Appendix 4
NOISE AUDIT JANUARY 2016
Atkins Acoustic

46.7029.R1:GA/DT/2016

ATKINS ACOUSTICS

Postal Address
P.O. Box 432
Gladesville
N.S.W. 1675
AUSTRALIA
A.C.N. 068 727 195
A.B.N. 19 068 727 195
Telephone: 02 9879 4544
Fax: 02 9879 4810
Email: AtkinsAcoustics@bigpond.com.au

Grants Road Sand Pty Ltd.
Grants Road
SOMERSBY NSW 2250

Attention: Steve Jones

24 January 2016

Atkins Acoustics and Associates Pty Ltd.
Consulting Acoustical & Vibration Engineers

SITE ATTENDED NOISE AUDIT GRANTS ROAD SAND QUARRY SOMERSBY

1.0 INTRODUCTION

Atkins Acoustics was requested by Grants Road Sand Pty Ltd to undertake an environmental noise audit of the Grants Road Sand Quarry operations. The site is identified as 270 Grants Road, Somersby (Lot 1 DP 358717). The audit was conducted by Graham Atkins, Grahams qualifications and membership include BE; MAAS, MIEAust, CPEng and MINCE. Graham is employed by Atkins Acoustics and Associates Pty Ltd a Member Firm of the AAAC.

The approval included extraction, processing and transportation of up to 250,000 tonnes per annum of various quarry products until 30 June 2044.The site currently operates under approval from DoPE dated 25 July 2014 (08_0099). Specific noise conditions (Schedule 3 - Conditions 5, 6, 7, 8 & 9) contained within the consent include the requirement for preparation of a *NMP* (*Schedule 3 - Condition 9*) to the satisfaction of the Secretary.

The approval includes:

- Extraction, processing and transportation of up to 250,000 tonnes per annum of various grades of washed sand, mortar sand, sandstone blocks and retaining wall rocks for a period of approximately thirty (30) years.
- Total extraction of approximately nine point five (9.5) million tonnes (Mt) of extractable sand and sandstone.
- Extension of quarry by approximately twenty (20) hectares.
- Extraction to depth of thirty-five (35) metres.
- Extraction by dozer and excavator.

The site operates from 7.00am to 6.00pm Monday to Friday and 7.00am to 1.00 pm Saturday. Due to the number of quarry staff, simultaneous plant operation is typically limited to three (3) items at any one time.

2.0 APPROVAL CONDITIONS (Noise)

Project construction and quarry operational noise conditions imposed by the DoPE (*Approval 08_0099*) dated 25 July 2014 – Schedule 3 are presented below:

NOISE

Hours of Operation

5. The Proponent shall only conduct construction activities and quarrying operations on the site:
   (a) between 7.00 am and 6.00 pm, Monday to Friday;
   (b) between 7.00 am and 1.00 pm, Saturday; and
   (c) at no time on Sunday or public holidays.

   Note: The Proponent may carry out other activities e.g. maintenance, on the site provided that these activities are conducted in a manner that is inaudible at all privately-owned residences.

6. The following activities may be carried out on the site outside the hours specified in condition 5:
   (a) delivery or dispatch of materials as requested by Police or other authorities; and
   (b) emergency work to avoid the loss of lives, property and/or to prevent environmental harm.

   In such circumstances the Proponent shall notify the Secretary and affected residents prior to undertaking the activities, or as soon as is practical thereafter.

Noise Impact Assessment Criteria

7. The Proponent shall ensure that the construction and operational noise generated by the project does not exceed the criteria in Table 1 at any residence on privately-owned land.

Table 1: Noise criteria

Receiver Location	$L_{Aeq\ (15\ min)}$ dB(A)
All privately-owned residences	40

Noise generated by the project is to be measured in accordance with the relevant requirements and exemptions (including certain meteorological conditions) of the *NSW Industrial Noise Policy*. Appendix 2 sets out the meteorological conditions under which these criteria apply and the requirements for evaluating compliance with these criteria.

However, the noise criteria in Table 1 do not apply if the Proponent has an agreement with the relevant landowner to exceed the noise criteria, and the Proponent has advised the Department in writing of the terms of the agreement.

It is noted that *Schedule 3 – Condition 7* does not provide noise limits for the National Park. In accordance with the EA Noise Assessment and procedures of the *NSW, INP* a level of $L_{Aeq,15min}$ 50-55dB(A) is applied for the National Park.

.

3.0 DESCRIPTION OF QUARRING ACTIVITIES

Site inspections during the audit identified that onsite extraction and processing was established in Area A.

- Wet Sand Wash Plant in western portion of Area A
- Commander Screen and Loader 1 on upper processing area within western portion of Area A.
- Truck 1 route between upper processing area and site entry.
- Stone saw in central portion of Area A.

4.0 SITE ATTENDED NOISE AUDIT

Site inspection and attended noise audits were conducted between 8.30am and 1.45pm on Monday 18 January 2016. Weather conditions during the audit were clear and dry with calm to light breeze from the south (1-2m/sec).

The site attended sound pressure level measurements were conducted at three (3) locations selected to represent the residential receivers identified in Grants Road Sand Noise Management Plan (45.6920.R1.NMP:CFCD7. Rev 02) dated September 2015.

The reference measurement locations are shown in *Attachment 1* and identified as:

Location 1: 'Ibels' - 380 Somersby Falls Road

Location 2: 'McGregor' - 239 Grants Road

Location 3: 'Sammut' - 210 Grants Road

4.1 Measurement Instrumentation

The noise measurement instrumentation selected comprised a SVAN949 Sound and Vibration Analyzer. The meter was programmed to calculate and record 15 minute statistical levels. The reference calibration level of the meter was checked prior to and after the measurements with a Bruel & Kjaer Sound Level Calibrator Type 4230 and remained within ± 0.5dBA. The meter carried appropriate and current NATA calibration *(Attachment 2).*

The noise audit and measurements were undertaken in accordance with procedures documented in Australian Standard AS1055-1997 ' Acoustics - Description and Measurement of Environmental Noise' and the NSW Environmental Protection Authority Industrial Noise Policy *(INP).*

4.2 Weather Conditions

Weather conditions during the audit varied from calm to light variable winds from the south (1-2m/sec). The day temperatures ranged between 20°C and 27°C. No rainfall was recorded during the audit.

5.0 MEASUREMENT RESULTS

Measurements were conducted over fifteen (15) minute periods, noise sources identified and measured during the audit where appropriate were used to assess source noise contributions from the Grants Road Sand Quarry operations. A summary of the measurement results and calculated contributions is presented in *Table 1*.

Table 1: Audit Measurement Results
dBA re: 20 x 10^{-6} Pa

Measured Ambient Sound Pressure Levels dBA				Grants Road Sand Contribution $L_{Aeq, 15min*}$	Comments
L_{Aeq}	L_{A10}	L_{A90}	L_{A1}		
Location 1: Ibels Residence – 380 Somersby Falls Road					
40.4	40.6	29.8	53.9	<30	Local domestic, birds, distant traffic, insects. GRS inaudible,
41.2	41.3	29.6	51.3	<30	Local domestic, birds, distant traffic, insects. GRS inaudible,
Location 2: McGregor Residence – 239 Grants Road					
42.1	44.6	34.7	53.0	<35	Local domestic, Motorway traffic, insects, Hanson trucks; GRS inaudible
44.8	47.5	39.0	53.7	<35	Local domestic, distant traffic, insects. Hanson trucks; GRS occasionally audible (saw cutting),
Location 3: Sammut Residence – 210 Grants Road					
51.5	56.0	38.6	62.5	<35	Local domestic, birds, insects, Hanson trucks. GRS inaudible. (noise controlled by birds),
38.5	41.5	35.2	45.8	<35	Local domestic, distant traffic, insects. Hanson trucks; GRS inaudible,
Location 4: National Park					
39.3	40.9	37.2	44.0	<40	Birds, Hansons processing plant;.GRS dam and wash plant power plants (diesels) audible, Plane
38.5	39.8	37.0	42.4	<40	Birds, Hansons processing plant;.GRS dam and wash plant power plants (diesels) audible, Plane

In addition to the measurements at the residential receivers, on-site measurements have been conducted to confirm sound power levels for the plant and equipment. *Table 2* provides a summary of the measurement results.

Table 2: Quarry Plant and Equipment Sound Power Levels
dBA re: 10^{-12} Watts

Plant Description	Sound Power Level dB 10-12 Watts									
	dB(A)	31.5	63	125	250	500	1k	2k	4k	8k
Settling Pond Pump	105	94	100	107	93	97	102	101	93	87
Cat 365C - Saw Cutting	114	95	103	102	101	104	103	106	106	110
Sand Wash Plant Motor	95	100	113	100	93	90	91	86	80	73
Power Screen	112	102	96	98	96	104	108	108	101	95
Sand Wash Plant Pump	104	89	114	100	96	99	99	98	93	85
Cat Loader 972G	102	102	116	105	104	100	97	95	87	79
Tricon Screen	109	105	103	108	106	106	104	103	98	93

The audit measurements have confirmed that operational noise contributions from Grants Road Sand Quarry operations satisfied the (*Approval 08_0099*) dated 25 July 2014 project noise goal $L_{Aeq,\ 15min}$ 40dBA and the NMP recommended limit for the National Park $L_{Aeq,15min}$ 50-55.

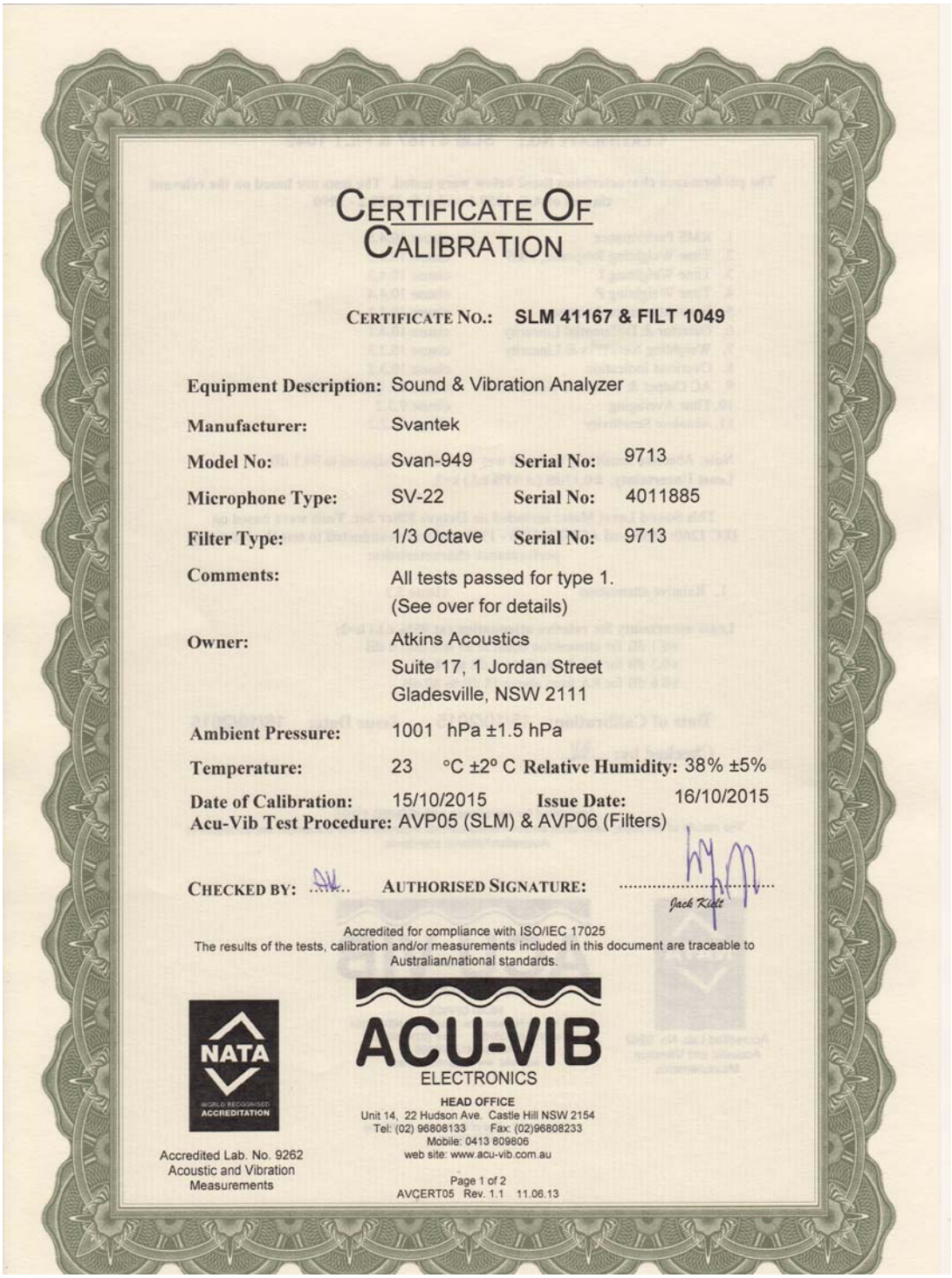
We trust the information in this letter is satisfactory. Please do not hesitate to contact our office if further information or clarification is required.

Yours sincerely,
ATKINS ACOUSTICS & ASSOCIATES PTY LTD.

Graham Atkins

ATTACHMENT 1: ASSESSMENT MONITORING LOCATIONS

ATTACHMENT 2: SVAN Certificate of Calibration.



CERTIFICATE OF CALIBRATION

CERTIFICATE NO.: SLM 41167 & FILT 1049

Equipment Description:	Sound & Vibration Analyzer		
Manufacturer:	Svantek		
Model No:	Svan-949	**Serial No:**	9713
Microphone Type:	SV-22	**Serial No:**	4011885
Filter Type:	1/3 Octave	**Serial No:**	9713
Comments:	All tests passed for type 1. (See over for details)		
Owner:	Atkins Acoustics Suite 17, 1 Jordan Street Gladesville, NSW 2111		
Ambient Pressure:	1001 hPa ±1.5 hPa		
Temperature:	23 °C ±2° C	**Relative Humidity:**	38% ±5%
Date of Calibration:	15/10/2015	**Issue Date:**	16/10/2015
Acu-Vib Test Procedure:	AVP05 (SLM) & AVP06 (Filters)		

CHECKED BY: ..... **AUTHORISED SIGNATURE:** .....
Jack Kidd

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. No. 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 2
AVCERT05 Rev. 1.1 11.06.13

Appendix 5
NOISE AUDIT AUGUST 2016
Atkins Acoustic

46.7027.R2:GA/DT/2016

ATKINS ACOUSTICS

Postal Address
P.O. Box 432
Gladesville
N.S.W. 1675
AUSTRALIA
A.C.N. 068 727 195
A.B.N. 19 068 727 195
Telephone: 02 9879 4544
Fax: 02 9879 4810
Email: AtkinsAcoustics@bigpond.com.au

Grants Road Sand Pty Ltd.
Grants Road
SOMERSBY NSW 2250

Attention: Steve Jones

10 August 2016

Atkins Acoustics and Associates Pty Ltd.
Consulting Acoustical & Vibration Engineers

SITE ATTENDED NOISE AUDIT GRANTS ROAD SAND QUARRY SOMERSBY

1.0 INTRODUCTION

Atkins Acoustics was requested by Grants Road Sand Pty Ltd to undertake an environmental noise audit of the Grants Road Sand Quarry operations. The noise audit was conducted by Graham Atkins. Grahams qualifications and membership include BE, MAAS, MIEAust and CPEng. Graham is employed by Atkins Acoustics and Associates Pty Ltd a Member Firm of the AAAC.

The approval included extraction, processing and transportation of up to 250,000 tonnes per annum of various quarry products until 30 June 2044.The site currently operates under approval from DoPE dated 25 July 2014 (08_0099). Specific noise conditions (Schedule 3 - Conditions 5, 6, 7, 8 & 9) contained within the consent include the requirement for preparation of a *NMP* (*Schedule 3 - Condition 9*) to the satisfaction of the Secretary.

The approval includes:

- Extraction, processing and transportation of up to 250,000 tonnes per annum of various grades of washed sand, mortar sand, sandstone blocks and retaining wall rocks for a period of approximately thirty (30) years.
- Total extraction of approximately nine point five (9.5) million tonnes (Mt) of extractable sand and sandstone.
- Extension of quarry by approximately twenty (20) hectares.
- Extraction to depth of thirty-five (35) metres.
- Extraction by dozer and excavator.

The site operates from 7.00am to 6.00pm Monday to Friday and 7.00am to 1.00pm Saturday. Due to the number of quarry staff, simultaneous plant operation is typically limited to three (3) items at any one time.

2.0 APPROVAL CONDITIONS (Noise)

Project construction and quarry operational noise conditions imposed by the DoPE (*Approval 08_0099*) dated 25 July 2014 – Schedule 3 are presented below:

NOISE

Hours of Operation

5. The Proponent shall only conduct construction activities and quarrying operations on the site:
   (a) between 7.00 am and 6.00 pm, Monday to Friday;
   (b) between 7.00 am and 1.00 pm, Saturday; and
   (c) at no time on Sunday or public holidays.

   Note: The Proponent may carry out other activities e.g. maintenance, on the site provided that these activities are conducted in a manner that is inaudible at all privately-owned residences.

6. The following activities may be carried out on the site outside the hours specified in condition 5:
   (a) delivery or dispatch of materials as requested by Police or other authorities; and
   (b) emergency work to avoid the loss of lives, property and/or to prevent environmental harm.

   In such circumstances the Proponent shall notify the Secretary and affected residents prior to undertaking the activities, or as soon as is practical thereafter.

Noise Impact Assessment Criteria

7. The Proponent shall ensure that the construction and operational noise generated by the project does not exceed the criteria in Table 1 at any residence on privately-owned land.

Table 1: Noise criteria

Receiver Location	$L_{Aeq\ (15\ min)}$ dB(A)
All privately-owned residences	40

Noise generated by the project is to be measured in accordance with the relevant requirements and exemptions (including certain meteorological conditions) of the *NSW Industrial Noise Policy*. Appendix 2 sets out the meteorological conditions under which these criteria apply and the requirements for evaluating compliance with these criteria.

However, the noise criteria in Table 1 do not apply if the Proponent has an agreement with the relevant landowner to exceed the noise criteria, and the Proponent has advised the Department in writing of the terms of the agreement.

It is noted that *Schedule 3 – Condition 7* does not provide noise limits for the National Park. In accordance with the EA Noise Assessment and procedures of the *NSW, INP* a level of $L_{Aeq,15min}$ 50-55dB(A) is applied for the National Park.

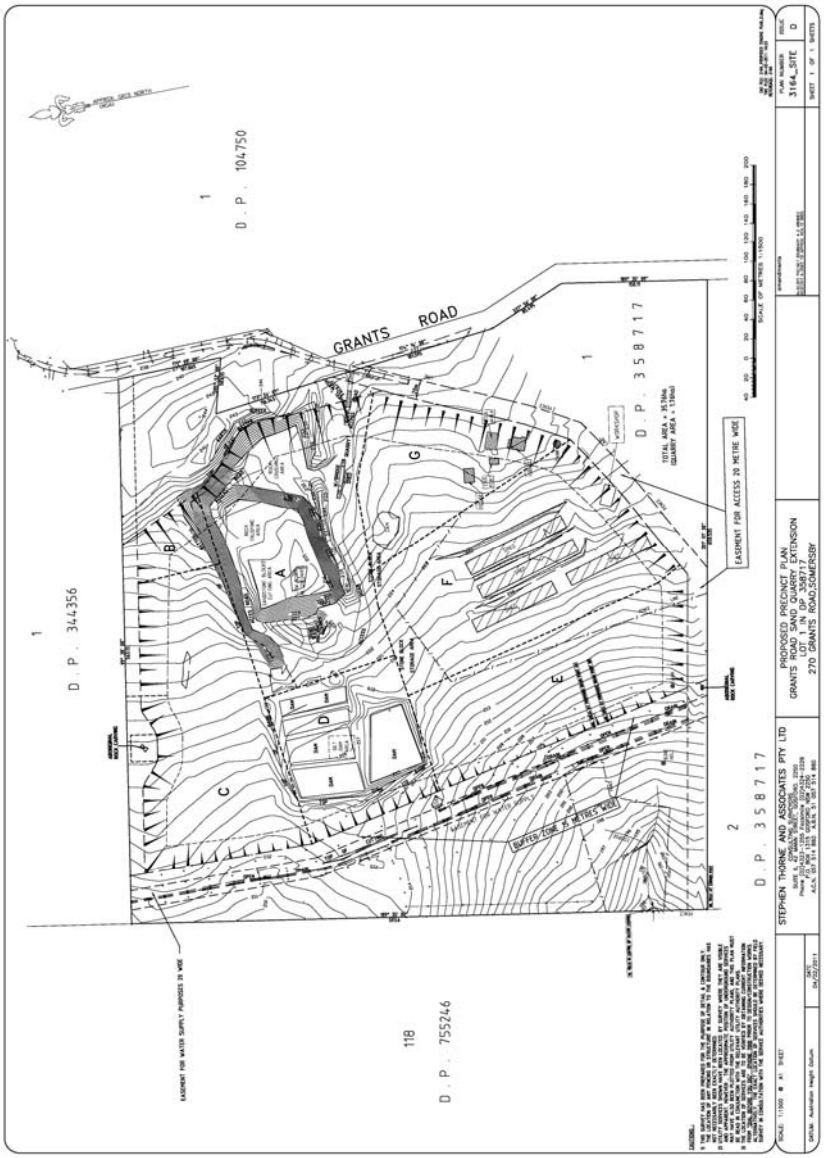
.

3.0 DESCRIPTION OF QUARRING ACTIVITIES

Site inspections during the audit identified onsite extraction and processing in Area A *(Figure 1)*. Activities and operating plant and equipment identified during the audit included:

- McCloskey Screen in western portion of Area A
- Loader 1 feeding McClosky Screen western portion of Area A.
- Truck loading upper processing area southern portion Area A.
- Stone saw cutting central lower portion of Area A.

Figure 1. Quarry Precinct Layout



4.0 SITE ATTENDED NOISE AUDIT

Site inspections and attended noise audits were conducted between 8.30am and 1.15pm on Monday 8 August 2016.

During the audit noise measurements were conducted at three (3) locations selected to represent the residential receivers identified in Grants Road Sand Noise Management Plan (45.6920.R1.NMP:GA/CF/DT. Rev 03) dated June 2016.

The reference measurement locations are shown in *Attachment 1* and identified as:

Location 1: 'Ibels' - 380 Somersby Falls Road

Location 2: 'McGregor' - 239 Grants Road

Location 3: 'Sammut' - 210 Grants Road

4.1 Measurement Instrumentation

The noise measurement instrumentation comprised a SVAN949 Sound and Vibration Analyzer. The meter was programmed to calculate and record 15 minute statistical levels. The reference calibration level of the meter was checked prior to and after the measurements with a Bruel & Kjaer Sound Level Calibrator Type 4230 and remained within ± 0.5dBA. The meter carried appropriate and current NATA calibration *(Attachment 2).*

The noise audit and measurements were undertaken in accordance with procedures documented in Australian Standard AS1055-1997 ' Acoustics - Description and Measurement of Environmental Noise' and the NSW Environmental Protection Authority Industrial Noise Policy *(INP).*

4.2 Weather Conditions

Weather conditions during the audit were clear and dry with calm to light wind from the west to south-west (1-2m/sec). The day air temperatures ranged between 18°C and 23°C. No rainfall occurred during the audit.

5.0 MEASUREMENT RESULTS

Measurements were conducted over fifteen (15) minute periods, noise sources identified and measured during the audit where appropriate were used to assess source noise contributions from the Grants Road Sand Quarry operations. A summary of the measurement results and calculated contributions is presented in *Table 1*.

Table 1: Audit Measurement Results
dBA re: 20 x 10^{-6} Pa

Measured Ambient Sound Pressure Levels dBA				Grants Road Sand Contribution	Comments
L_{Aeq}	L_{A10}	L_{A90}	L_{A1}	$L_{Aeq,\ 15min}$*	
Location 1: Ibels Residence – 380 Somersby Falls Road					
39.4	40.5	33.5	49.4	<35	Birds, distant road traffic, insects, GRS inaudible.
47.4	49.4	35.3	59.8	<35	Local domestic activities, birds, distant road traffic, insects, GRS inaudible.
Location 2: McGregor Residence – 239 Grants Road					
44.3	46.1	39.0	55.7	<38	Local domestic activities, Motorway traffic, insects, GRS McCloskey Screen audible at times
44.8	48.45	39.5	56.7	<38	Local domestic activities, Motorway traffic, insects. Hanson trucks; McCloskey Screen audible at times
Location 3: Sammut Residence – 210 Grants Road					
44.3	46.1	39.0	55.7	<38	Local domestic activities Motorway traffic, insects, GRS McCloskey Screen audible.
40.5	44.5	38.5	53.8	<38	Local domestic activities, Motorway traffic, insects. Hanson trucks; GRS McCloskey Screen audible.
Location 4: National Park					
40.9	42.6	36.9	48.4	<40	Hanson trucks; GRS McCloskey Screen audible, GRS Loader feeding McClosky Screen, Birds, Plane.
38.5	39.8	37.0	42.4	<40	GRS McCloskey Screen audible, GRS Loader feeding McClosky Screen, Birds, Plane.

In addition to the measurements at the residential receivers, on-site measurements have been conducted to confirm sound power levels for the plant and equipment. summarised in *Table 2*.

Table 2: Quarry Plant and Equipment Sound Power Levels

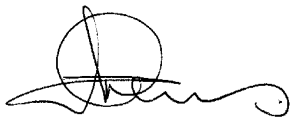
dBA re: 10^{-12} Watts

Plant Description	Sound Power Level dB 10-12 Watts									
	dB(A)	31.5	63	125	250	500	1k	2k	4k	8k
Cat Loader 972G	101	109	113	104	106	98	96	93	85	77
Cat Loader 980G	105	113	118	109	106	102	100	96	92	91
McClosky (Tricon) Screen	107	107	105	105	107	105	101	100	96	88
Allight Generator (83KVA)	94	98	100	99	96	92	89	88	83	76
Settling Pond Pump	105	115	113	97	94	95	100	99	91	85
Panoramic (F2611) Loader	102	99	113	104	98	99	97	95	90	87
Cat 365C - Saw Cutting	108	97	105	105	98	97	97	101	101	105

The audit measurements confirm that operational noise contributions from Grants Road Sand Quarry operations satisfied the (*Approval 08_0099*) dated 25 July 2014 project noise goal $L_{Aeq,\ 15min}$ 40dBA and the NMP recommended limit for the National Park $L_{Aeq,15min}$ 50-55.

We trust the information in this letter is satisfactory. Please do not hesitate to contact our office if further information or clarification is required.

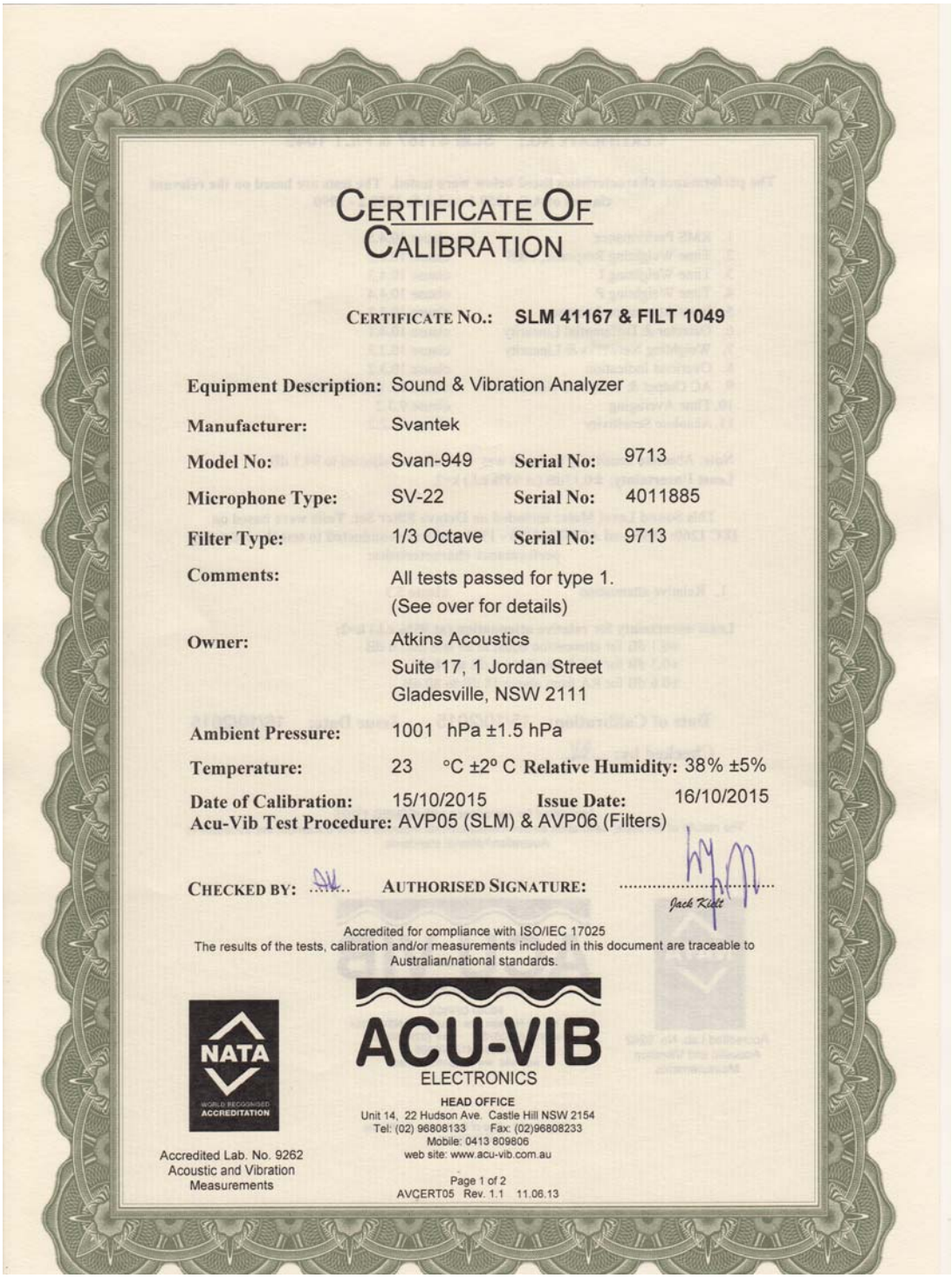
Yours sincerely,
ATKINS ACOUSTICS & ASSOCIATES PTY LTD.



Graham Atkins

ATTACHMENT 1: ASSESSMENT MONITORING LOCATIONS

ATTACHMENT 2: SVAN Certificate of Calibration.



CERTIFICATE OF CALIBRATION

CERTIFICATE NO.: SLM 41167 & FILT 1049

Equipment Description:	Sound & Vibration Analyzer		
Manufacturer:	Svantek		
Model No:	Svan-949	**Serial No:**	9713
Microphone Type:	SV-22	**Serial No:**	4011885
Filter Type:	1/3 Octave	**Serial No:**	9713
Comments:	All tests passed for type 1. (See over for details)		
Owner:	Atkins Acoustics Suite 17, 1 Jordan Street Gladesville, NSW 2111		
Ambient Pressure:	1001 hPa ±1.5 hPa		
Temperature:	23 °C ±2° C	**Relative Humidity:**	38% ±5%
Date of Calibration:	15/10/2015	**Issue Date:**	16/10/2015
Acu-Vib Test Procedure:	AVP05 (SLM) & AVP06 (Filters)		

CHECKED BY: ..... **AUTHORISED SIGNATURE:** .....
Jack Kidd

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. No. 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 2
AVCERT05 Rev. 1.1 11.06.13

Appendix 6
BASELINE AIR QUALITY MONITORING
Pacific Environmental Limited

Report

Baseline monitoring annual report – 2016 Grants Road Sand

Document control number: AQU-NW-002-20078D1

Date: 30 March 2017

Pacific Environment Limited

Technologies Consulting Monitoring

www.pacific-environment.com

Project name: Baseline monitoring annual report – 2016 Grants Road Sand

Document control number: AQU-NW-002-20078D1

Prepared for: Grants Road Sand

Approved for release by: Jane Barnett

Disclaimer & copyright:

Version	Date	Comment	Prepared by	Reviewed by
01	15.02.2017	First draft	Alejandro Vesga	Jane Barnett
02	30.03.2017	Final	Alejandro Vesga	Jane Barnett

Adelaide

35 Edward Street,
Norwood SA 5067
PO Box 3187, Norwood SA 5067
Ph: +61 8 8332 0960
Fax: +61 7 3844 5858

Brisbane

Level 19, 240 Queen Street
Brisbane Qld 4000
Ph: +61 7 3004 6400
Fax: +61 7 3844 5858

Melbourne

Level 17, 31 Queen Street
Melbourne Vic 3000
Ph: +61 3 9111 0021
Fax: +61 2 9870 0999

Perth

Level 1, Suite 3
34 Queen Street, Perth WA 6000
Ph: +61 8 9481 4961
Fax: +61 2 9870 0999

Sydney Head Office

Suite 1, Level 1, 146 Arthur Street
North Sydney, NSW 2060
Ph: +61 2 9870 0900
Fax: +61 2 9870 0999

Disclaimer

Pacific Environment acts in all professional matters as a faithful advisor to the Client and exercises all reasonable skill and care in the provision of its professional services.

Reports are commissioned by and prepared for the exclusive use of the Client. They are subject to and issued in accordance with the agreement between the Client and Pacific Environment. Pacific Environment is not responsible for any liability and accepts no responsibility whatsoever arising from the misapplication or misinterpretation by third parties of the contents of its reports.

Except where expressly stated, Pacific Environment does not attempt to verify the accuracy, validity or comprehensiveness of any information supplied to Pacific Environment for its reports.

Reports cannot be copied or reproduced in whole or part for any purpose without the prior written agreement of Pacific Environment.

Where site inspections, testing or fieldwork have taken place, the report is based on the information made available by the client or their nominees during the visit, visual observations and any subsequent discussions with regulatory authorities. The validity and comprehensiveness of supplied information has not been independently verified and, for the purposes of this report, it is assumed that the information provided to Pacific Environment is both complete and accurate. It is further assumed that normal activities were being undertaken at the site on the day of the site visit(s), unless explicitly stated otherwise.

Table of contents

List of Figures

List of Tables

1 Introduction

Pacific Environment has been commissioned by Grants Road Sand to undertake baseline air quality and meteorological reporting for the Grants Road Sand Quarry, located in the NSW Central Coast at Somersby, NSW.

The results of the monitoring programs are provided on an annual basis. This report summarises the data collected during the January to December 2016 period.

2 Relevant Monitoring Guidelines and Standards

2.1 Air Quality Monitoring Guidelines

All monitoring for air quality is conducted in accordance with the NSW Environmental Protection Agency (EPA)[1] "*Approved methods for the sampling and analysis of air pollutants in NSW"* (**NSW DEC 2005**).

Specifically, the approved methods relevant to this monitoring plan are:

- AM-1 – Guide for the siting of sampling equipment.
- AM-2 – Guide for measurement of horizontal wind for air quality applications.
- AM-4 – Meteorological monitoring guidance for regulatory modelling applications; and
- AM-18 – Particulate matter – PM_{10} – high volume sampler with size-selective inlet.

2.1.1 General Siting Requirements

AM-1 refers to the Australian Standard (AS) 2922 – 1987, however this has been superseded by AS/NZS 3580.1.1:2007 *Methods for sampling and analysis of ambient air - Guide to siting air monitoring equipment*.

The siting of all instrumentation is undertaken in accordance with the requirements set out in both AS 2922 - 1987 and AS 3580.1.1: 2007. Where conflicts arise, preference will be given to the more recent standard.

2.1.2 Meteorological Monitoring

AM-2 refers to the Australian Standard AS 2923 – 1987 "Ambient Air – Guide for Measurement of Horizontal Wind for Air Quality Applications". AS 2923 applies to the determination of wind speed and direction for the purpose of air quality applications and sets out requirements for apparatus, calibration and maintenance, siting and installation and data recording and processing (including appropriate methods for wind averaging). A monitoring site for the meteorological station (met station) was chosen in accordance with AS 2923 –

[1] The NSW EPA exists as a legal entity operated within the Office of Environment and Heritage (OEH) which came into existence in April 2011. OEH was previously part of the Department of Environment, Climate Change and Water (DECCW). The DECCW was also recently known as the Department of Environment and Climate Change (DECC), and prior to that the Department of Environment and Conservation (DEC). The terms NSW EPA, OEH, DECCW, DECC and DEC are interchangeable in this report.

1987. The location is away from buildings or other obstructions that would otherwise impact on the prevailing wind flow.

A summary of the parameters measured is shown in Table 2-1.

Table 2-1*: Weather Station Parameters*

Parameter	Unit	Frequency	Averaging Period	Sampling Method
Rainfall	mm	Continuous	1 Hour	AM-4
Temperature @ 2 m	°C		10 Minute	AM-4
Temperature @ 10 m	°C			AM-2 and AM-4
Wind Speed @ 10 m	m/s			AM-2 and AM-4
Wind Direction @ 10 m	Degrees			AM-2 and AM-4
Sigma Theta	Degrees			AM-2 and AM-4
Relative Humidity	%			AM-4
Solar Radiation	W/m^2			AM-4

2.1.3 Particulate Matter Monitoring

AM-18 refers to the Australian Standard (AS) 3580.9.6:1990, however this has been superseded by AS/NZS 3580.9.6:2015 *Methods for sampling and analysis of ambient air – Determination of suspended particulate matter – PM_{10} high volume sampler with size elective inlet – Gravimetric method*.

PM_{10} refers to all particles with equivalent aerodynamic diameters of less than 10 µm, that is, all particles that behave aerodynamically in the same way as spherical particles with a unit density.

The HVAS PM_{10} data is collected at the Grants Road Quarry site (Figure 3-1) before analysis is completed by ALS Environmental. These results are provided to Pacific Environment for presentation in the air quality baseline report.

2.2 Air Quality Criteria

The NSW EPA specifies air quality assessment criteria relevant for assessing impacts from air pollution (**NSW DEC, 2005**). These criteria are health-based (i.e. they are set at levels to reduce the risk of adverse health effects). The EPA criteria are consistent with the National Environment Protection Measures for Ambient Air Quality (referred to as the Ambient Air-NEPM) (**NEPC, 1998**, **NEPC, 2003**). In January 2017, the NSW EPA updated their Approved Methods (**EPA, 2016**) to amend the annual average PM_{10} criterion from 30 $\mu g/m^3$ down to 25 $\mu g/m^3$. The 2016 data in this report however, is referenced to the 30 $\mu g/m^3$ criterion. Future reports will reference the 25 $\mu g/m^3$ criterion and assess compliance accordingly.

Table 2-2 summarises the air quality criteria for concentrations of particulate matter that are relevant to this study. That is, the criteria stated form the basis for the standards to be achieved at the quarry.

Table 2-2: *Air Quality Standards / Goals for Particulate Matter.*

Pollutant	Averaging Period	Standard / Goal	Agency
Particulate matter with an equivalent aerodynamic diameter less than 10 µm (PM_{10})	24-hour maximum	50 µg/m^3	EPA impact assessment criteria; NEPM reporting goal (allows five exceedances per year for bushfires)
	Annual mean	30 µg/m^3	EPA impact assessment criteria

Notes: µg/m^3 – micrograms per cubic metre, µm – micrometre.

3 Monitoring Locations

The Grants Road Sand Quarry baseline monitoring locations are shown in Featured are the automatic weather station (AWS) and High Volume Air Sampler (HVAS).

Figure 3-1: *Monitoring Locations at Grants Rd. Quarry.*

4 Air Quality Monitoring Results

4.1 Meteorological Monitoring

Meteorological data collected during 2016 are summarised in Table 4-1 and Table 4-2.

The valid data recovery rate after all data validation processes is presented in Table 4-1. There were some problems with birds damaging the wiring from the sensors to the logger which caused a loss of data.

Table 4-1: *Valid Data Recovery Rates - AWS*

Parameter	Valid Data Recovery Rate
Wind Speed	76.6%
Wind Direction	76.6%
Temperature – 2 m	84.7%
Temperature – 10 m	79.6%
Relative Humidity	79.3%
Pressure	79.3%
Solar Radiation	84.7%

Table 4-2: *Summary statistics*

Parameter (units)	Statistical measure	Jan-16	Feb-16	Mar-16	Apr-16	May-16	Jun-16	Jul-16	Aug-16	Sep-16	Oct-16	Nov-16
Wind Speed (m/s)	Mean	-	-	1.7	1.6	2.1	2.4	2.4	2.0	2.3	2.4	-
Temperature (°C) – 2m		15.5	12.0	20.1	17.9	15.4	12.1	11.7	11.9	14.2	14.2	18.3
Temperature (°C) – 10m		-	-	20.1	18.4	15.9	12.6	12.1	12.4	14.6	14.5	18.2
RH (%)		-	-	77.1	76.7	59.0	67.1	66.1	66.2	66.1	46.6	41.9
Barometric pressure (hPa)		-	-	977.0	993.6	987.9	988.1	989.7	991.9	985.9	873.0	850.9
Wind Speed (m/s)	Median	-	-	1.6	1.4	1.8	2.2	2.1	1.7	2.0	2.2	-
Temperature (°C) – 2m		-	17.1	19.6	17.2	15.5	12.4	11.6	11.4	14.1	15.0	18.3
Temperature (°C) – 10m		-	-	20.0	17.8	16.2	13.0	12.3	12.1	14.6	15.3	17.6
RH (%)		-	-	81.6	80.2	58.4	64.5	64.1	65.0	66.7	46.5	37.5
Barometric pressure (hPa)		-	-	990.1	993.2	988.6	988.6	990.5	992.2	985.2	986.7	981.6
Wind Speed (m/s)	Standard Deviation	-	-	0.9	0.8	1.2	1.3	1.5	1.0	1.4	1.6	-
Temperature (°C) – 2m		-	11.5	3.7	3.5	4.0	3.3	3.8	3.7	3.1	6.8	5.8
Temperature (°C) – 10m		-	-	3.9	3.1	3.7	3.1	3.6	3.4	2.7	6.7	5.5
RH (%)		-	-	15.9	14.5	15.2	14.1	16.4	15.7	15.3	23.6	26.7
Barometric pressure (hPa)		-	-	111.2	4.0	5.7	10.6	6.9	5.5	8.0	315.0	335.2
Rainfall (mm)	Monthly Total	-	-	306.7	139.2	134.6	973.1	244.4	494.6	0.0	150.3	98.0

4.1.1 Wind Data

A wind rose for the annual period 2016 is presented in Figure 4-1. The wind rose indicates that winds from the west are dominant. The average wind speed for the period was 2.1 m/s and the percentage occurrence of calm wind conditions (less than or equal to 0.5 m/s) was 1.2 %.

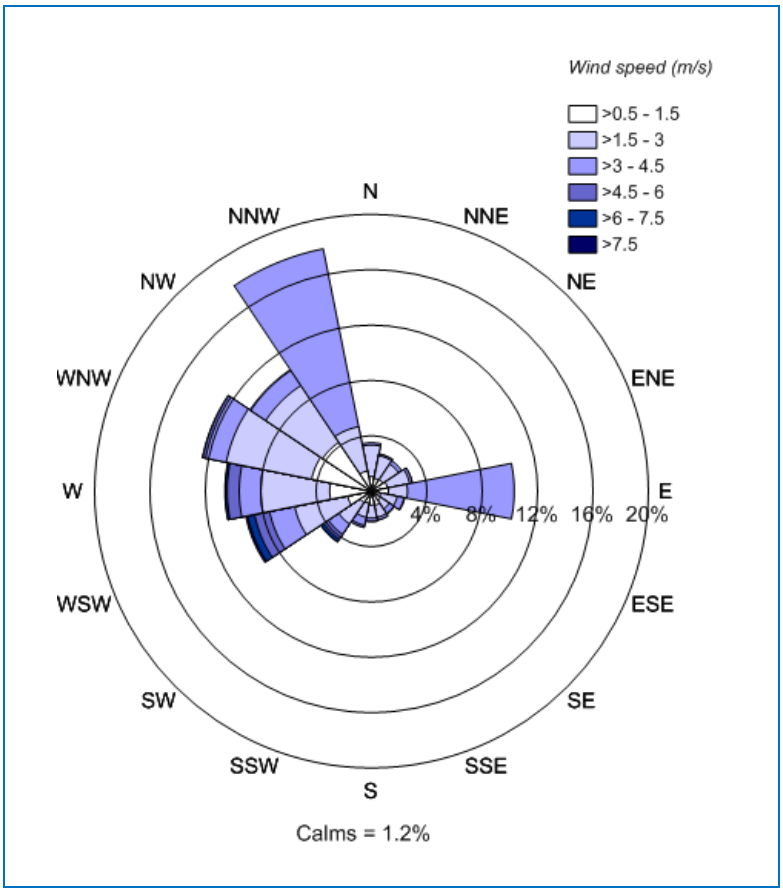


Figure 4-1: *Grants Road Sand Wind Rose, 2016*

4.1.2 Temperature

A plot of the hourly average temperature, recorded at 2 m and 10 m, is shown in Figure 4-2. July was the coldest month on average and February was the hottest month on average. The maximum daily average of 28°C was recorded on 14 February 2016.The monthly average temperature is shown in Table 4-3.

Table 4-3: *Monthly Average Temperature, 2016.*

Month	Monthly Average Temperature at 2m (°C)	Monthly Average Temperature at 10m (°C)
January	-	-
February	22	-
March	20	20
April	18	18
May	15	16
June	12	13
July	12	12
August	12	12
September	14	14
October	16	16
November	19	19
December	-	-

4.1.3 Rainfall

A plot of the daily average rainfall is shown in Figure 4-3 and the monthly average rainfall is shown in Figure 4-4. June recorded the highest monthly rainfall of 973 mm.

A significant weather even, an East Coast Low, brought record breaking rainfall to coastal parts of NSW on the weekend of the 4-5th June. This was the wettest June period since 1991[2].

[2] http://www.bom.gov.au/climate/current/month/nsw/archive/201606.sydney.shtml

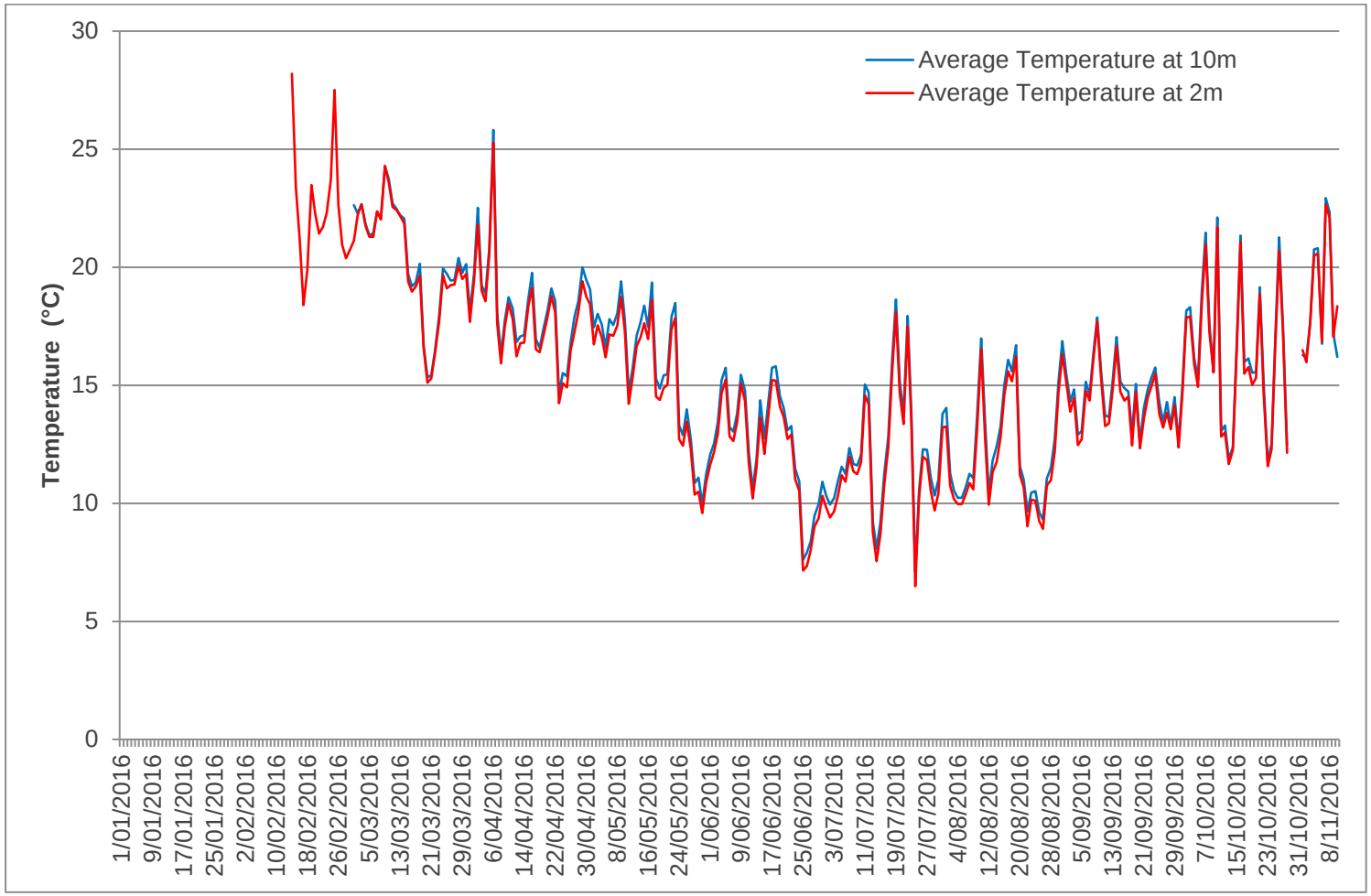


Figure 4-2: *Temperature Daily Temperature 2016*.

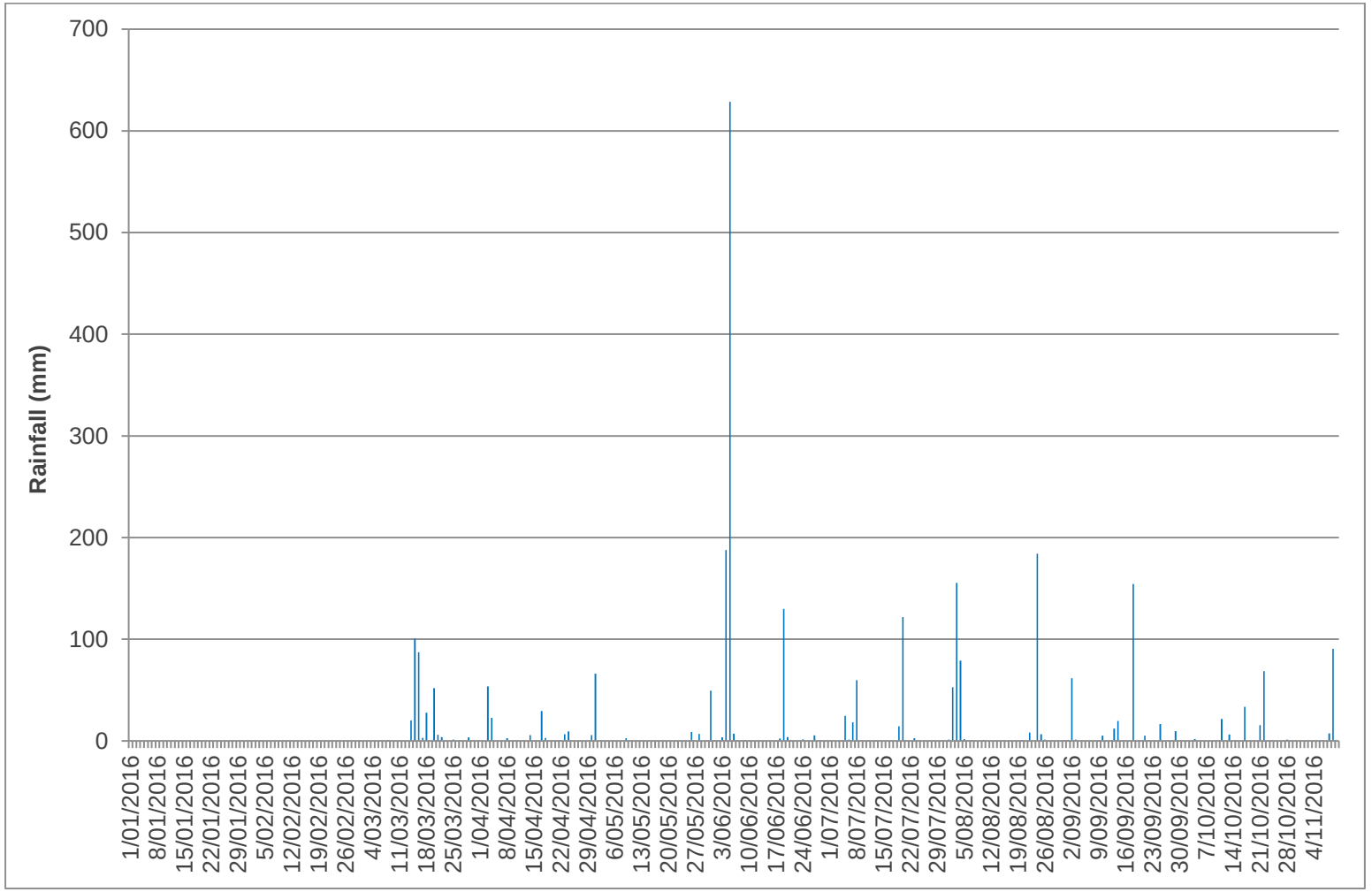


Figure 4-3: *Daily Rainfall, 2016.*

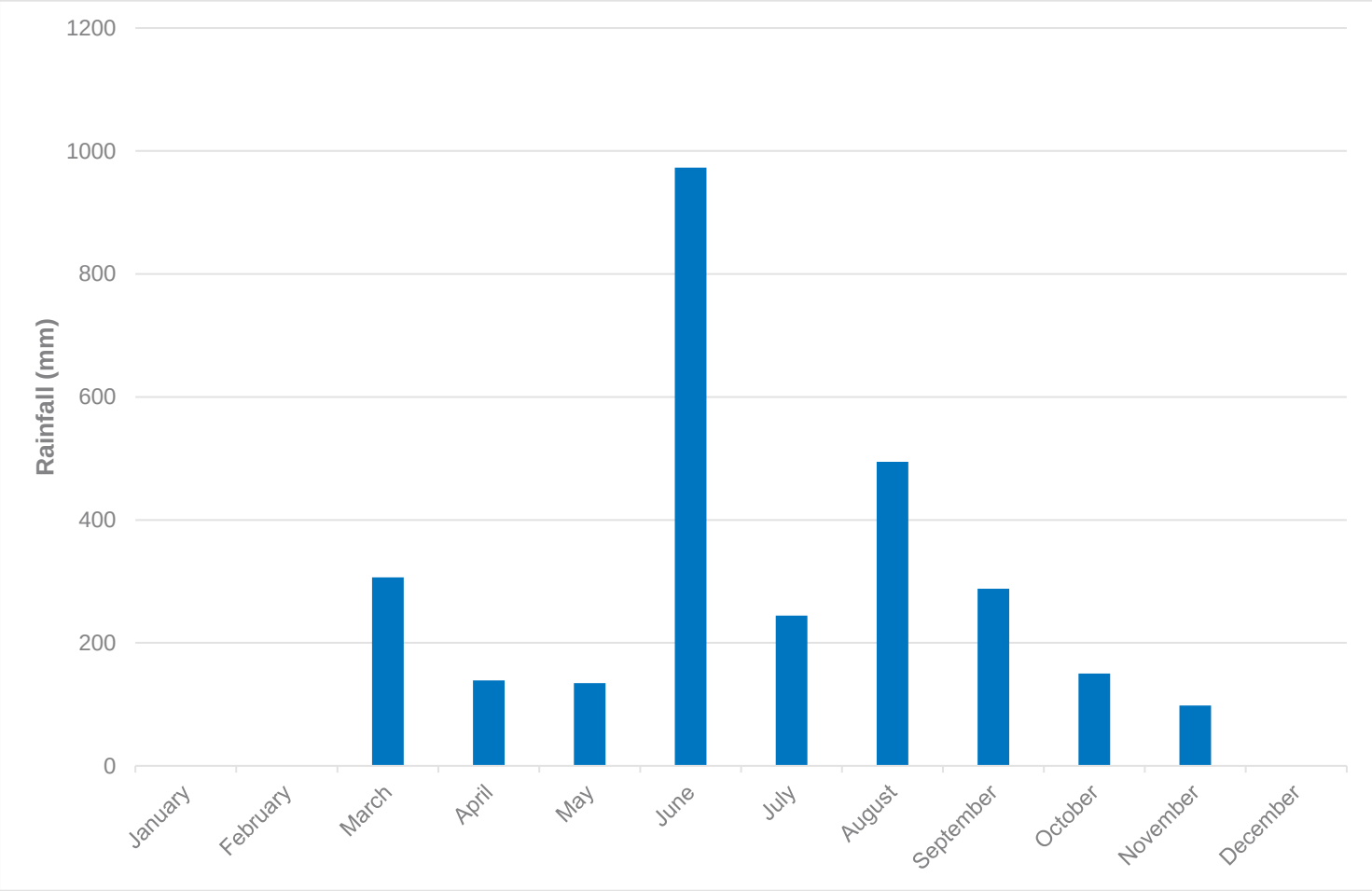


Figure 4-4: *Monthly Rainfall Total, 2016.*

4.2 Particulate Matter (PM_{10})

4.2.1 Measured Results

The results for the available data in 2016 are listed in Table 4-4. Of a possible 60 samples (over approximately 12 months), thirty eight samples are reported, resulting in a data recovery rate of approximately 65%. The average PM_{10} concentration over the recorded 1-year period was 10.1 µg/m^3, which is below the annual EPA impact assessment criterion of 30 µg/m^3. All reported results are well within the EPA maximum 24-hour average criterion of 50 µg/m^3 for PM_{10}, with a maximum 24-hour average of 25.9 µg/m^3 recorded on 1 November 2016.

The dust sample collected by the HVAS monitor includes both dust generated by site activities (incremental dust impact) and dust from all other local sources (background dust levels). However as stated previously, even with the background levels accounted for, the PM_{10} levels are considerably below their respective 24-hour and annual criterion.

Table 4-4: *HVAS Monitoring Results for PM_{10} 2016*

Date	Concentration (µg/m^3)
02-Jan-16	5.7
22-Feb-16	3.5
03-Feb-16	16.5
09-Feb-16	16.2
16-Feb-16	23.7
22-Feb-16	13.8
28-Feb-16	14
19-Mar-16	13.4
31-Mar-16	19
17-Apr-16	19.6
17-Apr-16	4.6
24-Apr-16	4.5
22-Jun-16	<0.1
28-Jun-16	1.9
04-Jul-16	5.5
10-Jul-16	3
16-Jul-16	6.1
22-Jul-16	2.6
28-Jul-16	1.3
03-Aug-16	3.4
09-Aug-16	7
15-Aug-16	9
31-Aug-16	14
02-Sep-16	4.2
08-Sep-16	5.7
16-Sep-16	6.2
24-Sep-16	3.6
02-Oct-16	2.4
08-Oct-16	18.3
14-Oct-16	3.1
20-Oct-16	5.7
26-Oct-16	7.7
01-Nov-16	25.9
07-Nov-16	17.4
13-Nov-16	15.5
19-Nov-16	2.5
Annual Average	**10.1**
Maximum Value	**25.9**

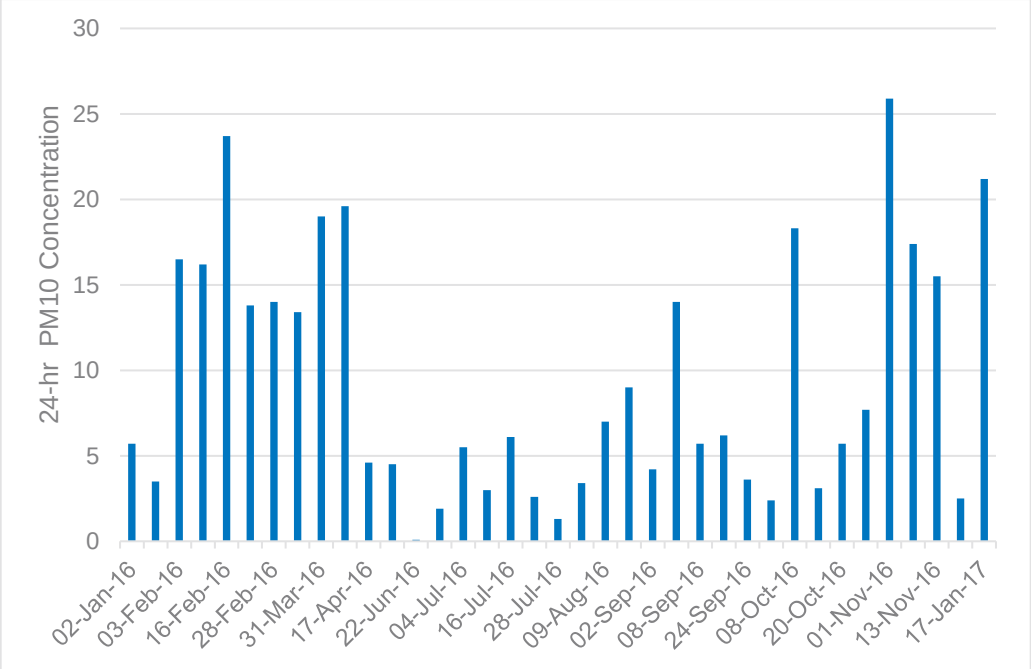


Figure 4-5: *HVAS Monitoring Results for PM_{10}, 2016*

4.2.2 Comparison to Environmental Assessment Predictions

The Air Quality Assessment (AQA) for the Grants Road Sand Quarry Extension was completed by PAEHolmes in 2013, *Air Quality Impact Assessment – Extension of Grants Road Quarry* (**PAEHolmes, 2013**). The cumulative results predicted in the assessment indicate that the 24-hour PM_{10} ground level concentrations at the current location of the HVAS would be in the order of 70 µg/m^3. The highest measured cumulative 24-hour PM_{10} concentration was 25.9 µg/m^3 in 2016) a value considerably lower than the conservative predictions made in the air quality assessment.

The predicted annual average PM_{10} concentration in the AQA was approximately 30 µg/m^3 at the HVAS location, however an annual average concentration of 10.1 µg/m^3 was measured in 2016. This is consistent with the 24-hour results, where the actual concentration has been established to constitute 50% or less than the predicted concentration at the same location.

Given the results of the data during the monitoring period, currently no action is required to control environmental performance. Rather it is recommended that current mitigation processes are sustained.

5 References

Australian Standard / New Zealand Standard (2015). Methods for sampling and analysis of ambient air - Determination of suspended particulate matter - PM_{10} high volume sampler with size-selective inlet - Gravimetric method. AS 3580.9.6:2015.

Australian Standard / New Zealand Standard (2007). Methods for sampling and analysis of ambient air - Guide to siting air monitoring equipment. AS 3580.1.1:2007

NEPC (1998, 2003). “National Environment Protection (Ambient Air Quality) Measure”

NSW DEC (2005). Approved Methods for the Sampling and Analysis of Air Pollutants in NSW. New South Wales EPA 59-61 Goulburn Street, Sydney, NSW August 2005.

NSW EPA (2016). “Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales”. NSW Environment Protection Authority. Sydney.

PAEHolmes (2013). “Air Quality Impact Assessment – Extension of Grants Road Quarry”.

Appendix 7
GROUNDWATER DEPENDENT ECOSYSTEM
Conacher Consulting

2016 ANNUAL MONITORING REPORT
FOR
GROUNDWATER DEPENDANT ECOSYSTEM MONITORING AND MANAGEMENT PROGRAM

GRANTS ROAD SAND QUARRY

MARCH 2017
REF: 7014

PREFACE

This report has been prepared by *Conacher Consulting* to address the 2016 annual reporting requirements for Groundwater Dependant Ecosystems for the approved extension to the Grants Road Sand Quarry at Somersby.

REPORT PREPARED BY:

PHILLIP ANTHONY CONACHER B.Sc.(Hons), Dip.Urb Reg Planning, M.Nat.Res.
NPWS Scientific Licence Number: SL100361
Project Director

JACOB MANNERS B.Sc.
NPWS Scientific Licence Number: SL100361
Senior Ecological Consultant / Project Manager

TABLE OF CONTENTS

1. INTRODUCTION & METHODS

1.1 Document Intent

This report has been prepared by *Conacher Consulting* for the Grants Road Sand Quarry Extension Project to provide details on the results of Groundwater Dependant Ecosystem (GDE) monitoring during the 2016 monitoring period.

1.2 Monitoring Methodology

Three monitoring quadrats were established at each of the locations shown in Figure 1.1. Groundwater dependant ecosystem condition was monitored through sampling of both qualitative and quantitative variables. The following variables were measured:

i. *Native Plant Composition*
The dominant native flora species and projected foliage cover for each vegetation stratum (upper, mid and lower) were recorded for each plot. The dominant native flora species in each vegetation stratum were recorded.

ii. *Exotic Plant Composition*
The dominant exotic flora species and total cover of exotic flora species for each vegetation stratum (upper, mid and lower) was recorded for each plot.

iii. *GDE Extent and Distribution*
Mapping of each GDE was undertaken from a recent aerial photograph from 13 November 2016 (Nearmap 2016).

iv. *Vegetation Photo Point Monitoring*
Photographs were taken for each monitoring quadrat from each cardinal point from the centre point of each monitoring plot.

v. *Surface Erosion and Sedimentation Monitoring*
A visual inspection of each GDE patch downslope of the site was undertaken.

vi*. Comparison of Groundwater Monitoring Data*
The results for the groundwater monitoring levels for the current monitoring period were reviewed.


Monitoring Point 1
0.22ha
Monitoring Point 2
0.04ha
Monitoring Point 3
0.24ha
Legend
Subject Site Boundary
Sandstone Hanging Swamp Location
N
0 25 50 75 100 125 150 175 200 m
Plan produced as A4 colour
conacher consulting
Drawn By: AM
Drawing Version: 1
Drawing No: 7015
Date:20/03/2017
* Plan for indicative purposes only. Not for detailed measurement.
Source: Aerial © Nearmap (2017) Aerial Photo Date: 13/11/2016
Figure 1.1
Groundwater Dependent Ecosystems
2016 Patch Size Mapping
Grants Road, Somersby

2. MONITORING RESULTS

2.1 Quantitative Floristic Monitoring Results

The following vegetation types mapped within one kilometre of the site by Bell (2009), have been identified in the Water Sharing Plan for the Kulnura Mangrove Mountain Groundwater Source (Dept. of Infrastructure, Planning and Natural Resources 2006) as high priority groundwater dependant ecosystems:

- Hawkesbury Coastal Banksia Woodland
- Sandstone Hanging Swamp

Previous site investigations have identified that areas mapped by Bell (2013) as Hawkesbury Coastal Banksia Woodland are located on shallow well drained sandstone soils and mostly do not contain obligate GDE flora species. However a coral fern understorey variant to this community occurs where upslope man-made drainage diversions have altered natural run-off patterns and resulted in increased soil moisture. These moister areas of Hawkesbury Coastal Banksia Woodland are considered to be partially groundwater dependant and two monitoring quadrats have been located in these areas.

Two patches of Sandstone Hanging Swamp were also located offsite downslope of the quarry operations. A monitoring quadrat was located within each of these two patches. Monitoring quadrat locations are shown in Figure 1.1.

The patch size for each area of GDE vegetation is mapped in Figure 1.1.

TABLE 2.1
GROUNDWATER DEPENDANT ECOSYSTEM PATCH SIZES

Patch Description	2016 Patch Size
Hawkesbury Coastal Banksia Woodland (Coral Fern Understorey) – Patch 1	0.22 ha
Hawkesbury Coastal Banksia Woodland (Coral Fern Understorey) – Patch 2	0.04 ha
Sandstone Hanging Swamp – Patch 4	0.24 ha

The results for the 2016 floristic monitoring surveys for groundwater dependant ecosystems are provided in Table 2.2.

TABLE 2.2 GROUNDWATER DEPENDANT ECOSYSTEM FLORISTIC MONITORING RESULTS			
	Monitoring Quadrat 1	**Monitoring Quadrat 2**	**Monitoring Quadrat 4**
Vegetation Type	Hawkesbury Banksia Scrub Woodland with Coral Fern Understorey (Somersby Plateau Fernland Woodland)	Hawkesbury Banksia Scrub Woodland with Coral Fern Understorey (Somersby Plateau Fernland Woodland)	Sandstone Hanging Swamp
Native Vegetation Structure			
Canopy Layer Species	*Eucalyptus piperita* *Eucalyptus haemastoma* *Eucalyptus scias*	*Eucalyptus piperita* *Eucalyptus haemastoma* *Allocasuarina littoralis*	*Eucalyptus piperita*
Canopy Layer Structure	Height: 5m PFC: 10%	Height: 15m PFC: 5%	Height: 25m PFC: 10%
Shrub Layer Species	*Acacia suaveolens* (Several burnt dead *Banksia ericifolia* observed)	*Banksia ericifolia*	*Callicoma serratifolia* *Cyathea australis* *Gahnia sp.* *Doryanthes excelsa*
Shrub Layer Structure	Height: 2m PFC: 5%	Height: 8m PFC: 20%	Height: 7m PFC: 5%
Groundcover Layer Species	*Gleichenia microphylla* *Entolasia marginata*	*Gleichenia dicarpa* *Pteridium esculentum* *Entolasia marginate* *Isolepis nodosa*	*Gleichenia dicarpa* *Hypolepis mullerii* *Oplismenus imbecillus* *Pteridium esculentum*
Groundcover Layer Structure	Height: 0.5m PFC: 80%	Height: 2.5m PFC: 60%	Height: 0.5m PFC: 5%
Exotic Vegetation Structure			
Canopy Layer Species	Nil	Nil	Nil
Canopy Layer Structure	Nil	Nil	Nil
Shrub Layer Species	Nil	Nil	*Solanum mauritianum*
Shrub Layer Structure	Nil	Nil	Nil

TABLE 2.2 GROUNDWATER DEPENDANT ECOSYSTEM FLORISTIC MONITORING RESULTS			
	Monitoring Quadrat 1	**Monitoring Quadrat 2**	**Monitoring Quadrat 4**
Groundcover Layer Species	Nil	Nil	*Ageratina adenophora* *Lonicera japonica*
Groundcover Layer Structure	Nil	Nil	To 0.5 metres high, with 80% PFC
Disturbance Notes	Controlled burn by NPWS 1 year ago has killed *Banksia ericifolia* canopy. Groundcover layer is regenerating.	Controlled burn by NPWS 1 year ago has killed *Banksia ericifolia* canopy. Groundcover layer is regenerating.	High levels of weed invasion present in groundcover layer (not recent weed invasion).

2.2 QUALITATIVE MONITORING RESULTS

i. GDE Surface Erosion and Sedimentation Results

No surface erosion attributable to the quarry operations was observed within any of the GDE areas shown in Figure 1.1 during the monitoring surveys.

ii. Assessment of Groundwater Monitoring Data

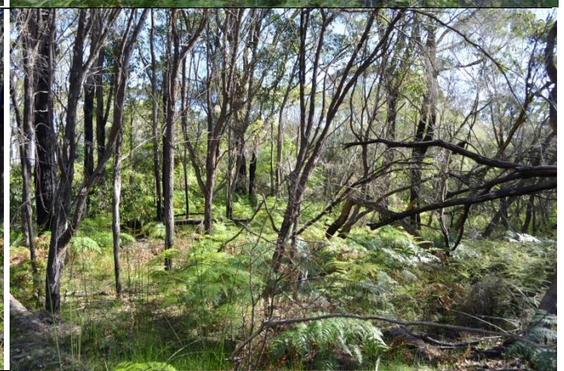
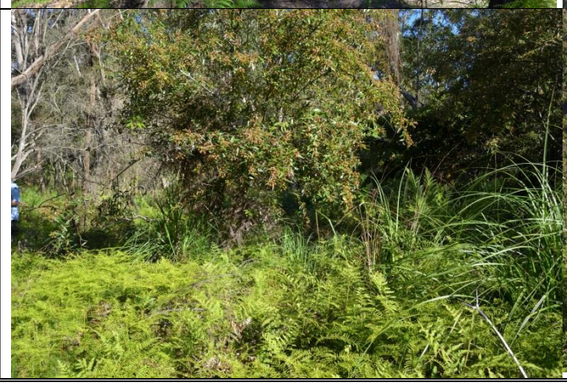
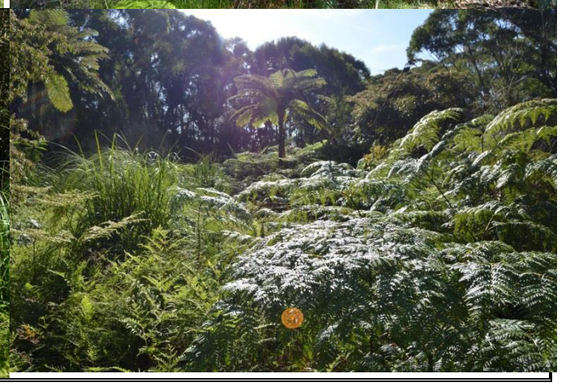
The Water Monitoring Report prepared by Larry Cook and Associates (2017) has identified that no potential impacts from approved quarrying activities on the aquifer system underlying the site were detected for the 2016 monitoring period.

Observations during the current monitoring period were able to be made during a period of extended heavy rainfall. High volumes of water were observed flowing downslope via man made drainage lines and a cross slope catch drain. Diversion and concentration of runoff from upslope areas is considered likely to be crucial to maintaining the small patches of GDE vegetation observed.

iii. GDE Photo Point Results

The results of the photo point surveys are provided in Table 2.3. The current monitoring survey has provided baseline photographs only for comparison during subsequent monitoring events.

TABLE 2.3
GROUNDWATER DEPENDANT ECOSYSTEM COMPARITIVE QUADRAT MONITORING PHOTOGRAPHS

	Northern Aspect	Eastern Aspect	Southern Aspect	Western Aspect
MQ1 2016				
MQ2 2016				
MQ3 2016				

3 COMPLIANCE WITH PERFORMANCE MEASURES

3.1 Erosion

The performance target for erosion is that negligible erosion of the surface within the GDEs occurs as a result of adverse impact attributable to the quarry operations authorised under the project approval.

The trigger level for management intervention is observable erosion of the surface within the GDEs, directly attributable to the quarry operations authorised under the project approval.

No surface erosion within GDE areas attributable to the quarry operations was observed and no management intervention is required.

3.2 Sedimentation

The performance target for sedimentation is that negligible sedimentation within the GDEs occurs as a result of adverse impact attributable to the quarry operations authorised under the project approval.

The trigger level for management intervention is observable sedimentation within the GDEs, directly attributable to the quarry operations authorised under the project approval.

No sedimentation within GDE areas attributable to the quarry operations was observed and no management intervention is required.

3.3 Ground Water Dependant Ecosystem Extent

The performance target for GDE size is for only minor changes in the sizes of the GDEs as a result of adverse impact attributable to the quarry operations authorised under the project approval.

The trigger level for management intervention is adverse change in size of the GDEs of greater than 20% mappable extent, directly attributable to the quarry operations authorised under the project approval.

The current monitoring surveys represent baseline surveys for GDE size. The GDE areas were burnt prior to site inspections undertaken in 2015 and are currently regenerating. The extent of the GDEs is to be mapped by aerial photograph interpretation supplemented by field checks in five years' time to further inform determination of any adverse changes attributable to the quarry operations.

3.4 Ground Water Dependant Ecosystem Species Composition and Distribution

The performance target for species composition and distribution is for no significant change to the composition or distribution of species within the GDEs as a result of adverse impact attributable to the quarry operations authorised under the project approval.

The trigger level for management intervention is adverse change in composition or distribution of the dominant species, directly attributable to the quarry operations authorised under the project approval.

The current monitoring surveys represent baseline surveys for GDE species composition and distribution. The GDE areas were burnt prior to site inspections undertaken in 2015 and are currently regenerating. Incidental observations have identified that the northern-most patches of GDE vegetation have started to regenerate as smaller sized patches with flora species more characteristic of dry environments typical of the adjoining vegetation communities. Changes between monitoring events are expected as these areas regenerate from the NPWS controlled burn which occurred in October 2015, these changes should not be related to the quarry operations at the subject site.

The GDE species composition and distribution is to be surveyed during the 2017 monitoring period to further inform determination of any adverse changes attributable to the quarry operations.

3.5 Mitigation and Response Measures

Monitoring has identified that all performance targets have been met for GDEs and requirement for mitigation or response measures has not been triggered in relation to 2016 site operations.

4. CONCLUDING COMMENTS & RECOMMENDATIONS

The quarry operations for the 2016 monitoring period have not exceed the compliance and performance measures for Groundwater Dependant Ecosystems and the implementation of mitigation and response measures in relation to the 2016 quarry operations is considered not necessary.

5. REFERENCES

Bell (2007) *Review of Flora and Fauna Information for Grants Road Sands*, Gosford LGA.

Bell, S.A.J. 2009. *The natural vegetation of the Gosford Local Government Area, Central Coast, New South Wales: Revised and Updated.* Report to Gosford City Council. Eastcoast Flora Survey.

Bell, S.A.J. (2013) *Review of vegetation mapping, Gosford LGA: addressing vegetation loss since 2004.* Unpublished Report to Gosford City Council. November 2013. Eastcoast Flora Survey.

NSW Scientific Committee 2012, Coastal Upland Swamp in the Sydney Basin Bioregion – endangered ecological community listing, NSW Scientific Committee Final Determination. Available Online: http://www.environment.nsw.gov.au/determinations/coastaluplandswampfd.htm

Water Sharing Plan for the Kulnura Mangrove Mountain Groundwater Sources 2003. New South Wales Government.

Appendix 8
BIODIVERSITY SOMERSBY MINTBUSH
Conacher Consulting

2016 ANNUAL MONITORING REPORT
FOR
SOMERSBY MINTBUSH
MONITORING PROGRAM

GRANTS ROAD SAND QUARRY EXTENSION

MARCH 2017
REF: 7014

PREFACE

This report has been prepared prepared by *Conacher Consulting* to address the 2016 annual monitoring and reporting requirements for Somersby Mintbush for the approved extension to the Grants Road Sand Quarry at Somersby.

REPORT PREPARED BY:

PHILLIP ANTHONY CONACHER B.Sc.(Hons), Dip.Urb Reg Planning, M.Nat.Res.
NPWS Scientific Licence Number: SL100361
Project Director

JACOB MANNERS B.Sc.
NPWS Scientific Licence Number: SL100361
Senior Ecological Consultant / Project Manager

TABLE OF CONTENTS

1. INTRODUCTION

1.1 Document Intent

This report has been prepared prepared by *Conacher Consulting* to address the monitoring requirements of Condition 22 “Somersby Mintbush Monitoring and Management Program” of the Schedule 3 Environmental Performance Conditions specified within the Project Approval issued under Section 75J of the Environmental Planning and Assessment Act (1979) for the Grants Road Sand Quarry Extension project.

1.2 Project Site Details

The project site is located within Lot 1 DP 358717, 270 Grants Road Somersby.

1.3 Previous Monitoring Results

A baseline assessment of the *Prostanthera junonis* locations previously identified adjacent to the site and described as Population 7 Reservoir Road Brisbane Water National Park was undertaken on 23 October 2015 and 7 November 2015.

No specimens of *P. junonis* were observed during the baseline surveys as the locations where this species was previously identified had been subject to a controlled burn undertaken by NPWS.

Contact with the National Parks and Wildlife Service confirmed that a hazard reduction burn was undertaken on 8-11 October with very high to extreme fuel loads which burnt very well over the three days emitting large smoke plumes. NPWS identified that the fire was limited to within 100m of the subject site, however field surveys identified that the burn was directly adjacent to the site and in some places burnt vegetation within the offset area on the site. Review of the Somersby Mintbush Recovery Plan has identified that the time of the previous fire in this location was 1994.

The previous location of *P. junonis* identified along the Great North Walk track showed noticeable signs of erosion caused by inadequate track maintenance and poor design.

2. 2016 MONITORING RESULTS

2.1 Somersby Mintbush 2016 Count Results

Counts of flowering *P. junonis* plants were undertaken on 24 November and 20 December 2016 and at each of the four Somersby Mintbush subpopulation locations adjacent to the quarry allotment identified by NSW NPWS (2000). The results of the counts are provided in Table 2.1

TABLE 2.1
SOMERSBY MINT BUSH CUMULATIVE COUNT RESULTS

Sub-Population Number	2015 Count Results	2016 Count Results
1	0	0
2	0	0
3	0	2 flowering plants (several non-flowering juvenile regrowth plants observed)
4	0	No flowering plants several non-flowering juvenile plants observed

2.2 Qualitative Monitoring Results

The following performance indicators have been developed with regard to *P. junonis.*

- *Prevention of any erosion of the surface of areas containing Somersby Mintbush as a result of actions associated with the approved extraction operations*
- *Prevention of sedimentation within areas containing Somersby Mintbush as a result of actions associated with the approved extraction operations*
- Prevention of reduction in the area of the sites containing Somersby Mintbush *as a result of actions associated with the approved extraction operations.*

No visible signs of disturbance to *P. junonis* or its habitats as a result of quarry activities were observed. Photographs of the habitats at subpopulations 3 and 4 during the 2016 monitoring period are provided in Figures 2.1 to 2.2.

Figure 2.1. Photo 1 Sub-population 3 habitat in November 2016

Figure 2.2 Photo of Sub-population 4 habitat in November 2016

Figure 2.3. Photo of Sub-population 4 habitat in November 2016

2.3 Details of Non-compliance Matters

No non-compliance matters were observed with regard to Somersby Mintbush.

2.4 Monitoring Trends

Regrowth of *P. junonis* was observed at subpopulations 3 and 4. Flowering plants were detected at sub-population 3 which were not detected in recent years. The low numbers of flowering plants detected and evidence of regrowth plants is considered to be a result of the NPWS hazard reduction burn undertaken during October 2015.

2.5 Project Impact Discrepancies

No discrepancies between the predicted and actual impacts of the project were observed with regard to Somersby Mintbush.

It is considered that the recent back burning operations of the NPWS have had more than negligible environmental consequences to the habitats of this species and these impacts may persist for several years while the habitats regenerate. This impact should not be attributed the the extraction operations within the site.

2.6 Measures to Improve Project Performance

No necessary measures to improve project performance were identified for the current monitoring period.

3. CONCLUDING COMMENTS

The following concluding comments are provided:

i. Further counts of the previously identified locations of *P. junonis* should be undertaken during the 2017 monitoring period.

ii. Suitable erosion and sedimentation controls should continue to be maintained for the site.

iii. The 2015 back burning operations of the NPWS have impacted the habitats of Somersby Mintbush adjacent to the site within the Brisbane Water National Park, which have showed low numbers of flowering plants. These impacts should not be attributed the the extraction operations within the site.

4. REFERENCES

Conacher Consulting (2016) Somersby Mintbush 2015 Monitoring Report, Grants Road Sand Quarry Extension Lot 1 DP 358717 270 Grants Road Somersby.

NSW National Parks and Wildlife Service (2000) Somersby Mintbush Prostanthera junonis Recovery Plan. NSW NPWS. Hurstville NSW

Appendix 9
LANDSCAPE & REHABILITATION MONITORING
Conacher Consulting

2016 MONITORING REPORT
FOR
LANDSCAPE AND REHABILITATION MANAGEMENT PLAN

GRANTS ROAD SAND QUARRY

MARCH 2017
REF: 7014/3

1 INTRODUCTION

This Report has been prepared by Conacher Consulting to outline the implementation and monitoring requirements of Project Approval Condition No. 27 (Landscape and Rehabilitation Management Plan) for the Grants Road Quarry Extension (Application No. 08-0099)

The Landscape and Rehabilitation Management Plan (LRMP) for the Grants Road Sand Quarry (Conacher Consulting November 2015) was approved by the Department of Planning and Environment in December 2015. The LRMP separated the management and rehabilitation of the site into the following three distinct components:

- Biodiversity Offset Area Management Plan
- Buffer Area Landscape Management Plan
- Quarry Rehabilitation Plan.

Reporting on actions undertaken and monitoring of actions for each of the above Plans are provided in in the following sections of this Report.

2 BIODIVERSITY OFFSET AREA MANAGEMENT PLAN

The Biodiversity Offset Area Management Plan is required to be implemented in conjunction with the extension of the quarry area into the Stage 2 areas. Notwithstanding this requirement, several actions have been implemented over the reporting period. This will provide some baseline data for evaluating future management actions within the Biodiversity Offset Area.

The works implemented or underway in relation to the Biodiversity Offset Area are noted in Table 1. Continued monitoring of these actions will be undertaken in the 2017 reporting period.

TABLE 1
ACTIONS IMPLEMENTED IN THE BIODIVERSITY OFFSET AREA

ACTIONS			COMMENTS
SITE RESOURCE MAPPING	A1	Complete micro habitat/site features mapping	Draft Completed – to be field verified
	A2	Identify and analyse soil erosion/sediment problems	Inspections completed – No issues arising
	A3	Identify surface drainage features	Draft completed
	A4	Identify habitat enhancement needs	Commenced, ongoing
VEGETATION AND WEED MANAGEMENT	B1	Collect soil samples for nutrient testing	Not yet completed
	B2	Map main weed occurrences	Draft Completed – To be field verified
	B3	Develop weed management strategy	Not commenced

TABLE 1 (cont.) ACTIONS IMPLEMENTED IN THE BIODIVERSITY OFFSET AREA			
ACTIONS			**COMMENTS**
	B4	Prepare revegetation strategy	Not commenced
	B5	Collect suitable seeds for revegetation	Not commenced
	B6	Implement revegetation strategy	Not commenced
FENCING	C1	Identify deer exclusion fencing requirements	Underway
	C2	Construct deer exclusion fencing	Not commenced
	C3	Maintain deer exclusion fencing	Not commenced
HABITAT ENHANCEMENT	D1	Implement habitat enhancement	Not commenced
	D2	Install 36 nest boxes, record locations	36 Nest boxes installed. Tree locations to be recorded
	D3	Salvage environmental/habitat resources	Clearing not commenced as yet
	D4	Undertake pre-clearance surveys	Not required as yet
REPORTING/MONITORING	E1	Re-assess risks to implementation of action	Not required as yet
	E2	Implement adaptive response strategies	Not required as yet
	E3	Implement monitoring and reporting strategy to cover:	
		– Nestboxes	Nest boxes monitored in 2016. All in good condition and secure to trees
		– Weed control	Not required as yet
		– Vegetation growth/condition	Not required as yet
		– Revegetation areas	Not required as yet
		– Habitat enhancement measures	Not required as yet
		– Fencing condition	Not required as yet

TABLE 1 (cont.) ACTIONS IMPLEMENTED IN THE BIODIVERSITY OFFSET AREA			
ACTIONS			**COMMENTS**
		– Ongoing actions	Not required as yet
		– Remedial actions	Not required as yet

3 BUFFER AREA LANDSCAPE MANAGEMENT PLAN

The timing of management actions within the Buffer Area are directly linked to the implementation of works/actions within the Biodiversity Offset Areas. The actions to be implemented in the Buffer Area are listed in Table 2.

TABLE 2 ACTIONS IMPLEMENTED IN THE BUFFER AREA			
ACTIONS			**COMMENTS**
BUFFER AREA DELINEATION – Identify on-ground and/on plan	A1	15m to 20m designated buffer area	Completed
	A2	Pipeline easement	Completed
	A3	Aboriginal Heritage sites	Completed
	A4	Trees to be retained	Trees retained
	A5	Location of noise abatement mounds	Not constructed
	A6	Drainage areas/culverts access easements	Underway
FENCING/ ACCESS	B1	Identify existing fence/condition	Underway
	B2	Identify fence access/gate requirements for pipeline easement, aboriginal heritage sites, vehicle access	Underway
VEGETATION	C1	Identify remnant vegetation	Underway
	C2	Locate and mark hollow bearing trees	Underway
	C3	Assess weed infestations requiring control	Underway
	C4	Identify bushfire hazard management needs by machinery slashing or stock grazing	Underway
	C5	Summarise vegetation management in aboriginal heritage sites	Not commenced yet
	C6	Identify vegetation management for noise abatement mounds	Not commenced yet

TABLE 2 (cont.) ACTIONS IMPLEMENTED IN THE BUFFER AREA			
ACTIONS			**COMMENTS**
DRAINAGE AND LAND MANAGEMENT	D1	Identify through drainage from quarry area and pipeline easement	Underway
	D2	Inspect for soil erosion or sediment accumulations	Not completed as yet
	D3	Maintain area free of rubbish accumulations	No rubbish accumulated

4 QUARRY AREA REHABILITATION

Resource extraction continued within the existing quarry pit in 2016. Rehabilitation of the Precinct A area is to be undertaken on a progressive basis after the extraction level for the resource is reached in this Stage, as identified in the approved Quarry Rehabilitation Plan.

5 CALCULATIONS FOR REHABILITATION BOND

The Conservation and Rehabilitation Bond Calculation Report (Conacher Consulting December 2016 Ref: 4143/6) was prepared to address Condition No. 28 of Schedule 3 of the approval. This Report calculated that the Conservation and Rehabilitation Bond be set at $306,000.00. This figure has been accepted by the Department of Planning and Environment.

6 MONITORING AND COMPLIANCE

Details of Non-compliance Matters

No non-compliance matters have been observed

Monitoring Trends

No monitoring trends have been observed

Project Impact Discrepancies

No discrepancies between the predicted and actual impacts of the project were observed with regard to Landscape and Rehabilitation matters.

Measures to Improve Project Performance

No necessary measures to improve project performance were identified for the current monitoring period.

7 RECOMMENDATIONS

No changes to the Landscape and Rehabilitation Management Plan are considered necessary at this stage.