GW 20

McFADDEN McMEEKEN PHILLIPS

LAWYERS

2 December 2009

Radich Law
PO Box 842
BLENHEIM

AND By email:
miriam@radichlaw.co.nz

Attention: Miriam Radich

RE: JEFFRIES APPEAL

Please find **enclosed** further evidence of Peter Callander.

Yours faithfully
McFADDEN McMEEKEN PHILLIPS

Nigel McFadden
Partner

nigel@mmp.co.nz

Our office will be closing at 3:00pm on Wednesday 23 December 2009 and re-opening at 8:30am on Monday 18 January 2010. The Partners and Staff of McFadden McMeeken Phillips wish you well for the Christmas season and the coming New Year.

IN THE MATTER OF The Resource Management Act 1991

AND

IN THE MATTER OF Resource Consent application U080280 by A J & K M Jeffries to take underground water from wells P28w/3226 and P28w/4781 for irrigation

ADDENDUM TO BRIEF OF EVIDENCE OF PETER FRANCIS CALLANDER

INTRODUCTION

1 My full name is Peter Francis Callander.

2 My qualifications and experience are set out in my main brief of evidence.

3 I have been engaged by AJ and KM Jeffries to describe the results of a pumping test that has been carried out on one of their bores.

4 I confirm that I have read the Environment Court's Code of Conduct for expert witnesses and this evidence has been prepared in accordance with that code. I agree to comply with the code's terms. In that regard, I confirm that the statements made in this evidence are within my area of expertise (unless I state otherwise) and I also confirm that I have not omitted to consider material facts which might alter the opinions stated in this evidence.

5 Since the preparation of my original statement of evidence, I have been provided with data of a constant rate pumping undertaken on the Jeffries bore P28w/4781 whilst water levels were monitored in nearby bores. My understanding is that this test was carried out in response to advice from Mr Scott Wilson. Mr Wilson is the consultant hydrogeologist who prepared the background reports on the Riverlands Aquifer for Marlborough District Council.

CONSTANT RATE PUMPING TEST

6 The pumping test was carried out on 13 and 14 November 2009 by Simpson Drilling, and the data has been provided to me to analyse.

7 The location of the bores involved in the test are shown in Figure A, and their details are summarised in the following table.

Table A: Details of Pumped and Observation Bores

Bore Name	MDC Bore Number	Easting	Northing	Screen Depth (m)	Bore Diameter (mm)	Distance From Pumped Bore	Direction From Pumped Bore
Pumped bore	P28w/4781	2595965	5964888	40.05-42.1	150	0	-
Pattie	P28w/0716	2595900	5964700	Not recorded	44.5	199	South-south-west
Galilee	P28w/4738	2595750	5964962	40.21-42.24	150	227	East
Morrin	P28w/0692	2595800	5965200	39.6	63.5	353	North-north-east

8 The Jeffries bore P28w/4781 was pumped at a rate of 26.14 L/s for a 24 hour period whilst changes in water level were measured both in the pumped bore and in the neighbouring bores. The pumping rate used in this test equates to an abstraction of 2,258 m^3/day, which is more than double the proposed abstraction rate from the bore of 1,078 m^3/day.

9 The measured water levels are plotted in Figure B. This shows how groundwater levels in all bores exhibit a pattern of regular tidally induced fluctuations with an amplitude of around 0.3 m. This is a typical characteristic of confined aquifers near the coast that are separated, and protected, from the sea by low permeability sediments (the confining layer) that overlie the gravel aquifer strata, as shown in the cross-section in Figure 2 of my main evidence.

10 The water level fluctuations are caused by the weight of water moving over the top of the seaward extension of the confined aquifer as the sea side goes in and out. It is not unique to this area, as demonstrated by Figure C, which show the magnitude of tidal loading fluctuations across the entire confined Wairau Aquifer. The magnitude of these water level fluctuations reduces with increasing distance from the coast.

11 The measured water levels (Figure B) indicate that pumping bore P28w/4781 at 26.14 L/s caused water levels in that bore to drop by around 7 m. The change in water levels in the surrounding bores is of a much smaller scale, and therefore Figure D has been prepared at an enlarged vertical scale to show the change in water levels in the observation bores. This indicates that the bores have experienced a drawdown of around 0.3 m, a similar magnitude to the naturally induced tidal loading fluctuations.

12 It is difficult to precisely analyse the test data because the drawdown effect is so small relative to the background tidal fluctuations. However, the analysis of the data is consistent with a transmissivity of 3.0 m^2/minute, and a storativity of 2 x 10^{-4}. An example of the modelled fit to the test data and the residual water level analysis is presented in Figures E and F. It is likely that the low permeability confining layer for the strata also exhibits some

leakage characteristics, although these cannot be determined from this test.

13 These aquifer characteristics indicate more permeable strata than those assumed in my main brief of evidence, which would be consistent with smaller drawdown effects than estimated.

CONCLUSION

14 The results confirm that the Jeffries bores abstract from a permeable and high yielding strata, which is characteristic of the coastal Wairau Aquifer. It is not part of the low yielding Riverlands Aquifer strata that occurs at the southern margin of the Wairau Plain. The Jeffries bores are high yielding, efficient abstraction systems that cause an insignificant drawdown effect in neighbouring bores.

Dated: 2 December 2009

PETER FRANCIS CALLANDER

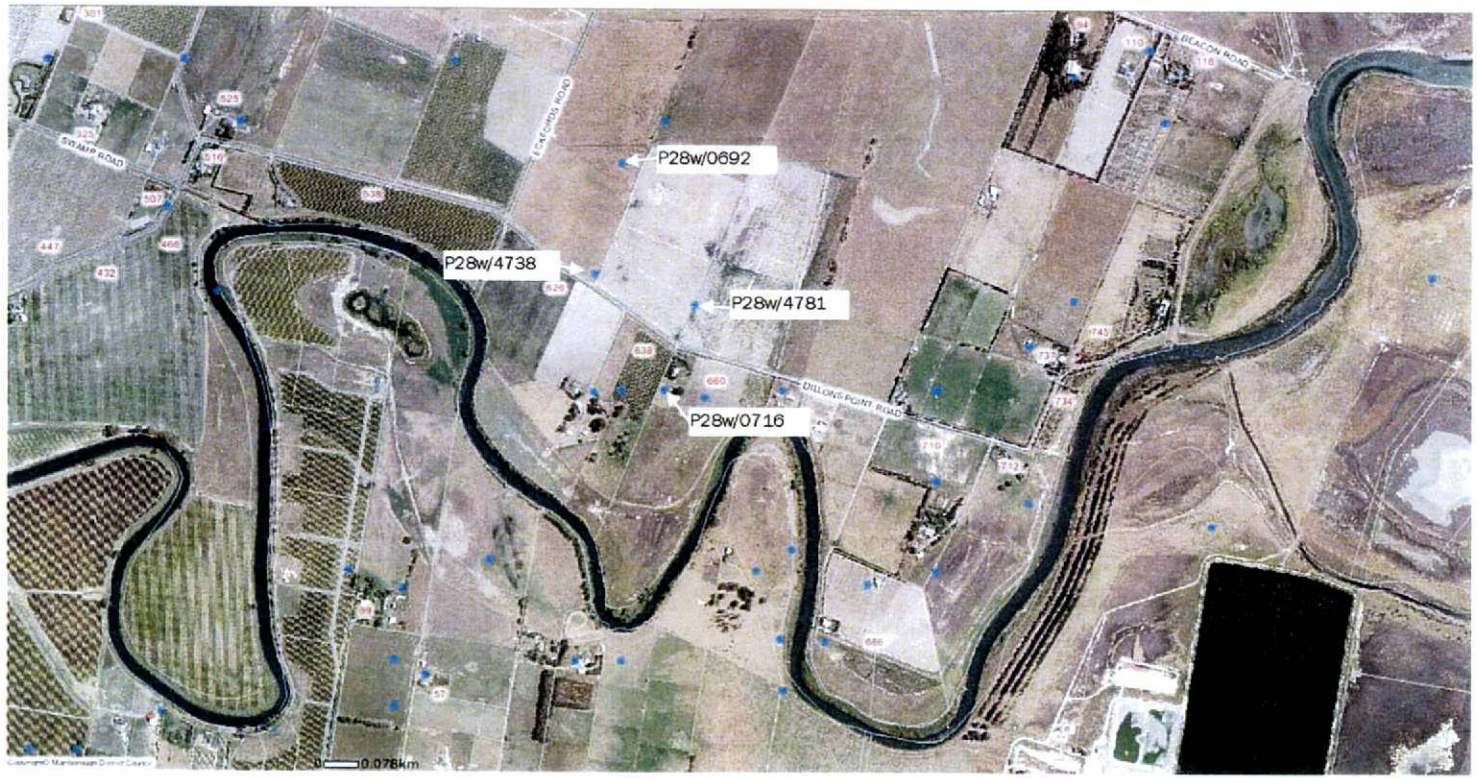

Figure A: Location of Pumped (P28w/4781) and Monitoring Bores (Image from MDC GIS website)

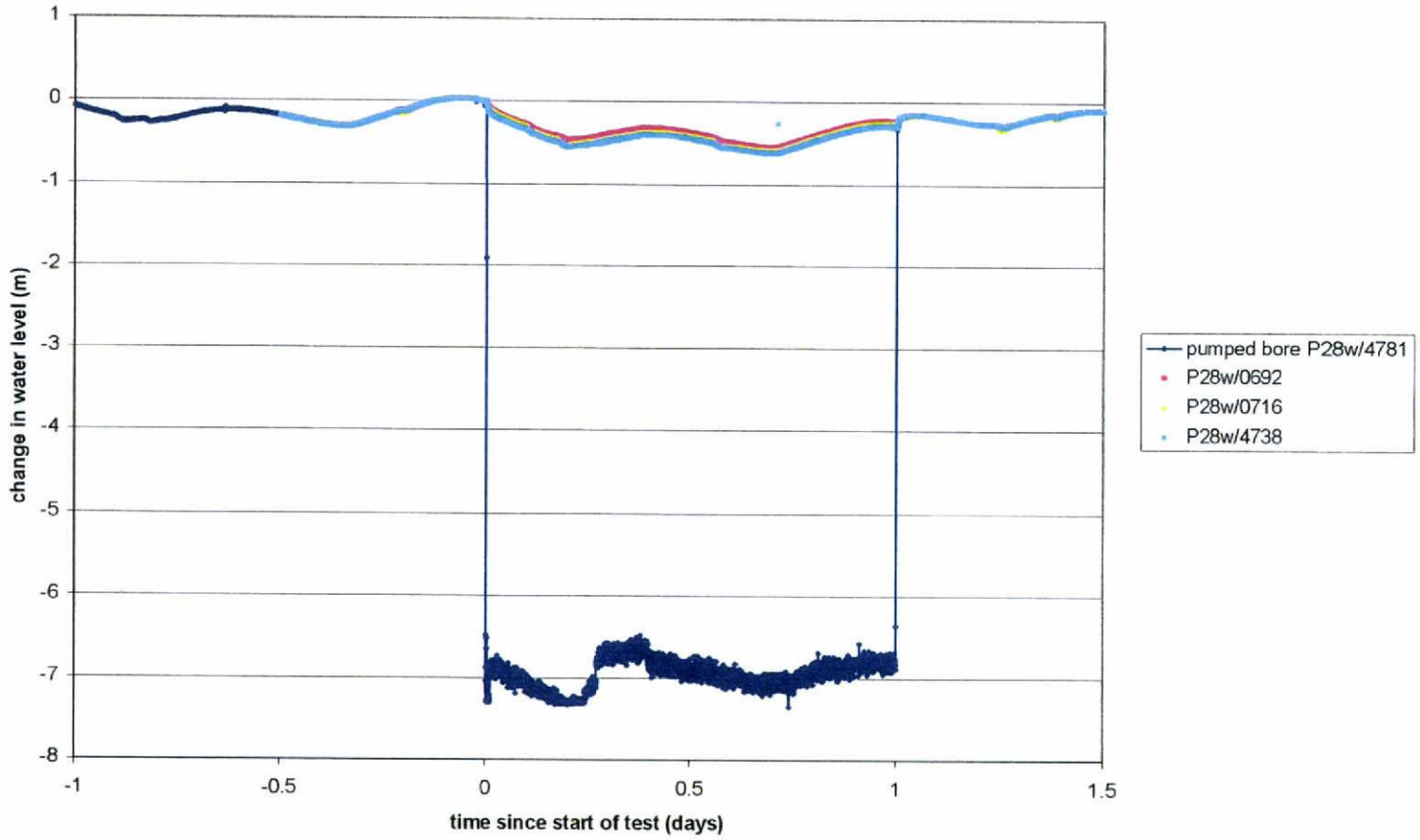

Figure B: Change in Water Levels Caused by Pumping Test

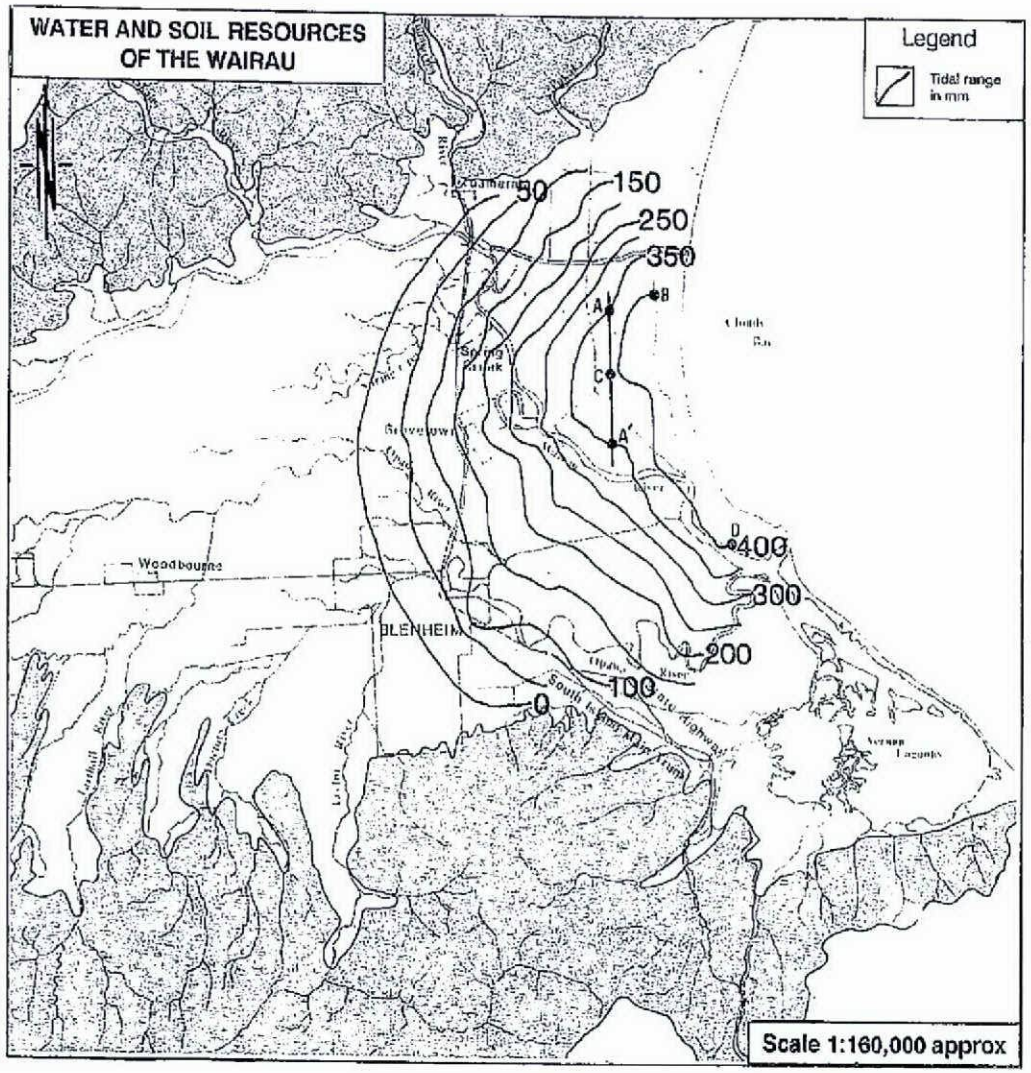

Figure C : Tidal Range Contours; Lower Wairau Plain

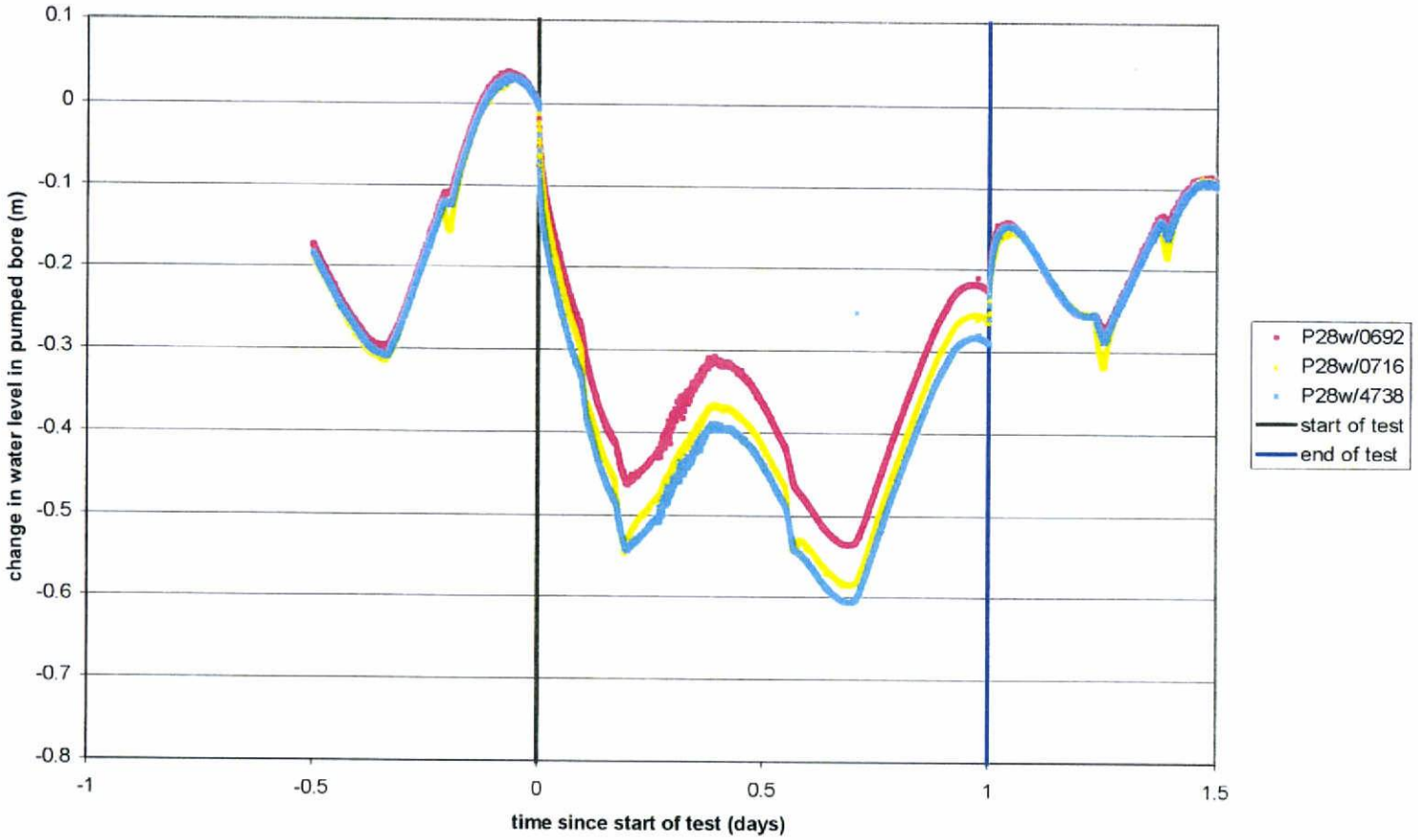

Figure D: Change in Water Levels in Observation Bores

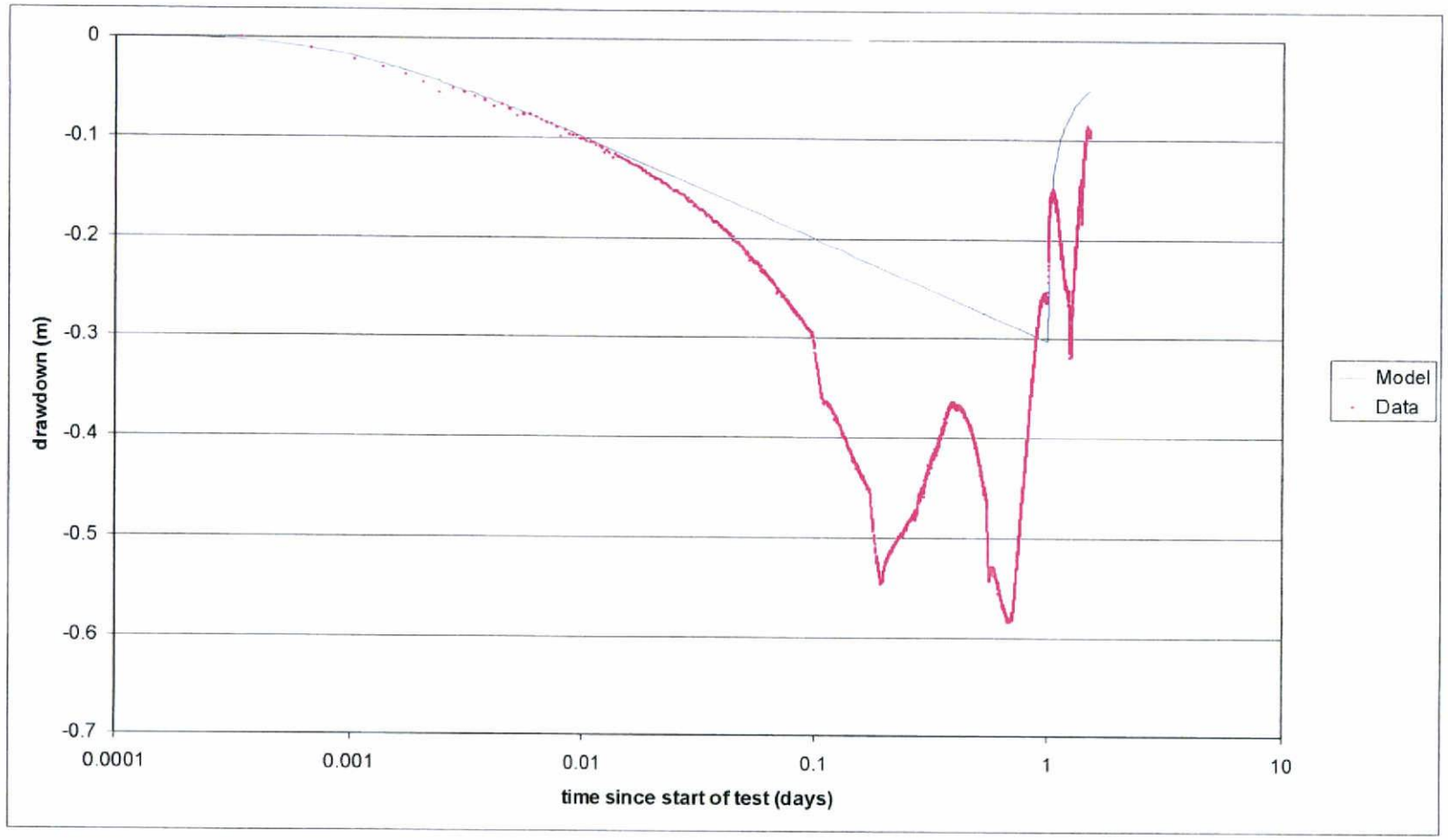

Figure E: Model Fit to Early Time Data in P28w/4738

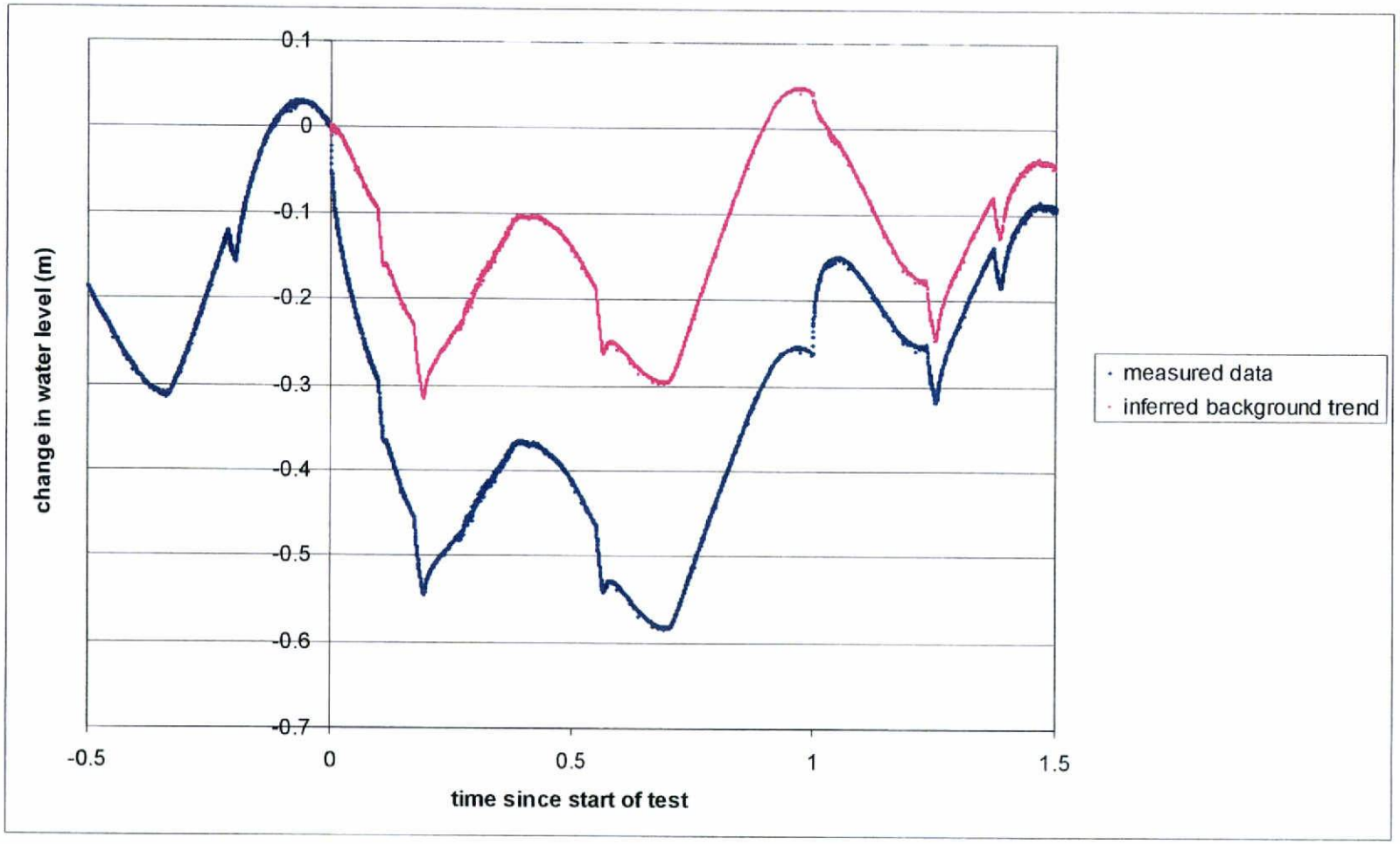

Figure F: Inferred Tidal Loading Pattern in P28w/4738