

PO Box 788 (3/17 Edith Street) INNISFAIL Queensland 4860 AUSTRALIA Phone 617 4061 3103 Fax 617 4061 8094

RL/rl: (15 Mile Groundwater Investigations) Project No. 265 December 2018

SHIRE OF FLINDERS

15-MILE AREA GROUNDWATER INVESTIGATIONS

ADDITIONAL DRILLING AND PUMPING TESTS 2018

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1.0 INTRODUCTION

The Shire of Flinders, centred at the town of Hughenden in North Queensland, is carrying out investigations into the development of irrigated agriculture at the 15 Mile Reserve, to the west of the town.

Following groundwater investigation work in 2017, the Shire of Flinders commissioned Ingham Drilling to undertake additional drilling in the 15-Mile area during 2018. As a consequence, four additional production bores have been installed and these have undergone pumping tests to further assess the sustainability of groundwater as a source of water supply for irrigation development. Pumping tests were undertaken by Kane Pumping and Irrigation (KPI) on behalf of Ingham Drilling.

The constraint to groundwater development that production bores should be located at least 1km from the centre of the Flinders River to preclude triggering of the licensing conditions of the Gulf Water Resource Plan remains current. Two of the 2018 production bores are located outside the 1km limit and the other two production bores are located within that 1km limit.

2.0 SCOPE OF WORK

The scope of work undertaken for this report was as follows:

- 1. Review of all the 2018 drilling information from Ingham Drilling.
- 2. Analyse pumping test data collected by KPI according to Australian Standard AS2368 0f 1990 and present test data and results as per AS2368 requirements.
- 3. Analyse results of the pump-test on the production bores and recommend long term, sustainable pumping rates and pump intake depths.
- 4. Re-assess the sustainable groundwater yield of the 15-Mile area.

3.0 ELEMENTS OF THE GROUNDWATER INVESTIGATION

3.1 Test Drilling Program

Groundwater investigation test holes were drilled in the 15-Mile area in 2018 as detailed in Table 1.

TABLE 1:	TABLE 1: BRIEF DETAILS OF 2018 GROUNDWATER INVESTIGATION TEST HOLES								
Easting MGA94	Northing MGA94	Site_ID	Status	Depth to top of aquifer (m)	Thickness of aquifer (m)				
195887	7698977	1140-2	Test hole	15	1.0				
195756	7699184	1140-5	Test hole	14.5	3.5				
195977	7698480	1140-7	Test hole	8	5.0				
195770	7698257	1140-3	Test hole	17	1.0				
195676	7698483	1140-8	Test hole	9.5	4.5				
195938	7698574	1177-5	Test hole	12	5.5				
195852	7698856	1179	Production bore	18.5	3.0				
195871	7698459	1140-6	Production bore	11	3.0				
197096	7698894	1163-4	Production bore	13.5	3.5				

Strata logs were recorded for all the test boreholes. Notes of where groundwater was intersected (if any) were recorded.

As a result of the 2018 drilling campaign, the 15-Mile alluvial aquifer has been further refined. The drilling logs of <u>all the test holes in the 15 Mile area</u> were evaluated and a sand percentage assigned to the strata within them. A higher percentage means that there was a high proportion of sand, and or gravel, intersected. A low percentage means that the strata were mainly clay or silt. These percentages were then contoured and assigned a colour scheme. A blue area of filled contours indicates potentially productive aquifer. Brown areas indicate areas of little or no aquifer potential. A potentially productive aquifer boundary was then assigned by inspection.

Figure 1 shows the re-defined area of potentially productive aquifer. The re-defined boundary of the potentially productive aquifer represents an increase in area of about 13ha. Such re-definition would not have been possible without the 2018 test drilling.



Figure 1: Re-defined Extent 15 Mile Reserve High Permeability Alluvial Aquifer Test holes shown by a star symbol, Potentially productive aquifer boundary shown as a dashed green line

There are too few test holes to permit confident extension of the potentially productive aquifer any further to the east.

Figure 2 shows the locations of the production and observation bores at the 15-Mile Reserve.



Figure 2: Locations of Production and Observation Bores Long-term pumping rates for production bores shown adjacent to bore designation

3.2 Aquifer Description

The drilling and construction logs of the four 2018 production bores are presented in Figures 3 to 6. They reinforce that the 15 Mile Reserve alluvial aquifer (hereafter referred to as the aquifer) consists of coarse-grained to fine-grained sand and fine-grained gravel that is intercalated with clay bands. It is usually encountered at a depth of about 10m below ground level (bgl) and extends to a depth of between 15 to 18m below ground level.





Datum: GDA94







Datum:GDA94







Datum: GDA94

Figure 5: Drilling and Construction Log of Production Bore 1163-4





Datum: GDA94



4.0 PUMPING TESTS

Pumping tests were carried out on 1179, 5496 (1177-5), 1140-6 and 1163-4 bores in November and December 2018. The pumping tests comprised initial 48-hour hour pumping tests on each bore to Australian Standard AS2368, followed by either a 5-hour or 24-hour confirmatory pumping test as necessary. All pumping tests included recovery measurement on the pumped bore and nearby holes and/or piezometers.

Table 2 outlines brief details of the pumping tests.

	TABLE 2: BRIEF DETAILS OF PUMPING TESTS								
Bore_ID	Dates of test	Test type	Static water level prior to testing m below ground level measuring point	Pump suction m below ground level measuring point	Discharge rate L/s				
1179	3 November 2018	Constant discharge	11.05	26	7.38				
1140-6	5 November 2018	Constant discharge	11.0	19	4				
1140-6	13 December 2018	Constant discharge	11.3	19	14.8				
5496(1177-5)	1 November 2018	Constant discharge	11.5	22	4.3				
5496(1177-5)	14 December 2018	Constant discharge	11.7	22	8.2				
1163-4	13 November 2018	Constant Discharge	9.6	22	32.5				

4.1 Data Analysis

The drawdown and recovery data were analysed using Microsoft Excel for time-water level plots to illustrate the pumping behaviour of the bores.

The water levels in the pumping bores were plotted against the time elapsed since pumping started. The resulting charts include recovery water levels. Figures 7 to 11 show time – water level charts for each pump test that was performed.



1179

Figure 7: Time – Water Level Chart for Bore 1179

During this test the water level in the bore reached a level of 21.8m below the top of the casing (btoc) which was 0.2m above the pump suction level. The pumping water level remained at 21.8m btoc from 800 minutes into the test until 2870 minutes into the test (almost two full days). As is usual the discharge of the pump fell in proportion to the head of water over the pump suction.

The recovery in the bore water level is deemed to be acceptable after two full days pumping.

The sustainable pumping rate for this bore in its current construction is assessed at between 7.52 and 8.9L/s.

1140-6

This bore was pumped at a more or less constant discharge of 16.5L/s for 24 hours. The water level during the pumping phase behaved as is expected for an unconfined aquifer with radial inflow. At the conclusion of pumping the bore recovered rapidly and the aquifer showed no evidence of being dewatered.



Figure 8: Time – Water Level Chart for Bore 1140-6

The sustainable pumping rate for this bore is assessed at 17.5L/s.

5496 (1177-5)

Two pumping tests were carried out on this bore. The first was undertaken over 24 hours at a discharge rate of 4.5L/s. Figure 9 shows the water level plot for this test.



Figure 9: Time – Water Level Chart for Bore 5496 (1177-5) – First Test

A second, confirmatory test was undertaken over 5 hours at a discharge rate of 7.5L/s. Figure 10 shows the water level plot for this test.



Figure 10: Time – Water Level Chart for Bore 5496 (1177-5) Second Test

As the drawdown and recovery in both tests was deemed acceptable the sustainable pumping rate for this bore is assessed at 12.3L/s.

1163-4

This bore was pumped at a constant discharge of 32.6L/s for 48 hours. Figure 11 shows the water level plot for this test.

The water level during the pumping phase behaved as is expected for an unconfined aquifer with radial inflow. At the conclusion of pumping the bore recovered rapidly and the aquifer showed no evidence of being dewatered.

The sustainable pumping rate for this bore is assessed at 40L/s.



Figure 11: Time – Water Level Chart for Bore 1163-4

Evidence of Interference between Adjacent Bores

There was no evidence of interference between adjacent bores during the 2018 pumping test program. The same phenomenon was observed during the 2017 pumping test program.

The lack of interference during all the pumping tests is evidence of a high transmissivity aquifer.

Notwithstanding these conclusions, it is critical that monthly measurements of groundwater level should be measured and recorded in the seven groundwater monitoring bores that exist in the aquifer.

Summary of 15-Mile Bore Sustainable Pumping Supplies

Figure 2 shows a summary of all the estimated sustainable pumping supplies from the production bores at the 15-Mile Reserve.

The total estimated sustainable pumping supply from the production bores outside the 1km limit is about 71L/s.

Additional assessed sustainable pumping supplies of 54L/s are available from the production bores within the 1km limit. One of the bores within the 1km limit – 1163-4 – has an estimated sustainable supply of 40L/s. This bore alone, if pumped during low electricity tariff periods (say 10 hours per day, 365 days per year) could deliver some 525ML/annum from the 5,000ML allocation available from the Flinders River. This volume is in addition to the volume available from the five bores outside the 1km limit.

Derivation of Aquifer Parameters

The drawdown data from the pumping tests were analysed using AquiferTest 2016.1 to derive hydraulic parameters of the aquifer and permit a re-assessment of useable groundwater in aquifer storage. Appendix 1 shows the methodology and graphical analytical solutions for the pumping test data.

5.0 AQUIFER STORAGE ANALYSIS AND PUMPING SCHEDULE

5.1 Volume in Aquifer Storage

The volume of groundwater in storage within the 15 Mile Reserve alluvial aquifer, has been reassessed.

The volume of groundwater in storage in the aquifer was assessed using the following relationship:

Total volume in storage = A b S

Where:

- A = area of aquifer
- b = saturated thickness of the aquifer
- S = average storativity

Table 2 outlines a summary of the estimates of useable volumes of groundwater in storage in the 15-Mile aquifer.

TABLE 3:	TABLE 3: ESTIMATES OF USEABLE VOLUMES OF GROUNDWATER IN THE 15-MILE AQUIFER										
Aquifer segment	Area of aquifer segment	S	Average saturated thickness	Volume i	Volume in storage						
	m²	dimensionless	m	m ³	ML						
Lower permeability	890353	0.1	2.5	222588	223						
High permeability	829647	0.259	5	1074393	1074						
				Total	1297						
				Useable	1038						

The total volume of groundwater in storage is 1,297ML <u>not all of which will be available for</u> <u>extraction</u> as some groundwater remains attached to the aquifer matrix even when pumping occurs. This is known as 'dead storage'.

If it is assumed that approximately 20% of the total storage is 'dead storage' **the estimated volume of groundwater available for use outside the 1km limit is about 1,038ML, assuming that regular annual rainfall recharge occurs**.

5.2 Suggested Pumping Schedule

The following pumping schedule could be implemented assuming that reasonably regular rainfall recharge occurs:

-) The five production bores located greater than 1km from the river could be equipped to their sustainable pumping rates;
- The five production bores located greater than 1km from the river could be pumped for up to 10 hours per day (possibly at night to take advantage of lower electricity tariffs should power be provided to the 15 Mile Reserve);
-) The aquifer would benefit from a 10-hour pumping, 14-hour recovery schedule to allow radial recharge flow to occur and to take advqantage of low electricity tariff periods;
-) The five production bores located greater than 1km from the river could be pumped on this basis for 346 days per year;
-) The nett draft on the aquifer under this schedule would be 1,037ML/annum which is approximately equal to the estimated useable aquifer storage.

5.3 Ongoing Groundwater Monitoring

The success of the suggested pumping schedule depends on regular annual rainfall recharge to the aquifer and the maintenance of adequate saturated thickness in the aquifer.

It is critical that monthly measurements of groundwater level should be measured and recorded in the seven groundwater monitoring bores that exist in the aquifer environs (RN 91500046, RN 91500047, OB1, OB2, OB3, 1126-2 and 1126-4).

Table 2 shows the coordinates of the seven groundwater monitoring bores.

TABLE 2: COOF	RDINATES OF GROUNDWATER MO	ONITORING BORES
Easting MGA94	Northing MGA94	Site
195667	7698497	OB1
195873	7698464	OB2
195702	7698618	OB3
195836	7699544	91500047
195572	7698549	91500046
196165	7698596	1126-2
195840	7698868	1126-4





Figure 12: Drilling and Construction Log of 1126-4



Figure 13: Drilling and Construction Log of 1126-2

It is recommended that observation bore 1126-4 should be equipped with an automatic groundwater level data logger set to capture daily groundwater level. This will permit assessment of both recharge and borefield performance.

It is also recommended that the production bores should be equipped with automatic groundwater level data loggers set to capture daily groundwater level in each bore, and that accurate water meters be installed on each pumping bore. Weekly groundwater abstraction volumes should be measured and recorded in the production bores. The data that result should be assessed at the end of the wet season and at the end of the dry season and adjustments to the pumping schedule could be required.

6.0 ACKNOWLEDGEMENTS

The assistance of Ingham Drilling and Kane Pumping and Irrigation staff throughout the field component of this investigation, and the assistance of Jeff Benjamin for technical review and comment on the report, is gratefully acknowledged.

Rob Lait and Associates Pty Ltd

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<u>ROB LAIT</u> Principal Hydrogeologist

LIMITATIONS OF REPORT

Rob Lait and Associates Pty Ltd (RLA) has prepared this report for the use of the Shire of Flinders in accordance with the usual care and thoroughness of the consulting profession. It is based on generally accepted practices and standards at the time it was prepared. No other warranty, expressed or implied, is made as to the professional advice included in this report.

This study was undertaken between 15th and 31st December 2018 using data obtained from drilling and hydraulic conductivity testing, and is based on the conditions encountered and the information available at the time of preparation of the report. RLA disclaims responsibility for any changes that may occur after this time.

The methodology adopted and sources of information used by RLA are outlined in this report. RLA has made no independent verification of this information beyond the agreed scope of works and RLA assumes no responsibility for any inaccuracies or omissions. No indications were found during our investigations that information contained in this report as provided to RLA was false.

This report should be read in full. No responsibility is accepted for use of any part of this report in any other context or for any other purpose or by third parties. It may not contain sufficient information for the purposes of other parties or other users. This report does not purport to give legal advice. Legal advice can only be given by qualified legal practitioners.

This report contains information obtained by inspection, sampling, testing and other means of investigation. This information is directly relevant only to the points in the ground where they were obtained at the time of the assessment. Where borehole logs are provided they indicate the inferred ground conditions only at the specific locations tested. The precision with which conditions are indicated depends largely on the frequency and method of sampling, and the uniformity of the site, as constrained by the project budget limitations. The behaviour of groundwater is complex.

Our conclusions are based upon the analytical data presented in this report and our experience.

Where conditions encountered at the site are subsequently found to differ significantly from those anticipated in this report, RLA must be notified of any such findings and be provided with an opportunity to review the recommendations of this report.

Whilst to the best of our knowledge, information contained in this report is accurate at the date of issue, subsurface conditions, including groundwater levels can change in a limited time. Therefore this document and the information contained herein should only be regarded as valid at the time of the investigation unless otherwise explicitly stated in this report.

APPENDIX 1: DERIVATION OF AQUIFER HYDRAULIC PARAMETERS

The hydraulic parameters of the aquifer were assessed using the Theis, 1935¹ or Neuman, 1975 methods. The hydraulic parameters that were derived are:

-) Specific Yield (Sy): usable pore volume, also known as the drainable porosity, is a ratio, less than or equal to the effective porosity, indicating the volumetric fraction of the bulk aquifer volume that a given aquifer will yield when all the water is allowed to drain out of it under the forces of gravity.
-) Storativity or Storage Coefficient (S): the volume of water released from storage per unit decline in hydraulic head in the aquifer, per unit area of the aquifer.
- J Transmissivity (T): the relative ease with which an aquifer transmits groundwater.

The graphical analytical solutions for the pumping tests are shown in the following pages.

¹ Theis, C.V., 1935. The relation between the lowering of the piezometric surface and the rate and duration of discharge of a well using groundwater storage, Am. Geophys. Union Trans., vol. 16, pp. 519-524.

	Rob Lait	and Associate	es Pty Ltd	Pumpi	ng Test Ana	alysis Report	Page 1 of 1
	PO Box	788		Project:	15 Mile		
	Queensl	and 4860		Number	: 265		
				Client:	Flinders Shi	re	
Locatio	on: Hughenden		Pumping Test: 1179			Pumping Well: 1179	
Test C	onducted by: Kane P	umping and Irriga	a Tiest Date: 3/11/2018	}		Discharge: variable, average	e rate 7.3814 [l/s]
Observ	vation Well: 1179		Static Water Level [m	n]: 11.05		Radial Distance to PW [m]: -	
	Time [min]	Water Level [m]	Drawdown [m]				
1	60	17.60	6.55				
2	120	17.80	6.75				
3	195	18.80	7.75				
4	315	19.40	8.35				
5	435	21.20	10.15				
6	555	21.30	10.25				
7	795	21.80	10.75				
8	1035	21.80	10.75				
9	1305	21.80	10.75				
10	1545	21.80	10.75				
11	1785	21.80	10.75				
12	1905	21.80	10.75				
13	2145	21.80	10.75				
14	2385	21.80	10.75				
15	2625	21.80	10.75				
16	2870	21.80	10.75				
17	2875	14.20	3.15				
18	2960	13.65	2.60				
19	3710	11.90	0.85				

Rob Lait and Associates Pty Ltd				ty Ltd	Pumpi	ng Test - Di	scharge Data	Page 1 of 1
	PO Box 7	788			Project:	15 Mile		
	Queensl	and 4860			Number	: 265		
					Client: Flinders Shire			
Location: Hughenden Pur			nping Test: 1179			Pumping Well: 1179		
Test Conducted by: Kane Pumping and IrrigaTiest Date: 3/11/201						Discharge: variable, average	ə rate 7.3814 [l/s]	
Observ	ation Well: 1179						Radial Distance to PW [m]:	-
	Time [min]	Discharge [l/s]						
1	60	9.40						
2	120	9.70						
3	195	9.30]				
4	315	9.00						
5	435	8.60						
6	555	8.10						
7	795	7.90						
8	1035	7.50						
9	1305	7.20						
10	1545	7.00						
11	1785	7.10						
12	1905	6.80						
13	2145	6.60						
14	2385	6.70						
15	2625	6.70						
16	2870	6.60						



5	Rob La	it and Associat	es P	ty Ltd	Pumping Test Analysis Report					
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Location: Hug	Queen	sland 4860			Number: 265					
	1				Client: Flinders S	Shire				
Location: Hughenden			Pumping Test: 1179			Pumping Well: 117	Pumping Well: 1179			
Test Conducted by: Kane Pumping and Irrigation					Test Date: 3/11/20	18				
Aquifer Thickness: NAN m		n	Disc	Discharge: variable, average rate 7.3814 [l/s]						
	Analysis Name	Analysis Performe	d by	Analysis Date	Method name	Well	T [m²/d]	S		
1	Theis	R Lait		27/12/2018	Theis	1179	1.48×10^{2}	1.00 × 10 ⁻⁷		

	Rob Lait and Associates Pty Ltd			Pumping Test Analysis ReportPage 1 of 1					
Г	PO Box	788		Project: 15 Mile	9				
	Queensl	, and 4860		Number: 265					
				Client: Flinder	s Shire				
Locatio	on: Hughenden	F	Pumping Test: 1177-	5 (2)	Pumping Well: 1177-5	i			
Test C	onducted by: Kane F	Pumping and Irrigal	iest Date: 14/12/201	8	Discharge: variable, a	verage rate 8.2 [l/s]			
Observ	vation Well [:] 1177-5		Static Water Level In	nl· 11 70	Radial Distance to PW	/ [m]: -			
	Time	Water Level	Drawdown			. [].			
	[min]	[m]	[m]						
1	1	14.30	2.60						
2	2	14.50	2.80						
3	3	14.70	3.00						
4	5	14.90	3.20						
5	7	14.90	3.20						
7	10	14.90	3.20						
8	10	14.90	3.20						
9	20	14.00	3.20						
10	30	14.00	3.20						
11	40	14.90	3.20						
12	50	15.00	3.30						
13	60	15.10	3.40						
14	75	15.10	3.40						
15	90	16.10	4.40						
16	120	16.30	4.60						
17	150	16.30	4.60						
18	180	16.50	4.80						
19	240	16.80	5.10						
20	300	16.80	5.10						
21	301	15.20	3.50						
22	302	13.50	1.80						
23	303	13.20	1.50						
24	304	13.10	1.40						
25	305	13.00	1.30						
26	307	13.00	1.30						
27	310	12.80	1.10						
28	315	12.80	1.10						
29	320	12.70	1.00						
30	340	12.00	0.90						
32	350	12.30	0.00						
33	360	12.20	0.50						
34	375	12.10	0.40						
35	390	12.10	0.40						
36	420	12.00	0.30						
37	450	11.90	0.20						
38	480	11.90	0.20						
39	510	11.80	0.10						
40	540	11.70	0.00						

2	Rob Lait	and Associat	es Pty Ltd	Pumpir	ng Test - Di	scharge Data	Page 1 of 1
	PO Box 7	788		Project:	15 Mile		
11	Queensla	and 4860		Number:	265		
				Client:	Flinders Shi	re	
Locatio	on: Hughenden		Pumping Test: 1177-	5 (2)		Pumping Well: 1177-5	
Test C	onducted by: Kane P	umping and Irrig	ja īies t Date: 14/12/201	8		Discharge: variable, average	rate 8.2 [l/s]
Observ	ation Well: 1177-5					Radial Distance to PW [m]: -	
	Time [min]	Discharge [l/s]					
1	1	6.90					
2	2	6.90					
3	3	6.90					
4	4	6.90					
5	5	6.90					
6	7	6.90					
7	10	6.90					
8	15	6.90					
9	20	6.90					
10	30	6.90					
11	40	6.90					
12	50	6.90					
13	60	6.90					
14	75	8.60					
15	90	8.60					
16	120	8.60					
17	150	8.60					
18	180	8.60					
19	240	8.60					
20	300	8.30					



5	Rob	bb Lait and Associates Pty Ltd			Pumping Test Analysis Report					
	PO I	3ox 788 sfail.			Project: 15 Mile					
	Que	ensland 4860			Number: 265					
	1				Client:	Flinders Shi	ire			
Loc	Location: Hughenden			Pumping Test: 1177-5 (2)			Pumping Well: 1177-5			
Location: Hughenden Pumping Test Test Conducted by: Kane Pumping and Irrigation						Test D	ate: 14/12/2	018		
Aqu	uifer Thickness: 3.0	0 m	Discharge: v	ariable, a	average rat	te 8.2 [l/s]				
	Analysis Name	Analysis Performed b	yAnalysis Date	Method r	name	Well		T [m²/d]	K [m/d]	S
1	Theis	R Lait	27/12/2018	Theis		1177-5		1.37×10^{3}	4.58×10^{2}	1.36 × 10 ⁻²⁰

	ROD Lait	and Associate	es Pty Ltd	Pumpi	ng Test Analy	sis Report	Page 1011
	PO Box 7	788		Project:	15 Mile		
11	Queensla	and 4860		Number	r: 265		
III				Client:	Flinders Shire	;	
Locatio	on: Hughenden		Pumping Test: 1140-	6	F	- Pumping Well: 1140	-6
Test C	onducted by: Kane P	umping and Irrig	aTest Date: 14/12/201	8	C	Discharge: variable,	average rate 15.318 [l/s
Observ	vation Well: 1140-6		Static Water Level [m	1: 11.30	F	Radial Distance to P	PW [m]: -
	Time	Water Level	Drawdown	1			
1	[min]	[m]	[m]				
2	2	12.00	0.40				
3	3	13.00	1.70				
4	4	13.00	1.70				
5	5	13.00	1.70				
6	7	13.00	1.70				
7	10	13.00	1.70				
9	20	13.00	1.70				
10	30	13.00	1.70				
11	40	13.20	1.90				
12	50	13.20	1.90				
13	60 75	13.20	2 10				
15	90	13.40	2.10				
16	120	13.40	2.10				
17	150	13.40	2.10				
18	180	13.80	2.50				
19	210	14.20	2.90				
20	437	14.80	4.00				
22	557	15.40	4.10				
23	677	16.00	4.70				
24	797	16.50	5.20				
25	1219	16.50	5.20				
20	1440	12 40	1 10				
28	1442	12.20	0.90				
29	1443	11.90	0.60				
30	1444	11.90	0.60				
31	1445	11.90	0.60				
33	1447	11.90	0.60				
34	1455	11.90	0.60				
35	1460	11.70	0.40				
36	1470	11.70	0.40				
37 38	1480	11.70	0.40				
39	1500	11.70	0.40				
40	1515	11.60	0.30				
41	1530	11.50	0.20				
42	1560	11.50	0.20				
43	1590	11.40	0.10				
45	1650	11.40	0.10				
46	1680	11.30	0.00				
47	1710	11.30	0.00				

Rob Lait and Associate PO Box 788 Innisfail, Queensland 4860			es Pty Ltd	Pumpi	ng Test - Di	scharge Data	Page 1 of 1	
				Project:	15 Mile			
				Number	r: 265			
iii				Client: Flinders Shire				
Locatio	on: Hughenden		Pumping Test: 1140-	6		Pumping Well: 1140-6		
Test Conducted by: Kane Pumping and Irrig			a Tiest Date: 14/12/201	8		Discharge: variable, average rate 15.318 [l/s		
Observ	vation Well: 1140-6					Radial Distance to PW [m]: -		
	Time	Discharge						
	[min]	[l/s]						
1	1	17.00						
2	2	17.00						
3	3	17.00						
4	4	17.00						
5	5	17.00						
6	7	17.00						
7	10	17.00						
8	15	17.00						
9	20	17.00						
10	30	17.00						
11	40	17.00						
12	50	17.00						
13	60	17.00						
14	75	17.00						
15	90	16.10						
16	120	16.10						
17	150	16.10						
18	180	16.90						
19	210	16.90						
20	270	16.90						
21	437	16.80						
22	557	16.80						
23	677	15.80						
24	797	15.10						
25	1219	14.30						
26	1440	13.50						



1	Rob	Lait and Associat	tes Pty Ltd		Pumping Test Analysis Report					
	PO E	3ox 788 sfail.			Project: 15 Mile Number: 265					
	Que	ensland 4860								
	1				Client: Flinders Shire					
Location: Hughenden Pumping Test:				st: 1140-6			Pumping Well: 1140-6			
Test Conducted by: Kane Pumping and Irrigation					Test Date: 14/12/2018					
Aquifer Thickness: 3.00 m Dis			Discharge: variable, average rate 15.318 [I			te 15.318 [l/s	/s]			
	Analysis Name	Analysis Performed b	yAnalysis Date Method		name	Well		T [m²/d]	K [m/d]	S
1	Theis	R Lait	24/12/2018 Theis			1140-6		1.76 × 10 ³	5.88×10^{2}	1.00×10^{-7}

	Rob Lait	and Associat	es Pty Ltd	Pumpir	ng Test Ana	Ilysis Report Page 1 of 1			
	PO Box 7	788		Project: 15 Mile					
11	Queensla		Number: 265						
IP				Client: Flinders Shire					
Location: Hughenden Pumping Test: 1163-					-4 Pumping Well: 1163-4				
Test C	onducted by: Kane P	umping and Irrig	a Tiest Date: 13/11/201	8 Discharge: variable, average rate 3					
Observation Well: 1163-4 Static			Static Water Level [m]: 9.60		Radial Distance to PW [m]: -			
	Time Water Leve		Drawdown [m]						
1	60	13.80	4.20						
2	122	13.80	4.20						
3	248	14.20	4.60						
4	2218	14.20	4.60						
5	5 2878 14.20		4.60						
6 2881 11.30		1.70							
7	7 2911 11.00		1.40						
8 3868 10.20		0.60							

Rob Lait and Associa PO Box 788 Innisfail.			and Associates Pty Ltd 88		Pumping Test - Discharge Data Page 1				
					Project: 15 Mile				
Queensland 4860					Number: 265				
IR				Client:	Flinders Sh	ire			
Locatio	on: Hughenden		Pum	mping Test: 1163-4			Pumping Well: 1163-4		
Test C	onducted by: Kane P	umping and Irrig	ja Tiest	: Date: 13/11/201	8		Discharge: variable, average	e rate 32.533 [l/s]	
Observ	vation Well: 1163-4						Radial Distance to PW [m]: -		
	Time [min]	Discharge [l/s]							
1	60	33.30							
2	122	32.30							
3	248	34.40							
4	358	32.00							
5	538	33.30							
6	778	33.00							
7	1018	32.00							
8	1258	33.00							
9	1498	33.00							
10	1738	32.00							
11	1978	33.00							
12	2218	33.00							
13	2458	32.00							
14	2698	31.20							
15	2878	31.40							



is a	Rob	Lait and Associa	tes Pty Ltd		Pumping Test Analysis Report						
	PO E	30x 788 sfail.			Project: 15 Mile						
	Quee	ensland 4860			Number: 265						
					Client: Flinders Shire						
Location: Hughenden Pumpin				Pumping Test: 1163-4			Pumping Well: 1163-4				
Test Conducted by: Kane Pumping and Irrigation					Test Date: 13/11/2018						
Aquifer Thickness: 3.50 m Discl				Discharge: variable, average rate 32.533 [l			/s]				
	Analysis Name Analysis Performed by Analysis Date Method			Method I	name Well			T [m²/d]	K [m/d]	S	
1	Theis	R Lait	27/12/2018 Theis		1163-4			1.94 × 10 ³	5.55×10^2	1.00×10^{-7}	