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The location of Heke's Pa, Te Kahika, Okaihau, New Zealand: a field analysis

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ABSTRACT

The paucity of field evidence of the Maori fortification which the British unsuccessfully attacked on 8 May 1845 has allowed difference of opinion as to its location. In this report, a cumulative case is presented in favour of an area where field remains, including a boulder filled pit, survive. The case is based on the accounts, topographical sketches and sketch maps of eyewitnesses, on the ranges of the weapons employed, on tactical considerations, on reports from the period 1899–1919, and on magnetometer, contour and general field surveys.

Key words: OKAIHAU, HONE HEKE, GUNFIGHTER PA, MAORI WARS, FIELDWORK, MAGNETOMETER.

INTRODUCTION

Te Kahika, otherwise known as Puketutu, was the fortification where Hone Heke successfully resisted an assault by British forces on 8 May 1845. The battle of Okaihau was the first set piece engagement of the Northern War. The British force consisted of 300 regulars of the 96th and 58th Regiments, 40 European volunteers, and 120 seamen and marines from Her Majesty's Ships *North Star* and *Hazard*, under the command of Lieutenant-Colonel William Hulme. There were no cannon, but high expectations were held of Congreve rockets. The fittest troops were appropriately equipped to assault the *pā*. Heke and about 200 men lay in the *pā*. Kawiti and about 140 warriors were concealed in the bush, unknown to the British. (For these and other historical details, see Belich 1986: 41–43.)

PERFORMANCE OF THE WEAPONS

Knowledge of the performance of the weapons employed is necessary to the understanding of any battle. The primary firearm in this engagement was the musket. It is thought that the British forces at Te Kahika used a percussion musket of 1839 pattern. The weaponry of Heke, Kawiti and their men may have included some percussion muskets alongside mainly flintlock muskets. Although the percussion system improved the reliability of ignition and gave marginally better range and accuracy, the performance of the percussion and the flintlock musket had similar ballistic characteristics. The bullet dropped rapidly beyond point blank range of about 75 yards [69 m]. (Point blank range is the range in which the bullet strikes a target towards which the gun is held level.) Muskets were smooth bored, muzzle loading weapons, which demanded a loosely fitting bullet for easy ramming. This resulted in poor accuracy and lack of range.

In a series of official experiments in 1846, musket fire was directed against a target 11 ft 6 in. high by 6 ft [approximately 3.4 x 1.8 m] wide (Blackmore 1961: 26). At a range of 250 yards [230 m] ten shots all missed, and at 150 yards [137 m] half the shots hit the target. The report concluded that musketry fire should not be attempted at a distance exceeding 150 yards and certainly not exceeding 200 yards [183 m], as beyond that range ammunition would be wasted. These results were produced with a large target in good conditions. In action there would be a fair chance of hitting a single man at 80 yards [73 m], little chance at 150, and none at 200 yards. The percentage of correctly discharged shots hitting a wider target such as a line of infantry might be 50% at 100 yards [91 m] and 30% at 200 yards (Hughes 1974: 30). There is consistent support for the assumption that 200 yards was the range beyond which the musket would have made little contribution to the action (Bailey 1972; Barthorp 1979: 35; Blackmore 1961: 226; Clunie 1977: 86–87; Hughes 1974).

A useful contemporary remark is "It is wonderful how few men are killed with muskets... the bullets nearly always went too high, and few hit what they aimed at during that period" (Webster 1908: 213–4). Where documentary sources refer to effective gunshot range, a distance of 200 yards or less is likely. A distance of 300 to 400 yards should be considered extreme and ineffective range under battle conditions.

The British brought no cannon to Okaihau but they did attempt to breach the palisades of the fortification with rockets. The Congreve rocket had a 15 ft [4.6 m] tail stick, and a cylindrical iron head, 4 in. [10 cm] in diameter and 3 ft [91 cm] long, packed with gunpowder and a shell which exploded on impact. It was fired from a tube supported on an iron framework (see Fig. 8). The maximum range was 3500 yards [3200 m], but the rocket's flight was erratic and unpredictable (Naylor 1960: 32–33; F. Clunie, personal communication). Reports of the use of rockets at Te Kahika indicate that twelve were fired. The first two created momentary alarm (Hulme 1845b): the first swerved, fell short, and ricocheted over the *pā* (Maning 1884: 237), and the second cut through the palisade (Johnson 1845). The missing post was quickly replaced (Marmon 1882). The remainder of the rockets were ineffective.

THE DOCUMENTARY SOURCES

Hone Heke built the *pā* "not far from Taumata Tutu, on the clear ground by the lake, for he said he would fight the soldiers on the spot where the last words of Hongi Ika had been spoken" (Maning 1884: 233). Taumata Tutu was the point or promontory into Lake Omāpere (Mawhe) on which Hongi's old *pā*, Tapuaeharuru, was situated (Fig. 1).

The site lay two or three miles south of Tamati Waka Nene's camp at Okaihau, from which position the British advanced on the *pā* (Fifty Eighth Regiment n.d.: 258; Webster 1908: 267; see Fig. 3: "Road from Waka's Pah by which the Forces advanced"). The site lay about half a mile [0.8 km] north of Tapuaeharuru (Burrows 1886: 21). (Distances in imperial measures are drawn from historical sources; metric equivalents are approximate only.) The later main road intersected or ran within a few feet of the site (Cowan 1922: 39, 45; Best 1927: 391; Duncan 1905; Maxwell 1899). Maps contemporary with the battle show Heke's *pā* opposite the Taumata Tutu promontory (Figs 2 and 3).

In recent years the precise location of Te Kahika has been disputed. Four positions, spaced along the northern approach to Tapuaeharuru, have claimed attention: A, X, Y and Z on Figure 1. Site Z is a series of rounded hollows on a gentle slope. Hill A has no field

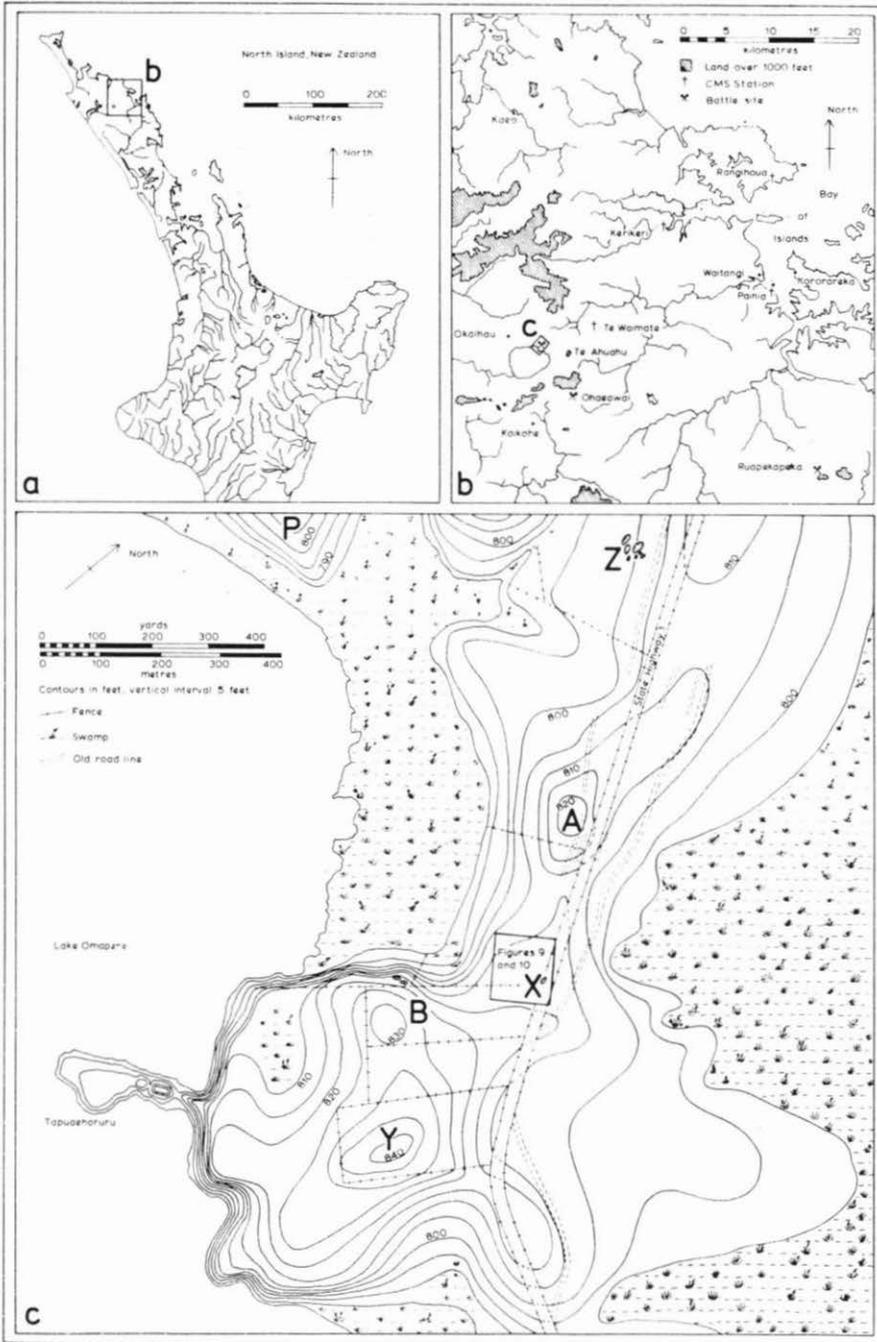


Figure 1: Location map: Heke's pā, Okaihau.



Figure 2: "Sketch map of routes between the Bay of Islands and Hokianga Harbour, showing native paths and positions of hostile natives on 8 May and 1 July 1845". Signed Robt. Fitzroy, dated 10 July 1845. Courtesy of Public Record office, London, Reference MPH 77(4).

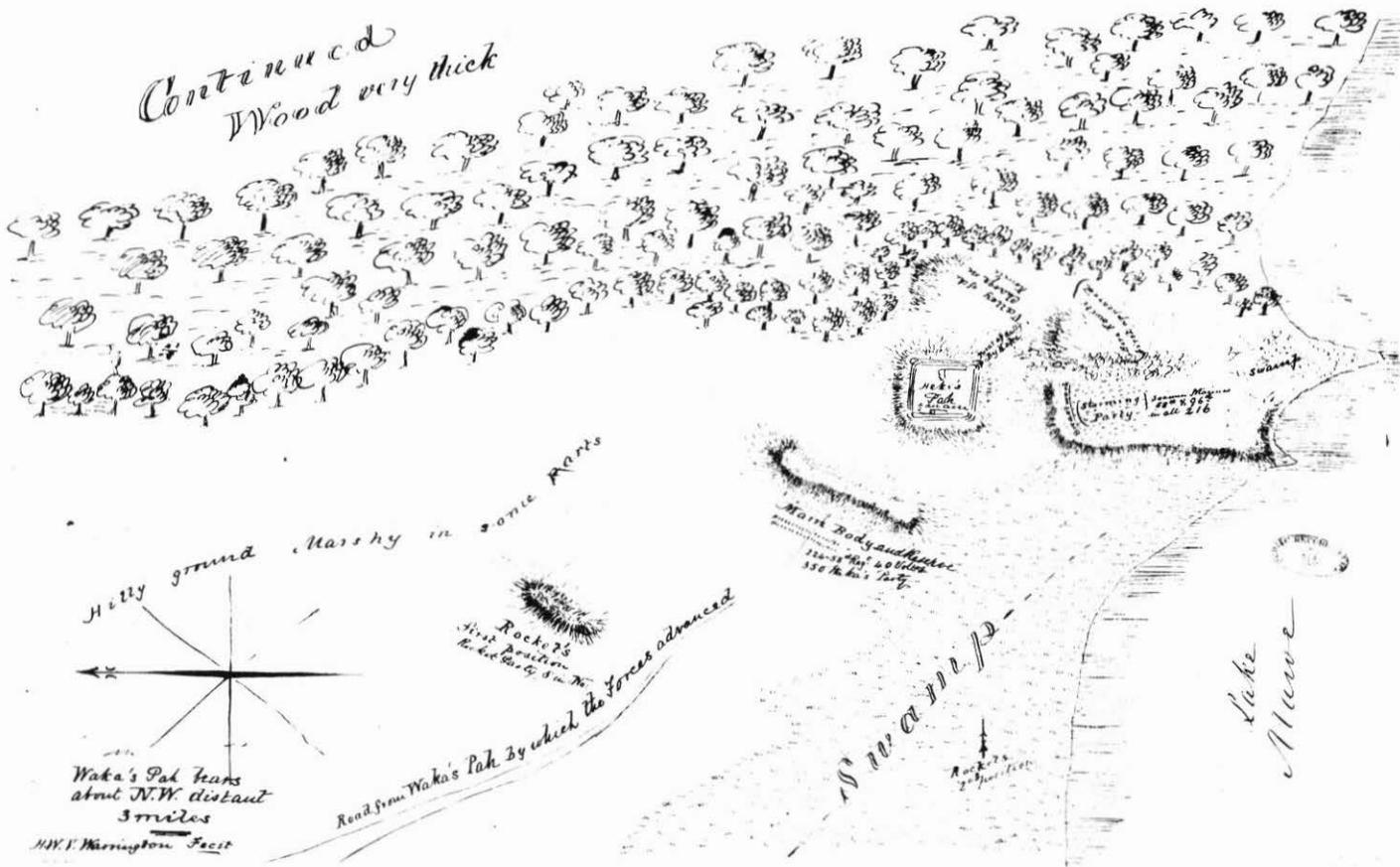


Figure 3: "Place of attack upon the pah of John 'Hiki', 8th May 1845", by H. W. V. Warrington. Courtesy of Public Record Office, London, Reference MPI 59.

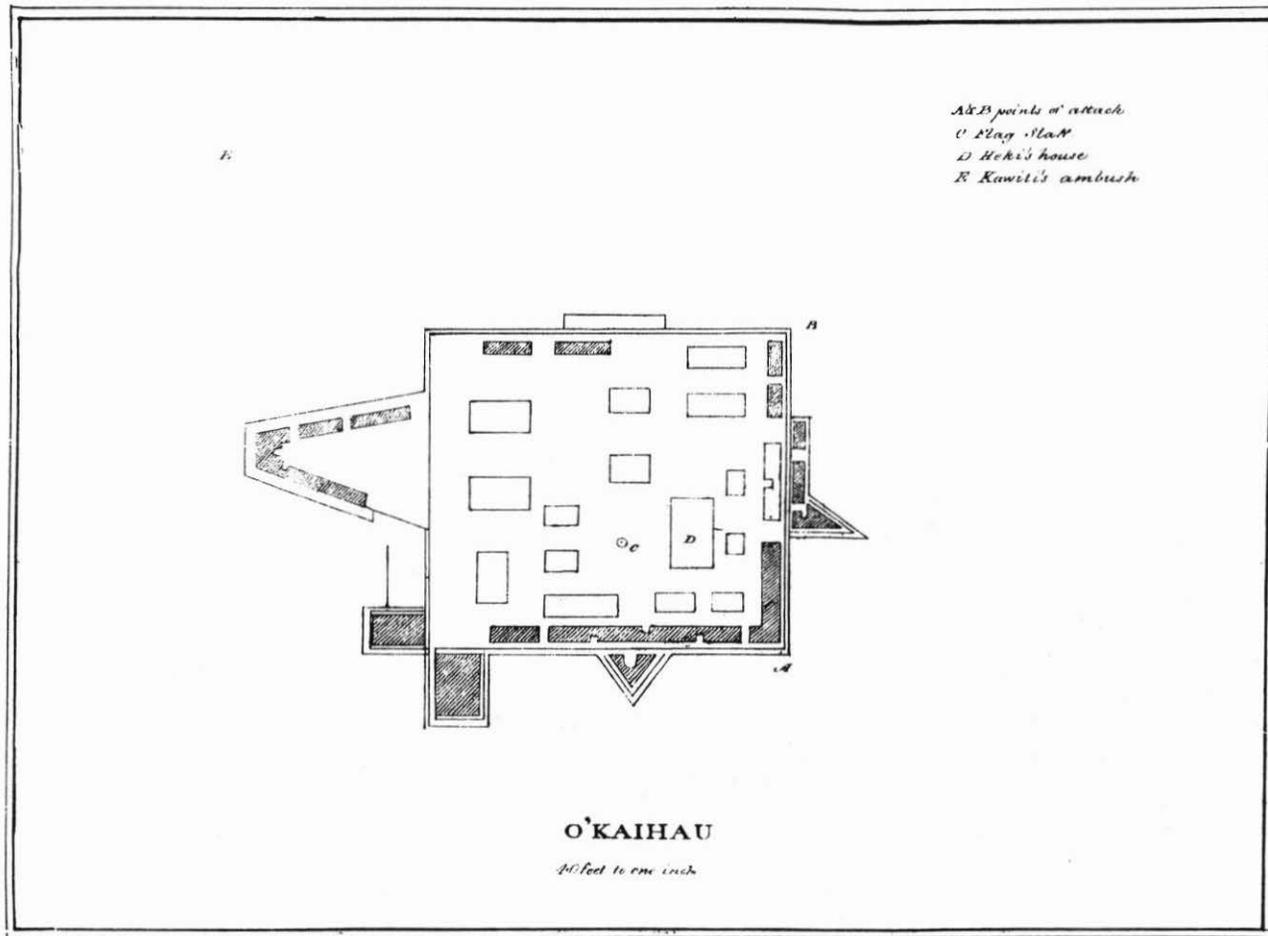


Figure 4: "O'KAIHAU, 40 feet to one inch". Courtesy of Museum of the Northamptonshire regiment, Northampton.

evidence, but is a vantage point on which gum trees stood until the early 1960s. Site Y is also a prominent hill with no field evidence, on which was a small clump of pine trees until 1960 (Alexander Turnbull Library photo 39532). There could have been confusion between tree-covered hills Y and A in the present century. At X, in the fenceline of a cultivated pasture, there is a depression in the ground, 7 x 4 m across and 500 mm deep, full of boulders (local basalt corestones).

Sketches of the action (views from the north) show the *pā* near the south end of a swampy embayment of the lake (Figs 6, 7, and 8). There are two such embayments, one north and one south of Tapuaeharuru. The southern end of the southern embayment (Wahi Tapu, Fig. 5) is on the Ohaeawai side of the promontory (in the wrong direction). The land there is low lying, whereas the sketches show a steep faced bluff above the lake (particularly Fig. 7). This distinctive feature can be identified with certainty as the cliffs marking the southern end of the embayment north of Tapuaeharuru, seen to the right (west) in the sketches.

This steep faced bluff is hill B (Fig. 1), which was described as a height or as rising ground (Hulme 1845a: 759; Bridge n.d.: 17; Webster 1908: 263). British storming parties, intending to attack the *pā* from the rear, advanced across the marshy lake margin towards it. On its brow, facing the *pā* (Merrett 1845: 270; Johnson 1845), was a breastwork or an entrenchment, which the storming parties occupied after dislodging opposition. (See Fig. 3: "Breastwork" and "Storming Party".) One contemporary illustration (Fig. 7) shows several short rows of stakes on the northern slope of hill B, above the swamp. Two oval depressions 8 m across remain here (Fig. 1). Between hill B and Tapuaeharuru is dead ground, in which is a swampy area (Fig. 1), marked by Warrington (Fig. 3). These details confirm hill B, the breastwork, as a fixed point in the analysis.

Heke's *pā* therefore lay in relation to this hill B, and in relation to the swampy embayment on the north side of the Tapuaeharuru peninsula. The land east of this embayment is undulating, composed of basalt flows weathered to friable clay. In 1845 it was clear of forest (Maning 1884: 233). It is now pasture. East and west of State Highway 1, old road lines can be seen in the surface (Fig. 1), especially around hill A where outcropping rounded basalt corestones have prevented mechanised tillage. Extensive swamps to the east and west create a defile, narrowing southwards from Z. The narrowest point is at X, between an arm of the eastern swamp and a small spring-fed swamp in the southern corner of the lake embayment (Figs 1 and 7).

The accounts specify the distance between the breastwork (hill B) and the *pā*: within 200 yards [183 m] (Hulme 1845a: 759; Mitchell n.d.), about 150 yards [137 m] (Fifty Eighth Regiment n.d.: 254; Merrett 1845: 270), or 300 yards [274 m] (Anon. n.d.). Distance estimates by officers of the armed services are generally accurate. (See, for comparison, McCormick 1884: 225.) The breastwork and the *pā* were within effective mutual gunshot range (Johnson 1845; Maning 1884: 239–40): 440 yards [400 m] was out of range, and 200 yards was long effective range (Burrows 1886: 20; Barthorp 1979: 35). The breastwork was uphill from the *pā* (Anon. n.d.), "a good position for commanding it" (Merrett 1845: 271), and is depicted overlooking it (Figs 7 and 8). The storming party intended to dash "down the face of this small hill" to the *pā* (Johnson 1845), whereas a sally from the *pā* "ran straight up the hill to the breastwork" (Maning 1884: 240; see also Fig. 3). Site Z is 900 yards [823 m] north of the breastwork, which is much too far. Hill Y is at a higher level, and 300 yards south east, to the rear, of the breastwork. Both Z and Y can therefore be eliminated as possibilities. Hill A is 400 yards across lower ground from the breastwork, twice as far as most of the accounts describe, and is not overlooked by it. Area X is 200 to 300 yards from the breastwork, at a lower level directly downslope, and so appears on

this evidence to be the likely location. Although the scale on the 1845 sketch map (Fig. 2) is small, it marks the site in relation to the promontory and the embayment at area X rather than at hill A.

Topographically, the *pā* was never described as being on a hill. It was on a "slight eminence" (Johnson 1845), or a "rise in the ground" (Webster 1908: 269). The most detailed sketch shows it to be relatively low lying (Fig. 7). Later field reports describe the site as "perfectly level land" (Cowan 1922: 39), a plateau (Maxwell 1899), or "a very gentle slope downwards from south to north" (Best 1927: 391). Site X, which is gently sloping downwards to the north and west, is a better fit than A which is distinctly elevated.

The site was directly upslope of the lake, which lay within very effective gunshot range, perhaps less than 200 yards away (Hulme 1845a and 1845b; Bridge n.d.: 19–20; Whisker n.d.: 5; White n.d.; Figs 6 and 7). (The lake level has since been lowered, so the present swamp in the embayment would have been largely water covered; but see Fig. 3, which shows extensive swamp.) This eliminates locations east of the present main road which slope towards the eastern swamp. Between the lake and the left face of the *pā* was a narrow slope or ravine (Bridge n.d.: 17), movement across which exposed the British to fire from two faces of the *pā*: its north and west faces (Johnson 1845), its front and left faces (Hulme 1845a: 759; in Hulme's account left and right are in relation to a defender facing the main British force to the north). This would be true of a *pā* around X, but not of a *pā* at A: troops passing below A to and from the breastwork would be exposed to fire not from the north, or front, face, but from the south, or back, face.

The fortification was also overlooked from the north, by a hill (Johnson 1845; Webster 1908: 271) or a ridge (Hulme 1845a: 759; see also Fig. 3: "Main Body and Reserve"). The sketches show this higher ground to the left (Fig. 6) or in the foreground (Figs 7 and 8). The British reserve was placed behind the brow of this ridge (Bridge n.d.: 17), within 300 yards of the *pā* (Hulme 1845a: 759). The crest and forward side of the ridge were sufficiently close to the *pā* for effective mutual fire (Fifty Eighth Regiment n.d.: 245; Johnson 1845; Bridge n.d.: 20); and they were also within long range of the slopes of the breastwork, sufficient for the claim to be made that fire from the reserve effectively supported the storming parties at the breastwork (hill B) when they were attacked by a sally from the *pā* (Hulme 1845a: 759; 1845b). Location A does not fit this description. There is no higher hill to the north within range. The continuation of the ridge to the north is lower, and the slopes of B are 700 yards [640 m] away from it, hidden by hill A; so there is no possibility of long range fire from the reserve over the top of hill A to the breastwork. On the other hand, if the *pā* was around X, A is the hill or ridge within 300 yards, the forward slopes of which would be less than 200 yards from the *pā*, and 350 yards across open ground (very extreme range) from the slopes of hill B.

If the breastwork was at B, the reserve behind A, and the *pā* around X, these points lie in an acute triangular relationship (Fig. 1). This is compatible with the relative positions on the Warrington sketch (Fig. 3) and on the clearest illustration (Fig. 7). The following passage summarises the evidence: "...the three assaulting parties ...gained a height within two hundred yards of the left face [of the *pā*] ...the Reserve covered themselves behind a ridge within three hundred yards of the front face" (Hulme 1845a: 759).

STRATEGY

The attack was expected from the north, given the route taken by the British force. Observers of the action who approached from the south saw an ambush party under Kawiti about a quarter of a mile [0.4 km] from the *pā* (Burrows 1886: 26), towards Tapuacharuru (White n.d.; see also Fig. 3: "Here Kawiti first appeared"). Kawiti was hidden from the storming parties at the breastwork, on their right wing (Hulme 1845a: 759; 1845b; Webster 1908: 263) behind the brow of the same hill (Burrows 1886: 26). The situation was described as dangerous (Clarke 1903: 81).

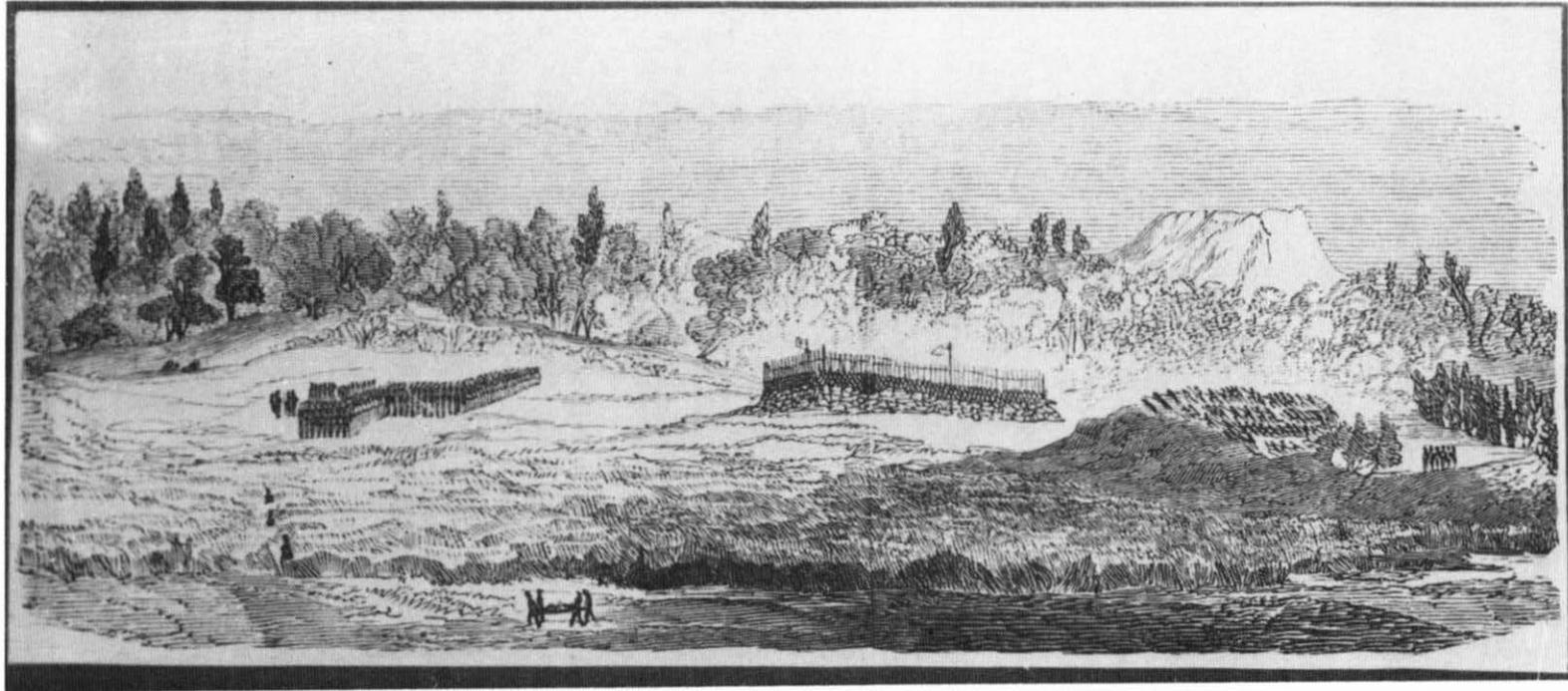
Given the use of flag signals in the *pā*, a strategy of mutual support seems to have been planned by Heke and Kawiti. It was suggested that a rumour of weak defence at the rear of the *pā* was a bait thrown by Heke to ensnare the troops between the two forces of Kawiti in their rear and Heke attacking from the *pā* (Anon. n.d.). In the event, the ambush party was discovered advancing (Hattaway 1899; White n.d.; Webster 1908: 763; Johnson 1845; see also Fig. 3: "Here Kawiti first appeared"), and was engaged. Flag signals were raised in the *pā* (Hulme 1845a: 759; Merrett 1845: 270). A party from the *pā* (see Fig. 3: "Point of sally by Heke") ran uphill (Maning 1884: 240) to attack the British at the breastwork. This appears to have been a planned pincer movement of combined assault on the British storming party (Hulme 1845a: 759). The sketches indicate the nature of the action (particularly Fig. 7). It is here that most of the casualties must have occurred. A recent reassessment of the history of the engagement confirms the conclusion that the operations of Heke and Kawiti were co-ordinated. The ambushing party was repulsed, but later reappeared. (See Fig. 3: "Valley of the Charge of Kawiti".)

Tactically, area X commands the defile when approached from the north. Situated in the neck, with the swamps approaching closely on both sides (Fig. 1), it could not be easily outflanked. Attack was invited from the higher breastwork hill B, which lay within effective range for fire and a rapid downhill charge. Hill B was itself vulnerable to attack from a wide angle. Further, area X was in close relationship with the broad expanse of undulating ground to the south of the defile, where Kawiti was to lie in wait. This offered supply in case of siege, the element of surprise in a support operation, and the possibility of effective retreat and scattering. Battle simulations, carried out by officers of the 1st Task Force of the New Zealand Army in July 1985, and annually by classes from Okaihau College, work well with the *pā* placed around X.

Hill A is tactically weaker. The relationship with the broader southern hinterland is reduced by the 300 yards of intervening narrowing defile. Specifically, a *pā* placed on hill A is a poor topographic and strategic fit with the close range surprise pincer movement towards the breastwork which was experienced.

THE TOPOGRAPHICAL SKETCHES

The sketches provide orientation of the *pā* in relation to the topography, and in particular to the volcanic cone of Te Ahuahu to the east (shown with trees at the right rim of the crater, Figs 7 and 8). Sketches of the action other than these reproduced here exist, but are either similar or more generalised.



Challis: Location of Heke's Pa

Figure 6: "Attack on Heke's Pa, Okaihau May 8th 1845". Courtesy of Alexander Turnbull Library, Wellington, Reference 22410 1/2.

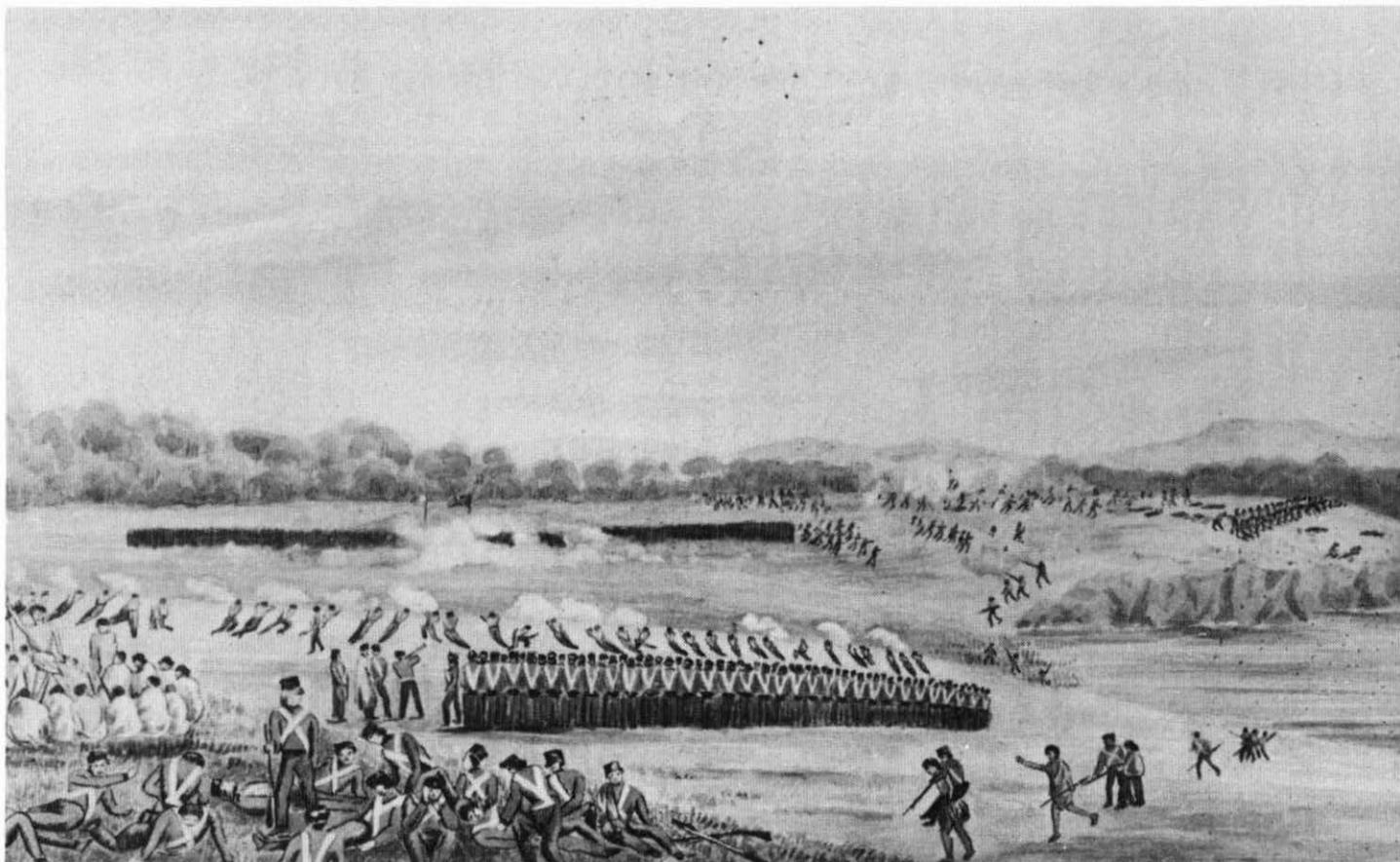


Figure 7: "Okaihow, N.Z. 8th May 1845 (3 o'clock p.m.). J. Williams, 58th Regt. Delt." Courtesy of Hocken Library, Dunedin, Reference 406.

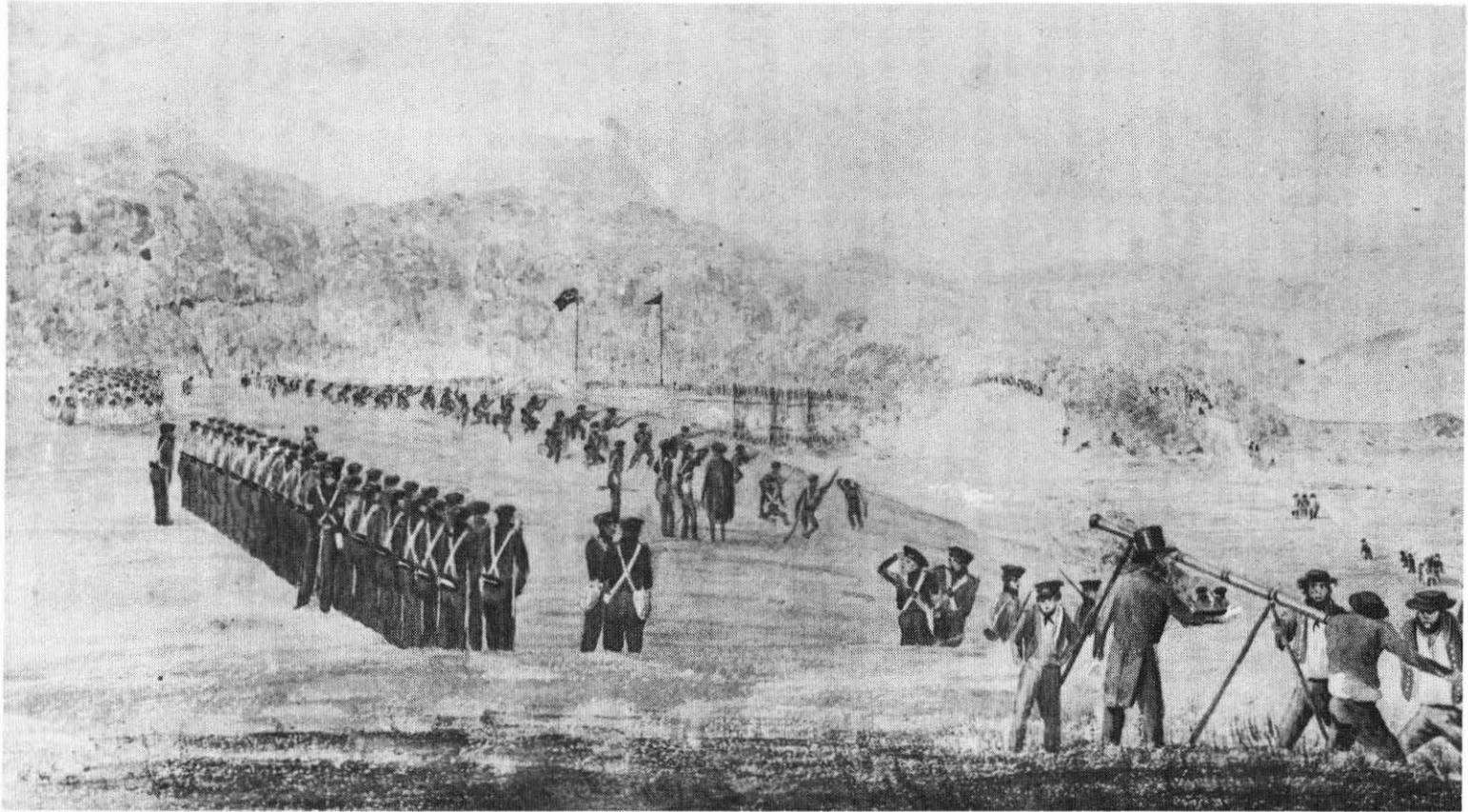


Figure 8: “Sketch of the action at Mawe (Mawai), New Zealand, by the Force under command of Lt. Colonel Hulme, 96th Regiment, Comprised of Head Quarter Division of 58th, Detachment of 96th, and a few Marines and sailors of H. M. ships North Star and Hazard, against the combined forces of the Rebels Heki and Kawiti”. Courtesy of Alexander Turnbull Library, Wellington, Reference 748 1/1.

Figure 6 appears to look slightly south of east, given the position of Te Ahuahu, across the marshy embayment in the foreground, and so was drawn from around hill P (Fig. 1). It shows the *pā* in stereotype, on rising ground at X; the breastwork bluff, hill B, to the right (south west); and the higher hill A to the left (north).

Figure 7 matches the view looking south east from the south western shoulder of hill A. It shows the horizon, the bluffs, and the swampy corner with remarkable accuracy. Two similar sketches exist (National Library of Australia NK1266; Alexander Turnbull Library 132301). These reinforce the impression that the *pā* lay on even ground directly up slope of the lake, in close relationship to the two overlooking features of the hill to the north (foreground, sketching position, hill A) and the breastwork to the south west (right, hill B). The broad extent of the outer palisades of the *pā* is shown. The existence of an advance guard, firing perhaps 50 to 100 yards from the *pā*, is confirmed in two accounts (Clarke 1903: 81; Whisker n.d.: 5). Significantly, the break in slope against which these troops lay remains as a stony ridge across the open ground between hill A and area X. The protection from fire that a small bank such as this could give was considerable. It is evident from the painting that the troops were firing over it. This unusually good illustration gives a clear insight into the limitations of the musket; unengaged troops are formed up and the dressing station is established safely behind the firing line.

Figure 8 is not so detailed topographically, but the relative position of the *pā* is similar. Compared with Figure 7, the sketching position is further west and is lower, and the *pā* seems to be built out on ground sloping downwards towards the lake. (These points are confirmed in two similar sketches: Mitchell Library PXn 539; and Blackley 1984: 50). The Congreve rocket launcher is shown in operation, well beyond musket range from the *pā*. First positioned at some distance (see Fig. 3: "Rocket's first position"), it was apparently brought up closer. The location of its position of operation is described as being to the left side of the *pā* (Maning 1884: 237; Marmon 1882); 150 yards from the north west side of the *pā* (Cowan 1922: 39; Buick 1926: 115); or at distant gunshot range (Johnson 1845); and was mapped on the lake margin (Fig. 3: "Rocket's 2nd Position"). The low angle of the tube (Fig. 8) and the close range trajectory described (Johnson 1845; Maning 1884: 237) suggest a distance in the region of 300 yards from the *pā*. A sketching position below and to the west of hill A, on the lake edge north west of the *pā*, at a range of 350 to 500 yards, matches Warrington's map (Fig. 3: "Rocket's 2nd Position") and the horizontal relationships of the topography. The backdrop is heightened in the sketch. From this position, Tapuaecharuru is visible beyond the bluffs of hill B (Fig. 8). The position of the *pā* around X in the centre of the view, rather than on hill A to the left of it, is confirmed.

DESCRIPTIONS OF THE FORTIFICATIONS AND THEIR REMAINS

The *pā* was rectilinear with flanking angles (Webster 1908: 266; Maxwell 1899; Figs 3 and 4). There were three palisade lines, all but the outer being of close set timbers dug four feet [1.2 m] into the ground (Webster 1908: 266). The innermost palisade had a stone breastwork on the inside (Bridge n.d.: 270), and a ditch on the outside "dug all round, wide enough for a man's body" (Webster 1908: 266). The middle palisade was present on two sides of the *pā* (Burrows 1886: 26). The outermost palisade was of smaller posts 10 inches [25 cm] in diameter (Burrows 1886: 26), "forming a sort of curtain, called a *pekerangi* ...the curtain does not reach the ground and is supported by stronger stakes here and there, so as to have a clear view of the approaching enemy" (Webster 1908: 266). Evidently the rear (south) side

was the weakest (Clendon n.d.: 14). "Inside ...the whares ...are arranged round the sides of the pa, but not touching it" (Webster 1908: 266). Estimated dimensions vary from about 60 x 40 yards [55 x 37 m] (Fig. 3; compatible with Maxwell 1899), through 66 x 45 yards [60 x 41 m] (Fig. 4) to 120 yards [110 m] square (Cowan 1922: 41).

The interior of the site did not rise above the *pekerangi* (see Fig. 7). Any hill top would have protruded when seen from a distance. In this respect, area X is compatible and hill A is not. The digging required for close set palisades and a ditch would not have been easy among the basalt corestones of hill A, as the excavation of a silage clamp into the western side of the hill top in the early 1980s confirmed. No archaeological evidence was seen at that time. Hill A has not been ploughed. Had a fortification existed here, some remnant evidence would be expected, given that old road lines survive (Fig. 1).

"Immediately after the troops had marched from Okaihau. ...Heke deserted his pa which was destroyed by Waka" (Clendon n.d.: 9). The next reference to the site is on a map surveyed by William Clarke (Fig. 5). The progress of this survey is referred to in official correspondence dated 1858 (Kemp 1858). On the map, the words "Heke's Pa" are written over hill A. A dotted rectangle, which might represent the location in the absence of swamp at this point, is marked abutting the eastern side of the subsequently drawn main road, on the opposite side of the ridge from the lake. Neither of these positions is compatible with the descriptions, illustrations and plans recorded at the time of the battle, as has been explained. In particular, intervisibility between the *pā* and the lake is an indispensable characteristic.

C. F. Maxwell discovered the site in 1899, and described it as on a small plateau not far from the lake edge, 200 yards downslope from shallow shelter trenches thought to have been a British position. There were sharply cut rifle pits, dilapidated palisades, and trenches five feet [1.5 m] deep. The site was square, said to be about 170 feet [37 m] across, with a flanking angle at the north east corner (Maxwell 1899).

The late Mr Arthur Mackereth, who was born in 1891 and brought up in Okaihau, claimed a clear memory of Heke's *pā* in the period 1900 to 1914. Insofar as his various descriptions given to the writer can be checked, they are correct. The *pā* was identifiable by lines of posts sticking out of the ground. The remaining pit by the present roadside fenceline (X) was then a swampy hole, later filled with boulders which lay outside the line of posts, and was accessible from the interior of the site by a "creep hole". The line of posts extended from the western side of pit X, south eastwards across the line of the present road, and north westwards towards hill A, at an angle from the present fenceline. After a distance (perhaps 30 yards [27 m]) towards hill A from pit X, the line of posts turned south westwards towards the lake; and then, after perhaps 30 to 50 yards, turned back south eastwards, defining a rectangular site. The posts were vertical, closely set, and up to 2 feet [61 cm] in diameter. There were shallow pits inside the site. Just before the First World War the timbers were removed, stones on the site were removed towards the lake, and the land was bulldozed and ploughed.

The site was visited by Best (1927: 391) and Cowan (1922: 45-48) in 1914 and 1919 respectively. Their topographic descriptions already referred to, like those of Maxwell, fit area X rather than hill A. Best indicated that the main works, on gently sloping ground on the western side of the road, had been obliterated by farming operations. Cowan gave a more detailed account of extant features on the eastern side, including a trench section 14 paces long, 5 feet wide, and 4 to 5 feet deep. Both men saw rifle pits on the eastern side of the road; and Best also saw "a few ill defined pits, etc., on the western side of the road, between it and the fence" (1927: 391). This could have included the remaining pit X.

Certainly Cowan, and probably also Best, were in contact with local Maori people at the time of their visits. Present day Maori authorities regard the whole general area as *tapu*.

THE ARCHAEOLOGICAL SURVEYS

In August 1985, the area around X was contoured. Measurements were taken at 5 m intervals or less, and a 10 cm contour map was produced (Fig. 9). The surface rises gradually and steadily from west to east in the northern and western areas. The major anomaly is the stone-filled hollow in the eastern fenceline, pit X (249.7 m), with a smaller hollow (less than 250.1 m) and a slight rise (greater than 250.2 m) adjacent. Extending to the south west along the fenceline is a ridge (over 250.7 m) 35 m long, with hollows intruding from the north west. Northwards from this ridge is a relatively flat area about 30 m square, bounded to the north by a slight gully adjacent to the fence. The contours in this area west of pit X are irregular, showing uneven small breaks in slope. Further west are small anomalies (hollows to below 248.9, 249.9 and 250.0 m, as marked, and slight gullies). Taken together and in comparison with other ploughed surfaces in the general locality, these irregularities indicate human interference with an otherwise even area of ground.

In April 1985, the same area was examined by Dr B. G. McFadgen and the writer, using an ELSEC proton magnetometer. It was thought that trenches infilled with volcanic boulders and possibly some ferrous materials might produce magnetic anomalies. Measurements were taken at 2 m intervals on traverses 4 m apart, with a bottle height of 60 cm. On Figure 10, lines of equal magnetic intensity are shown as contours.

Experimentation in the locality assisted the interpretation of results. Over a basalt flow with a 10 cm soil cover 2 km east of the site, high readings of 55800 to 56400 (measurements in gamma) were obtained. Over hill A, where many basalt corestones break the surface, readings were in the region 54400 to 54300. Over weathered basalt around hill C, readings were around 54200 to 54050. Over deep soil 200 m south of X, readings were in the range 54050 to 53920. The area mapped (Fig. 10) was generally free of stones, and had a general environmental field reading of 54050 to 54100. Soil appeared deeper on the western slopes (readings of less than 54150), but to the north, basalt corestones became evident (readings up to 54350). Within the environmental field there are linear waves trending east to west with an amplitude of up to 150 gamma. Generally, over the peripheries of the area mapped, gradients were slight and the contours regular.

Known features in the locality were tested to provide examples of anomalies. Surface magnetic features depressed the readings, whereas subsurface features increased them. Anomalies took the form of waves. For example, a mechanically excavated trench used for disposing of basalt boulders and now filled and grassed over increased the readings by 300 gamma with a slighter negative anomaly on the north side. Fences depressed the readings by around 250, a large basalt stone wall by 1050, and a vehicle by 1300 gamma. On this basis, readings at variance by 300 gamma or more from adjacent environmental field readings were considered to be anomalous.

Large anomalies of up to 800 gamma above and 500 gamma below environmental readings occurred on the mapped area, with very steep gradients of up to 1100 gamma in 10 m. No comparable anomalies were encountered elsewhere. To the north west (Fig. 10) a large positive anomaly trends south west to north east (high points 54875 and 54950), with parallel negative anomalies on the north west side (low points 53857 and 53752), producing a linear feature 45 m long. Extending east from the western extremity of this anomaly is a

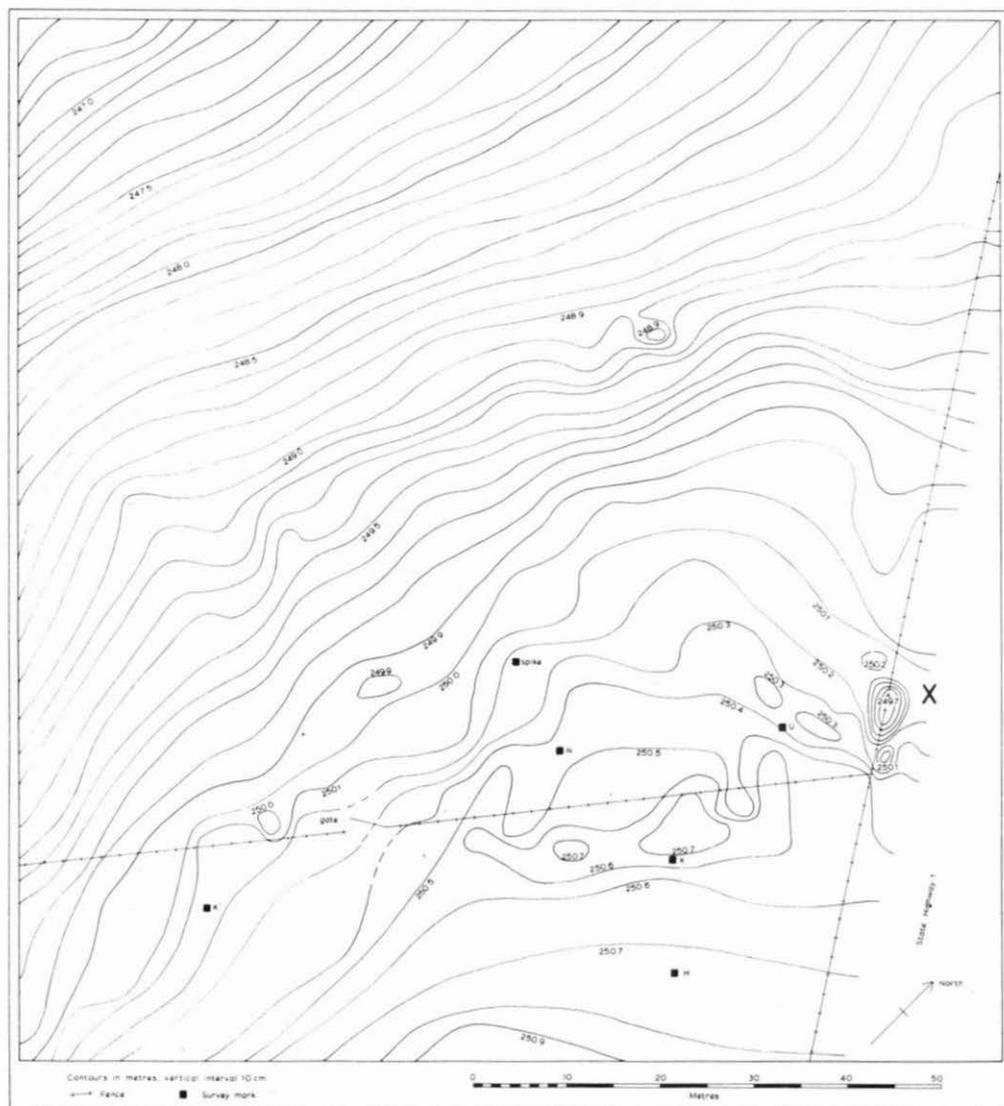


Figure 9: Contour survey, Heke's pā, Okaihau.

series of smaller positive anomalies (high readings 54450 to 54600), with parallel negative anomalies to the north (down to 54043). This series extends eastwards towards the fence north of the gateway, producing a discontinuous linear feature 50 m long. These two linear features mark two sides of a parallelogram, in the angle of which is an area of generally higher than normal readings (over 54200). Taken together, these results are sufficiently strong to preclude a natural explanation.

If the anomalies from the contour and magnetometer surveys are superimposed (Fig. 11), the former provides the south eastern and eastern and the latter the north western and western features of what appears to be a rectilinear anomaly about 50 m across. These surveys provide evidence, at the location indicated by other sources, consistent with there

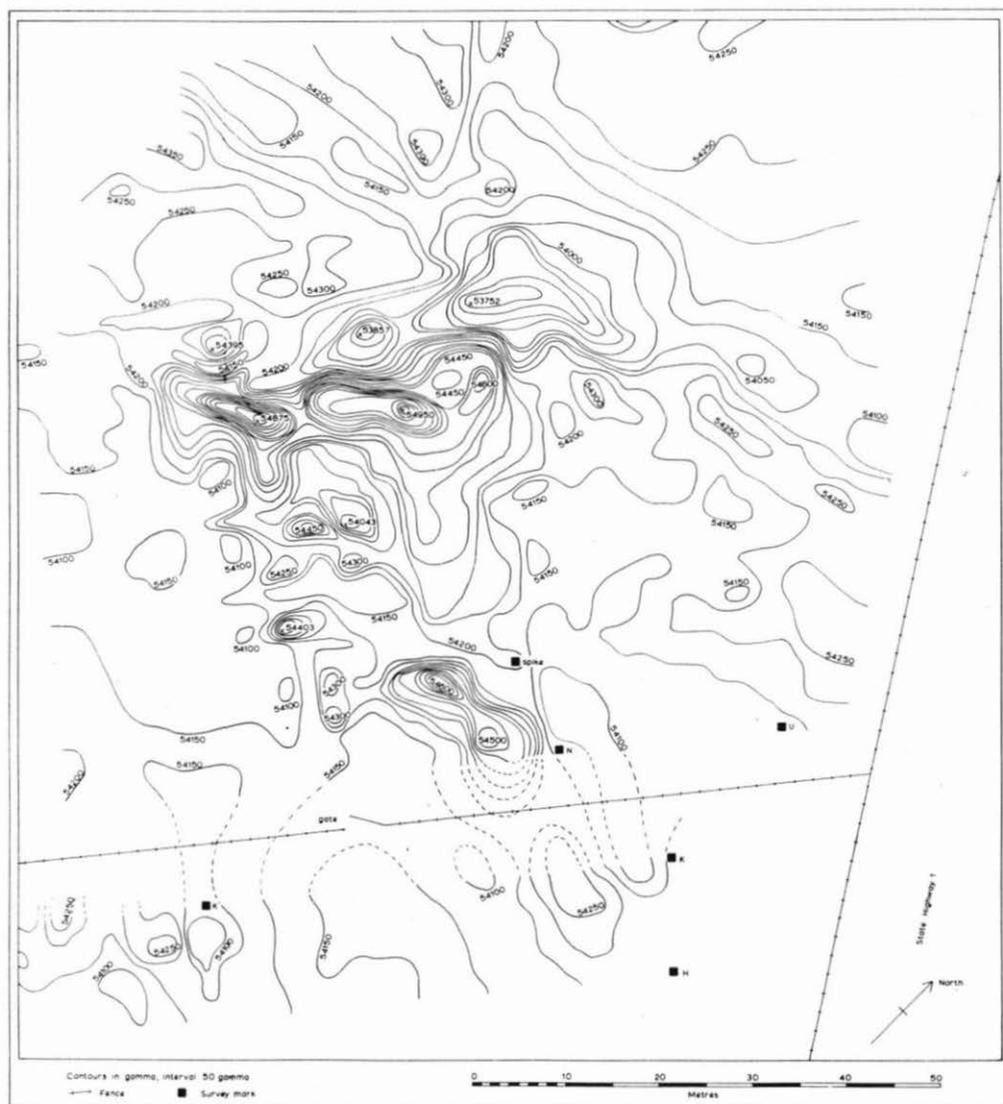


Figure 10: Magnetometer survey, Heke's pā, Okaihau.

having been a broadly rectangular fortification between 40 and 60 m across, impinging upon pit X and extending in a westerly direction. An estimated generalised outline of the site has been superimposed on Figure 11, using information from other sources.

CONCLUSION

The records deriving from the battle are extensive, and are not conjectural, arbitrary, or contradictory. They indicate that Heke's pā lay within 200 yards of the breastwork, the steep faced bluff (hill B) at the southern end of an embayment of Lake Omāpere, in an easterly



Figure 11: Anomalies from contour survey and magnetometer survey, Heke's pā, Okaihau.

to northerly direction. The site was on nearly level ground, and it was overlooked by this higher ground to the west (the breastwork) and by a ridge less than 300 yards to the north (hill A). Both these higher areas were close enough to the pā for effective exchange of gunfire with it (within about 200 yards), and were sufficiently close to each other for extreme range mutual fire (possibly up to 400 yards). The lake side was directly downslope, within very effective gunfire range (200 yards or less). A site impinging on and lying to the west of point X fits these requirements, and no other location does. Site Z is far too remote from the breastwork. Site Y lies too far south. Hill A might be considered a possible

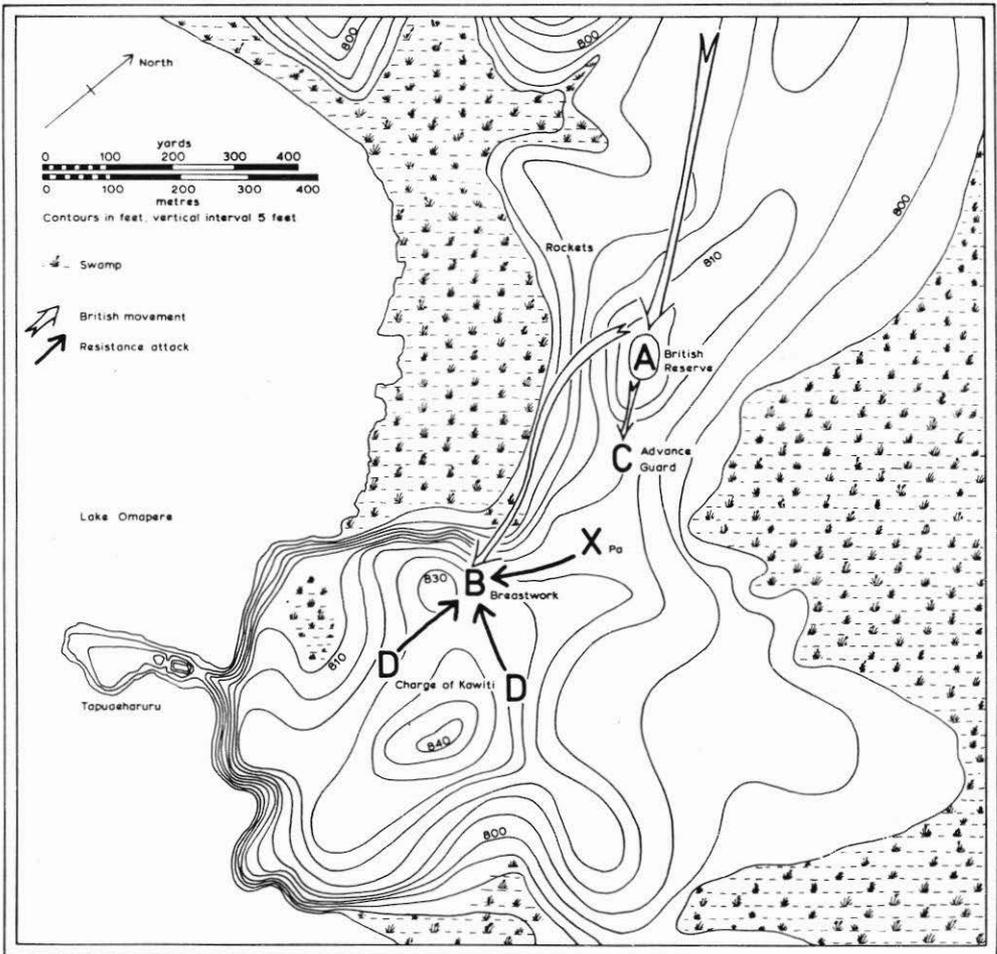


Figure 12: Diagram of movements in the engagement, Heke's pā, Okaihau.

contender should the fortification be sought on a hill, but contemporary maps, descriptions and topographical sketches, the performance of the musket, and tactical considerations, tell against it and strongly support X.

The site was levelled by farming operations before the First World War. It was seen before then by C. F. Maxwell and A. Mackereth, and shortly afterwards by Best and Cowan. These four descriptions relate the site to area X. The pit which remains at X was identified by Mackereth as part of the site. There is no archaeological field evidence of a defence on hill A.

Archaeological contour and magnetometer surveys have indicated significant anomalies at area X, consistent with there having been a fortified site at this location. These results combine with the other evidence to produce a cumulative case.

This, then, is how things stood (see Fig. 12, and compare with Fig. 3). Heke and his 200 men lay in the pā at X. Kawiti and his 140 warriors lay concealed in the area around D. Lieutenant-Colonel Hulme and his force advanced to the cover of hill A. Rockets were fired

off, probably from a position near the lake edge, with no effect. A storming party of 216 men was sent along the lake edge under heavy fire from the pā, towards hill B where, after dislodging opposition, they occupied a breastwork. An advanced guard from the reserve was placed close in to the palisades, under barely sufficient cover (C). The storming party at B, when on the point of rushing down on the pā, was attacked on the right flank by Kawiti and his men, who were detected advancing from the bush (D). Leaving 60 men at the breastwork to face the pā, the storming party engaged Kawiti. The British were gaining the upper hand when a small sally from the pā beat back the 60 at the breastwork. The main body of the storming party therefore turned about. Heke's men withdrew to the pā. Kawiti attacked again and was again forced back. By that time the British storming party had suffered loss and was exhausted. They were withdrawn along the lake edge. The engagement was over.

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