand surge stockpile would be maintained adjacent the hopper to provide a wet weather contingency. No VENM would be received within the initial processing area and no crushing, dry screening or blending would be undertaken. Washed sand would be stored in a stockpile of up to 6 000t with a maximum height of approximately 5m (3m lower than the approved processing area).

A Cat 980K Front-end Loader or equivalent would be utilised to either load raw sand to the plant hopper or washed sand to road registered trucks for transportation off site. The loader would be fitted with calibrated weigh cells to ensure that trucks are loaded within the legal load limit. Access would be provided via a temporary site entrance (Gate E) from Altona Drive (see **Figure 1**). The access would be constructed in accordance with the existing approved temporary site entrance design specifications.

Extraction would initially occur using a 30t excavator and off-road truck, i.e. in a manner consistent with the existing approval. As the existing extraction pond is expanded, extraction would also be undertaken using a 300mm cutter-suction dredge. Sand extracted using the excavator would be transported to the initial processing area and either loaded directly to the feed hopper or placed within the raw sand surge stockpile. Following the commencement of dredging, sand would also be pumped directly to the wash plant. All water for operation of the wash plant would be sourced from the extraction pond and all silts from the wash plant would be returned to the southern extraction pond via a return pipeline in accordance with the existing approved operations.

The initial processing area would be utilised for the initial 6 years of operation, pending market conditions for receipt of VENM and reprocessed products. Following the construction of the permanent processing area north of Altona Drive, the initial processing area would be decommissioned and the fill material either re-purposed on site for construction of bunding, sold as fill material or placed within the southern extraction pond. The sand resource beneath the initial processing area would then be recovered through the ongoing dredging operation.

3 ENVIRONMENTAL EFFECTS

3.1 EXISTING ENVIRONMENT

Figure 2 presents the location of surrounding residences and the location of the approved permanent processing area and proposed initial processing area.

3.2 AIR QUALITY

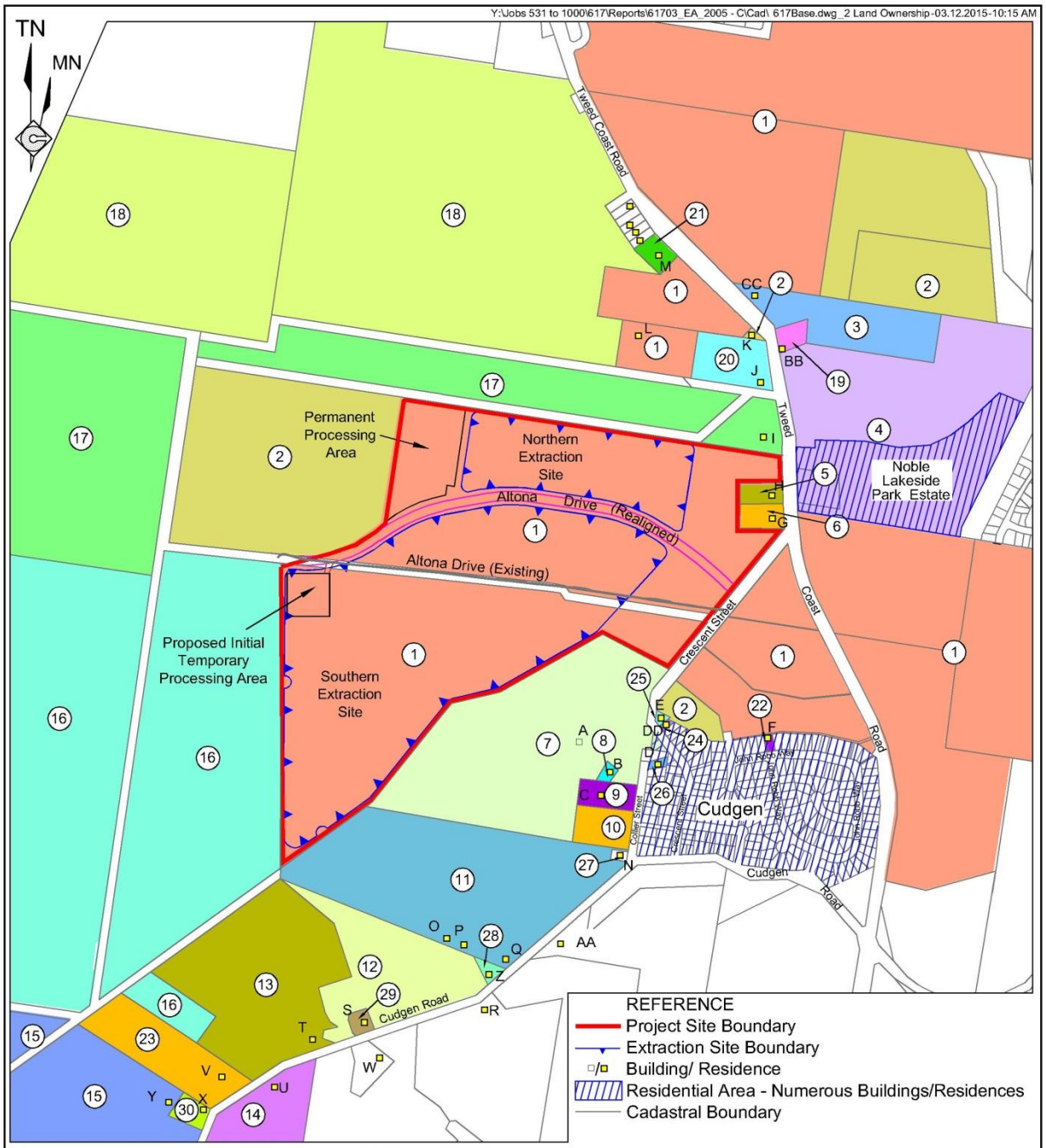
The internal area of the approved permanent processing area covers approximately 2.2ha incorporating various stockpile areas for washed sand, dry sand and VENM and includes a wash plant and multipurpose plant for dry screening and blending. The proposed initial processing area, which would be utilised prior to the construction of the approved permanent processing area, would cover an area of approximately 1ha and only include a wash plant and stockpile areas for raw sand and washed sand.

Particulate emissions during the use of the initial processing area would be less than the approved permanent processing area. This is concluded based on the following.

- Limitation of processing to the wet wash plant with no dry screening or processing.
- Exclusion of VENM receipts and transportation resulting in a reduction in truck movements and associated wheel generated dust.
- The reduction in surface area from 2.2ha to 1.0ha reducing the opportunity for windblown dust.
- The reduced height of the sand stockpiles from 8m to 5m reducing the opportunity for windblown dust.

An assessment of the potential changes in air quality impacts was completed by Ramboll Environ to quantify the changes to suspended particulates <10 microns (PM_{10}). A full copy of this assessment is provided in **Appendix 1** and a summary provided as follows.

- The predicted 24-hour and annual average PM_{10} concentrations resulting from the proposed modification (project-only contribution) are lower than the corresponding predictions for the existing approved operations (with the exception of a 0.3ug/m^3 increase at one residence for 24-hour PM_{10}).
- The predicted cumulative 24-hour PM_{10} which includes the proposed modified operations, Hanson Tween Sand Quarry and background concentrations are predicted to decrease at all but three surrounding residences.



Reference	Landowner	Reference	Landowner
1	Gales - Kingscliff Pty Ltd	17	C. Cooper
2	Tweed Shire Council	18	J. Brinsmead
3	P. Phillips	19	B. Rudman
4	Baglon Pty Ltd	20	M. & J. O'keeffe
5	K. Martin	21#	J. Brinsmead
6	L. & P. Hermann	22	T. & L. Rascionato
7	R. Julius	23	S. Elworthy
8	R. & B. Julius	24	S. & A. Lawton
9*	NSW Dept. of Education & Training	25	V. Long
10	Tweed Shire Council	26	D. & J. Clark
11	C. Pritchard & W. Julius	27	R. & C. Prichard
12	H. & R. Taylor	28	P. & H. Hardy
13	S. Thomson	29	Country Energy
14	S. & G. Melville	30	D. Green
15	I. Kettle & M. Stephens		
16	Hanson Construction Materials		

* Cudgen Public School
\# Chinderah Golf Club

SCALE 1:15 000 (A4)

250 0 250 500 750 m

Land Ownership Source: Dept. of Lands (2005)

Figure 2
SURROUNDING LAND OWNERSHIP AND PRINCIPAL RESIDENCES

- Predicted cumulative 24-hour and annual average PM_{10} concentrations would remain compliant with the respective criteria at all surrounding residences.
- The maximum predicted concentrations for the proposed modification are 45.2µg/m³ for 24-hour PM_{10} and 17.6µg/m³ for annual average PM_{10}. This is compared to 50µg/m³ for 24-hour PM_{10} and 18.4µg/m³ for annual average PM_{10} for the approved operations.

It is therefore considered that the overall potential for air quality impacts during the use of the initial processing area would be less than the currently approved operations.

3.3 NOISE

The Noise Assessment for the approved operations (Ron Rumble, 2008)[2] provided for the concurrent operation of the multipurpose plant and the wash plant with a sound power level of 114dB(A). However, the operation of only the wash plant within the initial processing area would reduce the sound power level to approximately 103dB(A).

An assessment of the potential changes in noise impacts was completed by Spectrum Acoustics to quantify the changes in noise emissions. A full copy of the noise assessment is provided in **Appendix 2** and a summary provided as follows.

- Noise emissions were calculated at three residences representative of the potentially most affected residences (B, O and DD – see **Figure 2**) for the worst case modelling scenario and worst case meteorological conditions (as determined by the 2008 noise modelling).
- The location of the processing area was altered, the sound power level for operation of the sand wash plant only was applied and sources relating to receipt of VENM removed. All other noise sources were retained.
- Additional noise attenuation was not applied to the dredge as per the unattenuated modelling completed in 2008.
- The predicted noise levels for the proposed modified operations remain below the applicable noise criteria at all residences.
- The highest received noise level is 45.3dB(A) at residence B compared to 47.7dB(A) predicted in 2008 for the same operational scenario and conditions.

It is therefore considered that the potential for additional noise impacts during the use of the initial processing area would be no greater than the currently approved operations.

3.4 TRANSPORTATION

The use of the initial processing area would not result in any increase in traffic movements. In fact, given that no VENM would be received for processing and sale, traffic movements during the use of the initial processing area would be less than the existing approved levels.

[2] *Cudgen Lakes Sand Extraction Project Noise Assessment* – Prepared by Ron Rumble (2008).

Additionally, during the use of the initial processing area, excavated sand would not be required to be transported north across the existing alignment of Altona Drive thereby further reducing traffic interaction on Altona Drive.

All existing traffic management measures would continue to be implemented and no changes to approved transportation routes would be required. It is therefore concluded that the use of the proposed initial processing area would not have any additional transportation impacts.

3.5 OTHER ENVIRONMENTAL CONSIDERATIONS

Surface Water and Flooding

The initial processing area would be filled above the 1 in 100 year local catchment flood level. Whilst, it is acknowledged that the initial processing area would be flooded during a Tweed River flood event, which exceeds a 1 in 100 year local catchment flood event, given the substantial warning time for Tweed River flood events, adequate time would be available to move the front-end loader and prepare the wash plant to avoid asset damage. As no hydrocarbons or other contaminants would be retained on site, no impacts to water quality would occur.

All fines from the wash plant would continue to be returned to the southern extraction pond via a return pipeline in accordance with the approved operations. As part of the washing process, the majority of water would be recovered from the washed sand prior to being discharged to the product stockpile. As for the approved operations, it is noted that a small amount of runoff may occur from the washed sand stockpile, however, this would either evaporate or soak into the pad. Given that no chemicals are used as part of the washing process, this would not result in any surface water impacts.

Based on the required fill of 11 000m^3 for the initial processing area compared to 28 600m^3 for the approved permanent processing area, and the fact that the initial processing area pad would be removed following construction of the permanent processing area, no additional impacts upon the floodplain capacity would occur.

Groundwater

Given that the initial processing area would be filled with clean fill material and that only washed sand would be stockpiled, no groundwater impacts would occur.

Flora, Fauna and Heritage

As the initial processing area is located wholly within the approved disturbance footprint of the southern extraction area, no change to flora, fauna or heritage impacts would occur.

4 CONCLUSION

The proposed use of the initial processing area would provide for the economic commencement of sand extraction and processing at the Cudgen Lakes Sand Quarry without resulting in any additional environmental impacts. In fact, it is considered that a number of environmental impacts would likely reduce during the operation of the initial processing area.

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Appendices

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Appendix 1 Air Quality Modelling Study

Appendix 2 Noise Impact Assessment

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Appendix 1

Air Quality Modelling Study

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RAMBOLL ENVIRON

ENVIRONMENT & HEALTH

3 December 2015

RW Corkery
Attn: Scott Hollamby
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205 Leitchs Road
BRENDALE QLD 4500

CUDGEN LAKES SAND QUARRY – PROPOSED MODIFICATION – AIR QUALITY MODELLING STUDY

Dear Scott,

Introduction

In 2008, R.W. Corkery and Co. Pty Limited (RWC) prepared an Environmental Assessment (EA) on behalf of Gales-Kingscliff Pty Ltd (the Proponent) for the proposed Cudgen Lakes Sand Quarry (the Project), located 2.5km west of the township of Kingscliff on the NSW Far North Coast. The Project received planning approval in May 2009. In support of the EA, an air quality impact assessment of the Project was undertaken by Simmonds and Bristow Pty Ltd[1] (the 2008 AQIA).

To meet current market demands, the Proponent is seeking approval to modify the approved Project design (the Modification). RWC are preparing an EA for the Modification on behalf of the Proponent. Key aspects of the Modification include:

- Operation of an initial processing area in the northwestern corner of the Project Site south of Altona Drive (original Project design featured a processing area north of Altona Drive); and
- No receipt of virgin excavated natural material (VENM) and no crushing, dry screening or blending to be undertaken at the initial processing area (all components were incorporated in the original Project design).

A number of key emission sources would be removed from during the modified operations and the initial processing area is located further away from surrounding sensitive receptors to the north and east of the Project. However, the initial processing area is located closer to surrounding sensitive receptors south of the Project. Consequently, the potential for adverse air quality impact at the neighbouring receptors requires review and assessment.

RWC have engaged Ramboll Environ Australia Pty Ltd (Ramboll Environ) to undertake an air quality modelling exercise of the Modification to investigate the implications for potential air quality impacts at neighbouring receptor locations.

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Ref AS121952

[1] Simmonds and Bristow Pty Ltd (2008). *Cudgen Lakes Sand Extraction Project – Air Quality Impact Assessment*.

Ramboll Environ Australia Pty Ltd
ACN 095 437 442
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Assessment Methodology

The 2008 AQIA assessed air quality impacts at neighbouring receptors for a number of operational scenarios for the Project, representative of the progressive movement of extractive operations about the Project site. The 2008 AQIA also assessed cumulative impacts between the Project and the adjacent Hanson Tweed Sand quarry (HTSQ) at neighbouring receptor locations. In order to assess the implications of the proposed Modification for predicted air quality impacts at the neighbouring receptor locations, the following steps have been undertaken:

- Maximum cumulative (Project + HTSQ + Background) 24-hour average PM_{10} concentrations were predicted at receptor A for Cumulative Scenario 7 (Stage 7 Project + HTSQ Phase 4) in the 2008 AQIA. This emissions scenario therefore represents the peak impact scenario for the Project and is the focus of this revised assessment;
- The critical pollutant for compliance with applicable impact assessment criterion in the 2008 AQIA was PM_{10}. Therefore, this revised assessment focuses on PM_{10} emissions and predicted concentrations only;
- The emissions inventory and calculations presented in Appendix 1 of the 2008 AQIA has been retained for this study, with the exception that VENM-related and blending/crushing emission sources are removed;
- Atmospheric dispersion modelling has been undertaken using the AERMOD dispersion model. While it is noted that the 2008 AQIA implemented the AUSPLUME dispersion model, AERMOD is now considered the "state of the science" regulatory dispersion model and most relevant for application for this study.
- Meteorological conditions have been adopted from the Bureau of Meteorology Coolangatta Airport automatic weather station, consistent with the 2008 AQIA. For this study, hourly observations recorded during 2014 have been applied;
- Emission source characteristics, as detailed in Appendix 1 of the 2008 AQIA have been retained in this study. Source locations have been modified to reflect the proposed modified site layout.

Results discussion

The predicted 24-hour and annual average PM_{10} concentrations at the neighbouring receptor locations are presented in **Table 1** for Project-only concentrations and **Table 2** for Project plus HTSQ concentrations. The corresponding predicted concentrations from the 2008 AQIA are also presented in **Table 1** and **Table 2** for comparison. The following conclusions are made based on the modelling results presented:

- *Project-only concentrations* (**Table 1**): The predicted 24-hour and annual average PM_{10} concentrations resulting from the proposed Modification are lower than the corresponding predictions from the 2008 AQIA (with the exception of a negligible predicted increase at receptor M2 for 24-hour average PM_{10});
- *Project + HTSQ concentrations* (**Table 2**): The predicted 24-hour average PM_{10} concentrations resulting from combined operations at both the Project and HTSQ are generally lower for the proposed Modification relative to the 2008 AQIA, with the exception of receptors M2, K and I where an increase in 24-hour average PM_{10} concentrations is predicted. This increase is attributable to the spatial redistribution of emissions sources, resulting in emissions from the Project and HTSQ aligning to cause higher downwind concentrations at these locations. All other 24-hour average and annual average PM_{10} concentration predictions for the Modification are lower than the corresponding predictions from the 2008 AQIA.

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It is noted that the maximum combined 24-hour average concentration for the Modification (14.2µg/m³ at receptor K) is lower than the maximum 24-hour average concentration for the 2008 AQIA (19.0µg/m³ at receptor M). In other words, the peak 24-hour concentration across all receptors is lower;

- *Cumulative concentrations*: When the adopted ambient baseline concentrations from the 2008 AQIA are applied to the relevant concentrations in **Table 1** and **Table 2** (31µg/m³ for 24-hour average PM_{10} and 17µg/m³ for annual average PM_{10}), the maximum concentrations are 45.2µg/m³ for 24-hour average PM_{10} and 17.6µg/m³ for annual average PM_{10}. The maximum cumulative concentrations from the 2008 AQIA were 50µg/m³ for 24-hour average PM_{10} and 18.4µg/m³ for annual average PM_{10}.

Table 1: Predicted Project-only incremental concentrations – Stage 7 - 2008 AQIA and Proposed Modification

Receptor ID	2008 AQIA	Modified Project
Maximum 24-hour Average PM_{10} Concentration (µg/m³)		
A - Residence south on hillside	16.0	7.7
C- School south on hilltop	9.6	4.4
M1 – Receptor southwestern corner hillside	4.7	3.3
M2 – Receptor southern boundary Hanson Tweed Sand	2.6	2.9
M - Chinderah golf range building	16.0	4.6
K - Residence north	9.9	9.2
I - Residence north close to site boundary	7.9	6.8
Noble Park Estate - Residence east side of Tweed Coast Road	8.0	5.0
G - Residence eastern boundary of northern extraction site	13.0	6.8
Annual Average PM_{10} Concentration (µg/m³)		
A - Residence south on hillside	1.2	0.4
C- School south on hilltop	0.8	0.2
M1 – Receptor southwestern corner hillside	0.7	0.3
M2 – Receptor southern boundary Hanson Tweed Sand	0.3	0.1
M - Chinderah golf range building	1.1	0.3
K - Residence north	0.6	0.2
I - Residence north close to site boundary	0.6	0.2
Noble Park Estate - Residence east side of Tweed Coast Road	0.4	0.2
G - Residence eastern boundary of northern extraction site	0.5	0.2

Table 2: Predicted combined incremental concentrations – Project Stage 7 + HTSQ Phase 4 - 2008 AQIA and Proposed Modification		
Receptor ID	**2008 AQIA**	**Modified Project**
Maximum 24-hour Average PM_{10} Concentration (µg/m³)		
A - Residence south on hillside	17.0	8.7
C- School south on hilltop	11.0	6.0
M1 – Receptor southwestern corner hillside	6.8	5.1
M2 – Receptor southern boundary Hanson Tweed Sand	4.8	5.4
M - Chinderah golf range building	19.0	9.9
K - Residence north	10.0	14.2
I - Residence north close to site boundary	8.9	10.7
Noble Park Estate - Residence east side of Tweed Coast Road	9.1	9.1
G - Residence eastern boundary of northern extraction site	14.0	9.9
Annual Average PM_{10} Concentration (µg/m³)		
A - Residence south on hillside	1.4	0.5
C- School south on hilltop	1.1	0.3
M1 – Receptor southwestern corner hillside	1.2	0.6
M2 – Receptor southern boundary Hanson Tweed Sand	0.7	0.4
M - Chinderah golf range building	1.3	0.5
K - Residence north	0.8	0.4
I - Residence north close to site boundary	0.7	0.3
Noble Park Estate - Residence east side of Tweed Coast Road	0.5	0.3
G - Residence eastern boundary of northern extraction site	0.6	0.3

Conclusions

In order to investigate the implications for air quality impacts from the Project at neighbouring receptor locations due to the proposed Modification, a screening dispersion model study has been undertaken. The study focused on the peak impacts presented within the 2008 AQIA to select the worst case scenario. Emission calculations and source configurations from the 2008 AQIA were adjusted to the modified Project design and dispersion modelling of PM_{10} emissions was presented as the key pollutant of concern.

The results from the modelling demonstrate that, except for a 0.3ug/m³ increase in 24-hour average PM_{10} at receptor M2, the proposed Modification would reduce the Project-only predicted impacts at neighbouring receptor locations relative to the results presented in the 2008 AQIA. When the neighbouring HTSQ operations are included in the modelling, the realignment of Project-emission sources results in an increase in combined downwind concentrations at three receptor locations (receptors M2, K and I) relative to the 2008 AQIA, however the increase is not considered significant for air quality impacts. When baseline air quality levels are applied to the model predicted concentrations,

the maximum cumulative concentrations are lower than those predicted in the 2008 AQIA with no exceedances of air quality criteria predicted.

Consequently, on the basis of the modelling results presented in this report, it is considered that the proposed Modification of the Project would not adversely impact upon the surrounding environment.

Yours sincerely

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Appendix 2

Noise Impact Assessment

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Project No: 151160

Noise Impact Assessment
Cudgen Lakes Sand Quarry Modification
Cudgen, NSW

Prepared for:

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December 2015

CONTENTS

1.0 - INTRODUCTION

This report provides the results and findings of a noise impact assessment (NIA) of the proposed modification of the Project Approval (PA 05_0103) for the operation of the Cudgen Lakes Sand Quarry (Quarry) at Cudgen, NSW.

This report follows on from the acoustic assessment for the original NIA for the project undertaken in 2008 by Ron Rumble Pty Ltd (Specialist Consultant Studies Part 8 – Noise Assessment Report No. 617/04) and, for completeness, should be read in conjunction with that report.

2.0 - BACKGROUND TO THE PROPOSAL

The modifications to the PA involve operating from an initial processing area located within the north western corner of the approved Southern Extraction Area prior to the use of the permanent processing area (see **Figure 1**). This would result in moving the processing area about 200m to the south west.

The initial processing area would consist of an approximately 100m x 100m pad constructed to 1m above ground level.

The initial processing area would include a small wash plant with a 15m^3 hopper. A Cat 980K Front-end Loader, or equivalent, would be used to feed raw sand to the hopper or to load washed sand to road registered trucks for transportation off site.

Extraction would initially occur with a 30t excavator and then move to a 300mm cutter suction dredge.

The initial processing area would be utilised for the initial five years of operation.

From an acoustic point of view the potential impacts from the modification would be the reconfiguration of the processing plant and the relocation of the processing area to be closer to residents to the south, off Cudgen Road, and to the south east, in the vicinity of Collier Street.

There would be no significant changes to traffic noise components of the original assessment and these will, therefore, not be considered further here.

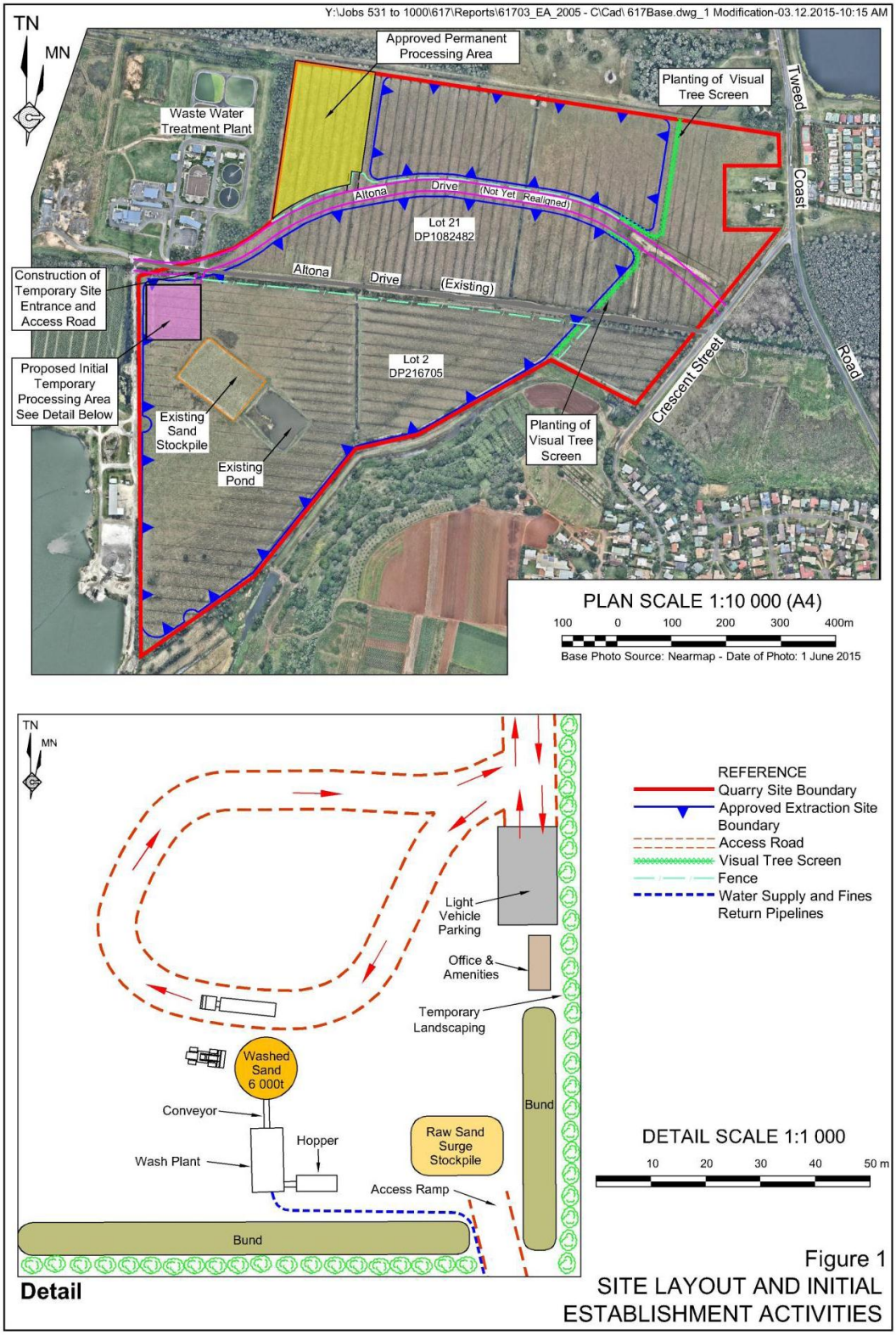


Figure 1
SITE LAYOUT AND INITIAL ESTABLISHMENT ACTIVITIES

3.0 - THE EXISTING ENVIRONMENT AND NOISE CRITERIA

The Ron Rumble report provided an in depth analysis of the existing acoustic and meteorological environment of the residential areas in the vicinity of the Quarry. From this analysis the project specific noise goals for the operation of the Quarry were determined for a number of representative receivers. These noise goals and the receptor locations are reproduced in **Appendix I**.

4.0 – NOISE ASSESSMENT

The sound power level spectra (Lw) of each of the modelled operational noise sources are shown in **Table 1**. Spectral data are presented as unweighted (linear) decibel levels and the total is A-weighted.

TABLE 1
MODELLED Lw's AND FREQUENCY SPECTRA OF MAJOR NOISE SOURCES

Item	Frequency (Hz)									
	dB(A)	31.5	63	125	250	500	1k	2k	4k	8k
Cat D6 Dozer	107	88	105	111	102	104	101	101	95	88
Cat 980K FEL	105	108	111	107	104	101	99	96	92	88
30t Excavator	97	91	85	92	88	88	87	84	81	78
Mini Tanker	100	103	105	97	92	91	95	96	88	82
Off Road Truck	102	96	99	95	99	99	99	95	90	82
Cat 615 Scraper	111	100	111	117	112	104	105	103	99	90
Road Truck	108	97	103	105	106	102	100	95	90	77
Grader	106	102	114	110	100	104	101	98	88	75
Medium Crane	100	92	103	107	98	97	94	92	83	75
Pump Stations	101	85	87	99	99	96	94	91	91	95
Suction Dredge	105	92	93	105	103	100	98	95	96	97
Wash Plant	103	105	117	107	101	97	95	96	94	92

The previous noise modelling, in the Ron Rumble report, was based on the Lw's detailed above with the exception that the "Wash Plant" was originally modelled as "Multipurpose Plant and Wash Plant" with an Lw of 114 dB(A). Under the proposed modification the processing plant would be a smaller scale unit with a reduced Lw as shown in **Table 1**. The Proponent has supplied detail on the noise levels for the proposed plant as shown in **Table 1**. The frequency spectrum for the plant has been derived from data from measurements for similar type plant contained in the Spectrum Acoustics technical database adapted to the supplied Lw.

Compared to the previous noise modelling, the modifications to the operation of the Quarry would involve the relocation of the wash plant and associated front-end loader. In addition to this there would be no transport or processing of VENM material within initial processing area.

Assessment of operational noise was conducted using RTA Technologies Environmental Noise Model (ENM) v3.06.

Noise modelling was undertaken for the following operational scenario;

OPERATIONAL SCENARIO:

- Dredging of sand from southern extraction site to initial processing area and refuelling of the dredge using fuel tanker.
- Excavation of loamy sand from southern extraction site and sand from northern extraction site[1] using 30t excavators and / or swamp dozers.
- Transport of sand from northern extraction site to initial processing area using haul trucks[1].
- Processing of sand and loamy sand using the wash plant.
- Handling and loading of sand products using front-end loader.
- Transport of products via Altona Drive.

The Ron Rumble assessment predicted, by modelling, the noise levels at various receivers under different atmospheric and operating conditions. The worst case received noise for all receivers was under the modelled 3m/s source to receiver wind. The current modelling was, therefore, done under these conditions, with modelling under calm conditions also done for comparison purposes.

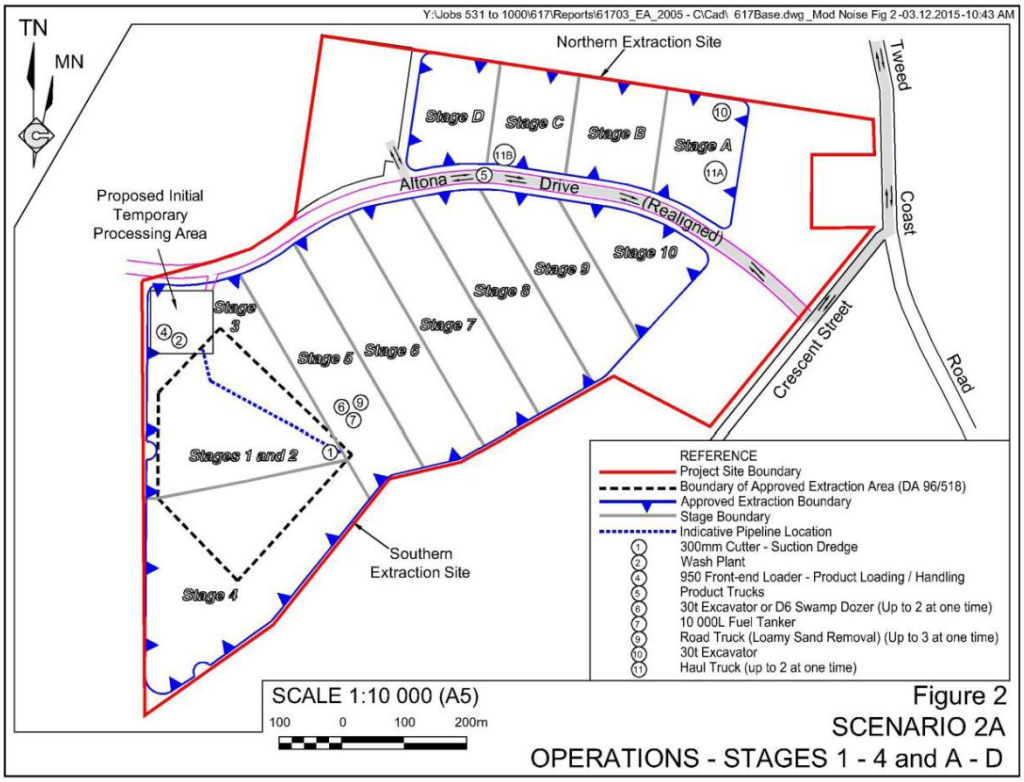
The modelling was, therefore, undertaken for the atmospheric conditions described below:

Scenario 1 - 20^{0}C, 70% R.H., calm conditions (neutral atmospheric).

Scenario 2 - 20^{0}C, 70% R.H., 3m/s wind from source to receiver.

The operational noise source locations for the modelled scenario are shown in **Figure 2**. As detailed above, the noise sources are the same as for the original modelling with the exception of the wash plant and FEL (which have been relocated to the south). As such only these two noise sources were included in the revised model, with the other noise levels as per the modelling by Ron Rumble (as operating scenario 2A).

[1] Whilst it is not planned to extract sand within the Northern Extraction Area during operation of the initial processing area, these noise sources have been retained to determine the change to noise levels solely as a result of modifying the processing area.



5.0 - RESULTS

Noise levels were modelled using ENM for the operational and each of the atmospheric scenarios described in **Section 4**.

The ENM noise model was utilised in point calculation mode to determine the actual predicted noise level at the three closest receivers to the Quarry, namely Receptors B, DD and O (see **Appendix I**). The results of the point calculations for each of the modelled atmospheric conditions are shown in **Tables 2**, **3** and **4**.

TABLE 2 ENM POINT CALCULATION RESULTS (dB(A) Leq (15 min)) RECEIVER B - Lot 1 Collier St.		
Noise Source	Scenario 1	Scenario 2
1.- Dredge	41.0	41.1
2.- Wash Plant	30.7	32.7
4.- FEL	32.9	34.9
6.- 30t Excavator	32.6	32.7
7.- Mini Tanker	36.4	36.4
9.- Road Truck Loamy Sand	38.2	38.3
10.- 30t Excavator	27.1	28.5
11.- Haul Truck	33.3	34.3
Total	**44.9**	**45.3**
Criterion	**46**	**46**

TABLE 3 ENM POINT CALCULATION RESULTS (dB(A) Leq (15 min)) RECEIVER DD - 34A Crescent St.		
Noise Source	Scenario 1	Scenario 2
1.- Dredge	11.6	17.5
2.- Wash Plant	26.5	28.7
4.- FEL	24.0	31.0
6.- 30t Excavator	3.7	9.6
7.- Mini Tanker	7	12.8
9.- Road Truck Loamy Sand	9.4	15.1
10.- 30t Excavator	20.5	26.4
11.- Haul Truck	25.0	31.0
Total	**30.6**	**35.8**
Criterion	**47**	**47**

TABLE 4 ENM POINT CALCULATION RESULTS (dB(A) Leq (15 min)) RECEIVER O - Lot 2 Cudgen Rd.		
Noise Source	Scenario 1	Scenario 2
1.- Dredge	28.9	35.3
2.- Wash Plant	19.5	27.3
4.- FEL	21.7	29.5
6.- 30t Excavator	18.9	25.4
7.- Mini Tanker	21.8	28.2
9.- Road Truck Loamy Sand	23.1	29.5
10.- 30t Excavator	10.7	18.6
11.- Haul Truck	17.3	25.0
Total	**31.8**	**38.5**
Criterion	**46**	**46**

The results in **Tables 2, 3** and **4** show that, under the assessed worst case conditions, there would be no exceedance of the noise criteria at any of the modelled receptor locations.

As these modelled receptor locations represent the worst case for the modification to the proposed operations, compliance with the noise criterion at these receptors implies compliance at all other locations.

It is noted that the modelled results reflect the noise levels determined by Ron Rumble and the additional modelling undertaken assuming a relocated wash plant with an Lw of 103 dB(A) and a frequency spectrum adopted from previous measurements of similar style plants (from the Spectrum Acoustic database) and a relocation of the FEL.

The modelled noise level for the dredge shown in **Tables 2, 3** and **4** represents that value for the unattenuated dredge from the Ron Rumble report. Therefore, during the operation of the initial processing area, sound power levels of the dredge should not exceed 105 dB(A).

6.0 – CONCLUSION

A noise impact assessment has been undertaken into the proposed modification of Project Approval (PA 05_0103) for the operation of the Cudgen Lakes Sand Quarry at Cudgen, NSW.

The results of the modelling of Quarry operational noise have shown that, for the assessed worst case scenarios, there would be no exceedance of the adopted day time noise criterion at any residential receivers.

APPENDIX I

NOISE GOALS and RECEPTOR LOCATIONS

Project Specific Noise Criteria

Receptor	Period	Intrusive Noise Limit, $L_{Aeq,\ 15\ min}$ dB(A)	Amenity Limit $L_{Aeq,\ period}$ dB(A)	Project Specific Limits
G	Day	56	55	55dB(A) $L_{Aeq,\ period}$
DD		47	55	47dB(A) $L_{Aeq,\ 15\ min}$
F		47	55	47dB(A) $L_{Aeq,\ 15\ min}$
B		46	55	46dB(A) $L_{Aeq,\ 15\ min}$
O		46	55	46dB(A) $L_{Aeq,\ 15\ min}$
G	Evening	47	49	47dB(A) $L_{Aeq,\ 15\ min}$
DD		46	45	45dB(A) $L_{Aeq,\ period}$
F		45	48	45dB(A) $L_{Aeq,\ 15\ min}$
B		44	45	44dB(A) $L_{Aeq,\ 15\ min}$
O		44	45	44dB(A) $L_{Aeq,\ 15\ min}$
G	Night	43	46	43dB(A) $L_{Aeq,\ 15\ min}$
DD		40	40	40dB(A) $L_{Aeq,\ 15\ min}$
F		40	40	40dB(A) $L_{Aeq,\ 15\ min}$
B		42	40	42dB(A) $L_{Aeq,\ period}$
O		42	40	40dB(A) $L_{Aeq,\ period}$
G	Shoulder Period (6am-7am)	49	50	49dB(A) $L_{Aeq,\ 15\ min}$
DD		43	48	43dB(A) $L_{Aeq,\ 15\ min}$
F		43	48	43dB(A) $L_{Aeq,\ 15\ min}$
B		44	48	44dB(A) $L_{Aeq,\ 15\ min}$
O		44	48	44dB(A) $L_{Aeq,\ 15\ min}$

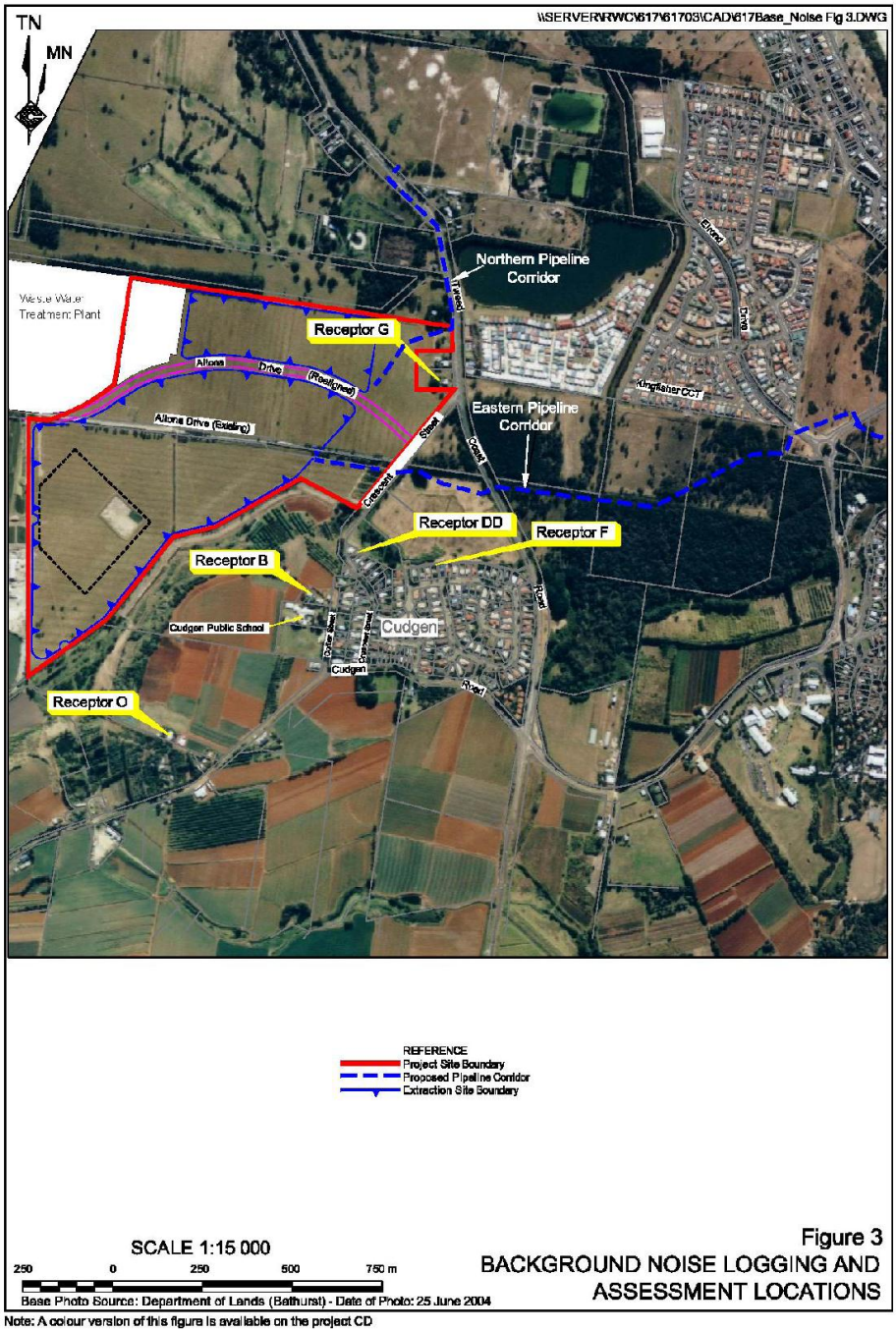


Figure 3
BACKGROUND NOISE LOGGING AND ASSESSMENT LOCATIONS

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