

27 July 2017

Lismore City Council PO Box 1138 Lismore NSW 2480

Attention: Greg Buckler

Dear Greg,

Re: Proposed quarrying of cap rock in southern pit, and potential effect on groundwater

Further to our recent correspondence, Gilbert and Sutherland (G&S) has reviewed the proposed quarrying of cap rock form the southern pit and the potential for that extraction to effect groundwater.

Summary

G&S understand that due to increased demand, Blakebrook Quarry have identified a target for additional extraction to the north of the southern pit and submitted an application for that work. That target is presented below in **Drawing 001**. The target area approaches as close as 85 m to the southern groundwater monitoring cluster, and as such that cluster provides relevant data for the target. The elevation of the target varies from approximately 127.5 mAHD to 132 mAHD, and G&S understand that the top four to six metres of rock are expected to be removed.

Southern groundwater monitoring cluster

Within the southern cluster are three bores (BQS1S, S1I and S1L), each targeting a different water bearing zones. The water bearing zones interflow and are formed of vesicular and fractured basalt and sediments between successive basalt flows which form the ridge on which Blakebrook Quarry is situated. Groundwater has been recorded using down-hole loggers, and that data is retrieved regularly for download by Mat Baker of GDCS.

Brisbane Sydney Melbourne and regions

5/232 Robina Town Centre Drive **Robina** QLD 4230 | PO BOX 4115 Robina QLD 4230 Phone 07 5578 9944 | Email robina@access.gs | **www.access.gs**



To analyse the level data and any potential effects, all heights and depths have been converted to mAHD.

Monitoring Bore	Target water bearing zone	Minimum groundwater level (mAHD)	Maximum groundwater level (mAHD)
BQS1S	shallow	101.55	105.64
BQS1I	intermediate	84.00	84.83
BQS1D	deep	53.59	53.97

The groundwater levels in the southern monitoring cluster can be tabulated as follows:

Table 1: minimum and maximum groundwater levels for the period 6 September 2016 to

 6 June 2017

Conceptual model

A conceptual model has been produced showing three different water bearing zones (shallow, intermediate and deep) and relative pressure head levels. The depths of these water bearing zones were obtained from G&S drilling borelogs whilst the pressure head levels were the maximum groundwater levels shown in Table 1. The location of the conceptual model cross section is shown in Drawing 001 and the model itself presented in Drawing 002.

Conclusions and recommendations

The highest groundwater level in the southern area is that of the shallow water bearing zone at a maximum of 105.64 mAHD, recorded in the period between 6 September 2016 and 6 June 2017. It is understood that extraction will be to a depth of approximately 122mAHD. As such the water bearing zones will not be interfered with by the proposed extraction. Indeed a buffer of greater than 15m will be maintained. The current regime of groundwater monitoring should continue.

We trust this is acceptable. Please do not hesitate to contact this office if you require any further details or elaboration.

Yours faithfully,

Chris Anderson Director/Principal Environmental Engineer/Scientist BEngEnv BScLan&Wat Man MEIANZ MIEAust

David Winterbotham
 Senior Geoscientist
 BSc(Hons)



Attachment 1: Drawings

Author Chris Anderson and David Winterbotham Our Reference 11737_GWA_WSDW4D_072017.DOCX Your Reference By □ Courier ☑ Email □ Facsimile □ Post Enclosures 2



\mathbf{A}	LEGEND	SOURCES		PROJECT		CLIENT		DRAWING
ORIENTATION	Proposed Southern Extraction Pit (ERM 2011)	Image & Proposed Southern Extraction Pit boundary :	Groundwork Plus - 2011 Proposed Extraction Limits drawing (1043.037)	BLAKEBF		LISMORE	-	PROPOSE
SCALE 1:1 600 20 40 60 8 ROBINA metre	Proposed Rock Extraction Area Cross Section A-A'	Proposed Rock Extraction Area:	Lismore City Council - Received by CMA from Greg Buckler via email (19/07/2017)	QUARRY GROUND ASSESSI	WATER	COUNCII	-	EXTRACTI AREA
PO Box 4115 Robina QLD4230 07 5578 994 Email robina@access.gs www.access.g				SCALE 1:1 600@A3	DATE 26/07/2017	DRAWN WPS	CHECKED CMA	PROJECT 11737

DRAWING 001 REVISION

ED ROCK TION



Α



Cross Section Length (m)

	LEGEND	SOURCES	PROJECT	CLIENT	DRAWING
ORIENTATION	Existing Ground Surface Bearing Zone	Surface elevations: ELVIS - Geoscience Australia. Lismore City Council - monitoring well survey data received	BLAKEBROOK	LISMORE CITY	PROPOSED
SCALE AS SHOWN	4 - 6m Proposed Rock Extraction Deep Water Bearing Zone	by CMA from Greg Buckler via email (24/07/2017) Geology and water G&S borelogs. Drilling dates: 23/08/2016 - 25/08/2016	QUARRY GROUNDWATER	COUNCIL	EXTRACTIO CROSS SEC
ROBINA	Basalt	bearing zones: Groundwater levels: GDCS data package 05/07/2017	ASSESSMENTS		
PO Box 4115 Robina QLD4230 07 5578 9944 Email robina@access.gs www.access.gs	Shallow Water Bearing Zone		SCALEDATEAS SHOWN26/07/201	7 WPS CMA	PROJECT D 11737 00

A'





Attachment 2: Borelogs

Department of Form A Particulars of completed work Primary Industries Water

Driller's Licence No	DL2364 1
Class of Licence:	4
Driller's Name:	Cameron Sharp
Assistant Driller:	Darrly Hunt
Contractor:	Gilbert and Sutherland
New bore	Replacement bore
Deepened	Enlarged
Reconditioned	Other (specify)
Final Depth 55	

Work Lice	nce No:	30BL	207399	2
Name of L	icensee:	Lismo	ore City (Council
Intended L	Jse:	Monit	oring	
Completio	n Date:	25/8/	16	
DRILLING	DETAILS	5		3
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Department of Primary Industries

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Form A Particulars of completed work

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GOVERNMEN						Work Lie	cence No:	30BL207	399	
				BOI	RE DEVEL	OPMENT				8
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Driller:	K				Licer	nsee:				

Date:

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Date:

9/16

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Work Licence No:

30BL207399

Page 3

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Form A Particulars of completed work

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	type		depth	Level	rate	pumping	of Test	Water	Time	taken
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					Signatur	es:				
Driller: Date:					License Date:	e:				

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> Work Licence No: 30BL207399

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,,				aquiler material	(Yes/No)	Installec	d Pump detail	S (Yes/No	D)		

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30BL 207399 Driller's Licence No: DL2364 1 Work Licence No: 2 Class of Licence: Lismore City Council 4 Name of Licensee: Driller's Name: Monitorina **Cameron Sharp** Intended Use: 23/8/16 Assistant Driller: **Darrly Hunt** Completion Date: Contractor: DRILLING DETAILS 3 Gilbert and Sutherland Hole Diameter Drilling Method New bore From То Х Replacement bore See Code 3 Deepened (m) (m) (mm)Enlarged 0 102.7 120 9 Reconditioned Other (specify) Final Depth 102.7 m WATER BEARING ZONES 4 Estimated Yield DDL Duration Salinity Test (L/s) (Conductivity or TDS) From То Thickness S W L method at end of test Cond TDS Individual Cumulative (m) Hrs min (m) (m) (m) (m) See Code 4 (µS/cm) (mg/L)Aquifer 39 5 30 0.195 0.195 30 15 300 34 1 Η 72 30 30 15 300 8 0.29 0.485 1 64 Η 30 300 4 30 0.73 1.215 1 Η 15 95 99 5 **CASING / LINER DETAILS** 2 Casing support method See Code 5 OD Wall From То Method Material Thickness Fixina See Code 5 1 Code 5 Type of casing bottom (mm) Code 5 (mm)(m) (m)Centralisers installed (Yes/No) (indicate on sketch) 13 50 0 102.7 No 5 99 Sump installed (Yes/No) Yes From То 103 m m Pressure cemented (Yes/No) No From m То m Casing Protector cemented in place 6 WATER ENTRY DESIGN Slot Details Screen General OD Wall From То Width Alignment Material Opening Fixing Aperture Length Thickness type See Code 6 (mm) (mm) See Code 6 See Code 5 (mm) Code 5 (mm)(mm) (m) (m) 87.7 99.7 0.5 Η 50 5 5 8 7 **GRAVEL PACK** Quantity Grain size Depth (mm) (m) Litres То m³ From From Type Grade Тο 3 82.7 190 0.19 Rounded X Graded X 2 102.7 Crushed Ungraded 0.01 76.7 60 Bentonite/Grout seal (Yes/No) Yes 82.7 Method of placement of Gravel Pack See Code 7 1 For Departmental use only: GW

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				BO	RE DEVEL	OPMENT				8
Chemical u	sed for breaking	down dril	ling mud	(Yes/No)	No	Name:	<u>, and a static space as an a</u>	an a		
Method	Bailing/Surging		etting	Airlifti	na	Backwashing	Pu	umping	Other:	
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Date:

Please submit forms to water.gds@dpi.nsw.gov.au or to the local NSW Office of Water agency

Date:

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Form A Particulars of completed work



Department of Primary Industries Water

Work Licence No: 30BL207399

DRILLER'S ROCK/STRATA DESCRIPTION (LITHOLOGY)										15
Depth		Description					wo	RK CON	요즘 같은 눈감가 많다.	TION
From	То		<u> </u>	See Code 15				SKE	ГСН	
<u>(m)</u>	<u>(m)</u>					<u>1993</u>				
0	5			clay red						
5	8			lay firm brown						
8	66	· · · · · · · · · · · · · · · · · · ·		assalt firm blue						
66	67.5			salt/clay broken						
67.5	102.7		ba	assalt firm blue						
		,					-			
		·								
				, <u>, , , , , , , , , , , , , , , ,</u>						
			· · · · · · · · · · · · · · · · · · ·		A					
			<u></u>							
			WORK NOT	CONSTRUCTED	BY DRILLING	RIG				16
Method of excavation: Hand dug Back hoe Dragline Dozer					Other					
Depth	Length	Width	Diameter	Lining	Dimentions			Depth		Depth
(m)	(m)	(m)	(m)	material	liner (m))	(<u>m)</u>	(<u>m)</u>
										<u>.</u>
			Please attac	h copies of the f	ollowing if ava	ilable				17
Geologist log	(Yes/No)		Laboratory analys	is of water Sample	(Yes/No) Yes	Pumpi	ng test(s)	(Yes	/No)]
Geophysical lo	D g (Yes/No)		Sieve analysis of	aquifer material	(Yes/No)	Installe	ed Pump o	letails (Yes	/No)	

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