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CONTINUING THE DIALOGUE: REMOTE SENSING - DATA AND METADATA

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The New Zealand Archaeology Professional Development Cell (PDC) has just held its 12th workshop in the four years since its inception. These workshops have covered eight different topics of relevance to practicing archaeologists and with each topic various issues are raised. Some of these issues have been published by PDC or our experts in response to the workshop series (see references).

For some time now I have intended to write up other issues as a series of short discussion pieces: this is to be the first. I have entitled the series 'Continuing the Dialogue'; firstly, because I make no pretence about them being new issues, and secondly, the New Zealand Archaeological Association (NZAA) Newsletter began its life as a lively discussion about aspects of New Zealand archaeology, which was then a new discipline.

I therefore invite others to contribute to this discussion, as they see fit, in order to progress ideas about the New Zealand archaeology of today.

This first issue derives from the latest PDC workshop on Remote Sensing held in Auckland on 26 August 2010, and concerns changes in data and issues surrounding metadata.

Remote sensing – data

Over the last 20 years many of the resources used by archaeologists have changed dramatically from being paper-based maps, plans and photographs that were largely available regionally at Lands and Survey offices, then after 1987 in the Department of Survey and Lands Information, and after 1996 at Land Information New Zealand (LINZ; Land Information New Zealand 2010a).

Since then, these resources have been separated out and privatised. Although some resources have been freed up and are available on the internet, others are much harder to access.

Topographic maps are available widely in booksellers and various recreation stores, but the data is now also online in a number of places including Koordinates, QuickMap, ArchSite, Tumonz and some council websites (see web links in references). As Allen Juffermans explained, surveying is undertaken as a series of angles and distances from fixed points. This contrasts to the coordinate system, used by archaeologists to locate sites and places of significance on topographic maps, which relies on flattening details on the curved earth (projection) and overlaying a grid from which positions can be determined as grid references. There have been series of different topographic maps, first imperial (NZGD1949), then metric (NZGD2000) and now a new metric projection called New Zealand Transverse Mercator (NZTM2000). "It was chosen because it is an internationally recognised type of projection that exhibits a low level of distortion at its east-west extents" (Land Information New Zealand 2010b). Translation between one grid system and another can be difficult, and can include large errors due to the differences in calculation (Figure 1). The error between imperial and metric has caused major difficulties for archaeologists and was one of the main reasons for the NZAA Site Recording Scheme Upgrade Project, but the error caused by converting the metric to the new NZTM appears to be very small (Figure 2). LINZ has an online conversion function (Land Information New Zealand 2010c), and ArchSite can automatically translate a position to a NZTM grid reference1.

Modern aerial photographs are also widely available (Google Earth, Tumonz, Koordinates and some council websites). However, the older ones are less readily available than they used to be. Older New Zealand Aerial Mapping (NZAM) photographs, which form the basis of the all the topographic maps since the 1940s, can be purchased from NZAM, but archiving, search fees, as well as printing and postage mean that they are prohibitively costly in many cases. Copies of their contact prints can be viewed at several places, such as some councils, museums and universities (though not all have the complete set for any area). Whites Aviation oblique photographs (taken from the 1940s to 1990s2) are currently being held by Archives New Zealand in Wellington, en route to the Alexander Turnbull Library (when their rebuilding has been completed; Alexander Turnbull Library 2010).

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1 ArchSite uses NZTM and had translated all the earlier metric data, as well as the remaining imperial sites into NZTM

2 I have encountered even earlier photographs in their collection.

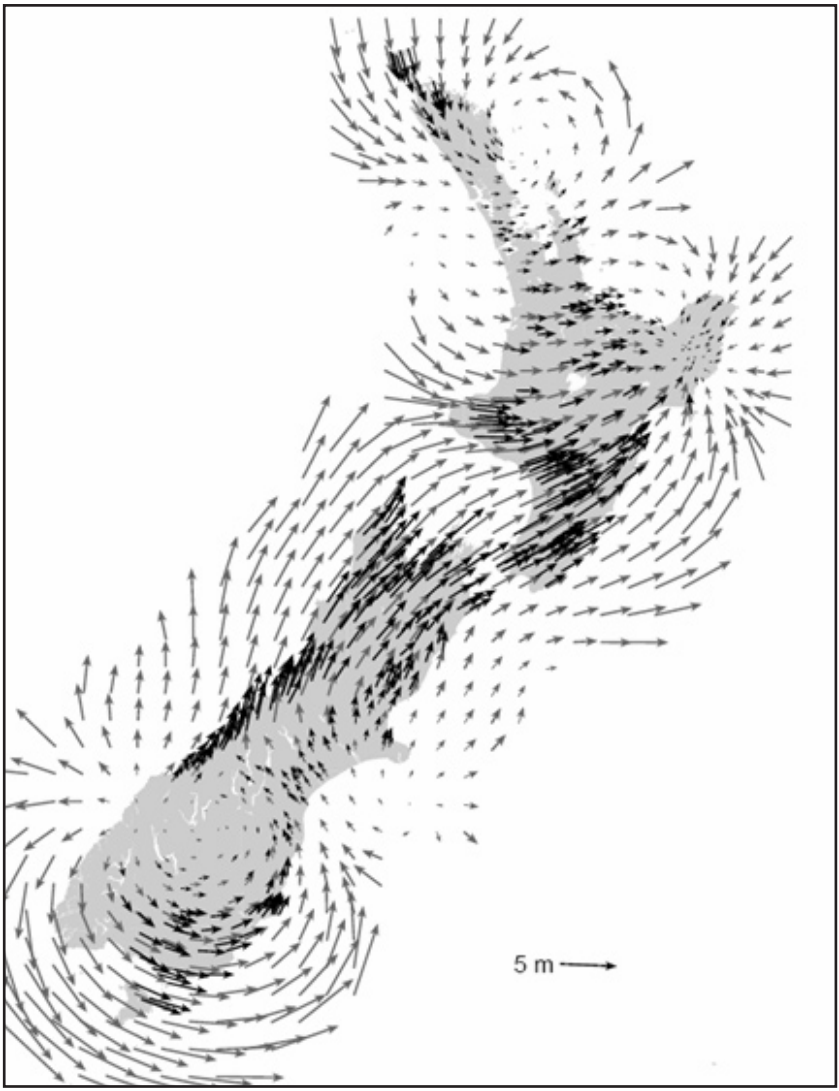

Figure 1. This shows the differences between NZGD1949 and NZGD2000 after applying the 7 parameter similarity transformation (Land Information New Zealand 2010d).

Scanned copies of survey maps, including MLs, SOs, DPs etc, are available in QuickMap (they have all maps up until 2002 when Landonline came

into being), and Landonline (the official LINZ site) has all the plans that have been created, as well as the modern cadastral. For those more interested in the archival maps QuickMap is much cheaper than Landonline. However, the original survey plans and surveyors notebooks are now very difficult to access, and most of the North Island material will soon be housed in Hamilton.

Location	NZMG		Online	NZTM
	ArcFlax	QuickMap	Conversion	ArchSite
Karikari trig nr lighthouse	2547292 6713013	2547295 6713013	1636338 6150936	1636338 6150936
One Tree Hill trig	2669304 6476429	2669294 6476424	1758870 5914730	1758870 5914730
Moehau trig	2725521 6515009	2725541 6515035	1815036 5953461	1815037 5953461

Figure 2. Comparisons between different map sources, and conversions from NZMG to NZTM for three different trig stations. Note using a pointer through the ArchFlax site results in errors up to 26 m. ArchSite also relies on pointers, so some error will result. The conversions using the Online Conversions (LINZ 2010c) have been done from the QuickMap survey data, and are almost identical to that using the ArchSite pointer. Note also that the figures after the decimal point (i.e. the millimetres) have not been included.

Cadastral information as well as contours and hill shading is available on most council websites, as well as Landonline, QuickMap, Koordinates and Tumonz. However, the scale or some of these are of little use for archaeology, except as an overall location map.

There are a number of sources of archival vertical and oblique prints, which will be posted on the New Zealand Archaeology website (thanks to Garry Law). In order to facilitate access to these invaluable archival sources which now extend back 150 years, I invite anyone who knows of any material to inform either Meri Low, PDC administrator, or Garry Law, so that the best use can be made of this historical material.

Infrared photography has not been used much in New Zealand archaeology3. It is most useful for archaeological purposes if the photographs are taken following a short wet period after a long dry one: generally March or April. This timeline may not fit with most projects or assessments. If successful, it

[3] Ian Lawlor has used aerial infrared photography at Puhinui, Wiri, Auckland and at Long Bay, North Shore, Auckland. Caroline Keen (1987-90) used colour and infrared photography on varied and densely vegetated landscape of the lower Waipoua River valley. Infrared photography from satellite imagery is to be used by Harry Allen, Caroline Phillips, Dilys Johns, Kelvin Day and Ngati Mutunga as part of a study of wetlands in Taranaki.

greatly enhances the crop marks seen in aerial photographs, by emphasising pits, trenches and even plough lines.

Unlike the previous resources (though some infrared can be taken especially for archaeological objectives), geophysical surveys are undertaken on ground suspected of, or known to have, archaeological evidence. They are focused and deliberate whereas the other data are often originally prepared for quite different reasons and some at much earlier times. Hans-Dieter Bader, first with Geometria, and now with Archaeology Solutions, has led the way with geomagnetic surveys, and increasingly such surveys are being undertaken as part of larger projects, when sites are going before the Environment Court, or where burials might be present. Interestingly, in the United Kingdom 30% of archaeological assessments now have some geophysical element in them, and English Heritage has published a list of criteria to guide practitioners in this field of archaeology (English Heritage 2008).

In summary, many data sources have moved from being at a one-stop shop to a range of online or purchased sources, but in some cases they can be harder to find than formerly. New methods, such as geophysical surveys and site-specific infrared photography can be expensive for smaller projects, but very valuable for larger ones.

Questions arising from this include:

- To what extent should we use archival information, and will our assessments be compromised by only using the freely available sources?
- Should the archaeological community push for easier and cheaper access to what was originally publicly-funded aerial photographs? [4]
- Should we commonly incorporate the newer more expensive methods now available?

Remote sensing – metadata

I owe this issue to Daniel Parker, who very clearly identified that metadata was an important factor in Geographic Information Systems (GIS). He demonstrated how variations in scale and precision could have a marked effect on how a feature or site could be interpreted. Metadata is often described as 'data about data', and includes information about how and why the data was created, who the author was, and what standards were used in its creation. In particular, GIS have created a standard that "provides information about the

[4] I know that Tony Walton was attempting something along these lines before his death.

identification, the extent, the quality, the spatial and temporal schema, spatial reference, and distribution of digital geographic data" (ISO 2003).

Of course metadata is crucial to remote sensing – the evidence used and interpreted is remote or removed, either spatially, chronologically or in substance, from the objects we wish to know about. Therefore understanding how and what the data is, or how it came to be, is imperative if our interpretation is to be valid.

The five speakers in the Remote Sensing workshop all referred to this in some way or other. Allen Juffermans talked about the history of surveying and the types of information that was, or was not, recorded by surveyors. I have observed in older survey plans that topographic features can sometimes be very detailed and at other times very sketchy and inaccurate. Aerial photographs can also be misleading occasionally, and in my presentation I included an example of where, after 40 years, slumping and vehicle tracks looked like a terrace and drain feature. Ian Lawlor referred to the authors of oblique photographs, and suggested that the purpose behind taking a particular view is something we should be concerned about. Hans-Dieter Bader discussed not only the different types of instruments used in geophysical surveys, each with its own advantages and limitations, but that differences can stem from similar machines being used by different practitioners, and that this can have a significant effect on the data collected and interpretation of the result.

Additionally, as Daniel stated, we as archaeologists should be explicit in how we present our data, and clearly identify aspects of scale, precision and any underlying assumptions. The New Zealand Historic Places Trust has produced a series of guidelines to assist practising archaeologist.

Again a series of questions arises, including:

- Do practising archaeologists need more guidelines for various aspects of archaeology?
- Is it time for standardisation in regard to the presentation of data?

Acknowledgements

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