

Chapter 4

The Modern Geothermal Resource

4.1 Introduction

This claim is made in respect of the Ngawha geothermal resource. Paragraph 2 of the statement of claim says that for the purposes of the claim the Ngawha geothermal resource means the Ngawha geothermal field in its entirety.

In 1840, neither Maori nor Europeans had any scientific knowledge of the geothermal field. In Ngawha in particular the field was not assessed and its approximate extent determined until resistivity studies were carried out by scientists of the Geophysics Division of the Department of Scientific and Industrial Research in 1966 and 1977 (A36:36). It would have been apparent to any observer at any time that if hot water was emerging at land surface it could only be from underground. But an understanding of the underground geothermal system which gives rise to the hot springs is a product of 20th century scientific investigation. While much is now known of the sub-surface geothermal resource much is yet to be learned.

4.2 The Ngawha Geothermal Field

4.2.1 The tribunal received evidence from several well qualified scientists in respect of the Ngawha geothermal system of which the geothermal field is part.

The claimants called Thomas Lumb who is currently in practice as an energy resource consultant concentrating on geothermal energy.¹ Mr Lumb described the Ngawha geothermal field as being the only high temperature (above 225°C) field in New Zealand known to exist outside the Taupo volcanic zone in the central North Island. In terms of the field's area as defined by resistivity surveying it is the largest in the country, but despite its size does not rank as highly as others in terms of energy capacity (A51:2).

The size of the field

4.2.2 Mr Lumb explained that the most common method, world-wide, of delineating geothermal fields and determining their size is to carry out an electrical resistivity survey. This effectively maps the distribution, in the ground, of rocks of varying electrical properties. Hot geothermal fluids readily conduct electricity and so rocks containing such fluids show up as regions of low electrical resistivity. Resistivity is the inverse of conductivity. Commonly the resistivity found within a field is less than one tenth of that of the surrounding region, and the geothermal field boundary determined by this method generally has fairly sharply defined sections. Mr Lumb stated that Ngawha is somewhat different in this respect in that, although there is clearly a resistivity "anomaly"

associated with the field, it is not as well defined as most other fields. As a consequence inner and outer limits of the boundary zone of the Ngawha geothermal field (see figure 3) have been assessed in the range of 25 to 50 square kilometres. Mr Lumb noted that the uncertainty over the area of the field must be reflected in uncertainty over the field's energy capacity (A51:3-4).

- 4.2.3 A statement of evidence by Dr Douglas Sheppard on behalf of the Crown in respect of the Ngawha geothermal system was produced in the absence of the author in the Antarctic. All counsel consented to this procedure.² In his paper Dr Sheppard described the current scientific understanding of what a geothermal system is and then applied this to the Ngawha system.

4.3 **The Nature of Geothermal Systems**

- 4.3.1 Dr Sheppard described the complexity of geothermal systems which are a part of hydrological systems. In appendix 4 we set out his account of the geological, chemical and other components of the processes which happen to cause geothermal systems. His purpose in doing this was not only to enable the tribunal to gain a reasonable understanding of such processes but also to illustrate that a geothermal "resource" does not stand alone. It is part of much larger systems which involve as essential components the climate of a region, the hydrology and types of rocks in a region, the regional and even global geological processes that result in the way the geology of a region has formed, and not least, that this is a continuous and dynamic process that is changing and evolving (B37:3-4).

Dr Sheppard emphasised that in the light of such a concept, the definition of the limits and boundaries of a geothermal system becomes somewhat difficult. Thus he said:

The system as a whole is more than, for instance, the surface features, and in the same sense, the system is more than hot water and rock reservoir. While a "resource" may be able to be defined in terms of the volume of water which is hot enough to be exploited, and that will depend on engineering criteria as much as anything else, this bears little relation to the physical realities of the system itself in terms of sources and influences. (B37:4)

Ngawha as a System

- 4.3.2 It is important that the Ngawha system should be explained and understood. The tribunal can do no better than set out here Dr Sheppard's excellent description in his own words:

3.1 The Ngawha geothermal system exists in the crust to an undefined depth below the Ngawha Springs area and its environs. It is comprised of physically separate but linked parts, and this structure is caused by the nature of the rocks and formations, and the faulting pattern in the area.

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3.2 The major rock units below Ngawha are present as layers, thinning to the east. The top geological formation below Ngawha Springs is composed of lake sediments and basalt lava flows. These have created the surface that we see, which is essentially a basin with overlying ridges of the lava. The springs and gases emerge through the old lake sediments and around the edges of the lava flows. The sandy lake sediments are full of cracks and the fluid seems to flow through these.

3.3 Below the shallow layers is a thick layer (about 500m) of sedimentary rocks of a very mixed and confused character, in a matrix of clays and mudstone. This layer to a large extent prevents the flow of water and gas through it from below, except in small quantities, and it is thought that these flows occur in fault zones, where there is much cracking and perhaps movement to keep the cracks open. The alignment of these faults is thought to be northeast-southwest, because of the alignments of springs and gas seeps in this direction.

3.4 While this "caprock" limits the quantity of water that can flow upwards through it, it also contains within it water which is essentially a mixture of deeper fluid and groundwaters. Some scientists believe that this water is continuous and very widely spread, extending some distance particularly to the north and east.

3.5 Beneath the "caprock" is a great thickness of the rock known as greywacke. The base of the greywacke has not been intercepted by drillholes (one of which was drilled for 3,300 m). Somewhere in or underneath the greywacke there is a heat source, probably a hot magma body, which provides the heat for the geothermal system. The greywacke is faulted over large distances, and this is thought to allow water to flow through. The geothermal "resource" targeted by the drilling in the early 1980s is within this greywacke. The water itself is thought by some scientists to come from the northeast, get heated and acquire dissolved components somewhere below the Ngawha area, circulate quite slowly in the cracks and faults in the greywacke, and drain away to the southeast, at some depth (perhaps 1000m or more).

3.6 Somehow the water becomes saturated with the gas carbon dioxide, perhaps from the magma, or from the greywacke, or both. As the water rises in the crust, the pressure lessens and the gas comes out of solution, so that the fluid becomes two phase, that is, a liquid and a gas phase are both present. Because the [water] in each rock unit has a different chemical composition, we can determine the origins of each water that we sample. We know that some of this gas and water gets through the relatively impermeable caprock because we see the same waters and gases in the springs, diluted and modified to some extent, as we get from the wells which take water from below the caprock.

3.7 We can consider there to be four types of water in the Ngawha geothermal system:

- (a) that from within the greywacke, which is characterised by being dominated by borate and chloride as dissolved components;
- (b) that from the caprock, which has more bicarbonate and less of the borate and chloride;
- (c) that from the surface or near surface, especially in pools, which has more sulphate in it than the others;
- (d) rainwater, which soaks into the ground and flows over the surface. It contains

little dissolved matter.

Most springs, particularly outside the Ngawha Springs basin, are of type (b) water. One or two, in the early 1980s, were hotter and had more type (a) water. All springs are diluted by rainwater to various extents, depending upon the recent rainfall, and the characteristics of the springs itself.

3.8 In addition to the water, gases reach the surface in unusually large quantities. The gas is mostly carbon dioxide, but can contain a few percent of hydrogen sulphide, and traces of other gases. These gases are presumed to come from beneath the caprock with some of the water phase, and percolate through the groundwaters above, chemically altering them as well as heating them, forming the type (b) waters. At the surface, the gases affect ponded waters by depositing sulphur causing the suspended white matter and sulphur muds, and forming sulphate when in contact with air.

3.9 The composition of all the pools and springs at and about Ngawha can be explained in terms of these processes. The waters in the surface features are derived from waters, gases and dissolved components from all depths within the system, whether the system be defined broadly or restrictively. (B37:4-5)

4.3.3 It appears to the tribunal that there are difficulties in isolating the hot water which emerges at the surface or which might be extracted below ground by drilling, from other essential components in the system, for instance, the rain water which feeds the system; the heat source, probably a hot magma body, which provides the heat for the geothermal system; the rising molten material (magma); the chemical and other interaction of hot waters with rocks and the variety of chemicals and gases present, sometimes in solution. All would appear to be essential components of the geothermal resource within the Ngawha system. Presumably ownership or rangatiratanga over all such components is claimed by the claimants.

4.3.4 Dr Arnold Watson a principal of KRTA Ltd, a firm of consulting engineers specialising in geothermal energy developments in New Zealand and overseas, was called by counsel for the Ngawha joint venture comprising the Bay of Islands Electric Power Board and the Taitokerau Maori Trust Board.³

On the question of over what area a geothermal resource extends, Dr Watson noted that the resistivity boundary is not a true boundary; geothermal fluid extends outside the boundary but in small amounts. The definition of "small" he said, is rather arbitrary but is related to technological issues. The area in question extends well away from the surface springs. He agreed with Mr Lumb's estimate that the area of the Ngawha resource is in the range of 25 to 50 square kilometres (B39:5). He added that the resistivity boundary is not a hard and fast boundary. It is an area in which geothermal fluids are known to have been present. Only if wells are drilled can you actually know whether they are still there.

4.3.5 In their statement of claim the claimants say in relation to their title to and

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rangatiratanga in respect of the Ngawha geothermal resource:

4.1 The Ngawha Geothermal Field is a taonga of immense cultural and spiritual significance to Nga hapu o Ngawha.

4.2 The traditions of our people abound with references to this sacred taonga.

Dr Watson was of the opinion that para 4.2 implies that the existence of the field was known to early generations of Maori people. He pointed out that geothermal fields are localised areas where heat from great depth leaks to the surface. The field, he said, is the surface area above a region where heat has risen from great depth by natural convection. The extent of the 'field' in his opinion is related to how deep one can drill wells. There is hot water to be found at 600 metres depth beneath the area within the Ngawha resistivity boundary (see figure 3). Dr Watson stated that if one was able to drill to 6,000 metres (six kilometres) depth beneath Kaikohe, it is probable that some hot water or steam would be found. While wells of this depth are drilled for oil and gas, the technology is too expensive to be used for geothermal developments. If, however, it proved possible to drill to those depths for geothermal energy, the definition of the geothermal field, Dr Watson says, would have to be extended. This is because the word field is related to the technology to be used.

Dr Watson went on to point out that well drilling technology is relatively recent, within the last 150 years, and the technology available to past generations of Maori was limited to shallow digging:

If the concept of a field had been used, it would have been defined as the area immediately surrounding springs where the hot water could be found by digging. (B39:6)

In response to questioning Dr Watson agreed that Maori would have observed changes to springs and recognised that they were due to some underground phenomenon. He accepted that Maori realised that something was going on under the surface of which they were not fully aware.

In answer to Dr Watson's suggestion that more precise exploration techniques may be available in the future, claimants' counsel submitted that the claimants would be entitled to any "larger" field to the extent that such "larger" field continues to be part of the identifiable geothermal taonga. If that were to happen, he said, it would simply demonstrate that the physical resource was larger or more complex in its relationships than is currently realised (C13:7).

4.4 **Surface Hydrothermal Activity**

4.4.1 As indicated in the previous chapter, the principal Ngawha hot water springs are in close proximity to each other in the Ngawha Springs locality (see figure 3). They are

- Parahirahi C1 Maori reservation comprising one acre, sometimes described as the Maori area and more recently as the Waiariki baths;
- the immediately adjoining domain area of approximately 4 acres owned by the Crown. Previously part of the original Parahirahi C block, it became part of Parahirahi D;
- the Spa Hotel area, also adjoining the Parahirahi C1 reservation, in the private ownership of the Ginn/Beadle family. This is on the Tuwhakino block; and
- the Ngawha Springs Hotel site, also now in private ownership, formerly part of Parahirahi B block.

There are more than 20 hot springs, many of which are used for bathing, on these four sites.

Outlying Springs

4.4.2 Barbara Simpson in a paper which includes a brief description of the Ngawha geothermal anomaly (A31:34-37) refers to several other sites in the region of the main Ngawha springs (see figure 3). These are described as:

- Kaikohe warm springs on the Kopenui stream about three kilometres north-east of Kaikohe;
- Lake Omapere hot soda springs on the shore flats of Lake Omapere about six kilometres north-north-east of Kaikohe. This spring she described as a man-made dug pool;
- Neilson's soda spring near Highway 12 about two kilometres north-north-west of Ngawha Springs village; and
- Te Pua springs about four and a half kilometres north-north-east of Kaikohe.

Ms Simpson expresses the view that all these natural discharges are probably related to the Ngawha geothermal reservoir. In her opinion they are most probably fed by shallow sub-surface outflows from the central resource (A31:36).

Dr Sheppard in discussing outlying springs (B37:9-10) stated that there are a large number of warm or gassy springs in the region about Ngawha. Some scientists, he says, believe that many of those close to Ngawha Springs are a part of that system. He provided a map prepared by officers of the New Zealand Geological Survey in 1987

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showing where these springs and seeps are. They are shown on figure 3.

The springs (other than the Ngawha Springs) shown on the map produced by Dr Sheppard are:

- Puketotara stream soda spring;
- Pakaraka springs;
- Ohaeawai soda springs;
- Lake Omapere soda springs;
- Te Pua springs;
- Neilson's soda springs;
- Waiparaheka lake springs;
- Waitotara Pond springs; and
- Ngamokaikai Pond springs.

Of the four springs mentioned by Ms Simpson, only the Kaikohe warm springs are omitted from Dr Sheppard's list. The Waiparaheka lake springs and the Ngamokaikai Pond springs are within the Parahirahi block. The Waitotara Pond springs are within the Tuwhakino block (see figure 3).

Dr Sheppard considered that the springs at Te Pua, Omapere, Pakaraka, Ohaeawai, and others within ten kilometres of Ngawha Springs, may well be "an integral part of the system, as distant expressions". Dr Sheppard continued:

Because their chemical compositions are similar to each other and to the caprock (intermediate level) waters, a common source has been postulated. This does not necessarily mean that the waters flow from, say, the Ngawha Springs area, to the outlying places, but it could mean that they are formed in the same way from similar original components by being linked into deeper parts of the system. Such springs are in the north and northeast of the system, perhaps a reflection of the regional hydrology, faulting structures and geological formations. Because they are remote and derivative in relation to the main system, direct and definable effects of exploitation of the deep reservoir on the outlying springs will be unlikely. (B37:9-10)

Presumably the claimants claim ownership and rangatiratanga over all those outlying surface springs within the Ngawha geothermal field. These include the springs within Parahirahi and Tuwhakino blocks mentioned above as well as Neilson's soda springs.

4.5 ***The Extent of the Geothermal Taonga***

In the previous chapter (3.14.2) the tribunal recognised that the hot springs of Ngawha in Parahirahi C block were a highly valued taonga, not only at the time of the Treaty, but also when the Crown embarked on the purchase of the Parahirahi blocks in 1886. But we left open for further consideration the question of whether at these times the taonga included the underground reservoir.

- 4.5.1 At 1840 all the Ngawha hot springs together with the outlying springs within the geothermal field were on land in the possession of the claimant hapu. But as we have seen, the Ngawha geothermal field, when it came to be appraised and defined very approximately in the later 1970s, covered an area of between 25 and 50 square kilometres. In 1840, we believe, all of this area was in the occupation of the hapu of Ngawha, with perhaps some additional hapu of Ngapuhi.

While those familiar with the springs must have been aware that the hot water emerging in the springs came from an underground source neither they nor anyone else had any knowledge of the nature or extent of the complex geothermal system which produced the springs and gases in and around the Ngawha hot springs area. Nor of course did they or anyone else have any knowledge of the extent of what is now known as the Ngawha geothermal field. Even today scientists are able to define the area with no greater certainty than to give lower and upper limits of 25 and 50 square kilometres.

The claimants in their statement of claim say at paragraphs 4.1 and 4.2 (see appendix 1) that the Ngawha geothermal 'field' is a taonga of immense cultural and spiritual significance to nga hapu o Ngawha, whose traditions abound with references to this sacred taonga. Such knowledge as nga hapu o Ngawha had in 1840, or at the time of the sales, of what lay underground was largely encapsulated in the myth of the taniwha Takauere discussed in our earlier chapter 2 (2.4.3).

The claimants' statement of claim then moves from the references to the geothermal 'field' to the geothermal 'resource' and goes on to claim that:

- the Ngawha geothermal resource is central to the mana and mauri of the claimants' people and they are kaitiaki of it (4.3); and
- the Ngawha geothermal resource is a taonga protected by article 2 of the Treaty of Waitangi (4.4).

- 4.5.2 The evidence of the kaumatua was directed principally at the Ngawha hot springs on the Parahirahi C block. The reason for this appears in the evidence of Ronald Wihongi cited in chapter 2 (2.8.4). His ancestors, he said, wanted to:

retain the whole of their sacred possession. The hot springs above the ground, and all the ... hot streams under the ground. In their minds, if they were to hold on to where the outlet of this sacred possession was they will retain it all, right down into the bowels of the earth. That was why they had this great desire to hold on to the five acres of Parahirahi C forever more.

He referred to the stories about the taniwha Takauere who went underground from Ngawha. The waters under the ground and the waters above the ground are one and the same in his view.

The concentration on the Ngawha hot springs or pools situate on what became Parahirahi C and the linkage of the underground waters to those pools, to the exclusion of those in adjacent or outlying areas, appears to reflect the fact that it was those particular pools which were so greatly prized by Ngapuhi. It was to those pools, it seems, they resorted for their healing and beneficial powers. It may help to explain why no restriction of any kind was placed on the sale of Parahirahi B block, although there were, and still are, hot springs on that land close to the Parahirahi C block hot springs. It may also explain why the neighbouring Tuwhakino block and the hot springs there (now known as the Spa Hotel springs) were also sold and have been in non-Maori ownership for the last 100 years.

The position at 1840

- 4.5.3 To revert however to the position at 1840. At that date and for some long time previously, the hot springs of Ngawha and the waters coming to the surface there were a sacred taonga. At this date also, the hapu of Ngawha with perhaps some other hapu of Ngapuhi were, we believe, the occupiers of, and held rangatiratanga over, what is now known as the Ngawha geothermal field including all surface geothermal springs within the field. Moreover, the various hapu, by virtue of their occupation and possession of the land above the sub-surface geothermal system, had rangatiratanga over the sub-surface and whatever it contained even though this was necessarily almost wholly unknown then. We do not accept the suggestion of Crown counsel (3.14.2) that it was the healing springs alone which were taonga at the time of the Treaty and not also the underground geothermal reservoir. As kaumatua Ngatihaua Witehira told us (2.6.3):

Our ancestors [knew] that the heart of the Ngawha is underground. They are channels of hot water flowing underground. They knew and believed that it was one taonga underground and up on the surface of the ground. (B36; A54(n))

4.6 The Position at 1894

- 4.6.1 As was foreshadowed in chapter 2, and as we have related in chapter 3, Maori sought and obtained individualisation of title to the Tuwhakino and Parahirahi blocks in 1873 and 1874 respectively. Between 1878 and 1894 Heta Te Haara sold the whole of the

Tuwhakino block. In 1885 the Parahirahi block was subdivided into three blocks (Parahirahi blocks A, B and C) and in 1894 the Native Land Court awarded Parahirahi D block of approximately 4293 acres to the Crown. This area included a portion of each of the three previously existing A, B and C blocks. In short, by 1894 the whole of the Tuwhakino block had passed from Maori to European ownership. In addition the Crown had acquired the greater part of Parahirahi B block on which were situate all the hot springs and other geothermal manifestations on that block. It also believed it had purchased some four acres in Parahirahi C block on which hot springs were also present.

4.6.2 Nga hapu o Ngawha in their statement of claim assert they were guaranteed ownership and rangatiratanga over the Ngawha geothermal resource so long as it is their wish to retain the same (appendix 1: 4.5). Later in the claim it is said:

- the Crown did not acquire ownership of the Ngawha geothermal resource in its acquisition of the Parahirahi block (5.6);
- Maori did not indicate any wish to alienate the Ngawha geothermal resource (5.7); and
- the fact that Maori sought the complete and inalienable reservation of the Ngawha Springs area in the Parahirahi C block is conclusive evidence that Maori in fact intended to retain the Ngawha geothermal resource (5.8).

4.6.3 We propose to deal with each of these claims. Before doing so however, we observe that the claimants appear nowhere to have defined what they mean by the geothermal resource. Counsel for the claimants in his closing address submitted that the Ngawha geothermal resource is a taonga. In support he referred to the evidence of kaumatua which he said made this abundantly clear (C13:12-15). Some of this evidence is cited in the earlier chapter 2. At the conclusion of this evidence counsel for the claimants submitted there could be no doubt but that the Ngawha geothermal resource is a taonga. As all the cited evidence relied on by counsel related exclusively to the hot springs or pools on Parahirahi C block we conclude that the claim to the "Ngawha geothermal resource" is based on the claimants' ownership of or rangatiratanga over the hot springs or pools located on Parahirahi C.

Counsel next submitted that the central question is not whether the resource is a taonga. It is the extent of that resource. He went on to say there is no doubt that the taonga includes the surface manifestations of the "underlying resource". He submitted that the taonga must also include the sub-surface components of the resource. He invoked the evidence of those kaumatua who spoke of the unity of the resource. Counsel also invoked the evidence of Professor Hohepa, who was also of the view that the concept of "Ngaawhaa" extended beyond mere surface pools. He said that it included volcanic activity and encompassed geothermal energy "in its widest sense" (B25(a):29).

Because of the central importance of the question of what constitutes the Ngawha geothermal resource, we set out a lengthy statement by counsel for the claimants in his closing address:

The evidence is clear that in a spiritual and perhaps indefinite sense (from a physical point of view), Maori conceived that the Ngawha was much greater than the pool through which it bubbled up to the surface. The stories of the intrepid subterranean voyages is evidence of this. Professor Hohepa's rendition of ngawha as geothermal energy confirm that the Maori concept of Ngawha extended traditionally to include the less tangible subterranean aspects of the resource. So does his lateral expansion of Ngawha beyond the immediate pools themselves. Thus, even in traditional times and without a clear physical conception of the underground component of the resource, Maori took a characteristically holistic approach to the taonga. Maori understood that the surface features were no more than the eye of something much greater. That eye was connected to other surface manifestations in the region. The genius of the Western legal tradition is its ability to deconstruct resources whether they be land or other resources, to separate them subdivide them and apportion rights or interests in the parts. Estates in land are separated into surface sub-surface and air space. They are subdivided in time - that is into leasehold estates, life interests and fee simple estates. Rights to certain resources within the land are divided as between the State and the landowner or third party transferees. It is easy for lawyers trained in the Western tradition to conceive of surface manifestations of the geothermal resource being something different from the underground resource itself. In Maori terms, this approach is totally inappropriate. It is as appropriate as saying that the waterfall is separate from the river. As is so often the case, the Maori view accords with the physical reality. Even the Crown accepts that the underlying geothermal resource stands apart from the surface land title above (B48 para 5). In Maori conception and in scientific fact, the surface pools are no more than a window into the resource. They traditionally "exploited" that window, and therefore the resource itself, to the maximum extent that they were able in accordance with their own cultural priorities. There is simply no basis upon which the surface and sub-surface components of this taonga can be severed. They are one thing. (C13:18-19)

We would observe in relation to the penultimate sentence quoted that while it is readily apparent there is a clear and obvious connection between the hot springs and the sub-surface system of which they are a very small part, this does not mean that the *ownership* or rangatiratanga over some of the hot springs cannot be severed from others if the parties so agree. It appears to the tribunal that this is in fact what happened both in relation to some hot springs on Parahirahi block B and to all hot springs on the adjoining Tuwhakino block.

Did the Crown acquire ownership of the springs on the Parahirahi B block?

4.6.4 As we have seen, the Native Land Court determined ownership of the Parahirahi block of 5097 acres on 5 November 1874. Thirty-six owners were identified as belonging to Te Uriohua hapu and one to Ngati Rangi hapu (3.6.2). Both are claimant hapu. This decision has not been challenged by the claimants, who include Ngati Rangi.

On 15 October 1885 the Native Land Court ordered that the Parahirahi block be subdivided into Parahirahi A and B blocks, each of 2546 acres and Parahirahi C block of

five acres. Ownership of each of the three blocks was granted to the same 45 named Maori owners, being the surviving original owners and the successors of those who had died since November 1874. The court ordered that A and C blocks were to be inalienable except with the consent of the Governor. No restriction was placed on the alienation of B block (3.7.7).

On 19 October 1894 the court subdivided Parahirahi blocks A, B and C by allocating some 804 acres to non-sellers in new blocks A1-3, B1 and C1. The balance of 4293 acres, being the residue of the former Parahirahi A, B and C blocks, was vested in the Crown. This included all of the former B block except 150a 2r at the southern end which became B1. The Tiger Bath springs and the springs now known as the Ngawha Springs Hotel springs, formerly part of Parahirahi B block, were now on the new Parahirahi block D vested in the Crown. While criticism has been made of the failure of the court to award some land on B block adjacent to Parahirahi C, to Wiremu Te Ripi and other non-sellers, all subsequent complaints in the form of petitions and representations have been directed solely at the acquisition by the Crown of the Ngawha domain area of approximately four acres.

Counsel for the claimants submitted that in respect of the Parahirahi transaction there was not in all the circumstances, a clear and unambiguous intention to extinguish rights in the geothermal resource. He further submitted that the only part of the transaction relevant to this question is that relating to Parahirahi C. He suggested that the Crown has sought to place some reliance on the apparent willingness of the owners to alienate the B block in proposing that it is only the pools which are a taonga. This, counsel suggested, was presumably because the sulphurous lakes are situated on the block. He submitted that there is no substance in that proposition because it is the pools which the claimants say are the eye of the resource. They provide the access to the resource and its healing powers. He concluded by submitting that, to the extent the transactions in respect of Parahirahi are relevant to the issue of rights in the wider geothermal resource, it is the Parahirahi C alienation which must provide the focus (C13:34). This proposition appears to be based on the premise that all the pools (the "eye" to the resource) are to be found on Parahirahi C block. But as we have seen that is not the case. Some were on Parahirahi B block, some on the Tuwhakino block and at least one on another block within the geothermal field (see figure 3).

The Crown submission to which counsel for the claimants was responding, contended that Parahirahi B block has geothermal activity in the form of other springs and two lakes. The reference to the springs is presumably to those now known as the Ngawha Springs Hotel hot springs and the Tiger Bath hot springs. The two lakes (one of which was inspected by the tribunal) are cold water but bubbling lakes and evidently part of the geothermal system. While Maori were presumably aware that those lakes are part of the geothermal system there can be no doubt that the springs on Parahirahi B were known by them to be part of the system or resource. The Crown submitted that because of the sale of Parahirahi B the owners were selling access to the geothermal field. The

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Crown further contended that it was the healing springs alone (on Parahirahi C block) which were taonga at the time of the Treaty (C16:59-60). As earlier indicated, the tribunal does not accept this last mentioned contention (4.5.3).

The tribunal has difficulty with the claimants' contention that their ownership or rangatiratanga over the whole of the Ngawha geothermal resource and field stems from, and is the consequence of, their ownership and rangatiratanga over the hot springs or pools on Parahirahi C block, of a part of which they were wrongfully deprived. The tribunal considers that this too narrowly states the basis for the rangatiratanga of the claimant hapu over the Ngawha geothermal resource. As we have stated earlier (4.5.3), in 1840 their rangatiratanga over the resource was based not merely on their rangatiratanga over the hot pools on Parahirahi C block but rather over the land overlying the Ngawha geothermal field and all the hot springs on such land.

The claimants' view is that the surface manifestations are inextricably linked one with the other and there is no basis on which the surface and sub-surface components can be severed. If this is so, however, it must follow there can be no severance of ownership or rangatiratanga over any surface component.

In fact such severance did take place when the Crown acquired ownership of that part of Parahirahi B block on which the Ngawha Springs Hotel hot springs and the Tiger Bath hot springs are situated. The cold bubbling lakes were an additional element. If, as is well established, the surface hot springs or pools are linked to the sub-surface system, then if the sub-surface component is capable of ownership, the purchaser of a surface component would necessarily acquire an interest in the sub-surface component. Such a purchaser would also of course acquire the right to exclude others from access to the surface component on the property or indeed to the sub-surface of such property.

- 4.6.5 When in 1894 the Crown acquired ownership of that part of B block on which hot springs were situate the Maori owners lost the right of access to the land and the hot springs on the land. As a consequence they necessarily lost the rights of management and control or rangatiratanga over the surface and sub-surface components of the geothermal system on and under the alienated land.

The attitude of the owners to the alienation of Parahirahi B block differed markedly from that in respect of block C. When in 1885 the Native Land Court partitioned the Parahirahi block into blocks A, B and C it was C block which was the principal focus of attention. The reason, it appears, was that it was the hot springs or pools on this small five acre block which were especially valued by the Maori owners for their healing and other qualities. On the evidence available to us we infer that the owners of Parahirahi B block had no wish to retain it because they did not place the same value on the surface geothermal manifestations on that block as they did on those on C block.

That the claimants' case is based on the critical importance of C block, not B block, is

evident from the submission already quoted that the fact that Maori sought the complete and inalienable reservation of the Ngawha Springs area in the Parahirahi C block is conclusive evidence that Maori in fact intended to retain the Ngawha geothermal resource. The tribunal is unable to accept this proposition which appears to be based on the premise that all the surface manifestations of the geothermal resource (the "eye" of the resource) were located solely on Parahirahi C block. In fact they were also present on Parahirahi B block and the Tuwhakino block. We turn now to the Tuwhakino block.

Did ownership of the hot springs on the Tuwhakino block pass to new owners?

4.6.6 In chapter 3 we related in some detail the history, so far as it is relevant for the purpose of the claim, of the Tuwhakino block. We briefly re-state the main points:

- Heta Te Haara, a prominent Ngati Rangi chief, together with Paora Ngai and Wi Raukawa also of Ngati Rangi, applied to have ownership of the Tuwhakino block determined by the court.
- Along the southern boundary a small triangular block of five acres was cut out of the Tuwhakino block and included in the Parahirahi block. This small area later became Parahirahi C block.
- On 15 July 1873 the entire Tuwhakino block of 1086 acres was awarded to Heta Te Haara alone. A certificate of title was issued in 1874.
- In 1876 Te Haara leased the entire block to one William Earl for 21 years. It included "all mines, metals, metallic ores, minerals and *mineral springs*". (emphasis added)
- Te Haara subdivided the block into two parts. On 5 July 1875 Te Haara transferred the northern block of 464 acres to Earl. The memorandum of transfer reserved to Te Haara "the right to use the waters contained in the two pools or lakes known by the names of Waima and Waipaoa".
- In 1884 a memorandum of transfer was registered against the title in which Te Haara surrendered the foregoing rights to use the waters in the two pools or lakes. A new title free of this encumbrance was issued to Earl on 14 May 1885.
- In April 1884 Te Haara leased the remaining 621 acres which adjoined the northern boundary of the Parahirahi block to Earl for five years. The lease included all the mineral, medicinal and other springs of water existing on the land and "the absolute and exclusive right to the use and enjoyment of the said springs". Earl was given the right to permit others to enter on the land for the purpose of using and bathing in the springs and to erect bath houses and other buildings.
- In 1892 Te Haara leased the 621 acre Tuwhakino block to George Patterson who

was to permit Te Haara, during the 21 years term of the lease, to have the use and occupation conjointly with Patterson. Presumably this would have enabled Te Haara to use the hot springs if he wished. Patterson had the right at any time during the term of the lease to purchase the land from Te Haara for £900.

- Two years later Patterson exercised his right of purchase and a transfer of the 621 acres from Te Haara to Patterson was registered in January 1894. With this sale Te Haara parted with all interest in the 1086 acre Tuwhakino block. No reservation in relation to the hot springs or pools on the land sold was made by Te Haara.

4.6.7 Counsel for the claimants in discussing the Tuwhakino block suggested that the apparent division of pools between that block and the Parahirahi C block may well have indicated that the underlying resource was shared as between Te Haara's hapu (Ngati Rangī) and the Uriohua and Takotoke hapu of Parahirahi (C13:33). The tribunal would comment that at that time, more than 100 years ago, it is highly unlikely the respective owners of Parahirahi C block and the Tuwhakino block would have adverted to their interest in the underlying resource about which they knew virtually nothing. What is clear is that following the Native Land Court order of 15 July 1873 vesting the Tuwhakino block in Heta Te Haara and the further court order of 10 November 1874 vesting the Parahirahi block in 37 named owners, ownership of the hot springs or pools in the respective blocks was clearly divided between a group of owners (Parahirahi) and Te Haara (Tuwhakino). Te Haara lost no time in subdividing his block and in alienating the northern part.

4.6.8 Counsel for the claimants further submitted there was no evidence to indicate one way or the other whether in alienating the Tuwhakino block, Te Haara intended to alienate the rights of his hapu in the resource. This assumes that his hapu retained an interest in the resource. The submission overlooks the actual transactions entered into by Te Haara. It overlooks that in 1876 Te Haara leased the entire block for 21 years including the mineral springs. No reservation was made for access by him or his hapu Ngati Rangī. It further overlooks that although Te Haara, when he sold the northern block to Earl in 1878, reserved the right to use the two pools or lakes known as Waima and Waipaoa, he made no such reservation on behalf of his hapu. He surrendered his right of access to these pools or lakes in 1884 and made no reservation in favour of his hapu. Also overlooked is that when Te Haara transferred to Patterson his interest in the southern block containing the hot springs or pools adjoining those in Parahirahi C block, he made no reservation of access to the hot pools whether for himself or his hapu.

4.6.9 The tribunal concludes that the final result of the two sale transactions whereby Te Haara disposed of all the land in the Tuwhakino block and the surrender of the right of access to pools in the northern block, was that the interest of Te Haara and any interest of his hapu in the hot springs and pools and the underlying resource was completely extinguished. Te Haara parted with the right of access to the land and the hot springs on the land. Consequently Maori no longer had any right of management and control or

rangatiratanga over the surface components of the geothermal system or the sub-surface components under the alienated land in the block. Ownership of the surface components vested absolutely in the new owners and was protected by the indefeasibility provisions of the Land Transfer Acts.

- 4.6.10 The tribunal notes at this point that claimants' counsel in his opening submissions (A53) discussed the question of the application of the common law relating to ground water. He also submitted that the claim to ownership of the subterranean geothermal resource is in the nature of a claim to non-territorial aboriginal title. Having discussed both issues however, Mr Williams preferred to rely on his claim that the Treaty guarantees to the hapu of Ngawha a right in the nature of ownership of the geothermal resource and a right to exercise rangatiratanga as kaitiaki of the resource in accordance with their practices. He submitted that the English common law fails to understand or recognise the Treaty guarantee and must be rejected as incapable of ensuring that the Treaty guarantees are fulfilled. The doctrine of aboriginal title he said, may well apply to ameliorate the situation but he submitted that even that doctrine lacks sufficient sophistication to adequately protect the Treaty rights (A53:24).

We would observe that a determinative answer to either of these matters can come only from the High Court. The jurisdiction of the tribunal is to hear and determine claims based on alleged breaches of the Treaty. We propose therefore to concentrate on those questions and avoid unnecessary distraction.

- 4.6.11 Counsel for the claimants further submitted that the alienation of the Tuwhakino block by Te Haara could not possibly have affected the rights held by the Ngawha hapu in the resource:

Their rights in the resource are pervasive, that is they apply to the whole of the resource. The reason being that the resource itself is not physically or conceptually subdivisible. Even if Te Haara's clear and plain intention was to extinguish his interest, or more accurately the interest of his hapu in the resource; and even if that intention was consistent with the wishes of his hapu (and we have absolutely no evidence on any of these matters), then the remaining rights of the Ngawha hapu must necessarily still be sufficient to use and control the resource. The rights might have been shared, but they are practically not severable. (C13:33)

It is necessary to consider these various propositions in some detail as they lie at the heart of the claimants' case. The claim is that notwithstanding the complete and final alienation of all his interest in the Tuwhakino block by its owner Te Haara, the Ngawha hapu (of which Te Haara's hapu Ngati Rangi is one) nevertheless retain their rights in "the resource". The geothermal resource, however defined, includes the surface hot springs and pools. Those on Tuwhakino were disposed of absolutely by the lawful owner Te Haara to new owners. Those owners, or their successors, whoever they are at any given time, own the hot pools and other surface manifestations, if any, on their land. Further, they can exclude any one else from access to them including nga hapu o Ngawha.

- 4.6.12 The tribunal heard evidence from Margaret Beadle (her family name being Ginn) one of the owners of the Spa Hotel property at Ngawha Springs on the Tuwhakino block. The Beadle property is immediately adjacent to the hot springs on the Parahirahi C1 Maori reservation and the Crown-owned four acre domain. Mrs Beadle told us that the Spa Hotel complex is privately owned with its own mineral hot pools adjacent to Lake Tuwhakino (on the property) and operates as a health resort (B47:1,4). Mrs Beadle was very critical of the geothermal drilling in the late 1970s and early 1980s which she said seriously affected the pools which went cold and became lifeless without gases and steam. She notes that she and her family have not been consulted by the joint venture as to what "we want to do with our geothermal resource" (B47:2). She was apprehensive of further adverse effects on the family's hot pools and supported the claimants in their opposition to the joint venture proposal. Mrs Beadle concluded by saying:

Our Lands, our Pools, our Thermal Valley, our Geothermal Resource is our Taonga.

Our treasure is precious to me and it is precious to my family. It is precious to those of my family who are living and it was very precious to those who are not living.

Taonga's have been talked about a great deal at this hearing and I seek to protect mine, for myself, for my family, for future generations and for the enjoyment of all. (B47:3)

There is no doubt in Mrs Beadle's mind that she, not the hapu of Ngawha, owns the pools and other surface components of the geothermal system on her family property and that she and her family have at least an interest in the underground components not being utilised in such a way that would have a deleterious effect on their pools. The tribunal is not persuaded by the submissions of claimants' counsel that the Ngawha hapu still have rights in the surface components of the geothermal resource on the Ginn/Beadle family property. It follows that the rights of the Ngawha hapu in the geothermal resource are not pervasive as claimed by claimants' counsel. His reason is that the resource itself is not physically or conceptually subdivisible. In the view of the tribunal this is plainly incorrect. The surface manifestations in the form of hot springs, pools or thermal lakes are clearly subdivisible. What may not be subdivisible are the underground components, including the rainwater which penetrates the system, the magma, the vast array of rocks of various temperatures, the gases, fluids and steam and the minerals both in and out of solution. We consider below whether these components of the complex and only partly known elements which go to make up the geothermal resource are indeed capable of ownership.

- 4.6.13 Counsel for the claimants in the passage quoted above, finally submitted that even if Te Haara's clear and plain intention was to extinguish his interest, or more accurately the interest of his hapu in the resource, and even if the intention was inconsistent with the wishes of his hapu (on which matter counsel claimed there was absolutely no evidence) the "remaining" rights of the Ngawha hapu must necessarily still be sufficient to use and control the resource. The rights he said "might have been shared, but they are practically

not severable".

The tribunal is of the opinion, on the evidence before it, that Te Haara's clear and plain intention was to extinguish his interest in the geothermal resource in so far as it related to the Tuwhakino block.

The tribunal is further of the opinion that when ownership of the Tuwhakino block (which necessarily included ownership of the hot springs and other thermal surface manifestations on the block) was alienated, any then existing interest of the hapu of Ngawha in the land and all geothermal components on and under it was extinguished. They necessarily lost any right of access to the land and the hot springs on the land. As a consequence they necessarily lost any right of management and control or rangatiratanga over the surface and sub-surface components of the geothermal system on and under the alienated land.

The tribunal also has difficulty with the final submission of claimants' counsel that the "remaining right" of the Ngawha hapu must necessarily still be sufficient "to use and control the resource". By "the remaining rights" of the Ngawha hapu, counsel presumably means their present rights in Parahirahi C1 (the one acre block) and to the four acre domain block at present owned by the Crown (but which this tribunal considers was not sold by the Maori owners and should be returned to Maori). The rights, he said, might have been shared, but they are practically not severable.

The tribunal for reasons it has given, considers the rights to the surface component of the geothermal resource, are severable. Their severance was completed when Te Haara transferred them along with the land, to the European purchasers.

The effect of severance of a significant part of the geothermal resource

- 4.6.14 The tribunal considers that once ownership of a significant part of the geothermal components, such as the surface hot springs and pools and other manifestations, are severed from that of other surface components, as has occurred in the Ngawha region, no one owner of some only of the surface components can validly claim the right to use and control the whole of the resource in and under the geothermal field. The present day owners, whether private or public, of the alienated surface of the geothermal resources in Parahirahi B block and the Tuwhakino block must necessarily have the right to use and control at least the surface components on land owned by them (subject always to any statutory provisions affecting them). Counsel has recognised that rights "might have been shared". If he was implying that rights in the alienated surface components continued to be shared following their being vested in separate individual Maori owners, we cannot agree. Once severed and separately owned, the right to use and control the surface component no longer lay with the previous owners.

In chapter 2 of this report we have recorded the adoption by the tribunal of what was said in the *Ngai Tahu Sea Fisheries Report 1992* and the *Muriwhenua Fishing Report*

1988 as to the meaning and significance of rangatiratanga. There it is noted from the *Muriwhenua report* that one of the three main elements embodied in the guarantee of rangatiratanga is that authority or control is crucial. The *Ngai Tahu Sea Fisheries Report* also noted that rangatiratanga includes management and control of the resource (2.5.1).

In so far as the Maori owners of such alienated land previously held rangatiratanga over it and the geothermal resource on and under such land they necessarily lost such rangatiratanga and the associated rights of control when they disposed of the land.

In the foregoing discussion the tribunal has considered the effect of alienation of surface components on part of the former Parahirahi B block and of all such components on the Tuwhakino block. We foreshadowed that the question of ownership of the sub-surface components perhaps raised different questions.

Are sub-surface components of the geothermal resource capable of ownership?

- 4.6.15 A critical question is whether the sub-surface components of the resource are capable of ownership. Our views on this topic cannot be in anyway definitive. As we have indicated, at 1840 and prior to the vesting of ownership of various parts of the field in separate owners, various hapu held rangatiratanga over the whole of the resource by virtue of their management and control of the land surface of what is now known as the geothermal field and of the hot springs and pools on the land. But since the alienation of part of the resource in the form of surface components and of the land on which they are situate, neither the hapu of Ngawha nor the trustees of the Parahirahi C1 Maori reservation have any right, or indeed power, to exercise management or control over such surface components for they no longer have rangatiratanga over them. Nor indeed do they have any right to access them.
- 4.6.16 As to the underground component of the "resource" there are problems in sorting out the various elements. Is it realistic for instance to segregate out ownership of the underground geothermal fluid from all the components which go to produce it? As we have seen from the scientific evidence the geothermal system is highly complex with many inter-related components. If, however, the subsurface geothermal fluid is isolated from the remainder of the underground components of the resource for the purpose of considering the question of ownership, the tribunal considers that once ownership of the surface components has been severed there is no basis for allocating the right of ownership of or rangatiratanga over the whole of the sub-surface geothermal fluid to the owner of only one set of hot springs or pools. No one such owner or group of owners can validly claim the exclusive right to manage and control the underground fluid or, in all circumstances, to exercise a veto over its extraction and use. The question of what degree of protection should, however, be given to the highly valued taonga comprising the hot springs and pools in the care and trusteeship of the trustees of the Parahirahi C1 Maori reservation and the adjoining Crown-owned recreation reserve pools, should they be returned to Maori ownership, is considered later in chapter 7 (7.6).

References

- 1... Mr Lumb holds a bachelors degree in geology and a masters degree in applied geophysics and was a DSIR scientist for over 27 years. For over half of that time he was involved in the overall management of the department's geothermal work.
- 2... Dr Sheppard has a MSc in geochemistry and a PhD in chemistry. He has been employed since 1977 as a geochemist by the Chemistry division of the DSIR and since July 1992 by one of its successors, the Institute of Geological and Nuclear Sciences Ltd. He has been involved in investigations on geothermal systems in New Zealand, Indonesia, California, Alaska and the Azores and has published widely on geothermal and volcanic geochemistry, nine of these on the Ngawha system which he has studied extensively.
- 3... Dr Watson holds a BSc in Mechanical Engineering and a PhD from the University of London in heat transfer by natural convection. He has had wide experience both as a University lecturer and consultant on geothermal resources in Japan, the Philippines, Papua New Guinea, Indonesia and Vanuatu as well as to the United Nations. He has been in New Zealand since 1980 when he joined KRTA.