

APPENDIX VI.

MR. J. LANGMUIR, Inspector of Surveys, reports as follows on the measurement of the Kaingaroa Plains base, Auckland District:—

This base was measured with all the care and same apparatus as used at previous base-measurements. (See reports of the survey operations, Department of Lands, for the years 1909 to 1912.)

Geographical Position of Base.—The northern terminal, or Trig. Station 38, now XLVII, Secondary Triangulation notation, is about south latitude $38^{\circ} 25' 05''$ and east longitude $176^{\circ} 35' 03''$. The southern end, or Trig. Station 34, now XLVI, is about $38^{\circ} 32' 51''$ south latitude and $176^{\circ} 27' 12''$ east longitude.

Selection of Base.—The position of this base was chosen as the best obtainable in a central situation to control the triangulation of about 15,000 square miles of country, extending to the north-east as far as the East Cape, and including the meridional circuits of Poverty Bay, Hawke's Bay, Tuhirangi, and parts of Mount Eden South and Bay of Plenty circuits.

Character of Country.—The character of the country over which the base runs is variable. About seven miles of the central portion is fair to good chaining country, being in great part nearly level, but both ends of the line are exceptionally rough for base-line work, as will be recognized by a glance at the longitudinal section and a reference to the "Remarks" column of Table No. 1. A marked difficulty, and source of considerable expense and delay, was the great scarcity of permanent water, the whole supply for the camp, including horses, having to be carted about four miles.

Standard of Length.—The standard of length for the measurement of this base was the Imperial Standard steel tape No. 5, deposited with its balance No. 5 in the District Survey Office, Napier. On the 18th June, 1903, this tape was certified to by the Standards Branch of the Board of Trade, London, as being 0.006 in., or 0.000758 link, long at 62° F., or it is nominally standard length at 60.788° F., it being still desirable to have this value again verified with the British standard.

Comparison with previous Triangulation Values.—

Present determination	...	...	...	...	91198.8298
Value by the original triangulation derived from the Maketu base measured in 1868	...	...	...	...	91202.2
Difference	...	...	...	...	3.3702

It has been found, however, that the old Auckland standard was 0.026 link per chain longer than the new Imperial standard, therefore to bring the old work into terms of the Imperial standard $0.026 \text{ link} \times 912 = 23.7117$ links to be added to the present triangulation value of the line, viz. :—

91202.2 + 23.7117	...	...	...	...	= 91225.9117
New chainage value	...	...	...	...	= 91198.8298
Difference	...	...	...	...	= 27.0819

The Maketu base was only 17809.7 links in length, and the systems of triangles through which the value 91202.2 was obtained are far from satisfactory. If the terminals of the old Maketu base had not suffered damage it would have been interesting to have again measured it, but it is not at all necessary, as the line between the new secondary stations, Te Pare and Ottawa, will control and check in a very satisfactory manner the immediate values in the old Maketu base net.

An auxiliary base-line, 12149.0347 links in length, was measured as an additional check on the measurements of Sections 8 and 9, but any values determined from it should not in any way enter into the final value of the main base-line, the results of the direct measurements being much more reliable.

Results of the Measurements.—The least probable error in any section is in Section 7, where it amounts to + or - 0.00205 in 10924.6861, or 1 in 5,329,115. The greatest probable error is in Section 8, where it is + or - 0.00971 in 7966.9420, or 1 in 820,488. (See note to Table No. 1.) The probable error of the whole line is + or - 0.01467 in 91198.8298, or 1 in 6,216,689. Mr. Willis was the rear-end observer for Sections 3 and 4, and Mr. Goulding for the remainder of the base.

The following tables and illustrations are appended:—

Table No. 1.—Results of measurements (four sheets).

Table No. 2.—Results of measurements of auxiliary base (one sheet).

Fig. No. 1.—Diagram showing the base-net of triangles.

Fig. No. 2.—Plan and section of base.

Fig. No. 3.—Diagram showing the position of the Maketu base and the old major triangulation from it to the Kaingaroa Plains base.

Fig. No. 4.—Diagram showing the triangle off the auxiliary base to check the measurements of Sections 8 and 9.

Plan on a scale of 20 chains to an inch giving all the details of the line.