Karuah East Quarry

Monthly Environmental Monitoring Report

December 2020

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TABLES

FIGURES

1. INTRODUCTION

This report has been completed to meet the requirements of Section 66(6) of the *Protection of the Environment Operations Act 1997* and the NSW Environmental Protection Authority's (EPA) Requirements for Publishing Pollution Monitoring Data (October 2013). This report summarises the required monitoring data under Environmental Protection Licence (EPL) 20611 for the Karuah East Quarry. This report also includes some monitoring requirements under Project Approval 09_0175 and the approved Statement of Commitments (SoC).

A summary of the environmental data for December 2020 is covered in this report.

A summary of the licence information is provided in **Table 1** below.

Table 1 Licence Information

Environmental Protection Licence Number	20611
Licensee's Name	Karuah East Quarry Pty Ltd
Licensee's Address	Postal Address: PO Box 3284 Thornton NSW 2322 Quarry Location: Lot 13 DP1024564 Pacific Highway Karuah NSW 2324
Link to full Licence on the EPA Website	EPL 20611

2. DUST MONITORING

There are no specific dust criteria listed in the EPL, but the dust criteria (Tables 2-4) are listed in Schedule 3 Condition 13 of *Project Approval 09_0175*.

Table 2 PA 09_0175 Long term impact assessment criteria for particulate matter

Pollutant	Averaging period	[4]Criterion
Total suspended particulates (TSP)	Annual	[1]90 µg/m³
Particulate matter < 10 µm (PM_{10})	Annual	[1]30 µg/m³

Table 3 PA 09_0175 Short term impact assessment criteria for particulate matter

Pollutant	Averaging period	[4]Criterion
Particulate matter < 10 µm (PM_{10})	Daily	[1]50 µg/m³

Table 4 PA 09_0175 Long term impact assessment criteria for Deposited Dust

Pollutant	Averaging period	Maximum increase in deposited dust level	Maximum total deposited dust level
[3]Deposited dust	Annual	[2]2 g/m²/month	[1]4 g/m²/month

Notes to Tables 2-4:

[1] Total impact (ie incremental increase in concentrations due to the project plus background concentrations due to all other sources).

[2] Incremental impact (ie incremental increase in concentrations due to the project on its own).

*[3] **Deposited dust** is to be assessed as insoluble solids as defined by Standards Australia, AS/NZS 3580.10.1:2003: Methods for Sampling and Analysis of Ambient Air – Determination of Particulate Matter – Deposited Matter – Gravimetric Method.*

[4] Excludes extraordinary events such as bushfires, prescribed burning, dust storms, sea fog, fire, incidents, illegal activities or any other activity agreed by the Secretary in consultation with EPA.

All dust monitoring is undertaken in accordance with the *Approved Methods of Sampling and Analysis of Air Pollutants in NSW* (EPA, 2007).

Dust deposition and TSP/PM_{10} monitoring is undertaken at Karuah East Quarry at the locations listed in **Table 5**.

Table 5 Air Quality Monitoring Locations for Karuah East Quarry

Site ID	EPL ID	Location	Address	GPS Coordinates
DDG 1	MP 4	South-East of Karuah East Quarry	5760 Pacific Hwy, Karuah NSW 2324	32°38’04’’S 151°59’58’’E
DDG 2	MP 5	South-East of Karuah East Quarry	5770 Pacific Hwy, Karuah NSW 2324	32°38’02’’S 152°00’09’’E
DDG 3	MP 6	East of Karuah East Quarry	DP 1024341, Karuah	32°37’57’’S 151°59’41’’E
DDG 4	MP 7	West of Karuah East Quarry	21 Halloran Rd, North Arm Cove NSW 2324	32° 37' 30.87"S 152°01'10.18"E
DDG 5	MP 8	West of Karuah East Quarry	Lot 21/DP 1024341 Karuah NSW 2324	32° 37' 55.33"S 152°00'2.74"E
HVAS (TSP/PM10)	MP 9	South-East of Karuah East Quarry	5770 Pacific Hwy, Karuah NSW 2324	32°38’03’’S 152°00’09’’E

2.1 Dust Deposition Results

Dust deposition results for December 2020 and the year to date are shown in **Table 6**.

Table 6 Insoluble Solids (g/m²/month) for the Year to Date

Date	DDG 1	DDG 2	DDG 3	DDG 4	DDG 5
13/01/2020 to 13/02/2020	3.4	1.6	2.3	3.5	3.5
13/02/2020 to 12/03/2020	1.7	1.5	0.7	0.9	1.6
12/03/2020 to 9/04/2020	0.8	0.8	0.5	0.1	0.5
9/04/2020 to 7/05/2020	1.2	0.9	1.0	-	1.3
7/05/2020 to 4/06/2020	0.2	0.3	0.3	0.7	0.1
4/06/2020 to 2/07/2020	0.1	0.2	0.3	0.3	0.3
2/07/2020 to 31/07/2020	0.2	0.1	0.2	0.6	0.1
31/07/2020 to 1/09/2020	0.4	0.2	0.4	1	0.1
1/09/2020 to 1/10/2020	0.6	0.5	0.4	1	1
1/10/2020 to 2/11/2020	0.2	0.1	1.3	0.7	0.6
2/11/2020 to 3/12/2020	3.2	2.3	0.8	0.7	4.7
3/12/2020 to 4/01/2021	0.3	0.5	0.1	0.4	1.5
[1]Rolling Annual Average	1.0	0.8	0.7	0.9	1.3

Note [1]: Rolling Annual Average from the EPL 20611 anniversary date of 9 April.

2.2 High Volume Air Sampling Results

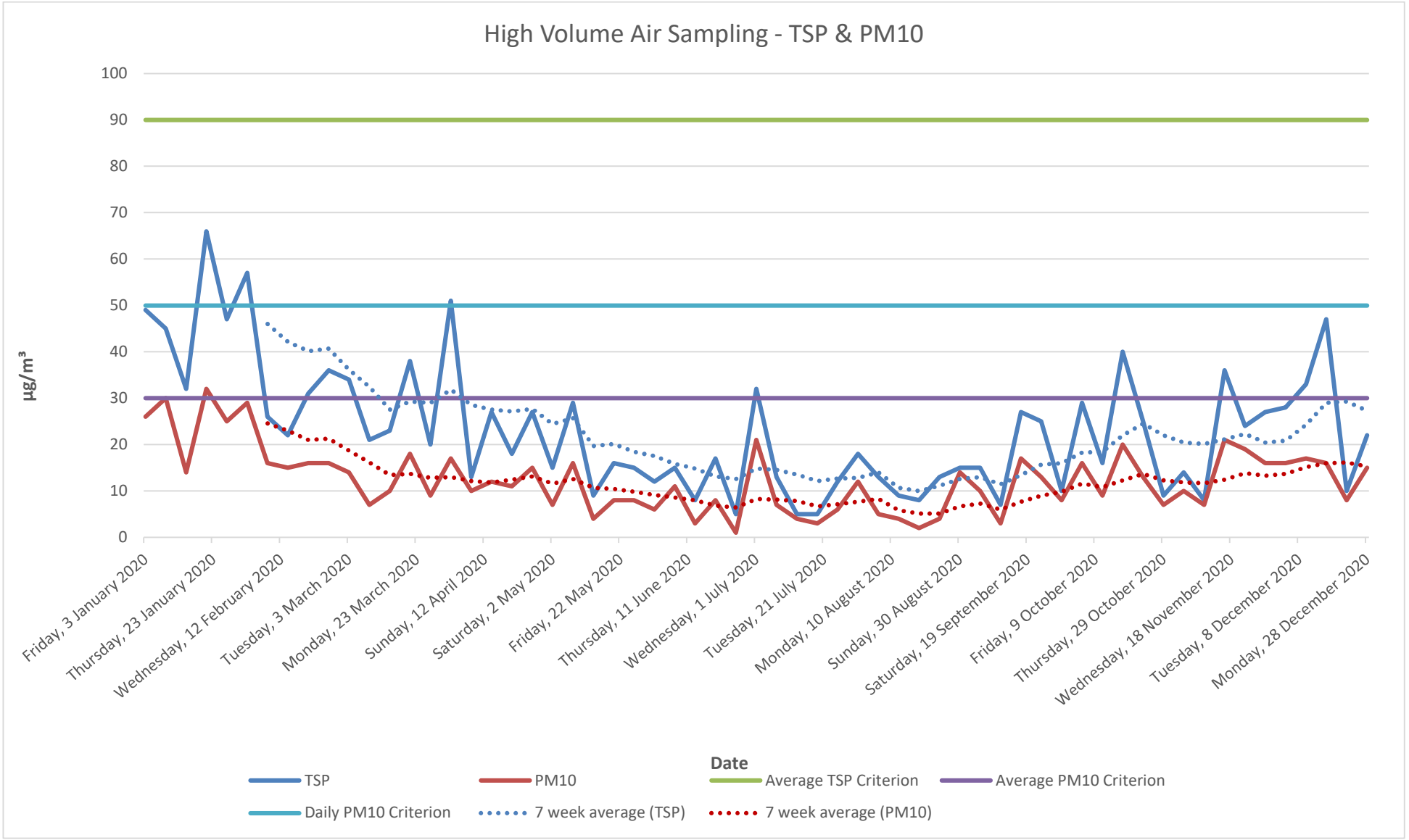
The TSP and PM_{10} results for December 2020 are shown in **Table 7** with the long term monitoring results displayed in **Figure 1**.

Table 7 High Volume Air Sampling (µg/m³) results

Date	HVAS TSP (µg/m³)	HVAS PM_{10} (µg/m³)
4/12/2020	28	16
10/12/2020	33	17
16/12/2020	47	16
22/12/2020	10	8
28/12/2020	22	15
[1]24hr Max Criteria	**N/A**	**50**
[2]Rolling Annual Average	23	12
[1]Annual Average Criteria	**90**	**30**

Note: 1. Maximum criteria as specified in PA 09_0175
2. Rolling Annual Average from the EPL 20611 anniversary date of 9 April.

Figure 1 High Volume Air Sampling – Long term results



2.3 Dust Monitoring Results Summary

All dust monitoring results to the end of December 2020 indicate that the Dust Deposition (Insoluble Solids), TSP and PM10 levels recorded were below the project criterion.

3. BLAST MONITORING RESULTS

The conditions stipulated for blasting is referred to in Condition L5 and M7 of EPL 20611 and Schedule 3, Condition 8 of PA 09_0175. Blast monitoring is undertaken at every blast. **Table 8** summarises the blast monitoring criteria.

Table 8 Blasting criteria

Location	Airblast overpressure (dB(Lin Peak)	Ground vibration (mm/s)	Allowable exceedance
Any residence on privately-owned land, or any public infrastructure	120	10	0%
	115	5	5% of the total number of blasts over a period of 12 months

Summary of blasting results are shown in **Table 9**.

Table 9 Blast Monitoring Results

Date and time	Overpressure and vibration	Location B (Nearest Residence)
1/12/2020 12:28 PM	Overpressure dB(L)	n/t
	Vibration (mm/s)	n/t
11/12/2020 12:27 PM	Overpressure dB(L)	n/t
	Vibration (mm/s)	n/t
18/12/2020 11:53 AM	Overpressure dB(L)	n/t
	Vibration (mm/s)	n/t
22/12/2020 12:32 PM	Overpressure dB(L)	n/t
	Vibration (mm/s)	n/t

4. NOISE MONITORING

Schedule 3 Condition 3 of the Project Approval and Condition L4.1 of the EPL requires Karuah East Quarry to ensure noise generated by Quarry operations does not exceed criteria outlined in **Table 10**.

Table 10 Operational Noise Criteria (dB(A) $LA_{eq(15min)}$)

Location	Criteria ([1]day)
Residence on Lot 11 DP 10244564	43
A	40
B	37
G	38
All other residence	35

Note [1]: A day is defined as the period from 7am to 6pm Monday to Saturday and 8am to 6pm Sunday and Public Holidays.

The noise criteria shown in **Table 10** is not indicative of the construction noise criteria for the Karuah East Quarry project. Construction noise criteria has been developed based on the *NSW EPA Interim Construction Noise Guideline* for each location and is set out in Table 9 of the approved *Noise Management Plan (SLR, 2015)*.

In accordance with Schedule 3 Condition 5 and Condition 7 of the Project Approval and the *Noise Management Plan (SLR, 2015)* a noise monitoring program has been implemented. Summary of this monitoring program is outlined in **Table 11**.

Table 11 Noise Monitoring Program

Construction Noise Monitoring			
Monitoring Method	**[1]Location**	**Frequency**	**[2]Criteria (dB(A) $LA_{eq(15min)}$)**
Attended noise monitoring	F	At the commencement of new activities and a min of once per quarter.	54
Attended noise monitoring	G	At the commencement of new activities and a min of once per quarter.	44
Operational Noise Monitoring			
Monitoring Method	**[1]Location**	**Frequency**	**[2]Criteria**
Attended noise monitoring	F, G	Quarterly	As per Table 10, 12 and 13 Noise MP (SLR, 2015)
Unattended noise monitoring	G	Quarterly	As per Table 10, 12 and 13 Noise MP (SLR, 2015)

Note: 1. Monitoring locations are shown in Appendix 1.

2. Criteria is for daytime limits. Daytime is defined as the period from 7am to 6pm Monday to Saturday and 8am to 6pm Sunday and Public Holidays.

4.1 Operator Attended Monitoring Results

The results of the operator attended noise surveys are presented in **Table 12**. Ambient noise levels given in the tables include all noise sources such as traffic, insects, birds, adjacent quarry and Karuah East Quarry. The table provides the following information:

a) Monitoring location and serial number of the noise logger;

b) Date, start time, and wind conditions at the measurement location; and
c) Typical maximum (LAmax) and contributed noise levels.

Quarry contributions listed in the tables are from Karuah East Quarry and are stated only when a contribution could be quantified.

Table 12 Operator Attended Noise Survey Results

Location	Date/Start Time/ Weather	Primary Noise Descriptor (dBA re 20 µPa)					Description of Noise Emissions and Typical Maximum Noise Levels (dBA)
		LAmax	LA1	LA10	LA90	LAeq	
A	04/11/2020 10:40 am Calm	58	54	47	41	44	Birds 35 - 40
		Karuah East Quarry inaudible					
B	04/11/2020 11:35 am Calm	75	70	66	57	63	Pacific Highway 55 - 65 Birds 40-45
		Karuah East Quarry inaudible					
F	04/11/2020 12:44 pm Calm	76	60	48	40	49	Birds 40 Local Traffic 50 – 55
		Karuah East Quarry inaudible					
G	04/11/2020 10:00 am Calm	59	50	42	36	41	Birds 30 - 35 Pacific Highway 35 - 40 Karuah East Quarry 30 - 36
		Karuah East Quarry audible					

4.2 Unattended Continuous Monitoring Results

Table 13 Unattended Continuous Noise Monitoring Results

INP Period	Units	LA1	LA10	LA90	LAeq
Daytime	dBA	56	49	41	49
Evening	dBA	57	50	41	48
Night[3]	dBA	52	48	37	46

4.3 Noise Monitoring Summary

5. The attended noise monitoring conducted during November 2020 identified that Karuah East Quarry was not audible at location A, B, F and audible at location G. Karuah East Quarry is determined to be compliant for the monitoring completed in November 2020.

6. SURFACE WATER MONITORING

Condition M2 of the EPL outlines the requirement to monitor surface water discharges from Karuah East Quarry via the three licensed discharge points (LDP001, LDP002, LDP003). The *Statement of Commitments* (Appendix 6, PA 09_0175) requires additional surface water monitoring to be undertaken for the first twelve months of operations. This additional water monitoring requires monthly sampling to be undertaken at the three licensed discharge points and at four locations on Yalimbah and Bulga Creeks when in flow.

All discharged water from the three licensed discharge points are required to meet the water quality concentration limits as stipulated in Condition L2.4 of the EPL. This criterion is shown in **Table 14** below.

Table 14 Surface Water Discharge Monitoring Criteria

Sampling Points	Pollutant	Unit	EPL Limit
LDP001 (Dam 1)	pH	pH units	6.5 – 8.5
LDP002 (Dam 2)	TSS	mg/L	40
LDP003 (Dam 3)	Oil & Grease	mg/L	5 and/or none visible

6.1 Discharge Monitoring Results

Controlled discharge occurred at Dam 2 throughout December. Discharge monitoring results shown in the tables below.

Table 15 Surface Water Discharge Monitoring Results – Dam 1

Date	LDP001 (Dam 1)		
	pH (Lab)	TSS	Oil & Grease
EPL Criterion	**6.5-8.5**	**40**	**5**
-	-	-	-

Units: pH in pH units, Total Suspended Solids (TSS) in mg/L, Oil & Grease in mg/L

Table 16 Surface Water Discharge Monitoring Results – Dam 2

Date	LDP002 (Dam 2)		
	pH (Lab)	TSS	Oil & Grease
EPL Criterion	**6.5-8.5**	**40**	**5**
16/12/2020	6.8	14	NV

Units: pH in pH units, Total Suspended Solids (TSS) in mg/L, Oil & Grease in mg/L

Table 17 Surface Water Discharge Monitoring Results – Dam 3

Date	LDP003 (Dam 3)		
	pH (Lab)	TSS	Oil & Grease
EPL Criterion	**6.5-8.5**	**40**	**5**
-	-	-	-

Units: pH in pH units, Total Suspended Solids (TSS) in mg/L, Oil & Grease in mg/L

6.2 Monthly Monitoring Results

Monthly water sampling was undertaken on the 1 December 2020.

Summary of monthly monitoring results is shown in **Table 18** and **Table 19**.

Table 18 Surface Water Monthly Monitoring Results – Sediment Dams

Date	LDP001 (Dam 1)				LDP002 (Dam 2)				LDP003 (Dam 3)			
	pH (Lab)	TSS	Oil & Grease	EC	pH (Lab)	TSS	Oil & Grease	EC	pH (Lab)	TSS	Oil & Grease	EC
19/01/2018	7.29	9	<5	665	7.29	37	<5	434	7.08	10	6	925
16/02/2018	7.71	9	<5	662	6.48	22	<5	548	7.21	16	<5	1075
20/03/2018	6.95	19	<5	574	6.81	6	<5	535	7.37	27	<5	788
18/04/2018	6.40	5	<5	529	7.70	17	<5	490	7.10	17	<5	830
18/05/2018	5.86	12	<5	555	5.80	4	<5	345	6.48	21	<5	654
19/06/2018	7.33	76	<5	496	7.51	828	<5	171	7.28	418	<5	347
20/07/2018	6.50	12	<5	600	6.80	5	<5	540	7.40	63	<5	570
17/08/2018	6.71	12	<5	553	6.64	5	<5	604	7.16	14	<5	622
14/09/2018	7.09	33	<5	508	6.37	7	<5	405	6.94	6	<5	520
19/10/2018	6.78	81	<5	593	6.77	191	<5	268	8.07	38	<5	688
15/11/2018	7.42	76	<5	1035	6.76	14	<5	470	8.01	23	<5	833
18/12/2018	7.20	98	<5	430	4.62	162	<5	193	7.57	341	<5	758
18/01/2019	7.13	10	<5	975	6.55	17	<5	533	8.15	43	<5	975
18/02/2019	7.12	19	<5	616	6.53	19	<5	563	8.35	23	<5	1140
20/03/2019	6.89	44	<5	494	5.29	185	<5	182	7.57	30	<5	915
16/04/2019	8.03	415	<5	538	7.30	109	<5	265	7.49	164	<5	998
15/05/2019	6.78	406	<5	520	6.71	135	<5	327	7.69	19	<5	1049
12/06/2019	6.5	13	<5	631	6.37	25	<5	288	7.63	12	<5	846
15/07/2019	6.79	19	<5	524	6.37	9	<5	468	6.96	6	<5	1036
14/08/2019	6.8	17	<5	780	6.67	21	<5	472	7.97	<5	<5	1230
12/09/2019	6.47	15	<5	706	6.56	56	<5	414	8.03	15	<5	1144
16/10/2019	7.11	187	<5	561	6.73	13	<5	1074	6.98	25	<5	993
14/11/2019	6.95	164	<5	616	6.72	9	<5	1235	8.58	10	<5	1172
12/12/2019	-	-	-	-	7.2	26	<5	1417	7.51	25	<5	1309
13/01/2020	-	-	-	-	6.78	67	<5	1820	7.78	6	<5	1588
13/02/2020	6.61	48	<5	554	6.52	271	<5	190	8.08	27	<5	740
12/03/2020	7.06	50	<5	686	7.02	124	<5	388	7.76	77	<5	943
14/04/2020	7.15	35	<5	728	6.95	31	<5	445	7.74	287	<5	904
7/05/2020	6.88	43	<5	751	6.62	88	<5	503	8.78	38	<5	945
4/06/2020	6.22	21	<5	724	5.92	17	<5	466	8.42	16	<5	836
2/07/2020	6.61	21	<5	816	6.28	10	<5	583	8.37	16	<5	782
3/08/2020	6.7	144	<5	687	6.5	102	<5	278	6.81	177	<5	577
1/09/2020	7.2	36	<5	796	6.6	13	<5	704	7.63	27	<5	612
1/10/2020	-	-	-	-	6.9	11	<5	843	9.16	13	<5	861
2/11/2020	6.7	64	<5	844	6.5	20	<5	737	7.04	305	<5	469
1/12/2020	7.1	212	<5	740	6.78	21	<5	1193	7.4	83	<5	609

Units: pH in pH units, Total Suspended Solids (TSS) in mg/L, Oil & Grease in mg/L, Electrical Conductivity (EC) in µS/cm

Table 19 Surface Water Monthly Monitoring Results – Drain lines

Date	SW1 (Bulga Creek)				SW2 (Bulga Creek)				SW4 (Yalimbah Creek)			
	pH (Lab)	TSS	Oil & Grease	EC	pH (Lab)	TSS	Oil & Grease	EC	pH (Lab)	TSS	Oil & Grease	EC
19/01/2018	-	-	-	-	-	-	-	-	-	-	-	-
16/02/2018	-	-	-	-	-	-	-	-	-	-	-	-
20/03/2018	-	-	-	-	-	-	-	-	-	-	-	-
18/04/2018	-	-	-	-	6.60	9	<5	550	-	-	-	-
18/05/2018	-	-	-	-	5.75	5	<5	536	-	-	-	-
19/06/2018	-	-	-	-	7.10	72	<5	255	6.55	61	<5	259
20/07/2018	-	-	-	-	6.50	14	<5	410	-	-	-	-
17/08/2018	-	-	-	-	6.52	16	<5	385	-	-	-	-
14/09/2018	-	-	-	-	6.72	10	<5	304	-	-	-	-
19/10/2018	-	-	-	-	6.34	20	<5	533	-	-	-	-
15/11/2018	-	-	-	-	6.57	19	<5	426	-	-	-	-
18/12/2018	-	-	-	-	6.45	63	<5	520	-	-	-	-
18/01/2019	-	-	-	-	6.86	24	<5	533	-	-	-	-
1/06/2019	-	-	-	-	6.17	11	<5	531	-	-	-	-
15/07/2019	-	-	-	-	6.99	<5	<5	526	-	-	-	-
14/08/2019	-	-	-	-	6.45	8	<5	501	-	-	-	-
12/09/2019	-	-	-	-	6.86	18	<5	563	-	-	-	-
16/10/2019	-	-	-	-	6.7	26	<5	570	-	-	-	-
14/11/2019	-	-	-	-	6.92	22	<5	562	-	-	-	-
12/12/2019	-	-	-	-	7.24	21	<5	584	-	-	-	-
13/01/2020	-	-	-	-	-	-	-	-	-	-	-	-
13/02/2020	-	-	-	-	5.93	60	<5	496	-	-	-	-
12/03/2020	-	-	-	-	6.41	25	<5	610	-	-	-	-
14/04/2020	-	-	-	-	6.91	74	<5	554	-	-	-	-
7/05/2020	-	-	-	-	7.12	42	<5	674	-	-	-	-
4/06/2020	-	-	-	-	6.69	13	<5	703	-	-	-	-
2/07/2020	-	-	-	-	7.86	16	<5	782	-	-	-	-
3/08/2020	-	-	-	-	6.46	85	<5	509	-	-	-	-
1/09/2020	-	-	-	-	7.49	17	<5	735	-	-	-	-
1/10/2020	-	-	-	-	6.63	15	<5	707	-	-	-	-
2/11/2020	-	-	-	-	3.23	56	<5	633	-	-	-	-
1/12/2020	-	-	-	-	6.46	27	<5	697	-	-	-	-

Units: pH in pH units, Total Suspended Solids (TSS) in mg/L, Oil & Grease in mg/L, Electrical Conductivity (EC) in µS/cm

6.3 Surface Water Results Summary

Controlled discharge undertaken from Dam 2 throughout December were compliant with the EPL.

The monthly water monitoring was conducted on the 1 December.

7. GROUNDWATER MONITORING

Groundwater monitoring is undertaken to meet the *EA Statement of Commitments* (Appendix 6, PA 09_0175) and Section 8.2 Water Management Plan (SLR, 2015). Groundwater levels are monitored quarterly and water quality biannually at four groundwater monitoring bores (piezometers). Details of this monitoring program is shown in **Table 20**. Refer to Appendix 1 for piezometer locations.

Table 20 Groundwater Monitoring Program

Piezometer	Location	Water Level monitoring frequency	Water Quality monitoring frequency
[1]BH205	Lot 13/DP1024564	Quarterly	Biannually
[2]BH207	Lot 13/DP1024564	Quarterly	Biannually
BH208	Lot 21/DP1024341	Quarterly	Biannually
BH303	Lot 21/DP1024341	Quarterly	Biannually

Note: 1. Piezometer BH205 was relocated approximately 30m to the west on 13 March 2017
2. Piezometer BH207 was relocated approximately 60m to the north on 26 September 2016.

7.1 Groundwater Levels

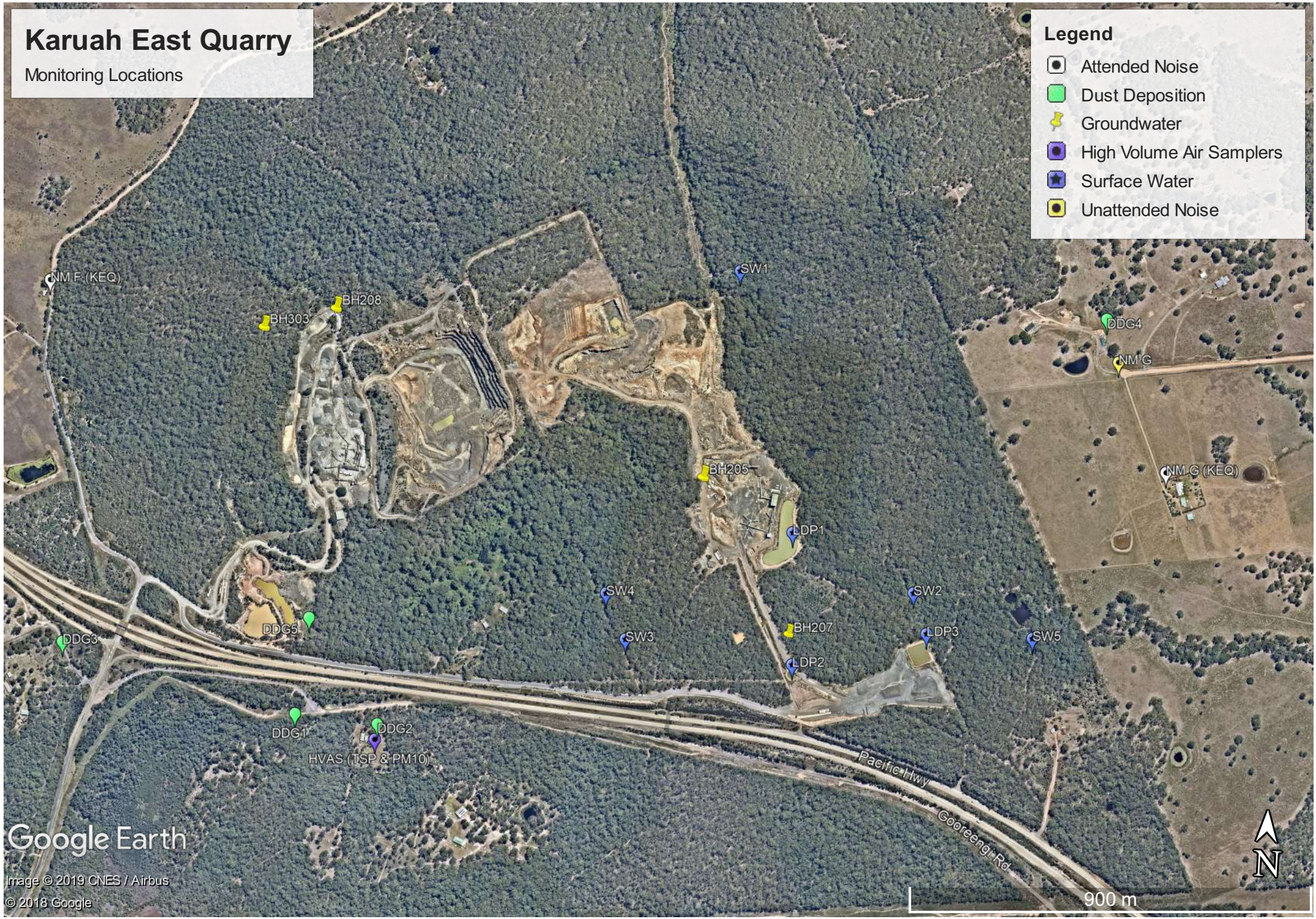
Table 21 Groundwater Levels

Date	Unit	[2]BH205	[3]BH207	BH208	BH303
17/01/2018	[1]metres	21.98	9.12	20.27	30.67
18/04/2018	[1]metres	21.69	9.20	20.47	30.80
26/07/2018	[1]metres	20.46	8.89	20.49	30.86
31/10/2018	[1]metres	20.40	9.30	19.98	30.80
18/01/2019	[1]metres	20.11	9.21	20.44	30.96
30/04/2019	[1]metres	20.30	9.20	20.45	30.61
23/07/2019	[1]metres	19.68	9.08	20.57	31.09
30/10/2019	[1]metres	18.6	8.23	20.55	30.70
14/01/2020	[1]metres	19.95	9.25	20.71	31.20
14/04/2020	[1]metres	18.37	8.3	20.59	30.40
27/07/2020	[1]metres	18.18	8.34	20.74	31.21
1/10/2020	[1]metres	16.66	7.7	20.7	30.87

Note: 1. Groundwater levels are measured in metres below ground level.

APPENDIX 1

Monitoring Locations


Karuah East Quarry
Monitoring Locations
Legend
Attended Noise
Dust Deposition
Groundwater
High Volume Air Samplers
Surface Water
Unattended Noise
NM F (KEQ)
BH208
BH303
SW1
DDG4
NM G
NM G (KEQ)
BH205
LDP1
SW4
SW2
DDG5
DDG3
SW3
BH207
LDP3
SW5
LDP2
DDG1
DDG2
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900 m