

# **Appendix 17** Pump test interpretations memorandum (GHD, 2015)



# Memorandum

08 July 2015

To Graham Ride

Copy to

From Lee Evans

Tel 61 3 6210 0660

Subject Pumping test interpretations

Job no. 43/22301

Greetings Graham, we have looked at your constant rate pumping tests provided and made the following interpretations (Table 1).

**Table 1 Pumping Test Interpretations**

Bore	ObsBore	S	T m <sup>2</sup> / day	b m	K m/day	Method	Aquifer Model	Aquitard_ Aquifer Justification
PB1 (RN19034)	RN19029	4.50E <sup>-08</sup>	250	69	3.6	HJ	Leaky Confined	Dictated by screen location
PB2 (RN18714)	RN18876	1.50E <sup>-01</sup>	95	14.2	6.7	H	Leaky Confined	PB2 Log
PB4 (RN19038)	PB4 (RN19038)		775	28	27.8	T CJ	Confined	PB4 Log
PB6 (RN19033)	RN19032	9.00E <sup>-04</sup>	225	51	4.4	T CJ	Confined	PB6 Log
PB7 (RN19037)	RN19036	7.00E <sup>-04</sup>	375	97	3.9	T CJ	Confined	PB7 Log
PB8 (RN19039)	PB8 (RN19039)		11. 5	33	0.3	H	Leaky Confined	PB8 Log

HJ: Hantush Jacob; H: Hantush; T: Theis; CJ: Cooper-Jacob

The pumping test input data is summarised in Table 2 and potential solutions considered are presented in Table 3 at the end of this memo. The pumping tests are presented as normal-normal graphs as Figure 1 to Figure 13 in this memo and the interpretations are appended as log-normal graphs to the back of this memo.

**Table 2 Summary of Pumping Tests**

<b>Bore</b>	<b>ObsBore</b>	<b>Rate (L/s)</b>	<b>Design Duration (hours)</b>	<b>Duration (actual pumped seconds)</b>	<b>Drawdown (m)</b>
PB1 (RN19034)	PB1 (RN19034)	17	31	111600	8.1
	RN19029				4.2
PB2 (RN18714)	PB2 (RN18714)	12	57	205080	37.0
	RN18876				0.3
	RN18879				No measurable response
	RN19026				No measurable response
PB4 (RN19038)	PB4 (RN19038)	10	31	111600	3.5
PB6 (RN19033)	PB6 (RN19033)	11.2	47	162900	7.3
	RN19032				2.7
	RN19030				2.2
PB7 (RN19037)	PB7 (RN19037)	10	24	86490	8.1
	RN19036				1.4
PB8 (RN19039)	PB8 (RN19039)	2.8	24	86400	32.6

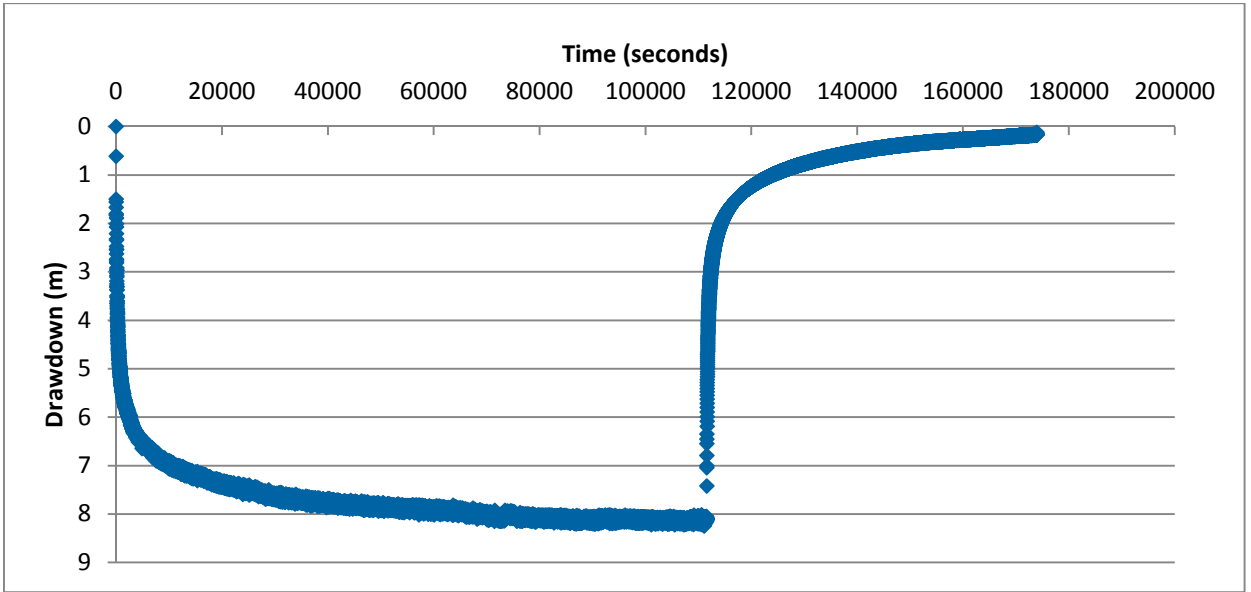


Figure 1 PB1 RN19034 Constant Rate Pumping Test (Time/Drawdown)

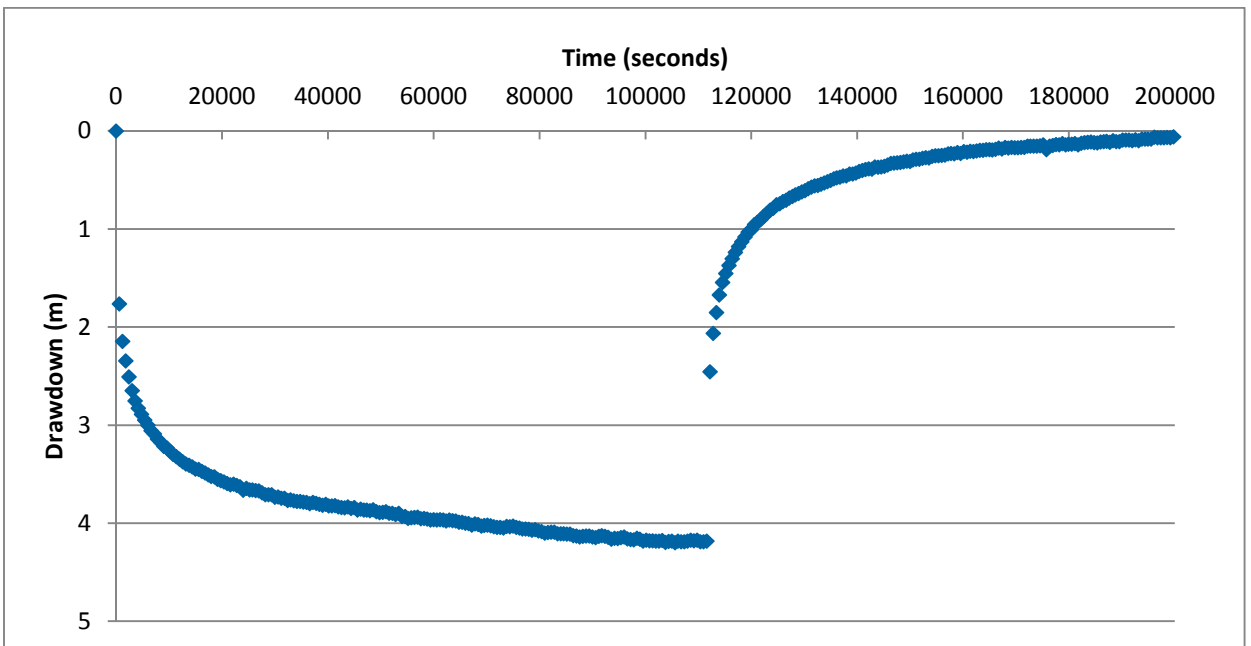
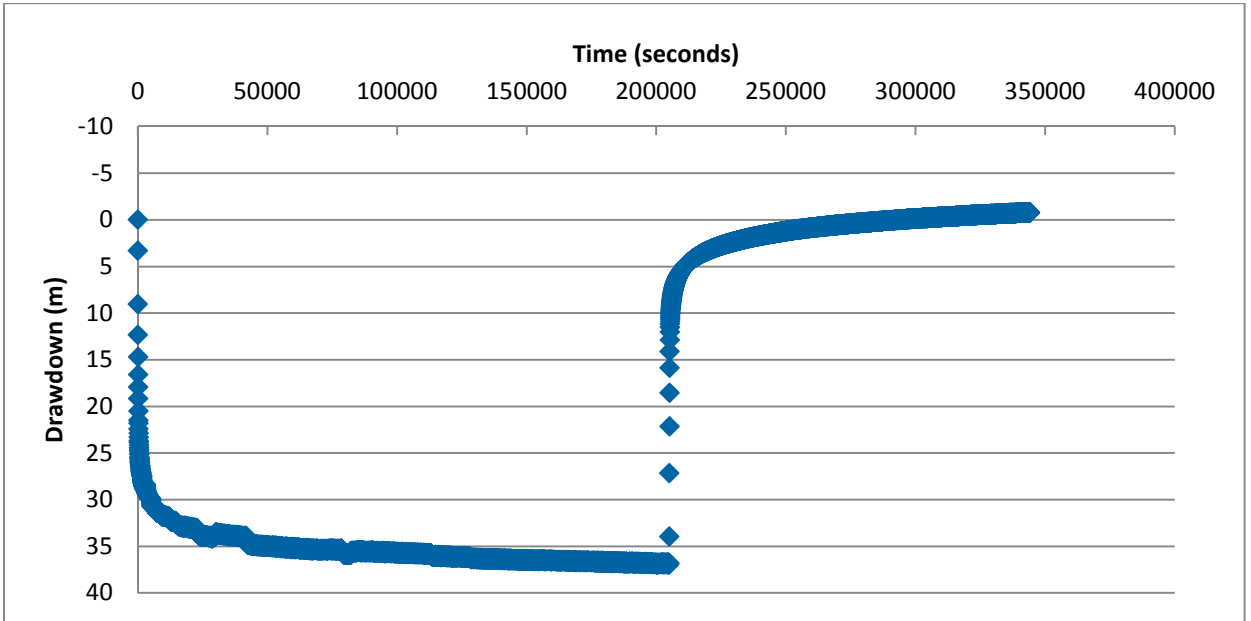
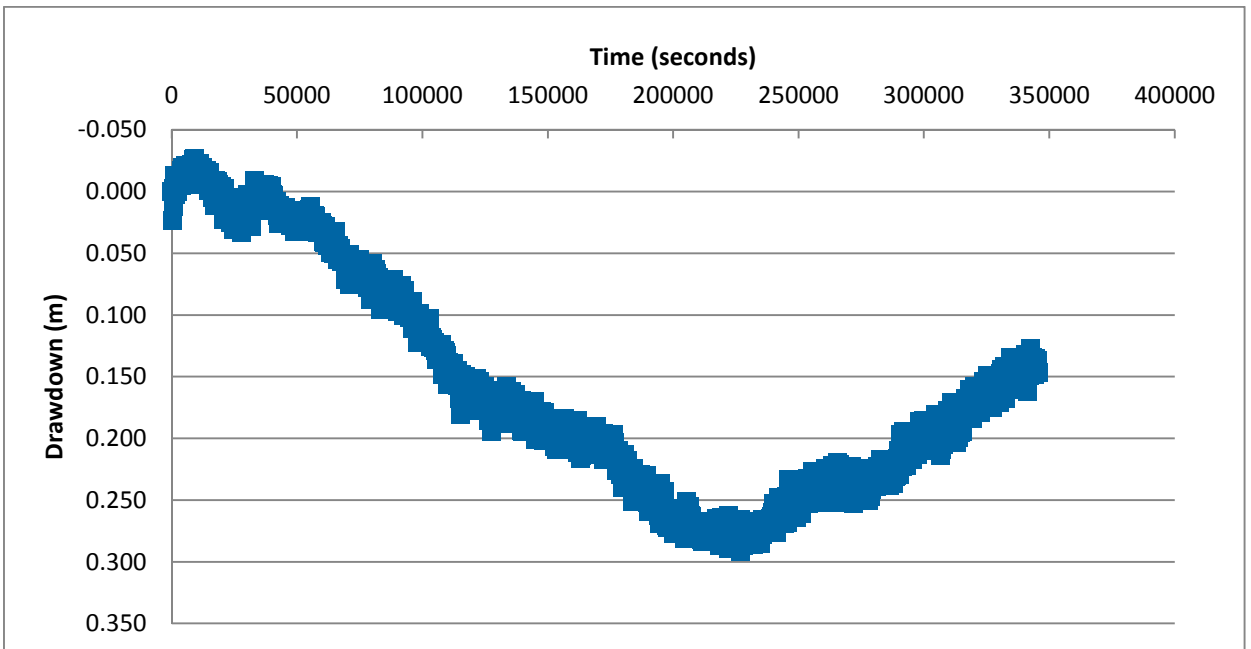


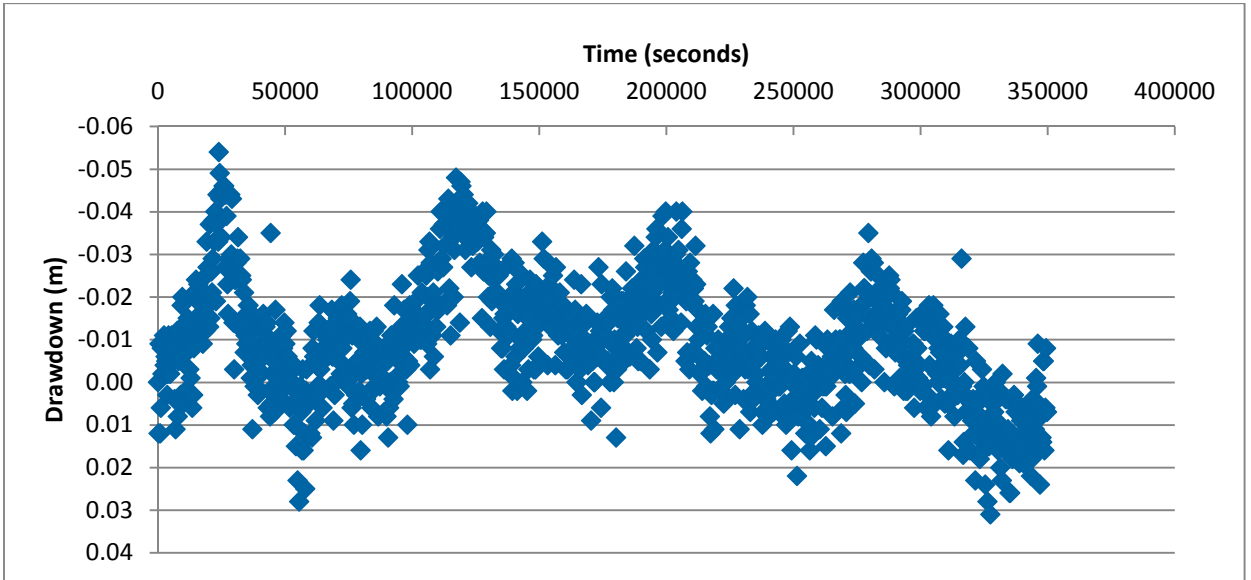
Figure 2 PB1 RN19034 Constant Rate Pumping Test (Time/Drawdown observations at RN19029)



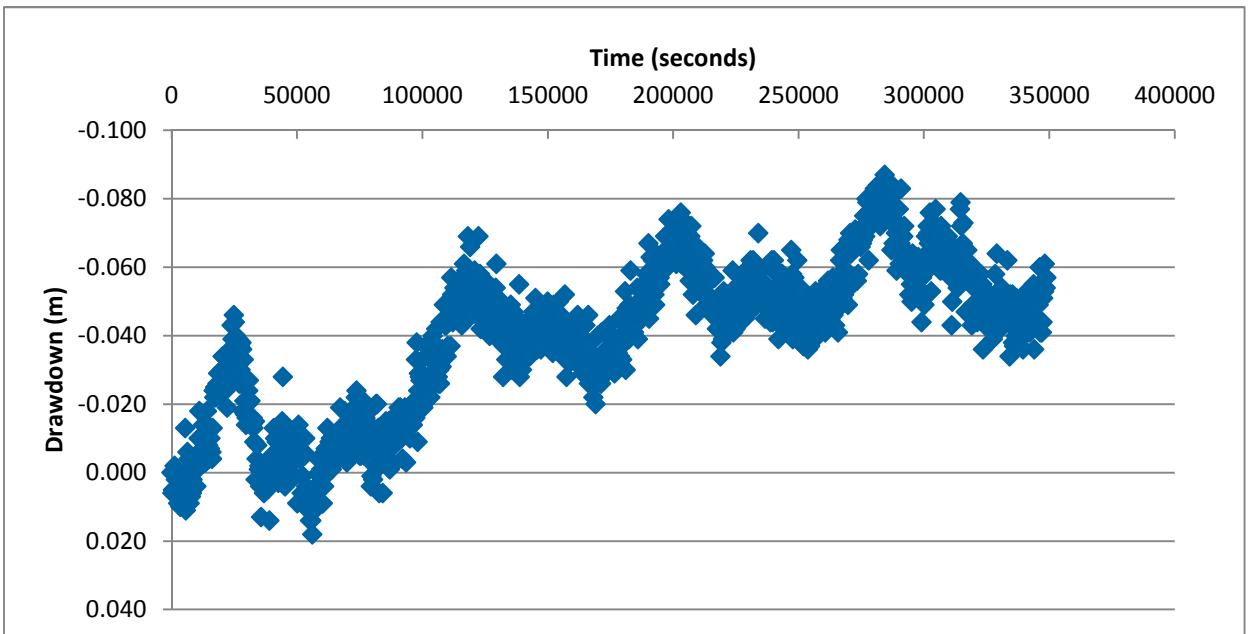
**Figure 3 PB2 RN18714 Constant Rate Pumping Test (Time/Drawdown)**



**Figure 4 PB2 RN18714 Constant Rate Pumping Test (Time/Drawdown observations at RN18876)**



**Figure 5 PB2 RN18714 Constant Rate Pumping Test (Time/Drawdown observation at RN18879)**



**Figure 6 PB2 RN18714 Constant Rate Pumping Test (Time/Drawdown observation at RN19026)**

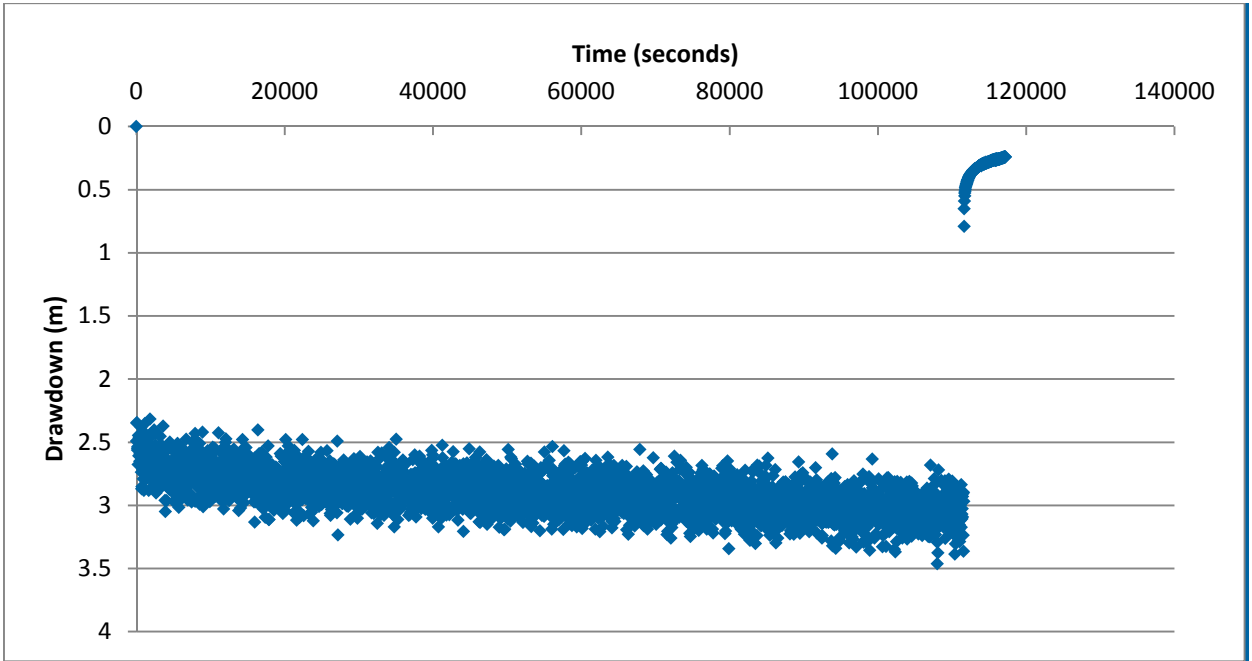


Figure 7 PB4 RN19038 Constant Rate Pumping Test (Time/Drawdown)

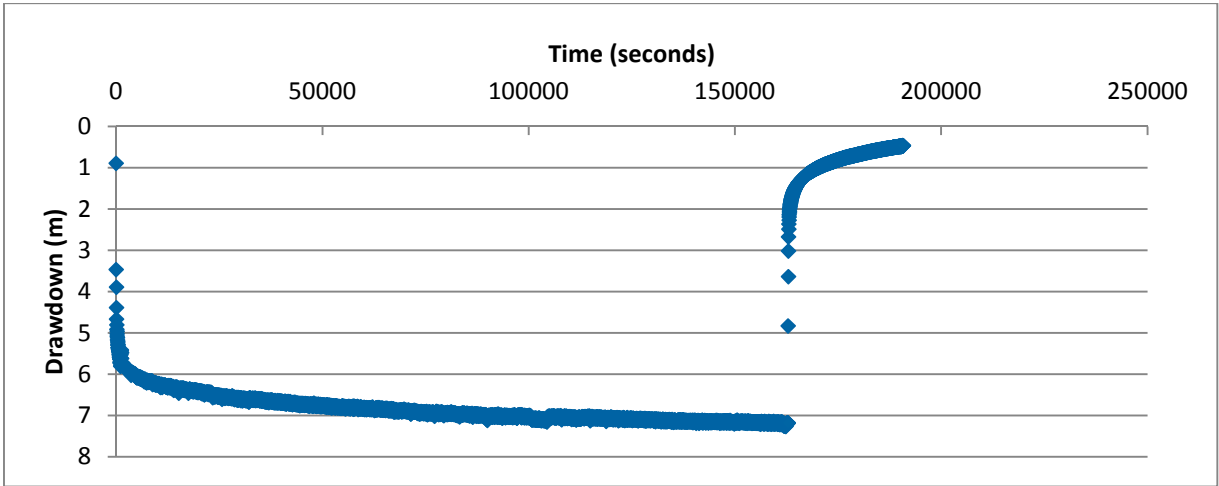


Figure 8 PB6 RN19033 Constant Rate Pumping Test (Time/Drawdown)

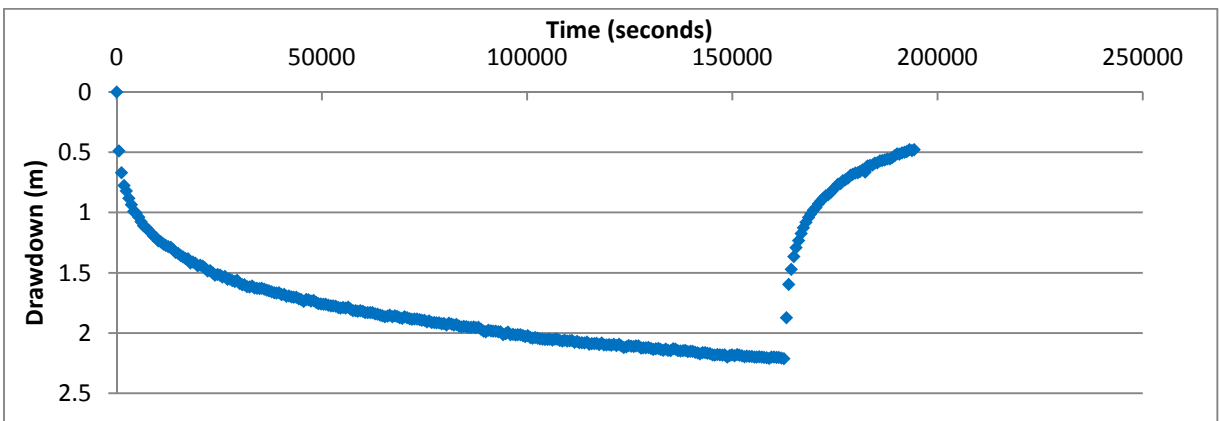


Figure 9 PB6 RN19033 Constant Rate Pumping Test (Time/Drawdown Observations at RN19030)

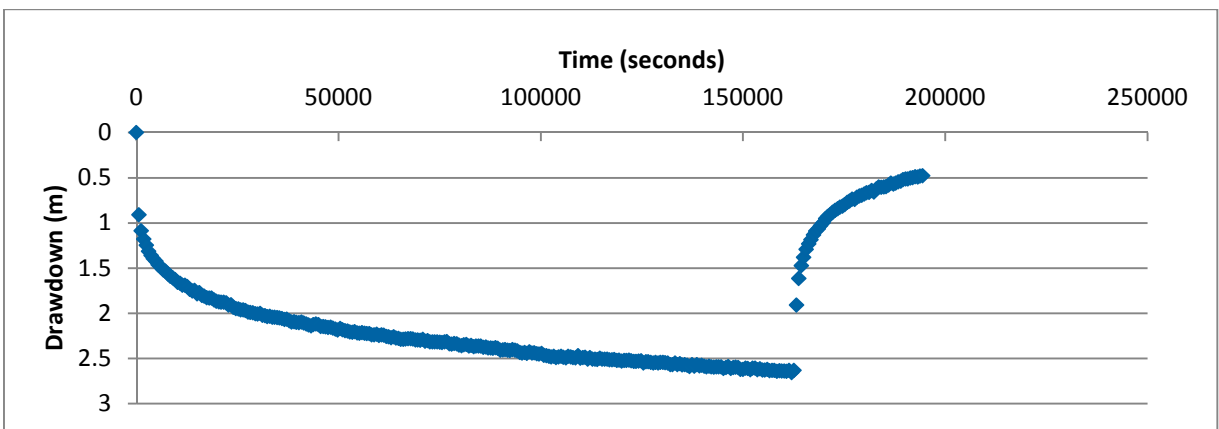


Figure 10 PB6 RN19033 Constant Rate Pumping Test (Time/Drawdown Observations at RN19032)



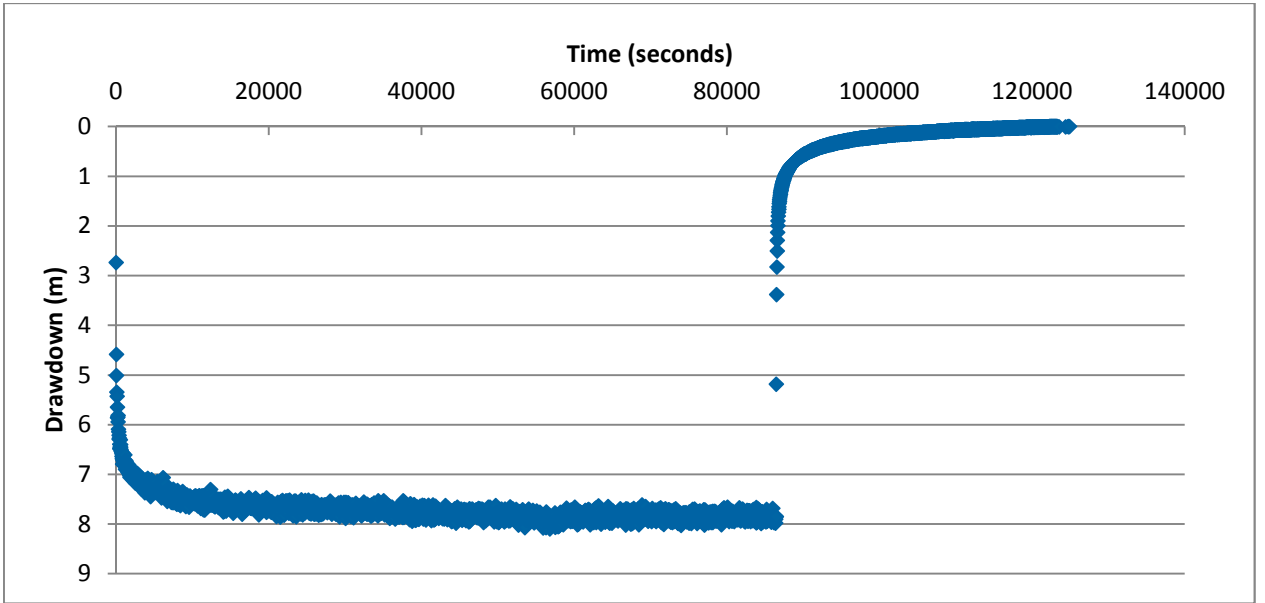


Figure 11 PB7 RN19037 Constant Rate Pumping Test (Time/Drawdown)

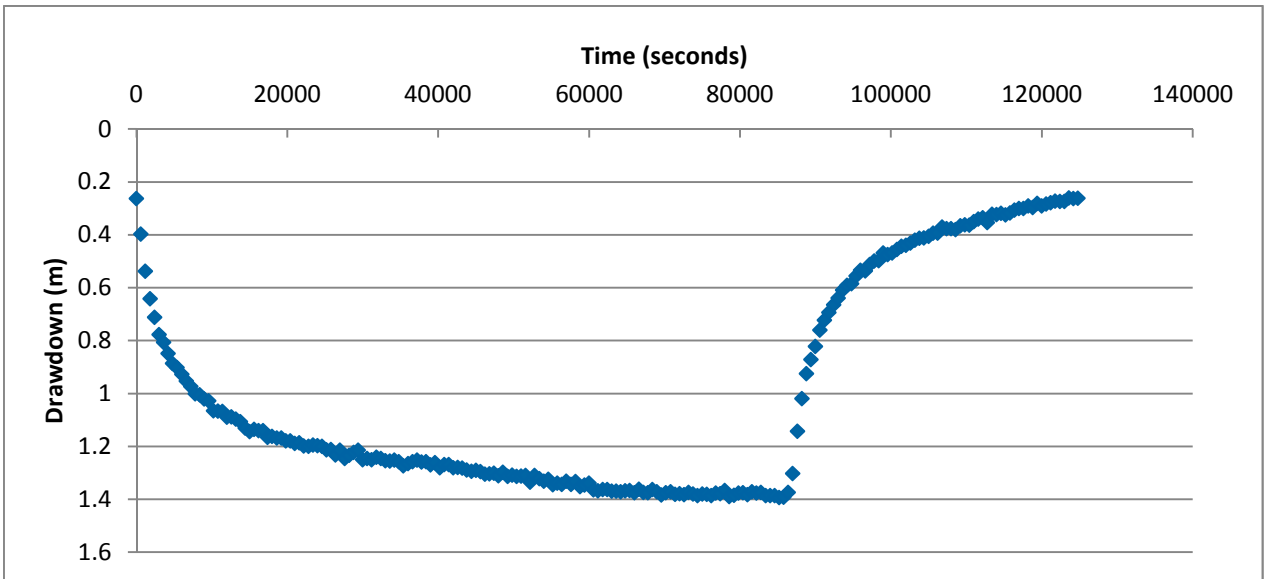


Figure 12 PB7 RN19037 Constant Rate Pumping Test (Time/Drawdown observations at RN19036)

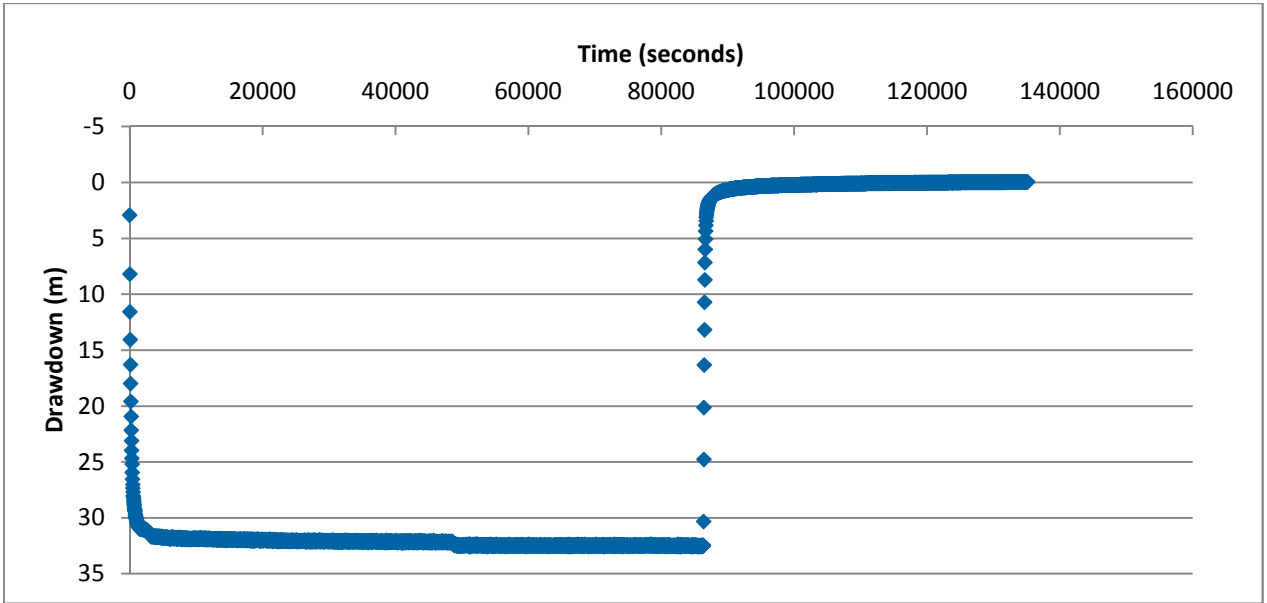


Figure 13 PB8 RN19039 Constant Rate Pumping Test (Time/Drawdown)

**Table 3 Potential Pumping Test Interpretations (adopted interpretations in yellow).**

Bore	ObsBore	S	T	b	K	Method	Aquifer	Aquitard_Aquifer Justification
PB1	RN19029	2.20E-08	285	117.5	2.4	CJ	Unconfined	N/A
PB1	RN19029	2.20E-08	285	117.5	2.4	T	Unconfined	N/A
PB1	PB1		179	117.5	1.5	T	Unconfined	N/A
PB1	PB1		215	117.5	1.8	CJ	Unconfined	N/A
PB1	PB1		200	69	2.9	HJ	Leaky Confined	Dictated by screen location
PB1	PB1		200	69	2.9	CJ	Confined	Dictated by screen location
PB1	RN19029	4.50E-08	250	69	3.6	HJ	Leaky Confined	Dictated by screen location
PB1	RN19029	4.50E-08	250	69	3.6	T	Confined	Dictated by screen location
PB1	RN19029	4.50E-08	250	69	3.6	CJ	Confined	Dictated by screen location
PB1	PB1		100	69	1.4	H	Leaky Confined	Dictated by screen location
PB2	RN18876	1.25E-01	70	14.2	4.9	HJ	Leaky Confined	PB2 Log
PB2	RN18876	2.50E-01	325	14.2	22.9	T	Confined	PB2 Log
PB2	RN18876	2.00E-01	400	14.2	28.2	CJ	Confined	PB2 Log
PB2	RN18876	2.50E-01	325	14.2	22.9	T	Unconfined	N/A
PB2	RN18876	2.50E-01	325	14.2	22.9	CJ	Unconfined	N/A
PB2	PB2	2.50E-03	30	14.2	2.1	HJ	Leaky Confined	PB2 Log
PB2	PB2	1.90E-05	44	14.2	3.1	T	Confined	PB2 Log
PB2	PB2	1.90E-05	44	14.2	3.1	CJ	Confined	PB2 Log

Bore	ObsBore	S	T	b	K	Method	Aquifer	Aquitard_ Aquifer Justification
PB2	RN18876	1.50E-01	95	14.2	6.7	H	Leaky Confined	PB2 Log
PB4	PB4		775	28	27.8	T	Confined	PB4 Log
PB4	PB4		775	28	27.8	CJ	Confined	PB4 Log
PB4	PB4		700	28	25.0	T	Confined	PB4 Log
PB4	PB4		700	28	25.0	CJ	Confined	PB4 Log
PB4	PB4		375	28	13.4	H	Leaky Confined	PB4 Log
PB6	RN19032	9.70E-05	110	51	2.2	H	Leaky Confined	PB6 Log
PB6	RN19032	9.00E-04	225	51	4.4	T	Confined	PB6 Log
PB6	RN19032	9.00E-04	225	51	4.4	CJ	Confined	PB6 Log
PB6	RN19030	1.50E-03	240	51	4.7	T	Confined	PB6 Log
PB6	RN19030	1.50E-03	240	51	4.7	CJ	Confined	PB6 Log
PB6	PB6		225	51	4.4	T	Confined	PB6 Log
PB6	PB6		225	51	4.4	CJ	Confined	PB6 Log
PB6	PB6		112	51	2.2	H	Leaky Confined	PB6 Log
PB7	RN19036	7.00E-04	375	97	3.9	T	Confined	PB7 Log
PB7	RN19036	7.00E-04	375	97	3.9	CJ	Confined	PB7 Log
PB7	RN19036	2.40E-03	270	97	2.8	CJ	Leaky Confined	PB7 Log
PB7	PB7		250	97	2.6	T	Confined	PB7 Log
PB7	PB7		250	97	2.6	CJ	Confined	PB7 Log
PB7	PB7		175	97	1.8	H	Leaky Confined	PB7 Log
PB8	PB8		11.5	33	0.3	H	Leaky Confined	PB8 Log
PB8	PB8		102	33	3.1	T	Confined	PB8 Log

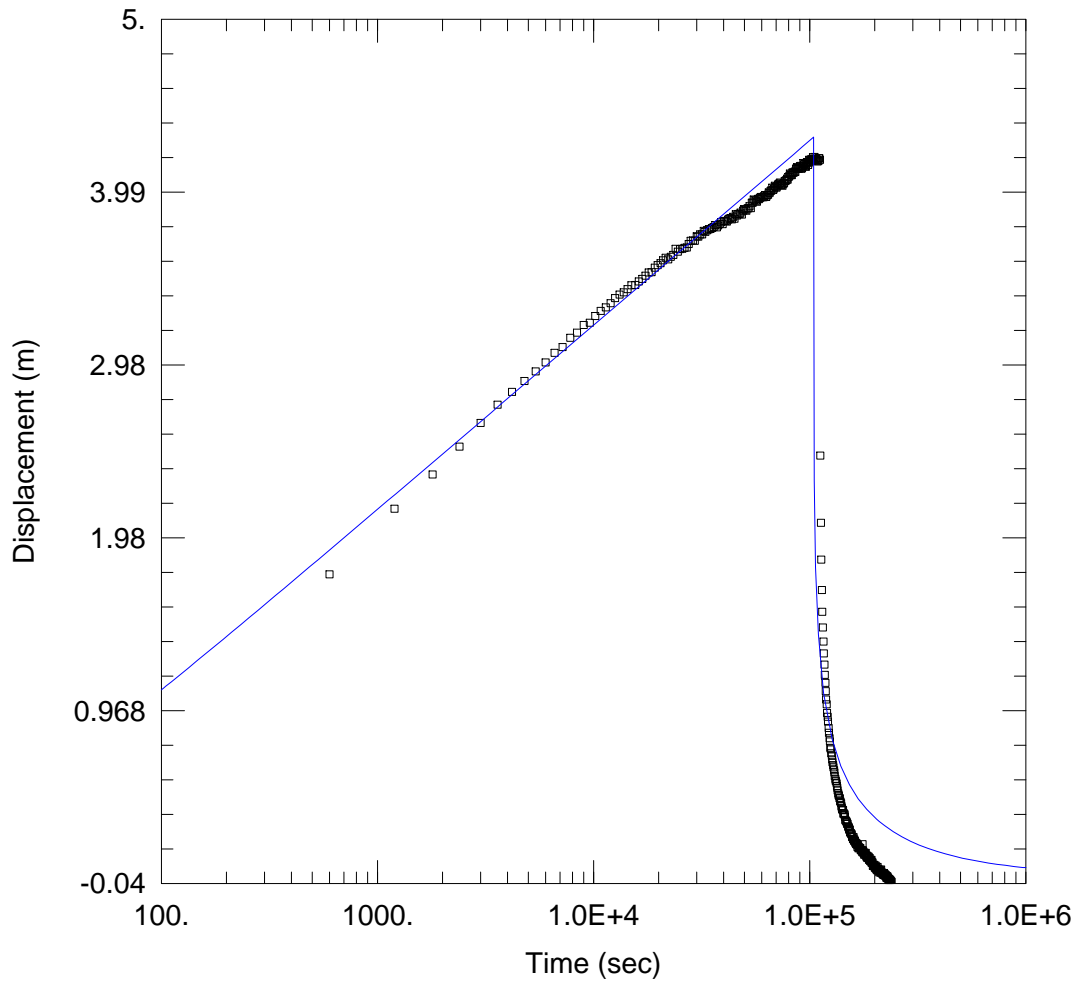
HJ: Hantush Jacob; H: Hantush; T: Theis; CJ: Cooper-Jacob

Thanks again graham, we look forward to your feedback or comparisons with your interpretations.

Regards

A handwritten signature in black ink, appearing to read "Lee Evans". The signature is written in a cursive style with a large initial "L" and "E".

**Lee Evans**  
Principal Hydrogeologist



### WELL TEST ANALYSIS

Data Set: PB1  
Date: 07/07/15

Time: 09:46:16

### PROJECT INFORMATION

Company: GHD  
Client: Arafura  
Project: 4322301  
Location: Nolans  
Test Well: RN19034  
Test Date: 20/8/15

### WELL DATA

#### Pumping Wells

Well Name	X (m)	Y (m)
RN19034	301273	7479847

#### Observation Wells

Well Name	X (m)	Y (m)
□ RN19029	300540	7478871

### SOLUTION

Aquifer Model: Leaky

Solution Method: Hantush-Jacob

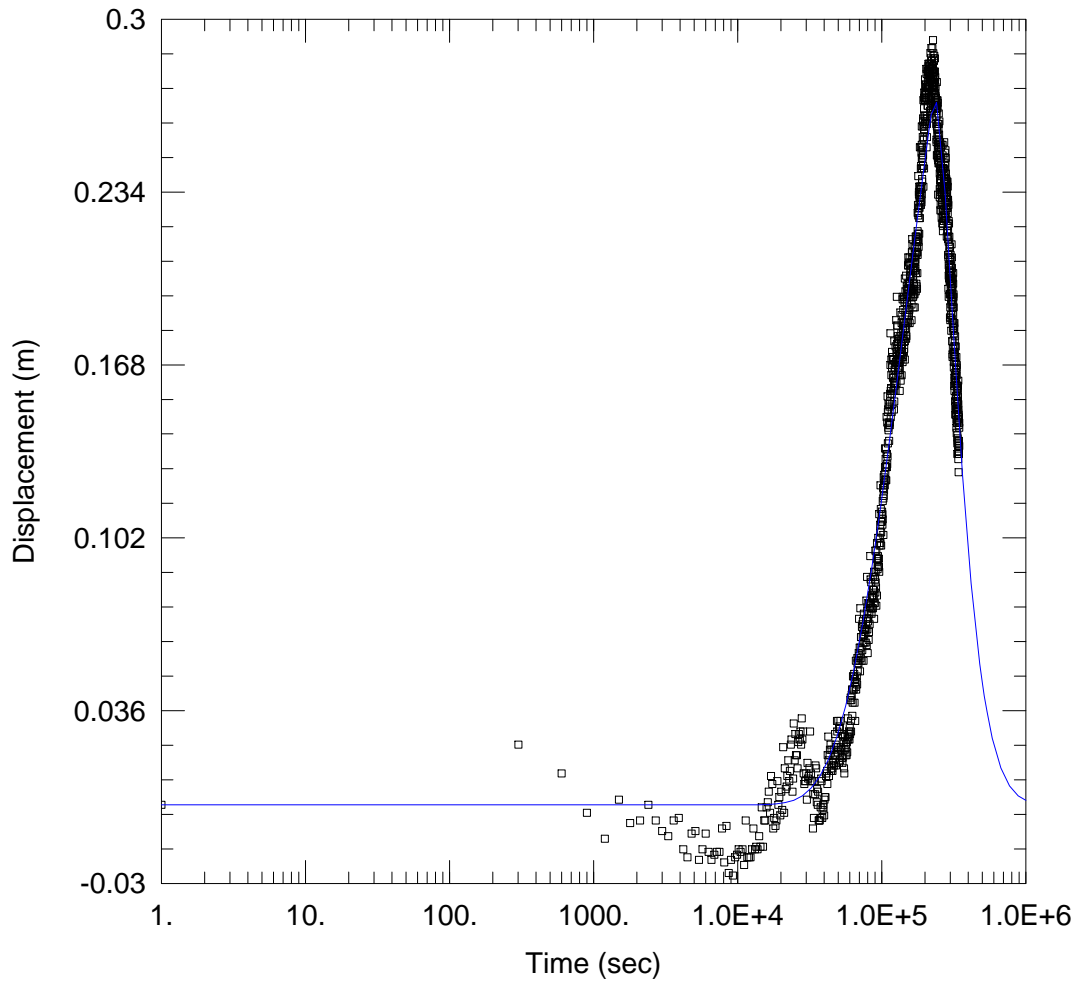
T = 250. m<sup>2</sup>/day

S = 4.5E-8

r/B = 1.0E-5

Kz/Kr = 1.

b = 69. m



### WELL TEST ANALYSIS

Data Set: PB2  
Date: 07/07/15

Time: 13:08:10

### PROJECT INFORMATION

Company: GHD  
Client: Arafura  
Project: 4322301  
Location: Nolans  
Test Well: RN19874  
Test Date: 30/11/15

### AQUIFER DATA

Saturated Thickness: 14.2 m  
Aquitard Thickness (b'): 51. m

Anisotropy Ratio (Kz/Kr): 1.  
Aquitard Thickness (b''): 1. m

### WELL DATA

#### Pumping Wells

Well Name	X (m)	Y (m)
RN18714	308061	7479250

#### Observation Wells

Well Name	X (m)	Y (m)
□ RN18876	308117	7479256

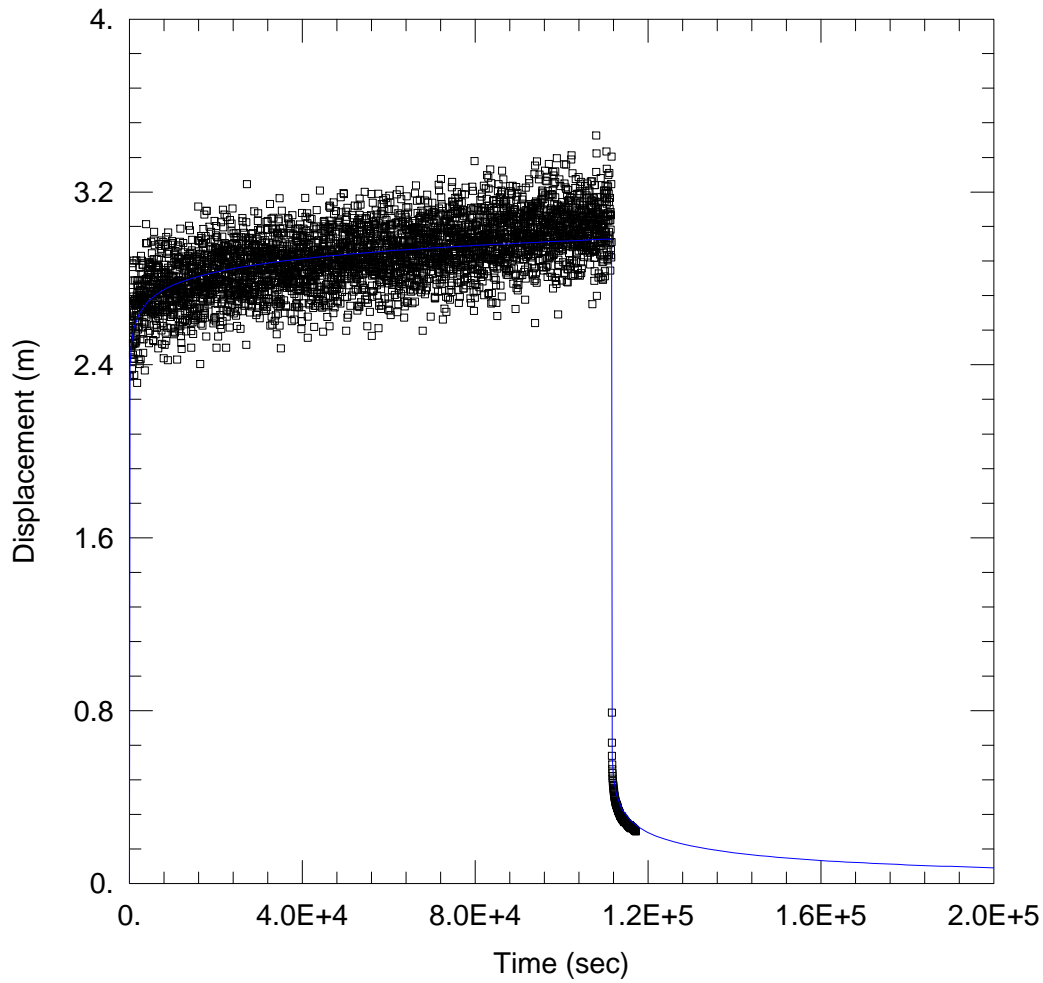
### SOLUTION

Aquifer Model: Leaky

Solution Method: Hantush

T = 95. m<sup>2</sup>/day  
r/B' = 1.505  
r/B'' = 0.

S = 0.15  
β' = 1.0E-5  
β'' = 0.



WELL TEST ANALYSIS

Data Set: PB4  
 Date: 07/07/15

Time: 12:44:59

PROJECT INFORMATION

Company: GHD  
 Client: Arafura  
 Project: 4322301  
 Location: Nolans  
 Test Well: RN19038  
 Test Date: 30/08/14

WELL DATA

Pumping Wells

Well Name	X (m)	Y (m)
RN19038	0	0

Observation Wells

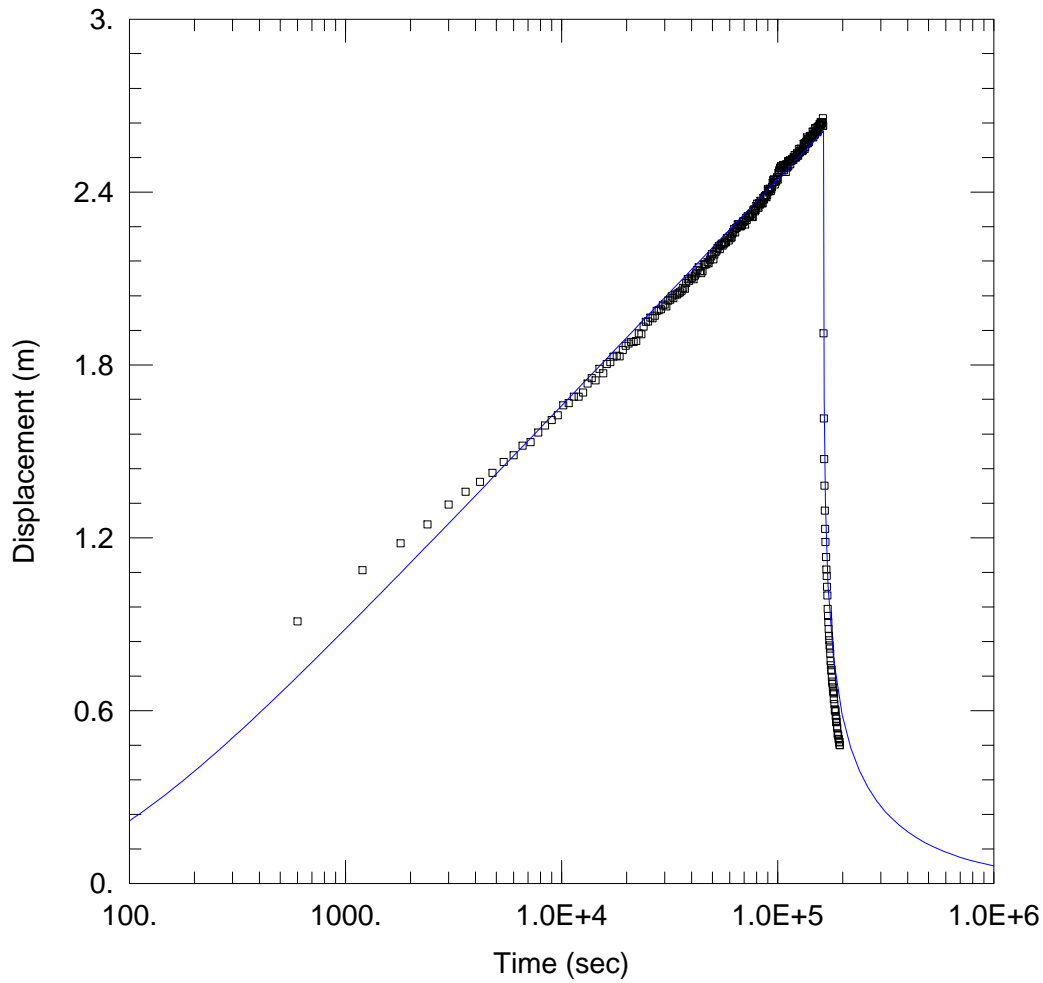
Well Name	X (m)	Y (m)
□ RN19038	0	0

SOLUTION

Aquifer Model: Confined  
 $T = 775. \text{ m}^2/\text{day}$   
 $Kz/Kr = 1.$

Solution Method: Theis  
 $S = 5.5E-10$   
 $b = 28. \text{ m}$





### WELL TEST ANALYSIS

Data Set: PB6  
Date: 07/07/15

Time: 13:55:45

### PROJECT INFORMATION

Company: GHD  
Client: Arafura  
Project: 4322301  
Location: Nolans  
Test Well: RN19033  
Test Date: 24/08/14

### WELL DATA

#### Pumping Wells

Well Name	X (m)	Y (m)
RN19033	294452	7482352

#### Observation Wells

Well Name	X (m)	Y (m)
□ RN19032	294467	7482369

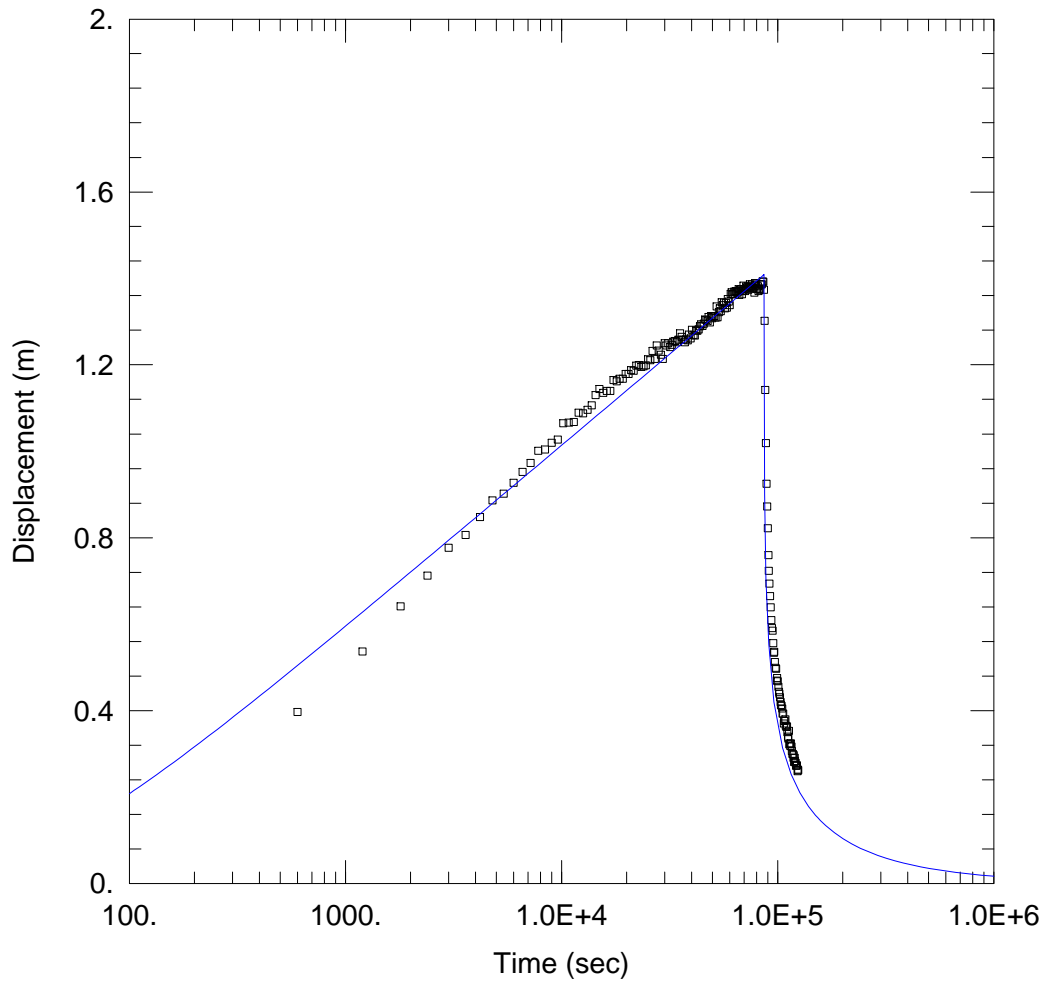
### SOLUTION

Aquifer Model: Confined

Solution Method: Theis

T = 225. m<sup>2</sup>/day  
Kz/Kr = 1.

S = 0.0009  
b = 51. m



### WELL TEST ANALYSIS

Data Set: PB7  
Date: 07/07/15

Time: 15:54:23

### PROJECT INFORMATION

Company: GHD  
Client: Arafura  
Project: 4322301  
Location: Nolans  
Test Well: RN19037  
Test Date: 27/08/14

### WELL DATA

#### Pumping Wells

Well Name	X (m)	Y (m)
RN19037	288454	7483300

#### Observation Wells

Well Name	X (m)	Y (m)
□ RN19036	288431	7483305

### SOLUTION

Aquifer Model: Confined

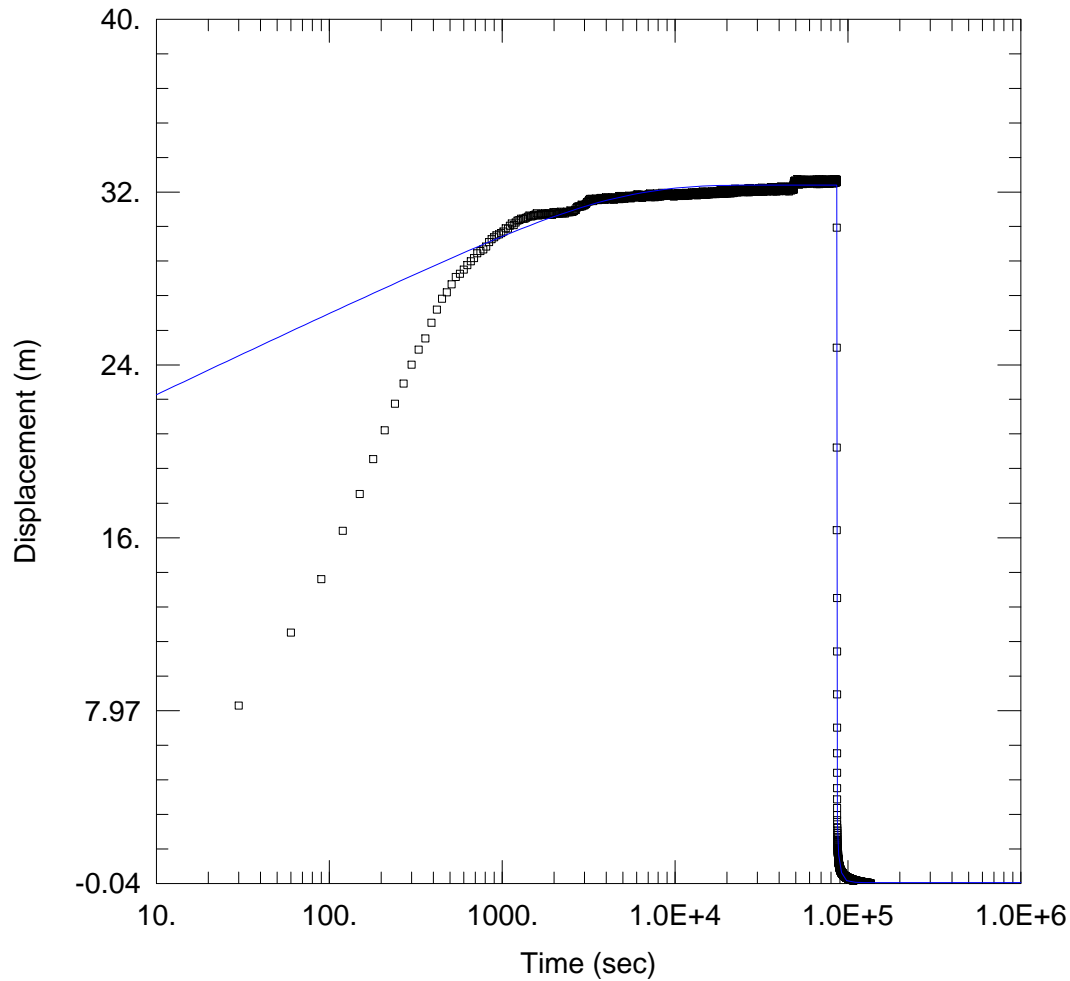
Solution Method: Theis

T = 375. m<sup>2</sup>/day

S = 0.0007

Kz/Kr = 1.

b = 97. m



WELL TEST ANALYSIS

Data Set: PB8  
 Date: 07/07/15

Time: 16:44:33

PROJECT INFORMATION

Company: GHD  
 Client: Arafura  
 Project: 4322301  
 Location: Nolans  
 Test Well: RN19039  
 Test Date: 27/08/14

AQUIFER DATA

Saturated Thickness: 33. m  
 Aquitard Thickness (b'): 48. m

Anisotropy Ratio (Kz/Kr): 1.  
 Aquitard Thickness (b''): 1. m

WELL DATA

Pumping Wells

Well Name	X (m)	Y (m)
RN19039	304175	7484915

Observation Wells

Well Name	X (m)	Y (m)
□ RN19039	304175	7484915

SOLUTION

Aquifer Model: Leaky  
 $T = 11.5 \text{ m}^2/\text{day}$   
 $r/B' = 7.218\text{E-}5$   
 $r/B'' = 0.$

Solution Method: Hantush  
 $S = 2.5\text{E-}7$   
 $\beta' = 1.0\text{E-}5$   
 $\beta'' = 0.$