NEW ZEALAND
ARCHAEOLOGICAL
ASSOCIATION

ARCHAEOLOGY IN NEW ZEALAND

NEW ZEALAND
ARCHAEOLOGICAL ASSOCIATION
ARCHAEOLOGY IN NEW ZEALAND

EXCAVATION AT SITE R11/1930, PUKAKI CREEK, MANGERE

Russell Foster
Auckland

Introduction

Proposed development of a small peninsula jutting into the Pukaki Creek, Mangere (Fig. 1) resulted in an archaeological survey (Foster 1997) being carried out and a total of 14 archaeological sites being located (Fig. 2). The developer agreed to create a reserve at the southern end of the peninsula that would preserve seven of these sites. Under Authority 1998/7, the NZ Historic Places Trust agreed to the destruction of the remaining sites on condition that sites R11/1925 and R11/1930 be investigated and a report be prepared for the Trust (Foster 1999). Unfortunately, site R11/1925 was destroyed by the developers prior to any investigation and the topsoil stripped from R11/1930. This paper describes the results of the excavation of site R11/1930. The site was excavated over four days by Richard Jennings, Sam Foster and the author.

The Site

At the time this site was first recorded the only visible archaeological evidence was three patches of shell midden (see Fig. 2.) which were evident where ploughing had disturbed the underlying archaeological site. It was on the eastern edge of a flat area reaching across the full width of the peninsula. At the eastern side of the site the landform dropped steeply towards the creek below. Despite the fact that only scattered shell midden was present at this site, and at the other sites on the peninsula, it was clear, from previous archaeological knowledge of the area, that the middens recorded here represented a settlement area of significance. It was also clear that, for at least the majority of the sites, there would be significant archaeological evidence surviving despite the ploughing that had been undertaken for market gardening. In the case of R11/1930 this proved to be the case.

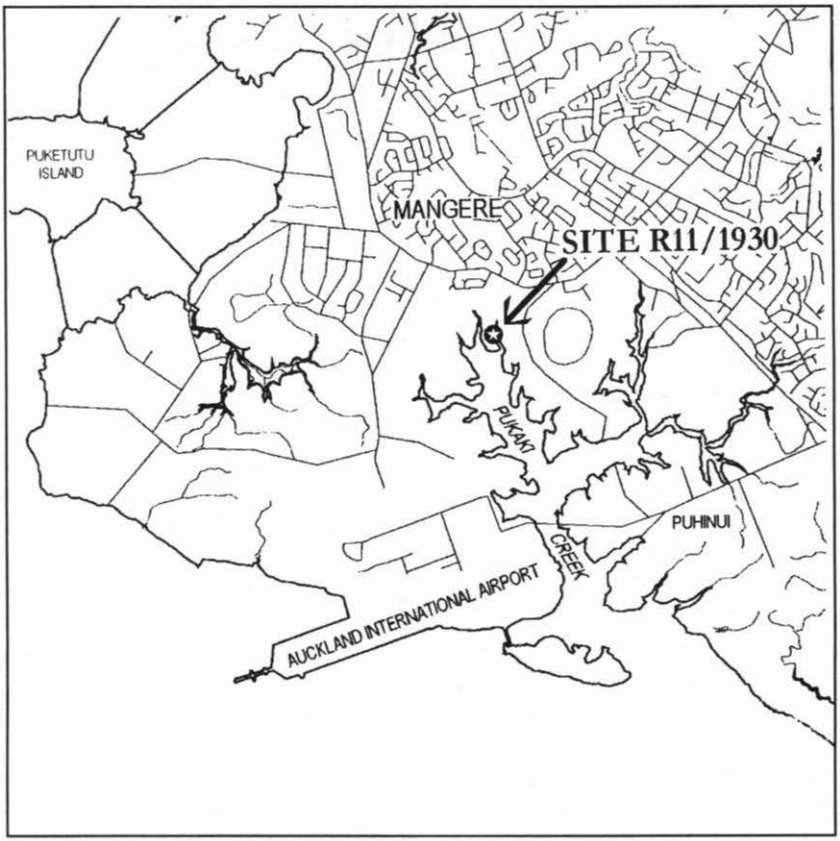


Figure 1. Location of Site R11/1930, Pukaki Creek.

Excavation Method

A hydraulic excavator was used to excavate of the site together with hand excavation of smaller features. A total of 11 pits, a number of 'drain' features and five postholes that did not relate directly to any pit were discovered. Figure 3. shows a plan of all features excavated.

Stratigraphy

The topsoil over the site had been removed before any excavation could be undertaken. However, examination of adjacent areas where the soil had not been stripped showed that there was some 300 mm of ploughed topsoil lying over a yellow-brown volcanic ash subsoil

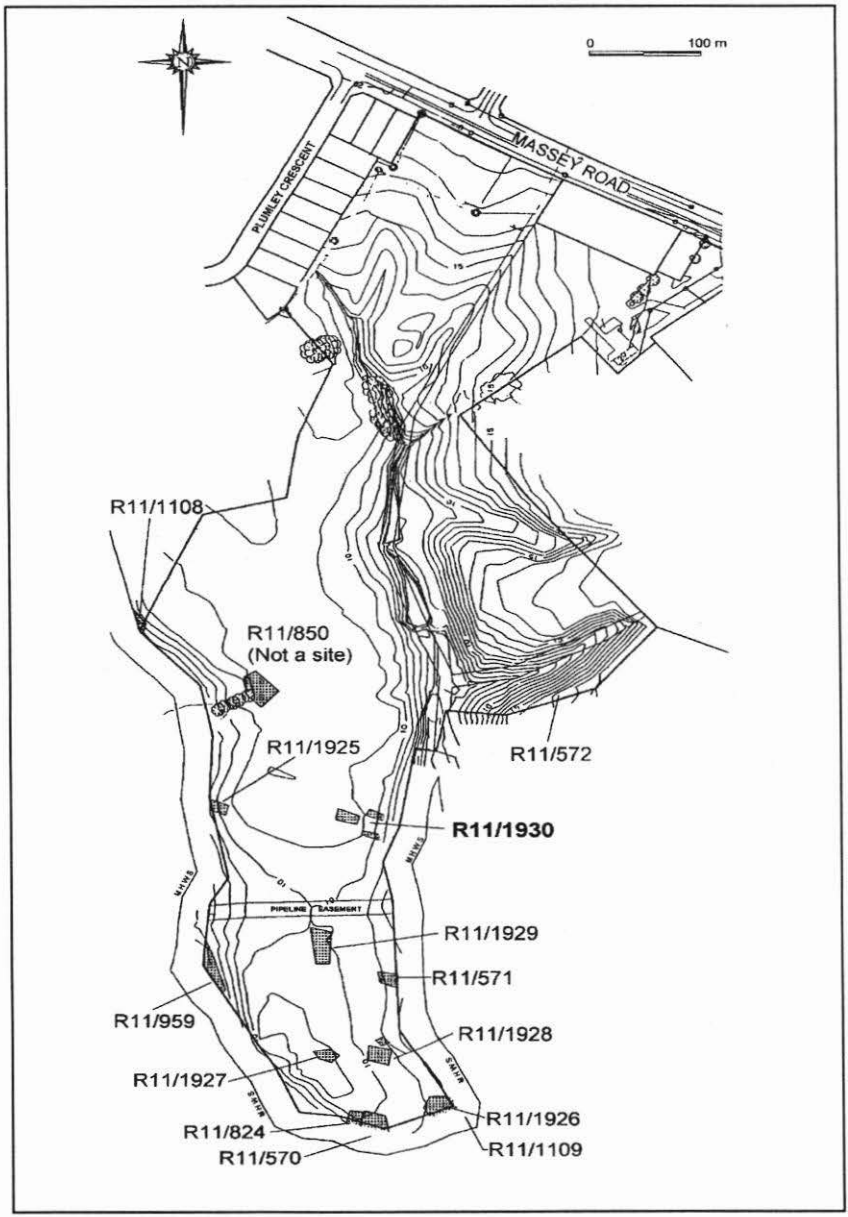


Figure 2. Pukaki Properties, Mangere, Archaeological Sites Recorded During 1997 Assessment (after Foster 1997)

Features

All the eleven pits were completely excavated. They fell into two basic categories: shallow pits without drains (Fig. 3: B, E, F, H, I and J) and deep pits with both internal and external drains (Fig. 3: A, C, D, G and K). Table 1 provides details of pit size and fill.

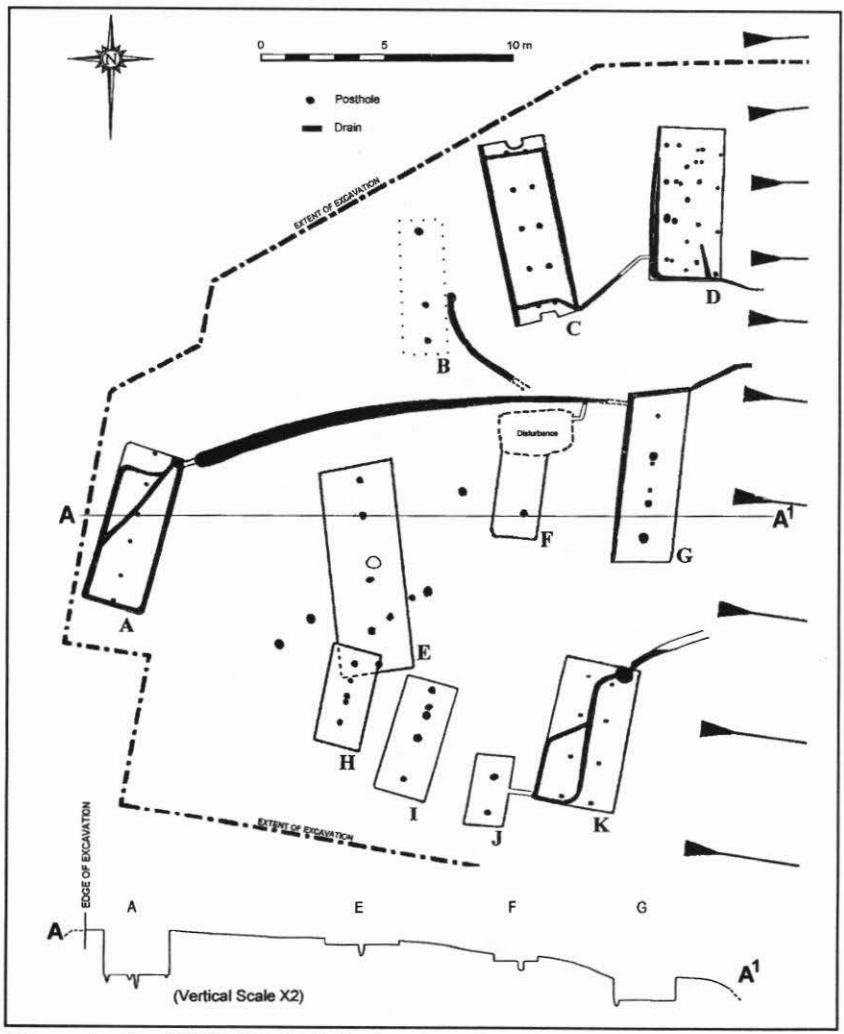


Figure 3. Site R11/1930, Pukaki Creek: archaeological features excavated.

Shallow Pits

Ploughing whilst the area was used for market gardening and the topsoil stripping before the excavation meant that the original depth of the pits was uncertain. However, structural evidence from the site as a whole (see below) indicated that, despite some truncation of features, it was unlikely that the shallow pits would have been much deeper than they appeared when excavated.

Pit B: this pit had been almost entirely destroyed by the initial topsoil removal. Only a rectangular shape of darker soil, measuring approximately 1.90 x 5.00 m, indicated that this was most likely a shallow pit similar to those described below, of which only the floor remained. Cleaning the surface by trowel removed the darker soil entirely. Three postholes were present; these would appear to have marked the centreline of the pit. In addition a drain ran from this area towards a large drain running west-east across the site.

Pit E: this was the largest of the pits at the site although the maximum depth at the time of excavation was only 70 mm. Five postholes marked the centreline. These postholes were circular, all between 130 and 180 mm in diameter and between 190 and 280 mm in depth. There was also a small bowel shaped 'scoop' cut into the floor measuring 550 x 680 mm and 210 mm deep. Small 'bin pits' of similar size have been excavated elsewhere, although not within other pits (e.g. Smart 1962, Davidson 1975, Walton 1982, Foster and Sewell 1995) and at R11/899 (Foster and Sewell 1988) and R10/26 (Sullivan 1972) bin pits were cut into the floors of larger pits. The example at this site is considerably smaller than those at R11/899 and R10/26 and would not seem to have served the same function. It is suggested than in this case it is probable that it was dug as a sump to provide some drainage capacity. Certainly the extent of drains elsewhere on the site indicates that getting rid of excessive water was a difficulty at this site.

Pit F: the northern end of the pit had been destroyed by a disturbance at some stage prior to the earthworks being started. Only a single post hole was present in this pit, but it would seem probable that a second, at least, would have been present at the northern end. The posthole measured 110 x 90 x 260 mm deep. A small drain feature led from the disturbed area into the main cross-site drain. It us likely that this would have originated from this pit.

Pit H: another smallish pit. Five postholes formed the centreline of the pit. These measured between 100 and 120 mm in diameter and between 95 and 130 mm in depth. This pit was the only one where a pit was clearly superseded by a subsequent pit as Pit H cut into and removed the south western corner of pit E.

Pit I: five post holes were cut along the centreline of the pit. They were between 110 and 220 in diameter and between 135 and 250 mm in depth. A thin layer of shell midden was present at the base of the fill at the southern end of the pit.

Pit J: this was the deepest of the shallow pits, being some 200 mm deep. Two postholes on the centreline measured 150 mm in diameter and 160 and 140 mm in depth. A drain was cut into the eastern side of the pit leading into the larger and deeper pit K.

Deep Pits

Pit A : (Fig. 4.): this was the deepest of all the pits on the site. Five small shallow fire scoops containing shell midden and some fired stones and measuring between 200 and 500 mm in diameter and up to 125 mm deep were present in the upper part of the fill. A single row of six postholes were present along the centreline measuring between 120 and 160 mm in diameter and between 190 and 220 mm deep.

An internal drain was present running around the edge of the pit floor, apart from at the northern end, where it ran at a distance from the pit wall. A diagonal drain also ran across the pit. The drains were approximately 80 mm in diameter and up to 70 mm deep. At the north eastern corner the drain ran into a sump measuring 340 x 480 mm and 400 mm deep. At the base of the sump a circular tunnel, 110 mm in diameter, extended from the sump for 500 mm to enter into the end of the substantial drain that ran eastwards across the site, eventually draining into pit G.

Pit C: (Fig. 4.): this pit had a buttress at each end reaching from the floor to the top of the pit. The northern buttress was 680 mm wide and extended 360 mm into the pit. The southern was 620 mm wide and 280 mm deep. End buttresses are frequent in many pits. Both of these examples were cut out of the parent material at the time the pit was dug and not added later as is occasionally found elsewhere, for

example Pit Q at R11/899 (Foster and Sewell 1988: 36) or Pit 4 at R10/31 (Leahy 1972: 18). The function of such buttresses has not been satisfactorily explained; whilst they are sometimes associated with roof supports or an entry step those in this pit would seem superfluous for the former function and could not have served for the latter function.

Roof support was provided by a double row of posts. The post holes varied from 130 x 130 mm diameter to 200 x 190 mm diameter. Depths ranged from 130 mm to 440 mm. The pit was drained by small drains cut into the floor, of similar size to those of pit A. Drains ran from end to end along the eastern and western walls. These were joined by further drains running east-west across the pit a short distance in front of each buttress. At the south eastern corner the drain was deepened to 100 mm and a 105 mm diameter tunnel was cut through the corner of the pit. This led to an external drain cut from the surface that ran into the south western side of pit D.

Pit D: (Fig. 5): this pit, along with pits G and K, formed a row immediately above the steep scarp to the stream. These three pits were the shallowest of the deep pits. It would seem probable that their original depth would have been similar to pits A and C, but their location on the edge of a scarp would have made them more prone to surface soil loss from recent ploughing and erosion, lessening their apparent depths.

Pit D was drained by a double drain running along its western side, where it would catch any water entering from the higher ground to the side. It could be hypothesised that the inner of these drains was added to supplement an original drain that proved ineffective. A single drain runs along the southern side (joined by a subsidiary drain running from towards the middle of the pit) to exit out of the south eastern corner, with an external drain running out over the edge of the scarp. Unlike pits A and C, there was no indication of a tunnel exiting the pit, rather the entire external drain was cut from the surface and through the pit wall. A similar situation where both tunnel and surface cut drain exits from pits was noted at Papahinu (Foster and Sewell 1995). A drain entered this pit from pit C towards its south western corner. It entered the pit some 500 mm above the floor. Pit D had the most complicated post hole pattern in its floor of any pit.

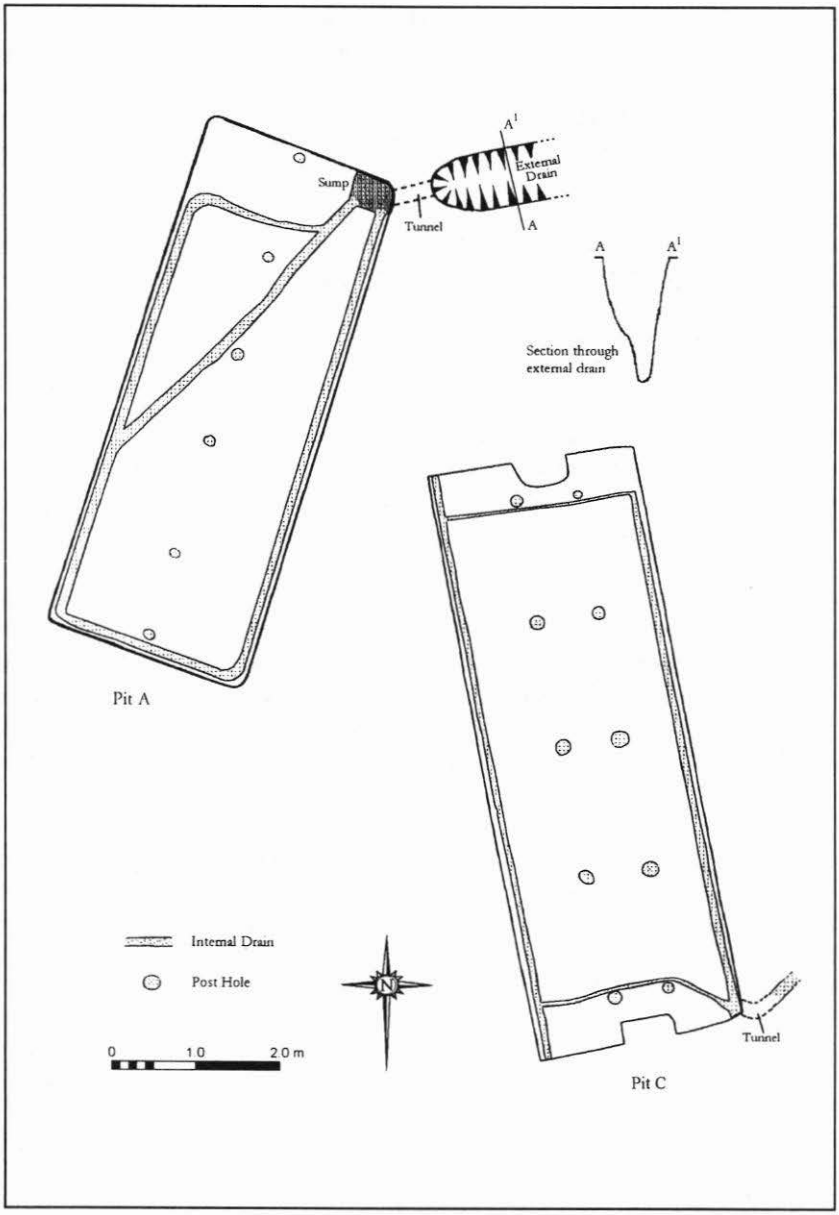
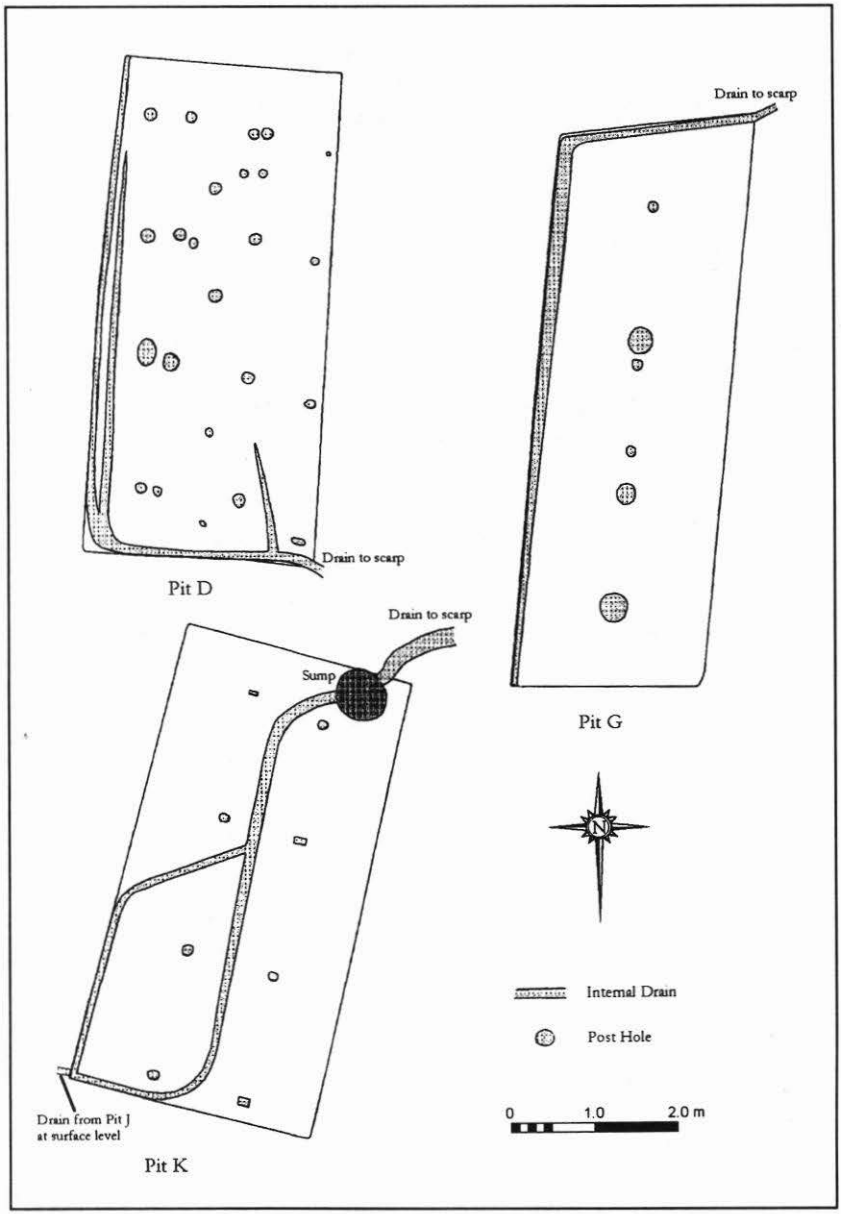


Figure 4. Site R11/1930, Pukaki Creek: floor plan of pits A and C.

A total of 24 post holes were present, varying in size from 60 x 50 in diameter and 100 mm deep to 190 x 110 and 180 mm deep. A row of four post holes is aligned more or less on the long axis of the pit, with many of the remaining post holes being in pairs. It could be argued that the post hole pattern indicates that a pit with a single row of central posts, as in pit A, had its roof replaced, possibly twice, with a double row, as in pit C, or *vice versa*. However, the four post holes along the eastern wall of the pit suggest an alternative explanation; as roof supports these four post holes are superfluous. Rather, it would seem likely that this pit did, in fact, have only a central row of posts and the others represent supports for racks or shelves along either side of the pit, as in one large pit at Maioro pa near Waikato Heads (R. C. Green pers. comm.), or, as suggested by Fox (1974: 146) for the Maioro pit and other examples elsewhere, such an arrangement of posts could have been for supporting horizontal planks subdividing the pit into a number of 'bins' where kumara could be sorted according to family groups or quality or size. It must be noted, however, that some of the post holes ascribed to these possible shelves or bins appear to be rather more substantial that one might expect for such structures.

Pit G: (Fig. 5): the simplest in form of all the deeper pits on this site, and also the pit with the least regular dimensions. A drain, similar to those of the other drained pits ran along its western (uphill) and northern sides, exiting into an external drain at the north west corner, from where the drain ran out over the scarp. The large drain from pit A entered the pit at its north western corner. Whilst this drain was 1.4 m deep where the tunnel from pit A entered it, it was only a few millimetres deep on entering pit G (although it was evident that some of this end of the drain has been lost by topsoil stripping). As with the drain entering into pit D, water from this drain would have run down the wall into the drain.

A single row of six post holes was present along the centreline measuring between 320 x 270 and 370 mm deep to 100 x 90 and 90 mm deep. The small size of the two inner posts suggests that the pit had only four posts to support the roof with the central posts representing an internal structure of some kind.



Site R11/1930, Pukaki Creek: floor plans of pits D,G and K.

Pit K: (Fig. 5): drainage in this pit was provided by a combination of internal drains and a sump leading to an external drain which ran over the edge of the scarp. The main internal drain ran in an S-shape from the south western corner to the north eastern corner where a circular sump was located. This drain was slightly wider than those of the other pits described - 100 to 120 mm wide. A smaller drain, 80 mm wide ran from the south western corner, part way along the western wall and then diagonally to join the larger drain in the centre of the pit. The sump was concave and roughly circular, 640 x 560 mm, and 150 mm deep.

A double row of posts, with four posts in each row, ran up either side of the centreline. Post hole sizes ranged between 110 x 60 and 130 mm deep to 150 x 140 and 220 mm deep. Whilst most of the post holes were more or less circular, as with the other post holes on the site, three were rectangular with sharp corners and straight sides.

Drains

The five deep pits at this site showed a wide variety of construction techniques with each pit conforming to a different pattern. However, a common feature of all these pits was their drainage system as all were drained with both internal and external drains. The largest on the site ran from pit A where it was 800 mm wide at the surface and 1.4 m deep (Fig. 4) to the northern end of pit G where it was only a few millimetres deep on entering the pit. Its entire length was cut from the surface but its western end was 500 mm from pit A and water entered into it from that pit through a tunnel. This substantial drain was also entered by smaller drains running from pits B and F. Pit G was subsequently drained by a further external drain cut from the surface that led over the edge of the eastern scarp. Pit C was drained through a tunnel into a smaller drain cut from the surface and running into pit D, which itself was drained over the edge of the scarp. The shallow pit J drained into pit K, from a further drain ran out from K over the edge of the eastern scarp.

Whilst not all pits that have been excavated in the Auckland area were drained, drained pits are more common. What is unusual is the effort put into providing drainage for this particular group. The only published site with a drain comparable to the main drain at this site is the early 19th century Maori settlement at Papahinu on the Pukaki Creek (Foster and Sewell 1995) where a similar drain 800 mm deep and 350 mm wide at the surface was found. A further excavated site where there was a particularly complex drainage pattern

was R11/1436 (Clough 1996), but only a brief preliminary report of this site has been produced and no report detailing information about the drainage of the site is available. At that site many drains apparently had ponga logs laid along their bases to provide a drainage channel and were then infilled (Clough pers. comm.) It is unlikely that such a practice was used at this site. The fill of the main drain was homogenous, without any apparent concentration of organic material at the base or an open hole left by the rotted logs as could be expected if the method had been used here.

Post Holes

With the exception of the pits the only other features found were five postholes. They did not appear to be part of the structure of any of the pits One single posthole was located to the west of pit F, measuring 140 mm in diameter and 150 mm deep. There were four postholes close to pit E. Those to the west of the pit were 160 mm in diameter and 220 and 280 mm deep whilst those to the east were 180 and 130 mm in diameter and 350 and 150 mm deep.

The function of these postholes is unknown. Nineteenth century European visitors commented on the number of single posts present in settlements and used for hanging various items (e.g. Murray-Oliver 1968: 140). These few post could indicate such uses at this site. Alternatively one or two could represent pataka (storage houses raised on poles) which could have either single or multiple posts.

Radiocarbon Age

A single radiocarbon age determination was obtained from this site. A sample of marine shell (*Austrovenus stutchburyi*) was collected from the midden from an earth oven at the top of pit A. This is taken to represent the final use of the site after the pit was filled. The sample was submitted to the Radiocarbon Laboratory at Waikato University (Wk 7135). An age determination of 710 +/- 50 BP[1] was obtained. The secular correction for the calibrated date is, at 1 SD, 1510-1646AD and at 2SD 1472-1673AD.

This date is similar to the dates obtained from R11/602 (M Taylor pers. comm.), the only other pre-European site on the Pukaki Creek where a ^{14}C age determination has been obtained.

---

[1] Result is Conventional Age as per Stuiver and Polack 1977, *Radiocarbon* 19: 353-363. This is based on the Libby half-life of 5568 yr with correction for isotropic fractionation applied.

Shell Midden Analysis

Although there had been quite extensive shell midden in the topsoil over this site, it had been almost entirely removed before excavation. What little remained was very disturbed and not *in situ* so samples of shell midden material were collected from *in situ* deposits at the top of the fill of Pit A and the fill of pit I. Each sample was analysed separately, but as the results were so similar they have been pooled for this discussion. Only shellfish were represented in the midden. No bone or fishbone were present. Charcoal was only present in very small fragments and no samples large enough for identification were found.

Minimum numbers of bivalves were estimated by counting hinges and dividing by two. The presence of the base of the columella was used to estimate gastropod numbers. Table 2 sets out the results of the analysis and indicates the predominant shellfish species was cockle, representing some 95% of all shellfish in the sample. The other 5% was made up from scallop (*Pecten novaeseelandiae*), mud snail (*Amphibola crenata*) pipi (*Paphies australis*), cat's eye (*Turbo smaragdus*), rock oyster (*Crassostrea glomerata*), melagraphia (*Melagraphia aethiops*) and turret shell (*Maoricolpus roseus roseus*). All these species would have been collected from mud flats or the muddy intertidal zone; all areas which would have been in easy reach of this site.

Discussion

Determining the length of occupation at a site such as this is difficult. The general alignment of the site, with all structures aligned north-south suggests that the site has a single phase of occupation and all features are related. However, the superimposition of pit H over the corner of pit E, indicates that some reconstruction took place at the site. It is probable that, by time the site was abandoned as a root crop storage area, the pits used for that purpose were infected by fungus and unusable[2].

The construction of pit H over part of E suggests the possibility that, whilst the pits for root storage were abandoned and filled in, the shallow pit structures continued in use and were repaired or replaced if necessary. The presence the shell midden and the earth ovens in the fill of pit A also suggests a change in site function at the time the deeper storage pits were abandoned as no evidence of cooking could be related directly to the use of the deeper pits for storage

[2] Fungus and the difficulties of sterilisation were common problems that limited the life of pits (Davidson.1984: 127).

The pits at this site quite clearly fall into two categories - shallow and deep. Whilst there are some indications that there has been some truncation of features, it is held that this alone is not an adequate explanation of the large number of very shallow pits at this site as the evidence of the close-by deeper pits and particularly the deep cross-site drain that runs quite close to the largest of the shallow pits (E) and the pit represented at B. Where this drain passed between these pits it was still almost 1.4 m deep. It would seem unlikely that the occupants of this site would have dug a drain much deeper than this, certainly not enough to have allowed for any significantly greater depth to the adjoining shallow pits.

Shallow pits have been found at many Auckland sites: for example such sites as Rahopara (Green 1970), Hamlins Hill (Nichol 1980), Motutapu Island (Davidson 1970), Fisher Road (Foster and Sewell 1988) and Papahinu (Foster and Sewell 1995). At all but the last of these sites the shallow pits in question were all small, with peripheral drains and central rows of post holes. These have been variously interpreted as sunken-floored store houses or domestic units. At the last site, Papahinu, a pit of this type was clearly a dwelling (Foster and Sewell 1995: 20, P34). The shallow pits at R11/1930 lack the drains common at the sites referred above. However, at Papahinu a similar type of structure was also recognised. These were several shallow pits similar in depth and proportion to those at this site and also lacking internal drains. They were interpreted as either houses or sunken-floored storage structures for non-perishable items. Crozet (Ling-Roth 1891: 32) described a village in the Bay of Islands in the later 18th century as having sheds for the storage of tools, weapons, water and fishing equipment. Such an interpretation would fit the type of shallow pits at R11/1930 as well.

It is also of note that no artefacts of any kind were found at this site. The presence of hearths and artefacts within a structure has often been taken to indicate the presence of a house. However, excavations at Fisher Road, the Tamaki River sites (Foster and Sewell 1997) and Papahinu have clearly demonstrated that houses were often devoid of either hearths or artefacts. But at these sites where houses were present, artefacts and evidence of stone working were found in the wider area of the site. At R11/1930 the total absence of artefacts argues against the interpretation of the site as a living site. Even though the area surrounding the pits had been stripped of topsoil before the site was investigated it is considered unlikely that evidence of a living site with a greater extent could have been completely destroyed without leaving any trace at all. It would seem most probable that this site was a specialised storage site

for both root crops in the deep pits and other items that did not require the specialised conditions provided by deep pits. Such specialised sites are known from elsewhere, indeed the later site at R11/1800 further south on the Pukaki Creek was a specialised storage site associated with a papakainga (R11/227).

Looking at this site in its wider context this site is only one of a concentration of sites on this peninsula. The most probable interpretation of the sites on this peninsula is that of a large papakainga (village) spread out over the southern part. This pit site would have been a storage area on the northern edge of the settlement, most probably amongst or bordering the gardens. In contrast to this peninsula monitoring that took place on the adjoining block to the west (Clough and Prince 1998) could only find limited occupation evidence, mainly shell middens and fire scoops with an occasional stone flake. It is likely that the shell midden that was recorded as R11/1925 and which was completely destroyed by earthworks before it could be investigated was a similar sort of ephemeral site as those discussed by Clough and Prince. This is the type of evidence that one might possibly expect to find in an area further removed from the main settlement site or sites, in this instance identified as the group of sites to the south of R11/1930.

The investigation of this site has provided important evidence for the interpretation of the settlement pattern of the Pukaki Creek where sites are present all around the creek. The orientation of sites is highly coastal but with several clusters similar to that of the papakainga to the south of site R11/1930. The majority have been recorded as 'shell middens' and many are in areas where modern horticulture has been practised; such site have often been considered be of limited archaeological interest and to have been destroyed by ploughing. The extent of the evidence remaining at this site clearly shows how much has survived

References

Clough, R. 1996. South Eastern Arterial (SEART) Archaeological Investigations Site R11/1436: preliminary report. Unpub. report, Clough and Associates, February 1996.

Clough, R. and D. Prince. 1998. Garden Court Subdivision: archaeological investigation. Unpub. report, Auckland, Clough and Associates, March 1998.

Davidson, J. 1970. Excavations of an "undefended" site, N38/37, on Motutapu Island, New Zealand. *Records of the Auckland Institute and Museum* 7: 31-60.

Davidson, J. 1975. The excavation of Skipper's Ridge (N40/7), Opito, Coromandel Peninsula. *Records of the Auckland Institute and Museum* 12: 1-42.

Davidson, J. 1984. *The Prehistory of New Zealand.* Auckland, Longman Paul.

Foster, R. 1997. Proposed Pukaki Properties Development, Massey Road: archaeological assessment. Unpublished report. Auckland, Russell Foster and Associates, May 1997.

Foster, R. 1999. Site R11/1930, Pukaki Creek, Mangere: archaeological investigations. Unpub. report to New Zealand Historic Places Trust. Russell Foster and Associates, December 1999.

Foster, R. and B. Sewell. 1988. An Open Settlement in Tamaki, Auckland, New Zealand. *Science and Research Series* 5. Wellington, Department of Conservation.

Foster, R. and B. Sewell. 1995. Papahinu. The Archaeology of an early 19th Century Maori Settlement on the Bank of the Pukaki Creek, Manukau City. *Auckland Conservancy Historic Resource Series* 12. Auckland, Department of Conservation.

Foster, R. And B. Sewell. 1997. The Tamaki River Pa: the excavation of a small defended site, R11/1506, on the Tamaki River, Auckland, New Zealand. *New Zealand Journal of Archaeology* 19: 5-25.

Fox, A. 1974. Prehistoric Maori storage pits: problems in interpretation. *Journal of the Polynesian Society* 83: 141-154.

Green, R.C. 1970. Investigations at Castor Bay Pa, Takapuna, New Zealand. *New Zealand Archaeological Association Newsletter* 13: 2-23.

Leahy, A. 1972 . Further excavations at site N38/30 Motutapu Island, New Zealand. *Records of the Auckland Institute and Museum* 9: 15-26

Ling-Roth, H. 1891. *Translation from the French of Crozet's Voyage to Tasmania, New Zealand, the Ladrone Islands and the Philippines in the Years 1771-1772.* London, Truslove and Shirley.

Murray-Oliver, A. 1968. *Augustus Earle in New Zealand.* Wellington, Whitcombe & Tombs Ltd.

Nichol, R. 1980 Hamlins Hill (N42/137) excavations: fourth season. *New Zealand Archaeological Association Newsletter* 23: 208-226.

Smart, C.D. 1962. Preliminary report on fieldwork in the Nukumaru-Waitotara area. *New Zealand Archaeological Association Newsletter* 5: 170-184.

Sullivan, A. 1972. Excavation of a pit at site N32/25, Station Bay, Motutapu. *Records of the Auckland Institute and Museum* 2: 27-60.

Taylor, M. 1983. Archaeological Investigation at Waokauri Creek, Crater Hill, 1982: a preliminary report. Unpub. report New Zealand Historic Places Trust, Auckland 1983/8.

Walton, A. 1982. Rescue archaeology at Puketarata Pa (N129/46). *New Zealand Archaeological Association Newsletter* 25: 144-150.

TABLE 1. Site R11/1930, Pukaki Creek: pit dimensions and fill

Pit	Length	Width	Depth	Fill
A	6.40	2.50	1.00	Surface covering of ploughed midden. 3 circular earth ovens on surface below midden: 500 x 460 mm diameter 125 mm deep; 200 x 200 mm diameter and 100 mm deep; 320 x 400 mm x 115 mm deep. All filled with midden, fired stones, ash and few charcoal fragments. These ovens cut into 100 mm layer of darker organic soil which dipped in the centre of the pit - hollow formed by subsidence of original fill. Lower fill dark brown soil. Two small earth ovens at base of this fill 250 x 220 mm x 80 mm deep; 230 x 230 mm x 100 mm deep. Fill Similar to ovens above. Sump filled with greyish silty material.
B	5.00	1.90	-	-
C	7.34	2.65	0.92	Homogenous dark brown soil. Northern 1/3 of floor covered with 50 mm layer of bright red ash, but no evidence of burning of pit floor.
D	5.80	2.70	0.60	
E	8.30	2.90	0.07	Dark brown soil
F	3.5+	1.85	0.08	Mixed dark brown and orange soil
G	6.94	2.34	0.65	
H	3.90	1.90	0.10	Dark brown soil
I	4.68	1.95	0.12	Dark brown soil
J	3.00	1.60	0.20	Mottled brown soil
K	5.80	3.15	0.62	Mottled brown soil

TABLE 2. Site R11/1930, Pukaki Creek: shellfish identifications

Species	MNI	Percentage
Austrovenus stutchburyi	2191	94.6
Crassostrea glomerata	45	1.9
Amphibola crenata	33	1.4
Paphies australis	15	0.65
Turbo smaragdus	11	0.47
Pecten novaeseelandiae	9	0.39
Melagraphia aethiops	9	0.39
Maoricolpus roseus	5	0.20
Cominella adspersa	P	-
TOTAL	2318	100