



Battle Hill Farm Forest Park

Resource Statement



Battle Hill
FARM FOREST PARK



greater WELLINGTON | Parks
REGIONAL COUNCIL | and Forests



Contents

HISTORY & CULTURAL HERITAGE	3
1. History of Battle Hill Farm Forest Park	3
1.1 The arrival of the New Zealand Company	3
1.2 The pressures of European settlement	6
1.3 Difficulties at Heretaunga	8
1.4 The pursuit of Te Rangihaeata	9
1.5 The first day of battle	11
1.6 Bombardment and siege	14
1.7 Immediate aftermath of battle	17
1.8 Subsequent history	18
1.9 Archaeology	20
1.10 Recent history	22
1.11 Establishing Battle Hill Farm Forest Park	24
Bibliography	25
PHYSICAL ENVIRONMENT	27
2. Topography, Geology and Landforms	27
2.1 Physical features and topography	27
2.2 Geological history of the Wellington region	28
2.3 Geology of Battle Hill Farm Forest Park	29
3. Climate	32
3.1 Regional climate	32
3.2 Climate at Battle Hill	32
4. Waterways	33
4.1 Hydrology	33
5. Soils	35
5.1 Soils of the Wellington region	35
5.2 Soils of Battle Hill	35
BIODIVERSITY	39
6. Flora	39
6.1 History of regional vegetation	39
6.2 Human impacts on the vegetation	40
6.3 Vegetation in Battle Hill	40





7.	Fauna	44
7.1	Birds	44
7.2	Freshwater Fish	46
7.3	Lizards	47
7.4	Invertebrates	47
ENVIRONMENTAL MANAGEMENT & LAND USES		49
8.	Ecosystems Classification and Environmental Protection	49
8.1	Battle Hill's ecosystems	49
8.2	Impact of introduced pests	49
8.3	Control of pest animals	50
8.4	Control of pest plants	51
8.5	Ecosystem monitoring and rehabilitation	51
9.	Landscape character	52
10.	Recreation	53
10.1	Recreation activities and user preferences	53
11.	Forestry	56
12.	Farming	56
REFERENCES		59
APPENDICES		
Appendix One – Plant species		61
Appendix Two – Freshwater fish species		68
Appendix Three – Bird species		68

History and Cultural Heritage

1. History of Battle Hill Farm Forest Park

On a wet morning on the 6th August 1846 in Horokiri Valley, the first shots were fired in an engagement between, on the one side, a mixed Government force of Maori, police, militia and British troops, and, on the other side, a party of Ngati Toa, Ngati Rangatahi, and Whanganui Maori under the Ngati Toa chief Te Rangihaeata. The subsequent battle and siege was to last eleven days. The events that occurred on Battle Hill, as the site of the engagement is now known, are interesting in themselves (*See Map 1, Historic Features*). They occurred, however, within a series of events during which the Colonial Government would achieve the pacification of the Wellington district after a number of years of controversy and dispute.

1.1 The arrival of the New Zealand Company

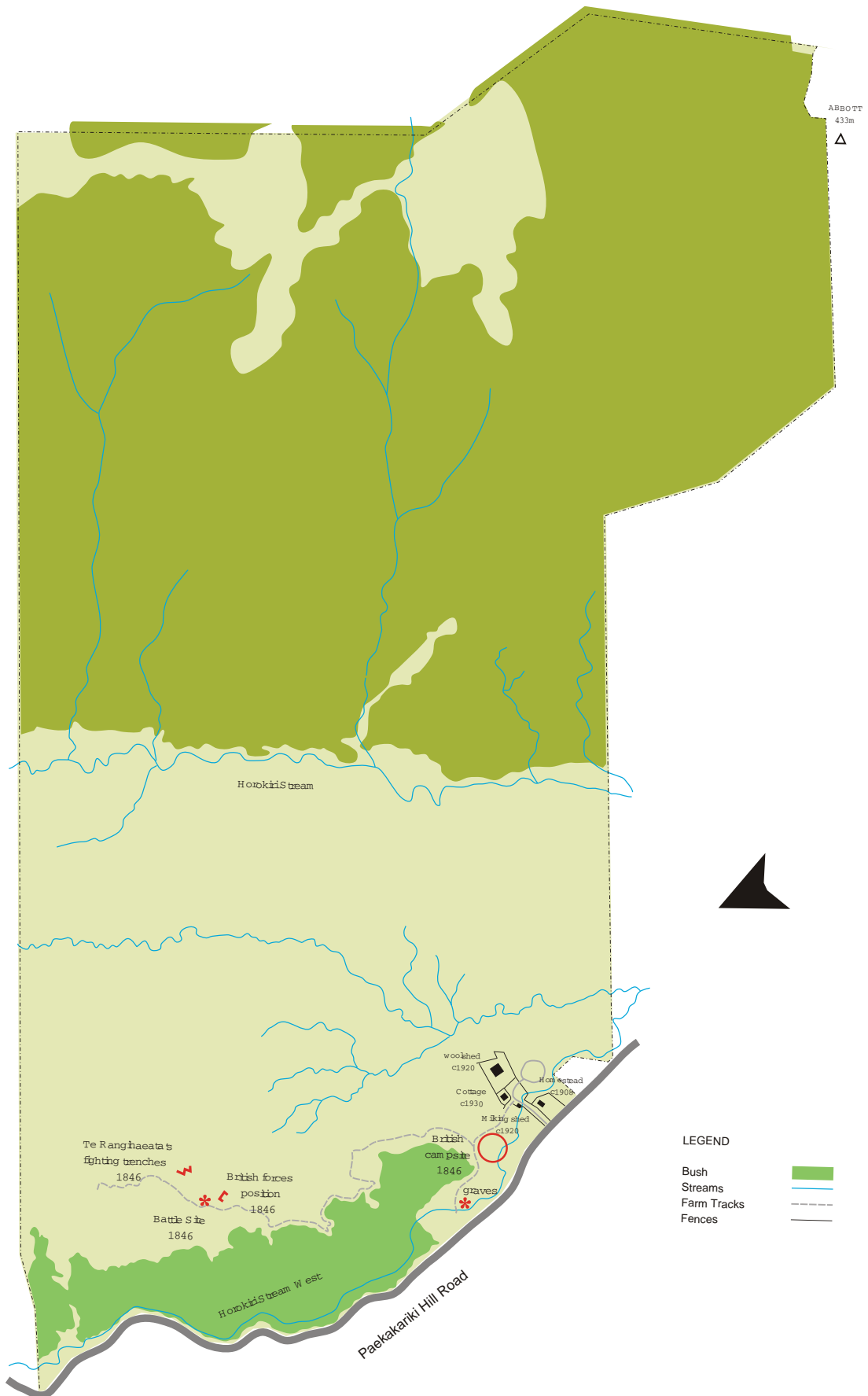
The origins for the events that took place on Battle Hill lie in the 1839 arrival in Wellington of the New Zealand Company. Dating back to 1825, the Company was established to put into practice a theory of colonisation devised by Edward Gibbon Wakefield. Ultimately, the Company would establish settlements at Wellington, Wanganui and Nelson as well as being linked with the establishment of towns at New Plymouth, Christchurch and Dunedin. Wakefield believed that colonisation would only succeed if it was planned, rather than being attempted in a haphazard manner. To accomplish this, he devised a system aimed at creating a balance between land, capital and labour. Any land acquired from local Maori had to be on sold to settlers at a price that would be sufficiently high to create a fund to pay for the costs of founding a colony. These costs included the providing of assistance to enable the migration of a labouring workforce to the new land. The labourers were needed to assist the settlement's landowners develop their properties. The wages received for this work would eventually enable the labourers to raise capital to buy their own land. With further purchases occurring as labourers saved capital, a perpetuating cycle of settlement and growth would theoretically result. Before all this could occur, however, the Company needed to buy a lot of land from Maori at the cheapest possible price.

A scheme to establish the town of Port Nicholson was described in a prospectus launched on 2 May 1839. Amid rumours that the British Government would soon intervene in New Zealand to seek sovereignty over the islands, the Company fitted out a ship named the *Tory* and their officials voyaged to New Zealand to buy land for their colonisation scheme. On 20 September, the *Tory* sailed into Te Whanganui a Tara (Wellington Harbour).¹





At the time that the New Zealand Company arrived, a number of iwi and hapu were settled around the Wellington district. A series of migrations to the area from Kawhia and Taranaki, beginning in the early 1820s and continuing for a number of years, had brought groups such as Ngati Toa, Ngati Mutunga, Ngati Tama, Te Atiawa, Ngati Raukawa and several others to different places around the district. Although the resulting occupation and nature of land rights was intricate and multi-faceted, as a very general overview it can be said that Ngati Toa held major areas of occupation along the Porirua Coast extending south to Ohariu and east to Heretaunga;

¹ Waitangi Tribunal *Te Whanganui a Tara me ona takiwa*. Wellington: Waitangi Tribunal, 2003, pp.45-8

Map 1 Battle Hill Farm Forest Park Historic Features



LEGEND

- Bush 
- Streams 
- Farm Tracks 
- Fences 

Ngati Tama were located in the Ohariu Valley, at Kaiwharawhara and in other places on western Te Whanganui a Tara; and Te Atiawa hapu occupied the northern western and northern shores of the harbour and the lower Hutt Valley, generally known at the time as Heretaunga. Ngati Rangatahi, a Ngati Maniapoto hapu who would play a significant role in events in Wellington during the early 1840s, occupied the central and northern Heretaunga valley area under the authority of Ngati Toa chiefs Te Rauparaha and Te Rangihaeata.²

The arrival at Te Whanganui a Tara of New Zealand Company officials on the *Tory* was soon followed by negotiations with local Maori to acquire land for settlement. On 27 September 1839, the Port Nicholson Deed was signed but there were numerous difficulties. The deed was in English, the interpreter had only a basic grasp of the Maori language, the boundaries were so poorly recorded that they remain difficult to map, no plan of the land transaction was available during the negotiations and certain key groups of Wellington Maori did not sign. To ensure the widest possible support for their objectives, the New Zealand Company officials sailed north to Kapiti Island, negotiated with Ngati Toa chiefs and signed another deed on 25 October, this one purporting to have acquired an area extending from Taranaki to the top of the South Island. Following this, a further deed was signed with Te Atiawa at Queen Charlotte Sounds on 8 November for the same area of land as that noted in the Kapiti document. If the first Port Nicholson deed has since been regarded as sketchy in detail, the later two deeds were especially vague.³

Soon after the Company's arrival, Crown officials landed in New Zealand and, on 6 February 1840, the Treaty of Waitangi was signed. One of the first actions of the new Government was to set up a Commission of Inquiry to generally inquire into the many hundreds of land transactions between Europeans and Maori that had allegedly occurred prior to 1840. If these were found to be valid, then they would be ratified by the Crown and a title awarded. During the 1842 hearings into the New Zealand Company's transactions for the Wellington district, however, the evidence revealed that local Maori who had been involved had varying views towards the transactions. Te Puni, of Te Atiawa, informed the Commission that not all of his people were satisfied with the transaction. Wi Tako, also of Te Atiawa, testified of his belief that the goods received were merely payments by the Company for anchorage rights. Te Kaeaea of Ngati Tama held similar beliefs. Of Ngati Toa, Te Rauparaha expressed his belief that the deed he signed related only to a piece of land on the northwest coast of the South Island whilst Te Rangihaeata thought the purchase related to his interests in Wakatu (present-day Nelson). Commissioner William Spain, having heard this testimony, expressed a view in a preliminary report of 12 September 1843 that it was difficult to view the New Zealand Company's 1839 land transactions as being valid. Despite this finding, a major complication existed. Since 1840, hundreds of colonists had settled in Port Nicholson. Any finding that the Company's claims had no validity would have major ramifications for the settlers.⁴

² Waitangi Tribunal, op cit, pp.17-43

³ Ibid, pp.52-59

⁴ Ibid, pp.60-65 and 199

1.2 The pressures of European settlement

Since the establishment of the new settlement, different Wellington district Maori were experiencing problems as the settlers acted in accordance with their assumption that all the surrounding land was now theirs. The people of Te Aro pa, who had not even participated in the signing of the 1839 deed, found that their land was surveyed up into settler sections. Increased arrival of colonists led to the pa at Pipitea, Kumutoto and Tiakiwai suffering encroachments as cultivations and wahi tapu were occupied. Disputes soon arose. Survey pegs were pulled up and complaints made to Governor Hobson. Ngati Tama, whose crops had been repeatedly destroyed by settler cattle, left their harbour kainga and moved out to Heretaunga in 1842. They joined Ngati Rangatahi who had maintained their occupation of the Hutt Valley.⁵ Ngati Toa also began to experience encroachments from New Zealand Company settlers as they took up occupation of outlying areas seen as included within the Company's land purchases. In April 1842, an attempt by colonists to build houses at Porirua resulted in Te Rangihaeata and his people destroying the buildings and sending the settlers away.

In the meantime, colonists from the Company's second settlement at Nelson, constrained in finding flat land for their rural sections, looked towards the Wairau Valley, over in current-day Marlborough, to fulfil their requirements. The Wairau had been a place particularly identified by Te Rauparaha as having not been included in any previous land transactions with the Company. Nevertheless, facing increasing settler pressure for land, by January 1843 the Company decided to commence a survey of the Wairau Valley in preparation for dividing it up into sections. Over the next few months, Ngati Toa chiefs, including Nohorua, Rawiri Puaha, Te Rauparaha and Te Rangihaeata, complained to Company official William Wakefield and Commissioner Spain about the survey. The chiefs were urged to wait and hear the results of Spain's Commission. Despite this, the chiefs sailed to Wairau to stop the surveyors and did so by finding each survey camp and escorting the surveyors out of the district. Hearing of this, the Company organised a posse to arrest the Ngati Toa chiefs. An inevitable result occurred. On 17 June 1843, on the banks of the Tuamarina Stream in the Wairau Valley, the two groups met. A tense debate resulted and an attempt was made to arrest Te Rauparaha and Te Rangihaeata. As tempers became heated and both sides increasingly nervous, the first shots were fired (each side later claiming the other was first to fire.) One of the casualties in the first exchanges of fire was Rongo – the wife of Te Rangihaeata – who was shot dead. As the battle waned, the militia broke and fled. They were chased by Ngati Toa. Although many militiamen escaped into the bush, one group formed on a hill and surrendered. However the death of many prominent persons among Ngati Toa required Te Rangihaeata and others to exact customary retribution.⁶ With the death of 22 Nelsonians, New Zealand Company officials and settlers expected Government support in quickly and decisively moving against Ngati Toa. Instead Crown officials, including the new Governor Robert FitzRoy, criticised the Company officials for provoking the situation and laid the blame for the tragic encounter on local Nelson officials several of whom had died at Wairau.⁷

In the meantime, the Spain Commission was faced with the dilemma of having identified serious problems with the Company's claim to Wellington but knowing that thousands of colonists were already located at Port Nicholson. A compromise was sought. Therefore Crown officials began an arbitration process which resulted in

⁵ Waitangi Tribunal, op cit, pp.84-87 and 199

⁶ Ibid, pp.192-3. Also Boast, Richard "Ngati Toa in the Wellington Region: A report to the Waitangi Tribunal", WAI-145 #H8, June 1997

⁷ Ibid, pp.194-5

making various groups of Port Nicholson Maori sign 'deeds of release' giving up all their interests in Wellington for a further small payment and the granting of small reserves. Although this might have been acceptable had the arbitration process been undertaken in a free and open manner, it has been found that "Crown officials threatened many Maori who were parties to the deeds of release that, if they did not agree to accept the sum of money offered in compensation for signing the deeds, no higher offer would be made and their land would go to European settlers without the consent of Maori."⁸

1.3 Difficulties at Heretaunga

By February 1844, Crown officials sought to include Ngati Toa in the arbitration process. Initial indications were that both Te Rauparaha and Te Rangihaeata were willing to participate. At a meeting between Ngati Toa and Crown officials at Porirua on 8 March 1844, however, it became clear that Ngati Toa had no intention in giving up their interests in the Hutt Valley. In fact, whilst the meeting was taking place, in Heretaunga the Ngati Tama chief Te Kaeaea was at work cutting a boundary line across the valley at Rotokakahi to record the area of land viewed as being excluded from previous land dealings. This cutting of the boundary line infuriated Crown and Company officials as they believed the Hutt Valley had already been purchased.⁹ For the rest of 1844, Crown and Company officials tried to rejuvenate negotiations with Ngati Toa. As for those living on the land, officials refused to negotiate other than to tell Ngati Tama and Ngati Rangatahi to leave. Although over time Te Rauparaha expressed some willingness to negotiate along the lines desired by the Crown, Te Rangihaeata, who was acknowledged as being the primary rightholder in the Hutt, refused to discuss matters unless reservations were made to protect the extensive cultivations of Ngati Tama and Ngati Rangatahi. By 1845, the Crown's offer of payment was accepted initially by Te Rauparaha, and then later by Te Rangihaeata. This did not, however, end Te Rangihaeata's support for Ngati Rangatahi. Instead he felt that their rights should be recognised in some way. On 15 May 1845, Te Rauparaha's instruction to Ngati Tama at Maraenuku pa to leave the Hutt was ignored. When he sought support from Te Rangihaeata, the latter responded that he would maintain the Hutt "with his life".¹⁰



Hall, R:Rangihaeata, Raparaha's fighting general and chief actor in the Wairau Massacre [184-] Reference No0 A-114-046

⁸ Waitangi Tribunal, op cit, pp.145-179

⁹ Ibid, pp.195-200

¹⁰ Ibid, pp.201-209

Officials continued to view Ngati Rangatahi and Ngati Tama as interlopers. Rather than negotiate, stockades and forts were built in the Hutt Valley and elsewhere and troop reinforcements were sent to Wellington. Governor FitzRoy gave specific instructions, however, that the troops were only to be used defensively. By November 1845, however, FitzRoy had been recalled by the British Government. His replacement, George Grey, had in his mind other ways of dealing with the Hutt situation.

Grey's first priority was to deal with the Northern Way in the Bay of Islands where Hone Heke was opposing Government forces. Grey did not turn his attention to Wellington until February 1846 when he visited the area arriving with extra military reinforcements including naval power. Grey immediately went to the Hutt and met with Te Kaeaea who promised to leave within a week but sought compensation for the crops and buildings his people had established. Grey refused to negotiate noting that discussions over compensation could only take place after an evacuation had occurred. By 17 February, Ngati Tama had departed leaving only Ngati Rangatahi in position. Grey then located settlers on the lands occupied by Ngati Tama, but Ngati Rangatahi drove them off. Grey responded by sending in troops. With little choice, Ngati Rangatahi also asked for compensation to be arranged before they left but Grey again said that negotiations would only begin once they had departed. By 25 February, Ngati Rangatahi left the Hutt Valley. On the same evening, settlers plundered Rangatahi houses and desecrated their chapel. Two days later, troops burnt down the pa including the chapel and the fences around the urupa. Both Kaparatehau, the chief of Ngati Rangatahi, and Te Rangihaeata were reported as being greatly angered by these actions.¹¹

Ngati Rangatahi responded by returning to the Hutt, plundering settler houses and skirmishing with British soldiers. On 3 March, martial law was declared and Ngati Rangatahi permanently withdrew from the Hutt. When Grey visited Te Rangihaeata at Porirua, the chief refused to go on board the Governor's ship but sent word that he desired peace and that he would not attack first. For the moment, believing all to have been secured, Grey left the district. Matters soon escalated again, however, when two Maori accused of plundering settler goods in the Valley were put on trial in late March. On 2 April, two of the settlers who had remained in the Hutt were killed. On 16 May, Boulcott's farm, which was being used as a military outpost, was attacked and six British soldiers killed. Although the attack involved Whanganui Maori who had Ngati Rangatahi affiliations, Te Rangihaeata's men were implicated with being involved. Plans were laid to attack the chief's pa located at Pauatahanui.¹²

Ahead of this occurring, Grey implemented another course of action involving Te Rauparaha. Although over the previous months, this chief had actively kept out of the events occurring in the Hutt, and, to the contrary, had sought a role as peacemaker, Grey decided it would satisfy public pressure and strike a blow at Ngati Toa power to kidnap Te Rauparaha. On 23 July 1846, a night raid by soldiers and militia on Taupo pa at Porirua resulted in the capture of Te Rauparaha and six others. Without being charged or committed to trial, the Ngati Toa chiefs were taken to Auckland and held there for 18 months.¹³ In the meantime, the attack on Pauatahanui was ordered. On 30th July, a party of militia and police, as well as 160 Te Atiawa under the chiefs Te Puni and Wi Tako, set off from the Hutt to converge on Te Rangihaeata's pa. The contingent of militia was under the command of Mr. Donagh and William Bertram White, the police under A.C. Strode and the "friendly natives" were said to be under the command of Mr. Scot.

¹¹ Waitangi Tribunal, op cit, pp.210-12

¹² Ibid, pp.214-216. See also Boast, op cit.

¹³ Boast, op cit.

When the Hutt force reached the pa on 1 August, they found it recently abandoned. They occupied the site and established a base. The party then intended to set off after Te Rangihaeata, who had headed towards the Horokiri Valley.



1.4 The pursuit of Te Rangihaeata

Whilst the Hutt detachment was at Pauatahanui, another force made up of 160 British officers and men of the 58th, 65th and 99th Regiments and under the command of Major Last had left their camp at Paremata to approach Te Rangihaeata’s pa from a westerly direction and cut off any escape but bad weather had delayed their arrival and they did not reach Pauatahanui until 3 August. With them were an estimated 200 Ngati Toa under the chief Rawiri Te Puaha. The Maori contingent were said to have been supplied with blue serge frocks which carried on the front and back the large white letters “V.R.” to distinguish them from Rangihaeata’s men.¹⁴ Whilst there are no accurate figures of the numbers in Rangihaeata’s party, the contemporary newspapers reported him to have 300 warriors with him.¹⁵ In addition, women and children had accompanied the warriors.¹⁶

¹⁴ McKillop, Henry F. *Reminiscences of twelve months' service in New Zealand, as a midshipman, during the late disturbances in the colony*, Christchurch: Capper Press edition, 1973, p.212
¹⁵ 12 Aug 1846, *New Zealand Spectator and Cook's Strait Guardian*
¹⁶ 13 Aug 1846, W.F.G. Servantes to Major Last, Enclosure 5 in Despatch No.34, *British Parliamentary Papers*, 1847 [766] Vol.38, p.48

Rawiri Te Puaha, as one of a younger generation of Ngati Toa chiefs who had accepted Christianity, held a different world view than his elders Te Rauparaha and Te Rangihaeata. Nevertheless, Te Puaha had been strong in the past in protesting the actions of the Company and was still closely tied to his elder relations.¹⁷ It is not surprising then to learn that after the campaign there were many claims that Te Puaha and his party of Ngati Toa had been less than helpful for the Government forces and probably even assisted in ensuring that Te Rangihaeata's party were protected from harm. Claims that Te Puaha's people supplied food and ammunition to Te Rangihaeata at night and suggestions that they fired blanks during combat have all been recorded.¹⁸ During the pursuit of Te Rangihaeata to Horokiri, there was immediate evidence of the role Te Puaha and his people played. On Tuesday, 4th August, the Government forces were ready to proceed with the pursuit of Te Rangihaeata but Puaha was unhappy "not wishing any Europeans to accompany them". He refused to travel in their company and went on ahead first, the Government forces staying behind for one further night.¹⁹ This is the first of many examples of Te Puaha's protective intervention.

Even with Te Puaha's protection, Te Rangihaeata faced close calls. Eyewitness soldier William Tyrone Power records that during the pursuit Te Rangihaeata and his party were almost surprised and captured as they moved on from Pauatahanui. An advance guard of the Government forces once reached a campsite where the fires were still burning and potatoes still boiling in the pots.²⁰ Power was sure they would have caught Rangihaeata then, but that members of the Maori contingent within the Government army had given the chief "timely information." Nevertheless, this led to the pursuit continuing through the Horokiwi Valley with Rangihaeata's party said to have little time to rest and little food, all this occurring during a winter that was described by participants as "unusually bitter."²¹ Midshipman of the *Calliope*, Henry McKillop recalled:

*The travelling was very bad, even the natives slipping down in passing along the sides of the rivers, the wet weather making it worse than usual. Our path lay through the most dense wood it has ever been my fate to tread, being frequently crossed by small rivers and fallen trees of such a size as to make it necessary to change the direction of the road to avoid them.*²²

On the morning of 5th August the Government forces caught up with some of Puaha's party who informed them that earlier they had come into contact with Rangihaeata's men. During an exchange of fire, one of Puaha's men had been wounded in the neck.²³ A scouting party of Ngati Toa under Te Puaha had volunteered to go forward and assess the situation. Lieutenant Servantes went with them. As this party went well forward up to the crest of the hill, Servantes looked around and "was astonished to see about a dozen of the enemy start up as it were from the ground, between his party and the camp, with their guns in their hands, many of them pointing at him."²⁴ Rangihaeata was among the group that had emerged from the scrub. The two parties of Ngati Toa conversed. Rangihaeata surprised to see Te Puaha advised him to either retreat and to take the soldiers with him or to join with him. Puaha suggested, however, that Rangihaeata give up those among his group who had been involved in the actions in

¹⁷ Reġ, Matiu Nohorua Te "Brief of Evidence", WAI-785, 9 June 2003, pp.14-5

¹⁸ Wards, Ian *The Shadow of the Land: A Study of British Policy and Racial Conflict in New Zealand 1832-1852*, Wellington: Government Printer, 1968, pp.282-285

¹⁹ Scot, David "Journal of expedition against rebel natives in 1846", MS-Papers-5574, Alexander Turnbull Library, Wgtn

²⁰ McKillop, op cit, p.212; Power, William Tyrone *Sketches in New Zealand, with pen and pencil: from a journal kept in that country July 1846 to June 1848*, Christchurch: Capper Press edition, 1974, p18

²¹ Power, op cit, pp.18-9

²² McKillop, op cit, pp.212-3

²³ 5 Aug 1846, Scot Journal, op cit

²⁴ McKillop, op cit, p.215

the Hutt. Rangihaeata declined the offer and the meeting ended with the two chiefs “rubbing noses”, Rangihaeata “expressing his regret at being at variance with his children.” The scouting party then returned without having learnt the exact location or nature of Rangihaeata’s defences.

Before nightfall, a camp was made by the Government army in a hollow at the foot of the hill. As the rain continued to pour down, the soldiers erected huts and lit fires. McKillop and his fellow sailors were required to take one of the watches during the night. Before he went out into the weather, an officer of the 65th Regiment gave him a small glass of liquor. McKillop, aware that the camp was not in a good position and that they could have been exposed to enemy attack, was glad of the stiff drink noting that he “never felt more grateful for Dutch courage than on this occasion.”²⁵

1.5 The first day of battle

The next morning, on 6th August, an hour before daylight, the Government soldiers stood to arms. Before going forward, both Ngati Toa and Te Atiawa did a haka as McKillop described:

*Our two friendly tribes now assembled for a war dance, previous to setting out to attack the enemy; for although it was the wish of the officer commanding to keep his movements as quiet as possible, he could not persuade our dark-skinned allies to dispense with this noisy and usual practice, although it gave good notice of our intentions to all within hearing. Several of us joined in this exhibition, much to the delight of our Maori friends...*²⁶

Ngati Toa and Te Atiawa advanced up the hill. Half way up, they halted for a prayer, and then continued onwards.²⁷ The Maori contingent advanced most cautiously, crawling through the bush and checking every bush before moving on. In this way, they finally located the exact location of Rangihaeata’s position about a mile up from the camp.²⁸

As the Government’s Maori allies neared the top, the troops and militia came up and took a position, whilst a pioneering party under Lieutenant Elliot and some of the Maori allies began clearing the bush in front of where Te Rangihaeata’s defences were thought to be located. After an hour of this work, the Government party was ready to again advance. Ngati Toa and Te Atiawa advanced up the hill in two parties on the left and right flanks and the Government soldiers followed through the centre. They continued to move forward until they were within two hundred yards of a defensive breastwork over which some of Te Rangihaeata’s men would look occasionally to observe proceedings.²⁹ Power later described the position where the Ngati Toa warriors had held their ground:

*No position could have been better chosen or more unassailable. On two sides it was nearly perpendicular bush covered mountain; and in front was the rising and narrow crest of the hill, densely covered with forest, except where some large trees had been felled to form a kind of breastwork covering the front of the position.*³⁰

²⁵ McKillop, op cit, pp.213 & 214

²⁶ McKillop, op cit, pp.216-7

²⁷ 6 Aug 1846, Scot Journal, op cit

²⁸ McKillop, op cit, pp.217-8

²⁹ 6 Aug 1846, Scot Journal, op cit

³⁰ Power, op cit, p.19

The layout of the ground made it almost impossible to go around the position without taking a very circuitous and difficult route.

Puaha's troops on the left and Wi Tako's men on the right moved about in the bush to within one hundred yards of Te Rangihaeata's defensive position trying to get a shot at those within the fort.³¹ The first shot was said to have been fired about 11am when Lieutenant Page encountered one of Rangihaeata's skirmishers crawling through the undergrowth in front of the breastwork. Page aimed but missed with the skirmisher in turn releasing a shot that also missed. At this point, Puaha's soldiers opened fire on Rangihaeata's position from which a brisk fire was returned. McKillop recorded of the Government soldiers: "...our people getting excited, commenced shooting away right and left amongst the tress, not half of them having seen a moving creature to fire at." In this exchange of fire the first known casualties were recorded with two or three men being wounded among the pioneers of the 99th Regiment who were moving towards the pa clearing trees.³²

The response of the Government force at this point was to try and advance on the front of Te Rangihaeata's position. During this movement Ensign Blackburne and three or four others were shot down "without being able even to see the enemy."³³ McKillop later recorded:

*Poor Blackburn, the acting brigade-major, was the first who fell; he received his death wound from a Maori who was concealed in a tree: he turned round to speak to me about the sailors being so much exposed, when he was shot; one of my own men was shot in the breast almost at the same time.*³⁴

The other man referred to by McKillop was Leading Seaman Roberts who, although not killed outright at this time, later died from his wound. The Ngati Toa warrior who shot Blackburne was in turn killed by return fire. When three of his comrades moved out of cover to retrieve his body, it was reported that they too were shot dead.³⁵

For several hours the firing continued, McKillop estimating that several thousand rounds of ball cartridges were fired during this time.³⁶ Major Last, the officer in charge of the Government contingent, had a narrow escape, a ball passing through the upper part of his cap.³⁷ McKillop too, later discovered a ball lodged in his own cap.³⁸ Despite several entreaties from fellow officers to be allowed another attempt to storm the pa, Major Last refused as he did not know the strength of Rangihaeata's position.³⁹ The position was so tightly constrained that there was no room for the Government troops to manoeuvre to go around Rangihaeata's party and attack its flank or rear. David Scot later recorded what occurred at this point which he believed was around 2pm:

*In the course of the day the war dance was splendidly performed by both parties of our allies and returned by the rebels with the bitterest spirit of defiance.*⁴⁰

³¹ 6 Aug 1846, Scot Journal, op cit

³² McKillop, op cit, pp.218-9

³³ Power, op cit, p.19

³⁴ McKillop, op cit, p.220

³⁵ 8 Aug 1846, *New Zealand Spectator and Cook's Strait Guardian*

³⁶ McKillop, op cit, pp.220 &222

³⁷ 6 Aug 1846, Scot Journal, op cit

³⁸ McKillop, op cit, p.225

³⁹ McKillop, op cit, pp.220 &222

⁴⁰ 6 Aug 1846, Scot Journal, op cit

The Government troops, fearing that the haka was a prelude to a charge, pulled back from their exposed position forty yards in front of Rangihaeata's breastwork, and took up a position behind a breastwork of their own which had since been built around a tree felled by the pioneers.⁴¹ The establishment of this position caused some consternation among the Government's Maori allies who felt that they had been left forward. Their concerns were then "...considerably increased by Majors Last and Arney ordering them to proceed in front beyond our front position in the face of the rebels' breastwork".⁴² Puaha and Wi Tako refused to comply. In response, Major Last called on Scot "to witness their cowardice and uselessness... at the same time intimating that such would be reported to His Excellency the Governor". Scot felt that this was not fair comment about his Maori allies as he later recorded:

...this I exceedingly regretted as I am sure almost all present will bear me out in saying they acted in every way promptly and willingly and at one time upon some of the soldiers retreating rather precipitously from the front of our advanced position among it the natives they cheerfully and steadily obeyed my request to remain in the position they had taken up.



The fight at Battle Hill, Horokiri, 6th August, 1846

⁴¹ McKillop, op cit, pp.220 &222. Scot's account differs somewhat suggesting that the army's breastwork was a forward position. [6 Aug 1846, Scot Journal, op cit]

⁴² 6 Aug 1846, Scot Journal, op cit

Firing continued until 4pm when the Government force retired leaving 70 soldiers and the militia, as well as the Maori allies on the hill. The rest of the army returned to the morning's base camp.⁴³ Overnight all was quiet except for the occasional shot. Scot did record, however:

*Our allies kept up a conversation with the rebels who acknowledged having five shot and two wounded amongst whom they said was Tapuhi the Ngatirangitahi chief, principal leader of Rangihaeata's party and the reported murderer of Richard Rusk; the chef Kohera's son and three others; the Wanganui chief Te Ora dangerously wounded.*⁴⁴

During the night, Rangihaeata's men were heard cutting down trees to strengthen their pa.

1.6 Bombardment and siege

When the troops retired, it had been decided that artillery was needed. McKillop and the sailors of the *Calliope* were ordered to return to Porirua and return with two small mortars and rounds of shell. As they descended from the hilltop, night overtook the party. They were then forced to stumble sightless down to their boats which they finally reached after many falls and with much of the party being dispersed in different directions. The sailors returned to Porirua "half famished and caked with mud", ate a good meal, grabbed four hour's sleep and returned with the mortars and ammunition on 7th August. The trip back up the hill was equally arduous as their previous trip down: "the men not unfrequently coming down with their loads, which rolling to the bottom of the hill, gave us the extra work of taking them up a second time. By 8th August, the mortars were deployed and the first shots fired. Although this resulted in some of Te Rangihaeata's men scurrying for cover, after the first volleys no further movement was seen. The artillery barrage lasted several hours with one observer believing that most of the shells were landing in what was supposed to be the centre of Te Rangihaeata's position.⁴⁵ Another account, however, revealed the barrage to be of little effect.

*...at 11 am commenced to fire shells at about 200 yards distance but which was found to be too near, the shells falling considerably beyond the pa. The mortars were then removed to a more level situation about 300 yards further from the pa when the shells fell nearer it, two in front of the breastwork, a few in the pa, but generally on one side or over it from the difficulty of taking any sure aim in consequence of the high trees with which it was surrounded; a great portion of the shells fired did not burst either from striking the trees or as supposed from some portion of the ammunition being damaged and no material effect upon the rebels was perceptible, they remaining perfectly quiet and no doubt in secure places...*⁴⁶

Later, Scot learnt from his Te Atiawa allies who had continued in conversation with Te Rangihaeata's camp, that the barrage was treated by the defenders "with the greatest contempt" and that the only casualty had been that one of the women who had been only slightly wounded.⁴⁷

⁴³ 6 Aug 1846, Scot Journal, op cit

⁴⁴ 6 Aug 1846, Scot Journal, op cit

⁴⁵ McKillop, op cit, pp.222-7

⁴⁶ 8 Aug 1846, Scot Journal, op cit

⁴⁷ 8 Aug 1846, Scot Journal, op cit

As the day progressed, Rangihaeata's men began to return fire which Major Last later reported continued for the whole day. Towards the end of the day, Maori among the Government party put forward an alternative plan to handle the situation.

*The native allies proposed to Major Last clearing a road and erecting a fence at some distance round the rebels' pa so as to cut off their retreat and starve them into submission which was approved by him and all the tools of the fatigue party were ordered to be left with them.*⁴⁸

By 10th August, Last came to believe that, with Rangihaeata's position being so strong, any advance would occur at a great loss of life among the Government forces. On the other hand, Rangihaeata and his men would merely disappear into the bush with few losses. The Major did not favour these outcomes knowing the impact they might have:

*...the destruction of so many of Her Majesty's troops, without an equivalent proportion on the part of the enemy, would have been regarded as a great victory on the part of Rangihaeata, might have produced a bad impression on the country generally, and have destroyed the effect of our previous successes.*⁴⁹

In addition, there was an issue with the difficulties of provisioning the army in its current location it already being noted that the Government troops were "suffering great privations".⁵⁰ Major Last therefore reached a decision to accept the offer of his Maori allies to stay behind and garrison the position, and "to carry out their own plans", whilst Last and his men withdrew to Porirua until needed again.⁵¹ Therefore, the Maori contingent remained with Lieutenant Servantes and Messrs. Scot and Swainson. William Bertram White recorded that the militia remained behind as well, however it was soon found that food provisions had not been allowed for.⁵²

The withdrawal of the British soldiers did not end their troubles. Power has described the difficulties of the return journey:

The soldiers were exposed for days to the pelting rain and bitter winds, lying at night on the wet ground, and, during the day, wading through mud and water, struggling through mountain torrents, among fallen timber, and the all but impenetrable forest, their clothes in rags, and their boots torn to pieces by the sharp stones and broken branches... rations went astray, or became the prize of those who would seize them first; so that often, while the parties in the rear were wasting food, the advanced guard and piquets were almost starving.

For those remaining on the hill, although the continuous firing had dropped away, caution was still needed. One night, when White was on watch drinking coffee and smoking a pipe by the fire, "a shot passed just over my shoulder within a few inches of my ear and plumped into the fire."⁵³

⁴⁸ 8 Aug 1846, Scot Journal, op cit

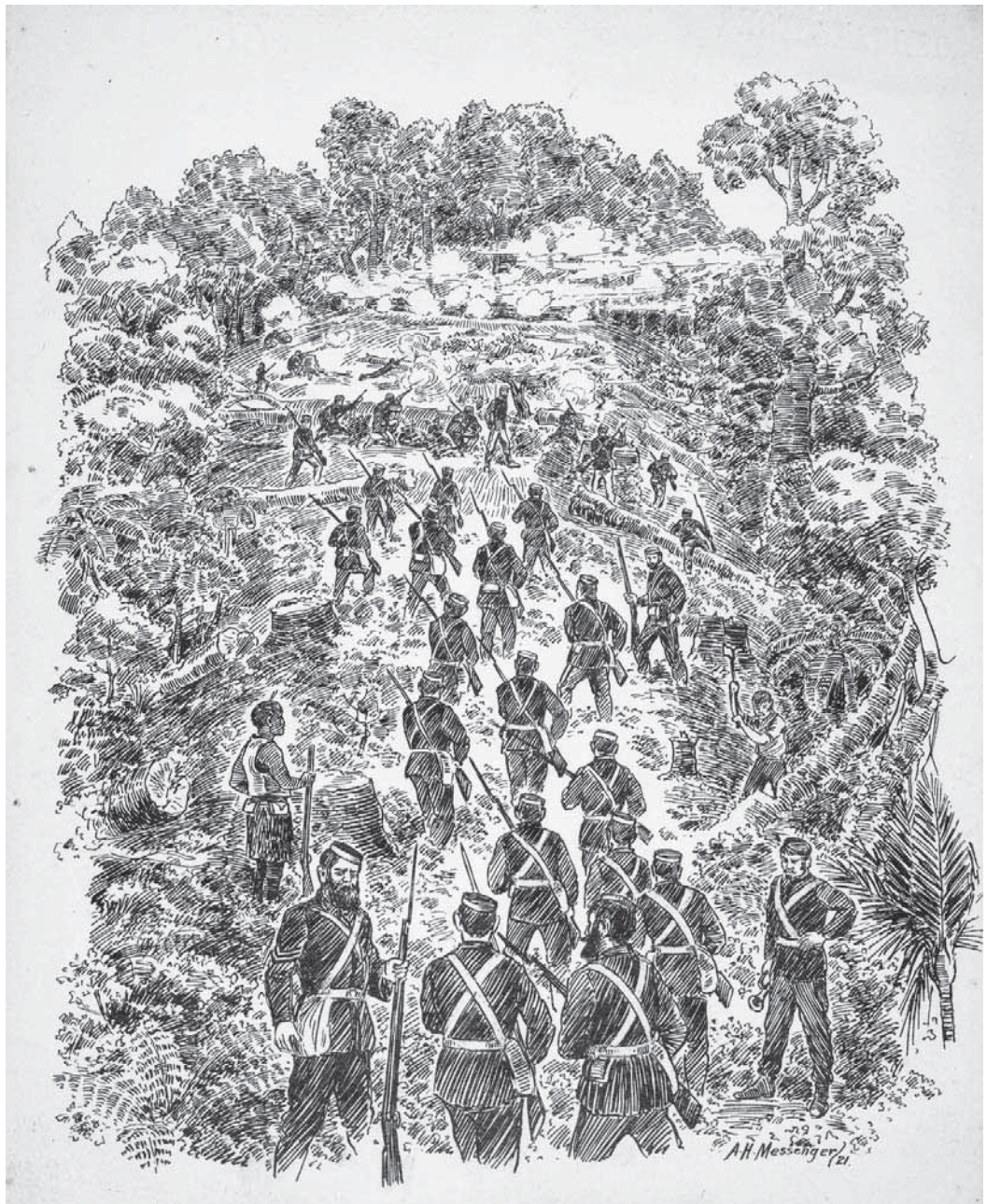
⁴⁹ 10 Aug 1846, Edward Last to Governor Grey, Enclosure 3 in Despatch No.34, *British Parliamentary Papers*, 1847 [766] Vol.38, p.47

⁵⁰ Power, op cit, p.20

⁵¹ Last, op cit, p.47

⁵² White, William Bertram "Highlights in the life of William Bertram White", MS-Papers-4542, Alexander Turnbull Library, Wgtn, p.23

⁵³ White, op cit, p.24



The Attack on Rangihaeata's position, Horokiri

Scot later reported that the Government's Te Atiawa allies were "disappointed" that Major Last had withdrawn the troops and they became unsettled at rumours, spread by Puaha's force, that the Governor had attacked Te Atiawa at Waikanae. This news and the doubts raised led to a halt in the building of fortification until 12th August when the rumours were revealed to be incorrect.⁵⁴

The preparations to entrap Te Rangihaeata were never completed, however. The morning of 13th August, began with a volley of gunfire from Rangihaeata's men. Puaha and his warriors rushed into the fortification to find Rangihaeata's Ngati Toa exiting from the scene. It appears that some days previous to this, after the shelling of the pa began, Rangihaeata and his men had sent the women and baggage away and had subsisted on eating mamaku. They had now fully withdrawn for their position.⁵⁵

⁵⁴ 12 Aug 1846, Scot Journal, op cit

⁵⁵ Servantes, op cit, p.48

David Scot examined the site of Te Rangihaeata's position immediately after the chief and his followers had left:

The breastwork we had hitherto observed was a mere advanced post that completely commanded the approach on that side in the form of a semi circle of about 50 feet composed of logs piled upon each other with upright stakes outside about two feet high, entrenched inside with the earth thrown up, extending to and commanding both sides to the ridge.

The main pa was situated about 50 yards at the back on lower ground so that the breastwork once carried would have commanded it. It consisted of a very hastily erected rough fence of small wood in many parts 6-8 inches apart fastened by a single rail, about half an acre in extent with about twenty very ill constructed sheds for houses which had the appearance of being as recently erected as those in our own camp.⁵⁶

1.7 Immediate aftermath of battle

Having found the breastwork and pa deserted, Puaha and Wi Tako agreed to give pursuit.⁵⁷ Although Scot urged instant movement, his allies wanted to wait the arrival of Waikane Maori whom they had heard were on their way. Unfortunately extremely poor weather held matters up and the pursuit was not begun until 17th August. Over the course of that day, the pursuit party came upon Te Rangihaeata's new camp and prepared to attack. The force split with Te Atiawa proposing to move around ahead by taking a different track and cutting off any possibility of Te Rangihaeata's retreat. Te Puaha was to continue forward and attack from the frontal position. However, as the Te Atiawa came around, they found Te Rangihaeata's camp deserted the reason for which was "attributed to several shots that were fired by a party of Puaha's natives who left us to return to Porirua this morning having been made as signals to the rebels of our march..."⁵⁸

Te Rangihaeata's party was caught up with by Te Atiawa several days later and a brief skirmish occurred. However, Te Rangihaeata's party again escaped. As they headed north, the Government's Maori allies learnt that Te Atiawa chief Wiremu Kingi of Waikanae would not join them against Te Rangihaeata and neither would Ngati Raukawa further to the north. Without this support, it was not possible to continue the campaign so far from home and the pursuit was abandoned. Safely in Ngati Raukawa territory, Te Rangihaeata ensconced himself at Poroutawhao, a swamp pa belonging to Ngati Huia of which Te Rangihaeata was also a chief. Grey took no further action to dislodge him. With the fighting over Te Rangihaeata remained at Poroutawhao.

⁵⁶ 12 Aug 1846, Scot Journal, op cit. See also Servantes, op cit, p.48

⁵⁷ Ibid

⁵⁸ 17 Aug 1846, Scot Journal, op cit

So ended the brief Horokiri campaign. On the Government side, in addition to Ensign Blackburne, Private Thomas Tuite was also killed and Seaman Roberts was mortally wounded. In addition, six regular army men were severely wounded with another being slightly wounded.⁵⁹ The only recorded loss among the militia was George Farmer, White's servant, who had his finger shot off.⁶⁰ Exact losses for Rangihaeata's party in the action were unknown, but it was recorded that at least nine Ngati Toa were seen to fall in action.⁶¹

With Te Rauparaha removed to Auckland, and Te Rangihaeata in exile in the Manawatu, leadership of Ngati Toa fell to three younger chiefs, Matene Te Whiwhi, Tamihana Te Rauparaha and Rawiri Puaha. Grey now turned to these men to complete his objectives of settling the New Zealand Company land issues which, despite the releases of 1844, had continued to be a source of annoyance for Wellington and Nelson colonists. At both places, the settlements that had been established were hedged against the coast by hills. There was not enough flat or easy land to provide a rural hinterland to enable the towns to grow. To fulfill this requirement in the immediate short term, Grey set his sights on acquiring Ngati Toa's lands at the Wairau and Porirua. On 18 March 1847, the Crown purchased the 608,000-acre Wairau block the deed being signed by Rawiri Puaha, Matene Te Whiwhi and Tamihana Te Rauparaha. Two weeks later, the Porirua purchase was completed on 1 April, with the Crown acquiring most of Ngati Toa's land from Ohariu to Paekakariki. Negotiations for these land transactions took place within the context of Te Rauparaha's continuing imprisonment. Commentators have also noted that Ngati Toa were further blackmailed by officials mentioning the Company settlers and officials who were killed at Wairau for which no one had yet been brought to trial.⁶² For Governor Grey, the purchases were part of a wider strategy to end Ngati Toa military power. With the acquisition of the iwi's land, Grey had pacified the Wellington district. For Ngati Toa, the acquisition of most of their lands would be ruinous for the iwi's future.

1.8 Subsequent history

An irony of the Crown's 1847 Porirua purchase is that included the site on which the Horokiri battle took place. More than ten years later, the property was sold to the Abbott family.

Henry Abbott had been a soldier in the East India Company's service and ended his army career as a sergeant in the Bengal Horse Artillery. Abbott had taken part in several military engagements and had been wounded in the leg by a bursting artillery shell. Abbott arrived in New Zealand in 1855. In 1860, he purchased a bush-covered section in the Horokiri Valley and over time acquired up to 900 acres of land including the current Battle Hill property which it is said Abbot named. On 3 June 1882, Henry Abbott died aged 84 years. By the time of his death, the greater portion of his farm was recorded as having been cleared and well stocked with cattle.⁶³

⁵⁹ Last, *op cit*, p.47

⁶⁰ White, *op cit*, p.23

⁶¹ 12 Aug 1846, *New Zealand Spectator and Cook's Strait Guardian*

⁶² Boast, Richard "Ngati Toa and the Upper South Island: A report to the Waitangi Tribunal", WAI-785 #A86, Sept 1999/Mar 2000, Vol.1 pp.220-229

⁶³ 10 Jun 1882, *New Zealand Mail*

Henry Abbott was buried on the farm. The following year, his son aged 46, also named Henry, died in a horse riding accident.⁶⁴ Both are buried on the property as well as two other members of the family: Their graves are located close to two of the Government troops who died at the 1846 battle – Private Tuite and Leading Seaman Roberts. Ensign Blackburn’s remains were taken back to Pauatahanui and eventually laid to rest in Bolton St. Cemetery in Wellington. In 1927, the government erected a memorial to Tuite and Roberts on the Battle Hill property.

The occupation of the battle site as a farming property led to a clearance of the bush that had been such a prominent feature of the 1846 engagement with the result that many of the physical features of the battle were soon erased from the landscape.



Abbott family headstones

⁶⁴ 18 Sept 1974, *Evening Post*

1.9 Archaeology

New Zealand has many archaeological sites that tell unique and wonderful stories of our history.

Our archaeological sites include sites and places where people lived and worked, where they made or gathered food and resources, and where people fought and died. They may be sites associated with the first people in New Zealand, who were the Polynesians voyagers who became the Maori. Later settler communities such as European sealers and whalers, settlers and farmers, and Chinese goldminers also left many sites through the country.

All our archaeological sites are important, no matter how small or similar to other sites. Every site contributes something to the story of our country.

Archaeological sites in Battle Hill Park

There are two groups of archaeological sites in the park: the graves of the Abbott family and two of the soldiers killed during the battle; and the site of the battle on the hill behind.

The graves are located on the flat valley at the base of the ridge where the battle took place, beside the Horokiri Stream. The graves are within two separate concrete structures; one large concrete enclosure contains two marble headstones, one for Henry Abbott d.1882, Delia d. 1877 and Maria d.1867, and a second is for Henry Abbott Jr, d. 1883. A second low concrete mound carries a headstone to William Roberts and Thomas Tuite, who were soldiers.

The site of the battle is part way up the steep dominant ridge immediately north of the valley where the graves are located.

Historian James Cowan first described the battle and its location in 1922. Cowan notes the battle took place on a "...steep and narrow ridge...about three-quarters of a mile north of [Abbott's] homestead..." (1969: 130-133)

Cowan describes several features on the landscape associated with the battle. He notes the leading spur up the ridge leads to the main ridge; this is the ridge the troops followed and the track today winds up and beside it.

The first feature is "A little distance up the ridge there is a trench or long riflepit, now more than half filled in and softly grassed; it does not run across the spur but almost parallel to it."

The second feature is "Several hundred feet higher up..." where "...the knife-back...leads to the knoll in which the Maoris lay behind their...breastworks of earth and logs..... In a slight dip in the ridge a line of depression in the turf running partly across the narrow saddle is...the trench cut by the Government forces...". This is about 300 feet below the fortified summit of the ridge. "A few yards onward the ridge rises into a small knoll; ...there is a rather steep ascent to the crest of Battle Hill...".

Cowan describes a group of features on the summit of the hill, where "the face of the Maori breastwork was immediately on the south end of the crest...the trench and the shelter-pit dug immediately in rear of the parepare are [visible]. The ruined trench...is... about three feet deep, and its ditch-like terminal on the verge of the precipitous slope on the southeast side is well marked. The trench extends across the ridge a distance of 26 paces; it is roughly zigzag in outline and about its centre there is an advanced rifle-pit.

Four paces in rear of the line of trench, at the north end, there is a grassy rua, a pit 9 feet long and 3 feet deep, occupying half the width of the ridge-crown. It was originally roofed over with earth and timber as a bomb-proof shelter”.

Despite Cowan’s description of the landscape and the features, interpreting the landscape and tying the landscape to Cowan’s description is difficult. However it should be remembered that the events described by Cowan took place nearly 160 years ago, and Cowan himself visited the site and described it over 80 years ago.

A trench can be seen today across the lower ridge, which could be either Cowan’s first feature, the “trench or long rifle pit” or it could be his second feature being the Government forces’ trench. This is located at grid reference E2672810, N6015298.

The most obvious feature to be seen today is a zigzag trench cut along the line of the ridge, at grid reference E2672863, N6015383. This is on a high crest of the ridge, but is definitely not at the summit of the ridge, as is the zigzag trench described by Cowan above. The zigzag trench visible today has been cut through at its north end by the farm track; any sign of an “advanced rifle pit” about its centre that may have been present is obliterated. There is also no sign of the rua described by Cowan, and moreover there is little room for a rua of the dimensions noted by Cowan at this point of the ridge where the zigzag trench is.

There are no man-made features to be seen at the summit of the ridge, save a large stone marking the battle.

Recorded archaeological sites:

Archaeological sites in New Zealand are recorded by the NZ Archaeological Association. Sites are referred to by the mapsheet on which they are located and then by their site number. So R26/246 is the 246th site recorded on the R26 mapsheet.

R26	246	2672863	6015383	Rifle trenches	2004
R26	325	2672652	6014923	Graves	2004
R26	326	2672652	6014923	Camp site	2004

Potential for unrecorded sites

There is unlikely to be any completely unknown archaeological sites located within the area of the park. However further unrecorded features associated with the known battle activities may be revealed or located.

1.10 Recent history

Over time, the farm remained in the possession of the Abbott family being passed down through women descendants to the Lynch family and then the Heywoods. By the mid-twentieth century, the Battle Hill property was 501 hectares in total. Of this, 96 hectares had been planted in exotic pine by the Heywoods.

The farm was purchased in 1975 by the Ministry of Transport to provide substitute land for the Miramar Golf Club in the event of planned Wellington Airport extensions of the time encroaching onto the neighbouring golf course. At the time, the descendants of Henry Abbott were reluctant to sell their farm and have the property cut up into lifestyle lots as had happened elsewhere in the valley. It appears that despite the property being privately owned, the southern paddocks were already being used as a picnic spot for group outings.⁶⁵ Local Ngati Toa people used the land for annual picnics and hangi were put down.⁶⁶ For the Abbott family, therefore, the Miramar Golf Course option preserved the integrity of their property and allowed continued public use.⁶⁷

Following the purchase by the Ministry of Transport, the need to use the land as a golf course did not immediately eventuate although the possibility remained and was dependant on developments with Wellington airport. In the meantime, in 1975, some of the property was leased on a short term basis.

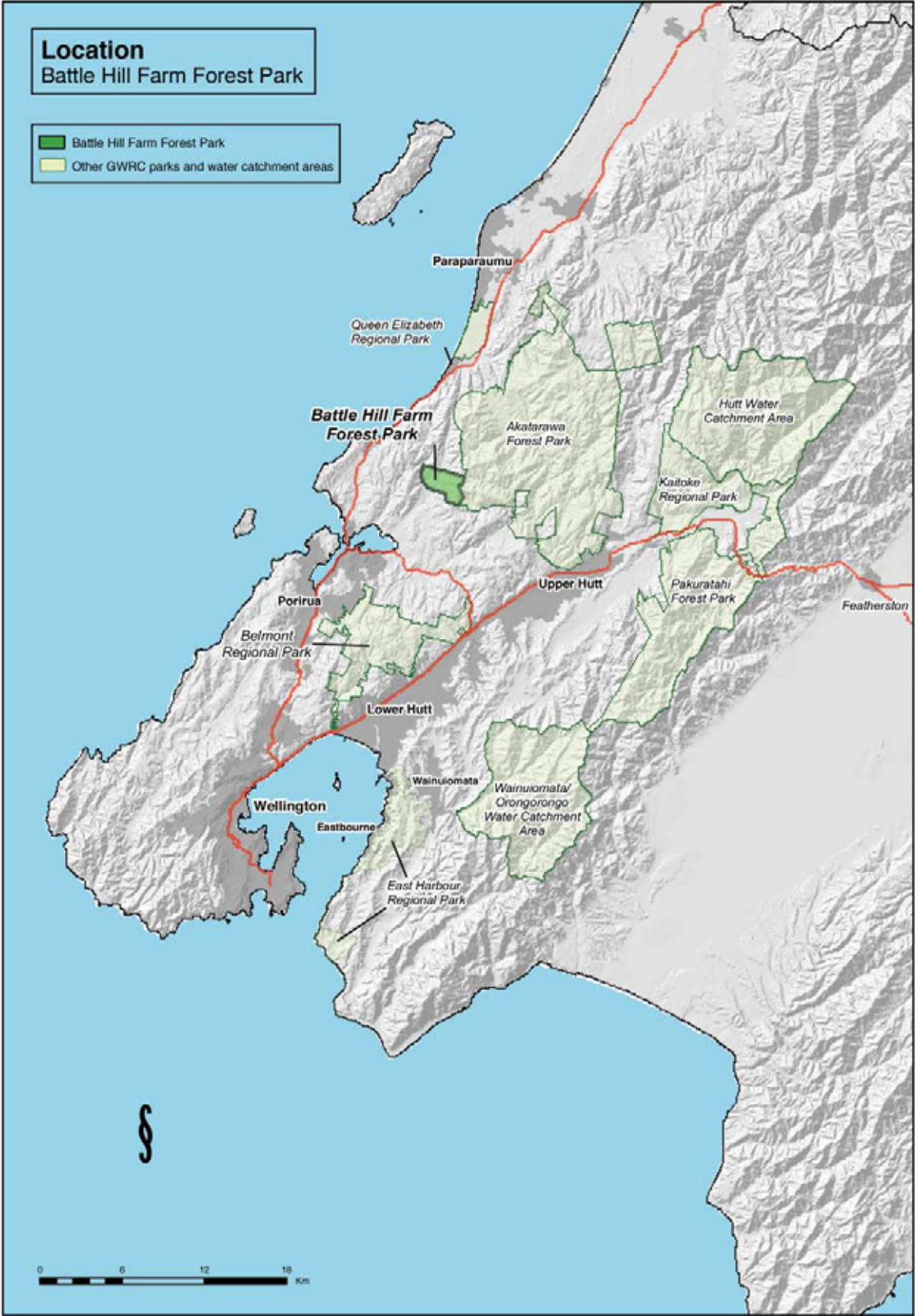
Soon after the acquisition of the land by the Transport Ministry, the Department of Lands and Survey sought to acquire the southern paddocks as a reserve for picnicking and to preserve the historical site located on the property. These arrangements were never quite secured although the use of the property for picnicking continued.

⁶⁵ 18 Sept 1974, *Evening Post*

⁶⁶ 26 Aug 1997, *Dominion*, p.10

⁶⁷ 18 Sept 1974, *Evening Post*

Map 2 Location of Battle Hill Farm Forest Park



1.11 Establishing Battle Hill Farm Forest Park

The Ministry of Works and Development offered the forestry hill sections to the Wellington Regional Council in 1983 to add to the Council's adjacent Puketiro forest property. In mid-1986, the Council decided not to accept this long-standing offer but to instead seek to purchase the whole of the Battle Hill property as this option provided the Council with better access to the Puketiro forest. In addition, the Battle Hill property was seen as an opportunity to combine a working farm, a commercial forestry operation and offer a wide range of recreational activity to the Wellington public. The sale was completed and the Wellington Regional Council took over the property on 16 July 1987, (See Map 2, Location).

When the Battle Hill property was acquired by the Wellington Regional Council, there were certain limiting factors associated with the use of the land. Firstly, there were major electricity and gas maintenance easements on the property running down through Transmission Gully. In addition, when the property was acquired, the potential for the northern motorway to run through Transmission Gully was already known.

Nevertheless, the Battle Hill property provided the Council with an opportunity to demonstrate its key integrated land management policy. The intention was to develop the property for maximum return on forestry and farming compatible with extensive recreational use. A broadly philosophical objective was to foster the development of a sense of regional identity and understanding between Wellington's urban and rural communities.

Over the last 20 years the Council has refurbished and restored many of the farm buildings at Battle Hill. Of note is the Abbott homestead originally built in 1908, which was restored in 1994 and is now used as the park administration centre. The woolshed and surrounding sheep yards originally built around 1920, were restored with a mezzanine floor in 1996. The complex is now known as the Ken Gray Education Centre and has facilities for group education and farm demonstrations.



Abbott Homestead restored 1994



Ken Gray Education Centre. Photo: Robin Blake

Bibliography

Newspapers:

Evening Post: 18 Sept 1974; 17 June 1989, p.30

The Dominion: 26 Aug 1997, p.10

New Zealand Mail: 10 Jun 1882

New Zealand Spectator and Cook's Strait Guardian: 8 Aug 1846; 12 Aug 1846

Archival Sources

Alexander Turnbull Library, Wellington

Luke, David M. "Battle Hill – An Historical Note", MS-Papers-4534

Scot, David "Journal of expedition against rebel natives in 1846", MS-Papers-5574

White, William Bertram "Highlights in the life of William Bertram White", MS-Papers-4542

Official Government Reports

British Parliamentary Papers, 1847 [766] Vol.38, Despatch No.34, Lieut.-Governor Grey to W.E. Gladstone, pp.43-48 [IUP edition, pp-499504]

Unpublished Reports

Boast, Richard "Ngati Toa in the Wellington Region: A report to the Waitangi Tribunal", WAI-145 #H8, June 1997

Boast, Richard "Ngati Toa and the Upper South Island: A report to the Waitangi Tribunal", WAI-785 #A86, Sept 1999/Mar2000, Vol.1

Rei, Matiu Nohorua Te "Brief of Evidence", WAI-785, 9 June 2003

Published Material

Cowan, James *The New Zealand wars: a history of the Maori campaigns and the pioneering period*, New York: AMS Press edition, 1969. [Reprinted 1983]

McKillop, Henry F. *Reminiscences of twelve months' service in New Zealand, as a midshipman, during the late disturbances in the colony*, Christchurch: Capper Press edition, 1973

Power, William Tyrone *Sketches in New Zealand, with pen and pencil: from a journal kept in that country July 1846 to June 1848*, Christchurch: Capper Press edition, 1974

Waitangi Tribunal *Te Whanganui a Tara me ona takiwa*. Wellington: Waitangi Tribunal, 2003

Wards, Ian *The Shadow of the Land: A Study of British Policy and Racial Conflict in New Zealand 1832-1852*, Wellington: Government Printer, 1968

Physical Environment

2. Topography, Geology and Landforms



Oblique view of Battle Hill looking north up Transmission Gully towards Paekakariki Hill

2.1 Physical features and topography

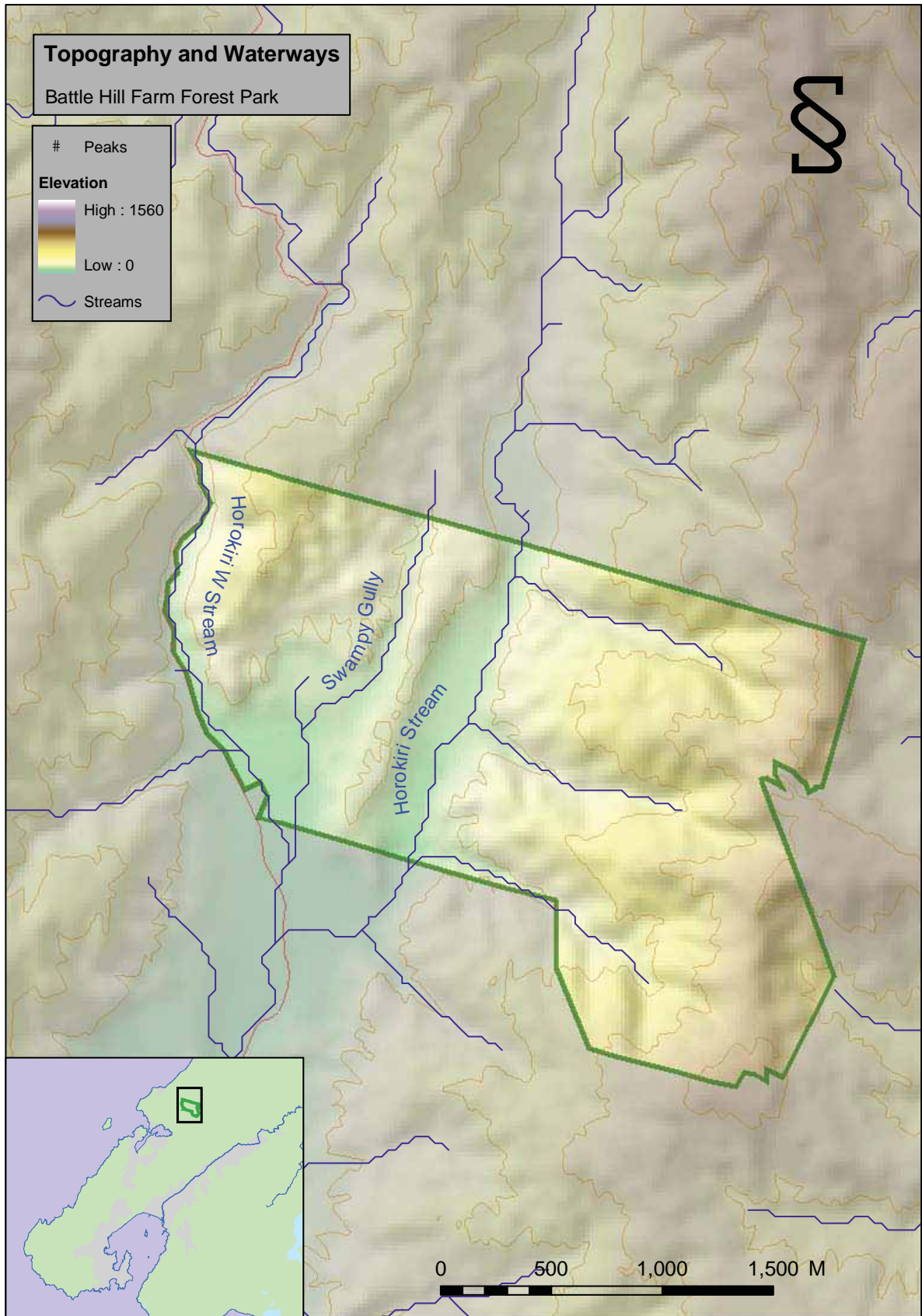
The smallest of the Regional Parks (501 ha) Battle Hill farm Forest Park sits astride Horokiri Valley and is about 5 km inland from the sea. The Park area has been subjected to land formation processes of uplift, erosion and deposition and this is reflected in the topography. (See Map 3, *Topography and Waterways*).

Various tributaries of the Horokiri Stream cross the Park deeply dissecting the high (400 m), steep hills to the east and transporting gravel and silt to the valley, more than 300 m below. These hills are covered with plantation forest. A small remnant of native lowland forest covers the west face of the lower, western hills and the remainder of the Park is pasture. The low relief of the farmed land means that the area is accessible to a wide cross-section of the community. The eastern boundary of this park borders the western boundary of Akatarawa Forest.

The entrance to the Park skirts the western hills where walking tracks lead to the historical battle site and offer views of the valley below. Further tracks cross farmland to Transmission Gully and up into the pine forest. Steep forested hill country is common in the Wellington region and well represented in reserve land. There are far less areas of relatively level, accessible, land with fertile soils.



Map 3 Topography and Waterways





Oblique view looking west across Battle Hill towards the Akatarawa hills

2.2 Geological history of the Wellington region

The landscape of the Wellington region has resulted from the interplay of tectonic and climatic processes over both geological (millions of years) and human (decadal) timescales. Much of the physical evidence of the processes that have shaped the region is preserved within regional parks, forests and water collection areas. The following guide helps to identify and interpret these geological and geomorphological features.

From the Triassic to the late Jurassic Period (240-140 million years ago) sediment was eroded from Gondwanaland and was deposited in an adjoining trough known as the New Zealand geosyncline (Stevens, 1973, Thornton, 1985). During the late Jurassic to early Cretaceous (140-100 million years ago) these sediments, now consolidated into rock, rose out of the sea in a movement known as the Rangitata Orogeny to form the landmass that is now New Zealand. The rocks forming the Wellington region, comprise a sequence of grey sandstones interbedded with mudstone, and these together are commonly known as greywacke. These greywackes are widespread and form all of our tectonic mountain ranges. In geological terms they are distinguished as the Torlesse Terrane after Mt Torlesse in Canterbury. The original landmass was raised in the Rangitata Orogeny to form mountain ranges but by the end of the Cretaceous Period this land had been eroded to a surface of low relief known as a peneplain.

Over the last 25 million years New Zealand has experienced another period of uplift known as the Kaikoura Orogeny. Orogeny or a period of uplift and mountain building is associated with the compression that results because of proximity to tectonic plate margins. New Zealand sits above a zone where the continental Indian/Australian Plate meets the oceanic Pacific Plate. As these plates converge, subduct and slide past each other, the stress generated causes the rock above to fracture and move along

long irregular lines known as faults. The Wellington region has a series of these faults, many tens of kilometres long, running roughly parallel to each other with an overall northeast trend. The four main fault lines are: the Wairarapa Fault; the Wellington Fault; the Ohariu Fault and the Pukerua Fault (McConchie *et al.*, 2000). Movements, on these faults are mainly lateral, that is, one side slides against the other, but some vertical movement also occurs. When this happens, the resulting shock is felt as an earthquake. The fault itself consists of shattered and pulverised rock.

The effect of this movement on the landscape continues to be dramatic. The hills immediately to the west of each fault rise steeply. Those adjacent to the Wairarapa Fault reach up to 900 m within 10 km of the fault. Hills west of the Wellington Fault reach 400 m within 4 km. Streams and rivers follow the easily eroded main faults and secondary faults which are north trending. This accounts for the orientation of the drainage network in the region (Cotton, 1914).

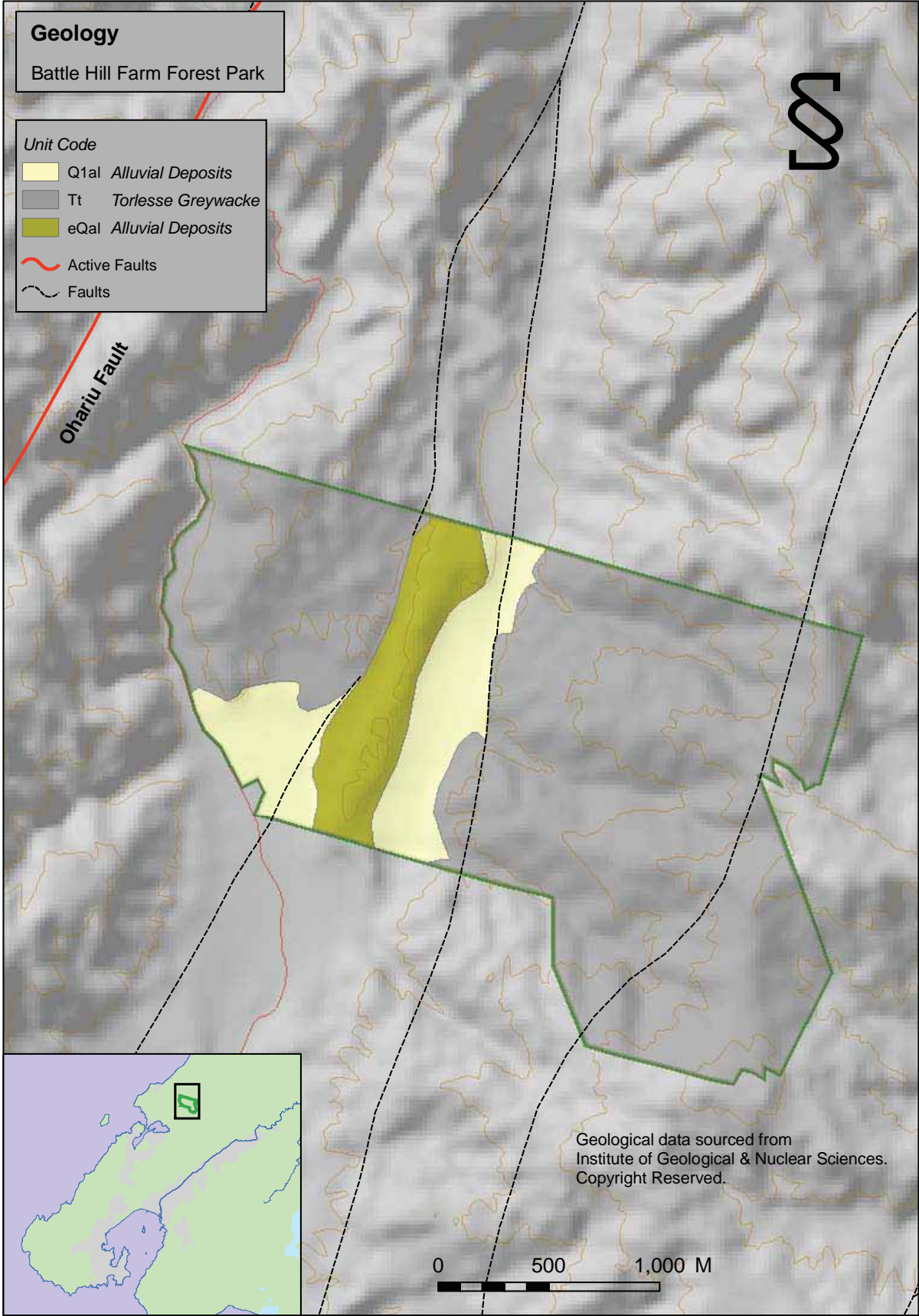
It is interesting to note that before the uplift began the Hutt River flowed along the route followed by the Haywards Hill Road to the Pauatahanui Inlet. As the Belmont hills rose, the river followed the line of least resistance and turned southwest along the fault, entering the sea where the suburb of Kilbirnie lies today (Stevens, 1991). Movement continues to occur on Wellington's fault lines. Climate also plays a large part in shaping the land. Many geological and climatic events in the past have left traces in the regional environment that help to explain the creation of the landscape as it is today.

2.3 Geology of Battle Hill Farm Forest Park

Horokiri and Transmission Valleys have been eroded out along old fault lines that run roughly parallel to the more recent Ohariu Fault. Major erosion during cool climate glacial periods has resulted in infilling of these valleys with alluvial gravels to a considerable depth. As the climate grew gradually warmer and forest returned to the hills above the valleys, the stream began cutting down through the gravels once more to create the scene we see today. Traces of the former thick gravel remain under the rolling land in the middle of the Park, (*See Map 4, Geology*).

The sandstone of the Torlesse greywacke with its sequences of interbedded siltstone has been fractured not only by the faulting but also the freeze/thaw cycles of the glacial climate. Clearance of this land by early settlers triggered widespread erosion. The steep slopes are susceptible to shallow slips especially in fossil gullies.

Map 4 Geology



3. Climate

3.1 Regional climate

The climate of Wellington is dominated by the proximity of the region to the ocean (in particular Cook Strait) and by the topography. Mountain ranges on either side of Cook Strait channel mid-latitude westerly winds to create the distinctive “Windy Wellington” weather.

The area around Cook Strait is noted for its high winds. This is because wind follows the path of least resistance and rather than pass over the Ranges on either side of the Strait, the wind bends and is funnelled through the Strait. Thus wind from the west can become a “nor’wester” by the time it has bent around the hills (Dickson, 1986).

The wind will also have increased in speed as a result of being squeezed through the gap. Average wind speed in the narrows of the Strait is 33 km/hr but maximum gusts of 237 km/h were recorded at Hawkins Hill during the Wahine storm in April 1968 (Goulter, 1984; Reid, 1998).

Migratory anticyclones move east across New Zealand every six to ten days. These are interspersed with troughs of low pressure. This pattern of northwesterly followed by southwesterly wind can become more complex when a wave of depressions or blocking anticyclones occur. The air mass travels over the ocean before reaching Wellington and can arrive laden with moisture. As the air moves up over the hills the temperature falls until moisture condenses out as rain. Thus the higher altitude parts of the region receive more rainfall per year than the coastal areas (Salinger *et al.*, 1986). The West Coast from Porirua Harbour north receives 1000-1200 mm per year while in the Tararua Ranges rainfall varies between 2000 mm at Kaitoke to 6400 mm on the main divide. Despite this overall pattern, the distribution of precipitation in the region on a daily basis is more complex. Intense rainfall can occur at both low and high altitude (Lew & Blackwood, 1995). Rain falls throughout the year with peaks in winter and spring due to the increased frequency of depressions that cross the region at these times.

The range of temperatures for Wellington is small compared to the rest of the country. This is because the maritime location and wind have a moderating effect on temperatures. The average winter mean temperature is 8.2°C and the average summer mean temperature is 16.4°C. The night/day temperature difference is also small (Salinger, 2000). Temperature does vary markedly within the region because of the rugged topography (Goulter, 1984). Variation in altitude (and therefore cloud cover), local winds and aspect all affect temperature.

3.2 Climate at Battle Hill

Battle Hill Farm Forest Park is situated on the margin of a warm, dry sunny coastal zone. The average annual rainfall of 1200-1400 mm/year is moderate for the region, (See Map 5, Rainfall). Climate varies across the park because it is bisected by a long valley and has tall hills to the east. There is no climate station in the Park so the data from nearby stations has been used.

Mean annual temperature at nearby Pauatahanui is 13.1°C, slightly higher than Kelburn (12.5) and the Kapiti Coast (12.9) where steady winds moderate temperatures. Monthly mean temperatures vary around this figure by about 4°C. It is likely that temperatures

at Battle Hill are similar to those at Kelburn as the Park is at a similar elevation and is not as sheltered as Pauatahanui. Air frosts are rare in the area except in flat, sheltered pockets such as occur near the entrance to the park, where cold air may pond. An air frost occurs when the temperature on a screen 1.2 m above the ground reaches 0°C.

Rain arrives from the northwest and falls more frequently in the hills to the east. There will be about 120 raindays (days with at least 1 mm of rain) per year. Periods exceeding 14 days without rain are common in the summer months but otherwise are rare.

As might be expected in Wellington the average wind run is quite high. At Pauatahanui it varies from 286 km/day in March to 381 km/day in October. At Paraparaumu Airport it is far higher, 312 km/day in March and 432 km/day in October. The statistics for Battle Hill should be somewhere in between these figures. Wind conditions are likely to be more varied than at the coast because the channelling effect of wind moving through Transmission Gully will increase the velocity and turbulence of the wind.

4. Waterways

4.1 Hydrology

Battle Hill Park spans a number of tributaries of the Horokiri Stream (previously known as the Horokiwi Stream) which drain the hills above Transmission Gully and Horokiri Valley (Horokiri Stream West), (*See Map 3, Topography and Waterways*). The total size of the catchment is 3,302 ha of which the Park comprises 501 ha. Almost the entire catchment has been cleared of the original native forest and in the Park and upstream from the Park the predominant land-use is pastoral farming and exotic forest. The stream is shallow and has a stony substrate.

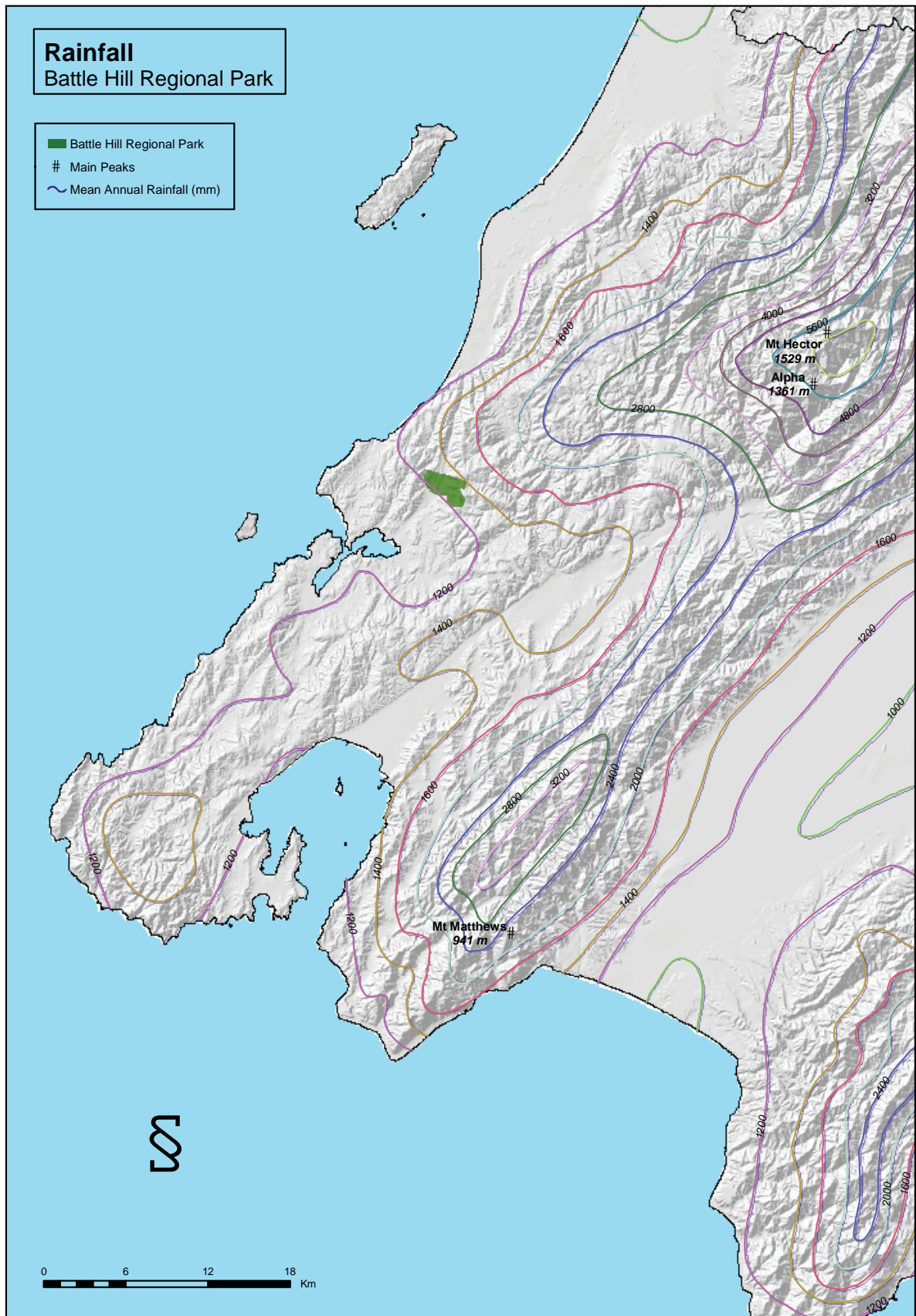
Downstream from the Park there has been a gradual degradation in stream health over the past 50 years. This is because lack of riparian management has caused in-stream erosion and more intensive farming practises have resulted in higher levels of nutrients in the stream (Jellyman *et al.*, 2000).

The geology of the catchment (fractured greywacke and alluvial gravels) makes it susceptible to erosion during intense rainfall especially when the vegetation cover is removed. Vegetation removal occurs periodically in a plantation forest and there is a window after harvesting until new trees are eight years old when silt may wash into waterways (Hicks, 1995). Pasture is not as effective as forest at intercepting rain and slowing surface run-off.

The steep narrow gullies where the headwaters lie channel water, and move it quickly downhill. This can cause erosion of stream-banks where tributaries join the main channel. Downstream erosion and deposition of silt can cause decreases in aquatic invertebrates such as caddis and mayfly and also therefore, in fish (Jellyman *et al.*, 2000).

Initial testing by a Community Stream-care Group in April 2002 using a Stream Health Monitoring and Assessment Kit (SHMAK) found the Horokiri Stream at Battle Hill had moderate overall stream health (Thorn, 2002).

Map 5 Rainfall



5. Soils

5.1 Soils of the Wellington region

Soil is a product of the environment in which it develops. It results from the interaction between the parent material from which it derives; the slope and aspect of that material; the climate (temperature and rainfall) and the biota (in particular vegetation) that grows on it. Soil takes time to develop.

The soils of the Wellington Region have formed on greywacke and argillite rock; slope debris (colluvium); river deposits (alluvium); wind blown silt (loess); sand and peat. They have formed on generally hilly terrain under a climate where temperatures and rainfall vary markedly. These soils have formed during the last ten thousand years, mainly under forest.

In order to understand the differences and similarities of soils they have been named and classified into groups. Maori were the first people in New Zealand to name different soils (Bruce, 2000). Since then various Classification Systems have been used. The New Zealand Genetic Soil Classification (NZG) (Taylor, 1948), was developed in the early 20th century, describing soils according to how they were formed. The present New Zealand Soil Classification (NZSC) (Hewitt, 1998), describes soils as they are. Soils within groups are given a series name based on a location where that soil was first described.

The largest (and most widespread) order is the brown earths. These form on materials derived from sedimentary rock in a climate where the soil rarely dries out and is not waterlogged in winter (Molloy, 1988). Other orders found in the Wellington region are: organic soils; gley (wet) soils; ultic (leached/illuviated) soils; podzols (leached with an horizon of accumulation); pallic (pale) soils; recent soils; and raw soils (very recent). Within these orders there are 33 soil series in the Wellington region.

5.2 Soils of Battle Hill

The soils in this Park are a mixture of alluvial river terrace soils, the silty loess soils of gently rolling hollows and smooth ridge crests, and thin hill and steep land soils. The risk of erosion is low on the moderate slopes but steep land soils are subject to slope failure especially following intense rainfall events. The following soil descriptions are from Bruce (2000), (*See Map 6, Soils of Battle Hill*).

Heretaunga silt loam has well-developed upper horizons in fine silty or sandy alluvium. In places these may be stony. Subsoils have weakly developed blocky structures and finer textures than the topsoils. Below about 40 cm subsoils become firm. These free draining soils are drought prone but groundwater is available where plants are capable of extending their roots 1 m or so to the underlying gravels. The loose nature of the soil means that some trees are susceptible to windthrow.

NZSC: *Typic Firm Brown soils*

NZG: *Yellow-brown earths*

Judgeford soils are some of the more versatile of the region. The loess in which they are developed contains volcanic ash (tephra) which weathers in the humid climate to form a clay mineral called allophane. This increases the water holding capacity of the soil. Nevertheless, the soils are well drained and will support high quality pastures if top-dressed.

The surface horizon of Judgeford soils is generally a dark, greyish brown, silt loam, and the subsoils have mainly silt loam or silty clay loam textures. Belmont soils have a dark brown, friable, silt loam topsoil over silt loam subsoils.

Judgeford series

NZSC: *Acidic-allophanic Firm Brown soils*

NZG: *Yellow-brown earths*

Belmont soils are similar to, and closely associated with Judgeford soils. They occur mainly above 300m elevation and have a dark brown, fxxxx, silt loam topsoil over silt loam subsoils.

Belmont series

NZSC: *Allophanic Firm Brown soils*

NZG: *Yellow-brown earths*

Korokoro soils occur on moderately steep to steep slopes and rolling ridge crests. There may be some loess in the thin silt loam surface horizons and subsoils are silt loam or clay loam with fragments of deep weathered greywacke. Erosion potential is low and the soils are well suited for pastoral farming.

NZSC: *Typic Firm Brown soils*

NZG: *Yellow-brown earths*

The steepland **Makara** soils are developed in weakly weathered greywacke and associated slope deposits. They occur on moderately steep to very steep slopes and have shallow stony profiles. Rock outcrops are common. Many areas of Makara soils are in pastoral use, planted in exotics or set aside for conservation purposes.

NZSC: *Typic Orthic Brown soils*

NZG: *Steepland soils related to yellow-brown earths*

Soils of the **Akatarawa** series are developed in weathered greywacke and related slope deposits. A common profile has a thin, dark greyish brown, silt loam surface horizon on a yellowish brown stony silt loam subsoil.

NZSC: *Typic Orthic Brown soils*

NZG: *Steepland soils related to yellow-brown earths*

Ruahine soils are also developed on greywacke, but the profiles are thin and stony. The profile is typically a thin, dark brown, silt loam topsoil with a strong subangular blocky structure on a dark yellowish brown stony silt loam subsoil.

NZSC: *Typic Orthic Brown soils*

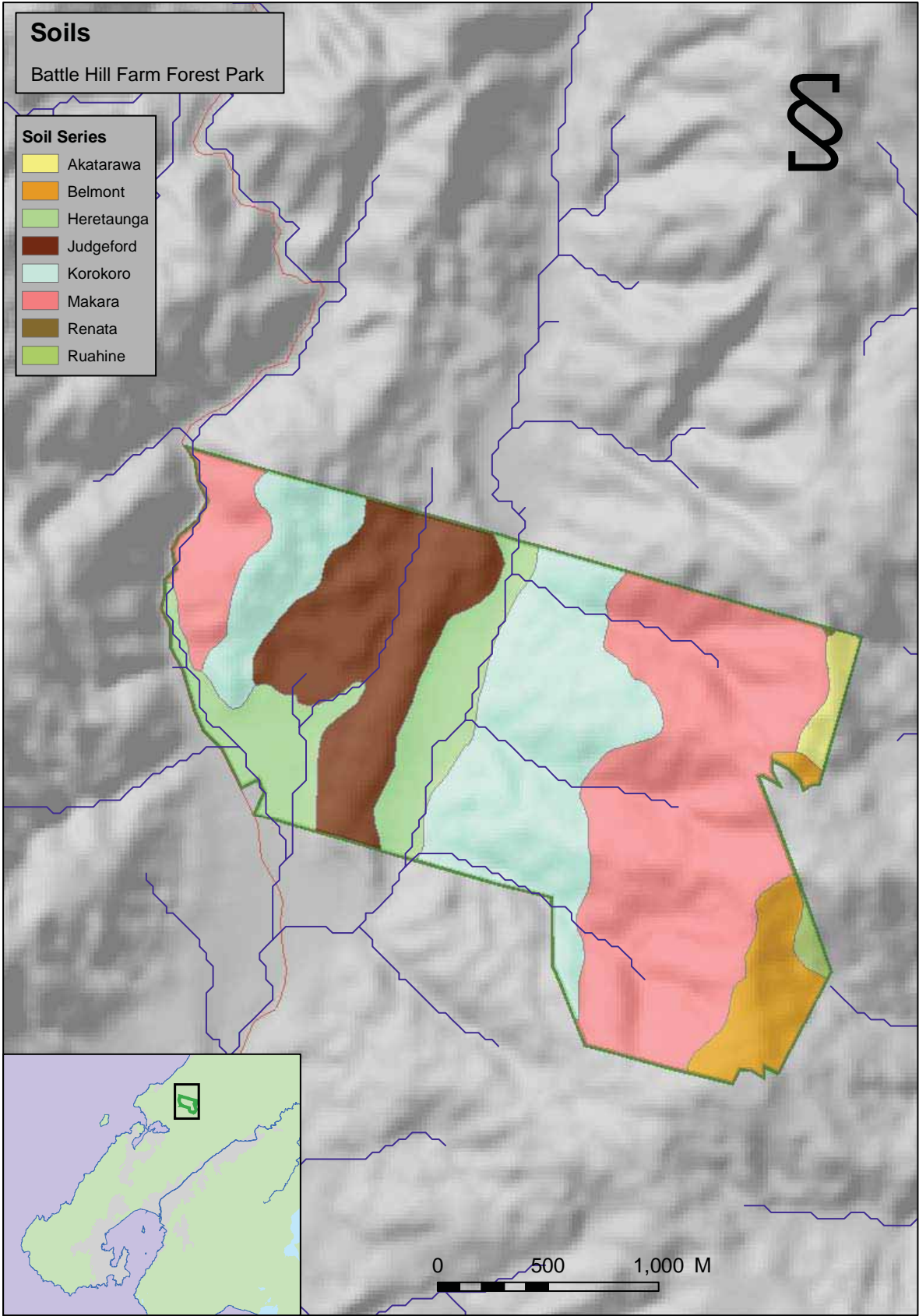
NZG: *Steepland soils related to yellow-brown earths*

There is only a very small piece of **Renata** soils in the north-eastern section of Battle Hill Farm Forest Park. Renata soils are imperfectly drained and subject to slight sheet erosion.

NZSC: *Peaty-silt-mottled Perch-gley Podzol*

NZG: *Podzol, weakly to moderately gleyed.*

Map 6 Soils



Biodiversity

6. Flora

6.1 History of regional vegetation

Before humans arrived in New Zealand, the climate was the main determinant of vegetation changes in the region. The two main forest types currently found here, beech and podocarp/broadleaf forests, have been present in New Zealand for perhaps 100 million years (Dawson, 1993), however past ice ages have caused fluctuations in their distribution throughout this time. There have been many periods when temperatures in Wellington have been both warmer and colder than today, sometimes by as much as 4°C (Mildenhall, 1994). The warmer periods seem to be associated with higher rainfall and the cooler ones with windier weather.

More than 80,000 years ago the climate was warm, rather similar to today. Palynological studies (of ancient pollen grains and wood fragments found at depth in soil cores) show that the forest around Wellington Harbour was dominated by rimu (*Dacrydium cupressinum*) and tree ferns (*Cyathea* spp.). Northern rata (*Metrosideros robusta*) grew at Seaview (Mildenhall, 1994). The forest retreated into sheltered gullies and warm west facing slopes during the last glaciation. During this time much of the Wellington region was covered with grass and low scrub, while silver beech (*Nothofagus menziesii*) and mountain toatoa (*Phyllocladus alpinus*) were the predominant trees. When this cold period ended abruptly about 10,000 years ago, the forest flourished again with the gradually rising temperature.

About 7,000 years ago, another cooling phase began and the climate also became drier with more frosts and wind, conditions that led to the development of forests seen in contemporary times. Black beech (*Nothofagus solandri* var. *solandri*) and hard beech (*N. truncata*) – both species able to withstand cooler temperatures – slowly invaded southwards along the uplands from the Tararua and Rimutaka Ranges. Beech trees have wind dispersed seeds and slowly colonise open sunny sites, surviving on poor soils and spur crests (Druce & Atkinson, 1959; McGlone, 1988). By 2000 years ago, black beech and hard beech were replacing podocarps in forest on the south coast at Pencarrow where Lake Kohangatera lies today (Upston, 2002), but podocarp/broadleaf forest still dominated in the lowlands and in the western parts of the region. Beech trees are thought to have been absent from the Pauatahanui district for many thousands of years.



Typical of ancient forests of the region





Tawa

In the Battle Hill area, the vegetative cover prior to human settlement would have been lowland podocarp/broadleaf forest. The composition of forest would have been similar to that seen in the western and southern Tararua foothills, but with an influence from the nearby coastal environment. The hills would have been covered with rimu-rata/tawa (*Beilschmiedia tawa*) forest mixed with varying amounts of hinau (*Elaeocarpus dentatus*), totara (*Podocarpus totara*), matai (*Prumnopitys taxifolia*) and miro (*Stachypitys ferruginea*). Tawa would have been very common. Some coastal forest, containing kohekohe (*Dysoxylum spectabile*), nikau (*Rhopalostylus sapida*) and titoki (*Alectryon excelsus*) would have existed in more sheltered sites.

6.2 Human impacts on the vegetation

Human induced changes to New Zealand’s natural environment began after Polynesians settled about 1000 years ago. Despite evidence of major fires throughout the country that caused extensive deforestation (most occurring roughly 750 years ago) (McGlone, 1989), Wellington’s hills appear to have suffered little of this loss.

At the beginning of the nineteenth century the Akatarawa uplands and the Tararua and Rimutaka ranges were dominated by beech forest – in contrast to the western hills of Makara, Karori and Belmont, which were still covered in podocarp/broadleaf forest (Druce & Atkinson, 1959; Park, 1999). The reasons for this pronounced difference in forest type have long been a matter of local scientific speculation. Soil differences are likely to be involved.

Early in 1840 the first European settlers landed on the beach at Petone and, needing wood for building and for fuel, immediately began to fell the forest (Oliver & Williams, 1981). Within a few years much of the floodplain forest and other accessible areas were cleared and replaced by pasture grasses or plantation trees. The Horokiri Valley appears to have still been in forest at that time, as an account by Buller in the 1860s emphasized the “impervious tangle of bush” (Healey, 1980). Settlement in the Horokiri Valley began after the road was established between Pauatahanui and Paekakariki in 1849. The NZ Official handbook recorded in 1883 that the valley had been cleared to a considerable extent and used for pasture.



Kohekohe
Photo: T.Lilleby, DoC

6.3 Vegetation in Battle Hill

Battle Hill Farm Forest Park (501ha) is now largely in pasture grassland (31%) and plantation forest (45%), as estimated using the New Zealand Land Cover Database, (2003), (*See Map 7, Landcover*). A small remnant of coastal forest (35ha) can be found at the front of the park, while there are areas of low producing grassland and indigenous forest within the plantation forestry blocks at the back of the park.

6.3.1. Bush Remnant

The bush remnant is representative of the forest that was once common in the area and as such is a valuable piece of indigenous bush. There is also an adjoining private bush block of a similar composition (Collyns’ QEII National Trust Covenant). The following description of this area is based on reports by Pat Enright *et al.*, (2000), Mitcalfe, (2002) and Polly & Lewington (1989).



Titoki
Photo: DoC

Battle Hill Bush rises steeply from a branch of Horokiri Stream to the historic battle site at the top of the hill. The lower slopes of the forest are dominated in places by tawa and in others titoki. This changes to almost pure kohekohe on the upper slopes. Swampy areas support kahikatea (*Dacrycarpus dacrydioides*) pukatea (*Laurelia novae zelandiae*) and swamp maire (*Syzygium maire*).

Occasional rimu, totara matai and miro occur through the remnant, while the understorey includes mahoe (*Melicytus ramiflorus*), kaikomako (*Pennantia corymbosa*), nikau, *Coprosma* species and other small trees and shrubs. The region's only self-sustaining population of the rare plant *Rhabdothamnus solandri* is found in the remnant. This orange-flowered shrub is from the same family as gloxinia. It is thought to be pollinated only by honeyeaters, such as stitchbird (*Notiomystis cincta*), bellbird (*Anthornis melanura*) and tui (*Prosthemadera novaeseelandiae*). Luckily, two of these bird species still use this remnant as habitat. *Rhabdothamnus solandri* is uncommon in the region because it is approaching its southern limit here. Isolated plants of this species are found at one or two other sites near Wellington.

Other plants of note in the reserve are:

- two maidenhair ferns (*Adiantum diaphanum* & *A. viridescens*) with restricted distribution in the region
- *Arthropteris tenella*, a fern local to Wellington
- gully tree fern (*Cyathea cunninghamii*) which has patchy distribution in the region
- perching kohuhu (*Pittosporum cornifolium*) a small shrub palatable to possums which grows as an epiphyte on trees
- and a greenhood orchid (*Pterostylus foliata*) that is rare in most regions
- four species of moss uncommon in the region (*Trichostomum brachydontium*, *Porotrichum oblongifolium*, *Leptodon smithii* & *Echinodium umbrosum*)



Rimu. Photo: D. Merton, DoC



Totara. Photo: J.Rolfe, DoC



Bush remnant at Battle Hill



View of bush remnant from front paddock

6.3.2 Rest of the park

The farmland (156ha) has been sown in improved pasture species. In some of the farmland gullies, mature pine (*Pinus radiata*) and macrocarpa (*Cupressus macrocarpa*) are growing amongst native scrub. The pine plantation is located on the hill-face at the back of the park. It totals 202ha in size. Around 60ha was planted in 1973/1974 and is due for harvest now (some has already been harvested). The largest forestry block of 158ha was planted in 1991. A small forestry block has been planted and maintained on the farm in conjunction with St Bernard's School as an ongoing school project.

A number of specimen trees have been planted in the park environs, including species such as karaka (*Corynocarpus laevigatus*), totara and lacebark (*Hoheria populnea*). There are also a number of revegetation sites in the park, where riparian species such as flax (*Phormium tenax*), carex species (*Carex* spp.) and toetoe (*Cortaderia toetoe*) have been planted.



Rhabdothamnus solandri in flower
Photo: P. Anderson, DoC

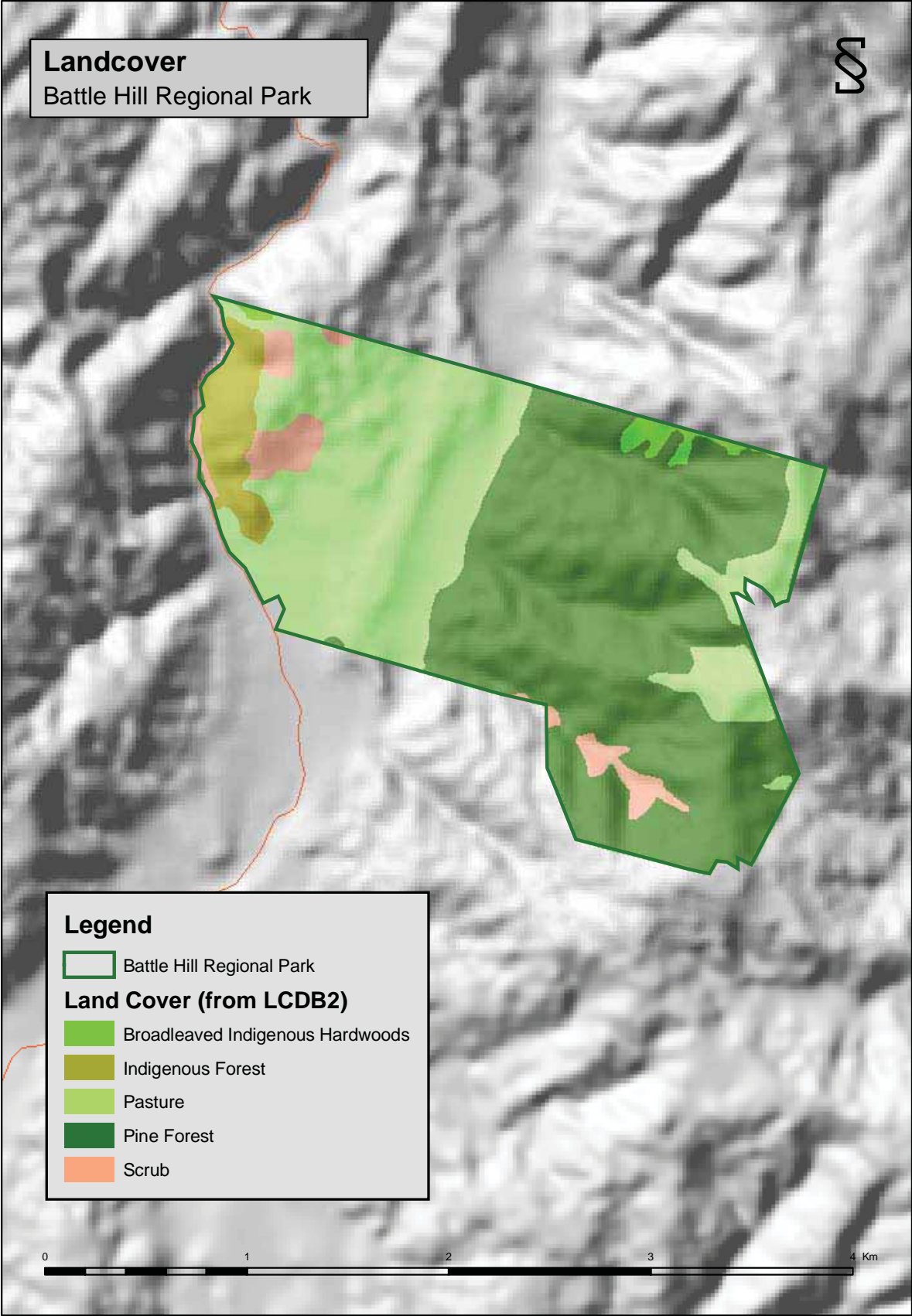


Rhabdothamnus solandri. Photo: P. Anderson, DoC



Pittosporum cornifolium. Photo D. Veitch, DoC

Map 7 Landcover



7. Fauna

7.1 Birds

7.1.1 Battle Hill as bird habitat in the wider Wellington Region

The diversity of birdlife found in the Wellington region today reflects the extensive changes that have occurred in the area since the arrival of European settlers. A number of forest and wetland bird species have become extinct in the region since that time. These include: North Island saddleback (*Philesturnus carunculatus*), NZ thrush (*Turnagra capensis*), NZ robin (*Petroica australis*), NI kokako (*Callaeas cinerea*), NI weka (*Gallirallus australis*), stitchbird, banded rail (*Rallus philippensis*), little spotted kiwi (*Apteryx owenii*) and huia (*Heteralocha acutirostris*). Habitat loss and the introduction of predatory mammals have been two of the major causes of this decline. The native birds that remain are much depleted in number and many are now confined to the large tracts of forest that still exist in the ranges in the northern and eastern parts of the region. Kaka (*Nestor meridionalis*), rifleman (*Acanthisitta chloris granti*), whitehead (*Mohoua albicilla*), long-tail cuckoo (*Eudynamys taitensis*) and tomtit (*Petroica macrocephala*) have only recently been seen returning to the smaller remnants of bush in farmland and in the urban areas of Wellington, but the mainstay of these birds is in the larger forested areas, such as Akatarawa Forest.

Rifleman, tomtit and whitehead have not been recorded in Battle Hill Farm Forest Park, despite the fact that Akatarawa Forest is only 2km away. It is thought that these birds would have been lost from the remnant in earlier times. Nearby Akatarawa Forest is regarded as a site of special wildlife interest and is ranked as a moderate value forested site (Parrish, 1984). The bush remnant, which has been shown to support a good number of bird species in recent years will form part of a corridor for native flora and fauna, stretching through farmland to the Akatarawa Forest to Taupo Swamp and the sea.

7.1.2 Survey of Bird Species

Annual monitoring of bird species in the bush remnant began in 2002. Fifteen native and ten introduced bird species were recorded in the bush remnant in Battle Hill Farm Forest Park in 2005. Silveryeye (*Zosterops lateralis*), grey warbler (*Gerygone igata*), kereru (*Hemiphaga novaezealandiae*), tui, fantail (*Rhipidura fuliginosa*), starling (*Sturnis vulgaris*) and blackbird (*Turdus merula*) have been the most common species recorded. Also noted have been bellbird and New Zealand falcon (*Falco novaeseelandiae*). This latter species is regarded as a threatened species and has been classified as nationally vulnerable, (Hitchmough, 2002). Kereru numbers have been reported to have increased since the mid 1990s (Bissell, pers. comm). Good numbers of harrier hawk (*Circus approximans*) have been seen on the farmland, as have exotic birds, such as sparrow (*Passer domesticus*), chaffinch (*Fringilla coelebs*), yellowhammer (*Emberiza citrinella*), blackbird, magpie (*Gymnorhina tibicen*) and spur-winged plover (*Vanellus miles novaehollandiae*). Mallard (*Anas platyrhynchos*), pukeko (*Porphyrio porphyrio*), paradise duck (*Tadoma variegata*) and black swan (*Cygnus atratus*) have been making a home in the constructed wetland.

A list of bird species recorded within the park is given in Appendix Three.



Bellbird. Photo: R Cole, DoC



Silveryeye. Photo: P Reese, DoC



Australian harrier hawk. Photo: A.G. Hall, DoC



Tui. Photo: Rob Suisted



Mallard drake. Photo: D Veitch, DoC



Paradise shelduck female. Photo: Rod Morris

7.2 Freshwater Fish

The Horokiri Stream (previously known as the Horokiwi Stream) has been the subject of two major studies looking at stream health and fish populations, notably, brown trout (*Salmo trutta*). The earliest of these was Allen’s survey in the late 1940s (1951). More recently NIWA have published findings of a follow-up survey after intermittent monitoring showed a radical decline in trout populations in the lower reaches of the stream (Jellyman *et al.*, 2000). Fish populations in the Park have not declined to the same extent as those downstream.

Jellyman reported that trout were present only in the bush section of the stream at Battle Hill while there were none in reaches below the Park. He and his team concluded that the loss was not due to a single catastrophic event but to a gradual decline of the

habitat including increased erosion and nutrient input. A number of intense rainfall events in the early 1960s changed the physical characteristics of the stream, making it wider and shallower. This erosion problem was compounded because landowners had failed to actively manage stream banks. As a result there are no deep pools, fewer areas of water with riffles and an absence of adequate cover such as high overhanging banks and streamside vegetation.

Increased nutrient input has resulted in vigorous algal growth on rocks in the stream and an increase in water cress in the streambed. This has multiple effects for freshwater fish, there is less food because invertebrate (insect) populations have declined, the water is warmer and therefore has less oxygen, there is less shelter or cover, where fish can hide, and conditions are unfavourable for spawning and the survival of eggs.

Today the most common fish in the stream are the shortfin eel (*Anguilla australis*). Inanga (*Galaxias maculatus*), banded kokopu (*Galaxias fasciatus*) and giant kokopu (*Galaxias argenteus*) are all part of the whitebait fishery and giant kokopu are listed as being in gradual decline under the New Zealand Threat Classification 2002 (Hitchmough, 2002). Inanga are still present in the lower reaches of the Horokiri Stream but only in low numbers as these fish have also suffered from habitat degradation (Taylor & Kelly, 2001).



Giant kokopu (juvenile)



Banded kokopu

Battle Hill Farm Forest Park freshwater fish statistics — In Battle Hill Park							
1964	1967	1982	1983	1985	1989	1997	2005
banded kokopu	banded kokopu	common bully	longfin eel	banded kokopu	koura	brown trout	redfin bully
brown trout	brown trout	longfin eel	redfin bully	brown trout	longfin eel	lamprey	longfin eel
giant kokopu	longfin eel	redfin bully	shortfin eel	common bully	redfin bully	longfin eel	shortfin eel
koura	redfin bully	shortfin eel		giant kokopu	shortfin eel	shortfin eel	giant kokopu
longfin eel	shortfin eel			lamprey			banded kokopu
redfin bully				longfin eel			
shortfin eel				redfin bully			
				shortfin eel			

7.3 Lizards

There are eleven species of lizard in the Wellington region (seven skinks and four geckos) (Parrish, 1984). As with the bird species, these fauna will have suffered from habitat loss and predation by introduced mammals. Four of the region's skinks have only been recorded on the coast or on islands, but common (*Oligosoma nigriplantare*) and copper skink (*Cyclodina aenea*) are likely to be present in the open country of the park. The ornate skink (*Cyclodina ornata*) prefers forest habitat and is thought to be widespread in the region. Of the geckos, one species is confined to Mana Island, but the other three; common (*Hoplodactylus pacificus*), forest (*Hoplodactylus granulatus*) and green gecko (*Naultinus elegans*) are likely to be present in the park. No official recordings of lizard species have been made in Battle Hill farm Forest Park, but the ranger has seen green gecko and common skink.

7.4 Invertebrates

Knowledge of invertebrate diversity is limited in New Zealand, because of a lack of information about most species and their distribution. The vast majority of the indigenous invertebrates are forest-dwellers and it is likely that these species have suffered from the same impacts as the birds and lizards. No studies of invertebrates have been completed in Battle Hill Farm Forest Park, but common insects such as cicada (*Amphipsalta spp.*), katydid (*Caedicia spp.*), praying mantis (*Orthodera novaezealandiae*) and stick insects (*Acanthoxyla spp.*) have been noted. Cave weta (*Gymnoplectron spp.*), peripatus (*Peripatoides novaezealandiae*) and glow worms (*Arachnocampa luminosa*) have also been seen.



Common gecko. Photo: Rod Morris



Forest gecko. Photo: B.W.Thomas



Green gecko. Photo: Rod Morris

Environmental Management & Land Uses

8. Ecosystems Classification and Environmental Protection

8.1 Battle Hill's ecosystems

One of the goals of the Battle Hill Farm Forest Park management plan is to protect and enhance indigenous ecosystems within the park. This ecosystem approach reflects a recognition that everything is interconnected and processes which occur in an ecosystem are as important as the species living within them. Defining ecosystems is not simple, as they generally lack concrete boundaries and biological communities are complex, with continuous variation across landscapes.

In the late 1980's ecological districts and regions across New Zealand were defined, using landscape and ecological patterns. Battle Hill Farm Forest Park is on the divide between two Ecological Districts. Roughly, the back face of the park is in the Tararua Ecological District, while the front face is within the Sounds-Wellington Ecological District. The Tararua Ecological District covers the Akatarawa, Tararua and Rimutaka ranges. It is characterised by the steep, dissected greywacke and argillite hills, high rainfall and strong westerlies winds (McEwen, 1987), while the soils are younger and more fertile in the Sounds-Wellington Ecological District.

A numerically-based approach to ecosystem classification has recently been developed – the Land Environments of New Zealand (LENZ), (Ministry for the Environment, 2003). Within LENZ, ecosystem patterns are mapped through consideration of 15 environmental drivers, combining climate, landform and soil variables such as, temperature, solar radiation, water supply, slope, soil drainage, soil fertility, etc. While the environmental drivers in LENZ were chosen primarily because of their importance for tree species growth, they are also useful for depicting the distribution of other organisms. Throughout New Zealand, LENZ has defined and mapped these 'environments' at different scales.

Eight environments of the most detailed LENZ classification level are found in the park. The bush remnant is located in an environment type which largely only found within the Wellington region. Regionally, around half of the area of this environment is still under natural cover. Much of park's farmland is in environments that are nationally depleted of natural cover.

8.2 Impact of introduced pests

Possums (*Trichosurus vulpecula*), goats (*Capra hircus*), mustelids (*Mustela spp.*) and rats (*Rattus spp.*) have major impacts on the ecological values of the park. Pigs (*Sus scrofa*), cats (*Felis catus*), mice (*Mus musculus*), rabbits (*Oryctolagus cuniculus*), hares (*Lepus capensis*), hedgehogs (*Erinaceus europaeus*) and magpies are also contributors to the decline of native flora and fauna. Possums eat leaves, seeds, fruit and seedlings of plants and are also known to predate native birds and insects. Possum damage



German ivy

varies between plant communities and possums will often target certain preferred food sources, such as rata and tawa (Pekelharing, 1995). Possums have colonised the Wellington region since the late 1800's and caused great damage to the vegetation during this early invasion phase. The vegetation change is now more gradual, but ongoing impacts can be seen where possums are not controlled. Goats browse the seedlings of the forest and shrublands. They also prefer particular species, such as wineberry (*Aristotelia serrata*), pate (*Schefflera digitata*) and fuchsia (*Fuchsia excorticata*), the early colonisers of slips. They are capable of removing much of the forest understorey. This browsing causes increases in erosion of steeper slopes, weakens forest structure and inhibits natural regeneration processes. Mustelids (*Mustela* spp.) and rats (*Rattus rattus*) prey on birds, invertebrates and lizards.

Pest plants have the potential to significantly change the composition or structure of native habitats. Many climbing pest plants, such as banana passionfruit (*Passiflora mixta*) and Japanese honeysuckle (*Lonicera japonica*) can smother mature plants, while other plant pests interfere with regeneration and compete with indigenous plants for space and soil nutrients.

8.3 Control of introduced pest animals

Possums

Possums in Battle Hill Farm Forest bush remnant have been controlled using a variety of ground-based methods since 1997. Bait stations are located throughout the remnant and brodifacoum, cholecalciferol and traps have been used at various times to keep possum numbers low. The plantation forestry block is part of a cycle of 1080 possum control operations programmed for the more rugged forested areas managed by Greater Wellington. This block was last controlled in 2001 and possum numbers fell from 19.1% to 0.9% RTC¹ at that time. The next 1080 operation is planned for 2007.

Ungulates

Goats and pigs have been present in the remnant, but have been cleared from the area since 1998. Feral deer, pigs and goats are present in low numbers in the plantation forestry block. Vigilance by ranging staff ensures that re-infestation is kept to a minimum.

Other pest animals

Rats will have been controlled as well as possums when brodifacoum-based baits have been used. Mustelid traps have been set around the remnant and on the farmland since 2003. Stoats (*Mustela erminea*), ferrets (*M. furo*) and weasels (*M. nivalis*) have been trapped. The Ranger is currently setting up a mustelid trapping regime across much of the front section of the park, in preparation for a possible brown teal reintroduction project. Rabbits and hares are controlled by night shooting. The RCD² virus did significantly lower rabbit numbers in the park in 1998.



Tradescantia

¹ RTC: Residual trap catch – how many possums caught per 100 traps

² RCD: Rabbit calicivirus disease

8.4 Control of pest plants

Pest plants have been controlled in the remnant bush for a number of years. In 2001, 34 pest plant species were identified within the bush remnant during a pest plant mapping exercise. Control of these infestations was then prioritised using criteria related to the urgency and practicality of control. One species, banana passionfruit is required to be controlled under the Regional Pest Management Strategy.

Twenty-three high priority pest plants were selected for control in the bush remnant, the regenerating hillside nearby and the roadside flats. The main species tackled have been holly (*Ilex aquifolium*), tradescantia (*Tradescantia fluminensis*), banana passionfruit, selaginella (*Selaginella kraussiana*) and German ivy (*Senecio mikanioides*). Ongoing professional control of pest plant infestations in the remnant has been programmed, as specified in the park's Pest plant control plan, (Greater Wellington, 2004)

8.5 Ecosystem monitoring and rehabilitation

One permanent 20m by 20m vegetation plot was installed in Battle Hill Farm Forest Park in 1996/97 and re-measured in 2000/2001. These vegetation plots measure changes in the forest structure over time. The number of stems per ha and the basal area, (a measure of tree growth) were found to have increased when the plot was re-measured. A good range of seedlings of different sizes were recorded, which indicates that the forest is in good health. The distribution of the *Rhabdothamnus solandri* population will be monitored over time. Other monitoring includes monthly flowering and fruiting recording, which has been completed by the ranging staff since 2001. This data will prove useful in the long-term to determine flowering and fruiting cycles of key plant species within the remnant.

A number of restoration projects are underway in the park. The largest of these is centred around Swampy Gully where large-scale wetland restoration is planned. The construction of three ponds near the woolshed was completed in 2002 and extensive fencing and planting had been undertaken. This project will be ongoing for a number of years, as it is planned to plant all of the gullies and upstream banks of the Swampy Gully stream over time. Other plantings in the park include riparian plantings on the banks of Horokiri West Stream and a wetland area near Transmission Gully. A seep was fenced in 1999, in order to demonstrate how fencing off an area can improve nutrient breakdown. A number of volunteers have been assisting with mustelid trapping in the park and are keen to restore the wetland habitat for rare species such as brown teal.



Upper Swampy Gully Arbor Day Planting



Swampy Gully Planting Arbor Day 2006



Three Wetlands Swampy Gully

9. Landscape character



Undulating pastureland

The contour of the Battle Hill property stretches west to east through a landscape of river flats, to undulating and rolling hill country to back country steeplands. The Park has a considerable diversity of habitat including wetlands, grassland, lowland indigenous forest and exotic forest and these variations each leave different impressions on the landscape.

The Battle Hill property is divided into three main landform groups. These are lowland (almost all river flat), capland (broad rolling interfluvial areas) and slopeland. The lowland, located in the Horokiri Valley and around the farmyard environs, consists primarily of river flats but also some terrace treads (with no water channels and former swampland). This area is primarily a pastoral landscape.

In addition, the farmyard area at the 'front' of the property contains a number of man-made structures which are very visible on the landscape. Individually, none of these buildings possesses any great distinction, but the ensemble, as a group, reflects the requirements and activities of a working farm. The structures are from various periods and thereby reflect the changing needs of the farm from the time of its establishment. Buildings include an early 20th century cottage and homestead, a 1920s or 1930s woolshed, a milking shed and several other structures.

Around the farmyard and cemetery, are a range of mature exotic trees (principally oaks (*Quercus* spp.), elms (*Ulmus* spp.), poplars (*Populus* spp.), bluegums (*Eucalyptus globulus*) and *macrocarpas*) planted in the late colonial era of 1880-1910. The disposition of these stands suggests a conscious effort to create a naturalistic European-style parkland effect of a scale and type which is unusual in the Wellington Region. The consistent visual character of the farmyard buildings surrounded by the parkland effect created by broad stretches of pasture amongst which are placed mature, exotic trees, enhance the aesthetic experience of park users. The presence of water in this part of the Park, with its sight, sound and tactile qualities adds to the experience of park users in this area of the property.

Beyond the farmyard, the pastoral landscape continues over rolling hills creating the impression of wide expanses uncluttered by buildings that offer freedom of movement to visitors. This capland area includes the high level terrace surface west of the Horokiri valley. It also includes the significant features of Transmission Gully which combine seclusion, clearly defined spatial boundaries and a strong linear axis to the park.

The slopelands, which make up the largest area of the Battle Hill property, are located towards the 'back' of the farm. A small but significant part of this land above the public road is covered in dense, indigenous forest cover. On the pastoral areas of the slopeland there is evidence of past slumping. The complex modelling of the eastern hill slopes provides a unique point of aesthetic attraction within the park.

A visual assessment of the property's attributes taken at three locations (farmyard and surrounding valley floor, middle ridge and rear hills) and using evaluative components of coherence, mystery and complexity, returned an overall landscape quality score of around 60% indicating that the landscape quality of the property was high, with room for improvement. The visual sensitivity of the property – a measure of the degree to which the visual qualities of the landscape could be altered by development of change in land use – also returned a score of 60% indicating a high level of sensitivity to change which needs to be taken into account in the management and use of the property.



River terraces in Transmission Gully



Lowland forest remnant

10. Recreation

10.1 Recreation activities and user preferences

The final acquisition of the park was completed in July 1987. By August 1988, over 500 visitors were using the park each month. At that time, individual activities included picnicking, walking and horse riding. Organised functions of scout and guide camping, organised picnics and model aeroplane flying were held. The rapidly increasing visitor numbers and increasing range of visitor activities necessitated a higher level of site management.

In 1993, a user survey of Battle Hill visitors was undertaken to gain information on specific aspects of use. Generally it was found that those who came to use the Park did so to enjoy open spaces, bush and rivers environs or to follow walking and riding tracks. The experience of a working farm was not recorded as an attraction nor was it recorded as adding to the recreational experience in that survey, (*See Map 8, Recreation*).



Farm visit

By the mid-1990s, recreational use had extended to mountain biking, cross country horse riding, orienteering and cross country running. Two primary mountain biking and horse riding tracks are available: the battle hill summit, offering a one hour easy/medium ride and the Transmission Gully-Puketiro Loop, this being a 2-4 hours medium/hard ride.

Battle Hill is a popular place for groups of children to learn about a working farm and experience farm animals. The Ken Gray Education Centre is a large mezzanine area inside the original farm woolshed which was refurbished along with the surrounding stock yards in 1996.

Numbers of recreational visitors

Battle Hill Farm Forest Park visitation grew significantly in the decade following the inception of the Park. By the summer of 1997, 60,000 people were visiting the park and 2,000 people were camping during the season. Recreational facilities developed on the property include vehicle entry and parking, toilets and basic visitor information facilities, picnic areas, limited facility camping, marked walking tracks, horse and bike riding tracks and a cross country equestrian course. In 1996, the 150-year anniversary of the battle was marked by Ngati Toa being funded to arrange for a memorial to be placed on site. A large stone was selected from Taranaki and was carved by Rangi Skipper with the moko of Te Rangihaeata

During the 2004-2005 year 95,000 user visits were recorded to Battle Hill Farm Forest Park.



Farm visit



Shearing demonstration

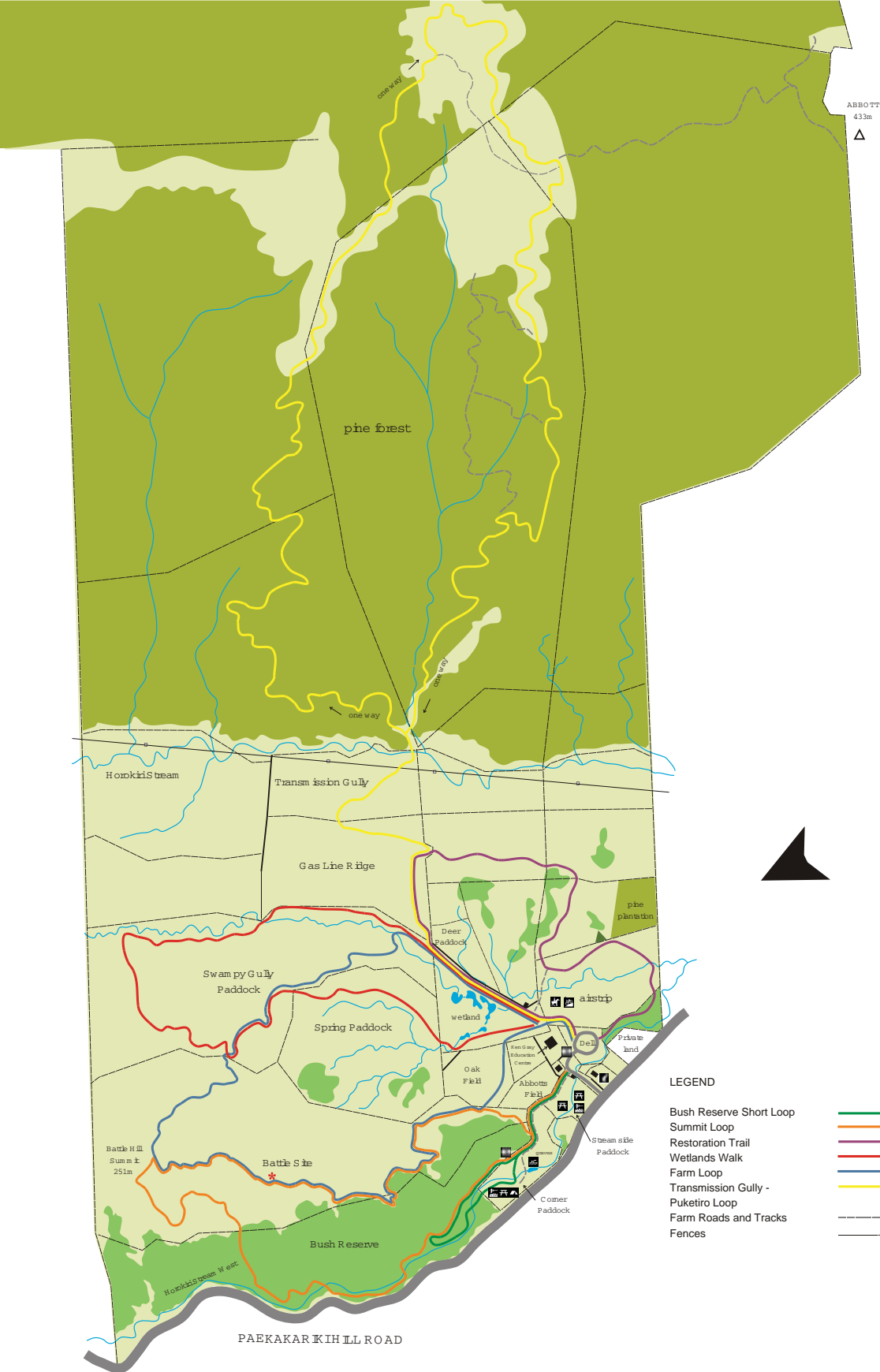


Horse rides Battle Hill Country Fair Day



Commemorative stone carved by Rangi Skipper

Map 8 Battle Hill Farm Forest Park Recreation



11. Forestry

An initially important motive behind the acquisition of the Battle Hill property was the development of exotic forestry. It was anticipated that harvesting would be a year round operation over the entire estate and for neighbouring Puketiro forest. The forestry was seen as having three main functions: the generation of income, providing an attractive setting for recreational use and as a visitor attraction through the demonstration of forest management practices. In 1992, the Park was split into two sections with the front 160-hectare area being kept for farming and recreation, and the remaining 309 hectares to be developed as forest plantation.

Originally two forestry blocks were planted by the Ministry of Transport in 1973 and 1974 of land areas 15ha and 44ha respectively. Today almost half of this combined area has been logged with the balance overdue for logging and awaiting suitable market conditions. 22ha of logged forest is now replanted and scheduled for harvest in 2033.

After the purchase of Battle Hill Farm Forest Park by Wellington Regional Council, the 157ha Battle Hill forestry block was planted in 1991 and is scheduled for harvest after 2020.

12. Farming

At the time of purchase the property was farming sheep and beef with some deer. It was carrying between 2,200 and 2,500 units of stock. The farm was relatively free of noxious weeds, with good to average pasture. The buildings and fencing required maintenance however, as the farm had been used for short term farming leases.

Aside from the objective of improving return from the farming operation, a key Council objective was to run Battle Hill as a farm park providing the public with an opportunity to observe a working farm. Therefore, the house and group of surrounding buildings already located on the property were retained as part of the working farm concept and also as they represented historic buildings in their own right. The farm initially was leased but on better terms for the production of revenue. By 1994, the farm carried 1,200 breeding ewes, a 50-cow beef breeding herd and a small deer herd of 20 hinds.

Despite the provision of educational opportunities being a driving motivation associated with developing a farm park, little education use was made of Battle Hill through to the mid-1990s. This changed in 1993 when the Ken Gray Education Centre was opened and dedicated to the memory of a former Councillor who was instrumental in the establishment of the Battle Hill Farm Park. The Centre was developed during the restoration of the historic woolshed. A mezzanine floor and display area was added overlooking the shearing stands. Entry is via a wheelchair accessible ramp over the adjacent stock yards. The Centre allows for the safe viewing of a number of farm activities and an indoor space where students can carry out experiments.

By 1995, it was proposed that the leasing of the farmland be replaced with a sharefarming venture to increase the Council's share of revenue received from farming and to allow the Council more control in the management of recreation areas.

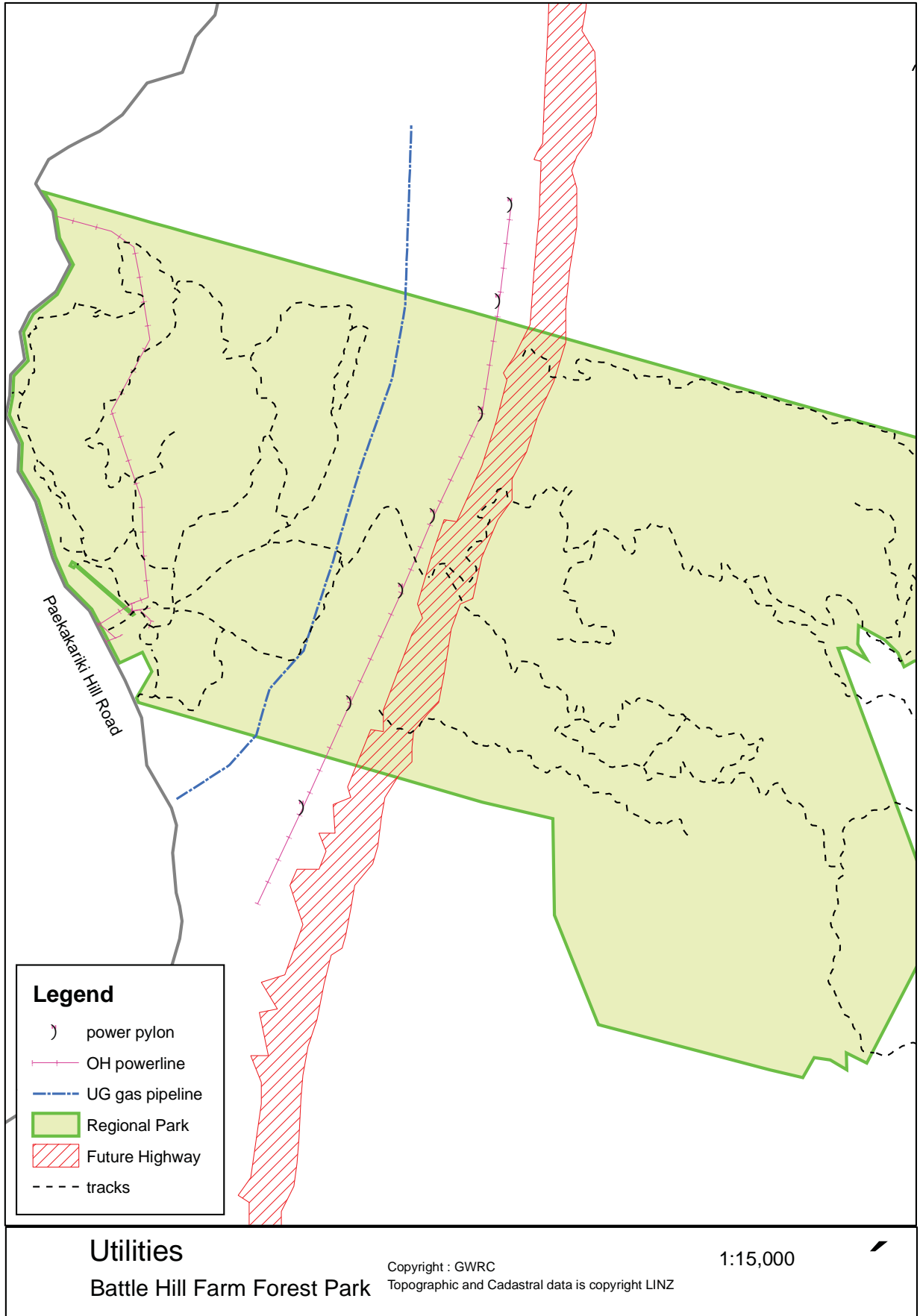
Eventually, however, a grazing licence operated over the 162 hectares of flats and easy hill country at the front of the property. Grazing licensing is considered a land management tool intended to maintain the traditional character of the farm. As an example of maintaining the balance between recreational use of the Park and farm management, the Council placed restrictions on stock levels which were not to exceed 1,600 units in the winter and 2,200 units in the summer. These levels were to ensure the pasture standard was maintained in light of the recreational uses of the park. Keeping good standards of stock and maintaining property presentation is also important. Stock numbers in 2006 remain about the same. Efforts to control pests and weeds, replace old fencing and reduce paddock sizes over the last 10 years have made significant improvements to pasture quality. Today, sheep, cattle, deer and goats are farmed.

Network Utilities

Network utilities associated with Battle Hill include the high voltage AC electricity transmission pylon line owned by Trans Power that crosses the park via Transmission Valley.

The main underground gas pipeline servicing the Wellington region is located within the park, (*See Map 9, Utilities*).

Map 9 Utilities



References

- Allen, K.R., 1951: The Horokiwi Stream. A study of a trout population. *New Zealand Marine Department Fisheries Bulletin 10*.
- Bissell, John. Current Battle Hill Farm Forest Park Ranger.
- Bruce, J., 2000: The Soils of Wellington. *In:* (eds.) McConchie, J., Willis, R. & Winchester, D. *Dynamic Wellington, a contemporary synthesis and explanation of Wellington*. Institute of Geography, Victoria University of Wellington. Wellington.
- Cotton, C. A., 1914: Supplementary notes on Wellington physiography. *Transactions and Proceedings of the New Zealand Institute 46:294-298*.
- Dawson, J & Lucas, R., 1993: *Lifestyles of New Zealand forest plants*. Victoria University Press. Wellington.
- Dickson, P., 1986: *Wellington windlore*. Wellington Weatherwatchers. Wellington.
- Druce, A.P. & Atkinson, A.E. 1959: Forest variation in the Hutt catchment. *Proceedings of the New Zealand Ecological Society 6:41-45*.
- Enright, P.; Olaf, J.; Beverage, P.; Currier, P. & Hopkins, C., 2000: Battle Hill Farm Forest Park and the Hill Track. Botanical report prepared for Wellington Regional Council on various trips between 1994 & 2000.
- Goulter, S.W., 1984: The climate and weather of the Wellington region. *New Zealand Meteorological Service Miscellaneous Publication 115:16*.
- Greater Wellington, 2004: *Pest plant control plan 2002-2007*, Battle Hill Farm Forest Park.
- Hewitt, A.E., 1998: *New Zealand soil classification*. *Landcare Research Scientific Series 1, 2ed*.
- Hicks, D., 1995: *Decision support package for sustainable land use in the Wairarapa Hill Country*. Collated documents. Wellington Regional Council. Masterton.
- Hitchmough, R. (Compiler), 2002: *New Zealand Threat Classification lists*. *Threatened Species Publication 23*.
- Jellyman, D.J.; Glova, G.J.; Bonnett, M.L.; McKercher, A.I. & Allen, K.R., 2000: The Horokiwi Stream 50 years on: a study of the loss of a productive trout fishery. *NIWA Technical Report 83*.
- Lew, D., & Blackwood, D., 1995: *Rainfall intensities and runoff estimates for culvert design in Wellington City*. Unpublished Report. Wellington Regional Council. Wellington.
- McConchie, J., 2000: *From shaky beginnings*. In, *Dynamic Wellington*. Eds McConchie, J., Winchester, D., Willis, R. Institute of Geography, Victoria University of Wellington. Wellington.
- McEwen, M. 1987. *Ecological Regions and Districts of New Zealand*. Department of Conservation, Wellington.
- McGlone, M.S., 1988: *New Zealand*. *In:* Huntley, B. & Webb, T., (eds.) *Vegetation history*. Kluwer Academic Publishers.
- McGlone, M.S., 1989: The Polynesian settlement of New Zealand in relation to environmental and biotic changes. *New Zealand Journal of Ecology 12:115-129*.
- Mildenhall, D.C., 1994: Palynostratigraphy and paleoenvironments of Wellington, New Zealand, during the last 88 ka, based on palynology of drillholes. *New Journal of Geology and Geophysics 37:421-436*
- Mitcalfe, B.J., 2002: *Battle Hill Farm Forest Park: plants recommended for amenity and/or restoration purposes*. Report prepared for Wellington Regional Council.
- Ministry for the Environment, 2003: *Land Environments of New Zealand*. Bateman,
- Molloy, L., 1988: *The living mantle - soils in the New Zealand landscape*. Mallinson Rendell in association with the New Zealand Society of Soil Science. Wellington.



- New Zealand Land Cover Database, 2003. LCDB2. Terralink International Ltd.
- Oliver, W.H. & Williams, B.R., (eds.) 1981: The Oxford history of New Zealand. Oxford University Press. Wellington.
- Parrish, G.R., 1984: Wildlife and Wildlife Sites of the Wellington Region
- Pekelharing, C.J., 1995: Impact of possums on the vegetation in Porirua Scenic Reserve. Landcare Research Contract Report to Porirua City Council.
- Polly, B. & Lewington, R., 1989: Mosses of Battle Hill Bush, Battle Hill Farm Forest Park, Paremata. *Bulletin Wellington Botanical Society* 45:120-124
- Reid, S.J., 1998: Southerly wind speed extremes caused by Cook Strait. *National Institute of Water and Atmospheric Research Technical Report* 39.
- Salinger, M.J., 2000: The windy city, a climate of contrast. In: (eds.) McConchie, J.; Willis, R.; & Winchester, D., *Dynamic Wellington, a contemporary synthesis and explanation of Wellington*. Institute of Geography, Victoria University of Wellington. Wellington.
- Salinger, M.J.; Smith, R.M. & Tweeddale, M., 1986: Mesoscale precipitation patterns around Wellington, New Zealand. *New Zealand Journal of Geology and Geophysics* 29:99-114.
- Stevens, G.R., 1973: New Zealand geological survey tour guide. Quaternary geology, tectonics and geomorphology of Wellington Peninsula. New Zealand Geological Survey. Lower Hutt.
- Stevens, G.R., 1991: On shaky ground. Geological Society of New Zealand guidebook number 10. DSIR and the Geology and Geophysics and Geological Society of New Zealand. Lower Hutt.
- Taylor, N.H., 1948: Soil map of New Zealand. *New Zealand Soil Bureau Map* 280.
- Thorn, V., 2002: Stream monitoring results at Battle Hill Forest Park. Report to Battle Hill Ranger.
- Thornton, J., 1985: Field guide to New Zealand geology. Reed Methuen. Auckland.
- Upston, K., 2002: Palynology of Late Holocene sediments from Lake Kohangatera, Fitzroy Bay, Wellington. Unpublished BSc Hons thesis. Victoria University of Wellington.

Appendix One

Battle Hill Farm Forest Park plant species

Species name	Common name	Maori name
Gymnosperm Trees		
<i>Dacrycarpus dacrydiodes</i>	white pine	kahikitea
<i>Dacrydium cupressinum</i>	red pine	rimu
<i>Podocarpus totara</i>	totara	totara
<i>Prumnopitys taxifolia</i>	matai	matai
<i>Stachypitys ferruginea</i>	brown pine	miro
Monocot Trees		
<i>Cordyline australis</i>	cabbage tree	ti kouka, cabbage tree
<i>Rhopalostylis sapida</i>	nikau plam	nikau
Dicot Trees / Shrubs		
<i>Alectryon excelsus</i>	titoki	titoki
<i>Aristotelia serrata</i>	wineberry	makomako
<i>Beilschmiedia tawa</i>	tawa	tawa
<i>Brachyglottis repanda</i>	rangiora	rangiora
<i>Carpodetus serratus</i>	marble leaf	putaputaweta
<i>Coprosma areolata</i>	thin-leaved coprosma	
<i>Coprosma grandifolia</i>	kanono	kanono
<i>Coprosma lucida</i>	shining karamu	karamu
<i>Coprosma propinqua</i>		
<i>Coprosma propinqua x C. robusta</i>		
<i>Coprosma rhamnoides</i>		
<i>Coprosma robusta</i>	karamu	karamu
<i>Corynocarpus laevigatus</i>	karaka	karaka
<i>Dysoxylum spectabile</i>	kohekohe	kohehohe
<i>Elaeocarpus dentatus</i>	hinau	hinau
<i>Fuchsia excorticata</i>	tree fuchsia	kotukutuku
<i>Geniostoma rupestre</i>	hangehange	hangehange
<i>Griselinia littoralis</i>	broadleaf	kapuka, papauma, maihihi
<i>Griselinia lucida</i>	<i>puka</i>	<i>puka</i>
<i>Hebe stricta var. atkinsonii</i>	koromiko	koromiko
<i>Hedycarya arborea</i>	pigeonwood	porokaiwhiri
<i>Knightia excelsa</i>	rewarewa	rewarewa
<i>Kunzea ericoides</i>	kanuka	kanuka
<i>Laurelia novae-zelandiae</i>	pukatea	pukatea
<i>Leptospermum scoparium</i>	tea tree	manuka
<i>Lophomyrtus bullata</i>	ramarama	ramarama
<i>Macropiper excelsum</i>	pepper tree	kawakawa
<i>Melicope simplex</i>		poataniwha
<i>Melicope simplex x ternata</i>		
<i>Melicytus ramiflorus</i>	whiteywood	mahoe
<i>Myrsine australis</i>	mapou	mapou
<i>Olearia rani var colorata</i>	tree daisy	heketara
<i>Olearia solandri</i>	coastal tree daisy	

Species name	Common name	Maori name
Dicot Trees / Shrubs continued		
<i>Ozothamnus leptophyllus</i>	tauhinu, cassinia	tauhinu
<i>Pennantia corymbosa</i>	kaikomako	kaikomako
<i>Pittosporum cornifolium</i>	perching kohuhu	tawhirikaro, wharewhareatua
<i>Pseudopanax arboreus</i>	five-finger	whauwhaupaku
<i>Pseudopanax crassifolius</i>	lancewood	horoeke
<i>Rhabdothamnus solandri</i>		turepo, kaikaiatua, waiuatua
<i>Schefflera digitata</i>	seven-finger	pate
<i>Solanum aviculare</i>	poroporo	poroporo
<i>Solanum laciniatum</i>	poroporo	poroporo
<i>Streblus heterophyllus</i>	small-leaved milk tree	turepo
<i>Streblus banksii</i>	large-leaved milk tree	ewekuri, pukariao, turepo
<i>Syzygium maire</i>	swamp maire	maire tawake
<i>Urtica ferox</i>	tree nettle	ongaonga
<i>Weinmannia racemosa</i>	kamahi	kamahi
Monocot lianes		
<i>Freycinetia banksii</i>	kiekie	kiekie
<i>Ripogonum scandens</i>	supplejack	kareao
Dicot lianes		
<i>Clematis paniculata</i>	white clematis	puawhananga
<i>Metrosideros diffusa</i>	white climbing rata	rata
<i>Metrosideros fulgens</i>	rata vine	rata
<i>Metrosideros perforata</i>	clinging rata	aka, akatea, akatorotoro
<i>Muehlenbeckia australis</i>	pohuehue	pohuehue
<i>Muehlenbeckia complexa</i>	wire vine, pohuehue	pohuehue
<i>Parsonia heterophylla</i>	kaihua	kaihua
<i>Passiflora tetrandra</i>	passion vine, kohia	kohia
<i>Rubus australis</i>	swamp lawyer	tataramoa
<i>Rubus cissoides</i>	bush lawyer	tataramoa
Lycopods and Psilopsids		
<i>Huperzia varia</i>		
<i>Lycopodium volubile</i>	climbing club moss	wae wae koukou
<i>Tmesipteris elongata</i>	fork fern	
Ferns		
<i>Adiantum cunninghamii</i>	maidenhair fern	
<i>Adiantum diaphanum</i>	small maidenhair	huruhuru tapairu
<i>Adiantum viridescens</i>	maidenhair fern	
<i>Arthropteris tenella</i>		
<i>Asplenium bulbiferum</i>	hen and chickens fern	manamana
<i>Asplenium flaccidum</i>	hanging spleenwort	makawe o Raukatauri
<i>Asplenium gracillimum</i>		
<i>Asplenium hookerianum</i>	perching spleenwort	
<i>Asplenium oblongifolium</i>	shining spleenwort	huruhuru whenua
<i>Asplenium polyodon</i>	sickle spleenwort	petako
<i>Blechnum chambersii</i>	lance fern	nini
<i>Blechnum discolor</i>	crown fern	piupiu
<i>Blechnum filiforme</i>	thread fern	panako
<i>Blechnum fluviatile</i>	ray water fern	kiwakiwa
<i>Blechnum membranaceum</i>		

Species name	Common name	Maori name
Ferns continued		
<i>Blechnum minus</i>	swamp kiokio	kiokio
<i>Blechnum novae-zelandiae</i>	kiokio	kiokio
<i>Blechnum penna-marina</i>	little hard fern	
<i>Blechnum procerum</i>	small kiokio	
<i>Blechnum vulcanicum</i>	mountain hard fern	korokio
<i>Cyathea cunninghamii</i>	gully tree fern	punui
<i>Cyathea dealbata</i>	silver tree fern	ponga
<i>Cyathea medullaris</i>	black tree fern, mamaku	mamaku
<i>Cyathea smithii</i>	soft tree fern	katote
<i>Dicksonia squarrosa</i>	rough tree fern	wheki
<i>Histiopteris incisa</i>	water fern	mata
<i>Hymenophyllum demissum</i>	drooping filmy fern	iriangi, pipiripi
<i>Hymenophyllum dilatatum</i>	filmy fern	matua mauku, irirangi
<i>Hymenophyllum multifidum</i>	much divided filmy fern	mauku
<i>Hypolepis ambigua</i>		rarauhi, nehenehe
<i>Hypolepis lactea</i>		
<i>Lastreopsis glabella</i>	smooth shield fern	
<i>Lastreopsis hispida</i>	hairy fern	
<i>Lastreopsis microsora</i>		
<i>Lastreopsis velutina</i>	velvety fern	
<i>Leptolepia novae-zelandiae</i>	lace fern	
<i>Leptopteris hymenophylloides</i>	single crepe fern	heruheru
<i>Microsorium pustulatum</i>	hounds tongue	kowaowa
<i>Microsorium scandens</i>	scented fern	mokimoki
<i>Paesia scaberula</i>	scented fern	matata
<i>Pellaea rotundifolia</i>	round-leaved fern	tarawera
<i>Pneumatopteris pennigera</i>	gully fern	pakauroharoha
<i>Polystichum richardii</i>	common shield fern	pikopiko
<i>Pteridium esculentum</i>	bracken	rauaruhe
<i>Pteris macilenta</i>	sweet fern	
<i>Pteris pendula</i>	sweet fern	
<i>Pyrrosia eleagnifolia</i>	leather-leaf fern	ota
<i>Rumohra adiantiformis</i>	leathery shield fern	karawhiu
<i>Trichomanes endlicherianum</i>		
<i>Trichomanes venosum</i>	veined bristle fern	
Orchids		
<i>Drymoanthus adversus</i>	drymoanthus spotted leaf	
<i>Earina autumnalis</i>	Easter orchid	raupeka
<i>Earina mucronata</i>	Spring or bamboo orchid	peka-a-waka
<i>Microtis unifolia</i>	onion-leaved orchid	maikaika
<i>Orthocerus novae zelandiae</i>		
<i>Pterostylis banksii</i>	greenhood orchid	tutukiwi
<i>Pterostylis foliata</i>		
<i>Pterostylis montana agg.</i>		
<i>Thelymitra longifolia</i>	white sun orchid	maikuku
Grasses		
<i>Cortaderia fulvida</i>	toetoe	toetoe
<i>Microlaena avenacea</i>	bush rice grass	
<i>Microlaena stipoides</i>		patiti
<i>Poa anceps subsp. anceps</i>	broad leaved poa	
<i>Rytidosperma gracile</i>		

Species name	Common name	Maori name
Sedges		
<i>Carex breviculmis</i>	grassland sedge	
<i>Carex dissita</i>		
<i>Carex flagellifera</i>	Glen Murray tussock	manaia, maruia
<i>Carex forsterii</i>		
<i>Carex geminata</i> "large"	cutty grass	rautahi, toetoe-rautahi
<i>Carex inversa</i>	creeping lawn sedge	
<i>Carex lambertiana</i>		
<i>Carex lessoniana</i>		rautahi
<i>Carex secta</i>	purei	purei, purekireki, pukio, mata
<i>Carex solandri</i>		
<i>Carex virgata</i>	swamp sedge	purei
<i>Cyperus ustulatus</i>	giant umbrella sedge	toetoe upokotangata
<i>Isolepis prolifer</i>	three square	
<i>Isolepis reticularis</i>		
<i>Schoenus maschalinus</i>	dwarf bog rush	
<i>Uncinia uncinata</i>	hooked sedge	kamu, matau-a-Maui
Rushes		
<i>Juncus gregiflorus</i>	leafless rush	wi, kopupungawha
<i>Juncus pallidus</i>	giant rush	wi, kopupungawha
<i>Juncus planifolius</i>	flat/grass leaved rush	wi, kopupungawha
<i>Juncus sarophorus</i>	leafless rush	wi
Other Monocot Herbs		
<i>Astelia fragrans</i>	bush lily	kahaha
<i>Astelia solandri</i>	perching astelia	kawharawhara
<i>Collospermum hastatum</i>	collospermum	kahakaha
<i>Libertia grandiflora</i>	NZ iris	mikoikoi
<i>Phormium tenax</i>	swamp flax	harakeke
Dicot Herbs		
<i>Acaena anserinifolia</i>	bidibid	piripiri
<i>Cardamine debilis</i> agg.	NZ bittercress	panapana
<i>Centella uniflora</i>	centella	
<i>Cotula australis</i>	soldier's button	
<i>Crassula sieberiana</i>		
<i>Epilobium nummulariifolium</i>	creeping willowherb	
<i>Epilobium pedunculare</i>	long-stalked willowherb	
<i>Epilobium pubens</i>	willowherb	
<i>Euchiton gymnocephalus</i>		
<i>Euchiton involucreatum</i>		
<i>Galium propinquum</i>		mawe
<i>Geranium microphyllum</i>	geranium	
<i>Helichrysum filicaule</i>		
<i>Hydrocotyle elongata</i>		
<i>Hydrocotyle heteromeria</i>	wax weed	
<i>Hydrocotyle moschata</i>	hairy pennywort	
<i>Hydrocotyle novae-zelandiae</i>		
<i>Leptostigma setulosum</i>		
<i>Lobelia anceps</i>	NZ lobelia	
<i>Nertera depressa</i>	bead plant	
<i>Oxalis exilis</i>	yellow oxalis	
<i>Parietaria debilis</i>		
<i>Plantago raoulii</i>		tukorehu

Species name	Common name	Maori name
Dicot Herbs continued		
<i>Pratia angulata</i>		panakenake
<i>Pseudognaphalium luteo-album</i> agg.		
<i>Rhabdothamnus solandri</i>	NZ gloxinia	taurepo
<i>Ranunculus reflexus</i>	hairy buttercup	maruru
<i>Raoulia glabra</i>	mat daisy	
<i>Senecio hispidulus</i>	fireweed	
<i>Solanum americanum</i>	small flowered solanum	
<i>Stellaria decipiens</i>	chickweed	kohukohu
<i>Urtica incisa</i>	scrub nettle, stinging nettle	ongaonga
<i>Wahlenbergia ramosa</i>	NZ harebell	
<i>Wahlenbergia violacea</i>	NZ harebell	

Mosses

Achrophyllum dentatum
Bryum billardierei
Calomniom complanatum
Calyptopogon mnioides
Calyptrochaete brownii
Camptochaete arbuscula
Campylopus pyriformis
Cryphaea tenella
Cyathophorum bulbosum
Dicranoloma billardierei
Ditrichum dufficile
Echinodium umbrosum
Eurhynchium muriculatum
Fissidens aff. taylorii
Fissidens asplenioides
Fissidens humilis
Fissidens leptocladus
Fissidens pungens
Fissidens rigidulus
Homalia punctata
Hymenodon pilifer
Hypnum cupressiforme var. *cupressiforme*
Hypnum cupressiforme var. *filiforme*
Hypopterygium commutatum
Hypopterygium filiculaeforme
Hypopterygium rotulatum
Leptodon smithii
Leptodontium interruptum
Leptostomum inclinans
Leucobryum candidum
Lopidium concinnum
Macrcoma tenue
Macromitrium gracile
Macromitrium helmsii
Macromitrium ligulare
Macromitrium retusum
Neckera laevigata
Orthorrhynchium elegans
Pappillaria crocea
Philonotis tenuis
Plagiomnium novae-zelandiae
Polytrichum juniperinum
Porotrichum oblongifolium

Species name	Common name	Maori name
--------------	-------------	------------

Mosses continued

Ptychomnion aciculare
Pyrrhobryum bifarium
Racopilum convolutaceum
Rhizogonium distichum
Sematophyllum contiguum
Stokesiella praelonga
Tetrarhizopsis pusilla
Thamnobryum pandum
Thuidium furfurosum
Thuidium laeviusculum
Thuidium sparsum
Tortula papillosa
Tortula princeps
Trachyloma diversinerve
Trychostomum brachydontium
Weissia controversa
Seymouria mollis
Wijkia extenuata
Zygodon intermedius

Some adventive plants

Species name	Common name	Maori name
--------------	-------------	------------

Gymnosperm Trees

Chamaecyparis lawsoniana Lawsons cypress
Cupressus macrocarpa macrocarpa
Pinus radiata Monterey pine

Dicot Trees/Shrubs

Chamaecytisus palmensis tree lucerne
Crataegus monogyna hawthorn
Cytisus scoparius English/Scotch broom
Ilex aquifolium common/English holly
Leycesteria formosa Himalayan honeysuckle
Salix sp. willow
Teline monspessulana Montpellier broom
Ulex europaeus gorse

Dicot Lianes

Rubus fruticosus blackberry
Senecio mikanooides German ivy
Vicia hirsuta hairy vetch
Vicia sativa common vetch

Grasses

Carex spicata
Dactylis glomerata cocksfoot
Errhata erecta veld grass
Holcus lanata yorkshire fog
Poa annua annual poa

Sedges

Carex spicata
Cyperus eragrostis umbrella sedge

Species name	Common name	Maori name
Other Monocot Herbs		
<i>Allium triquetrum</i>	onion weed	
<i>Crocosmia x crocosmiflora</i>	monbretia	
<i>Sisyrinchium iridifolium</i>	purple eyed grass	
<i>Sisyrinchium "blue"</i>	blue eyed grass	
<i>Tradescantia fluminensis</i>	wandering willie	
<i>Zantedeschia aethiopica</i>	arum/calla lily	
Dicot Herbs		
<i>Apium nodiflorum</i>	water celery	
<i>Bellis perennis</i>	double/English daisy	
<i>Brassica rapa</i>	wild turnip	
<i>Callitriche stagnalis</i>	starwort	
<i>Centaureum erythraea</i>	centaury	
<i>Cerastium fontanum</i> <i>subsp. vulgare</i>	mouse-eared chickweed	
<i>Cirsium vulgare</i>	scotch thistle	
<i>Conium maculatum</i>	hemlock	
<i>Cymbalaria muralis</i>	ivy-leaved toadflax	
<i>Digitalis purpurea</i>	foxglove	
<i>Galium aparine</i>	cleavers	
<i>Geranium robertianum</i>	herb robert	
<i>Gnaphalium spicatum</i>	purple cudweed	
<i>Hypericum androsaemum</i>	tutsan	
<i>Hypochaeris radicata</i>	catsear	
<i>Linum catharticum</i>	purging flax	
<i>Mimulus guttatus</i>	monkey musk	
<i>Oxalis corniculata</i>	horned oxalis, yellow wood sorrel	
<i>Oxalis incarnata</i>	lilac/pale oxalis	
<i>Picris echioides</i>	ox tongue	
<i>Phytolacca octandra</i>	inkweed	
<i>Plantago lanceolata</i>	narrow leaved plantain	
<i>Prunella vulgaris</i>	selfheal	
<i>Ranunculus repens</i>	buttercup	
<i>Rumex obtusifolius</i>	dock	
<i>Senecio jacobaea</i>	ragwort	
<i>Sonchus oleraceus</i>	sow thistle	
<i>Stellaria media</i>	chickweed	

References

- Enright, P.; Olaf, J.; Beverage, P.; Currier, P. & Hopkins, C., 2000: Battle Hill Farm Forest Park and the Hill Track. Botanical report prepared for Wellington Regional Council on various trips between 1994 & 2000.
- Mitcalfe, B.J., 2002: Battle Hill Farm Forest Park: plants recommended for amenity and/or restoration purposes. Report prepared for Wellington Regional Council.
- Polly, B. & Lewington, R., 1989: Mosses of Battle Hill Bush, Battle Hill Farm Forest Park, Paremata. *Bulletin Wellington Botanical Society* 45:120-124

Appendix Two

Battle Hill freshwater fish species

Species	Common name	Maori name
<i>Anguilla australis</i>	shortfin eel	tuna
<i>Anguilla dieffenbachii</i>	longfin eel	tuna
<i>Galaxias argenteus</i>	giant kokopu	kokopu
<i>Galaxias fasciatus</i>	banded kokopu	kokopu
<i>Geotria australis</i>	lamprey	piharau, kanakana
<i>Gobiomorphus cotidianus</i>	common bully	
<i>Gobiomorphus huttonii</i>	redfin bully	
<i>Paranephrops palnifrons</i>	freshwater crayfish	koura
<i>Salmo trutta</i>	brown trout	

Appendix Three

Battle Hill Farm Forest Park bird species

Birds that have been recorded in the park:

Species	Common name	Maori name
<i>Alauda arvensis</i>	skylark	
<i>Anas platyrhynchos</i>	mallard	
<i>Anthornis melanura</i>	bellbird	korimako, makomako
<i>Branta canadensis</i>	canada goose	
<i>Carduelis carduelis</i>	goldfinch	
<i>Circus approximans</i>	Australasian harrier hawk	kaho
<i>Cygnus atratus</i>	black swan	
<i>Emberiza citrinella</i>	yellow hammer	
<i>Falco novaeseelandiae</i>	New Zealand falcon	karearea
<i>Fringilla coelebs</i>	chaffinch	
<i>Hirundo tahitica</i>	welcome swallow	
<i>Gerygone igata</i>	grey warbler	riroriro
<i>Gymnorhina tibicen</i>	Australian magpie	
<i>Halcyon sancta vagans</i>	kingfisher	
<i>Hemiphaga novaeseelandiae</i>	New Zealand pigeon	kereru
<i>Larus dominicanus</i>	black backed gull	karoro
<i>Passerdomestica</i>	sparrow	
<i>Platycercus eximius</i>	eastern rosella	
<i>Porphyrio porphyrio</i>	pukeko	
<i>Prothemadera novaeseelandiae</i>	tui	
<i>Rhipidura fuliginosa placabilis</i>	fantail	piwakawaka
<i>Sturnus vulgaris</i>	starling	
<i>Tadorna variegata</i>	paradiseshelduck	putangitangi
<i>Turdus merula</i>	blackbird	
<i>Turdus philomelos</i>	song thrush	
<i>Vanellus miles novaehollandiae</i>	spur-winged plover	
<i>Zosterops lateralis</i>	silveryeye	tauhou

Water, air, earth and energy: elements in Greater Wellington's logo that combine to create and sustain life. Greater Wellington promotes **Quality for Life** by ensuring our environment is protected while meeting the economic, cultural and social needs of the community.

FOR FURTHER INFORMATION

Greater Wellington
PO Box 11646
Wellington 6142
T 04 384 5708
F 04 385 6960
info@gw.govt.nz
www.gw.govt.nz

View of Battle Hill Farm Forest Park
Cover image: View from Battle Hill
Photo: Jessica Dewsnap, 2004

Greater Wellington is the
promotional name of the
Wellington Regional Council

Published August 2006
GW/PF-G-06/157