NIWA
Taihoro Nukurangi

Interpolation of Mean Annual Rainfall for Marlborough District

Prepared for Marlborough District Council

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Executive summary

NIWA was asked by Marlborough District Council (MDC) to produce a mean annual rainfall map for the Marlborough District by combining rainfall data from the NIWA National Climate Database with rainfall data from MDC. The combined dataset was interpolated onto a 500m grid using the same interpolation methodology as was previously used by NIWA to generate rainfall maps, with the additional data improving the representativeness of rainfall over the Marlborough District.

1 Background

The median annual rainfall map produced by NIWA in 2012 (Figure 1) is based on data stored in NIWA's national climate database. The data period covered for the map is 1981-2010.

MDC asked NIWA to re-produce the annual rainfall map (the mean, rather than the median) using a combination of data from the NIWA National Climate Database and additional data from MDC, and covering the longer period 1961-2015 (see Figure 2 for the location of all the stations used in the derivation of the revised map). It was proposed that by doing this, the resultant map would better represent the mean annual rainfall for the Marlborough District.

An Envirolink Small Advice Grant was applied for and granted, and work began on the new rainfall map in November 2016. The new map (and the GIS data) was provided to MDC in January 2017.

2 Combined rainfall dataset

MDC provided mean annual rainfall data for several additional stations in the format requested by NIWA. Table 1 in the Appendix shows these data. The mean annual rainfall values for these stations were based on all available data.

A similar length of record (from 1961 to 2015, inclusive [i.e. 55 years]) to the MDC data record was chosen for the calculation of mean annual rainfall based on data kept in NIWA's National Climate Database. All stations in New Zealand with at least 2 years of record between 1961 and 2015 were extracted and a mean annual rainfall was calculated. There were over 2500 stations used.

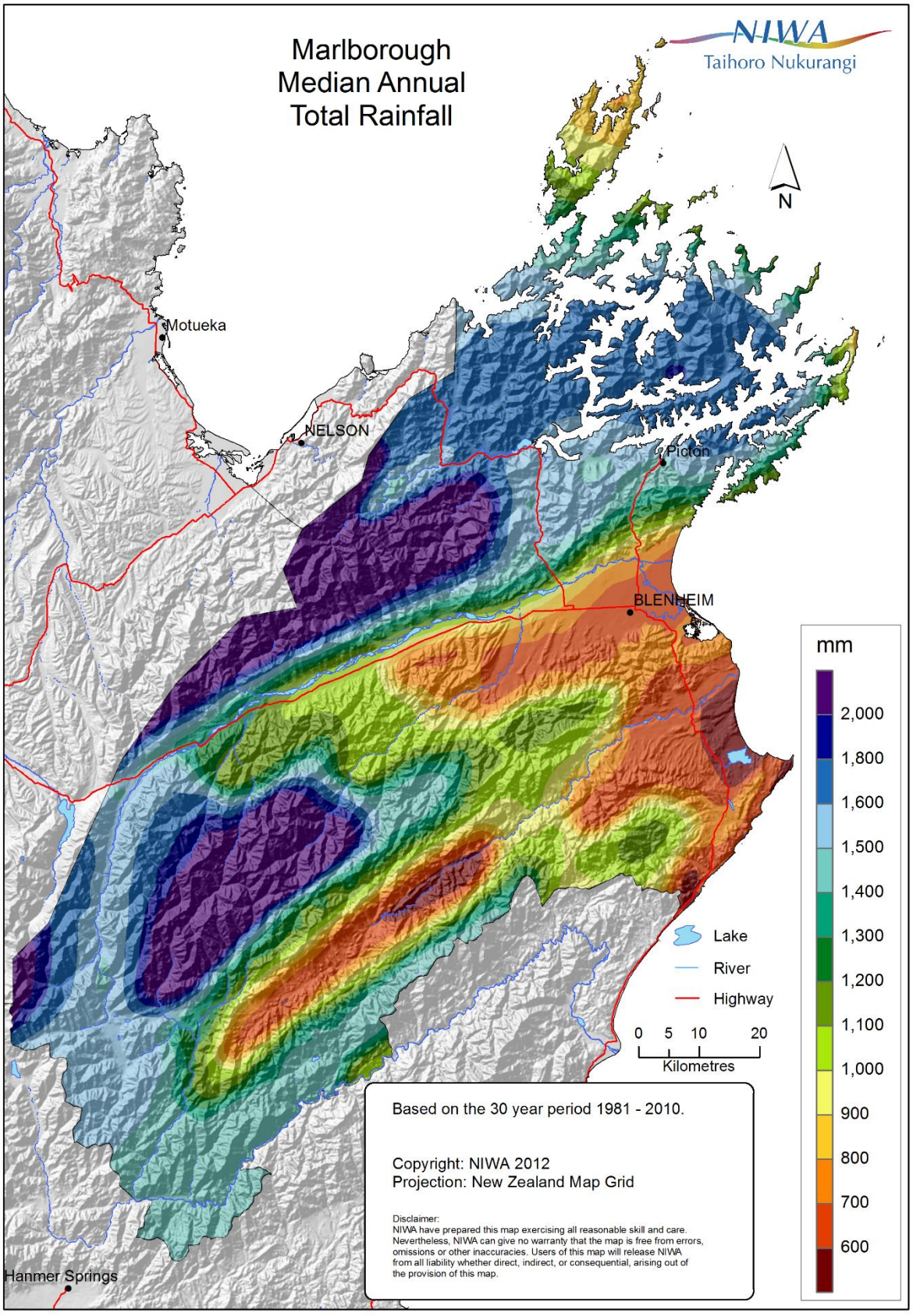

Figure 1: *Median Annual Rainfall map produced by NIWA in 2012.*

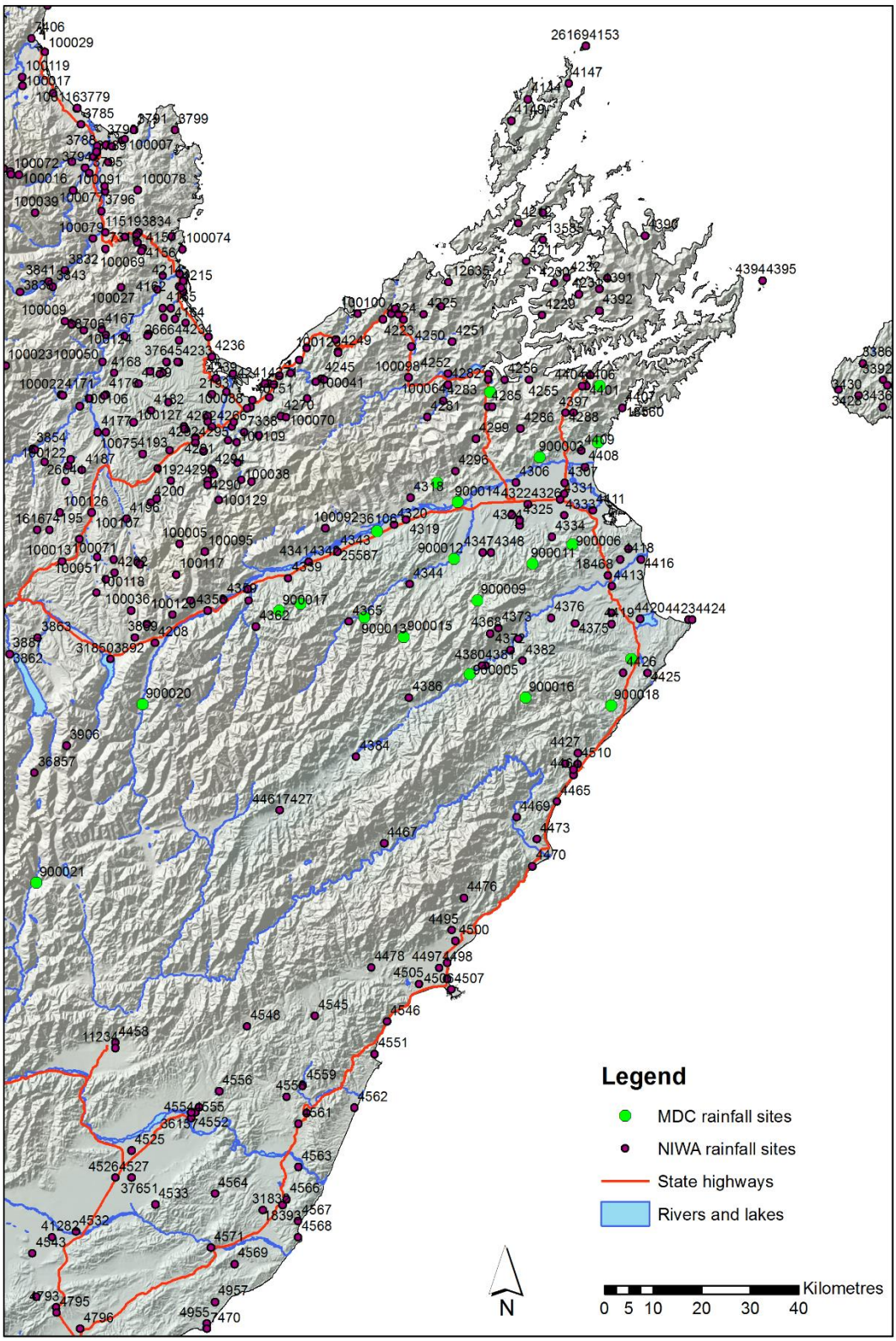

Figure 2: *Location of stations (and their agent numbers) used in the derivation of the revised rainfall map.*

3 Interpolation methodology

The NIWA station mean annual rainfall data were combined with the MDC mean annual rainfall data and the concatenated file was used interpolated onto a 500m grid for all of New Zealand (NZ Map Grid Projection). The software used was ANUsplin v4 and the interpolation scheme was identical to that used for the original NIWA rainfall map (Figure 1). The interpolation methodology is described in Tait et al. (2006) and Wratt et al. (2006).

4 Revised rainfall map

The revised mean annual rainfall map for MDC (plus surrounding area), based on the concatenated station data file, is shown as Figures 3 (emphasising the rainfall pattern in the high elevation areas) and 4 (emphasising the rainfall pattern in the low elevation areas).

The GIS grid (500m resolution, NZMG projection) of the revised mean annual rainfall map has been sent to MDC for their internal use.

5 References

Tait, A.; R. Henderson; R. Turner and X. Zheng (2006) Thin-plate smoothing spline interpolation of daily rainfall for New Zealand using a climatological rainfall surface. *International Journal of Climatology*, 26, pp 2097-2115.

Wratt, D.; A. Tait; G. Griffiths; P. Espie; M. Jessen; J. Keys; M. Ladd; D. Lew; W. Lowther; I. Lynn; N. Mitchell; J. Morton; J. Reid; S. Reid; A. Richardson; J. Sansom and U. Shankar (2006) Climate for crops: Integrating climate data with information about soils and crop requirements to reduce risks in agricultural decision-making. *Meteorological Applications*, 13, pp 305–315.

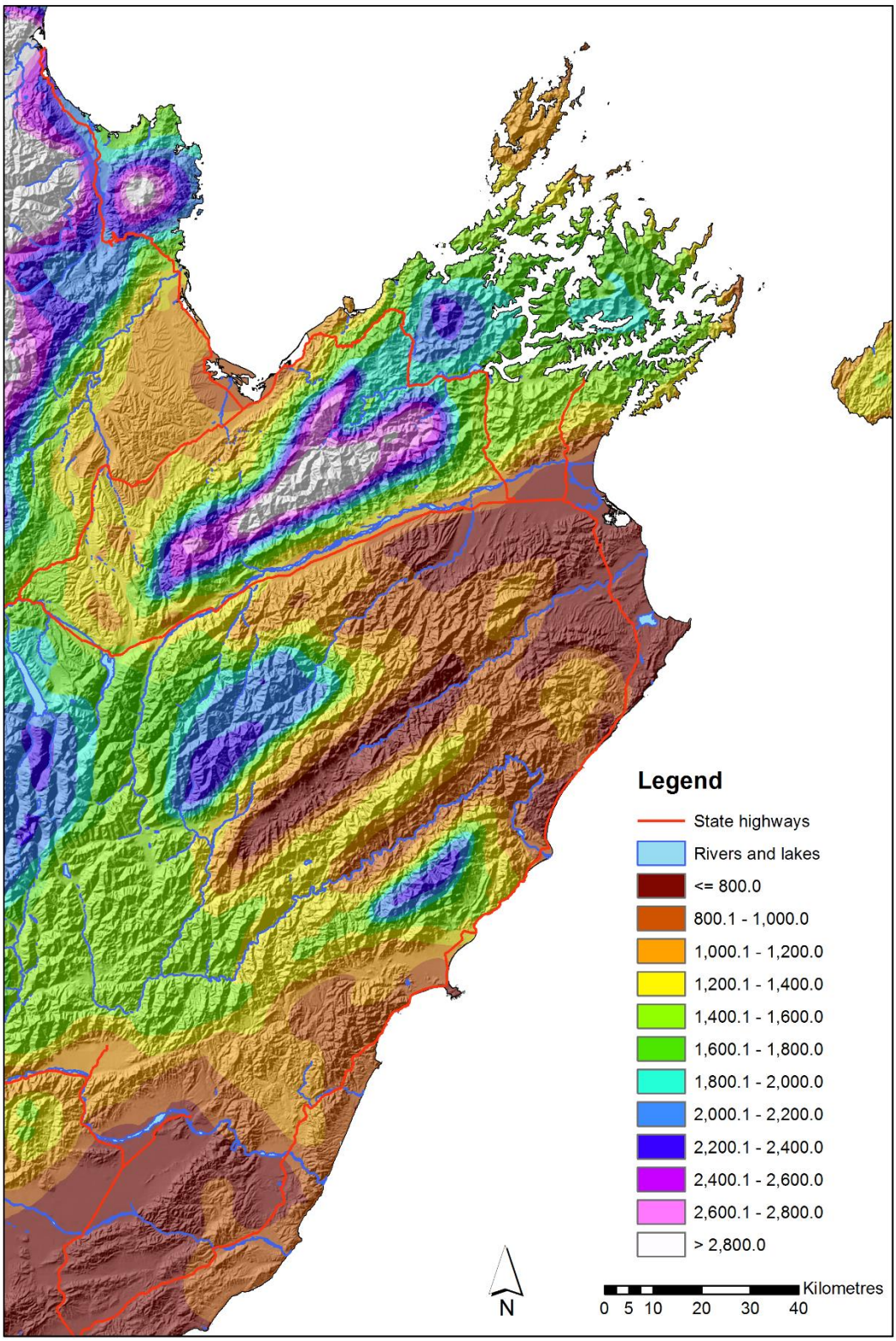

Figure 3: *Revised mean annual rainfall map (emphasising the rainfall pattern in high elevation areas) for Marlborough District (plus surrounding area) based on NIWA and MDC rainfall data.*

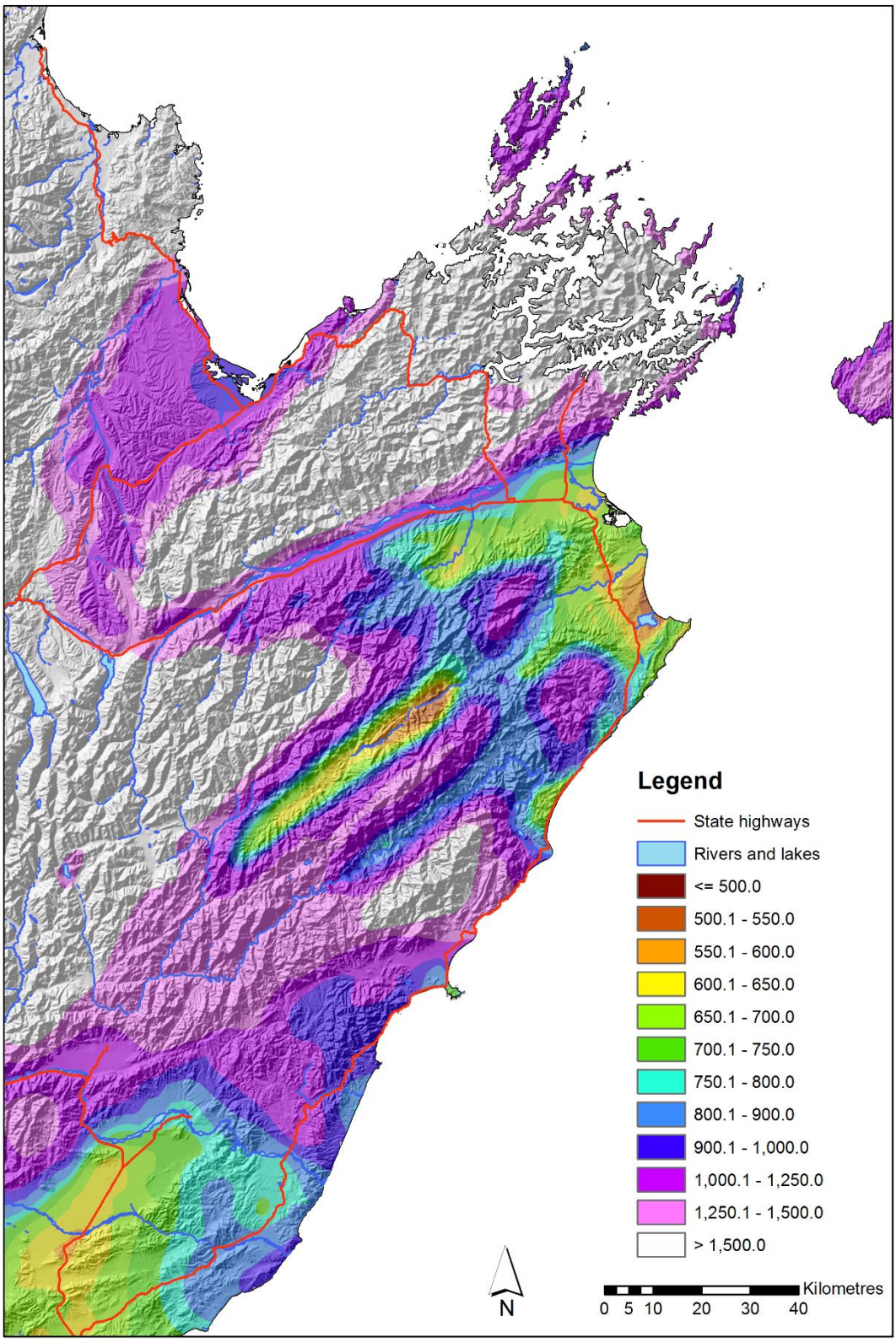

Figure 4: *Revised mean annual rainfall map (emphasising the rainfall pattern in low elevation areas) for Marlborough District (plus surrounding area) based on NIWA and MDC rainfall data.*

6 Appendix

Table 1: *Mean annual rainfall data provided by MDC to be added to data held in NIWA's National Climate Database.*

Site Name	NZTM Easting	NZTM Northing	Years of record	Annual RF (mm)
Waikawa	1687398	5427635	16	1487
Readers Road	1664835	5426400	8	1334
Waikakaho	1675000	5412960	5	920
Charlies Rest	1625800	5382875	24	927
Awapiri	1660660	5368320	15	804
Beneagle	1681820	5395020	28	757
Flaxbourne	1693910	5371530	7	659
Mill Road	1641545	5397750	8	1100
Ramshead	1662268	5383538	22	846
Onamalutu	1653965	5407765	21	1576
Tinpot	1673577	5391052	37	878
Craiglochart	1657400	5392050	20	649
Spray	1638965	5380040	23	811
Narrows	1658173	5403720	13	962
Malvern Hills (Farmer)	1647080	5376000	53	977
Mt Misery (MDC)	1672145	5363510	3	787
Mt Nobel (old MCB)	1621460	5381410	16	1031
Te Rapa (MDC)	1689720	5361905	6	900
Rarangi Driving Range (MDC)	1687048	5416046	5	846
Dip Flat (NIWA)	1593310	5362150	40	1690
Maling Pass (Ecan)	1571497	5325514	31	1714