

**Median water table elevation in
Christchurch and surrounding area
after the 4 September 2010 Darfield Earthquake
Version 2**

S. van Ballegooy, S. C. Cox, C. Thurlow,
H. K. Rutter, T. Reynolds, G. Harrington,
J. Fraser, T. Smith

GNS Science Report 2014/18

May 2014

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GNS Science Report 2014/18 May 2014

The following report is an update of the median water table elevation report for Christchurch and surrounding areas released in March 2013 (GNS Report 2013/01). The revision encompasses an extension of the period of groundwater monitoring (4 September 2010 to 30 November 2013) and new surfaces for improved definition of water table fluctuation.

BIBLIOGRAPHIC REFERENCE

S. van Ballegooy, S. C. Cox, C. Thurlow, H. K. Rutter, T. Reynolds, G. Harrington, J. Fraser, T. Smith, 2014. Median water table elevation in Christchurch and surrounding area after the 4 September 2010 Darfield Earthquake: Version 2. GNS Science Report 2014/18, 79 pages plus 8 appendices.

Sjoerd van Ballegooy, Chris Thurlow, Tony Reynolds
Tonkin and Taylor Limited, P O Box 5271, Auckland

Simon Cox
GNS Science, Private Bag 1930, Dunedin

Helen Rutter
Aqualinc Research Ltd, PO Box 20-462, Christchurch

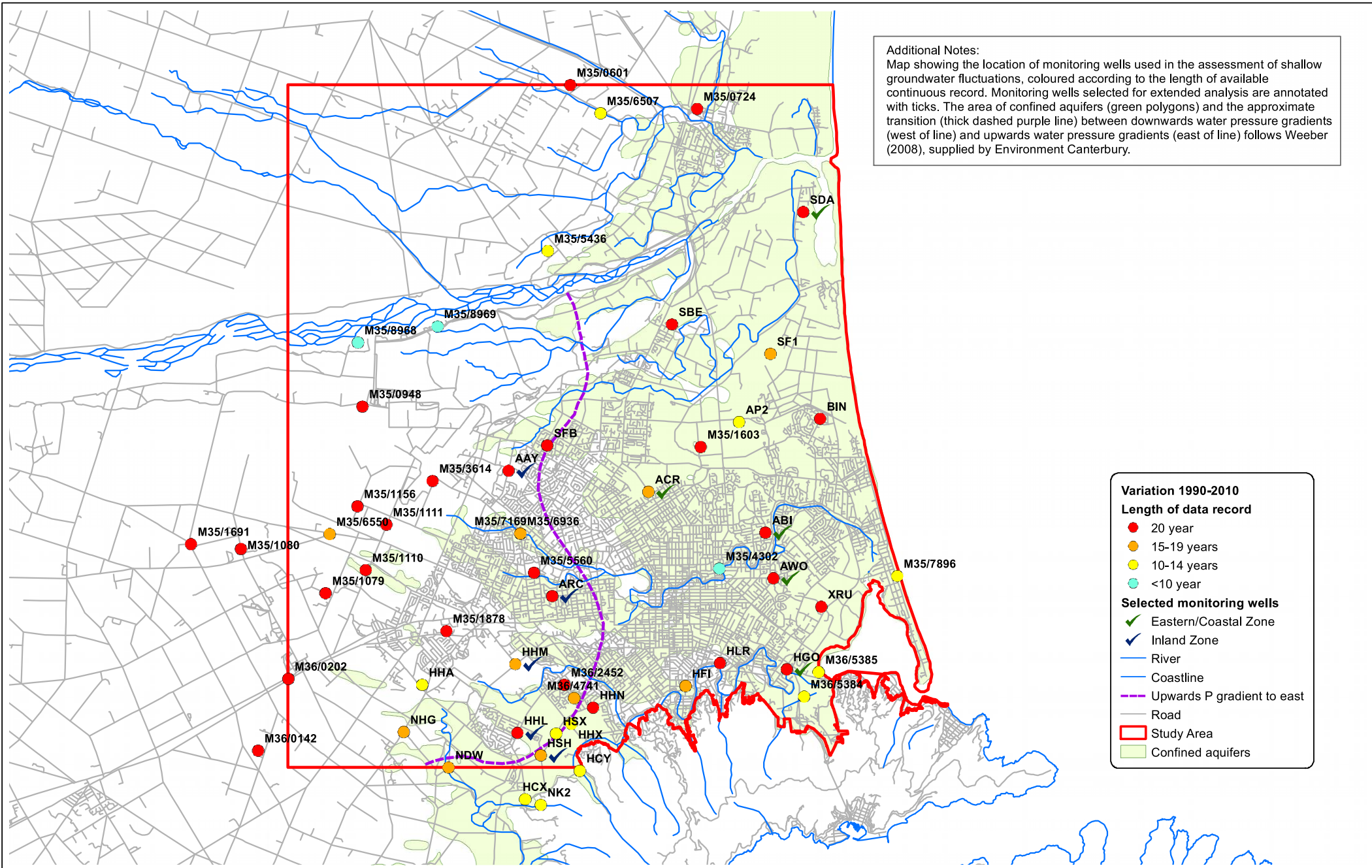
Graham Harrington
Christchurch City Council, PO Box 73014, Christchurch

Jeff Fraser
Golder Associates (NZ) Limited, PO Box 2281, Christchurch

Titus Smith
Riley Consultants Ltd, PO Box 4355, Christchurch

APPENDIX H: WATER LEVEL FLUCTUATION

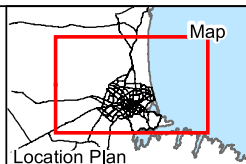
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0 2 4 6 8 Kilometers



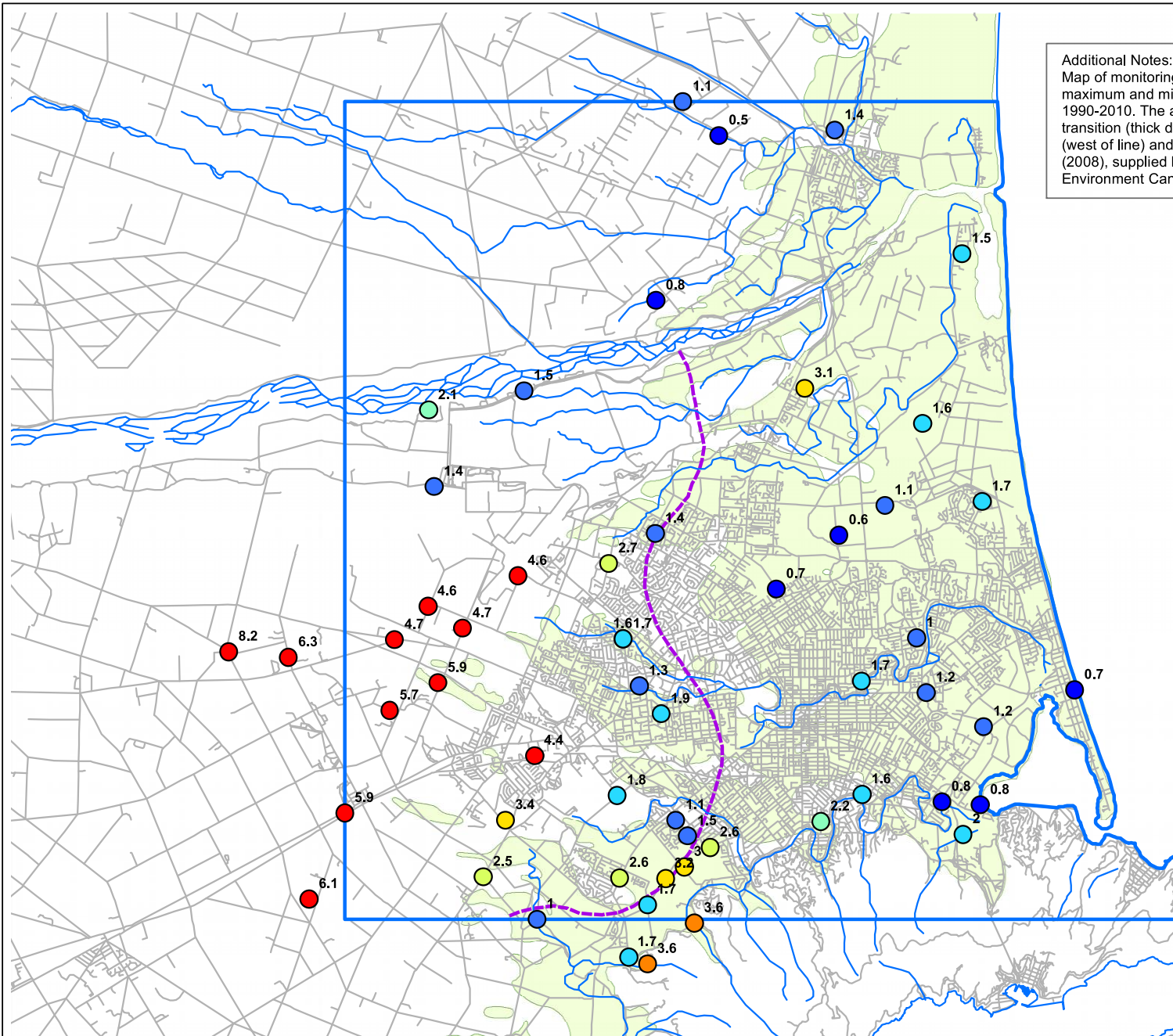
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Ref.	52020.0200	

CHRISTCHURCH MEDIAN WATER TABLE ELEVATION REPORT

Location of monitoring wells used in the
assessment of pre-earthquake fluctuations

FIGURE No. Figure H.1

Rev. 0



Additional Notes:
 Map of monitoring wells coloured according to the range (in metres) between maximum and minimum groundwater elevations recorded during the period 1990-2010. The area of confined aquifers (green polygons) and the approximate transition (thick dashed purple line) between downwards water pressure gradients (west of line) and upwards water pressure gradients (east of line) follows Weeber (2008), supplied by Environment Canterbury. Monitoring data supplied by Environment Canterbury and Christchurch City Council.

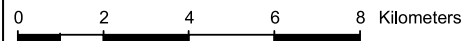
Variation 1990-2010
 Range = Max-Min (m)

- >4
- 3.5 - 4.0
- 3.0 - 3.5
- 2.5 - 3.0
- 2.0 - 2.5
- 1.5 - 2.0
- 1.0 - 1.5
- <1.0

- River
- Coastline
- Upwards P gradient to east
- Road
- ▭ Study Area
- ▭ Confined aquifers

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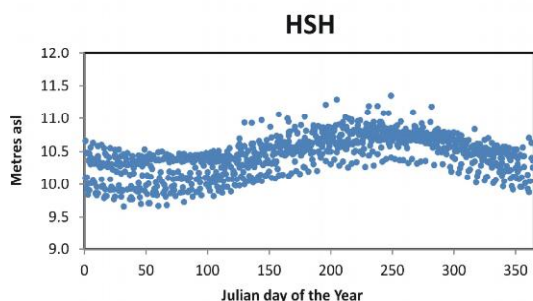
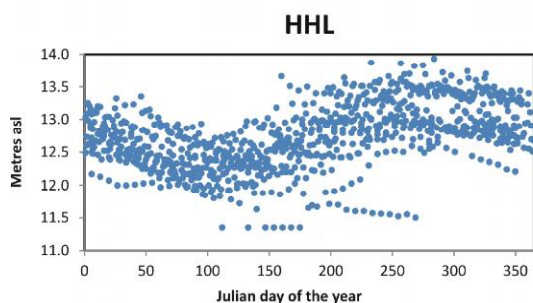
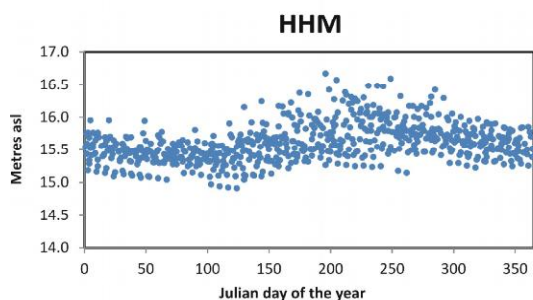
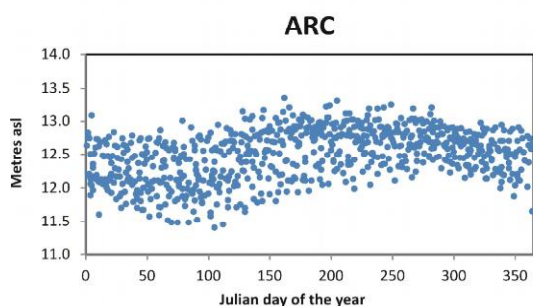
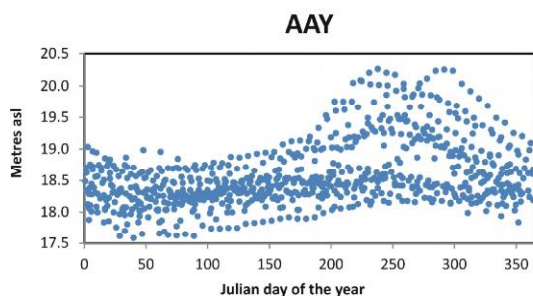
CHRISTCHURCH MEDIAN WATER TABLE ELEVATION REPORT

Range of groundwater elevation in metres,
for the period 1990-2010

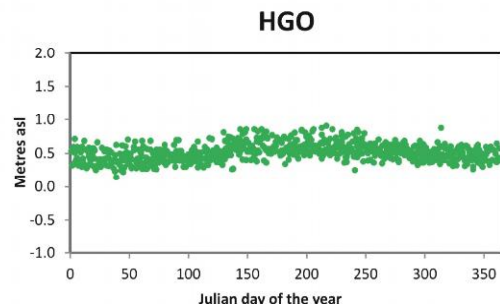
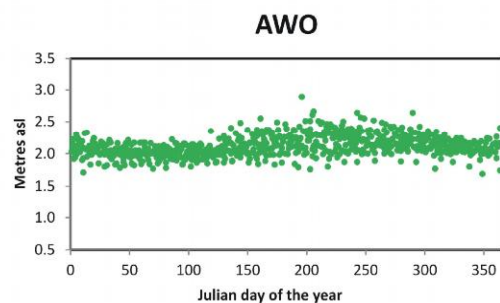
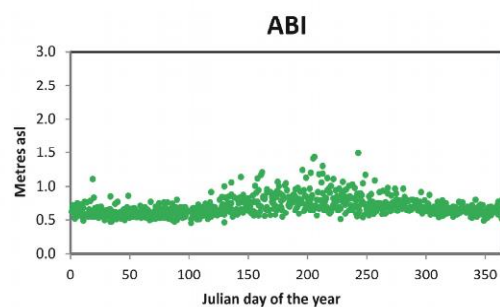
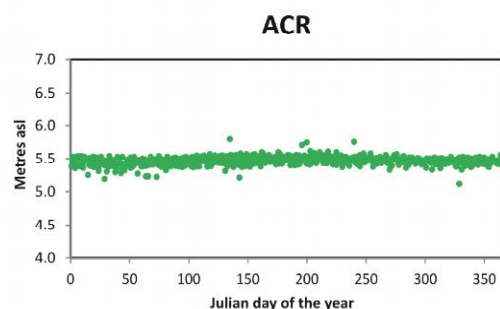
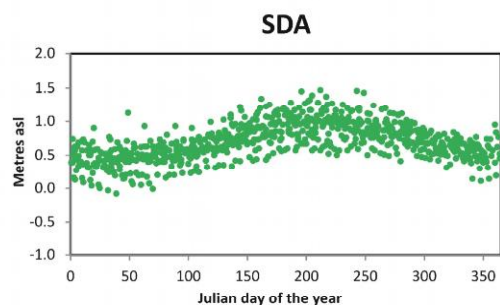
FIGURE No. Figure H.2

Rev. 0

Inland Zone



Eastern/Coastal Zone



Notes:

Groundwater elevations (in mRL above sea level) in selected monitoring wells for the period 1990-2010, plotted according to the numerical (Julian) day of the year (0-365). Monitoring wells from the inland zone (blue) are distinguished from the eastern coastal zone (green). The scale ranges of the water elevations (vertical axes) are all the same (3 m), although absolute values differ between graphs, for ease of comparison between graphs. Monitoring data collected by NIWA and supplied by Christchurch City Council.



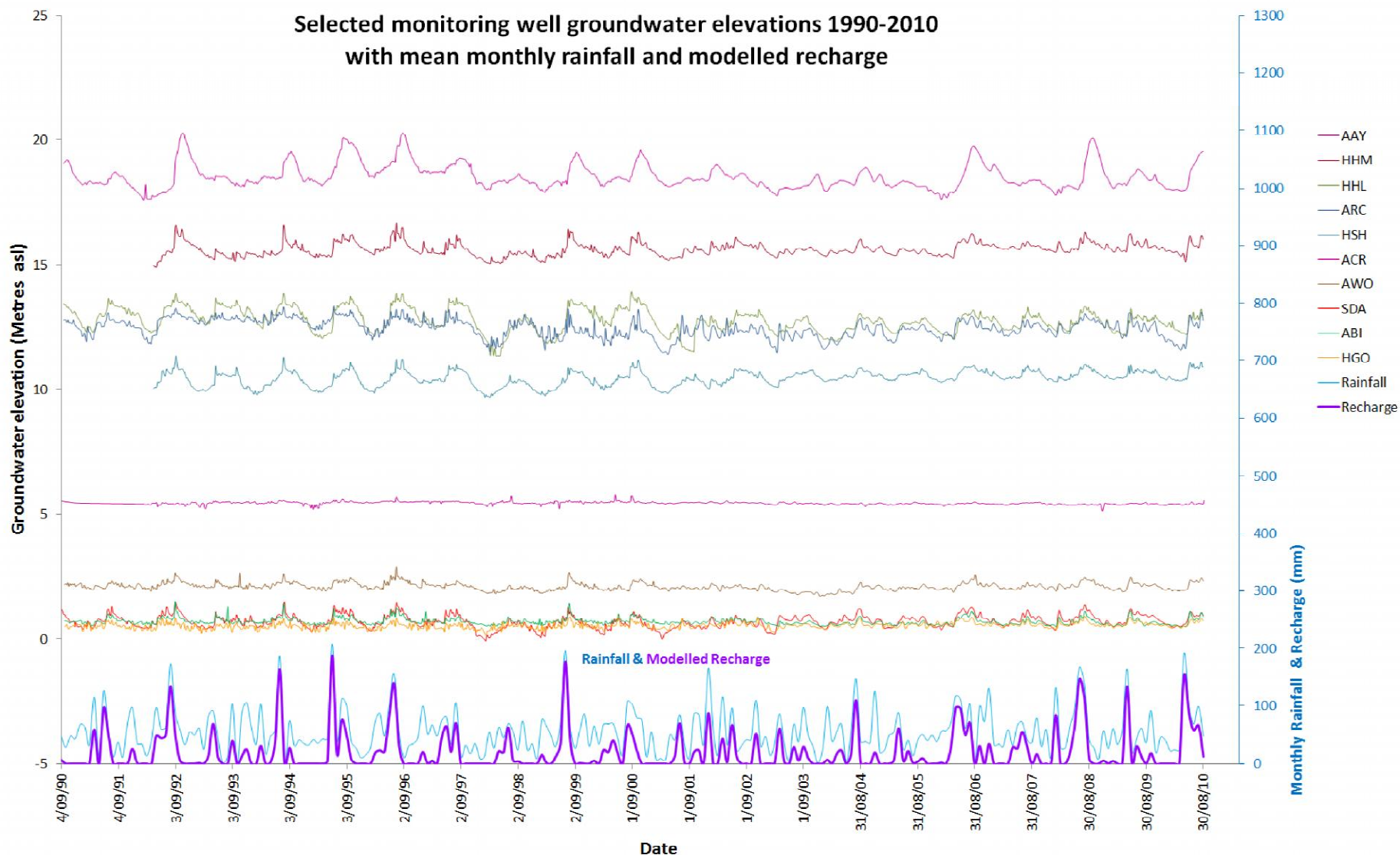
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CHRISTCHURCH MEDIAN WATER TABLE ELEVATION REPORT

Groundwater elevation in selected monitoring well water levels,
1990-2010, plotted by numerical (Julian) day of the year

FIGURE No. Figure H.3

Rev. 0



Notes: Time series plot of water level fluctuations in selected monitoring wells during the period 1990-2010. Data collected by NIWA and supplied by Christchurch City Council. The mean monthly rainfall and modelled groundwater recharge (in mm – right axis) at Christchurch airport is shown at the base of the graph for reference. Monitoring data collected by NIWA and supplied by Christchurch City Council. Rainfall data sourced from NIWA through the Cliflo database.

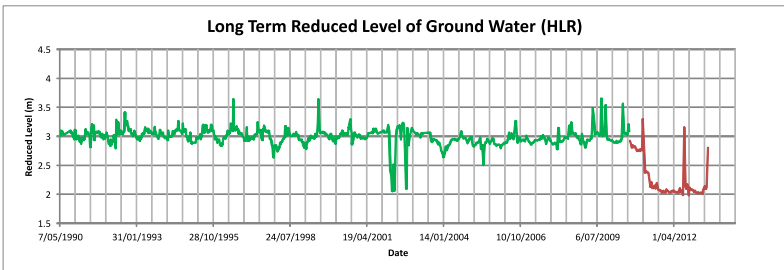
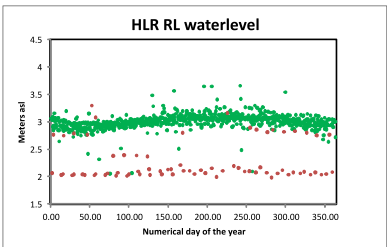
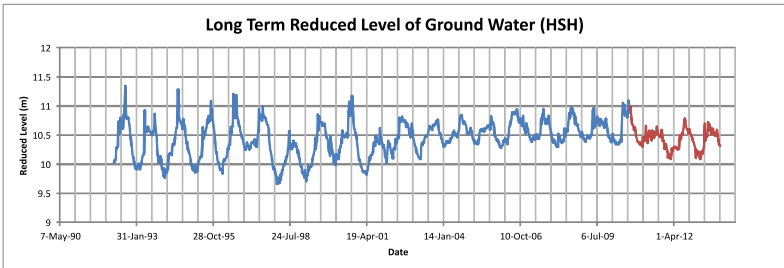
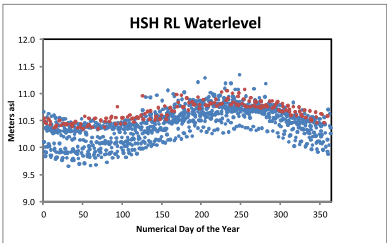
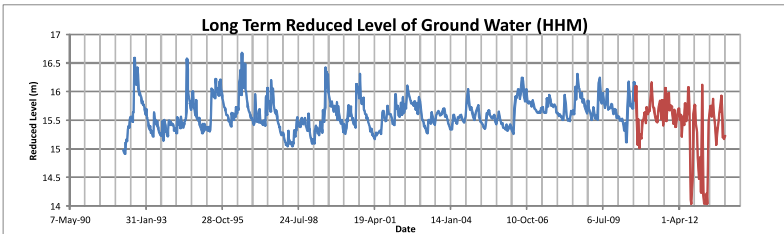
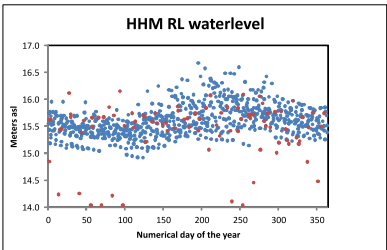
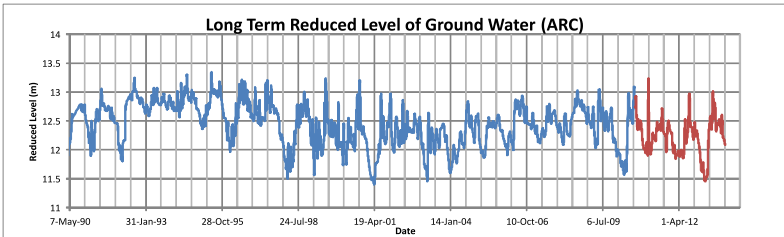
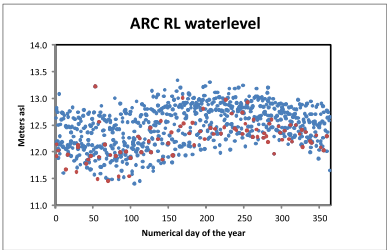
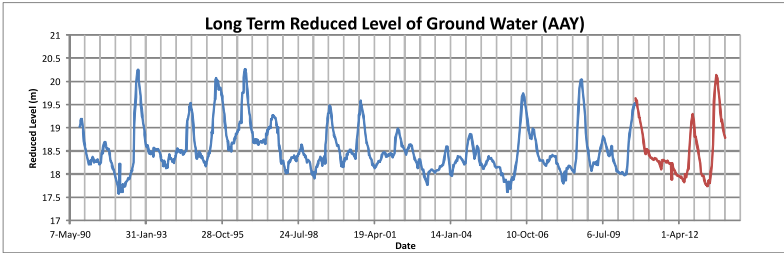
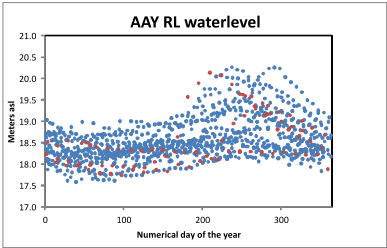


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**CHRISTCHURCH MEDIAN WATER
TABLE ELEVATION REPORT**
Groundwater elevation in selected monitoring wells, rainfall
& groundwater recharge, 1990-2010 time series

FIGURE No. Figure H.4

Rev. 0



Inland Zone Eastern/Coastal Zone

— pre Darfield Earthquake — pre Darfield Earthquake

— post Darfield Earthquake — post Darfield Earthquake

Notes:



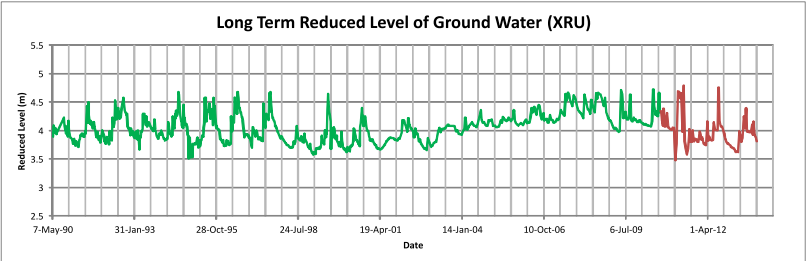
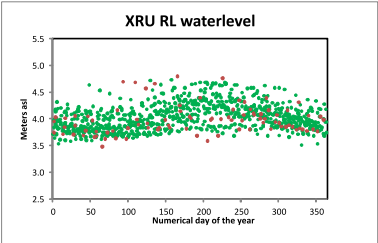
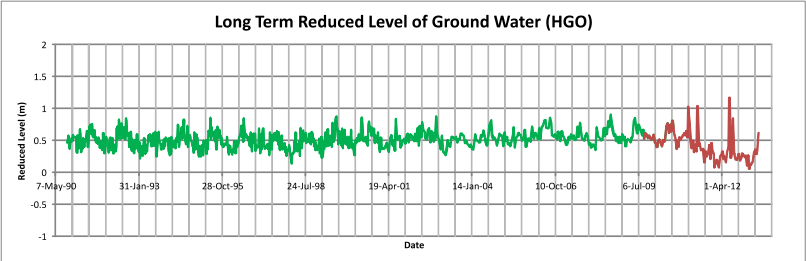
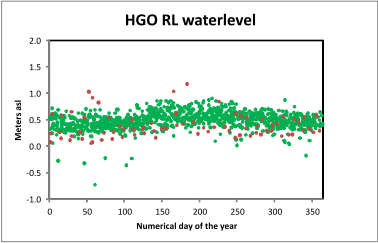
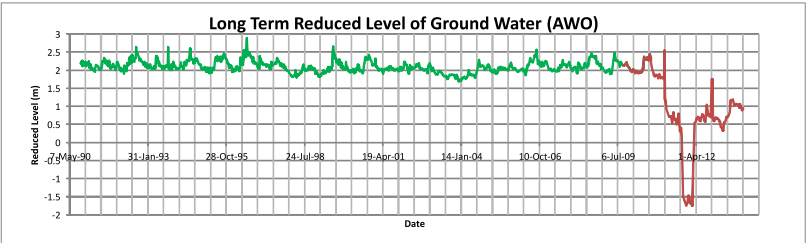
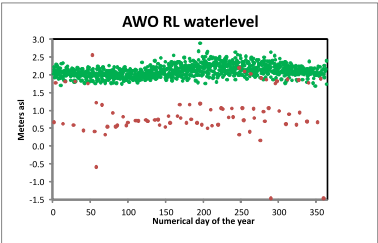
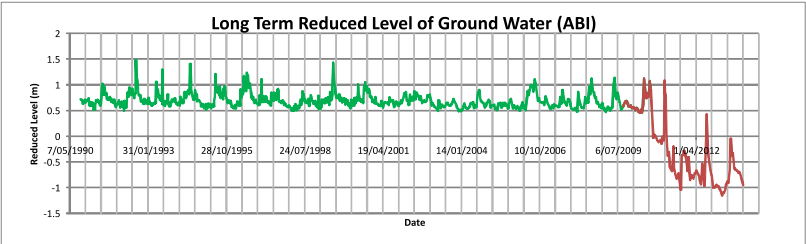
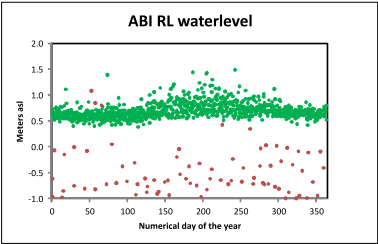
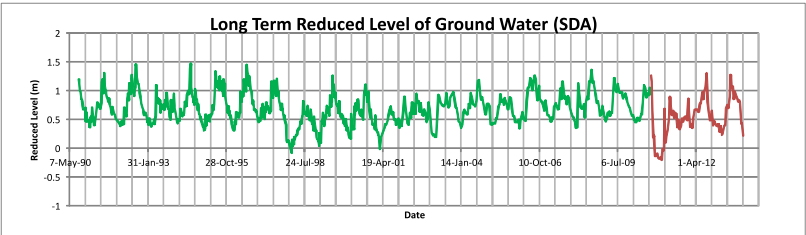
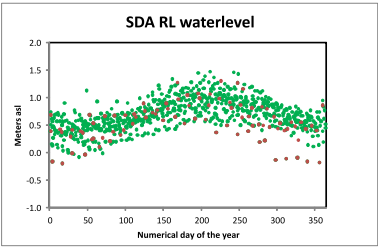
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**CHRISTCHURCH MEDIAN WATER
TABLE ELEVATION REPORT**

Comparison of shallow groundwater elevation in monitoring wells including 2010–2011 Canterbury earthquake sequence

FIGURE No. Figure H.5

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Eastern/Coastal Zone

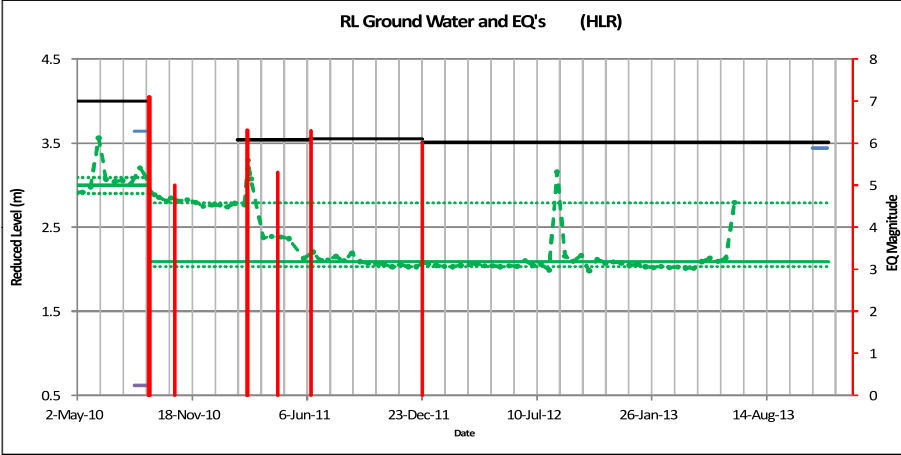
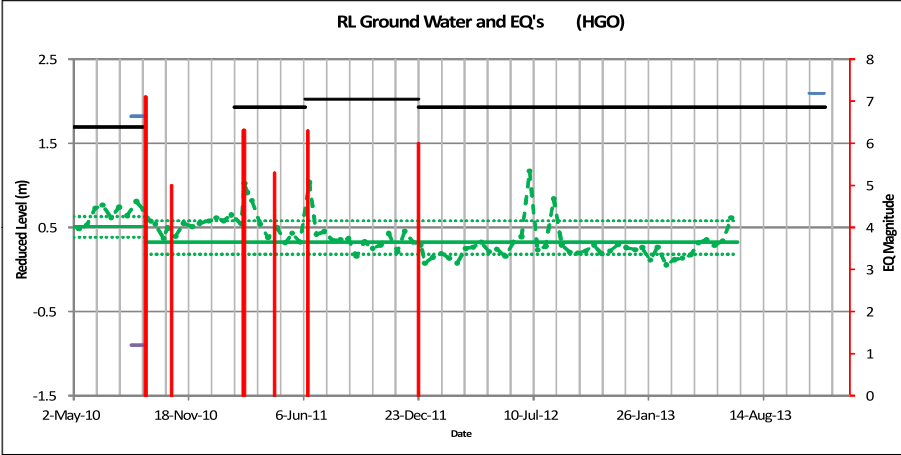
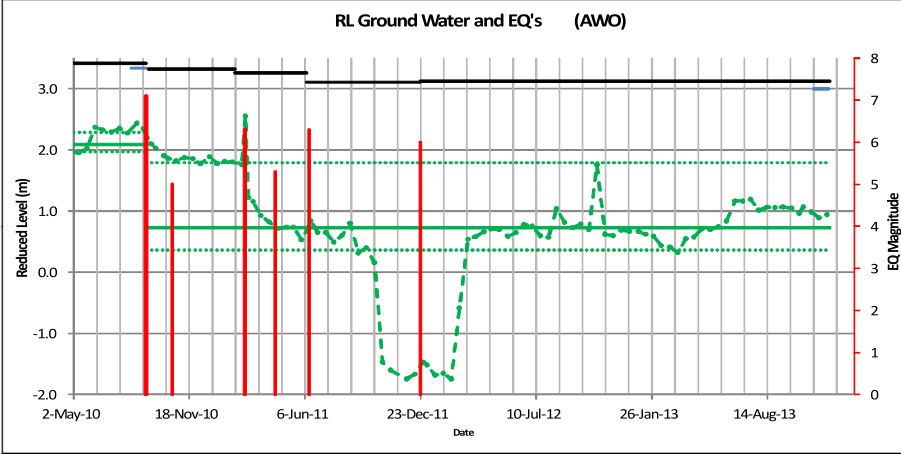
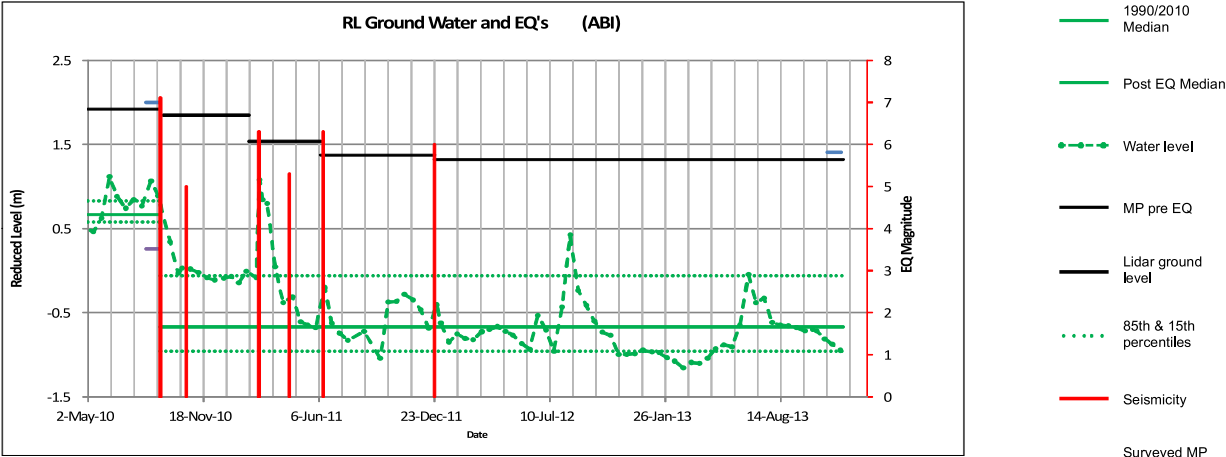
— pre Darfield Earthquake
— post Darfield Earthquake

Notes:



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CHRISTCHURCH MEDIAN WATER		
TABLE ELEVATION REPORT		
Comparison of shallow groundwater elevation in monitoring wells including 2010–2011 Canterbury earthquake sequence		
FIGURE No.	Figure H.6	Rev.

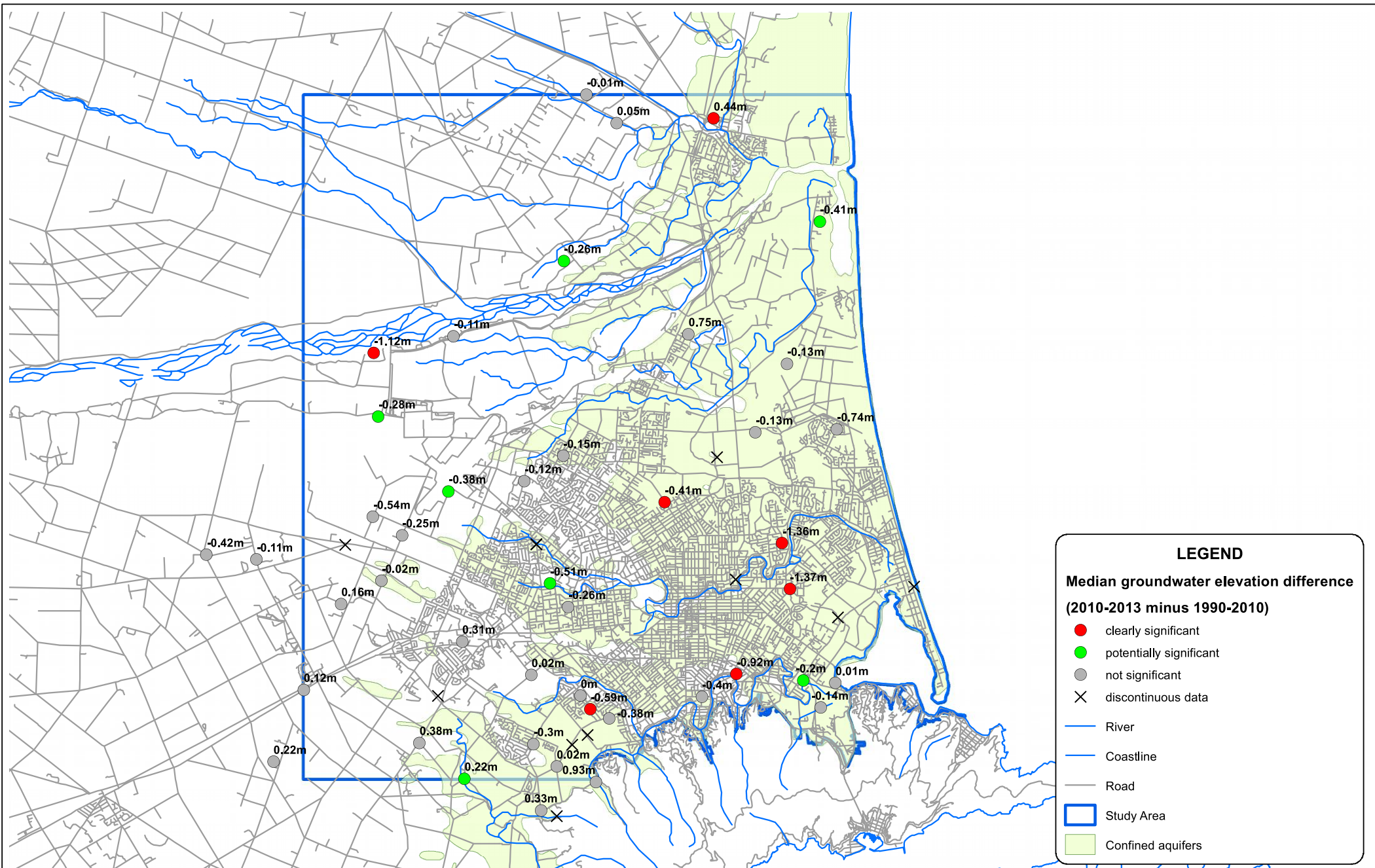


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CHRISTCHURCH MEDIAN WATER		
TABLE ELEVATION REPORT		
Ground & shallow groundwater elevation changes in selected monitoring wells during 2010-2011 Canterbury earthquake sequence		
FIGURE No.	Figure H.7	Rev.
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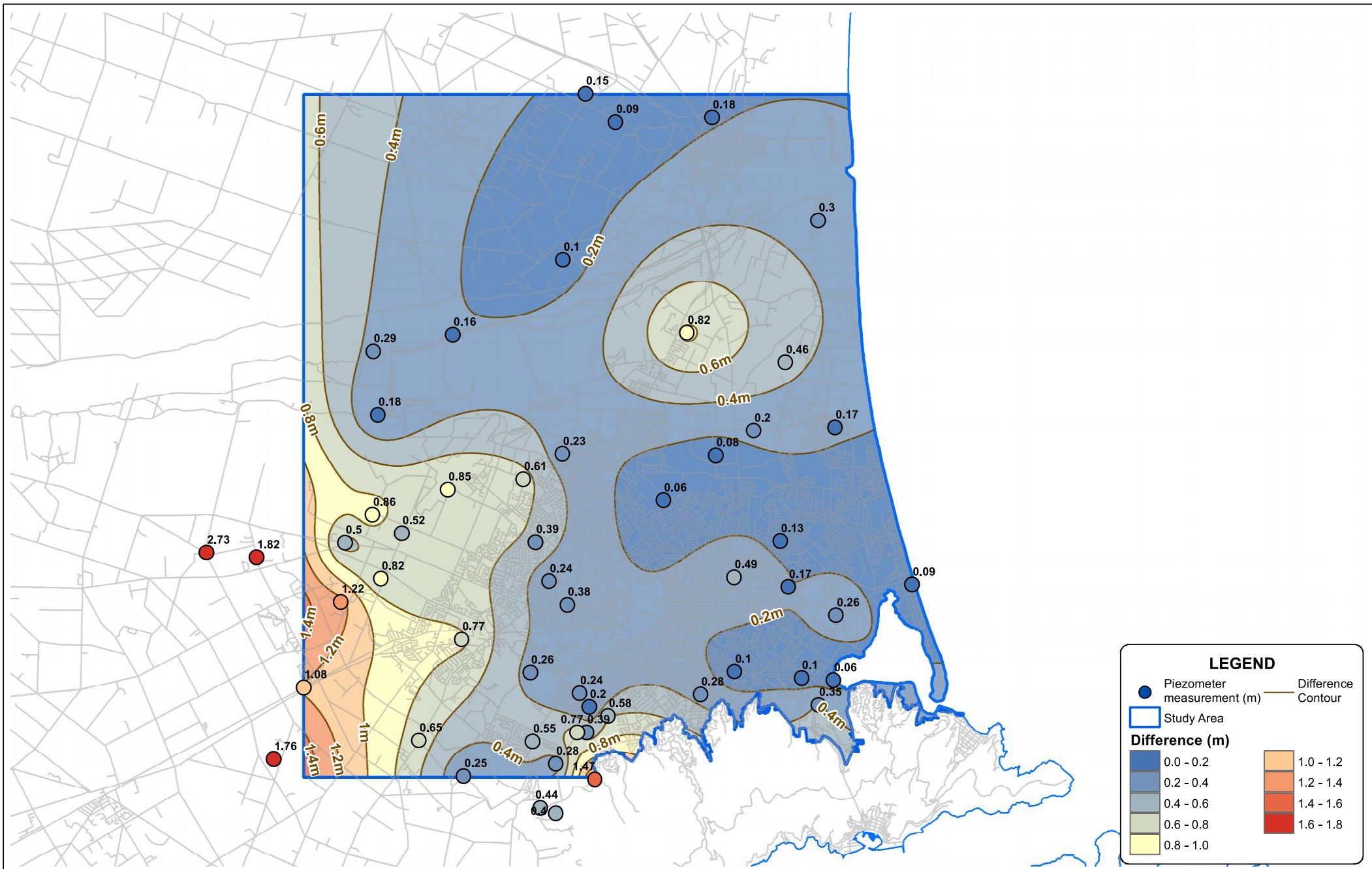
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CHRISTCHURCH MEDIAN GROUNDWATER REPORT

Difference between Pre- and Post-Darfield Earthquake median groundwater elevation

FIGURE No. Figure H.8

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0 2 4 6 8 Kilometers



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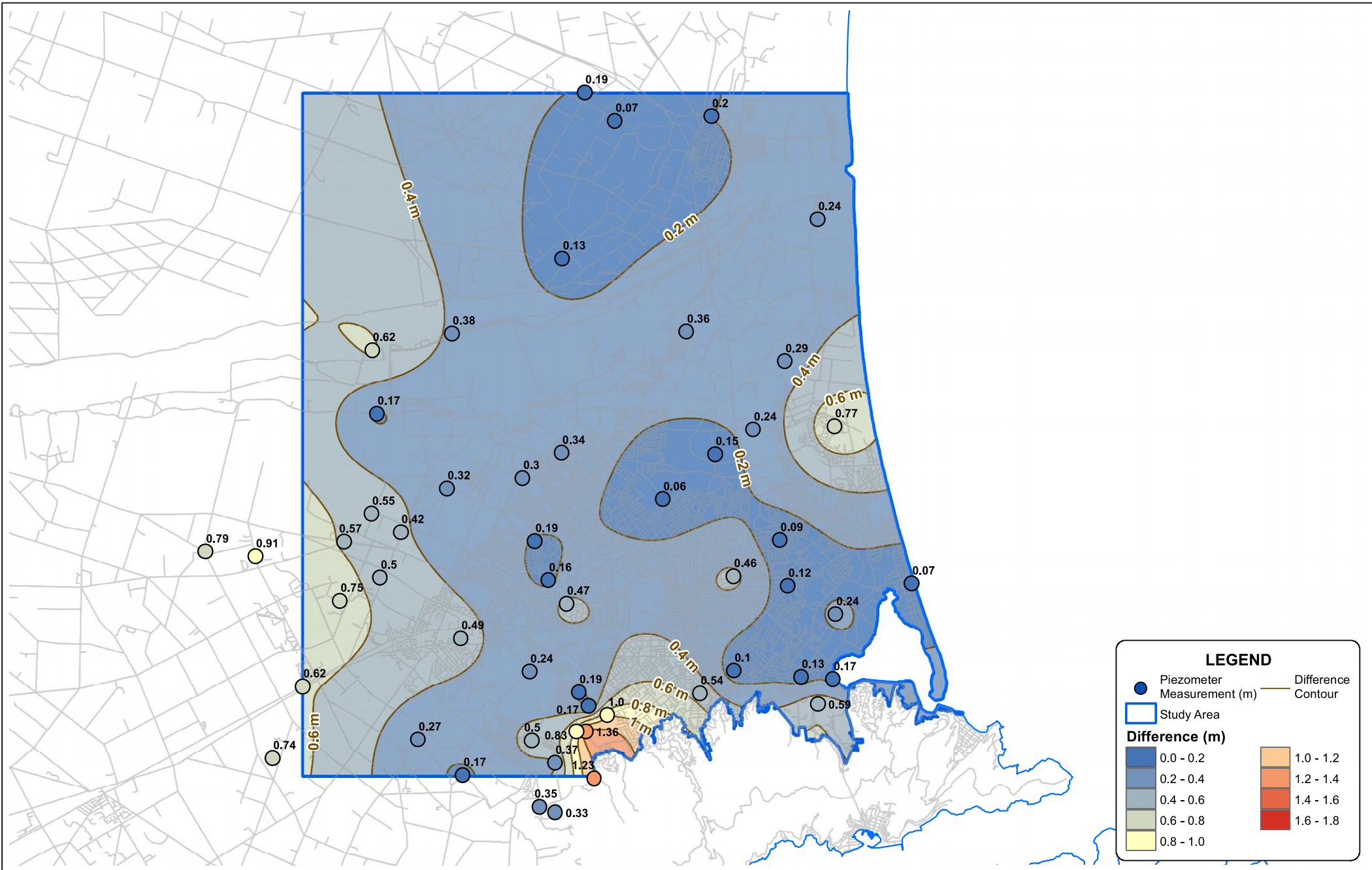
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CHRISTCHURCH MEDIAN WATER TABLE ELEVATION REPORT

Difference between the 85th percentile and median groundwater elevation 1990-2010

FIGURE No. Figure H.9

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0 2 4 6 8 Kilometers



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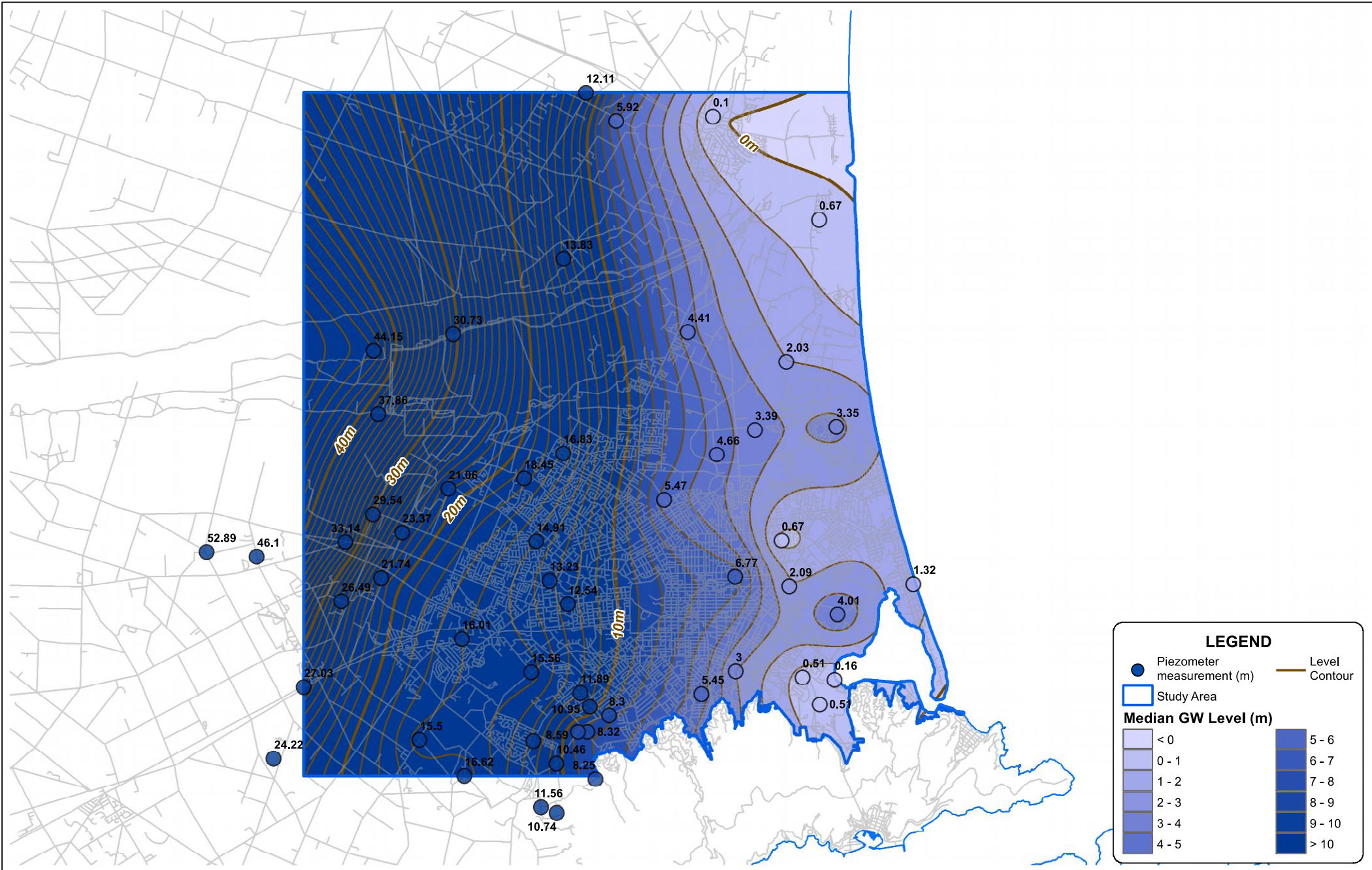
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CHRISTCHURCH MEDIAN WATER TABLE ELEVATION REPORT

Difference between median and the 15th percentile groundwater elevation 1990-2010

FIGURE No. Figure H.10

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0 2 4 6 8 Kilometers



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CHRISTCHURCH MEDIAN WATER TABLE ELEVATION REPORT Median groundwater elevation 1990-2010

FIGURE No. Figure H.11

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Principal Location

1 Fairway Drive
Avalon
PO Box 30368
Lower Hutt
New Zealand
T +64-4-570 1444
F +64-4-570 4600

Other Locations

Dunedin Research Centre
764 Cumberland Street
Private Bag 1930
Dunedin
New Zealand
T +64-3-477 4050
F +64-3-477 5232

Wairakei Research Centre
114 Karetoto Road
Wairakei
Private Bag 2000, Taupo
New Zealand
T +64-7-374 8211
F +64-7-374 8199

National Isotope Centre
30 Gracefield Road
PO Box 31312
Lower Hutt
New Zealand
T +64-4-570 1444
F +64-4-570 4657