Karuah East Quarry

Monthly Environmental Monitoring Report

May 2016

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TABLES

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.

Construction of the Karuah East Quarry commenced on 27 April 2016. This is the first monthly report for Karuah East Quarry. A summary of the environmental data for March to May 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	[4]Criterion
Total suspended particulates (TSP)	Annual	[1]90 µg/m³
Particulate matter < 10 µm (PM10)	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 (PM10)	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.

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	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
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 deposition dust gauge 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
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**
Rolling Annual Average	2.2	0.8	0.8	1.5

Monitoring results indicate that the insoluble solid levels recorded at DDG1 to DDG4 monitoring locations were at or below the project criterion of 4 g/m^2/month.

2.2 High Volume Air Sampling Results

High volume air sampling was undertaken in the period between 29/4/2016 to 29/5/2016. The monthly results for TSP and PM10 are shown in **Table 7**.

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

Date	HVAS TSP (µg/m³)	HVAS PM10 (µg/m³)
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
[1]24hr Max Criteria	**N/A**	**50**
Report Average	21.8	14.7
Year-to-date Average	21.8	14.7
[1]Annual 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 criteria.

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 May 2016, blasting has not occurred at Karuah East Quarry.

Table 9 Blast Monitoring Results

Date and time	Overpressure and vibration
No blasting during March – May 2016	

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 Nose 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:

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

b) Date, start time, Wind velocity (m/s) and Temperature (°C) 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 ?Pa)					Description of Noise Emissions and Typical Maximum Noise Levels (dBA)
		LAmax	LA1	LA10	LA90	LAeq	
F Lot 50 DP 103	29/04/2016 1:59 pm W = 1m/s NW Temp = 25.6°C	73	61	49	43	50	Local road traffic 71 to 73 dBA Pacific Highway 47 to 52 dBA Frogs 48 dBA Dog Barking 48 to 50 dBA Birds 40 dBA Insect 38 dBA Hunter Quarry 34 dBA Karuah East Project not audible
		Contribution not measurable above background noise.					
G Lot 3 DP 1032636	29/04/2016 2:26 pm W = 1m/s NW Temp = 25.6°C	56	49	41	35	39	Chainsaw (not project related) 40dBA Insects 36 to 40 dBA Aircraft 42 dBA Birds 52 to 56 dBA Distant Road Traffic Noise 35 dBA Karuah East Project not audible
		Contribution not measurable above background noise.					

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	*Unattended noise monitoring was not conducted during March – May 2016*			
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 10.00 pm.

4. Night - 10.00 pm to 7.00 am pm Monday to Saturday, 10.00 pm to 8.00 am Sunday.

4.3 Noise Result Summary

Operator-attended noise monitoring was conducted on the 29 April 2016 to coincide with the beginning of construction. Unattended monitoring was not required. Noise contribution from the Karuah East Quarry project was not audible above the background noise during the attended noise survey.

5. SURFACE WATER MONITORING

Condition M2 of the EPL outlines the requirement to monitor surface water discharges from the 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.

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
[1]LDP001 (Dam 1)	pH	pH units	6.5 – 8.5
[2]LDP002 (Dam 2)	TSS	mg/L	5
[2]LDP003 (Dam 3)	Oil & Grease	mg/L	40
	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)	*No discharge during March – May 2016*					
LDP002 (Dam 2)	*Dam 2 and Dam 3 have not been constructed*					
LDP002 (Dam 3)						

5.2 Monthly Monitoring Results

Summary for the monthly surface water monitoring is shown in **Table 16**. Sampling was not conducted during the period of March to May 2016. Creeks were dry during this period.

Table 16 Surface Water Monthly Monitoring Results

	Unit	LDP001	LDP002	LDP003	[1]SW1	[1]SW2	[1]SW3	[1]SW4
Sampling was not conducted during March to May 2016								

Note [1]: Sampling at SW1 to SW4 is undertaken when there is flow.

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 17**. 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
BH207	Lot 13/DP1024564	Quarterly	Biannually
BH208	Lot 21/DP1024341	Quarterly	Biannually
BH303	Lot 21/DP1024341	Quarterly	Biannually

6.1 Groundwater Levels

Table 18 Groundwater Levels

Date	Unit	BH207	BH205	BH208	BH303
30/03/2016	[1]metres	12.38	22.83	19.54	29.93

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

6.2 Groundwater Quality

Groundwater was sampled on 30 March 2016. Results shown in **Table 19**.

Table 19 Groundwater Quality

ANALYSIS	UNITS	BH207	BH205	BH208	BH303
Date Sampled	-	30/03/2016	30/03/2016	30/03/2016	30/03/2016
pH Value	pH unit	6.42	6.95	6.33	6.08
Conductivity	µS/cm	2360	2230	2720	1711
Total Dissolved Solids	mg/L	1456	1424	Inappropriate sample for analysis	1069
BTEX					
Benzene	µg/L	<0.5	<0.5	<0.5	<0.5
Toluene	µg/L	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	µg/L	<0.5	<0.5	<0.5	<0.5
m/p-xylene	µg/L	<1	<1	<1	<1
o-xylene	µg/L	<0.5	<0.5	<0.5	<0.5
Total Xylenes	µg/L	<1.5	<1.5	<1.5	<1.5

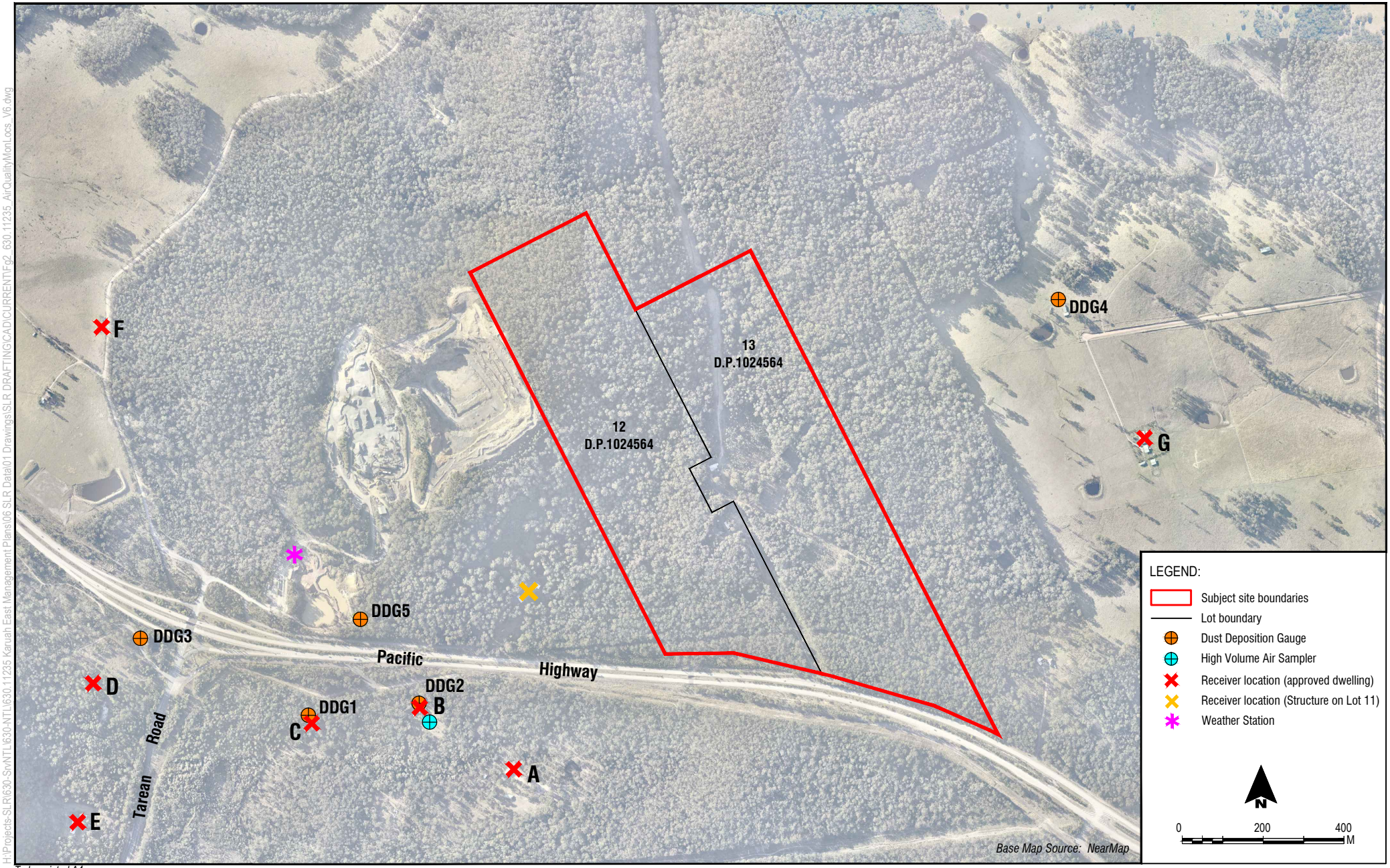
Total BTEX	µg/L	<3	<3	<3	<3
Total Recoverable Hydrocarbons					
TRH C6-C9	µg/L	<40	<40	<40	<40
TRH C10-C14	µg/L	<50	<50	<500	<50
TRH C15-C28	µg/L	<200	530	<2000	1400
TRH C29-C36	µg/L	<200	<200	<2000	<200
TRH C37-C40	µg/L	<200	<200	<2000	<200
Polynuclear Aromatic Hydrocarbons					
Naphthalene	µg/L	<0.1	<0.1	<1	<0.1
2-methylnaphthalene	µg/L	<0.1	<0.1	<1	<0.1
1-methylnaphthalene	µg/L	<0.1	<0.1	<1	<0.1
Acenaphthylene	µg/L	<0.1	<0.1	<1	<0.1
Acenaphthene	µg/L	<0.1	<0.1	<1	<0.1
Fluorene	µg/L	<0.1	<0.1	<1	<0.1
Phenanthrene	µg/L	<0.1	<0.1	<1	<0.1
Anthracene	µg/L	<0.1	<0.1	<1	<0.1
Fluoranthene	µg/L	<0.1	<0.1	<1	<0.1
Pyrene	µg/L	<0.1	<0.1	<1	<0.1
Benzo(a)anthracene	µg/L	<0.1	<0.1	<1	<0.1
Chrysene	µg/L	<0.1	<0.1	<1	<0.1
Benzo(b&j)fluoranthene	µg/L	<0.1	<0.1	<1	<0.1
Benzo(k)fluoranthene	µg/L	<0.1	<0.1	<1	<0.1
Benzo(a)pyrene	µg/L	<0.1	<0.1	<1	<0.1
Indeno(1,2,3-cd)pyrene	µg/L	<0.1	<0.1	<1	<0.1
Dibenzo(ah)anthracene	µg/L	<0.1	<0.1	<1	<0.1
Benzo(ghi)perylene	µg/L	<0.1	<0.1	<1	<0.1
Total PAH (18)	µg/L	<1	<1	<10	<1
OP Pesticides					
Dichlorvos	µg/L	<0.5	<0.5	<5	<0.5
Dimethoate	µg/L	<0.5	<0.5	<5	<0.5
Diazinon (Dimpylate)	µg/L	<0.5	<0.5	<5	<0.5
Fenitrothion	µg/L	<0.2	<0.2	<2	<0.2
Malathion	µg/L	<0.2	<0.2	<2	<0.2
Chlorpyrifos (Chlorpyrifos Ethyl)	µg/L	<0.2	<0.2	<2	<0.2
Parathion-ethyl (Parathion)	µg/L	<0.2	<0.2	<2	<0.2
Bromophos Ethyl	µg/L	<0.2	<0.2	<2	<0.2
Methidathion	µg/L	<0.5	<0.5	<5	<0.5
Ethion	µg/L	<0.2	<0.2	<2	<0.2
Azinphos-methyl	µg/L	<0.2	<0.2	<2	<0.2
Dichlorvos	µg/L	<0.5	<0.5	<5	<0.5
Acid Herbicides					
Dicamba	µg/L	<0.5	<0.5	<5	<0.5

MCPP (Mecoprop)	µg/L	<0.5	<0.5	<5	<0.5
MCPA	µg/L	<0.5	<0.5	<5	<0.5
Dichlorprop (2,4-DP)	µg/L	<0.5	<0.5	<5	<0.5
2,4-D	µg/L	<0.5	<0.5	<5	<0.5
2,4,5-TP (Silvex, Fenopop)	µg/L	<0.5	<0.5	<5	<0.5
2,4,5-T	µg/L	<0.5	<0.5	<5	<0.5
Dinoseb (Dinitrobutylphenol)	µg/L	<0.5	<0.5	<5	<0.5
2,6-D	µg/L	<0.5	<0.5	<5	<0.5
2,4,6-trichlorophenoxyacetic acid	µg/L	<0.5	<0.5	<5	<0.5
Bromoxynil	µg/L	<0.5	<0.5	<5	<0.5
4-chlorophenoxy acetic acid (4-CPA)	µg/L	<1	<1	<10	<1
Clopyralid	µg/L	<0.5	<0.5	<5	<0.5
Fluroxypyr	µg/L	<0.5	<0.5	<5	<0.5
Ioxynil	µg/L	<1	<1	<10	<1
MCPB	µg/L	<1	<1	<10	<1
Triclopyr	µg/L	<0.5	<0.5	<5	<0.5
2,4-DB	µg/L	<0.5	<0.5	<5	<0.5
Picloram	µg/L	<1	<1	<10	<1
Anions					
Chloride	mg/L	680	910	830	400
Sulphate, SO4	mg/L	68	100	310	25
Nitrogen and Phosphorous					
Nitrate Nitrogen, NO3-N	mg/L	0.01	0.027	4	0.027
Total Alkalinity as CaCO3	mg/L	<5	300	64	100
Nitrite Nitrogen, NO2 as N	mg/L	0.012	0.007	<0.005	0.005
Total Oxidised Nitrogen, NOx-N	mg/L	0.023	0.035	4	0.032
Total Kjeldahl Nitrogen	mg/L	6.8	49	6	8.5
Total Nitrogen (calc)	mg/L	6.8	49	10	8.6
Organic Nitrogen (calc)	mg/L	6.8	47	6	8.5
Total Phosphorus (Kjeldahl Digestion)	mg/L	8.1	5.5	2.3	0.64
Filterable Reactive Phosphorus	mg/L	0.13	0.12	0.25	0.086
Ammonia Nitrogen	mg/L	0.013	1.4	0.071	0.047
Metals					
Calcium, Ca	mg/L	31	71	45	21
Magnesium, Mg	mg/L	38	40	44	21
Sodium, Na	mg/L	460	350	590	270
Potassium, K	mg/L	2	2.7	3.2	5.5
Total Hardness by Calculation	mg CaCO3/L	230	340	290	140
Arsenic, As	µg/L	<1	<1	<1	1
Cadmium, Cd	µg/L	0.1	<0.1	0.2	<0.1

Chromium, Cr	µg/L	<1	<1	<1	<1
Copper, Cu	µg/L	<1	<1	3	<1
Lead, Pb	µg/L	<1	<1	<1	<1
Nickel, Ni	µg/L	1	<1	19	2
Zinc, Zn	µg/L	11	<5	47	10
Manganese, Mn	µg/L	480	680	30	420
Iron, Fe	µg/L	280	16	8	96
Mercury	mg/L	<0.0001	<0.0001	<0.0001	<0.0001
Total Iron	µg/L	5800	25000	160000	17000

APPENDIX 1

Monitoring Locations



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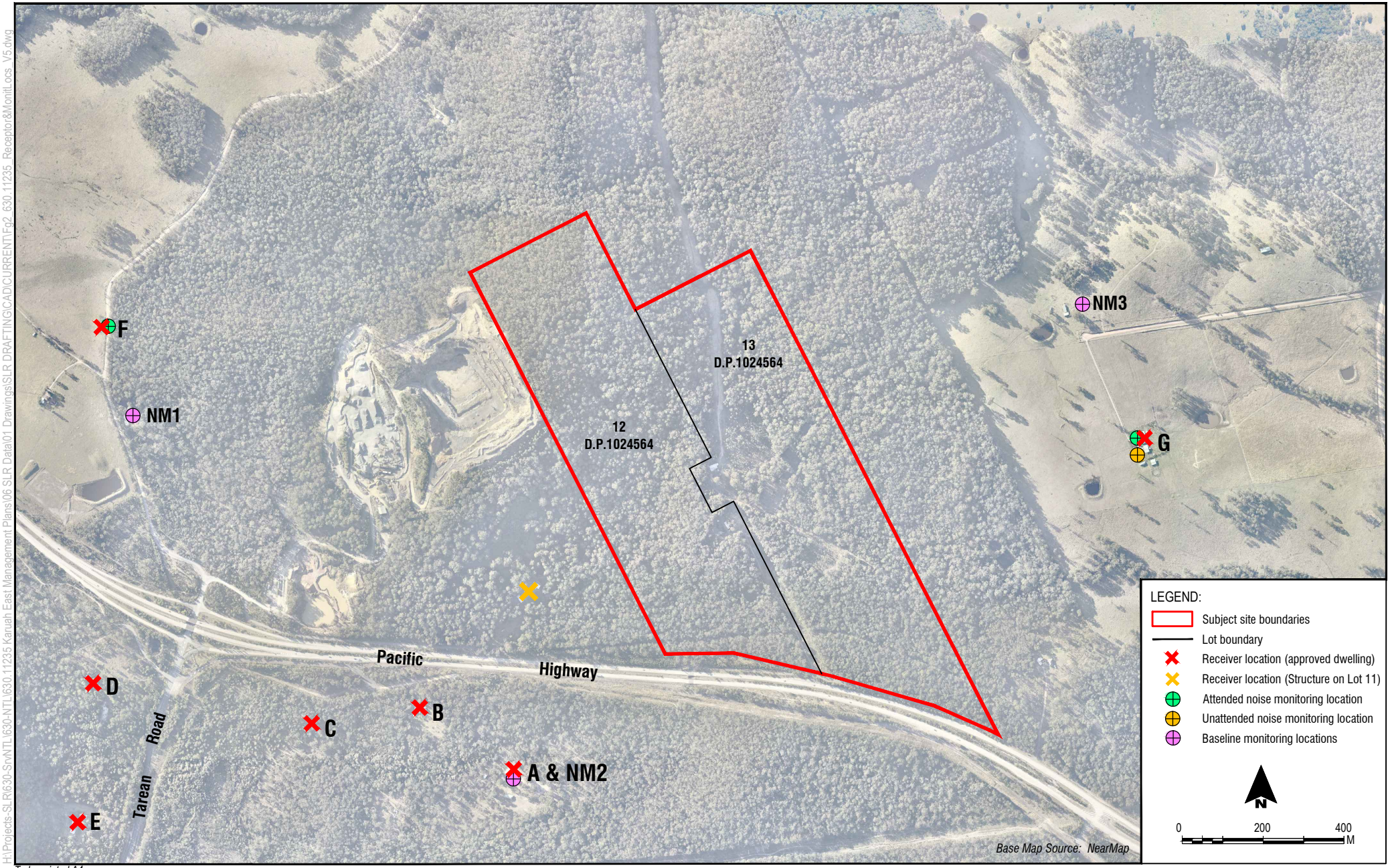
Karuah East Quarry - Sensitive Receivers and Air Quality Monitoring Locations

FIGURE 2



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Karuah East Quarry - Sensitive Receivers and Monitoring Locations

FIGURE 2

Powerline Easement
SW1
Haul Road
13
D.P.1024564
Quarry Extraction Area
In-pit Sump
Sediment Fence
Bund
Proposed LDP1
DAM
Existing Farm Dams to be Upgraded
Dam 1
Crushing Plant
Existing House & Shed
Bund
SW2
1
SW4
12
D.P.1024564
2
3
Existing farm dam
SW3
Proposed LDP3
Dam 3
TRUCK PARKING
Proposed LDP2
ENTRANCE ROAD
ENTRANCE ROAD
MAIN OFFICE & CARPARK
Dam 2
WB OFFICE & 2x WEIGHBRIDGES

LEGEND

- Culvert
- Lot boundary
- Proposed dam
- Existing Farm Dam
- Existing Drainage line
- Riparian corridor
- Drop structure
- Clean Water Diversion drain
- Dirty Water Diversion drain

Catchment Areas

- Quarry extraction area (Stage 5)
- Dam 1
- Dam 2
- Dam 3

SW3 ⊗ Proposed Surface Water monitoring points.

N
W
E
S

0 50 100 150 200m

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Proposed Surface Water Management Plan

FIGURE 4

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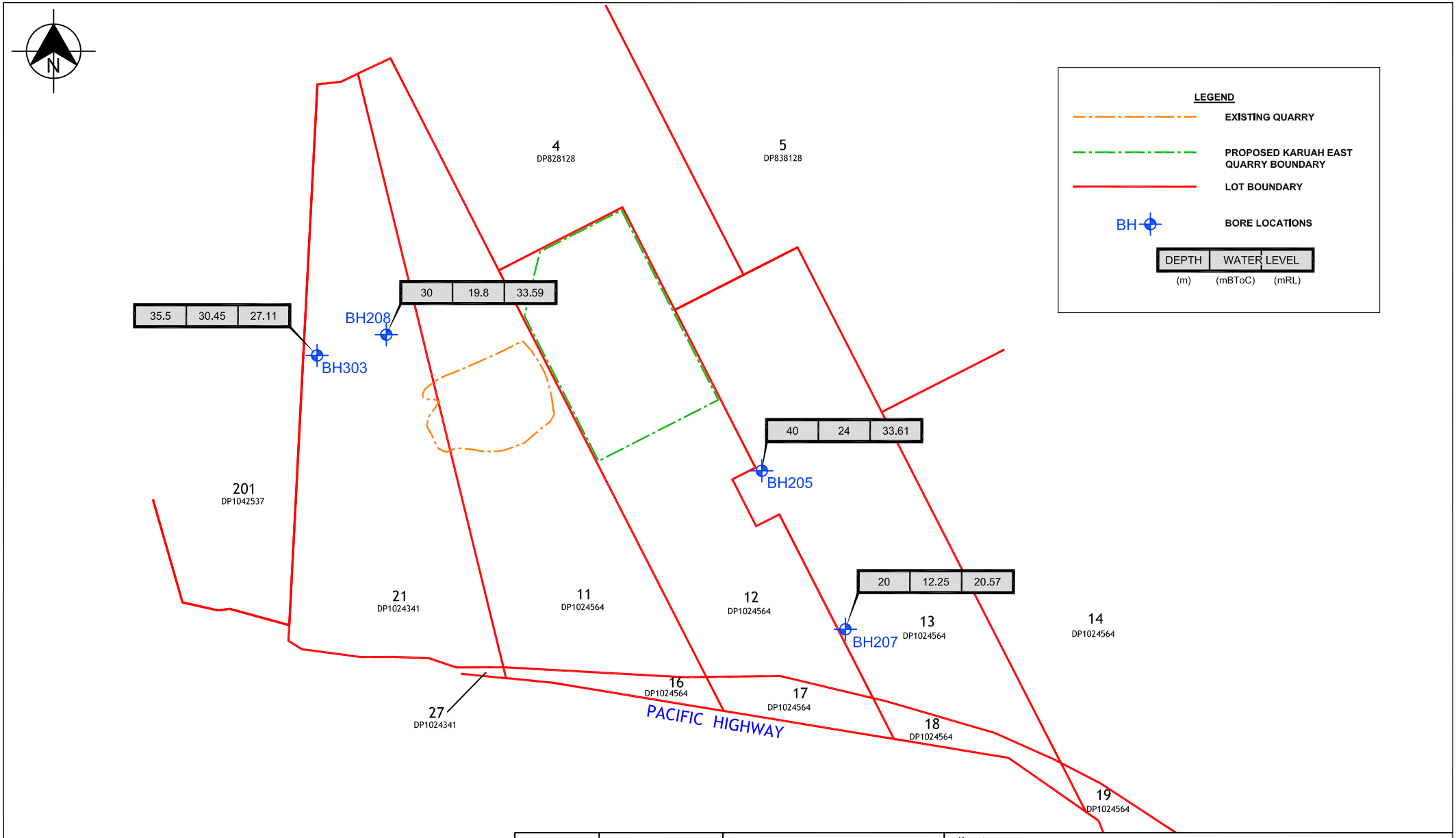

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approved	MB
date	18.08.11
scale	1:12,000
original size	A4

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