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**NEW ZEALAND ARCHAEOLOGICAL ASSOCIATION NEWSLETTER**



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MADE SOILS IN THE VICINITY OF AOTEA HARBOUR

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Made soils are man-made soils containing deliberately transported sand or gravel. The use of added sand or gravel is only feasible in areas where there is a readily available supply, and extensive areas of made soils are found only where sand or gravel could be obtained from the subsoil. The best known, and most extensive, made soils are those in the inland Waikato (Grange *et al*, 1939:39-40; Taylor, 1958) and Tasman Bay lowlands (Rigg and Bruce, 1923; Chittenden, Hodgson and Dodson, 1966:16; Challis, 1978) but smaller areas are found throughout northern and central New Zealand.

A large area of made soils is found near Aotea Harbour on the north-west coast of the North Island. Sand was quarried from tephra-mantled dunes and large quantities incorporated in adjacent soils. The information summarised in this paper was gathered during a number of visits to the area between 1976 and 1978.

Environmental setting

In geomorphological terms Aotea and Kawhia Harbours are coastal embayments impounded by drift deposits of Pleistocene age, and younger (Chappell, 1970; Bruce, 1978). The dune lands are characterised by a rolling and occasionally hilly topography. Two late Quaternary andesitic tephra mantles the area (Pain, 1976: 155) coating a number of areas of well-defined parabolic and longitudinal sand dunes.

The dominant soil type of the North Aotea barrier is Tuahu sandy loam. This soil is derived from admixed tephra and wind-blown sand. Bruce (1978:58) has described a typical soil profile as consisting of "about 15 cm of very dark brown friable sandy loam topsoil, on dark brown friable sandy loam subsoil which grades down to strong brown and dark yellowish brown firm sandy clay loam over slightly weathered grey sand." Small amounts of sand are continually being added naturally to these soils in some places and this, together with the variation in texture arising from the original mix of ash and sand, makes it difficult to identify deliberately added sand unless it is present in considerable quantities.

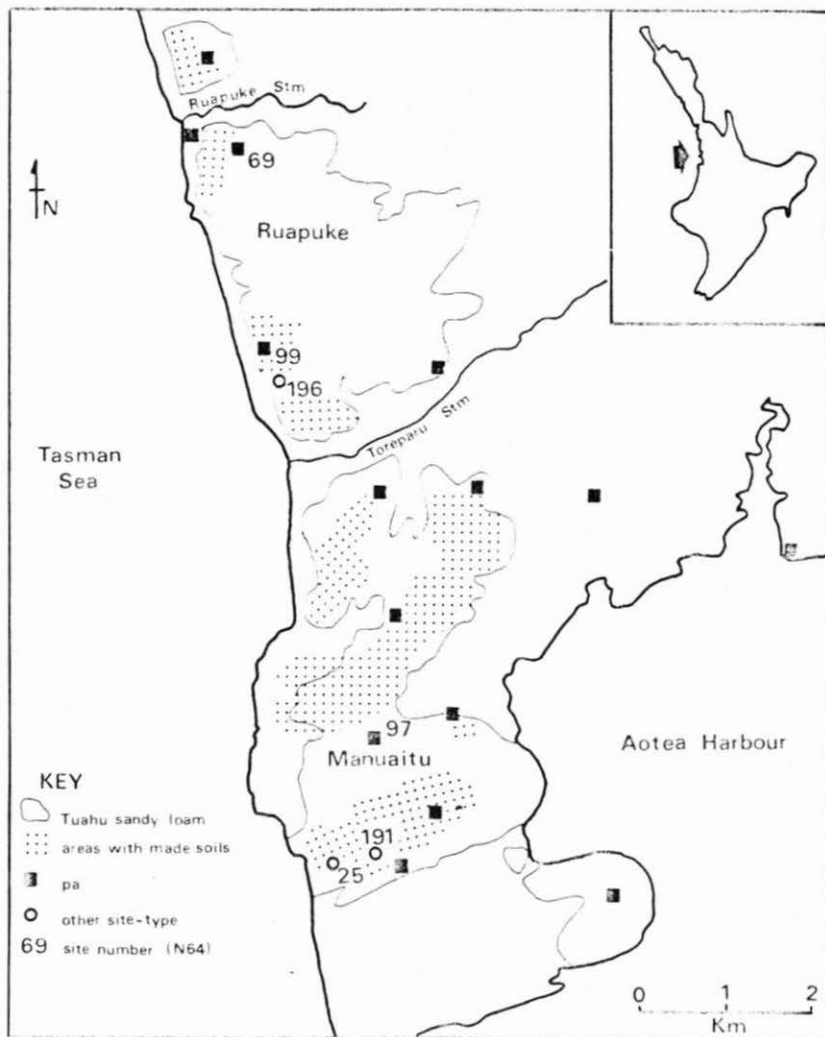


FIGURE 1. Distribution of made soils in the vicinity of Aotea Harbour.

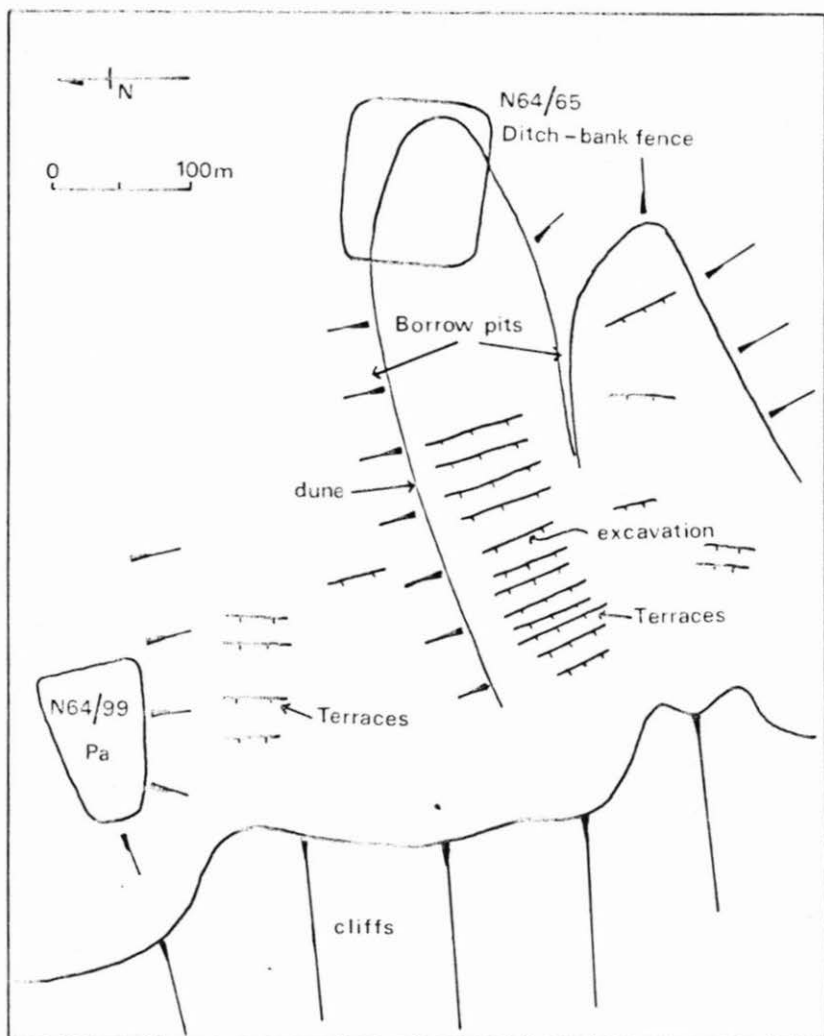


FIGURE 2. Sketch plan of site N64/196.

### Distribution of made soils

Test pits dug at intervals along transects (e.g. N64/328233) showed an abrupt marked change in soil profiles from areas of "unsanded" soils to soils with large quantities of sand. This could only be accounted for by human intervention. The added sand creates a significant disparity in texture between the made soil and the adjacent unsanded counterpart. Made soils were up to 40 to 50 cm deep with a loamy sand texture. They were well mixed in with the original topsoil. Finely divided charcoal was present in small amounts in some soil profiles but was not a significant feature of the soils.

The added sand was obtained by quarrying and it is clear that the availability of sand determined the distribution of made soils. The distribution of made soils (Fig. 1) may, therefore, be approximated from the distribution of borrow pits. These are conspicuous and are found in large numbers strung out along the tops and sides of the tephra-mantled dunes.

The borrow pits sunk into the top of the ridges generally have walls of even height on all sides but more commonly the pits are dug into the sides of the ridges producing a high face on the upward side and a low face on the downward side. This presumably would have had advantages in terms of access.

There is a marked concentration of borrow pits around Manuaitu, a central location that overlooks much of the surrounding area, and the site of a large pa (N64/97). Further north, at Ruapuke, there are smaller areas where borrow pits occur. In all cases the borrow pits are found in close proximity to a range of other archaeological sites including pa, pits, terraces and shell middens.

Many factors may be relevant to explaining why made soils occur in one area but not in another. Environmental setting is an obvious factor determining the distribution. However, borrow pits and made soils are absent in some localities at Ruapuke in spite of apparently suitable geomorphology and soils. There is, however, extensive evidence of other forms of horticulture on the clifftops in both the Manuaitu and Ruapuke areas.

### Terraces

The occurrence of terraces on westward facing slopes along the clifftops at Ruapuke was noted by Wellman (1962:66). The terraces occur on slopes varying in gradient, with size of terrace closely related to the degree of slope. On some gentle

slopes the scarps between terraces are small (of the order of 40 cm) and may indicate that soil loosened by cultivation was trapped behind a barrier and gradually formed the terrace.

Near pa sites N64/69 and N64/99 terraces occupy fixed parabolic clifftop dunes. The terraces run like a flight of stairs up the steep-sloping valley floor and occupy most of the valley.

One of these sets of terraces (N64/196 - see Fig. 2) was briefly investigated in July 1978. A three metre long trench was excavated through a scarp and a series of test pits dug at intervals across the terrace to trace the changing levels of fill and substrate. Two postholes were found just in front of the present position of the scarp (Fig. 3). Both were found in the substrate and this suggests the terrace was originally deliberately built up behind a wooden barrier. In 1980 near Paekakariki Wakefield saw terraces which,

"extended about 30 yards up the face of the hill, formed by logs laid horizontally, and supported by large pegs. The terraces were covered with sand from off the beach, which the natives assured me was the best soil for the growth of kumara."

(Wakefield, 1845 I:225)

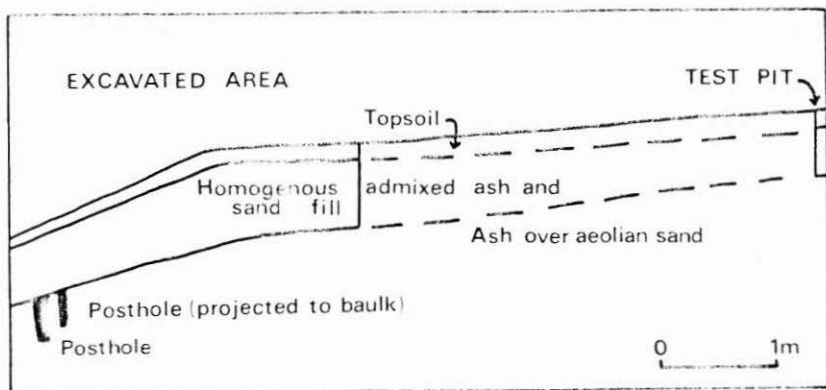


FIGURE 3. Section through scarp at N64/196.

There are a number of borrow pits on the sides of the ridges and on surface evidence one borrow pit appears to have been dug through a scarp and thus post-dates the formation of the terraces. Soils on the terraces contain varying amounts of added sand: from none at all to substantial quantities in places where the conditions were favourable in terms of supply.

The excavation produced no direct evidence of the function of the terraces but their size and context would indicate a horticultural function. Borrow pits and terraces do occur in close proximity in some locations but in others the depth of overburden seems to preclude the occurrence of made soils and the terraces alone are present.

#### Antiquity

Midden is occasionally found in the fill of borrow pits and a sample of Paphies australe from a pipi and cockle midden in the fill of one pit (N64/191) has been dated. This midden was presumably deposited soon after the pit was abandoned and provides a terminus ante quem for the use of the pit and hence for adjacent made soils. The result was  $410 \pm 40$  (NZ4523A). Radiocarbon samples for a nearby terrace/pit/midden site (N64/25) excavated by R Cassels have a similar antiquity (Cassels, pers. comm.).

#### Discussion

Made soils in the region of Aotea Harbour are distinguished from surrounding soils by the presence of large quantities of added sand. The distribution of made soils is confined to areas where sand could readily be obtained by quarrying into old tephra-capped sand dunes.

The best known major areas of made soils are in the inland Waikato and on the Waimea plains where soils occur on river flats and terraces and alluvial soil and gravel was quarried from near-surface deposits. Made soils near Aotea Harbour are found in a different setting. A close parallel is the situation in South Taranaki (Fleming, 1953:94-96) where dunes covered by Egmont ash were quarried for sand.

Were sand or gravel added to make heavy soils suitable for kumara growing? In the inland Waikato and near Aotea Harbour the soils that have been modified are not the poorer kumara-growing soils. Tuahu sandy loam has advantages over most other soils in the area for kumara growing and it seems that made soils were not so much an attempt to bring into production "heavy soils" as an attempt to enhance production, and perhaps quality, on good

kumara growing soils. This point has already been made about the situation in the inland Waikato (Cassels, 1972:200). However this option was often not available as a readily available supply of sand was needed so it is likely that unsanded counterparts and other soil types were cultivated. Many otherwise unmodified soil profiles around Manuaiti have been disturbed up to a depth of up to 40 cm indicating cultivation at some time in the past. Use of sand or gravel was thus a preferred way of growing kumara but it is unlikely that it was of any greater significance than a host of other, archaeologically less visible, techniques that were employed.

### Conclusions

There are extensive areas of made soils in the region of Aotea Harbour. The soils were being formed at least as far back as the sixteenth century.

Terraces are found on slopes above the cliffs along the coast and their size and context suggest a horticultural function. Some are spatially closely associated with borrow pits, others are found alone. Excavation suggests the presence of a retaining wall similar to those seen by Wakefield in 1840.

The borrow pits, made soils, and horticultural terraces are found amongst other archaeological remains that include pa, pits, terraces and middens.

### Acknowledgements

I would like to thank the various landowners (particularly Mr and Mrs Berntsen, Mr and Mrs Chamberlin, and Mr A Thomson) for permission to work on their land. A grant from the Skinner Fund made some of the fieldwork possible. This paper brings up to date material incorporated in an MA Research Essay, Anthropology Dept., University of Auckland. I would like to especially thank R Cassels for his part in this project.

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