THE ARCHAEOLOGY

OF THE RAKAIA RIVER MOUTH

MOA HUNTER SITE PRECINCT

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1. Introduction

The Rakaia River Mouth Moa Hunter Site was investigated by von Haast in 1869-1871. This was only about 20 years after the first Canterbury Association ships landed at Lyttleton. European occupation was still expanding, and new land was going under the plough, which was how the site came to be discovered. The first scientific publication on moa was by Richard Owen in 1840 (Worthy and Holdaway 2002:12). Following that was great interest in discovering the various species of moa, as well as other large extinct birds in New Zealand. The presence of stone artefacts, ovens and moa bone at the Rakaia River mouth was a chance to push forward an understanding of moa and how they related to humans. Von Haast used this opportunity to propose the Moa Hunter culture in New Zealand (von Hast 1972), and Moa Hunters have been in the archaeological and popular literature ever since.

Now, 135 years after the first publication the site it is being assessed for its conservation values so that management options can be considered. Among the terms of reference for this project are the following objectives:

1. A brief description of the history of the site and the relevant literature

2. A summary of the historical cultural archaeological significance of the site

3. A full description and maps of the site, showing boundaries of recommended management areas, current land uses and the likely sensitivity (both cultural and archaeological) of different parts of the site.

It is the archaeological aspects of the above points which are addressed here. This is approached as follows:

- Summarise the three major archaeological investigations. These provide the bulk of information about the Moa Hunter site.
- Summarise the minor investigations which mainly provide additional contextual information about the precinct in general.
- Present the results of the 2007 investigation for the purposes of a plan of management.
- Assess the significance of the site in general and it's potential to provide information for the future.

The Rakaia River Mouth site is located on the eastern terraces of the Rakaia River where it enters the sea (Figure 1). The Rakaia River is one of the great Canterbury braided rivers, where the huge gravel and boulder bed load carried down from the Southern Alps is dropped on the plains as an enormous alluvial fan. The river is wide with multiple channels, and at its entrance to the sea an extensive barrier bar of boulders and gravel is built up with a lagoon behind it. The channel where the river breaks out to sea shifts regularly. The lagoon which extends behind the barrier bar on the eastern side is sometimes called the Little Rakaia. This however terminates further east where the

barrier bar is merged with the coastal plain. The barrier bar and lagoon are in a dynamic process of erosion and deposition.

The terraces where the archaeological site is located consist of a lower, middle and upper terrace. The lower terrace is at the south west corner and is small and inconspicuous. The middle terrace is partly built up as the Rakaia Huts settlement and is where the Council campground is located. This is often called the lower terrace. The upper terrace is extensive; part of it is built up, but most of it is cultivated paddock.

Other archaeological sites in the Canterbury region were also notable for their moa bone. These include Redcliffs with nearby Moa Bone Point Cave located on the Ashley-Heathcote Estuary and in the side of Banks Peninsula. These also had early excavations by von Haast and produced early Polynesian artefacts, such as necklace reels. Wakanui was another site with abundant moa bone, and the Wataki River Mouth was also known to have moa bone (Chalis 1995). Another site, resulting from Witter Archaeology investigations is the Waihora Channel Site which is not yet described. This is in the middle of Kaitorete Spit and is dominantly freshwater mussel middens, but it also produced moa bone. It is located where a channel was cut through Kaitorete Spit because of the Waimakariri River flowing south of Banks Peninsula into Lake Ellesmere (McFadgen and Goff 2005). At this time Lake Ellesmere would have been freshwater, and this would account for the massive freshwater mussel middens, but moa bone was recovered from the initial cultivation of the land. The Waihora channel would have closed about 500 years ago after the Waimakariri River shifted to its present course.

Thus, although there are other sites with moa bone in Canterbury, the Rakaia River Mouth Site is the best known, best described, and best preserved. A description of what is known about this site follows.

2. Major Investigations

2.1 Von Haast 1869-1871

The Rakaia River Mouth site was visited by von Haast during the period of 1869 to 1871 (Trotter 1972:130-131) in which he undertook excavations and made collections (von Haast 1872). The site was exposed by ploughing bringing to the surface an abundance of oven stones and moa bones. The material was so thick that von Haast thought that it must have made the ploughing difficult. The material was widely distributed, but there were two main areas of archaeology. One was on the upper terrace roughly 150 m north of the barrier bar lagoon (called the Little Rakaia), and about 150 m east of the lower terrace. The other was on the relatively small middle terrace. The map produced by von Haast is shown in Figure 2.

The upper terrace was mainly ovens and moa bone concentrations and seems to have been his main area of focus on the first visit. The ovens were described as circular and 2 ½ m in diameter, or oval and 2 ½ by 1 ½ m, and were about half a metre deep. They were in groups of 5 to 8, with a gap of about 20 m between them and the next cluster. The concentrations of moa bone with associated flaked stone artefacts were deposited

close by. The bone mostly belonged to the smaller species of moa in which there were 45 individuals of *Emeus crassis* and 37 individuals of *Anomalopterix didyformis*. Larger moa, inducing *Pachyornis elephantropus* and species of *Dinornis* were uncommon (names updated according to Worthy and Holdaway 2002:70-73). Six other bird species were identified including Cnemiornis, an extinct large flightless goose. In addition there were the bones of dog, seal and the tympanic bone of small whales.

The flaked stone artefacts included abundant greywacke impact flakes – large thin flakes 75 by 100 mm in size up to 150 by 100 mm. Other stone materials were represented chert, porcellanite (probably silcrete), a variety of chert or flint-like materials, and obsidian. Flint tools are listed, elongated in shape and unifacially flaked.

The middle terrace appears to have been his focus of excavation on the second visit in the winter of 1971. In the middle of the terrace there were five to six rows of ovens about 3 or 3 ½ m apart. Some were empty; others were full of bones and flaked stone artefacts. The bones included moa, dog and seal and the tympanic bone of whales. There also were concentrations of flaked stone artefacts and bones not in ovens. Also on the lower terrace, but near the slope of the upper terraced was a house floor about 4 ½ by 2 metres in size. This was noted on the first visit, and it had a cooking hearth containing charcoal, fish and bird bone and ground stone artefact fragments. No moa bone or flaked stone was present. His map shows two rectangular "Maori dwellings" in this location. Three loose human bones were also found on the lower terrace.

Over the site generally a number of ground stone adzes were found including those made of greenstone. Von Haast also mentions the discovery of caches. In one there were 22 pieces of flaked green palla tuff, close to another with 4 large adzes, apparently argillite, 30 cm long. These were located on the northeastern boundary of the moa ovens. Another cache was on the southwestern side, outside the line of ovens. It contained a grind stone together with small chisels and gouges some of which were argillite.

Other finds by Haast include a net weight, two minnow lure shanks, various other adzes, shell freshwater mussel, pierced albatross humeri and articulated moa necks in an oven. A notable absence was the lack of one-piece moa bone fish hooks, the manufacturing waste, and the stone drills and files used to make them.

2.2 Trotter 1967

Although the Rakaia River Mouth Site was where the concept of "Moa Hunter" originated, and represented a major step in New Zealand archaeology, there was no further work for about a hundred years. Artefacts however had been regularly collected from the site and the total in the Canterbury Museum was 450 (48 of which were adzes), see Appendix I in Trotter (1972:145). About half of the artefacts were from the original collections by von Haast. Among these artefacts was a minnow lure hook of bone, and a remarkable one of red argillite carved in the shape of a fish. There also was part of a reel from a necklace and a greywacke net weight.

To provide an update on the site, Trotter returned for 5 days field work where he laid out a grid system of 18.28 x 18.28 m squares (Figure 3) for the purpose of collecting and recording (Trotter 1972:133). There were 30 of these squares located in the main area on the upper terrace where von Haast had found the concentration of ovens and moa bones and 1326 stone artefacts were recovered, of which there were 8 broken adzes. There also were 14 pieces of moa bone attributed to the small *Euryapteryx gravis*, now known as *Emeus crassus* (Worthy and Holdaway 2002:70-73).

A metre square test excavations were also dug to test for stratigraphy below the plough zone (see Figure 4). The feature shown in Figure 3 (Trotter 1972:133) consisted of an oven pit covered with a layer of animal bone and artefacts *in situ* below the plough zone. This layer contained 2126 gm of moa bone 17% of which were burnt. Another contrast between the two layers was 7 moa gizzard stones in the bone layer and 41 gizzard stones in the lower layer. This produced 19 artefacts, including a complete and broken adze. Considerable animal bone was present in the test excavation, although only a single species of moa was found (*Emeus crassus*). A total of 17 stone artefacts were recovered by the excavation was in which there was a complete adze and a poll fragment.

Overall, this investigation produced 10 other bird species besides the moa, including an extinct duck (*Euryanas finschi*). In addition was seal (2 species), dog, whale, fish, and a single human bone. Freshwater mussel shell was also present in small amounts and blue mussel was also found. The artefacts consisted of a wide range of materials: greywacke, silcrete (orthoquartzite), flint, green palla (rhyolitic tuff), obsidian, argillite (indurated mudstone), slate, basalt, nephrite, sandstone and a variety of other siliceous materials. Silcrete was the most common material followed by flint. Greywacke was common as impact flakes (Witter 2006) or teshoa, as was palla, obsidian and argillite. There was a substantial amount of argillite and nephrite flakes with grinding and hammer dressing on them to indicate the manufacture and repair of adzes, and the two greywacke stone saws (attrition saws) would have been used for cutting the nephrite. The silcrete artefacts include unmodified elongated blades as well as those with heavy retouch.

An assemblage of 33 ground stone artefacts from the museum collection were described by Trotter (1972) and some were illustrated. These adzes comprise a wide range of the Archaic adze types as well as small chisels.

The excavation provided material for radiocarbon dating, and two of the dates from bone collagen were considered to be reliable by Trotter (1972:135). These were at 585 $\pm$ 64 and 518 $\pm$ 80 years before present.

2.3 Jacomb 1996-1997

The investigations by Jacomb (2005) were in response to a proposal to develop a Selwyn District Council camp ground on the small middle terrace. This followed an assessment by Smith (1996) who produced a comprehensive review of the archaeological work up to that time and set out a series of management recommendations. The work was conducted by using a digger to strip the 20 cm thick plough zone and reveal the underlying features in two areas where construction was proposed. The surface was

then cleaned and 70 features were discovered in Area A (Figure 5). These included postholes, ovens, fire scoops, ochre stained patches and drains. The 56 post holes were highly variable in size, depth and fill contents (Figure 6). All of the hand-excavated soil was sieved with a 3 mm mesh (Jacomb 2005:93-96).

The post hole pattern was analysed in detail. The reconstruction made was a pitched roof house 3.5 x 8.5 m with a 2.5 m extension or lean-to on the east side (Figure 7). The structure was surrounded by a fence and the fire features were in the vicinity of the veranda.

Over 300 stone artefacts were recovered, mainly flakes. The materials were listed as argillite, chert (flint), greywacke, obsidian, orthoquartzite (silcrete) and nephrite. Of these there were 2 adzes, 4 preforms, 12 adze fragments, 6 cores and 19 flake tools. The total amount of bone found was 1058 gm. It included small fragments of moa, dog, and small bird. There also was moa egg shell and freshwater mussel shell.

Three radiocarbon dates were obtained from the excavation. One was from moa eggshell at 770 $\pm$ 55 BP and another was 720 $\pm$ 50 BP from charcoal. An egg shell sample from the Trotter 1967 excavation (see above) was also dated at 600 $\pm$ BP. When calibrated, the "before present" dates generally fall into the time period of 1300 to 1400 AD.

The possibility of some of the postholes belonging to raised storage platforms, rather than belonging to a house as described by Jacomb has been raised by Anderson (2006). He also questioned whether all of the postholes could be assumed to have roughly the same date. The response by Jacomb (2006) was to argue for his house model, and for all the structures to be the same time period.

3. Minor Investigations

In addition to the above studies, there have been other discoveries and minor archaeological investigations. These add considerably to the context and overall pattern.

One discovery (L37/5) was described by Owen Wilkes in 1965 as "an unfinished greenstone adze 22.9 cm long and numerous flint flakes from a paddock (Figure 8). This is located about a kilometre away from the Moa Hunter Site, and may be a contemporaneous out-lier from this occupation, or belong to a later settlement.

There also was a cache of adzes found by digging a posthole for a fence on a house block in 1984 (Figure 8). This was on the middle terrace, but on the margin of where von Haast indicted the concentration of artefacts and ovens. These adzes are described (apparently by Chris Jacomb) in the NZAA file on the Rakaia Huts Moa Hunter Site as follows:

- Large hogbacked est 260 mm long light grey argillite
- Medium hogbacked est 230 mm long dark grey argillite
- Flaked hogbacked est 260 mm long dark grey argillite
- Flaked coffin-shaped est 200 mm long dark grey argillite
- Distal half hogbacked est 120 mm long medium grey argillite
- Tanged quadrangular est 180 mm long medium grey argillite

- Tanged quadrangular est 180 mm long medium grey argillite
- Type 2A prox. half est 120 mm long light grey argillite
- Broken adze head in process of being reworked about 150 mm long basalt.
- Grindstone

This is an extraordinary find of adzes, all of which belong to Archaic types. The use of argillite (probably from Nelson) was much favoured for the early adze tool kit.

In the process of monitoring the construction of the Ocean View Place road in 1987 two postholes and 9 ovens were recorded (McFadgen and Walton 1989). One of the ovens contained a nephrite adze and numerous other artefacts (Figure 8, also Figure 5 Area C). This is located on the fringe of the main site area, and may represent an additional area of early house structures.

The strip between the paddock fence line of the Rakaia River Mouth site and the bank of the lagoon was included in a project by Witter Archaeology (Figure 8). This was a survey of the coastal strip for a gold mining proposal running from Taumutu to south of the Rakaia River in 2003 (Witter and Witter 2003). An oven area was found opposite the Moa Hunter site, but there was little other evidence from this site.

In 2004 a damage assessment (Witter and Witter 2005 a) was undertaken to evaluate the impact caused by a road upgrade along the edge of the lagoon on the southern edge of the Rakaia River Mouth Site where the above 2003 survey had been (Figure 8). A grader had cut into some *in situ* deposit near a fence line where a small amount of archaeological material (oven stones and 2 artefacts) had been disturbed. The grader scrape between the paddock and lagoon bank had further disturbed four oven areas and four artefacts. It was clear that although there was material from the site on the edge of the lagoon, it was not great, and disturbance as an access track may have reduced it considerably.

Another Witter Archaeology report (Witter 2005 b) was on monitoring road construction on the side of the terrace and Rakaia River flood plain (Figure 8). This was well north of the site area shown by von Haast, and no archaeological material was exposed in the process. However, this part of terrace edge was not indicated as part of the site area by von Haast.

A second damage report in 2005 (Witter 2005 c) was to assess disturbances made by playground and cloths line post holes in the Council camp ground (Figure 8). This recommended an archaeological investigation of the spoil removed from the existing post holes as well as the additional post holes needed to complete the playground construction. This was located near the area previously investigated by Jacomb (see above)

The examination of the posthole spoil was completed in 2006 (Witter in prep). The soil was passed through a 5 mm sieve and the oven stone fragments and artefacts retained. The 12 artefacts found were made from greywacke, silcrete, chalcedony, flint, obsidian and a “pink tuff” – a remarkable variety for such a small sample. The artefact of greatest interest was an argillite flake which had wear showing that it had been used as a stone saw, probably for working nephrite. The results of this investigation was consistant with

the findings of Jacomb, and indicated a more wide-spread distribution of artefacts and ovens to within at least 10 m of the edge of the lagoon.

4. Witter 2007 Investigation and GIS Survey

4.1. Objectives

The strategy for the archaeological component of the Plan of Management was as follows:

- Prepare a GIS map showing the management zones of the precinct.
- Assess any archaeology visible on the ground
- Relate the results to the previous archaeological work

4.2 Field Work and Methodology

A preliminary visit to the site was made on 29 April 2007. A preliminary assessment of zones was made based on whether particular areas were built up and where the previous archaeological work had been. One of the paddocks on the upper terrace in the oven and moa bone area described by von Haast and Trotter had been ploughed and had a broccoli crop in it. This had the potential for surface visibility and recording artefactual material in the rows between the crops.

The initial zone scheme for GIS mapping was done by Andy Standley of Opus. He also geo-registered the area as a 100 x 100 metre New Zealand Map Grid to assist recording artefacts in the field.

Recording artefacts in the broccoli paddock began on 4 June 2007 with the help of Tim Priddy of Opus (Figure 8). The coverage was not completed on that day, and on 15 July I returned and finished the recording. The procedure was to walk the bare strips between blocks of broccoli which had been cultivated but not planted. The presence of artefacts was recorded by a hand-held GPS, and the artefact type and raw material were noted. Length, width and thickness measurements were taken except for broken flakes where only the maximum length was measured. Moa gizzard stones of quartz were also found, and these were measured to maximum length. The presence of fire-cracked greywacke cobble oven stones was also recorded with the GPS as follows:

- Concentrated burnt rock. Area with abundant fire cracked-rock.
- Burnt rock. Fire-cracked rock common on the ground with every pace and evenly distributed.
- Rare burnt rock. Fire cracked rock occurring as a single piece every few paces.
- No burnt rock. No fire-cracked rock seen for several paces.

These data were recorded on an Excel spread sheet and sent to Andy Standley to be plotted on the GIS map. The oven stones and gizzard stones are shown in Figure 9, and the artefacts are shown in Figure 10. The data recorded for the artefacts is shown in Table 1.

The burnt or fire-cracked rock oven stones were all of greywacke. The closest source for this is the barrier bar across the lagoon to the south. Greywacke was also an important tool material. Many of the greywacke cobbles on the barrier bar are flat and oval to circular in shape and well worn. This flat thin shape means that there is a high surface area to volume, making this kind of cobble relatively buoyant, and results in them being thrown high up on the beach, and readily available.

A special technology was developed for these cobbles to produce an exceptionally large thin flake with a very low edge angle. They were made by slamming a flat thin cobble down on an anvil with great force. These have been described as impact flakes (Witter 2006), and in the archaeological literature are often referred to as teshoa. The look like good general purpose-knives and show a variety of usewear patterns (Williams 2006). These range from slight rounding of the edge, to a series of micro-flakes, as well as heavy edge damage. Sometimes the edge is resharpened by retouch flakes, and with a few there may be modification of the edge in to saw-like dentations. Some also show the heavy wear and polish of their use as a stone saw to cut greenstone. The presence of impact cores show that this type of flake was made on site as well. The flat greywacke cobbles were also used as heavy-duty nuclear tools. An edge on the cobble was made by impact flakes, and then often flaked further by conventional hand-held flaking using a hammerstone.

Another material was recorded as silcrete. This is usually considered to be derived from a bed of sandy soil or sandstone in which the sand grains have been cemented together by silica in the ground water, especially where the climate is relatively dry. Outcrops of silcrete are frequent in Central Otago usually with abundant evidence of their use as a quarry. Tools made of this material feature with Moa Hunter sites in that region, and are usually the elongated thin and narrow flakes known as blades. These appear to have been particularly favoured for moa butchery.

A source of this material has been reported near Oxford and may be the main source of the Canterbury silcrete. Examination with a hand lens of this material however indicates that the margins sand grains seem to be ruptured rather than sharply defined as is usual for silcrete. It is possible that this source may be near some volcanics and the sand grains have been baked together rather than cemented. If so this material should be called hornfels, and the distinction between the Otago and Canterbury sources should be relatively easy to identify, and it should be possible to determine what proportion of the "silcrete" was local or from Central Otago.

The term chert covers a wide range of siliceous rocks. One form is of marine origin and found in limestone. It typically is grey in colour and is also called flint. The advantage of the term flint over chert in general is that it can be sued to identify the material source. In this case, the source of the flint is likely to be in the direction of Kaikoura. Other sorts of chert-like stone, such as chalcedony, are known to be available locally.

The term argillite here is used to refer to the metasomatized material associated with the ultramafic rocks found in the Nelson and Bluff areas. This material consists of blocks of

sedimentary rock which was torn off by the oceanic floor as it plunged below the crustal rocks of New Zealand. This material was indurated with mineral gases and fluids which made it into a very hard and tough kind of stone. When it was uplifted and exposed by erosion it was discovered by the early Polynesian inhabitants as an outstanding material for adzes. It is assumed that the Nelson source is the most likely origin of the Canterbury argillite. The Mount Somers area is known to be the source of a distinctive green volcanic ash known as palla. It also was used to make adzes.

Obsidian is a form of volcanic glass, and the most well-known source is Mayor Island in the North Island. This material flakes into very sharp edges, and was very widely distributed in New Zealand throughout prehistory.

Nephrite or greenstone is restricted to the west coast of the South Island. To be transported to the Canterbury coast it must either be packed over the high passes in the Southern Alps or hauled by canoe. Nephrite is not only very hard, but its fibrous texture makes it especially tough. These characteristics make it the material of choice for adzes. It holds a sharp edge well, and is extremely durable and less likely to break during heavy use. However, it is difficult and time consuming to work. After the Moa Hunter period it became the material most often used for adzes and chisels in Canterbury.

4.3 Results

The proportions of materials found during the GIS survey is shown in the graph in Figure 11. Greywacke was the most frequent material, with silcrete the next most common. The artefact types are presented in a scatter gram in Figure 12. The presence of a variety of material types from a range of sources is consistant with a relatively complex range of implements and stone working on the upper terrace.

This is a reduction chart which shows the size and cross section of the artefacts which were measured in three dimensions. The impact flakes and cores as well as nuclear tools were all made of greywacke, and these comprise the larger sized artefacts. The smallest flakes are very thin, with the somewhat larger other flakes, as well as complete and broken flake tools making up a cluster.

A large adze preform was found made out of a material resembling fully metamorphosed quartzite (although quartzite as a raw material has not been listed previously). A preform is a tool which has been worked into its approximate shape before hammer-dressing (pecking with a hammerstone) and grinding to give a functional tool. It seems to have been made on a very large split flake in which attempts to thin and shape it were unsuccessful. Another relatively large artefact was a sandstone grind stone which would have been used to grind and shape the adzes.

A sample of about a hundred artefacts would help to identify better the technology and function of these artefacts. The graph does however suggest that this artefact assemblage represents highly varied manufacturing processes and uses. There is more than simple moa butchering indicated on the upper terrace.

The gizzard stone measurements are graphed in Figure 13. Although there were only 20 of them the show an intriguing pattern. Most are in the range of 5 to 9 mm, and therefore are relatively small. These probably represent *Emeus crassis/ Anomalopterix didyformis* which were the main species of moa. There are however a few larger ones, including an example 21 mm long. Since these are length measurements, it is necessary to imagine the size of the gizzard stone increasing exponentially, and there being the occasional gizzard stone of one of the larger moa present as well.

The concentrations of burnt rock (oven stones) recorded by the GPS are shown in Figure 9. These would be at an oven where the plough has brought them to the surface. The rest of the burnt rock seen would have been dragged back and fourth by 130 years of ploughing and scattered over the entire area. The locations of rare burnt rock is probably where some of these have been dragged out beyond the main oven area. The gastroliths (moa gizzard stones) distribution are correlate with the burnt rock to show that the ovens were for cooking moa as has been interpreted by the previous work.

The stone artefacts shown in Figure 10 reveal an unexpected pattern. The greywacke impact artefacts are mostly around the margins of the site area, with tools of other materials in the centre. Since the graph in Figure 11 indicates these are mostly silcrete, and the descriptions in Table 1 identify most of the silcrete artefacts as blades, these would be consistant with the idea of this type of artefact as being mainly for cutting up moa. The presence of these tools is also closely associated with the oven stones and gizzard stones.

In this case, what are the impact flakes for? These would seem to be admirably suited as a butchering tool, being large, thin and sharp. They would even seem superior to a silcrete blade which had been repeatedly resharpened and had a thickened edge. However, they are clearly on the margin of the moa butchering and cooking, and must represent some other activity. In addition, the other stone flake materials suggest other kinds of manufacturing activities,

In summary, the results of the analyses and plotting of the GPS data is consistant with the main location of moa processing on the upper terrace as documented by von Haast and Trotter, but imply a more complex pattern of activities as well.

4.4 Comparison of Artefact Distributions

A review of the previous work and including the GPS survey should make it possible to assess some of the behaviour represented at the Rakaia River Mouth Site. Two houses were identified in the middle terrace by von Haast. The excavation of postholes by Jacomb was also on this terrace. The suggestion that these postholes were for raised storage platforms made by Anderson is interesting, but the row of three big posts is not consistant with ethnographically historic examples. The most likely explanation is as the main supports for a large ridge pole as suggested by Jacomb. This would seem to be the main living area. Although there were a few moa bone fragments in the ovens dug by Jacomb, it would seem that near the houses was where a wide variety of other foods were cooked. The materials recorded by Jacomb are shown in the graph Figure 14. His most

abundant material was flint/chert with obsidian also being common, and silcrete was rare. In the more limited sample of the Witter 2006 sieve recovery (Figure 15), flint was common and silcrete was rare. The reduction chart in Figure 16 shows a cluster of flakes, mostly broken. The relatively few complete flakes however do not suggest a regression line, or other patterns which indicate a single type of flaking process. This would be as expected in a domestic area. The partitioning of the middle terrace as the living area seems to be well supported.

The survey results by Trotter is shown in the Figure 17 graph. Although silcrete is shown as the most abundant, flint is also very common. There also were few greywacke artefacts. This differs somewhat from the GPS survey in Figure 11. The description by Trotter however does not show where he recorded his artefacts, although he laid out a grid of 30 metre squares. It is possible that access to the map of this grid would give spatial patterning that would fit in better with the GPS survey results. The contents of the oven excavated by Trotter in Figure 18 is a very small sample in which the main artefact was part of a large basalt adze ("other" material) which happened to be present.

The results from Trotter back up the idea that butchering moa (presumably with silcrete blades) and cooking then was only one activity which took place on the upper terrace. The noisome separation of this together with any uneaten remains and viscera by at least 100 m from the habitation area makes good sense. However, what is the explanation of the other kinds of stone working? It appears that workshops of some sort were present, and this could imply habitations nearby.

The patterning from the GPS survey plotted points makes it possible to identify activity areas, even after over 100 years of ploughing (Figure 19). The ovens are indicated by the concentrations of fire cracked rock which were recorded. The presence of moa butchered and cooked at these ovens is implied by the presence of gizzard stones. The area of most abundant stone artefacts is suggested to belong to tool-making and using workshops, not necessarily directly related to butchering. These may also be associated with some form of habitation, even though the main habitation area seems to be on the middle terrace. Excavation below the plough zone would test this possibility by the presence of post holes.

4.5. Model of the Rakaia River Mouth Moa Hunter Settlement

A date of 1300 to 1400 AD for the site has been demonstrated by Jacomb (see above). The concept of the entire site being contemporaneous although the two main occupation areas were separated by 100 metres seems plausible, but is not a certainty. This date is consistant the large number of adzes recorded by Trotter (1972:146-147) of different types that comprise a full Archaic woodworking tool kit. There were 8 deep triangular cross section Duff type 4A (hogback) which were probably primarily for hollowing out canoes. The 7 tanged Duff 1A type quadrangular cross sectioned adzes were large and would be for heavy duty wood working. This might have been used in canoe carving, but also would have been applicable to shaping planks for houses. There were another 14 adzes of various cross sections which would have been used for lighter work, and there were three which were chisel-like. Although useful for lighter work such as making

paddles or wooden tools, the abundance and variety might have been applied for decorative carving on houses as well.

On the middle terrace two rectangular dwellings were identified by von Haast who gave the dimensions of one as 4 ½ by 2 metres. Nearby was a larger house interpreted by Jacomb to be 3.5 x 8.5 m in size with a 2.5 x 8.5 veranda attached. This terrace had a scatter of bone and stone artefacts as well as numerous ovens concentrated across the southern half. A substantial level of building is indicated beyond a temporary shelter if this was only a hunting camp. A settlement of well-built houses is indicated. The term village thus would be appropriate, and the abundance of ovens, flaked stone of diverse materials and scattered animal bone is consistant with this.

Von Haast, Trotter and Jacomb all feel that the middle terrace "village" is contemporary with the moa ovens which are separated by at least 100 metres. Von Haast was able to account for close to a hundred individual moa, and this was probably a small percentage of the total. Ratios of anatomical parts have not been given, and it is difficult to assess whether the less meaty parts of the moa carcases had been dismembered and left behind for transport, or whether the entire animal had been carried in. *Emeus crassis* has been estimated to average 58 kg, and the average for *Anomalopterix didyformis* 44 kg (Worthy and Holdaway 2002 146-147). Since nearly all the moa were these small-sized species they could have been readily packed entire for a kilometre or so by one or two persons. Whole animals are indicated by the large numbers of gizzard stones showing that the viscera was present. The oven excavated by Trotter contained numerous gizzard stones with only a few in the overlying layer indicating that gizzards were cooked in the ovens. The oven described by von Haast with two articulated necks imply that this rather less meaty part of the body was not discarded in the field. Moa butchery however seems not to have been part of the activities on the middle terrace where the dwellings were, and no gizzard stones were reported there by Jacomb.

The amount moa bone which seems to have been present is consistant with a kill site, or at least the regular harvesting of moa close by. The beach from Banks Peninsula to the Rakaia River was well known to have been a major Maori travel route due to the extreme swampy conditions inland. Small moa travelling down from the Kaitorete Spit and Banks Peninsula along the foreshore would have had to cross the Rakaia River to keep going, and at least partially trapped before trying to cross or heading back. The Rakaia River Mouth site is squarely located at this crossing area. In addition, the Rakaia River bed (except in times of flood) gave a route into the Southern Alps, and there was an extensive high alluvial plain south of the Rakaia River. Thus there was extensive access to other moa habitat as well. Occasional but regular kills of small sized moa within the range of transport of unbutchered animals would seem to have been the most likely pattern. The carcases would have been carried to the cooking area where they were cut up for the ovens. Game drives and mass kills seem unlikely.

Von Haast mentions that he saw no moa egg shell, but its presence in small quantities was reported by Trotter and Jacomb. Had the site been occupied at the egg-laying time of year more egg shell might be expected to be present. Thus the eggs may have come to

the site unlaid in the bodies of the females transported there, possibly before the spring of the year.

Seals and dogs and various other birds of were supplemental, and it would appear that moa was a major part of the diet and there was no great pressure to add fish. The carbohydrate component however has had no comment from any of the main investigators of the site. The area between the Rakaia River and Banks Peninsula was dominated by wetlands, and would have included a great number of cabbage trees. This might have provided the carbohydrate.

The moa oven zone however seems to have been an area of additional kinds of activities. The range of artefacts reported by Trotter and by the GPS survey indicate that much more than butchering was taking place. In the GPS survey the silcrete blades were closely associated with the ovens and gizzard stones. These tools may well have been primarily for butchering. Around this area however was a zone of large greywacke impact flakes that were probably used for something else. Trotter records nephrite working for adzes with greywacke stone saws and manufacturing debris, as well as the waste from the extensive repair of already made argillite adzes (i.e. flakes with grinding and hammer dressing). Further investigations below the plough zone in this area are likely to reveal post holes belonging to structures away from the main dwelling area on the middle terrace.

In addition to the above pattern is the presence of cached or apparently stored artefacts, especially adzes. These imply the temporary or extended absence of the owner. A full working kit of adzes of different sizes and shapes would be heavy and awkward to transport. The accumulation also might represent wealth, and be valuable for trade.

In the 1984 cache, four of the eight adzes were of the 4A hogback type. These have a triangular cross section in which the apex has a bevel ground on it. Thus it is the narrow gouge-like edge which does the cutting. These are usually large heavy tools with tang angled so as to keep the hafting clear of the cutting stroke. It is presumed that these were designed for hollowing out canoes. The list of adzes collected from the ploughed paddocks in Trotter (see above) was eight 4A hogback types to twenty one of the other types. These are remarkably high proportions of what would seem to be a specialised canoe making tool. It is possible that the high energy Rakaia River nearby was a factor in this. In building ocean-going canoes large trees are needed, and these are not easy to transport. The Rakaia River in flood could be expected to float down forest giants to its mouth on a regular basis. The result would be suitable logs already in position to carve into canoes and then slip into the water. All that is needed would be a supply of food for the workers and a trade network to obtain the tools.

If the Rakaia River Mouth Site was a settlement where moa harvesting took place, it may not have been a permanently occupied village (Smith 1996:3). The rarity of fish bone and the absence of one-piece bone fish hooks or their manufacturing waste, as well as the lack of stone drill bits and fish hook files indicates a lack of fishing at this site, even though it had good access to the sea. This is another possible seasonal indicator, such as winter weather mitigating against going out on the open sea. The caches seem to be

located around the fringes of the main site area suggesting their deposition in secret hiding places, rather than tidied away in a house or left in a working area. This also may imply a temporary usage, in which the owners expected to comeback for their goods. The variety of stone tool raw material indicates considerable mobility in the Canterbury local area as well as travel further a field. Perhaps this was a winter village with snug houses and a good supply of moa, as well as convenient place for canoe building.

5. Archaeological Site Potential and Management Zones

5.1. Issues.

The Rakaia River Mouth Moa Hunter Site is in a precinct of river terraces, and has the potential for there being later Maori sites as well as historical (pre 1900) European archaeology. Much of the area has been built up as part of the Rakaia Huts settlement. So far the focus has been on the Moa Hunter archaeology of the 1300's AD. An assessment now needs to be made for the potential of this site to contain further archaeological materials and evidence, and whether others sites are likely to be associated. This information needs to be compiled and presented as a management zone system.

The issues which need to be considered are as follows:

- Significance
- Management zones
- Management recommendations

5.2. Significance of the Rakaia River Mouth Archaeological Precinct

The main Moa Hunter site area shown by von Haast, Trotter and Jacomb above has either been built on, or is cultivated paddock. Jacomb and Trotter have shown that below the plough zone there is a wealth of information represented by the lower parts of ovens and postholes. Surveys of ploughed surfaces by Trotter and Witter also show that there remains a great abundance and variety of stone artefacts, even after over 100 years of collecting. The impact on the built-up areas is more substantial due to house foundations, septic tanks, trenches and roads. There remains however the potential for the discovery of important archaeology, such as the 1984 adze cache.

The discussion above on the activities that took place at the site, and that spatial patterning is still evident, shows that there are many questions still to be asked about the life of Moa Hunters, and there is still the material to seek the answers. The site is remains an important source of information, particularly since so many of the known sites of this age have been destroyed by coastal erosion.

Although the Moa Hunter site is of dominant interest, other cultural heritage values should be considered. The site recorded by Wilkes in 1965 about 2 ½ km north of the lagoon on the edge of the river terrace consisted of flint flakes and a greenstone adze. There is no particular indication that this site belongs to a Moa Hunter site and it may

belong to later Maori times. The landscape on the terrace edge does not look entirely natural, and may have been modified by Maori or European earthworks. This site needs to be investigated further.

The ditch and bank system which along the paddock fence next to the lagoon as described by Witter and Witter (2005) has been identified as a European pre-1900 feature on the landscape. These were built in the 1860s before fencing wire became available. A ditch was dug and the turf and soil piled up to make a bank which would deter sheep from drifting away. Gorse was planted on the bank which was made into a hedge and a much more effective sheep fence. Since so much of the ground was swampy, the ditch was also important as a drain. Field systems of drainage ditches and hedges date back to the Late Bronze Age in the fen country north of the Thames Valley (Pryor 2004:79-80). Thus it was a cultural tradition some 3000 years old from the British Isles which was brought to New Zealand and used in the initial stages of European farming.

Maori oral tradition also relates to this site area. The use of the foreshore as a travel route from Banks Peninsula across the Rakaia River features in various traditional accounts. During the Eat Relations Feud in the 1820's a party of Taumutu warriors returning from Otago were ambushed by Te Maiharanui at Orehu (Jollie Brook). just east of the Rakia River Mouth (Taylor 1950:89).

Crossing the three main channels at the mouth of the Rakaia River was "… the main route south in the 1840's" and Bishop Selwyn crossed there on 11 January 1844 (Penney 1979:9). In 1848 it was crossed by Commissioner Walter Mantell on 30 September (Mantell, n.d.) The diary of surveyor Charles Torlesse describes his crossing there on 3 March 1849 (Maling 1958:62-63).

A more inland route to the south was not established until later. The Canterbury plains with the absence of land marks meant according to Cannon stack that "… it was not uncommon thing for travellers to find, after waling or riding all day long, that they were back at night at the very spot from which the set in the morning. Several lives had been lost in this way." (Purchase 1909:96). The diary of Henry Sewell however describes his crossing further up-stream in January 1856, near the present highway and railway bridges. This on a route around Lake Ellesmere, crossing the Selwyn River and then to the Rakaia "… the worst of our rivers, the terror of travellers" (McIntyre 1980:208). Bishop Harper in 1857 also crossed the Rakaia at about this point (Purchase 1909:96). Thus by the 1850's a more inland track had been found. Until then, anyone wanting to travel through South Canterbury walked over the Rakia River Mouth Moa Hunter Site and through the present settlement of Rakia Huts.

All of the known large Moa Hunter sites are on the coast, although many smaller ones are inland. Most of these sites are completely or mostly destroyed through recent disturbance or coastal erosion or both. Some of the major sites are as follows (Anderson 1989):

- Shag River Mouth (mostly destroyed by coastal erosion)
- Kaupokanui River Mouth (mostly destroyed)
- Wairau Bar (destroyed)

- Redcliffs and Moa Bone Point Cave (mostly destroyed)
- Hohoura (destroyed by sand mining)
- Wakanui (coastal erosion)
- Waitaki River Mouth (coastal erosion)
- Waitaki Valley (mostly farmed)
- Heaphy River Mouth (destroyed by coastal erosion)
- Bulla (current University of Otago excavations)
- Hohoura Entrance (ploughed but otherwise probably mostly intact)

There are probably under a dozen known Moa Hunter sites of comparable size to the Rakaia River Mouth Site and very few of those would have as much surviving research potential. The Rakaia River Mouth site which still has an extensive assemblage in the plough soil, as well as deposits in the sub soil is a rarity, and of great importance for learning more about the earliest Polynesian occupation in New Zealand.

A standard method of assessing significance for conservation plans and plans of management is to use the ICOMOS criteria. This is an international system but the detail varies by country. The NZ criteria applicable to the Rakaia river Mouth precinct is given in Table 2.

criterion	**assessment**
Archaeological: evidence of pre-1900 activities.	The site precinct contains highly significant evidence for 1300-1400 AD, and has major research potential for our understanding of the Moa Hunter culture.
Historical and social: notable figure, event, phase or activity, and whether it is an important reflection of social patterns of its time.	The place has significance as a travel route and river crossing area. It also was the site used to define the concept of Moa Hunters giving it a special significance in archaeological history
Technology and craftsmanship**:** nature and use of materials, finishes and/or construction methods which were innovative for the period or of noteworthy quality.	The ground contains a major assemblage of artefacts representing a variety of stone technologies belonging to the time. It also undoubtedly still contains ground stone tools and possibly ornaments which would be considered taonga by tangata whenua. The example of a ditch and bank fence also represents a unique European method for livestock control.

Table 2. NZ ICOMOS significance criteria for the Rakaia River Mouth precinct.

Table 2 provides a summary of the significance and shows the importance of a conservation strategy. A summary of significance by Smith (1996:3) also makes the following points:

- The site played a central role in the development of archaeology in New Zealand giving it *historical* significance.

- It contains relatively intact deposits with the potential for further information giving it *scientific* significance

- It is one of the earliest dated sites in Canterbury giving it *regional* significance.

- It is an example of a specialised site type, of which there are few if any other examples, giving it *nationa*l significance.

In addition to this is the point made by Jacomb (2006) is that it has house structures preserved by postholes, giving it the potential for an understanding of the social organisation of the earliest period of New Zealand archaeology for which there remains very little information. This also gives the site national significance.
Selwyn District Council should therefore be aware that this site is an extraordinary cultural asset and requires special consideration for conservation and research.

5.3. Management Zones

A method commonly used for conservation plans is an ICOMOS-based statement of significance which is used to give direction to conservation practice. The New Zealand ICOMOS criteria for significance are as follows:

A zone system to manage the heritage values is proposed as follows (These zones are shown in Figure 20).
:

1. Foreshore bank/cliff. This is the current vehicular access route to the barrier bar and is used extensively by fishermen and other visitors. It is between the fence bordering the cultivated land and Council campground and cliff bordering the lagoon. This cliff is about three metres high, vertical and slumping. As it slumps the sediment is transported away by the tidal and wave action of the lagoon. Thus the cliff face remains vertical through erosion and has not developed a stable slope. This cliff will continue to retreat back until it cuts into the paddocks and camp. ground behind. When compared with the 1984 topographic map the lagoon appears to be widening and becoming shorter. This zone has been heavily disturbed by the road use and erosion, and its archaeological potential is limited. The main values associated are along the northern edge. This is the apparent historic (pre-1900) ditch and bank fence along the fence line, and the intact un-ploughed soil horizon containing undisturbed material belonging to the Rakaia River Mouth Moa Hunter Site. For the rest of this site the archaeological significance is much diminished.

2. Middle terrace SDC campground. This camp ground is on the known residential focus of the Moa Hunter site and most of it consists of the intact ploughed soil zone and undisturbed subsoil. This zone has the greatest archaeological potential in the precinct. Most of the remaining posthole, oven, and other features are undisturbed

below the plough soil (as shown by Jacomb 2005) and have the capacity of showing the integral pattern and organisation of the settlement. It is not possible to excavate a representative sample, or leave undisturbed a representative reserve because all of the subsoil features are needed to determine the pattern. The artefactual content of the plough zone is also expected to have some valid spatial association.

3 Middle terrace built up area. This area has been built over by houses and batches, and a road cuts through it, although according to Smith (1996), there probably has been considerable fill added to the southern part of the road. As noted by Smith (1996) it contains remnant deposits, and is still archaeologically significant. Future minor disturbance can be anticipated by various household works such as tree planting, post holes and stump removal. Some larger scale disturbance may include the replacement of septic tanks or demolition and rebuilding. More extensive disturbances would be in the form of sewerage trenches, new water lines, fibre optic cable lines and similar ditch digging. As shown by the 1984 adze cache, all of these forms of ground disturbance, especially if they cut below about 20 cm of the ground surface may impact important elements of the Moa Hunter site.

4. Upper terrace cultivated land. Although ploughed for over 100 years, this study has shown that the plough soil retails some spatial integrity. The study by Trotter also shows that there are ovens and other deposits below the plough soil. These will undoubtedly contain moa bone and artefacts in primary context. This area generally represents moa cooking and butchering, as well as other tool use activities. Thus it may be argued that its pattern and content could be investigated archaeologically by sampling, or that a representative area could be reserved for it. At present, as long as the current agricultural use does not alter and affect the deposits below the plough soil, it is not at further risk. As commented by Smith (1996), agricultural practices which might cut more deeply into the ground, or residential subdivisions would have a significant impact.

5. Upper terrace built up area. This area, although built up, has remnant archaeological deposits as indicated by the findings of McFadgen in 1989. The management implications are similar that for the built up middle terrace, except that since it is probably more on the fringe of the Moa Hunter site, the significance is not as great, and the artefacts in the plough soil are probably not as abundant, and there may be fewer ovens and postholes.

5.4. Management Recommendations

The management implications of the zones described above are as follows;

1. Foreshore bank/cliff. The vehicular access across this area is not expected to do further damage. The proposed stabilisation works of the road cut (Witter 2005 a) needs to go ahead, and the test excavation to determine details about the historic ditch and bank fence also should go ahead. The stability of the cliff needs to be assessed by a geomorphologist, and stabilisation works may be justified.

2. Middle terrace SDC campground. This has the greatest archaeological potential, and is a high risk and impact prone area. It belongs to the Selwyn District Council, and therefore is under the direct control of a single owner. A set of protocols needs to be established for the use of this area, and an educational program established for Council staff and others who may be involved in activities here.

3 Middle terrace built up area. Significant remnant archaeological deposits are expected in this area. Activities which are likely to create even small scale disturbance below 20 cm below the ground should have archaeological monitoring. Larger scale works should be planned to have impact minimalisation (eg any ditches should go down the road corridors).

4. Upper terrace farm paddock. This is an area of major archaeological potential. The current use imposes no further threat, but any changes in land use need to be reviewed and probably would require archaeological investigation. Any subdivisions would require major archaeological studies. This also is an area with research potential based on the 2007 GPS survey. More detailed survey work would be productive after ploughing, and this could be compared with the Trotter surface grid collection in the Canterbury Museum. It also would allow archaeological excavation without long term impact on the agricultural value of the land. Such excavations would have the capacity to add greatly to our knowledge abut the site, and could be located to optimum effect from the surface survey data.

5. Upper terrace built up area. This area is similar in management terms to the middle terrace built up area. Surveillance need not be at as high a level, but any substantial ground disturbance would require monitoring.

6. References

Anderson, A. 1989. *Prodigious Birds*. Cambridge University Press, Cambridge.

Anderson, A. 2006. Alternative interpretations of structural evidence at Rakaia River Mouth, New Zealand. Archaeology in Oceania 41(123-127)

Haast, von J. 1872. Moas and moa hunters. Transactions of the New Zealand Institute 4:66-107.

Jacomb, C. 2005. A fourteenth-century house from the Rakaia River Mouth, Canterbury, New Zealand. Archaeology in Archaeology 40(3):91-105.

Jacomb, C. 2006. Comment on Anderson's alternative interpretation. Archaeology in Oceania 41(123-127)

Maling, P. 1958. *The Torlesse Papers 1848-51*. The Pegasus Press, Christchurch.

Mantell, W. n.d. Extract from diary of journey from Taumutu to Waitaki, 30 September 1848 – 24 October 1848. Manuscripts Department, Canterbury Museum.

McFadgen, B n.d. Investigation and monitoring Rakaia moahunter site, February 23 1989. File HP 12/9/234. New Zealand Historic Places Trust, Wellington.

McFadgen, B. and J. Goff 2005. An earth systems approach to understanding the tectonic and cultural landscapes of linked marine embayments: Avon-Heathcote Estuary (Ihutai) and Lake Ellesmere (Waihora), New Zealand. *Journal of Quaternary Science* 20(3):227-237.

McIntyre, D. 1980. *The Journal of Henry Sewell 1853-7.* Whitcolls Publishers Christchurch.

Penney, S. 1979. Lake Ellesmere to Te Priita. The Pegasus Press, Christchurch.

Pryor, F. 2004. *Britain AD: a Quest for Arthur, England and the Anglo Saxons*. Harper Perennial, London

Purchase, H. 1909. *Bishop and the Canterbury Settlement.* Whitcombe and Tombs, Christchurch.

Smith, I. 1996. Rakaia River Mouth: condition, potential, significance and threats. Anthropology Department University of Otago, report to New Zealand Historic Places Trust.

Taylor, W. 1950. *Lore and History of the South Island Maori*. Bascands Limited, Christchurch.

Trotter, M. 1972. A Moa-hunter site near the mouth of the Rakaia River, South Island. *Records of the Canterbury Museum* 9(2):129-150.

Williams, E. 2006. The place of spall tools in New Zealand archaeology: a descriptive and classificatory study. Unpublished Postgraduate Diploma in Arts, University of Otago.

Witter, D. and A. Witter 2003. Archaeological survey for a gold prospecting licence on the Taumutu-Rakaia coast. Witter Archaeology report for Cedric Livingston, Plains Prospecting Ltd

Witter, D. and A. Witter April 2005 a. Archaeological Damage Report at Rakaia Huts. Witter Archaeology Report for Selwyn District Council

Witter, D. 2005 b. Archaeological Monitoring of Road Construction at Rakaia Huts Witter Archaeology for Selwyn District Council

Witter, D. 2005 c. Damage Report: Rakaia Huts Caravan Park Witter Archaeology Report for Selwyn District Council

Witter, D 2006. Greywacke stone artefacts on the Canterbury coast, New Zealand. New Zealand Journal of Archaeology 27:127-143

Witter. D. in prep. Salvage report: Rakaia Huts playground construction. Report for Selwyn District Council and Historic Places Trust.

Worthy, T and R. Holdaway 2002. *The Lost World of the Moa.* Indiana University Press, Bloomington and Indianapolis.

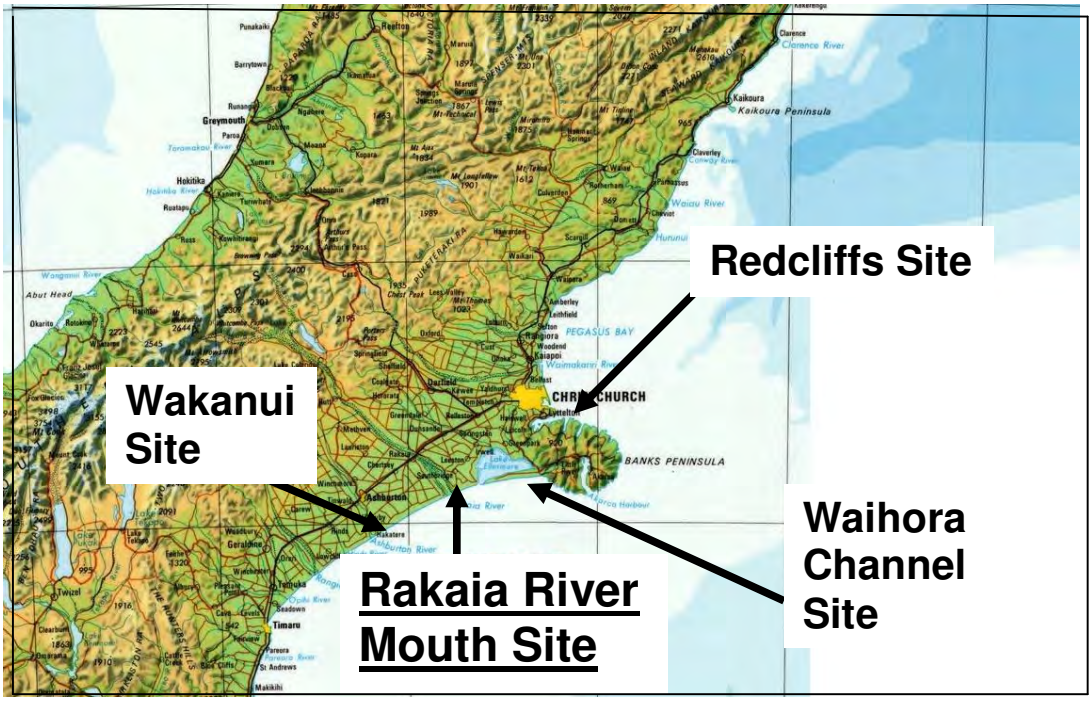

Figure 1. The location of the Rakaia River Mouth Site and other Canterbury sites with significant moa bone.

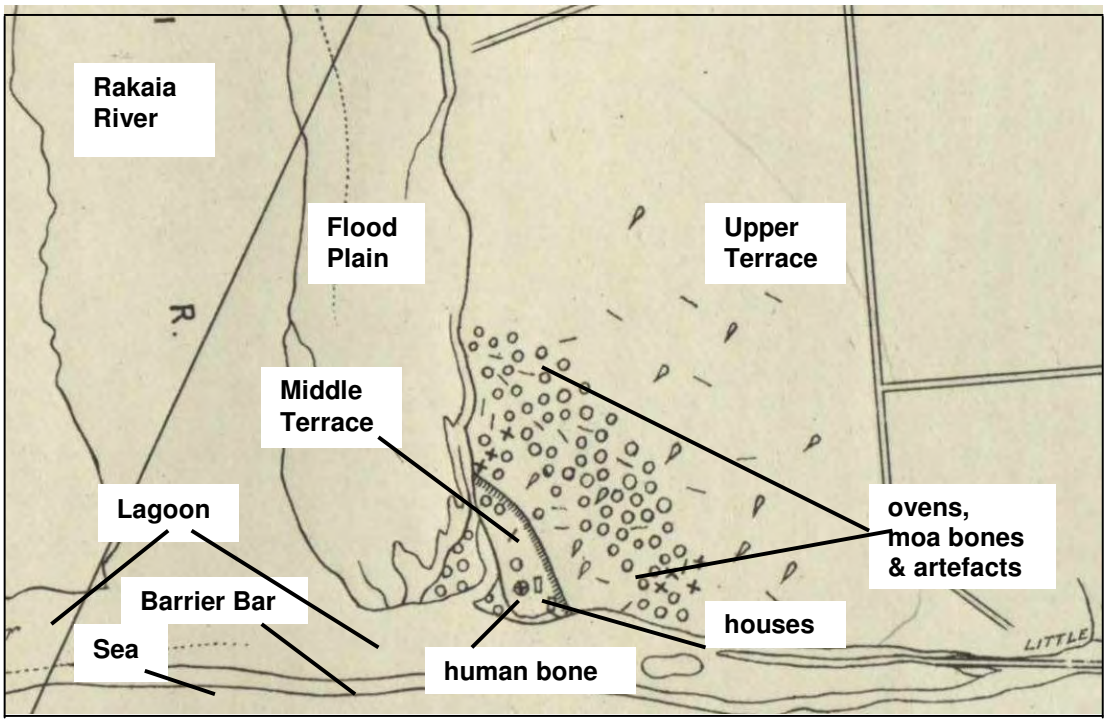

Figure 2. Map of the Rakaia River Mouth Site by von Haast 1872.

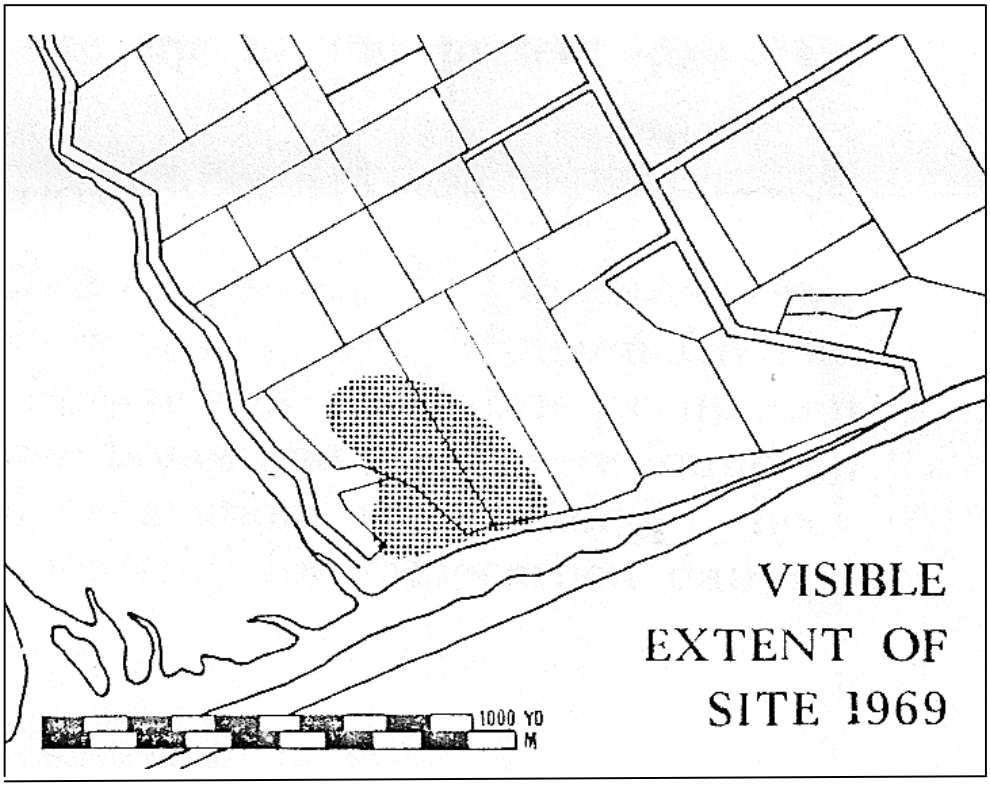

Figure 3. Map of the Rakaia River Mouth Site, Trotter 1972.

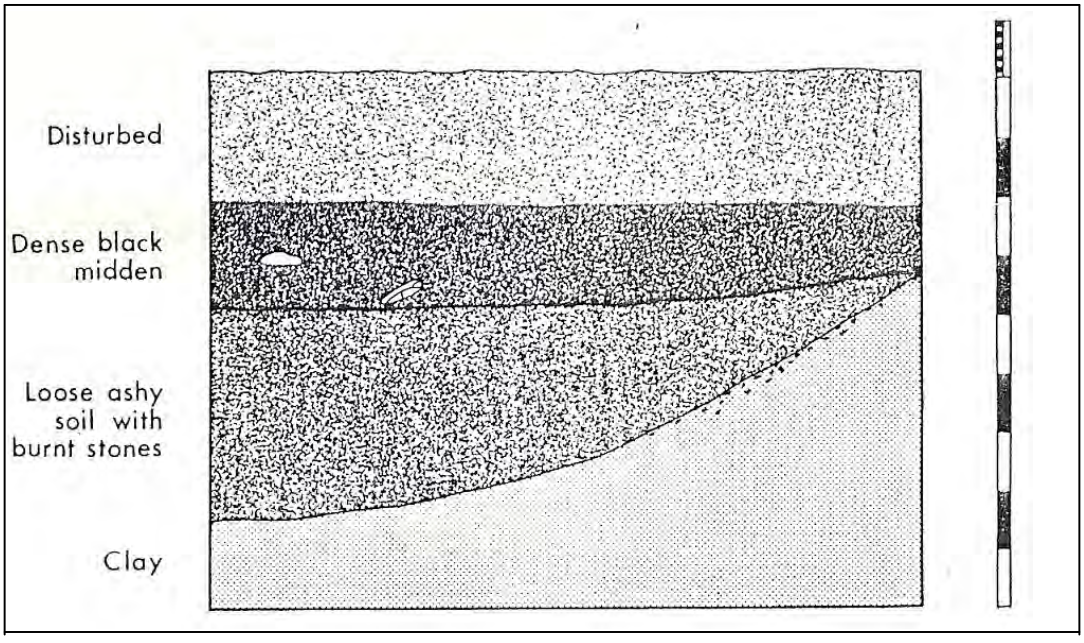

Figure 4. Stratigraphy of Trotter excavation on upper terrace.

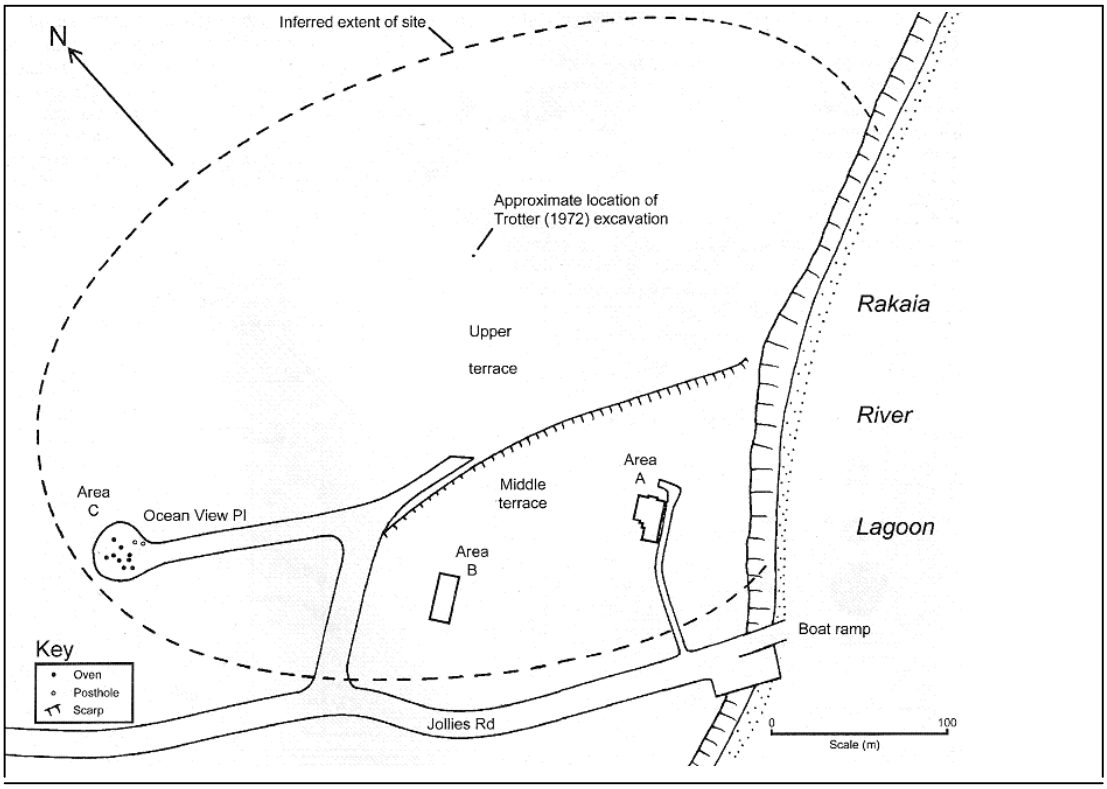

Figure 5. Map of the Rakaia River Mouth Site, Jacomb 2005.

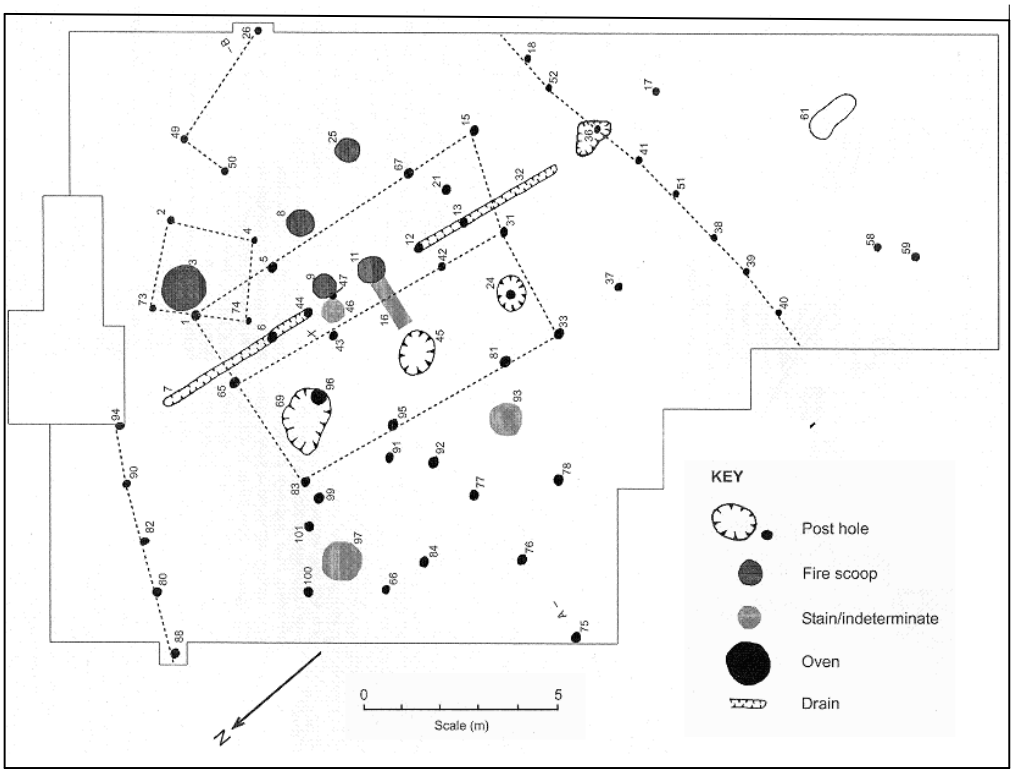

Figure 6 Map of the Rakaia River Mouth Site by Jacomb 2005.

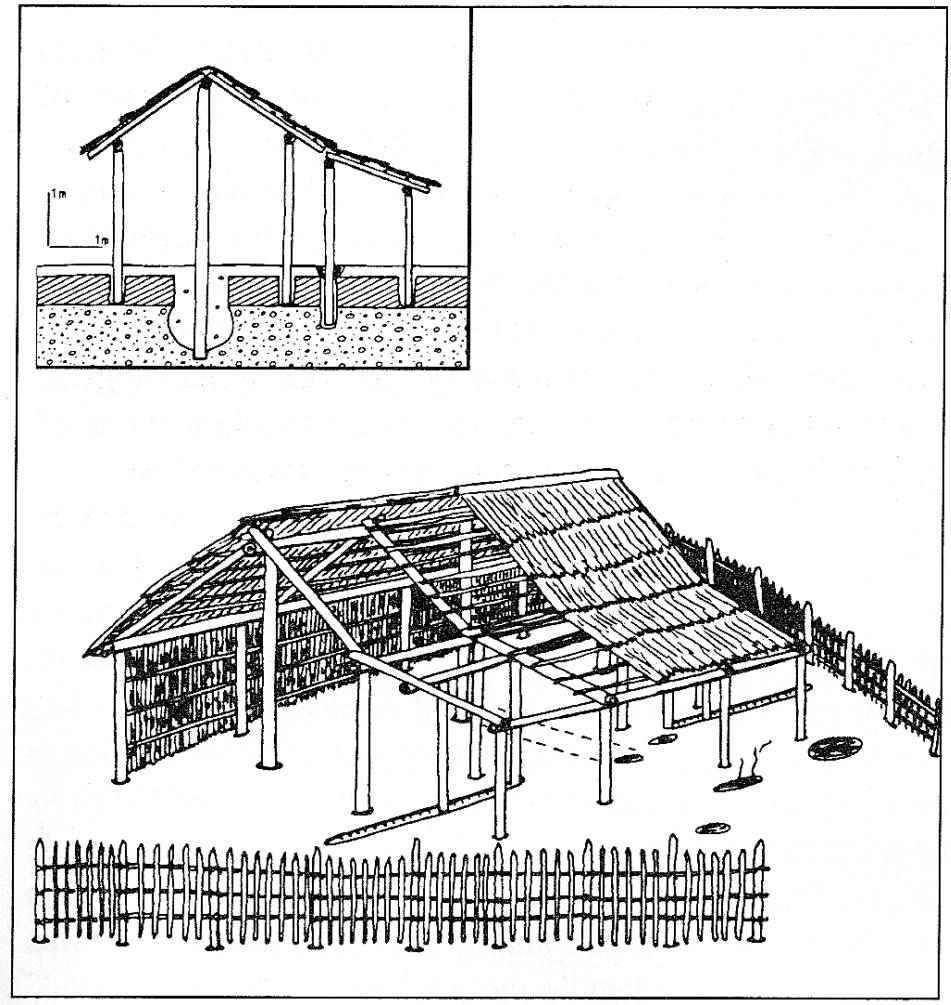

Figure 7. Interpretation of house on middle terrace, Jacomb 2005.

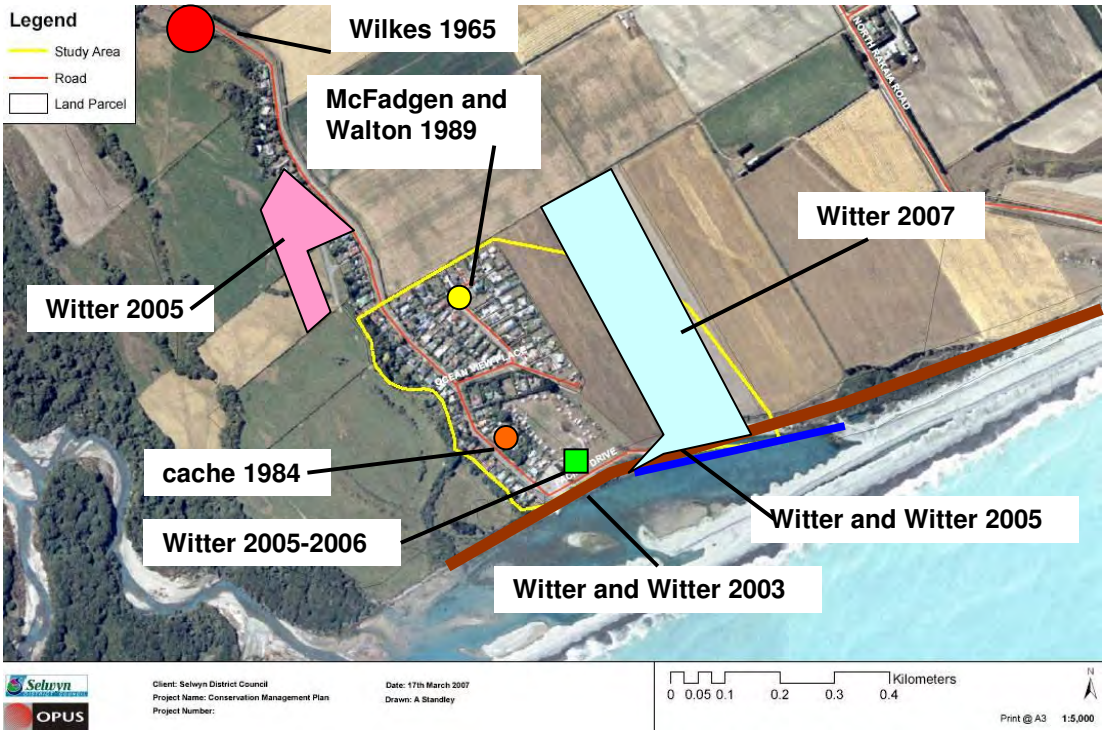

Figure 8. Location of minor archaeological finds and activities, including the Witter 2007 GIS survey reported here.

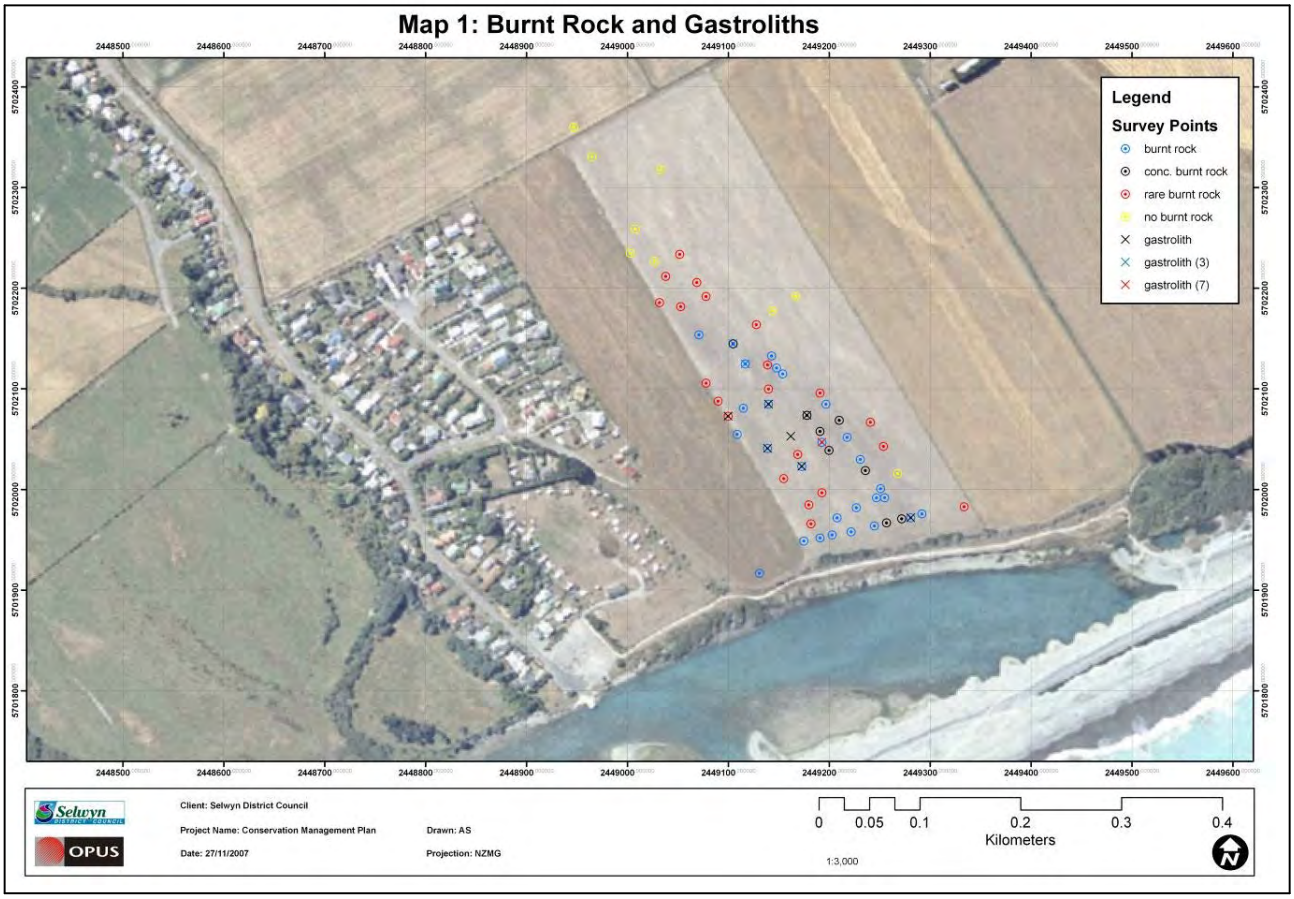

Figure 9. Map of Rakaia River Mouth Site showing distribution of oven stones and gizzard stones, Witter 2007.

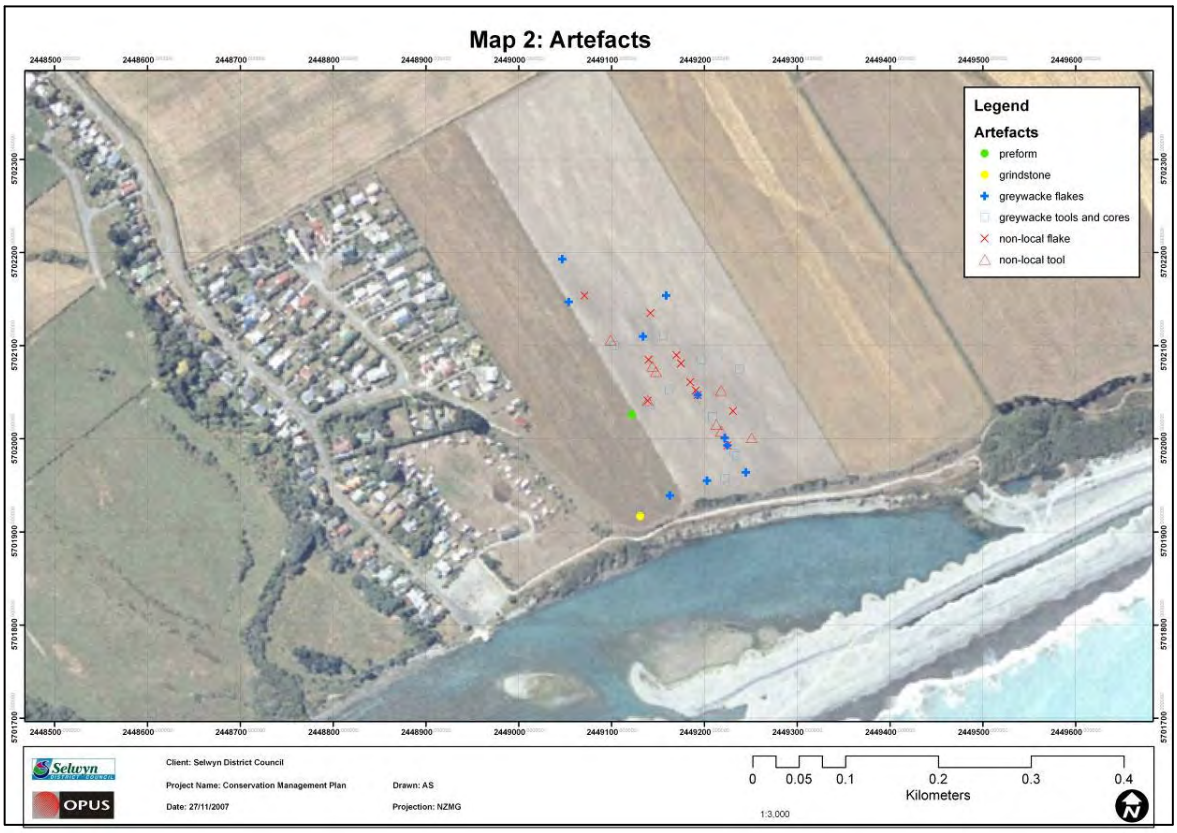

Figure 10. Rakaia River Mouth Site distribution of artefacts on upper terrace, Witter 2007.

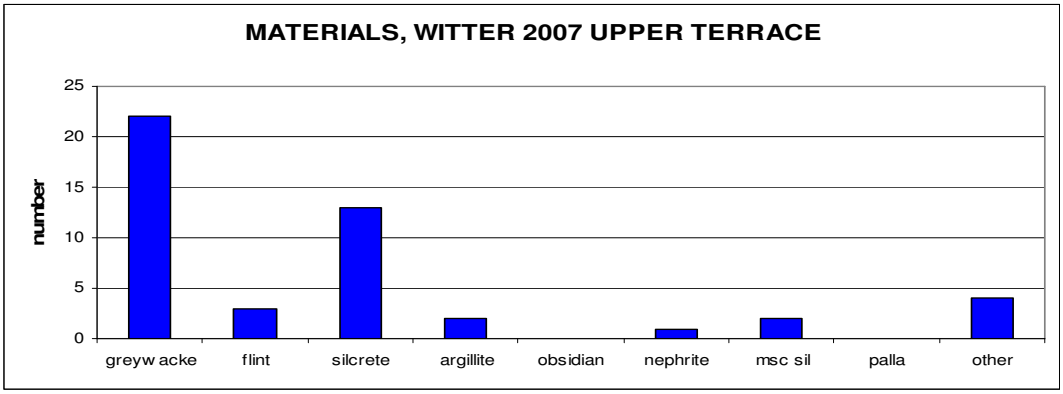

Figure 11. Raw materials for artefacts recorded on the Upper Terrace, Witter 2007

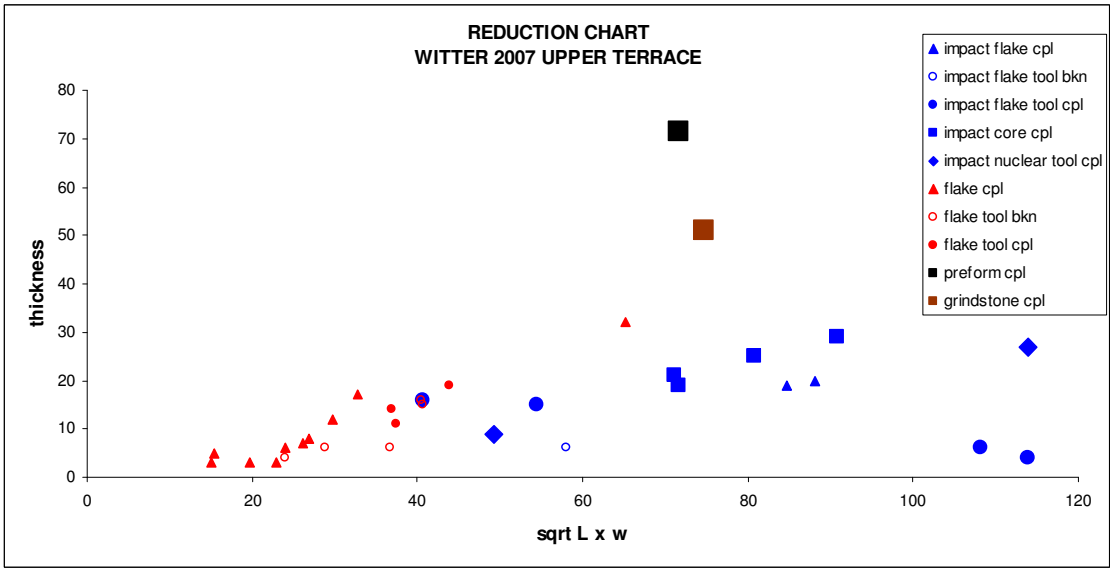

Figure 12. Reduction chart showing artefacts recorded on upper terrace, Witter 2007.

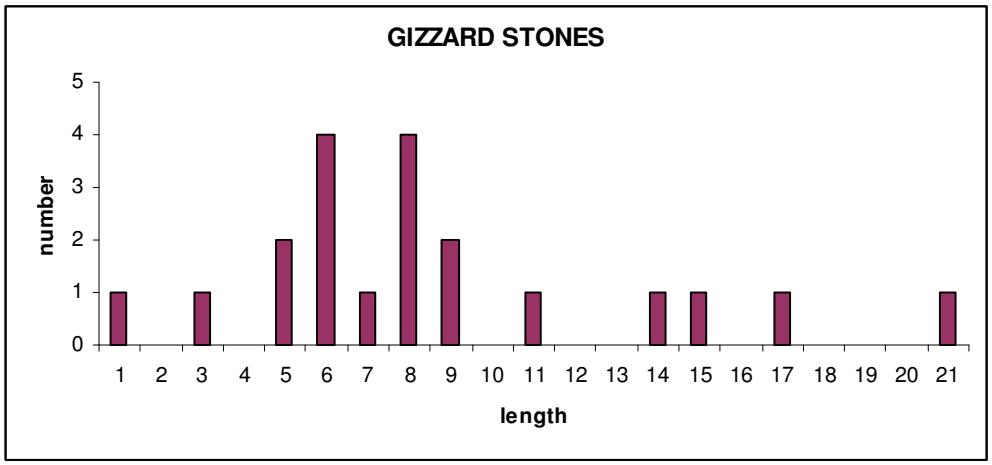

Figure 13. Length measurements on moa gizzard stones recorded on the GIS survey, Witter 2007.

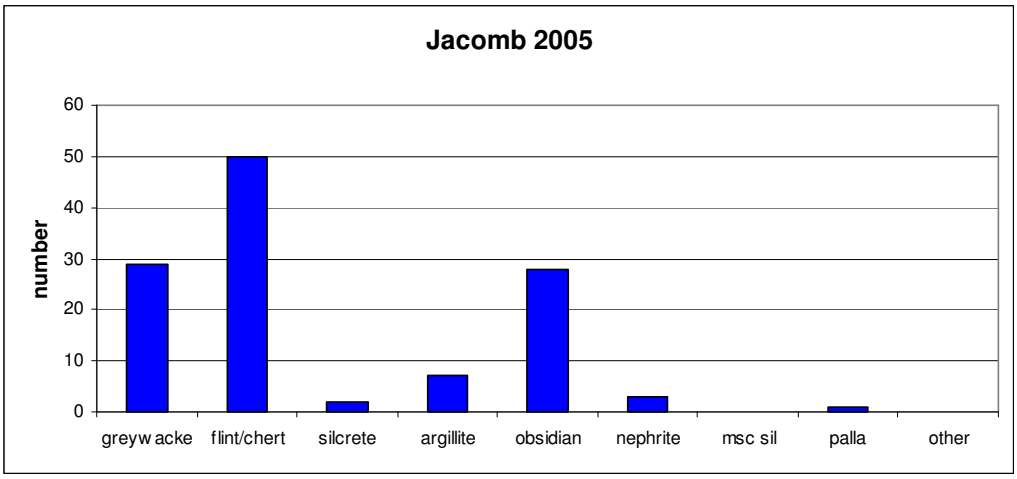

Figure 14. Artefact materials excavated on the middle terrace, Jacomb 2005.

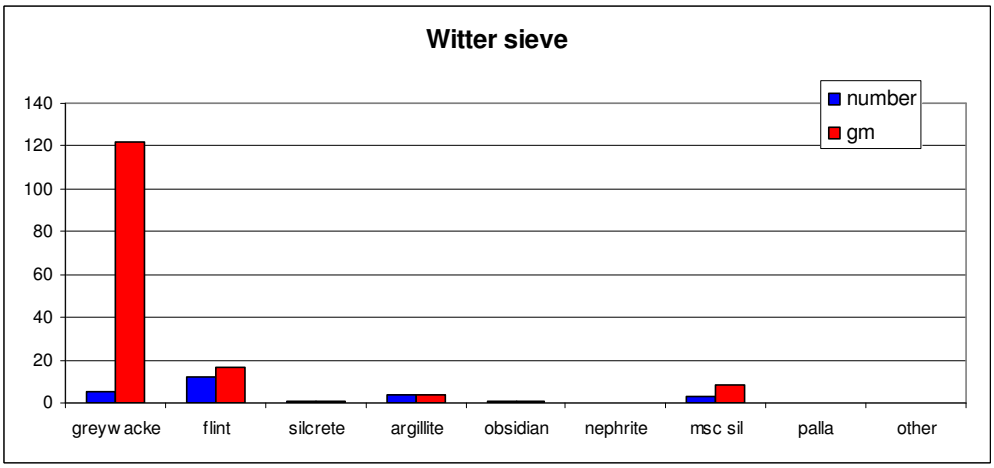

Figure 15. Artefact materials sieved from posthole spoil on the middle terrace, Witter 2006.

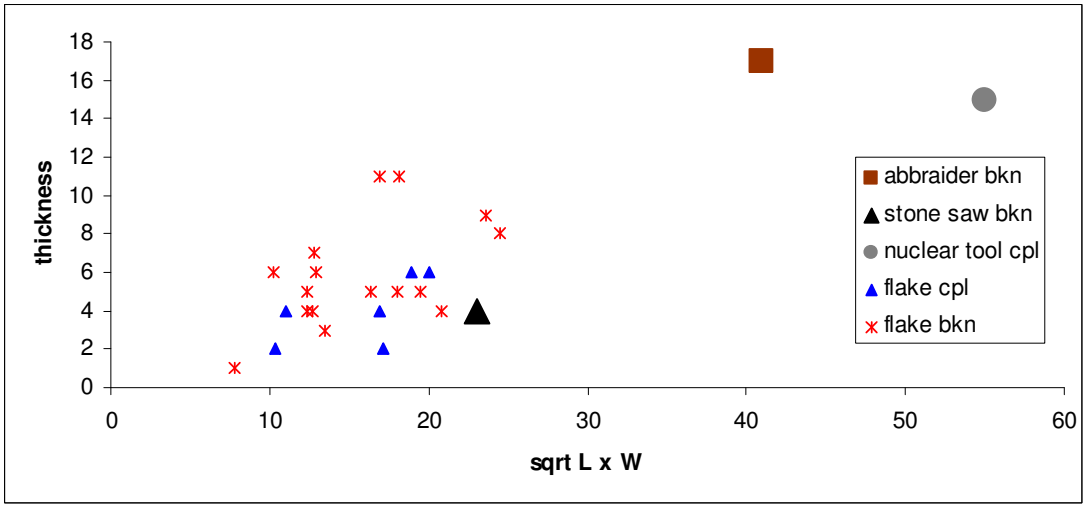

Figure 16. Reduction chart of artefacts sieved from posthole spoil on the middle terrace, Witter 2006.

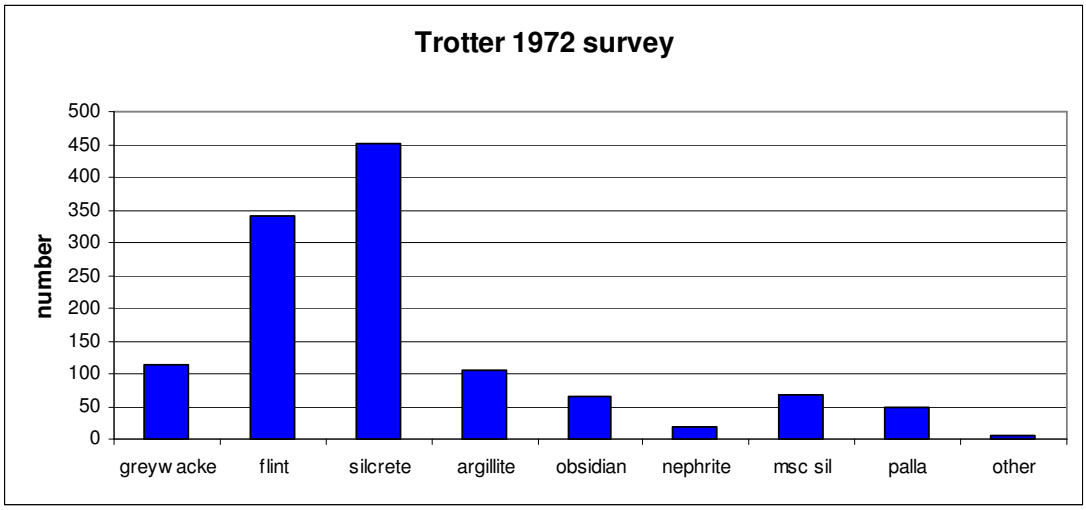

Figure 17. Artefact materials recorded on the upper terrace, Trotter 1972.

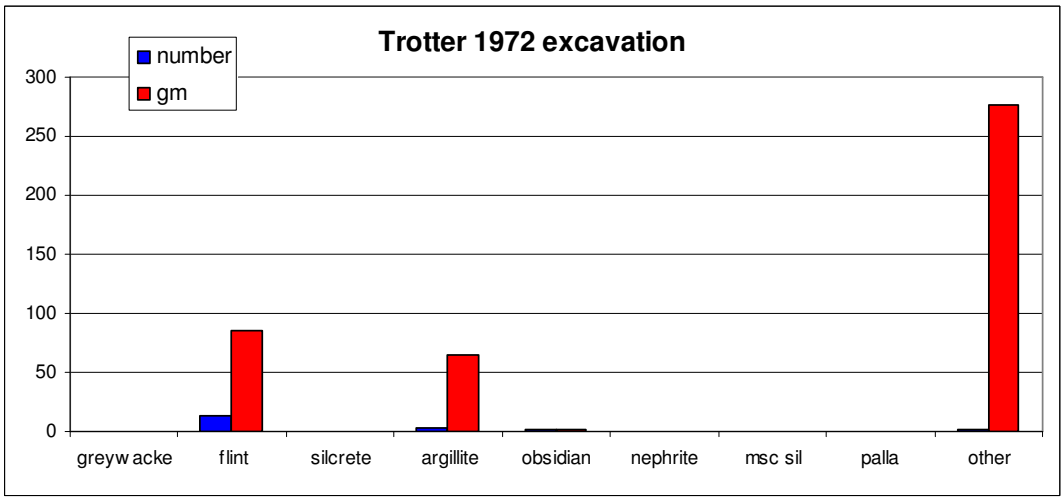

Figure 18. Artefact materials excavated on the upper terrace, Trotter 1972.

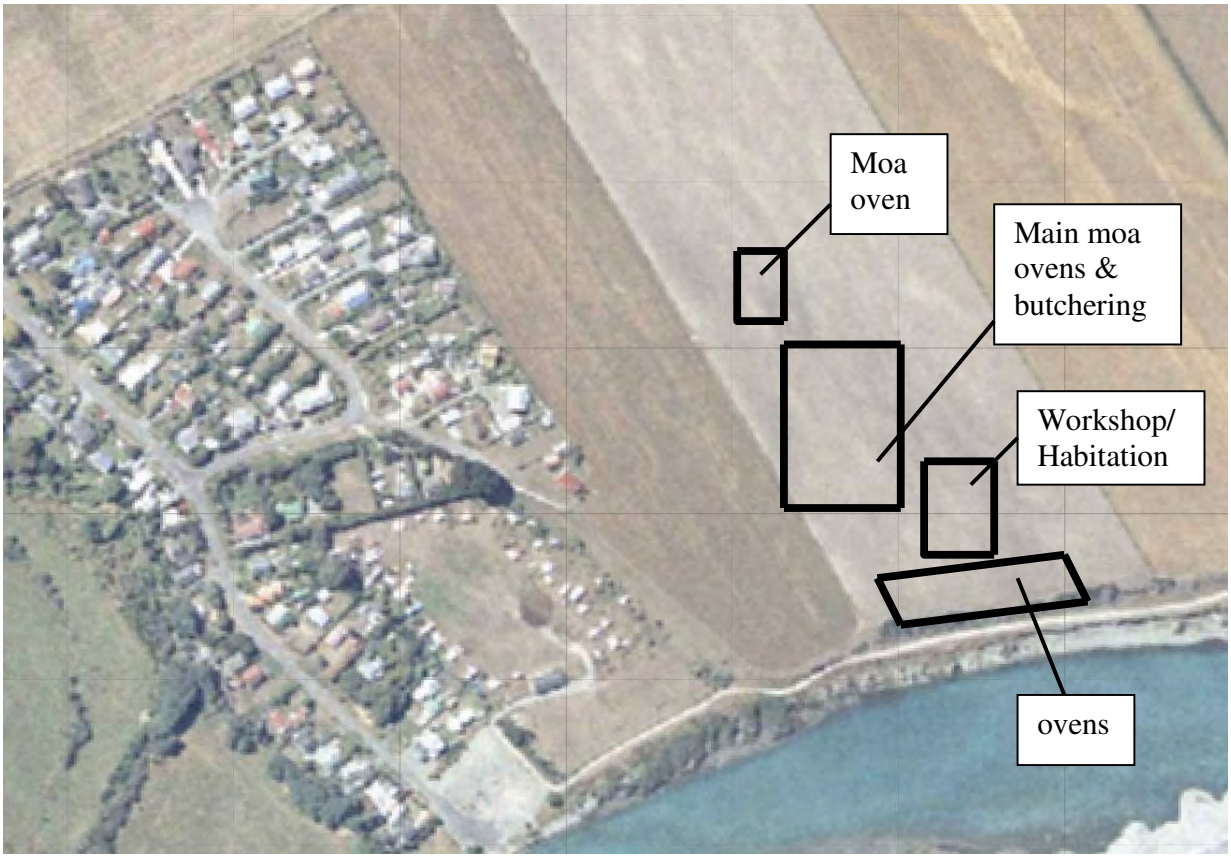

Figure 19. Activity areas interpreted from the GIS survey, Witter 2007.

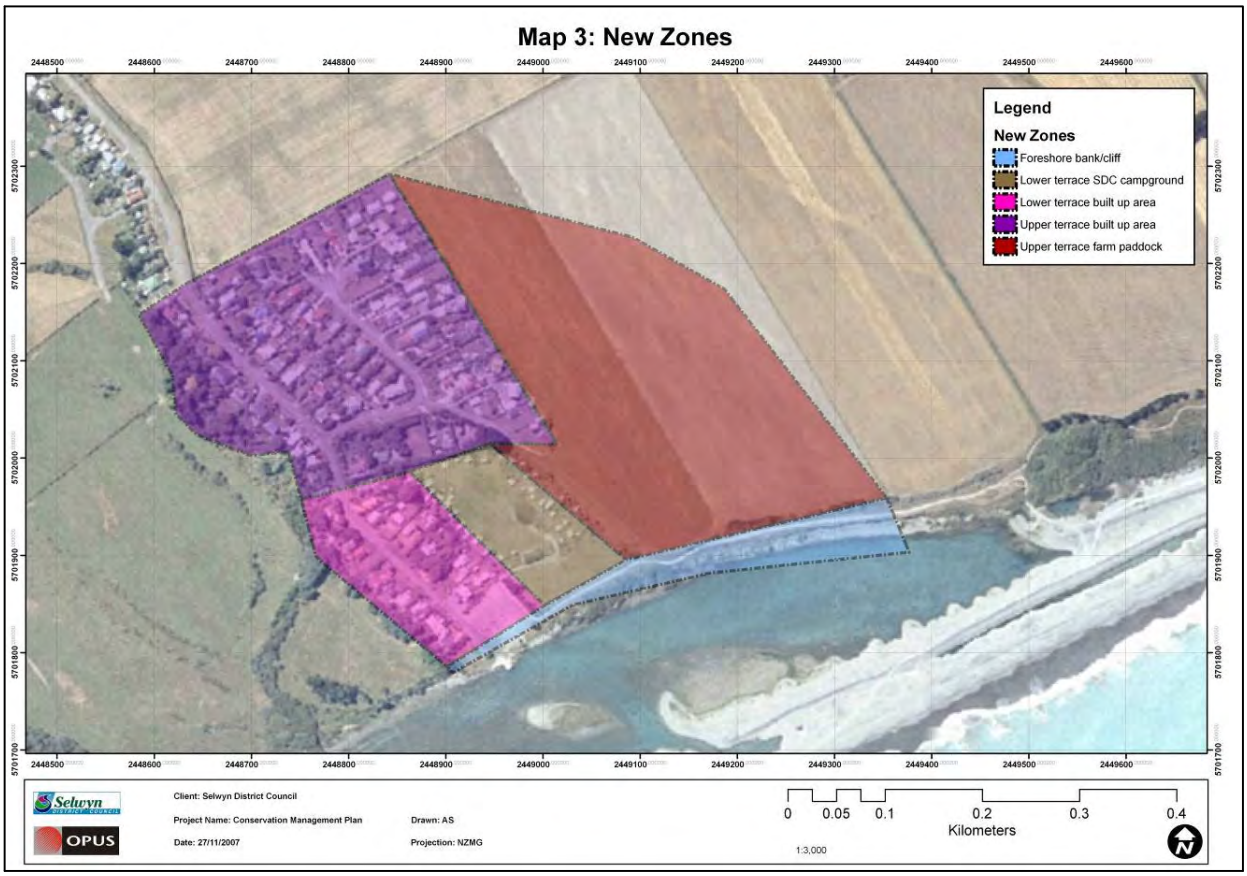

Figure 20. Rakaia Huts Management Zones: Foreshore bank/cliff, Lower terrace SDC campground, Lower terrace built up area, Upper terrace farm paddock, Upper terrace built up area

type	material	L mm	W mm	T mm	breakage	details
bipolar impact core	greywacke	87	58	21	complete	bipolar on flat beach cobble
flake	greenstone	23	17	3	complete	with adze polish
flake	silcrete	34	26	12	complete	bif plat, hinge
flake	chert	38	19	8	complete	expanded, bif ret plat, hinge
flake	silcrete	17	14	5	complete	bif plat, hinge
flake	silcrete	16	14	3	complete	bif plat, feather
flake	silcrete	31	22	7	complete	expand, unif plat, hinge
flake	silcrete	24	22	3	complete	expand, bif plat, feather
flake	argeillite	29	20	6	complete	unif plat, feather
flake	chancedony	45	24	17	complete	expanded, unifacial plat, hinge
flake tool	silcrete	41	33	6	broken	serrate retouch
flake tool	silcrete	53	31	16	broken	on blade, unifacial plat, scalar retouch
flake tool	argeillite	32	26	6	complete	expanded, plat adze ground. Edge use wear
flake tool	silcrete	50	33	15	broken	on blade, retouch
flake tool	flint	25	23	4	complete	unif plat, hinge, fine ventral retouch,
flake tool	flint	48	40	19	complete	nif plat, plunge, edge usewear
flake tool	silcrete	40	34	14	broken	unif plat, prox, edge retouch
flake tool	silcrete	45	31	11	broken	unif plat, prox, edge retouch
grindstone	sandstone	81	69	51	broken	
impact core	greywacke	97	85	29	complete	
impact core	greywacke	87	75	25	complete	flat beach cobble
impact core	greywacke	80	64	19	complete	bipolar
impact flake	greywacke	92	78	19	complete	
impact flake	greywacke	111	70	20	complete	heavy use wear
impact flake tool	greywacke	66	51	11	complete	edge usewear
impact flake tool	greywacke	50	33	15	broken	edge retouch
impact flake tool	greywacke	141	83	24	complete	edge heavy scalar retouch
impact flake tool	greywacke	57	52	14	complete	edge scalar retouch
nuclear tool	greywacke	116	112	27	complete	flat beach cobble, impact retouch, edge scalar retouch & usewear
nuclear tool	greywacke	62	39	9	complete	flat beach pebble, plat retouched edge
plat flake	greywacke	71	60	32	complete	expand, cortex bending plat, plunge
preform	quartzite?	109	47 to 21	35 mid	complete	quadrangular cross sec, made on large flake fragment

Table 1. Artefact data from GPS survey, Witter 2007