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MANAGEMENT OF THE MOTUTAPU ARCHAEOLOGICAL LANDSCAPE

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Introduction

Motutapu in the inner Hauraki Gulf is a 1510 ha island reserve wholly owned and administered by the Department of Conservation. It has a diverse history that encompasses virtually the full span of New Zealand settlement, and has one of the largest and intact pre-contact archaeological landscapes in the Auckland region. The earliest evidence for occupation of Motutapu predates the eruption of adjoining Rangitoto in c. AD 1400.[1]

Gazetted as a recreation reserve, Motutapu faces a diverse array of potential pressures both on the archaeological landscape and on its numerous historic structures. The size and complexity of the landscape, the numerous pressures and often competing conservation values have resulted in a largely reactive approach to site protection and a slow, cumulative attrition of heritage fabric.

Historic background

Prior to the eruption of Rangitoto Maori settlements were predominantly on the low lying coastal land near stream mouths along the leeward western coastline and sheltered eastern bays. The subsistence economy appears to have been based on hunting of forest bird species. Stone sources

[1] The dating of the Rangitoto eruption has been subject to review since it was originally published. Davidson's review of the dates from the Sunde site in 1974 and Law's in 1975 suggested a late 14th century date on the basis of two charcoal dates, NZ1898 and NZ1899. However, since that time the problems with in-built age in wood samples have become apparent. Nichol reviewed the dates in 1992 and included evidence from thermoluminescence (AD 1400–1420) and paleomagnetic (AD 1420) dating. These together with NZ1167 and NZ6954, which suggested that AD 1400 was the earliest possible date, led him to conclude a date of c. AD 1400. This was also supported by McFadgen (1996), and the additional average dates from 6 obsidian hydration samples published in 2000 by Lowe et al.

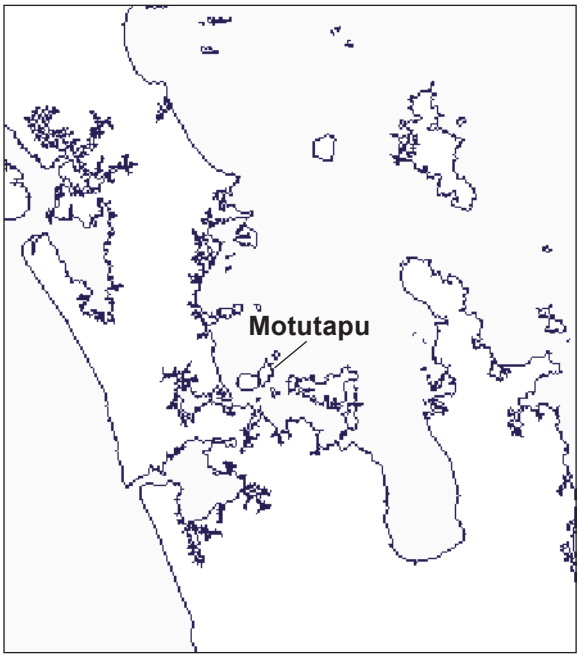

Figure 1. Location of Motutapu.

exploited for tool manufacture were the locally available greywacke found on Motutapu and nearby Motuihe, but also included obsidians from Great Barrier and Northland, as well as Nelson argillites and basalts from Tahanga (Davidson 1981: 111–12). Other locally sourced rock used in tool production included jaspers for hammerstones and sandstone grinders (Davidson 1982: 31). The Rangitoto eruption smothered Motutapu in ash up to a metre deep and caused widespread deforestation but also produced friable volcanic soils suitable for gardening. Archaeological deposits bracketing the ash suggest the eruption prompted a shift from broad spectrum hunting of forest birds to intensive marine exploitation and horticulture (Davidson 1978, 1984: 42).

Following the eruption Motutapu is reported to have been visited by both the Awara and Tainui canoes and was subsequently settled by the Tainui ancestors of Ngai Tai. Ngati Tai maintained rights of occupation from that time until its eventual sale, with only minor incursions from other groups. Ngati Huarere of Arawa descent claimed bird snaring rights over the kaka on Rangitoto, and from the 18th century reciprocal fishing rights were negotiated with Ngati Paoa on Waiheke.

In the 1820s many of the islands in the Hauraki Gulf, including Motutapu, were evacuated in response to the threat of Hongi Hika and Ngapuhi

armed with muskets. Many of the Hauraki tribes retreated south and Ngati Tai are said to have taken refuge at Maungatautari (Auckland Minute Book 1 Folio 26, cited by Coster and Spring-Rice 1984: 8). Occasional ventures were made back to former territories in the gulf, but not without consequence, as with when a local fishing party was attacked at Motutapu by Ngapuhi with several casualties (Fenton 1879: 61–74, cited by Coster and Spring-Rice 1984: 8). From 1836 many of the evacuated territories were resettled, and Ngati Tai remained on Motutapu until the northern part of the island was sold to Thomas Maxwell in 1840.

Maxwell had lived at Maraetai with Ngati Tai and was married to Ngeungeu, the daughter of the principle chief, Tara Te Irirangi (Turton 1882 :561). From 1840–45 Maxwell leased out the northern end to James Moncur. The southern end was purchased by Williamson and Crummer in 1845 and subsequently granted to Robert Graham in 1857. The Reid brothers purchased the island in 1869–70 and retained ownership until 1943. A homestead was built at Emu Bay c. 1869–70, occupied by James Reid until 1901 and demolished in 1976. A series of homesteads and outbuildings were built at Home Bay, the first between 1840–57, and the present Reid Homestead was built in 1901–03. The Reids were fond of entertaining and the premier picnic regularly attracted crowds of over 10,000, making it the Hauraki Gulf's most popular visitor destination.

As New Zealand prepared for renewed conflict in the build-up to the Second World War, Motutapu was chosen as the location for the principle gun emplacement to defend Auckland Harbour. Work began on the Motutapu counter-bombardment battery in 1936, roads to the battery had been formed by May 1936, and the battery and observation post were completed by June 1937 (Pearson 1997: 16–21). A temporary camp was established at Administration Bay in 1937 and the guns mounted by the end of August 1938. War broke out in September 1939 and the military population on the island went from 10 to 200, requiring the construction of additional buildings at Administration Bay and at the observation posts. Plotting rooms were constructed in 1941–42 and searchlights installed at Billy Goat point. The US Navy intended to use Auckland as a staging point into the Pacific and this led to the construction of deepwater wharfing facilities and of 50 ammunition magazines between 1942–23. The war ended in 1945 and within five years the complex had been abandoned, leaving only the army camp in Administration Bay which continued in use until 1958.

In 1943 the Public Works Department arranged the purchase of the island for the crown and Mr E. Bull was the first permanent farm manager, based in Home Bay. In 1949 a livestock quarantine station was opened on

Figure 2. Premier picnic, Home Bay, Motutapu, c. 1910. W Price ATL 1/2-001101-G.

Figure 3. Firing of the Moutapu guns during an exercise in c. 1957. DOC Auckland Conservancy collection.

Motutapu. The Motuihe quarantine facility had effectively closed from 1928, after which all imported stock were taken to Somes Island in Wellington Harbour.[2] Motutapu was incorporated into the Hauraki Gulf Maritime Park in 1967, and ownership was transferred to the Department of Conservation in 1987.

The present day landscape

The island's geology comprises Waipapa series greywackes, cherts and argillites, overlaid with Waitemata teritiary sediments, and later blanketed with Rangitoto ash. The Auckland Conservancy Register of Actively Managed Historic Places states "the cultural landscape of archaeological sites includes pre-eruption archaic campsites and stone tool manufacturing sites, 13 pa, numerous open settlements, midden deposits, storage pits, and agricultural areas. 372 archaeological sites have been documented and it is likely that many more subsurface deposits remain unrecorded" (DOC 1996). Some of the sites will have been damaged or destroyed by farming or military activity.

Pre-European settlement sites are spread across the whole island, with some apparent clustering on the western leeward side of the island around 'the mountain' and causeway stream catchments, and early Archaic settlements at open stream mouths and adjacent spurs. It has been suggested that settlements clustering around stream mouths and high number of distinct sites might be suggestive of a rotation garden system (Davidson 1978). Pa sites are present on most of the easily defendable coastal headlands, although the relatively small amount of habitable land enclosed within defensive earthworks compared to area of occupied open settlements led Davidson to conclude some of the open settlements may have been pallisaded without earthwork defences, and that settlement on Motutapu was most likely a "peace-time horticultural based occupation, with periodic episodes of stress leading to fort construction and use" (Davidson 1978).

There are three main areas associated with 19th century farming and these include associated remnant plantings (Brassey 1992). Home Bay retains the homestead, plantings, seawall and graves. Emu Bay has the foundations of 4 separate groups of buildings, remnant plantings and isolated Norfolk pines on high points of the island. No archaeological remains have yet been located at Station Bay where the remaining farm settlement is known to have been located.

[2] By the advent of immunisation and control of infectious diseases in the 1930s quarantine stations were considered obsolete. Motuihe's status for this purpose was however kept in force until the island was taken over for use as a Naval training facility in 1940.

The military structures on Motutapu comprise a largely intact WWII landscape including: the main 6" gun emplacement with 3 gun pits, underground magazines, shelters and stores; the battery observation post, engine and radar rooms; the Emu observation post and engine room for the anti-submarine defences; the ground level plotting complex with miniature range, plotting and generator rooms; the underground plotting complex with command exchange, radio, plotting generator, battery and fuel rooms, as well as access tunnels and corridors; the search light emplacements and directing station; personnel camps at Administration Bay and the battery; the US Navy magazines north of the causeway and store at Home Bay; and numerous pillboxes to protect the battery from a commando assault. The landscape also includes a number of roads, wharves and quarries.

The significance of the archaeological landscape, early farm settlements and military installation on Motutapu is recognised by the Department in the Conservation Management Strategy, and the sites themselves are actively managed. The significance of the Sunde site (R10/25) is further reflected in its scheduling in the Regional Plan: Coastal as a cultural heritage site for preservation (Schedule 1/134). The site and its environs are also scheduled as an Area of Significant Conservation Value (Schedule 3/64 and 3/124). There are 10 archaeological sites scheduled in the Auckland City Council Gulf Islands District plan (B3 3.16–25) and trees and graves are also scheduled (B1 1.32–3; B2 2.26). Military structures on Motutapu and Rangitoto are listed in the Regional Plan Coastal (798) and have been proposed for Registration as a Category I Historic Place.

Previous archaeological and historic research

The 1960–70s archaeological surveys and investigations on Motutapu have been well published in the Records of the Auckland Institute and Museum and New Zealand Archaeological Association Newsletter. The publications include accounts of excavations (Davidson 1970b, 1971, 1972, 1977; Golson and Brothers 1959; Leahy 1970, 1972, 1986; Nichol 1981; Scott 1970; Sullivan 1972), dating (Davidson 1974a, 1978c; Law 1975; Moore and Tiller 1975), analysis of faunal remains (Allo 1970; Clark and Duff 1979; Grange 1974; Smith 1981), lithic assemblages (Davidson 1974b; Ward 1974), human remains (Byrne 1973; Houghton 1977) and site recording surveys (Davidson 1970a, 1987; Law 1987), as well as prompting initial attempts at erosion control (Law 1973). They have been summarised on a local scale specific to the island (Davidson 1978a), and incorporated into both regional (Davidson 1975, 1978b, 1982; Bulmer and McDonald 1981) and national (Prickett 1982; Davidson 1984) syntheses. The discovery of the Rangitoto ash footprints during

1959	Auckland University excavations at Pig Bay archaic site	Golson and Brothers 1959: 5–8
1960	Auckland University excavations at the Sunde site	Scott 1970: 13–30
1963	University site recording begins – Davidson, Leahy and Nicholls record 72 sites	Davidson 1970: 1–12
1967-8	Auckland Museum excavations at Station Bay – N38/30,	Leahy 1970: 61–82; Davidson 1970b: 31–60
1970–1	Second season of excavation at Station Bay	Leahy 1972: 15–26; Sullivan 1972: 27–60; Davidson 1972: 1–14
1972–3	Systematic re-survey of Motutapu – Davidson records an additional 324 sites	Davidson 1987: 228–29
1972–3	Excavation of N38/140	Leahy 1986:160-66
1977	Davidson and Leahy complete re-survey, and identify an additional 98 potential sites	Davidson 1987: 229
1986	Histories and bibliographies for Motutapu and Rangitoto	Cottrell 1986; Coster and Spring-Rice 1986
1987	Law carries out check survey	Law 1987
1988	Nichol PhD Thesis, Auckland University	Nichol 1988
1991	History of Rangitoto compiled by Murdoch	Murdoch 1991
1992	Draft working plan for Motutapu Island	DOC 1992
1992	Archaeological survey and assessment of early European settlements	Brassey 1992
1993	Public workshop for developing a strategy for Motutapu	Proceeds on file
1993	Restoration Working plan developed for Motutapu	Hawley 1993
1994	Ross MA Thesis, Auckland University	Ross 1994
1994–5	Auckland University geophysical investigation and test excavation R10/410	Ross 1994; Irwin et al 1997: 266–77
1994–5	Auckland University archaeological survey in northern and southern quarters of island	Irwin, Ladefoged and Wallace 1996: 254–58
1995	Vegetation management case studies prepared for specific archaeological sites (R10/26, R11/213, R11/218) with general comments on wider landscape	Jones and Simpson 1995 18–26
1995	Palynological study of Pig Bay and Billy Goat Point swamps to determine late Holocene Vegetation	Elliot 1995
1995–6	Auckland University geophysical investigations and test excavation at R10/22; 39; 47; 496; 497; R11/1277	Irwin et al 1997: 226–77
1996	Dougherty MA Thesis, Auckland University	Dougherty 1996
1996	Auckland University archaeological survey in central southern part of island	Irwin, Ladefoged and Wallace 1996: 254–58
1997	Conservation Plan completed for military structures	Pearson 1997
1997	Conservation plan completed for Reid Homestead	Sharley 1997
1997	Identification and arboreal assessment completed for heritage vegetation	Arborlab 1997
2001	Remedial and Maintenance specifications prepared for military structures	Salmond Reed 2001
2003	Heritage Assessment completed for Administration Bay camp	Pearson 2003
2003	Auckland City Council Inner Gulf Islands archaeological survey and significance assessment carried out the survey and data was made available for Auckland City Council GIS	Clough and Associates
2007	Heritage Assessment for Motutapu archaeological landscape completed	Dodd in prep

Table 1. Summary of Historic Research and Archaeological Investigations.

Figure 4. Eroded ash block from Sunde site R10/25.

1980s excavation of the Sunde site (Nichol 1981, 1982, 1988) rekindled and furthered discussions on dating (Nichol 1992; McFadgen 1996; Lowe 2000), and prompted revised assessments of significance (Black et al. 1991; McKay 1982; Nichol 1983), and renewed attempts at site management (Jones and Simpson 1995: 18–26) and stabilisation (Coster and Spring-Rice 1984; Collen 1983, 1984).

In the 1990s it was the prospect of re-forestation proposed in the draft working plan 1992 of the island that sparked renewed academic interest. University of Auckland field survey, geophysical prospecting and excavations were undertaken between 1994–96 to assist in the management of the archaeological landscape (Irwin et al. 1996, 1997; Phillips 1995), and the island was included in case studies for archaeological site stabilisation and vegetation management (Jones and Simpson 1995).

More recently the Auckland City Council's Inner Gulf Island project for the revised district plan, and the Auckland Conservancy contribution to the NZAA upgrade project (Dodd 2006) and internal assessments for all actively managed sites (Dodd in prep) have provided the stimulus for updating archaeological information. Field assessments undertaken by DoC archaeologists for routine farm management and restoration planting also include a significant amount of information on individual sites (held on file HHA–02–01–02–01; DOC010–40).

Detail and consistency in site data is imperative for any information upgrade and program or management regime, and this has been stated ex-

plicitly in the case of Motutapu (Davidson 1987: 227–32; Jones and Simpson 1995: 19). Attempts have been made to create complete data sets for the island a number of times, but constraints such as time and funding have limited their effectiveness. Nevertheless, considerable advances have been made in landscape based site recording using Motutapu as a subject case in areas such as intensive field recording (Davidson 1978a), individual feature distribution across a defined area to lump and split sites (Dougherty 1996; Irwin et al. 1996) and consistency in significance assessment (Clough and Associates).

A considerable amount of research also been undertaken on the history and oral traditions of Motutapu. Many of the Maori traditions were derived from the Maori Land Court records and made more publicly accessible first by Graham (1920, 1921, 1922, 1951), and Kelly (1949), with more recent synthesises by Simmons (1984), Murdoch (1991) and Monin (1996). Unpublished local histories and extensive bibliographies have been compiled for Motutapu and Rangitoto are available in Department of Lands and Survey reports (Cottrell 1984; Coster and Spring-Rice 1984). Historic research and archaeological survey and assessment of the 19th century farming were undertaken (Brassey 1992) and followed by identification and proposed arboreal treatment for significant vegetation at Home Bay and Emu Bay (Arborlab 1997). The Reid homestead and military installations are subject to Conservation plans (Sharley 1997; Pearson 1997).

Reserve management − pressures

Recreational/visitor impact

Motutapu's Recreation Reserve classification is the most enabling, allowing for a wide range of use, and preservation, of open space. The visitor numbers are estimated at 15,000 per annum and the reserve classification allows for a range of recreational activities such as camping, walking, tree planting and the provision of facilities as required such as a walking track network, campground shelters and toilets, and a recreation review has identified the potential for mountain biking. All of these require some degree of infrastructure and bring additional pressures on preservation of the archaeological landscape. Walkways are poled routes rather than cut tracks but include provision of stiles, marker posts and signage which may impact of archaeological deposits.

Farming operations

Although farming the island is intended as a means of managing the island's intrinsic conservation values in an open space environment it has also led to additional pressures. The present day arrangement of paddocks and

fence lines is largely a product of farm operations rather than the management of natural and historic values within that framework. A loosely framed concession has also meant that it has been difficult to control the impact of stock, and the day-to-day running of the farm which has required pasture replenishment, relocation of fence lines, disposal of rubbish and offal and formation of vehicle access routes. The expiry of the current farm lease in 2010 will allow for renegotiation of a lease that better integrates farming practices with Departmental operations and the management of historic and natural values.

Native revegetation

The revegetation of Motutapu was proposed in the early 1990s and reached the stage of having a working plan produced. Numerous submissions were received requesting that cultural values be given higher priority. A public workshop was held in 1993 and a restoration plan developed in the following year (Hawley 1993:2). The Motutapu Restoration Trust was formed to restore the cultural and natural landscape of Motutapu (MRT website: http://www.motutapu.org.nz/). In addition to planting, the Motutapu Restoration Trust is actively involved in the maintenance, repair and interpretation of historic heritage fabric on Motutapu including the Reid homestead and numerous military installations.

It is accepted that to reproduce the pre-human ecology of Motutapu would be an 'unattainable goal' so it is instead stated that one of the goals of the restoration programme is to see the island restored to the state of a functioning ecosystem (Miller et al. 1994: 69; Hawley 1993: 3). The rate and area proposed for active planting vary from 1000 ha by 2020 at a rate of 35 ha per annum (Miller et al. 1994: 79) to more conservative 5 year working plans which encourage the management of the majority of archaeological sites under grazed pasture (Hawley 1993: 11)

One of the key drivers for the ecological restoration of Motutapu is the preservation of biodiversity values on adjoining Rangitoto (Miller et al. 1994: 67). Rangitoto is an internationally significant botanical landscape because of the opportunity to observe the vegetative colonisation of a lava surface. The island is also unique as the only surviving pohutukawa forest. With Rangitoto and Motutapu linked by a causeway and mudflats at low tide, the ecology of the two islands is interlinked, and control of key weed species such as rhamnus, privet, honeysuckle and pampas is important to both islands as these species have a tendency to colonise and force out native vegetation. With the exception of pampas these weeds are bird dispersed and as the revegetation programme continues increasing numbers of birds will be attracted to the

island furthering the spread of seed this is a key component of the restoration sequence (Cashmore 1995: 76).

Another key issue of the ecological restoration of Motutapu is the protection and development of wetlands. Wetlands are in decline on the mainland and are particularly rare on islands. Motutapu has several large stream catchments and broad swampy valleys which make it particularly significant in this regard (Miller et al. 1994: 76).

Carbon sequestration

In early 2007 individual Conservancies have been asked to provide additional open land to revegetate for the purpose of establishing Kyoto-compliant carbon sinks. Much of the land that the Department manages for open space has been managed to protect values that are best preserved as such, and many of them are important archaeological landscapes. Hauraki Gulf islands proposed for further revegetation in this scheme included Motuihe, Rakitu, and Motutapu.

Response to pressures

To date the response to infrastructure and planting proposals has been to assess the vicinity of the proposed activity to identify and locate archaeological sites and determine their extent to avoid adverse effects. For tree planting, the response from staff advocating historic protection has typically been to resist additional planting, but for areas where it is resolved that planting will go ahead archaeological sites are then battened off and the sites excluded from planting to prevent damage from root growth. This has not been ideal for a number of reasons:

- the response has been largely reactive in response to pressure;
- the mitigation is frequently not adequately resourced; and
- archaeological data has often been vaguely defined, and infrastructure and planting areas have not been pre-determined specifically for the minimization of impact on archaeological areas.

The response to tree planting pressure in particular is not ideal. Marking out archaeological site boundaries for exclusion has not always been successful, resulting in some sites being inadvertently planted and seedlings being removed (Dodd 2002). Leaving pockets of unplanted pasture among revegetated paddocks with no access routes will result in areas susceptible to weed infestation. Patchwork type arrangements of planting also exacerbate the ‘edge-effect’ where a greater length of transitional edge between planted and unplanted areas will result in greater susceptibility to colonisation from wind dispersed weeds. Stock grazing controls both pasture and weed growth

and once stock have been removed weeds will establish in the absence of ongoing control. Small pockets left unplanted will eventually succeed naturally to woody vegetation as seed is further dispersed and seedlings left to grow. Ultimately the end result is the same regardless of whether the sites are planted or avoided, and the compromise has served neither ecological nor archaeological purpose. This has the effect of a negative advocacy for the protection of archaeological heritage, especially among recreational tree planters.

It has been noted that vegetation management for archaeological protection and native restoration are quite separate and require different approaches (Jones 2007: 35). In regimes where the principle objective is native planting archaeology is viewed as a hurdle and staff advocating for its protection are seen as killjoys. After all, these days in light of impending climate change it is one's moral obligation to plant more trees but not to preserve one's historic heritage.

The real irony is that tree planting has many critics amongst ecologists too. The planting of trees over a landscape to accelerate succession effectively creates a native garden, as opposed to restoring natural forest. While a considerable amount of care goes into selecting species already present in the local environment or identified as present in the past as a result of archaeological investigations, as well as taking care to source seed and propagating plants on the island to reduce the introduction of disease, the act of planting trees creates a somewhat un-natural pattern of vegetation. Few people planting the trees realise that the trees planted today are not the ones that will be present in fifty years time. The real value of the project is often seen as getting people behind conservation and actively involved (Miller et al. 1994: 81).

GIS aided reserve management

Creation of a complete GIS overlay for the historic features has allowed for the more accurate location of archaeological features in relation to the landscape as well as management features including roads, fence lines and planting areas. Until recently the proliferation of site data has not been well managed and has been the source of more confusion than integrated management. The 1993 working plan afforded good objectives for the protection of sites and the resulting research provided good site information but lacked a framework to bring it together into coordinated management direction. With GIS the spatial information is used to identify specific areas where archaeological features have not been recorded, and these can be investigated and assessed as to their appropriateness for revegetation. Targeting areas with relatively low density of archaeological sites minimises constraints on planting in these areas and mitigates the impact on the wider archaeological landscape.

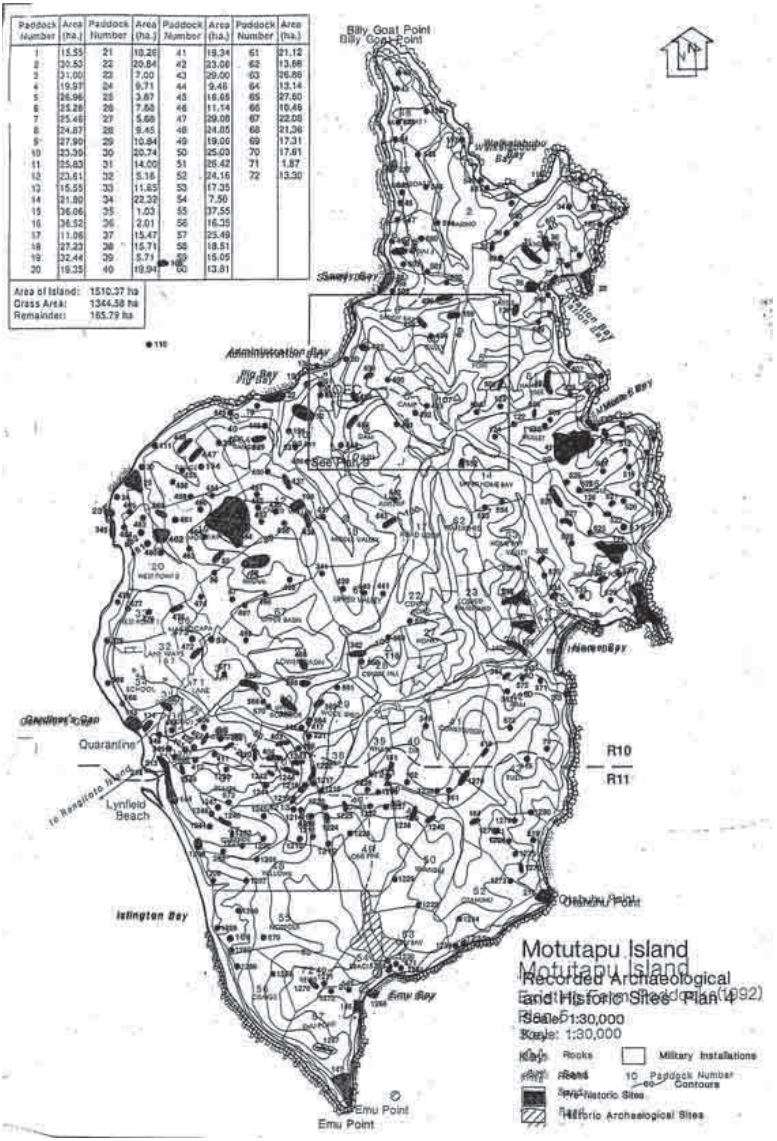

Figure 5. Attempt at using base maps and overhead transparencies to mimic GIS functionality. Having the mylar sheet on top also afforded a degree of weather resistance, but still sucked on a windy day

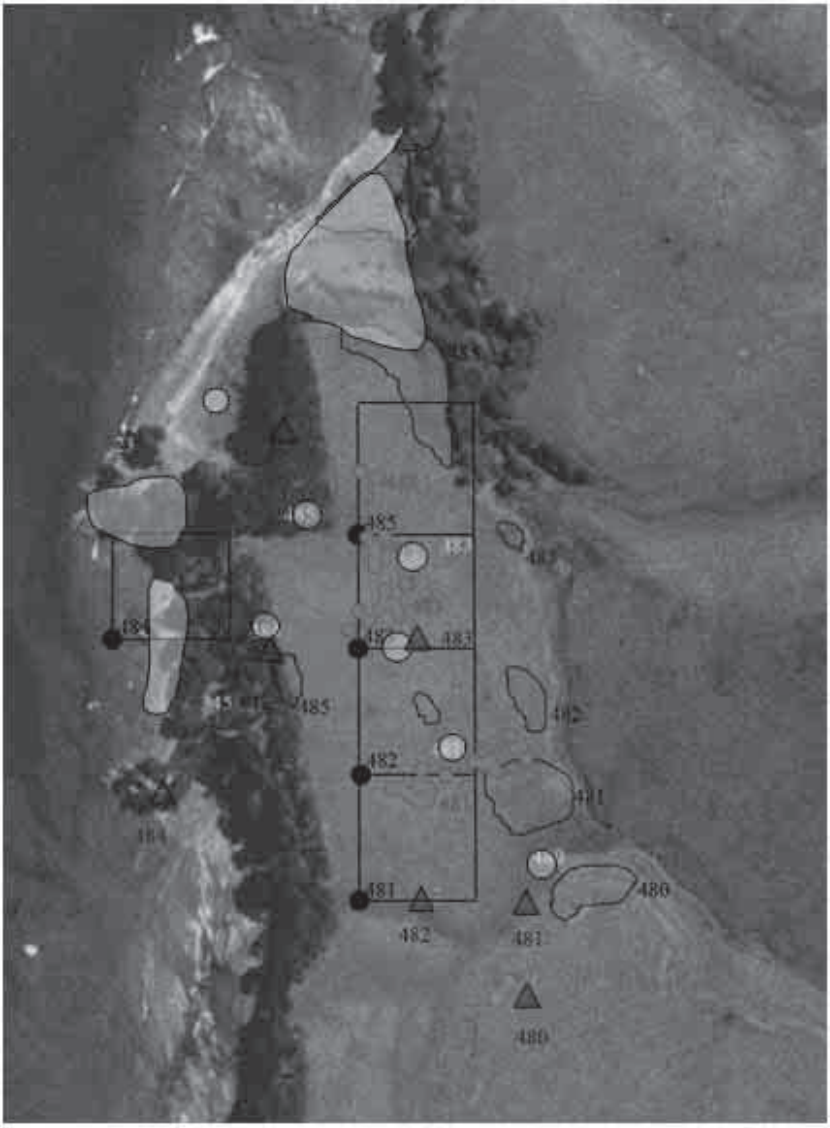

Figure 6. The numerous pre GPS/GIS attempts at defining site location caused problems in defining usable area and avoiding site damage. Data was often distorted during transfer.

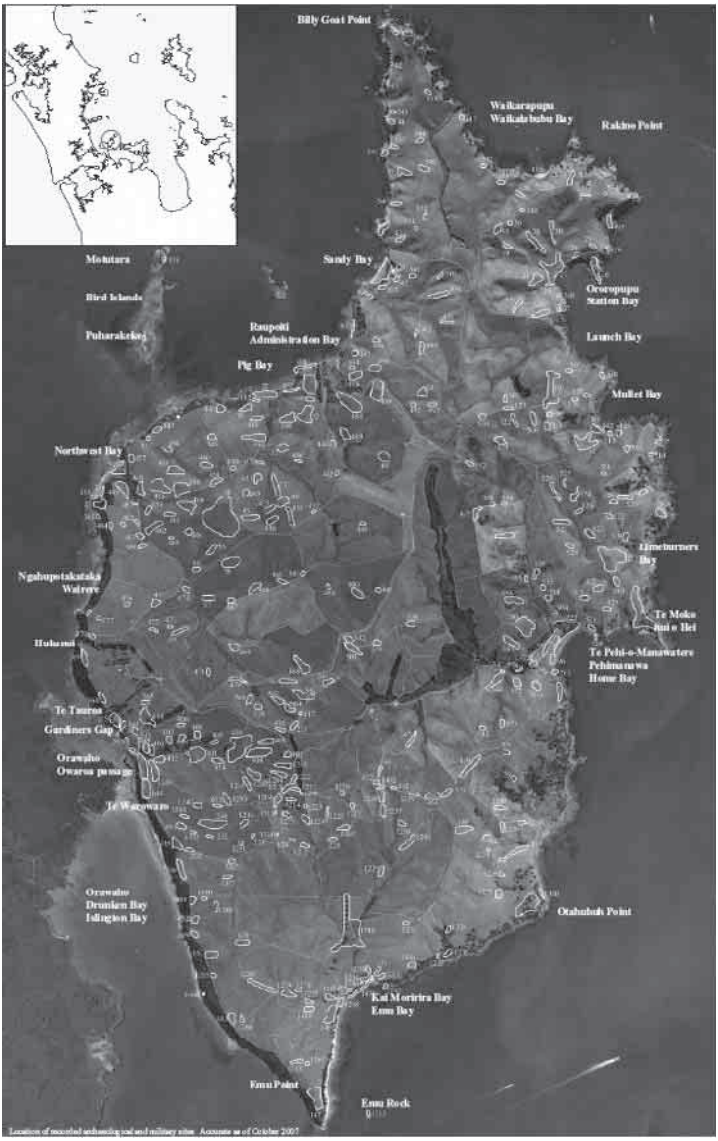

Figure 7. Location of recorded archaeological and military sites Accurate as of October 2007.

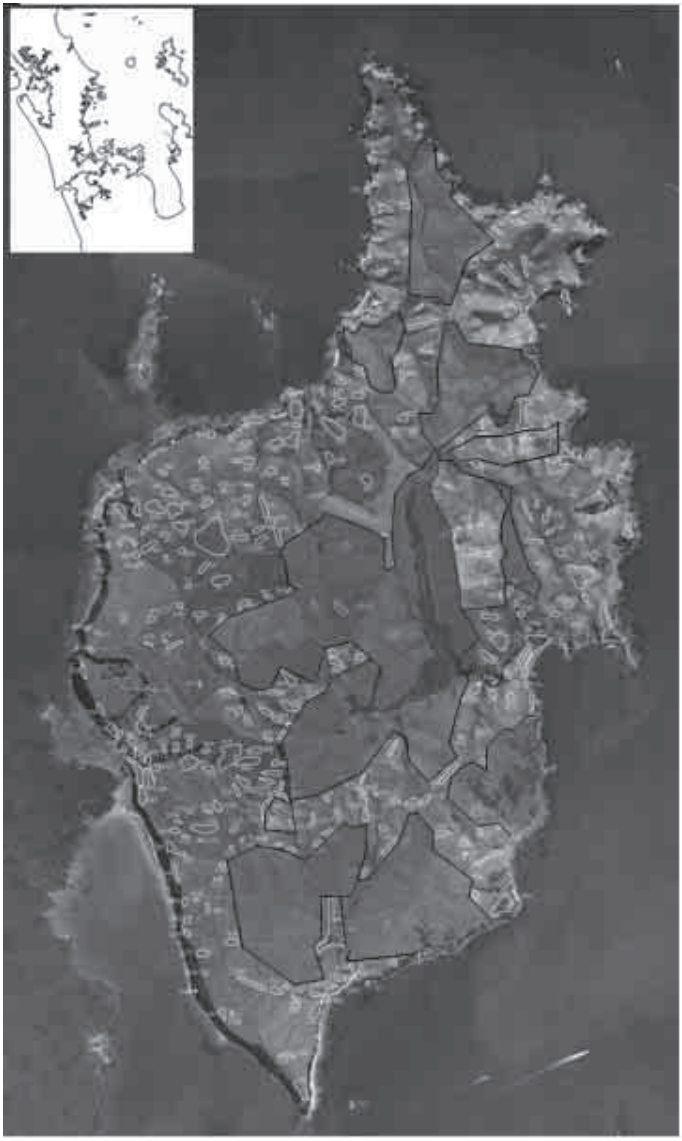

Figure 8. Scenario were c. 300 ha could be made available for sequestration planting including whole catchments with minimal alteration of existing fence lines. Lighter areas are those where planting has already been undertaken.

To improve farm management individual paddock boundaries and fence lines need to be repositioned to section off areas with archaeological and natural values, provide suitable areas to retire from grazing for planting, and allow manageably sized paddocks for stock grazing while still providing practical stock and vehicle access. A well designed program of restoration that incorporates a holistic approach will have significantly lower on-going costs both in maintaining open areas and weed control. Part of this will be the consolidation of revegetated areas both to reduce the edge effect and to aid in management of open space. By concentrating planting into whole catchments it is also possible to maximise ecological benefit as this effectively combines terrestrial and stream ecosystems.

While considerable benefits can be achieved with minimal alteration of current paddock boundaries, carbon sequestration may provide the opportunity and cash injection necessary to carry out a more comprehensive approach that incorporates more intensive management of small isolated archaeological sites such as capping deposits beneath geotextile and fill to provide a buffer against root penetration (Jones 2007: 58–61). Succession resistant vegetation could also be selected for these sites. A further advantage of the proposed refencing is that it allows for the planting of certain stream catchments and potential wetland areas as well as inter-connecting revegetated areas which maximises the ecological benefit of planting both by keeping stock away from stream courses and providing an acceptable area for the reintroduction of native fauna.

It remains to be seen if this presents an acceptable alternative to previous plans, but it demonstrates some useful considerations, and has some similarities with a Conservation Plan approach. Proactively identifying areas of lesser archaeological significance can pre-empt pressures on the archaeological landscape. Once a course has been set and funded, it is more difficult to steer it away from adverse effects. Incorporation of the objectives of ecological restoration also facilitates finding an acceptable compromise that better suits both agendas. It focuses on the wider long-term picture and so is likely to achieve better results. The 1993 plan was written as a 5 year working plan and its revision is well overdue. Mapping technology and archaeological site information has improved considerably since 1993, and while the plan advocated the conservation of archaeological sites through managed grazing and gradual repositioning of fences and infrastructure, the selection of areas for replanting was not ideal from an archaeological perspective. Creation of an archaeological GIS layer does not replace the need for revision of the working plan, or a conservation plan for the archaeological landscape, but will assist considerably in the protection of the archaeological landscape, the preparation

of future plans and also provide clearer direction for management decisions in the interim. Good control of information both in terms of consistency and detail is imperative to achieving protection on Motutapu, as is a management framework that allows its application.

References

Allo, J. 1970. Analysis of midden from two sites on Motutapu Island, New Zealand. *Records of the Auckland Institute and Museum*, 7: 83–91.

Arborlab, 1997. Historic trees – Motutapu Island. Unpublished report A10172 prepared for Department of Conservation

Black, T.M., S.B. Nowell and B.W. Hayward 1991. *Inventory of Geologically-related Historical Sites and Features of International, National and Regional Importance*. Geological Society of New Zealand Miscellaneous Publication, No.52. Geological Society of New Zealand, Lower Hutt.

Brassey, R.J.N. 1992. An archaeological survey of historic places associated with European settlement on Motutapu Island 1840–1935. Unpublished draft report, Department of Conservation, Auckland.

Bulmer, S. and J. McDonald 1981. Archaeological sites of the Hauraki Gulf Maritime Park. Unpublished report to the New Zealand Historic Places Trust 1981/7

Byrne, D. 1973. Prehistoric coprolites: a study of human and dog coprolites from prehistoric archaeological sites in the North Island of New Zealand. Unpublished M.A. Thesis, University of Auckland.

Cashmore, P. 1995. Revegetation ecology on Tiritiri Matangi Island and its application to Motutapu Island. Unpublished MSc Thesis, University of Auckland.

Clark, C. and L. Duff. 1979. Midden remains collected from an eroded block of Rangitoto ash, Sunde site, N38/24 Motutapu. In A. Sullivan (ed.) Unpublished Class Projects. Anthropology Department, Auckland University

Collen, M. 1983. Erosion protection; Sunde archaeological site, Motutapu Island. Unpublished ms, Ministry of Works and Development NP24/6

Collen, M. 1984. Erosion protection; Sunde Archaeological Site, Motutapu Island. Unpublished report, Ministry of Works and Development NP24/6

Coster, J. and W. Spring-Rice, W. 1984. History, archaeology and site management on Motutapu and Rangitoto. Unpublished report for Department of Lands and Survey, Auckland.

Cottrell, N. 1986. A history and bibliography of Motutapu and Rangitoto Islands. Archaeological and Historical Reports, No.13. Department of Lands and Survey, Auckland.

Dave Pearson Architects. 1997. The military installations of Motutapu Island: A Conservation plan. Report prepared for the Motutapu Island Restoration Trust.

Davidson, J.M. 1970a. Survey of Archaeological Sites on Motutapu Island, New Zealand. *Records of the Auckland Institute and Museum*, 7: 1–12.

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

Davidson, J.M. 1971. Fieldwork on Motutapu Island, Hauraki Gulf. *New Zealand Archaeological Association Newsletter*, 14(3): 80–81.

Davidson, J.M. 1972. Archaeological investigations on Motutapu Island, New Zealand. *Records of the Auckland Institute and Museum*, 9: 1–14.

Davidson, J.M. 1974a. Radiocarbon dates from the Sunde Site (N38/24), Motutapu Island, New Zealand. *Records of the Auckland Institute and Museum*, 11 :9–10.

Davidson, J.M. 1974b. Further identifications of sources of obsidian flakes from N38/37 on Motutapu Island, New Zealand. *Records of the Auckland Institute and Museum*, 11: 11–12.

Davidson, J.M. 1975. Archaeological sites in the Auckland Region. Auckland Regional Authority Planning Division

Davidson, J.M. 1977. Final report on excavations at the Sunde site. Unpublished report to the New Zealand Historic Places Trust, Wellington.

Davidson, J.M. 1978a. The prehistory of Motutapu Island, New Zealand: five centuries of Polynesian occupation in a changing landscape. *Journal of the Polynesian Society*, 87(4): 327–337.

Davidson, J.M. 1978b. Auckland prehistory: a review. *Records of the Auckland Institute and Museum*, 15 :1–14.

Davidson, J.M. 1978c. Radiocarbon dates for three sites at Station Bay, Motutapu Island. *Records of the Auckland Institute and Museum*, 15: 15–16.

Davidson, J.M. 1981. The Polynesian foundation. In W.H. Oliver and B.R. Williams (eds) *The Oxford History of New Zealand*, 3–27. Oxford University Press, Wellington.

Davidson, J.M. 1982. Auckland. In N. Prickett (ed) *The First Thousand Years: Regional Perspectives in New Zealand Archaeology*, 28–48. New Zealand Archaeological Association Monograph No.13. Dunmore Press, Palmerston North.

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

Davidson, J.M. 1987. Fourteen years of site recording on Motutapu Island: A Cautionary Tale. *New Zealand Archaeological Association Newsletter*, 30(4): 227–238.

Department of Conservation 1992. A draft working plan for the revegetation of Motutapu. Unpublished draft report, Department of Conservation, Auckland.

Dodd, A. 2002. Mullet Bay restoration planting, Motutapu, Hauraki Gulf. Unpublished report to the New Zealand Historic Places Trust.

Dodd, A. 2006. NZAA Site Recording Scheme Upgrade Project: Department of Conservation Auckland Conservancy. Stage 1 review. Unpublished report prepared for the Department of Conservation and the New Zealand Archaeological Association

Dodd, A (in prep). Motutapu historic and archaeological landscape: heritage assessment.

Dogherty, M. 1996. Motutapu Revisited. Unpublished MA Thesis, University of Auckland

Elliot, M. 1995. Motutapu Island Late Holocene vegetation history: A REPORT to the Regional Conservator, Auckland Conservancy, Department of Conservation. Unpublished report

Golson, J. and R.N. Brothers 1959a. Excavation at Motutapu. *New Zealand Archaeological Association Newsletter*, 2(2): 5–8.

Grange, C. 1974. A comparison between shellfish species seen today and those found at the Sunde Site, Motutapu Island. In A. Sullivan (ed) Working papers in Archaeology, 33, 53–56. Department of Anthropology, University of Auckland.

Graham, G. 1920. The wars of Ngati-Huarere and Ngati-Maru-Tuahu of Hauraki Gulf. *Journal of the Polynesian Society*, 29: 37–41

Graham, G. 1921. Te Tuhi-a-Manawatere and other legends of Marei-tai, Auckland. *Journal of the Polynesian Society*, 30: 252–253.

Graham, G. 1922. Te Heke-o-Nga-Toko-Toru (The Migration of the Three). *Journal of the Polynesian Society*, 31: 190–192.

Graham, G. 1951. Tainui. *Journal of the Polynesian Society*, 60: 80–92.

Grattan, F.G. 1948. *Official War History of the Public Works Department*. Public Works Department, Wellington.

Hawley, J. 1993. Motutapu restoration working plan. Department of Conservation, Auckland Conservancy, Auckland.

Houghton, P. 1977. Prehistoric burials from recent excavations on Motutapu Island. *Records of the Auckland Institute and Museum*, 14: 37–43.

Irwin, G. J., T.N. Ladefoged and R.T. Wallace 1996. Archaeological fieldwork in the inner Hauraki Gulf 1987–1996. *Archaeology in New Zealand*, 39(4): 254–263.

Irwin, G.J., T.N. Ladefoged, R.T. Wallace, M.D. Jones, S.C.L. Ross and S.D. Clout, 1997. Experimental geophysical survey on Motutapu Island 1994–96. *Archaeology in New Zealand*, 40(4): 266–277.

Jones, K. L. and P.G. Simpson 1995. *Archaeological Site Stabilisation And Vegetation Management. Case Studies 2: Auckland and Northland, Otago and Canterbury, and Wellington*. Science and Research Series, 90. Department of Conservation, Wellington.

Jones, K.L. 2007. *Caring for Archaeological Sites: Practical Guidelines For Protecting And Managing Archaeological Sites in New Zealand*. Department of Conservation, Wellington

Kelly, L.G. 1949. *Tainui – The story of Hoturoa and his Descendants*. Polynesian Society, Wellington

Law, R.G. 1973. Prevention of wave erosion of an archaeological site, Motutapu Island. Unpublished report to Department of Lands and Survey.

Law, R.G. 1975. C14 dates from Rangitoto and Motutapu: a consideration of dating accuracy. *New Zealand Journal of Science*, 18: 441–451.

Law, R.G. 1987. Site survey methods and standards: a check survey of Motutapu Island. *New Zealand Archaeological Association Newsletter*, 30(1): 16–26.

Leahy, A. 1970. Excavations at site N38/30, Motutapu Island, New Zealand. *Records of the Auckland Institute and Museum*, 7: 61–82.

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

Leahy, A. 1986. Excavations at site N38/140, Motutapu Island, Auckland. *New Zealand Archaeological Association Newsletter*, 29(3): 160–166.

Lowe, D., R. Newnham, B. McFadgen, and T. Higham 2000. Tephras and New Zealand archaeology. *Journal of Archaeological Science*, 27: 859–870.

McFadgen, B. 1996. Re: Dating the Rangitoto ash and its implications. *Geological Society of New Zealand Newsletter*, 109: 4–5

McKay, J. 1982. Motutapu, Sunde site. Unpublished ms, Department of Conservation.

Miller, C., J. Craig and N. Mitchell 1994. Ark 2020: a conservation vision for Rangitoto and Motutapu Islands. *Journal of the Royal Society of New Zealand*, 24(1): 65–90

Moore, P. and E. Tiller. 1975. Radiocarbon dates for New Zealand archaeological sites. *New Zealand Archaeological Association Newsletter*, 18(3): 98–107

Monin, P. 1996. The Islands lying between Slipper Island in the south-east, Great Barrier Island in the north and Tiritiri-Matangi in the north west. Report for the Waitangi Tribunal on the Hauraki Gulf Islands. Wai 406 # 7

Murdoch, G. J. 1991. He korero tawhito mo Rangitoto: a brief outline of the Maori historical association with Rangitoto Island. Department of Conservation, Auckland.

Nichol, R.K. 1981. Preliminary report on excavations at the Sunde Site, N38/24, Motutapu Island. *New Zealand Archaeological Association Newsletter*, 24(4): 237–256.

Nichol, R.K. 1982. Fossilised human footprints in Rangitoto ash on Motutapu Island. *Geological Society of New Zealand Newsletter*, 55: 11–13

Nichol, R.K. 1983. An assessment of the archaeological importance of the Sunde Site, N38/24, at West Point on Motutapu Island. Unpublished ms, Department of Lands and Survey.

Nichol, R.K. 1988. Tipping the feather against the scale: archaeozoology from the tail of the fish. Unpublished PhD Thesis , University of Auckland.

Nichol, R. 1992. The eruption history of Rangitoto: reappraisal of a small New Zealand myth. *Journal of the Royal Society of New Zealand*, 22: 159–180

Phillips, C. A 1995. Note on field school excavation at Motutapu. Archaeology in New Zealand, 38(2): 78.

Prickett, N. (ed) 1982. *The First Thousand Years: Regional Perspectives in New Zealand Archaeology.* New Zealand Archaeological Association Monograph, 13. Dunmore Press, Palmerston North

Robertson, D. 1986. A Paleomagnetic study of Rangitoto Island, Auckland, New Zealand. *New Zealand Journal of Geology and Geophysics*, 29: 405–411

Ross, S.C.L 1994. Image Classification of Archaeological Geophysical Data, Unpublished M.A. Dissertation, University of Auckland.

Scott, S.D. 1970. Excavations at the "Sunde Site", N38/24, Motutapu Island, New Zealand. *Records of the Auckland Institute and Museum*, 7: 13–30.

Sharley, H. 1997. Reid homestead, Motutapu Island: conservation plan for the Motutapu Island Restoration Trust.

Simmons, D.R. 1984. Motutapu. Appendix to J. Coster and W. Spring-Rice, History, archaeology and site management on Motutapu and Rangitoto. Unpublished report. Department of Lands and Survey, Auckland.

Smith, I.W.G. 1981. Mammalian fauna from an Archaic Site on Motutapu Island, New Zealand. *Records of the Auckland Institute and Museum*, 18: 95–103.

Sullivan, A. 1972. Excavation of a pit at Station Bay Motutapu Island. *Records of the Auckland Institute and Museum*, 9: 27–60.

Turton, H. 1882. *Maori Deeds of Old Private Land Purchases in the North Island of New Zealand*. Government Printer, Wellington.

Ward, G.K. 1974. Source of obsidians from the Motutapu undefended site N38/37. *Records of the Auckland Institute and Museum*, 11: 13–14.