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LOCATIONAL DISCREPANCIES BETWEEN NZMS 1 AND 260 MAPS

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A familiar cry of anguish from people using a metric Infomap (formerly NZMS) 260 sheet to locate a site originally recorded on an NZMS 1 sheet is that the metric grid reference is wrong. When the hapless site recorder realises that the reference has been calculated by computer, the explanation appears obvious. The computer got it wrong! In fact, the computer program will always calculate a grid reference acceptable for use on an Infomap 260 sheet unless there is an error in

(a) one of the maps (mostly confined to NZMS 1);
(b) the NZMS 1 grid reference on the site record form; or
(c) its transcription to the computer file.

Fortunately, the problem is rarely of serious magnitude, but it is important for users to know where, and to what extent, errors may exist. Let me therefore restate the situation in summary and suggest an independent method of identifying and assessing the significance of errors in any given area.

If your research uses an Infomap 260 sheet, you will sooner or later have to assess the reliability of grid references that were originally determined from NZMS 1 (yard grid) maps. I have shown (Sheppard 1985: 191) that the computer program's mathematical conversion is correct to within a few metres but that, because it identifies equivalent 100 yd and 100 m grid squares, it will generally locate a site on the ground to within 100 or 200 m. This assumes negligible cartographic error, and means that the site will have been recorded in the 100 m square identified by the calculated grid reference, or one adjacent to it.

In order to appreciate the nature of the underlying problem, a user should be aware of the differences between maps that have been used in the Site Recording Scheme. It begins with the distinction between the 'yard grid' and 'metric' maps. These are:

NZMS 1

Drawn to the Transverse Mercator Projection on separate National Yard Grids for the North and South Islands, and published at a scale of 1:63,360.

INFOMAP 260 (Formerly NZMS 260)

Drawn to the New Zealand Map Grid projection, using a single metric grid to cover all of New Zealand. These maps, published at a scale of 1:50,000, have all been redrawn using aerial photographs and photogrammetric plotting techniques. They are the most accurate of the published topographic maps available in this scale range.

NZMS 1 maps have been published in many forms, as provisional, interim and full specification NZMS 1 and as different editions within these series. In their earliest form, maps were prepared using plane table surveys, which often contained sketched topographical features such as streams. Each new map refined the accuracy of information presented but, in so doing, often showed a different part of the landscape at a given grid reference. The greatest advances in accuracy, and therefore change, came first from the adoption of the Geodetic Datum 1949 and later with the full specification NZMS 1 sheets, which were drawn using aerial photographs and photogrammetric plotting techniques.

The most common source of error in a grid reference derived from an earlier map is thereby completely outside of the mathematical conversion and can emerge between any combination of maps, even within the single series of NZMS 1. It is seen when distortion of parts of the landscape depicted on one map's grid wrongly locates a feature's position on another. While this has no effect on the use of a grid reference to relocate a site from the same map, the grid reference defines a different part of the landscape on a corrected map.

Experience has shown that landscape features on an NZMS 1 map are normally depicted correctly to within a hundred yards but at times can be displaced by up to a few hundred yards. The largest of these errors identified to date have been confined to the provisional and interim series of NZMS 1 maps. An understanding of these errors is vital for any archaeologist and, particularly with the proliferation of computer-based geographical information systems, for other users of site recorders' observations (Sheppard 1990).

Cartographic errors are not usually detected until a corrected map is available for comparison. The Site Recording Scheme has mostly been based on the successive series of topographical maps described above, each of which has been compiled with greater accuracy than its predecessor. Corrections made to a new edition of a map are revealed when a different section of landscape is presented at a grid reference to which an earlier observation had been recorded.

Corrected cartographic errors can be identified by comparing equivalent landscape features relative to a pattern of trig points. Trig points are unlikely to have been depicted in a wrong location on any of these maps and therefore remain valid points of reference for this exercise. It should, however, be noted that, other than for pa which house a trig station, they are rarely points of reference for archaeological field recording. A site recorder normally identifies a location on a map from nearby recognisable landscape features. A trig point is frequently out of sight or too distant for use without sophisticated survey equipment.

The simplest method of identifying and quantifying corrected cartographic errors is to compare sections of the maps, reproduced at the same scale from a variable scale photocopier. Photocopy the suspect part of the NZMS 1 map at a magnification of 1.27, or the section of Infomap 260 at 0.79 reduction. These factors represent the difference in scale between the maps (63,360 / 50,000 = 1.27 and 50,000 / 63,360 = 0.79).

Identify and superimpose the trig points depicted on both maps and examine the overlaid maps on a light table or by holding them up to the light. The extent to which coastlines, roads, streams and other landscape features match indicates the degree of correction to mapping errors on the earlier map.

The same test can be undertaken, albeit more laboriously, without a

photocopier, from a series of spot calculations. In this exercise, identify on each map a group of trig points and easily recognised landscape features, such as bends in roads and streams. Given no cartographic distortion, the distance between them should be the same when multiplied by the scale factor. For example, the distance on an NZMS 1 map between a trig point and a road bend may be 20 mm. The equivalent distance on an Infomap 260 map would be 1.27 x 20 = 25 mm. Conversely, a distance between two points on an Infomap 260 sheet of 20 mm is equivalent to 0.79 x 20 = 16 mm on an NZMS 1 sheet.

A record made from an NZMS 1 sheet and originally entered with a calculated metric grid reference can be identified by the presence of an NZMS 1 site accession number. By contrast, a site initially recorded on an Infomap 260 sheet will rarely have an accession number for the NZMS 1 equivalent, and will not be affected by the problems described above. This information is normally included in computer listings produced from the Computer Index to New Zealand's Archaeological Sites (CINZAS).

Corrections to grid references and other details are made to the records as information comes to hand so please notify the NZAA Filekeeper, and/or me of any corrections that are required. Routine application of this type of test is, however, recommended for any new study area in order to understand the limiting accuracy of a calculated metric grid reference.

REFERENCES

Sheppard, B. 1985. Grid reference reliability. *NZAA Newsletter* 28 (3): 187-191.

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