



Karuah East Quarry

Monthly Environmental Monitoring Report

October 2016

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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.

A summary of the environmental data for October 2016 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	⁴Criterion
Total suspended particulates (TSP)	Annual	¹ 90 µg/m ³
Particulate matter < 10 µm (PM10)	Annual	¹ 30 µg/m ³

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

Pollutant	Averaging period	⁴Criterion
Particulate matter < 10 µm (PM10)	Daily	¹ 50 µg/m ³

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/m ² /month	¹ 4 g/m ² /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.

Dust deposition and TSP/PM₁₀ 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	Location	Address	GPS Coordinates
DDG 1	South-East of Karuah East Quarry	5760 Pacific Hwy, Karuah NSW 2324	32°38'04"S 151°59'58"E
DDG 2	South-East of Karuah East Quarry	5770 Pacific Hwy, Karuah NSW 2324	32°38'02"S 152°00'09"E
DDG 3	East of Karuah East Quarry	DP 1024341, Karuah	32°37'57"S 151°59'41"E
DDG 4	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	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)	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 monitoring has been undertaken. Dust monitoring commenced at site DDG5 on 31 August 2016. Dust deposition results for this month 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
8/1/2016 to 8/2/2016	1.4	0.9	1.1	1.2	-
8/2/2016 to 3/3/2016	4.0	0.7	0.6	0.9	-
3/3/2016 to 4/4/2016	3.1	0.3	1.0	2.0	-
4/4/2016 to 6/5/2016	1.5	1.1	0.4	3.2	-
6/5/2016 to 3/6/2016	1.0	0.9	0.7	0.4	-
3/6/2016 to 4/7/2016	0.4	1.6	0.5	0.3	-
4/7/2016 to 1/8/2016	1.4	0.7	0.3	0.5	-
1/8/2016 to 31/8/2016	2.7	3.0	0.8	0.7	-
31/8/2016 to 28/9/2016	2.1	1.6	0.8	0.8	0.9
28/9/2016 to 26/10/2016	0.8	0.6	0.8	0.5	0.7
Rolling Annual Average	1.8	1.1	0.7	1.1	0.8

Monitoring results indicate that the insoluble solid levels recorded at DDG1 to DDG5 monitoring locations were at or below the project criterion of 4 g/m²/month.

2.2 High Volume Air Sampling Results

The monthly results for TSP and PM10 are shown in **Table 7**.

Table 7 High Volume Air Sampling ($\mu\text{g}/\text{m}^3$) results

Date	HVAS TSP ($\mu\text{g}/\text{m}^3$)	HVAS PM10 ($\mu\text{g}/\text{m}^3$)
29/04/2016	23	18
05/05/2016	20	18
11/05/2016	17	8
17/05/2016	25	19
23/05/2016	35	20
29/05/2016	11	5
04/06/2016	9	8
10/06/2016	11	4
16/06/2016	10	8
22/06/2016	11	4
28/06/2016	11	6
04/07/2016	20	5
10/07/2016	10	6
16/07/2016	10	8
22/07/2016	14	7
28/07/2016	9	5
03/08/2016	27	14
09/08/2016	11	6
15/08/2016	18	12
21/08/2016	10	5
27/08/2016	9	4
02/09/2016	11	7
08/09/2016	15	8
14/09/2016	11	6
20/09/2016	16	9
26/09/2016	<i>Breakdown</i>	<i>Breakdown</i>
02/10/2016	18	7
08/10/2016	35	21
14/10/2016	12	8
20/10/2016	19	11
26/10/2016	21	12
¹24hr Max Criteria	N/A	50
Report Average	21.0	11.8
Year-to-date Average	16.0	9.3
¹Annual Average Criteria	90	30

Note ¹: Maximum criteria as specified in PA 09_0175

Monitoring results indicate that the 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 the blasting results is shown in **Table 9**. As of 31 October 2016, blasting has not occurred at Karuah East Quarry.

Table 9 Blast Monitoring Results

Date and time	Overpressure and vibration
<i>No blasting conducted during October 2016</i>	

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 the development 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.

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. Appendix 1 illustrates the monitoring locations.
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:

- Monitoring location and serial number of the noise logger;
- Date, start time, Wind velocity (m/s) and Temperature (°C) at the measurement location; and
- Typical maximum (LA_{max}) 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)
		LA _{max}	LA1	LA10	LA90	LA _{eq}	
F Lot 50 DP 103	<i>Attended noise monitoring was not conducted during October 2016</i>						
G Lot 3 DP 1032636							

4.2 Unattended Continuous Monitoring Results

Table 13 Unattended Continuous Noise Monitoring Results

INP Period	Units	LA1	LA10	LA90	LAeq
Location G					
Daytime during Operational Hours ¹	dBA	<u>Unattended noise monitoring was not conducted during October 2016</u>			
Daytime outside Operational Hours ²	dBA				
Evening ³	dBA				
Night ⁴	dBA				

- Note:**
1. Daytime - 7.00 am to 5.00 pm Monday to Friday, 8.00 am to 12.00 pm Saturday, not operational on Sunday.
 2. Daytime - 5.00 pm to 6.00 pm Monday to Friday, 12.00 pm to 6.00 pm Saturday, 8.00 am to 6.00 pm Sunday.
 3. Evening - 6.00 pm to 10.00 pm.
 4. Night - 10.00 pm to 7.00 am Monday to Saturday, 10.00 pm to 8.00 am Sunday.

5. 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 *EA 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.

5.1 Discharge Monitoring Results

Table 14 summarises the discharge criteria as per EPL.

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
	Turbidity	NTU	-

Table 15 Surface Water Discharge Monitoring Results

Sampling Point	Date	Time	pH (pH units)	TSS (mg/L)	Oil & Grease (mg/L)	Turbidity (NTU)
LDP001 (Dam 1)	<i>No discharge during October 2016</i>					
LDP002 (Dam 2)						
LDP002 (Dam 3)						

5.2 Monthly Monitoring Results

Table 16 Surface Water Monthly Monitoring Results

	Unit	LDP001 Dam 1	SW2 Bulga Creek ¹	EPL & ANZECC Guidelines ²
Date Sampled	-	19/10/2016	19/10/2016	
pH (Lab)	pH unit	5.57	5.84	6.5 - 8.5 (EPL)
Total Suspended Solids	mg/L	96	7	40 (EPL)
Total Dissolved Solids	mg/L	1150	160	-
Conductivity (Lab)	µS/cm	317	172	125-2200
Nitrogen (Nitrate)	mg/L	<0.005	0.005	0.35
Total Phosphorous	mg/L	0.12	<0.01	0.025
Ammonia	mg/L	0.019	0.022	0.02
Oil and Grease	mg/L	<5	<5	5 (EPL)
Calcium	mg/L	0.7	3.0	-
Magnesium	mg/L	4.5	3.8	0.0034
Sodium	mg/L	48	19	-
Potassium	mg/L	1.8	3.5	-
Total Hardness (as CaCO ₃)	mg/L	20	23	-
Arsenic	mg/L	0.005	<0.001	0.0002
Cadmium	mg/L	<0.0001	<0.0001	0.0002
Chromium	mg/L	0.008	0.001	0.001
Copper	mg/L	0.003	0.001	0.0014
Nickel	mg/L	0.001	<0.001	0.011
Lead	mg/L	0.0012	0.001	0.0034
Manganese	mg/L	0.046	0.076	1.9
Vanadium	mg/L	0.029	0.005	-
Zinc	mg/L	0.077	0.048	0.08

Note: 1. Water was present at SW2 but creek was not in flow at time of sampling.
2. Key default trigger values presented in ANZECC 2000 for slightly disturbed upland rivers in NSW. Heavy metals based on hard water (120-179 mgCaCO₃/L).

5.3 Surface Water Results Summary

The pH values at LDP001 and SW2 were below the EPL limit for discharge (6.5-8.5). The Total Suspended Solids (TSS) at LDP001 were higher than the EPL limit for discharge (40mg/L).

The TSS value at LDP001 was below 5mg/L in July and August 2016. The sudden increase in the TSS value for October 2016 was the result of construction works on Dam 1 during September and October 2016. As shown by previous sampling results, pH levels of surface water surrounding Karuah East Quarry is naturally low. As there was no discharge in October 2016, compliance under the EPL was met.

6. 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 16**. Refer to Appendix 1 for piezometer locations.

Table 17 Groundwater Monitoring Program

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

Note ¹: Piezometer BH207 was relocated approximately 60m to the north on 26 September 2016.

6.1 Groundwater Levels

Table 18 Groundwater Levels

Date	Unit	BH205	² BH207	BH208	BH303
30/03/2016	¹ metres	22.83	12.38	19.54	29.93
04/10/2016	¹ metres	24.00	9.61	19.77	30.45

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

Note ²: Piezometer BH207 relocated 26 September 2016.

6.2 Groundwater Quality

The groundwater quality was tested on 4 October 2016 as part of the biannual monitoring program. Results are shown in Table 18 below.

Table 19 Groundwater Quality

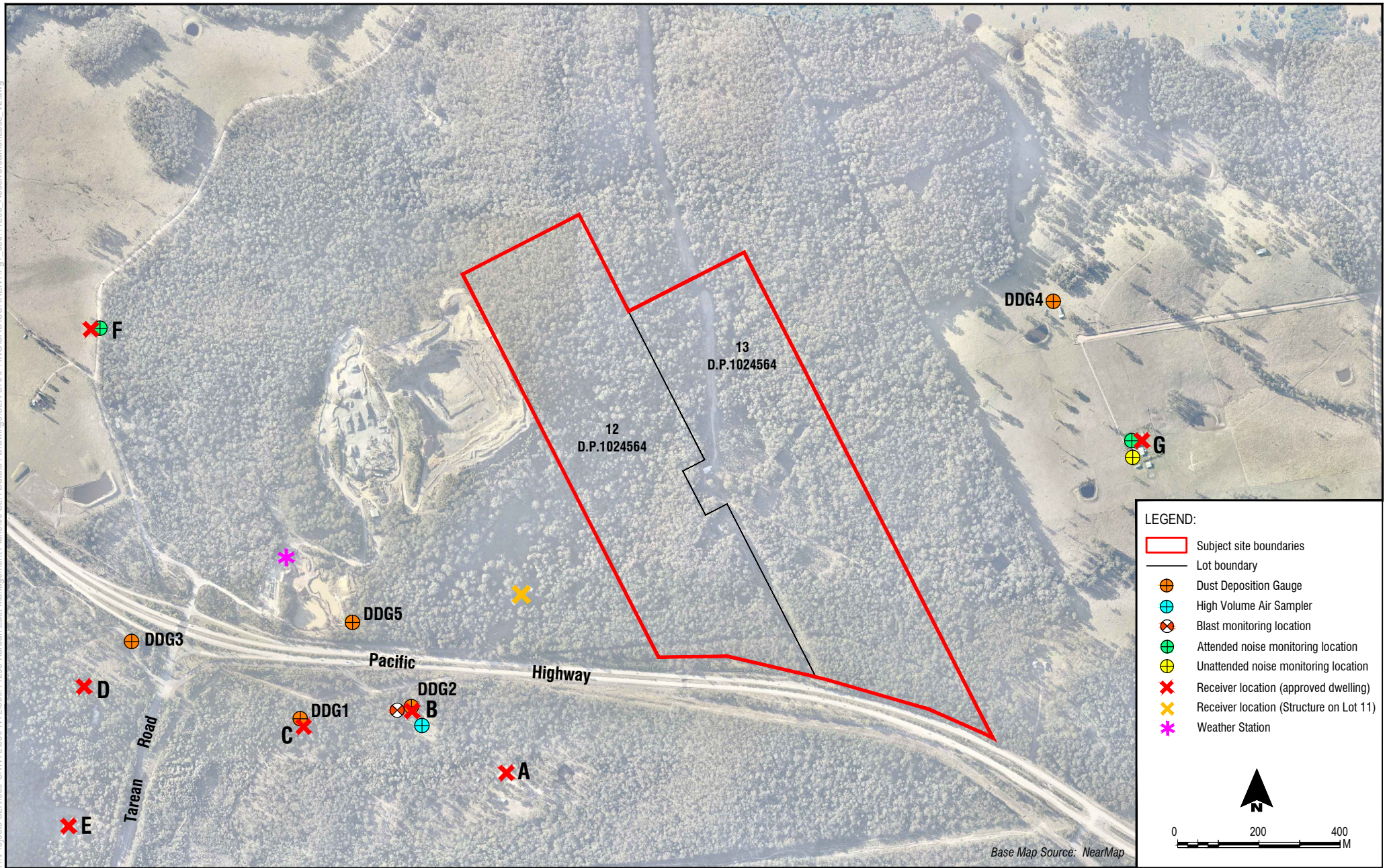
ANALYSIS	UNITS	BH205	¹ BH207	BH208	BH303
Date Sampled	-	04/10/2016	04/10/2016	04/10/2016	04/10/2016
pH Value	pH unit	7.7	7.4	6.4	6.7
Conductivity	µS/cm	1800	3200	3300	1400
Total Dissolved Solids	mg/L	940	1700	2000	710
<i>BTEX</i>					
Benzene	µg/L	<1	<1	<1	<1
Toluene	µg/L	<1	<1	<1	<1
Ethylbenzene	µg/L	<1	<1	<1	<1
m/p-xylene	µg/L	<2	<2	<2	<2
o-xylene	µg/L	<1	<1	<1	<1
Total Xylenes	µg/L	<3	<3	<3	<3
<i>Total Recoverable Hydrocarbons (1999 NEPM Fractions)</i>					
TRH C6-C9	µg/L	<20	<20	<20	<20
TRH C10-C14	µg/L	<50	<50	<50	<50
TRH C15-C28	µg/L	<100	<100	<100	1000
TRH C29-C36	µg/L	<100	<100	<100	<100
TRH C10-C36 (Total)	µg/L	<100	<100	<100	1000
<i>Anions</i>					
Chloride	mg/L	360	780	720	370
Sulphate (as S)	mg/L	31	25	98	13
<i>Nitrogen and Phosphorous</i>					
Nitrate & Nitrite (as N)	mg/L	<0.05	<0.05	3.9	<0.05
Total Alkalinity (as CaCO ₃)	mg/L	360	220	77	120
Total Kjeldahl Nitrogen	mg/L	1.0	<0.2	1.0	<0.2
Total Nitrogen (calc)	mg/L	1.0	<0.2	4.9	<0.2
Total Phosphate (as P)	mg/L	0.25	0.36	0.51	0.10
<i>Metals</i>					
Calcium, Ca	mg/L	62	32	42	13
Magnesium, Mg	mg/L	31	48	58	21
Sodium, Na	mg/L	220	490	510	200
Potassium, K	mg/L	7.2	6.5	19	7.8

Note ¹: Piezometer BH207 relocated 26 September 2016.

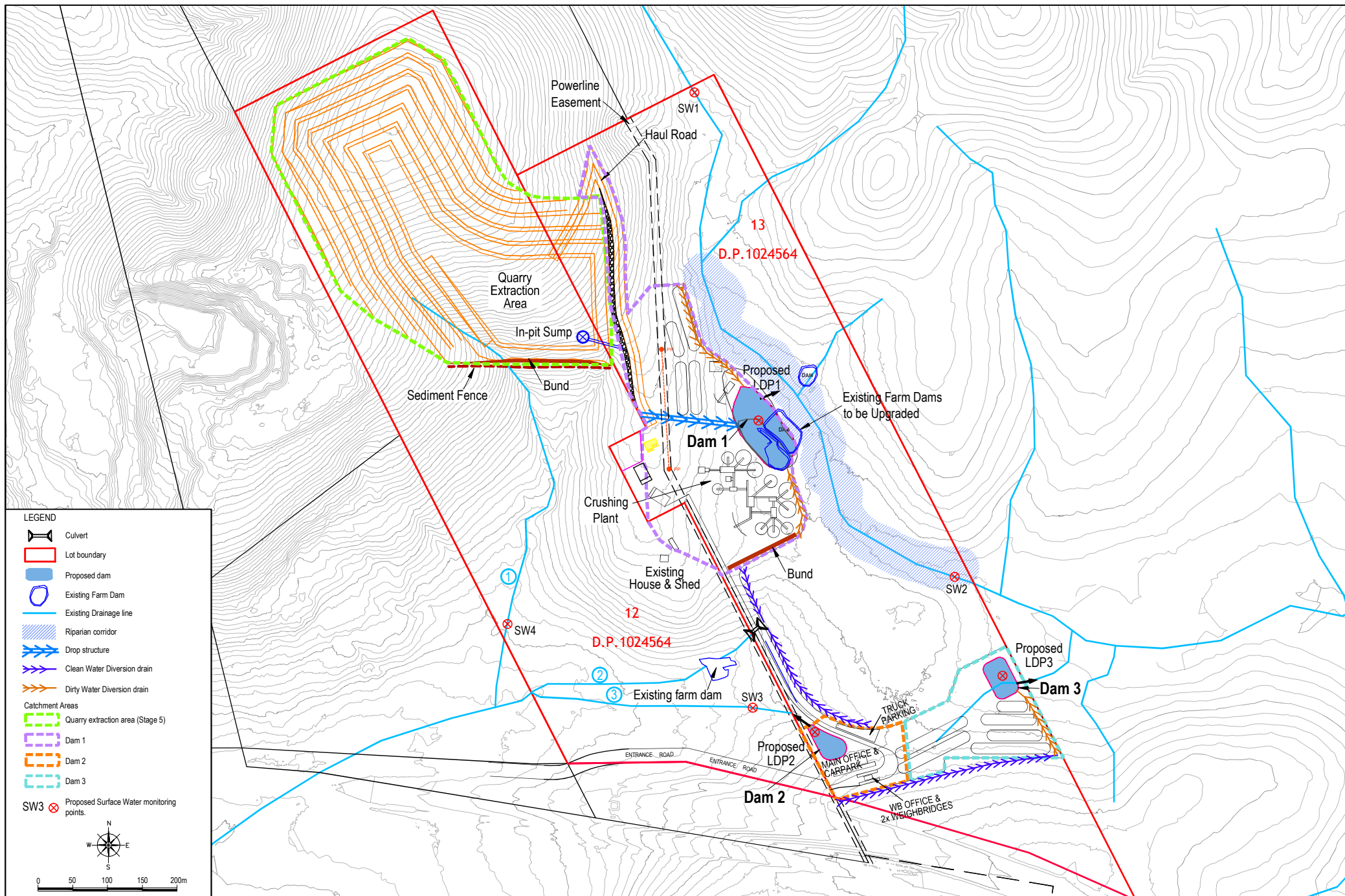
APPENDIX 1

Monitoring Locations

H:\Projects\SLR\630-SvNTL\630-NTL\630-11235 Karuah East Management Plans\06 SLR Data\01 Drawings\SLR DRAFTING\CAD\CURRENT\Fig1_630_11235 Receivers&MonLocs_V2.dwg



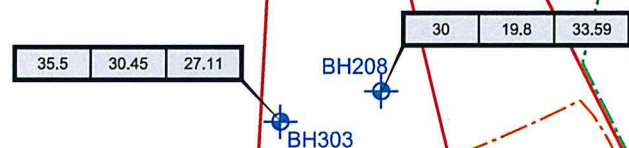
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To be printed A3

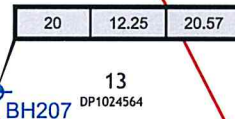
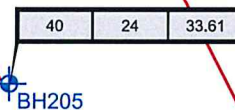
Proposed Surface Water Management Plan

FIGURE 4



5
DP838128

4
DP828128



201
DP1042537

21
DP1024341

11
DP1024564

12
DP1024564

14
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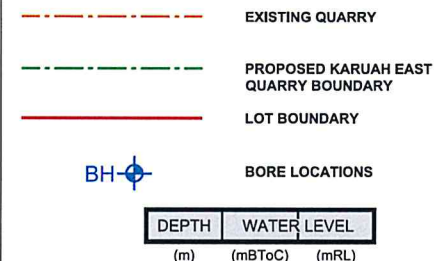
18
DP1024564

19
DP1024564

27
DP1024341

PACIFIC HIGHWAY

LEGEND



drawn	LZ
approved	MB
date	18.08.11
scale	1:12,000
original size	A4

coffey 
geotechnics
SPECIALISTS MANAGING
THE EARTH

client:	KARUAH EAST QUARRY PTY LTD	
project:	PROPOSED KARUAH EAST HARD ROCK QUARRY GROUNDWATER STUDY	
title:	GROUNDWATER BORE LOCATIONS AND MONITORING DATA	
project no:	GEOTWARA21232AA-AG	figure no: FIGURE 3.1