Licensee	Perilya Broken Hill Limited (PBHL)
Address	Argent St, Broken Hill, NSW 2880
Environmental Protection Licence	**2683** (North Mine and Potosi Operations)
Link to Environmental Protection Licence	http://www.epa.nsw.gov.au/prpoeoapp/ViewPOEOLicence.aspx?DOCID=31559&SYSUID=1&LICID=2683

Environmental Protection Licence 2683

Deposited Particulates Monitoring

Perilya Broken Hill Limited (PBHL) has eleven (11) deposited particulates monitoring points located around the North Mine and Potosi Operations (Figure 1). Licence point 20 is located on a private residence on Hall Street. A summary of Environmental Protection Licence (EPL) 2683 conditions is shown in Table 1.

Figure 1 Location of the deposited particulates monitoring points associated with EPL 2683

Table 1 Summary of EPL 2683 conditions for dust monitoring points

Dust Monitoring Points: EPL 2683 Conditions	
Condition	**Licence Requirement**
Licence Point	15,16,17,18,19,20,21,22,23,24,25
Pollutant/s	Total Deposited Particulates (TDP)
	Pb in Deposited Particulates (TDP-Pb)
Unit of measure	Grams per square meter per month (g/m^2/month)
Sampling Method	AM-19
Monitoring frequency	Every 30 days ± two (2) days

Deposited Particulates Monitoring Results

March 2020 TDP and TDP-Pb are presented in Table 2. Results of laboratory analyses were received by Perilya on 29/04/2020.

Table 2 March 2020 dust monitoring point results

Licence Point	Particulates – deposited matter (g/m^2/month)	Total Lead (g/m^2/month)
15	*	*
16	1.2	0.001
17	2.7	0.004
18	1.7	0.004
19	2.0	0.004
20	3.0	0.002
21	3.3	0.005
22	3.2	0.002
23	1.8	0.001
24	1.6	0.015
25	1.9	0.002

*Sample contaminated – black residue consistent with tar

Ambient Air Monitoring

EPL 2683 requires three (3) ambient air monitoring sites, one located at the Potosi Operations and the other two at the North Mine (Figure 2). PBHL currently uses high volume air samplers (HVAS) for the ambient air monitoring program. The HVAS operate (sample) for 24 hours every six (6) days.

Figure 2 Locations of the ambient air monitoring points associated with EPL 2683

Table 3 provides a summary of EPL 2683 conditions.

Table 3 Summary of EPL 2683 conditions for ambient air monitoring points

Ambient Air Monitoring Points: EPL 2683 Conditions	
Condition	**Licence Requirement**
Licence Point	26 and 27
Pollutant/s	Total Suspended Particles
	Total Lead
Unit of measure	Micrograms per cubic meter (µg/m^3)
Sampling Method	AS 3580.9.15:2014
	AS/NZS 3580.9.3:2015
Monitoring frequency	Every 6 days for 24 hours

HVAS Results

TSP and TSP-Pb results are presented in Table 4. Monthly averages for TSP and TSP-Pb for the previous 12 months are shown in Figure 3 and Figure 4 respectively. The final set of results for March ambient air monitoring, were received on 16/04/2020.

Table 4 March HVAS total lead and TSP results

Licence Point	**Pollutant**	**No. times measured during the month**	**Min. Value**	**Mean Value**	**Median Value**	**Max. Value**
26	TSP (µg/m3)	4*	37.6	53.6	53.1	70.7
	Total Lead (µg/m3)	4*	0.041	0.127	0.134	0.198
27	TSP (µg/m3)	4*	23.49	54.8	62.622	70.4
	Total Lead (µg/m3)	4*	0.033	0.107	0.051	0.293
30	TSP (µg/m3)	4*	25.39	45.6	50.812	55.2
	Total Lead (µg/m3)	4*	0.033	0.060	0.068	0.072

*Power loss at all sites during scheduled sampling on 21/03/2020

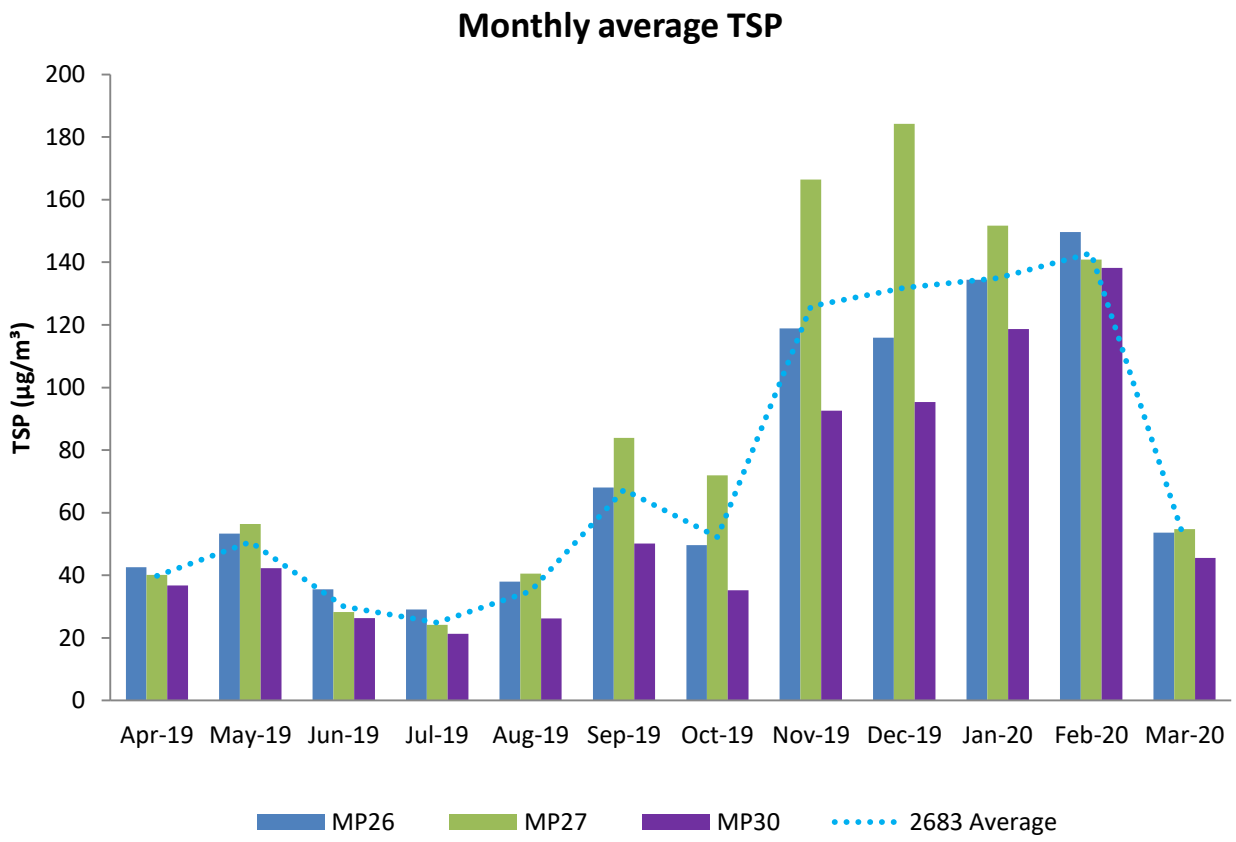

Figure 3 Average TSP results for the 12 months up to and including March 2020

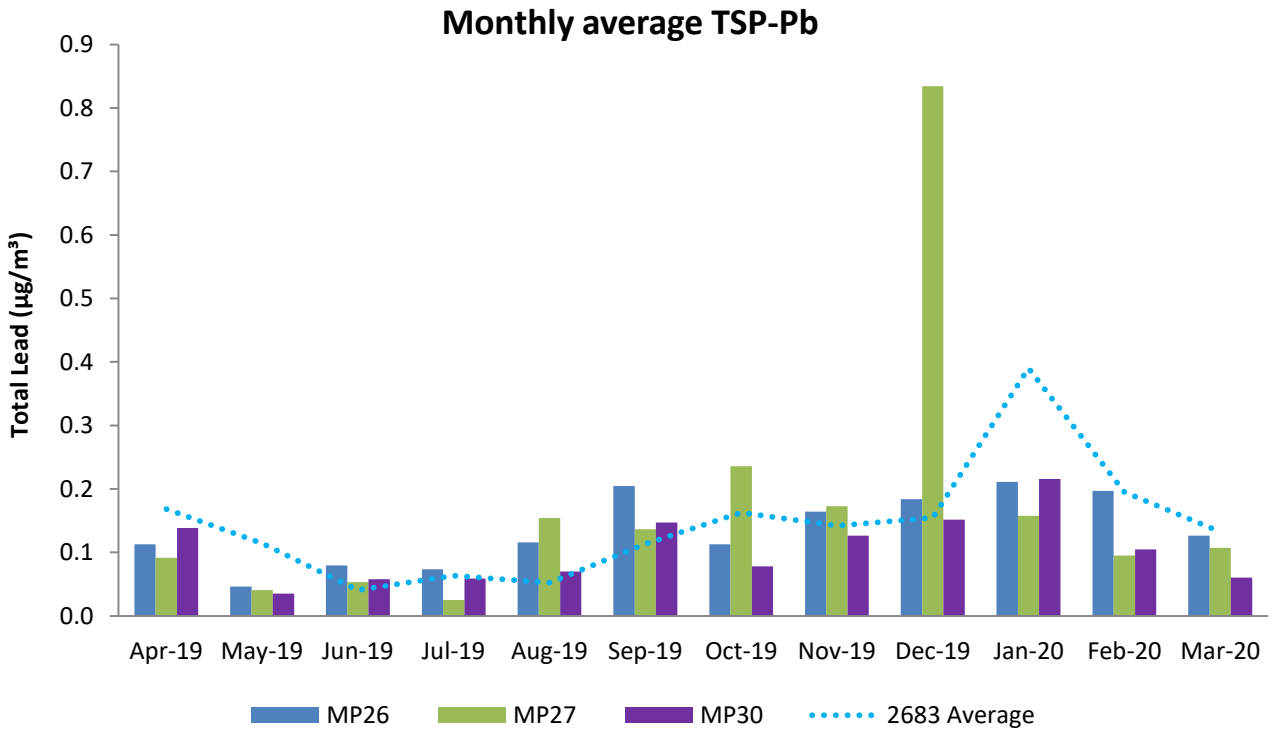

Figure 4 Average total lead results for the 12 months up to and including March 2020

Real Time Air Quality Monitoring

EPL 2683 requires two (2) real time air quality monitoring sites, one located on the Argent St side of the North Mine and the other located on the Menindee Rd side of the North Mine (Figure 5). PBHL currently uses Beta Attenuation Monitors (BAM) for the real time air monitoring program. The BAM operate (sample) for 24 hours every day.

Figure 5 Locations of the real time air monitoring points associated with EPL 2683

Table 5 provides a summary of EPL 2683 relevant conditions.

Table 5 Summary of EPL 2683 conditions for real time air monitoring points

Real Time Air Monitoring Points: EPL 2683 Conditions	
Condition	**Licence Requirement**
Licence Point	29 and 31
Pollutant	PM10
Unit of measure	Micrograms per cubic meter (µg/m^3)
Sampling Method	AS 3580.9.11 – 2008
Monitoring frequency	Continuous

BAM Results

PM10 results for the BAM (LP 29 and LP 31) are presented in Figure 6 and Figure 7 below. Data validation excluded results on 10/03/20 to 12/03/20 at LP 29 due to contamination in measuring chamber and low flow due to pump fault, requiring instrument exchange and stabilisation of unit. Given this the data still complied with AAQ NEPM data availability requirements.

Wind pollution rose for events on the 2/03, 14/03 and 29/03 are presented in Figures 8 to 10.

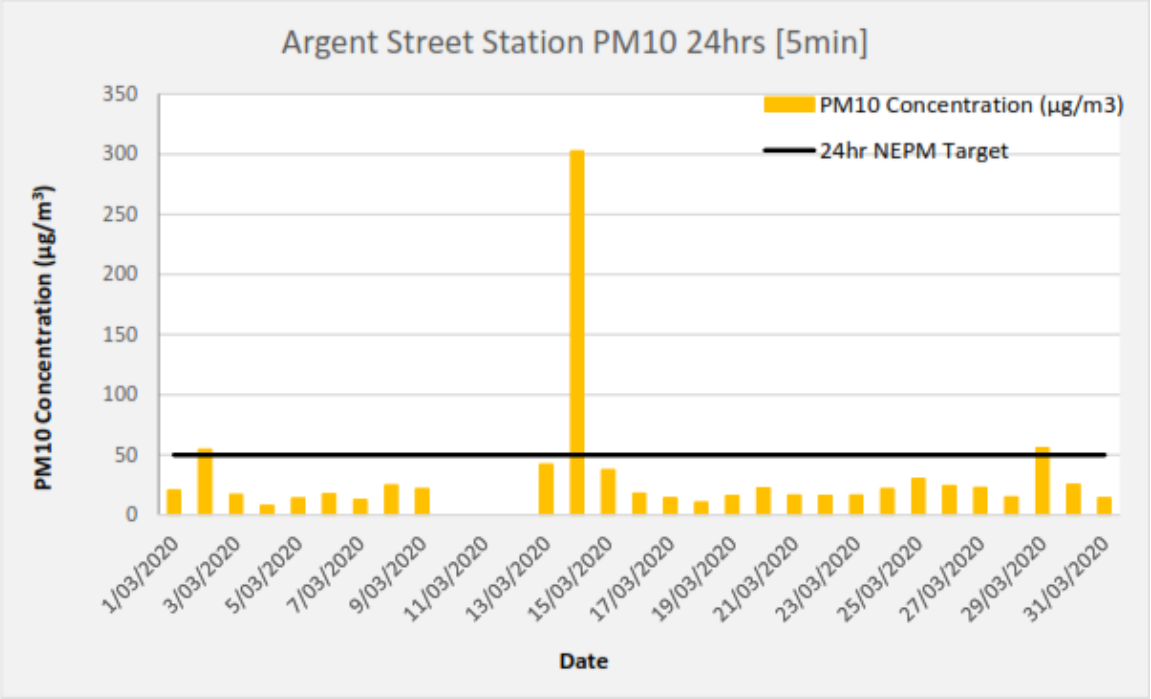

Figure 6 24 hr average PM10 BAM results (Argent St)

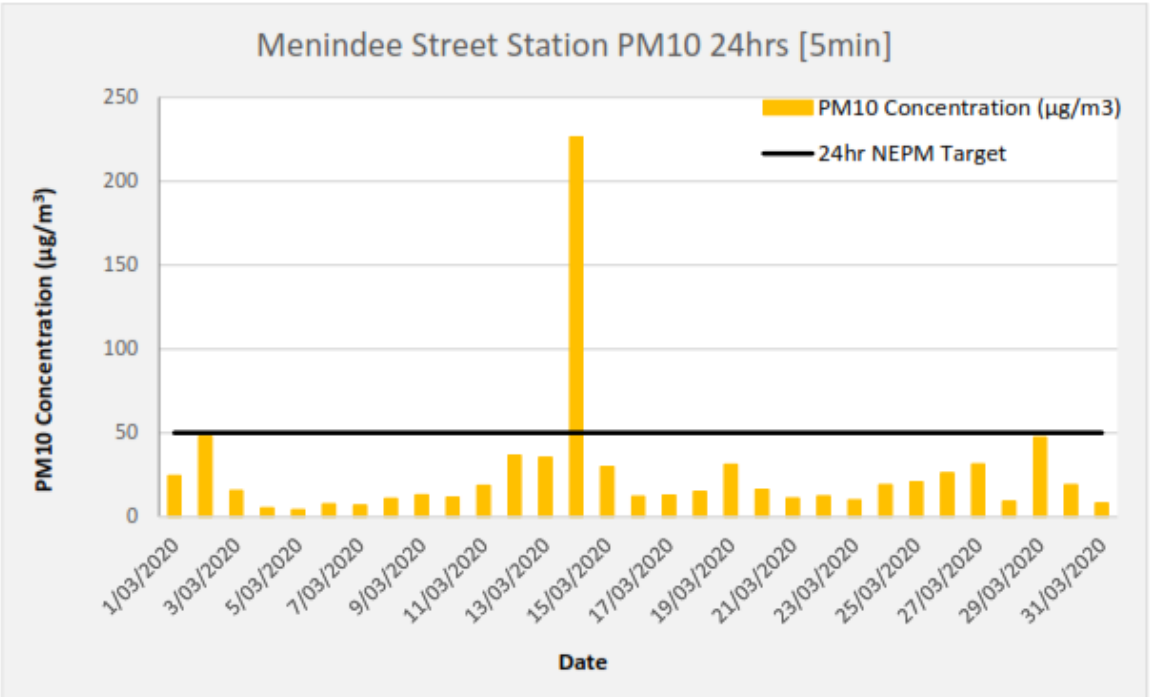

Figure 7 24 hr average PM10 BAM results (Menindee Rd)

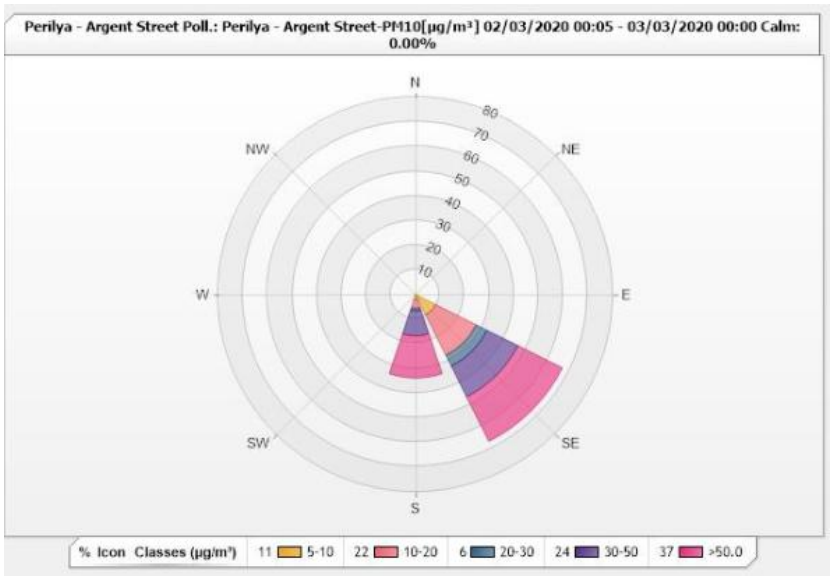

Figure 8 Pollution rose for 02 March2020 at Argent St

Figure 9 Pollution rose for 14 March2020 (Left Argent St) (Right Menindee Road)

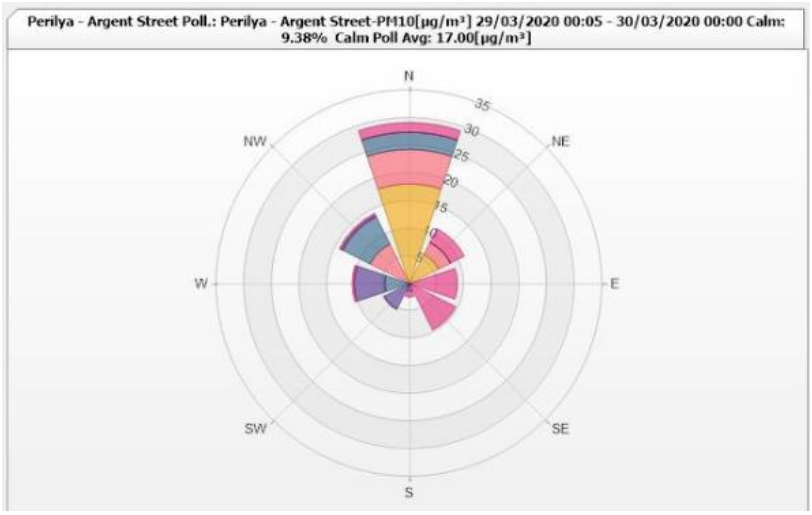

Figure 10 Pollution rose for 29 March2020 at Argent St

Groundwater Monitoring

Perilya holds a water supply works approval (60WA583325) for the underground workings of the North Mine as well as a water access licence (WAL40959) that allows for the extraction of up 1.466 gigalitres of groundwater per annum from Perilya operations.

A summary of the approval requirements for North Mine is shown in Table 6.

Table 6 Summary of relevant Water Licence conditions

Water Licence conditions	
Condition	**Licence Requirement**
Volume of use	Groundwater
Unit of measure	Gigalitres (GL)
Net Volume of Groundwater Produced	
Volume extracted (in combination with Potosi Mine, Southern Operations and While Leeds)	<1.466

North Mine pumping

	March(GL)	**Annual (GL)**
No 3 Shaft Dewatering	0.055	0.162
Transfer to Southern Operations	0.043	0.128
Transfer to Evaporation Dams	0	0

Noise Monitoring

Potosi Mine and North Mine have different conditions for noise monitoring under EPL2683.

Potosi

A summary of the EPL requirements for Potosi noise monitoring is shown in Table 7.

Table 7 Summary of the EPL 2683 conditions for Potosi noise monitoring

Noise EPL 2683 Conditions for Potosi	
Condition	**Licence Requirement**
Pollutant	Noise
Unit of measure	Decibels (dB)
Limits	
Monday to Friday - 0700 hours (h) to 1800 h	An *Leq (15 minute) of 40 decibels (A weighted)
Monday to Friday - 1800 h to 2200 h	An Leq (15 minute) of 39 decibels (A weighted)
All other times	An Leq (15 minute) of 35 decibels (A weighted)

*Leq is the equivalent continuous noise level – the level equivalent to the energy average of noise levels emitted by the premises over the stated measurement period (Source: Environmental Protection Licence 2683).

The location of the Potosi noise monitoring is shown in Figure 11.

Figure 11 The location of the noise monitoring associated with EPL 2683

Noise results

The quarterly noise monitoring of Potosi Mine were carried out by Muller Acoustic Consulting on Wednesday 18/03/2020. The noise monitoring consisted of daytime, evening and night measurements at the locations identified in the above map (Figure 11). The following tables show the survey results for sites with mine contributions. All locations determined mine contributions were below EPL limits.

Table 8 Operator-Attended Noise Survey Results - Location P1.

Date	Time (hrs)	Descriptor (dBA re 20 µPa)				Meteorology	Description and SPL, dBA
		L_{Amax}	L_{A1}	L_{Aeq}	L_{A90}		
18/03/2020	12:46 (Day)	59	54	43	27	WD: NW WS: 1.5m/s Rain: Nil	Traffic 33-59 Birds 30-38 Wind 25-42 BHPM Transient Event 25-33 (multiple 1-2 second durations)
		BHPM $L_{Aeq(15min)}$ Contribution					<30
18/03/2020	21:13 (Evening)	65	60	45	19	WD: N WS: 0.5m/s Rain: Nil	Aircraft 30-42 Traffic 24-65 Dogs 28-41 Truck Idling 24-28 BHPM Haul Truck 24-27 (2-3 minute duration)
		BHPM $L_{Aeq(15min)}$ Contribution					<30
18/03/2020	23:18 (Night)	66	61	45	18	WD: NW WS: <0.5m/s Rain: Nil	Dogs 24-36 Traffic 20-66 BHPM Haul Truck 20-34 (8-9 minute duration)
		BHPM $L_{Aeq(15min)}$ Contribution					<30
		BHPM $L_{A1(1min)}$ Contribution					<40

Note: Day - the period from 7am to 6pm Monday to Friday; Evening - the period from 6pm to 10pm Monday to Friday.

Table 9 Operator-Attended Noise Survey Results - Location P2.

Date	Time (hrs)	Descriptor (dBA re 20 µPa)				Meteorology	Description and SPL, dBA
		L_{Amax}	L_{A1}	L_{Aeq}	L_{A90}		
18/03/2020	16:15 (Day)	61	48	37	26	WD: N WS: 1.0m/s Rain: Nil	Distant Traffic 26-31 Birds 30-61 Dogs 30-48 BHPM Transient Event <25-36 (2-3 minute duration) BHPM Impacts 32-42 (multiple 1-2 second durations)
		BHPM $L_{Aeq(15min)}$ Contribution					30

Table 10 Operator-Attended Noise Survey Results - Location P3.

Date	Time (hrs)	Descriptor (dBA re 20 µPa)				Meteorology	Description and SPL, dBA
		L_{Amax}	L_{A1}	L_{Aeq}	L_{A90}		
18/03/2020	22:04 (Night)	67	50	42	24	WD: NW WS: <0.5m/s Rain: Nil	Dogs 28-67 Residential Nosie 30-45 Insects 20-25 BHPM Haul Truck 25-31 (7-8 minute duration)
		BHPM $L_{Aeq(15min)}$ Contribution					<30
		BHPM $L_{A1(1min)}$ Contribution					<40

Note: Day - the period from 7am to 6pm Monday to Friday; Evening - the period from 6pm to 10pm Monday to Friday.

Table 11 Operator-Attended Noise Survey Results - Location P4.

Date	Time (hrs)	Descriptor (dBA re 20 µPa)				Meteorology	Description and SPL, dBA
		L_{Amax}	L_{A1}	L_{Aeq}	L_{A90}		
18/03/2020	16:46 (Day)	47	37	30	23	WD: NW WS: 1.0m/s Rain: Nil	Birds 25-47 Traffic 25-42 Wind 25-36 Train 31-39 BHPM Hum <20 (10-15 minute duration) BHPM Transient Event 28-30 (multiple1-2 second durations)
		BHPM $L_{Aeq(15min)}$ Contribution					<30
18/03/2020	20:51 (Evening)	48	44	33	20	WD: N WS: 0.5m/s Rain: Nil	Insects 20-34 Livestock 20-36 Dogs 25-30 Traffic 25-48 BHPM Hum <20 (10-15 minute duration)
		BHPM $L_{Aeq(15min)}$ Contribution					<30
18/03/2020	22:56 (Night)	51	43	30	18	WD: N WS: <0.1m/s Rain: Nil	Traffic 25-51 Insects 20-31 BHPM Hum <20 (10-15 minute duration)
		BHPM $L_{Aeq(15min)}$ Contribution					<30
		BHPM $L_{A1(1min)}$ Contribution					<30

Note: Day - the period from 7am to 6pm Monday to Friday; Evening - the period from 6pm to 10pm Monday to Friday.

North Mine

A summary of the EPL requirements for North Mine noise monitoring is shown in Table

Table 12 Summary of the EPL 2683 conditions for North Mine noise monitoring

Noise EPL 2683 Conditions for North Mine										
Condition	**Licence Requirement**									
Pollutant	Noise									
Measurement frequency	Quarterly									
Unit of measure	Decibels (dB)									
Time Period	**Monitoring Point Limits (LAeq (15 minute))**									
	33	**34**	**35**	**36**	**37**	**38**	**39**	**40**	**41**	**42 (All others)**
Day	38	38	36	36	36	35	35	35	35	35
Evening	38	38	36	36	36	35	35	35	35	35
Night	35	35	35	35	35	35	35	35	35	35

*Leq is the equivalent continuous noise level – the level equivalent to the energy average of noise levels emitted by the premises over the stated measurement period (Source: Environmental Protection Licence 2683).

The locations of North Mine noise monitoring are shown in Figure 12.

Figure 12 Location of the North Mine noise monitoring associated with EPL 2683

Noise results

The quarterly noise monitoring of North Mine were carried out by Muller Acoustic Consulting on Tuesday 17/03/2020 and Wednesday 18/03/2020. The noise monitoring consisted of daytime, evening and night measurements at the locations identified in the above map (Figure 12).

Sites MP38, MP40 and MP41 had no audible noise generated from the North Mine. MP33, MP34, MP35, MP36, MP37 and MP39 detected noise from the North Mine. The following tables show the survey results for sites where North Mine noise was detected.

Table 13 Operator-Attended Noise Survey Results - Locations 33 and 34.

Date	Time (hrs)	Descriptor (dBA re 20 µPa)				Meteorology	Description and SPL, dBA
		LA_{max}	LA_1	LA_{eq}	LA_{90}		
18/03/2020	13:08 (Day)	69	61	49	30	WD: NW WS: 1.0m/s Rain: Nil	Traffic 34-69 Aircraft 35-41 Wind 27-35 BHNM Vehicles 30-36 (1-2 minute duration)
BHNM $LA_{eq(15min)}$ Contribution							30
17/03/2020	19:49 (Evening)	69	62	48	31	WD: NE WS: 1.0m/s Rain: Nil	Traffic 38-69 Insects 30-38 Dogs 35-47 BHNM Haul Truck 30-36 (2-3 minute duration)
BHNM $LA_{eq(15min)}$ Contribution							30

Table 14 Operator-Attended Noise Survey Results - Locations 35 and 36.

Date	Time (hrs)	Descriptor (dBA re 20 µPa)				Meteorology	Description and SPL, dBA
		L_{Amax}	L_{A1}	L_{Aeq}	L_{A90}		
17/03/2020	22:43 (Night)	78	71	57	28	WD: N WS: <0.5m/s Rain: Nil	Traffic 31-78 Dogs 35-56 Aircraft 38-51 BHNM Haul Truck <28-30 (4-5 minute duration)
		BHNM $L_{Aeq(15min)}$ Contribution					<30
		BHNM $L_{A1(1min)}$ Contribution					<40

Table 15 Operator-Attended Noise Survey Results - Locations 37 and 39.

Date	Time (hrs)	Descriptor (dBA re 20 µPa)				Meteorology	Description and SPL, dBA
		L_{Amax}	L_{A1}	L_{Aeq}	L_{A90}		
17/03/2020	23:04 (Night)	67	60	46	30	WD: N WS: <0.1m/s Rain: Nil	Traffic 35-67 Dogs 30-41 Insects 25-30 Train 30-35 BHNM Haul Truck 25-34 (7-8 minute duration)
		BHNM $L_{Aeq(15min)}$ Contribution					30
		BHNM $L_{A1(1min)}$ Contribution					<40

Note 1: Day - the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays; Evening - the period from 6pm to 10pm; Night - the remaining periods.

Blasting

The North Mine blast monitors are located on properties adjacent to the North Mine. Location of these monitors are shown in Figure and labeled as ‘North 56’ and ‘Junction Circle’. The Potosi blast monitor is located onsite and adjacent to the Potosi Offices and is shown in Figure 13 as ‘Potosi’.

Figure 13 Location of the blast monitors associated with EPL 2683

A summary of Licence conditions for blasting is provided in Table .

Table 16 Summary of EPL 2683 conditions for blasting

Blasting EPL 2683 Conditions	
Condition	**Licence Requirement**
Licence Points	56 North Mine, 48 Junction Circle, Potosi
Pollutant/s	Ground Vibration
	Overpressure
Unit of measure	Millimetres per second (mm/s), Decibels (dB)
Sampling method	AS 2187.2-2006
Monitoring frequency	All blasts
Data Reporting	All blasts
Date results received	Immediately following each blast
Limits	
Ground Vibration – 95% of blasts	Five (5) millimetres per second (mm/s)
Ground Vibration – Upper limit	Ten (10) millimetres per second (mm/s)
Overpressure – 95% of blasts (not including Potosi) between 0700 h -1900 h	115 decibels (dB)
Overpressure – upper limit (not including Potosi) between 0700 h -1900 h	120 decibels (dB)
Overpressure – upper limit (not including Potosi) between 1900 h -0700 h	95 decibels (dB)
Overpressure - 95% of blasts (Potosi) between 0700 h – 1900 h	130 decibels (dB)
Overpressure – upper limit (Potosi) between 0700 h – 1900 h	135 decibels (dB)
Overpressure – upper limit (Potosi) between 1900 h – 0700 h	110 decibels (dB)

Blasting Results

A total of 46 blasts were conducted at Potosi and a total of 105 blasts were conducted at North Mine during March 2020 (Table 8).

Table 8 March2020 blast results for EPL 2683

Licence Point	Parameter	No. times measured in the month	Min. Value	Mean Value	Median Value	Max. Value
Potosi	Overpressure (dB)	4	88.0	88.0	88.0	88.0
56 North Mine	Overpressure (dB)	7	88.0	95.7	99.1	99.9
Junction Circle	Overpressure (dB)	0	<95	<95	<95	<95
56 North Mine	Ground Vibration (mm/s)	8	0.43	1.23	1.43	1.61
Junction Circle	Ground Vibration (mm/s)	0	<0.3	<0.3	<0.3	<0.3
Production Blasts	9	Development Blasts	142	Total Blasts	151	
Calculations are based on blasts registering above 0.3 mm/s PVS						

It is significant that over-pressure is not a useful indicator of impacts on sensitive receptors from underground mining activities (compared to open pit mining), as any pressure gradients are rapidly attenuated in the underground environment.

Complaints

There were no complaints received for EPL 2683 during March 2020.