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Excavation of Wellers Rock Try-works, Otakou Whaling Station, Otago Harbour, New Zealand

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ABSTRACT

An excavation of the Wellers Rock try-works in March 1991 formed part of a wider investigation of the archaeology of shore whaling in the southern South Island. The site was small and well defined and the excavation revealed a thick layer of ash and numerous bricks associated with the process of trying out the oil in the try-works furnace.

Keywords: OTAKOU, SHORE WHALING, TRY-WORKS, BRICKS, ASH, CONTACT PERIOD.

INTRODUCTION

In 1792 the Sydney whaler *William and Ann* visited Doubtless Bay in northern New Zealand. This was the first recorded visit of a whaling ship to New Zealand waters. From this time on ocean going whalers visited New Zealand with increasing frequency, but the first shore station was not set up until 1827 or 1829 (the date and place are matters of historical dispute). As many as 80 shore stations may have operated around the New Zealand coast during the 1830s and early 1840s, but the whalers, both ship and shore based, were so successful that the whales were virtually wiped out and the industry collapsed in the mid 1840s (Morton 1982).

The Otakou whaling station is typical. It was operated by the Weller Brothers of Sydney between 1831 and 1841. During that time it was one of the largest and most successful shore whaling stations in the country, taking a total of about 1500 tons of oil with a peak production in 1834 of 310 tons. By 1841 it took only 10 tons and the Weller brothers were bankrupt (Shortland 1974: 301). The Wellers operated three stations in Otago Harbour and one in conjunction with them at Purakanui, as well as stations at Caroline Bay in Timaru and Taieri Island south of the Otago Harbour, although only the main station at Otakou ran for as long as ten years.

Historical records of the Otakou station include the Weller Brothers' correspondence as well as the journals of their storekeeper, Octavius Harwood. The station was also described while still in operation by Dumont D'Urville (1955) in 1840, and after production ceased by Edward Shortland (1974) in 1843, and both Frederick Tuckett (1898) and Dr David Monro (1898) in 1844. D'Urville made a chart of the harbour showing the station and, as part of Tuckett's 1844 expedition, William Davison (n.d.) and John Barnicoat surveyed the harbour and Barnicoat made sketches of the try-works (Fig. 1) and Harwood's store.

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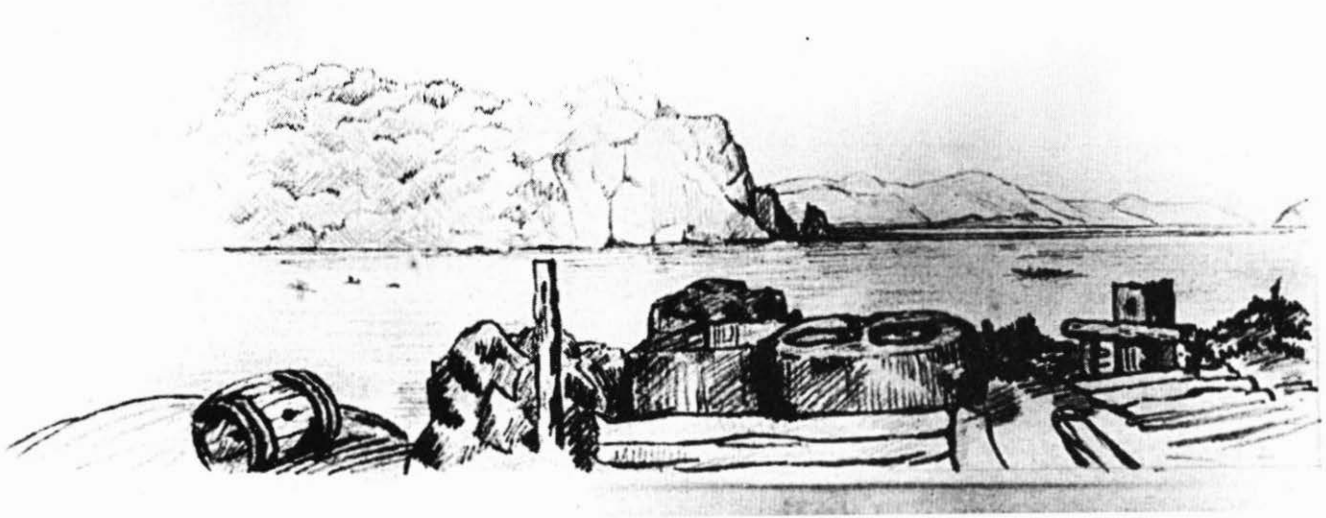

Figure 1: J. W. Barnicoat's 1844 sketch of the try-works. Courtesy of the Hocken Library.

Although Otakou is richly documented historically, it is poorly known archaeologically. The primary reason for this is a build-up of sand to a considerable depth over the site. Most of the station buildings and the whalers' village lie beneath this sand, which began to build up in the 1840s. Monro (1898: 243) in 1844 reported "immense sand-banks like drifts of snow, without a blade of vegetation upon them, and shifting with every wind, so that you may see cottages half buried, and garden fences completely overtopped." A photograph of Otakou from around the 1860s shows Harwood's derelict store entirely surrounded by sand. This sand effectively seals the site, except where changes in the configuration of Aramoana Spit have caused the current to erode the southern end of Te Rauone Beach, presumably destroying some of the station buildings that were there (Campbell 1992: 124).

A field survey of whaling stations on the southern coast of the South Island, between Riverton and Moeraki, was carried out in October 1990 (Campbell 1993: 135). The Otakou station was examined during this survey, and the decision to excavate the try-works arose directly from this work. The Otakou try-works is situated on top of Wellers Rock, a small basalt outcrop which juts out into Otago Harbour and is joined to the mainland by a narrow causeway that today is a parking area (Fig. 2). The sand that blew over Wellers Rock in the middle of the last century has since partly eroded so that, before the excavation, an area of hard black soil containing a scatter of broken brick was visible on the surface. Black soil was also visible in an eroded section. Preliminary observation suggested that this soil was ash from the try-works. Although the Wellers Rock site is small and the try-works comprises only part of the whaling station, it was felt that an excavation here would contribute to a clearer assessment of the archaeological potential both of Otakou and of whaling stations in general. As try-works may be regarded as the central diagnostic component of whaling stations, an archaeological analysis of the form and function of one would provide a basis for evaluating similar sites in future.

THE EXCAVATION

Archaeological evidence on Wellers Rock survived in two separate areas (Fig. 2): Area A, the main area of ash and brick exposed on the surface, covering about 7 m^2, and Area B, a small cluster of broken brick exposed on the surface of a knoll to the south of the main area. A grid was laid out incorporating both areas. Excavation initially concentrated on Area A before proceeding to Area B. Normal excavation procedures were employed except in the case of the hard ash deposits of layer 5, which could not be trowelled. They were excavated with an iron spike and wooden mallet. The lumps of material thus excavated could not be sieved but very few artefacts were expected in this ash layer and few were found.

AREA A

Stratigraphy

An exposed section was observed before the excavation. It was approximately 700 mm deep, of which about 250 mm was a dense black layer, but the stratigraphy was unclear. Figure 3, the south section, shows this after excavation, in the southern wall of squares B6, C6 and D6. Eight layers were excavated in these three squares. Layer 1 was a layer of grey sand, including the root-zone. Below this was layer 2, a thin layer of black sand. These layers contained artefacts such as crown seal bottle tops, clay pipe stems, copper nails, iron and glass, some of which were of more recent origin than the whaling period. These upper layers were clearly disturbed. Layer 3 had been visible in places on the surface before excavation. It was a layer of compact clay, light brown in colour, containing broken brick on or in its surface. Below this were layers 4 and 5. Layer 5 was a thick layer of black ash hardened to a clinker-like consistency. It was up to 350 mm thick, extending to bedrock in places. This layer was also exposed on the surface before excavation. Layer 5 merged with

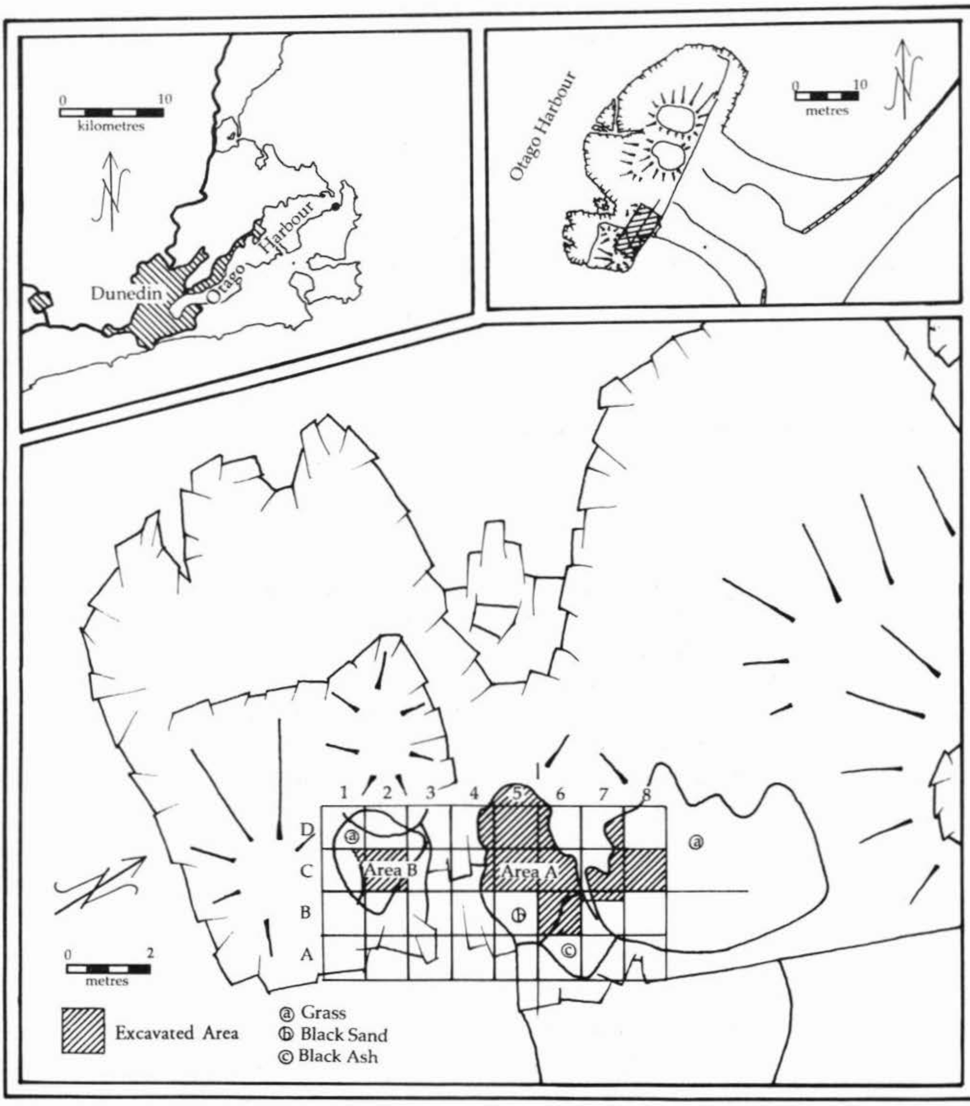

Figure 2: Plan of Wellers Rock showing the excavated area.

layer 4, less abruptly than the section drawing indicates. Layer 4 was a brown ash layer, less consolidated and soft enough to be trowelled. It was not as deep as layer 5. Layer 6 was an unusual, deep lens of burnt sand below a charcoal lens. It merged with layer 7 below it. This was a layer of variable depth comprising sand with scattered rock and brick with lenses of ash and charcoal throughout. It appeared to be fill. Layer 8 was a layer of clean, light grey/yellow sand of varying depth extending down to bedrock.

Many of the same layers occurred in a different sequence in the eastern edges of squares C6, B7 and C8 (Fig. 4). The central part of this section was set back 25 cm. This small portion of square B7 was excavated in order to recover a wooden plank, similar to the one still *in situ* in the section drawing. Although the stratigraphy of the south section continued into the corner of the east sections, layers 4 and 5 rapidly faded out. At the north end of the section a material identical to layer 1 overlay bedrock beneath layer 8, the clean sand layer that was evident as fill in the south section. Layers 7 and 1 occurred above this, overlain by layer 3, which in this case contained no artefactual material. In the central portion of the section, the stratigraphy appeared to have been cut into in the northern end and refilled with layer 1, grey sand. It appears that the grey sand that blew up over the Otakou station was here used as fill in the course of cleaning and re-levelling the try-works. It was indistinguishable from the same material lying above layer 3, which would have blown over after the try-works ceased operation and was dismantled.

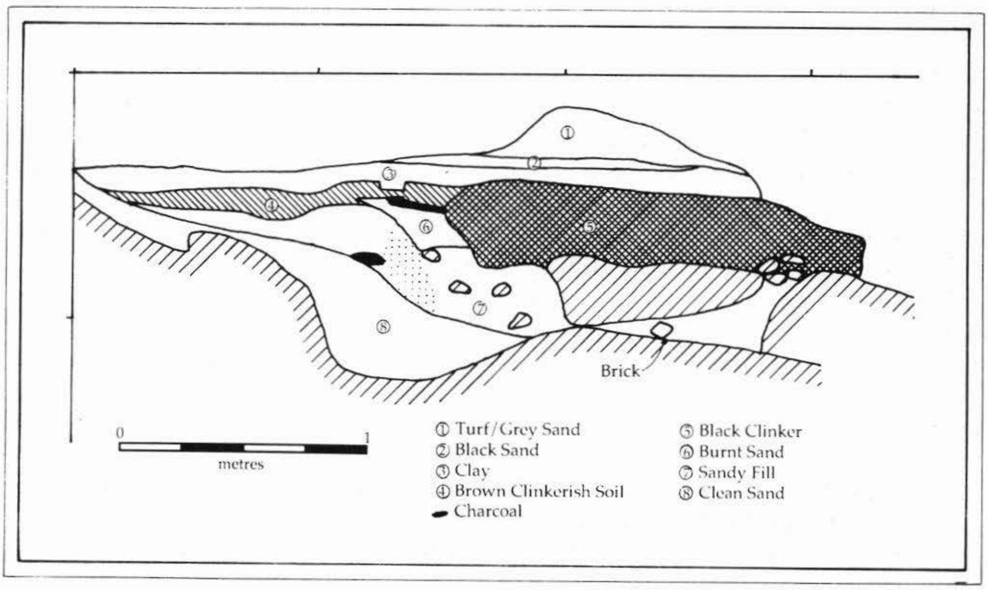

Figure 3: South section, squares B6, C6 and D6.

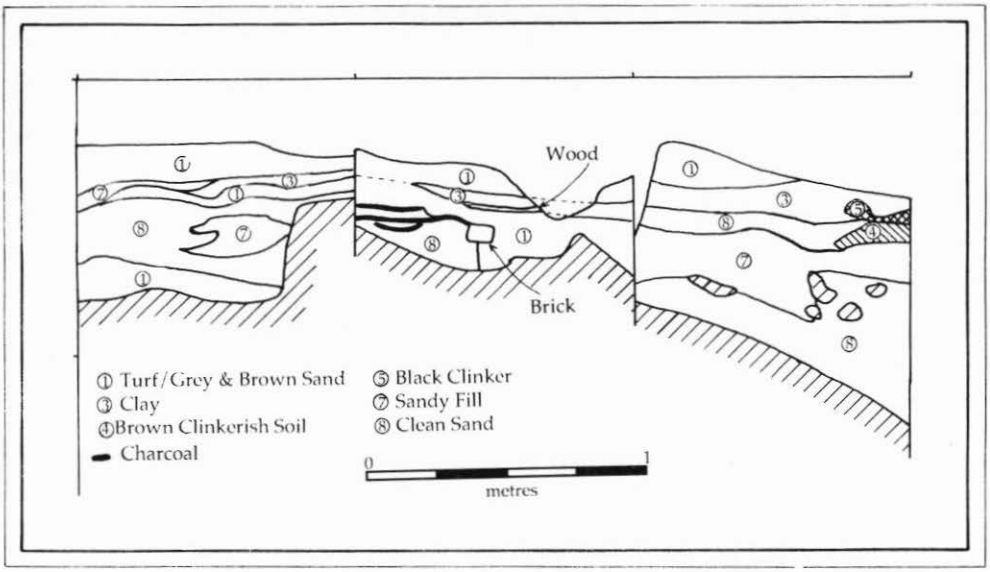

Figure 4: East sections, squares C6, B7 and C8.

Features

On or in the surface of layer 3 was a scatter of grey, red and orange bricks, all broken and of varying sizes. Associated with them was a large iron bar measuring 470 x 70 x 70 mm. Layers 4 and 5 also contained a number of features. A piece of sawn timber remained in the surface of layer 4 in square C6 as charcoal and a mould. Beside this was a hard baked surface showing brick moulds. In square D5, below the surface of layer 5, was a pavement of five whole bricks and some broken bricks *in situ*, with one broken brick resting on top of them. In square D4 a whole brick lying on its side and some brick moulds associated with it were visible before the excavation. The features in layers 4 and 5 are shown in Figure 5.

AREA B

Only one layer was present in Area B. Below the root-zone was a layer of brown sand extending to bedrock. Part of this was exposed before the excavation. A stack of bricks, five of them whole and many more in fragments, was found in squares C1 and C2. They rested on bedrock.

DISCUSSION

The upper sand layers in Area A contained various artefacts. Some, such as the clay pipe stems and copper nails, may have originated with the whalers, but these upper layers were clearly disturbed and contained modern artefacts such as .22 shells and crown seal bottle tops. Layer 1 is presumed to be the sand that blew over the area in the 1850s and 60s.

The numerous bricks scattered on the surface of layer 3, the clay layer, are the remains of the try-works furnace. Such a structure would have had to be built of fireproof material, brick being an obvious choice. The bricks stacked in Area B are identical in form, and are presumed to be also from the furnace, which was dismantled and the whole, usable bricks removed for other purposes. The bricks in Area B are all that remain of this process. Of 220 bricks and brick fragments collected, only 5 from this stack, the pavement of 5 bricks in square D5, layer 5, and the brick in square D4, were whole. Another was collected loose on the surface during the field survey. The brick in square D4 was *in situ* and together with the associated brick moulds formed part of the furnace wall. The pavement of bricks in square D5 was also *in situ* and seems to have been a base for the try-pot to rest on (Fig. 5). The brick moulds in the surface of layer 4 in square C6 could be the remains of a previous

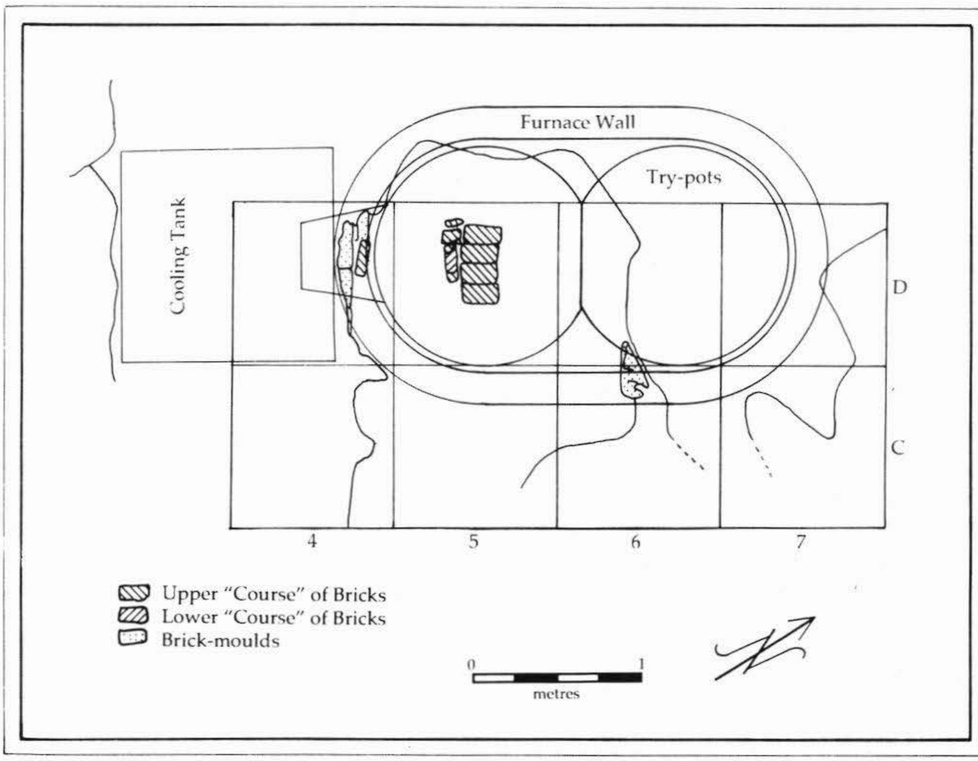

Figure 5: Features in layers 4 and 5, also showing a reconstruction of the try-works.

such try-pot base. From time to time the furnace would have been dismantled and cleaned. It would not necessarily have been put back in exactly the same place.

The clay in layer 3 may have been used as mortar for the furnace or to stop the outside of it. The sixteenth century try-works at Red Bay, Labrador, used clay as a mortar (Logan and Tuck 1990: 68). Barnicoat's drawing (Fig. 1) did not show any details of the try-works construction, but the texture he gave the furnace walls does not look like brick and may well represent a clay covering. In this interpretation, the wooden planks shown in front of the furnace in Barnicoat's drawing remain *in situ* and were covered in clay when the try-works was finally dismantled. The bricks from the dismantled furnace lie on the surface of the clay. However, if the clay was used as mortar in this way, it could be expected to be baked in places and to be heavily stained with charcoal or other combustion products. Neither of these seems to be the case. It is not known at what temperature the try-works operated and it may not have been as high as might be thought. If the furnace walls were just covered with clay on the outside they may not have become hot enough to bake the clay.

The hard, clinker-like texture of the ash in layer 5 is thought to result from the binding of the ash and sand by organic fractions remaining from the burning of blubber scrap (Campbell 1992: 146). Layer 4 also appeared to be try-works ash but was less clinkerish in texture. There are two possible explanations for its origin. It may, along with the brick moulds in its surface, have resulted from a previous placement of the furnace or it may be rake-out from the furnace placement represented by the bricks in squares D4 and D5. This would probably have happened when the furnace was dismantled and cleaned before re-assembly for a new season. Layer 6 was a lens of burnt sand beneath layer 4. It was more burnt towards the top and was overlain by a charcoal lens. It was, therefore, *in situ*. It may have resulted from a spillage of flammable whale oil drenching an area of sand. Apart from being burnt it was otherwise identical to layer 7, which was a layer of fill containing lenses of charcoal and ash as well as broken brick and rock. This sand seems to have been used to level the site between cleanings of the furnace. Broken brick, too small to be useful for furnace construction, was also incorporated into the fill layers. Thus the try-works may have been reconstructed at least twice in its lifetime; once when the broken brick in layer 7 was discarded and the try-pot base was set up in layer 4, and secondly when the try-pot base was shifted from square C6 to D5.

The confused stratigraphy evident in the east section, where layer 1 overlay bedrock, could be the result of sand blowing in before the try-works was set up. Clean sand would then have been laid on top of this during the levelling process. In the middle of the section the abrupt loss of layer 7 and the vertical edge of layer 8 indicate that this area was dug and later filled with grey sand rather than with the clean sand of layer 1. Grey sand later blew over this as well and the seemingly single layer 1 in this part of the section resulted from the homogeneity of the material which did not form distinct visible strata, although different times of deposition above and below layer 3 were indicated.

THE EXCAVATED MATERIAL

By far the most abundant artefacts recovered from Wellers Rock were bricks. The few other artefacts found were mostly from the disturbed upper layer. Many of these were clearly modern.

MINOR ARTEFACTS

The majority of artefacts other than brick came from the disturbed layers 1 and 2, where modern artefacts such as crown seal bottle tops or .22 shells, as well as modern glass and brick, were found alongside clay pipe stems. Bricks similar to those from layer 3 were also incorporated into layers 1 and 2.

Clay pipes and iron and copper nails could have been used in the whaling period. There is no definite indication that these artefacts are from that time, however. None were definitely *in situ*. The iron is all severely corroded, although most of it would appear to have been nails. Only one pipe stem had some indistinct, non-diagnostic markings on the spur.

Shell and fishbone were found in small quantities in these layers and in the fill layers, 6 and 7. There is no evidence that these were cultural.

WOOD

Five samples of wood were found *in situ*. One is a plank identified as kowhai (*Sophora microphylla*). Another, similar plank remained unexcavated in the baulk of square B7 (Fig. 4). Barnicoat's drawing (Fig. 1) shows these planks as part of a deck, or working platform, in front of the try-works, still visible in 1844. Burnt lancewood (*Pseudopanax crassifolium*) was found in square C6, layer 4 and a mixed sample of matai (*Prumnopitys taxifolia*), kowhai identical in form to the plank wood, and a broad-leaf species were found in square B7, layer 3. The square mould visible in the south section was caused by a plank of 'four by two' (4 x 2 inch [approximately 10 x 5 cm]) of burnt rimu (*Dacrydium cupresssinum*). The square section of both the mould and the sample removed from it indicate that this was a sawn timber intended at some stage for structural use. Clearly, local resources were being utilised for construction and fuel.

There is also one piece of burnt exotic timber from square D6, layer 5. This is tentatively identified as ash (*Fraxinus* sp.). Whale boat oars were made from ash, which is a tough wood and suitable for this purpose because the oars had to withstand considerable leverage since the rower sat in the middle of the boat some distance from the rowlock (Morton 1982: 34). Ash has other uses in boat-building, but it also has more prosaic uses such as tool handles, agricultural implements and wheels, any one of which could explain its presence at the station. This suggests that specialised tools were imported, that is, sent over from the Wellers' Sydney base.

ASH

The organic fractions binding layer 5 to its hard, clinker-like texture are thought to originate from the burning of blubber 'scrap' in the furnace; that is, the chips of blubber that remained after the oil had been boiled out. Remaining unburnt oil fractions would have reacted over time to bind the sand and ash to a solid mass. A similar process was noted at Red Bay in Labrador where the clay mortar of the sixteenth century Basque try-works "became saturated and consolidated during use by spilled whale oil [and has] assumed the consistency of asphalt" (Logan and Tuck 1990: 68).

This hypothesis was tested by chemically analysing the ash as part of a fourth year archaeological methods project at the University of Otago (Campbell and Smith 1993).

X-ray fluorescence revealed traces of zinc, a good general indicator of marine origin. Gas chromatography and mass spectroscopy showed a series of fatty acids that had not degraded over time through oxidation and was similar to the known fatty acid composition of the right whale. Analysis of material from the Bathers Bay try-works, Freemantle, Western Australia in 1984, also indicated that whale blubber was the likely origin of the organic fractions obtained from the ash, which in this case was a "sooty residue" (McIlroy 1986: 48). Similarly, the Wellers Rock analysis, though inconclusive, demonstrated a probable cetacean origin for the ash of layer 5 as well as establishing a useful test for other possible try-works ashes in future.

BRICKS

Measurement and physical characteristics

Both qualitative and quantitative features of the bricks were analysed. All pieces were weighed to the nearest gram and length, width and depth were measured with callipers, where possible. Width or depth often varied from one part of the brick to another by as much as 7 mm. The two extreme measurements were recorded and the average used for statistical calculations. Only ten bricks were sufficiently complete to measure for length; six of these were the furnace bricks from squares D4 and D5.

The surface of the brick, where it remained or was visible, was examined for colour, deformities and vitrification. Although a range of colours was visible within any one brick, a single base colour was assigned, usually red, orange or grey. Grey colour was due to staining of the brick as a result of exposure to heat. Deformities refer to such aspects as bowing and cracking in the brick, bulging at the sides, etc. Vitrification occurs when the surface is overfired and silicates melt out and become glassy. This usually happened on the strike, or upper, face and could cover the whole surface or occur at localised hot spots, usually where grog intruded into the surface. Gemmell (1986: 43) illustrates examples of this in hand made bricks from New South Wales. A similar effect can occur when cinder is mixed with the clay to facilitate burning. Vitrification takes place at low levels as a slight reddening and proceeds with greater heat to a grey-green glazing similar to a pottery glaze. It is possible that re-firing occurred in the try-works furnace and contact with sand, a source of silica, may have been responsible for some of the grey-green vitrification.

Virtually all the bricks were broken in some part and the interior fabric exposed. The fabric differs from the surface in that it will not have been buffed during manufacture and it will not demonstrate vitrification. Its colour may differ. The fabric shows inclusions such as grog in the make-up of the brick, and mix. Mix is a rather subjective category based on the apparent texture of the fabric, and is affected by the range of colour. The more homogeneous the colour, the more homogeneous the mix appears.

The surface of the brick, where visible, was examined for evidence of manufacture. All the bricks, except the modern bricks in layers 1 and 2, were made in sand moulds. Most had sand adhering to the stock, or lower face, sides and ends, and in many strike marks were visible on the strike, or upper face. The sand comes from the inside of the mould, the whole of which is coated with sand to facilitate the removal of the moulded brick. The top of the brick is smoothed and the excess removed, or struck, with a tool which leaves parallel lines, or strike marks, in the surface. In bricks where enough of the stock face remained a frog mark was also usually visible. The frog mark is made by the kick, a small rectangle of wood or metal fixed to the stock board to push the clay into the corners of the mould. However, in the case of the Wellers Rock bricks, it seems that sand and clay had built up on the kick and the frog marks are usually very indistinct. This is not uncommon in hand-made bricks (Gemmell 1986: 55).

Two main classes of brick were initially established in hand specimen: 'Red' and 'Orange'. These classes were based entirely on colour although in general the orange class appeared to have a coarser mix than the red class. The red class was assumed to be at least more highly fired than the orange class if not a different type of brick altogether. All the bricks that seemed to have been used as firebricks, i.e., that seemed to have been subjected to greater heat *in situ*, such as the try-pot support bricks, fell into the red class and it initially appeared that they might have been made specifically as firebricks. Statistical analysis of the dimensions of the bricks could not establish any more definite separation between the two classes.

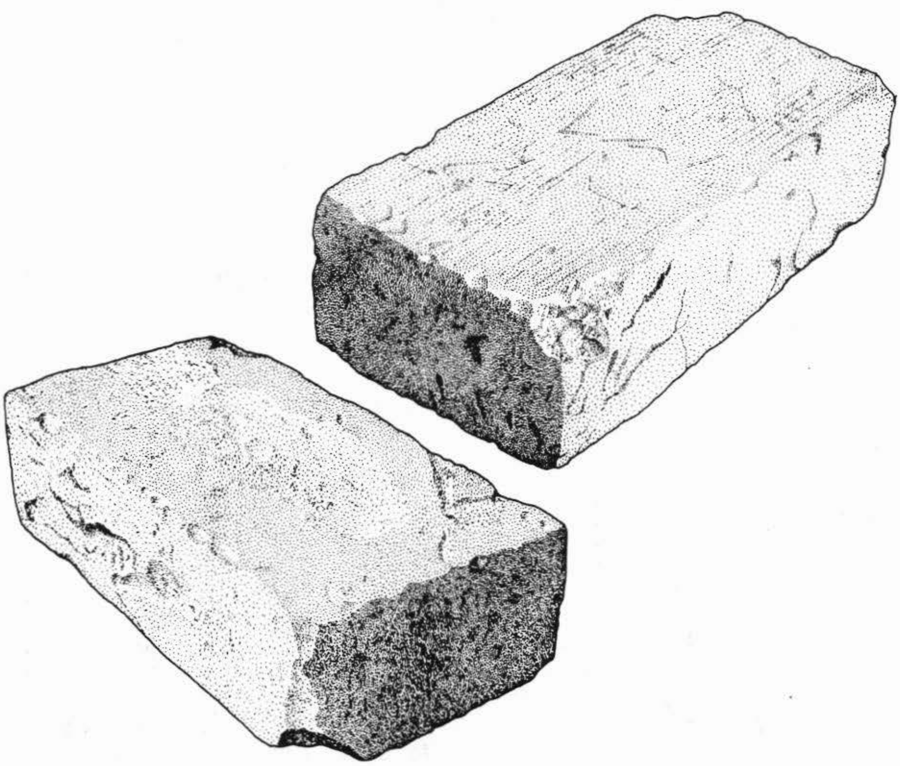

Figure 6: A typical brick from the furnace. Top: upper, or strike, face showing strike marks. Bottom: lower, or stock, face showing indistinct frog. Dimensions approximately 220 x 100 x 70 mm.

Porosity

"Porosity is defined as the ratio of the volume of pore space to the total volume" (Intoh 1989: 132). Pores are formed during the firing process as the various grains of material that make up the clay, or fabric, partially fuse together. A more highly fired ceramic will be less porous, but stronger, than a less highly fired one (Intoh 1989: 133). Because of the large number of factors affecting porosity, comparisons between ceramics from different sources will be meaningless. However, comparisons within a single source can be useful. Measurements of porosity, therefore, seemed ideally suited to the Wellers Rock material where the two apparent classes of brick were defined in hand specimen on the basis of colour, but otherwise seemed identical. Since this difference in colour was probably due to different exposures to heat during the firing process, it was expected that porosity could be used to demonstrate this statistically.

Of the several possible methods of measuring porosity, the immersion method is the simplest, but is also considered the least reliable. Not all the trapped air will find its way out even after lengthy immersion (Intoh 1989: 134). However, the immersion method gave meaningful results and was sufficient for this study. It is clear that what is being measured is not true porosity but what might be termed "apparent surface porosity"; in other words, how much water is absorbed at the surface during the period of immersion. Greater

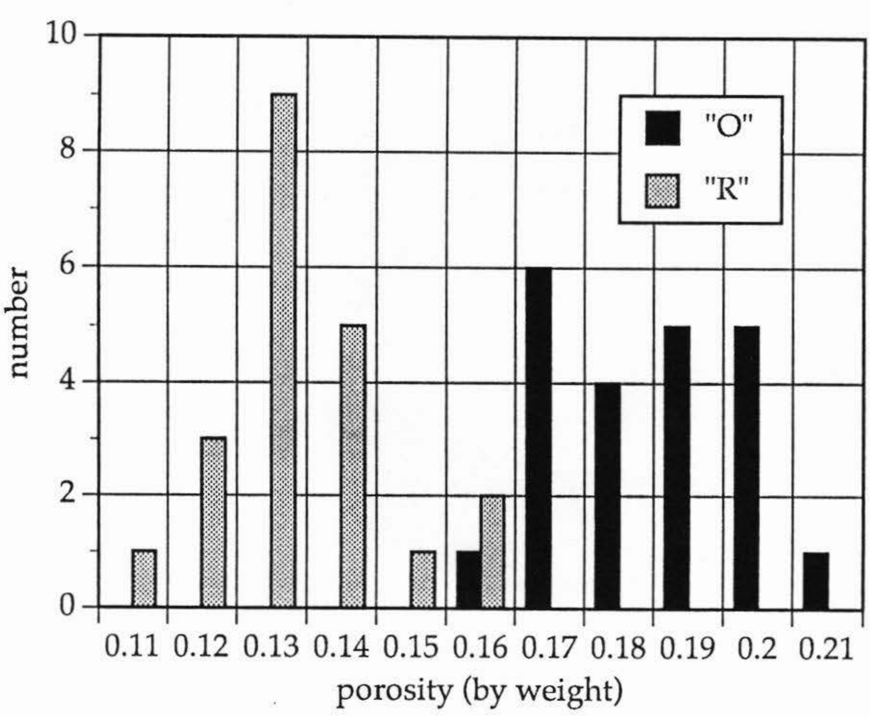

Figure 7: Histogram of porosity by weight for classes 'O' and 'R' bricks.

exposure to heat during firing results in more fusion between the grains of the fabric. This has two implications for porosity; firstly, that fewer and smaller pores will result and, secondly, that more of the pores will be dead end pores. Therefore such a brick is apparently less porous. A measure of true porosity may yield different results.

Forty-three bricks from both classes were selected for testing by immersion. Porosity was calculated as: porosity = wet weight/dry weight. As can be seen from Figure 7, the separation of the two classes according to porosity is almost complete. However, initial results were not so clear cut. It became apparent that colour alone was not enough to separate the two classes. Closer examination revealed that the texture of the fabric was the critical variable. Highly fired bricks had a harder, crisper texture, while less highly fired bricks had a softer, smoother texture, more likely to be worn. The latter were always orange while the former were usually red, but sometimes orange. The labels 'O' and 'R' refer to these new classes rather than the old, colour-determined classes, 'Orange' and 'Red'.

Statistical Analysis

Once the bricks were reassigned to the newly established classes, t-scores were calculated for both width and depth. These showed no differences between the two classes (Fig. 8). It is clear, then, that the two classes of brick differ only in colour and porosity, which are the

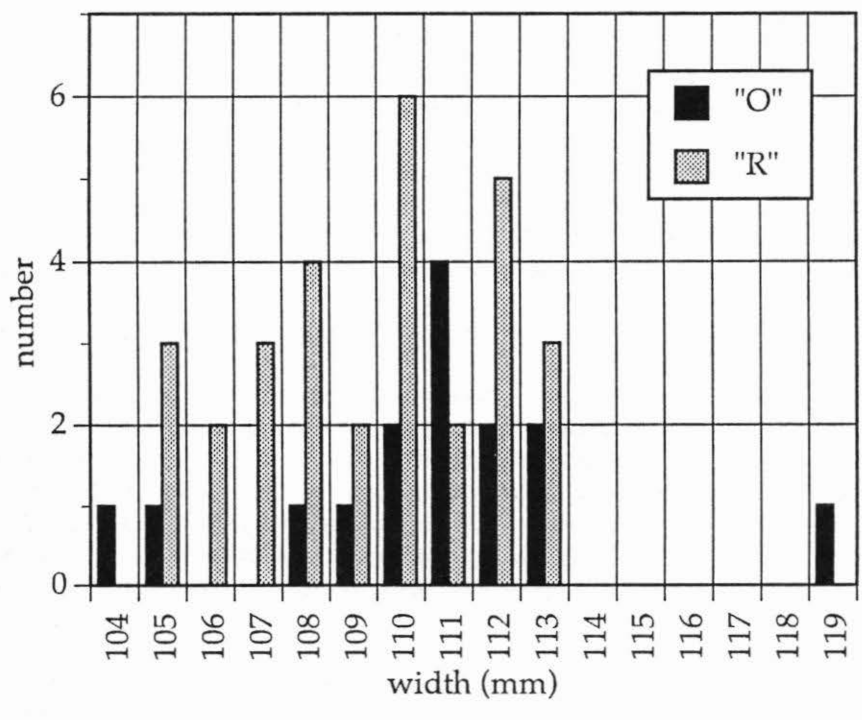

Figure 8: Histogram of depths for both classes of brick.

result of the degree of firing the brick has been subjected to. Pearson product-moment correlation coefficients were calculated between porosity and density for both classes of bricks. For class 'O' the correlation was -0.498, which is 95% significant, and for class 'R' it was -0.344, which is 90% significant. Thus variation in porosity within classes is largely dependent on density.

Newly moulded bricks were stacked to dry in a hack (Hammond 1990: 11). This often resulted in hack marks which the stacked bricks impressed into each other while still plastic. No such marks were observed in the Wellers Rock assemblage, but a Pearson product-moment correlation coefficient calculated between width and depth of -0.293, 95% significant, indicated that some of the bricks, presumably those on the bottom of the hack, were compressed vertically in the drying process.

AN EARLY LOCAL BRICKMAKING INDUSTRY?

Figure 9 summarises the occurrence of the various manufacturing features, singly or in combination. The 'R' class of brick contains disproportionately more examples showing all three features together. All ten whole bricks were class 'R', and larger pieces are more likely to show a distinguishable frog mark. Seven of these were the furnace bricks, only one of which was cleaned and examined closely. It exhibited all three features, and the others are taken to be similar.

All the bricks were clearly hand-made. Sand moulding is a hand manufacturing method and the presence of strike-marks also indicates hand-manufacture. The bricks were crudely made in many ways. Depth or width could vary considerably along the length of the brick. 'O' class bricks are basically underfired. Where they rested directly on a solid clay surface, as in square C8, they frequently disintegrated through contact with water and could not be recovered by excavation. The interior mix was often uneven and firing was also uneven. Figure 6 shows a typical brick. The frog is very indistinct and the folded pattern along the side is typical of sandstock bricks before the introduction of pugmills in the 1860s to mix the clay more thoroughly (Gemmell 1986: 50). Only the outer layers of bricks in the firing stack were properly fired. These constitute the class 'R' bricks, whereas the class 'O' bricks remained underfired. Nonetheless they were used in the try-works furnace alongside the class 'R' bricks. Probably only class 'R' bricks were used as firebricks as in the try-pot support or inner furnace wall.

All these considerations could indicate a local manufactory for the bricks. Their essential crudeness and the fact that underfired bricks were not rejected would indicate that the Weller Brothers were not sending good bricks over from Sydney. It is possible that the bricks came over as ballast on one of the Wellers' ships, but their general uniformity and clear separation into two classes indicate a single site, probably even a single episode, of manufacture. Even if more than one episode of manufacture is represented, the same mix, moulds and methods of firing are represented. Also, the class 'R' bricks are durable and useful for all their ugliness, and would not have been used as mere ballast alongside their class 'O' cousins.

Only further analysis such as XRF or chemical analysis could determine whether the bricks were made from local clays. Although such analysis has not been undertaken, the existing evidence suggests an 1830s brick manufactory, albeit a cottage industry, at Otakou.

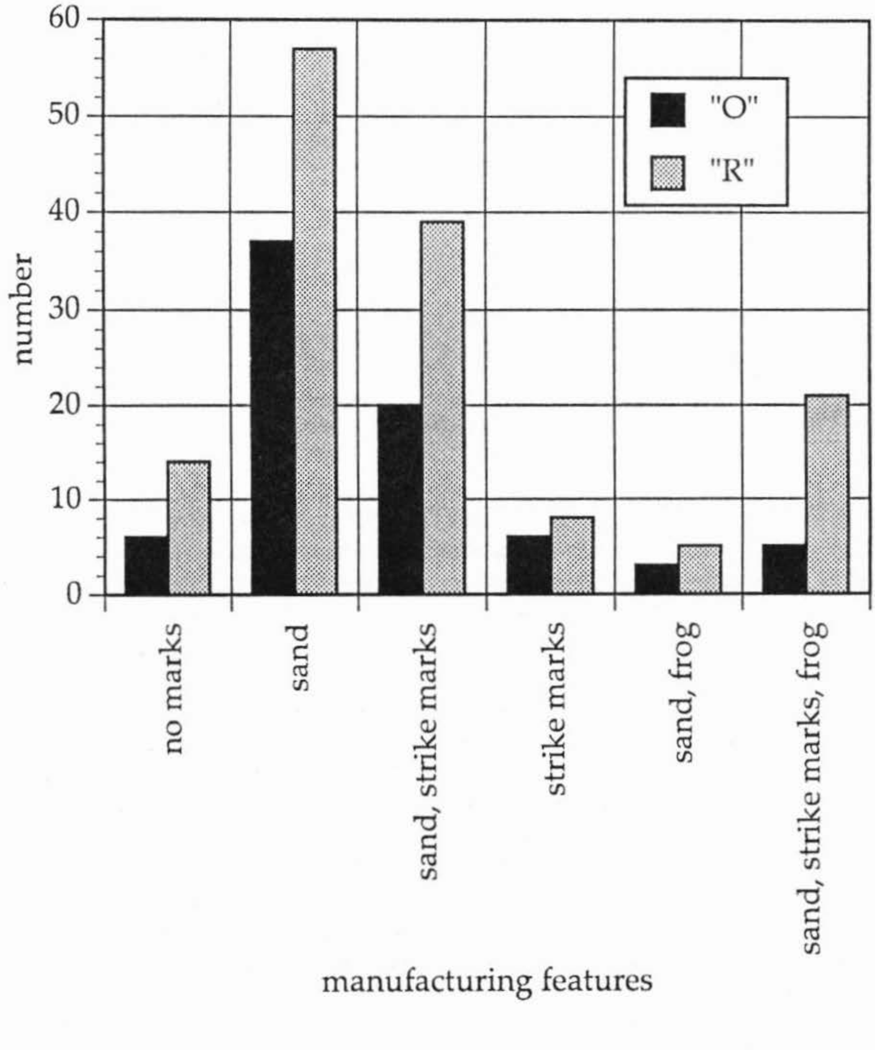

Figure 9: Manufacturing marks in 'O' and 'R' class bricks.

THE TRY-WORKS CONSTRUCTION

The main use of bricks at the try-works was to construct the furnace. Barnicoat's drawing of 1844 shows no details of how this was done, but an examination of the spatial distribution of the bricks gives some clues about the try-works history and construction. The distribution of the bricks is summarised in Table 1.

TABLE 1
DISTRIBUTION OF THE BRICKS BY LAYER

		'O'		'R'		Total	
		n	wt	n	wt	n	wt
Area A	Layer 1	3	68	15	1954	18	2022
	Layer 2	27	8946	50	6485	77	15431
	Layer 5	-	-	8	20796	8	20796
	Fill layers	5	668	14	2947	19	3615
Area B	Layer 1	42	17220	56	36806	98	54026
	Total	77	26902	143	68988	220	95890

Area B is treated as separate and distinct. The bricks in these two squares were neatly stacked off to one side of the try-works. Barnicoat's drawing shows the knoll of rock to the left of the try-works unencumbered by furnace or tanks of any kind. These bricks may not have been part of the furnace, although the incidence of burning and breakage indicates that they had previously been used for this purpose. They were probably stacked there after the try-works had ceased to function by someone intending to use them for another purpose. It seems likely that many of the bricks were removed during this period, as a full try-works furnace would have contained a great many more bricks than those recovered in the excavation. Table 1 shows that more than half the total weight of bricks, 56.5%, was contained in the Area B bricks. Four of the bricks from Area B were complete, whereas in Area A only the bricks from within the ash layer and the base of the furnace wall were complete, further indicating that all visible complete bricks were removed for further use.

Throughout layer 3 on the main part of the site is a seemingly random scatter of broken bricks. These are the remains of the try-works structure. This is very much what might be expected, given that the furnace walls were deliberately dismantled. Although there were twice as many pieces of class 'R' brick as class 'O', the 'O' bricks are, on average, much heavier. Class 'R' bricks were probably less likely to break under thermal stress and so were removed for re-use. When they did break they shattered into smaller fragments than the class 'O' bricks.

Seven of the bricks in layer 5, the clinker or ash layer, came from a single square, D5, and the other came from an associated context in square D4. The seven bricks from square D5 resembled a small pavement in the middle of the ash layer and the furnace. They were about 70 cm from the brick in square D4, which is the only remaining representation of the furnace wall *in situ*. They were probably used as a base or support for the try-pot itself. One piece of brick lay on top of the base and would have helped stabilise the round-bottomed try-pot. Although the size of the Wellers Rock try-pots is not known, try-pots examined during the field survey were generally about 1 m in diameter at the lip and somewhat larger at their widest point. A try-pot of this size resting on the brick base would have fitted snugly inside the furnace wall represented by the brick in square D4. Four brick moulds were also found in the eroded edge of the clinker layer next to the brick in square D4. These paralleled the remaining brick, and their bricks would also have formed part of the furnace wall. Since this implies a double layer of bricks it seems likely that the inner skin of the furnace wall would have consisted of class 'R' bricks, perhaps lying on their side like the remaining example rather than on their face. The outer skin would have been class 'O' bricks, underfired and more likely to break under thermal stress.

It is quite possible that the inner skin of bricks received a second firing in the furnace. This second firing could account for the separation of class 'R', inner skin, bricks from class 'O', outer skin, bricks. However the manufacturing method alone could also account for the difference between the two classes. A combination of the two would be possible, i.e., class 'R' bricks were recognised as more suitable for the inner skin of the furnace wall where they were subjected to greater heat than those of the outer skin, resulting in frequent grey staining of the surface and occasional vitrification.

There is no mould of the round-bottomed try-pot above the try-pot base. It would certainly be expected that a well defined mould would be evident if the ash had hardened to clinker during the try-works operation. The fact that there is no mould indicates that the clinker formed later through some sort of weathering or chemical process. The brick moulds in square D4 indicate removal of the bricks after this process was complete.

Layers 6, 7 and 8 represent episodes, not necessarily always separate, of filling and levelling the try-works, perhaps as part of an off-season cleaning operation. The furnace would have been dismantled and repaired, excess ash raked out and the floor re-levelled. Layer 4 could represent such rake-out. On the other hand, the brick moulds in the surface of layer 4 in squares C6 and D6 could well be the remains of a previous try-pot base. In the edge of square D6, shown in the south section (Fig. 3), rocks were piled up to fill gaps in the surface of the bedrock. Throughout squares B6 and C6 (also visible in Fig. 3), layers of sand have been used for a similar purpose. Layer 8 is clean sand, probably used to level the surface of the rock before the try-works was first constructed in 1831 and undisturbed since. Layer 7 contains a series of charcoal and ash lenses as well as bricks and large pieces of rock. These bricks, 11 in total, are all broken and their mean weight is relatively small. As part of the previous season's furnace wall, they were too shattered to be of further use and were included in the fill. All were class 'R' bricks.

RECONSTRUCTING THE TRY-WORKS

Using this information, a plan of the try-works can confidently be drawn on a plan of the site. Barnicoat's drawing also helps. Clearly, a much larger section of the rock was level in 1844 than is the case today. The area below the cooling tank, between the furnace and the knoll of rock, corresponding to squares C3 and D3, would have been filled, but today is a gap more than 1 m deep and 1 m wide.

Using the relationship between the try-pot base in square D5 and the remains of the wall in square D4, a round-ended furnace can be reconstructed, much the same as the one in Barnicoat's drawing. Since the two try-pots would have been flattened on one side so that they could be bolted back to back, the overall interior length of the furnace would have been somewhat less than four times the distance from the inside of the brick in square D4 to the centre of the base in square D5, that is, about 0.7 m. I have drawn the furnace 2.6 m from end to end. Since the two skins of the furnace wall come to 0.2 m thick, the overall length would be about 3 m. Using the same calculation, a width of 1.8 m is arrived at. If the major axis of the furnace runs parallel to the excavation baseline and through the centre of the base in D5, the furnace can be mapped on a plan of the site as in Figure 5. The furnace would have had some sort of door, perhaps represented by the iron bar found in square C7. Although the site where the bar was unearthed does not correspond exactly to the supposed position of the furnace, the bar would have been moved when the furnace was dismantled. It is quite heavy and was not moved far. Assuming the cooling tank to be square in plan and hard up against the knoll of rock, as it appears to be in Barnicoat's drawing, it can also be drawn on to the same axis (Fig. 5).

Not all the other structures shown in Barnicoat's drawing have obvious uses. The post to the left of the furnace, in front of the knoll of rock, could have been used for any of a number of purposes. The rail and square structure to the right is quite enigmatic. It may have been a holding tank of some sort. This area is today eroded down to bedrock. The barrel to the left of the rock may be lying on a beach in the foreground or on a part of the rock or beach no longer extant. There is nothing in this area today.

DISCUSSION

This small excavation, comprising 13 one metre squares, concentrated on a single feature only, the try-works, represented by numerous brick fragments and try-works ash. Because of this limited focus one class of artefact, brick, was predominant. Any other securely provenanced artefacts were also part of the try-works, if not the furnace. Since the surface layers were disturbed, any artefacts found in them were not considered to be *in situ* and indeed modern artefacts were found in them.

The term 'whaling station' is ill-defined archaeologically. It implies an industrial activity, but a whaling station was more than just a whale oil factory. Frequently in the literature reference to the station may mean either the try-works or, as implied in Coutts' (1976) account of the excavation at Taieri Island, the whalers' village, but not necessarily both.

There are two basic components of whaling stations. The whalers' village may be termed the domestic component. These villages, like any settlement before or since, had their own domestic economy, and any excavation of a whaling village would expect to uncover evidence of trade, agriculture, subsistence patterns, etc. Conversely, the industrial component of the stations was a specialised complex containing features unique to whaling, in particular the try-works. Although try-works are the central component of any whaling station they are by no means the only aspect of the industrial component. Boat sheds and storage areas would also have been necessary, and coopers and carpenters would have needed workshops. The two components are not unconnected but they are distinct, and the formulation of this distinction goes some way towards defining whaling stations as archaeological entities.

Although it is a mistake to refer to the try-works as the station, they are the primary diagnostic feature. Boatsheds and workshops are common to many marine industries, but only whalers used try-works, and so a try-works leads to the definite identification of a site as a whaling station.

The only visible try-works identified during the field survey were at Otakou and Waikouaiti. Whereas the Waikouaiti try-works was identified by reference to an 1899 photograph (Campbell 1992: 33), the Otakou try-works was identified by the ash visible on the surface. The Otakou works was constructed as well as, if not better than, any in the study area and is a model for try-works throughout the area and perhaps beyond. Other try-works can now be identified by reference to the excavation and analysis of ash from whale blubber residues.

The Otakou station was the largest in the country and so Wellers Rock might be expected to contain all the features of a shore-based try-works writ large. However, this try-works seem to have been rather rudimentary. Some of the sixteenth century Red Bay try-works, where there were 16 'shore stations' and hence, probably, 16 try-works, appear to have been more elaborate, being within a series of postholes indicating some sort of superstructure (Logan and Tuck 1990: 68). Logan and Tuck also report that a seventeenth century Dutch try-works at Spitzbergen contained the remains of ducts used to regulate the temperature. No evidence of either of these aspects was found at Wellers Rock, although any evidence of ducting may have been destroyed when the furnace was dismantled, or through subsequent erosion. Nor does there appear to have been the sort of superstructure found at Red Bay. It is interesting to note, however, that the try-works at Waikouaiti was built inside a shed (Monro 1898: 240).

Some of the Red Bay try-works contained seven or eight fireboxes, each with its individual try-pot, although the sixteenth century try-pot was smaller than the nineteenth century pots.

It seems likely that the Wellers Rock try-works was more closely modelled on the two try-pots in a single firebox used on eighteenth and nineteenth century ocean going whaling ships. A shipboard try-works had to be very securely made and bound together with iron bands to cope with the movement of the ship at sea and to minimise the danger of fire. Like other shore-based try-works, the Wellers Rock works did not have to cope with these dangers and so need not have been as sturdily built. An open fire beneath the pot may have sufficed. An 1899 photograph of the Waikouaiti try-works shows no evidence that a furnace had been built. However, a furnace is obviously a more efficient way to heat the large pots and most try-works would have had some form of casing for the pots.

The Wellers Rock try-works was constructed of rather crude bricks, and the dimensional uniformity of the bricks and the crudeness of their manufacture indicate a probable local manufactory. In the 1830s and 1840s, whaling stations were isolated settlements, especially in the south where virtually no other European settlement had taken place. Although there was contact between neighbouring stations and between the stations and their Sydney head offices, they were generally reliant on their own resources and on trade with local Maori for most of their needs. Carpenters and coopers, for instance, were essential to the running of the stations, although barrels were imported in kitset form and made up on site. This self reliance may have extended to the manufacture of bricks as well. Of course no specialist brickmaker would have been employed and this explains the appearance of the bricks—rough but serviceable.

CONCLUSION

The excavation of the try-works revealed a well preserved layer of ash and enough of the outlines of the furnace wall to enable a reconstruction of the furnace to be made. Bricks and brick fragments were also uncovered and their analysis indicated a probable local manufactory, although this assertion is based on circumstantial evidence. The ash was chemically analysed and a cetacean origin for the organic fractions in it was suggested.

Apart from the sea and the resource it contained, try-works were the focus of activity at a whaling station. Dumont D'Urville's chart of Otago Harbour in 1840 and C. H. Kettle's 1846 chart both show the whalers' village and other buildings, with Wellers Rock occupying a physically as well as economically central position. The excavation at Wellers Rock has revealed very little of this. The history and methods of construction were revealed in part, but little was established of the wider context. This was due to the self contained nature of the site, which was one factor that made it attractive for excavation in the first place. Another factor was the narrow focus of activity that took place at a try-works. Information regarding settlement or subsistence patterns could not be expected to be found here. Neither could information regarding the important early period of contact between Maori and European that the whaling period represents.

What was sought in excavating Wellers Rock was an indication of the type of archaeological evidence that might remain here, throughout the Otakou station site and at whaling stations generally. Analysis of the artefacts indicates a fair degree of self reliance on the part of the whalers; although they imported specialised wooden tools made of ash they made their own bricks. Enough of the structure remained to enable a fairly accurate reconstruction of the try-works. This reconstruction also relied on Barnicoat's sketch and, as a test of the archaeological reliability of historical data, of which more exists for Otakou than for any other station on the south coast, it at least shows that the type of evidence Barnicoat has left is useful and reliable. Of the many types of historical archaeological site, whaling stations, among the earliest, are also among the least documented. Archaeological investigation is one of the primary methods we can use to fill out our meagre understanding of them. The excavation at Wellers Rock has demonstrated the validity of this approach and indicates that a great deal of evidence about these important early historic sites probably remains hidden in the ground.

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REFERENCES

Campbell, M. 1992. A Preliminary Investigation of the Archaeology of Whaling Stations on the Southern Coast. Unpublished M.A. thesis, Anthropology, University of Otago.

Campbell, M. 1993. A site survey of whaling stations on the southern coast of the South Island. *Archaeology in New Zealand* 36 (3): 135–146.

Campbell, M. and Smith, N. 1993. Chemical analysis of a try-works ash. *Archaeology in New Zealand* 36 (4): 223–226.

Coutts, P. J. F. 1976. An approach to the investigation of colonial settlement patterns: whaling in southern New Zealand. *World Archaeology* 7 (3): 291–305.

Davison, W. n.d. Field books 1 and 2. Ms held at Department of Survey and Land Information, Dunedin.

Dumont D'Urville, J. S. C. 1955. *The Voyage of the Astrolabe—1840; An English Rendering of the Journals of Dumont D'Urville and his Officers of their Visit to New Zealand in 1840, together with some Account of Bishop Pompallier and Charles, Baron de Thierry*. Translated by Olive Wright. Reed, Wellington.

Gemmell, W. 1986. *And so we Graft from Six to Six; The Brickmakers of New South Wales*. Angus and Robertson, North Ryde.

Hammond, M. 1990. *Bricks and Brickmaking*. Shire Album 75, Shire Publications, Aylesbury.

Intoh, M. 1989. Water absorption testing of Pacific pottery. *In* D. G. Sutton (ed.), *Saying So Doesn't Make it So; Papers in Honour of B. Foss Leach*, pp. 132–152. New Zealand Archaeological Association Monograph 17.

Logan, J. A. and Tuck, J. A. 1990. A sixteenth century Basque whaling port in Southern Labrador. *Association for Preservation Technology Bulletin* 22 (3): 65–72.

McIlroy, J. 1986. Bathers Bay Whaling Station, Freemantle, Western Australia. *Australian Historical Archaeology* 4: 43–50.

Morton, H. 1982. *The Whale's Wake*. University of Otago Press, Dunedin.

Monro, D. 1898. Notes of a journey through a Part of the Middle Island of New Zealand, July 20, 1844, *et seq.*. Reprinted from the *Nelson Examiner*. Appendix C in T. M. Hocken, *Contributions to the Early History of New Zealand (Settlement of Otago)*. Sampson Low, Marston and Company, London.

Shortland, E. 1974. *The Southern Districts of New Zealand; A Journal, with Passing Notes of the Customs of the Aborigines*. Capper Press, Christchurch. [Facsimile reprint of Longman, Brown, Green, and Longmans, London, 1851.]

Tuckett, F., 1898. Diary. Appendix A in T. M. Hocken, *Contributions to the Early History of New Zealand (Settlement of Otago)*. Sampson Low, Marston and Company, London.

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