21 September 2020

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Hanson Construction Materials Pty Ltd
Level 5, 75 George Street
Parramatta NSW 2150

Attention: **Ms Belinda Pignone**

Dear Belinda

Annual Noise Compliance Monitoring 2020
Central Coast Sands Quarry
Lot 2 Reservoir Road Somersby

1 Introduction

VMS Australia Pty Ltd has been appointed by Hanson Construction Materials Pty Ltd to conduct the annual noise compliance monitoring for the Central Coast Sands Quarry located at Lot 2 Reservoir Road, Somersby (the Project), in order to assess noise emission levels from the quarry's operation. This report presents the findings of the morning shoulder period and daytime measurements conducted at the nearest residential receivers during site activities between 14 September and 16 September 2020.

2 Hours of Operations

The Project operating hours have been limited in the Environmental Protection Licence (EPL) 3751, and shown in **Table 1** below.

Table 1 Hours of Operation

Activity	Day	Time
Extraction and processing	Monday – Friday	6:00am to 6:00pm
Extraction and processing	Saturday	6:00am to 4:00pm
Extraction and processing	Sundays and Public Holidays	Never
Delivery and Distribution (ie. Truck movements)	Monday – Friday	6:00am to 4:00pm

Activity	Day	Time
Delivery and Distribution (ie. Truck movements)	Saturday	6:00am to 2:00pm
Delivery and Distribution (ie. Truck movements)	Sundays and Public Holidays	Never
Construction Activities (ie. construction of Noise Bunds)	Monday – Friday	7:00am to 4:00pm
Construction Activities (ie. construction of Noise Bunds)	Saturday	7:00am to 12:00pm
Construction Activities (ie. construction of Noise Bunds)	Sundays and Public Holidays	Never
Maintenance (if inaudible at neighbouring residences)	Any day	Any time

Excerpt from Environmental Protection Licence - 3751 dated 11 November 2016.

3 Quarry Activity

With an annual extraction limit of 310,000 tonnes per annum, the quarry operates primarily as sand extraction that processed on-site and transported off-site to regional and local customers by road. The quarry comprises of fixed plant sand washing and processing, office and amenities.

A summary of the quarry activities and equipment list during this monitoring period are presented in **Table 2**.

Table 2 Quarry Activities – 14 September to 16 September 2020

Activity	Monday 14 September 2020	Tuesday 15 September 2020	Wednesday 16 September 2020
	Morning Shoulder (06:00 - 07:00) and Day (06:00 - 18:00)	Morning Shoulder (06:00 - 07:00) and Day (06:00 - 18:00)	Morning Shoulder (06:00 - 07:00) and Day (06:00 - 18:00)
Pit Operations	Komatsu PC450-8 (Excavator) Volvo A40G (Dump Truck) Komatsu WA500-6 (Front End Loader)	Komatsu PC450-8 (Excavator) Volvo A40G (Dump Truck) Komatsu WA500-6 (Front End Loader)	Komatsu PC450-8 (Excavator) Volvo A40G (Dump Truck) Komatsu WA500-6 (Front End Loader)
Stock Yard	L180H (Front End Loader)	L180H (Front End Loader)	L180H (Front End Loader)
Processing Plant	Plant in operation during time of measurement.	Plant in operation during time of measurement.	Plant in operation during time of measurement.

4 Environmental Protection Licence Noise Limits

The Environmental Protection Licence (EPL) 3751 specifies that noise from the premises must comply with the following conditions:

- L4 – Noise Limits
- M7 – Noise Monitoring
- 8 – Pollution Studies and Reduction Programs

Operational noise limit for the Project are stipulated in Condition L4.2 of the EPL and are replicated in **Table 3**.

Table 3 Project Operational Noise Limit

Location	Day	Evening	Morning Shoulder	
	LAeq(15minute)	LAeq(15minute)	LAeq(15minute)	LA1(1minute)
B - 126A Keighley Avenue	37	35	35	45
C - 110 Keighley Avenue	37		35	
D - 100 Keighley Avenue	38		35	
G - 87 Keighley Avenue	36		35	
R - 21 Reservoir Road	36		36	
All other privately-owned land	35		35	

Excerpt from Environmental Protection Licence - 3751 dated 11 November 2016.

5 Noise Monitoring Locations

Noise monitoring was conducted at the nearest residential receivers at locations at B, C, D, G and R during the morning shoulder period (6.00am to 7.00am) and day-time periods (7.00 am to 6.00 pm). Day-time attended measurements were conducted for 1.5 hours at each location as per EPL conditions.

Figure 1 presents the monitoring locations.

Figure 1 Noise Monitoring Locations

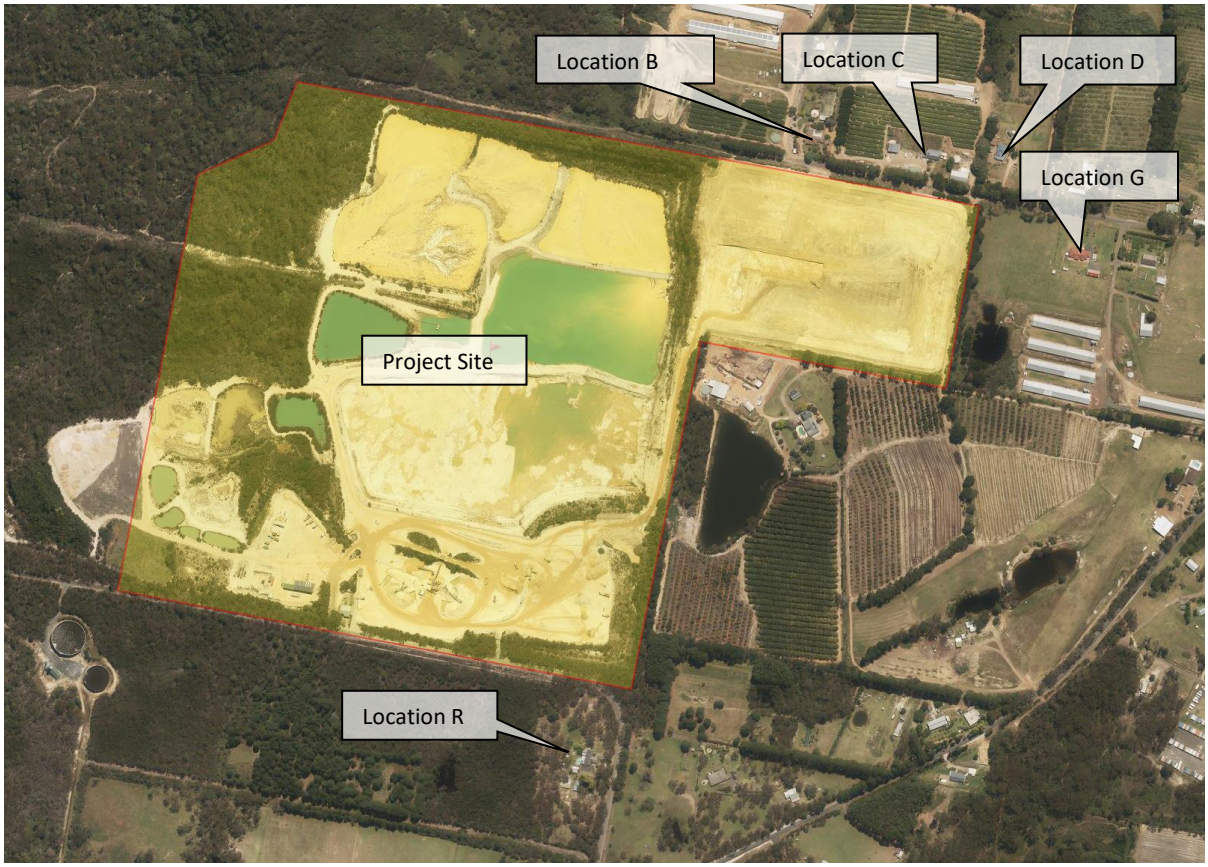

Image courtesy of Six Maps

5.1 Instrumentation and Measurement Procedure

Noise monitoring was conducted in accordance with the procedures specified in the *Central Coast Sands Quarry Project Noise Management Plan* dated 3 January 2018.

The acoustic instrumentation employed during the monitoring programme complied with the requirements of AS 1259.1-1990 "*Acoustics - Sound Level Meter - Non-Integrating*" and IEC 61672.1-2004 "*Electroacoustics - Sound Level Meters - Specifications*" and carried current NATA or manufacturer calibration certificates. The schedule of noise monitoring equipment deployed during the programme is presented in **Table 4**.

Table 4 Noise Monitoring Equipment

Instrumentation	Type	Serial Number
B&K 2250 SLM	Type 1	3024564
B&K 2250 SLM	Type 1	3023945
B&K 4231 Acoustic Calibrator	Type 1	2574227

In order to determine compliance with the noise limits nominated in **Table 1**, operator-attended 15-minute noise surveys were conducted between 14 September and 16 September 2020 at the nominated residential receivers.

The measurements were conducted in accordance with Australian Standard AS 1055-1997 *"Acoustics - Description and measurement of environmental noise"*.

A level calibration check was undertaken using an acoustic calibrator which emitted a 94 dBA calibration tone at 1 KHz. The calibration check was conducted prior and after the survey with no shift noted during the calibration process.

6 Operational Noise Compliance Monitoring Results

The measured noise emission levels from quarry operations are presented in **Table 5** to **Table 10**, during the morning shoulder period and daytime periods.

Table 5 Operational Noise Compliance Monitoring Results - Morning Shoulder Period 14 September 2020

Location	Date/Start Time/Weather	Primary Noise Descriptor (dB re 20 µPa)		Description of Noise Emission, Typical Maximum Levels LAmax (dB)	Estimated Project LAeq (15minute)	Estimated Project LA1 (1minute)	Assessment
		LAeq	LA1				
R – 21 Reservoir Road	14/09/2020 6.00am Wind: Calm Temp: 11 ºC	59	73	Birds:40-60 Road traffic: 65-78 FEL:50 Air brakes: 45 Haul truck: 40-46 Sand pump: 32-36	36	44	Complies
G – 87 Keighley Avenue	14/09/2020 6.20am Wind: Calm Temp:11 ºC	43	55	Birds:40-59 Dog Bark:50 Reverse Alarm: 39-40 Haul trucks: 36-38 Distant traffic 38	35	45	Complies
D – 100 Keighley Avenue	14/09/2020 6.22am Wind: Calm Temp:11 ºC	44	57	Birds:45-68 Dog Bark:48-58 Haul trucks: 36-39 Local traffic: 42-56 Distant traffic 35-37 Reverse Alarm: 42-45	37	45	Complies
C – 110 Keighley Avenue	14/09/2020 6:41 am Wind: Calm Temp: 11 ºC	43	49	Birds: 45-63 Dog barking: 42-52 Local traffic:50-58 Haul trucks: 38-42 FEL: 35-40	35	44	Complies
B – 126A Keighley Avenue	14/09/2020 6:40 am Wind: Calm Temp: 11 ºC	42	49	Birds: 45-55 Excavator: 35-40 Dog barking: 38 Water pump (residence): 38 Local traffic:45-50 Haul trucks: 40-44	35	45	Complies

Table 6 Operational Noise Compliance Monitoring Results - Morning Shoulder Period 15 September 2020

Location	Date/Start Time/Weather	Primary Noise Descriptor (dB re 20 µPa)		Description of Noise Emission, Typical Maximum Levels LAmax (dB)	Estimated Project LAeq (15minute)	Estimated Project LA1 (1minute)	Assessment
		LAeq	LA1				
R – 21 Reservoir Road	15/09/2020 6.40am Wind: Calm Temp: 14 ºC	50	55	Birds:40-60 FEL: 35-38 Reverse alarm: 44-46 Haul truck: 40-45 Freeway traffic: 36-40	36	46	Complies
G – 87 Keighley Avenue	15/09/2020 6.00am Wind: Calm Temp: 14 ºC (Temp inversion likely)	49	52	Birds:44-64 Water pump: 38-42 Freeway traffic: 37-40 FEL: 33-34 Rev alarm: 38 Local traffic: 45-55	34	44	Complies
D – 100 Keighley Avenue	15/09/2020 6.01am Wind: Calm Temp: 14 ºC (Temp inversion likely)	50	56	Birds:44-64 Water pump: 38-42 Local traffic: 45-50 Freeway traffic: 35-39 FEL: 33-38 Rev alarm: 41	34	43	Complies
C – 110 Keighley Avenue	15/09/2020 6:20 am Wind: Calm Temp: 14 ºC (Temp inversion likely)	43	50	Birds: 45-65 Freeway traffic 36-39 Dog barking: 50-55 Road traffic: 40-58 FEL: 36-38 Dump trucks: 40-50 Reversing alarm: 35-42	35	45	Complies
B – 126A Keighley Avenue	15/09/2020 6:18 am Wind: Calm Temp: 14 ºC (Temp inversion likely)	44	52	Birds: 40-60 Dog barking: 60-64 Road traffic: 32-42 FEL: 34-38 Dump trucks: 40-48 Freeway traffic 37-39	35	44	Complies

Table 7 Operational Noise Compliance Monitoring Results - Morning Shoulder Period 16 September 2020

Location	Date/Start Time/Weather	Primary Noise Descriptor (dB re 20 µPa)		Description of Noise Emission, Typical Maximum Levels LAmax (dB)	Estimated Project LAeq (15minute)	Estimated Project LA1 (1minute)	Assessment
		LAeq	LA1				
R – 21 Reservoir Road	16/09/2020 6.22am Wind: Calm Temp: 11 ºC	48	58	Birds:43-68 Reverse alarm: 46 Truck Exiting site: 62-76 FEL: 40-48 Siren:52 Haul truck:50-55 Sand pump:34-36	36	45	Complies
G – 87 Keighley Avenue	16/09/2020 6.43am Wind: Calm Temp: 11 ºC	42	51	Birds:35-62 Dog Bark: 58 FEL: 30-32 Haul trucks: 30-32 M1: 30-32	30	34	Complies
D – 100 Keighley Avenue	16/09/2020 6:00 am Wind: Calm Temp: 11 ºC	44	56	Birds: 38-62 Local Traffic:40-46 M1: 30-36 Dog barking: 52 Plant not audible	<30	<30	Complies
C – 110 Keighley Avenue	16/09/2020 6:45 am Wind: Calm Temp: 11 ºC	46	59	Birds:48-63 Dog: 35-45 Local traffic: 40-46 FEL: 38-42 M1: 32-35 Sand pump: 30-31	32	36	Complies
B – 126A Keighley Avenue	16/09/2020 6:00 am Wind: Calm Temp: 11 ºC	41	53	Birds: 38-62 Local Traffic:40-46 M1: 30-34 Plant not audible	<30	<30	Complies

Table 8 Operational Noise Compliance Monitoring Results - Daytime Period 14 September 2020

Location	Date/Start Time/Weather	Primary Noise Descriptor (dB re 20 µPa)	Description of Noise Emission, Typical Maximum Levels LAmax (dB)	Estimated Project LAeq (15minute)	Assessment
		LAeq(15minute)			
R – 21 Reservoir Road	14/09/2020 10.10am Wind: Calm Temp: 18 ºC	49	Birds: 44-62 Haul truck:52 Empty haul truck:48	36	Complies

Location	Date/Start Time/Weather	Primary Noise Descriptor (dB re 20 µPa) LAeq(15minute)	Description of Noise Emission, Typical Maximum Levels LAmax (dB)	Estimated Project LAeq (15minute)	Assessment
R – 21 Reservoir Road			Reverse alarm:42 Traffic: 66-72 Excavator: 44-49		
	14/09/2020 10:25am Wind: Calm Temp: 18 ºC	40	Birds: 43-50 Traffic: 83 Road traffic:46-68	35	Complies
	14/09/2020 10:40am Wind: Calm Temp: 18 ºC	48	Birds: 42-60 Truck leaving site:65 Horn:47-51	35	Complies
	14/09/2020 10:55am Wind: Calm Temp: 18 ºC	45	Birds: 45-60 Road traffic:45-62 Horn:45-51 Road traffic:46-66	34	Complies
	14/09/2020 11.10am Wind: Calm Temp: 18 ºC	44	Birds: 39-62 Loaded haul truck:40-46 FEL:38-42 Plane:42 Horn:56 Dog:52 Road traffic:50-62	36	Complies
	14/09/2020 11:25am Wind: slight gust Temp: 18 ºC	46	Birds: 37-51 Truck movements:47-49 Haul truck:40-45	36	Complies
G – 87 Keighley Avenue	14/09/2020 7:00am Wind: Calm Temp: 12 ºC	40	Birds: 40-57 FEL bucket: 42 Local traffic:30-65	34	Complies
	14/09/2020 7:15 Wind: Calm Temp: 12 ºC	40	Birds: 41-55 Haul truck: 33-34 Road traffic: 46-47 FEL:32-36	34	Complies
	14/09/2020 7:30am Wind: Calm Temp: 12 ºC	37	Birds: 40-55 Road traffic: 41-45 FEL: 30-36 Dump trucks: 30-34	34	Complies
	14/09/2020 7:45 am Temp: 13 ºC	40	Birds: 35-55 Road traffic: 40-73 FEL: 32-35	35	Complies

Location	Date/Start Time/Weather	Primary Noise Descriptor (dB re 20 µPa) LAeq(15minute)	Description of Noise Emission, Typical Maximum Levels LAmax (dB)	Estimated Project LAeq (15minute)	Assessment
	14/09/2020 8:00 am Wind: Calm Temp: 13 ºC	37	Birds: 41-55 FEL: 30-33 Haul truck 34 M1:33-35 Quad:35-40	34	Complies
	14/09/2020 8:15 am Wind: Calm Temp: 13 ºC	41	Birds: 41-50 Local traffic:60-68 FEL: 32-35 M1:30-36	32	Complies
D – 100 Keighley Avenue	14/09/2020 7:01am Wind: Calm Temp: 12 ºC	41	Birds: 45-61 FEL bucket: 40-45 Pump (residence): 38 Local traffic: 30-60	37	Complies
	14/09/2020 7:14 Wind: Calm Temp: 12 ºC	42	Birds: 46-58 Haul truck: 35-39 Road traffic: 40-50 FEL:3 3-37	35	Complies
	14/09/2020 7:29am Wind: Calm Temp: 12 ºC	38	Birds: 40-60 Pump (residence): 38 Road traffic: 43-49 FEL: 30-38 Dump trucks: 32-36	37	Complies
	14/09/2020 7:44 am Temp: 13 ºC	40	Birds: 45-58 Road traffic: 40-65 FEL: 34-37	35	Complies
	14/09/2020 7:59am Wind: Calm Temp: 13 ºC	39	Birds: 38-58 FEL: 30-36 Haul truck 30-36 Impacts: 45-49 M1:35 Quad:35-40	36	Complies
	14/09/2020 8:14am Wind: Calm Temp: 13 ºC	43	Birds: 41-50 Local traffic: 45-65 FEL: 33-35 M1:30-36	35	Complies
C – 110 Keighley Avenue	14/09/2020 8:36am Wind: Calm Temp: 12 ºC	45	Birds: 45-65 Plane: 30-57 Dog barking: 45 FEL: 35-44 Local traffic: 40-55 Dump trucks: 37-40	36	Complies

Location	Date/Start Time/Weather	Primary Noise Descriptor (dB re 20 µPa) LAeq(15minute)	Description of Noise Emission, Typical Maximum Levels LAmax (dB)	Estimated Project LAeq (15minute)	Assessment
C – 110 Keighley Avenue	14/09/2020 8:51 am Wind: Calm Temp: 12 ºC	45	Birds: 45-65 Helicopter: 45-55 Dog barking: 43-46 ATV: 46 Road traffic: 41-57 FEL: 32-42 Haul trucks: 35-37	38	Complies
	14/09/2020 9:06 am Wind: Calm Temp: 13 ºC	44	Birds: 45-63 Dog barking: 65 Local traffic: 40-56 Plant not audible	<,30	Complies
	14/09/2020 9:21 am Wind: Calm Temp: 14 ºC	43	Birds: 40-68 Motor bike: 45-58 Local traffic: 40-52 FEL:34-39 Impacts: 56 Reversing alarm: 44 Dump trucks: 32-45	38	Complies
	14/09/2020 9:36 am Wind: Calm Temp: 14 ºC	47	Birds: 40-53 Light plane: 40-50 FEL: 35-42 FEL bucket: 35-44 Haul trucks: 35-43	37	Complies
	14/09/2020 9:51 am Wind: Calm Temp: 15 ºC	45	Birds: 45-60 FEL: 35-47 Reversing alarm: 45 Dump trucks: 40-45	39	Complies
B – 126A Keighley Avenue	14/09/2020 8:35am Wind: Calm Temp: 12 ºC	44	Birds: 45-62 Plane: 34-55 FEL:38-42 Local traffic: 43-50 Local truck:45-50 Dump trucks: 37-40	38	Complies
	14/09/2020 8:50 am Wind: Calm Temp: 12 ºC	43	Birds: 45-70 Helicopter: 40-52 Dog barking: 43-46 Quad: 52 Road traffic: 41-50 FEL: 35-40 Haul trucks: 34-38	39	Complies
	14/09/2020 9:05 am Wind: Calm Temp: 13 ºC	44	Birds: 40-56 Dog barking: 50-63 Hum from residence water pump: 34	<,30	Complies

Location	Date/Start Time/Weather	Primary Noise Descriptor (dB re 20 µPa) LAeq(15minute)	Description of Noise Emission, Typical Maximum Levels LAmax (dB)	Estimated Project LAeq (15minute)	Assessment
			Local traffic: 40-45 Plant not audible		
	14/09/2020 9:20 am Wind: Calm Temp: 14 ºC	42	Birds: 40-60 Residents tractor:48-50 Motor bike: 50 Local traffic: 40-44 FEL:35-38 FEL bucket: 45-52 Excavator reversing alarm: 41-42 Dump trucks: 36-48 Horn: 40 Rev alrm:42	38	Complies
B – 126A Keighley Avenue	14/09/2020 9:35 am Wind: Calm Temp: 14 ºC	46	Birds: 41-58 Light plane: 45 FEL: 38-41 FEL bucket: 40-45 Haul trucks: 40-44	39	Complies
	14/09/2020 9:50 am Wind: Calm Temp: 15 ºC	45	Birds: 45-50 Dog barking: 48 FEL: 38-44 FEL bucket: 40-50 Reversing alarm: 40-41 Dump trucks: 40-44	39	Complies

Table 9 Operational Noise Compliance Monitoring Results - Daytime Period 15 September 2020

Location	Date/Start Time/Weather	Primary Noise Descriptor (dB re 20 µPa) LAeq(15minute)	Description of Noise Emission, Typical Maximum Levels LAmax (dB)	Estimated Project LAeq (15minute)	Assessment
R – 21 Reservoir Road	15/09/2020 10:10am Wind: Calm Temp: 18 ºC	47	Birds: 42-55 Dog barking: 56 FEL: 43-49 Reversing alarm: 43-45 Haul Truck 40-48 Road traffic: 45-66 Sand pump: 33-35	36	Complies
	15/09/2020 10:25am Wind: Calm Temp: 18 ºC	46	Birds: 40-65 FEL: 43-52 Reversing alarm: 48 Sand pump: 33-34 Road traffic: 45-63	35	Complies

Location	Date/Start Time/Weather	Primary Noise Descriptor (dB re 20 µPa) LAeq(15minute)	Description of Noise Emission, Typical Maximum Levels LAmax (dB)	Estimated Project LAeq (15minute)	Assessment
R – 21 Reservoir Road	15/09/2020 10:40am Wind: Calm Temp: 18 ºC	48	Birds: 45-62 Plane: 58 Road traffic: 40-44 FEL: 42-50 FEL bucket: 38-46	36	Complies
	15/09/2020 10:55am Wind: Calm Temp: 18 ºC	49	Birds: 40-60 FEL: 45-50 Sand pump: 33-35	36	Complies
	15/09/2020 11:10 am Wind: Calm Temp: 18 ºC	45	Birds: 40-64 FEL: 40-45 Sand pump: 34-35 Road traffic: 45-63 Road trucks: 40-66	36	Complies
	15/09/2020 11:25 am Wind: Calm Temp: 18 ºC	48	Birds: 40-56 FEL: 40-45 Sand pump: 33-34 Road traffic: 45-65	36	Complies
G – 87 Keighley Avenue	15/09/2020 7:00 am Wind: Calm Temp: 14 ºC	39	Birds: 42-58 M1:30-36 FEL: 36-39 Road traffic: 46-47	33	Complies
	15/09/2020 7:15 am Wind: Calm Temp: 14 ºC	40	Birds: 42-55 M1:30-37 FEL: 32-35 Road traffic: 40-45	34	Complies
	15/09/2020 7:30 am Wind: Calm Temp: 14 ºC	42	Birds: 42-58 M1:30-36 FEL: 32-34 Road traffic: 40-48 Rev alarm: 37	34	Complies
	15/09/2020 7:45 am Wind: Calm Temp: 14 ºC	40	Birds: 50-65 M1:30-35 Dog Barking:45-56 FEL: 35-40 Impacts: 42	34	Complies
	15/09/2020 8:00 am Wind: Calm Temp: 14 ºC	45	Birds: 50-67 M1: 30-32 Local traffic: 50-75	33	Complies

Location	Date/Start Time/Weather	Primary Noise Descriptor (dB re 20 µPa) LAeq(15minute)	Description of Noise Emission, Typical Maximum Levels LAmax (dB)	Estimated Project LAeq (15minute)	Assessment
			Dog Barking:45-51 FEL: 35-36 Impacts: 40 Rev alarm: 35		
	15/09/2020 8:15 am Wind: Calm Temp: 14 ºC	41	Birds: 55-65 Cow: 48 M1: 30 Dog Barking:45-51 FEL: 35-37 Impacts: 40	32	Complies
D – 100 Keighley Avenue	15/09/2020 7:01 am Wind: Calm Temp: 14 ºC	41	Birds: 40-61 M1:30-35 FEL: 35-40 Road traffic: 45-52	36	Complies
	15/09/2020 7:16 am Wind: Calm Temp: 14 ºC	42	Birds: 45-63 M1:30-36 FEL: 32-37 Road traffic: 40-53	35	Complies
	15/09/2020 7:31 am Wind: Calm Temp: 14 ºC	43	Birds: 40-54 M1:30-35 FEL: 32-36 Road traffic: 40-45 Rev alarm: 43	36	Complies
	15/09/2020 7:46 am Wind: Calm Temp: 14 ºC	42	Birds: 50-69 M1:30-33 Dog Barking: 67 FEL: 36-42 Impacts: 45	35	Complies
	15/09/2020 8:01 am Wind: Calm Temp: 14 ºC	46	Birds: 50-63 M1: 30 Local traffic: 42-54 Dog Barking: 67 FEL: 32-38 Impacts: 45 Rev alarm: 40	36	Complies
	15/09/2020 8:16 am Wind: Calm Temp: 14 ºC	41	Birds: 40-58 M1: 30 Dog Barking: 40 FEL: 32-39 Impacts: 46	34	Complies

Location	Date/Start Time/Weather	Primary Noise Descriptor (dB re 20 µPa) LAeq(15minute)	Description of Noise Emission, Typical Maximum Levels LAmax (dB)	Estimated Project LAeq (15minute)	Assessment
D – 110 Keighley Avenue	15/09/2020 8:35 am Wind: 1-2 m/s (NE) Temp: 16 ºC	45	Birds: 46-68 Dog barking: 48 Wind in trees: 35-48 FEL: 34-41 FEL bucket: 46 Dump trucks: 39-43	35	Complies
	15/09/2020 8:50 am Wind: 1 m/s (NE) Temp: 16 ºC	45	Birds: 48-63 Wind in trees: 38-48 FEL: 35-39 FEL bucket: 52 Dump trucks: 40-46	35	Complies
	15/09/2020 9:05 am Wind: 1-2 m/s (NE) Temp: 16 ºC	43	Birds: 40-58 Wind in trees: 38-46 FEL: 35-40	35	Complies
	15/09/2018 9:20 am Wind: 1-2 m/s (NE) Temp: 16 ºC	44	Birds: 40-66 Wind in trees: 38-47 Road traffic: 35-56 FEL: 32-39 Plane: 45 Dump trucks: 35-42 Reversing alarm: 43	36	Complies
	15/09/2020 9:35 am Wind: 1 m/s (NE) Temp: 16 ºC	44	Birds: 45-59 Road traffic: 35-57 Wind in trees: 39-51 Dump trucks: 35-43 FEL: 35-41	35	Complies
	15/09/2020 9:50 am Wind: 1-2 m/s (NE) Temp: 16 ºC	43	Birds: 40-65 Wind in trees: 30-46 Road traffic: 45-52 Dump trucks: 40-44	35	Complies
B – 126A Keighley Avenue	15/09/2020 8:35 am Wind: 1-2 m/s (NE) Temp: 16 ºC	44	Birds: 41-55 Dog barking: 42-55 Wind in trees: 40-46 FEL: 38-42 FEL bucket: 47-50 Dump trucks: 41-45	36	Complies
	15/09/2020 8:50 am Wind: 1 m/s (NE) Temp: 16 ºC	44	Birds: 45-60 Wind in trees: 40-46 FEL: 35-40 FEL bucket: 46-50 Dump trucks: 41-48 Horn: 50-51	36	Complies
	15/09/2020	43	Birds: 42-65	35	Complies

Location	Date/Start Time/Weather	Primary Noise Descriptor (dB re 20 µPa) LAeq(15minute)	Description of Noise Emission, Typical Maximum Levels LAmax (dB)	Estimated Project LAeq (15minute)	Assessment
	9:05 am Wind: 1-2 m/s (NE) Temp: 16 ºC		Wind in trees: 40-47 FEL: 35-38		
	15/09/2018 9:20 am Wind: 1-2 m/s (NE) Temp: 16 ºC	43	Birds: 40-60 Wind in trees: 35-45 Road traffic: 38-40 FEL: 35-38 Plane: 42 Dump trucks: 38-40 Reversing alarm: 38	36	Complies
	15/09/2020 9:35 am Wind: 1 m/s (NE) Temp: 16 ºC	42	Birds: 45-55 Road traffic: 38-42 Wind in trees: 35-46 Dump trucks: 36-40 FEL: 36-42	36	Complies
	15/09/2020 9:50 am Wind: 1-2 m/s (NE) Temp: 16 ºC	42	Birds: 42-60 Wind in trees: 35-42 Water pump (residence): 38 Road traffic: 40-45 Dump trucks: 41-48	36	Complies

Table 10 Operational Noise Compliance Monitoring Results - Daytime Period 16 September 2020

Location	Date/Start Time/Weather	Primary Noise Descriptor (dB re 20 µPa) LAeq(15minute)	Description of Noise Emission, Typical Maximum Levels LAmax (dB)	Estimated Project LAeq (15minute)	Assessment
R – 21 Reservoir Road	16/09/2020 8:35 am Wind: Calm Temp: 17 ºC	50	Birds: 42-58 FEL: 38-42 Plane:49 Haul truck: 40-50 Road traffic: 45-76 Sand pump: 32-34	36	Complies
	16/09/2020 8:50 am Wind: Calm Temp: 18 ºC	49	Birds: 42-60 Plane: 49 FEL: 38-42 FEL reversing alarm: 41-43 Haul truck: 40-50 Road traffic: 50-65 Sand pump: 34-35	36	Complies

Location	Date/Start Time/Weather	Primary Noise Descriptor (dB re 20 µPa) LAeq(15minute)	Description of Noise Emission, Typical Maximum Levels LAmax (dB)	Estimated Project LAeq (15minute)	Assessment
	16/09/2020 9:05 am Wind: Calm Temp: 18 ºC	47	Birds: 42-68 Dog barking: 60 Haul truck: 40-50 Road traffic: 45-62 Sand pump: 33-34	34	Complies
	16/09/2020 9:20 am Wind: Calm Temp: 19 ºC	48	Birds: 42-64 Dog barking: 60 Plane: 59 FEL:37-40 Haul truck: 40-45 Road traffic: 45-55 Sand pump: 34-35	36	Complies
	16/09/2020 9:35 am Wind: Calm Temp: 19 ºC	40	Birds: 40-60 FEL: 36-44 Haul truck: 40-50 Road traffic: 42-57 Sand pump: 33-35	35	Complies
	16/09/2020 9:50 am Wind: Calm Temp: 20 ºC	43	Birds: 45-62 FEL: 36-41 Haul truck: 40-45 Sand pump: 32-34	36	Complies
G – 87 Keighley Avenue	16/09/2020 10:10 am Wind: 1-2m/s (NW) Temp: 21 ºC	40	Birds: 40-55 Wind in trees: 33-54 FEL:30-32 Haul truck: 32-34	34	Complies
	16/09/2020 10:25 am Wind: 1-2m/s (NW) Temp: 22 ºC	40	Birds: 40-63 Wind in trees: 30-42 FEL: 32	34	Complies
	16/09/2020 10:40 am Wind: 1-2m/s (NW) Temp: 22 ºC	39	Birds: 40-67 Wind in trees: 30-47 Mower: 35-45 Road traffic: 45-64 FEL: 30-32	33	Complies
	16/09/2020 10:55 am Wind: 1-2m/s (NW) Temp: 22 ºC	38	Birds: 45-59 Wind in trees: 30-52 Haul truck: 34 Plane: 45-50 FEL: 30-32	33	Complies
	16/09/2020 11:10 am	41	Birds: 40-55 Wind in trees: 35-57 FEL: 34-36	32	Complies

Location	Date/Start Time/Weather	Primary Noise Descriptor (dB re 20 µPa) LAeq(15minute)	Description of Noise Emission, Typical Maximum Levels LAmax (dB)	Estimated Project LAeq (15minute)	Assessment
	Wind: 1-2m/s (NW) Temp: 22 ºC		Local traffic:35-70		
	16/09/2020 11:25 am Wind: 1-2m/s (NW) Temp: 22 ºC	43	Birds: 45-71 Wind in trees: 38-60 Haul truck: 30-34 FEL: 30-32	32	Complies
D – 100 Keighley Avenue	16/09/2020 10:09 am Wind: 1-2m/s (NW) Temp: 21 ºC	42	Birds: 42-60 Wind in trees: 35-45 Dust monitor ?:35 FEL:32 Horn: 40 Haul truck: 36	35	Complies
D – 100 Keighley Avenue	16/09/2020 10:24 am Wind: 1-2m/s (NW) Temp: 22 ºC	41	Birds: 45-56 Wind in trees: 30-42 Dust monitor ?:35 FEL: 32	36	Complies
	16/09/2020 10:39 am Wind: 1-2m/s (NW) Temp: 22 ºC	40	Birds: 45-67 Wind in trees: 30-53 Dust monitor ?:35 Road traffic: 46-57 ATV: 50 FEL: 32-35	33	Complies
	16/09/2020 10:54 am Wind: 1-2m/s (NW) Temp: 22 ºC	39	Birds: 45-67 Wind in trees: 30-56 Dust monitor ?:35 Haul truck: 34 Plane: 45-54 FEL: 32-34	33	Complies
	16/09/2020 11:09 am Wind: 1-2m/s (NW) Temp: 22 ºC	39	Birds: 40-59 Wind in trees: 35-60 Dust monitor ?:35 Haul truck: 38-40 FEL: 36-40 Local traffic:40-65 Tractor 35-38	35	Complies
	16/09/2020 11:24 am Wind: 1-2m/s (NW) Temp: 22 ºC	40	Birds: 40-68 Wind in trees: 35-56 Dust monitor ?:35 Haul truck: 33-37 FEL: 33-36	36	Complies

Location	Date/Start Time/Weather	Primary Noise Descriptor (dB re 20 µPa) LAeq(15minute)	Description of Noise Emission, Typical Maximum Levels LAmax (dB)	Estimated Project LAeq (15minute)	Assessment
D – 110 Keighley Avenue	16/09/2020 7:02 am Wind: Calm Temp: 12 ºC	45	Birds: 35-60 Road traffic: 30-55 FEL: 35-40 Trucks: 38-43	36	Complies
	16/09/2020 7:17 am Wind: Calm Temp: 12 ºC	43	Birds: 40-59 Dog barking:55-64 Road traffic: 40-55 FEL: 36-41 Dump trucks: 35-40	36	Complies
	16/09/2020 7:32 am Wind: Calm Temp: 12 ºC	46	Birds: 42-70 Road traffic: 40-45 FEL: 33-36 Reversing alarm: 40 Dump trucks: 40-45	34	Complies
D – 110 Keighley Avenue	16/09/2020 7:47 am Wind: Calm Temp: 11 ºC	44	Birds: 35-58 Road traffic: 35-46 FEL: 38-41 FEL bucket impacts: 43-49	35	Complies
	16/09/2020 8:02 am Wind: Calm Temp: 12 ºC	44	Birds: 44-52 Road traffic: 43-49 FEL: 38-42 Dump trucks: 35-40	35	Complies
	21/09/2018 8:17 am Wind: Calm Temp: 11 ºC	45	Birds: 41-54 FEL: 32-39 Reversing alarm: 40 Dump trucks: 40-50	35	Complies
B – 126A Keighley Avenue	16/09/2020 7:00 am Wind: Calm Temp: 12 ºC	43	Birds: 38-55 Road traffic: 30-40 FEL: 38-42 Trucks: 35-42	36	Complies
	16/09/2020 7:15 am Wind: Calm Temp: 12 ºC	44	Birds: 44-52 Road traffic: 43-49 FEL: 38-42 Dump trucks: 35-40	36	Complies
	16/09/2020 7:30 am Wind: Calm Temp: 12 ºC	43	Birds: 42-68 Road traffic: 43-46 FEL travelling: 34-38 FEL loading: 39-43 Loading trucks (tray): 45-56 Truck reversing alarm: 40-42 Dump trucks: 42-45	35	Complies

Location	Date/Start Time/Weather	Primary Noise Descriptor (dB re 20 µPa) LAeq(15minute)	Description of Noise Emission, Typical Maximum Levels LAmax (dB)	Estimated Project LAeq (15minute)	Assessment
	16/09/2020 7:45 am Wind: Calm Temp: 11 ºC	43	Birds: 38-55 Road traffic: 30-40 FEL: 38-42 FEL bucket impacts: 40-45	35	Complies
	16/09/2020 8:00am Wind: Calm Temp: 12 ºC	45	Birds: 44-52 Road traffic: 43-49 FEL: 38-42 Dump trucks: 35-40	35	Complies
	21/09/2018 8:15 am Wind: Calm Temp: 11 ºC	43	Birds: 41-54 FEL: 34-36 Loading trucks (tray): 46-49 Reversing alarm: 40-42 Dump trucks: 42-49	34	Complies

7 Assessment and Findings

Based on the measured noise emissions presented in **Section 6**, the estimated Project related noise contributions for each location are summarised in **Table 11** to **Table 13**, together with an assessment against the corresponding EPL Operational Noise Limit.

Table 11 Morning Shoulder and Daytime Period 14 September 2020

Period	Location	Estimated Project Noise Level Contribution dBA		Project Noise Limit	
		LAeq(15min)	LA1(1min)	LAeq(15min)	LA1(1min)
Morning Shoulder	B – 126A Keighley Avenue	35	45	Pass	Pass
	C – 110 Keighley Avenue	35	44	Pass	Pass
	D – 100 Keighley Avenue	37	45	Pass	Pass
	G – 87 Keighley Avenue	35	45	Pass	Pass
	R – 21 Reservoir Road	36	44	Pass	Pass
Day	B – 126A Keighley Avenue	<30-39		Pass	N/A
	C – 110 Keighley Avenue	<30-39		Pass	
	D – 100 Keighley Avenue	35-37		Pass	
	G – 87 Keighley Avenue	32-35		Pass	
	R – 21 Reservoir Road	34-36		Pass	

Table 12 Morning Shoulder and Daytime Period 15 September 2020

Period	Location	Estimated Project Noise Level Contribution dBA		Project Noise Limit	
		LAeq(15min)	LA1(1min)	LAeq(15min)	LA1(1min)
Morning Shoulder	B – 126A Keighley Avenue	35	44	Pass	Pass
	C – 110 Keighley Avenue	35	45	Pass	Pass
	D – 100 Keighley Avenue	34	43	Pass	Pass
	G – 87 Keighley Avenue	34	44	Pass	Pass
	R – 21 Reservoir Road	36	46	Pass	Pass
Day	B – 126A Keighley Avenue	35-36	N/A	Pass	N/A
	C – 110 Keighley Avenue	34-36		Pass	
	D – 100 Keighley Avenue	34-36		Pass	
	G – 87 Keighley Avenue	32-34		Pass	
	R – 21 Reservoir Road	35-36		Pass	

Table 13 Morning Shoulder and Daytime Period 16 September 2020

Period	Location	Estimated Project Noise Level Contribution dBA		Project Noise Limit	
		LAeq(15min)	LA1(1min)	LAeq(15min)	LA1(1min)
Morning Shoulder	B – 126A Keighley Avenue	<30	<30	Pass	Pass
	C – 110 Keighley Avenue	32	36	Pass	Pass
	D – 100 Keighley Avenue	<30	<30	Pass	Pass
	G – 87 Keighley Avenue	30	34	Pass	Pass
	R – 21 Reservoir Road	36	45	Pass	Pass
Day	B – 126A Keighley Avenue	34-36	N/A	Pass	N/A
	C – 110 Keighley Avenue	34-36		Pass	
	D – 100 Keighley Avenue	33-36		Pass	
	G – 87 Keighley Avenue	32-34		Pass	
	R – 21 Reservoir Road	34-36		Pass	

Based on the operator-attended noise survey results presented in **Table 11** to **Table 13**, on 14 September 2020, 15 September 2020 and 16 September 2020, the project contributed $L_{Aeq(15min)}$ and $L_{A1(1min)}$ noise levels at locations B,C,D,G and R comply with the project morning shoulder noise limits . The project contributed $L_{Aeq(15min)}$ noise levels at locations B,C,D,G and R also comply with the daytime project noise limit.

8 Conclusion

VMS has conducted operator-attended noise monitoring for Central Coast Sands Quarry operations over a three-day period between 14 September 2010 and 16 September 2020 during the morning shoulder and daytime periods. Measurements conducted during the morning shoulder and daytime periods did not exceed the project $L_{Aeq(15min)}$ and $L_{A1(1min)}$ noise limits. VMS conclude that the project is in compliance with the EPL project noise limits.

Yours sincerely

Steven Brown
Principal - Acoustics and Vibration

Terminology Relating to Noise and Vibration

Sound Pressure	Sound, or sound pressure, is a fluctuation in air pressure over the static ambient pressure.
Sound Power	Sound Power is the rate at which sound energy is emitted, reflected, transmitted, or received, per unit time. Unlike sound pressure, sound power is neither room-dependent nor distance-dependent.
Sound Pressure Level (SPL)	The sound level is the sound pressure relative to a standard reference pressure of 20µPa ($20x10^{-6}$ Pascals) on a decibel scale.
Sound Power Level (SWL)	The Sound Power Level is the sound power relative to a standard reference pressure of 1pW ($20x10^{-12}$ Watts) on a decibel scale. The SWL of a simple point source may be used to calculate the SPL at a given distance (r) using the following formula: $SPL = SWL - 10 \times Log_{10}(4 \times \pi \times r^2)$ Note that the above formula is only valid for sound propagation in the free-field (see below).
Decibel (dB)	A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds s1 and s2 is given by 20 log10 (s1 / s2). The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is 20µPa.
A-weighting, dBA	The unit of sound level, weighted according to the A-scale, which takes into account the increased sensitivity of the human ear at some frequencies.
Noise Level Indices	Noise levels usually fluctuate over time, so it is often necessary to consider an average or statistical noise level. This can be done in several ways, so a number of different noise indices have been defined, according to how the averaging or statistics are carried out.
Leq,T	A noise level index called the equivalent continuous noise level over the time period T. This is the level of a notional steady sound that would contain the same amount of sound energy as the actual, possibly fluctuating, sound that was recorded.
Lmax,T	A noise level index defined as the maximum noise level during the period T. Lmax is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall Leq noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
L90,T	A noise level index. The noise level exceeded for 90% of the time over the period T. L90 can be considered to be the "average minimum" noise level and is often used to describe the background noise.
L10,T	A noise level index. The noise level exceeded for 10% of the time over the period T. L10 can be considered to be the "average maximum" noise level. Generally used to describe road traffic noise.
Free-Field	Far from the presence of sound reflecting objects (except the ground), usually taken to mean at least 3.5m
Fast/Slow Time Weighting	Averaging times used in sound level meters.
Octave Band	A range of frequencies whose upper limit is twice the frequency of the lower limit.
DnT,w	The single number quantity that characterises airborne sound insulation between rooms over a range of frequencies.
Rw	Single number quantity that characterises the airborne sound insulating properties of a material or building element over a range of frequencies.
Reverberation	The persistence of sound in a space after a sound source has been stopped.
PPV	The particles of a medium are displaced from their random motion in the presence of a vibration wave. The greatest instantaneous velocity of a particle during this displacement is called the Peak Particle Velocity (PPV) and is typically measured in the units of mm/s.
Hertz, Hz	The unit of Frequency (or Pitch) of a sound or vibration. One hertz equals one cycle per second. 1 kHz = 1000 Hz, 2 kHz = 2000 Hz, etc.
Acceleration	Acceleration is defined as the rate of change of Velocity of a particle over a period of time and is typically measured in the units of m/sec^2.
Vibration Dose, VDV	When assessing intermittent vibration, it is necessary to use the vibration dose value (VDV), a cumulative measurement of the vibration level received over an 8-hour or 16-hour period. The VDV formulae uses the RMS Acceleration raised to the fourth power and is known as the Root-mean-quad method. This technique ensures the VDV is more sensitive to the peaks in the acceleration levels. VDVs are typically measured in the units of $m/s^{1.75}$.