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BORROW PITS AND MADE SOILS NEAR WAVERLEY, SOUTH TARANAKI

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This report describes the investigation of borrow pits and made soils at two localities near Waverley, South Taranaki (Fig. 1). The investigations were carried out in 1974 during the excavations at the Kokako site (Q22/21) (Cassels and Walton 1991). Some additional work was undertaken in 1976. The work was directed specifically at testing Best's (1976 [1925]: 121) and Fleming's (1953: 94-6) hypothesis that the large pits (quarries or borrow pits) in the Waverley area had been excavated to obtain sand for use in gardening. This was germane to the interpretation of the Kokako site, which was thought to be a small settlement associated with the tending of gardens.

The soils of the Waverley area are mapped as Egmont loams (Soil Bureau 1968). These are soils which have formed in the fine andesitic ash which mantles the area. They are very friable, well drained, soils and are generally considered to have excellent physical properties. The landscape with which they are associated is a gently rolling one, intersected by deep valleys. In places, the subdued forms of old sand ridges can be detected underlying the mantle of ash. The ash mantle is thinner on the steeper slopes, thus facilitating quarrying of the underlying sand.

Two localities were investigated:

- (1) The Wilson-Train borrow pits (Q22/36) (Fig. 2, Plate 1).

A series of about forty borrow pits were identified, most of which had been dug into the north side of an ash-mantled sand ridge. This group of borrow pits lies just south of the Kokako Stream, a tributary of the Whenuakura River. Sites in the vicinity include the Kokako site (Q22/21) and a large group of 91 pits (Q22/37). Two borrow pits and the adjacent soils were investigated at this locality.

This cluster of borrow pits is not unique: there is a further large group of borrow pits north of the stream, and another south of State Highway 3 (Fig. 2).

- (2) The Dickie borrow pit (Q21/234) (Plate 2, Fig. 3).

A borrow pit dug into the side of an ash-mantled sand dune was the focus of the investigation. Nearby sites include a pa site (Q21/226) and

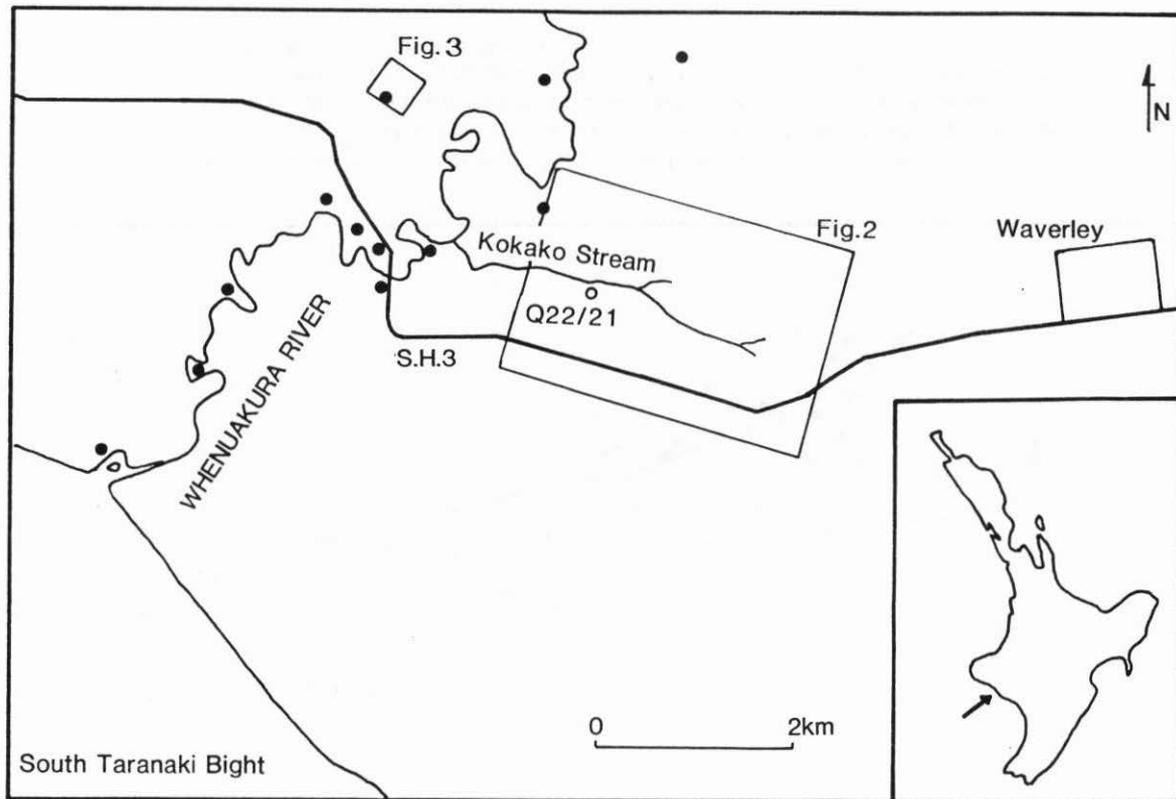


Fig. 1. Waverley area, showing the locations of sites Q21/234 and Q22/21. Infilled circles indicate pa. Wilson-Train borrow pits (Q22/36) – see Fig. 2. Dickie borrow pit (Q21/234) – see Fig. 3.

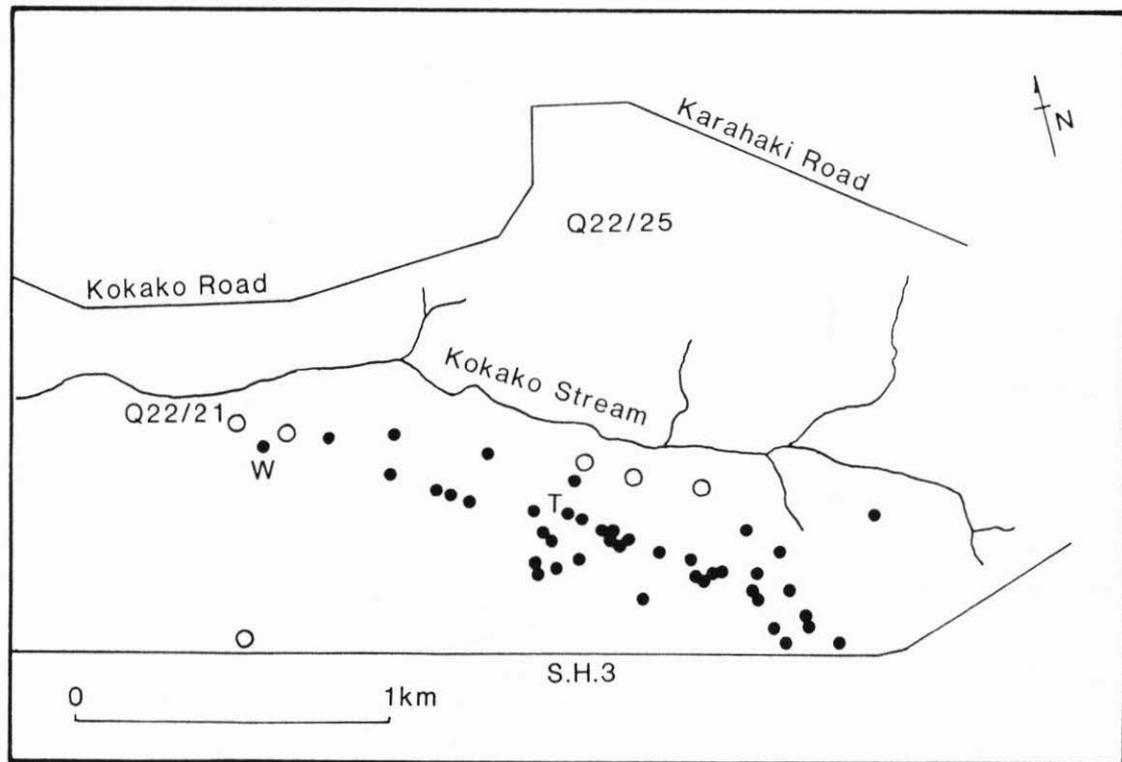


Fig. 2. Sites in the vicinity of the Wilson-Train borrow pits. Infilled circles = borrow pits, W = Wilson borrow pit, T = Train borrow pit and open circles = pit sites. Borrow pits north of Kokako Stream (locations not shown) are recorded as Q21/225 and Q22/25. Borrow pits south of SH 3 (locations not shown) are recorded as Q22/30.



Plate 1. Aerial photo from SE showing borrow pits. Train borrow pit (see Fig. 2) is the large pit centre right. Photo: Alastair Buist.



Plate 2. Aerial photo from the north showing Dickie borrow pit and area with rough surface (right foreground). Three pit sites (Q21/235, Q21/236, and Q21/237 also shown). The pa site (Q21/226) is on the spur top right. Photo: Alastair Buist.

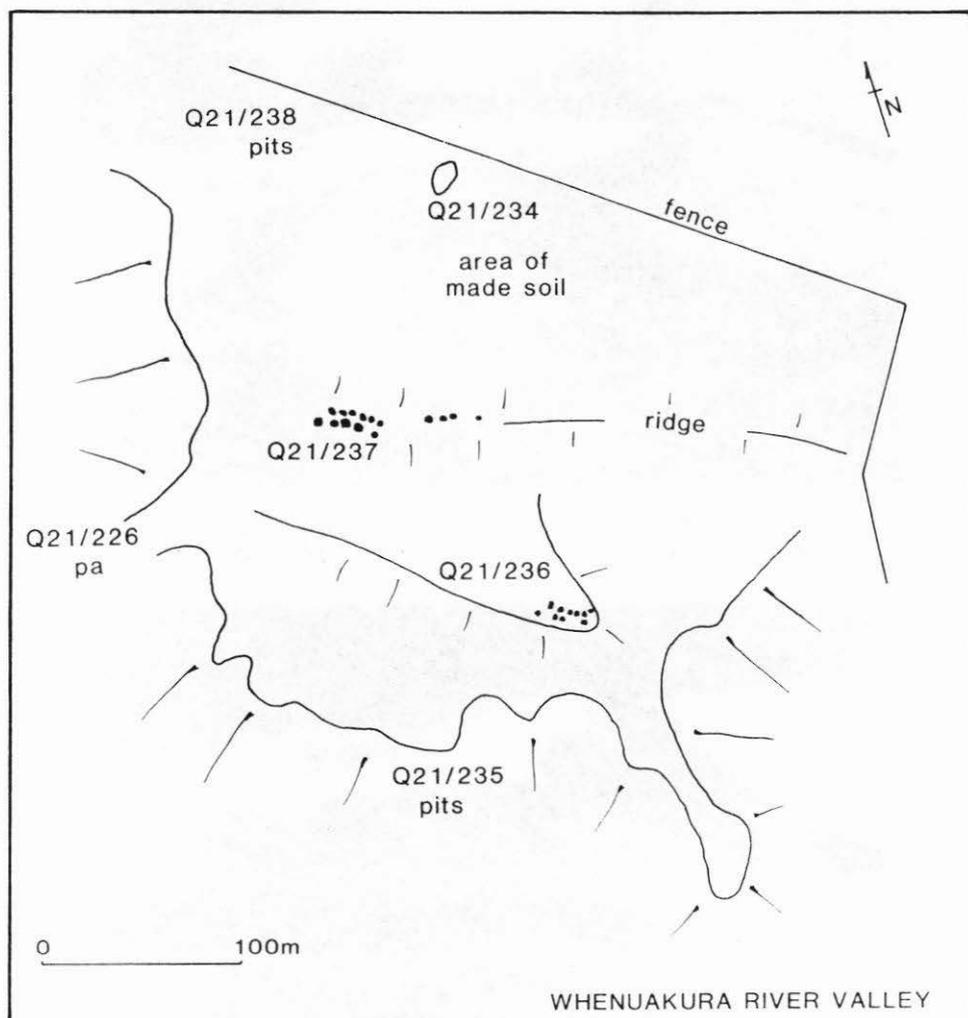


Fig. 3. Sites in the vicinity of the Dickie borrow pit.

several pit sites (Q21/235, 236, 237, 238). This group of sites is located on the western side of the Whenuakura River. There are no other borrow pits in the immediate vicinity.

The investigation began with the inspection of exposed soil profiles in the two areas under investigation. Trenches and test pits were dug in the pits to confirm that they were borrow pits and to identify the material which had been removed from them. Small test pits (not more than about 300 mm by 300 mm) were dug along transects centred on the borrow pits. The test pits were dug with a spade or a posthole borer and were intended to detect obvious differences in the soil which might be due to the addition of sand. Made soils were identified on the basis of any marked difference in texture when compared with the usual Egmont loam soils of the area.

Soils which show no signs of sand addition are referred to here as 'unaltered' soils. This refers only to the lack of sand addition and not to other forms of modification. Most soils had evidence of some form of modification. Disturbance on the topsoil/subsoil boundary was particularly common. Many soils had also been subject to ploughing.

THE WILSON-TRAIN BORROW PITS

The Wilson-Train borrow pits are a set of about 40 borrow pits situated between the Kokako Stream and State Highway 3 (Fig. 2). Two borrow pits, the Wilson borrow pit and the Train borrow pit, were selected for investigation. The investigations were limited to a series of test pits in the two borrow pits and in the areas immediately around them.

The Wilson borrow pit is a large pit near the Kokako site. The pit is unusual, but not unique, in having been sunk into a level surface. It is nearly 40 m long, 10-15 m wide, and has a maximum depth of 3 m. Elsewhere in this same paddock, which had been ploughed at least once, are other borrow pits, storage pits, and an area which, in spite of ploughing, has a conspicuously uneven surface (Cassels and Walton 1991: Plate 1).

The Wilson borrow pit had been dug through the ash and into the underlying sand. A test pit on the edge of the pit contained sand at a depth of 950 mm. Four test pits dug in the borrow pit revealed about a metre of fill, mostly layers of sand, in the bottom. This may be a by-product of the original quarrying and the subsequent natural, and cultivation-induced, infilling.

Eleven test pits were dug on a line from the borrow pit across the hummocky area which lay about 10 m south of the pit. The soil immediately around the pit was unaltered. The hummocky area, however, showed signs of sand addition on a large scale. In this area a layer of loamy sand overlay the ash subsoil. A topsoil had formed in the top of this layer.

An example of an altered soil profile is:

0-200 mm	topsoil (ploughed)
200-600 mm	loamy sand to sand (thickness varies from 150 to 400 mm)
on	ash

By contrast, an example of an unaltered soil profile is:

0-300 mm loam topsoil
on ash

A 150 mm layer of charcoal and ovenstones in an unaltered soil in one test pit suggests a brief episode of cooking, perhaps while tending nearby cultivations.

The sand in the hummocky area can only have got on top of the ash by human agency. The changes in the soil caused by sand addition were substantial. It is not suggested, however, that these were the only areas used for cultivation: unaltered soils in the vicinity often had signs of disturbance on the boundary between topsoil and subsoil and may also have been cultivated.

From near the Wilson borrow pit a ridge of wind-blown sand, mantled by ash, runs east-west. A series of borrow pits had been dug along the northern face of the ridge, presumably because the ash overburden was thinnest there. The Train borrow pit is one of these. It is a large borrow pit and is nearly 35 m long and 20 m wide. A test pit at the lowest point in the bottom of the pit revealed undisturbed sand at a depth of about 900 mm. Possibly as much as 2000 cubic metres of sand had been removed. Near the top of the fill in the pit (about 100-150 mm below the surface) a 200 mm thick charcoal-rich layer was found. Further investigation of this layer as a possible source of dating material confirmed that considerable infilling had already occurred when this occupation took place. The layer was also found to contain nails and both pig and horse bone. This presumably represents the use of the hollow as a convenient dump some time in the last 150 years, a practice still common today.

Fourteen test pits were dug on two transects in the vicinity of the borrow pit to identify changes in the soil. The area around the pit had been ploughed on numerous occasions in the past. The test pits confirmed that sand had been added to the soils of the immediate vicinity, but the depth of added sand was less than around the Wilson borrow pit. The made soils here characteristically had a loamy sand to sandy topsoil some 200-250 mm deep overlying the ash subsoil.

The sand was particularly evident near the lip of the pit: further away it became less and less conspicuous in the topsoil. Little appears to have been taken more than about 100 m from the quarry. This suggests that areas of made soil are restricted to areas immediately adjacent to borrow pits. Some of the soils were black. This was not due to the presence of charcoal, but more probably indicates that the soil once supported a vegetation of bracken fern.

Some differences were apparent between the two made soils investigated, but these may be due, in large part, to the different history of ploughing at the two sites. As with Wilson borrow pit, there were storage pit sites (Q22/38, 49) close by.

THE DICKIE BORROW PIT

Within a small area were a number of archaeological features including a small pa (Q21/226), a number of clusters of pits (Q21/235, 236, 237, 238), and a borrow pit (Q21/234). The area, and all the sites within it (with the exception of Q21/238), were mapped as part of the exercise (Figs. 3, 4, 5). When revisited in 1986, the pa was under young pine trees and most of the other sites, with the exception of Q21/235, had been, or were being, obliterated by regular ploughing.

Three low linear banks (Q21/239), which probably represent the sides of an enclosure, were present in the area under investigation. The enclosure is thought to be of late 19th century origin and is discussed elsewhere (Cassels and Walton 1992).

One part of the paddock, adjacent to the borrow pit, had a very rough surface. This was noticeable both from the air (Plate 2) and on the ground. It resembled the hummocky area adjacent to the Wilson borrow pit.

A large borrow pit (Q21/234) had been dug into the side of a low ridge. A 3 m long trench was dug in the borrow pit and uncovered a complicated sequence of fills to a depth of over 1.5 m. Near the base of the pit were patches of charcoal indicating either the use of the pit as a convenient spot to light a fire, or material containing charcoal washed in from above.

Eight test pits were dug across the adjacent hummocky area. These revealed a loamy sand of variable thickness overlying the ash. This was in sharp contrast to the unaltered soils in adjacent areas, which were the usual Egmont loams.

Two 2 m long trenches were dug to investigate the hummocks or 'mounds'. Each trench was cut from the centre of the hummock to the bottom of the adjacent depression. These trenches confirmed that the uneven ground surface was due to the varying thickness of added sand. A representative profile is:

0-200 mm	topsoil (ploughed)
200-550 mm	loamy sand (thickness variable)
on	ash

Charcoal is present in the sand, but is rare. Also present, but extremely rare, are small stones. In one of the two trenches a small feature with a charcoal-rich fill was found, but it was only partially uncovered in the trench. It had been dug to a depth of some 100-150 mm into the ash. This is likely to be the remains of a feature which has been truncated by the subsequent gardening.

The sand has not been carried far: the far edge of the hummocky area is within 100 m of the borrow pit and there is no evidence that any large quantity has been carried further than this.

It is likely that this sandy area has been used for gardening, and probable that the crop grown was kumara. It is possible that the hummocky surface reflects the creation of mounds in gardening.

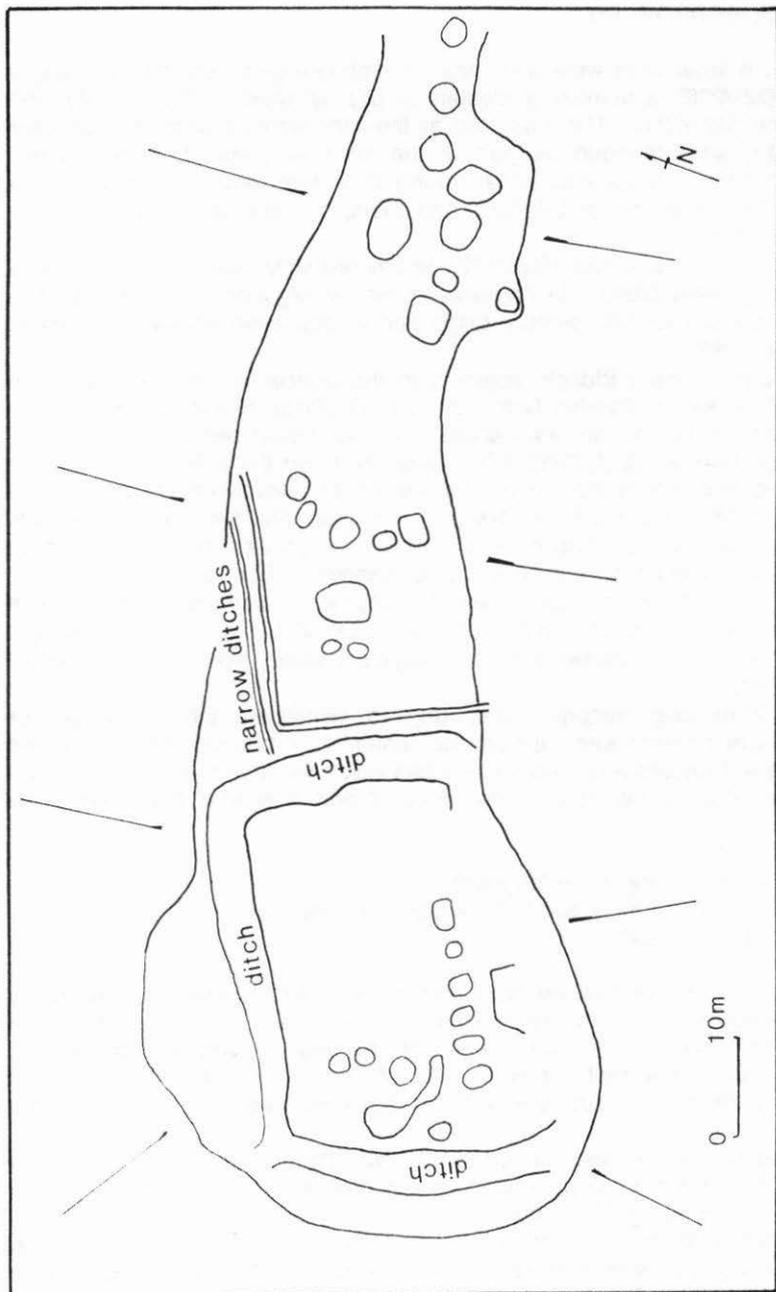


Fig. 4. Plan of site Q21/226.

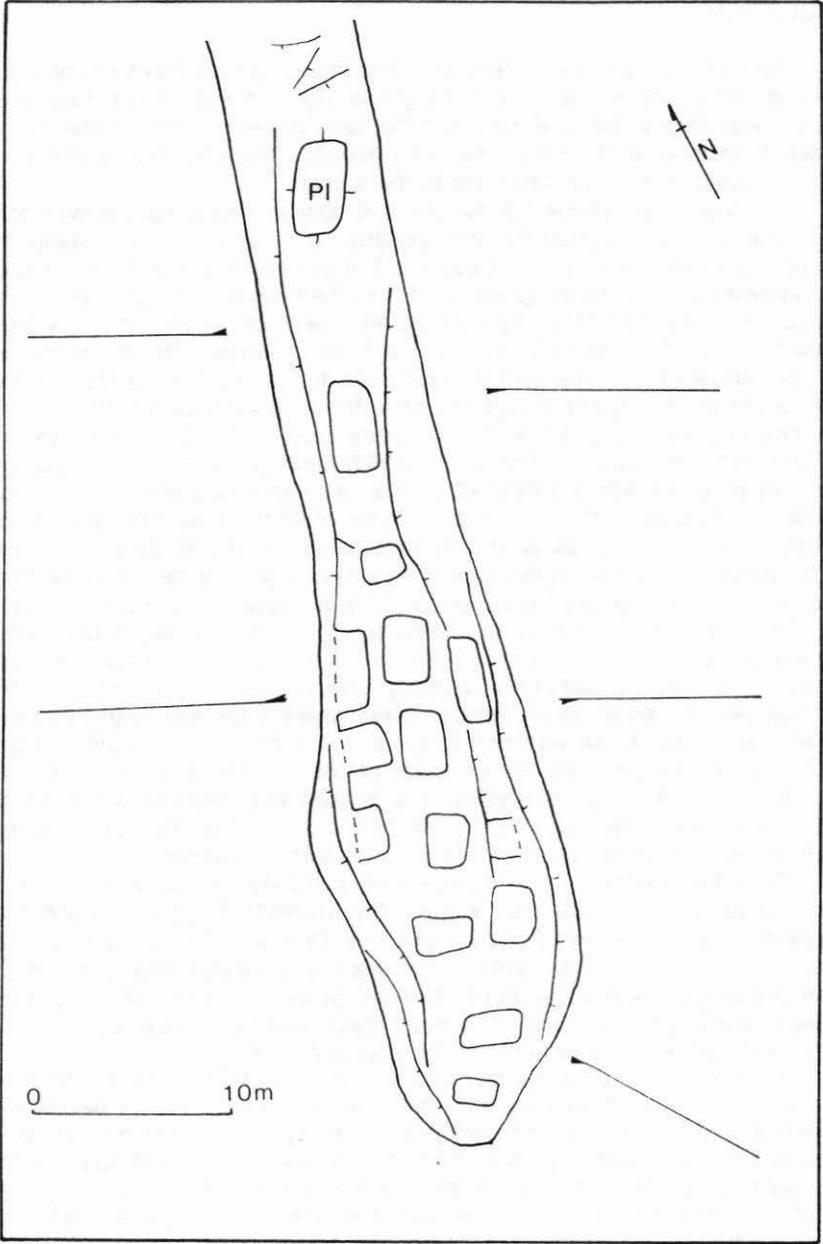


Fig. 5. Plan of site Q21/235. PI = Platform.

DISCUSSION

The investigations were intended to test the hypothesis that sand had been quarried and added to nearby soils for gardening purposes. The transportation of sand was clearly demonstrated, and the sand appears to have been used to create mounds or beds, rather than as a mulch. The only crop which would seem to respond to such treatment is the kumara.

The Wilson and Dickie borrow pits and adjacent made soils proved to be very similar. Both suggest the transportation of large amounts of sand and, perhaps, the use of mounds in gardens. The cultivation soil at the Kokako site also appears to have been spread as a thick bed rather than used as a mulch (Cassels and Walton 1991). By contrast, the Train borrow pit and the adjacent made soils suggest that sand was spread more sparingly. The difference may be more apparent than real as the made soils around the Train borrow pit have been subjected to regular ploughing, while the other examples have not. The investigations were also limited to just these cases so it is too soon to draw any very firm conclusions. The recent (1988) investigation by Chris Jacomb of a borrow pit and made soil (R22/42) in this same area has, however, produced results comparable to the Wilson and Dickie situations (Jacomb pers. comm.; Walton pers. obs.) and aerial photographs taken by Alastair Buist in the early 1970s sometimes show conspicuously hummocky ground near borrow pits in areas where no ploughing has occurred. This is suggestive, but not conclusive.

The extent of the practice of adding sand to soils is largely determined by the availability of a ready supply of sand. Storage pits, an indirect indicator of gardening, are widespread in the Waverley area, but borrow pits and made soils are restricted to certain areas, usually areas where there was only a thin layer of ash overburden to be removed to get to the sand below. In the vicinity of the Dickie borrow pit there are four sets of pits, yet the area of made soil is very restricted. Although conspicuous, it is likely that made soils formed only part of the area under cultivation. The conclusion is that the use of sand in gardens was preferred, but only when it was readily available.

There are extensive areas of made soils in the Waikato (Grange and others 1939: 39-40; Taylor 1958) and Tasman Bay lowlands (Rigg and Bruce 1923; Chittenden, Hodgson, and Dodson 1966: 16; Challis 1978), but smaller areas have been found in other parts of northern and central New Zealand. In geomorphological terms, the South Taranaki situation is very similar to that at Aotea Harbour (Walton 1983). In both areas, sand was quarried from ash-mantled dunes and incorporated in the adjacent soils.

The Kokako site (Cassels and Walton 1991), which lies close to the Wilson borrow pit, has been interpreted as a temporary settlement used by people while tending their gardens during the late prehistoric period. No material suitable for radiocarbon dating was recovered from the borrow pits or made soils but they are likely to be part of a settlement pattern which includes pa, seasonally occupied outsettlements like the Kokako site, and the storage pit sites. This points to their dating to the later part of the prehistoric sequence.

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