BEFORE THE HEARINGS PANEL
FOR THE QUEENSTOWN LAKES PROPOSED DISTRICT PLAN

IN THE MATTER of the Resource Management Act 1991

AND

IN THE MATTER of Hearing Stream 10 – Natural Hazards, Definitions and Whole of Plan

CASEBOOK FOR QUEENSTOWN LAKES DISTRICT COUNCIL

Hearing Stream 10 – Natural Hazards, Definitions and Whole of Plan

13 March 2017

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TAB 1

ORIGINAL

Decision No: C126/97

IN THE MATTER of the Resource Management Act 1991

AND

IN THE MATTER of an appeal under section 120 of the Act

BETWEEN **AQUAMARINE LIMITED**

Appeal : RMA 822/95

Appellant

AND **SOUTHLAND REGIONAL COUNCIL**

Respondent

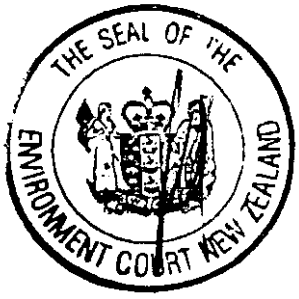
BEFORE THE ENVIRONMENT COURT

His Honour Judge Skelton - (presiding)
Mrs R. Grigg
Mr I.G.C. Kerr

HEARING at GORE on the 26th, 27th and 28th days of February 1997; 3rd, 4th, 5th, 6th and 7th days of March 1997; and 10th, 11th and 12th days of March 1997
RESUMED HEARING at INVERCARGILL on the 5th, 6th, 7th and 8th days of May 1997

APPEARANCES

Mr J.R. Milligan for the appellant
Mr B.J. Slowley for the respondent
Mr R.H. Ibbotson for Fiordland Travel Limited and Deep Cove Outdoor Education Trust
Mr A.F.D. Cameron for Director-General of Conservation and Southland Conservation Board
Mr L. Shaw - in person
Mr S.R. Bull for Murihiku Resource Management Consultancy



DECISION

Introduction

On 29 June 1994 the appellant Aquamarine Limited made a notified application to the respondent for four coastal permits to lay, fix and use a water pipeline from the Lake Manapouri tailrace at Deep Cove in Doubtful Sound to a support vessel; to install and use moorings for vessels in Deep Cove; to occupy part of the coastal marine area in Deep Cove with vessels; and to take water from the tailrace outfall plume.

This application became the subject of more than 40 submissions in opposition and was heard by the respondent's Hearing Committee between 24 and 26 May 1995. In a decision issued on 26 June 1995 the respondent refused all four resource consents and this appeal has followed.

Thereafter, there were several pre-hearing conferences and an interlocutory application to determine certain questions of law which was decided by the presiding Judge in a decision issued on 6 November 1996 - see Decision No: C79/96 This decision is the subject of an appeal to the High Court by the present appellant. However it has chosen not to seek a hearing of that appeal pending the outcome of the substantive hearing of this appeal which began at Gore on 26 February 1997.

When the hearing began, appearances were entered as set out above except for Murihiku Resource Management Consultancy. This original submitter was admitted as a party on 27 February 1997 after hearing submissions from Mr Bull, Mr Cameron and Mr Milligan. Initially, the appellant opposed this submitter's application to be admitted as a party, but in the end this opposition was withdrawn by Mr Milligan and later in the hearing Mr Bull gave evidence in support of the original submission in opposition to the appellant's proposal.

On 13 March 1997 with the consent of the parties the Court travelled to Doubtful Sound to make a site inspection. This involved the members of the Court, accompanied by the Registrar, taking the commercial tourist trip provided by Fiordland Travel Limited that commences at Pearl Harbour Manapouri, crosses Lake Manapouri to West Arm, and then traverses Wilmot Pass by bus to Deep Cove. From there the Court travelled by boat down Doubtful Sound to Crooked Arm where we experienced the "Sound of Silence" and then to the open sea as far as Nee and Shelter Islands. On return to Deep Cove we visited the Deep Cove Outdoor Education Trust facilities and inspected the existing tailrace. On this part of the site inspection the Court was also accompanied by Mr M.B. Anderson, who is special projects manager with Fiordland Travel Limited. This too was by arrangement with the parties and we record that Mr Anderson observed all the usual proprieties and confined his assistance to providing us with transport to and from various vantage points as requested by us.

Although the substantive hearing concluded in May our duties elsewhere; the volume of evidence requiring review; and the complexity of some of the issues requiring determination have combined to delay this decision until now. In addition we have been very mindful of the importance of the outcome of this appeal, both to the appellant and to those who have opposed its proposal. As we proceed with this decision the tensions between the appellant and the various opposing interests will become apparent, but it is important to say at the outset that the nature and extent of the competing interests are such that it was inevitable that the Court would find itself having to make value judgments and choices that would not satisfy everyone.

The Proposal

In this section of this decision we will discuss the appellant's proposal as described in the application and the evidence of Mr J.E. Fletcher, Chairman of Directors of the appellant company.

One of the difficulties opposing parties claim to have encountered is a lack of detail supplied by the appellant about its proposal and a good deal of time was spent at the hearing trying to clarify various points of detail.

There was substance in some of the concerns expressed by opposing parties about lack of detail and in a later section of this decision under a heading 'Discussion and Consideration of Legal Issues' we will mention this again. The appellant also faced difficulties because in some respects it is relying on other agencies such as the Maritime Safety Authority to advise it on navigational requirements, even though it called evidence itself about some of these matters.

The original application had annexed to it an assessment of effects on the environment which was also the subject of some criticism, but which does in fact contain a good deal of information. This was supplemented by further information provided at the request of the respondent before the initial hearing took place before its Hearing Committee.

In broad terms, the appellant proposes taking fresh water that is discharging from the Manapouri tailrace at the head of Deep Cove through an intake structure located below mean low water springs. The original proposal was to locate the intake structure at the side of the tailrace itself, but this would have been in the Fiordland National Park and the Minister of Conservation would not consent to this. The intake structure, which would be submerged, would be attached to a permanent fixed submarine pipeline. Water would be conveyed via the pipeline

to a point near a proposed mooring in Deep Cove. When the pipeline is not in use it would be lightly capped. Tankers ranging in size from 12,000 dead weight tonnes (dwt) to 40,000 (dwt) would moor in Deep Cove and with the assistance of a support vessel containing the necessary pumping equipment the freshwater would be loaded onto these tankers which would then depart for overseas destinations.

The proposal is not new. Mr Fletcher told us that in the early 1970's he was involved in the formation of a company called Resources Development Limited which was set up for the express purpose of exploiting the Manapouri tailrace freshwater resource. In December 1972 Resources Development Limited obtained a water right under the Water and Soil Conservation Act 1967 enabling it to take water from the tailrace at the rate of 80 cubic feet per second. It was a condition of this right that an export of water was to occur within three years of the grant. At that time, how the water was to be exported had not been resolved. A number of possibilities were under consideration. These included using new vessels which had been designed originally as oil tankers but not used for that purpose; the use of conventional double skin cargo vessels; the use of conventional oil tankers; and the use of dracones which are huge flexible containers developed by the Dunlop company which, when filled with freshwater, would float in the sea.

In the event none of these developments proceeded but the requirement that an export of water occur within three years was met by extracting approximately 30 tons of freshwater from the tailrace, placing it in large plastic containers, and transporting these by truck across the Wilmot Pass, then by barge across Lake Manapouri and again by truck to the port of Lyttelton near Christchurch. There the water was repackaged into wine cask like containers, with the intention that 20 tons would be shipped to Bahrain. Mr Fletcher said that although this was

successful in the sense that the shipment occurred and payment was received, the exercise was not repeated.

Shortly after this Resources Development Limited obtained a further consent enabling it to extract water from Lake Manapouri. The intention was to facilitate further shipments of the kind earlier described. At that time an American company, Triune Corporation became interested in this proposal. Individual shareholders of Resource Development Limited were canvassed and offers were made to acquire their shares. The majority accepted the offers.A minority, including Mr Fletcher,did not but in the event found themselves unable to continue in opposition. For this reason the whole of the shareholding of Resources Development Limited was transferred to Triune Corporation for a sum of $US250,000 but payment in full was never made. There were difficulties within Triune Corporation. There was litigation and the Corporation never exercised the water rights which it had purchased. Mr Fletcher understands they were onsold but eventually allowed to lapse.

In late 1992 after he had ascertained that the earlier rights had expired Mr Fletcher formed Aquamarine Limited. With one exception, all 27 shareholders in this company are New Zealanders. The exception is Mr Fletcher's son in law who is an Australian. Aquamarine Limited is set up in a way which will reduce the risk of a takeover bid being mounted as occurred previously. The prime objective of the appellant is to develop the freshwater resource in the way earlier described as an export commodity.

The detailed expert evidence about moorings in Deep Cove, tanker navigation, support vessels and matters of that kind will be discussed later. However, in this section we record that during Mr Fletcher's evidence several matters of detail emerged. We have already stated the range in size of the tankers. These are known as parcel tankers. They are double skinned vessels designed principally to

carry liquid cargoes in compartmentalised holding tanks. They are used throughout the world for a variety of purposes from conveying chemicals to conveying wine. The cargo compartments are usually made of stainless steel and are sometimes teflon-lined.

The principal source of vessels of this kind is a brokerage company called Stolt Nielsen which is associated with several vessel owing companies. Mr Fletcher said that Stolt Nielsen has assured the appellant that tankers can be made available for the purpose of conveying freshwater. It is proposed to obtain appropriate vessels by way of charter "otherwise than by demise". Mr Fletcher produced a copy of a standard charter party and attendant documents used by Stolt Nielsen as Exhibit "A".

It will be necessary for these vessels to enter Doubtful Sound in ballast and discharge their ballast water contemporaneously with the loading of freshwater into the cargo compartments. The appellant is aware of the concerns about discharging ballast water in New Zealand and Mr Fletcher told us that the appellant will make it a term of every charter party contract that mid-ocean transfers or exchanges of ballast water are to take place before the ship enters New Zealand waters. The appellant will accept a condition of consent to this effect. Again, we will be considering the matter of ballast water in more detail later.

A 40,000 dwt tanker of the kind proposed to be used by the appellant has an overall length of 200 metres. Mr Fletcher was at pains to point out that he was unsure whether vessels of this size would in fact be used, and if so how often. In his prepared evidence-in-chief he said the vessels to be used cannot be ascertained at this stage because much will depend upon the destination of cargoes and the requirements of purchasers. These were matters he was not prepared to discuss because of commercial sensitivity. It is clear however, that

the intention is to export water in large quantities and Mr Fletcher did say in cross-examination that he regarded this as a more advantageous proposal economically than some other activities currently taking place in New Zealand that involve bottling water for export. It was Mr Fletcher's opinion that it was better to export water in bulk and have it bottled in the purchaser's environment rather than try to penetrate the overseas bottled water market from New Zealand.

Preliminary costings have been done by the appellant using a tanker of 40,000 dwt and, for the purposes of assessment, we have concluded that it is appropriate to consider the effects of this proposal on that basis.

At the hearing questions were also raised about the number of tanker visits and, in the end, Mr Fletcher agreed to accept a condition along the lines that there would be an average of one tanker visit per week with a maximum of 52 in any one year. Questions also arose about the support vessel and whether it could also double as a tug, and indeed whether tugs will be required. This too is a matter we will consider in more detail later. It is also clear that, at least in the initial stages, it will be a requirement of the Maritime Safety Authority that the vessels enter Doubtful Sound with a pilot and questions were raised as to how the pilot would join the tanker vessel. Originally it had been the intention of the appellant to use helicopters but when the hearing resumed on 5 May 1997, Mr Milligan was asked to obtain instructions on this matter and having done so informed us that the appellant will agree to a condition to the effect that except in emergencies helicopters would not be used for any purpose.

The tankers will be moored to fixed buoys and details of the proposed moorings were given by Mr G.C. Teear, an engineer with considerable experience in this field whose evidence will also be considered in more detail later. The important point for present purposes is that one of the moorings, a single anchor-leg mooring (SALM) will be quite large with some 6 metres exposed above the

surface of the water in Deep Cove. The other mooring will also be visually prominent. The support vessel which was said by Mr Fletcher to be 120 feet long, and 400 dwt would contain a laboratory and an ozone generating plant to sterilise the water to ensure that it does not contain any impurities such as giardia. It is intended that the support vessel would be serviced at Bluff on a monthly basis and it would remain in Deep Cove between tanker visits.

Mr Fletcher said that the proposal is to bring the tankers into Doubtful Sound, or possibly Thompson Sound which joins Doubtful Sound, and thence to Deep Cove during daylight hours. He thought it would take approximately 20 hours to fill a 40,000 dwt tanker which could then depart Deep Cove and Doubtful Sound in daylight.

Conclusion

Having regard to the foregoing, and for the purposes of assessing the effects of the appellant's proposal, we have concluded that it will involve some underwater structures such as the intake structure and the pipeline; two substantial fixed moorings with their attendant lines; at least the use of one support vessel which could double as a tug ; the use of tankers ranging in size from 12,000 dwt to 40,000 dwt and some form of arrangement now unspecified but not involving helicopters, for placing a pilot on the tankers for the duration of their time in Doubtful Sound and Deep Cove.

The Relevant Statutory Instruments

There were no less than eight statutory instruments referred to as having some relevance for the purposes of these proceedings. These were a transitional regional plan; a transitional regional coastal plan; the transitional Southland District Plan; the New Zealand Coastal Policy Statement; the proposed Southland

Regional Policy Statement; the proposed Southland District Plan; a proposed Regional Coastal Plan and the Fiordland National Park Management Plan. Two witnesses with expertise in resource management assessment gave evidence which will be discussed in more detail under another heading. For present purposes it is sufficient to refer to these statutory instruments and provide a brief summary of the relevant provisions contained in each of them.

Before doing this it is important to record that all the appellant's proposed activities will take place in the coastal marine area, that is to say below mean high water springs. The waters of Doubtful Sound are not part of Fiordland National Park but are surrounded by the National Park recognised internationally as a World Heritage area.

The land surrounding Deep Cove was originally within the Wallace County and the relevant district scheme, as it then was, was the Wallace District Scheme which became operative on 1 July 1991. This scheme became part of the transitional Southland District Plan when the Resource Management Act 1991 came into force.

This part of the transitional Plan recognises the Fiordland National Park and, while seeking to manage land uses outside the Park, accepts that the Park is controlled pursuant to the provisions of the National Parks Act 1980.

The Plan also recognises that this Park was accorded World Heritage status in November 1986. Tourism is recognised by the Plan as playing an increasing role in the economic activity of the district. It also recognises that the Fiordland National Park constitutes approximately 60% of the district, that is to say the former Fiord County, and is a valuable wildlife, tourist and recreational resource used extensively by New Zealanders and overseas visitors.

The transitional Southland Regional Coastal Plan which came into force on the passage of the Resource Management Act 1991 as a collection of various statutory instruments then in force, does not contain any provisions that are relevant for present purposes. It does refer to various provisions in the former Wallace District Scheme concerned with coastal protection and, in particular, the Wallace Coastal Protection Wildlife Habitat zone, but this zone covered areas of coastal environment outside the Fiordland National Park.

The transitional Southland Regional Plan, formerly the Southland Regional Planning Scheme, contains a section on coastal and marine resources comprising several objectives and policies of a broad based nature seeking to recognise a number of things such as the preservation of the natural character of the coastal environment, mercantile shipping and related port facilities, defence, navigation, energy related use of the seabed and coastal margins, fishing and other sea products, and the tradition of the New Zealand public of free access to and enjoyment of the coastline and adjoining land.

There are objectives for maintaining water quality and, referring to the fiords, there are specific policies to recognise the national and international significance of the marine coastal life of the fiords by preserving at least representative samples of the fiord environment in their natural state and minimising the effects of development throughout Fiordland. It is stated in the reasons for this policy, which is policy E-4, that the fiord marine environment is unique in that species are found on the rock walls which occur elsewhere only in the lower latitudes and deeper waters. Some species found in Fiordland are on the endangered list elsewhere. Seaweeds are also recognised by a specific policy, as is black coral. In policy E-6 it is said that Fiordland is the only known area in the world where black corals are abundant in shallow water and therefore readily accessible. Coastal bird habitats are similarly recognised.

In a section on port development policy P-3 recognises the importance to the Southland region of a number of fishing ports, one of which is Deep Cove, and there is a policy to assign high priority to meeting the reasonable needs of the fishing industry in and adjacent to the region. In policy P-4 it is said that further port development could be required in the event of a resource based development proceeding, and one example given is the bulk export of water from Fiordland. It is said in the reasons for this policy that the former United Council considered that these possibilities should be recognised but that any proposal should be subject to thorough environmental assessment and problems revealed in that assessment addressed.

The New Zealand Coastal Policy Statement, which was gazetted on 5 May 1994, contains 14 general principles in addition to the statutory principles set out in sections 6, 7 and 8 of the Resource Management Act 1991, some of which have direct relevance for present purposes. Principle 1 recognises that some uses and developments which depend on the use of natural and physical resources in the coastal environment are important to the social, economic and cultural wellbeing of people and communities and functionally can only be located on the coast or in the coastal marine area. Principle 2 recognises the protection of the values of the coastal environment need not preclude appropriate use and development in appropriate places. Principle 5 recognises that people in communities expect that lands of the Crown in the coastal marine area shall generally be available for free public use and enjoyment. Principle 6 recognises that the protection of habitats of living marine resources contributes to the social, economic and cultural wellbeing of people and communities. Principle 9 states that the tangata whenua are the kaitiaki of the coastal environment, and principle 10 states that it is important to maintain biological and physical processes in the coastal environment in as natural a condition as possible and to recognise their dynamic, complex and interdependent nature. Principle 11 states it is important to protect representative or significant natural ecosystems in sites of biological importance

and to maintain the diversity of New Zealand's indigenous coastal flora and fauna. Principle 12 states that the ability to manage activities in the coastal environment sustainably is hindered by the lack of understanding about coastal processes and the effect of activities. For this reason it is said that an approach which is precautionary but responsive to increased knowledge is required for coastal management.

It is a national priority to preserve the natural character of the coastal environment by encouraging development where the natural character has already been compromised; taking into account potential effects of development on values relating to the natural character of the coastal environment both within and outside the immediate location and avoiding cumulative adverse effects of development on the coastal environment. There are also several other national priorities of a more detailed nature relating to indigenous vegetation and significant habitat, landscape, seascape and landforms, and protecting the integrity, functioning, and resiliance of the coastal environment in terms of its several values such as dynamic processes, movement of biota, substrate composition, water and air quality, biodiversity, productivity and biotic patterns and intrinsic values.

This instrument then goes on to set out policies for making provision in other policy statements and plans, some of which refer back to the matters just mentioned, and in a schedule there is a description of the activities that are to be made restricted coastal activities. None of the activities that are the subject of these proceedings are included in this schedule as restricted coastal activities.

The Proposed Regional Policy Statement for Southland, which at the time of the hearing of this appeal was close to becoming operative, contains a whole section on biodiversity which was the subject of proceedings before this Court that have

now been resolved - see ***Electricity Corporation of New Zealand Limited and Others v Southland Regional Council*** Decision No: C29/97.

There is an objective to protect areas of significant indigenous vegetation and significant habitats of indigenous fauna within Southland where this will maintain or enhance biodiversity of indigenous ecosystems and there is another objective to maintain and enhance the biodiversity of indigenous species within the Southland region. There is also a policy to identify and encourage the protection of areas containing these values. There is an objective to ensure the taking, use, damming and diversion of water does not compromise the environmental standards established for the region, and there is a policy to manage abstraction of water and the transferability of permits on the basis of the effects of that abstraction or transfer taking into account the standards set for the water body and the use to which the water is to be put. There is another policy to encourage the conservation of water and its efficient allocation and use. There is also a policy to recognise and provide for the values that Maori place on water.

Landscapes and natural features are the subject of another section in the proposed policy statement and it is said that within Southland there is a range of landscape forms, one of which is identified as fiords, harbours and estuaries.

In a section on the coast, Fiordland is specifically identified as containing 63% of the region's total coastline. One of the resource management issues identified in this section is ballast water, bunkerage and other discharges from ships, for example bauxite and fertiliser spilt on transfer can adversely affect water quality and ecosystems, particularly where new organisms are introduced. Another is the best means of preserving the natural character of the coastal environment while providing for appropriate use and development. There is an objective to preserve the natural character of the coastal environment and to avoid wherever practicable, remedy, or mitigate any adverse effects from the use and

development of the natural and physical resources within the coastal environment. There is a further objective to ensure that only those activities and developments that require a location in the coastal environment are situated there, and a further objective to ensure that any exclusive or preferential occupation of the coastal marine area is necessary and fully justified.

On the discharge of ballast water, bunkerage and other material within the waters of the region there is a policy to advocate that central Government take action to avoid adverse effects from ships carrying out these activities. In an explanation of this policy it is said that because discharges from vessels registered outside New Zealand cannot presently be prosecuted under the provisions of the Resource Management Act 1991 there is limited opportunity to require compliance with existing central Government policy and any guidelines that the Regional Council or other bodies may prepare. Discharges from ships into coastal waters is a matter that requires national consistency and for this reason requires co-ordination at a central Government level. It is acknowledged there are practical difficulties in implementing an effective regime for the management of discharges from vessels and there are still technological impediments to the implementation of the Government's ballast water policy.

There is a further policy to manage development within the coastal environment to protect outstanding natural features and landscapes, and to preserve the natural character of that environment. There is another policy to recognise that some activities will require exclusive or preferential occupation notwithstanding the fact that the public has a right to use the coastal marine area. There is also a policy to identify the values of the coastal marine area which require protection, the degree of protection of each value to be commensurate with the significance of the value. In the explanation of this policy it is said that the protection of values of international and national significance will rank higher than the protection of values of local significance. However, adverse effects on each

should be avoided where possible. The effect of the policy is to provide a hierarchy of protection to give values identified in areas of significant conservation value a status commensurate with their significance. The policy is said not to reduce in any way the general obligation under section 5 of the Resource Management Act 1991 but is intended to recognise the first and second principles in the New Zealand Coastal Policy Statement and principles 6 and 8 which relate to the protection of values. A further policy is to adopt a precautionary approach towards proposed activities where their effects are, as yet, unknown or little understood.

The proposed Southland District Plan, is also close to becoming operative except for one outstanding matter yet to be finally heard and determined by this Court. The Plan has a section on the coast based on a landscape and ecology study which broke the coastal down into 8 units, one of which was Fiordland. The Plan also refers to the New Zealand Coastal Policy Statement and the proposed Regional Policy Statement.

This Plan too, contains objectives for preserving, as far as practicable, the natural character of the coast from inappropriate development and recognising and providing for the importance of coastal resources to Maori. As with its predecessor, Fiordland National Park is specifically recognised and there is a section in the Plan devoted to Fiordland where many of the values already referred to are again recognised and provided for.

The proposed Regional Coastal Plan for Southland was publicly notified on 15 February 1997, some 11 days before the hearing of this appeal began. It was still open for submissions when the hearing concluded. It is probably the instrument most directly relevant to these proceedings and it is certainly the most controversial. In another section of this decision we will refer to the legal submissions made by counsel on this Plan, but we say it is controversial because

of the timing of its public notification and also because it contains rules that purport to control the activities the appellant is here proposing in ways which, it was submitted, are ultra vires. Also in other sections of this decision we will refer to some of the provisions of particular relevance such as a description of the relevant part of the coast adjoining the Fiordland National Park; the general rule controlling noise, and a more specific provision relating to noise in the internal waters of Fiordland.

The proposed Plan contains a number of objectives and policies that are very similar to the ones we have already referred which is hardly surprising because it deals with the same area, and of course is required to recognise and maintain consistency with the New Zealand Coastal Policy Statement. To the extent that these objectives and policies provide for the protection of indigenous flora and fauna, public access, landscape and Maori values, we do not think it is necessary to refer to them again.

There is a chapter on Coastal Water which contains an objective to maintain coastal water quality and the natural state of coastal waters wherever it is considered they can be fairly described as being in their natural state. In this chapter the Plan also addresses discharges from vessels, and contains a policy to avoid the adverse effects of the discharge of ballast water and associated contaminants in Doubtful Sound amongst other areas where it is said there are high ecological values. There are also policies to recognise the importance of the Manapouri power scheme: to ensure that the discharge from the Deep Cove tailrace meets water classification standards for Doubtful Sound: and to monitor the effects of freshwater discharges into Doubtful Sound. There are also objectives and policies about the use of oil dispersants for mitigating the adverse effect of oil spills. Another part of this chapter is concerned with the taking and use of water, and provides that the taking of freshwater from the coastal marine area is a discretionary activity.

There is a chapter on occupation of the coastal marine area and there are objectives to maintain or enhance the availability of the coastal marine area for public recreation and other uses not requiring any form of preferential occupation, as well as an objective to provide for occupation of the coastal marine area while minimising alienation of the public right to the coastal marine area. There is a policy to grant preferential occupation where it is required and deemed appropriate. This policy states that the consent authority prefers preferential occupation to exclusive occupation. It is said that preferential occupation allows for an area to be used by more than one activity. It does not prevent others from using the particular part of the coastal marine area when the consent holder does not require it.

There are rules controlling the use of vessels for residential purposes where this is incidental to the principal activity. This is a permitted activity. Where mooring or anchoring of vessels that will be used predominantly for residential purposes or as a service facility in more or less the same area is for more than seven consecutive nights in the coastal marine area this is a discretionary activity.

Part of chapter 13 refers to anchorages, moorings and marinas. One of the specific areas recognised for moorings is Deep Cove. The chapter then states there is either a shortage of space or no space left in Deep Cove. There is a policy to require moorings to be visually unobtrusive and to minimise damage to benthic ecosystems and make efficient use of space. Moorings for which preferential or exclusive use is required are a discretionary activity in Deep Cove.

In another part of this chapter concerned with ports, harbours and havens, Deep Cove is recognised as a port providing for a fishing fleet and tourist vessels. It is said that with the exception of the main port of Bluff, the operational areas associated with the other recognised ports are not large.

In a chapter on surface water activities on the internal waters of Fiordland, there are objectives to maintain the essential characteristics of the coastal marine area environment: to preserve the remoteness values of these internal waters: and to ensure that commercial and private recreational surface water activities do not adversely effect the intrinsic values of the Fiordland coastal environment.. There is a policy to identify arms or parts of arms of Doubtful Sound and other waters of Fiordland where landscape and amenity values are vulnerable to the adverse effects of increased use, and there is also a policy to limit the extent and number of commercial activities that occur within the coastal marine area of Fiordland to a level which does not reduce landscape and amenity values, specifically remoteness and tranquility.

There is specific recognition in another policy of the value that Doubtful Sound contributes to the remote educational experience of school children who visit the Deep Cove hostel at the head of the Sound. There is a policy to limit the number of regular day trips by vessels capable of carrying 50 or more passengers in parts of Doubtful Sound to 4 per day for what are described as short trips, and 4 per day for what are described as long trips, the purpose being to limit the total number of trips per day to 8. One of the purposes of this policy is to protect the natural character, landscape and amenity values which are said to be very significant elements of the Deep Cove experience for those who use the Hostel.

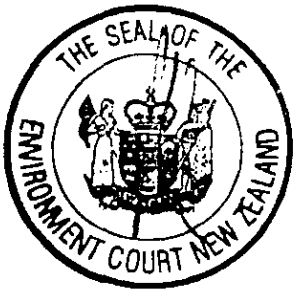
There is a policy to control foreign vessels in the internal waters. There is a rule which is one of the rules challenged as to its validity, that the use of the internal waters of Fiordland, except relevantly Doubtful Sound north of Rolla Island, by foreign vessels over 100 tonnes is a prohibited activity. This rule would prevent the appellant's tankers from entering Deep Cove. There is another rule that would permit a vessel of this size to use Doubtful Sound north of Rolla Island and Thompson Sound as a discretionary activity.

The Plan addresses Deep Cove itself. There is a policy to identify and preserve an area suitable for the general public to launch vessels or temporarily berth vessels for the purpose of loading or off-loading people and cargo. There is a policy to identify and preserve an area for temporarily berthing vessels for the purpose of loading or off-loading people and cargo. There is a further policy to preserve a vista of open space from the beach below the Deep Cove hostel, and a policy to concentrate structures in Deep Cove to the western shore south of Archer Point. There is a plan, Figure 16.4.1, that identifies these.

The thrust of these policies is to maintain as far as possible the natural character of Deep Cove, while at the same time recognising the historical use of the Cove by fishing vessels and smaller craft for recreation purposes.

Finally, we refer to the Fiordland National Park Management Plan 1991. This is a plan prepared under the National Parks Act 1980. It was common ground that it is a relevant instrument to which we should have regard pursuant to section 104(1)(i) of the Act.

Under a heading 'Habitat Conservation' reference is made to Secretary Island which is located between the entrance to Doubtful Sound and the entrance to Thompson Sound. The objective is to recognise and maintain as far as practicable the ecological values of Secretary Island which deserve special recognition and particular protection. There is a problem mentioned in the Plan concerning deer control and it is also said that while it is no longer necessary to continue with a specially protected area status for Secretary Island, public access can be restricted during animal control operations by way of bylaws. It is also said that the Island still retains ecological qualities which deserve recognition.



There is an objective to seek the protection of inshore marine waters adjoining the National Park, and a section on implementation of this objective. It is said that the intertidal zone adjacent to the Park is considered an integral part of the sequence of ecosystems. It is important to Park ecology that this zone is managed on a comparable basis to ensure the safeguarding of the fragile and sensitive coastal margins of the Park.

In a section on recreation and tourism, Deep Cove is shown on a visitor distribution map - map 4 - as being in the 10,000 to 100,000 visitors annually category by contrast, for example, with Milford which is shown as being in the 100,000 plus visitor category. In the narrative it is stated that this National Park attracts an estimated 450,000 visitors annually, with the main concentration of visits being to the north-eastern sector from Manapouri to Milford Sound. Most recreation and tourism facilities are located in this sector. The main visitor season occurs from mid-October until the end of May. It has extended earlier and later over recent years. The peak period is during January/February/March. Moderate but increasing numbers mainly tour groups visit the area outside the main seasons.

On water access, the Plan states that transport by boat is a distinct feature of recreation/tourism opportunities in Fiordland. While having no direct jurisdiction over the waters of the fiords, the challenge for park management is to influence use of the coastline so that visitors can have a quality experience and at the same time historical or natural values are not compromised. An example of this is Doubtful Sound which is promoted as the "Sound of Silence". On a map associated with the narrative, map 5, Deep Cove is recognised as containing port facilities and having a boat service. On the same map Secretary Island is shown as a specially protected area.

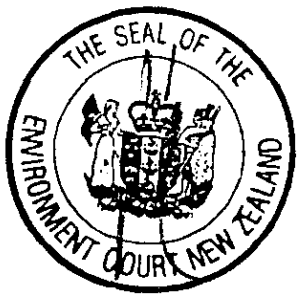
Following this there is some further narrative which records, inter alia, that boat ramps, jetties and moorings have been long established at popular egress points on the major lakes in the National Park, as well as at Deep Cove and Milford Sound. Currently the existing facilities are considered sufficient for general public use.

On another map following this narrative, map 6, visitor facilities are identified at Deep Cove as being boat slips, boat fuelling, nature walks, Deep Cove hostel, tourist launch, and wharf.

An interpretation plan prepared for the National Park in 1985 identified themes and the type of location of interpretative facilities for services to be provided for visitors. In the case of Deep Cove these are identified as launch trips with commentary - see map 7.

Map 8, identifies recreation management areas. Deep Cove is in an area described as eastern popular. The objectives for this area are to provide opportunities for a wide variety of recreational activities compatible with National Park purposes and to provide opportunities for facility development which will enhance public enjoyment of the Park without impairing or diminishing its natural values.

While the intention is that the eastern popular area should absorb the greater part of any increased use of the Park, it is also said that not all parts of this area will be intensively used and any development proposals must include assessment of impacts on the natural environment and existing recreational opportunities. An important consideration would be the impacts that proposed developments might have on landscape vistas in this popular part of the Park and any optional sites or routes that could be used to avoid such impacts.



In a section on walking tracks and huts there is an objective to provide and maintain a variety of easy walks which encourage and enable less active or short stay visitors to better enjoy and appreciate the outdoor environment of the Park. Amongst these walks are listed Brasell Point nature walk and Deep Cove tailrace to the foot of Helena Falls.

On interpretation and education, there are objectives to enhance visitor enjoyment through the provision of interpretative facilities and services that will enrich peoples understanding and knowledge of the Park, its natural processes and human history. There is also an objective to support activities of the education centres at Deep Cove and Borland, while recognising the regional needs for outdoor education facilities. To implement this objective it is proposed that the ongoing operation of the education centre at Deep Cove will be encouraged, but Departmental support for this facility must be weighed against the regional commitments to conservation, education and cost effective programmes.

In a section on water resources there is an objective to prevent water resource uses from adversely impacting on the waterways, ecology and other natural features of the Park. It is stated in this section that proposals for bulk taking or use of freshwater are of concern, mainly because of the likely impacts on other features of the Park. For example the proposed export of freshwater from Deep Cove would probably bring significant changes to the natural environment of that location as experienced by park visitors because of the scale of such an operation. It is said that full environmental assessment procedures should be required for this type of proposal. This is obviously a reference to the earlier proposal mentioned by Mr Fletcher and not to the proposal that is the subject of these proceedings. Nevertheless it remains a concern as the evidence called by the Director General of Conservation made clear.

Finally on fishing fleet facilities, Milford Sound and Deep Cove are recognised as the two main servicing locations for the local fishing fleet offering wharf facilities, slipways and fuel installations. It is said that space for facilities is limited at both locations. There is an objective to recognise the needs of the local fishing fleet for onshore facilities, subject to environmental safeguards. It is also said that at Deep Cove the existing facilities are considered to be adequate and no expansion is envisaged.

This Plan also contains a section on aircraft and aircraft activities, but because the appellant's proposal is now promoted on the basis that aircraft and helicopters in particular will not be used, except in the case of emergencies, there is no need for us to consider these provisions.

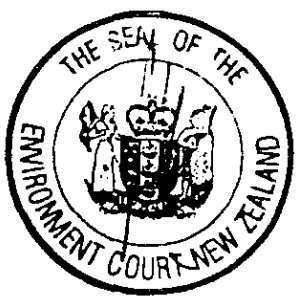
Discussion and Consideration of Factual Issues

In this section of this decision we will briefly consider the evidence concerning the freshwater resource the appellant wishes to export. We will then turn our attention to the natural and physical values of Doubtful Sound and its environs and the adverse effects that those opposing the appellant's proposal claim it will have on these values.

The Freshwater Resource

We have already referred to the source of the freshwater.

In his evidence Mr Fletcher said he had spent time in areas - we presume overseas - in which freshwater is a readily sought after commodity. In parts of Australia, particularly along the south coast the absence of ready supplies of freshwater significantly limit development. In areas of the Middle East, Asia and America similar problems occur. It was plain to him that providing transport



difficulties could be overcome freshwater discharging from the tailrace into Deep Cove which he said otherwise wastes to the sea can become a significant contributor to the New Zealand economy.

Mr Fletcher went on to say that a variety of water analyses which he has obtained over the years confirms that the water from this source is as pure as any in the world. He understands the volumes being discharged from the tailrace are between 350 and 400 cubic metres per second. The appellant's proposal is to take water at the rate of 3-4 cubic metres per second so there can be no doubt, and we readily accept, that the taking will have no appreciable effect on the flow. Indeed this is one of the few matters upon which there is no dispute between the parties.

During the hearing we received evidence from a witness called by Electricorp New Zealand Limited at our request, about a proposed second tunnel from the Manapouri power station which will also discharge water through the tailrace to Deep Cove. We will be referring to this again when we consider adverse effects, but we record at this point that Mr B P Heer, assistant director for this project and the witness to whom we have just referred, said that this proposal will not have any effect on present flows and that if there were to be any increases in flow rate from the tailrace a change to the existing resource consent would be required.

Mr Fletcher was cross-examined at some length about potential alternative sources of freshwater for export including water from Lake Manapouri but he rejected any suggestions that the appellant should be investigating these alternatives, because of course it is at the very heart of the appellant's case that this abundant source of freshwater should be exploited for export in bulk rather than harvested and packaged in smaller quantities such as bottles.

There can be no doubt that this is a continuous resource and that the water is of an extremely high quality. As Mr Fletcher explained there have been occasions in the past when tests have shown it to contain humanly introduced contaminants and this is why an ozone producing machine will be used in conjunction with the pumping equipment when the tankers are being filled. But in its raw natural state we accept Mr Fletcher's assertion, which really was not contested, that it is as pure as any water in the world.

The question remains however what value it has as an export commodity. Mr Fletcher asserted that it does have a value but he did no more than this. As we said earlier he was not prepared to discuss potential export arrangements and we really have no idea whether the nation as a whole is likely to benefit if this export venture proceeds.

In an attempt to assist us in this regard the Director-General of Conservation called evidence from Dr Geoffrey Kerr, a senior lecturer in Resource Management at Lincoln University. Dr Kerr has extensive experience in the theory and practice of cost benefit analysis including investigations of several major schemes in the South Island such as the Rakaia River irrigation schemes, the Upper Clutha Hydro Electric proposals, Port Development at Clifford Bay and Inter Catchment Water Transfers in South Canterbury.

The witness discussed in some detail the theory of net national benefit and how this might be applied to the present proposal. He described net national benefit as a measure of the return to New Zealand for giving away the right to extract water from Deep Cove. Before it is possible to identify whether the appellant's project is likely to yield positive net national benefit it is necessary to obtain estimates of the value of the private costs and benefits to the applicant and external costs and benefits which involve the community at large. In the absence of such information and there was none in this case, there is no basis upon which

to determine whether the proposal to export this water produces a net social benefit and is therefore in the national interest, or whether it results in a net social cost. For this reason it is readily understandable why Dr Kerr was not cross-examined by Mr Milligan.

Conclusion

We will refer to this aspect of the case again when we discuss legal issues, but at this point we record that we do not have sufficient evidence to make a finding that this proposed export of freshwater is of national significance in the sense that the nation is likely to benefit from it. We accept that the water is readily available in abundance in the sense that it is freely available as a discharge from a hydro-electric generation station. We accept too that it probably adds little by way of benefit to the waters of Doubtful Sound, although unlike many discharges there was no evidence that it has any detrimental effect on those waters, except to the extent that it creates an additional current to that from the Lyvia River in Deep Cove.

Nevertheless its value to the nation as an export commodity remains unknown.

The Coastal Environment

In the proposed regional coastal Plan earlier referred to Doubtful Sound, Thompson Sound and their environs are recognised as part of a significant coastline stretching from Awarua Point to Big River which is said to be virtually unmodified with extremely high value in terms of natural character. This stretch of coastline is subdivided into five units, one of which is Fiords. This unit includes Doubtful Sound and Thompson Sound and is described in the proposed Plan as Landscape Unit 19.

The key landscape elements of this unit are intricate coastline with long narrow sounds, inhospitable outer coast with stacks and reefs, U-shaped fiords with steep cliffs, hanging valleys with fast flowing streams and waterfalls cascading into the sounds, a mixture of luxuriant vegetation hanging tenuously to the rock walls, and sheltered coves at the end of the sounds.

The distinctive features of this unit are the combination of precipitous glacial land forms and large expanses of water that create one of New Zealand's most dramatic natural landscapes; overpowering scale of the glaciated land form; outstanding wilderness qualities; ever presence of water in the form of rain, sea, rivers and waterfalls; and a strong impression of enclosure.

The cultural elements of this unit are a scattering of Department of Conservation huts; nationally significant historic sites; Deep Cove hostel and fishing facilities; and the Deep Cove tailrace.

The fiords have a naturalness rating of 5 which is the highest rating.

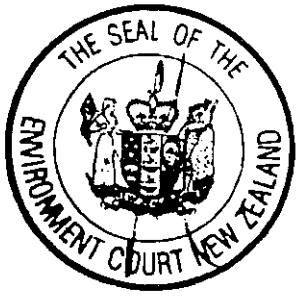
The foregoing is a general description of the fiords but in many respects it is also a fair description of Doubtful Sound and Thompson Sound. We refer to Thompson Sound because it is an alternative route by which tankers could enter or leave Doubtful Sound rather than using the more conventional route direct to Doubtful Sound from the open sea. Annexed to this decision as Appendix 1 is a copy of a map taken from the proposed Regional Coastal Plan showing this. [See Map 3 on page 424].

Mr J R Hudson is a landscape architect of some 17 years experience who was called by the appellant to give an assessment of the impacts of the appellant's proposal on the natural character of Deep Cove in particular.

Mr Hudson accepted that the fiords as a whole have a rugged wilderness natural character recognised by the Fiordland National Park and World Heritage status. When focused onto Doubtful Sound this character prevails. When focused even further onto Deep Cove at the head of Doubtful Sound a similar overall character continues but with some modification due to human activity. However it is not until the focus is taken right down to the head of Deep Cove that human activities in the opinion of this witness significantly impact upon the purely natural character.

While on a broad scale, Fiordland and Doubtful Sound have overwhelming natural character when considered on a smaller scale, one small part, the head of Deep Cove, has activities which modify this natural character. Nonetheless when describing the existing character of Deep Cove words like "grandeur", "awe" and "majesty" come to mind. These describe the sheer size of the mountains and the feelings evoked by the dominating cliffs in the winding fiords. In the opinion of this witness the reason for this overwhelming character is primarily due to the scale of the setting. Steep cliffs climb thousands of feet straight out of the deep waters, meandering fiords hide views around seemingly endless corners, and the presence of water dominates in all forms except steam. The scale of the place and its elements are majestic.

The human activities to which the witness referred were those associated first with the construction of the Manapouri power station which created the tailrace into Deep Cove and the Wilmot Pass Road, secondly the existing hostel which is now used primarily as an outdoor education centre, and thirdly the wharf facilities that are used for tourist boats and fishing vessels.



Basically it was Mr Hudson's opinion that the presence of a tanker in Deep Cove would have limited visual impact because of the scale, backdrop and colour of

the surrounding landscape. However it became apparent in the course of cross-examination that he was unaware that if the tankers were chartered from Stolt Nielsen they could well be coloured orange and he accepted that such tankers would be very apparent in Deep Cove, and from various viewing points such as the top of Wilmot Pass, the hostel and the wharf area. Mr Hudson had not done a visual assessment of a tanker transiting Doubtful Sound.

Mr A R Petrie is also a landscape architect who was called as a witness by the Director General of Conservation. The provisions of the proposed Regional Coastal Plan to which we referred earlier are based on assessments done by him. It was his opinion that Doubtful Sound is an outstanding glacial landscape that can be divided into three sub-units, namely the outer coastal environment where the naturalness and sense of wilderness are extremely high and there are no substantial structures; the mid-coastal environment where again naturalness is extremely high with the only "built" element being a fishing industry facility at Blanket Bay; and the inner coastal environment, the most prominent physical features of which are the vertical rock walls.

So far as Deep Cove is concerned Mr Petrie somewhat akin to Mr Hudson, was of the opinion that this is dominated by the surrounding precipitous glacial land forms that convey an overpowering feeling of enclosure and that it retains a predominantly natural character with the most tangible effect on this character being the berms that contain the tailrace.

Mr Petrie had also carried out a visual assessment of the effects of tankers in Deep Cove and was of the opinion that the size, profile, colour and reflective qualities of these large vessels would severely conflict with the more subdued qualities contained within the natural range of both landscape and seascape elements. Mr Petrie also drew attention to the fact that these vessels would be

illuminated while they were being filled at night and this too would have an adverse effect on other user groups in Deep Cove.

We have referred earlier to the ECNZ second tunnel proposal and to the evidence we heard about this given by Mr Heer. For a period of years while this project is being carried out there will be significant earthworks that will clearly have an adverse effect on the existing natural character of Deep Cove. However it was Mr Petrie's opinion that this will be temporary because of the extensive and detailed proposals for restoration which he concluded will return the head of Deep Cove generally, to a greater degree of naturalness than is there now. This is because it is intended to contour and re-plant the earthworks to create a more natural effect than has existed since the original tailrace construction. Consequently so this witness concluded the impact of the ECNZ project will in the end, be beneficial in terms of the natural character of the coastal environment.

Mr Petrie did not agree with Mr Hudson about the Deep Cove landscape having an inherent capacity to absorb objects the size of the proposed tankers because of scale, but he did agree that in a more modified environment this might be the case. He was also of the opinion that indigenous vegetation has less capacity for absorption than exotic vegetation.

Other witnesses spoke of the natural character of Doubtful Sound and Deep Cove in particular but more from the perspective of their own particular interests and we will refer to those shortly.

However, at this point we also refer to the evidence of Mr P T Doole, a planning and visitor services manager with the Southland Conservancy of the Department of Conservation, and Mr Andrew Cox, protection and use manager for the Southland Conservancy, both of whom were called as witnesses by the Director General of Conservation.

Mr Doole gave evidence about Fiordland National Park and in particular, the provisions of the Fiordland National Park Management Plan which is one of the statutory instruments earlier referred to. He said there are two principal concerns regarding adverse effects on national park values at Deep Cove and Doubtful Sound. These are the presence of the activities and the likely noise effects. He agreed with Mr Petrie that the small fishing boats and tourist launches have minimal detrimental effect on the intrinsic values of the Deep Cove coastal environment, and he also asserted that larger vessels moored in Deep Cove would introduce a new and more dominant modification to the existing setting.

On the matter of noise which we will refer to later, he relied on the evidence of another witness, Mr Neville Hegley.

Erroneously Mr Doole took into account that the appellant's proposal would by implication involve several activities within the National Park, and to this extent his opinions needed to be modified because of course this is not the appellant's case.

Mr Cox gave evidence about the significance of Doubtful Sound and Thompson Sound as habitats of indigenous fauna. There are thirteen listed threatened species in the Doubtful Sound/Thompson Sound area and Mr Cox' principal concern was the effects of any accidental oil spills on these species. This again is a matter to which further reference will be made later, but it is clear from his evidence that this coastal environment has international importance with regard to certain species of indigenous fauna.

Conclusion

There can be no doubt that the area we are dealing with as earlier described is a nationally and indeed internationally important part of the coastal environment where natural characteristics predominate. It is interesting to note the changes that have occurred in Deep Cove since the construction of the Manapouri power scheme was completed. These can be seen by comparing one of the photographs of Deep Cove attached to Mr Hudson's evidence with the Cove as it is today. As Mr Hudson commented, significant re-vegetation has occurred over the disturbed areas and we think this augurs well for the disturbance that will occur during the second tunnel construction.

On the other hand it is beyond dispute that Deep Cove itself is no longer pristine. Nonetheless it is our judgment based on all the evidence we heard on this subject which was confirmed by our own site inspection, that Deep Cove retains a predominantly natural character where human modifications such as the hostel the wharf facilities and the tailrace are subordinate to the overwhelming sense of grandeur that Mr Hudson referred to. Likewise the Wilmot Pass Road is relatively unobtrusive.

Into this largely natural coastal environment it is proposed to introduce on a regular basis - an average of one each week for a period of at least 24 hours - ocean going vessels of up to 40,000 dwt measuring 200 metres in length, and in all probability coloured orange and illuminated at night. We accept as we think in the end Mr Hudson accepted, that this would be a significant visual intrusion into this environment for the whole of the time a vessel is there. We also conclude that such vessels would be a significant visual intrusion into the environment of the remainder of Doubtful Sound and Thompson Sound for the time they are transiting either of these Sounds.

Tourism and Recreation Values

Largely for the reasons just discussed Doubtful Sound in particular has significant value as a tourist attraction. It is this aspect of the case that is of special concern to Fiordland Travel Ltd.

Mr M B Anderson who is Special Projects Manager for Fiordland Travel Ltd, gave evidence about this company's interest in Doubtful Sound. He said that in 1954 the grandeur of the Sound first attracted Mr L. Hutchins the founding director of a company that later became Fiordland Travel. Over the years this attraction has continued. The brochures of the 1960s describe Doubtful Sound as the "holiday for nature lovers - a place where you can enjoy unspoilt natural beauty". This has remained the key ingredient of Fiordland Travel Ltd's image of Doubtful Sound.

Professor G W Kearsley, who is Professor of Tourism and a director of the Centre for Tourism at the University of Otago was called to give evidence on behalf of Fiordland Travel Ltd. From surveys done by himself and others in the Centre for Tourism, he has concluded that most visitors to Fiordland National Park and other national park environments expect and wish to encounter naturalness and wilderness.

For most visitors to Doubtful Sound the commercial trip operated by Fiordland Travel Ltd offers a structured wilderness experience. This is built up from a series of experiences to culminate in the sense of being in a true wilderness. The sense of remoteness is built up by the trip across Lake Manapouri which creates the sensation of venturing deep into the Fiordland National Park. This is accentuated by the bus trip to Deep Cove, although the presence of the

Manapouri power station's superstructure means that a true wilderness experience is not achieved. Deep Cove is seen as the gateway to remote Fiordland. The structures there are seen as the necessary facilities which make travel into the expected wilderness possible.

Professor Kearsley said the mooring facilities for the tanker would not by themselves create a major perceptual problem, although they would have a cumulative effect and a threshold of unacceptability would be reached at some time as facilities were added. However, it is extremely likely that the scale and sheer bulk of a tanker vessel would seriously detract from the perception of Doubtful Sound as a wilderness environment. Deep Cove would cease to be perceived as a remote outpost and springboard to wilderness and would likely take on the nature of a substantial commercial port and the sense of remoteness and isolation would be lost. The wilderness spirit would be contaminated by the knowledge that this was a commercial site routinely visited by large vessels.

This witness went on to compare Doubtful Sound with Milford Sound. Concerning the latter he said that the volume of traffic on that Sound had reduced the wilderness value of the experience enjoyed. This was not to say that it was still not a magnificent scenic and wildlife spectacle but from what is known from overseas and domestic visitors' wilderness imagery suggests that it will have undergone a product shift in many peoples' minds. For this reason Doubtful Sound has become the wilderness location that many standard tourists seek and this displacement has played a significant part in the growth of Doubtful Sound visitor numbers, which Mr M.B. Anderson told us, are currently about 30,000 each year.

In cross-examination Professor Kearsley was asked about his understanding of the frequency of tanker visits to Deep Cove and he said he thought they were between six and eight per month. However even an average of four per month

was in his opinion too frequent. He was also asked a series of questions about the wilderness perceptions and peoples' experience of these. He said that in the case of the visitors taking the Fiordland Travel trip they were doing so to encounter wilderness that they would not otherwise encounter. They were not of course expecting to experience it in the same way as those who might wish to do so more directly by visiting and remaining in an area of wilderness for some period of time.

However, there was some evidence, though not from this witness, about a growing number of people wishing to do this in the Deep Cove/Doubtful Sound area.

While he did not doubt there were people who would be interested to know why the water discharging from the tailrace was not being harnessed or collected for the benefit of people they would probably be in a minority. We record here, that although the transcript at page 303 indicates the witness said "majority" our own notes taken at the time show he said "minority" and subsequent material in the transcript is consistent with this. Professor Kearsley doubted that visitors to this area would be interested in seeing a water tanker in operation in Deep Cove.

Another witness who gave evidence about tourism was Mr L Shaw who appeared in these proceedings on his own behalf as an original submitter in opposition to the appellant's proposal. Mr Shaw is a self-employed seaman residing at Manapouri and the skipper of a 65 foot charter vessel based at Deep Cove. He came to Manapouri in 1950 and has spent most of his working life in Fiordland. He worked for Fiordland Travel Ltd in the early 1970s when he was senior launch master. He then bought a crayfishing boat and fished commercially for three years before joining a Government research launch based in Doubtful Sound working there for 12½ years. In 1993 he and his partner began a business running ecology based tours in the fiords and to the sub-Antarctic islands.

One of Mr Shaw's principal concerns about the appellant's proposal is the potential for introduction of foreign organisms in the fiords through the discharge of ballast water or from the hulls of ships and this is a topic we will consider in more detail later. Generally, it was his view along with other witnesses having particular interests in this area, that it should be maintained in its natural state for the values we have just been discussing and the wildlife and scientific values yet to be further discussed. The charter boat industry is developing fast in the fiords. There are already about 10 vessels making part or all of their living in Fiordland. In the opinion of this witness there was no basis for comparison in visual terms between charter boats and fishing vessels and water tankers such as those proposed to be used by the appellant.

Mr Shaw also gave evidence about potential problems arising from the wake of tankers, particularly as this might affect divers on the surface of Doubtful Sound itself. With the consent of the parties we also viewed a video presented by Mr Shaw showing some of the activities that take place in the Deep Cove/Doubtful Sound area such as sea kayaking. He also told us about research work that is going on in the sounds, fishing trips, private boating trips and other charter operations like his own.

Mr Shaw was cross-examined at some length by Mr Milligan on his evidence about ships' wake and although initially we thought it strange that he had not raised this in his evidence-in-chief but only when asked about it by Mr Cameron, in the end we accept that this was genuinely recorded evidence from his log books. That is to say a genuine record of observations by him on the dates and at the times stated.

Mr K W Janson is employed by the New Zealand Tourism Board as a conservation/resource analyst. He was called to give evidence by the Director

General of Conservation about tourism. As part of his duties with the New Zealand Tourism Board he has developed a draft tourism strategy for Stewart Island and is currently working as part of a team invited by Queenstown Lakes Southland and Central Otago District Councils to develop a tourism strategy for the Southern Lakes region. Part of his brief is to determine the status of tourism in the Fiordland area and investigate opportunities for further growth provided these opportunities do not adversely affect the natural values of the area.

Mr Janson said growth in the environmental consciousness of consumers has created a strong demand for environmentally based products. As a result visitor numbers to Fiordland National Park can be expected to continue to increase. Fiordland National Park attracts about 500,000 visitors per annum. This is an increase of almost 50% since 1991. It is predicted that visitor numbers will increase a further 33% to 625,000 per annum within the next five years. The vast majority of visitor activity is concentrated in a narrow corridor from Deep Cove at the head of Doubtful Sound through Lake Manapouri to Te Anau and up the Milford Road to Milford Sound. Doubtful Sound known as the "Sound of Silence" contrasts with Milford Sound in that apart from a small fishing fleet the only commercial activities based in Doubtful Sound are two sea kayaking and one scenic boat operation. We add that there is also Mr Shaw's eco-tourism business.

Mr Janson confirmed annual visitor numbers to Doubtful Sound are approximately 30,000 worth in the order of $4.5m to the local economy in ticket revenue alone. In addition most of the visitors to Doubtful Sound stay overnight in Te Anau and contribute at least another $2m per annum for accommodation, food and sundry costs. Consequently Doubtful Sound is currently worth at least $6.5m per annum to the region. Doubtful Sound is becoming increasingly important providing a "spillover" capacity for visitors wishing to undertake a

fiord experience during peak periods. This is because Milford Sound is fast approaching the carrying capacity of the existing facilities.

In the opinion of this witness the Doubtful Sound experience starts with a boat trip across Lake Manapouri, then through the vibrantly coloured alpine moss gardens of Wilmot Pass to the expansive rain forests and 41 kilometres of intricately carved waterways of Doubtful Sound. Here visitors can see and hear many of New Zealand's rare native birds, encounter dolphins and seals and if lucky view the world's rarest penguin. To heighten the experience the engines of the boat are turned off and for the first time in many visitors' lives they hear a world devoid of human noise. Mr Janson described this as "a truly unique experience".

It was his opinion that tourism in this area is dependent on protecting the natural character of Doubtful Sound which would be seriously damaged by the presence of tankers plying the fiord and anchoring at Deep Cove. The view from Wilmot Pass is arguably the most important for visitors. It is their first view of Doubtful Sound and the one on which they form their first impressions of its character and environmental quality. The second most important view is from the wharf at Deep Cove where visitors first see the fiord close up. Both of these views would be dominated by any tanker moored at Deep Cove giving visitors the impression that rather than having an unspoilt natural character the Sound is the base for a major extractive industry.

Asked about the effects of the ECNZ project Mr Janson said he thought there would be adverse effects on tourism but these would be short term. He thought about two years. However as Mr Heer told us although the actual tunnelling work will take approximately two years, planting and re-vegetation is expected to continue until 2001 with ongoing maintenance extending until 2005.

Nonetheless it was this witness' opinion that the effects will be temporary whereas the effects of the appellant's proposal will be more lasting.

In cross-examination he was asked about frequency of ships' visits and said that although there had been various estimates he thought it was somewhere in the order of six per month for a duration of approximately 24 hours each visit. Mr Janson was also cross-examined at some length about his conclusion that Aquamarine's proposed activities would have adverse effects on tourists. His answer was that research had shown that large scale human activity in wilderness areas is considered inappropriate by such visitors. He thought it was a mistake too to treat the visitor as having started his or her experience from Deep Cove. The experience starts at Manapouri and in the opinion of this witness Deep Cove is a transition point and not an entry into the experience.

All this was in the context of putting to the witness that such visitors would have already experienced a fairly substantial structure at West Arm in the form of the Manapouri power station, particularly the underground portion thereof, but Mr Janson was steadfast in his view that while this is an expected part of this trip the visitor is also expecting to see a wilderness area from the time he or she arrives at the top of Wilmot Pass and the sight of a large water tanker in Deep Cove would be detrimental to this expectation. He agreed that no surveys have been carried out asking visitors directly what their reaction would be to seeing such a vessel in Deep Cove or transiting Doubtful Sound. His opinion was based on knowledge from surveys of what is acceptable and unacceptable to visitors expecting to view and experience a wilderness setting and in this connection the witness referred to work done by Professor Kearsley.

The witness who referred to the "gateway" concept was Mr D R Anderson a planning consultant called by the appellant. Indeed it was an important part of this witness' evidence that the whole of the tourist trip experience from

Manapouri to Deep Cove is seen as a gateway to the wilderness experience of Doubtful Sound. It was because he viewed it this way that Mr Anderson did not see Deep Cove itself as being particularly important to the tourist's experience.

Conclusion

The views of the several witnesses who gave evidence on this aspect of the case are in some respects difficult to reconcile. Professor Kearsley thought Deep Cove should be regarded as a gateway to remote Fiordland but in the context of the evidence he was giving this is understandable because of the intervention as he saw it, of the presence of the Manapouri power station sub-surface structure in the whole tourist experience on this particular trip. This view, so it seems to us, is somewhat akin to that of Mr D R Anderson but at odds with that of Mr Janson. Nevertheless Professor Kearsley still regarded Deep Cove as being adversely affected by the presence of tankers.

Be this as it may, we think Mr Janson made a strong point about the anticipation a tourist would have on reaching the top of the Wilmot Pass Road. We accept that this is an important aspect of the tourism values of Doubtful Sound including Deep Cove, and that the presence of a large tanker in Deep Cove or so far as it could be seen from that point transiting Doubtful Sound, would seem incongruous to such a tourist. Consequently although Deep Cove might be seen as the end of a gateway as Mr D R Anderson thought, the important point is whether the expectation that from the top of the Wilmot Pass a wilderness area can be seen and experienced will be realised.

We think the evidence is clear that the whole of Doubtful Sound including Deep Cove, is a valuable tourist resource not just in regional but also in national terms. This is because of its wilderness values marketed to tourists

as the "Sound of Silence" but not just for that. The physical characteristics of this area provide a prime example of the dramatic grandeur of Fiordland and we have no doubt at all that this too is an important component of the tourism value of Doubtful Sound and its environs.

Once again we are faced with evaluating the effect a large tanker will have on these values bearing in mind the frequency of visits now proposed by the appellant. It was interesting to note that Mr D R Anderson thought five or six visits per month would be close to if not in excess of the tolerable limit so far as adverse effects are concerned, but an average of four per month would be acceptable. In this regard he was not completely at one with the appellant. He was confining himself to 48 visits per year whereas the appellant seeks a maximum of 52.

Whichever is the chosen figure the plain fact is that large ships will be present in Doubtful Sound and Deep Cove for 24 hours and possibly longer if the filling operation is held up for any reason or bad weather delays a departure. Then with transiting and mooring being confined to daylight hours the probability is that at certain times of the year tanker presence in the Sound and Deep Cove will occupy a substantial part of a two day period and could be encountered by tour parties on each of those days.

However, even if this did not eventuate, once this activity becomes established and the moorings and the support vessel(s) are in place we have no doubt that Deep Cove will become known as the place where water tankers visit to take on water from the tailrace. In our judgment this must have an impact on the perception of Deep Cove and Doubtful Sound as a remote wilderness area and none of the witness' with expertise in tourism were prepared to say this would be a positive effect.

Education Values

Mr W.A. Ryan is a member of the Deep Cove Hostel Committee and a trustee of the Deep Cove Hostel Trust. He is a retired diesel engineer and currently a marine search and rescue adviser to the New Zealand Police. He is also an honorary launch warden appointed by the Ministry of Transport and an honorary ranger for the Invercargill City Council Parks and Reserves.

Mr Ryan told us that the original Deep Cove Hostel was built in 1968 to provide accommodation for workers associated with the construction of the Manapouri power scheme. When this project was completed the building was transferred to the ownership of the Fiordland National Park Board. In 1971 at a public meeting in Invercargill the Deep Cove Hostel Committee was formed. Its members included representatives of intermediate and secondary schools, Southland Education Board, the Department of Education and the Fiordland National Park Board.

Being a temporary structure, the original hostel did not last for many years and its foundations and timbers began to deteriorate. The Deep Cove Hostel Committee began a Southland wide fundraising campaign for the purpose of building a new Deep Cove Hostel. This hostel was opened in 1980. It cost $360,000 made up of $120,000 from community fundraising and a two to one Government subsidy.

The Deep Cove Hostel Committee decided on the Deep Cove site for the rebuilt hostel after having investigated seven other sites in the Fiordland National Park. The Deep Cove site was chosen for the following reasons:

(a) It is a unique remote wilderness location unparalleled in world tourism;

(b) It provided a packaged deal of experiences beginning with the trip from Invercargill followed by a launch trip across Lake Manapouri, a visit to a power station, a Wilmot Pass bus trip and the opportunity to explore Doubtful Sound by launch;

(c) It provided the best place for a national park and wilderness education experience.

In 1994 the Department of Conservation formally handed over the Deep Cove Hostel buildings to the control of the newly formed Deep Cove Outdoor Education Trust. This is a charitable trust which is responsible for the education programme and for the maintenance and operation of the Deep Cove Hostel as a venue for school camps and a facility for organisations, youth groups, families and individuals to enjoy the unique Deep Cove experience.

The hostel has a very high occupancy rate. The main users are school camps catering for approximately 2,000 children and 500 parents from the Southland area each year; boating clubs; youth groups and family groups from Southland and Otago when the hostel is not used for school parties; and an increasing number of backpackers, kayakers and mountain bikers who are now staying for a night or two at the hostel, although it is still primarily an education facility.

As such it provides studies in marine biology, forest studies and bush skill courses. Most school parties stay for four nights at the hostel and the evenings are spent looking at appropriate films of the area, pursuing the day's studies and social activities. The children also use mountain tracks and go fishing in Deep Cove.

Mr Ryan outlined some of the concerns the Trust has about potential adverse effects arising from the appellant's proposal. It is concerned that the mooring site which is intended to be located immediately opposite the hostel would interfere

with established pupil activities and may preclude marine studies that an education officer of the Department of Conservation carries out with the children, as well as interferring with fishing activities and giving rise to noise nuisance, particularly at night. The presence of the vessel close to Brasell Point in Deep Cove which is an historic site and contains an important nature walk would also spoil the natural impact of this area. The Trust is also concerned about effects of wave action on the stability of the ground upon which the hostel is located. Apparently there have already been problems with ground stability. It is concerned too about visual pollution or adverse visual effects such as the ones we have already discussed, and potential adverse social effects relating to the safety of the children if crew members of vessels are allowed to come ashore.

Mr Ryan also gave evidence based on his personal knowledge of the area about weather conditions in Deep Cove and suggested it is not a sheltered mooring and the appellant's advisers, particularly Mr Teear, may have underestimated the conditions.

We will be considering navigation and mooring issues in more detail shortly, but we record at this point that in cross-examination Mr Ryan conceded he is not an expert when it comes to the mooring of ships.

Also in cross-examination Mr Ryan agreed that school children coming to Deep Cove are made aware of the part this area played in the development of the Manapouri power scheme and the changes that have occurred as a result. He agreed that this is part of the education programme. He also agreed that he had not taken into account a change in the positioning of the proposed moorings so that his view about the obstruction that would be caused by these was not completely accurate. There would be more open water than he had originally thought.

He also explained that it would be difficult to co-ordinate the marine studies so as not to conflict with tanker visits because of the commitments already made by the Department of Conservation's education officer which are usually made well in advance of the school visits. It might be necessary for the Department to provide two people so there could be some flexibility depending on the timing of tanker visits, but he was still confused about these because of the various changes that had been made by the appellant.

On the matter of adverse social effects he was asked about a similar potential effect that might arise as a result of the ECNZ project and said that the Trust had received a guarantee from ECNZ that its staff will not be allowed in the vicinity of the hostel. Failure to comply with this direction would result in immediate dismissal. He agreed that a similar guarantee by the appellant could be considered by the Trust.

Mr Ryan was also asked in cross-examination about whether exporting freshwater from Deep Cove might not itself be an educational experience of value to the children. He said the concept of the Trust was one of wilderness experience and although the building of the second tunnel would have some effect on this it would not be as significant as the effect of Deep Cove being turned into a port for use by the tankers. He agreed that for the period of construction the ECNZ project will have an obvious effect on the wilderness values, but when this is finished these effects will cease whereas the adverse effects, as he saw them, of the appellant's proposal will continue.

Noise

On the matter of noise it is the Trust and those for whom it provides facilities at Deep Cove who are most likely to be affected, and for this reason we will now consider the evidence given on this topic.

The appellant called evidence from Mr J.R. Twinn who we accept is an expert acoustics consultant. Mr Twinn visited Deep Cove in September 1994 and measured noise over a 24 hour period from 2.00 p.m. on 7 September to 2.00 p.m. on 8 September. The hostel was used as a reference point with one measurement location for 24 hour monitoring close to the hostel, and another, 250 metres east of the hostel towards Brasell Point. Spot checks were made at the slipway approximately 150 metres from the hostel, and the jetty approximately 400 metres from the hostel. Mr Twinn also measured noise produced by a tanker, the MV Toanui, as it entered and docked in Lyttelton Harbour. This vessel is about the same size as the largest of the vessels the appellant proposes to use in Deep Cove.

Mr Twinn said that in Deep Dove, in the absence of intrusive noise, for example a skill saw, the tendency was for the background level - L_{95} - and the L_{10} level to be within 4 or 5 dB of each other. This indicated a relatively steady noise situation. For the 24 hour period measured the mean value of the background level was 45 dBA L_{95} and the L_{10} level was 65 dBA. In the absence of local activity the mean value of the L_{10} level would be between 48 and 50 dBA. Comparing the noise level to a rural area near Christchurch the background noise at the hostel was, in the opinion of this witness, significantly higher than that typically experienced in rural environments.

At the Brasell Point measuring location which was within 20 metres of the waters edge there was considerable outboard motor activity and also a helicopter flyover. The mean values were 44 dBA L_{95} and 48 dBA L_{10}. At the slipway there was an almost constant noise level due to a stream about 30 metres away and further measurements were not made. At the jetty, the Helena waterfall, which is on the opposite side of Deep Cove, produced a low rumble from time to time. Outboard motors and coach noise also affected the measurement. At 7.40 p.m. on 7 September 1994 and 10.20 a.m. on 8 September 1994 noise from the

waterfall appeared dominant. At a location on the road south-east and 300 metres from the hostel the Helena waterfall noise was dominant and the variation in noise levels was a maximum of 3 dB.

There was a continuous noise from the air compressor generator situated near the hostel which was measured at 58 dBA over a period of 3 minutes. When this was switched off, the L_{eq} was 52 dBA which compares favourably with the measurement at the hostel location of 49 dBA. A shipboard generator close to the wharf had an L_{eq} of 59 dBA on load and 56 dBA off load at a distance of 30 metres west.

The maximum noise level over the two days of measurement was 97 dBA at Brasell Point at 6.00 p.m. on 7 September 1994 due to a helicopter. The overall L_{max} ranged from 55 dBA to 83 dBA from 7.00 a.m. to about 7.00 p.m. Between 7.00 p.m. and 7.00 a.m. the L_{max} did not exceed 60 dBA.

Measurements of noise from the MV 'Toanui' were affected by the movement of fishing vessels. The single background measurement at the oil wharf at Lyttelton was 38 dBA. The MV 'Toanui' entered the harbour at 7.02 a.m. accompanied by two tugs, and this resulted in an L_{10} of 70 dBA at approximately 45 metres over a period of 6.5 minutes. The L_{eq} was also 70 dBA. Measurements at the oil wharf indicated that the dominant noise was from the diesel/electric generator at the stern of the vessel. This operates at all times. It is likely that this noise meets the international requirements for ship board noise.

Mr Twinn was of the opinion that the background noise at the measurement locations in Deep Cove will not fall below 40 dBA even at night under ideal conditions, that is to say no wind, surf or rain noise. For comparison a typical rural site near Christchurch showed a 24 hour mean background level of 34 dBA with a mean L_{10} of 41 dBA. During the night the background level was, for a

time, below the measuring capability (26 dBA) of the equipment. So far as the hostel and Brasell Point are concerned, Mr Twinn said that in the absence of intrusive noise the background level and the L_{10} level tend to converge which indicates a continuous almost non-varying noise level of about 44 to 46 dBA for the period measured.

At the slipway water flow can in some areas raise the local background level to 45 dBA and at the jetty there is little change in noise except for coach movement, with the background level being 44 dBA. So far as the air compressor generator noise is concerned, he thought this was most likely an acceptable part of the operations at the hostel but could be a nuisance depending on the period of operation. The ship board generator measured some 700 metres from the hostel makes it difficult to measure background noise level, although its tone may make it detectable. If the wharf was a residential area there may be complaints during the night.

Mr Twinn went on to consider the noise that might be expected from the appellant's proposed operations in Deep Cove. He considered two sources of noise, a diesel pump being the pump used to fill the tanker, and ship noise. He calculated that water pumping would add less than 1 dB to background levels as measured at the hostel and up to 3 dB at Brasell Point. A vessel similar to the MV Toanui would increase background levels by up to 5 dBA at the hostel and up to 16 dBA at Brasell Point due to the diesel generator. An efficient exhaust system would, in his opinion, reduce these levels to below the background level at the hostel and equal to that level at Brasell Point.

Mr Twinn was cross-examined at some length, both by Mr Ibbotson and Mr Cameron. In answer to Mr Ibbotson he said he doubted that the sheer rock walls on the side of Deep Cove would add much to the noise level received at the hostel by way of reflection because of the distances involved between the moored

tanker and the hostel, but he agreed that on a calm clear night the hostel would be exposed to an increase in sound of approximately 5 dB.

On the day he took his measurements there was a ship at the jetty at Deep Cove with a generator operating constantly. Mr Twinn walked to the jetty and on that evening found the noise to be intrusive. It was not a very large vessel. He was not sure if the generator was petrol or diesel driven, but he agreed the noise was substantial in terms of other noise in the area. In Mr Twinn's opinion, however, this could have been mitigated by an appropriate noise reduction system being fitted.

He agreed that noise at night from the appellant's operation will have a marginally adverse effect on the hostel. 5 dB is subjectively not a very great increase and it will be less inside the hostel. He had taken into account the noise from the pumping system filling the tanker and the diesel generator on the tanker. He did not consider any other possible sources of noise associated with the appellant's proposal

In answer to questions from Mr Cameron, Mr Twinn said the information he had been given by the appellant was that there would be a diesel pump within the pumping vessel which would be a source of noise. He was not aware that the support vessel would accommodate four to seven people and that other vessels, for example tugs, could be moored with people on board. He agreed too, that the support vessel would require a small generator but this was not important because again treatment of exhausts and mechanics could reduce the noise generated by such equipment and he took the view that people noise from the vessels would be about as much of a nuisance as that from the hostel itself.

He agreed that 3 dBA could be added to the calculations because noise was being transmitted across water, but would only agree there could be, but not necessarily would be, such an increase.

Mr Twinn was also asked about evidence yet to be given by another noise expert, Mr Neville Hegley, who took into account the effects of the climatic phenomenon known as 'inversion'. Mr Twinn said he had not taken this into account but he doubted that temperature inversions would exist for 146 days a year, a figure based on the evidence of a later witness Mr Hessell who said calm inversion inducing conditions are likely to exist in Deep Cove for 40% of the time.

Mr Twinn did not agree that in the environment of Deep Cove the appropriate noise level is no more than 40 dBA L_{10} during the day and 30 dBA L_{10} at night. He did agree however, that 55 dBA L_{10} at night would probably be in excess of that ordinarily expected in a residential area. This was in the context of a suggestion put to him by Mr Cameron that if it could be shown there was one noise source of 55 dBA L_{10} and there were other noise sources such as generators working then potentially the overall noise would be greater than 55 dBA L_{10} and with this Mr Twinn agreed. However he went on to say that in the context of Deep Cove he was considering lower noise levels anyway and mitigation by the fitting of efficient exhaust systems.

Earlier we referred to the evidence of Mr Hegley, who we also accept is an expert acoustic consultant.

Before we discuss Mr Hegley's evidence we will refer to the evidence of Mr J.W.D. Hessell who is a meteorologist and climatologist, and again we accept an expert in these particular fields.

Mr Hessell was called to give evidence about atmospheric temperature inversions and wind climatology at Deep Cove. He had prepared a detailed report about these which he read as his evidence. He began by making it clear that to report on atmospheric temperature inversion climatology at Deep Cove it would be desirable to have a long period of upper air temperature soundings on which to base the assessment. In the absence of this information for this remote locality estimates based on the information available have to be made. Reliable climatic information used included temperature information from Invercargill, mean air temperatures from West Arm in Lake Manapouri and wind and temperature observations from Milford Sound. Along with topographical information these were used to deduce inversion climatology at Deep Cove following established physical meteorological procedures.

Mr Hessell also made it clear that the report referred only to inversions induced by low surface temperatures, that is to say radiation inversions and did not include the universal boundary layer inversion induced by broad scale friction within the Ekman layer. This inversion is almost always present and has a base of the order of 1,000 metres above flat land but usually less above mountainous terrain.

Mr Hessell said the topography of Deep Cove bears broad scale resemblances to Milford Sound and it is therefore justifiable to use subjectively many of the long term surface climatic observations from Milford Sound. He also pointed out that the orientation of both Doubtful Sound and Milford Sound is north-west to south-east; both are quite narrow, generally between 1 and 5 kilometres; they extend some distance from the open sea, 20 to 30 kilometres; and they are surrounded by mountains exceeding 1500 metres which fall very steeply to sea level. Both are fed by a considerable influx of freshwater.

Deep Cove lies 140 kilometres north-west of Invercargill which has a well established climatology of upper air parameters, and Mr Hessell was of the opinion that it was also reasonable to apply these to Deep Cove.

As there are freshwater layers on the surface of these Sounds, the sea level temperatures will be strongly influenced by the temperature of the freshwater influx. The temperature of the water entering the intake at West Arm in Lake Manapouri has been considered to be equal to the temperature at the tailrace at Deep Cove. Inversion potential can be gauged to some extent by the difference between upper air temperatures and surface temperatures. Upper air brought to ground level increases its temperature by adiabatic heating, about 1° Celsius per 100 metres of altitude. As upper air temperatures vary spatially less than surface temperatures, the 900 h Pa (hectapascals pressure surface - about 1000m) temperatures at Invercargill give a good approximation to those at Deep Cove. Mr Hessell then set out in a table the corresponding dry-adiabatically heated surface temperatures. From these it can be seen that winter shows by far the greatest potential for inversions to form both at Milford Sound and Deep Cove, and Deep Cove is likely to have stronger inversions than Milford Sound. Milford Sound temperatures are compatible with those deduced for Deep Cove.

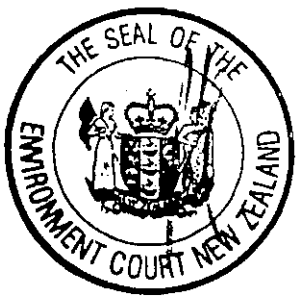
The mean diurnal variation of temperature at Milford Sound throughout the year varies by less than 0.5°C. It can therefore be expected that temperature inversions would be strongest overnight, around the time of minimum surface temperature and weakest at the time of maximum temperature, usually taken as 1300 hours true solar time which would be close to 1400 hours New Zealand standard time at Deep Cove.

In another table Mr Hessell set out the mean maximum seasonal inversion-top heights as spring 270 metres, summer 100 metres, autumn 400 metres and winter 700 metres.

The thickness of the inversions as just stated have been calculated assuming an isothermal lapse rate, that is to say no decrease of temperatures with height and with the base at sea level. On most occasions, and especially in winter, there will be a katabatic wind flow down the mountain which will induce a degree of turbulence in the Sound. This will have the effect of raising the base of the inversion above sea level, the height being determined by the degree of turbulence. This is apparently an important effect as the number of days in the year on which fog, which is indicative of a ground level inversion base, has been reported at Milford Sound averages only about 2. Jacksons Bay and Haast also record less than 10 fogs per year.

The heights of the inversion layers at Deep Cove can only be surmised, but due to weaker katabatic flows and high humidities in summer they could be as low as 30 metres and in winter an average of 100 metres would be reasonable for the minimum diurnal value. The base of radiation inversions would always be well below the height of the mountain tops and ridges forming the Sound. These are in the range 900 to 1200 metres within a few kilometres of the coast. On occasions when there is a general south-east flow over the South Island inversions will be weakened and raised due to the presence of quasi dry-adiabatic lapse rates.

On wind climatology at Deep Cove Mr Hessell said under conditions of great atmospheric instability and strong wind gradients gusty conditions will prevail but these will not be associated with atmospheric conditions susceptible to producing inversions. The topography in Deep Cove is much more restrictive compared with Milford Sound, though a major valley joins the Sound some 5 kilometres to the north-west. At this point inversions would change character and weaken considerably. Consequently only the area to the south-east of this confluence is considered. Using the Milford Sound winds and the local



topography at Deep Cove as guides Mr Hessell then set out in another table his estimate for winds at all hours neglecting minor directions. This table shows that for 40% of the time there is calm, and for 1% of the time there are winds in excess of 30 kilometres per hour.

Available seasonal wind data from Milford Sound 100 kilometres to the north-east of Deep Cove and Puysegur Point 90 kilometres to the south-west of Deep Cove shows there is no great variation in the seasonal frequencies of strong winds, though winter is the least windy season and spring the most windy. No attempt has been made therefore to apportion winds and consequently inversion frequencies seasonally. It is only the strengths of the inversions which appear to have a strong seasonal dependence. In mountainous terrain where horizontal wind implies also large vertical motions, inversions cannot exist in windy conditions. Allowance has also been made for days when rain is occurring and there is thus considerable vertical motion. These vary significantly seasonally and have been allowed for in another table prepared by Mr Hessell setting out the mean frequencies of inversions as a percentage of all days. The fewer rain days in winter increases the frequency of winter inversions.

Inversions will fall earlier in the night and persist longer into the next day in winter than in summer due to the weaker incoming radiation in that season. On some winter days inversions may persist throughout the day but show some loss of strength around the middle of the day. As the mountains lower towards the sea and the Sound tends to broaden, especially at the major branch 5 kilometres north-west of Deep Cove, inversions will lower and weaken progressively north-westwards. This is in response to the decreasing confinement in that direction by the mountain walls enclosing the Sound.

Mr Hessell was asked to comment on the evidence given by Mr W.A. Ryan on the subject of inversions and said he did not agree with Mr Ryan's opinion as to

how inversions are formed or what they consist of, but he went on to say that the appearance of cloud forms and of haze layers spoken of by Mr Ryan do conform with what he understands would be the case in Deep Cove. He said too, that the basic characteristic of an inversion is that less dense air overlies more dense air. This means there is in effect a lid on the atmosphere at the base of the inversion which prevents dispersion of pollutants aloft so that under strong inversion conditions pollutants are accumulated over a period of time.

In cross-examination Mr Hessell was asked about his assumptions concerning water temperatures and said he assumed the water temperature in Deep Cove would be close to the water temperature in Manapouri. He also assumed the water temperature within the immediate confines of Deep Cove would be almost constant.

In re-examination by Mr Cameron he said he did not see there would be any major modifying influence from seawater on the freshwater layer in Deep Cove.

The witness was also asked some questions by Mr Milligan about his evidence concerning wind climatology at Deep Cove and he agreed there are quite significant periods of low wind velocity and that winds 30 knots and above appear to have occurred for 1% of the time. He pointed out that the frequencies he was talking about were for mean winds over an hour and did not apply to gusts. The importance of the evidence about wind is that inversions of the kind the witness was talking about occur most commonly in periods of low wind velocity. The undesirable effects arising from inversions, to the extent there are any, the witness agreed would be less in duration in summer than in winter.

Turning now to Mr Hegley's evidence, he used three sets of measurements to assess the existing noise environment in Deep Cove. Some had been made by himself, some by an assistant under his instructions, and some by a regional noise

control officer. Mr Hegley's original measurements taken in 1994 in calm weather at the wharf in Deep Cove when the waterfalls were at a reasonably low flow rate showed background levels of 36 dBA. Measurements by his assistant over two days in January 1997, approximately 10 metres from the south-eastern corner of the hostel also gave similar background levels. Field measurements carried out by the regional noise control officer, Mr Goodwin, 8 metres from the south-east corner of the hostel undertaken with a variable wind in the tree tops, light rain and cool weather and whitecaps in the centre of the Sound together with noise from the waterfalls, gave a background level of 45 dBA and 49-54 dBA L_{10} over a period of one hour.

Mr Hegley said that although these levels are not particularly low in terms of the other measured noise levels it is reasonable to say that when in the area there is a feeling of isolation that results from very quiet conditions. Apart from a subjective response this can be explained by a number of factors. The site is remote from any known industrial commercial activity other than a limited number of tourist buses and fishing vessels. There are no other sounds except for the effects of the weather and water noise and these sounds have a broad band composition. The broad band type of sound experienced from wind in the trees and waterfalls is often termed "white noise". "White noise" is never considered to be offensive and tends to pass by without any nuisance value.

When he prepared his evidence there were no noise rules for this area and Mr Hegley relied on the New Zealand standards for saying that at the hostel the expectation should be that noise should not exceed an upper limit of 55 dBA during the daytime and 45 dBA at night. He went on to say that the very upper limit of acceptability he would expect for this locality would be 50 dBA during the daytime and 40 dBA at night, without taking into account the special nature of the area. He said that many local authorities adopt these values and lower during the daytime and night time periods. However, he believed it would be

reasonable for visitors to expect an even lower noise level at this site, that is to say at the hostel, and it would be his recommendation that levels of 40 dBA L_{10} during the day and 30 dBA L_{10} at night should be the goal.

Asked about the provisions of the recently publicly notified proposed regional coastal Plan Mr Hegley said he thought this supported the view just expressed. He referred to paragraph 16.3.1 in the Plan which contains a policy for noise in Hall Arm in Doubtful Sound. The policy is to avoid any noise that compromises the value of Hall Arm as a "sound of silence". It is of some interest to notice too, that Rule 16.3.3 is a general rule controlling noise in Fiordland and provides that any activity within Fiordland, other than as a consequence of vessels or aircraft in motion, which emits a noise measured and assessed in conformity with the New Zealand standards at the boundary of the space occupied by the activity greater than 15 decibels above the ambient noise level is a prohibited activity. Then too, there is another rule about noise in the section of the Plan on amenity values. This is Rule 5.3.4 which sets general noise limits of 50 dBA L_{10} during the day and 40 dBA L_{10} at night. This is a noise level to be measured at the notional boundary of any dwelling. It is not clear how Rule 5.3.4 and Rule 16.3.3 can be reconciled except that the place of measurement is of course different in each case.

Be this as it may, it would seem on the basis of the general noise limits in Rule 5.3.4 that Mr Hegley's recommendation is on the low side. But his earlier comment about the values adopted by local authorities 50 dBA during the day and 40 dBA at night is consistent with the proposed regional coastal Plan.

Mr Hegley then discussed construction noise which we can say here is not a matter that influences us because the period of construction would be quite short.

He then referred to some work he had done analysing measurements of noise from tugs operating in the Tauranga Harbour and went on to say that he does not agree that ships do not have external sources of noise. He has visited a number of ports throughout the country and measured the noise of at least 30 different types of ship. Without exception they all generate relatively high levels of noise, some of them generate very high noise levels. They have on board generators to run the ship and ventilation fans. This equipment operates at all times when the ship is in port and he would expect this equipment to operate throughout the time a ship is moored in Deep Cove. He did not have sufficient information about the proposed support vessel, but said it would need to generate onboard power and he would expect it to have noisy generators operating 24 hours each day it was in use. Mr Hegley analysed a 30,000 dwt ship in the port of Tauranga. The noise he measured while standing on the wharf 10 metres from the ship was 74 dBA L_{10}.

On the water pump he commented that this would be located on the support vessel, and as this would be a dedicated vessel it would be practicable to reduce the noise from the pump and the drive unit to no more than 30 dBA as measured at the closest point on the shore.

Mr Hegley then discussed the effects of temperature inversions based on the evidence given by Mr Hessell. He said that if a temperature inversion formed with its base below the tops of the mountains the effect would be to create an acoustic enclosure. This in turn makes the noise effects totally different from anything experienced in normal open terrain. Mr Hegley believes that when there are inversions there will be much higher noise levels than would normally be expected. It was his opinion that noise effects at the head of the Sound would be such that there would be an increase in the noise level on the shoreline by a minimum of 6 dBA and as much as 10-15 dBA. The other aspect of this is that

the noise will travel a long way. It could easily be heard 2 to 3 kilometres down the Sound.

This effect can be demonstrated to some extent by sound travelling across water when a temperature inversion is present. Mr Hegley said he has heard voices of people on a boat over 2 kilometres away in such conditions. The most critical aspect of all this is that the inversions will generally form during the same period as calm conditions. The background sound during these periods will be at the lowest so any noise will have the maximum impact at this time. This is the exact period when community expectations of peace and quiet will be greatest, yet the noise intrusion will be at its worst. During these periods it is the surroundings of the area that is one of its attractions. It is the particular type of surrounding that Mr Hegley believed the Fiordland National Park Management Plan 1991 seeks to protect and visitors come to experience.

Mr Hegley also referred to the use of helicopters but, as we have recorded earlier in this decision, the appellant has agreed that helicopters will not be used except in emergency situations.

On ship noise Mr Hegley said that at anchor and without any activity he predicted 46 dBA L_{10} at the hostel assuming normal open topograhpy. In addition there would be variations in the noise of between 5 and 10 dBA depending on the particular ship. These levels would increase typically by 10 dBA at Brasell Point to 56 dBA plus any meteorological effects and ship variations. He also assumed that the pumping of the water would be controlled at 30 dBA at any point on the land. From these predictions there are two aspects that become apparent.

First, the activity associated with the water tankers will be clearly audible at the hostel and will, in the opinion of this witness, exceed the upper limit normally adopted for night time activities. This conclusion did not take into account the

special requirements of the area. Secondly, the proposed activity would have a significant noise impact for anyone near the edge of the water. This would also be true for people visiting the Helena Falls.

For these reasons it was Mr Hegley's opinion that the appellant's proposal would cause enough noise intrusion to be classed as unreasonable for an activity in a city residential environment and would have a significant adverse effect on the characteristics of the existing noise environment at Deep Cove. This would be the case even if the activities of vessels already in the area are taken into account. Noise from these vessels is transient and quieter. The noise associated with each water tanker would be continuous.

Mr Hegley was also asked about the evidence given by Mr Fletcher concerning the proposal to treat the water using an ozone treatment plant. He did not know about this but said that treatment pumps generally generate noise levels of between 85 and 90 dBA at about 5 metres distance. They can go as high as 95 dBA. He thought it likely that the pumps from the support vessel would cause noise nuisance at the hostel. He also thought that the permanent presence of tugs would exacerbate the predicted noise problem to which he had already referred.

In cross-examination Mr Hegley was asked particularly about the difference between himself and Mr Twinn on background levels. He agreed that these will vary over time depending on conditions, but went on to say that this is why he could not agree with Mr Twinn that they will never fall below 40 dBA. Other differences between himself and Mr Twinn were that the latter had only considered part of the noise likely to be generated, and in the opinion of Mr Hegley had not addressed ship's noise satisfactorily. He did agree however, that with appropriate design noise from the water pump could be reduced but the support vessel would have to be designed to enclose the pumps and the ventilation system for cooling must be adequate to control noise breakout. The

concern Mr Hegley had about this was, that there was no evidence about what would be done to mitigate the noise produced by the pumps and the cooling system and whether, if mitigation steps were taken, the noise would then be at a reasonable level.

On his references to the New Zealand standards, and in particular NZS6802, Mr Hegley was asked whether the night time standard of 45 dBA is applicable to areas of permanent accommodation. His answer was that it is designed to protect people from disturbance to sleep. He did not think it was confined solely to permanent accommodation, but in this regard too, as we have already said, we have the standard set by the proposed regional coastal Plan to consider.

In re-examination Mr Hegley said he would expect a tug moored in Deep Cove to produce a noise level of 45 dBA or maybe 48 dBA at the hostel.

Conclusion

Based on Mr Ryan's evidence which in this respect was largely unchallenged we accept that the education values he described constitute an important regional resource that should not be put at risk from the effects of other competing activities.

It is the appellant's case that its activities will not do this because tankers will only be in Deep Cove for a relatively brief period of time each week at the most; they will not interfere with studies undertaken by visiting parties of schoolchildren; and they will not give rise to noise nuisance.

It will be recalled that Mr Ryan told us that the Deep Cove site was chosen after seven sites had been investigated because it was seen as a unique remote wilderness location unparalleled in world tourism; it provided a packaged

deal of experiences from Invercargill to the Cove; and it was the best place for a national park and wilderness education experience. It will be recalled also that Mr Ryan disagreed with the proposition that the presence of tankers in Deep Cove would be educational. There was also a concern about disruption to marine studies which are scheduled well in advance with the Department of Conservation's education officer.

When considering effects on tourism we concluded that the presence of tankers in Deep Cove would alter the perception of this area as a valuable tourist resource, even if it were seen as a gateway to the rest of Doubtful Sound, and for much the same reasons we conclude that tanker presence would have a similar effect on the value of Deep Cove as an educational experience. It is plain from all Mr Ryan said, that a tanker would be seen as an unwanted intrusion into this wilderness location. What is more it is probable that every intake of school children would experience the tanker operations at some stage during their stay. At present Deep Cove which is confined waters, is used by parties of school children for a variety of activities and although the position of the moorings has altered from Mr Ryan's original understanding we think the reality is that tankers and their attendant vessels would be so dominant in their occupation of this area that for all practical purposes other water based activities would be precluded while those vessels are there.

For these reasons we think the presence of the tankers and the activities associated with them would have significant adverse effect on the educational values sought to be protected by the Deep Cove Outdoor Education Trust.

On noise, which would, of course, affect not only the education values but the peace and quiet sought by others who go to Deep Cove for its wilderness

values, we think on balance Mr Hegley's assessment is to be preferred to that of Mr Twinn.

The main area of difference between these two experts lay in their differing assessments of background noise levels. Generally, Mr Twinn's background levels were higher than those of Mr Hegley but we think it important that Mr Hegley measured background levels significantly lower than those measured by Mr Twinn on two separate occasions some years apart. It was for this reason that he said he could not agree with Mr Twinn that background levels would not fall below 40dBA even at night under ideal conditions and we accept Mr Hegley's opinion on this.

We also think Mr Hegley made a strong point when he described noise created by the elements such as wind noise and water noise as broad band sound experiences often termed "white noise". Mr Hegley said this kind of noise is never considered offensive and tends to pass without any nuisance value and he was not challenged on this.

We think too that Mr Twinn may have underestimated the noise likely to be created by the appellant's activities in Deep Cove. He based his opinion on two noise sources only, namely the pumping of the freshwater and ship noise. He did not have any regard for noise from a tug, either when working or possibly moored, or from the support vessel when moored. On the latter he was asked some questions about this. He said that he did not think there would be any significant noise but Mr Hegley thought otherwise.

Then too Mr Twinn did not take into account the effects of temperature inversions which on the basis of Mr Hegley's evidence are likely to occur quite often and as Mr Hegley pointed out, during periods of calm conditions when the background noise is at its lowest and community expectations of

peace and quiet will be at their highest. We think the affects of inversions as described by Mr Hegley are of significance in this particular locality.

Although day time noise may not significantly exceed the standard that appears to be acceptable in terms of the proposed Regional Coastal Plan at the hostel, it could do so at Brasell Point which is an important part of the educational experience. At night time our conclusion is that the occupants of the hostel are likely to be adversely affected by noise from the appellant's operations, the levels of which will exceed those indicated by the Plan as being acceptable. In this regard we refer particularly to Rule 5.3.4 which sets a general noise limit of 50dBA L_{10} during the day and 40dBA L_{10} at night.

Ecological Issues

Under this heading we will consider the evidence given by several scientists about intertidal and underwater flora and fauna in Doubtful Sound and Thompson Sound, and the concerns some of these witnesses have about potential adverse effects of the appellant's proposal on this ecosystem.

Dr S.M. Bennett, was a witness called by the Director General of Conservation. She has dived in Milford, Doubtful, Dusky and Thompson Sounds. In Doubtful Sound and Thompson Sound she has dived at 13 locations, her most recent diving activities being between 14 and 18 January 1997.

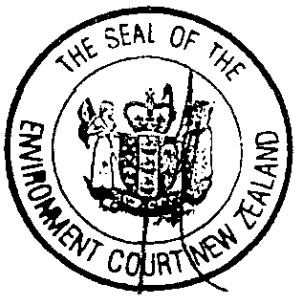
Before the Manapouri power scheme was constructed a study was carried out which described the rock wall intertidal region of Doubtful Sound. This showed that the intertidal community was influenced by the freshwater layer in the Sound and by tidal amplitude. Shaded inner intertidal shores were largely algal-dominated with few molluscs other than the brackish water snail, *Potomopyrgus antipodum*. Most of Doubtful Sound was algal-dominated in the shade and the

open areas were dominated by algae and the barnacle *Elminius modestus*. At high tide levels lichens formed a conspicuous belt, with the isopod *Ligia novaezelandiae* on the surface. At low tide level the alga Neptune's necklace *Hormosira banksii* was prominent.

Towards the entrance to the Sound there was a distinct increase in the diversity of algae, barnacles and molluscs and the tubeworm *Pomatoceros caeruleus* became common. The variable oystercatcher may be found foraging and feeding in the rocky intertidal areas.

A more recent survey of Doubtful Sound's intertidal zone in 1995 noted a change in community composition from that observed by earlier workers. Due to seasonal differences in growth and distribution patterns of algae however, it is difficult to reconcile the results of the 1995 study with those of earlier studies which were conducted in the summer months. A reported decline in the distribution of Neptune's necklace seaweed in Doubtful Sound has caused concern and may be linked to the increased freshwater discharge via the tailrace since this species is less affected by seasonal variations. This is a matter that is being addressed by a monitoring condition attached to the most recent ECNZ coastal permit authorising this discharge.

Based on her own qualifications, experience and observations in the field Dr Bennett said the surveys of others to which she had just referred are entirely accurate. She went on to say that the coastline of Fiordland has been calculated to be 949 kilometres long within the sounds. The Doubtful/Thompson/Bradshaw Sound complex is one of the largest sounds in Fiordland with a coastline of 223 kilometres, equating to 23.5% of the total coastline within the sounds. While the rocky intertidal zone of life in the sounds is not internationally unique, it is an important ecosystem nationally and contributes to the natural character and life supporting capacity of the sounds. Outside the sounds the prevailing coastal



current is such that any accidental discharge which either occurs outside or which is carried out of the sounds in the seaward flowing surface layer will be entrained southwards towards Breaksea and Dusky Sounds, potentially affecting even more kilometres of pristine coastal habitat.

Dr Bennett also produced a series of photographs showing the intertidal communities to which she had earlier referred.

Another scientist to whom we will refer again shortly, Dr K.R. Grange, explained by means of a diagram the phenomenon known as fiord estuarine circulation or, in lay terms how a sound like Doubtful Sound functions. The following is a quote from the transcript at page 212:

> *"This is a cartoon of the steep rocksides of the fiord with forest cover. Heavy rainfall constant runoff from the land, being freshwater it is less dense than saltwater so it remains on top of the saltwater as a layer somewhere between 3 and 4 m deep. Because it is continually pushed from the land it is flowing seaward. As it flows seaward it traps small amounts of saltwater and mixes with it and it takes it out as a low salinity level out to the coast. Physics dictate there must be a replenishment further up the fiord or it would empty out. The depth of the sill at the entrance of the fiord can restrict water movement to that area which is shallower than the sill.*
>
> *However what also happens is water gets swept over the sill and back into the deep basins. It is this oceanic water replacement which carries with it larvae of deep sea animals to then become colonised within the fiord. What sets the NZ fiords apart from other fiords elsewhere in the world is the very narrow continental shelf we have off the coast which supplies these deep water organisms that come in. Once inside the fiord deep*

water organisms can survive because there is a lack of physical damage through wave action and reduced competition by seaweeds because the light absorbing quality of the low salinity layer which is stained by tannins."

Dr Bennett said she agreed entirely with this description. She also agreed with Dr Grange that the depths of the freshwater and mixing zone above the seawater layer extends to an average of around 7 metres and this layer can vary in depth. Under the current coastal permit held by ECNZ the maximum depth of freshwater will be about 10 metres. This coincides with the distribution of black coral. It is found below depths of 10 metres only. The mixing zone is apparent as an oily appearance within which it is hard to focus. The depth of the mixing zone can be 1 to 2 metres. The wave action near the entrance of the Sound makes it deeper.

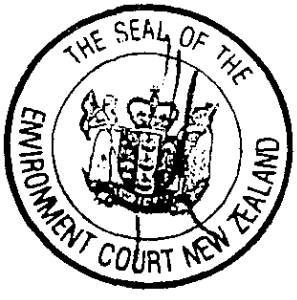
At a depth of between 0 and 40 metres at the entrance to the Sound in a narrow passage between Bauza Island and Secretary Island there is a shallow sill and the seaward currents are particularly strong. Because of this there is a rich food supply for life in the area known as "the gut". This has become a marine reserve.

As a diver Dr Bennett has observed that the currents in the middle of the Sound are not as strong or apparent as they are at the gut. However, the current is discernible moving in the freshwater layer seaward. In the deeper water Dr Bennett understands that the current provides a replacement flow moving up the Sound but not as strongly as the seaward flowing surface layer. At the head of the Sound, that is to say in Deep Cove, the current is less obvious. The tailrace does provide a current and this can be seen visibly in the surface of the water. There is a flow in a seaward direction of the freshwater layer.

Earlier in this decision we mentioned the evidence of Mr Andrew Cox who described the largely unmodified vegetation of Doubtful Sound, its birdlife and its mammal populations including New Zealand fur seal breeding colonies and a resident population of bottlenose dolphin. The bare rocky foreshore of the Shelter and Nee Islands near the entrance to Doubtful Sound also contain Fiordland skink.

Mr Cox said that the Doubtful Sound/Thompson Sound area is significant to the survival of the Fiordland crested penguin. These forage at sea but come ashore in Doubtful Sound to breed and moult. The breeding season commences in July and the last chicks and adults leave for the sea in December. The penguins use the waters of the Sound to travel between feeding and breeding areas. The total population is estimated at 2,500 to 3,000 nests or breeding pairs. In a study area the latest breeding census at Doubtful Sound recorded 133 breeding pairs but some may breed outside this area. Using the ICUN (World Conservation Union) criteria and conservative figures, it is thought that 4.43% of the total population of these penguins breed in Doubtful Sound. The Fiordland crested penguin is listed as a threatened species both by the ICUN and by the Department of Conservation. Again as we said earlier the principal concern in this regard is the potential for harm from a tanker involved in an oil spill.

Dr P A Ryan described himself as an environmental consultant/photographer and a writer in his specialist areas of expertise. He told Mr Milligan in cross-examination that he is a freshwater biologist and the evidence he gave to us was based on material published by others. However he produced a series of slides which he had taken himself and which gave us a very good idea of the underwater ecology of Doubtful Sound which was described by others and in particular by Dr Grange.



Dr Ryan claimed that the marine ecosystem within the inner sounds including Doubtful Sound, is globally unique. In his evidence Dr Grange appeared to agree with this.

Dr Grange is the regional manager of The National Institute of Water and Atmospheric Research Limited (NIWA). He has over twenty years experience in marine biological and ecological research in New Zealand and is an acknowledged expert on Doubtful Sound, including Deep Cove. He said that the New Zealand fiords generally are regarded as pristine. While this may be true of many parts of Fiordland it is not an accurate description of Deep Cove.

The environment including the marine environment of Deep Cove has already been modified by past developments and is likely to be further modified by future developments. The shoreline around the sand delta at the head of the Cove has been changed through reclamation following placement of the spoil from the construction of the tailrace. The volume of the freshwater entering the Sound has been increased by the tailrace discharge. Wharf facilities have been constructed along the southern shore. Mooring blocks from the Wanganella which was moored in Deep Cove during the construction of the Manapouri power scheme are visible along the foreshore and under water there is an enormous "rubbish dump" of articles that were thrown from the Wanganella while it was moored.

The present tourist traffic in Deep Cove is in the opinion of this witness, considerable and increasing. The discharge from the tailrace has increased the thickness of the low salinity surface layer of the waters in Deep Cove by 2-3 metres. A foreign species of seaweed or red algae has spread through Deep Cove, first being recorded in the area occupied by the Wanganella about ten years ago. Although a number of studies have been carried out the seaweed has not been identified and therefore it cannot be said with certainty that it is either

introduced or invasive. It appears to coexist with native species causing no apparent adverse effects.

Dr Grange expressed the opinion that the proposal to export water from Deep Cove will have minimal impact on the existing marine environment and will not compromise the ecologically important and fragile species that live on the rock walls of Doubtful Sound including Deep Cove. He went on to explain the basis for this opinion. He said the unique marine communities of the New Zealand fiords have become established through a combination of physical and biological processes which include heavy rainfall, thin soil cover, dense vegetation, little erosion except during catastrophic landslides, estuarine circulation - (earlier described) - lack of wave action, steep rock walls and larval transport from continental shelf environments.

Provided these structuring processes remain intact the marine communities will survive. In the opinion of this witness the movement of a vessel through Doubtful Sound and the removal of a small proportion of freshwater from the surface layer will not compromise the ecological processes which allow the marine communities to thrive. Adverse impacts such as increased sedimentation, over exploitation or physical damage are not likely with this proposal. The proposal may have two potential impacts on the marine environment - the effects of vessel wake and the discharge of ballast water.

Dr Grange acknowledged that he is not an expert on the generation of vessel wake but he has experienced under water surge during the passage of a large cruise ship in Doubtful Sound and he noted that while this surge caused black coral colonies to sway no damage was apparent. He has concluded that the passage of ships during the export of freshwater will not cause an adverse impact through wake generation.

On ballast water Dr Grange said that almost all ballast water contains some organisms. Their viability depends on the length of the voyage, the environmental conditions such as the similarity of the original and receiving waters, and biological conditions such as predators, diseases or lack of space causing competition. If these organisms do survive they do not necessarily go on to breed and cause ecological harm. The risk of harm can be minimised by working within certain parameters. There are already toxic dinoflagellates in Doubtful Sound but they are only harmful to mammals that eat shellfish that feed on them. They can form blooms that reduce oxygen levels and smother fish gills but this is unlikely to occur because conditions are not for the most part conducive to phytoplankton growth.

Exchange of ballast water mid-ocean has been successful in removing coastal species picked up at the port of origin. If this practice is used for the water export proposal there would be no more risk of introduction of organisms at Deep Cove than at any other port in New Zealand. This is because the low salinity layer in Deep Cove and the relatively low temperature of the water will kill most marine species.

Dr Grange was also asked to give additional evidence about his understanding of the composition of the seabed of Deep Cove in particular. He said that echo-sounding tracks showed that the bed was mud and not rock. This has some importance on the question of construction of safe moorings, a matter to which we will refer shortly.

Dr Grange was cross-examined at some length about his opinions because it is an important part of the case presented by the Director General of Conservation that the fragile marine ecology of Doubtful Sound, including Deep Cove, will be placed at unacceptable risk if the appellant's proposal is allowed to proceed.

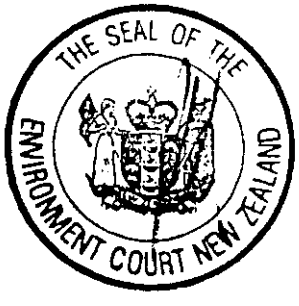
As we said earlier, Dr Grange agreed that to the extent that the overall communities earlier described do not occur elsewhere they are globally unique. The zone of diverse life is very narrow from 6 metres to 40 metres deep on the rock walls. However, at the entrance to the fiords the diverse life extends deeper. This is also true for the main part of Doubtful Sound and Deep Cove. It has to be understood that as one moves towards the entrance there is a decrease of diversity in animal communities.

Dr Grange also agreed that a precautionary approach to allowing an activity within this environment is necessary if that activity is likely to compromise any of the structuring processes in that environment. It is of course his opinion that the appellant's proposal will not do this.

On the introduction of foreign organisms either through the discharge of ballast water or on the hulls of foreign vessels Dr Grange reiterated his opinion, there was no more risk here than at any other port in New Zealand. He went on to say that even if foreign organisms were introduced their chances of survival were not high.

He was asked particularly about *Undaria* or Asian kelp and Asian date mussel. He agreed there are some marine species that could survive for a while in the low salinity layer but this would depend on health, length of time and temperature. A few species that are common in estuarine waters survive in the estuarine part of the low salinity layer. It is one thing to talk about these organisms being introduced. It is quite another to talk about their survival.

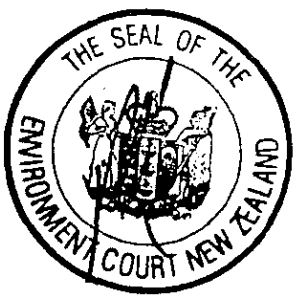
However, so far as *Undaria* is concerned, he finally agreed that the chance that it would grow would be of low probability but it was possible.



So far as Asian date mussel is concerned, if the ballast water was taken on where the mussel is prolific and during its breeding cycle when there are free swimming larvae it is possible it could be introduced but he believed the water in Doubtful Sound, including Deep Cove, is too cold for its establishment.

It was put to him from work that he had earlier published that he had already accepted there is a narrow temperature range throughout the year in the fiords that would permit subtropical forms to exist. In answer to this Dr Grange said this narrow temperature range allows native subtropical forms to exist. He does not know of any subtropical species in the fiords which are not found between the fiords. This is different from dumping larvae in the Sound, particularly because they would have to go through the cold freshwater layer when a few days before they were somewhere in Asia. It was then put to him that the summer freshwater layer can reach temperatures of 21.5°C and therefore the Asian date mussel would have an increased chance of survival during summer. Dr Grange said he did not think this was so because the freshwater is inhospitable to the mussel and if it gets below that layer the temperature is unlikely to be as high as 21.5°C. The mussel lives on shady and muddy shores. The muddy sea floors of the fiords, including Doubtful Sound, are not part of this unique and fragile community. Therefore it would be hard for the mussel to find a place to live.

He reminded us at this point, that so far as the fragile community is concerned he had been talking about the band of rock down to 35 or 40 metres deep. He agreed that this occurs in Deep Cove but the unique community earlier referred to is on the rock walls only. Introductions through ballast water could occur but the freshwater layer has to actually reach a habitat suitable for the species. The surface water layer is largely inhospitable so it does not necessarily follow that colonisation will occur.



Dr Grange was then asked about black coral. He was reluctant to say these are susceptible to damage from oil because it is not known if black coral is immune to oil. He agreed that if they came into contact with oil there would be a risk they would be damaged. However, where the corals live it is highly unlikely they would contact oil given that it floats and there are no large waves to mix it. Even if colonies were found as shallow as 6 metres he still thinks without wave action it is highly unlikely that oil would reach that depth. As for detergents used to break up oil from the surface slick, if the oil was dispersed hard up against the rock face it is likely it would impact on black coral.

In re-examination Dr Grange said that from what he has read and knows about it the Asian date mussel is intertidal around 5 metres deep. In his opinion this would place it in the freshwater layer in Doubtful Sound including Deep Cove.

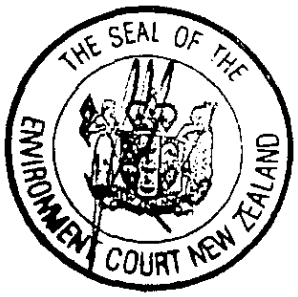
In answer to questions from the Court Dr Grange said that discharging ballast water on the surface would be a great help. The top layer is low salinity and therefore it is unlikely freshwater organisms would survive in the surface for long.

He also gave us a further explanation of the globally unique status of the marine environment in the fiords. He said that it is the combination of organisms and habitat that is unique. Some of the organisms are found elsewhere but it is the particular combination that is unique. From a scientific point of view this is important because many of these animals are not accessible elsewhere. Fiordland is a living laboratory. There is very high biodiversity, especially in the subtidal rocks, and there are species like brachiopods which are the marine equivalent of the tuatara. They are relic species that cannot grow elsewhere. This environment is a refuge for species of this kind.

Dr C.H. Hay, a witness called by the Director General of Conservation, is also a marine biologist. He is senior scientist at the Cawthron Institute in Nelson and as part of his work he surveys ballast water from ships entering New Zealand waters and non-indigenous species of marine life. He began his evidence by hypothesising that the discharge of ballast water from tankers will introduce foreign acquatic species to Doubtful Sound, some of which are likely to become successful colonists forming breeding populations and eventually spread to other fiords.

He then proceeded to demonstrate the correctness of this hypothesis.

Dr Hay referred to the translocation of marine species by shipping. He said that this gives the greatest opportunity for accidental dispersal. Of foreign species that have become resident in New Zealand and have been studied, the conspicuous examples are the Pacific oyster which may not have been a ballast introduction, the Asian date mussel and Asian kelp which were almost certainly introduced by ships. Research at the Cawthron Institute has shown that zoo spores of *Undaria* remain vulnerable for periods of 50 to 80 days in simulated ballast tank conditions. There are also non-indigenous species in Tasmania and mainland Australia, including European rock crab and the northern Pacific sea star which, if they became established in the New Zealand fiords, could have a major ecological impact on the shallow water marine life of Doubtful Sound and Thompson Sound. They could be spread by the prevailing Southland current and be detrimental to the mussel farming industry in the South Island.



Dr Hay then referred to the characteristics of modern ships, pointing out that it takes a tanker about sixteen days to travel from Japan to New Zealand. Ballast tanks allow the water to heat up and cool down very slowly meaning species within the tanks can be buffered from extremes of temperature. Ballast water can contain most elements of the coastal marine ecosystem from hard and soft shores and those that swim freely in the water column. Virtually all organisms less than one centimetre in size in the immediate vicinity of a ballasting vessel, whether benthic species swimming in the water, or rubbed off harbour pilings can be sucked into ballast tanks. The number of benthic species depends on the depth of the water between the ship's keel and the harbour bottom.

In 1995/96 the Cawthron Institute sampled ballast water from 250 tanks from 52 vessels entering Lyttelton and Nelson harbours. 80% of these contained a wide range of marine life. The Institute has not sampled tankers specifically but has examined ballast water samples collected from tankers exporting fuel and methynol from Taranaki. These contain phytoplankton and zooplankton similar to samples from the tanks of bulk carriers. Overseas programmes show that the marine life within the ballast tanks of tankers and bulk carriers and large tanks of containerships is similarly diverse.

The witness then turned his attention to the biota of ballast tanks and said that of the floating microscopic plants or phytoplankton, diatoms and dinoflagellates are particularly common in most ballast water samples. Cysts of the latter are often found in the sediment at the bottom of the tanks. There is also a high potential for the transport of spores and fragments of larger plants like seaweeds and sea grasses.

Some species of dinoflagellate which are eaten by bivalve shellfish such as mussels and oysters, produce toxins which concentrate in the bivalves and can then become poisonous to humans. The toxins can also kill other forms of

marine life. Other species of phytoplankton can clog the gills of fish and shellfish.

In recent years toxic phytoplankton blooms have periodically closed areas of the New Zealand coast including Fiordland where the recreational gathering of mussels, scallops and paua has been affected. Sea farmed populations of salmon and paua are periodically devastated by blooms of toxic algae. If toxic blooms were to occur in Doubtful Sound species like fish, dolphins and penguins would avoid the area until conditions improved which could result in detriment to their breeding success.

Tanks where water has been contained for longer than two weeks typically have depleted phytoplankton flora. Due to them being photosynthetic the periods of total darkness take their toll. Cysts of dinoflagellates are more resilient and remain viable for months in sediment in the tank bottom. Other studies show that some zooplankton only last 24 days while others can last at least six months. These longer-living species probably complete their life cycle in the sediment of the tank and become semi-permanent occupants as the sediment is unlikely to be removed by re-ballasting at sea. There is also evidence that viable development occurs in tanks.

Turning to the fate of organisms when the ballast water is discharged Dr Hay said the greater the difference between the original location of the species and their destination the less likely it is they will survive. However many estuarine species will survive whether discharged into freshwater or seawater. Biological characteristics, environmental conditions, seasonality, circumstance and chance are all important factors in survival.

Deep Cove has a vertical stratification of the water column with freshwater on top which means that marine, estuarine or freshwater species discharged in

ballast water may find a suitable niche. It is possible the larvae of freshwater species could survive in Doubtful Sound. Similarly if the ballast is fully saline and the discharge is near the surface the denser seawater is likely to sink below the freshwater and mix with the seawater beneath.

There are many species that are adept at hitchiking either on or in ships and these become pests where they colonise, especially if they form dense "carpets" on the seabed or rocky shores. In doing this they oust the indigenous species.

Dr Hay went on to say that without actually stopping all international trade there is no way to avoid transporting marine organisms by ships. The point of ballast uptake needs to be examined. The only effective treatment to date is for vessels to re-ballast in the open ocean. There they can replace their coastal water with cleaner oceanic water which usually has low species diversity, and contains plankton species less likely to survive in harbours where ballast is discharged. This especially applies to vessels moving between temperate areas across the tropics. By re-ballasting in water that is deeper than 2,000 metres in ocean tropical waters, the chances of transplanting are reduced greatly.

Dr Hay said he understood there are two ways to exchange ballast water mid-ocean. The first is by pumping ballast tanks dry and refilling with deep ocean water. This is called a complete re-ballast and in his understanding, places stress on the hull of the ship. The second is to dilute the original ballast water by pumping seawater in and discharging the ballast water simultaneously.

Neither method removes the sediment and therefore the dinoflagellate cysts are still present even with a second exchange. This creates a problem because the cysts may remain viable for years. The amount of sediment removed also depends on the extent the original water is diluted by oceanic water which in turn is dependent upon pumping duration. Even flushing with three times the amount

in the tank a significant amount of original water remains. He was also concerned that the owners of ships may be disinclined to slow down and re-ballast in mid-ocean.

On the implications for the marine ecology of a ballast discharge in Doubtful Sound Dr Hay said there is a high probability due to the narrowness of the Sounds - that is Doubtful and Thompson Sounds -larvae spores or other propagules of benthic species will drift short distances to reach adjacent shore lines within the Sounds. There is also a greater risk as compared with de-ballasting offshore of temperate reef species becoming established and spreading within Doubtful Sound.

However as we understood his evidence-in-chief much of what Dr Hay was saying at this point was based on his prediction that original ballast water would be discharged in Doubtful Sound but this is unlikely for reasons that will be discussed shortly. Nonetheless it was still his opinion that even if mid-ocean ballast exchanges took place foreign organisms would in all probability be included in the discharge of this ballast water which undoubtedly will take place in Deep Cove if the appellant's proposal proceeds.

Dr Hay concluded his evidence-in-chief by saying that although it is impossible to estimate the risk of species colonising, there is no doubt that vessels will introduce foreign living aquatic life. The risk of introduction increases with the number of visits, the volumes discharged, the number of vessels and the variability of ballast water source areas. The water column of Fiordland and by this we understood him to be including Doubtful Sound, would also encourage colonisation of marine estuarine or aquatic species.

Due to the high ratio of length of shoreline to area of the Sound there is a high risk of exotic rocky species establishing breeding populations. Old poorly

maintained vessels that are not regularly docked also increase the risk of introducing species via growths on the hull of the vessel. There is a real risk of encrusting colonial animals being introduced as they are easily translocated by ships and the rock walls of the Sounds beneath the top salinity water layer may be an excellent environment for these.

The risk of marine introductions would be significantly reduced if the appellant could guarantee complete ballast exchange, that is to say empty and fill, mid-ocean. However it was the opinion of this witness that no such guarantee is possible because it depends on the design and construction of the tankers, possibly the agreement of foreign owners and insurers if the tankers are chartered, and consistently calm seas to make the exchanges on the outward journey. There are also problems with ineffectual exchanges, sediment in tanks and epi biota on the hulls. Dr Hay said there is no practical way to ensure that effective exchanges are made consistently.

For the above reasons he concluded the best way to ensure no introduction of foreign organisms is to prohibit ballast discharges inside Doubtful Sound or immediately offshore and to discourage any development of a commercial port that will attract foreign shipping in the midst of our largest National Park.

In additional evidence-in-chief Dr Hay was asked about apparent areas of disagreement between himself and Dr Grange. He said that Dr Grange's comments on *Undaria* are inconsistent with the laboratory experiments on zoospores and gametophytes and also with his own field observations of the invasive plant. In Tasmania in 10 years *Undaria* has spread down to a depth of 20 and sometimes 22 metres forming beds on the bottom that are hectares in area. The upper limits of the kelp is 5 or 6 metres. Above this depth it seems unable to compete with the native seaweeds and also because there is a slight freshwater layer. Light levels in this area are not much different from those that Dr Hay has

experienced when diving below the freshwater layer in Milford Sound and Dusky Sound, and to a lesser extent, Doubtful Sound.

The freshwater layer means that it is unlikely that *Undaria* will colonise the low tidal zone or the very shallow sub-tidal zone near the head of the Sound. He also said that he disagreed with Dr Grange about the potential spread of *Undaria* because it is readily transported by ships and it has life and reproductive stages that are clearly tolerant of low salinities. In New Zealand and Australia the same kelp grows in light levels down to 1%, and thus it could grow in Doubtful Sound. In the middle and outer parts of the Sound and in many areas below the freshwater layer there is a thick kelp bed called *Ecklonia* which has an identical history to *Undaria* with similar light tolerance. If this can grow so can *Undaria.*

Potentially any foreign inter-tidal seaweeds, particularly from temperate areas, produce propagules that can be carried in ballast water. This has been seen at the Cawthron Institute where samples of ballast water are cultured routinely. Also from the work done with the 250 ballast water samples earlier referred to there are indications that mid-ocean exchanges are not effective because the biota in the samples commonly include a mixture of coastal species usually consistent with the port of origin of the vessel and tropical species from oceans such as the Coral Sea which is apparently a popular area for mid-ocean exchange. This work indicates that exchanges are not effective either because the tanks were not completely emptied before refilling or flushing was not sufficient to dilute the water to recommended levels.

On oil spills Dr Hay acknowledged he is not an expert but it is his understanding that oil can sink quite rapidly if there is wind generating wave action and oil would be detrimental to inter-tidal and sub-tidal marine life.

In cross-examination Dr Hay was questioned at some length about the current voluntary aspect of ballast water mid-ocean exchanges and about the possibility of New Zealand regulations being promulgated to make this compulsory. He was of the view that this should occur but he was unable to say that it will or if so, when. He was also asked about other management options such as adding biocides to ballast water tanks or ozonation. The former is costly and chlorine which is the biocide used is highly corrosive. It is not an option favoured by ship owners. Ozonation is less effective with large quantities of organic matter in seawater. At present the Cawthron Institute is experimenting with heating and using ultrasonic treatment but this is still in the experimental stage.

The fundamental problem with all management options is that the flow rates of water to fill ballast tanks are fast and in general if water is passed rapidly through any form of steriliser or treatment system the effects are diminished. This witness understands that in the United States of America where there is a budget of some $29m available for looking at this whole problem some $5.6m has been devoted to considering new treatment scenarios.

Dr Hay was also questioned at some length about the effectiveness of mid-ocean exchanges and he seemed to be sceptical first that they would take place even if there were charter party obligations, and secondly that they would be effective.

Evidence of an earlier witness, Mr J E Rees, a marine engineer to whom we will refer later, was put to Dr Hay. He was told that this witness had said that mid-ocean exchanges can be carried out and that if water 5-6 times the capacity of the tank is pumped through then the industry regards this as a complete exchange. Dr Hay said that from research on this matter which he knows has been done in Australia it has been found that 3-4 times the capacity of the tanks reduced the original water concentration to about 4-5%. Consequently he would consider that an exchange of 6 times the capacity of the tank, and he has never heard of

this being done, would eliminate 99% of the original water. However he is still sceptical that this would occur. For example weather conditions might render it impractical. So might the condition of the vessel itself.

In re-examination Dr Hay said again, that he was concerned that the design of some ships may not allow effective mid-ocean exchanges and he was also aware of numerous instances where sea conditions were such that complete exchange was impossible. In answer to the Court Dr Hay said he thought it was necessary to remove the sediment from ballast tanks, at least arguably because the sediment is shown to contain the spores of cysts of dinoflagellates and as he had mentioned earlier these are living in the sediments. When the sediments are discharged they can be released into the water column.

Dr Hay has also researched the problem relating to discharge of ballast water into a freshwater environment. In the case of Fiordland the discharged water being of oceanic salinity would quickly sink through the freshwater layer. Dr Hay said that he is also aware of one key paper that has been published for the Institute of Marine Engineers in London on a ballast ocean exchange system design which has looked at the plumbing and evaluates the cost of converting a bulk carrier to make flushing effective at 600,000 British Pounds. He also said he believed tankers as distinct from bulk carriers can have design limitations for the purposes of ocean exchanges.

Maori Values

Stewart Rewiti Bull is acting secretary for the Murihiku Resource Management Consultancy. This group deals with matters that fall within the Resource Management Act 1991 that may impact on the relationship of Maori and their culture with their ancestral lands, waters, sites, wahi tapu and other taonga which

are regarded as being of national importance in terms of section 6 of the Act, and also to do with the obligations set out in section 7 of the Act.

Mr Bull reminded us that the New Zealand Coastal Policy Statement states that tangata whenua are the kaitiaki of the coastal environment and he proceeded to explain to us the role performed by kaitiaki for the purposes of kaitiakitanga.

Mr Bull then turned his attention to two issues. The first concerning oil spills and the second concerning ballast water. Both issues are of course raised by other parties and in substance, although from the Maori perspective, they are the same concerns as we have earlier discussed. Mr Bull concluded that in his opinion the risks of damage to the ecosystem of Deep Cove and Doubtful Sound from oil spills or the consequences of the discharge of ballast water outweigh any benefits there might be from allowing the appellant's proposal to proceed - and to compromise Doubtful Sound in this way would be inconsistent with section 5 of the Resource Management Act 1991.

Further Consideration of these Issues

The ecology and the Maori values we have just been discussing were all said to be at risk from the appellant's proposal by reason of the possibility of oil spills from tankers and/or the introduction of foreign organisms through the discharge of ballast water in Deep Cove.

Mr Shaw also referred to a potential problem for kayakers and other small vessels due to wave action set up by the tankers transiting Doubtful Sound.

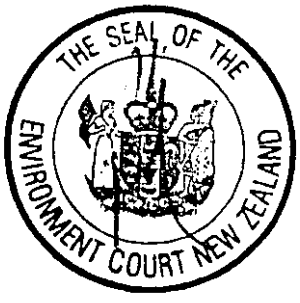
For these reasons issues arose about the safety of the tankers transiting the Sounds and mooring in Deep Cove. There were also issues about the adequacy

of the proposed moorings. It will be apparent from what we have said already that the discharge of ballast water was also an issue..

To enable us to further address these issues and come to some conclusions about them we now turn our attention to the remainder of the evidence on these topics. We will consider first the adequacy of the moorings, then navigation issues and finally some additional evidence about ballast water discharges.

The appellant's professional adviser on moorings was Mr C H Teear who we referred to earlier when discussing the appellant's proposal. Mr Teear is a qualified engineer and a director of Offshore and Coastal Engineering Limited, an engineering consultancy firm specialising in the marine field. He is a registered civil engineer with 25 years experience in offshore, sub-sea, coastal and port engineering and marine civil engineering. In 1982 he was the Project Manager/Engineer for the installation of two catenary anchor leg mooring buoys offshore Abu Dhabi in the Arabian Gulf. Both buoys were designed to take tankers up to 350,000 tonne displacement.

In 1994 his company was approached by the appellant to design the offshore loading facilities for the present proposal. The principal design objectives were that the design should be such as to minimise environmental and visual impact while maximising cost effectiveness and efficiency. Mr Teear considers that this has been achieved. The only permanent visible features of the marine loading terminal would be the two tanker mooring buoys, one bow and one stern. The submarine pipeline and the water intake would be below the surface. The flexible hoses used to connect the service vessel and tanker to the submarine pipeline would be left on the bottom when not in use, the free end being marked by a buoy, with the buoy line serving as the recovery line.



The initial concept was developed based on Mr Teear's company's knowledge of offshore loading terminals and the Doubtful Sound area. The company had previously carried out work for Electricorp in the Manapouri tailrace canal. The initial concept was refined following a survey trip to Doubtful Sound by a team comprising company engineers/divers, a scientist from NIWA and an acoustic consultant. Further information has been collected from launch masters with experience in operating in the Doubtful Sound area, including Mr George Brasell, who gave evidence at the hearing of this appeal.

Surveys were done of the effect of the current created by the tailrace and the seabed which Mr Teear said consists of clean dense sand giving way to soft normally consolidated mud below depths of 10-12 metres. From these surveys it is not anticipated there will be any difficulty installing the deep water mooring which will be at 90 metres and is known as a SALM (single anchor leg mooring) and is normally used as a bow mooring.

There will be two fixed moorings for the tankers, namely the SALM to the seaward end and a two legged conventional mooring at the landward end. The SALM configuration has been chosen for the deep water mooring because it is difficult to snag should a ship strike it, (the buoy is merely pushed to one side without catching on the ship) and because of the relative ease of installation in deep water when a dead weight anchor is used to hold the SALM.

Mr Teear said it is recognised that the winds and currents are strongly directional which obviates the need for either a conventional multi 6-8 point mooring or for a ship to need to weather vane about a buoy. It is also recognised that over a 50 year return period there can be 3 second gusts of up to 103 knots. The 20 year return period is 95 knots. Preliminary design calculations have been based on a 50 year return period sustained wind speed for one minute of 85 knots.

During the design and construction phase of the project and for a minimum time of one year an automatic weather station would be established at the site to collect wind data.

There are no technical difficulties with the water intake and submarine pipeline facilities and we do not need to consider these any further.

However there was some challenge to the appellant's proposed mooring system and we turn now to deal with Mr Teear's evidence about this in more detail.

Mr Teear explained the technical workings of a SALM buoy which are not contested and went on to say that it would be held in place with a dead weight anchor which will progressively settle into the seabed. The anchor capacity of the SALM is a function of its weight and strength of the anchor cable or chain. The SALM anchor would be installed diverless. The chain will be a larger diameter than that calculated as being necessary to allow additional deadweight to be added if required.

The stern mooring will be a conventional mooring buoy connected to a two anchor leg mooring arrangement, each anchor leg terminating in a high holding power anchor. The stern buoy will be located beyond the outer edge of the sedimentary material delta pushed out from the head of the Sound by the Lyvia River. High holding power anchors such as Stevshark anchors can be used in this sedimentary material.

The mooring facility would be designed for 40,000 dwt tanker because this is the maximum size that can approach and get onto the mooring with minimal assistance. The safety factor for the mooring system would be set by a classifications society under whose rules the mooring is classed. If vessels are smaller than 40,000 dwt the safety factor would of course be much higher.

Returning for a moment to the loading system it is anticipated that the pump capacity on the support vessel which is expected to be a vessel of 30-40 metres length overall and contain the water treatment plant as well, would be sufficient to load at a rate of 500 litres per second. Mr Teear said that pumping time for a 40,000 dwt vessel would be less than 24 hours and less than eight hours for a 12,000 dwt vessel. He understood the vessels would transit Doubtful Sound in daylight hours only and most of the loading would be done at night.

Returning to the moorings Mr Teear said that following the completion of installation these would be proof test loaded as for a standard offshore mooring installation by pulling the moorings against one another. The test set up would be established on the barge used for installation and construction purposes so that before any vessel was able to use the mooring system it would have been properly tested in this way.

Mr Teear was also asked and gave opinions on the effect of tankers transiting the Sound from the point of the view of the wake they would generate and on the matter of ballast water. On the former it was his evidence that the tankers would transit Doubtful Sound at less than 10 knots so that the resultant wake would be negligible and not damaging. He had calculated that the wake generated by a vessel travelling at 10 knots, 100 metres from the shore is 0.1 of a metre.

On ballast water he said this is recognised as a potential problem and should be guarded against by re-ballasting at sea. He thought the intake water could be filtered to prevent the uptake of dinoflagellate cysts but this appears to be at odds with the evidence of witnesses such as Dr Hay and indeed Dr Grange.

In cross-examination Mr Teear said that when not in use the SALM buoy would project 6 metres above the surface of the water. It has an overall length of 12

metres and a diameter of between 4 and 5 metres. It will be lit and have radar reflectors and may be painted a bright colour. The stern buoy would be no more than 2 metres in diameter and would be above the surface of the water by no more than 2 metres and would also be lit.

He said that vessels could be moored either bow out or bow in and this is of some importance when we come to consider the evidence of a Master mariner who was also called by the appellant.

If as a result of the automatic wind station records it was discovered that there is a significant sustained cross wind in Deep Cove then another mooring could be added or the stern moorings could be spread further. Mr Teear was satisfied that a 200 metre long vessel could satisfactorily complete a 180 degree turn in an area 400 metres wide which is approximately the distance between Brasell Point and the opposite side of Deep Cove. The witness agreed that the turning circle of the vessel could become very crucial but was aware that cruise vessels had been in Doubtful Sound. Diagrams referred to by Mr Teear show, of course, that turning would begin before Brasell Point was reached.

Mr Teear was then asked about the need for tugs to assist with mooring the tankers. When asked by Mr Slowley how many tugs he would expect to be used to moor a tanker in Doubtful Sound, by which we understood the question to be referring to Deep Cove, Mr Teear's answer was "none". He went on to say that conventionally tugs are not used and he referred to an open sea example in New Zealand concerning the iron sand export facility. However he agreed that if the support vessel had a bollard pull of 10 tonnes as had originally been proposed by Mr Fletcher this would be useful because it would provide the Master of the tanker with an option.

This evidence, as will be seen shortly, was at odds with other evidence called by the appellant. However to round off this topic so far as this witness is concerned we record that in answer to questions by Mr Ibbotson, Mr Teear said whether tugs were used or not did not affect the design criteria for the mooring system. The use of tugs was an operational matter.

Also in answer to questions by Mr Ibbotson this witness said that looking at the diagrams he thought the tanker at the proposed moorings would be between 100 and 150 metres from Brasell Point and about 300 metres from the opposite side of Deep Cove. Also it would be about 300 metres from the mud flats at the head of the Cove near the tailrace. If a tanker ran aground there it would do so in a depth of water between 10 and 20 metres and the distance to this depth from the mooring is about 250 metres.

Given these distances the probability of a tanker running aground either at Brasell Point or on the mud flats it was in the opinion of this witness very low because it would require complete loss of power of the vessel and an assumption that one line had not already been connected to a mooring.

Mr Teear also said in answer to a question by Mr Ibbotson that the construction phase of this proposal would be less than a month at Deep Cove. There would of course be other construction work off site in terms of fabricating the mooring buoys and the anchor and procuring the concrete weights for the anchor. He did not think this would be affected to any significant extent by weather conditions. With a barge, a support vessel and an accommodation vessel there could be a total of 20 people involved in the construction phase. The operation is designed to be self-contained and it is not necessary to use onshore facilities.

Mr Cameron also asked this witness a series of questions about the potential effects of an earthquake in Deep Cove or a tsunami and he concluded that these

natural phenomena would pose no greater risk than other environmental forces that could be encountered in this area.

The next witness we will refer to on moorings is Mr R M Davis who was called by the Regional Council. Mr Davis is a qualified civil engineer and naval architect. He has had more than 40 years experience in harbour engineering and amongst other things he has designed and constructed moorings including buoys for offshore coastal locations.

On the proposed tanker moorings Mr Davis said the systems are well proven and the preliminary design has been done in accordance with sound engineering practice and the proposed methods for installation are also sound and practical. The same applied to the proposed pipeline.

However based on his own experiences at Milford Sound Mr Davis questioned two of the design parameters chosen by Mr Teear for the preliminary design. These were windspeeds and wind direction. Mr Teear had chosen a value for the maximum three second gust of 103 knots. Mr Davis thought this was too low and said he would choose a value of at least 112 knots. This would apply considerably more force to a tanker in a light ship condition than that adopted by Mr Teear. The difference is 67 tonnes as opposed to 45 tonnes.

On wind direction it was suggested that Mr Teear's assumption that the tanker will be moored in line with the wind is not valid. At higher wind speeds considerable vortices and deflections are caused by the local topography and it is possible for very high athwartship components to be created in the resultant force on the ship. Gusts can be repetitive at short intervals and these should be considered in the design process because the total area exposed to a lateral wind is four times that for a wind blowing parallel to the ship's centre line.

Mr Davis also considered that because there was no geotechnical data available for the seabed at the proposed site of the moorings, suitability of the seabed should be confirmed. A detailed bathymetric survey should be made to ensure that the seabed is clear of moraine residue at the location of the anchor.

When he prepared his evidence-in-chief Mr Davis did so on his understanding that it was proposed to use a service vessel with a bollard pull of 10 tonnes as a tug to assist in manoeuvring the tankers. Based on his experience Mr Davis believed that at least three such vessels or a more powerful tug would be required. He said most of the tugs used in major New Zealand ports have a bollard pull of about 30 tonnes. He added to his evidence-in-chief that at all New Zealand ports handling ships of 40,000 dwt at least two tugs are used.

Mr Davis went on to give some evidence about navigation in Doubtful Sound. This consisted of several comments on the evidence of Captain Hibberdine to which we will refer shortly. Although he is not a Master mariner Mr Davis is a naval architect and has designed navigation channels, berths and moorings as well as tugs. This has given him a knowledge of ship handling. He has also visited the simulator at the Australian Maritime College in Launceston, Tasmania, and has contracted this facility for ship response studies as part of a major investigation for port development.

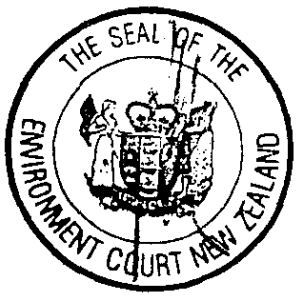
Captain Hibberdine, who was called to give evidence before Mr Davis, had expressed the opinion that Doubtful Sound should not be entered by any vessel of significant size when the wind conditions exceed 30 knots sustained. Mr Davis said that winds at 30 knots sustained with gusts to 45 knots are not uncommon in Fiordland and will occur both inside Doubtful Sound and offshore to the extent that the scheduling of arrivals and departures from the loading buoy will be frequently disrupted. To minimise such disruptions it was his opinion that it

would be necessary to provide for an escort tug to assist the tankers to transit Doubtful Sound.

Mr Davis also expressed the opinion that Captain Hibberdine had underestimated the effects of katabatic winds. He said that winds that are initiated by the katabatic process are greatly intensified by the funnelling effect down valleys extending towards the main part of Doubtful Sound. This results in tributary effects which markedly modify the wind direction where branches such as First Arm, Crooked Arm and Hall Arm meet the main Sound. These variations in wind would in his view significantly affect the handling of large vessels, more particularly those in ballast. From his observations katabatic winds in the Sounds are steadier than the winds produced by pressure differences.

Mr Davis did not have any real concerns regarding a water tanker fully loaded travelling at 10 knots outward bound in Doubtful Sound. His concern was with such vessels in ballast at manoeuvring speeds between 2 and 4 knots in the confined waters of Deep Cove. He said that in such circumstances such a vessel would be riding high on the water. There would be high windage, low draught and therefore low lateral resistance and the ship would be affected by wind more especially by strong winds and gusts.

Mr Davis was critical of the simulations that had been carried out by Captain Hibberdine. He pointed out that the approach and manoeuvring to the moorings in these simulations were not as described by Mr Teear in that they did not result in the tankers mooring bow out. Mr Davis agreed with Mr Teear that it was better for the tankers to moor bow out because this would enable a direct and rapid departure in the event of adverse wind conditions. To do this however the tankers would have to turn through 180 degrees on arrival and this manoeuvre should have been tested in the simulator by Captain Hibberdine with the ship in ballast.



This test should also have been repeated with the wind velocity up to at least 50 knots sustained. This is because winds in the Sounds frequently reach speeds in excess of 75 knots in gusts and 50 knots sustained is not unreasonable for such a test. In winds of this strength the ship's Master could opt to take the ship directly to the moorings berthing bow in. However this produces the situation where the way has to be taken off the ship, that is to say it has to be stopped in a relatively short length of water. In the case of westerly winds which are the most likely, the high windage of the ship at light displacement and the reduced effectiveness of a single shallow propeller in a stern mode combine to produce a decidedly hazardous situation. It was Mr Davis' opinion that this situation should also have been tested in the simulator.

In cross-examination by Mr Ibbotson, Mr Davis was asked about this matter again and he concluded his discussion by saying that if one end of the ship gets loose and there is only one service vessel for the dual purpose of holding the tanker in place and assisting with securing the mooring line he believes the position is decidedly hazardous. In answer to Mr Cameron he thought the pilot vessel should be no less than 20 metres in length. It would probably have about 7-8 metre beam, a 2½ metre draught and have a displacement of about 110 tonnes.

Taking this matter up in cross-examination Mr Milligan asked Mr Davis whether he was aware that the appellant proposed using a support vessel for a number of purposes including functioning as a tug as well as providing the pumping facility and the water treatment facility. Mr Davis said it is possible that a vessel could be designed to serve these multi-functions but it could not also serve as a pilot boat. He also maintained that a pilot boat would need to be a relatively large vessel because of the conditions it might encounter when entering the open sea to meet a tanker. At this stage he thought the pilot boat would have to be at least 10

metres long. It would have to be of sufficient size to withstand weather conditions but not so large that it could not be taken out of the water and transported up and down the Sound on the parent vessel.

On the matter of moorings Mr Davis agreed that provided the environmental forces principally wind velocity and direction, can be established and appropriate parameters adopted, this would lead to an acceptable solution so far as the mooring system is concerned. He repeated that physical inspection of the seabed would be necessary.

Referring back to navigation he expressed the opinion that it was going to be very difficult for the Maritime Safety Authority to set satisfactory parameters, particularly for wind velocities, to control entering Doubtful Sound. Even if this was done difficulties could still be experienced if those parameters changed while the vessel was transiting the Sound. He thought considerable flexibility would be required and we took it from his answers on these matters that this could give rise to hazardous situations being encountered.

The next witness we will refer to is Captain W J B Hibberdine, who is a ships Master and was called to give evidence by the appellant. Captain Hibberdine has been at sea since 1959. He obtained his Masters (foreign going) certificate in London in 1968. His present employer is Milburn New Zealand Limited and for the past 8 years he has been Master of that company's vessel "Westport". This is a bulk cement carrier of 4,000 dwt which carries cement from the Milburn works at Westport to a number of ports throughout New Zealand.

In the eight years he has been Master of the "Westport" this vessel has travelled the south western coast of the South Island many times. Captain Hibberdine has often taken the "Westport" into and out of various sounds. He has sailed the

"Westport" in and out of Doubtful Sound on a number of occasions and sometimes as far as Hall Arm and Deep Cove.

With this experience he claims to be one of the few "big ship" Masters in New Zealand (and indeed the world) with practical seagoing experience of the Sounds area. On the basis of this experience and after the present project had been explained to him he concluded that a parcel tanker, that is to say one built specifically for the purpose of conveying a variety of liquid but non-petroleum cargoes, and significantly larger than the "Westport" could safely be brought into and out of Deep Cove.

It was his opinion, contrary to suggestions he had heard, that weather conditions on the West Coast are predictable. Masters of vessels such as the "Westport" have available to them sophisticated systems of weather description and prediction. From these and from the records of a ship's instruments it is possible for a Master to form a very clear idea of what the weather will be doing in the following 24 hours. The idea that a storm comes out of nowhere is principally the figment of a journalistic imagination. Although storms may appear to arise in this way this is only because those to whom they so appear do not have available to them a sufficient set of predictive tools.

Captain Hibberdine expressed the opinion that Doubtful Sound should not be entered by any vessel of significant size in wind conditions exceeding 30 knots. These he told us are near gale conditions and there is nothing unusual about this sort of limitation.

His experience of weather within the Sounds is that once a vessel has entered wind velocity tends to drop and seas significantly flatten out compared with what may be experienced outside the entrance. The only exception to this arises from katabatic winds which he described as a temperature gradient winds consisting of

cold air tumbling down a mountain side. In the Sounds area these winds occur most commonly in the afternoons and wind gusts of velocities of 30-40 knots can be experienced. These, so Captain Hibberdine said, are not particularly hazardous for large vessels because their direction is effectively determined by the shape of the valleys and the lie of the Sounds. A vessel travelling into Doubtful Sound for example would experience these as head winds of comparatively short duration in flat sea conditions that not significantly affect the handling of large vessels.

A wind speed of 30 knots would imply gusts often in excess of 45 knots with comparable lulls and a mean wind speed of 60 knots would imply gusts of 90 knots or more. What is important so far as ship manoeuvrability is concerned is the mean wind speed. Because of the ship's mass, draught, lateral resistance and skin friction it possesses a huge inertia upon which gusts make little impact.

On the basis of his own experience Captain Hibberdine concluded that vessels up to 40,000 dwt could be safely handled within Doubtful Sound and Deep Cove. To check this conclusion he went to the Australian Maritime College in Launceston, Tasmania. This college possesses a vessel simulator which is widely regarded by Masters as an accurate means of determining whether particular kinds of vessels can feasibly be employed in situations in which there is no direct experience. The concept is identical to that of an aircraft simulator.

On 24 August 1996 using this simulator, Captain Hibberdine arranged for it to simulate a tanker of approximately 40,000 dwt having bow thrusters of 15 tonne force. He explained to us that a bow thruster is a propulsion device which enables the bow of the vessel to be pushed to one side or the other as required from the bridge. Bow thrusters significantly increase the manoeuvrability of vessels to which they are fitted. The relevant specifications of a real vessel "The Australian Spirit" were used.

A report on these simulations was produced as Exhibit "D". In the simulations Captain Hibberdine also had the use of a tug with a 10 tonne bollard pull.

The simulator was operated under varying wind conditions up to winds of 40 knots sustained and a current speed of 3 knots which he said is significantly greater than he would expect to experience in practice but less than he has experienced in the Buller River when berthing at Westport. On this matter he also said he knew that speeds of up to 3 knots had been experienced in the vicinity of the proposed moorings, largely aa a result of water from the Manapouri tailrace, but these are surface currents and the deeper water is effectively still.

The results of these simulations confirmed his earlier assessment. He said that it became obvious that with tug assistance it would be perfectly practicable to manoeuvre a vessel of 40,000 dwt in Deep Cove in weather circumstances more adverse than would be experienced in conditions where an entry to Doubtful Sound would even be contemplated. On each occasion the vessel approached the mooring from the west and after having picked up the moorings lay roughly facing south east. Effectively it lay head to wind in circumstances where the wind was coming down the valleys and the Sound. The vessel left after manoeuvring through 180 degrees. This is the sort of approach and departure he would envisage as standard practice.

Captain Hibberdine said he did not endeavour to manoeuvre the vessel in the absence of a tug. However the process of simulation included occasions on which various things went wrong. For example there was one occasion when he "lost" the tug half way through the manoeuvre and on another occasion he "lost" all power to the bow thrusters. On each occasion he was able to complete the manoeuvre safely.

He concluded by saying that he did not think there was any doubt about the ability of vessels of this size to navigate up and down Doubtful Sound. He thought this was a perfectly simple exercise even in conditions of poor visibility when radar would provide accurate positioning. His understanding was that this part of the passage, that is the transiting of the Sound would only be done during daylight hours. The passage would take 4-5 hours at a speed in the order of 6-8 knots. Essentially it was straight running and navigationally less complex than taking a vessel into Tory Channel.

Captain Hibberdine had assumed that a vessel would be in ballast when it entered Doubtful Sound and that it would discharge its ballast at the time of freshwater loading.

He went on to say he was aware of concerns about the discharge of ballast water into New Zealand waters and suggested that two things needed to be said about this. The first is that the organisms in question are those found in shallow water. Consequently the prospect of an infestation by exotic organisms occurs if ballast water is taken on at or about the port of origin or in shallow coastal waters where these organisms are to be found. He then went on to say that it is common place for vessels to undertake ballast water exchange in the course of a voyage. This involves the sequential pumping out of the ballast tanks and then refilling with deep ocean water. He said there was no practical reason why this process could not be repeated if necessary two or three times during the course of an extended ocean voyage. He was also aware of the development of regulations throughout the world requiring ballast water exchange. The point he wished to make was there was nothing either unusual or complicated about ballast water discharge.

Captain Hibberdine was cross-examined at some length by Mr Slowley. He was asked if he had any command experience of vessels of 40,000 dwt and he said he

had not. He also said that pilot exemption does not extend to tankers and he agreed that all tankers must have a pilot when they come within harbour limits. So far as Doubtful Sound is concerned Captain Hibberdine said it is not a harbour but there was later evidence from Captain E D Nicol that satisfies us that it is.

Captain Hibberdine also agreed that the average harbour tug around New Zealand has a bollard pull of about 30 tonnes and that at low speeds, particularly when coming to berth, a vessel loses manoeuvrability and this is why tug assistance is required. He agreed the waters of Deep Cove could be described as enclosed waters but he would not accept that there is not much room to manoeuvre a large vessel in the Cove itself. He said there is enough room to manoeuvre such a vessel quite easily, including turning it through 180 degrees. If he were the Master of a vessel of 40,000 dwt and 200 metres overall length he would like to have the use of one large tug with a bollard pull of between 30 and 40 tonnes.

He was then asked some questions about changes in weather during the 3 to 4 hours it would take to transit Doubtful Sound. He did not think there would be much change in that space of time although he agreed that it is a possibility and that in fact he has experienced weather changes in such a period. Personally he has never entered Doubtful Sound when the weather conditions have been anything other than perfect. He also agreed there are limited opportunities for safe anchorage once a vessel enters the Sound, particularly if it had proceeded beyond the point where it could leave the Sound through Thompson Sound.

Asked what he would do as Master of a vessel transiting Doubtful Sound if it lost power he said he would call for tug assistance. He would expect there would be a tug available from Deep Cove in these circumstances. There are tugs at Bluff but in his estimation they would be some 12 hours away. Other witnesses said 2-3 days in rough conditions. Asked how he would prevent the disabled vessel

from drifting without tug assistance he said this would be difficult due to water depth. Using anchors may not be very effective.

In answer to questions by Mr Ibbotson, Captain Hibberdine said he had not personally experienced a katabatic wind in Doubtful Sound or Deep Cove but so far as the simulations were concerned he went on to say that the parameters used did not understate conditions because if conditions were any worse the ship would not be brought into Doubtful Sound. However when pressed on this he agreed that it would be possible for wind conditions or weather conditions within the Sound to change once the ship had entered and had got beyond the point where it could safely return to sea. He agreed that on the whole a high sustained wind would result in navigational difficulties through the narrow Sound. It would limit steerage. He agreed too from his knowledge of the Sound that there are no areas of soft grounding so that the grounding of the ship would be on to rock. A consequence of this could be a breach of the ship's fuel tanks. Tankers of 40,000 dwt carry between 2,000 and 3,000 tonnes of fuel oil. He doubted however that all of this would spill into the sea because it is carried in several tanks. It is heavy fuel oil known as bunker C oil. It will float on the surface of the water and create a slick. Other tanks containing contaminants could also rupture on grounding.

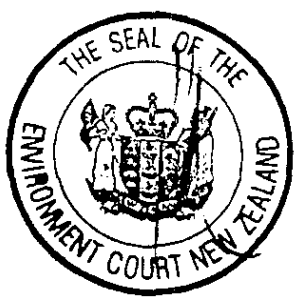
Captain Hibberdine also agreed that there were other risks such as navigation errors, mechanical failure of steerage, a bow thruster failure, problems with radar and loss of visibility although he was of the opinion that because all modern ships have radar backup and radar would be accurate even in the confines of Doubtful Sound, these risks are of a very low order.

Mr Ibbotson then asked a series of questions about mooring the tanker and during this it transpired that as well as the tug a mooring boat would be required to take the ship's lines to the buoys. In the simulations it appears the tug also acted as a

mooring boat but in answer to questions from Mr Ibbotson, Captain Hibberdine said he would use another vessel for the mooring lines. He explained that the simulations did not show this because all he was simulating was getting the ship into the right position for mooring. There are also time lapses involved in all this and indeed the results of the simulations showed that the mooring manoeuvres took between 15 and 26 minutes and the departing manoeuvres between 9 and 13 minutes.

In each simulation the tanker was moored with the bow towards the head of Deep Cove and the stern towards the sea. Captain Hibberdine explained to Mr Ibbotson that this was because of the limitation of having a tug with only a 10 tonne bollard pull. If there had been a larger tug and if the windspeed was allowable he would have tried to swing the ship on arrival but with a small powered tug he deemed this not acceptable. This was so even though we were told by Mr Teear the proposal was to have the bow or SALM mooring seaward and the stern moorings to landward. When asked again if he thought one tug of at least 30 tonne bollard pull would be sufficient for a manoeuvre such as swinging the tanker 180 degrees onto its moorings in Deep Cove he said he thought this would be so.

When mooring the tanker the bow thruster and the tug would be used to counteract windage and Captain Hibberdine agreed that windage could present problems in Deep Cove. A katabatic wind for example would be of concern both to the Master and to the pilot. However he doubted that even in these circumstances the tanker would be forced onto one side or other of Deep Cove. He thought the simulation work demonstrated this would be unlikely to happen even though the wind used in the simulations was bow on or stern on. When it came to cross winds Captain Hibberdine took the view that these would not last long enough to create this kind of problem. Again he resorted to saying that if



weather conditions were like this it would be unlikely that the ship would enter the Cove.

Further on this matter, when cross-examined by Mr Cameron, Captain Hibberdine had put to him an extract from a publication of the Maritime Safety Authority of New Zealand entitled Maritime Accidents 1994/95 which describes the key events leading to an incident involving the inter-island ferry "Aratika" on 30 June 1995. This extract which was later produced as Exhibit "4" makes it clear that on that occasion there was an unanticipated change in the weather in Cook Strait which Captain Hibberdine agreed the ships officers did not know about in advance. This was the much publicised incident where two vehicles were lost overboard when the "Aratika" took a particularly heavy roll due to the weather conditions.

Captain Hibberdine agreed that the findings of the Maritime Safety Authority on that occasion were not the figment of a journalistic imagination but he would not agree that weather conditions can necessarily develop in a most unexpected way. He went on to say that when there is a front or low from Tasmania heading towards New Zealand it has a large area of water to cover and it is much easier to predict the weather patterns than it would be in Cook Strait where it is notoriously difficult to get the weather right.

Questioned more specifically about Doubtful Sound however, he agreed that localised meteorological effects may occur from time to time and they might not be reflected in the weather forecasts that a ship's Master receives prior to entering the Sound.

Again asked about mooring in the Doubtful Sound/Deep Cove situation Captain Hibberdine agreed there is little room for misjudgment. If misjudgment did occur the vessel may go aground at the head of the Sound or alternatively onto the cliffs

opposite. He agreed too that the level of risk increases with the frequency with which mooring procedures take place.

Mr J E Rees is a marine surveyor and engineer and currently Fleet Manager, (Marine) for Fiordland Travel Limited. He was called to give evidence by that company. He has had experience as a fleet manager of overseas shipping companies and was a consultant marine engineer and surveyor. He has also investigated marine accidents.

Mr Rees gave some evidence that was in some respects similar to that given by Mr Davis about potential problems mooring a tanker in Deep Cove and about the proposed moorings themselves. He also had something to say about ballast water. He too was critical of the simulations carried out by Captain Hibberdine and expressed particular concern that not one of these simulations followed a run that resulted in a tanker mooring bow out.

When questioned by Mr Cameron he was referred to the evidence of Mr Shaw concerning the latter's experience with pressure waves from a passing vessel while moored in Doubtful Sound. Mr Rees said he had experienced such waves, more particularly in river berths and he recalled an incident when moored alongside a river berth in the United States. On that occasion a loaded vessel passed up the river causing the moored vessel to list between 5 and 10 degrees towards the centre of the river. This caused the majority of the mooring lines to break leaving the vessel attached by two discharge posts. This was caused by the vessel passing through the water having to displace its own mass and then the water having to recombine after the ship had passed. If this were to occur to a sea kayak the effect would be negligible in the body of Doubtful Sound but if the sea kayaker was close to the shore or rock walls of the Sound then that person could be violently pushed against the rock wall or the shore. If the kayaker was aware of such a phenomenon the effects could be lessened by paddling out to

meet the mass of water. If unaware the kayaker could be in considerable difficulty.

He was also asked some questions about the location of the ballast points in a tanker of the kind likely to be used by the appellant such as the "Stolt Aquamarine" which the witness had obtained some knowledge about from Lloyds Register of Shipping. These are normally immediately adjacent to the pump room on both the port and starboard sides in an area called the "sea chests". These sea chests can be used either for taking on or discharging ballast water. Assuming the loading of the export water and the discharge of ballast water would be carried out simultaneously - an agreed fact - he was then asked at what depth below the surface of the water the ballast water would be discharged. He said that at the start of loading the sea chest would be approximately 5 metres below the water level and towards the end of loading it would be approximately 8-9 metres below the water line. But this would depend on the particular vessel. Assuming a 40,000 dwt vessel with a length of 180-200 metres and a standard configuration the depths just stated would be approximately correct.

Mr Rees confirmed that he was familiar with the process of exchanging ballast water at sea and this led to some interesting evidence about how a purported exchange could be fabricated for the benefit of officials at the next port of call. We will not go into the detail of this evidence. It is sufficient for our purposes to record to do this it would be necessary to falsify all the ship's logs.

Mr Rees also gave us a very useful description of the way a mid-ocean exchange of ballast water can be carried out. In circumstances where it is not desirable to pump out a ballast tank completely in order to refill with clean ballast water, the procedure is to overflow the ballast tank by opening the hatch cover on the top of the tank and pumping fresh ballast water into the tank. It will be recalled that this procedure was discussed with Dr Hay when he gave his evidence. Mr Rees

went on to say that this procedure does not require a ship to alter speed and it can be done at full speed. It would take approximately three days.

In cross-examination by Mr Milligan, Mr Rees said he was now satisfied about the positioning of the proposed SALM mooring so far as seabed slope is concerned. It should pose no problem.

The appellant also called Captain G T Nicol to whom we referred earlier. He is Manager, Safety Services, Maritime Operations Division of the Maritime Safety Authority.

Captain Nicol confirmed that Doubtful Sound and Thompson Sound are harbours by virtue of a gazette notice published on 14 June 1976. They are part of Fiordland harbour which comprises 11 separate and defined harbours in the Fiordland area. The Southland Regional Council has not exercised its power under section 7(a) of the Harbours Act 1950 in relation to any of the Fiordland harbours and on 30 September 1991 the then General Manager of the Maritime Transport Division gazetted Captain Nicol's appointment as Harbourmaster for Fiordland harbour.

As a consequence a wide range of powers exist in relation to Doubtful Sound. For example operations within the Sound are subject to the provisions of the General Harbour, (Nautical and Miscellaneous) Regulations 1968. Regulation 50 empowers a Harbourmaster to take steps to prevent risk or accident or to prevent overcrowding or confusion in the harbour under his control and to give directions regulating the position, mooring, unmooring, placing, removing, security or unsecuring of any vessel. Effectively the Harbourmaster is able to control the use of any mooring within the harbour.

In the case of the appellant's proposal the Maritime Safety Authority would concern itself with the sufficiency of any moorings which are laid pursuant to any resource consents granted in terms of design and construction and in terms of day to day use Should the proposal proceed this and other matters relating to the safety of navigation within the harbour will be controlled on a day to day basis by the appointed harbourmaster. Regardless of whether or not the control of Doubtful Sound and Thompson Sound remains within the Maritime Safety Authority, section 49 of the Harbours Act 1950 requires that a full time harbourmaster of any harbour hold a Certificate of Competency as the Master of a foreign going ship.

Captain Nicol said it was premature to consider what conditions if any might be appropriate to control shipping movements in the interests of maritime safety in Deep Cove. If the present proposal were to proceed he would require a detailed feasibility study to be completed. He would then consider with the appropriate officers of the Maritime Safety Authority, the appropriate conditions and if necessary seek independent expert advice.

If the appellant proceeds it is unlikely Captain Nicol would exercise direct control over operations in Doubtful Sound. It is more likely that a Deputy Harbourmaster would be appointed, probably a person with the appropriate qualifications and specific experience in Fiordland.

Captain Nicol said that general cargo vessels are inspected on first arrival in New Zealand and thereafter at six monthly intervals. This can be more often if deficiencies are reported by other authorities. So far as water tankers are concerned it has not yet been established what regularity of inspection would be required. Six monthly inspection would be the absolute minimum and inspections may be more regular depending upon circumstances as they develop.

Deep Cove is within the geographical region covered by the Maritime Safety Inspector stationed at Invercargill.

In the context of the present case Captain Nicol went on to say that the powers of a harbourmaster of Fiordland harbour would extend to determining whether pilots and tug assistance would be required. He envisaged that pilots would be required in all cases and it is likely that tugs would be required to assist vessels when mooring and leaving the moorings. Navigation lights may be required in Doubtful Sound after the pattern of ship movements becomes apparent. If pilotage occurred exclusively in daylight hours there may be no need for lights to be reintroduced. Apparently there were navigation lights in Doubtful Sound during the construction phase of the Manapouri power scheme.

Captain Nicol was cross-examined at some length by Mr Slowley, Mr Ibbotson and Mr Cameron on a variety of matters. It is apparent to us that some of these are matters of day to day administration and control such as the protocol to be followed for allowing water tankers to enter Doubtful Sound but a number of them also have ramifications so far as effects on the environment are concerned.

So, for example it became reasonably clear to us in the course of this cross-examination that for tankers of 40,000 dwt Captain Nicol would expect tug assistance to be available for mooring in Deep Cove and he would also expect a minimum of two tugs each of 30 tonne bollard pull. He was also of the view that it would take some 2-3 days for tugs to reach Doubtful Sound from Bluff in adverse weather conditions. This was in contrast to Hibberdine who thought that tugs could make this journey in about 12 hours.

Captain Nicol was also clearly of the view that a pilot would be required.

He explained to us the kinds of hazards that he thought would need to be considered in this environment. He pointed out that the Sounds are extremely deep and manoeuvrability of larger vessels is difficult in enclosed waters because anchors cannot be used if there are mechanical failures. It was again his view that a tanker of the size here proposed would probably need to be accompanied by a tug or tugs throughout the length of its journey to Deep Cove.

Captain Nicol was also asked a number of questions about radar and satellite navigation systems and their effectiveness in this environment. He was also questioned on radio communications with a view to establishing whether a permanent ground station would be required, no doubt for the reason that if it were it would be opposed by the Minister of Conservation because it would be located in the National Park. However these were relatively minor matters by comparison with those that we regard as being of critical importance from the point of view of the environmental effects, namely the potential for a tanker to get into difficulties either when transiting Doubtful Sound or more particularly when mooring and leaving the moorings Deep Cove.

On these matters we have to say our impression was that Captain Nicol was being extremely cautious, no doubt properly so from his point of view, because as he pointed out on more than one occasion there are no port facilities in Deep Cove at the present time and yet what is here proposed by the appellant is regular visits by commercial shipping in circumstances where facilities such as the provision of a pilot, tugs, appropriate navigational aids, and equipment to cope with oil spills are all taken for granted in the regular port situation.

In addition there were questions raised about whether port state inspections might or could be carried out in Deep Cove and we gathered that Captain Nicol did not favour such a procedure.

On the matter of ballast water the appellant also called evidence from Mr J L Burton who is Regional Business Manager in the Quarantine and Outbreak Response Division of the Ministry of Agriculture.

Mr Burton said that Doubtful Sound is not presently nominated as a port of entry. Accordingly and in the absence of special arrangements, overseas ships bound for Doubtful Sound will have to clear at some other port. The nearest nominated port of entry to Doubtful Sound is Bluff. From time to time passenger vessels are cleared at Milford Sound. When this is done the appropriate New Zealand officials are flown to the last port of departure and conduct their investigations and give the appropriate clearances during the voyage to New Zealand. There is no reason in principle why this could not be done in the case of Doubtful Sound. Whether it is done is a matter which may have to be determined in the future. In this context Mr Burton was of course talking about clearing ships for matters of concern to the Ministry of Agriculture such as food from foreign high risk areas being sealed, garbage not containing diseases and matters of that kind.

More specifically on ballast water Mr Burton said there are no mandatory controls administered by the Ministry of Agriculture relating to the discharge of ballast water in New Zealand. For many years ships have travelled to New Zealand in ballast and of necessity have discharged this water some time before or upon entering a port. In his experience it is not at all uncommon for some part of the ballast water discharge to take place outside the port of entry or loading. That is to say at various places around the New Zealand coast.

He went on to say that it is not at all clear that the discharge of ballast water is posing or has posed a significant threat to the marine environment. He understands there is ongoing research about this. He said too that currently there is a practice of ocean exchange of ballast water which has been accepted voluntarily by ship owners and Masters. He does not know whether this is in

existence throughout the world but it certainly applies to Australian and New Zealand waters.

In New Zealand, Masters are asked to complete a vessel ballast report form and in it to provide details of the transfers that have occurred. At the same time as this is handed to a Ministry of Agriculture official, that person has available the ship's log and can also inspect the engineering log. These provide confirmation of the matters contained in the Master's certificate. It is possible therefore to establish when and where ballast water exchange has occurred.

Ballast water sampling does not take place as an additional confirmatory measure. Mr Burton said that sampling has occurred for the purposes of analysis as was discussed by Dr Hay but it is not a routine procedure.

On the affects of discharge of ballast water and in particular the introduction of foreign organisms Mr Burton was cross-examined by Mr Cameron but his knowledge was really confined to what he had read in the reports of others and in the end he said that so far as the efficacy of mid-ocean ballast transfers are concerned he would defer to Dr Hay on this issue. His knowledge and expertise is more to do with operational requirements.

When asked about the voluntary nature of the present reporting system Mr Burton said that although there is no detailed auditing of the documentation provided by ships' Masters, of some 10,000 records 95% were filled in correctly and the Ministry of Agriculture has no reason to believe that Masters have fraudulently filled them in. Mr Burton said that Masters are not interrogated but if checks of the logs are consistent with the information provided in the forms this is accepted on its face value unless there is some good reason for thinking otherwise.

Mr Burton also explained that before a commercial port can operate it has to be designated by the Director General of Agriculture and before this can happen certain things have to take place and if they do not take place then the recommendation is that the port not be designated as a port of arrival for overseas vessels. If this is the case then vessels cannot arrive at that particular place. From time to time passenger vessels are allowed to cruise through Milford Sound direct from Australia on the understanding that a quarantine officer is on board the vessel to ensure that refuse controls and passenger landings controls are in place. If these special arrangements are not made then cruise ships are not allowed to come direct to Milford Sound but first have to go to a designated port such as Bluff.

Considering the proposed tankers in this case, Mr Burton said that if Deep Cove were a designated port then the tankers would be met by a quarantine officer on arrival. If this was not the arrangement, then the tankers would have to go to a port of entry. Again addressing the proposed tankers Mr Burton said that he would expect that the Master of such a vessel would enter into the normal voluntary control method so far as ballast water is concerned, that is to say mid ocean exchange and completion of the form on arrival. The Ministry of Agriculture has no special arrangements in mind should Deep Cove become the place of operation of these tankers.

Mr Burton also told us that a tanker would not be able to enter Doubtful Sound, take on its cargo and leave New Zealand waters without the Ministry of Agriculture knowing about it. There is an unofficial network of people around the New Zealand coast who are on watch for this sort of thing. At the present time the Ministry hears about yachts coming in to different parts of the Sounds and if a tanker did enter Doubtful Sound in this way it would be directed to a designated port.

On navigation and safety of vessels in Doubtful Sound the appellant also called evidence from Mr G.E. Brasell who was a well known identity in this area during the construction of the Manapouri power scheme. He owned and operated a vessel called "Miss Akaroa" which was used to assist in berthing the "Wanganella" in Deep Cove where it was used as a hostel ship for workers. The "Wanganella" was a passenger vessel of some 10,000 tonnes. Mr Brasell told us the "Wanganella" arrived in Doubtful Sound before there were any facilities for mooring. She was brought through the entrance without a pilot although one was put on board about halfway down the Sound. She was initially anchored in the Sound but after steel ring bolts had been fastened to the shore these were used to secure her stern. Later the "Wanganella" was moved close in and secured bow and stern. This took several months to accomplish and during that time the only connection between the "Wanganella" and the shore was the "Miss Akaroa".

During the construction of the power scheme there were a variety of vessels in Deep Cove. These ranged in size from 12,000 to about 22,000 tonnes. Deep Cove would have been visited about once a month by a fuel tanker of some 20,000 tonnes.

In cross-examination Mr Brasell was asked about a passage in a book of which he is the author called "Blokes and Boats". The passage describes difficulties that were incurred with a tanker in Deep Cove. Mr Brasell said this occurred because the harbourmaster was not experienced. There was in fact no danger. If it had not proved possible to bring the tanker ahead again it would have drifted onto a shingle bank near the Lyvia River. He would not agree with Mr Ibbotson that this incident should serve as a warning that even in fine weather human error can lead to a ship getting into difficulty.

Mr Brasell made his own views on this whole matter perfectly plain when near the end of his evidence-in-chief he said this:

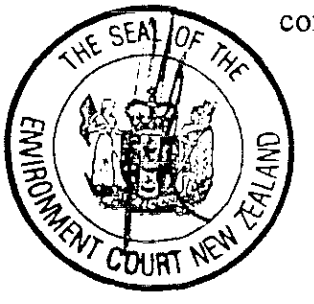
> *"I consider it to be a crime against humanity that freshwater (I understand to be the purest in the world) has not been taken from Deep Cove before the present time. I consider that the impact of the proposed operation is insignificant in comparison with the development that has taken place and from which the area has recovered remarkably well."*

Here he was referring to the Manapouri power scheme.

Mr G.R. Comerford who is a director of the appellant company and a keen recreational sailor also gave evidence about his observations of boating activities in Deep Cove, but in the end we did not find this evidence to be of any particular value in resolving the issues raised by this aspect of the case.

On oil spills, Mr D.M. Bradley, who is currently planning manager for the Regional Council and in that capacity has responsibilities for coastal, natural, hazard, and marine oil spill planning told us that while the risk of a shipping incident leading to an oil spill could be described as low, it is not as low as in more accessible ports where there is a greater degree of backup, access to support, and widely shared knowledge of local conditions.

A significant oil spill from the rupture of one fuel tank containing heavy fuel oil would, apart from direct impacts on wildlife and naturalness, seriously compromise the pristine character and reputation of the Doubtful Sound area. Depending on the characteristics of the fuel oil itself, any cleanup response would only partially mitigate these effects. It was his opinion that the outcome of an oil spill in Doubtful Sound is such that unless there are very significant positive effects arising from the proposed activity, avoidance should be considered before mitigation.



The major equipment for an oil spill around the Southland coast is stored at Bluff on the reasonable assumption that a spill is more likely at this commercial port than anywhere else. There is oil spill equipment at Manapouri in case there is a spill of diesel and transformer oil on Lake Manapouri or in Deep Cove. This equipment is stored by ECNZ. In the judgment of this witness it would not be capable of dealing with spills in anything but very sheltered waters. It would be a significant logistical exercise to have equipment transported from Bluff to Doubtful Sound.

In cross-examination Mr Bradley said the equipment at Bluff is intended to cope with oil spills within the capability of a regional response, but if any spill was beyond that, assistance would be requested from other regions or the National Oil Spill Service Centre in Auckland. The equipment is not there simply to cope with transfer spills in the harbour. However, he also agreed with Mr Milligan that if a ship foundered on the coast at Bluff the capacity to respond would be limited in the same way as it would be at Deep Cove for the same reasons. He said in fact it would probably be worse.

Dr K.A. Rose is a veterinarian who is currently the manager of the NZ Wildlife Rehabilitation Trust. This Trust has been contracted by the Maritime Safety Authority to provide an effective response to wildlife affected by marine oil spills in New Zealand. Dr Rose who was called as a witness by the Director-General of Conservation gave us a good deal of detailed evidence about oil spills worldwide and New Zealand in particular. She also told us about the effects of oil on birds and their eggs, and on dolphins and seals.

She went on to say that if a marine accident occurred as a result of the appellant's activities in Doubtful Sound the product spilled would most likely be bunker C oil. This is one of the most dense oils. Gas oils, hydraulic oils and lubricating oils are found in smaller quantities but may also contaminate the environment.

Nearly all marine and coastal wildlife species of Doubtful Sound, Thompson Sound and Deep Cove have the potential to be affected by a spill even a small localised spill. The effects on colonies of breeding species and geographically restricted or threatened species, could be catastrophic.

There are resident populations of penguins and shags that have feeding and behavioural patterns that place them at risk of becoming affected by an oil spill in Doubtful Sound. One of the most significant breeding colonies of Fiordland crested penguin is, as we have already said earlier, on the islands at the entrance to Doubtful Sound. Other animals that could be affected are ducks, gulls, terns, kingfishers, heron and oystercatchers if the oil reaches the foreshore. Also the geographically restricted fiordland skink and a fur seal colony on Nee Island could be affected.

The effects on the resident bottlenose dolphins and the dusky dolphin are uncertain. There is no evidence that dolphins avoid an oil slick simply because experience has shown them to detect slicks. Exposure to bunker C oil may cause skin and eye irritation and possible irritation and obstruction of the blowhole.

While much of this witness' evidence came from published material outside her particular expertise, and this was clearly demonstrated when she was cross-examined, it did help us to put the matter of oil spills and their consequences into some kind of perspective so far as potential effects are concerned.

The risk of an oil spill was also a matter to which Dr Rose referred based again on risk analysis work done by others, and she agreed that the risk depends on the frequency of the type of vessel transporting oil around the New Zealand coastline, the number of shipping events and the volume and type of oil being carried. In this study, which was commissioned by the Ministry of Transport, it is suggested that cargo vessels contribute up to 39% of what is classed as a sub-

catastrophic oil spill, that is to say in excess of 7,400 tonnes of oil. The study found that out of 24 possible sections of New Zealand coastline Fiordland received the fourth greatest oil spill probability index despite the low vessel traffic density. She also agreed that there is potential for oil spills when cruise ships enter Doubtful Sound.

Conclusion

The scientists with relevant expertise seemed to be agreed that to the extent that the marine communities in Fiordland do not occur elsewhere in the world this is a globally unique area of which Doubtful Sound and Thompson Sound are important examples. This is true for both the inter-tidal and underwater communities.

Where they differ, and here we are referring particularly to the differences between Dr Grange and Dr Hay is in the likelihood that the appellant's proposal will put these fragile communities at risk. In considering these matters we also include the important marine mammal communities described by Mr Cox.

The risks, if there are any, arise basically from two sources - oil spills and ballast water. There is also a risk to humans from pressure waves and we will refer to this again later.

Returning to oil spills, for such an event to arise from the appellant's activities a tanker would have to founder. It is to be remembered that these are not oil tankers so there are no risks from loss of cargo. If there were an oil spill the principal source of pollution would be the tankers' fuel oil known as bunker C oil. A 40,000 dwt tanker transiting Doubtful Sound or Thompson Sound could be carrying several thousand tonnes of fuel oil -

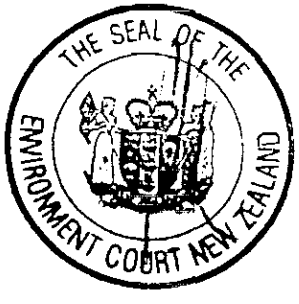
Captain Hibberdine thought between 2,000 and 3,000 tonnes. He also thought that not all of this would spill into the sea because it is carried in several tanks. However the important point is that if such a tanker were to run aground in either of these Sounds a fuel tank or tanks could be breached and a significant oil spill could result.

In our judgment this would have a high adverse impact on the ecology of this area, notwithstanding Dr Grange's reservation about how deep the effects of an oil spill might go. Realistically, there is little prospect of effective mitigation being readily available and there are significant marine mammal and inter-tidal communities in particular that could be devastated by such an event.

The more challenging question for us is the likelihood of such an event occurring. Again in the context of the appellant's proposed activities this could only occur when a tanker was transiting the Sounds to or from Deep Cove; when mooring at Deep Cove; or while moored at Deep Cove.

On the safety of tankers transiting the Sounds and mooring at Deep Cove the appellant has relied, in particular, on the evidence of Captain Hibberdine. On the safety of the moorings it has relied, in particular, on the evidence of Mr Teear.

Notwithstanding some reservations expressed by Mr Davis about the preliminary design work done by Mr Teear, we accept the latter's evidence that the moorings can be safely constructed in Deep Cove and will be adequate for tankers up to 40,000 dwt. Mr Teear agreed that before the final design further investigation would have to be done. He also stressed that before the moorings are used by a tanker they will be tested on site and



certified by an appropriate classification society. The Maritime Safety Authority will also be involved in this process.

For these reasons we think the likelihood of a tanker breaking free from its moorings is so remote that we need not consider such an event any further. We turn now to transiting and mooring.

On the former it was Captain Hibberdine's opinion that there would be no difficulties bringing a tanker in and out of Doubtful Sound or Thompson Sound and he stressed, on several occasions, that if weather conditions were judged to be too adverse the prudent thing for a Master to do would be to wait in the open sea until conditions improved. We have no doubt this is sound advice from an experienced Master mariner.

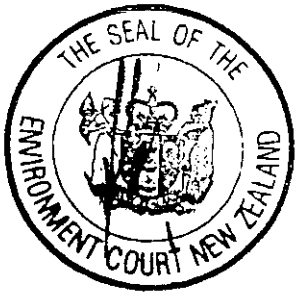
Nevertheless we have reservations about tankers transiting these waters. As Captain Nicol pointed out they are deep and confined waters and if a tanker were to lose power or steerage there is nowhere to anchor. It was for this reason that he was of the opinion that a tug or tugs would be needed to accompany a tanker throughout its journey to Deep Cove. We will refer to tugs again shortly.

We bear in mind that Captain Nicol also said that a pilot would be required, and as we understood the evidence, the pilot would probably be a deputy harbourmaster, and a person with knowledge of this area. Nonetheless, as the evidence of several witnesses demonstrated, and here we refer to Mr Brasell, the cross-examination of Captain Hibberdine and the evidence of Dr Rose, accidents do occur even in circumstances where it might be thought that all necessary precautions have been taken. Also, as the incident involving the ferry "Aratika" demonstrated, ships' officers are not always aware of changing weather conditions. The transiting of Doubtful Sound or

Thompson Sound is likely to take 3-4 hours, or possibly longer as Captain Hibberdine indicated initially, and during this time weather conditions could change for the worse. Beyond Thompson Sound an inbound tanker has nowhere to go but Deep Cove. In other words it cannot safely return to sea.

We suppose that with the assistance of tugs, the presence of a qualified and experienced pilot, and given the normal responsibilities of a Master for the safety of his ship, the likelihood of a tanker foundering during transiting is very low. Indeed, we are prepared to so conclude but we are not prepared to say it is so remote that it can be put to one side altogether. We bear in mind too that these vessels would be under charter. They would be engaged in a commercial activity that could be quite demanding in terms of schedules and unlike normal commercial shipping which uses ports that have been properly assessed and planned for the purpose, these vessels would be using waters that at least to date have not been assessed. This was another matter referred to by Captain Nicol, who as we commented earlier, we thought was taking a very cautious approach to this whole proposal.

On the mooring of the tankers we have to say we were surprised that Captain Hibberdine's simulations were carried out using a tug with a 10 tonne bollard pull when the Captain himself told us in evidence he would have preferred a larger tug. There is also some force in the criticisms made of the simulations in so far as a katabatic wind event was not simulated and a 180 degree turn before mooring was also not simulated. It seems clear to us that the preferred mooring position is bow out and the fact that all Captain Hibberdine's simulations resulted in moorings bow in has left us with considerable doubt about the weight we should give to the results of these simulations.



Indeed, it is our view, on the whole of the evidence on this topic, that it is when mooring and possibly leaving the moorings if it then has to make a 180 degree turn, that a tanker would be at its most vulnerable to mishaps. Once again the evidence of Captain Nicol is important. He stated quite clearly that two tugs would be required for tankers of 40,000 dwt and the provision of two tugs is not part of the appellant's proposal.

It is also clear from Captain Hibberdine's evidence that as well as at least one tug, there needs to be another vessel known as a line vessel which we suppose could be a relatively small vessel but this too would have to be in addition to the support vessel if it were to be used as one of the tugs.

The other problem about tugs is that the nearest tugs of appropriate size are stationed at Bluff and, depending on weather conditions, they could take two or three days to reach Doubtful Sound. If the schedule of tanker visits were to be one each week as proposed, this creates obvious logistical problems for the provision of two tugs unless they are permanently stationed in Deep Cove and again this is not part of the appellant's proposal.

For these reasons we have considerable reservations about the safety of the tankers when mooring or leaving Deep Cove. We think the probability of a tanker foundering during these manoeuvres is not high but it certainly cannot be discounted.

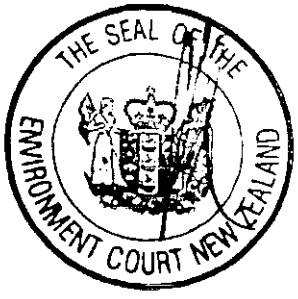
We will now consider the potential adverse effects of a discharge of ballast water in Deep Cove which is the only place, as we understand the evidence, where ballast water will be discharged in the course of the appellant's operations within New Zealand waters.

There is a high probability that foreign ballast water, particularly if it were taken on in the port of origin, would contain organisms that would be harmful to the marine ecology of Doubtful Sound and Thompson Sound.

However it was Dr Grange's opinion that the likelihood of harm occurring is no greater than it would be at any other port in New Zealand. He was also of the opinion that many organisms would not survive long enough in the waters of Deep Cove to pose a threat to the existing marine ecology. This was because, as he understood it, they would be discharged into the freshwater layer and would die before they reached the saline layer.

On the other hand, Dr Hay took a somewhat different view. He thought because ballast water can be discharged quite quickly the likelihood is that foreign organisms would survive and reach the saline layer. This was confirmed to some extent by the evidence of Mr Rees who told us that ballast water from a tanker of the kind here proposed would be discharged from the sea chests which would be at a depth of 5 metres at the beginning of the discharge and approximately 8-9 metres at the end of the discharge which as we understand it would probably be below the freshwater layer.Then too Dr Hay said that experiments have shown that some species can survive in low salinity situations for longer than Dr Grange thought and could therefore spread and grow in other parts of the Sounds

However, whether foreign organisms would be discharged into Deep Cove depends on another factor, namely whether there has been an effective mid-ocean exchange of ballast water before the foreign vessel arrives at its port of entry in New Zealand.



Dr Hay thought mid-ocean exchanges are not fully effective and all the testing he has done on ballast water certified as having been exchanged, tends

to show he is right. However Mr Rees said that exchanging the water five or six times over a period of three days can result in a virtually complete exchange, and Dr Hay accepted that if this took place (and we remind ourselves that he had never heard of it before), this would all but eliminate foreign organisms of the kind that are of concern here.

Mr Burton satisfied us that a foreign tanker could not enter Deep Cove, take on its cargo and leave New Zealand waters without his Department knowing about it. This means that unless Deep Cove were to become a port of entry which is most unlikely, tankers would have to visit a designated port of entry where the Masters would be subject to the voluntary process described by him. Mr Rees satisfied us that the chances of false reporting are very low indeed because to falsely certify there has been an exchange of ballast water involves having to falsify the ship's logs.

In addition we take into account that the appellant has offered to accept a condition that its charter party contracts will require mid-ocean exchanges of ballast water.

If everything were to go according to plan with every tanker on every voyage, the chances of a discharge of foreign organisms would ,in our opinion, be very low indeed. But here we are considering a proposal to bring tankers into these Sounds on a regular basis, up to 52 each year, and to reach that state of low probability, on the evidence we have, every tanker would have to exchange its ballast water of origin five or six times, which according to Dr Hay's sampling to date has not been done, and these exchanges would have to be completely successful.

Accepting in favour of the appellant, that mid-ocean exchanges can be required at least by contract and that they will occur, there remains a

possibility that they will not be completely successful and even if they were there is also the possibilty again mentioned by Dr Hay, of organisms being transported on a tanker's hull.For these reasons we think there is still a risk that the presence of tankers in Doubtful Sound and Deep Cove could give rise to unwanted foreign organisms, which could survive and spread into the Sounds. This is a small risk but again we are unable to say it can be discounted altogether.

Finally, on the effects of pressure waves we accept the evidence of Mr Shaw and Mr Rees that there is the possibility of a potentially dangerous situation arising from these.

Consideration of Resource Management Assessments

In an earlier section of this decision we referred to the relevant statutory instruments and summarised the relevant provisions of each. Two witnesses, Mr D.R. Anderson and Mr D.M. Bradley, both of whom we have already referred to, provided us with their assessments of the appellant's proposal having regard to these statutory provisions and, more particularly in the case of Mr Anderson, the relevant provisions of the Act with particular reference to Part II and section 104.

Another witness, Mr K.N. Murray, who is a scientist by qualification, and a senior planner with the Southland Conservancy was called by the Director-General of Conservation to give an overview of port investigations he is familiar with. He described the support services required to operate the appellant's proposed facility, outlined the role of the statutory agencies and their requirements to access vessels; and discussed the planning implications of the appellant's proposal with regard to the New Zealand coastal policy statement.

However, with respect to Mr Murray, and bearing in mind that much of what he had to say had already been referred to by other witnesses with particular expertise in the various topics relating to port facilities and the statutory agencies involved we prefer ,in this section of our decision, to consider the contrasting opinions expressed by Mr Anderson and Mr Bradley.

Mr Anderson's evidence -in-chief is lengthy and detailed as was his cross-examination. He began by recording his general conclusions. He assessed that the proposed pipeline and the moorings would be benign and have little effect on the environment. He also assessed that tankers at berth would create some loss of amenity value for those using the hostel but this would be short term and the infrequency of tanker visits would mitigate this loss while allowing what he described as a "wasted" resource to be made available to the wider community. The resource to which he was referring was of course the freshwater resource from the Manapouri tailrace.

Mr Anderson acknowledged that the appellant's proposal requires a balance to be struck between the effects on those using the hostel at Deep Cove and the benefits to the recipients of the exported water. He also assessed that the taking of the water itself would be of no consequence. So far as the discharge of ballast water was concerned he took the view that this was a matter that required management and was properly within the control of the Ministry of Agriculture. He also took the view that the passage of the tankers within Doubtful Sound was likewise a matter of administration and properly within the control of the Maritime Safety Authority.

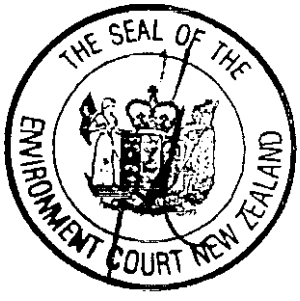
On the natural character of the coastal environment it was Mr Anderson's opinion that so far as Deep Cove is concerned this has already been compromised by existing development. He also referred to Deep Cove as being part of a gateway to Doubtful Sound. We have already discussed this concept under an

earlier heading, Tourism and Recreation, where we referred to Mr Anderson's evidence about the mitigating effect of limiting the number of tanker visits. In that section we concluded that the tanker visits would have an impact on the perception of Deep Cove and Doubtful Sound as a remote wilderness area and that none of the witnesses with expertise in tourism were prepared to say that this was a positive effect.

This was an important conclusion so far as Mr Anderson's evidence is concerned because his assessment of the effects of tanker visits to Deep Cove is really fundamental to his conclusion that by reference to the relevant provisions of the statutory instruments that we have summarised earlier, and as well as the relevant provisions of Part II of the Act the appellant's proposal can be supported.

On Part II matters Mr Anderson saw the proposal as enabling people in the wider community, by which we understood him to be referring to communities beyond New Zealand who might be the recipients of the exported freshwater, to make provision for their wellbeing while at the same time any potential adverse effects of the activities would be adequately mitigated. For the reasons already discussed, he saw little effect on the natural character of the coastal environment and indeed it was his opinion that in terms of both section 6(a) of the Act and the National Coastal Policy Statement the appellant's proposal was an appropriate development in Deep Cove. It also represented an efficient use of a resource and he did not think there were any Maori values that were likely to be compromised or adversely affected.

For these reasons it was Mr Anderson's opinion that the appellant's proposal would promote the sustainable management of natural and physical resources and therefore accord with the purpose of the Act.



He pointed out too that Deep Cove was not specifically recognised in any statutory instrument as having any international scientific importance whereas there are some features that are so recognised, particularly in the proposed Regional Coastal Plan. However, in cross-examination it was made clear that these identifications are for specific scientific purposes. We do not understand any of those opposing the appellant's proposal to be asserting that Deep Cove contains some special scientific value on either a national or international scale. Rather we understand them to be saying that it is part of a waterway that as a whole comprises an intertidal and underwater ecosystem that is globally unique.

Mr Anderson also pointed out that Deep Cove is recognised as a port in the proposed Regional Policy Statement and in the National Park Management Plan but of course recognition is limited to specific activities such as providing slip, fuelling and wharf facilities for fishing vessels and wharf facilities for tourist vessels. It is also to be remembered that the Fiordland National Park Management Plan 1991 in particular makes it clear that the available area of Deep Cove for these purposes is fully occupied and there is no intention to extend. The proposed Regional Coastal Plan also identifies the potential impacts of exporting water from Deep Cove as a resource management issue as does the National Park Management Plan.

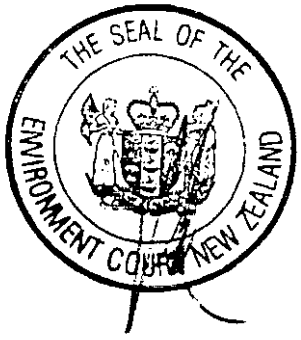
On the proposed Regional Coastal Plan Mr Anderson was critical of the approach taken in the Plan to seek to prohibit foreign vessels from Deep Cove. He said this was the bluntest tool available under the Act because once the Plan is operative, effectively it would exclude access to the Manapouri tailrace water. He went on to say that it appeared to him that the relevant objectives and policies of the proposed Plan that led to this prohibition followed the concerns expressed by the respondent in its decision on the appellant's application. It was Mr Anderson's opinion that the proposed Plan fails to provide the required integrated

management so that the natural water resource could be harvested for the wellbeing of the wider community.

For these reasons he believed that less weight should be placed on the method adopted for controlling activities in Deep Cove than might otherwise be the case. At the same time he accepted that the proposed Plan is concerned with handling development in Fiordland with care and its recognition that tourism in Fiordland via Milford Sound and Deep Cove is very important to the economic wellbeing of the area and the region, and to a lesser extent, to New Zealand as a whole. It was also his view that many of the objectives and policies in Part 4 of the proposed Plan largely restate the purpose of the Act, the matters of national importance in section 6, the matters to which particular regard is to be had in section 7 or a combination of all three, and therefore did not require specific consideration because he had already had regard to the purpose and relevant principles in Part II of the Act.

Mr Anderson went on to address several of the rules which would provide for constraints, or as we have already said, in one instance a prohibition on the appellant's proposed activities. He concluded that the taking of the freshwater would be a discretionary activity as would the occupation of the coastal marine area and the construction of the moorings. As we have already said, the use of Deep Cove by foreign vessels would be prohibited, but he regarded it as a legal issue as to what effect the prohibition would have over the procedures of the Ministry of Agriculture and the Maritime Safety Authority.

Mr Bradley was of the opinion that such development as there was in Deep Cove, which he regarded as minor in the context of the Cove as a whole, is consistent with its use as a tourist embarkation point, a coastal fishing base and an outdoor education centre. In his opinion the appellant's proposal is not an appropriate use or development in this environment.

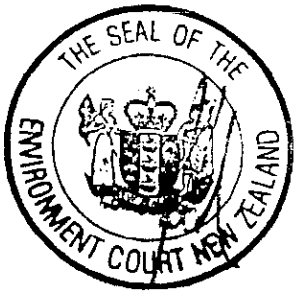


He disagreed with Mr Anderson's assessment in this regard. He accepted that the Manapouri tailrace construction has had some adverse effects on the natural character but in his opinion these have to a large extent been remedied. The operation of the tailrace and the introduction of large volumes of additional freshwater may have had adverse effects on the pre scheme state of Doubtful Sound. However the change brought about by the additional freshwater is now largely accepted and viewed as a new equilibrium.

Much of the wharf construction is minor and associated with infrequent low impact activity. The Wilmot Pass Road does not compromise the natural character of Deep Cove but its presence does lead to a level of activity greater than is found in most other sounds. This level and scale of activity is such that while the natural character, landscape and amenities values have undoubtedly been compromised, these values remain in Deep Cove and Doubtful Sound at levels where elsewhere they would be valued very highly. They are in the opinion of this witness at least, nationally and probably internationally significant.

Mr Bradley said he agreed with the assessment of high natural character rating made by Mr Petrie, a witness to whom we referred earlier. He went on to say that vegetation has covered much of the scars created by the former hydro development. The structures at Deep Cove are relatively small and of a scale that is appropriate to one of the principal entrances to the fiord area and the type of experience to be enjoyed by tourists. He emphasised that such development as there is at Deep Cove is nowhere near as sophisticated as that at Milford Sound, nor does Deep Cove cater for the same number of tourists.

Mr Bradley also said that in his opinion the sustainable future of this area lies principally in the careful management of the tourism, recreation, education, and

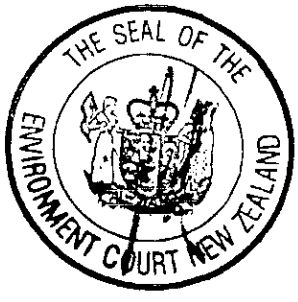


fishing activities in a manner that protects the values of the area. Other activities may also be appropriate but only if they have minor adverse effects on these values.

For the foregoing reasons he saw the appellant's proposal as being inconsistent with Principle 2 and policies 1.1.1 and 1.1.3 in the New Zealand Coastal Policy Statement. That is to say that it is not appropriate development in Deep Cove and does not assist in preserving the natural character of that coastal environment. Nor does it protect the collective characteristics that give the coastal environment its natural character, including wild and scenic areas.

Again in contrast to Mr Anderson, Mr Bradley was of the opinion that while tourism, education and recreation are dependent on the use of the natural and physical resources of the coastal environment it is difficult to see what importance the export of water has for the social, economic and cultural wellbeing of any relevant community. Consequently the appellant's proposal is not in accord with Principle 1 of the New Zealand Coastal Policy Statement.

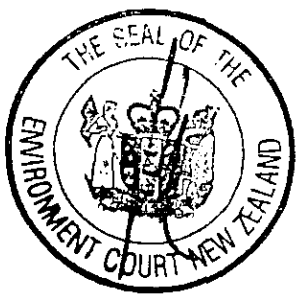
It was Mr Bradley's opinion that there was nothing in the Transitional Southland Coastal Plan that is of particular significance so far as the appellant's proposal concerned, but there are objectives in the Transitional Regional Plan such as the ones to which we have already referred that do have some relevance, and there are also provisions in the proposed Regional Policy Statement, again to which we have already referred that also have relevance. Mr Bradley then referred at some length to the proposed Regional Coastal Plan, highlighting various provisions already referred to by us earlier.



At the end of his evidence Mr Bradley summarised his assessments in a series of propositions. He said he found it difficult to envisage many positive effects arising out of the appellant's proposal, especially positive effects for the local community, the region, New Zealand and visitors. On the other hand he could envisage very significant actual adverse effects on the natural character, landscape and amenity values of Doubtful Sound and Deep Cove from the movement and presence and operation of vessels associated with the proposal.

He said that he envisaged potential adverse effects of low probability which could have high potential adverse impacts on Deep Cove and/or Doubtful Sound. It was his opinion that the applicant's proposal was contrary to the relevant objectives and policies of the proposed Regional Policy Statement and the proposed Regional Coastal Plan. He believed that the applicant's proposal would not maintain or enhance the quality of Doubtful Sound or Deep Cove. He believed also that the appellant's proposal would represent a large step towards changing the essential character of Deep Cove from a place that is very special to just another port, albeit in very natural surroundings. In doing so the values of the natural environment that are rare, becoming more scarce and are rated very highly, would be substituted by an economic value for which alternatives exist. Finally he did not believe that the applicant's proposal is an appropriate development in this part of the coastal marine area in the Southland region.

In cross-examination Mr Bradley was asked whether he thought policy 1.1.3 in the National Coastal Policy Statement should be read as precluding the presence of tankers taking water in accordance with the appellant's proposal and he said that the policy added weight to the conclusion that such vessels should be precluded. He also acknowledged that in the transitional Regional Planning Scheme the bulk export of water from Fiordland is contemplated in a policy



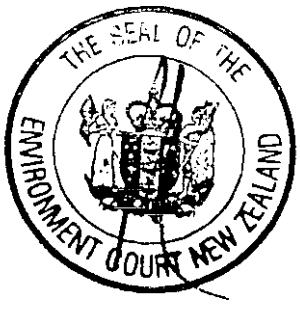
statement, but of course as this statement goes on to say, while the Council of the day considered such a possibility should be recognised, any proposal would have to be subject to environmental assessment and problems revealed in that assessment would have to be addressed.

Mr Bradley was then asked some questions about the proposed Regional Policy Statement and the policies to advocate control of discharges of ballast water at a national level which is to be contrasted with the proposed Regional Coastal Plan that seeks to control this activity and the passage of ships by means of rules. He pointed out that one of the methods referred to in the proposed Policy Statement could include the preparation, implementation and administration of a regional coastal plan.

Mr Bradley was then asked another series of questions about how the relevant provisions of the proposed Regional Coastal Plan came to be prepared because it was part of the appellant's case that we should either rule them invalid or at least give them very little weight. Mr Bradley said this was part of the consultation process but it appears that the appellant was not invited to participate. This apparently was the case at least since 29 May 1996 when there was a proposed plan put before the Regional Council for its consideration. In the section on legal issues we will have something more to say about this aspect of the case.

The foregoing summarises record some of our views on the competing assessments made by Mr Anderson and Mr Bradley. When we come to discuss our conclusions on all the issues raised we will refer to these assessments again.

In the meantime we turn now to discuss and consider the legal issues raised in these



Discussion and Consideration of Legal Issues

We begin this part of this decision by recalling that the appellant has applied for four coastal permits. These are, in summary, a permit to take water; a permit to lay, fix and use a submarine water pipeline; a permit to install and use moorings in Deep Cove; and a permit to occupy part of the coastal marine area in Deep Cove by vessels.

When he opened his case for the appellant Mr Milligan said he was not sure whether the permit to occupy part of the coastal marine area by vessels was required but it had been applied for *ex abundante cautela*, that is to say out of an abundance of caution. Mr Milligan said he had been unable to decide whether the appellant's proposal involved 'occupation' as that word is defined in section 12(4)(a) of the Act. He pointed out that this definition contains two elements, namely the exclusion of others from the area concerned and for a period of time and in a way that but for the holding of a resource consent a lease or licence to occupy would be necessary.

No other submissions were received on this aspect of the case. This is probably because the proposed Regional Coastal Plan contains rules controlling occupation of the coastal marine area relevantly in this case, as a discretionary activity.

Be this as it may, it is our understanding that the appellant proposes exclusive occupation because when tankers are not moored a support vessel or vessels would be occupying at least part if not the whole of the area occupied by a tanker when moored and the degree of exclusivity needed for the whole operation would require a lease or licence were it not for a resource consent.

This can be contrasted with the circumstance considered by the Court in *Southern Scallop Fishery Quota Holders v Tasman District Council* Decision

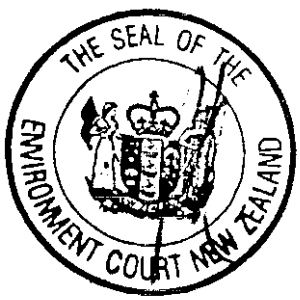
No: A137/93. The proposal in that case was not regarded as requiring at law an exclusive right of occupation of the kind that would be available to the holder of a lease or licence.

For this reason irrespective of the provisions of the proposed Regional Coastal Plan we consider the appellant does require consent to occupy part of the coastal marine area.

The proposed Regional Coastal Plan is the only relevant statutory instrument that controls the appellant's proposed activities by classifying them in terms of rules promulgated under section 68 of the Act.

For this reason it appeared to be common ground, and we certainly had no submissions to the contrary, that were it not for the proposed Regional Coastal Plan the appellant's proposed activities could be considered as innominate as the discharge to air was in ***Te Aroha Air Quality Protection Appeal Group v Waikato Regional Council*** (1993) 2 NZRMA 574. The appellant's activities require consent because of the proscriptions in section 12 but under section 88 of the Act it is subsection (3)(b) that would apply. Consequently, and again in the absence of the proposed Regional Coastal Plan, the threshold tests in section 105(2)(b) of the Act would not apply so that having considered the relevant provisions in Part II and section 104 the Court would then determine whether permits should be granted in the exercise of its discretion under section 105(1)(c) of the Act.

However the advent of the proposed Regional Coastal Plan raises several issues, not only about classification of the appellant's proposed activities but also whether the appellant has applied for all the consents that may now be necessary in terms of that Plan.



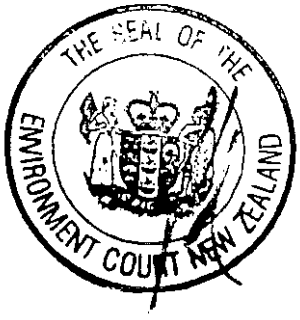
Another related issue raised at the hearing was whether the original application was adequate.

We can deal with this last issue quite shortly. We said near the beginning of this decision that those opposing the appellant's proposal complained of a lack of detail and to some extent we thought this was justified. Section 88(4)(e) of the Act requires an assessment of any actual or potential effects that an activity may have on the environment, to be made in accordance with the Fourth Schedule to the Act and in this case to the extent that it thought it was necessary, the appellant did this. We have also commented on this assessment earlier in this decision.

In *Affco NZ Limited v Far North District Council* (No. 2) [1994] NZRMA 224 the Court adjourned two appeals that had been heard together to enable an applicant to obtain some additional consents and to provide further evidence in support of its proposal. In doing so the Court commented on the need for sufficient particulars to be given to enable potential effects to be properly assessed.

So far as we are aware it has never been held that insufficient particulars in an application or an inadequate assessment of environmental effects will deprive this Court of jurisdiction to hear and determine the application and in this case no party sought to argue otherwise. In *Scott and Others v New Plymouth District Council* Decision No: W91/93 there was a suggestion that this might be so but there was no determination to that effect and, as we say, in this case no party sought to raise inadequacy as a jurisdictional threshold.

In effect those opposing the appellant submitted that the Court should refuse the permits because there was insufficient information to enable it to determine the nature and extent of the adverse effects of it's proposal. Whether we had



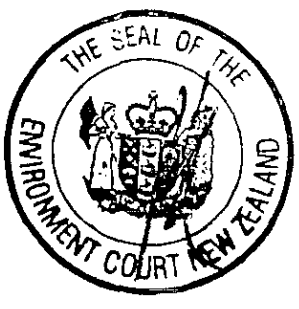
sufficient information is a matter of fact and degree and will become apparent in the next section of this decision. Because jurisdiction is not in issue we need say no more about this matter here.

Of potentially more substance, from a legal point of view, is the question whether the appellant has applied for all the necessary consents. It is well established that an application cannot be amended to include consents that have not been applied for. This was also made clear in ***Affco NZ Limited*** and there are earlier cases to like effect.

At the substantive hearing Mr Ibbotson and Mr Cameron renewed a submission made during the hearing of the interlocutory application that the appellant required consent to discharge ballast water by virtue of section 15(1)(a) of the Act. Mr Cameron also submitted that the appellant may require several land use consents for communication and navigation facilities. It may also require discharge permits for other vessels in Deep Cove.

Mr Slowley submitted that in terms of the proposed Regional Coastal Plan the appellant required consents to moor vessels for residential purposes and to enable tankers to transit Doubtful Sound or Thompson Sound. These would be discretionary activities. It was also pointed out, as we have recorded in an earlier section of this decision, that in terms of the proposed Plan the use of Deep Cove by a tanker is a prohibited activity. It was accepted however, that until this Plan becomes operative this prohibition is not effective and this activity is to be considered as a non-complying activity - see section 105(2)(d) of the Act.

It was also suggested by Mr Slowley that further consents may be required because of failures to comply with rules controlling noise levels.



Mr Milligan repeated a submission he made during the hearing of the interlocutory application that section 343 of the Act provides an exemption from section 15 for foreign vessels. Although section 343 refers only to a discharge of a contaminant into water Mr Milligan submitted it would be contrary to Parliament's intention to read this section as excluding a discharge of water into water. Consequently whether ballast water is regarded as a contaminant or simply as water is immaterial.

On the submissions that further consents are required in terms of the proposed Plan Mr Milligan countered these by submitting that the provisions relied on by opposing counsel are either invalid or void for uncertainty with the consequence that they cannot control the appellant's activities.

Indeed, Mr Milligan went further and in reliance on ***Fairmont Holdings (No 2) Limited v Christchurch City Council*** 13 NZTPA 461 submitted that we should strike down the relevant provisions of the proposed Plan as being in breach of the rules of natural justice. Referring to the prohibition on foreign vessels and to some of the other rules that are now seen as controlling the appellant's proposal Mr Milligan submitted that these were introduced by the respondent in a deliberate attempt to thwart the appellant's legitimate expectations.

Mr Milligan also mounted an argument, which we confess we had some difficulty understanding, that simply because an activity is prescribed by a rule as a discretionary activity does not mean that it contravenes a rule in a Plan for the purposes of section 12 of the Act. With respect to Mr Milligan we do not think this can be right because a discretionary activity is defined as one that is to be allowed, inter alia, only if a resource consent is obtained. Therefore, without a resource consent a person carrying on such an activity would be in breach of section 12(3) of the Act.

The proposed Regional Coastal Plan is at a very early stage in the statutory process. Indeed as we said earlier, by the time we finished hearing this appeal the time for lodging submissions had not expired. In these circumstances we think it undesirable to rule definitively on the validity of the challenged provisions in the Plan unless it is necessary to do so in order to determine this appeal.

For reasons that will appear in our conclusions we do not think this is necessary. Nor is it necessary to decide whether the appellant requires any additional resource consents. If it did, we would have no difficulty adjourning these proceedings to enable it to apply, given that the proposed Plan was publicly notified only a matter of days before the hearing of this appeal began.

On the matter of the Plan however, we also say that we do not accept the appellant's claim that the relevant provisions are deliberately intended to thwart its reasonable expectations. We can understand why the appellant and its advisers might view them this way but as Mr Bradley told us, the Plan was prepared over a period of time during which there was consultation with those thought to be affected, although so it appears not with the appellant. The policy decisions regarding the control of shipping in the sounds which were not confined to Doubtful Sound were taken some time before the Plan was publicly notified, albeit after the respondent had made its decision leading to this appeal. Although this might lead a suspicious mind to an adverse conclusion about the respondent's motives, the plain fact is that the appellant always required resource consents for its proposal, and therefore cannot claim the kind of legitimate expectation that was successfully claimed by ***Fairmont Holdings (No 2) Limited*** in the case earlier referred to.

In any event we do not have the jurisdiction to strike down the relevant parts of the proposed Plan in the way the High Court did in that case. Therefore even if

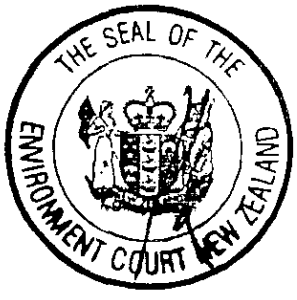
we thought the respondent had been motivated by considerations that the High Court found to be unlawful we could do nothing about it.

On the matter of ballast water discharge we think Mr Milligan is right about section 343 of the Act. If this section were limited to contaminants this would mean that a foreign vessel would not have an exemption for a discharge of water that did not contain a contaminant and we cannot think that Parliament intended this to be the outcome. It is to be noticed too however that section 343 provides an exemption from Part XII of the Act only. That is to say the enforcement provisions. Consequently, there is some force in the submissions of Mr Ibbotson and Mr Cameron that section 15(1)(a) of the Act still requires a resource consent to be obtained for such a discharge and that the only effect of section 343 is that a foreign vessel cannot be prosecuted. On the other hand as Mr Milligan submitted during the interlocutory proceedings, this is an undesirable construction to put on section 15(1)(a) because a proscription without enforcement is really no proscription at all.

However as we have already said, it is not necessary for us to finally determine this issue.

We can turn now to the submissions that were made about how we should apply section 5 of the Act and what weight, if any, we should give to the so-called precautionary principle.

In the end we do not think there was an issue between counsel on section 5 because Mr Milligan and Mr Cameron, the two counsel who made the principal submissions on this topic, appeared to agree that we should follow the approach to this section discussed in such cases as ***Trio Holdings Limited v Marlborough District Council*** [1997] NZRMA 97 and more recently ***North Shore City Council v Auckland Regional Council*** [1997] NZRMA 59 which can be



described briefly as the 'overall judgment' approach. This is to be contrasted with other approaches that have been described from time to time as the 'environmental bottom line' approach and the 'balance' approach.

In ***NZ Rail v Marlborough District Council*** [1994] NZRMA 70 Greig J said this of Part II of the Act which of course includes section 5:

> *"This part of the Act expresses in ordinary words of wide meaning the overall purpose and principles of the Act. It is not, I think, a part of the Act which should be subjected to strict rules and principles of statutory construction which aim to extract the precise and unique meaning from the words used. There is a deliberate openness about the language, its meanings and its connotations which I think is intended to allow the application of policy in a general and broad way..."*

In the ***North Shore City Council*** case this Court said that where, on some issues, a proposal is found to promote one or more of the aspects of sustainable management and on others is found not to attain or to attain fully, one or more of the aspects of (a), (b), and (c) of section 5(2) it would be contrary to the judgment in ***NZ Rail v Marlborough District Council*** to conclude that the latter overrides the former with no judgment of scale or proportion. The Court went on to hold that the method of applying section 5 involves an overall broad judgment of whether a proposal would promote the sustainable management of natural and physical resources. This recognises that the Act has a single purpose. Such a judgment allows for comparison of conflicting considerations and the scale or degree of them and their relative significance or proportion in the final outcome.

This Court's judgment in the ***North Shore City Council*** case went on appeal to the High Court where it was upheld in a judgment delivered by Salmon J on 18 August 1997 - see [1977] NZRMA 519. It is interesting to notice that in his

judgment Salmon J refers specifically to this Court's approach to section 5 - see page 537 - but, so it appears, he was not called upon to decide whether this approach was correct in law because the appeal to the High Court turned on other issues. Consequently in the absence of any adverse comment on this approach by the High Court we think we are entitled to adopt it for ourselves and we respectfully do so.

In the context of this case the judgment of the High Court in ***NZ Rail v Marlborough District Council*** is also important for another reason. At pages 85 and 86 Greig J sets out the way section 6(a) of the Act providing for the preservation of the natural character of the coastal environment should be applied.

At this point we also refer to two other decisions of this Court in ***Thomas v Marlborough District Council*** Decision No: W16/95 and ***Port Mussel Company Limited v Marlborough District Council*** Decision No: W26/96. In both cases the Court had to consider policy 1.1.1 in the New Zealand Coastal Policy Statement 1994 which it will be recalled, provides that it is a national priority to preserve the natural character of the coastal environment by inter alia encouraging appropriate development in areas where the natural character has already been compromised.

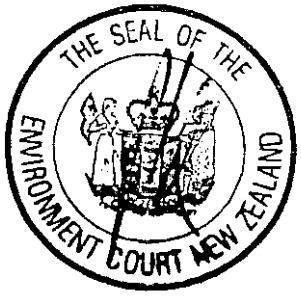
In ***NZ Rail v Marlborough District Council*** Greig J held that the preservation of natural character is subordinate to the primary purpose of the promotion of sustainable management. It is not an end or an objective on its own but is accessory to the principal purpose. He also held that the word "inappropriate" has a wider connotation than the word "unnecessary" which was considered in an earlier case under the Town and Country Planning Act 1977 in ***Environmental Defence Society v Mangonui County Council*** [1989] 3 NZLR 257. The learned Judge went on to say however that inappropriateness is to be decided on a case

by case basis in the circumstances of the particular case. What is inappropriate is to be judged from the point of view of the preservation of the natural character in order to achieve the promotion of sustainable management as a matter of national importance. He pointed out too that it is only one of the matters of national importance and other matters may have to be taken into account. It is certainly not the case that preservation of the natural character is to be achieved at all costs. The achievement which is to be promoted is sustainable management and questions of national importance, national value and benefit and national needs must all play their part in the overall consideration and decision.

These observations were of course made in the context of a case where this Court had held that a log and coal export facility in Shakespeare Bay near Picton was appropriate development at a national level, justifying the setting aside of the preservation of the natural character of Shakespeare Bay if that were necessary,and an argument on appeal that section 6(a) requires preservation of natural character to be achieved even in the case of appropriate development.

In the two subsequent decisions of this Court earlier referred to, both of which involved marine farming in the Marlborough Sounds, the Court has held that policy 1.1.1 which is really derived from section 6(a) of the Act is not to be taken as a blank cheque for encouraging unlimited further development simply because an environment has already been modified. It has pointed out that the same policy requires potential effects of use or development to be taken into account and cumulative adverse effects are to be avoided.

With respect, we do not think these decisions are inconsistent with the approach to section 6(a) laid down in *NZ Rail v Marlborough District Council* and we intend to adopt this approach and the approach in the two marine farming cases just referred to.



It is for these reasons that we accept the submission that was made by Mr Slowley that as a matter of law a proposed activity cannot be justified on the basis that it will only further compromise the natural character of a coastal environment that has already been compromised. In the end, of course, the ultimate test is whether consenting to such an activity will promote the sustainable management of natural and physical resources.

We turn now to the precautionary principle.

Our discussion of this matter arises out of a submission made by Mr Cameron that because, as he saw it, the appellant's proposal would have a range of both direct effects and effects of low probability but high potential impact, then in this globally unique marine environment no risk should be acceptable and for this reason the consents should be refused.

For this proposition Mr Cameron appeared to be relying on the decision of this Court in ***McIntyre and Others v Christchurch City Council*** [1996] NZRMA 289 where the precautionary principle is discussed at some length.

Mr Milligan submitted that the Resource Management Act does not mandate a "nil effects" regime and that Mr Cameron's submission was simply another version of the environmental bottom line approach which he had himself already rejected. Mr Milligan went on to submit that there is no precautionary principle recognised by the law in New Zealand and that Mr Cameron's approach really amounted to a shifting of the onus of proof.

In reliance on the decision in ***McIntyre and Others*** Mr Milligan also submitted that in proceedings under this Act there is no onus of proof other than the evidentiary burden on the person making an assertion to provide evidence to support it. In ***McIntyre and Others*** reference is made to ***West Coast Regional***

Abattoir v Westland County Council (1983) 9 NZTPA 289 as providing the authority for this proposition.

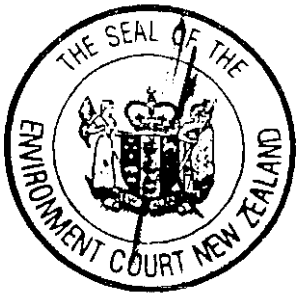
We have to say that we have some difficulty understanding the place of the precautionary principle or the precautionary approach in proceedings under the Resource Management Act, if as appeared from Mr Cameron's submission, it is to be understood as supporting a no risk regime. We do not think this is compatible with the definition of sustainable management in section 5(2) of the Act.

In ***McIntyre and Others*** the Court referred amongst others to a judgment of the Land and Environment Court of New South Wales in ***Leatch v National Parks and Wildlife Service and Shoalhaven City Council*** (1993) 81 LGERA 270. In this case Stein J said this at page 282:

> *"In my opinion the precautionary principle is a statement of common sense and has already been applied by decision-makers in appropriate circumstances prior to the principle being spelt out. It is directed towards the prevention of serious or irreversible harm to the environment in situations of scientific uncertainty. Its premise is that where uncertainty or ignorance exists concerning the nature or scope of environmental harm (whether this follows from policies, decisions, or activities), decision makers should be cautious".*

With respect we consider this to be a helpful and lucid exposition of the precautionary principle and we gratefully adopt it.

Mr Cameron also referred to principle 12 in the New Zealand Coastal Policy Statement 1994 which reads as follows:



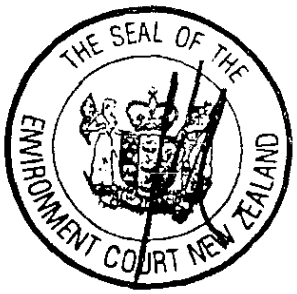
"12. The ability to manage activities in the coastal environment sustainably is hindered by the lack of understanding about coastal processes and the effects of activities. Therefore, an approach which is precautionary but responsive to increased knowledge is required for coastal management."

We are not certain whether this principle is intended to be a re-statement, if that is possible, of the precautionary principle articulated by Stein J. However whether it is or not it is clear from both that learned Judge's exposition and principle 12 that caution or a precautionary approach need only be applied in circumstances where there is scientific uncertainty or ignorance about the nature or scope of environmental harm.

We think it is significant that the three cases in New Zealand where this principle has been considered are all cases where the effects of radiation from power lines or radio frequencies have been in issue. We refer to ***Transpower NZ v Rodney District Council*** Decision No: A85/94, ***Telecom New Zealand Limited v Christchurch City Council*** Decision No: W165/96, and ***McIntyre and Others*** itself.

In each of these cases the Court appears to have accepted that there may be a need for caution where there is scientific uncertainty although mere suspicion or innuendo will not suffice to create this uncertainty, and whether caution is to be applied is a discretionary matter to be exercised at the time when the overall judgment is being made. In the context of the Resource Management Act this would be when exercising the discretionary judgment under section 105 of the Act.

In ***Telecom New Zealand Limited*** the Court did not refer to section 105 explicitly, but on page 11 it cited a passage from the decision in the ***McIntyre*** case which reads as follows:



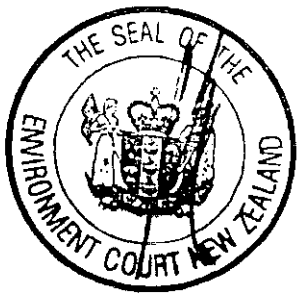
"The influence of the general precautionary principle on the evaluation and ultimate judgment is a matter for discretion. None of the cases supports the application of a formal threshold. Like all elements that contribute to the ultimate judgment, the weight to be given to the precautionary principle would depend on the circumstances. The circumstances would include the extent of present scientific knowledge, and the impact on otherwise permitted activities. However we think that in an appropriate case they would also include the gravity of effects if, despite present uncertainty, they do occur."

The Court then said that it agreed with this and thought it was applicable to the concerns that had been expressed in the case before it.

In this case we are not faced with scientific uncertainties or ignorance about the nature or scope of environmental harm. There are, of course, differences of opinion about whether there will be environmental harm but we did not understand any of the witnesses with relevant expertise, whether as scientists, landscape architects, noise experts or resource management assessors, to be in doubt about the potential for environmental harm if certain events were to occur.

So for example, conflicting opinions were expressed about whether the appellant's proposal would result in noise nuisance but the experts who gave evidence on this topic were in no doubt at all about how noise nuisance arises, what creates it, what might cause it in this case. There was no lack of scientific knowledge, nor were there any unsubstantiated assertions.

The same can be said for the evidence about the potential effects of oil spills and the discharge of ballast water. Although Dr Grange expressed some uncertainty



about the extent of the effects of oil spills we did not understand him to be in any doubt that environmental harm would be likely if an oil spill were to occur.

Likewise we did not understand him to be in any doubt that there would be environmental harm if foreign organisms were released during a ballast water discharge and survived long enough to reach the saline layer of Doubtful Sound.

His conclusions were based on his opinion that these things would not occur, just as Dr Hay's conclusions and Dr Rose's conclusions were based on their opinions that there was a likelihood that they would occur.

For these reasons we doubt that there is any need to apply the precautionary principle in this case. Rather, we think that when we come to the exercise of our discretionary judgment it will be a matter of deciding the weight to be given to the various conclusions we have come to about effects by reference to the purpose and relevant principles contained in Part II of the Act.

Conclusions

We have now reached the point where by reference to the conclusions just mentioned and applying the legal tests we have just been discussing, we can record our conclusions on each of the consents sought by the appellant. Although a package of consents is necessary for the appellant's proposal to proceed we understand our task to be to consider each of these by reference to the relevant provisions of the Act, which of course includes the relevant objectives and policies of the statutory instruments.

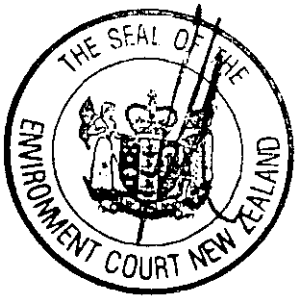
The coastal permit to take water does not by itself present any major problems. As we said earlier there is an abundance of water; there is no opposition to the taking as such; and there is no evidence that there will be any adverse effects if

the water is taken at the rate proposed by the appellant. The relevant objectives and policies in the various statutory instruments can best be described as equivocal..

However, as we also said earlier there is no evidence of benefit to New Zealand if the taking is permitted. In this context we are reminded that it was Mr D J Anderson's opinion that the whole of the appellant's proposal, including of course the taking, would enable communities by which he obviously meant communities beyond the shores of New Zealand, to make provision for their economic wellbeing and possibly their health, and therefore the proposal accords with the purpose of the Act.

Whether the Resource Management Act is intended to foster the social, economic and cultural wellbeing and the health and safety of people and communities beyond New Zealand is not a matter on which we received any assistance from counsel, and accordingly we are reluctant to determine this question in these proceedings. We rather doubt that this was Parliament's intention, bearing in mind that it is a domestic statute and did not arise ,at least explicitly, out of New Zealand's obligations under any international conventions.

In any event, even if Mr D J Anderson is right about the meaning of communities in section 5, there is insufficient evidence to enable us to determine what benefits there would be for foreign communities. We simply do not know what communities might be involved nor to what purpose or purposes this water might be put. All we know is that in its raw state this water is as pure as any in the world, and as a general proposition pure water can be a valuable resource. But for the purpose of deciding a case such as this we would need to know a good deal more about the purpose or purposes to which the resource is to be put before we could make any meaningful findings in favour of a proposal to take it when,



as we will discuss shortly, there are potential adverse effects associated with that taking.

Notwithstanding these observations, the taking itself is probably worthy of consent for the reasons set out earlier.

To take the water the appellant needs to establish an intake structure lay and use a submarine pipeline and again there was no evidence that this activity will have any adverse effects. Once these are in place and, as we understood the evidence, this is a relatively innocuous procedure, they will not have any adverse visual effects or any adverse effects on the seabed, nor will granting consent contravene the objectives and policies in the various statutory instruments that, in summary, provide for the natural characteristics of this area to be recognised and protected for their wilderness, tourism and educational values.

Consequently again by itself, this activity is probably worthy of consent.

The installation and use of the moorings does raise questions about visual effects and safety. On the former we think the SALM mooring will have an adverse visual effect. On the latter we have already held that the moorings can be safely installed.

However there are policies, particularly in the Fiordland National Park Management Plan and the proposed Regional Coastal Plan, that indicate that Deep Cove is already fully committed as a mooring place and it may well be contrary to the relevant objectives and policies of the proposed Regional Coastal Plan to grant consent to these moorings. On the other hand there are objectives and policies, in some of the earlier statutory instruments, that recognise Deep Cove as a mooring place, sometimes indeed called a port, although this recognition is for fishing and tourism purposes. There are no objectives or

policies that recognise Deep Cove as a port for any other purpose. Consequently, again it may be contrary to these objectives and policies to grant consent to the moorings.

Of course, moorings are not installed without a purpose and the nub of this case is that purpose which is to provide a port facility for large ships to moor in Deep Cove to take on freshwater as a commercial cargo.

We have already held that the appellant requires consent for this purpose, that is to say to occupy the coastal marine area, and it has applied for such a consent. The question now is whether this consent should be granted. If it should then we think there would be little difficulty about concluding that consent for the moorings should also be granted, notwithstanding the reservations just expressed.

Mr D J Anderson's opinion was that there is nothing in any of the statutory instruments by way of objectives and policies that should preclude the granting of this consent. On the contrary, Deep Cove is recognised as a port. If it were a port as understood by Mr Anderson it might be thought that this proposal would be in accord with the policy in the New Zealand Coastal Policy Statement that encourages appropriate development in the coastal environment in areas which have already been compromised.

However we do not view Deep Cove in this way, nor as we have just said do we regard those objectives and policies that recognise Deep Cove as a port as doing so.

Overall, we respectfully disagree with Mr D J Anderson's assessments which as we have said earlier, were based on two fundamental premises - first that Deep Cove is simply a gateway without any natural character worthy of preservation,

and secondly any adverse effects of the proposal can be mitigated by the frequency, or as he saw it, lack of frequency of tanker visits.

In an earlier section of this decision we concluded that Deep Cove retains a natural character worthy of protection and we also concluded that the presence of large tankers in this environment would have adverse consequences for tourism and education. We think there was a good deal of force in Mr Bradley's assessment of the effects of this proposal when he expressed the view that it would represent a large step toward changing the essential character of Deep Cove from a place that is very special to just another port.

Again in earlier sections of this decision we have reached certain conclusions about the potential adverse effects of the appellant's proposal, with reference to both Deep Cove and the remainder of Doubtful Sound and Thompson Sound, that are different from Mr Anderson's assessments.

The characteristics and values of Deep Cove and the remainder of Doubtful Sound and Thompson Sound are important natural and physical resources that are recognised by the statutory instruments; by section 6(a), and 6(e) to the extent that Maori values are involved, and section 7(a), (c), (d) and (f) of the Act. Treaty matters referred to in section 8 were not raised in these proceedings but of course Mr Bull raised other matters concerning Maori values which, as it turned out, largely coincided with some of the other principles of national importance and those contained in section 7 to which we have just referred.

It was part of the appellant's case that its proposal is an efficient use of a natural resource but as we have already said, there is insufficient evidence to be able to make a finding about that. We recognise that Mr D J Anderson referred to the present state of this resource as "waste" water but again with respect to him, we think this was something of an overstatement. The water is the inevitable product

of a nationally important hydro-electric generation process and while there is no evidence that it is of any particular benefit to the waters of Deep Cove there is likewise insufficient evidence, at least at the present time, to show that it is having a detrimental effect on those waters.

At this point it is pertinent to refer again to the ECNZ project because it is a condition of the current water permit for this development that the effects of the new discharge on the waters of Deep Cove are to be monitored. It is also pertinent to record our conclusion that on the evidence we had about this project we are satisfied that its effects on the natural character of Deep Cove will be transitory,and in the end the likelihood is that with restoration they will be positive rather than negative.

Whether the appellant's proposal will give rise to oil spills or the release of unwanted foreign organisms into the waters of Deep Cove and Doubtful Sound are matters that we have already discussed in some detail elsewhere and we have concluded that the causes of these potential adverse effects, namely the foundering of a tanker and a discharge of ballast water containing foreign organisms are events of low probability but their consequences would have high impact.

The evidence also satisfies us that realistically these impacts are incapable of avoidance, remedy or mitigation. If there were to be an oil spill it is very unlikely that in this remote part of New Zealand there could be an effective clean up and as we understood his evidence this too was the conclusion reached by Mr Bradley who is the officer responsible for dealing with these matters in this region.

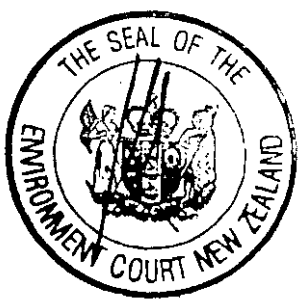
Then, if unwanted foreign organisms were to survive long enough to reach the saline layer of Doubtful Sound we think it was generally accepted by all the

scientists, including Dr Grange, that permanent and widespread damage to the marine ecology would occur. We have also concluded that Mr Shaw's concern about the adverse effect of pressure waves has substance.

As we have now said on more than one occasion there are valuable natural and physical resources in this area that are already being used to enable people and communities to provide for their economic and cultural wellbeing, and it is our judgment that the appellant's proposal has the potential to jeopardise the continued use of these resources by reason of the potential adverse effects we have been considering. We think the visual and intrusive effects which will be adverse to tourism and the activities of the Deep Cove Education Trust are highly likely to occur as are the adverse effects of noise. These adverse effects, which again are really incapable of avoidance, remedy or mitigation for the reasons discussed earlier in this decision, are probably serious enough by themselves to justify refusing consent to allow vessels to occupy part of the coastal and marine area in Deep Cove.

However, taken together with the admittedly more remote prospects of adverse effects on the marine ecology and people such as kayakers using the Sounds and having regard to the potential impacts of these effects, it is our overall judgment after considerable and lengthy consideration of all that has been put before us that to grant a coastal permit that would enable large tankers to enter and transit Doubtful Sound or Thompson Sound and Deep Cove and occupy part of Deep Cove for the purposes of taking on water for export would not promote the sustainable management of the existing valuable resources and consequently consent should be refused.

Because we have now decided that the critical consent should be refused there is no point in granting the ancillary consents for they would have no purpose. Consequently, the appellant's application as a whole should be refused.



In the light of these conclusions it will now be apparent why we said earlier that there was no need to consider the validity of the relevant provisions in the proposed Regional Coastal Plan or whether the appellant needed any further consents. We have been able to arrive at these conclusions without giving any special weight to the proposed Regional Coastal Plan and indeed we think we would have arrived at the same result even if this Plan had not been publicly notified before we heard this appeal.

Determination

For all the foregoing reasons these proceedings are determined in the following way:

1. Appeal RMA: 822/95 by Aquamarine Limited is disallowed and the respondent's decision to refuse the necessary resource consents is confirmed.

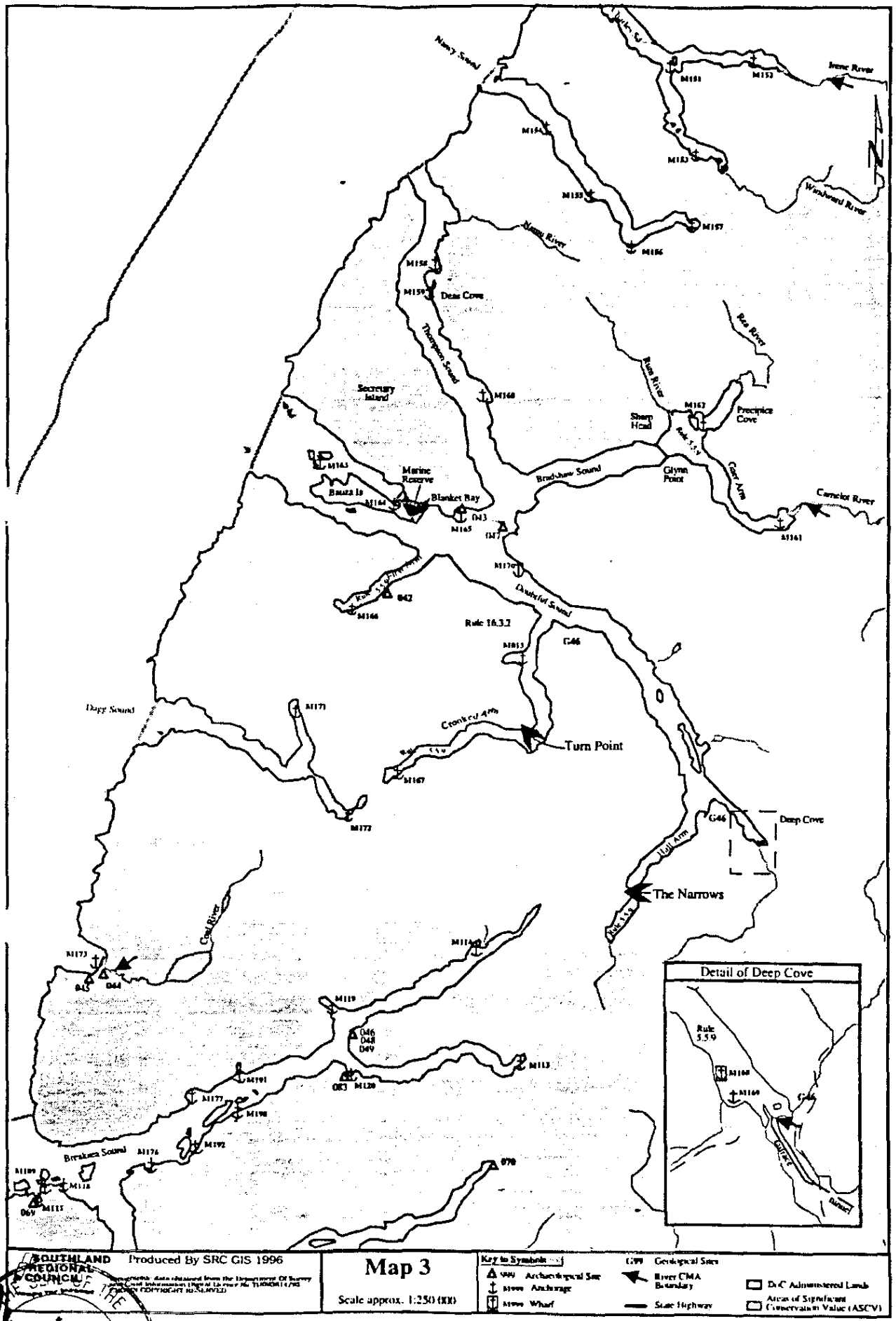
2. All questions of costs are reserved. Any applications for costs are to be lodged with the Registrar's office at Christchurch by 30 January 1998. Any replies are to be lodged by 22 February 1998.

DATED at **CHRISTCHURCH** this 15th day of **December** 1997.

THE SEAL OF THE ENVIRONMENT COURT NEW ZEALAND

P R Skelton

Environment Judge



TAB 2

BEFORE THE ENVIRONMENT COURT

Decision [2016] NZEnvC 151

ENV-2006-WLG-000057, 60,66, 69, 81,88, 92, 94, 97

IN THE MATTER	of appeals under section 120 of the Resource Management Act 1991
BETWEEN	FRIENDS OF NELSON HAVEN AND TASMAN BAY INC Appellant/Party
AND	THE MARLBOROUGH DISTRICT COUNCIL Respondent

Court: Environment Judge C J Thompson
Environment Commissioner W R Howie
Environment Commissioner J R Mills
Hearing: at Blenheim 27 - 29 June 2016
Counsel: M Hardy Jones and N J McKessar for the Admiralty Bay Consortium – applicant
J C Ironside for Friends of Nelson Haven and Tasman Bay Inc and Marlborough Environment Centre
E M Jamieson and G A Rainey for the Director-General of Conservation
M J Radich for the Marlborough District Council

DECISION ON APPEAL - REVISED APPLICATION

Decision issued: - 9 AUG 2016

The appeal is allowed – consents declined

Costs are reserved

THE SEAL OF THE ENVIRONMENT COURT OF NEW ZEALAND

Introduction and background

[1] The Admiralty Bay Consortium (ABC) is a grouping of eight corporate and individual interests in marine (mussel) farming. It proposed to extend its members' existing farms in Admiralty Bay, and the Council granted resource consents enabling that to be done, subject to some reductions in area, principally for reasons of navigation safety. Those applications were made in the course of 1999 and 2000 and the Council hearing was in 2001. This Court has made interim decisions in 2006 and 2009. It is immediately obvious then that the proceedings about them have been very long, and at times rather tortuous.

[2] It should be understood that when the applications were first considered and decided upon by the Council, there was no evidence that Admiralty Bay was a significant habitat for Dusky Dolphins, and the relevant portions of Part 2 of the RMA were not brought into the equation on that account. The evidence about the use of the Bay by Dusky Dolphins began to come to public light c2003 and has evolved into the central issue in considering the ABC proposals. In decisions issued in 2005 and 2006, (*Kuku Mara Partnership v Marlborough DC* W37/2005, and *Friends of Nelson Haven and Tasman Bay & Ors v Marlborough DC*, W36/2006, both dealing with proposed marine farms elsewhere in the Bay), the Court found that the Bay was a *significant habitat* for Dusky Dolphins (which are plainly *indigenous fauna*) in terms of s6 RMA, and that view is not in dispute. In the balance of this decision, references to *dolphins* should be understood as meaning Dusky Dolphins.

[3] In respect of the current applications and appeals, by 2009 the parties all accepted that more information about the dolphins' use of the Bay was necessary before any principled decisions could be made. The proposal *on the table* was to defer further action until well-designed and sufficiently long-term studies could be made to provide that information. Also, and as part of the parties' recognition of the centrality of the dolphin issue, substantial modifications of the proposals were being suggested – eg the deletion of *mid-bay* (rather than perimeter) farms altogether; the possibility of removing farm structures from the water during the time the dolphins migrated into the Bay, and others.

[4] Having traversed the then available evidence about the potential effect on the Dolphins' habitat in, and use of, the Bay by inserting more marine farm structures into its waters, we came to these conclusions in decision (W027/2009):

> [32] The only principled way forward that we can see is to defer final resolution of all of these appeals until the results of the three-year study [ie, into the Dusky Dolphin use of the Bay] are known, and decisions can be taken on the basis of what it may disclose, additional to what is already known. ...
>
> [33] We are very conscious that these applications have been live, and unresolved, for a very long time already. But the only decisive outcome we could deliver now is to decline both applications, because we cannot properly assess effects. Further, we do point out that notwithstanding that extraordinarily long lead-time significant, indeed fundamental, modifications were being made to the proposals even as the hearing continued. In those circumstances, the parties can hardly wonder that issues of sufficiency and certainty of information loom large. ...
>
> [35] Formally then, the appeals are adjourned without a further hearing date being set at present. When the study is complete, and the further information collated and analysed so that the Court can consider it, the parties should seek a further hearing date.

[5] There matters were left, with the expectation that during the course of 2012 the results of the study would be known, the hearing would be resumed, and a final decision given with the benefit of the information gleaned from the baseline studies.

[6] In September 2011 the Court was advised that no studies had yet been done, but that they could shortly commence, and could conclude in May 2014.

[7] For the reasons given in the decision *Marlborough Aquaculture Ltd v Marlborough DC* [2011] NZEnvC 327, the Court agreed to adjourn the appeals until such time as the studies were completed, and they now have been. The Marlborough Aquaculture Ltd applications, the appeals about which were being dealt with concurrently with this proceeding, are not now pursued, and the ABC proposal is now to extend (to a somewhat lesser extent than previously proposed) its existing perimeter farms in the Bay. There were no issues raised about the scope of the revised application being within the terms of the original applications, and we need not spend time on that.

[8] Happily, the members of the Court who have heard the successive rounds of evidence and submissions as these issues have slowly moved forward, remain available to hear and consider the current evidence and submissions, so the concern earlier expressed at para [11] of the 2011 (as cited above) decision about their possible unavailability, and the indication that all of the now relevant evidence may have to be heard afresh has, fortunately, not come to pass.

The parties' current positions

[9] The ABC recognises that the now available information about seasonal use of the Bay shows that the dolphins are present for significantly more of the year than previously thought. It is clear that they are present in significant numbers from late autumn, thorough winter, and well into spring – ie seven or eight months out of twelve. Against that knowledge, ABC has acknowledged that the previously suggested seasonal removal of some lines is not a workable proposition, and does not now advance that as a possible solution. As noted, the originally proposed mid-bay farms are not pursued.

[10] Accepting also that the present state of knowledge requires a precautionary approach (a topic to which we shall return) ABC's proposal now is to put in place an adaptive management plan (AMP) for the expansion of the farms to provide assurance that if adverse effects do emerge, steps can be taken to remove the cause of those effects, and that the effects can be reversed. The area of the proposed extensions is now reduced from c148ha to 60.45ha. If granted that would mean that ABC's total farm area would be c289ha, or some 10.4% of the inner Bay's total area of 2,781ha (for present purposes, the area of the outer Bay, and the Current Basin to the south of French Pass, are not really relevant). The extensions would be on the seaward side of ABC's 23 existing farms, but the extensions would still be within 300m of mean low water springs.

[11] Much condensed, the AMP now proposed is that the additional areas should be occupied in two stages. The first would consist of not more than 50% of the total proposed extensions, leaving the balance for the second stage. It is envisaged that Stage 1 would be in place for a minimum of 3 years, with an annual monitoring regime. Depending on monitoring outcomes, Stage 2 could proceed; Stage 1 could remain, or Stage 1 could be removed.

[12] The Friends of Nelson Haven and Tasman Bay Inc (the Friends) are the appellant in the proceeding, and Mr Ironside appeared both for the Friends and for Marlborough Environment Centre, a s274 party to the appeal. In his opening, Mr Ironside emphasised the ... *cascade of ecological connections* ... (to take Professor Bernd Wursig's description) flowing from the bait-balling feeding tactics of the dolphins in the Bay. The dolphins, working co-operatively, herd target fish such as pilchards into closely packed balls and push them towards the water surface, so

making them available to other species such as sea birds, seals and sharks. In particular, the Friends emphasised the presence in the Bay of King Shags, but also noted the other eleven important species of seabirds that have been recorded as foraging in the Bay, with a still further ten species recorded as resting and feeding there.

[13] King Shags are endemic to the Marlborough Sounds – the only seabird with that status. They are one of the rarest seabirds in the world – numbering less than 1000 mature individuals, and are classified as *threatened* under both the IUCN and the New Zealand Threat Classification System. The Department of Conservation's Threat Classification System has them as *nationally endangered.* They predominantly feed on flatfish species, diving and foraging to depths of between 10m and 50m. Admiralty Bay is within the foraging range (c25km) of three breeding colonies on the Trio Islands, Rahuinui and (northern) Stewart Island. The Friends' argument here is that all benthic habitats within the Shags' foraging range should be recognised as *significant* habitat and regarded as critical for the survival of the species.

[14] The Director-General of Conservation is a s271A party to the proceeding. In short, the Director-General opposes any extensions of the existing farms in the Bay. His position is that any adaptive management regime can only work, and be truly precautionary, when it can ... *robustly inform future management decisions and unambiguously direct future action.* Ms Jamieson cites the judgment of the Supreme Court in *Sustain Our Sounds Inc v The New Zealand King Salmon Co Ltd* [2014] NZSC 40 [2014], 1 NZLR 673 in support of that position, and we shall return to that. Noting the evidence of Professor Wursig and Mr Andrew Baxter, Ms Jamieson submits that the available information discloses extremely high inter-annual and intra-annual variability of dolphins' presence in the Bay, meaning that there really is no *normal* to be taken as a reliable *baseline.* That means that there would be no identifiable trigger points to warn of a damaging decline in dolphin presence in the Bay. Further, there is no basis on which to assess a *cause and effect* relationship between expansion of the farms and dolphin presence in, and use of, the Bay.

[15] The Council acknowledges the information about Dusky Dolphins which has come to hand since its decisions were made in 1999 – 2000, and accepts that what is now known puts a significantly different perspective on the matters to be

considered. It also reminds us that what ABC proposes now, by way of further marine farm structures, is very different from what the Council considered. That means, we accept, that the regard to be had to the Council's decision under s290A must be very qualified.

[16] On the substantive issues the Council's position, expressly recognising that it has ... *no persuasive right or obligations* ... is put by Ms Radich in this way:

> The key issue which ... will determine these appeals is whether an adaptive management plan which contemplates the occurrence of potentially significant adverse effects up to an undesirable limit, within a significant habitat and on an indigenous species, is consistent with the threshold of effects required to be applied to an assessment of this Proposal (and particularly the thresholds in the MSRMP and Policy 11 of the NZCPS) and the precautionary approach which must be applied in terms of Policy 3 of the NZCPS.

We adopt that summary as correctly identifying the core of the issue to be resolved in this proceeding.

The applicable law

[17] As noted, the applications were first lodged in 1999 and the Council decisions were made in 2001. Appeals were lodged shortly thereafter. That means that, in terms of s112 of the Resource Management Amendment Act 2003, if an application for a resource consent was made before that enactment ... *the continuation and completion of that matter (including any rights of appeal) must be in accordance with the principal Act as if* ... the amendment Act had not been passed. Similarly, in terms of s109 of the amendment Act, and expressly despite sections 62(3), 67(2), and 75(2) ... *a regional policy statement or a plan in force on the date of the commencement of this section does not need to give effect to a New Zealand coastal policy statement, but must not be inconsistent with it.*

Planning status

[18] It is accepted that the site as a whole is contained within the *Coastal Marine Zone 2* (CMZ 2) of the Marlborough Sounds Resource Management Plan (MSRMP). Marine farms between 50m and 200m of the mean low water springs line are *discretionary* activities. Those extending beyond 200m (which is the case for all those being considered) are *non-complying* activities. That means that one of the thresholds contained in the former s105A (now s104D) must be passed before a resource consent can be considered, but it is to be noted that the Sounds Plan does not elaborate upon the difference between *discretionary* and *non-complying* in terms

of assessment criteria. The thresholds are that the adverse effects of the proposed activity of the environment will be minor, or that the activity will not be contrary to the objectives and policies of the relevant planning documents.

The presently existing but unconsented farm areas

[19] As is well-known, some marine farms within the Bay were established pre the Resource Management Act, and are authorised by Marine Farm Licences issued under earlier legislation. Those licences terminate in 2024. But it was drawn to our attention, and we do not recall hearing of it previously, that there are considerable areas of the existing marine farms in the Bay that have been established and used without the blessing of any form of consent. Relevant to the present application, 17.6ha of the total sought of 60.45ha already exists as unconsented farm space. The net increase, if the proposal goes ahead, would therefore be 42.85ha. We were told that these areas, rather euphemistically described as the *off-site developments,* came about because of inaccuracies with the original GPS data and anchor placements. That is as maybe, but the unconsented areas cannot, obviously, be regarded as part of a *permitted baseline*, nor of a lawful *existing environment.*

The precautionary principle and adaptive management

[20] As discussed in the Court's decision in *Friends of Nelson Haven and Tasman Bay v Marlborough DC* (W36/2006) the *precautionary principle* is increasingly relevant in considering marine farming in the Bay (and indeed in the Marlborough Sounds generally):

> [18] ... It is self-apparent that, simply in terms of space to put them, the inner Bay is approaching saturation point for inshore – ie within 200m or so of the shoreline – marine farms. For the expansions, in some cases beyond the 200m line, sought in these applications we accept the evidence that the habitat provided by the waters of the inner Bay must be approaching a point where the *preservation* and *protection* required by s6, and the matters to which *particular regard* is to be had under s7, become increasingly dominant factors in the balancing exercise. In other words, the *precaution* inherent in the RMA will be increasingly likely to outweigh factors such as, for instance, economic wellbeing.

[21] Considering the *precautionary approach* (to distinguish it from the *principle*) – as per the Rio Declaration of 1992 – is not helpful in the New Zealand context. That approach is in these terms:

> Principle 15
>
> In order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or

irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.

[22] The *precautionary principle*, as developed in New Zealand case law, has a different emphasis. It comes into play where there is uncertainty about the likelihood, or possibility, of adverse effects arising from a given activity, and/or the significance of those adverse effects. Where that is so, the principle holds that commensurate caution should be applied to any necessary decision-making. So, applying that concept to the present debate, the question must be whether there is a foreseeable likelihood, or possibility, that extending the existing marine farms would, or might, so reduce the area of usable habitat for the dolphins that there would be an appreciable decline in the Bay's population. A similar issue arises about possible effects on the King Shag population.

[23] One possible tool for giving effect to the precautionary principle is that of *adaptive management*. That usually will involve a staged establishment and operation of the activity in question. At each stage, the adverse effects, if any, are to be measured against a known baseline. If the effects are both attributable to the activity, and adverse beyond a pre-set limit, then that stage of establishment and operation is to be reversed. It follows from that last point that it must be reliably predictable that the reversal will allow the affected environment to return to its undamaged state.

[24] So it follows that an adaptive management regime, to give effect to the precautionary principle must have, at the very least:

- A clear baseline against which future effects can be measured;
- A means of reliably measuring the nature and extent of future adverse effects;
- A means of knowing that a given adverse effect is the product of a known cause.
- Certainty that the identified cause can be stopped, and that any adverse effects attributable to it can be reversed.

[25] That prescription fits, we think, with the comments made by the Supreme Court in *Sustain Our Sounds Inc v The New Zealand King Salmon Co Ltd* [2014] NZSC 40 [2014], 1 NZLR 673 (at para [133]) as to what is required of an effective and supportable adaptive management regime - ie:

> We accept that, at least in this case, the factors identified by the Board are appropriate to assess this issue. For convenience we repeat these here:

[a] There will be good baseline information about the receiving environment;

[b] The conditions provide for effective monitoring of adverse effects, using appropriate indicators;

[c] Thresholds are set to trigger remedial action before the effects become overly damaging; and

[d] Effects that might arise can be remedied before they become irreversible.

The Court held that a threshold point had to be reached before an adaptive management regime could be considered appropriate – there must be an adequate evidential foundation to have a reasonable assurance that the regime would sufficiently reduce uncertainty, and adequately manage residual risk. Noting that the Court expressed the proviso ... *at least in this case* ... we have to say that we see no material difference between that case and this in assessing the requirements of an effective AMP.

New Zealand Coastal Policy Statement

[26] The New Zealand Coastal Policy Statement 2010 has this policy, specifically calling for the kind of *process* we have just discussed (while, perhaps a little unhelpfully, calling it an *approach)*, in certain circumstances:

> Policy 3 Precautionary approach
>
> (1) Adopt a precautionary approach towards proposed activities whose effects on the coastal environment are uncertain, unknown, or little understood, but potentially significantly adverse.
>
> (2) In particular, adopt a precautionary approach to use and management of coastal resources potentially vulnerable to effects from climate change, so that:
>
> (a) avoidable social and economic loss and harm to communities does not occur;
>
> (b) natural adjustments for coastal processes, natural defences, ecosystems, habitat and species are allowed to occur; and
>
> (c) the natural character, public access, amenity and other values of the coastal environment meet the needs of future generations

On the present state of knowledge, placing more marine farm structures within the habitat for dolphins provided by the Bay would seem to be exactly the sort of situation Policy 3(1) should be held to apply to. It is to be emphasised that ABC accepts that to be so – the live issue is whether its proposal gives effect to that precautionary approach.

Marlborough Regional Policy Statement and Marlborough Sounds Resource Management Plan

[27] The Marlborough Sounds Resource Management Plan also, as Mr Hardy Jones acknowledges, effectively requires a precautionary approach to be taken. Ms

Radich pointed to the threshold provisions of the MSRMP, which give effect to the relevant provisions of the Marlborough Regional Policy Statement, which are these:

> Objective 5.3.10 – The natural species diversity and integrity of marine habitats be maintained or enhanced.
>
> Policy 5.3.11 – Avoid, remedy or mitigate habitat disruption arising from activities occurring within the coastal marine area.
>
> Method 5.3.12(a) – Identify in resource management plans areas of significant marine habitat and include controls to protect those habitats.
>
> Policy 7.2.10(d) – Allocation of space for aquaculture in the coastal marine area will be based on marine habitat sustainability, habitat protection, landscape protection, navigation and safety, and compatibility with other adjoining activities.
>
> Policy 8.1.6 – Preserve the natural character of the coastal environment.

[28] In particular Chapter 4 of the MSRMP deals with what it describes as the ... *primary resource management issue* ... of the ecological values of the Sounds and adverse effects on its indigenous flora and fauna. Indeed, the single management issue addressed is the potential for the ... *degradation of ... the habitat of indigenous fauna*. The presence of structures in the water is identified as a particular issue of concern, or a significant threat to the habitat, in these terms:

> Degradation of coastal marine habitats arising from structures

[29] Assessment criteria are contained in Rules 35.4.1, 35.4.2.3.1 and 2, and 35.4.2.7. General assessment criteria are:

> Rule 35.4.1.1.5.3 – The likely effects of the proposal on any significant environmental features and in particular that the proposal does not:
>
> [a] Adversely affect any habitat of any indigenous species or any ecological value identified in Appendix B, [see Volume 2] or
>
> [b] Compromise the integrity of any terrestrial or marine ecosystem.
>
> [c] Diminish the natural character of the locality, having regard to the natural character areas identified in Appendix Two, Volume One. [see Item D]

Also relevant are the assessment criteria in:

> Rule 35.4.2.7 – Occupation of the Coastal Marine Area
>
> [a] The effect on other users of the coastal environment.
>
> [b] The effect on cultural and landscape values.
>
> [c] Any effects on the ecology, fauna and flora of the surrounding environment.

Is the proposed adaptive management plan sufficient?

[30] Taken as a whole, the national and regional planning documents point powerfully and unmistakeably to a conservative approach to the use of the marine

habitat and the protection of its ecology. With that directive in mind, we consider whether the proposed AMP will provide the necessary assurances.

[31] Coming from the studies done on dolphin occupation of and activities in the Bay, there is significantly more information than there was. We note though that Professor Wursig, who has undertaken and guided much of the research into this population of dolphins, and who was called jointly by the Council and the Director-General, confirms, as he has done in earlier evidence, that it is clear that the dolphins avoid the near-shore areas of the bay where marine farms are present, and that it is the farms, and not some other causative factor such as depth or prey distribution which drives that behaviour.

The applicant's evidence about dolphin presence in the Bay

[32] Dr Deanna Clement provided data on the abundance and trends of Dusky Dolphins in Admiralty Bay. The annual abundance estimate for the years 1998 – 2004 was 711 dolphins. A statistical calculation of the error of estimate was provided by the 95% confidence interval indicated by a vertical line on a graph (Clement EIC figure 3) but without any stated measure of that confidence interval. The confidence interval appears to lie in the range of 600 – 830 dolphins.

[33] The annual abundance estimate for the years 2005 and 2006 is very similar at 712 dolphins. The 95% confidence interval appears to lie in the range 500 – 1130 dolphins. The confidence interval in this case is much larger presumably because of the fewer observations.

[34] The annual abundance estimate for the years 2011 and 2012 was 1147 dolphins. No confidence interval was shown for these results.

[35] The mean weekly abundance estimates were also provided for each of the years 2000 – 2006. (Clement EIC figure 4.) The numbers of dolphins varied between 272 in 2001 and 105 in 2005. Confidence intervals were shown for each year but no measure was provided. The results showed a possible decline after 2003 in the mean number of animals regularly using the Bay on any given week.

[36] Encounter rates were also measured for the years 2001 – 2006 and 2011 - 2012. This is the relative index for the mean number of dolphin groups that might be

observed in Admiralty Bay each winter over one hour of surveying. Results varied from 6 down to 0.46 and showed a distinct declining trend.

[37] A similar declining trend was reported for the mean proportion of groups initially observed feeding in Inner Admiralty Bay. 80% of the group were observed to be feeding in 2001 and 38% in 2006.

[38] On this evidence Dr Clement concluded that:

> Based on winter estimates and demographics, more dusky dolphins are now visiting the greater Admiralty Bay region over winter. But rather than steady numbers of dolphin staying throughout the winter months, fewer animals appear to be remaining for as long as the 2000 – 2001 findings, and this continues to decline. (Clement EIC paragraph 10.6 (c).)

Dr Clement also concluded that:

> There also appears to be a shift away from coordinated prey herding over winter to more individual foraging strategies, perhaps associated with the smaller group sizes of dolphins now observed. (Clement EIC paragraph 10.6 (d)).

[39] Interestingly, Dr Clement ended her evidence in chief at para 10.10 by saying:

> The fact that dusky dolphin population dynamics within Admiralty Bay appear to be undergoing large-scale changes suggests that this species might potentially be less resilient to any additional modifications within their current habitats.

Nevertheless she considered that because the mussel farming structures can be removed and their effect eliminated, it is appropriate to adopt an adaptive management approach.

[40] The adaptive management approach suggested by Dr Clement is, broadly, to continue to monitor the occurrence and behaviour of dusky dolphins and, if the results lie below the previously observed variability limits, then the additional mussel farms would be removed. Dr Clement did not provide us with the actual measurements to be undertaken, or the actual measurement in each case that would define the level at which action would be required. She refers to the limits of variability and presumably means the averages already reported, less the confidence intervals, but we were not given these figures, nor indeed the reasoning for adopting such an approach.

[41] Dr Simon Childerhouse supports the adaptive management approach suggested by Dr Clement. He considers that the criteria adopted for this regime

measure the state of the dolphins and provide for remedial measures if those criteria are exceeded. He considers that approach avoids the difficulties that arise from a lack of suitable baseline data, the high variability of the baseline data, and the inability to establish a cause and effect relationship. However he also does not provide the criteria. That he leaves to an annexure in the evidence in reply of Mr John Kyle, the applicant's planner.

[42] Mr Kyle proposes, in his Annexure 3, that annual winter monitoring will collect information on four surveillance indicators under the two categories of population estimates, and contextual demographics. The four indicators are inter annual winter abundance estimates, mean weekly winter abundance estimates, mean winter encounter rate, and winter feeding behaviour prevalence.

[43] After three years of monitoring, presumably with the additional mussel farms in place, Mr Kyle proposes that a decline in dolphin behaviour would be shown by a sustained decline in the population estimates and in the contextual demographics. Why there needs to be a decline in one case and a cumulative sustained decline in the other case is not explained.

[44] Lower bounds for the indicators are established at the lowest value of the confidence interval for the lowest average year or week. No justification or reasoning is provided for selecting this value. The inter annual abundance estimates for 1998 – 2004 and those for 2005 – 2006 are about the same at 711 and 712 respectively but the confidence interval for the longer period is considerably smaller (ie the measure is more certain). If the lower bound for that indicator was based on the longer period of record then the indicator lower bound would be significantly higher. Indeed why confidence intervals should be taken into account at all is not explained.

[45] Mr Kyle also describes additional criteria for so called *zones of concern*. If monitoring shows results that fall in these zones of concern then further monitoring and ultimately action to limit mussel farming would be required. Again the basis and justification of these values and consequent actions are not explained.

The opposing views

[46] Professor Wursig considered that evidence and, for the reasons he gave, confirmed his view that despite the increase in knowledge about the dolphins:

... largely because of the intra and inter-year variability, we still do not know the long term trends, and so not do have clear enough information to predict occurrence pattern for the next five or ten years, for example.

[47] Directly addressing the concept of adaptive management Professor Wursig noted (and we make no apology for quoting him at some length):

> 60 ... In particular, an adaptive management regime which is premised on detecting changes on the wider population or at the level of numbers of animals utilising the bay would be ineffective.
>
> 61 A key problem within an effective adaptive management regime in this case is the high variability in dusky dolphin abundance and usage of Admiralty Bay evident in the existing information we have. ...
>
> 62 Doctor Childerhouse in his evidence mentions tracking the *state and health* of the population (paragraph 5.2), but it is unclear what metrics would be used as surveillance indicators, and how these could be linked to mussel farms. Dr Clement (paragraph 9.9) suggests using some of the long-term metrics discussed in her Section 7 (eg total abundance, weekly abundance, and encounter rates) as a starting point. However, because of the variability in the baseline information it is very hard to identify appropriate indicators for the monitoring of effects. If the indicators chosen have to do largely with whether there is a population level or even only bay-wide change in numbers of dolphins and overall use of habitat as related to experimental addition (or deletion) of mussel farms, then there would need to be intensive and long-term effort to ascertain such potential effects. Dr Clement mentioned >20 years, and I concur. ... I agree with statements by Srinivasan et al (2012) and Dr Clement in her evidence that such fluctuations may be caused by presently unknown larger scale drivers such as prey availability patterns (inside and out of the bay), with secondary drivers perhaps being more direct and anthropogenic effects such as fishing and mussel farming, but these effects are presently unknown at any level except for direct exclusion of dolphins by mussel farms. If the indicators have to do with whether the areas of the mussel farm would no longer be used by dolphins, then the effect may be able to be determined more easily and rapidly. However, I question the sense of such an approach as we already know that mussel farms tend to exclude most dusky dolphin use.
>
> 63 Although mussel farms could be taken away if adverse effects arose, it would be very difficult to set appropriate thresholds or metrics for the identification of these effects; and because population level effects would not be detectable for a long-time, it is unlikely that an effect could be

measured well enough for the remediation action to be triggered, so this becomes a moot point.

[48] We find that line of reasoning very convincing. *Effective monitoring of adverse effects, using appropriate indicators* (as the *King Salmon* judgment puts it) raises at least two issues that, with present knowledge, cannot be accurately known or determined. The first is that of the indicator itself. Should it be just population numbers at a certain time of year? Should it be the times of arrival in significant numbers, or departures in significant numbers? Whichever measurement is chosen, what number should/would be regarded as the baseline?

[49] Assuming those issues can be resolved, and an adverse effect is measured, how is a cause to be attributed to that effect? As was mentioned as an example in the hearing, a catastrophic oil spill in a habitat could provide an identifiable cause of animal deaths, or of abandonment of the habitat. Such a cause, and its extent, would be immediately apparent to any above-surface observer. But something less dramatic and obvious, and taking longer – possibly years or more – for its causative link to emerge, may have done irreparable damage before cause and effect can be identified.

[50] We have borne in mind that the ABC suggestion is that if any adverse effect on the dolphins is observed, then the additional lines will be removed, even if it cannot be established that they were the cause. That is all very well, and no doubt well-intentioned, but the uncertainty of the baseline and the elapsed time before an adverse effect can be demonstrated means, in our view, that the concession of not requiring a proven causal link does not remove the problem.

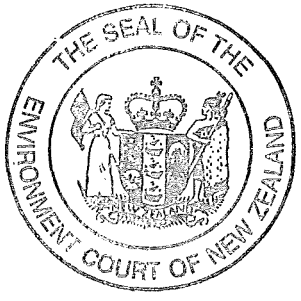
The evidence about King Shags

[51] In considering fauna in general, there is as mentioned earlier, the related but distinct subject of the habitat of King Shags in and around Admiralty Bay.

[52] We received evidence on King Shags from Dr Paul Fisher and Dr David Thompson on behalf of the Friends and the Applicant respectively. The witnesses prepared a joint witness statement (JWS)[1] where they agreed, relevantly, that:

[1] Joint Witness Statement: Seabird experts 25 May 2016

- Inner Admiralty Bay and the proposed mussel farm sites are within the 25 kilometre foraging range of the New Zealand King Shag (King Shag) breeding colonies at (northern) Stewart Island and Trio Islands (11 and 20 kilometres respectively from Hamilton Island).
- Admiralty Bay forms part of the Marlborough Sounds Important Bird Area (IBA) recognised for its global significance to seabirds. Significant numbers of breeding King Shag, Fluttering Shearwater and Australasian Gannet feed within Admiralty Bay.
- The Marlborough Sounds IBA is defined by the seaward extensions to seabird colonies and includes coastal congregations of non-breeding seabirds. The qualifying species: King Shag, (foraging range 25 kilometres from colony) and extent of foraging depth (50m); at sea feeding/aggregations for Fluttering Shearwaters and Australasian Gannet (occurring throughout Admiralty Bay and outer Sounds); and Fairy Prion (occurring mainly outer Admiralty Bay and outer Sounds). Seabird species groups (multi-species) not listed above.
- It is recognised that inner Admiralty Bay is part of the wider Admiralty Bay marine ecosystem, which includes unique feeding assemblages of seabirds and marine mammals;
- King Shag Area of Occupancy (defined in the Marlborough Sounds Important Bird Area) is significant habitat for the King Shag given its small population;
- New Zealand has adopted a national threat classification system under which King Shag is listed as *Nationally Endangered*, based on a restricted range in a population between 250 to 1000 mature individuals. This species qualifies for listing as *Threatened* under both the IUCN and New Zealand threat classification systems;
- Sightings of King Shags in the Marlborough Sounds represent locations of birds at a point in time but not the true extent of their feeding habitat or quantify the relative importance of feeding areas (e.g. because their benthic prey distribution and density vary over time).
- It is agreed that New Zealand King Shag population size has maintained low numbers (ie less than 1000 individuals) in modern times;
- They agree that there are methodological limitations on data collections and some large gaps between surveys. Dr Thompson is of the view *that it appears over time, the numbers appear to be about the same;*



- Dr Fisher is of the view that there is insufficient information describing King Shag breeding population dynamics to describe the population as *stable* and fully understand the vulnerability of the King Shag species to anthropogenic and natural stressors.

[53] It is clear there are many areas of agreement between the experts in respect of King Shag in Admiralty Bay. The matter of the long term stability of the population is a significant area of disagreement. As already noted Dr Thompson's evidence, based on population counts and estimates is that the King Shag population appears to be at least stable but relatively small.[2]

[54] Dr Fisher's evidence, while noting the difficulties of accurately counting the colonies is that:

> The colony counts alone cannot be used to determine the long term *stability* of the population because the count does not reflect the number of breeding attempts, weather-related breeding failure events or age and sex ratio of birds, the latter determining the number of potential breeding pairs.[3]

[55] Both witnesses acknowledge that current lack of information about the biology of the King Shag and it limits one's ability to fully assess potential impacts of the proposed development.

[56] Dr Fisher's evidence is that the total area of inner Admiralty Bay occupied by marine farms equates to 9 % of the King Shag foraging area in inner Admiralty Bay.[4]

[57] The majority (92 %) of the global King Shag population is spread across four main and four smaller breeding colonies all located in offshore islands in the outer Sounds.

[58] Admiralty Bay is within the foraging range of King Shag from three breeding colonies (Trio Islands, Rahuinui and (northern) Stewart Island).

[59] Mr Ironside submitted that as the experts had agreed the total number of King Shags globally is less than 1000 mature individuals and that the whole of the King

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[2] Thompson EiC para 17
[3] Fisher EiC 10.8
[4] Fisher EiC para 11.5

Shag Area of Occupancy is significant habitat then this habitat should be recognised as critical to the survival of the species. As noted earlier in our decision when discussing the Dusky Dolphin, it is the Friend's case that the significance of the habitat should not be considered in isolation but, as Professor Wursig has described the interactions between various species as the *cascade of ecological connection* sea birds are an important part of this cascade: and Mr Ironside submits:

> A precautionary approach to further marine farm development within Admiralty Bay is warranted until there is a more co-ordinated research effort to promote a better understanding of the Admiralty Bay ecosystem, and threats and risks to its food web inter-relationships.[5]

[60] It is agreed in the JWS that the King Shag qualifies for listing as *threatened* under both the International Union for Conservation of Nature and Natural Reserves and the New Zealand Threat Classification System, and that for the International Union the category following *threatened* is *extinction*. We see this as strongly supporting the need for a precautionary approach to any activity which will, or even could, affect the viability of the habitat for these birds.

[61] As noted below, Policy 11 of the NZCPS requires protection of the indigenous biological diversity in the coastal environment by avoiding adverse effects of activities on indigenous taxa that are listed as *threatened* in the New Zealand Threat Classification System, and habitats of indigenous species where the species are at the limit of their natural range or are naturally rare.

[62] There have been no recordings of King Shag foraging within marine farms in Admiralty Bay or Current Basin (or in any other bays with high densities of marine farms such as Forsyth and Beatrix Bays) and we accept that the presence of marine farms appears to preclude King Shag from foraging under marine farms. It must follow that further reducing significant habitat, as the proposed extensions would, fail the directive of Policy 11 of the NZCPS.

[63] We accept that the proposed extensions do not, in percentage or spatial terms, reduce the available King Shag foraging area by a great deal, and we note Dr Thompson's evidence that King Shag foraging distribution in Admiralty Bay is *patchy;* that Admiralty Bay is not particularly important for foraging King Shags[6] and

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[5] Ironside submissions para 14
[6] NOE pages 159-160.

his conclusion that the effects of the extensions on King Shag in Admiralty Bay are … *hard to draw a conclusion other than it would be largely unaffected.*[7]

[64] However the proposed extensions will constitute a further cumulative impact on King Shag habitat and, on its face, Policy 11 of the NZCPS (which we are about to discuss) requires such encroachment to be avoided.

Section 104(1)(b) – national planning documents

[65] We have discussed some parts of the NZ Coastal Policy Statement at para [26]. Two further parts of the document reinforce the importance of the issues, and thus the care to be taken in decision-making. Taking them in numerical order, the first is Policy 8, which is not of direct relevance to the immediate issues, but does neatly summarise the importance of marine farming:

> Aquaculture
>
> Recognise the significant existing and potential contribution of aquaculture to the social, economic and cultural well-being of people and communities by:
>
> (a) including in regional policy statements and regional coastal plans provision for aquaculture activities in appropriate places in the coastal environment, recognising that relevant considerations may include:
>
> (i) the need for high water quality for aquaculture activities; and
>
> (ii) the need for land-based facilities associated with marine farming;
>
> (b) taking account of the social and economic benefits of aquaculture, including any available assessments of national and regional economic benefits; and
>
> (c) ensuring that development in the coastal environment does not make water quality unfit for aquaculture activities in areas approved for that purpose.

[66] The second is Policy 11, which is directly relevant to the present issues:

> Indigenous biological diversity (biodiversity)
>
> To protect indigenous biological diversity in the coastal environment:
>
> (a) avoid adverse effects of activities on:
>
> (i) indigenous taxa that are listed as threatened or at risk in the New Zealand Threat Classification System lists;
>
> (ii) taxa that are listed by the International Union for Conservation of Nature and Natural Resources as threatened;
>
> (iii) indigenous ecosystems and vegetation types that are threatened in the coastal environment, or are naturally rare;

NOE page 164.

(iv) habitats of indigenous species where the species are at the limit of their natural range, or are naturally rare;

(v) areas containing nationally significant examples of indigenous community types; and

(vi) areas set aside for full or partial protection of indigenous biological diversity under other legislation; and

(b) avoid significant adverse effects and avoid, remedy or mitigate other adverse effects of activities on:

(i) areas of predominantly indigenous vegetation in the coastal environment;

(ii) habitats in the coastal environment that are important during the vulnerable life stages of indigenous species; ...

The direct references to *protection* of indigenous biological diversity and *avoidance* (ie not allow to happen at all) of adverse effects on indigenous taxa that are threatened or at risk [see para [13] re King Shags], and on habitats of rare indigenous species, are unmistakably strong and directive.

Regional planning documents

[67] We have discussed the particularly relevant provisions of the Regional Policy Statement and the Marlborough Sounds Resource Management Plan at para [27] to [29]. We do not think that any further discussion is required.

Part 2 of the RMA

[68] While it may (indeed should) be assumed that the NZCPS and the regional planning documents give effect to Part 2 of the Act, it is still worth pointing out the direct relevance of the s6 matters of *national importance*, which are to be recognised and provided for in all decision-making:

> In achieving the purpose of this Act, all persons exercising functions and powers under it, in relation to managing the use, development, and protection of natural and physical resources, shall recognise and provide for the following matters of national importance:
>
> (a) the preservation of the natural character of the coastal environment (including the coastal marine area), wetlands, and lakes and rivers and their margins, and the protection of them from inappropriate subdivision, use, and development: ...
>
> (c) the protection of areas of significant indigenous vegetation and significant habitats of indigenous fauna:
>
> (d) the maintenance and enhancement of public access to and along the coastal marine area, lakes, and rivers: ...

There is, as mentioned, no question but that the Bay as a whole is a significant habitat of indigenous fauna.

Conclusions- Section 104D and section 104

[69] In terms of s104D, it will follow that we must conclude that neither threshold can be crossed. We cannot conclude that the adverse effects of the activity on the environment will be minor. The plan provisions discussed at paras [27] to [29] are, as noted, strong and directive. We simply cannot say that the proposed activity will not be contrary to them.

[70] For completeness, we may add that even if one or other threshold had been crossed, on an overall assessment of effects, both positive and adverse, and of all the relevant plan provisions, the result would be the same.

[71] We are left with an incompletely explained proposed adaptive management regime that, we have to say, we do not find convincing. Further, the studies to date show there has been a decline in dolphin residence. A cause for that is not able to be attributed but under these circumstances it is difficult to conclude the expansion of mussel farming in Admiralty Bay could be allowed. The evidence about the King Shags adds to that view.

[72] The result is that we do not see a way to allow further expansion of the farms on the proposed basis. The baseline information remains insufficient to know whether adverse effects are being caused by staged extensions, at least within a time frame that would give confidence that we could know that the effects are actually occurring, and that those effects can be stopped, and reversed, before an irrecoverable tipping point is reached.

Result

[73] In short, the requirement for caution cannot be met, and the only principled option is to allow the appeal and decline the resource consents necessary to further expand the existing farms.

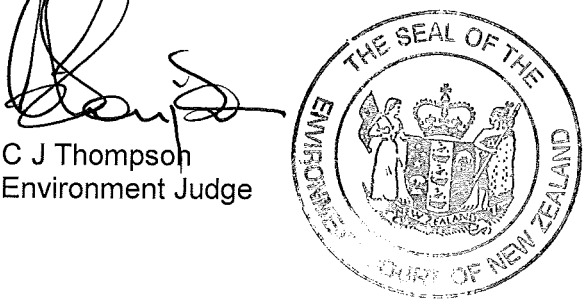
[74] Although we are unable to find in favour of the application, we wish to commend the position taken by ABC, and its responsible and helpful attitude and conduct throughout the appeal process. It has been more patient than many appellants would have been, and has devoted both time and considerable resources

to assisting the research about the habitats in the Bay, and their use by the dolphins and other species.

Costs

[75] In all the circumstances we do not encourage any application for costs, but as a matter of formality, costs are reserved. If there is to be any application, it should be lodged and served within 15 working days of the issuing of this decision, and any responses lodged and served within a further 10 working days.

Dated at Wellington this 9th day of August 2016
For the Court



C J Thompson
Environment Judge

TAB 3

McIntyre v Christchurch City Council

The Planning Tribunal: His Honour Principal Planning Judge Sheppard, presiding; Mrs N J Johnson and Mr I G C Kerr.

13 - 17, 22, 23 November 1995; 5 March 1996 Decision A 15/96

Resource consents — Telecommunications facility — Whether emissions of radio frequency radiation from the proposed facility would have adverse health effects — Whether proposal would have adverse visual effects — Whether compliance with New Zealand Standard was decisive of whether there would be adverse effects — Precautionary principle and Resource Management Act — Approach taken in other jurisdictions to application of precautionary principle — Evidentiary burden — Regard to potential effects of low probability with high impact — Conflict of opinion among expert witnesses — Proposal a discretionary activity under proposed district plan — Proposal a non-complying activity under transitional district plan — Whether appropriate for case to set a general standard — Amendment of conditions imposed — Standards Act 1988, ss 10, 22; Resource Management Act 1991, ss 2(1), 3, 5(2), 17, 88(4)(b), 104(1), 105(1), 105(2)(b), 108(2), 128, 276, 319(2).

BellSouth New Zealand (BellSouth) proposed to site a telecommunications facility for its mobile telephone service in Fendalton. Under the transitional district plan, a telecommunication facility had to be treated as a non-complying activity in the area; under the proposed district plan, the facility was a discretionary activity.

BellSouth applied to the Christchurch City Council, the respondent, for consent. Properties in the vicinity of the proposed facility were zoned and occupied for residential activities. A number of residents, including Ms McIntyre, the appellant, objected to the proposal, concerned about harmful health effects from radio frequency radiation from the facility. The respondent granted consent and imposed a number of conditions, including provision for review of a condition setting power flux density limits.

Ms McIntyre appealed to the Planning Tribunal against the consent, and BellSouth appealed against the provision for review of the power flux density limits. The amendment sought by BellSouth was to limit the incident power flux density of radio frequency emissions from the facility to 50 microwatts per square centimetre at any point where any member of the public would approach the facility's antennas.

The appellant's case was that it was a serious hypothesis that exposure to the amounts of radiation that would be emitted by the transmissions from the proposed facility was potentially harmful to health. The appellant argued that it would be an error of law to decide on the present state of scientific knowledge, on the balance of probabilities, that there were no harmful health effects from low-level radio frequency exposure. The appellant submitted that the Resource Management Act contains a precautionary policy and that s 104 requires a consent authority to have regard to potential effects of low probability with high impact in considering an application.

BellSouth maintained that there were no proven harmful effects from radio frequency emissions from such a facility as was proposed. The exposure of the general public from the proposed facility would be no more than 12 microwatts per square centimetre which was well below the New Zealand Standard NZS 6609:1990 maximum recommended exposure of 200 microwatts per square centimetre.

Held (disallowing the appeal):

(1) The proposed activity would not have significant visual effects on the environment.

(2) Compliance with the New Zealand Standard NZS 6609:1990 dealing with maximum exposure levels to radio frequency radiation, was not decisive of whether or not there would be actual or potential effects on the environment of allowing the activity, and the Tribunal had still to consider all the evidence.

(3) There was no basis in the evidence presented for finding that exposure to radio frequency radiation from the proposed transmitter at the predicted intensity of about 12 microwatts per square centimetre would have a potential effect on people, not even an effect of low probability but of high potential impact.

(4) The facility had been designed to minimise adverse effects on its surrounding environment, and would not conflict with any of the objectives, policies or rules of the proposed district plan under which it was a discretionary activity.

(5) Under the transitional district plan the proposal was non-complying. However, the adverse effects on the environment would be minor. Also the proposal did not conflict with any of the objectives or policies of either the transitional district plan or the proposed district plan. Both of the conditions stipulated in s 105(2)(b) on which a consent authority could grant consent were fulfilled.

(6) Granting the consent sought, subject to the conditions imposed by the city council, with amendment setting a maximum power flux density of 2 microwatts per square centimetre measured at any dwelling, would serve the statutory purpose; the application deserved to be granted.

Cases cited

Canterbury Regional Council v Canterbury Frozen Meat Co Ltd (Decision A 14/94), 3 NZPTD 368

Darroch v Whangarei District Council (Decision A 18/93)

Daubert v Merrill Dow Pharmaceuticals Inc 915 F 2d 1128 (1991), (1993) 125 L Ed 2d 469, 113 S Ct 2786

Environmental Defence Society Inc v Manukau City Council (Decision A 11/86)
Erebus Royal Commission; Re; Air New Zealand v Mahon [1983] NZLR 662
Greenpeace Australia v Redbank Power Company (1994) 86 LGERA 143
Leatch v National Parks and Wildlife Service and Shoalhaven City Council (1993) 81 LGERA 270
Liquigas Ltd v Manukau City Council (1983) 9 NZTPA 193
McQueen v Waikato District Council (Decision A 45/94), 3 NZPTD 644
Meadow Mushrooms Ltd v Paparua County Council (1977) 6 NZTPA 327
Newbury District Council v Secretary of State for the Environment [1981] AC 578, [1980] 1 All ER 731
Peninsula Watchdog Group Inc v Waikato Regional Council (Decision A 52/94), 3 NZPTD 656
R v Mohan [1994] SCR 9; 89 CCC (3d) 402
R v Secretary of State for Trade and Industry, ex parte Duddridge "The Independent", 4 October 1994 (QBD)
Te Aroha Air Quality Protection Appeal Group v Waikato Regional Council (No 2) (1993) 2 NZRMA 574
Te Runanga o Taumarere v Northland Regional Council [1996] NZRMA 77
Trans Power New Zealand v Rodney District Council (Decision A 85/94), 4 NZPTD 35
West Coast Regional Abattoir v Westland County Council (1983) 9 NZTPA 289

Appeals under s 120 of the Resource Management Act 1991.

John Fogarty QC and *Margo Perpick* for Ms McIntyre and others
Paul Cavanagh QC and *Leigh McGregor* for BellSouth New Zealand
Tony Hearn QC for Christchurch City Council

The decision of the Tribunal was delivered by His Honour Judge Sheppard.

DECISION

[The introductory chapter has been omitted from this report and is briefly summarised in the headnote.]

CHAPTER TWO: BASIS FOR DECISION-MAKING

The issue

In considering resource consent applications, consent authorities are required to have regard to the actual and potential effect on the environment of allowing the activity (s 104(1)(a) of the RMA). The only effects on the environment suggested by the parties to this appeal were visual effects and potential effects of radiation on the health of people in the vicinity. The duty to have regard to actual and potential effects on the environment is expressed to be subject to Part II of the Act. That implies that the duty is to yield to the provisions of that part where there is a conflict between them. However it is not suggested that having regard to any of the classes of matter listed in s 104(1) that is relevant in this case would conflict with any of the provisions of Part II. We will therefore have regard to them.

Although visual effects on the environment of the proposed antennas and their supports were raised by the applicant for consideration, it was not part of the appellants' case that those effects would be significant. The applicants called evidence of a qualified landscape architect, Mr P Rough, who deposed to the opinion that the antennas would have moderate visual effect when viewed from 100 m or less; that beyond that range the visual impact would be minor; and that with proposed improvements to the visual amenity of the area, the proposed antennas would have a generally minor visual impact on the environment. That evidence was not contradicted, and having ourselves visited the neighbourhood, we accept it and find that there would not be significant visual effects on the environment of the proposed activity.

The applicant maintained that the radiation from the proposed transmitter would not endanger the health of any individual of any age or state of health, and that there are no proven harmful effects from radio frequency emissions of such facilities, which are well below the maximum level set in the relevant New Zealand Standard.

However it was the heart of the appellants' case that a serious hypothesis exists that exposure to the amounts of radiation that would be emitted by the proposed transmissions is potentially harmful to health. On their behalf it was contended that the national and international standards do not address or apply the risk avoidance policy of the Resource Management Act; that it would be an error of law to decide on the present state of scientific knowledge, on the balance of probabilities, whether there are harmful health effects from low-level radio frequency exposure from these facilities; and that s 104 requires a consent authority to have regard to potential effects of low probability with high impact.

It was the respondent's case that where there is acceptable evidence supporting international standards they should be adopted unless there is a plausible basis for doing otherwise. Likewise counsel for the applicant submitted in reply that the appellants' case asks that the applicant's activities be restricted not on any basis of a recognised standard but on an unproven hypothesis, which had not been established in many years of research.

Although we need to examine the evidence carefully and make our findings, we first seek to identify the correct basis for making them.

Compliance with standards not decisive

The New Zealand Standard

The relevant standard is New Zealand Standard Radiofrequency Radiation Part 1: Maximum exposure levels – 100 KHz to 300 GHz and Part 2: Principles and methods of measurement – 300 KHz to 100GHz which is designated as NZS 6609:1990. It was approved on 20 September 1990 by the Standards Act 1988. It is an adoption of the corresponding Australian Standard AS 2772:1990.

The general preface states:

> The purpose of the standard is to provide guidance on the exposure of the human body to radio frequency radiation and to set levels of exposure intended to avoid the production of effects hazardous to the body, based on current knowledge of biological effects of radiation in the frequency range of 100 KHz to 300 GHz. The standard applies to the exposure of radiation workers due to their employment and the incidental exposure of the general public but it does not apply to patients undergoing medical diagnosis or treatment.

> By analogy with the approach adopted for ionizing radiation, the non-occupational (24-hour) limit averaged over a time of one minute has been arbitrarily set at one-fifth of the occupational limit, as justified in the guidelines on limits of exposure to radio frequency electromagnetic fields in the frequency range of 100 KHz to 300 GHz developed by IRPA in conjunction with the Environmental Health Division of the World Health Organisation.

The New Zealand Standard added to the preface a comment that amendment or clarification was indicated, particularly in the area of measurement and interpretation. However, in view of the urgent need for a standard, the Australian Standard was considered adequate for use in the interim, and the project committee was to proceed with revision of the standards.

The foreword to the standard contains references to international sources and states: "The standard recommends that the level of all electromagnetic fields should be kept as low as reasonably achievable".

Part 1 of the standard on maximum exposure levels contains the following passages (at NZS 6609: Part 1, p 6, para 2):

> This standard is applicable wherever people may be exposed to radio frequency electromagnetic fields as a result of their employment and wherever the general public has access to regions in which they may be exposed.
>
> The standard is applicable to all forms of radio frequency electromagnetic fields. Except where specified in this standard, no distinction is made between continuous wave (CW) fields, such as a radio frequency heater might emit, or modulated fields, such as from a radio transmitter, or modulated intermittent fields such as from a radar transmitter which regularly scans a fixed path.
>
> The limits specified in this standard are intended to be used as a basis for planning work procedures, designing protective facilities, the assessment of the efficacy of protective measures and practices and the determination of the extent and nature of the required health surveillance. Nevertheless, because of the increasing use of equipment generating radio frequency radiation and the potential for exposure of individuals, all possible efforts should be made to keep such exposure as low as reasonably achievable (ALARA), below the prescribed limits. The overall economic and social consequences associated with the reduction of exposure to the individual and the public in general shall be taken into account.

As outlined in the preface, the standard sets separate maximum exposure levels for people exposed to radiation in the course of their occupations (referred to as occupational) and for people who may be exposed to an electromagnetic field otherwise than in the course of their occupation for periods up to 24 hours per day (referred to as non-occupational).

The recommended maximum exposure levels are expressed in terms of incident power flux density, that is, the amount of radio frequency power incident per unit area. This is measured in units of watts per square metre, or in the equivalent microwatts per square centimetre. The effect of the New Zealand Standard is that for people exposed to a radio frequency electromagnetic field at a frequency in the region of 900 megahertz otherwise than in the course of their occupation, the maximum recommended exposure is 200 microwatts per square centimetre.

It was not contested that the exposure of the general public from the proposed cell transmissions would be far below that, in the vicinity of no more than 12 microwatts per square centimetre. Further, it was not contested

that the New Zealand (and Australian) Standards are very conservative compared with other standards, including those adopted by the International Radiation Protection Association, the United Kingdom National Radiological Protection Board, and the United States of America (Institute of Electrical and Electronic Engineers/American National Standards Institute).

After setting the non-occupational maximum exposure levels, the standard states (at NZS 6609: Part 1, p 9, para 6):

> Notwithstanding the above requirement, because the effects of such exposures to electromagnetic fields are only imperfectly understood, it is recommended that the levels of all electromagnetic fields to which people are non-occupationally exposed, should be kept *as low as reasonably achievable.*

Significance of compliance with standard

For the applicant, Mr Cavanagh submitted that the New Zealand Standard is scientific, follows careful consideration and analysis, represents the present state of knowledge, is more conservative than the international scientific community's recommended threshold level, and is a plausible basis to which the proposed facility can perform. For the city council, Mr Hearn submitted that where there is acceptable well-qualified evidence supporting international standards, they should be observed unless on the evidence there is a plausible basis for doing otherwise.

However, it was the case for the appellants that the national and international standards do not address or apply the risk-avoidance policy of the Resource Management Act. On their behalf, Mr Fogarty submitted that it is the criteria in that Act by which the effects of allowing the activity are to be judged. He contended that standards-setting organisations set standards for known effects, but that one cannot draw from the existence of a standard that there is no concern in the scientific community; and he referred to indications that there is cause for concern about effects of radiation below the standards levels, although there is no proof of them.

The Standards Act 1988 provides for the preparation and approval of New Zealand standards (s 10), and also contains provision for regulations to be made by referring to or incorporating any New Zealand standard (s 22). However neither that Act nor the Resource Management Act gives New Zealand standards any status that would bind a consent authority to use them as a basis for deciding a resource consent application. In practice, relevant New Zealand standards (eg NZS 6802:1991 Assessment of Environmental Sound) are commonly used for that purpose, and are also referred to in district plans. Other technical guidelines and standards are also relied on (for examples see *Canterbury Regional Council v Canterbury Frozen Meat Co* Planning Tribunal Decision A 14/94, 3 NZPTD 368; *McQueen v Waikato District Council* Planning Tribunal A 45/94, 3 NZPTD 656; *Peninsula Watchdog Group Inc v Waikato Regional Council* Planning Tribunal Decision A 52/94, *Trans Power New Zealand v Rodney District Council* Planning Tribunal Decision A 85/94, 4 NZPTD 35 and *Te Runanga o Taumarere v Northland Regional Council* [1996] NZRMA 77). The stated purpose of the New Zealand Standard NZS 6609 is, relevantly, to provide guidance, and to be used as a basis for the assessment of the efficacy of protective measures and practices.

A party to resource consent proceedings is entitled to rely on compliance with a relevant New Zealand standard as tending to show that effects on the environment of a proposed activity should be acceptable because emissions would not exceed levels set in that document. Absent challenge by another party, a consent authority may treat the standard as setting an appropriate level of emissions that would not have unacceptable effects on the environment.

However parties to resource consent proceedings are not bound to accept that compliance with a New Zealand standard would avoid adverse effects on the environment that should be taken into account in deciding whether resource consent should be granted or refused. Because New Zealand standards are not given particular status by law, parties must be free to assert that significant adverse effects on the environment would occur despite compliance with the standard.

In practice, New Zealand standards are prepared by committees of people well-qualified in the subject, and with consultation with interested sections of the community. The standards are generally accorded respect. So opposition to a resource consent application based on an assertion of significant environmental harm despite compliance with a relevant New Zealand standard would usually need to be supported by expert opinion to be worthy of serious consideration. A mere assertion of harm, without such support, may not be a responsible exercise of a right of appeal.

That is not the present case. The appellants' assertion of environmental harm notwithstanding compliance with NZS 6609, and the implied challenge to the sufficiency of the maximum exposure levels set in that standard, was supported by expert witnesses. In addition, although the radiation emissions would fall far short of those which would cause the maximum exposure level set in the standard, that document contains other expressions of caution. The foreword recommends that the level of all electromagnetic fields should be kept as low as reasonably achievable; the text states that "... because the effects of exposures to electromagnetic fields are only imperfectly understood, it is recommended that the levels of all electromagnetic fields to which people are non-occupationally exposed, should be kept *as low as reasonably achievable*". So even on its own terms, those responsible for the standard do not claim absolute reliability for it; and on adoption of the Australian standard for this country an urgent need for revision, particularly in the area of measurement and interpretation, was acknowledged.

We cannot avoid our duty to decide the resource consent application on the evidence by simply accepting the New Zealand Standard as decisive of the issue. The law does not give the standard that status. It is the Tribunal's duty to consider all the evidence and find whether or not there would be actual or potential effects on the environment of allowing the activity. We hold that compliance with the New Zealand Standard is not decisive of that question; and any challenge to the adequacy of the levels set in the standard is collateral to it.

Differences among experts

The health effect of radiation from the proposed activity is a subject on which there were clear differences of opinion between the expert witnesses called for the applicant and those called for the appellants. We refer to decisions of

the Planning Tribunal describing its function in reaching findings where there are conflicts between experts on facts about which there can be no certainty.

In *Darroch v Whangarei District Council* (Planning Tribunal Decision A 18/93) differences among expert technical witnesses had arisen about discharge of wastes from a livestock saleyard. The Tribunal said (at p 5):

> There was therefore a conflict of opinion among those expert witnesses, all of whom were well qualified, both in academic attainments and professional experience, to give opinion evidence.
>
> The Tribunal is obliged to make a finding on the issue. As a judicial body it would not be appropriate merely to adopt the opinion shared by three of them because of weight of numbers. It is necessary to be open to accepting the opinion of the other after examination of the evidence of those witnesses and consideration of any submissions on that evidence.
>
> The purpose of the appeal hearing is to determine whether the water and discharge permits should be granted, not to resolve technical differences. The Tribunal does not conduct a scientific inquiry to discover absolute truth, nor is it judging between the expert witnesses, and our findings should not be seen in that way. We have to make a finding about the adequacy of the proposed waste water treatment system to reach a decision on these appeals. In that task we have been assisted substantially by the evidence of all those witnesses. We are grateful for the care with which each of them explained the reasons for the conclusion reached, and assisted us to understand and test the conclusion by cross-examination by other counsel and questions by ourselves.

In *Canterbury Regional Council v Canterbury Frozen Meat Co Ltd* there had been a difference between expert witnesses about confidence limits to be applied to analyses of samples of waste discharged to a river. The Tribunal said (at p 13):

> We accept that all sampling, analysis and measurement of the determinants for the present discharge right would be subject to error, and that the results can only be taken to represent the condition of the effluent from which the samples were taken in terms of probability. We also accept that calculation of 95 per cent confidence limits for the results would conform to accepted scientific practice, and could inform our judgment about the reliability to be accorded to the results for the purpose of making our findings.
>
> However we need to remember that our function is not so much to find the condition of the effluent in the sense that scientists might seek after absolute truth about a subject. Our function is a judicial one, to make findings on the evidence before us on the balance of probabilities, and having regard to the gravity of the matter, on the question whether the discharge has been exceeding the limits prescribed by the conditions of the discharge permit.
>
> We accept that to make a finding we need to feel persuaded that it is correct; and that we ought to exclude sampling results which cannot be said with any reasonable degree of confidence to be non-complying. Further, although a finding might be made on the balance of probabilities where there was not more than 51 per cent confidence in the reliability of the evidence, in recognising the gravity of the present matter we would wish to have rather greater confidence than that.
>
> Yet we are not expected to apply to the evidence a standard of proof that reflects confidence in a finding beyond reasonable doubt. We are not to put the applicant to such a threshold.

In *Peninsula Watchdog Group Inc v Waikato Regional Council* the Tribunal agreed with the opinion that had been expressed by an expert witness that (at p 13): "... needless excessive protection would place operation of the applicant's mining activity at a disadvantage with no purpose served".

Those passages from earlier Planning Tribunal decisions set out our understanding of the Tribunal's function in making findings where there have been differences of opinion among qualified expert witnesses. We did not understand any of the parties to this appeal to urge that the Tribunal has a different function in this appeal.

Another Planning Tribunal decision on which the parties made submissions was *Trans Power New Zealand v Rodney District Council*, an appeal from refusal of resource consent for extension of a high-voltage electricity transmission line in which health effects of electrical and magnetic fields created by passage of current through the line had been a principal issue.

Dr A C McEwan, a witness called for the applicant, had given opinions that there was no established mechanism which explains how biological cells might be affected by those fields, that epidemiological studies had shown a lack of consistency and had not established a causal association; and that while the evidence did not demonstrate a risk to health, if a risk does exist it would be very small. Another witness for the applicant in that case, Dr M H Repacholi (who was also called for the applicant in this case), had affirmed that it would be quite safe to live continuously under the power lines; that the intensity of the magnetic fields produced would be lower than that at which any health effect had been established; that many studies had not produced any reproducible robust result showing any adverse effect; and that if there is any effect it must be very weak. However Dr I Beale, called for the respondent, had testified that there had been systematic findings that human nervous system physiology may be affected by exposure in changed biological rhythms, and he referred to other studies (which he acknowledged had weaknesses), and referred to research work that he had conducted which was incomplete.

In that decision, the Tribunal said (at p 21):

> It is our duty to make findings about actual or potential effects of the proposed activity on the environment. To make a finding on a question on which there is a conflict of evidence, we have to be satisfied on the balance of probabilities, having regard to the gravity of the matter in question. The possibility of adverse effects on the health of people who may be exposed to electric and magnetic fields from high-voltage power lines has sufficient gravity to deserve a higher standard of proof. However we would not be justified in putting the applicant to a standard of proof beyond reasonable doubt: *Canterbury Regional Council v Canterbury Frozen Meat Company* Decision A 4/94 [The decision referred to is correctly identified as Decision A 14/94].
>
> We accept the validity of statements by Dr Repacholi that it is not possible for scientists to prove that exposure to electrical magnetic fields from high-voltage transmission lines does not have adverse effects on health; and that an appropriate approach is that with open minds we carefully consider the evidence from studies that suggest that there is or is not an effect. Yet although we can accept that scientific knowledge about the potential health effects of the fields may be incomplete, it is our duty to make a decision now, on the present state of

> knowledge. It would be an abdication of that duty if we were to allow opponents of proposals to prevent them proceeding on the basis that science might in future discover effects that had not yet been established. That is not to reject the precautionary approach, but there needs to be some plausible basis, not mere suspicion or innuendo, for adopting that approach.
>
> We acknowledge our own personal limitations in making findings on technical scientific questions. The appropriate course for us is to be guided by the scientific community and by conclusions reached by application of scientific method.

Later in that decision the Tribunal said (at p 22):

> As a judicial body it would not be appropriate for us to weigh suspicion, even when expressed by one who is qualified as an expert witness, against the opinions of even better qualified experts which are consistent with the consensus of the international scientific community. There is not evidence of probative value before us that electric or magnetic fields surrounding the proposed transmission line would have any actual or potential effect on the health of anyone who may be exposed to them. On the balance of probabilities, having regard to the gravity of the matter, we find that they would not.

In the present appeal the applicant submitted that the approach described in that decision was the correct one, and should be adopted in this case. Counsel for the applicant, Mr Cavanagh, submitted that there is a necessary threshold to be crossed before scientific supposition or hypothesis reaches a confidence level where any notice should be taken of them; and that consideration of an appropriate threshold must address the present state of scientific knowledge and the onerous impact that any decision to impose restrictions might have on otherwise permissible activities of legitimate enterprises. He contended that otherwise the Tribunal would be restricting the applicant in a manner not contemplated by any recognised standard; that the level of emissions would be considerably lower than even the conservative New Zealand Standard; that compliance with that standard and the technology employed by the applicant considered together meet any need for caution; and that there is no credible risk of any adverse health effects.

Counsel for the appellants, Mr Fogarty, submitted that correctly understood, the *Trans Power* decision does not support the approach BellSouth was contending for. He contended that the critical finding in the *Trans Power* decision was that there was no plausible biological mechanism which would explain a connection between magnetic fields and cancers, and that Dr Beale's contrary view was not accepted because it had not been sufficiently based on published studies subject to peer review.

Mr Fogarty acknowledged that whether or not there could be any potential effect is a question of opinion for experts. He submitted that the Tribunal needs to take into account that scientific knowledge is acquired over time during which hypotheses are verified or rejected; and that a hypothesis that warrants serious scientific attention is thereby plausible, and sufficiently significant to support any potential effect of low probability which has high potential impact, being the test resulting from reading s 104(1)(a) with the meaning given to the word "effect" in s 3(f). Counsel contended that it is antithetical to the Act to require that a hypothesis be verified before the Tribunal has regard to it; and that such serious hypotheses exist to the extent that it is regarded as important to prove or disprove them as a matter of

priority. He asserted that the evidence of the appellants' witnesses exceeds the scientific standard of 0.05 probability.

Standard of proof

For the appellants Mr Fogarty submitted that it would be an error of law to decide on the present state of scientific knowledge, on the balance of probabilities, whether there are harmful health effects from low-level radio frequency exposure from these facilities; and that s 104 requires a consent authority to have regard to potential effects of low probability with high impact. Counsel accepted that a judgment cannot be founded upon fantasy, or superstition, or ignorance; and that there needs to be a reasonable apprehension. He also submitted that there is a distinction between the high probability that the results of experiments or studies are right, and the relative probability that in a community the effects suggested as potential by the experiments or studies may be realised.

Mr Cavanagh adopted the approach taken in the *Trans Power* decision. Mr Hearn (counsel for the city council) submitted that the appropriate approach is to ask whether it is plausible that the likely effect of operation of the proposed activity on the health of neighbours of the proposed cell transmitter will be significant and adverse; whether health effects are likely at the level that could be emitted in conformity with the conditions of consent.

Other jurisdictions

We were not referred to any New Zealand decisions of authority on these questions. The Tribunal invited counsel to address it on the relevance of the judgment in the English case *R v Secretary of State for Trade and Industry, ex parte Duddridge* ("*The Independent*", 4 October 1994 (QBD)), and that led to references to an American Supreme Court case, a Canadian Supreme Court case, and two judgments of the Land and Environment Court of New South Wales. We consider the approach taken in those cases before returning to the specific provisions of the Resource Management Act.

England

The *Duddridge* case was an application to the English High Court for review of a decision by a Secretary of State declining to issue regulations to an electricity distributor so as to restrict electromagnetic fields from electric transmission cables. The application was brought on behalf of three children who lived in an area where a new high-voltage underground cable was being laid, and it was alleged that radiation which would be emitted from the new cables when commissioned would be such as would or might expose them to a risk of developing leukaemia. The law required the Secretary of State to judge whether there existed any dangers or risks of personal injury and whether he ought to make regulations. The Secretary of State considered whether there was evidence that exposure to electromagnetic fields does in fact give rise to a risk of childhood leukaemia. The scientific evidence did not establish that there is such a risk, and the Secretary of State concluded that he need not use his power to regulate exposure to electromagnetic fields.

The applicants argued that the Secretary of State had approached the matter incorrectly, and that he should have considered whether there was any evidence of a possible risk even though the scientific evidence was presently

unclear and did not prove a causal connection. The basis of that argument was a claim that the Secretary was obliged to apply the precautionary principle.

Neither of the expert witnesses for the applicants suggested that a causal link had been established between exposure to electromagnetic fields and cancer, or their claim to limiting exposure to any particular level. The National Radiation Protection Board Advisory Group had found that studies had not established that exposure to electromagnetic fields is a cause of cancer but, taken together, provided some evidence to suggest that the possibility exists in the case of childhood cancer; that experimental studies had failed to establish any biologically plausible mechanism whereby carcinogenic processes can be influenced by exposure to low levels of electromagnetic fields to which the majority of people are exposed; that there was no persuasive biological evidence that extremely low frequency electromagnetic fields could influence any of the accepted stages of carcinogenesis; but had stressed the urgent need for large and statistically robust studies based on objective measurements of exposure.

The applicants accepted that unless the Secretary of State was bound to apply the precautionary principle, their application could not succeed; but contended that if he was under a duty to take account of the precautionary principle, the possibility of increased risk of leukaemia found by the NRPB would oblige him to apply that principle in considering whether to regulate exposures to electromagnetic fields. The Court found that the Secretary of State was not under a duty to apply it, and the application failed.

Mr Cavanagh referred to passages in the judgment which indicated that the precautionary principle is primarily intended to avoid long-term harm to the environment rather than damage to human health, and reminded us that the *Duddridge* case concerned electromagnetic fields of high-voltage power lines, not radio frequency radiation from a cell telephone transmitter. Mr Fogarty submitted that the fundamental difference between the present case and *Duddridge* is the risk-avoidance policy of the Resource Management Act and the absence of a duty to apply the precautionary principle in the English case.

United States of America

In *Daubert v Merrill Dow Pharmaceuticals Inc* 125 L Ed 2d 469, 113 S Ct 2786 (1993) the United States Supreme Court considered the standard for admitting expert scientific testimony. The case concerned birth defects allegedly sustained as a result of the mothers' ingestion of an anti-nausea drug. The Court of Appeals (9th Circuit) (*Daubert v Merrill Dow Pharmaceuticals* 951 F 2d 1128 (1991)) had affirmed that re-analyses of epidemiological studies were not reliable as evidence in judicial proceedings because they had not been published, had not been subjected to peer review, and had been generated solely for use in litigation. The judgment of the Supreme Court was delivered by Blackmun J. Requist CJ and Stevens J dissented in part, considering that the Court should have left the further development of the area of law in question to future cases. The judgment of the Court turned in part on Rules 402 and 702 of the Federal Rules of Evidence, the material parts of which read:

> 402. All relevant evidence is admissible, except as otherwise provided ... Evidence which is not relevant is not admissible. [The meaning of the term

> "relevant evidence" is given in Rule 401 as that which has "any tendency to make the existence of any fact that is of consequence to the determination of the action more probable or less probable that it would be without the evidence".]
>
> 702. If scientific, technical, or other specialised knowledge will assist the trier of fact to understand the evidence or to determine a fact in issue, a witness qualified as an expert by knowledge, skill, experience, training, or education, may testify thereto in the form of an opinion or otherwise.

The Court held that the rules replaced the former precondition of "general acceptance", and observed that any scientific testimony or evidence must not only be relevant but reliable (at p 480, col 2); that the adjective "scientific" implies a grounding in the methods and procedures of science, and the word "knowledge" connotes more than subjective belief or unsupported speculation (at p 481, col 1). The Court acknowledged that it would be unreasonable to require that the subject of scientific testimony must be "known" to a certainty, but said:

> ... in order to qualify as "scientific knowledge", an inference or assertion must be derived by the scientific method. Proposed testimony must be supported by appropriate validation – ie "good grounds", based on what is known. In short, the requirement that an expert's testimony pertain to "scientific knowledge" establishes a standard of evidentiary reliability.

[In a footnote to that passage, the Court concluded with the summary: "In a case involving scientific evidence, evidentiary reliability will be based upon scientific validity".]

The Court acknowledged that this entails an assessment of whether the reasoning or methodology underlying the testimony is scientifically valid, and properly can be applied to the facts in issue (at p 482, col 2); that a key question in determining whether a theory or technique is scientific knowledge that will assist the trier of fact will be whether it can be (and has been) tested (at p 483, col 1). It said that another pertinent consideration is whether the theory or technique has been subjected to peer review and publication, but recognised that publication is not a sine qua non and does not necessarily correlate with reliability. The Court noted that some propositions are too particular, too new, or of too limited interest to be published, but held that submission to the scrutiny of the scientific community is a component of "good science", in part because it increases the likelihood that substantive flaws in methodology will be detected. So the fact of publication (or lack of it) in a peer-reviewed journal, while not decisive, is a relevant consideration on assessing the scientific validity of a particular technique or methodology on which an opinion is premised (at p 483). The judgment of the Court continued by stating that in addition, a Court should consider the known or potential rate of error; that "general acceptance" can have a bearing, that a "reliability assessment does not require, although it does permit, explicit identification of a relevant scientific community and an express determination of a particular degree of acceptance within that community" (idem); and continued (at p 483, col 2 to 484, col 1):

> Widespread acceptance can be an important factor in ruling particular evidence admissible, and a "known technique that has been able to attract only minimal support within the community" ... may properly be viewed with scepticism.

> The inquiry envisioned by R 702 is, we emphasise, a flexible one. Its overarching subject is the scientific validity – and thus the evidentiary relevance and reliability – of the principles that underlie a proposed submission. The focus, of course, must be solely on principles and methodology, not on the conclusions that they generate.

In rejecting submissions that abandonment of the former requirement of general acceptance would result in a "free-for-all in which befuddled juries are confounded by absurd and irrational pseudoscientific assertions", the Court considered that "overly pessimistic about the capabilities of the jury, and of the adversary system generally" and observed (at p 484, col 2):

> Vigorous cross-examination, presentation of contrary evidence, and careful instruction on the burden of proof are the traditional and appropriate means of attacking shaky but admissible evidence ... Additionally, in the event the trial Court concludes that the scintilla of evidence presented supporting a position is insufficient to allow a reasonable juror to conclude that the position more likely than not is true, the Court, remains free to direct a judgment ...

Addressing submissions that a screening role that allows for the exclusion of "invalid evidence" would sanction a stifling and repressive scientific orthodoxy, inimical to the search for truth, the Court said (at p 485):

> It is true that open debate is an essential part of both legal and scientific analyses. Yet there are important differences between the quest for truth in the courtroom and the quest for truth in the laboratory. Scientific conclusions are subject to perpetual revision. Law, on the other hand, must resolve disputes finally and quickly. The scientific project is advanced by broad and wide-ranging consideration of a multitude of hypotheses, for those that are incorrect will eventually be shown to be so, and that in itself is an advance. Conjectures that are probably wrong are of little use, however, in the project of reaching a quick, final, and binding legal judgment – often of great consequence – about a particular set of events in the past.

Canada

In *R v Mohan* [1994] SCR 9; 89 CCC (3d) 402 the Supreme Court of Canada upheld a trial Judge who had ruled as inadmissible a psychiatrist's testimony that an accused did not fit psychological profiles of the perpetrators of the alleged offences. After considering Canadian and English authorities on expert evidence, Justice Sopinka (delivering the judgment of the Court) said (at pp 25, 415):

> In summary therefore it appears from the foregoing that expert evidence which advances a novel scientific theory or technique is subjected to special scrutiny to determine whether it meets a basic threshold of reliability and whether it is essential in the sense that the trier of fact will be unable to come to a satisfactory conclusion without the assistance of the expert.

New South Wales

Leatch v National Parks and Wildlife Service and Shoalhaven City Council (1993) 81 LGERA 270 was an appeal to the Land and Environment Court of

New South Wales against a decision by the Director-General of the National Parks and Wildlife Service granting the Shoalhaven City Council a licence to take or kill endangered fauna in the course of making a new road. The relevant legislation required the Court to take into account any public submissions received by the Service. Two of the submissions raised the application of the precautionary principle. The learned Judge referred to international instruments and Commonwealth and State legislation incorporating that principle (at p 281 per Stein J), and said (at p 282):

> In my opinion the precautionary principle is a statement of common sense and has already been applied by decision-makers in appropriate circumstances prior to the principle being spelt out. It is directed towards the prevention of serious or irreversible harm to the environment in situations of scientific uncertainty. Its premise is that where uncertainty or ignorance exists concerning the nature or scope of environmental harm (whether this follows from policies, decisions or activities), decision-makers should be cautious.
>
> I have earlier referred to the factors the Court must take into account on an appeal under s 92C of the Act. These include the submissions made ... some of which argued that the precautionary principle was appropriate to the case; any other matter the Court considers *relevant* ... and the circumstances of the case and the public interest ... The issue then is whether it is relevant to have regard to the precautionary principle or what I refer to as consideration of whether a cautious approach should be adopted in the face of scientific uncertainty and the potential for serious or irreversible harm to the environment.

After finding that making the road was likely to involve adverse effects on vulnerable rare fauna, the Judge found that an alternative route had been screened out too early in the process to be properly considered, and said (at p 286):

> I am not satisfied that a licence to take or kill the Yellow-bellied Glider, or any of the other species discussed in the fauna impact statement, is justified. The applicant for such a licence needs to satisfy the Court, on the civil standard on the balance of probabilities, that it is appropriate in all the relevant circumstances to grant the licence.

The appeal was upheld and the licence refused.

In *Duddridge*, Smith J observed that in the *Leatch* case, Stein J (at p 16):

> ... had the power to take [the precautionary principle] into account and he chose to do so. The decision is of no relevance in English law and in any event gives no support for the proposition that the Secretary of State (or any other decision-maker) is obliged to take the principle into account in all decisions involving environmental or health considerations. I find the suggestion that the Secretary of State's decision may be impugned on *Wednesbury* grounds, because he has failed to apply the principle under the dictates of common sense to be a startling proposition and I have no hesitation in rejecting it.

Greenpeace Australia v Redbank Power Company (1994) 86 LGERA 143 was an appeal to the Land and Environment Court of New South Wales against consent for a new power station on the ground that emission of carbon dioxide would contribute to the greenhouse effect. In her judgment, the learned Chief Judge Pearlman referred to Greenpeace's contention that

scientific uncertainty should not be used as a reason for ignoring the environmental impact of carbon dioxide emission, in other words that the Court should take into account the precautionary principle, observed that there were instances of scientific uncertainty on both sides of the issues in that case, and said (at p 154):

> The application of the precautionary principle dictates that a cautious approach should be adopted in evaluating the various relevant factors in determining whether or not to grant consent; it does not require that the greenhouse issue should outweigh all other issues.

The Resource Management Act 1991 and the precautionary principle

It was BellSouth's case that the precautionary approach does not require that the transmission be constrained on the basis of mere suspicion or innuendo.

Mr Fogarty analysed the relevant provisions of the Resource Management Act – s 104(1)(a), s 3, and the definition of the term "environment" in s 2(1) – and submitted that it is logically impossible, and would be an error of law, to apply the statutory test after being satisfied on the preponderance of probabilities on evidence from past studies that prove there is or is not an effect; that one cannot graft a test of "more probable than not" on to the provision in s 3 for an effect of low probability, which includes a proven potential effect. After distinguishing between the understanding in the law of probabilities and the understanding of scientists of high and low probabilities, and the difference between a caution and a precaution, counsel submitted that the concept of sustainable management includes accommodating the fact that reasonable scientific hypotheses may take time to be proved or disproved but warrant attention, and if need be precaution, in the meanwhile. He described that as the risk-avoidance policy, or precautionary policy, of the Act.

We did not understand Mr Fogarty's submissions to be relying on the general precautionary principle of environmental law referred to in the *Leatch, Duddridge, Redbank* and *Trans Power* cases, but to specific provisions of the Resource Management Act that he contended amount to a precautionary or risk-avoidance policy of the Act. Even so, the imposition of a threshold based on the present state of scientific knowledge (as scientific knowledge was explained in the *Daubert* case) would of course be inconsistent with the application of the policy contended for by Mr Fogarty.

We distinguish between the policy of the Resource Management Act and a general precautionary principle of environmental law. The policy of the Act advanced for the appellants was derived from the specific provisions already mentioned. Taken together, those provisions relate to a consent authority's duty under s 104 to have regard to certain matters "when considering an application for a resource consent and any submissions received" (s 104(1)). Applying those provisions is the way to give effect to the policy of the Act. That is to be done when considering the application and submissions.

The discretionary judgment whether to grant or refuse resource consent is provided for by the succeeding s 105(1) of the Resource Management Act. That is prescribed to be done after considering the application.

The relationship with the duty to have regard to various matters listed in s 104(1) seems plain. A consent authority is to have regard to them when considering the application and the submissions; and after having considered

the application and submissions and having regard to the matters listed, it is to make the judgment whether consent is to be granted or refused.

As was explained by Chief Judge Pearlman in the *Redbank* case (at p 143), the general precautionary principle of environmental law is an approach to "be adopted in evaluating the various relevant factors in determining whether or not to grant consent" (at p 154). So in the course of the decision-making process, the step of having regard to potential effects on the environment is earlier than the step at which any application of that principle is to occur.

If the two are distinguished, it is evident that Mr Cavanagh's contention for a threshold applies to the second, the general precautionary principle. Apart from the "basic threshold of reliability" referred to by the Canadian Supreme Court in *R v Mohan* (at p 89 and p 415) there is no place for introducing a threshold for the first, which involves a consent authority giving effect to a duty imposed on it by the Act. As explained in *Daubert's* case (Supreme Court at pp 469 and 2786), the general law about standard of proof and finding facts on material of probative value applies to that fact-finding.

The influence of the general precautionary principle on the evaluation and ultimate judgment is a matter of discretion. None of the cases supports the application of a formal threshold. Like all elements that contribute to the ultimate judgment, the weight to be given to the precautionary principle would depend on the circumstances. The circumstances would include the extent of present scientific knowledge, and the impact on otherwise permitted activities. However we think that in an appropriate case they would also include the gravity of the effects if, despite present uncertainty, they do occur.

Potential effects and hypotheses

It was the case for the appellants that sustainable management would be best advanced by avoiding the potential risk where it is possible to do so.

Mr Fogarty submitted that a hypothesis that warrants serious scientific attention is thereby plausible and sufficiently significant to support a finding of a potential effect of low probability which has a high potential impact; and that it is antithetical to the Act to require that a hypothesis be verified before the Tribunal has regard to it. Counsel relied on evidence of a hypothesis that exposure to radio frequency radiation at the levels that result from the proposed cell site is potentially harmful to health, and that it is regarded as important to prove or disprove that hypothesis.

On low risk and high impact, Mr Hearn distinguished cases such as the LPG cases (eg *Liquigas Ltd v Manukau City Council* (1983) 9 NZTPA 193; *Environmnetal Defence Society Inc v Manukau City Council* Decision A 11/86), the Te Aroha rendering plant (*Te Aroha Air Quality Protection Appeal Group v Waikato Regional Council (No 2)* (1993) 2 NZRMA 574), and Meadow Mushrooms (*Meadow Mushrooms Ltd v Paparua County Council* (1977) 6 NZTPA 327). In those cases, there was no doubt that if the LPG was ignited, there would be danger from an explosion; if the rendering odour was discharged, it would be nauseating and noxious; and if the methyl bromide was ingested at a sufficient concentration, it would be toxic. Here the transmissions are known to emit radiation much lower than the health effects threshold, and the real issue is whether those emissions are likely to have a significant adverse effect on health. There has been 40 years of research, and

nothing justifying refusal has been identified, and he warned against being frightened of shadows.

Mr Cavanagh described the appellants' position as being that a scientific hypothesis, which may be totally unsupported by any actual scientific evidence to prove or support that hypothesis, is sufficient to raise a threshold concern to bring into play the precautionary principle where a risk of serious harm to human health is postulated. He submitted that there is a necessary threshold to be crossed before scientific supposition or hypotheses have reached a confidence level where any notice should be taken of them, and argued that the Tribunal was being asked to restrict BellSouth's activities in a manner not contemplated by any recognised standard. Mr Cavanagh contended that the evidence for the appellants had come nowhere near establishing that there is a credible risk to human health; that in vivo endorsement is necessary for all in vitro research, but in vivo research has not been done, and in 20 years of research, no proven health effect had been found, and epidemiologists had not been able to reach conclusions with a confidence level that justifies any present concern of a perceived risk of serious injury to human health.

Conclusions

The submissions summarised above raise three issues. The first issue is a definition of the question of fact on which the Tribunal has to make a finding required by s 104(1)(a); the second issue is the standard of proof by which the Tribunal is to be satisfied about the existence of the fact to support a finding of it; and the third issue is the influence of the precautionary principle in making a discretionary judgment whether consent should be granted or refused.

On the first, it is our understanding of the law that on a resource consent application, like a planning application under the former regime, there is not a burden of proof on any party, but that there is an evidentiary burden on a party who makes an allegation to present evidence tending to support the allegation (*West Coast Regional Abattoir v Westland County Council* (1983) 9 NZTPA 289). In this case, the applicant has asserted that there would not be an actual or potential effect on the environment from the radiation emitted from the cell phone transmitter; and it has adduced evidence tending to establish that. The appellants have challenged the applicant's assertion, and have adduced evidence which they claim will satisfy us that there is a potential of an effect of low probability but high impact on the environment from the health effects of radiation from the transmitter. Therefore we have to consider whether on all the evidence we find that there will or will not be an actual or potential effect (including any potential effect of low probability which has a high potential impact) on the environment (a term which is defined to include people) from radiation that would be emitted by the proposed transmitter. In that regard, the word "potential" is not defined, and can be understood in its ordinary meaning as an adjective of "capable of coming into being or action" (*Concise Oxford Dictionary*, 8th ed, 1982), "possible but not yet actual; capable of being or becoming" (*New Collins Concise English Dictionary*, NZ ed, 1982).

On the second issue, the Planning Tribunal is free to receive anything in evidence that it considers appropriate, and is not bound by the rules of law about evidence that apply to judicial proceedings (s 276 of the RMA). Even

so, the basic principles of evidence developed by the general Courts provide a valuable guide for fact-finding by the Tribunal. It is our understanding that there are three requirements for us to make a finding on a question of fact. There needs to be material of probative value, ie tending logically to show the existence of facts consistent with the finding (*Re Erebus Royal Commission; Air New Zealand v Mahon* [1983] NZLR 662, 671). Also, the evidence must satisfy us of the fact (ie that there will or will not be such an effect) on the balance of probabilities and having regard to the gravity of the question; but we are not to put either party to having to prove its assertion of fact beyond reasonable doubt. Further, the heart of a finding of fact is that we ourselves need to feel persuaded that it is correct.

We do not accept that the existence of a serious scientific hypothesis, or even one that is regarded as deserving priority for testing, is necessarily sufficient by itself to establish a potential effect, even a potential effect of low probability which has a high potential impact. Nor do we accept that the Tribunal should impose a threshold based on current scientific knowledge before taking notice of a scientific hypothesis. We hold that like any other evidence tending to establish a contested fact, the grounds for the hypothesis have to be exposed to testing (as discussed in *Daubert's* case (Supreme Court)) to assist the Tribunal to weigh the evidence and make a finding one way or the other.

On the general precautionary principle, we note that a consent authority is entitled to have regard to any other matter not listed in s 104(1) which it considers relevant and reasonably necessary to determine the application; and that the definition in s 2(1) of the term "environment" extends to include people. The purpose of the Act is to promote the sustainable management of natural and physical resources. The term "sustainable management" is described by reference among other things to enabling people to provide for their health and safety.

There may be resource consent applications in which a consent authority may consider it relevant and reasonably necessary to have regard to the precautionary principle. In the context of the Resource Management Act the principle can apply to people and their health as well as for the rest of the natural and physical environment. So a consent authority may allow its discretionary judgment to grant or refuse consent to be influenced by the precautionary principle to the extent consistent with the statutory purpose of promoting the sustainable management of natural and physical resources and with judicial exercise of that discretion.

[Chapter Three: "Matters not for adjudication" has been omitted from this report.]

CHAPTER FOUR: EFFECTS ON THE ENVIRONMENT

As mentioned in Chapter Two of this decision, we are to have regard to actual and potential effects on the environment of allowing the cell site.

Radiation

The only effect on the environment raised by the appellant was effects on health of radio frequency radiation from the cell site transmissions. In chapter two of this decision we outlined the cases for the parties in that respect. In summary, the applicant (supported by the respondent) maintained that there

would not be any effects on the environment from that radiation, and the appellants maintained that there is a serious hypothesis that exposure to the radiation is potentially harmful to health.

The heart of the difference lay in distinguishing between thermal and non-thermal effects from radio frequency radiation. The experts relied on by the applicant maintained that there is no reliable evidence of any harmful effects from that kind of radiation except where it is experienced at an intensity that generates heat, described as thermal radiation. However the experts relied on by the appellants maintained to the contrary, that there is some evidence of harmful effects from radiation at or near radio frequencies at sub-thermal intensities which, while inconclusive in itself, is sufficient to support a serious hypothesis of potential harm from the radiation emanating from the proposed cell site transmissions. Their opinions were challenged by the experts for the applicant.

The evidence for the appellants on that topic comprised the opinions of their expert witnesses, together with two classes of material relied on by them for their opinions. The first class was reports in scientific papers or journals of particular pieces of research that had been carried out into health effects of radiation, being in vitro research (laboratory study of cells or tissue removed from living organisms) or epidemiological (statistical) research. The second class was reviews of the research that had been carried out by other scientists.

We accept that in considering what findings we are able to come to, it is necessary for us to scrutinise the material produced in the first class, and consider its scientific validity and reliability, and the extent to which it is probative of the fact on which the appellants seek that we make a finding. The evidence of the expert witnesses who testified in the appeal hearing may assist us in those assessments of the studies reported.

However we do not consider that the material in the second class is necessarily helpful in the task that has fallen on us. We acknowledge the value of peer review of scientific work, while recognising that new understandings can be valid before they are accepted by the relevant scientific community. Yet for the present purpose the value of those reviews is limited because of the absence of opportunity for cross-examination of the authors of the reviews. In particular, where the reviewer has re-interpreted the results to come to a conclusion different from that reached by the original researcher, we do not consider that the substitute conclusion has sufficient weight or reliability to be probative of a fact on which we need to make a judicial finding.

Thermal effects

The opinion that harmful effects of radio frequency radiation have been established only where accompanied by heat was expressed by Dr M H Repacholi, chief scientist of the Royal Adelaide Hospital, chairman of the International Commission on Non-Ionizing Radiation Protection, and a consultant to the World Health Organisation.

The witness referred to a number of reports of experiments and studies of molecules and cells; (in respect of animals) of genetic effects, effects on reproduction and development, central nervous system, behaviour, endocrine system, cancer studies; and (in respect of humans) thermal considerations and epidemiological studies. In respect of each he gave his reasons for not accepting the result as reliable evidence of health effects on humans from

radio frequency radiation at the proposed frequency from the cell site. He summarised his opinion that to produce any adverse health effect, radio frequency exposure above a threshold level needs to occur, the threshold being the exposure that would increase tissue temperature by at least one degree Celsius.

Dr Repacholi asserted (and this was not challenged) that the low radio frequency power levels from base transceiver stations cannot cause that temperature rise. He also gave the opinion that multiple exposures to sub-threshold levels of radio frequency have not been found to have any adverse health impact; that exposure to radio frequency fields has not been established to cause cancer; that there is no scientific evidence to suggest that at the level which would be emitted from the proposed facility there would be any influence on cancer initiation, promotion or progression; and that no accumulation of damage occurs to tissues from low level (sub-threshold) radio frequency exposures. The witness affirmed that there is no evidence that there are any effects on pregnancy from radio frequency emissions as low as those from the proposed facility and that children, pregnant mothers or other sensitive groups are not at risk from it. He also explained that it was only at specific absorption rates of between one and four watts per kilogram that even transient changes in animal behaviour had been established, and that even at an absorption rate of four watts per kilogram where the human body temperature increases by one-half of a degree Celsius, there is no health consequence.

In cross-examination Dr Repacholi asserted that because many studies reported in the scientific literature had not been replicated or had been conducted poorly or had obvious flaws, his approach had been to try to ensure that rigid scientific criteria are used in development of the literature on which exposure limits are based. He also affirmed that the view that he was taking was the view of the national and international scientific consensus; and that the current epidemiological studies do not show that there are adverse health effects from radio frequency fields. He explained the wish for more research as being that there is always a need to provide fine tuning to a health hazard assessment.

Counsel for the appellants asked Dr Repacholi what would be wrong with a cautionary principle, or saying we don't know, but we can do it another way which we know is much safer. The witness replied that scientists have been researching this area for over 40 years, the consistency of the database has not changed significantly in the last 15 years, a lot is known about the effects of radio frequency fields on human and biological systems, and to say it is not ignores the 5000 to 6000 items in the scientific literature which has been reviewed. He testified that since the early days, researchers had been trying to see if non-thermal effects occur, and if they do, whether they have any impact on human health; and in over 20 years' research non-thermal effects have not been established.

Dr Repacholi stated that the epidemiological studies had not been conducted with the dosimetry he would like to see, that it is very difficult in epidemiological studies to assess the dosage that people receive from radio frequency fields; and he deposed that indices or similar measures to determine the dose can be quite incorrect. The witness gave the opinions that in science, epidemiology is a very blunt instrument; it could not consistently indicate causal associations; and it has many methodological problems in identifying

significant associations, so that for risk ratios less than about three, one needs laboratory support, and epidemiology alone is not sufficient to be predictive.

Dr Repacholi also gave the opinion that re-analysis of epidemiological studies that had been conducted by others cannot produce valid conclusions, but only a hypothesis that could be validated by a separate study designed specifically to test it. However he agreed that such re-analysis could raise a hypothesis that may be worthy of serious scientific investigation. He affirmed that the only way to say whether an association pointed to by results of epidemiological research is positive, is to test it in a separate study; and that until it is confirmed by such a study it has no validity.

Dr Repacholi expressed his disagreement with a statement by Dr Luben (a witness called for the appellants) that the effect of extremely low frequency (ELF) fields is similar to the interaction of modulated microwave signals, and he told the Tribunal that as the frequency of a field increases, the amount of absorption in the body decreases. Dr Repacholi explained that in the low frequency range of 300 hertz up to about 100 kilohertz the predominant mechanism of interaction is induction of currents in the body; that in the frequency range between 100 kilohertz to 10 megahertz there are two predominant mechanisms by which an electromagnetic field interacts with the body, induced currents and heating within tissue; but that at above 10 megahertz the overwhelming mechanism is heat, and at 900 megahertz that is effectively the only established mechanism by which radio frequency fields interact with the body. The witness acknowledged that there is valid concern within the community that there may be promotion of cancer from radio frequency fields. He affirmed that the bulk of the evidence suggests that there is no effect, but he accepted that there have been some conflicting results and there should be more experiments to determine that.

Subthermal physiological effects

Dr Repacholi described findings of movement of calcium and other ions across cell membranes caused by radio frequency fields at levels too low to produce significant heating. He deposed that no health effects had been established from those effects, and that many researchers had tried to replicate those effects but had not been able to. He also referred to a report (Balcer-Kubiczek and Harrison (1991): "Neoplastic Formation following exposure to 120 Hz modulated 2.45 Ghz microwaves and phorbol ester", Radiation Research 126: 65-72) that modulated microwave exposure of chromosomally abnormal cells which were treated with X-rays and a chemical promoter had shown an accelerated rate of change from normal to cancer cells. Dr Repacholi observed that the study needed independent confirmation, that the implications for carcinogenesis in humans are not clear, and that radio frequency fields are not modulated by cellular telephone base stations. (We find that the latter remark reflects a misunderstanding to the extent that the radio frequency transmissions from the proposed cell site would be modulated.)

Dr Repacholi deposed that a large number of studies had been conducted into various somatic cells and that most had reported a lack of effect on chromosome aberrations and single or double strand breaks in DNA; that studies on germ cells had suggested that acute or chronic exposure to radio frequency does not result in increases in mutation or chromosome aberration frequency when the temperature is maintained within physiological limits;

that where increased frequencies of chromosomal aberrations had been reported, those studies had not been successfully replicated; and that chronic exposure experiments had not produced any evidence of chromosomal aberrations in rodents exposed to specific absorption rates of 1 to 5 watts per kilogram. The witness referred to two studies of effects on mice. In one (Sarkar et al (1994) "Effect of low power microwave on the mouse genome: A direct DNA analysis". Mutation Research 320: 141-147), mice had been exposed to 2.45 GHz fields at 1 milliwatt per square centimetre (a specific absorption rate of 1.18 watts per kilogram) for two hours per day, from which there had been an indication of structural genomic rearrangement in brain and testes cells. In the other (Lai and Singh (1995): "Acute low-intenstiy microwave exposure increases DNA single-strand breaks in rat brain cells", Bioelectromagnetics – in press), it was reported that rats exposed to pulsed or continuous wave 2.45 GHz fields with specific absorption rates of 0.6 or 1.2 watts per kilograms for two hours increased the number of strand breaks in brain DNA. Dr Repacholi remarked that both those papers had quantitative data subject to sources of inter-trial variation and experimental error, so the experiments should be replicated before the results are used in any health risk assessment; and that mobile phones do not operate at the pulsed frequency used in those experiments.

Appellants' evidence

The appellants called three expert witnesses to support their case about the possibility of non-thermal effects of radio frequency radiation on human health. The first was Dr N Cherry, a senior lecturer in agricultural meteorology at Lincoln University whose academic training and professional experience is in other areas of physics, but do not include health effects of radio frequency radiation. The second was Dr R A Luben, an associate professor of biomedical sciences and biochemistry at the University of California, Riverside, whose research specialities include biomedical effects of electromagnetic fields on mammalian cells in tissue culture. The third was Dr J R Goldsmith, professor of epidemiology at Ben Gurion University of the Negev, Beer Sheva, Israel, who had written, among others, an article published in the International Journal of Occupational and Environmental Health entitled "Epidemiologic Evidence of Radiofrequency Radiation (Microwave) Effects on Health in Military, Broadcasting and Occupational Studies".

The witnesses for the appellants referred to a number of particular reports of scientific studies on which they relied in supporting the appellants' case. In some cases we were provided with copies of the reports in scientific journals. In respect of others, we have the witnesses' evidence describing the conclusions of the reports. In total there were more than 50 such reports referred to by the appellants' witnesses.

We have carefully considered the evidence concerning them, but we have found that a number do not have probative value for the purpose of making the findings required in this case.

First, over 20 of the reports refer to exposure to electric or magnetic fields at frequencies remote on the electromagnetic spectrum from that of the transmissions from the proposed cell site, or where signals were modulated in different ways from that proposed. Many of them referred to experiments with extremely low frequency (ELF) fields, and a few related to exposure to

radiation in excess of 2 GHz. Dr Luben expressed the opinion that studies of the effect of extremely low frequency fields may be relevant for the present purpose. Dr Repacholi and Mr M D Gledhill (a scientist at the Ministry of Health's Radiation Laboratory) gave contrary opinions.

We have carefully reviewed the evidence that Dr Luben gave in that respect in cross-examination by Mr Cavanagh. Dr Luben acknowledged that at a level of primary interaction of the field with the human body the mechanisms would be different, but he expressed the opinion that at the level of cell mechanisms they appear to be similar. He acknowledged that this would need to be tested by research before a conclusion could be drawn. However he also agreed that for frequencies below 100 kilohertz the predominant mechanism is induced currents in the body, but that at frequencies above 100 kilohertz the only established mechanism is thermal. He remarked that this did not close the door on other possible mechanisms, but that he had no evidence of others.

Having considered Dr Luben's evidence, we have not been persuaded that the reports of effects of extremely low frequency fields, or of radiation at frequencies in excess of 2 gigahertz, are probative of likely or potential effects of transmissions from the proposed cell site. We prefer the contrary opinions in that respect of Dr Repacholi and of Mr Gledhill.

During most of the hearing it was assumed that the maximum exposure of people to radiation from the proposed cell site would be to incident power flux density as great as 12 microwatts per square centimetre. As appears later, we find that it would not be as great as that. However, even if we accepted that the exposures might be as high as 12 microwatts per square centimetre, several of the scientific studies relied on by the appellants' witnesses involved exposures in excess of that, or (expressed in specific absorption rate) at greater than 1 microwatt per kilogram. We do not find that experiments or reports of effects of exposure substantially more intense than 12 microwatts per square centimetre can assist us to determine the likely or potential effects of radiation from the proposed cell site. Therefore, we do not take these reports into account in reaching our finding.

Published reports of several of the studies relied on by witnesses for the appellant were not presented to us, and we can only rely on the witnesses' own description of these studies. In the case of several of them, the witness did not provide us with details of the frequency and exposure intensity that are sufficient to enable us to assess whether the results can have probative value for the present purpose, or to assess how much weight we could place on them. We have therefore not felt able to take those studies into consideration.

There are four particular studies on which the hearing focused: the Korean War veterans ("Effects upon Health of Occupational Exposure to Microwave Radiation (Radar)" by C Dennis Robinette, Charlotte Silverman and Seymour Jablon, American Journal of Epidemiology vol 112, p 39), the United States foreign service workers ("Foreign Service Health Status Study" by A M Lilienfeld et al, Final report, Contract 6025-619073, Department of State, Washington DC, 1788), the physical therapists ("Miscarriages among Female Physical Therapists who report using Radio and Micro Frequency Electromagnetic Radiation" by Rita Ouellet-Hellstrom and Walter F Stewart, American Journal of Epidemiology vol 138, p 775) and a study by Dr L Von Klitzing of the effect of electroencephalograph (EEG) traces in students'

brains. This work was described by Dr Cherry following personal communications with Dr Von Klitzing, but does not appear to have been the subject of a report published in a peer-reviewed scientific journal.

We were not provided with the frequency or intensity of the radiation to which the Korean War veterans had been exposed. Dr Goldsmith informed us that no actual exposures are available; that the results had not been analysed for the ages of the subjects; and he acknowledged that association had not been proved. Dr Cherry informed us that both exposed and control groups had been exposed. The study had been re-analysed by Dr Szmigielski and others, but one of them, Dr Silverman, had later resiled from that report. All in all, we do not consider that we can have sufficient confidence in the results of that study for them to be a reliable basis for a judicial finding.

The exposure intensity to which the foreign service workers had been exposed is not known, but was estimated as being 5-18 microwatts per square centimetre. Dr Goldsmith told us that follow-up studies had not been done. He had himself re-analysed the results and concluded that they had been understated. However, we share the reservations expressed by the United States Court of Appeals (*Daubert v Merril Dow Pharmaceuticals* (at p 1131) and by Dr Repacholi and Mr Gledhill concerning re-analysis of epidemiological studies. We do not consider that the reported experience of the foreign service workers provides us with a reliable basis for a finding in this case.

Dr Cherry and Dr Goldsmith were both cross-examined by Mr Cavanagh concerning the study of miscarriages among physical therapists in the United States. There is no evidence that the actual exposures experienced by the respondents to that study had been measured. We infer that they had merely been estimated. Dr Goldsmith acknowledged that the odds ratio was just barely above the margin of significance, and in the circumstances we do not consider that study reliable (in the sense referred to by the Supreme Courts of the United States of America and Canada) for our present purpose either.

Mr Cavanagh challenged Dr Von Klitzing's study on the ground that the Hall sensor equipment which had been used was not able to measure in the 150 hertz frequency range down to the level reported, and because of 17 subjects studied, the results in respect of only one were reported. Apparently, the values experienced had been calculated, but the method of calculation is not known. In any event, the report showed changes in EEG traces, but no evidence of health effects. In the circumstances, we consider that the evidence before us of Dr Von Klitzing's work is not sufficient to provide a reliable base for our findings.

In another study relied on ("Microwave induced calcium efflux from brain tissue in vitro" by S K Dutta et al Bioelectromagnetics vol 5 p 71 (1984)), neuroblastoma cells had been exposed to radiation at 915 megahertz modulated at 16 hertz with a specific absorption rate of 0.05 watts per kilogram. It was reported that there had been efflux of calcium ions in cultured brain tissue. However, the experiment has not been replicated using signals modulated differently. Bearing in mind that the proposed transmissions would be modulated in a different way, by the gaussian mean shift key method, we do not find that report helpful in deciding about cell site transmission effects. Similarly a report by Dr C V Buyus ("Alterations in Ornithene Decarboxylase Activity" by C V Byus, published in Papers of 1993 Radiofrequency Radiation Conference) of tumour promotion enzyme activity

as a result of exposure to a field at 450 megahertz with 12 to 20 hertz sinusoidal modulation cannot assist us because again the modulation was of a different kind. We do not have enough detail of the studies by Dr R L Davis and F K Mostotfri and others on traffic police using hand-held radar for traffic monitoring. A study by Dr M C Shandala and colleagues ("Study of non-ionising microwave radiation effects upon the central nervous system and behaviour reactions" by M G Shandala et al, Environmental Health Perspectives vol 30 p 115 1979) concerned microwave exposure at 10, 50, and 500 microwatts per square centimetre, and reported that at 10 and 50 microwatts per square centimetre, exposure stimulated the brain at the initial stage of irradiation. Dr Cherry commented that exposure to 10 microwatts per square centimetre for seven hours a day would give an average exposure of 2.9 microwatts per square centimetre. However, there is no evidence of health effects from exposures to radiation at or below 10 microwatts per square centimetre.

Finally, a report by Dr A W Guy ("Dosimetry associated with exposure to non-ionising radiation: very low frequency to microwaves" Health Physics vol 53, p 569, 1987) that rats exposed to pulsed radio frequency radiation producing a specific absorption rate at 0.4 watts per kilogram showed induction of benign growths does not appear to have been replicated, and we have insufficient particulars to enable us to assess its reliability or its significance to the present case.

In the foregoing passages we have summarised our attitude to the reports and studies relied on by the appellants' witnesses. The summary should not obscure the fact that we have considered in detail all of the evidence related to those studies.

Finding on radiation effects

We refer back to the conclusions that we reached in Chapter Two of this decision. The question of fact for our decision is whether there would or would not be an actual or potential effect (including any potential effect of low probability which has a high potential impact) on the environment (as defined) from radiation that would be emitted by the proposed transmitter.

On the evidence that we have been analysing we have now to consider what finding we come to. We are confined to evidence probative of the fact, that meets a basic threshold of reliability, and is persuasive to us on the balance of probabilities having regard to the gravity of the question.

We recognise that the question is a grave one, in that if the transmissions turn out to be harmful, people who had no choice about being exposed to radiation, including members of more vulnerable sections of the community, may suffer ill-effects. Yet, as Mr Fogarty submitted, there needs to be a reasonable apprehension.

Even so, we have to come to our finding on the basis of the evidence before us, and not on the basis of a possibility that further research might (or might not) show something that has not already been shown by previous research. That would be to decide a different question. It would not be deciding whether, on the balance of probabilities, there would be a potential effect of low probability but high potential impact on the environment. It would be to decide whether there is a potential, even of low probability, that there would be an effect of high potential impact on the environment. We do not understand that to be the question on which we have to make a finding.

We also bear in mind that the Resource Management Act provides other ways of addressing adverse effects on the environment that later become apparent but which are not recognised when resource consent is granted (see for example ss 17, 128 and 319(2)).

The hearing of the appeal proceeded on the basis that people would not be exposed to radio frequency radiation from the cell site transmissions greater than about 12 microwatts per square centimetre. However a technical witness for the applicant, Mr M J Lancaster, was recalled at the end of the hearing to provide additional evidence about the way in which the radiation emitted from the transmission antennas is disseminated. He produced technical specifications from the manufacturer of the equipment, and diagrams to illustrate the exposure that would be experienced at the residence of one of the appellants, Ms J M McIntyre.

It is accepted that the greatest protection should be given to people's homes. They may be occupied by people, such as children and the elderly, who may be more vulnerable to radiation effects. They are occupied for longer periods than other premises, and people do not have the same choice as they do about where they work or shop or take recreation. We therefore consider effects of the proposed radiation on homes in the vicinity, on the understanding that if there are not adverse effects on residents, there will not in general be adverse effects on other people.

Although Ms McIntyre's home is near the site, it is approximately 60 degrees off the main transmission axis, and the intensity of the radiation that would be experienced at her home would be reduced accordingly. We find that the most vulnerable dwelling is another one, to the north-west of the site. It is on the main transmission axis from the antenna that would be oriented at 300 degrees, and is at least 55 m from that antenna. From Mr Lancaster's unchallenged evidence we find that at that distance it would not be exposed to radio frequency radiation greater than 1.8 microwatts per square centimetre at the elevation of the transmission, namely a 2 degree down tilt from the antenna at 12 metres above ground level. Applying the information shown in exhibits L and Q produced by Mr Lancaster, the exposure of that dwelling at 3 metres above ground level would be 3 decibels less, about 1.2 microwatts per square centimetre.

We have not overlooked that people would be employed in business premises in the building on which the transmitter would be located, and others nearby. However the decrease in the intensity of the radiation in the vertical plane, as illustrated in exhibits L and P, produced by Mr Lancaster, shows that they would not be exposed to greater radiation than the occupants of the dwelling to the north-west of the site. We find that to be the greatest exposure.

There is no basis in the evidence before us for finding that exposure to radio frequency radiation at the predicted intensity of about 1.2 microwatts per square centimetre would have a potential effect on people, not even an effect of low probability but of high potential impact. Although there are some scientists who maintain that there is a serious hypothesis that exposure even to low densities of radio frequency radiation may be harmful, there is not general acceptance of that in the scientific community. On the totality of the evidence, our finding is that there would not be an actual or potential effect (including any potential effect of low probability which has a high potential impact) on the environment (as defined) from the radio frequency radiation that would be emitted by the proposed transmitter.

[The Tribunal found (in Chapter Two) that there would not be significant visual effects on the environment.]

CHAPTER FIVE: PLANNING INSTRUMENTS
Section 104(1) of the Resource Management Act also directs that in considering a resource consent application a consent authority is to have regard to various instruments under the Act. The only such instruments applicable to this case that were brought to our attention were the transitional district plan and the proposed district plan. It was not suggested that the contents of any national or regional instrument could assist in our consideration of this application.

Deemed (transitional) district plan
[The applicant acknowledged that the application has to be treated as a non-complying activity in respect of the transitional district plan.]

Proposed district plan
[Sections of the proposed plan have been omitted from this report.]
The proposed plan refers to control of utilities on the basis of their effects, contains an objective (8.3) of minimisation of the adverse effects of utilities on their surrounding environments, particularly those in living areas; a policy (8.3.1.) that radio and telecommunication facilities are subject to specialised controls; a policy (8.3.3) of ensuring that utilities are provided in a manner that takes account of adverse effects having regard to the character of the local environment; and another policy (8.3.4) of taking account of operational needs in assessing the location, design and appearance of utilities.

The proposed plan contains no explanation of the 300 metre prescription in R 4.3.1.(a)(i). As the emissions from the proposed cell site would fall within the descriptions in subcls (i) and (ii) of cl (a) of that rule, the proposal is a discretionary activity in respect of that plan. The assessment criteria in rule 4.5.2. do not raise new issues, but are particular aspects of actual and potential effects on the environment of allowing the activity. Addressing them, we find that there would be no significant visual effects; screening and landscaping would be inappropriate; the design of the antennas and support structures are necessary for their function but their proposed colour would ensure reasonable compatibility with the character of the surrounding locality; they would be located so as to minimise visibility from dwellings nearby; they are appropriate for their function; and there would not be any likely effect of increased level of microwave emissions on the health of persons in the vicinity of the facility with regard to its location. We have also considered the extent to which granting consent would serve the relevant objective and policies of the proposed district plan. We find that the facility has been designed to minimise adverse effects on its surrounding environment; and would not conflict with any of its objectives, policies or rules.

CHAPTER SIX: THE THRESHOLD TEST
[Sections of this chapter have been omitted from this report.]

We are therefore satisfied that both of the conditions stipulated in s 105(2)(b) on which a consent authority can grant resource consent for a non-complying activity are fulfilled.

CHAPTER SEVEN: CONDITIONS

If resource consent is granted, the consent authority has authority to impose conditions of consent that it considers appropriate (s 108(2)), provided that they are not for an ulterior purpose, fairly and reasonably relate to what is authorised by the consent, and are not unreasonable (*Newbury District Council v Secretary of State for the Environment* [1981] AC 578, [1980] 1 All ER 731).

In its decision granting consent, the city council imposed six conditions. BellSouth's appeal against the city council's decision sought deletion of conditions 3 and 4 and replacement of a condition worded as follows or to the like effect:

> That any radio frequency emissions from the antennas in the facility do not exceed 50 microwatts per square centimetre at any point where any member of the public (including commercial users of the building on and in which the facility is located) would approach the antennas.

The council did not resist that appeal, and agreed to that amendment to the conditions. Although BellSouth did not resile from that amendment, a witness called for it, Mr Gledhill of the National Radiation Laboratory, expressed criticisms that the condition is ambiguous as no measurement position is defined; and that there is no rationale for the 50 microwatts value. The council acknowledged the position that the limit of 50 microwatts per square centimetre was considered by some to be unnecessarily restrictive, but submitted that it would not affect the proposed operation, and that it would cause no harm for it to apply.

It was suggested by the appellants that the Tribunal should take this appeal as an opportunity to set a general standard for radio frequency radiation from cell site transmitters. We are aware of the possibility that a decision on an individual appeal may have a normative effect. However a decision on a particular resource consent application is not an appropriate occasion for setting a general standard. The Resource Management Act contemplates other ways in which that might be done, such as by national policy statements and in regional policy statements or district plans. The processes for settling instruments of those kinds are better suited for the purpose, because they allow participation by those with a general interest. In addition, as mentioned earlier in this decision, the New Zealand Standards Association has already issued a relevant standard and doubtless keeps it under review. Therefore it is sufficient for the purpose of deciding this appeal for us to set conditions that are specific to the particular circumstances.

Applicants for resource consent are required to assess the actual and potential effects that the proposed activity may have on the environment (s 88(4)(b)). The consent authority, and anyone who may be forming an attitude to the application, should be able to rely on such an assessment. For an applicant's environmental assessment to have its intended value, an applicant must expect to be held to the effects stated in it.

In this case the applicant has given evidence to the Tribunal about the proposed arrangement of the transmission antennas and the expected radiation

effects on the environment from the proposed cell site transmissions. It is in reliance on that evidence that we have found that there would not be actual or potential adverse effects on the environment of allowing the proposed activity. We consider that if the application is granted, the community is entitled to have the grantee held to the applicant's assessment of the radiation effects. That can be done in two ways. First, we can impose a condition restricting the installation and the incident power flux density to that described in the evidence. The city council can monitor the installation and the actual emissions and if necessary take enforcement action to prevent excessive radiation. Secondly, we can expressly identify the limits of the radiation effects that we recognise in granting consent, so that as contemplated by s 319(2) anyone can apply for an enforcement order if (contrary to our finding on the evidence that we heard) the emissions prove to have adverse effects on human health.

Using the technical information produced in evidence, we have estimated that the power flux density at the most vulnerable dwelling would be about 1.2 microwatts per square centimetre. Because that is an estimate, and because the grantee would be bound by law not to exceed the maximum set by the condition, it would be appropriate to allow a tolerance. We consider it would be reasonable to round that value up to the next whole number. A maximum of 2 microwatts per square centimetre (equivalent to a specific absorption rate of 0.2 milliwatts per kilogram) measured at any dwelling would be a hundredth of the standard of 200 microwatts per square centimetre set in the New Zealand Standard 6609 and the Australian Standard from which it was derived, which is considerably more conservative than those adopted in the United Kingdom (3300 microwatts per square centimetre) and the United States of America (600 microwatts per square cemtimetre), and that adopted by the International Radiation Protection Association (450 microwatts per square centimetre). It would respond to the recommendations in the New Zealand Standard NZS 6609 to keep exposure as low as reasonably achievable. It would also ensure that a specific absorption rate experienced by a member of the public would not exceed the level of 2 watts per 100 grams recommended in the World Health Organisation report ("Electromagnetic Fields (300 Hz to 300 Ghz)" Environmental Health Criteria 137, World Health Organisation, Geneva, 1993, pages 21, 23 and 177) to protect more sensitive parts of the body from excessive local temperature elevations. We are as confident as we can be in the circumstances that transmissions complying with such a condition would cause no harm to anyone.

We will therefore consider whether resource consent for the proposal should be granted or refused on the footing that if it is to be granted, conditions 3 and 4 imposed by the city council would be replaced by a condition to that effect.

CHAPTER EIGHT: CONCLUSION

In considering this application for resource consent, we have had regard to any actual and potential effects on the environment of allowing the activity, and have found that there would be no adverse effects. We have also had regard to the relevant provisions of the district plan, and have found that consenting to the proposal would not conflict with any of its objectives, policies or rules. In approaching the exercise of the discretionary judgment to grant or refuse

resource consent, we bear in mind the conclusion we reached earlier in this decision about the precautionary principle. We have considered the application of that to the circumstances of this case. We have concluded that the low power of the proposed transmissions, the condition that we would impose limiting the incident power flux density to 2 microwatts per square centimetre at any dwelling, and the relationship between that limit and the relevant standards referred to in the preceding chapter, all illustrate the application of a precautionary approach to this proposal.

The exercise of the discretionary judgment is to be informed by the statutory purpose of promoting the sustainable management of natural and physical resources (s 2(1)). The elaboration of the term "sustainable management" in s 5(2) refers to enabling people and communities to provide for their social, economic, and cultural wellbeing and for their health and safety. The extension of BellSouth's cellphone service would contribute to enabling the people and community of Fendalton to provide for their social and economic wellbeing. Even so it could not be contemplated if it imperilled anyone's health or safety. However, this case focused on the possibility of adverse health effects from the radio frequency radiation, and after careful consideration of the evidence we have found that the transmissions would not have any actual or potential adverse effect on the public, not even a potential effect of low probability which has a high potential impact. That can be assured by the amended condition that we would substitute, and by the provisions of the Act that could be invoked if it should turn out, contrary to the evidence before us, that the transmissions have an adverse effect, including the ability to review the condition.

The objective of sustainable management already addressed is subject to achievement of the matters described in paras (a), (b) and (c).

In our judgment, establishing and operating the proposed cell site would not imperil the values described in paras (a) and (b); and if done in compliance with the proposed conditions of consent, would avoid or sufficiently mitigate any adverse effects of the activity on the environment.

The remaining provisions of Part II amount to elaboration, for particular aspects of the environment, of the general purpose of sustainable management of natural aspects of the environment, of the general purpose of sustainable management of natural and physical resources. None of those particular aspects arises for specific consideration in the circumstances of this case.

We conclude that granting the consent sought, subject to the conditions imposed by the city council, amended as we propose, would serve the statutory purpose; and that the application deserves to be granted.

The Tribunal's determinations are therefore:

1. That the respondent's decision is amended by deleting conditions 3 and 4 of the conditions of consent, and by substituting the following condition 3:

   3. That the incident power flux density of radio frequency radiation emitted by the facility, measured at any dwellinghouse, is not to exceed 2 microwatts per square centimetre.

2. In all other respects the respondent's decision is confirmed.
3. The appeal is disallowed.
4. The question of costs is reserved.

TAB 4

Decision No. A066/2006

IN THE MATTER of the Resource Management Act 1991

AND

IN THE MATTER of two appeals under section 120 of the Act

BETWEEN **SEA-TOW LIMITED**
ENV-2006-AKL-000548
(formerly ENV A 0104/05)

McCALLUM BROS LIMITED
ENV-2006-AKL-000533
(formerly ENV A 0105/05)

Appellants

AND **AUCKLAND REGIONAL COUNCIL**

Respondent

BEFORE THE ENVIRONMENT COURT

Alternate Environment Judge D F G Sheppard (presiding)
Environment Commissioner P A Catchpole
Environment Commissioner D H Menzies

HEARING at Auckland on 5, 6, 7, 8, 9, 12, 13, 14, 15 and 16 December 2005; 7 and 8 February, and 27 March 2006.

APPEARANCES

J K MacRae and K Wilson for the appellants
J Burns and L S Fraser for the respondent Auckland Regional Council and for the Rodney District Council
G M Houghton for the Director-General of Conservation
KRM Littlejohn and J A Carnie for the Friends of Pakiri Beach
J R Welsh and L Daniel for Te Uri o Hau Settlement Trust and Te Uri o Hau /New Zealand Land Trust Joint Venture
J D Young for the University of Auckland and for Kaipara District Council
V Cooper for Northland Regional Council
G P McDonald for Mahurangi and Gulf Islands Collective and as an owner of Taumata B Block
C S Baines as an owner of Taumata B Block
J Tahitahi for Manuhiri Omaha Kaitiakitanga Ora Trust Board
G J Mackenzie for the Mangawhai Harbour Restoration Society
G J Mackenzie in person
M C Farnsworth in person and for C V Farnsworth

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Introduction

[1] These appeals concern proposals for continuing extraction of sand from near-shore areas of the Mangawhai-Pakiri embayment on the eastern coast of the North Island, in the northern part of the Hauraki Gulf. The proposals were stoutly opposed on contentions of serious adverse environmental effects of doing so. Decision of the appeals has called for careful and detailed evaluation of conflicting opinions of scientists. It has also called for decision of a dispute over whether the proposal is a restricted coastal activity.

The proposal

[2] Sea-Tow Limited applied to the Auckland Regional Council for resource consents to enable extraction of 27,000 cubic metres of sand per year for 20 years from the extraction sites, and McCallum Bros Limited applied for resource consents to enable extraction 49,000 cubic metres of sand per year for 20 years from the extraction sites. Those extractions would be largely continuations of previous consents which have expired. The extraction sites are located in near-shore areas of water (between 5 metres and 10 metres water depth) in the Mangawhai-Pakiri embayment at the northern end of the Auckland Region.

[3] The Sea-Tow application would involve a barge and tug being present for extraction activity for 4 to 6 hours per day on up to 45 days per year approximately; and the McCallum Bros application would involve a barge and tug being present for

extraction activity for 4 to 6 hours per day on up to 82 days per year approximately. Sand slurry would be pumped into the barge through wire mesh gratings, which screen off coarse material, including shells. Excess water and sand would be discharged back into the sea. As the barge fills, the sand would settle and sea-water drain back into the sea over weir boards. The extraction activity would not be carried on at Easter, over the Christmas-New Year holiday period, or on other public holidays.

[4] The consents were sought for the following aspects of the proposal as required by sections of the Resource Management Act:

(a) Disturbance of the seabed (section 12(1)(c) and (e)):

(b) Removal of sand (section 12(2)):

(c) The activity of extraction (section 12(3):

(d) Occupation of extraction sites by barge for the purpose of extraction:

(e) Ancillary discharges of sea-water, excess sand and shell into the sea (section 15(1)(a)).

[5] The existing and proposed consent conditions require the barge to operate at least 100 metres seaward from the crest of the near-shore bar, and in not less than 5 metres depth of water. In practice this requires that the barge operates at least 200 metres offshore, and usually about 300 metres.

[6] The applications proposed certain amendments to conditions attached to the previous consents to require bathymetric surveys, and adjustments to the extraction sites to allow an exclusion zone 500 metres from a headland called Te Arai Point. They also proposed terms of 20 years, instead of the 10-year terms of the previous consents.

[7] The applications were notified by the Auckland Regional Council and a total of 678 submissions were received, of which 658 opposed the applications, and 20 supported them.

[8] The applications were heard together by a committee of the Auckland Regional Council which, because they were treated as restricted coastal activities, included an appointee of the Minister of Conservation. The committee recommended that the applications be refused.

The appeals

[9] Sea-Tow and McCallum Bros each appealed to, and sought inquiries by, the Environment Court in respect of the recommendation that its application be refused. Each sought that its application be granted, subject to the conditions of consent proposed by it, and/or as the Court considered appropriate to avoid, remedy or mitigate any adverse effects of the proposal.

[10] During the course of the appeal hearing, the appellants proposed further amendments to the consent conditions.

The parties

[11] We briefly describe the parties who took part in the appeal hearing.

The appellants

[12] The appellants are Sea-Tow Limited and McCallum Bros Limited, who had applied to the Auckland Regional Council for coastal permits to extract 27,000 cubic metres and 49,000 cubic metres respectively of sand per year from inshore locations in the Mangawhai-Pakiri embayment, for terms of 20 years in each case. The applications are to replace coastal permits previously granted to extract 25,000 cubic metres per year and 45,000 cubic metres per year respectively, for terms of 10 years in each case, those permits having expired.

[13] The appellants have agreed that McCallum Bros Limited will acquire Sea-Tow's sand extraction business (which McCallum Bros has been carrying out as contractor), subject to obtaining the necessary consent to transfer of the permits.

The respondent

[14] The respondent to the appeals is the Auckland Regional Council (the Regional Council), which is the consent authority for activities in the coastal marine area (below mean high-water springs) of the Auckland Region (other than in respect of restricted coastal activities, for which the Minister of Conservation has the authority to decide resource-consent applications).

[15] The Regional Council informed the Court that the appellants' resource-consent applications had been heard by a special hearing committee that had included a person appointed by the Minister. The committee had recommended that the Minister refuse the applications.

[16] In the appeal hearing, the Regional Council supported that recommendation, and presented evidence.

The Director-General of Conservation

[17] The Director-General of Conservation is the Chief Executive of the Department of Conservation, which has the function of advocating for the conservation of natural resources. The Director-General took part in the appeal hearing pursuant to section 274 of the Act in opposition to the appeals, and called evidence.

[18] The Director-General's case was that sand extraction is disrupting natural coastal function, exacerbating episodes of coastal erosion which are significant habitat for endangered indigenous fauna, and depleting the beach-foreshore sand budget.

Northland Regional Council

[19] The Northland Regional Council is the regional council for the Northland Region, the southern boundary of which is also the northern boundary of the Auckland Region. The boundary meets the embayment about 4 kilometres south of the entrance of Mangawhai Harbour, and the northern extent of the near-shore locations from which the appellants seek to extract sand is adjacent to the regional boundary.

[20] In 2003 Sea-Tow Limited and Norsand Limited had applied for permits to extract sand adjacent to the harbour entrance, and a hearings committee appointed by the Northland Regional Council recommended to the Minister of Conservation that those applications be declined.

[21] The Northland Regional Council took part in the hearing of these appeals pursuant to section 274 of the Act in opposition to the appeals on the ground that the proposed extraction may have adverse effects in the Northland region, and seeking consistent decision-making within the Mangawhai-Pakiri embayment.

Kaipara District Council

[22] The Kaipara District Council is the territorial authority of a district that includes Mangawhai, and took part in the appeal hearing under section 274 in opposition to the appeals. The District Council's main concern was that the proposed sand extraction could adversely affect the social and economic well-being of the Mangawhai community by causing increased erosion of the Mangawhai Sandspit and the nearby shoreline. It did not itself call evidence, but adopted the evidence of the Auckland Regional Council.

Friends of Pakiri Beach

[23] The Friends of Pakiri Beach is an unincorporated society of residents and landowners at Pakiri Beach. They too took part in the appeal hearing pursuant to section 274 of the Act in opposition to the appeals, and called evidence.

[24] The Friends' case was that the proposed extraction would cause significant and irreversible adverse effects on the natural character of the coastal environment by erosion of the beach and sand dunes, and decreasing accretion where that might occur.

Te Uri o Hau

[25] Te Uri o Hau Settlement Trust and an unincorporated joint venture between Te Uri o Hau and New Zealand Land Trust Limited had lodged submissions in opposition to the applications, and under section 274 took part in the appeal hearing in support of the respondent.

[26] Te Uri o Hau are hapū of Ngati Whatua Te Iwi, and have had many centuries' association with the Mangawhai-Pakiri embayment, including gathering kaimoana from the beach and foreshore. They have concerns about effects of the proposed sand extraction on their cultural and spiritual interests.

[27] Te Uri o Hau Settlement Trust has purchased land occupied by the Northern Mangawhai Forest (which the joint venture plans to develop together with the Mangawhai South Forest). The development plans involve significant coastal reserves, including a 200-metre reserve along the 5.2-kilometre seaward boundary to the Mangawhai-Pakiri embayment. The Joint Venture partners' interests being the land facing the length of the sand extraction areas, their concerns were that the proposed sand extraction would cause erosion or decrease accretion, and harm the natural character of the coastal environment.

[28] These parties called evidence and adopted evidence of other parties opposing the appeals.

[29] Where, in this decision, we refer to the Settlement Trust and the Joint Venture together, we simply refer to them as Te Uri o Hau.

University of Auckland

[30] The University of Auckland also took part in the appeal hearing under section 274. It opposed the appeals, and submitted that the proposed extraction of sand could result in beach and dune erosion, particularly in the southern portion of the embayment; and potential adverse effects of reduction in water quality in the Cape Rodney to Okakari Point Marine Reserve, in which the University's Leigh Marine Research Laboratory is involved. The University called evidence.

Manuhiri Omaha Kaitiakitanga Ora Trust Board

[31] The Manuhiri Omaha Kaitiakitanga Ora Trust Board is the hapū authority of Ngati Manuhiri hapū, whose rohe[1] includes the Mangawhai-Pakiri embayment. The Board took part in the appeal hearing under section 274 of the Act in opposition to the appeals, evidence being given by the manager of the Board's resource management unit.

[1] Tribal area.

[32] The Board's case was that sand extraction would cause erosion of coastal sand and destruction of, or damage to, wāhi tapu and taonga toku iho.

Mangawhai Harbour Restoration Society

[33] The Mangawhai Harbour Restoration Society is a community based society of volunteers which since 1991 have continued the ecological and geomorphological reconstruction of the Mangawhai Harbour distal spit following destructive damage in a series of storms in 1978. Maintaining that this damage, and deflation of sand dunes, had been caused by sand extraction, the society took part in the appeal hearing under section 274 in opposition to the appeals.

[34] Evidence on the society's behalf was given by its chairman.

G P McDonald

[35] Mr G P McDonald is of Ngati Manuhiri, and a shareholder of Taumata B Block of coastal land on Pakiri Beach, where he resides on ancestral land. Under section 274, Mr McDonald took part in the appeal hearing, in which he opposed the appeals, and gave evidence himself. His main concerns were that the sand of the embayment is a finite resource, and that continued mining would have real risk of beach and dune erosion and impact on the mana of the Maori people.

C P Baines

[36] Mrs C P Baines is also of Ngati Manuhiri and a shareholder of Taumata B Block. Under section 274, Mrs Baines took part in the appeal hearing, giving evidence of her opposition to any removal of sand from their traditional tribal areas.

G J Mackenzie

[37] Mr G J Mackenzie is a property owner and part-time resident of Mangawhai Heads, and chairman of the Mangawhai Harbour Restoration Society. Under section 274, Mr Mackenzie took part in the appeal hearing in opposition to the appeals. He gave evidence of his belief that the reconstruction of the Mangawhai Spit had been 'trashed' by sand extraction.

M C & C V Farnsworth

[38] Messrs M C and C V Farnsworth also took part, under section 274, in the appeal hearing in opposition to the appeals. Mr M C Farnsworth is a resident of Mangawhai Heads, and an elected member of the Northland Regional Council. Mr C V Farnsworth formerly resided at Mangawhai Heads. Mr M C Farnsworth gave evidence on behalf of them both.

[39] It was their case that the sand resource is finite, and that continued sand mining in the near-shore area poses a very real threat to the long-term integrity of the Mangawhai Spit.

Primary legislation

[40] The primary legislation governing the decision of these appeals is the Resource Management Act 1991 and the Hauraki Gulf Marine Park Act 2000.

Resource Management Act

[41] Subject to Part 2 of the Act, the appeals are to be heard and decided in accordance with the relevant provisions of Part 6, for the purpose of the Act described in section 5.

[42] The Resource Management Act 1991 has been the subject of successive amendments. We need to consider whether the amendments enacted in 2003 and in 2005 are applicable to deciding these appeals.

Is the 2003 Amendment Act applicable?

[43] The relevant provisions of the Resource Management Amendment Act 2003 came into force on 1 August 2003.

[44] Counsel for the appellants submitted that the effect of section 112 of that Amendment Act is that these appeals are to be decided in accordance with the Act as amended. That was accepted by counsel for the friends of Pakiri Beach and for Te Uri o Hau Hapu, and was not disputed by any party.

[45] We accept that these appeals are not included in the classes of matters that, by section 112, are to be continued and completed in accordance with the principal act as if the amendment had not been enacted. We find that the appeals are to be decided in accordance with the Act incorporating the amendments made by the 2003 Amendment Act.

Is the 2005 Amendment Act applicable?

[46] The relevant provisions of the Resource Management Amendment Act 2005 came into force on 10 August 2005.

[47] Counsel for the appellants submitted that the effect of section 131(1) of that Amendment Act is that the amendments made by that Amendment Act do not apply to these proceedings. Counsel for the Regional Council and for the Friends of Pakiri Beach agreed with that, and no party disputed it.

[48] Section 131(1)(b) of the 2005 Amendment Act provides that the amendments made by that Act do not apply to a resource-consent application that had been made on or before the commencement of that Act, but had not by then proceeded to the stage at which no further appeal is possible.

[49] The appellants' resource-consent applications were made on 30 July 2003, being before the commencement (on 10 August 2005) of the relevant part of the 2005 Amendment Act. Since, by section 299 of the Act, a party would be entitled to appeal on a point of law to the High Court against the Environment Court's decision on these appeals, these proceedings had not, by the commencement of the 2005 Amendment Act, proceeded to the stage at which no further appeal was possible.

[50] Therefore we accept the correctness of the appellants' submission, and hold that the amendments made by the 2005 Amendment Act do not apply to these appeals.

[51] The result is that in these appeals, section 290A of the principal Act (which was inserted by section 106 of the 2005 Amendment Act) does not apply, and the Court is not required to have regard to the Auckland Regional Council's decision on the applications.

Hauraki Gulf Marine Park Act

[52] The Hauraki Gulf Marine Park Act 2000 defines the Hauraki Gulf as including the coastal marine area of the east coast of the Auckland region. Section 9 (4) of that Act directs that a consent authority considering a resource-consent application for the Hauraki Gulf is to have regard to sections 7 and 8 of that Act. Section 10 (1) of that Act provides that sections 7 and 8 are to be treated as a New Zealand coastal policy statement for the coastal environment of the Hauraki Gulf.

[53] Counsel for the appellants submitted that in these appeals the provisions of sections 7 and 8 of the 2000 Act that are relevant are the same as or similar to the matters that are relevant under Part 2 of the Resource Management Act, under the New Zealand Coastal Policy Statement, the Auckland Regional Policy Statement, the Auckland Regional Plan: Coastal, and the proposed Rodney District Plan. He contended that the 2000 Act does not raise any new or different matter that requires particular attention.

[54] One resource-management planner, Mr D F Serjeant, gave the opinion that the Hauraki Gulf Marine Park Act does not add any analysis requirement or factor to be considered in weighing up whether the applications meet the tests of sustainable management.

[55] Another resource-management planner, Ms ACE Leijnen, gave the opinion that the legislation attempts to traverse man-made boundaries in an effort to offer an holistic management of the environment and resources. This witness noted an important concept of man's relationship with the environment, not only in terms of the physical, but also over spiritual and cultural matters. She considered that the legislation requires a holistic overview to assess these applications as they would be located in the area that is not defined by statute or government-imposed administrative boundaries.

[56] We do not understand the significance of the last point. However we accept that provisions of the Marine Park Act are consistent with holistic management of the natural resources of the Hauraki Gulf, and that assessment of the proposal should extend to consideration of spiritual and cultural relationships with those resources.

[57] Consideration of the applications in terms of the Resource Management Act involves an evaluative judgement for the single purpose of that Act, and includes recognising and providing for the relationship of Maori and their culture and traditions with their ancestral lands, water, sites, waahi tapu and other taonga.[2] So we accept the correctness of Mr Serjeant's opinion that the Marine Park Act does not add any requirement for analysis or criterion in deciding whether the applications meet the sustainable management purpose of the Act.

Statutory instruments

[58] The Court is required to have regard to the relevant provisions of applicable planning instruments under the Act when considering the resource consent application.[3] There being no dispute between the parties, we find that provisions of the following instruments are relevant: the New Zealand Coastal Policy Statement, the Auckland Regional Policy Statement, and the Auckland Regional Plan: Coastal. In addition planning witnesses alluded briefly to the Northland Regional Coastal Plan and the Proposed Rodney District Plan.

New Zealand Coastal Policy Statement

[59] The New Zealand Coastal Policy Statement (NZCPS) sets out general principles for the sustainable management of New Zealand's coastal environment. Its purpose is to state policies in relation to the coastal environment, in terms of s. 65; and the policies contained in it largely replicate provisions of the Act.

[60] The witnesses all identified policies 1.1-1.4 as being relevant, and Ms Leijnan also added policy 1.1.5.

[61] These policies include the national priority to preserve the natural character of the coastal environment by encouraging development in areas where the natural character has already been compromised, taking the potential effects of development into account and avoiding cumulative adverse effects.[4]

[2] RMA, s 6(e).
[3] Ibid, s 104(1)(b).
[4] NZCPS Policy 1.1.1

[62] A further national priority is to protect areas of significant indigenous fauna and flora. This is to be undertaken by avoiding actual or potential effects of activities on areas containing nationally vulnerable species; avoiding and remedying actual or potential effects of activities on habitats important to regionally or nationally endangered species; and protecting unique coastal ecosystems which are vulnerable to modification including estuaries, coastal wetlands, mangroves and dunes and their margins.[5]

[63] There is also a policy to protect features which in themselves or in combination are essential or important elements. The features include landscapes, seascapes and landforms including significant representative examples of each landform in the region, wild and scenic areas and significant places or areas of historic or cultural significance.[6]

[64] The protection of the integrity, functioning and resilience of the coastal environment in terms of the dynamic processes and features arising from the natural movement of sediments, water and air is also addressed. This policy also provides for natural substrate composition and intrinsic values of ecosystems.[7]

[65] There was a difference among the planning witnesses about the relevance of the policy addressing the priority to restore and rehabilitate the natural character of the coastal environment, where appropriate.[8]

[66] A policy addressing appropriate use states that adverse effects of use should be avoided, as far as practicable. Where complete avoidance is not practicable the adverse effects should be mitigated and provision made for remedying those effects to the extent practicable.[9]

[67] There are also policies dealing with the precautionary approach.[10]

[68] There is a policy concerning recognition of natural hazards and provision for avoiding or mitigating their effects, including the possibility of sea level rise and the protection of the integrity of natural systems from erosion and/or inundation.[11]

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[5] NZCPS Policy 1.1.2
[6] NZCPS Policy 1.1.3
[7] NZCPS Policy 1.1.4
[8] NZCPS Policy 1.1.5
[9] NZCPS Policy 3.2.2
[10] NZCPS Policy 3.3
[11] NZCPS Policy 3.4.2

[69] We were referred to a policy of having regard to any alternatives to what the applicant seeks to do, and to an applicant's reasons for making the proposed choice, in relation to removal of sand from lands of the Crown in the coastal marine area.[12]

Auckland Regional Policy Statement

[70] The Auckland Regional Policy Statement (ARPS) gives effect to the NZCPS.[13]

[71] There are a number of provisions of the ARPS that are relevant. We identify them, noting that the Regional Council referred to a strategic objective and two policies, and the Friends of Pakiri Beach referred to chapters 2, 7, 13 and Appendix B, and other provisions. The appellants submitted that two issues are also relevant: the recognition of the value of sand as a strategic resource for growth,[14] and barging as a contribution to transportation objectives and policies.[15]

[72] Strategic Objective 2.5.1(5) is to protect the region's natural resource base, to make appropriate provision for avoidance, remediation or mitigation of adverse effects, and to protect areas from inappropriate subdivision use and development.

[73] Policy 7.4.4(1) indicates how the natural character of the coastal environment is to be preserved. In areas of high natural character, adverse effects on the natural functioning and natural processes of sediment transport are to be avoided, as well as adverse effects on habitats of indigenous fauna and associated processes.

[74] The ARPS includes identification of the birds of the Pakiri area, which are within a significant natural heritage area and value. Eight bird species are identified, including white-faced heron, blue reef heron, banded rail and pied stilt. In addition the record notes that New Zealand dotterel and variable oyster catcher breed in the area.[16]

[12] NZCPS Policy 4.1.6
[13] Resource Management Act, s62(3).
[14] ARPS Issue 2.3.3 Urban Development in the Region, page 5.
[15] ARPS Chapter 4
[16] ARPS Map 2, sheet 1, Appendix B. (The omission of reference to fairy terns is not explained.)

[75] Okaraki Point to Mangawhai Harbour (Pakiri Beach) is identified as the only exposed east coast surf beach free of housing and backed by extensive sand dunes and dune lakes. It is described as a wild and scenic coastline of regional significance and to be protected.[17]

[76] Mineral prospecting, exploration, extraction and processing are to be avoided in locations where the activities would have significant adverse effect on the significant values of natural or cultural heritage and the natural character of the coastal environment.[18]

[77] A proposed change to the ARPS was notified in September 2005, identifying areas of outstanding natural landscape and outstanding features.[19] Map series 3A identifies areas of outstanding natural landscape and landscape features. By the proposed change, Areas 23 and 24 (Pakiri Beach and the coastline from Pakiri River to Omaha Cove) would be identified as areas of outstanding natural landscape.[20]

Auckland Regional Plan – Coastal

[78] We identify specific provisions of the Auckland Regional Plan: Coastal (ARPC) that apply to Pakiri Beach, and then refer to the relevant general provisions of the plan.

[79] Pakiri Beach is recognized as an outstanding landscape, rating 6.[21] Te Arai Point has a similar identification with a rating 7, and Pakiri Beach from Te Arai Point to Pakiri River and south to the headland is identified as an area of significant conservation value. Sites classified by the Minister of Conservation as Areas of Significant Conservation Value are listed in Schedule 4.[22] This area is also identified as a Coastal Protection Area, together with the mouth of the Pakiri River.[23]

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[17] ARPS Appendix B.
[18] ARPS Policy 13.4.4 (1)
[19] ARPS Proposed Plan Change 8 Landscape and Volcanic Cones
[20] ARPS Proposed Plan Change 8 Appendix F
[21] ARPC map series 1 (Map 39)
[22] ARPC
[23] Schedule 4, 109; Schedule 3, 87b)

[80] The purpose of the Coastal Protection Area is to preserve the character of the coastal marine environment, outstanding natural features and landscapes and areas of significant indigenous vegetation and significant habitats of indigenous fauna from inappropriate subdivision, use and development.[24]

[81] The Department of Conservation administers the Mangawhai Marginal Strip and the Pakiri Marginal Strip.[25]

[82] The birds of the Pakiri area are listed in Significant Natural Heritage Areas and Values.[26]

[83] The Values, Objectives, Policies and Rules of chapters 3 – 9 of Part III, and Part IV (chapters 10-35) on use and development were drawn to our attention.

[84] The natural character of the coastal environment is the topic of Chapter 3. The section notes that dredging extraction and deposition of material on the seabed modifies the natural character of sub tidal areas but that elements of natural character may remain which are worthy of recognition and protection. This chapter also lists matters to which particular regard should be had in assessing actual or potential effects of use. These include the natural character in identified areas, Outstanding and Regionally Significant Landscape Areas, avoiding where practicable adverse effects on natural character in other parts of the coastal marine area and protecting appropriate remaining elements of natural character. An activity in the coastal marine area is to be considered inappropriate where it would result in significant adverse effects on key elements, features and patterns which are identified in this chapter.[27] This section also sets out considerations for mitigation of effects.[28]

[85] Policies listed in Chapters 4, 5, 6 and 8 are to be given particular regard when there are actual or potential effects on the natural character of the coastal environment, in recognition of the contribution of landscape, natural features, ecosystems, and cultural and historic areas and sites. Outstanding landscapes and features are to be protected from adverse effects, and the visual integrity of the landscape in its entirety is to be considered in an assessment of adverse effects. [29]

[24] ARPC Chapter 2, clause 2.9.1
[25] ARPC Maps Rodney Series 6, Sheet 2, (538 and 376)
[26] ARPC Appendix B.
[27] ARPC Chapter 3, clause 3.4.2.
[28] ARPC Chapter 3, clause 3.4.4.
[29] ARPC Chapter 4, clause 4.4.1

[86] Chapter 5 deals with ecosystems and natural features, setting out objectives including the protection of the dynamic functioning of physical coastal processes, integrity, functioning and resilience of ecosystems and preservation of ecological and physical values and processes.

[87] Sand extraction from the coastal marine area is dealt with in Chapter 14, which acknowledges that sand extraction is likely to increase. There is an objective[30] in this chapter that provides for the appropriate extraction of sand, shingle, shell and other natural material from the coastal marine area while avoiding, remedying or mitigating adverse environmental effects. The precautionary approach is deemed prudent in allowing for extraction where there is limited scientific or technical information available.[31]

[88] There is a policy of taking into account the values and provisions in the chapters 3 to 9 in assessing extraction of sand.[32] Damage to, and modification of, coastal stability, dunes and coastal vegetation is to be avoided as far as is practicable, and adverse effects are to be remedied or mitigated.

[89] We also note matters that may have special spiritual, historical and cultural significance to tangata whenua.[33] Objectives and policies include sustaining the mauri of natural and physical resources of the coastal environment, and enabling provision for the social, economic and cultural wellbeing of Maori.

Northland Regional Coastal Plan

[90] The Northland Regional Coastal Plan is not directly applicable, as the area from which the appellants propose to extract sand is in the Auckland region.

[91] By the Northland Regional Coastal Plan, Mangawhai Spit is identified in the Marine 1 (Protection) area, the purpose of which is to sustain the important values of the area, and to limit activities to those with public benefit where there are no practical alternative locations and restoration and rehabilitation can be achieved.[34]

[30] ARPC Objective 14.3.1.
[31] ARPC Chapter 14, Policy 14.4.4.
[32] ARPC Chapter 14, Policy 14.4.2.
[33] ARPC Objective 6.3.1 and 6.3.2.
[34] NRCP Sections 7,8 and 25.

Proposed Rodney District Plan

[92] The proposed Rodney District Plan is not directly applicable, as the area from which the appellants propose to extract sand is not within the district. Two planning witnesses, Mr Serjeant and Mr A P Benson, alluded to the Proposed Rodney District Plan.

[93] Mr Benson drew our attention to the zoning of the land adjacent to Pakiri Beach as a Landscape Protection Rural Zone. He listed the objectives for this zone including protection and retention of the natural coastal, non-urban and remote character of the Mangawhai to Pakiri coastline, and the protection and enhancement wherever possible, of the high landscape values, and significant natural areas and features including streams and harbours. He did not indicate whether any aspect of the zoning is still subject to appeal.

[94] In addition Mr Serjeant referred to noise limits which we understand were contained in the Proposed Rodney District Plan.

The status of the proposal

Is the proposal a restricted coastal activity?

The issue

[95] There was no dispute that when (on 30 July 2003) the resource-consent applications were made, to the extent that consent to the proposal was required by sections 12(1)(c) and 12(2)(b) of the Act the proposal was correctly classified as a restricted coastal activity. Those aspects had that status because of a rule of the transitional regional plan that had been inserted by direction of the Minister of Conservation. The applications were treated as being for restricted coastal activities by the committee appointed by the Regional Council and the Minister to conduct the primary hearing and make a recommendation on the application to the Minister.

[96] However, by the time these appeals were heard, a regional coastal plan prepared under the First Schedule of the Resource Management Act had become operative. That plan replaced the provisions of the transitional regional plan by

which the proposal had been classified as a restricted coastal activity. By the regional coastal plan no aspect of the proposal is a restricted coastal activity.

[97] On the appeals, a dispute arose over whether or not the proposal should now be treated as a restricted coastal activity. The Director-General of Conservation maintained that the aspects of the proposal to which sections 12(1)(c) and 12(2)(b) apply are still restricted coastal activities; but the appellants and the Friends of Pakiri Beach submitted that they are not. The Regional Council, Te Uri o Hau Hapu and other parties did not contest the correctness of the submissions of the appellants and the Friends of Pakiri Beach that the proposal is not a restricted coastal activity.

[98] The classification as restricted coastal activities of the aspects of the proposal to which sections 12(1)(c) and 12(2)(b) apply was derived from a rule of the transitional regional coastal plan that had been included in compliance with the Minister's direction. Both elements of that combination have ceased to apply. By section 372(3)(c) of the Act, the Minister's direction ceased to have effect on the date that the regional coastal plan was made operative, which was on 8 October 2004. By section 370 (1)(c) of the Act the transitional regional coastal plan ceased to be operative on that day too. So, by 22 April 2005 when these appeals were lodged, there was no rule or direction in force by which any aspect of the proposal was classified as a restricted coastal activity.

Submissions of Director-General of Conservation

[99] However the Director-General of Conservation submitted that the applications still have to be processed as restricted coastal activities, because they had that status at the time the applications had originally been lodged with the Regional Council. Counsel for the Director-General, Mrs Houghton, argued that the whole process is dictated by the status of the applications when made, and cited section 88A for the proposition that consent authorities are to continue to process, consider, and decide applications in terms of the classification that applied when they were made.

[100] Mrs Houghton also reminded us that it is not only the type of activity that could change, but the actual process and decision-maker. She contended that it is desirable for applicants, submitters, and councils to have certainty that the process remains the same, despite reductions in size and scope, and changes in operative plans. Counsel also argued that it would be more challenging if the regional coastal

plan had become operative during the period between the recommendation of the hearing committee (or the Environment Court) and the Minister's determination; or if a proposal became a restricted coastal activity after having been heard on a non-notified basis, and the applicant had appealed against refusal of consent.

Submissions of appellants

[101] The appellants submitted that by section 372, it was the Minister's direction under that section, rather than the transitional coastal plan, that was the operative instrument for creating and terminating restricted coastal activities in transitional coastal plans.

[102] In support of that counsel for the appellants, Mr Macrae, referred to the following provisions of section 372:

(a) That subsection (1)(a) empowers the Minister to direct a regional council to treat any specified activity as a restricted coastal activity even in the absence of a transitional coastal plan, and such a direction is not among the instruments deemed by section 370 to be a transitional coastal plan.

(b) That by subsection (6) a direction takes effect on the date it is served, regardless of whether the regional council makes any change to any regional coastal plan.

(c) That by subsection (3)(c), a direction ceases to have effect on the date that a proposed regional coastal plan is notified.

[103] Mr Macrae submitted:

(a) That the intent of subsection (3)(c) must be that any activity specified in the direction ceases to be a restricted coastal activity when a proposed regional coastal plan is notified, observing that otherwise, where the transitional plan has been amended to give effect to the direction, this provision would be meaningless.

(b) That the overall scheme of section 372 is that a direction by the Minister under it is a temporary measure to preserve the position pending notification of proposed coastal plans; and that regional councils were then able to provide for restricted coastal activities if required by the Minister under section 68(4). If they did so,

the direction then became redundant; and if not, the direction would be inconsistent with the provisions of the regional coastal plan.

(c) That the difficulty with the Director-General's contention that the status of the activity is 'dictated by the status of the application' when made is that the legislation applicable to these applications did not so provide. Section 88A has never dealt with status as restricted coastal activities.

Consideration

[104] We consider first Mr Macrae's submission that the intent of section 372(3)(c) must be that any activity specified in the direction ceases to be a restricted coastal activity when a proposed regional coastal plan is notified.

[105] Prior to the coming into force on 1 August 2003 of the relevant provisions of the 2003 Amendment Act, the provision read:

> (3) A direction under subsection (1)–
>
> ...
>
> (c) Shall cease to have effect upon the date that a proposed regional coastal plan is notified under clause 5 of the First Schedule.

[106] Section 90 of the 2003 Amendment Act provided:

> Section 372(3)(c) of the principal Act is amended by omitting the words "notified under clause 5", and substituting the words "made operative under clause 20".

[107] So in general the current intent and effect of section 372 is that an activity specified in a direction ceases to be a restricted coastal activity when a proposed regional coastal plan is *made operative* under clause 20 of Schedule 1, not when the proposed plan was *notified*. However when in February 1995 the Auckland regional coastal plan was notified, the version of section 372(3)(a) then in force had the effect that a direction under that section ceased to have effect on the date the proposed plan was *notified*. Consequently, we find that the Minister's direction to the Auckland Regional Council ceased to have effect on that day.

[108] So we accept the appellants' submission to that effect, and hold that by section 372(3)(c) the Minister of Conservation's 1991 directions (in compliance with which the Auckland Regional Council included in the transitional plan provisions

classifying activities as restricted coastal activities) ceased to have effect on notification of the proposed regional coastal plan in February 1995.

[109] Following notification of the proposed plan, the Regional Council would then have been free to initiate a change to the transitional plan to alter the classification rule, but it was not suggested to us that it had done so. So while the transitional plan continued to have effect (until the proposed Auckland Regional Plan: Coastal became operative), the classification rule also continued to have effect. It had effect as a regional rule, even though the Minister's direction no longer had effect. The rule was not deprived of effect by section 68(4), because the Minister of Conservation had earlier required the activity to be so specified, even though the direction had since ceased to have effect.

[110] We also accept the appellants' submission that the overall scheme of the section is that a ministerial direction under it is a temporary measure to preserve the position pending the relevant action in respect of a proposed regional coastal plan – the relevant action prior to 1 August 2003 being notification, and since then, being made operative.

[111] We accept, too, the appellants' submission that section 88A does not deal with restricted coastal activities. By subsection (1)(b), the section is concerned with the classification of activities as controlled, restricted, discretionary, or non-complying. It does not apply to the classification of activity in the coastal marine area as a restricted coastal activity.

[112] By section 290(1) of the Act, on the appeals the Environment Court has the same power, duty, and discretion in respect of the decision appealed against as the person against whose decision the appeals were brought. So the nature of the appeals is that they are by way of complete rehearing as an exercise of original jurisdiction.[35]

[113] In that context it is our understanding that the Court is to conduct the hearing of the appeals, and make its decision, on the basis of the facts as they are at the end of the appeal hearing, and the law as at the date of its decision. If that is correct, there is no basis upon which we can find that any aspect of the proposal is a

[35] *Ireland v Auckland City Council* (1981) NZTPA 96 (HC); *Countdown Properties v Dunedin City Council* [1994] NZRMA 145; 1B ELRNZ 150 (FC).

restricted coastal activity, because since 8 October 2004 no direction or rule to that effect has been in effect.

[114] The other arguments presented on behalf of the Director-General of Conservation do not directly question that there is no rule or direction now in force by which the proposal is classified as a restricted coastal activity. Rather they suggest difficulties that may arise in marginal cases, and suggest that the law should be different than it is.

[115] Be that as it may, the role of this Court is to find the law as it is and determine the appeals in accordance with it. Consideration of whether the law is capable of improvement is for the Minister and for Parliament, not for the Environment Court.

[116] So we do not accept the Director-General's submissions. Although elements of the proposal would previously have been classified as restricted coastal activities, we find that for the purpose of these proceedings they are not so classified.

[117] In summary, we find that the proposal is not a restricted coastal activity, and that enables the Court to proceed with determination of these appeals.

What is the status of the proposal?

[118] The Act provides for plans to classify activities as permitted, controlled, restricted discretionary, discretionary, non-complying and prohibited.[36] The status of a resource-consent application as being in one of those classes depends on its classification at the time the application was first lodged.[37] The scope of a consent authority's power in dealing with a resource-consent application varies according to the classification.[38] So we have to identify the classification of the applications the subject of these appeals.

[119] The appellants submitted that as the area from which the sand is proposed to be extracted is by the Auckland Regional Plan: Coastal in the general management area defined by that plan, the proposal is a discretionary activity.[39] That submission was supported by the planning evidence of Mr Serjeant (whose testimony to that

[36] RMA, s77B.
[37] Ibid, s 88A.
[38] Ibid, ss 104A-104D.
[39] ARP:C, Rule 14.5.4.

effect was not challenged in cross-examination); evidence to the same effect was given by Mr Benson and Ms Leijnen; and no party submitted to the contrary.

[120] Accordingly we find that the proposal is a discretionary activity, and that the Court has jurisdiction to grant or refuse the applications, and if it grants them, may impose conditions under section 108 of the Act.[40]

Would the proposal have actual or potential effects on the environment?

[121] In considering a resource-consent application a consent authority has, subject to Part 2 of the Act, to have regard to any actual and potential effects on the environment of allowing the activity.[41] That includes positive or beneficial effects on the environment, and adverse effects as well. We address the positive effects first.

What positive environmental effects would the proposal have?

[122] The appellants contended that the there are seven key aspects of the proposal which would either be beneficial, or where there could be an adverse effect, it would be so small as to be negligible. The seven aspects are –

(a) The appellants' sand extraction activities make an important contribution to the economic and social well-being, and to the health and safety, of people and communities in the Auckland region. Elements of that are the high quality of the Pakiri sand, its importance as an essential product in the construction industry, the scarcity of the resource, and the current lack of alternate sources of replacement sand.

(b) The extraction industry represents an efficient use of natural and physical resources having regard to the particular suitability of the sand for its purpose, its location, the efficiency of extraction, landing and the distribution process, and the significant additional costs that alternative sources of supply would involve.

(c) The extraction of the volumes of sand for which consent is sought would not have any discernible adverse effect on the coastal and geomorphology. The appellants submitted that extraction at the proposed rate of 76,000 cubic metres

[40] RMA, s104B.
[41] RMA, s 104(1)(a).

per annum is well within the sustainable capacity of the system. They relied on the absence of any erosion which can be tied back to the large quantities of sand extracted over 85 years, and their evidence showing that variations in the coastline are a result of natural processes rather than sand extraction.

(d) In the absence of any discernible erosion, the sand extraction would have no consequential or other adverse effects on natural character, landscape, habitat for flora and fauna or the cultural values of iwi.

(e) The effects of sand extraction, and particularly the operation of the barge, on the amenities of the residents, users of the beach and users of the coastal waters would be negligible. The effects in question are noise effects, visual effects, effects on public access, recreational activities and navigation and safety.

(f) The extraction of sand from the inshore site would not have adverse effects on marine ecology, benthic communities or shellfish.

(g) The proposal is consistent with the relevant policies, objectives and other provisions in the New Zealand Coastal Policy Statement, the Auckland Regional Policy Statement, the Auckland Regional Plan: Coastal, the proposed Rodney District Plan, and the Hauraki Gulf Marine Park Act.

[123] Taking those items overall, the appellants relied on the high quality of the Pakiri inshore sand, and its particular suitability for the manufacture of high strength ready-mix concrete for use in high rise buildings and infrastructural projects. That evidence was not contested.

[124] The appellants also asserted that refusing the application would inevitably lead to an increase in the costs of high-grade sand used in the manufacture of ready-mixed concrete. Those increased costs would be reflected in higher prices for the concrete and construction generally in the Auckland region, including costs for public infrastructure projects. The appellants contended that such costs may lead to delays in the completion of the projects. The evidence was also that there would be external additional costs in transport from outside the region, costs associated with traffic accidents as well as congestion effects.

[125] The appellants also contended that no erosion along this stretch of coastline would be caused by sand extraction operations, observing that sand has been extracted in the area for many years with negligible effects on users of the beach or on users of the coastal waters.

[126] We address the questions of physical effects of the sand extraction later in this decision; and now consider in more detail the contention that the proposal would serve economic efficiency.

Would the proposal serve economic efficiency?

The issue

[127] The appellants contended that the proposal would be economically efficient because of the clean natural state of the sand, the availability of barge transport from the embayment to a central distribution point at Auckland Port, and avoiding external effects of land transport (including increased heavy traffic movements, carbon dioxide emissions, and congestion effects).

[128] The Friends of Pakiri Beach disputed that. They contended that the proposal would have no economic effect on the Auckland regional economy, because an adequate supply of sand suitable for concrete manufacture is apparent within the region; and there may be a more sustainable source in the Kaipara Harbour. Mr Littlejohn remarked that the appellants had not provided evidence of the relative cost of obtaining sand from other sources; and that the loss of the Mangawhai-Pakiri near-shore source would have only a minor effect (if any) from a regional economic perspective.

[129] Te Uri o Hau submitted that in considering economic efficiency, the Court should keep the purpose of the Act in plain sight.

[130] In reply, the appellants explained that it was not their case that alternative sources of suitable sand are necessarily uneconomic, but that other sources within the Auckland region would represent a less economic use of physical resources than the Pakiri inshore site; and that sources beyond the region would be uneconomic. They also maintained that the relative economics of sourcing sand from elsewhere is

only relevant if that sand is (like the sand from the Pakiri site) suitable for ready-mixed concrete.

The evidence

[131] Mr M C Copeland, a consultant economist, gave evidence that three classes of externality are associated with road transport, all of which impact on the efficient use of resources and thus on community economic well-being:

- environmental costs associated with the additional road transport, including the emission of carbon dioxide and other pollutants.
- additional road accident costs incurred because of the additional road transport.
- congestion effects of road transport for other road users.

[132] Mr Copeland concluded that if consent is not granted for the extraction of the high-grade sand from the Mangawhai-Pakiri embayment, alternative sources will have to be sought. In the short to medium term (perhaps up to a maximum of 10 years) suitable sand could be extracted from land-based reserves at Tomarata.

[133] However this would incur additional transport costs estimated at around $1.8 million per annum, and would raise the ex-depot cost of sand by 60.1 percent. In the event that future consents are granted for additional quantities of high-quality sand from the Kaipara Harbour, there would also be additional transport costs, although not as great as those calculated for Tomarata.

[134] In the longer term, when the Tomarata source has been exhausted and if sufficient supplies of high quality sand are not available from the Kaipara Harbour, sources further afield would need to be accessed with even greater negative impacts on the resource use efficiency and economic well-being.

[135] Dr BMH Sharp, also a qualified economist, gave the opinion that removal from the market of sand from Pakiri near-shore would be likely to be met by other suppliers increasing the amounts of sand under existing resource consents, or by quarry operators. So this witness disputed Mr Copeland's opinion that there is no available alternative supply capacity in the market. He also referred to external impacts, and welfare costs arising from them, showing that the real cost of extracting

sand is greater then the market cost. He agreed that there would be environmental costs associated with transportation, but questioned Mr Copeland's opinion, because the latter had not considered the market response to having to recover higher transportation costs, nor on-site environmental costs.

The law

[136] The extent to which the proposal would have beneficial effects of economic efficiency is relevant to the decision of these resource-consent applications because the statutory purpose of sustainable management of natural and physical resources includes managing them in a way and at a rate which enables people and communities to provide for their economic well-being (among other things).[42] That is supported by the direction that consent authorities (among other functionaries), in relation to managing the use, development and protection of natural and physical resources, are to have particular regard to the efficient use and development of natural and physical resources.[43]

[137] Those provisions do not extend to requiring consent authorities to have regard to the efficient use of minerals;[44] nor to the relative efficiency of the proposal with that of other possible uses of the resources.[45]

Consideration

[138] In comparing the opinions of the two economists who gave evidence, we are inclined to resolve any differences between them by preferring the opinions of Mr Copeland, for two reasons.

[139] The first is that Dr Sharp's finding that there is no present shortage or future potential shortage of sand in the Auckland region did not distinguish between the availability of sand generally, and the availability of sand suitable for ready-mixed concrete, and had no evidence on how much of total available sand is suitable for that purpose. The witness acknowledged that he is not expert in the kinds of sand used for making concrete for different purposes, and was not able to dispute the

[42] RMA, s5(2).
[43] RMA, s7(b).
[44] *Winter v Taranaki Regional Council* [1999] NZRMA 1; 4 ELRNZ 506.
[45] *Swindley v Waipa District Council* Environment Court Decision A075/94.

evidence of other witnesses with extensive knowledge and experience of that subject.[46]

[140] The second reason is that Dr Sharp relied for his opinion on information from others that we could not rely on, because it was not in evidence and exposed to testing by cross-examination. We refer in particular to Dr Sharp's evidence based on resource consent records; and to his reliance on findings of fact by the Commerce Commission and by the Planning Tribunal in other litigation.

[141] Any proposal's economic efficiency impacts should be assessed on the basis of a forward-looking comparison *with* the proposal as compared to *without* the proposal. In this case it is reasonable to assume that in both 'with' and 'without' scenarios, the future locations and quantities of sand demand are fixed – ie they are the same with and without the consents being granted, although price can modify demand.

[142] However continued sand extraction would impact on the sources of supply and on the transport requirements for delivery of sand to the points of demand. Having regard to the efficient use of resources requires attention to minimising transport costs in meeting the future demand for sand in the Auckland region.

[143] If the appellants are unable to continue extracting the high quality sand from the seabed offshore in the Mangawhai-Pakiri embayment, the most likely alternative source of supply, at least in the short to medium term while reserves last, is the Tomarata land-based sand to the north-east of Wellsford. This resource is finite, so it is not a long-term solution. From an economic efficiency viewpoint, the key disadvantage of using it instead of the Pakiri sand is the additional transport costs incurred in carting it from the northern part of the Auckland region to the centre.

[144] At present the appellants largely supply sand to the part of the region south of the Auckland Harbour Bridge, most of the demand north of the bridge being met by sand from the Kaipara Harbour and from Tomarata. If the appellants are not able to continue sand extraction at Pakiri, there would be a small offsetting cost-saving for that sand which would no longer have to be transported north from the Port of Auckland to Albany.

[46] Transcript, pp458, 459.

Finding

[145] So we find that the proposal would be economically efficient in delivering to Auckland sand of quality suitable for ready-mixed concrete, including the use of barge transport from the embayment to a central distribution point, and avoiding external effects of land transport (including increased heavy traffic movements, carbon dioxide emissions, and congestion effects). In our judgement that efficient use of the natural and physical resources involved would be a beneficial effect on the environment of allowing the proposed activity.

What adverse environmental effects would the proposal have?

[146] We now consider whether there would be actual or potential adverse effects on the environment of allowing the activity. In doing so, we give the terms 'effect' and 'environment' the meanings attributed to them by the Act.[47]

Would the proposal cause direct adverse effects on the environment?

[147] The opponents raised allegations of a several categories of adverse actual and potential effects on the environment of allowing the activity. We consider them in this order:

- Whether the proposal would cause direct adverse physical effects on the environment:

- Whether it would have direct adverse non-physical effects:

- whether it would have indirect physical adverse effects consequential on the direct effects: then

- whether it would have indirect non-physical adverse affects consequential on the direct effects.

[148] No party contended that having regard to those considerations would conflict with Part 2 of the Act.

[47] RMA, ss 3 and 2(1).

Would the proposal cause direct adverse physical effects on the environment?

[149] In this case the outcome of the question whether the proposal would have direct physical effects on the environment is significant, because many of the non-physical and indirect effects in issue would be consequential on alleged direct physical effects.

[150] We start by summarising the cases of the parties on this topic, to define the issue. We then consider conflicting evidence on whether the Mangawhai-Pakiri sand system is closed to entry of significant amounts of sediment, addressing flows of sediment into and out of the embayment, sea-level rise, and other indications bearing on that question. (We do so on the understanding that the Court should make its findings on a topic by considering the totality of the evidence bearing on it, not by reference to any party having a burden of proof.[48])

[151] After coming to our finding on that question, we consider whether the proposed extraction would have adverse effects on marine habitat, flora or fauna, noise effects, or visual effects.

Summary of the parties' cases

[152] We summarise the cases of the parties in respect of direct adverse physical effects on the environment of allowing the activity.

Auckland Regional Council

[153] It was the Auckland Regional Council's case that, while some uncertainties remain, the effect of the proposed extraction would be to reduce the amount of sand in the system, and this being cumulative on the effect of past sand extraction from the area, would lead to irreversible degradation of the natural character of the coastline. The Regional Council contended that although the extent of any adverse effects is not known, it is known as a matter of scientific principle that sand extraction in a closed system such as the Mangawhai-Pakiri embayment would have an adverse impact on the beach system. The uncertainty lies in the timing and extent.

[48] *West Coast Regional Abattoir v Westland Regional Council* (1981) 10 NZTPA 297; *McIntyre v Christchurch City Council* [1996] NZRMA 289; *Shirley Primary School v Christchurch City Council* [1999] NZRMA 66.

Director-General of Conservation

[154] The Director-General of Conservation contended that the sand is proposed to be extracted from a closed sand system, in which the volume of sand is finite; that it is proposed to be extracted from the most vulnerable part of the system (in geomorphic terms); that the volumes to be extracted are large in relation to the total resource; and that sand mining is disrupting natural coastal functions.

Friends of Pakiri Beach

[155] The Friends of Pakiri Beach contended that the coastal processes render the sand system essentially closed to appreciable inputs of new sand; and that the effects of the current proposal have to be considered cumulative on those of historic extraction, and the future erosion effects of that extraction.

[156] The Friends of Pakiri Beach contended that there is a robust causal link between sand extraction from the near-shore area and erosion effects observed in the same area; and that the latter are adverse and unable to be mitigated. They contended that the Mangawhai-Pakiri Embayment is essentially a closed system with no appreciable inputs; and asserted that it is axiomatic that removal of sand from anywhere within the system will deplete the system in an amount equal to the quantity removed.

Te Uri o Hau Hapu

[157] It was also the case for Te Uri o Hau that within an essentially closed system, any amount of sand taken from it would have a consequence of contributing to erosion or decreasing the rate of accretion.

University of Auckland

[158] The University of Auckland's case was that the Mangawhai-Pakiri embayment is a finite sand resource, and that continued near-shore extraction of sand from it could result in beach and dune erosion, particularly in the sediment-poor southern portion of the embayment.

The appellants

[159] The appellants disputed that the sand resource in the embayment is a closed system, and contested the alleged effects of the proposed extraction, on the ground that despite huge volumes of sand having been extracted from the Pakiri in-shore area over the last 85 years, there has been no significant erosion or change to the coastline which is attributable to sand extraction, and not attributable to natural processes.

Response of Friends of Pakiri Beach

[160] The Friends of Pakiri Beach responded to the appellants' case by asserting that the effects of the sand removal would spread out through the system, and that finding equilibrium (involving the constant movement of large volumes of sand within the active system) could take decades to occur, so there might be significant delays before the physical effects of the removal of sand manifest themselves on visible parts of the system such as dune and beach erosion or shoreline retreat.

[161] The Friends contended that this time lag, and the ever-changing nature of the system, make it difficult to measure an actual effect of sand removal; but the axiom of removal of sand depleting the system is not affected by the processes of finding equilibrium over time, and does not permit an assertion that sand extraction from within the system would not have an adverse effect on it.

[162] The Friends of Pakiri Beach also asserted that the only way to escape that contention would be for the appellants to identify inputs of sand into the system of sufficient magnitude to offset both the outputs from extraction and sea-level rise, as well as offering a reasonable reserve to maintain a margin of safety. They asserted that the modelled inputs into the embayment are insufficient to counter the effects of the proposed removal of sand.

Consideration

[163] From the positions of the parties, we define the issue as being whether or not the proposed sand extraction would have the potential effect of so reducing the

quantity of sand in the system that, cumulative on the effects of past extraction, would contribute to erosion (or decreasing accretion) in the beach and foredunes.

[164] To the extent that some of the parties and witnesses focused on the loss of sand from the system, we accept the appellants' submission that this does not respond to a consent authority's task in deciding a resource-consent application. The description of the term (critical to the statutory purpose) 'sustainable management' does not support treating loss of sand (or other minerals) in itself as an adverse effect. The relevant effects (as defined) are those on the 'environment' (as defined).

[165] It is evident that a critical question in resolving the issue of adverse physical effects on the environment is whether or not the Mangawhai-Pakiri sand system is a closed system, receiving no appreciable inputs of sand from outside it. So we now review the evidence on that topic and come to a finding on that question.

Is the sand system closed?

[166] The Auckland Regional Council, the Director-General of Conservation, the Friends of Pakiri Beach, and the University of Auckland called expert witnesses in support of the contention for a closed system; and the appellants called experts giving the contrary opinion. We consider first the evidence on the flow of sediment into and out of the system, then the evidence on other indications that the system may be closed or open, before coming to our finding.

[167] The expert witnesses whose testimony bore on this topic were:

(a) Dr T M Hume, a marine scientist whose expertise includes coastal sand resources. He had led the Managawhai-Pakiri Sand Study, 1995 to 1998, and several other relevant studies.

(b) Dr M J Hilton, a university lecturer in coastal processes and coastal management whose research has focused on the natural character and management of exposed sandy coasts, and who has studied dune geomorphology and ecology, including near-shore sedimentation in the Pakiri Mangawhai embayment.

(c) Dr R G Dean is a coastal and oceanographic engineer from the United States of America with considerable academic and practical experience, who has

published extensively. He too has had some previous professional experience with Pakiri Beach and Mangawhai Harbour.

(d) Mr A W LaBonté is a coastal engineering consultant specialising in harbour, dune and beach restoration and coastal protection. He has had professional experience concerning restoration of the Mangawhai Harbour inlet, river channel and dune stabilisation.

(e) Dr S L Nicol is a university senior lecturer, with 20 years experience as a practising scientist in coastal geomorphology, and research interest in the evolution of coastal landforms, particularly sandy coasts and estuaries.

(f) Dr A G Barnett is a consulting hydraulic engineer specialising in modelling water flows (including tidal currents) and sediment transport.

(g) Mr D J Todd is a consultant scientist experienced in coastal geomorphology, monitoring coastal processes, and assessing potential future changes in shoreline stability and coastal sediment extraction.

(h) Dr D G Goring is consulting engineer specialising in hydraulics, including coastal and tidal hydraulics and analysis of data. He had analysed beach profile data and wave data in respect of the Mangawhai-Pakiri embayment.

Mangawhai-Pakiri Sand Study

[168] The evidence made reference to a study that had been commissioned to investigate and report on:

(a) The overall extent and volume of the Mangawhai-Pakiri sand resource (which includes the Holocene coastal plain, sand dunes and sea-bed out to the 40-metre isobath); and

(b) The sustainable level of near-shore (less than 25-metre depth) extraction of sand at Mangawhai-Pakiri which avoids, remedies or mitigates any adverse effects on the environment.

[169] The study had been carried out between April 1994 and June 1997, and aimed to resolve differing views on long-term level of sustainability and provide more information on which to base medium and longer-term decision-making. Specific objectives were to (i) establish a sediment budget and quantify sediment transport, (ii) determine the long-term shoreline trend and short-term fluctuations, (iii) determine broad sediment characteristics and composition of the sand resource, and (iv) determine the relationship (if any) between extraction and the long-term shoreline trend.

[170] The findings of the study were presented in five technical reports and a final report as follow:

- Module 1: Onshore Sands: Long-Term to Short-Term Shoreline Change along the Mangawhai-Pakiri Coast (March 1996)
- Module 2: Marine Sands (December 1996)
- Module 3: Morphodynamics (June 1998)
- Module 4: Oceanography and Sediment Processes (January 1997)
- Module 5: Numerical Modelling (June 1998)
- Module 6: Final Report: Sand Movement and Storage and Nearshore Sand Extraction in the Mangawhai-Pakiri Embayment (August 1998).

[171] The technical reports (Modules 1 to 5) were produced independently of each other, and the final report (Module 6) was described as the synthesis of all available technical information and the project team's considered interpretation of it.

[172] One of several methods used was periodic field surveying of the profile of the beach at a number of established transects, which had begun in 1978. The transects identified as P6 and P7 were distant from the sand-mining, and the profiles of the beach there were used as controls for comparison.

[173] Valuable as the Sand Study is, neither the parties in these appeals, nor the witnesses called by them, nor the members of the Court are bound to accept the conclusions. Some witnesses found it relevant to explain reservations they had about some findings of the Study. In the sections of this decision that follow, we will refer to the Sand Study as such.

The flow of sediment into and out of the system

[174] The more direct approach to the question whether the Mangawhai-Pakiri embayment is a closed system, is consideration of inputs of sand from outside it. In that context, we consider the evidence on how much sediment enters the system from various sources, and how much leaves the system naturally. We then consider the evidence on other indications that the system may be closed or open, including any indications that the proposed extraction would be unsustainable, and any indications of significant change due to past sand extraction.

How much sediment enters the system?

General

[175] Dr Hume explained that in general, inputs come from long-shore movement of sand around headlands into the onshore compartment, onshore transport across the continental shelf, input from rivers, and cliff erosion. Losses include long-shore movement out of the system, offshore transport onto the continental shelf, sand extraction and wind transport land-ward into dunes.

[176] This witness gave the opinions that the Mangawhai-Pakiri embayment is a closed sand system with finite stores of sand, in that there is little new sand coming into the embayment from external sources such as the ocean, rivers, and adjacent beaches, and it is less than losses from extraction and leakage. He did not dispute that there is some natural replenishment of sand from external sources, but he estimated that the amount is small (of the order of 20,000 cubic metres per year) compared with the proposed extraction rate (76,000 cubic metres per year), and less than losses from extraction and leakage.

[177] In cross-examination, Dr Hume gave evidence that the figure of 20,000 cubic metres per year was an average over 23 years, within which there had been quite large fluctuations, and in any individual year there might have been an input of new sand into the system of 10 times 20,000.[49] He agreed that over the next 20 years, the average inputs to the system could be substantially higher.[50]

[178] Dr Hilton gave the opinion that the sand system receives no significant replenishment from any source.

[179] Dr Dean gave the opinion that, with the exception of the small fluvial and cliff inputs quantified in the Sand Study, the Mangawhai-Pakiri embayment is essentially a closed system; and that the near-shore subsystem, shallower than about 20 metres, is essentially a closed system. He considered unsupportable the Tonkin and Taylor report of natural sand accumulation of 140,000 cubic metres per annum, as it had been based on surveys commencing in 1978 after a major storm; and he relied on Module 5 of the Sand Study, and a 1996 paper by Hilton and Hesp, as a more reliable assessment of the closed nature of the system. Dr Dean also stated that the general 'plan' form of the embayment is consistent with a closed system in which no, or very little, sand is entering from or leaving to adjacent embayments.

[180] Mr LaBonté gave the opinion that the Mangawhai-Pakiri embayment is a closed system in a non-accretionary and possibly erosional state with no significant inputs of new sand from land or from offshore. However he did not give specific testimony on the quantities of sediment that enter the system.

[181] Dr Nichol also gave the opinion that the system is a closed sediment compartment, receiving no new sediment from external sources. In cross-examination, he acknowledged that he had not attempted to establish that proposition in his evidence to an acceptable standard of scientific proof.[51]

[182] Dr Barnett gave the opinion that the system receives a net inflow of around 150,000 cubic metres per year from river and cliff erosion, from sand entering southwards past Bream Tail, and from shell growth. He acknowledged that there is some uncertainty about that quantity, of the order of probably 10,000 or 20,000 cubic

[49] Transcript, pp 225, 226.
[50] Ibid, p 226.
[51] Ibid, p712.

metres per year.[52] This witness maintained that the closed model is not consistent with the evidence, and that the most probable explanation of the shoreline record over the period of historic sand extraction is consistent with accumulation at a rate somewhat above the average extraction rate.

[183] In summary, Dr Hilton, Dr Nichol and Mr LaBonté were all of the opinion that no significant amount of sediment enters the system from external sources; Dr Dean considered that only a small amount enters the system from fluvial and cliff erosion sources; Dr Hume considered that on average the input would be around 20,000 cubic metres per year; and Dr Barnett's opinion was that the total input from all external sources is about 150,000 cubic metres per year.

[184] It is our duty to compare the reasons given by those experts for their differing opinions, before coming to our finding. We address separately the evidence in respect of inputs from the classes of source: cliff erosion and rivers; from around headlands; from breakdown of shell; and from deeper water across the shelf.

How much sediment enters from cliff erosion and rivers?

[185] Dr Barnett gave the opinion that the Sand Study estimate of 5,700 cubic metres per year from cliff erosion is well established from the literature. He adopted an assessment by Dr H L MacMurray that cliff erosion and river sediment flows together of 10,000 to 20,000 cubic metres per year enter the Mangawhai-Pakiri system.

[186] Dr Hume gave the opinion that 2,000 cubic metres per year is a more realistic estimate of the input from streams. He maintained that Dr Barnett's estimate at 17,000 cubic metres per year was an over-estimate, because of dubious field methodology and inappropriate assumptions, including:

(a) The estimate of sand content in samples had been done visually from two 0.5-litre samples, when several samples should have been taken and sieved:

(b) The assumption of bulk density of 2 tonnes per cubic metre was too high, and 1.6 tonnes per cubic metre should have been used:

[52] Ibid, p109.

(c) The assumption that the Pakiri River sand yield of 93.3 cubic metres per square kilometre per year is representative of the sand delivery to the coast from the whole 180 square kilometres of the catchment had led to an over-estimate, because more than half of the catchment drainage enters the Mangawhai Estuary (which traps sand from reaching the sea), and because lakes and wetlands in the catchment also act as sediment traps.

[187] Dr Nichol gave the opinion that supply of river sediment to the coast from the northern part of the catchment is negligible, and that the only credible source of river sediment to the coast is the Pakiri River and Stream, which he calculated yield about 175 cubic metres per year. This witness considered that as the supply of sand from those sources is an event-based process, driven only by the largest floods, calculations of the sediment supply should not be expressed as annual loads, but as irregular and unpredictable loads. In cross-examination he agreed that as he had assessed only a subset (roughly a quarter) of the sand fraction, it was consistent with Dr Barnett's estimate.[53]

[188] Dr Barnett accepted that there had been defects in Dr MacMurray's methodology, and observed that there should have been sampling of sediment transport in high flood conditions, which had not occurred prior to the hearing. He reported that the lack of sieve analysis had been redressed on 23 October 2005, when the results had given a sand fraction ranging from 25.5% to 99.3%, so Dr MacMurray's visual assessment of 20% had not led to an over-estimate of the sand yield.

[189] On Dr Hume's criticism of the assumed density of 2 tonnes per cubic metre, Dr Barnett observed that this assumption had produced a smaller volumetric sand yield than the density suggested by Dr Hume (1.6 tonnes per cubic metre) would have done. Dr Barnett acknowledged that 1.6 tonnes per cubic metre is a typical value used for reasonably uniform sand deposited underwater, and stated that the value of 2 tonnes per cubic metre is often suitable for heterogeneous sediment found in a river bed.

[190] Dr Barnett also accepted Dr Nichol's assessment of the likely breakdown of siltstones to mud, and gave the opinion that some compensating breakdown of coarser material to sand may occur. Dr Barnett remarked that Dr Nichol had given

[53] Ibid, p716.

no justification for confining use of the word 'sand' to mean only the medium (0.25-0.5 mm) fraction, which had been less than half of both his beach samples.

[191] Dr Barnett suggested that doubling the medium sand fractions would give a more reliable estimate of the total typical beach sand delivered by the stream. He observed that an average of those fractions at Dr Nichol's sites 4, 5, 6 and 7 would give 8.75%, which doubled would give 17.5%, not far from Dr MacMurray's assumed 20%. Applying 17.5% and 1.6 tonnes per cubic metre, and extending the resultant sand yield for the Pakiri River catchment of 100 cubic metres per year over the whole catchment of the Mangawhai-Pakiri embayment, Dr Barnett arrived at a sand yield of about 18,000 cubic metres per year. Dr Barnett did not accept the concerns by Dr Hume and Dr Nichol about extending the Pakiri yield to the whole catchment, observing that there is no reason why sediment of river origin, once deposited in the middle and lower Managawhai Estuary, could not participate in exchanges of sediment between the estuary and the open coast.

[192] Dr Barnett accepted Dr Nichol's description of river sediment yield as 'irregular and unpredictable loads', but reported that the convention of expressing as annual averages the cumulative effect of a series of extreme events had been used by other witnesses of beach sediment transport by storms which are also irregular and unpredictable.

[193] In summary, there was no dispute that there is some input of sediment from cliff erosion and rivers. But the experts differed widely over the amount.

[194] There was no dispute, either, that the amount contributed to the system from these sources is not a steady flow, but the result of irregular storm events, so the amount might fluctuate widely between one year and the next. With that understanding, for our purpose the convention of expressing a medium-term average in cubic metres per year is convenient.

[195] Dr Nichol's estimate is 175 cubic metres per year, but for only a subset of the sand fraction; Dr Hume's opinion is 2,000 cubic metres per year; and Dr Barnett's opinion is a range between 10,000 to 20,000 cubic metres per year, on which he settled on 18,000 cubic metres per year.

[196] A major item of difference was Dr Barnett's opinion that the sediment load of the Pakiri River should be extrapolated to the whole catchment of the embayment.

Dr Hume questioned that on the basis that more than half the catchment drains to the Mangawhai Estuary which traps sand from reaching the sea, and lakes and wetlands in the catchment also act as sediment traps.

[197] We accept as valid Dr Barnett's response that sediment in the middle and lower estuary is available to the system as a whole; but we also accept that small quantities from the catchment are trapped in lakes and wetlands. With a small allowance for that, we accept the notion of extrapolating the sediment contribution of the Pakiri River to the whole catchment on a pro rata basis, and adding an amount representing a contribution from erosion of cliffs.

[198] The only evidence describing the quantification of the amount derived from the Pakiri River and extrapolating that to the contribution of the catchment as a whole to the loads of rivers and streams was that of Dr Barnett. That calculation was acceptable, and we rely on it. We make an allowance for sediment trapped in lakes and wetlands of 1,000 cubic metres per year, and deduct that amount from Dr Barnett's 18,000 cubic metres per year. To the resulting 17,000 cubic metres per year we add the generally uncontested 5,700 cubic metres per year from cliff erosion, yielding a total from these sources of 22,700 cubic metres per year as a medium-term average.

How much sediment enters from around headlands?

[199] Dr Barnett gave the opinion that there is a flow of sand southward past Bream Tail of around 150,000 cubic metres per year. This assessment was based on evident lack of erosion at the point of divergence, roughly half-way between Mangawhai and Te Arai Point, between northward (112,300 cubic metres per year) and southward inshore flows (40,000 cubic metres per year). He considered it consistent with modelled flow patterns.

[200] Dr Hume explained that in general, inputs come from longshore movement of sand around headlands into the onshore compartment, onshore transport across the continental shelf, input from rivers, and cliff erosion. Losses include longshore movement out of the system, offshore transport onto the continental shelf, sand extraction and wind transport landward into dunes.

[201] Dr Hume gave the opinion that the Bream Tail and Cape Rodney headlands form substantial barriers to the transport of sand along the coast. He explained that open systems occur where a river of sand connects adjacent beaches, bypassing short headlands when the surf zone is wide and rips jet sand offshore. He also explained that it is in less frequent larger storms and waves that sand is moved at depth, and those are conditions in which sand bypasses headlands and reaches adjacent beaches or is lost to the system.

[202] Dr Hume gave the opinion that inputs to the embayment from around the headlands are small. He considered that the occurrence of coarse, gravelly seabed sediments on the northern flank of Cape Rodney, and about Bream Tail, suggests that little sand is transported past the headlands and exchanged between adjacent Omaha Bay and Bream Bay respectively.

[203] Dr Hume observed that the seabed off Cape Rodney is 50 metres deep, and the steep shore face is rocky reef. He considered that there is no evidence that sand can come in from Omaha Bay.

[204] Dr Hume continued that if there were large quantities of sand being transported south from Bream Bay, he would expect to have seen deposits of sand at the headland and on the north end of Mangawhai Beach. He testified that there are no such deposits on Mangawhai Beach, and that in fact rocks are exposed on the beach. The witness acknowledged that there may be new sand coming around Bream Tail, but remarked that the amount must be small, and less than a few thousand cubic metres per year. In cross-examination he said that it would certainly be less than 5,000 cubic metres per year.[54]

[205] In cross-examination, Dr Hume accepted that the relevant Figure 3.3 of Module 6 of the Sand Study[55] (depicting debits and credits of sediment from and to the embayment) showed net longshore flows of sand going north and south, but asserted that it was in error in showing flows to the south.[56] He confirmed that they flow to the north towards Managwhai, and agreed that there is at least some evidence that they may go into the Mangawhai Harbour, or result in accretion on the

[54] Ibid, p236.
[55] *Mangawhai-Pakiri Sand Study Final Report* August 1998.
[56] Transcript, p237.

Mangawhai Spit.[57] Dr Hume also accepted that currents are capable of moving fresh or new material into the 'box'.[58]

[206] The witness also agreed that Figure 3.2 of the same report describes a pathway, a corridor of sand, that had been found coming around Bream Tail, shown as fine sand; and at 10 metres depth a line of featureless fine sand through the rocks at Bream Tail and extending down past Mangawhai Harbour, extending slightly to the north of the vicinity of Te Arai Point, and then coming on down to a point between or just to the north of the Pakiri River.[59] He confirmed that sand moves through the area of rocks at Bream Tail, that it is a pathway, a weak current; but he was not convinced that it is actually heading to the south. He agreed that sand is creeping on Te Arai Point from the north as a result of a current moving in a southerly direction along the shoreline from the north.[60] He accepted that there is a pathway to the south on the basis of the wave-driven littoral drift calculations described by Dr Goring.

[207] Dr Hume also confirmed that there is no dispute between himself and Dr Barnett that sand moves southward along the 10-metre contour, moves around Te Arai Point and down to the beach south of the Point, and that there is an accretion of sediment at the southern end of the embayment where the long-shore wave energy flux is strongly directed to the south.[61]

[208] Module 5 of the Sand Study contained a general conclusion that the net inputs of new sand into the embayment are of the same order or greater than the amount being mined each year. Dr Hume stated that the conclusion resulted from modelling work by Drs Black and Bell, who are well-respected modellers in whose work he had confidence.

[209] Asked about a contrary conclusion in the Final Report (Module 6) which is described as 'drawing together information from the five previous modules', Dr Hume quoted this passage from the Final Report:

> Where any difference in interpretation exists between the Final Report and a technical report, the Final Report represents the substantive opinion of the study team.

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[57] Idem.
[58] Ibid, p241.
[59] Ibid, p243.
[60] Ibid, p244.
[61] Ibid, p246.

[210] Dr Hume stated that there had been no new analysis or data or modelling undertaken for the purpose of Module 6 after Module 5 had been completed; that the only new information that had gone into the Final Report had been thinking, and re-interpretation of information that had already been collected.[62] He agreed that the computer simulations, geological information, and other material that the study team had available to them in preparing the Final Report had been known to the authors of Module 5.

[211] Dr Hume stated that the study team had seen a recirculating loop in the modelling, and had looked for evidence that that might be the case, such as rocks on the northern headland, and had seen only a narrow strip of sand there, so he thought that had been the supporting evidence. But when it was put to him, he agreed that neither Module 5 nor Module 6 supported the hypothesis that material recirculates in the northern part of the embayment, leaves the box and comes back.[63]

[212] In re-examination, Dr Hume stated that Dr Black, who had been lead scientist of Module 5, had been a participant in the presentation of the Final Report, Module 6, and is not recorded as having dissented from the views expressed in Module 6.

[213] Dr Dean explained that for waves to transport appreciable amounts of sediment, it is necessary for that transport to occur on a relatively shallow platform or base of sediment. So he considered that if there is appreciable sediment transport occurring into the Mangawhai-Pakiri Embayment around Bream Tail, there would be a visible beach (the sediment platform) at Bream Tail around which the transport would occur. The same would apply for sediment transport around Cape Rodney. Dr Dean stated that aerial photographs of those features do not show evidence of sand platforms, and that rocky steep slopes associated with those two headlands would shunt any sediment to deeper water, where it would be lost to the near-shore system.

[214] Dr Dean gave the opinion that an estimate of shore-parallel transport of 112,300 cubic metres per year in the outer zone of the embayment, determined by the Sand Study, appeared excessive. The estimate had been based on calculations for a water depth of 15 metres, and on assumptions that the width of the shelf is 1.5 kilometres, and that the flux across the shelf is uniform. The witness considered that

[62] Ibid, p249.
[63] Ibid, p250.

the large value of long-shore sediment transport in the outer zone is invalid because of the comparison with the cross-shelf flow.

[215] Dr Dean stated that from his experience of similar wind and wave climates elsewhere, the dominant deposition in channels occurs within the inner breaking wave zone, with turbulence mobilising the sediments so they can be moved by weak currents. In cross-examination, this witness agreed that Cape Rodney is an effective barrier to inward movements of sediment around the southern end of the embayment; and that he had identified a possible pathway for sediment flows around Bream Tail.

[216] Dr Dean denied that the pathway for transfer of sediment around Bream Tail in a northerly direction, would also in different wind directions be a pathway for sediment inputs around Bream Tail into the system. He stated that the Mangawhai-Pakiri embayment protrudes so much further out into the Hauraki Gulf than the adjacent embayments, and that a lot of sand would be lost around Cape Rodney. Waves would need to come from more from the north than their average direction to have that result. He doubted that waves from that direction would be great enough, but agreed that there could be an extreme change in wind direction for a long period that could bring sediment around Bream Tail.

[217] Dr Dean agreed that he did not dispute Dr Hume's assessments of the inshore and surf-zone flows having a northward net flow of 46,000 cubic metres.[64]

[218] Mr LaBonté gave the opinion that Dr Barnett's hypothesis of 40,000 cubic metres per year of new sand coming into the system from bordering embayments is unconvincing, being based on assumptions that are unsupported by credible data or evidence. In cross-examination he referred to previous assessments of the amount of sand coming into the system as having been based on limited and old data, and having overestimated the volumes of sand coming into the system.

[219] Dr Nichol disputed Dr Barnett's opinion that 40,000 cubic metres per year enters Mangawhai-Pakiri bay past Bream Tail, asserting that this opinion has no scientifically credible basis, because there is no evidence of sand accumulation on the shore immediately south of Bream Tail.

[64] Ibid, p328.

[220] Dr Barnett responded that the conditions around Bream Tail are more conducive to long-shore sediment transport than those around Cape Rodney, and that nothing in the evidence suggests a firm basis on which this can be ruled out. He cited a general conclusion of Sand Study Module 5 for a recirculating sediment transport loop attached to the south side of Bream Tail, agreed that sediment transport in recirculating gyres would be unrealistic if they pass through deep water, and maintained that a gyre passing through shallow water (less than 15 metres depth) would be consistent with the wind-driven currents shown. Dr Barnett gave the opinion that it would be unreasonable to discount those flows, and maintained that a flow of sediment around 40,000 cubic metres per year could be by-passing Bream Tail.

[221] So there is no difference among the experts that there is no transport of sediment into the embayment around Cape Rodney from Omaha Bay to the south; but there is a difference among them about transport of sediment into the embayment around Bream Tail from Bream Bay to the north. Dr Dean had identified a possible pathway for sediment flow around Bream Tail, and acknowledged that there could be wind conditions in which sediment would be brought southward around that feature; Dr Barnett gave his estimate of 40,000 cubic metres per year on average; Dr Nichol and Mr LaBonté disputed that it would be that much; and Dr Hume gave the opinion that it would be less than 5,000 cubic metres per year.

[222] The only estimate of quantity was Dr Barnett's 40,000 cubic metres per year, and that was not given with confidence. It was arrived at by allocating to this and another potential source (breakdown of shell) proportions of the total input of 150,000 cubic metres per year assumed by evidence of equilibrium following total extractions of that amount. At the same time none of the experts maintained that there is no input from that source, so there is no basis for a finding to that effect.

[223] Given the range of opinions of the experts, the reasons for uncertainty about Dr Barnett's estimate of 40,000 cubic metres per year, the opinions of Dr Nichol and Mr LaBonté that it would not be that much, and of Dr Hume that it would be less than 5,000, we consider it would be unsafe to adopt Dr Barnett's figure. As we are obliged to make a finding on the point, we adopt as more probable than not an annual average of 25,000 cubic metres, considerably less than 40,000, although not as small as Dr Hume's less-than-5,000 cubic metres.

[224] Dr Barnett's 40,000 was based on equilibrium following extraction of 150,000 cubic metres per year, allocating the difference (or much of it) to contribution from breakdown of shell. We address the question of equilibrium later, and acknowledge the inter-dependence of the two.

How much increase in sediment is derived from breakdown of shell?

[225] Dr Barnett acknowledged that the creation of sand from shell growth is highly problematic, and gave the opinion that an assessment of the net contribution of 90,000 cubic metres per year from shell growth would be reasonable. He considered this a plausible source for much of the 'missing' volume, between the 40,000 cubic metres per year that he estimated comes south around Bream Tail and the total of 150,000 cubic metres per year to maintain the evident stability of the coastline during extraction.

[226] In cross-examination, Dr Barnett acknowledged that the proportions may be different, but he considered that the greater amount is likely to be from shell production. He acknowledged that there is uncertainty about the volume from shell production (and about the volume coming around Bream Tail), but did not consider that the uncertainty stretches to zero.

[227] Dr Nichol stated that he did not dispute the volume adopted by Dr Barnett, but he did dispute the relevance of considering shell as a sand source at all, because shell-free sand is preferred by the concrete industry, and the presence of shell reduces the quality of the resource as viewed by the industry. In cross-examination he accepted that the shell supply is part of the sediment budget, and in some instances could contribute to beach construction and to a buffer to erosion.[65]

[228] Dr Hume gave the opinion that the contribution of shell to the sediment budget is accounted for in the figure for net shoreward transport of 12,000 cubic metres per year. In cross-examination he agreed that whether that sediment is shell or something else does not matter for the purpose of his sediment budget; and that he had made no allowance in his sediment budget for production of shell. He agreed with Dr Barnett that shell is broken down to sand-size material, but stated that he had not included the product in his sand budget because to get to the beach it has to be

[65] Ibid, p720.

carried by waves and currents, and the onshore transport capacity for sand-size shell or other fragments is only 12,000 cubic metres per year.[66]

[229] On Dr Barnett's opinion that breakdown of shell could provide an additional 90,000 cubic metres per year of sand (being 10 % of the 900,000 cubic metres per year that had been estimated by Dr Hilton) Dr Hume observed that the annual production estimated by Dr Hilton would produce a layer some 2 centimetres thick spread over a shore-face 26 kilometres long by 2 kilometres wide, which he considered highly debatable for these reasons—

(a) The total capacity of winds and currents to transport sand (whether the sand particles be made of shell fragments or quartz and feldspar) in a net shoreward direction across the shore-face and inner shelf is only 12,000 cubic metres per year:

(b) Little sand-size shell appears to make it to the beach and near-shore, where shell fragments make up only 2 to 5 % of the total sediment weight.

[230] In re-examination, Dr Hume agreed that if Dr Barnett's estimate of 90,000 cubic metres per year from carbonate is correct, it would change his (Dr Hume's) conclusion that natural replenishment is small relative to the proposed extraction rate.[67]

[231] In re-examination, Dr Hume also stated that if large-scale seafloor diabathic sediment flux was occurring, indicators of that would be build-up of sand on the offshore bars, and on the beach if the transport was toward the shore. Asked if those indicators were present, the witness relied 'No, not large scale'.[68]

[232] Dr Hilton stated that he did not agree with Dr Barnett's estimate of 90,000 cubic metres per year input into the near-shore area of sand from shell growth, describing it as incredible. He explained that calcium carbonate in shell material is softer than the quartz and feldspar components of sand, so the amount of shell in the fine near-shore sands that are extracted by mining companies is of the order of a few per cent. This witness gave the opinion that the carbonate gravels occur in deeper

[66] Ibid, p231.
[67] Ibid, p268.
[68] Ibid, p269.

water and are not part of the active sand system, so they could not contribute to the resource.[69]

[233] Dr Hilton agreed that he had not, in preparing his evidence, undertaken any analysis of waves and currents, nor of long-term transport of sediment.[70]

[234] In cross-examination, Dr Hilton agreed that the Sand Study had referred to a 1990 paper of his in which he had estimated shell production in the southern part of the embayment at approximately 456,000 cubic metres per year, and that this could be extrapolated to about 900,000 cubic metres production per year for the whole bay.[71] He agreed that his work in 1990 had suggested that the figure of 900,000 cubic metres a year was likely to be far less than the actual figure for shell production in the embayment.[72]

[235] Mr LaBonté gave the opinion that Dr Barnett's estimate of a net contribution of 90,000 cubic metres per year from shell growth is unrealistic, taking into consideration that 75 years of sand extraction has removed approximately 5.4 million cubic metres of quartzo-feldspathic sand with only 2% to 5% carbonate (shell) content. This witness observed that if Dr Barnett's suggestion was accurate, there would have been 6.75 million cubic metres of shell available to replace the 5.4 million cubic metres of sand extracted from the active sand-sharing system, which contains approximately 6.25 million cubic metres of sand. Mr LaBonté observed that Dr Barnett's suggestion implies that the sand-sharing system should be predominantly composed of carbonate sediments, contrary to the 2% to 5% identified by the Sand Study.

[236] Of Dr Hume's estimate of 12,000 cubic metres per year, Dr Barnett observed that this would leave 98.7% of shell material unaccounted for. He acknowledged that shell fragments near the beach and foreshore had been found to make up only 2% to 5% of total sediment weight, but referred to Dr Hilton having described the facies at the south end of the embayment as 'carbonate gravel', suggesting a much higher shell content. Dr Barnett concluded that shell production contributes more material to the deeper seabed, and preferentially to the southern end of the embayment, and from the viewpoint of shore protection there is no valid reason for discounting shell production, even if it is partly replacing sand in other locations.

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[69] Ibid, p550.
[70] Idem.
[71] Ibid, p555.
[72] Ibid, p556.

[237] In cross-examination on Mr LaBonté's evidence about the 2% to 5% of carbonate sediments, Dr Barnett responded that the beach does not have the same composition all the way down the embayment. He referred to Dr Hilton's evidence that the material changes radically at the southern end, and becomes much more shell-intensive, so Dr Barnett considered that the sample containing 2% to 5% was not representative.

[238] Having reviewed that evidence, we need to make decisions on two questions: whether the contribution to the system from the breakdown of shell should be taken into account at all; and if so, what amount is contributed from that source.

[239] On the first of those questions, Dr Nichol's reason for questioning the relevance of shell as a sand source was that shell-free sand is preferred by the concrete industry, and the presence of shell reduces the quality of the resource as viewed by the industry. Dr Barnett's response was that from the viewpoint of shore protection there is no valid reason for discounting shell production, even if it is partly replacing sand in other locations.

[240] The resource-consent applications are to be decided for the purpose of promoting the sustainable management of natural and physical resources, which includes managing the use and protection of them at a rate which enables people and communities to provide for their economic well-being while avoiding, remedying or mitigating any adverse effects on the environment.

[241] We accept that the relative shell content of sand extracted for use in the concrete industry for the economic well-being of people and the community may affect its value for that purpose. Although that may influence the selection of locations from which the appellants wish to extract sand, it is not relevant to the Court's consideration of whether consent to the extraction should be granted, and if so, on what term and conditions.

[242] By contrast, the shell content of sand is part of the natural and physical resource the use and protection of which is to be sustainably managed while avoiding, remedying or mitigating adverse effects on the environment. In that respect it is relevant to the Court's consideration of the resource-consent application.

[243] So we do not accept Dr Nichol's questioning of the relevance to the proceedings of the contribution from the breakdown of shell. We accept Dr Barnett's opinion as responsive to the purpose by which the Court's decision is to be directed, and find that the contribution from that source is relevant.

[244] On the second question, what amount is contributed from the breakdown of shell, Dr Barnett estimated 90,000 cubic metres per year on average, and Dr Nichol stated that he did not dispute that. Dr Hume observed that the contribution from this source is included in the limit of the ability of the currents and waves to move sediment shoreward, which he had estimated at 12,000 cubic metres per year. Mr LaBonté considered 90,000 unrealistic; and Dr Hilton considered the contribution from that source would be only a few per cent.

[245] Dr Hilton was cross-examined on the basis of prior inconsistent statements in his participation in the Sand Study. We accept that scientists modify opinions in the light of new evidence, and on reviewing previous reasoning. But we did not find persuasive Dr Hilton's explanation for the inconsistency between the content of his 1990 paper and the opinion he gave in evidence in these proceedings.

[246] The limit on shoreward transport referred to by Dr Hume could apply to sediment brought to the shore. But that is only part of the total sand system of the embayment. The product of the breakdown of shell can exist in the deeper water and still contribute to the total sediment in the system.

[247] Dr Barnett's estimate of the contribution from shell of around 90,000 cubic metres per year was, like his estimate of the contribution from around the Bream Tail headland, derived from an assumption that the system remained in equilibrium despite extraction at 150,000 cubic metres per year. That assumption is disputed, and we address that question next.

[248] Acknowledging that inter-dependence of the questions, on reviewing the opinions of the expert witnesses we consider that Dr Barnett's opinion (which Dr Nichol stated that he did not dispute) is acceptable as a basis for a finding on the balance of probabilities. We find that that the contribution to the system from breakdown of shell is of the order of 90,000 cubic metres per year on average.

How much sediment enters the system from deeper water?

[249] We now consider the fourth possible source of sediment to the Mangawhai-Pakiri sand system, from deeper water across the inner continental shelf.

[250] This involved a difference of opinion among the experts about the outer depth of closure.

[251] Closure depth is raised in the Sand Study and relates to a method for determining sediment budgets for the embayment. They are an important tool for determining the sustainability of sand extraction.

[252] The concept of closure depths is that there are two limiting depths for waves to move sand on the seabed. The inner depth is the maximum depth for near-shore erosion by extreme (12 hours per year) wave conditions. The outer depth is the maximum depth for motion initiation by median wave conditions. So the inner depth is the depth at which vigorous stirring of the bed occurs in storms, and the outer depth is the depth where median waves are strong enough to cause particles to lift a height of four times their diameter and therefore become available for transport. The transport mechanism is that for 12 hours every year the sand from between the inner closure depth and the shore is eroded by very large waves. Then for the remainder of the year, it can be replaced at slower rates by sand in the region between the two closure depths, by waves under median conditions.

[253] Hilton and Hesp (authors of the paper[73] quoted by Mr Todd) calculated the closure depths at Pakiri based on one year's wave record to be an inner closure depth of 10.1 metres, and an outer closure depth of 24.5 metres.

[254] In his evidence Mr Todd questioned the interpretation by some commentators of the inner closure depth of around 10 metres on the sustainability of sand extraction at Pakiri as being an absolute boundary over which virtually no transfer of sediment can occur. He gave the opinion that if the Hallermeier[74] concept of two closure depths is applied, then, by definition, that interpretation cannot be correct, as there is significant cross-shore transport between the inner and outer closure depths.

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[73] Hilton M J & Hesp P (1996) Determining the Limits of Beach-Nearshore Sand Systems and the Impacts of OffShore Coastal Sand Mining. *Journal of Coastal Research, 12, 2, 497-519*

[74] Hallermeier R J (1978) Uses for a calculated limit depth to beach erosion. *In proceedings 16th InternationalConference on Coastal Engineering Hamburg Germany 1493-1512* and (1981) a Profile zonation for Seasonal Sand Beaches from Wave Climate.*Coastal Engineering 4: 253-277*

He stated that this is consistent with modelled wave data and with morphological indicators of wave induced sediment transport at depths greater than 10 metres. It is also not inconsistent with the approach taken in the Sand Study itself in which an outer limit of approximately 25 metres is accepted as the appropriate closure depth for the purposes of calculating a sediment budget.

[255] The morphological indicators referred to above and as defined by Hilton and Hesp are –

(a) The boundary between fine sand and medium to coarse sands being at around water depths of 22 metres.

(b) A change in geometry of the seabed from concave out to depths of around 22 metres to convex or irregular on the inner shelf

(c) The sequence of sand ripples on the seabed of the shore-face and inner shelf agreeing with the theoretical estimates of bed responses to oscillatory flow under wave currents.

(d) Variations in seabed level as a function of rips and bar migration out to water depths of 18 metres.

[256] These morphological indicators at depths of up to 25 metres were confirmed by the investigations of the Sand Study. We accept that, and find that the appropriate outer closure depth is approximately 25 metres.

[257] Dr Hilton asserted that there is no evidence that the coast comprising the foredune-beach-nearshore sand system is receiving significant volumes of sand from the inner continental shelf, and stated that the main pathways of sand movement occur alongshore and onshore-offshore within the beach-nearshore sand system down to depths of about 10-12 metres.

[258] Dr Dean stated that sea level came to a relative standstill some 6,000 years ago; and gave the opinions that the Sand Study estimate of a net onshore rate of 12,000 cubic metres per year had initially increased after standstill, and that it has been decreasing since. He considered that the present onshore transport rate would be approximately 3,320 cubic metres per year, which would be more than offset by offshore transport caused by sea-level rise.

[259] In cross-examination, Dr Dean agreed that he had not undertaken any modelling or other independent study of cross-shore sediment transport at Managawhai-Pakiri, and had not assessed the proportion of sediment that is moved by waves in the Mangawhai-Pakiri system. He accepted as a qualitative statement Mr Todd's estimate that 10% of waves have the ability to move sediment at 35 metres depth.

[260] On cross-shore transport to the shore, Dr Hume gave the opinion that the inputs of sand from deeper water to the shore are small, a net movement ranging from 200 to 64,000 cubic metres per year, averaging 12,000 cubic metres per year, across the entire embayment shore-face. Dr Hume gave several reasons for having confidence that the cross-shelf transport toward the shore is small—

(a) The modelling of waves and currents, and selection of co-efficients, had been verified against field measurements of current strength and direction, wave orbital currents, seabed sediments and sediment suspension dynamics on an experimental transect during 2 months of observations by instruments moored on the transect, and the hydrodynamic models had been independently verified by publication in scientific literature.

(b) The methods of predicting near-bed reference concentrations, a critical input to the sediment flux calculations, had been confirmed by subsequent experiment at the site.

(c) The net flux is consistent with the total amount of sand (92 to 552 million cubic metres) that had been trapped onshore in the dunes over the entire Holocene Epoch, being equivalent to an average annual accumulation of 14,000 to 85,000 cubic metres per year, and of the same order as the 200 to 64,000 cubic metres per year calculated for shoreward cross-shore transport.

(d) Tracer experiments in 23 metres depth near the toe of the shoreface off Mangawhai over a 2-month period had showed that the dyed sand stayed substantially within a 32-metre sampling area, despite two storms having stirred the seabed.

(e) There is no evidence of steady build-up of sand deposits in the offshore area. Instead, the large total rate of sand transport in the embayment (about 0.78 million cubic metres per year), the lack of sedimentary structures in the

Holocene, and the scatter of radiocarbon ages across the nearshore and the inner shelf, suggested extensive *in situ* re-working and mixing of the Holocene sediment.

[261] In cross-examination, Dr Barnett did not dispute Dr Hume's assessment of 12,000 cubic metres per year coming in across the shelf, perpendicular to the coast.

[262] Dr Nichol accepted that the inner shelf sustains some active diabathic sediment transport to shallow depths;[75] and that there is some movement of unknown quantity and unknown rate, though it will eventually be depleted.[76]

[263] It was Mr Todd's evidence that there is frequent sediment transport to near shore from very large volumes of sand in deeper water from 15 to 35 metres depth which replenish the inshore extraction areas; that the wave energy is sufficient to do that, that the system is not fully closed; and there is transfer across the boundary at the outer closure depth.[77]

[264] In summary, Dr Barnett did not dispute Dr Hume's estimate of 12,000 cubic metres net per year on average from this source. That amount has to be compared with Dr Dean's estimate of 3,320 cubic metres per year.

[265] Dr Hume gave a full description of how he had arrived at his estimate, but Dr Dean did not. We prefer Dr Hume's estimate accordingly, and find that the input to the system from deeper water, across the inner shelf, is on average about 12,000 cubic metres per year.

What is the total input of sediment into the system?

[266] So we find that the total input to the Mangawhai-Pakiri sand system is on average around 149,700 cubic metres per year, being the aggregate of 22,700 from cliff erosion and rivers, 25,000 from Bream Bay passing around the Bream Tail headland, 90,000 from breakdown of shell, and 12,000 from deeper water passing across the inner shelf.

[75] Ibid, p714.
[76] Ibid, p715.
[77] Ibid, p191.

How much sediment leaves the system naturally?

[267] There was general acceptance that there is some natural loss of sediment to the system from longshore movement out of the system, offshore transport onto the continental shelf, and wind transport landward into dunes. None of the expert witnesses attempted to quantify the amount of the natural loss.

[268] We accept that the knowledge of the quantities of inputs from the various sources is broad and approximate only. The number we have adopted of 149,700 cubic metres per year implies more precision than is justified. We round it to 150,000 cubic metres per year, and end with a figure that avoids any implication of greater exactness. The result supports Dr Barnett's estimate.

Sea-level rise

[269] Dr Dean gave the opinion that his estimate of the onshore transport rate of 3,320 cubic metres per year would be more than offset by offshore transport caused by sea-level rise.

[270] Dr Hume gave evidence that over the next 20 years, mean sea level is expected to rise by about 4 centimetres (an average of about 2 millimetres per year, compared with the average over the last 100 years of 1.7 millimetres per year).[78] He agreed that in the context this would not have measurable effects.[79]

[271] As Dr Hume gave a coherent basis for his opinion, and Dr Dean did not, we prefer the former's evidence, and find that over the 20-year term of extraction applied for, sea-level rise would not have measurable effects.

Other indications that the system may be closed or open

[272] We have made our findings on the evidence on the net inputs to the sand system. We now consider the evidence of other indications that the system may be closed, or open, in two categories: indications that the proposed extraction would be unsustainable, and indications of significant change due to past sand extraction.

[78] Ibid, p227.
[79] Ibid, p228.

Are there indications the proposed extraction would be unsustainable?

[273] Three matters were proposed as indicators that the proposed extraction of sand would be unsustainable: the non-recurring nature of the source of the surface sediments; a result of a study of sand on the Coromandel Peninsula; and features of the offshore bed-form of the Mangawhai-Pakiri embayment.

Source of surface sediments

[274] There was no significant difference among the expert witnesses about the source of the Holocene quartz and feldspar sand: all accepted that it had originated in volcanic eruptions in the Taupo locality, been carried by ancestral Waikato River (when it flowed through the valley now occupied by the Firth of Thames), and with rising sea level was reworked as the coastline retreated landward, when the sand supplied the east coast, including Mangawhai-Pakiri. There was no difference either that this source has long ceased to supply sand to the Mangawhai-Pakiri embayment.

[275] Where the experts did differ was over the question whether the offshore deposit of that sand is capable of being transported inshore. Mr Todd gave the opinion that it is, and Dr Hume, Dr Dean, Mr LaBonté and Dr Nichol considered that it is not. We review the evidence on that point.

[276] Dr Hume stated that the total cumulative quantity of sand that has been extracted to date is a significant proportion (4 to 6%) of the entire accumulation of sand during the last 6,500 years, derived from periods when the Waikato River flowed north through the Hauraki lowlands into the Hauraki Gulf.

[277] Dr Hume observed that the seabed sediments of the embayment offshore and in water depths greater than 40 metres are largely very fine muddy sands, so any supplies of largely medium-sized sand of which the beaches are made must come from shallower areas. He deposed that the surface sediments on the beach and seabed have a strong Taupo Volcanic Zone mineralogical signature, suggesting there is little supply from local sources such as rivers, shells and cliffs (which have different mineralogy). We have already recorded this witness's opinion that the inputs of sand from deeper water to shore average 12,000 cubic metres per year,

[278] It was Dr Dean's evidence that following relative sea-level stabilisation, the sediment transport system has had approximately 6,000 years to equilibriate, and would have first adjusted rapidly and then more slowly. We have already recorded his estimate that the present onshore transport rate would be approximately 3,320 cubic metres per year.

[279] Mr LaBonté stated that sea level has been relatively stable for the last 6,500 years, so the Holocene sand in the Mangawhai-Pakiri system has had that period to sort itself into a dune-beach-bar system that is in a state of equilibrium. He gave the opinion that there are no significant inputs of sand from land or from offshore.[80]

[280] Dr Nichol described the cross-section profile of the embayment as concave in shape, a classic equilibrium profile, showing that waves have transported as much sand as is necessary, and that further shoreward transport is not possible for the given wave climate. He gave the opinion that further seaward, in 25-40 metres depth, the profile is convex, formed in coarse sand and shell which the Sand Study had shown to be too coarse for shoreward transport. He viewed that as relic sediment that could not be considered a source of new sand for the beach.

[281] Mr Todd gave the opinions that there are large volumes of Holocene sand available on the shoreface out to 25 metres depth which can frequently be transported to the nearshore zone to replace material extracted, and that photographic evidence of changes in the shoreline position supports the proposition that sand that has been extracted has been replenished.

Findings

[282] In summary, Dr Nichol and Mr LaBonté considered there would be no significant input, Dr Dean estimated about 3,320 cubic metres per year, Dr Hume 12,000 cubic metres per year on average; and Mr Todd referred to large volumes replacing material excavated. This evidence does not cause us to depart from the finding that we gave in a previous section, that the input to the system from deeper water, across the inner shelf, is on average about 12,000 cubic metres per year.

[80] A LaBonté, evidence in chief, para 3.2.

Results of Coromandel study

[283] Dr Hume cited results of a study of Holocene sand on the Coromandel Peninsula that showed that little sand had come ashore there in the last 2,000 years.

[284] The point of that was to invite the Court to infer that the same would be true of Holocene sand in the Mangawhai-Pakiri embayment. In the absence of a direct expression of that opinion by an expert witness qualified to do so, we decline to assume that the conditions where the study was carried out are sufficiently similar in all significant respects to warrant a finding to that effect.

Bedform features offshore

[285] Dr Hume referred to rippled scour depressions and sorted bedforms found on the seabed at Pakiri and elsewhere. He stated that it is current theory that those features persist on shelves with low regional sediment supply.

[286] Again we find the witness's evidence insufficiently persuasive as a basis for a finding that the proposed extraction is unsustainable.

Finding

[287] We have reviewed the evidence on the indicators that the proposed extraction of sand would be unsustainable. We accept that the source of the quartz-feldspar Holocene sand is non-recurring. We are not persuaded that we should depart from our finding that the input to the system from deeper water, across the inner shelf, is on average about 12,000 cubic metres per year. Plainly that alone would be insufficient to render sustainable extraction at the rate of 76,000 cubic metres per year. But we have also made findings of additional net inputs from other sources amounting in total to 150,000 cubic metres per year –roughly twice the proposed rate of extraction. Allowing for variations year by year, and uncertainties in the methods, on that finding we do not accept that the proposed extraction is unsustainable.

Are there indications of significant change due to past sand extraction?

[288] In considering whether the sand system is closed or not, we have made our findings on the direct question of the flow of sediment into and out of the system, and on indications that the proposed extraction would be unsustainable. We now consider whether there are indications of significant change in the environment due to past sand extraction from the Mangawhai-Pakiri embayment.

[289] In this respect the parties opposing the appeals maintained that there are such indications, particularly in signs of erosion of dunes and retreat of the beach. However the appellants disputed that the signs of erosion and retreat relied on by them were attributable to the extraction of sand.

Erosion of dunes and retreat of the beach

[290] There was considerable evidence about signs of retreat of the beach and erosion of the dunes, and whether they can be attributed to past sand extraction. We review first the evidence of primary fact by several 'lay witnesses' having considerable experience of Pakiri Beach, who gave evidence of their own observations of indications of erosion on the beach, dunes, and foreshore. We then review the evidence of the expert witnesses relating to this topic.

Lay witnesses

[291] Mr D P Ivory has 30 years of surfing, and gave his opinion that the beaches of Te Arai Point now no longer perform naturally, and that each time a sand bank forms for waves to break on, it is removed by sand mining. He also reported a general decline in the consistency and quality of the surf at Pakiri Beach and Ocean Beach. He mentioned a survey on a surf website to which the majority of the 263 respondents had reported noticing a general decline in the consistency and quality of the surf at Pakiri and Ocean Beach, which Mr Ivory attributed to the removal of near-shore sand-banks.

[292] Mrs C A Reid has been a regular visitor to Pakiri Beach for nearly 40 years, and her comparison of her memories of its past condition with its present condition were assisted by family photographs. This witness described the change to the profile of the beach as dramatic, dunes once rolling down to the mouth of the

Poutawa Stream having totally gone. Mrs Reid estimated that this area of the beach is probably 5 metres lower overall, so only stripped-down dunes with an occasional weathered outcrop remain. She also referred to erosion of a midden site and cutting into vegetation at the tops of the dunes.

[293] Mr TDJ Reid, son of the previous witness, stated that he had been visiting Pakiri regularly for over 30 years. He acknowledged that the beach is a dynamic, ever-changing landscape. He remembered that in his childhood there had been 20-foot-high white sand dunes at the mouth of the Poutawa Stream, which have entirely disappeared during the past 10 years; and stated that extreme erosion has occurred to bare white dunes in Zone 5 immediately north of the mouth (being the most southerly extraction area). Mr Reid also reported having observed several indications of erosion along Pakiri Beach and north of Te Arai Point to the start of the Mangawhai dune. He also reported that for swimmers there are more holes and rips than in the past.

[294] Mrs G T Hubble, who has been familiar with Pakiri Beach for 60 years, gave evidence of serious sand depletion over the last 7 or 8 years, which seemed to have accelerated in the last 5 years, including loss of huge sand dunes that formerly lay across the entrance to the Pakiri River estuary; and noticing that where there used to be soft, whiter sand across much of the beach, the sand there is now hard and brown. This witness also remarked that although the southern end of the beach used to be relatively safe for swimming, now the current sucks the water northward, which she presumed to be toward the holes of the mined area.

Dr Hume

[295] Dr Hume stated that no studies of the Mangawhai-Pakiri sand system had detected effects on the shore that could be solely attributed to sand extraction, but observed that this does not mean that sand extraction is not having an effect. He reported that it had been difficult to detect the effect of extraction.[81] He gave the opinion that removing sand permanently from the system can only result in shoreline retreat and erosion, or slowing of the rate of progradation.

[296] Dr Hume distinguished the effects of sand exchange or cycling between the beach and near-shore that occurs frequently from processes that inject new sand into a system or result in a total loss of sand from the system. The former may result in

[81] Transcript, p227.

significant variability of beach morphology and patterns of beach shoreline erosion and accretion that may mask the effects of sand extraction.

[297] Dr Hume confirmed that the only way he could detect any net sand loss of the kind that would cause an adverse effect on the beach or embayment would be from looking at changes in the Profile P1; and that he could not detect that result from that method.[82]

[298] In cross-examination, Dr Hume gave the opinion that it had not been possible to determine the effects of sand extraction from the early days.[83] He confirmed that the Sand Study had found that the beach in the extraction area south of Te Arai Point was showing more erosion than the control area at Transect P7, being 5 kilometres to the south.[84] He agreed that this had been based on surveys of the profiles between April 1994 and July 1997.[85]

[299] The witness agreed that there had been subsequent surveys of profiles at three transect sites from 1978 to October 2003,[86] that the surveys to March 2005 had shown that at Transect P2A over the period from mid-1997 to March 2005 there had been some reduction in volumes, and that they had then recovered to almost exactly the same level or possibly a fraction better. The net result was that there had been no erosion at that profile between 1997 and 2005; and just a very slight reduction in the volume from the first survey of that profile in 1990.[87]

[300] Dr Hume agreed that a curve representing the volumes of sand at the other profiles had a similar shape, and that a series of storm events in the year 2000 would have been a major player in the dip in the curve for that year. He agreed, too, that at the last survey in March 2005, the profile at Transect P4 had shown that the sand volume had been significantly in excess of that at the survey of the volume there in July 1997; and that surveys of the volume at control site Transect P7 had shown a reduction between 1997 and the last survey.[88]

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[82] Idem.
[83] Ibid, p227.
[84] Ibid, p253.
[85] Ibid, p254.
[86] Ibid, pp255-257.
[87] Ibid, pp257-258.
[88] Ibid, p258.

[301] Dr Hume also agreed that over the period from 1997 to 2005, the most heavily extracted area south of Te Arai Point had shown less erosion than the beach 5 kilometres to the south; that the rate of recovery from the erosion in the storm events in 2000 had been greater in the beach profiles adjacent to the extraction areas than at the control profiles; and that at none of the profiles adjacent to the extraction areas had the rate of recovery after those events been less than at the control sites. The witness accepted that on the full period of record, his evidence to the contrary about the effects of sand extraction could not stand.[89]

Dr Hilton

[302] Dr Hilton gave the opinions that sections of the coast closest to the mining operations have a history of sustained coastal erosion;[90] that prior to mining the shoreline had oscillated around an equilibrium position; and that recent human activities, particularly sand mining, had resulted in a net deficit of sand, resulting in a landward shift of that equilibrium position.[91] Dr Hilton also claimed that the appellants tacitly acknowledge that mining is adversely affecting beach-dune development by proposing changes in the extraction areas to avoid the Te Arai Point area.[92] Asked in cross-examination to identify the changes he referred to, the witness referred to a modest shift to the south of Te Arai Point.[93]

[303] Dr Hilton had produced in evidence (as Figure 3) a diagram showing a comparison of post-storm 1978 beach-nearshore profiles, and a more recent representative beach-nearshore profile. In cross-examination the witness agreed that the diagram showed the characteristic position of the along-shore bar starting at a water depth of about 2 metres and finishing at around 5 metres depth. The diagram identified that position as the mining zone, which he stated had been based on his observation from working in boats in the 1980s.

[304] Dr Hilton stated that he was not sure of the current Sea-Tow extraction zone, and gave his understanding that the current extraction zone and the proposed extraction zones were approximately the same. He agreed that it was possible that the extraction he had observed might have been in a separate inshore extraction

[89] Ibid, pp259-260.
[90] M J Hilton, Evidence in chief, para 39.
[91] Ibid, para 47.
[92] Ibid, para 58.
[93] Transcript, p552.

zone.[94] He stated that he was not aware that the current Sea-Tow permit for an inshore zone contains a condition prohibiting extraction within 100 metres of the crest of the near-shore buffer.[95]

[305] Dr Hilton stated that on a recent visit, the morphology of the coast south of Te Arai Point for some kilometres had appeared erosional.[96] He agreed that since the 1978 storm, no event or series of events had resulted in further retreat beyond the scarp formed by it; and that the dune had not recovered sufficiently to cover it. He also agreed that this is consistent with storm scarps elsewhere which had taken up to 18 years to recover,[97] and that recovery from the 1978 storm has been slower in Bream Bay than at Mangawhai-Pakiri.[98]

Dr Dean

[306] Dr Dean had calculated the shoreline recession he expected in various zones of the beach resulting from extraction of sand in the embayment. He gave the opinions that the actual erosion evident is consistent with the predicted effects of the extraction, and that continued sand extraction from the active sand-sharing zone of the embayment would further weaken the beach and dune system leading to greater damage during severe storms, and would be spread over a longer stretch of coastline.

[307] In cross-examination, Dr Dean estimated that the extraction from the system of 5.5 million cubic metres of sand over the last 80 years, and taking into account sea-level rise over that period, would have resulted in a total retreat along the whole of the beach of 22.8 metres. The witness did not know of any measurements or other evidence that supported such a retreat having occurred.

[308] Dr Dean also conceded in cross-examination that information that he had given in his evidence (Table 2) presenting the volumes of sand extracted from each zone in various 6-monthly periods had been incorrect in that in each case the amounts had been extracted in the previous 6-monthly period. He agreed that the information he had presented in his evidence-in-chief about extraction volume densities (Table 3), and a graph showing volume changes due to sand extraction (Figure 6), had depended on the information given in Table 2, so the data in Table 3

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[94] Ibid, p553.
[95] Ibid, p554. (We understand the word 'buffer' in the transcript as probably a mis-hearing of 'bar'.)
[96] Ibid, p563.
[97] Ibid, p566.
[98] Ibid, p567.

related to periods 6 months earlier than stated, and the curve on the graph (Figure 6) would change as well, as the volumes plotted on the Y-axis would change.[99]

[309] Further, Dr Dean conceded that in presenting the evidence he had given comparing total volume changes 1978 to 1999 (Table 5), he had misread the source material and shown data for 1999 that related to 2000.[100] Also, Dr Dean acknowledged that he had not studied the record of beach and dune volume surveys for the period following September 2002.[101] There were other contents of his evidence-in-chief that in cross-examination this witness accepted to have been incorrect.[102]

Mr LaBonté

[310] Mr LaBonté gave the opinion that observed and documented shoreline changes demonstrate that sand extraction in the Mangawahi-Pakiri embayment has contributed to erosion and deflation of the Mangawhai Sand spit. He acknowledged that specific monitoring data is very limited and largely inconclusive, and relied on a 2002 report[103] for stating that the embayment is a closed system.

[311] Mr LaBonté described a breach in the spit that occurred during an extreme storm event in July 1978; closure of the historic inlet in November 1990, closure of the breach inlet in June 1996, and redirection of the tidal flow through the historic inlet; and partial re-opening of the breach inlet in 2003. This witness gave the opinion that sand extraction had depleted sand reserves along the spit shoreline, contributing to breach inlet formation; and attributed delay in closure of the breach inlet and its partial re-opening in 2003 and inundation in 2005 to a deficiency of sand in the inshore system.[104]

[312] Mr LaBonté concluded that the embayment is stable at best, and probably erosional.[105] He reported signs of recession (scarps in mature dunes, exposure of middens and old shoreline protection measures, and emergence of geological strata, and absence of thriving pingao forming seaward advancing dunes) along the shoreline near extraction zones.

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[99] Ibid, pp 344, 345.
[100] Ibid, p349.
[101] Ibid, p350.
[102] Ibid, pp 353-355.
[103] Smith, Ovenden: *Beach profile change along Mangawhai-Pakiri Embayment*, NIWA 2002.
[104] A LaBonté, evidence in chief, paras 4.9, 4.12, 4.14.
[105] Ibid, para 8.3.

Mr Todd

[313] Mr Todd gave evidence of having analysed aerial photographs taken over the last 50 years, and having reviewed the excursion distances from the network of transects for measuring the beach profile. From the results of that work, and consideration of the coastal processes in the embayment, he gave reasons for his opinions–

(a) that sand extraction at rates similar to or greater than the proposed rate of 76,000 cubic metres per year over the past 50 years has caused no detectable erosion of the coastline in the embayment:

(b) that the sand extracted has been replenished: and

(c) that changes that have occurred are attributable to natural variations rather than sand extraction.

[314] In response to Mr Benson's concern about effects of erosion on the environmental values of the coastline, Mr Todd gave the opinion that periodic and episodic erosion is a natural part of the coastal processes on beaches such as Mangawhai-Pakiri, and is part of the natural character and landscape which will occur regardless of whether there is sand extraction or not.

[315] Mr Todd relied on the band of foredunes along the length of the embayment, and the nearshore bar being still present in a similar position after 80 years of extraction. He maintained that the whole beach-dune profile is not in retreat in the area further than 1,000 metres south of Te Arai Point, beyond its influence; and that to the north of the Point, the dune face (as represented by the 5.5-metre contour) has advanced seaward 30 metres in the last 12 years, and the dune toe (as represented by the 3.5-metre contour) by over 20 metres over the same period. He gave the opinions that sediment is still accumulating to the north of the Point, and that there is natural starvation of the beach to its south, in the dominant southward sediment-transport regime.

[316] On the effect of sea-level rise, Mr Todd observed that the rise in sea level of about 1.7 millimetres per year over the last 100 years does not appear to have resulted in shoreline retreat at Mangawhai-Pakiri, so he considered that current

sediment supply or exchanges are sufficient to accommodate that magnitude of sea-level rise.

[317] On Dr Hilton's opinion that the lack of total recovery of the beach since the 1978 storm is due to sand mining, Mr Todd observed that the adjacent Bream Bay (which is not subject to sand extraction) has showed considerable slower recovery from that storm and from the storms in 2000, from which he concluded that the lack of total recovery was not necessarily a function of sand extraction.

[318] Mr Todd differed from Dr Hilton's analysis of the surveys of beach profiles at the transects, as the surveys at the control sites had started in September 1978 when the beach had been low in volume due to the 1978 storm, and surveys of profiles adjacent to the extraction areas had started much later and had not included the post-storm recovery when considerable beach accretion had occurred.

[319] Mr Todd observed that comparison of surveys made at equivalent times showed that the profiles in the extraction areas were similar to those of the control sites to the south. He reported that the longest period of record available for all representative extraction and control sites had showed a gain in sediment volume over the total profiles and for the beach area (0 to 3.5-metres contours). That period had excluded the 10 years of largely El Nino weather conditions and post-1978 storm recovery, and had included 6 years when La Nina weather conditions had dominated, including the erosive period of 1996-2000.

[320] On Mr LaBonté's evidence about the erosion of the Mangawhai Spit tip, Mr Todd agreed with the author of a report to the Northland Regional Council that the correspondence between the magnitude of erosion in one year and the calculation by the reverse renourishment model over 9 years is coincidental, and not evidence of the effect of sand extraction. Mr Todd also differed from Mr LaBonté on the significance of the supposed coincidence of the extent of retreat of the dune toe at Transect P1 with his prediction of shoreline change. Mr Todd observed that over the total survey record at that transect (September 1978 to March 2005), there had been no net movement of the dune toe, which is considerably different from the results of the reverse renourishment model over a nearly 30-year period.

Dr Goring

[321] Dr Goring gave his opinion that almost all the changes in beach volume can be explained by the wave climate, and those that cannot be so explained are the result of errors in the beach profile surveys and wave data. Dr Goring considered that the beach profile data were not as useful for the present purpose as they could have been. He had also studied wave climate data from NIWA[106] and NOAA[107] that were not directly comparable, but the direction and period of the waves recorded agreed well; and tidal data from a sea-level recorder at Frenchman Island, Marsden Point.

[322] Dr Goring had found that the flow of energy from waves along Pakiri Beach, and therefore the transport of sand, varies quite markedly from one place to another along the beach; and in a particular event the transport can be either in a northerly or a southerly direction, depending on the angle of attack of the storm. This witness had also found that the tidal range from lowest to highest astronomical tide is 2.84 metres, and on a 7-month cycle the elevation of high tide varies over a range of 0.63 metres, so the state of the tide in that 7-month cycle has a substantial effect on the extent to which a particular storm affects wave run-up and cross-transport of sand. In addition sea levels can be elevated above normal tide levels by storm surge and by climatic effects.

[323] Dr Goring had found that the profile surveys had not been a reliable bases for calculating beach volumes because in about half of the surveys, the survey had been terminated before mean sea level had been reached, and the position of mean sea level had been extrapolated from the last two surveyed points. The witness had found that this process can lead to errors of ±5% or more in the beach volumes, and routine survey errors about ±3%, so he expected that the error bounds on the volumes are of the order of 8%. Dr Goring had also assessed the efficacy of waves to erode the beach.

[324] Applying those findings, Dr Goring gave the opinion that the beach volumes derived from the profile surveys could not be used to assess the effect of sand extraction, because the errors in the calculated volume are more than twice the extracted volume, so any effect would be hidden within the errors. He concluded

[106] National Institute of Water and Atmospheric Research (a New Zealand Crown Research Institute).
[107] National Oceanic and Atmospheric Administration (an agency of the US Department of Commerce).

that the beach volume records exhibit no significant changes that cannot be explained by wave activity and survey error.

[325] Dr Goring responded to Dr Dean's disputing his methods of calculating the errors in beach volume. Dr Goring described having re-calculated them, and finding that they are ±158,000 cubic metres at the 95% confidence level, confirming that the quantity of sand being extracted is of the same order as the possible errors in the surveys. Dr Goring maintained that the data from the survey cannot be used with any confidence to indicate the effect of the sand extraction on beach volumes. He also stated that the beach at Transect P5, which Dr Dean had relied on to illustrate a weakening in the system due to sand extraction, had since recovered from the effects of the month-long storm in 2000 to be 1.2 times the long-term mean.

[326] Dr Goring also gave reasons for his opinion that no useful conclusions about changes in beach volume from one location to another on Pakiri Beach could be drawn from the double-mass curve analysis in a NIWA 2002 report relied on by Dr Hume and Dr Hilton.

[327] On Mr Ivory's evidence that the quality of surfing had reduced as a result of sand extraction, Dr Goring presented data showing the percentage of the time from June 1997 to June 2005 the wave conditions had been most suitable for surfing. Those data had shown considerable season-to-season and year-to-year variability in the wave climate, none of which is influenced by sand extraction.

[328] In cross-examination, Dr Goring maintained that extraction of sand is having no effect on the system able to be detected; and that the changes are explicable by the wave climate.[108]

Consideration

[329] We accept the veracity and sincerity of the lay witnesses. It is no criticism of any of them that we have in mind the difficulty of making reliable comparisons based on memories of the past, even when assisted by photographs.

[330] Changes in the volume of sand at any part of the beach or dune toe occur as a result of natural processes. Those changes may not be evidence of erosion or shoreline retreat.

[108] Transcript, pp 141, 142.

[331] Without a systematic series of observations, related to established positions, and allowing for stages of tidal and other natural cycles and preceding weather conditions, the evidence of those witnesses is experiential, but it does not enable us to identify whether any of the changes they observed is attributable to sand extraction rather than to natural changes and fluctuations. As Mr Reid said, the beach is a dynamic, ever-changing landscape.

[332] Dr Hume fairly acknowledged the difficulties that scientists have in identifying and separating effects of extraction from natural variability and the effects of irregular events such as major storms and El Nino/La Nina and other climatic influences.

[333] We were not persuaded by Dr Hilton's evidence, which did not seem to represent application of scientific method, being dependent on inadequate knowledge of the near-shore zones from which sand was being extracted at various times,[109] and on what he took to be a tacit acknowledgement by the appellants in selecting proposed extraction zones.

[334] Nor were we persuaded by Dr Dean's opinions, which depended on shoreline recession corresponding with what he had calculated would result from sand extraction, although changes in the position of the shore over the 80-year sand extraction record did not correspond with his calculation method. His evidence did not show the careful attention to accuracy that is expected of expert witnesses in law courts if their opinions are to be found acceptable or helpful.

[335] Mr LaBonté's evidence provided no acceptable basis for finding that signs of erosion that he had observed, and the events at Mangawhai Spit that he reported, had been caused by sand mining in the embayment. His criticism of Dr Barnett's assessment of shell production was based on an incomplete scrutiny of the scope of the data on which that witness had formed his opinion.[110]

[336] Further, Mr LaBonté showed signs of being partial, rather than of being an expert whose opinions were independent of the interests of the party that called him. At times his language was consistent with a purpose of discrediting the appellants, and he seemed unwilling to give direct answers to questions in cross-examination.[111]

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[109] Evidence in chief, para 22.
[110] Transcript, pp 429-432.
[111] Transcript, pp 430-431.

We are not able to treat his evidence as that of an independent and uncommitted expert.

[337] By comparison there was nothing in the evidence of Dr Goring and Mr Todd to indicate that either of them was not independent, and carefully and thoroughly applying scientific method to analyse the available data to form opinions that were supported by and consistent with *all* of those data. Dr Dean confirmed that the models and data used in Dr Goring's wave climate analysis had been verified and calibrated by other work.[112] Despite difficulty in accurately measuring the beach profile at the various transects, if past extraction had been having an effect that was consistently different than the effects of wave action, this would have been detected, and it was not.

[338] As such the evidence of Dr Goring and Mr Todd is an acceptable and preferable basis for our findings. So, relying on the evidence of those witnesses, we find that signs of shoreline retreat and erosion cannot be attributed to past sand extraction, and that past extraction has had no detectable effect on the environment.

[339] It follows that no revision is necessary to the provisional findings we made in an earlier section that the total input of sediment to the Mangawhai-Pakiri sand system is on average around 150,000 cubic metres per year.

Finding that system is not closed

[340] We now return to the main issue, whether the sand system of the Mangawhai-Pakiri embayment is a closed system or not. We have found that the total input of sediment to the system is on average around 150,000 cubic metres per year; we have not accepted the contention that the proposed extraction is unsustainable; and we have found that signs of shoreline retreat and erosion cannot be attributed to past sand extraction, which has had no detectable effect on the environment. It follows that we do not accept the contention that the system is a closed system.

What would be the direct adverse physical effects on the environment?

[341] Having rejected the opponents' contention that the sand system is closed, we can now consider their contentions about the adverse physical effects of the activity on the environment in the light of that. In that respect, we can discard contentions of

[112] Transcript, pp 357-8.

direct physical effects on the system itself that are dependent on the system being a closed one. That includes contentions that depleting the system of significant quantities of sand would disturb its equilibrium and cause erosion of dunes, retreat of the shoreline, reduction of the rate of accretion, or deflation of the Mangawhai Spit.

[342] These are not potential effects of the proposed activity that may happen or may not happen, to which we should or can ascribe probabilities of occurrence.[113] As the evidence does not support the opponents' assertions that the sand system is closed to replenishment, we find (on the appropriate balance of probabilities standard, and having regard to the gravity of the case) that the activity would not cause effects that would result from depletion of the resource.

[343] (Counsel for the Friends of Pakiri Beach presented submissions about the appellants' burden of proof. He accepted that there is not a legal burden of proof on an applicant for resource consent;[114] and that the appropriate standard of proof is the balance of probabilities, having regard to the gravity of the situation.[115])

[344] The remaining direct adverse physical effects on the environment of the proposed activities are those of the extraction process itself: effects on marine habitat, fauna and flora; noise of the machinery, and visual effects of barges working in the embayment.

Adverse effects on marine habitat, fauna and flora

[345] Dr R V Grace is a marine biologist who has undertaken study in the extraction area in the last 15 years. He was the only marine biologist to present evidence relevant to the extraction zone. This witness described the marine ecology of the extraction area, utilising in addition a study that Dr Hilton had undertaken in 1990. Dr Grace described a sequence of species zones, parallel to the shore, and changing with increasing depth and distance.

[346] The extraction site is in a zone of medium to fine, well-sorted sand, in which species that are tolerant of heavy surf would be anticipated. Dr Grace testified to the results of his sampling undertaken in 1991 and again in 2005, which had extended to a sand depth of a metre or so. The dominant species identified in 2005 had been the

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[113] See *Dye v Auckland Regional Council* [2001] NZRMA 513 (CA) para [39].
[114] Transcript, pp 381-382.
[115] Citing *McIntyre v Christchurch City Council* [1996] NZRMA 289; and *Contact Energy v Waikato Regional Council* Environment Court Decision A4/2000, para [42].

sand dollar.[116] In addition the siphon worm, mantis shrimp and scale worm occurred regularly. Dr Grace also noted that the stink worm[117] had also been present at all sites and he had noted an increase in numbers of the paddle crab.[118]

[347] His summary was that there had been a decrease in species diversity over the 15 year period, and an increase in some species. Dr Grace gave the opinion that none of the changes had been due to sand-extraction activities over the sampling period. Instead they had been due to natural variations in marine life in a naturally harsh marine environment. He observed that in a dynamic environment it can be regarded as no surprise that species come and go over time. Annual variation in water temperature, and other factors, have a strong influence on recruitment success of many marine species.

[348] Dr Grace also gave the opinion that loss of small numbers of marine animals through the sand extraction process would have negligible consequence to shellfish, or to the ecology of the area.

[349] Dr Grace's evidence not being contradicted, we accept it and find that the proposed sand extraction would have no significant adverse effect on the shellfish and other marine life in the extraction zone.

Noise effects

[350] Mr Reid stated that he had heard the dredges in action from his beach house, which is at least a kilometre south from the extraction site. He also stated that the sand-mining process is noisy and disruptive to those walking along the beach.

[351] Ms Leijnen acknowledged that a submitter had given evidence on the close proximity of an extraction barge to the beach, but considered that noise effects were unlikely to be an issue.

[352] Mr Serjeant testified that noise is generated by the barge engines, pump and other machinery. It was Mr Serjeant's evidence that the noise of the operation received at the nearest dwellinghouse would be approximately 30 dBA, and would be unlikely to be noticed due to the ambient noise environment, including louder

[116] *Fellaster zelandiae.*
[117] *Travisia olens.*
[118] *Ovalapes catharus.*

sound from the waves on the beach. He cited maximum noise limits in relation to residential activity from 7.00 am to 10.00 pm prescribed by the ARPC as 55 dBA L_{10}.

[353] The appellants' proposal is that the sand-extraction barge is to operate at least 100 metres from the crest of the near-shore bar, and in not less than 5 metres depth of water; and would continue the past practice of returning to Auckland at 2 pm, and not working into the evening. We accept that the effect of those limits is that the barge would not be closer to the shore than 200 metres, and would usually be 300 metres offshore.

[354] Given those distances, and as Mr Serjeant's evidence about the noise at the nearest dwellinghouse was not challenged or contradicted, we accept that the noise would comply with the applicable limits set by the ARPC, and would not be a direct physical adverse effect on the environment.[119]

Visual effects

[355] Mr Serjeant noted that the barge used by the applicant is large, and acknowledged that there is potential for adverse amenity effects. The proposal involves a barge being at Pakiri for up to 7 hours (from 7.00am to 2pm) for up to 110 days a year. The barge would not return to the same site each day, but would move along the coastline. The proposed dredging is to be a further 300 metres from the main public access point at Te Arai Point, than that provided for in the current consent. Our attention was drawn to the long history of sand extraction in the Pakiri area, and the lack of lasting or permanent visual effect.

[356] The barges and tugs were regarded as a 'blot on the landscape' and 'visual pollution' by Mr Reid, who showed the Court a video of the barge operating at sea, taken from Pakiri Beach in January 2004. Mrs Reid also described the barge's 'intrusive presence as being so very in one's face and at odds with the pristine beauty of sand, sea and islands.'

[357] Ms Leijnan gave the opinion that the barges are not particularly visually attractive, and could be considered adverse to the visual environment. She agreed, though, that their presence is not permanent. We heard no evidence from a landscape architect on visual impact, and no party sought mitigation of visual effects.

[119] See *88 The Strand v Auckland City Council* [2002] NZRMA 475 (HC).

[358] We acknowledge the opinions of Mr Reid and his mother, and accept that they perceive the visual presence of the barge at sea as conflicting with the natural character of the beach which they enjoy. However, the Hauraki Gulf is not a wilderness waterway. It is frequented by pleasure boats, shipping and other craft. Although a barge and tug passing regularly may not be an attractive view to residents or leisure users of the beach, their presence at sea could not be deemed markedly out of place.

[359] We conclude that the proposed operation would have no more than minor adverse visual effects, and that those effects would be passing. We find that the extraction operation would not have a significant adverse visual effect on the landscape of Pakiri Beach.

Would the extraction have direct non-physical adverse effects?

[360] In considering potential direct non-physical effects of the proposed activity, we have regard to effects on the relationship of Maori and their culture and traditions with their ancestral lands, water, sites, waahi tapu and other taonga;[120] and on kaitiakitanga.[121]

Maori relationships

[361] The Regional Council's evidence was that the tangata whenua of the Pakiri area are descendants of Rahui Te Kiri o Ngatiwai, who hold mana whenua and mana moana over the proposed extraction areas; and that Te Uri o Hau, a hapū of Ngāti Whatua, are recognised as tangata whenua of the Mangawhai area (north of Te Arai Point).[122]

[362] Counsel for Te Uri o Hau, Mr Welsh, submitted that Te Uri o Hau has had an association with Te Arai since around 1250AD; and that their interest is through their spiritual, historic and traditional association with the area, particularly the rivers, lakes, wetlands and coast at Te Arai. These are described in the Te Uri o Hau Settlement Act 2002, and include statutory acknowledgement over the Mangawhai Marginal Strip and Mangawhai Harbour. The Court is required to have regard to the

[120] RMA, s6(e).
[121] RMA, s7(a).
[122] Te Uri o Hau Settlement Act 2002.

special relationship Te Uri o Hau has with the statutory area when exercising its function, and when considering activities adjacent to the statutory area.[123]

[363] Evidence was provided by Mr E R Henderson on the project intended by the joint venture company to develop the site for residential accommodation, leisure and conservation. The joint venture has applied to Rodney District Council for a private plan change to enable the project to proceed. As a result of this proposed development, and the building underway at Mangawhai, Mr Henderson anticipated increased leisure use of the beach.

[364] Mr Welsh also informed us that the Crown forestry rights had recently been acquired by the joint venture, and that a regional park was envisaged which would border 11 kilometres of the beach. Te Uri o Hau are therefore the major owners of land adjoining the ocean where the barging operations are being conducted.

[365] Mr W R Wright is a trustee of Te Uri o Hau Settlement Trust as well as other entities, and is tangata whenua. His evidence covered the significance of the area and environment of the coastline and coastal area to Te Uri o Hau. He described the many villages and temporary settlements that had been scattered along the coastline for many hundreds of years, and the customary collection of fish and shellfish from the area. Those local associations with the coastline have resulted in the area being regarded as sacred to Te Uri o Hau. Mr Wright also outlined the protracted settlement process which had finally resulted in the enactment of Te Uri o Hau Settlement Act 2002, which provides recognition of Te Uri o Hau's cultural, spiritual, historic and traditional links with the coastline.

[366] Mr Wright described a protocol Te Uri o Hau and the Ministry of Fisheries had agreed on. It allows the Hapū input into the decision-making processes of the Crown in their area relevant to fish and shellfish species, including seaweed, extending out to the continental shelf. Mr Wright testified that the protocol gave recognition by the Crown of Te Uri o Hau's kaitiaki role with respect to the fish and shellfish in their ancestral area. A further protocol has been established with the Minister of Arts Culture and Heritage with respect to Mangawhai Harbour, foreshore, seabed and coastal areas to the continental shelf, relevant to artifacts and taonga.

[123] Te Uri o Hau Settlement Act 2002, s.65(3).

[367] Mr Wright asserted that the extraction of sand is having an adverse physical effect on their seafood, on erosion and on tangata whenua values with respect to mauri,[124] in their relationship with the area. Mr Wright acknowledged that he is not a marine biologist.

[368] The extraction area is in a depth of at least 5 metres and we did not understand there to be an issue of prevention of access to kaimoana, rather that the dredging operation may remove the sustenance of fish and other sea life.

[369] We have addressed the direct physical effects of the dredging on shellfish and fish, based on the evidence of Dr Grace. That witness testified that previous studies in 1990 and 1991 had shown that edible shellfish numbers were extremely low in the sand extraction zone, and none was found in his 2005 study. His evidence was that there is no problem of damage to shell-fish and that fish in the area fed on small marine life such as worms which were disturbed by the operation, so no food was lost from the system.

[370] Our conclusion is that there is no adverse physical effect to kaimoana from the past or proposed sand-extraction operation; and that kaitiakitanga and Maori relationships would not be physically affected.

[371] We do not intend to demean Mr Wright's opinion with respect to Maori traditional values. But we understand that his concerns are premised on the assumption that the extraction activity will inevitably result in erosion. And, we understand that Te Uri o Hau believe the extraction to be an intrusion that does not accord with their belief concerning balance in the ecosystem, therefore affecting the mauri of the coastal area.

[372] Those concerns and beliefs are factors that we will have regard to in considering indirect non-physical effects of the proposed activity. However, we do not find that the extraction activity has any physical effect on Te Uri o Hau's relationship with their ancestral lands and water, nor with their customary activities, that are recognised and expressly provided for in the various protocols agreed between the Crown and Te Uri o Hau, and by the Settlement Act.

[124] Life force

[373] MOKO is an acronym for the Manuhiri Omaha Kaitiakitanga Ora Charitable Trust Board. Mr J Tahitahi is the manager of the resource management arm of MOKO, and presented evidence on their behalf, as tangata whenua. Mr Tahitahi stated that the approach of MOKO, when assessing and responding to applications by organisations which involved activities within their area, is to require that all actual and potential effects on the well-being of the hapū be fully considered and provided for.

[374] Mr Tahitahi listed MOKO's concerns about the applications, which included the recognition and provision for the relationship of tangata whenua with their ancestral lands. His evidence was that tangata whenua sought agreement or consultation with the applicant on a process or plan for addressing their concerns in regard to removal or damage through the activity 'considering also the non-renewable nature of the sand resource,' concluding that MOKO firmly oppose sand extraction.

[375] Mr Tahitahi presented an outline of investigation work that he proposed be undertaken by the appellants as a means of addressing Maori relationship issues.

[376] Mr G McDonald, tangata whenua of Pakiri Beach, also presented evidence on the importance of the area, and the effect of sand extraction on Maori identity and inheritance.

[377] Most of the concerns expressed on behalf of tangata whenua were based on their understanding that the sand extraction would have direct physical effects on the environment. However our review of the evidence had led us not to accept that it would do so. Some concerns are based on their belief system relevant to sand extraction within their area. We address that later in considering whether the extraction would have indirect non-physical effects.

Kaitiakitanga

[378] Ms Baines claimed mana whenua status as a descendent of Te Kiri, a paramount chief, and also as a land owner herself. Ms Baines explained the extensive work the Taumata B Environmental Trust is undertaking to rehabilitate and protect Pakiri Beach vegetation, and to protect the habitats and fauna of the beach.

[379] In addition, Mr Wright and Mr Tahitahi referred to their kaitiaki role as established through iwi resource management work and through the Settlement Act. We understand that Te Uri o Hau consider that the joint project currently envisaged would serve the kaitiakitanga responsibilities of the hapū.

[380] However we find that the proposed sand extraction activity would not impede active demonstration of kaitiakitanga, as described by Ms Baines and by Mr Tahitahi.

Would the extraction have indirect physical adverse effects?

[381] In considering whether the extraction would have any indirect physical effects, we address the potential loss of significant indigenous vegetation, and the potential loss of significant habitat of indigenous fauna.

Loss of area of significant indigenous vegetation?

[382] In this section we consider evidence presented about areas of significant indigenous vegetation and indirect physical effects. Dr Hilton presented evidence on behalf of the Department of Conservation on coastal processes. While his evidence also addressed other matters relevant to the sand resource and erosion, he specifically described the natural values of the Pakiri-Mangawhai dunes. He gave the opinion that the flora and fauna of the Pakiri-Mangawhai coast have exceptional conservation value, containing extensive areas of pingao[125] and spinafex,[126] as well as other characteristic back-dune species. He gave evidence that Dr T Partridge had allocated Pakiri the highest score of any beach in the Auckland Region in the national dune inventory which had been undertaken fourteen years ago.[127]

[383] Mr Benson had also noted the presence of sand tussock.[128] The plants identified, he testified, are classified as being in gradual decline, and are particularly vulnerable to episodes of foredune erosion in storm events.

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[125] *Desmoschoenus spiralis*
[126] *Spinafex sericeus*
[127] Partridge,T. (1992) *The Sand Dune and Beach Vegetation Inventory of New Zealand*, 1 North Island, DSIR Land Resources Scientific Report, No 15, DSIR Land Resources, Christchurch, 253p.
[128] *Austrofestuca littoralis*

[384] With the exception of marram grass invasion[129] and destruction by afforestation, the dune system and flora is relatively intact. Dr Hilton gave evidence that the dune system had been damaged by sheep and cattle grazing, pedestrians, vehicles and horses as well as by sand-mining in the vicinity of Pakiri River. Dr Dowding acknowledged that opossum and rabbit numbers could have had an effect (through grazing and damage) on the habitat of the birds of Pakiri. Despite this damage, Dr Hilton gave the opinion that there is no lack of native foredune sand-bonding vegetation. He did not identify any rare or endangered flora in the area, and we understand that the value of the vegetation is for its ability to stabilize dunes as well as its ecological benefits, particularly as habitat for nationally significant fauna.

[385] We refer to the identification of the area in the ARPC as a Significant Natural Heritage Area, as well as an Area of Significant Conservation Values (Department of Conservation) and as a Coastal Protection Area. We accept that this identification indicates that the indigenous vegetation could be significant for its own value, and / or as habitat for fauna. The loss of areas of indigenous vegetation may occur as the result of dune instability as well as from the current damage occurring as described above.

[386] We accept that indigenous vegetation on Pakiri Beach and Mangawhai has been identified as significant in various ways. However, the suggested loss of vegetation as the result of dune erosion dune and systems destabilisation is predicated on the embayment being a closed system, and a direct cause-and-effect relationship between the sand extraction which has taken place for many years and is proposed, and dune erosion. That was not established.

Loss of significant habitat of indigenous fauna

[387] The evidence established that the coastal area of Mangawhai-Pakiri is a significant habitat for two threatened endemic shore birds, the New Zealand dotterel[130] and the New Zealand fairy tern.[131] Dr J E Dowding is an expert on New Zealand dotterels and presented evidence on the importance of the Mangawhai-Pakiri area as a habitat and breeding area for them. He gave his opinion that this is an area of international significance for the New Zealand dotterel and for the fairy

[129] *Ammophila arenaria*
[130] *Charadrius obscurus aquilonius*
[131] *Sterna nereis davisae*

tern, the latter being the rarest breeding bird in New Zealand. The stretch of beach where the dotterels breed, and the Te Arai stream area where the fairy terns flock, are directly adjacent to the extraction zone.

[388] However, Dr Dowding did not suggest that direct effects of the extraction operations such as noise, the presence of the barge, or sand-extraction activities would have an impact on the birds. He did not report any impact on the birds over the previous 80 years of sand extraction. His concern was about any potential adverse effects of activities on the area. He opined that erosion caused by sand extraction is probably occurring south of Te Arai Point, and 'is at least possible' elsewhere in the zone. Dr Dowding depended for this opinion on evidence of the Regional Council and Friends of Pakiri Beach, as his expertise is in biological sciences.

[389] Mrs Hubble, gave evidence from her experience on the depletion of dotterel habitat and breeding. She had observed that dunes in the area were flattening, causing nests to be washed away through tide inundation. Although we accept that this has taken place from time to time, we defer to the evidence presented by experts on the sand budget and extraction impacts.

[390] Further we note that Mrs Hubble herself observed that horse-riding, children's games, running and walking occur on the beach. Bird-breeding areas have been identified, and the public excluded from them, to try to prevent disturbance to the birds. There is a variety of threats to the birds.

[391] We accept that if the sand extraction were to cause erosion of the dunes, then there would be potential for adverse impact on the shore birds. We have found that the extraction will not do so.

[392] In short, we conclude that indirect physical effects to the birds or their habitat caused by the proposed sand extraction were not established.

Would the extraction have indirect non-physical adverse effects?

[393] The final class of environmental effects of the proposed sand extraction to which we have regard is indirect non-physical adverse effects. In this class we consider adverse effects on the natural character of the coastal environment (including the coastal marine area); non-physical adverse effects on the relationship

of Maori and their culture and traditions with their ancestral lands, water, sites, waahi tapu and other taonga; and adverse effects on amenity values for safe swimming and surfing, and generally for recreation.

Loss of natural character

[394] It was the Auckland Regional Council's case that the sand extraction would have a potential adverse effect of degradation of the natural character of the landscape of the Mangawhai-Pakiri coastal environment. Mr Benson gave the opinion, based on the evidence of Dr Hume, Dr Dowding and Dr Hilton, that the coastal environment at and surrounding the extraction sites has significant natural values, as well as a high degree of natural character.

[395] We accept the evidence of Dr Hilton and Dr Dowding that the coastal environment there possesses a high degree of natural character. Mr Benson listed the Regional Council and other statutory documents which collectively affirm the Pakiri Beach to have an outstanding natural character.

[396] However we have already reviewed the conflicting opinion evidence on the Regional Council's case that the sand system is closed to replenishment, and our reasons for rejecting that. We have given our reasons for finding that the proposed sand extraction activity would not cause effects that would result from depletion of the resource.

[397] There may be potential for impact on the natural character of the coastal environment caused by increase in recreational and other use of the beach, but that is not relevant to these appeals. We do not accept there is a realistic potential for any impact on the natural character of the coastal environment from the sand extraction.

[398] We accept that dredging extraction and deposition of material on the seabed may modify the natural character of sub-tidal areas, but that elements of natural character may remain that are worthy of recognition and protection. However we also note that Policy 1.1 of the NZCPS encourages use in areas that are already compromised.

[399] Dr Grace's evidence on the natural character and marine life in the extraction zone was that marine life in the extraction area is sparse, because of the naturally harsh environment, and that the continued extraction as proposed would not have any significant effect on the marine ecology of the area.

[400] In summary we find that the proposed activity would not have any significant adverse effect on the natural character of the coastal environment (including the coastal marine area).

Effects on Maori beliefs

[401] As mentioned before, Mr Wright gave evidence that the extraction of sand is having an adverse effect on tangata whenua values with respect to mauri, and to the relationship Te Uri o Hau have with the area, conflicting with their beliefs concerning balance in the environment. Mr Tahitahi gave evidence to similar effect. Likewise, Mr McDonald gave evidence on the importance of the area to territorial authority, and the effect of sand extraction on Maori identity and inheritance.

[402] We do not intend to belittle Maori attitudes to the sand extraction, and how it affects the metaphysical values described. However their concerns are premised on their understanding that the sand extraction would have direct physical effects on the environment, leading to erosion and consequential adverse effects.

[403] On considering the expert evidence we have not found that the extraction would have those effects. Nor would it affect the customary activities of tangata whenua. So we do not accept the premise on which their concerns are based.

[404] Beliefs are not themselves a natural or physical resources; they are metaphysical. The Act does not require the absolute protection of beliefs, even beliefs that are expressions of relationships of Maori, their culture and traditions, with their ancestral lands, water, sites, waahi tapu and other taonga.[132]

[405] We consider that beliefs of effects of the proposed sand extraction that are not supported by the evidence do not provide an appropriate basis for judicial findings of adverse effects on the environment, and should not influence the Court's

[132] *Friends and Community of Ngawha v Minister of Corrections* (HC Wellington AP110/02, 20/06/02; Wild J) paras [49]-[51].

judgment of whether or not the extraction would represent sustainable management of natural and physical resources. So because we do not accept the premise that the extraction would have direct physical effects on the environment, leading to erosion and consequential adverse effects, we do not take the beliefs of effects into account in deciding these appeals.

Loss of safety for swimming and surfing

[406] Submitters gave evidence of their concern that perceived safety problems in the surf off Pakiri Beach were caused by sand extraction. Mrs Hubble presented a series of photographs taken to show that changes had occurred in the area along the coastline. Her belief was that the changes had been the direct result of sand extraction. She gave evidence that whereas the beach at the southern end used to be relatively safe for swimming, all of her family had had dangerous experiences, and in the last 4 years currents moving to the north had been observed.

[407] No scientific evidence was given to support a finding that any changes in wave action had been caused by the extraction operation, and we have no basis for concluding that sand mining has had any effect on currents. We observe that sand extraction has been taking place in the embayment for the last eighty years, and that the changes in conditions as indicated by Mrs Hubble have occurred much more recently. That leaves open the possibility of the changes observed having another cause.

[408] Another witness gave evidence of a tragic drowning fatality, which we can understand would have had an impact on the beach community. The beach had been widely used for swimming, but after that event, swimming is now perceived as dangerous. There has been no establishment of a surf lifesaving presence.

[409] As mentioned earlier, the proposed sand extraction would occur seaward of the near-shore bar, at least 200 metres from the shore, in a depth of at least 5 metres. There is no scientific basis in evidence for supposing that extraction from the seabed there would result in holes or rips inshore, where people would be swimming. Evidence presented was that the tide would level the sand surface after sand extraction.

[410] Mr Ivory explained how sandbanks in a 'beach-break system' are understood by surfers to produce waves suitable for board-riding. He explained that sand banks 'move' up and down the beach naturally depending on wind, tide and swell movement, and produce waves in various locations along a beach as a result.

[411] Mr Ivory presented the results of a survey of opinions on the apparent changes in surf quality at Pakiri Beach. His assumption was that the sand-extraction operators aim to extract from sand-banks, and that this in turn changes wave formation, making it unsuitable for surfing.

[412] The proposal is that extraction is to be at least 100 metres from the crest of the near-shore bar. This does not allow for extraction of sand from the near-shore sand banks as alluded to by Mr Ivory.

[413] We accept that changes may have occurred to the quality of the waves at the beach for surfing, and to the beach itself. However, we have no evidence suitable to base a finding that this has been or could be caused by sand extraction activity.

Loss of amenity value for recreation

[414] Residents who provided evidence for Friends of Pakiri Beach produced photographs as testimony of the happy experiences they had enjoyed in the past at Pakiri, and to show that changes have occurred to the beach, which in turn have affected their recreational pleasure. Mrs Reid spoke of 'rolling, generous and bountiful sand dunes flowing to the mouth of Poutawa Stream' which have now gone. Her perception was that the beach now looked 'sick', depleted and diminished. This was based on her understanding that the changes had been the result of sand extraction, in accordance with the opinions of Dr Dean and Mr LaBonté.

[415] Mrs Hubble spoke of her anger over what she perceived to be the effects of sand extraction, and she also gave evidence that the beach is widely used for a range of recreational uses. Groups of people sunbathe and picnic on the beach. In addition we note the high landscape ranking that Pakiri Beach has been assigned by the regional landscape study, indicative of amenity values for recreation.

[416] The Regional Council listed four environmental effects that may result from potential adverse physical effects. One effect listed was the degradation of amenity values including public access and recreational. However, no information was presented by Regional Council on any inhibition to public access and recreation.

[417] We understand their evidence to be based on the premise that sand excavation would have a potential impact on the beach. However our review of the evidence led us to reject claims that it would. Instead we note the proposed regional park which the Te Uri o Hau joint venture company propose, and other residential development, and the anticipated increased leisure use of the beach.

[418] Our conclusion is that recreational use continues in the Pakiri area, and can be expected to expand in the future. We do not accept that there has been or would be any significant effect on amenity values caused by the extraction operation, despite the perceptions of submitters about the appearance and noise from the barge, and assumptions about the cause of perceived changes.

Are there alternative sources of suitable sand?

[419] We have now to consider whether there are relevant alternative sources of sand suitable for ready-mixed concrete manufacture.

[420] Despite increasing demand for concrete quality sand as a result of growth and substantial infrastructure projects in the Auckland region, the supply of Pakiri inshore sand to the market has been steadily shrinking. The average annual rate of extraction between 1993-2003 was about 110,000m^3 per annum. Those volumes were extracted under the following coastal permits:

Norsand Limited, Mangawhai	25,000m^3
Sea-Tow, Mangawhai	25,000m^3
Kaipara Limited, Pakiri	45,000m^3
McCallum Bros., Pakiri	45,000m^3
Sea-Tow, Pakiri	25,000m^3
Total	165,000m^3

[421] Of all these permits, only the existing McCallum Bros and Sea-Tow Pakiri inshore permits (70,000m^3) remain on foot. The others were either refused and no appeal followed, or they were withdrawn. The result has been a loss to the Auckland market of up to 95,000m^3 per annum of high quality sand.

[422] The current extraction rates from inshore Pakiri are limited to a maximum of 70,000m^3 per annum. This would marginally increase to 76,000m^3 if these appeals are allowed. This amount is not significantly more than the average rate of extraction over the last 85 years.

[423] In his evidence Mr C McCallum set out the current sources of sand available to supply the Auckland region's ready-mix concrete requirements, which we summarise:

(a) Kaipara Limited, off-shore Pakiri, approximately 35,000m^3 pa. (now operated by McCallum Bros)
(b) Mt Rex Shipping, Tapora Banks, Kaipara Harbour, up to 60,000m^3.
(c) Winstone Aggregates, Tapora Banks, Kaipara Harbour up to 90,000m^3.
(d) Kaipara Limited, Tomarata Quarry, approximately 40,000m^3.
(e) Winstone Aggregates, Puni, Waikato River, up to 20,000m^3.
(f) Perry Aggregates, Horotiu, Waikato River, approximately 10,000m^3.

[424] Together with the existing McCallum Bros/Sea-Tow Pakiri inshore permits, these sources total 325,000m^3. With the current level of demand in the Auckland region assessed at 410,000m^3 there is a shortfall of 85,000m^3.

[425] McCallum Bros, Winstone Aggregates and Mt Rex Shipping have all made applications to extract substantial additional volumes of sand from inside and outside the Kaipara Harbour as follows:

(a) Winstone Aggregates,	350,000m^3
(b) Mt Rex Shipping,	150,000m^3
(c) McCallum Bros.,	300,000m^3 (ARC), 300,000m^3 (NRC)

[426] The first two of these applications were approved by the Auckland Regional Council, but are subject to appeals to this Court; and the McCallum Bros applications are at an early stage of processing.

[427] The appellants contended that in the absence of any certainty about the availability of additional sources of supply, the inshore Pakiri sand remains critical to the Auckland concrete and construction industry. They contended that if supplies from Pakiri are not maintained, insufficient sand will be available to meet current levels of growth in Auckland, and to satisfy the nationally important infrastructural projects that are in progress in Auckland.

[428] In submissions in reply, counsel for the appellants explained that the shortfall is being supplied by the temporary extraction of additional volumes from the Tapora Banks in the Kaipara Harbour, and some additional production at the Tomarata Quarry.

[429] Mr Macrae also announced that although, at the start of the appeal hearing, it had appeared that additional volumes of sand would be available, at least temporarily, from the Winstone and Mt Rex Shipping sites, that had not in fact occurred. That was because a question had arisen about the Court's jurisdiction to make a recommendation to the Minister of Conservation that additional rates of extraction could be commenced prior to the determination of appeals against the consents for increased volumes granted by the Auckland Regional Council.

[430] Mr J Rae, the Managing Director of the Stevenson Group (which is a large multi-purpose family business with well-established roots in the Auckland region) gave evidence. The Group's range of business activities includes the extraction of mineral resources and the manufacture and supply of ready-mixed concrete, and pre-cast concrete products. Mr Rae attested that if the consent sought is not granted and additional supplies of sand do not become available, there would be a strong possibility that the company could be forced to close one of its ready-mixed concrete batching plants. While he could not say with certainty what the exact social and economic implications of that would be, it would certainly have widespread consequences for sectors of the building and development industries whose forecasting and programming has proceeded on the expectation of Stevenson meeting pre-determined delivery schedules. It would also harm Stevenson's long-term position within the concrete manufacturing industry, and its staff and their families.

[431] Mr Rae accepted that the Kaipara Harbour is a potential source of high quality sand. The Stevenson Group had itself made applications for coastal permits to extract sand from that source. However the witness observed that there is no certainty that additional supplies from the Kaipara will be authorised, or when.

[432] The Friends of Pakiri called evidence intended to show that there is no shortage of sand for the construction industry in Auckland, and that there are alternate suitable sources available.

[433] We have already addressed the conflict of opinion on this point between Mr McCallum, Mr Rae and Mr Cunningham on one hand, and Dr Sharp on the other. The former have the advantage of many years of involvement in the concrete and construction industries, and their evidence was based on their personal knowledge and experience. In contrast, Dr Sharp acknowledged that he does not possess expertise on those topics.

[434] Another witness, Mr S C Male (a Director of Kaipara Limited) gave evidence suggesting that further quantities could be extracted from Tomarata Quarry. His evidence was not supported by any survey or scientific data, and appeared to be simply a personal estimate; and he was not able to identify any potential customers for the additional volumes of sand from that source. As it turned out some of Mr Male's figures were not consistent with figures that Mr McCallum had obtained from Mr Male's own company.

[435] We do not accept that Mr Male's evidence established that there is an adequate supply of sand suitable for ready-mixed concrete manufacture in the Auckland region.

Finding

[436] On this point we prefer the evidence of Messrs McCallum, Rae and Cunningham, and we do not accept that there are currently sources of sand suitable for ready-mixed concrete manufacture alternative to the near-shore areas the subject of these applications.

Would there be any cumulative effects?

Submissions

[437] The respondent submitted that the proposed sand extraction would have a cumulative effect in that its effects would, over time, be cumulative on those of past sand extraction in the area.

[438] The Friends of Pakiri Beach submitted that consideration is to be given to the effects of the activity on the environment as it actually exists now, and as it is likely to be from time to time, including further effects of the historic extraction, whether by the applicant or by anyone else, and the effects of further extraction authorised by existing consents.[133]

[439] The University of Auckland contended that if the consents sought are granted, they will be exercised to the fullest extent (counsel remarking that nothing in the evidence suggests otherwise), so if the Court finds that there will be an adverse effect on the beach and dune system, it can conclude that a cumulative effect will occur.

[440] The appellants responded that the Court can safely discard the contention that sand extraction will have cumulative effects; and that the issue is whether erosion effects are of sufficient probability and impact to fall within the category of potential effects of low probability but high impact.

Consideration

[441] We accept that the duty of consent authorities to have regard to any actual and potential effects on the environment of allowing an activity[134] extends to any cumulative effect which arises over time or in combination with other effects.[135] We also accept that a cumulative effect is not the same as a potential effect; it is one that will occur (not one which may occur or may not) as a result of the activity under consideration.[136]

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[133] Citing *Contact Energy v Waikato Regional Council*, supra, para [38].
[134] Imposed by s104(1)(a).
[135] RMA, s3.
[136] *Dye v Auckland Regional Council* [2001] NZRMA 513 (CA) para [38].

[442] We accept, too, that the duty is to have regard to effects on the environment as it exists (including the effects of past extraction), and as it will be from time to time, including further effects of past extraction, and effects of further extraction authorised by existing consents.[137]

[443] However, we have rejected the opponents' contentions that the extraction under consideration would have direct physical effects on the system itself, whether of depleting the resource, of disturbance of its equilibrium, of dune or beach erosion, of shoreline retreat, of reduction of the rate of accretion, or of deflation of the Mangawhai Spit. So if any adverse effects have been caused by past sand extraction (a question on which we need make no finding for this purpose), extraction in exercise of the permits the subject of the current applications would not add to them. In short there would be no effect to accumulate with those of other activities.

[444] So we find that the proposed extraction would not have a cumulative effect.

Should a precautionary approach be taken?

Submissions

[445] The respondent submitted that the case merits a precautionary approach. It contended that the scientific evidence establishes that there is a legitimate uncertainty as to the extent of the effect of sand extraction in the embayment in denigration of the beach system that will accelerate the natural erosion of the beach.

[446] Mr Burns relied on a passage in the New Zealand Coastal Policy Statement that promotes a precautionary principle where there is a lack of understanding about coastal processes and the effects of activities on them, particularly where those effects are as yet unknown or little understood. Counsel also cited decisions in which the Court had done so.[138]

[447] The Director-General of Conservation also submitted that it would be appropriate to take a precautionary approach, one that adopts prudent foresight. Mrs Houghton argued that this approach is in accord with the philosophy of the Act and the requirements of section s 35 and 17, and with Policy 3.3.1 of the NZCPS;

[137] *Contact Energy v Waikato Regional Council* (2000) 6 ELRNZ 1, 16, para [38].
[138] *Rotorua Bore Users Association v Bay of Plenty Regional Council* Environment Court Decision A138/98; and *Paterson v Bay of Plenty Regional Council* Environment Court Decision A135/2000.

and cited another decision on the topic.[139] She contended that much of the evidence indicates that there is a high degree of uncertainty concerning the sustainability and cumulative effects of sand extraction.

[448] Te Uri o Hau submitted that, given uncertainty in the monitoring data, and the clear scientific difficulty in assigning erosion events and/or decreased accretion due to the extraction, it is open to, and appropriate that, the Court adopt a precautionary approach to the applications. Counsel also relied on Policy 3.3.1 of the NZCPS, and on a Planning Tribunal decision.[140]

[449] Mr Welsh acknowledged that the Act embodies a precautionary approach, and the Court being entitled to have regard to the precautionary principle in exercising its judgement as to whether a risk is worth taking, contended that it should apply it in this case because of the high ecological, biological and cultural values of the coastal environment in question.

[450] The Kaipara District Council, too, submitted that the potential adverse effect of the near-shore extraction on the Mangawhai Harbour is of sufficiently high impact as to warrant a precautionary approach, and that the low probability of a potential effect is a product of scientific uncertainty, supporting adoption of such an approach.

[451] Likewise the University of Auckland asserted that there is uncertainty regarding cumulative and potential effects of near-shore sand extraction on the beach and dune system, on the marine reserve and on the marine laboratory; and that although of low probability, the potential impact is so great as to warrant a precautionary approach.

[452] However the Friends of Pakiri Beach submitted that there is sufficient certainty of future adverse effects to avoid the need for the Court to apply a precautionary approach. They submitted that such an approach may be required where there is genuine scientific uncertainty about the likely effects, and a threat of serious or irreversible damage; and contended that there is no credible or reliable scientific evidence to undermine the opinions of their expert witnesses Dr Dean and Mr LaBonté, on which the Court could make an informed decision. They also submitted that the evidence establishes actual serious damage arising from the activity, so a precautionary approach is not necessary.

[139] *Aquamarine v Southland Regional Council* Environment Court Decision C126/97.
[140] *McIntyre v Christchurch City Council & Bell South* [1996] NZRMA 289; 2 ELRNZ 84.

[453] The appellants submitted that the precautionary approach is not to be equated with declining an application; rather (they contended) it applies where there is a lack of full scientific certainty and a threat of serious or irreversible damage which warrants cost-effective measures to ensure protection. The appellants also submitted that the precautionary approach is implicit in the obligation under section 3(f) to consider potential effects, as well as being expressly referred to in the NZCPS, section 3.3.

[454] The appellants acknowledged that there is some scientific uncertainty on the extent to which sand extraction might contribute to changes in beach volumes; and that some aspects of the proposal attract the precautionary approach under Policy 14.4.4 of the regional coastal plan.

[455] However they contended that although the application of caution may affect whether consent is granted, its effect may be satisfied by the scope and terms of consent and the conditions to be imposed, particularly on improved monitoring and review. These would provide sufficient safeguards and would be cost-effective measures to ensure protection.

Consideration

[456] We start our consideration of those submissions by reviewing the applicable law and judicial decisions. We will then apply the law to the circumstances of the case, leading to our finding on this question.

The law

[457] The Resource Management Act does not expressly prescribe adoption of a precautionary approach. However the combination of the direction that consent authorities have regard to potential effects on the environment,[141] and the inclusion in the meaning of the term *effect* of any potential effect of low probability which has a high potential impact,[142] is precautionary in substance.

[458] Consent authorities are also directed to have regard to any relevant provisions of a New Zealand Coastal Policy Statement and of a plan.

[141] RMA, s104(1)(a).
[142] Ibid, s3(f).

[459] Policy 3.3.1 of the New Zealand Coastal Policy Statement 1994[143] is–

> Because there is a relative lack of understanding about coastal processes and the effects of activities on coastal processes, a precautionary approach should be adopted towards proposed activities, particularly those whose effects are as yet unknown or little understood. The provisions of the Act which authorise the classification of activities into those that are permitted, controlled, discretionary, noncomplying or prohibited allow for that approach.

[460] Policy 14.4.4 of the Auckland Regional Plan: Coastal is–

> A precautionary approach shall be taken when assessing the location of the extraction activity, the maximum volume to be extracted, and the term of consent, in recognition that the potential adverse effects on the physical coastal system are uncertain, and that it is difficult in many cases to determine an accurate sediment budget.

[461] The decisions cited by the parties on this topic were all given by the Planning Tribunal or the Environment Court. However there is a judgment of the High Court, *Greenpeace v Minister of Fisheries,*[144] and this Court is bound to apply the basis or principle for that determination. We have also reviewed the Planning Tribunal and Environment Court decisions cited by the parties, being *McIntyre v Christchurch City Council*;[145] *Aquamarine v Southland Regional Council*;[146] *Rotorua Bore Users Assn v Bay of Plenty Regional Council*[147]; *Patterson v Bay of Plenty Regional Council*;[148] and *Skinner v Tauranga District Council.*[149]

[462] From those sources we derive these statements of general principle about the adoption of a precautionary approach to deciding resource-consent applications–

(a) Good environmental decision-making under the Act involves careful and balanced judgement. In many cases such a judgement is reached without the need to call in aid any principle of precaution; but in others, particularly those where scientific uncertainty exists, the need for balance may only be adequately achieved by applying precaution to the ultimate judgement.[150]

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[143] NZ Gazette, 5 May 1994, p1563.
[144] HC Wellington, CP492/93; 27/11/95 Gallen J.
[145] [1996] NZRMA 289; 2 ELRNZ 84 (Planning Tribunal).
[146] Environment Court Decision C 126/97.
[147] Environment Court Decision A138/98.
[148] Environment Court Decision A135/2000.
[149] Environment Court Decision A163/2002 para [74].
[150] *Rotorua Bore Users v Bay of Plenty Regional Council* ante.

(b) A consent authority may allow its discretionary judgement to grant or refuse resource consent to be influenced by the precautionary principle to the extent consistent with the statutory purpose of promoting the sustainable management of natural and physical resources and with judicial exercise of that discretion.[151]

(c) The fact that a dispute exists as to the basic material upon which the decision must rest, does not mean that necessarily the most conservative approach must be adopted. The obligation is to consider the material and decide on the weight which can be given to it with such care as the situation requires.[152]

(d) A precautionary approach should only be applied where there is scientific uncertainty or ignorance about the nature or scope of environmental harm. Conflicting opinions about whether a proposal would result in adverse effects, where the expert witnesses were in no doubt about how the effects arise, what creates them, what might cause them, are not lack of scientific knowledge.[153] There needs to be a plausible basis, not mere suspicion or innuendo, for adopting that approach.[154]

Application of law to case

[463] A precautionary approach may be appropriate where there is scientific uncertainty or ignorance about the nature or scope of environmental harm, such as doubt about how effects arise, what creates them, what might cause them.

[464] In this case there was a difference among the expert witnesses on the question whether the proposed activity would have potential effects that would result from depletion of the sand resource, such as erosion of dunes, retreat of the shoreline, or deflation of the Mangawhai Spit. But the difference was not about how such effects might arise, what would create them, what might cause them. Rather the difference was mainly one of interpretation of the evidence on whether the sand system is closed or not. To infer from the difference among the experts that scientific uncertainty or ignorance exists would not be warranted.

[151] *McIntyre v Christchurch City Council*, ante.
[152] *Greenpeace v Minister of Fisheries* (HC Wgtn CP492/93 27/11/95 Gallen J) p32.
[153] *Aquamarine v Southland Regional Council*, ante pp 146-47.
[154] *TransPower v Rodney District Council* Planning Tribunal Decision A85/94.

[465] We have analysed the evidence, and have given our reasons for finding that the system is not closed, and that the extraction activity would not have potential resource-depletion effects. Having come to that finding, to give weight to the contrary opinions by applying a precautionary approach would be unsupported, and simply indecisive. Opponents of resource-consent applications cannot expect to invoke the precautionary approach whenever the consent authority prefers the applicants' evidence to theirs.

[466] We have had regard to the precautionary policies of the New Zealand Coastal Policy Statement and the Auckland Regional Plan: Coastal already quoted. We find that a precautionary approach is inherent in the appellants' proposed review conditions. But, consistent with the decisions that we have summarised, we consider that we should make a careful and balanced judgement of the appellants' resource-consent applications for the purpose of the Act on the basis of our findings on the evidence, without adopting a precautionary approach in the balancing.

Finding

[467] In short, our judgement whether the purpose of the Act would be better served by granting or refusing consent, and on the conditions to be imposed if consent is granted, should be made having regard to our findings on the evidence on actual and potential environmental effects, and on the relevant provisions of the act and applicable statutory instruments. We do not accept that in the circumstances of this case our evaluative judgement should be influenced by caution based on the possibility that our findings on the evidence may not accord with what in fact occurs in future.

Other arguments

[468] In accordance with the direction to consent authorities in section 104(1), we have had regard to any actual and potential effects on the environment of allowing the proposed sand extraction activity; and to the relevant provisions of applicable statutory instruments. Section 104(1) also provides for a consent authority to have regard to any other matter it considers relevant and reasonably necessary to determine the application. So we now address several matters raised in the appeal hearing to consider whether or not they qualify in that regard.

Previous decisions

[469] The Friends of Pakiri Beach relied on decisions of the Commerce Commission[155] in support of their contention that renewal of the appellants' coastal permits for extraction of sand would have no economic effect on the Auckland regional economy. Mr Littlejohn acknowledged that the decisions had been given under the Commerce Act, and submitted that this Court could take its findings into account. He likened it to the Court taking into account reports of the Waitangi Tribunal in terms of analysis of factual findings; and suggested that Dr Sharp's opinions in evidence could be given more weight because they accord with findings of a specialist tribunal.

[470] The Friends of Pakiri Beach also relied on a decision and recommendation of a hearing committee of the Northland Regional Council on applications by Sea-Tow Limited and Norsand Limited for permits to extract sand from adjacent to the Mangawhai Harbour entrance, and a decision by the Minister of Conservation refusing those permits. Counsel contended that the decision is relevant because the New Zealand Coastal Policy Statement directs that regard is to be had to the potential for adverse effects of activities to spread beyond regional boundaries may be significant in the coastal marine area.

[471] The Auckland Regional Council cited an Environment Court decision where sand extraction permits had been renewed for a 3-year phase-out period;[156] and the Friends of Pakiri Beach cited another decision in which the Environment Court had found that the embayment is closed to significant inputs from deeper than 25 metres.[157]

[472] The appellants replied that the purpose of the Commerce Act, relating to competition and market dominance, provides an inappropriate basis for an assessment of economic issues under the Resource Management Act; and that findings on other applications under the Resource Management Act are not relevant to these applications.

[473] There are rules of law by which one can determine whether findings in one proceeding are, or are not, open for reconsideration in another proceeding. Counsel did not submit that the parties in the present appeals are restricted by the rules of *res*

[155] Decisions 513 and 558.
[156] *Paterson v Bay of Plenty Regional Council* Environment Court Decision A135/2000.
[157] *McDonald v Auckland Regional Council* Environment Court Decision A204/2002.

judicata or issue estoppel from contending for findings or outcomes different than those supporting the decisions referred to.

[474] The Resource Management Act directs that the Environment Court has the same power, duty, and discretion in respect of the decisions appealed against as the consent authority against whose decision the appeals are brought; and may confirm, amend, or cancel a decision to which an appeal relates.[158] For that purpose, the Court conducts appeals by complete rehearing.

[475] In that context we understand our duty in deciding appeals such as these to be to make our own findings of fact on the evidence given at the public appeal hearing in these proceedings; and to form our own judgements on the basis of those findings, in coming to our decision on how the appeals should be disposed of.

[476] Except to the extent required by the law on *res judicata* and issue estoppel, or by consent of all parties on questions only of private interests, we hold that it would not be consistent with that duty for us to accept findings of fact made by another person or body (however much deserving of respect), or to adopt judgements of such a person or body.

[477] In addition, we accept the appellants' submissions that findings on proceedings under other legislation, or on other applications under the Resource Management Act, are not appropriate bases for findings in the present proceedings. It would be neither relevant nor reasonably necessary to have regard to them. We therefore decline to be influenced, in deciding these appeals, by the Commerce Commission decision, or by findings or judgements made on other applications under the Resource Management Act.

Consistent decision-making

[478] The Friends of Pakiri Beach also submitted that the Court should have regard to the Northland recommendation and decision, and the findings on which they were based, because they relate to the same system and are relevant to determining cross-boundary effects. The Northland Regional Council also referred to that recommendation and decision, contended that the adverse effect of the proposed extraction on shoreline erosion would be the same, and would have adverse effects in

[158] Resource Management Act, s290(1).

the Northland region; and sought consistent decision-making within the Mangawhai-Pakiri embayment.

[479] A plea for consistent decision-making is superficially attractive.

[480] However in practice the same outcomes cannot be expected on multiple applications on differing circumstances, with different submissions, evidence and cross-examination and differing decision-makers.

[481] Rather what the Act contemplates is that resource-consent applications will be decided on consistent principles and for a single purpose. The purpose and principles are found in the Act and in more specific terms in instruments under the Act.

[482] That is the process we have to follow. In doing so, we act independently of other decision-makers and other decisions on other applications. So we reiterate our understanding that consistency of outcome with that of the applications made to the Northland Regional Council for extraction adjacent to the Mangawhai Harbour entrance is not relevant or reasonably necessary to the decision on these appeals; and we decline to allow it to influence this decision.

What other countries do

[483] In his evidence Dr Dean described experience of sand extraction in other places, mainly in the United States of America. To the extent to which his description of them demonstrated the professional experience from which he formed the opinions he expressed, that evidence was acceptable.

[484] Dr Dean then testified that many countries do not permit sand to be extracted from the near-shore sand sharing system, and gave particulars in respect of Florida and South Carolina. He continued by stating that he knew of no developed country other than New Zealand that presently allows sediment extraction from the active sand sharing zone for commercial purposes; and gave some particulars in that respect.

[485] Although the reliability Dr Dean's evidence about regimes applicable elsewhere was challenged by the appellants, we make no finding on that. Rather, we express our disappointment that hearing time was taken on that evidence at all.

[486] These appeals have to be decided in terms of the law of New Zealand, and particularly the Resource Management Act. Whatever may be the position under the law of other countries or states, the law of this country does not prohibit the granting of coastal permits for extraction of sand from near-shore areas. Nor does the law of this country give the Environment Court jurisdiction to give a decision on whether such extraction should be prohibited generally. Our function is to make a judgement based on findings of the actual and potential effects on the environment of allowing the proposed activity, for the purpose of the Resource Management Act and having regard to relevant provisions of instruments under it. So if the law elsewhere prohibits such activities, that is simply irrelevant to the Court's functions in these proceedings.

[487] In short, Dr Dean's evidence on whether sand is permitted to be extracted from near-shore sand-sharing systems in other countries or states was not relevant, nor would it be reasonably necessary to have regard to it. That evidence was a distraction that was entirely unhelpful to the Court.

Deficiencies of the AEE

[488] The Friends of Pakiri Beach called Mr LaBonté as an expert witness. In his evidence-in-chief, this witness set out at some length his criticisms of an Assessment of Environmental Effects that had been submitted with the appellants' original resource-consent applications.

[489] The Director-General of Conservation called Dr Hilton as an expert witness. In his evidence-in-chief, this witness identified several respects in which he did not agree with a 2004 report by Todd & Westgate. Counsel explained that this was relevant because the report by Todd & Westgate had been incorporated in the appellants' Assessment of Environmental Effects, as part of the application process. However Mrs Houghton explained that the Director-General was not seeking a finding from the Court on the adequacy of the Assessment.[159]

[490] The Act directs that a resource consent application is to be accompanied by an assessment of environmental effects in accordance with Schedule 4;[160] and provides that if an adequate assessment is not included, the consent authority may

[159] Transcript, p545.
[160] RMA, s88(2)(b).

determine that the application is incomplete.[161] However the Act does not provide for review by the Environment Court of the adequacy of an assessment of environmental effects that has been accepted by the primary consent authority. The Court's function in that regard is confined to appeals against disallowance by the primary consent authority of an applicant's objection to a determination that an assessment is incomplete.[162] (No doubt that is why counsel for the Director-General disclaimed challenging the adequacy of the appellants' assessment in this case.)

[491] Accordingly we regard Mr LaBonté's evidence of his criticisms of the appellants' assessment of environmental effects as inappropriate. In our opinion that evidence is not relevant, and it is not reasonably necessary to determine the applications the subject of these appeals. We decline to have regard to it.

McCallum Bros' acquisition of Kaipara Ltd business

[492] In describing the other sources of sand available to supply Auckland's ready-mixed concrete requirements, the appellants referred to coastal permit held by Kaipara Limited to extract 35,000 cubic metres per year, and explained that the exercise of that permit is now operated by McCallum Bros Limited.

[493] That was the subject of rebuttal evidence by Mr C McCallum who stated that on 7 November McCallum Bros had entered into an agreement with Kaipara Limited to take over the sand extraction operation authorised by Kaipara Ltd's coastal permit 20795 which authorises the extraction from an area offshore of Pakiri Beach of up to 2 million cubic metres of sand over a 20-year period from February 2004; and to purchase a dredger[163] and suction unit. This witness explained that the agreement is for an initial term of 5 years, with rights of renewal for the remaining life of the permit (which would continue to be held by Kaipara Limited).

[494] In his evidence Mr McDonald stated his opposition to the agreement between McCallum Bros and Kaipara Limited on the grounds:

(a) That the section 274 parties had not been consulted, or notified of the change of circumstances to have input.

[161] RMA, s88(3).
[162] RMA, s358.
[163] MV *Coastal Carrier*.

(b) That the offshore area had been included in the Pakiri Sand Study, which should now be considered in the final decision of these appeals.

(c) That the agreement should be declined, as the offshore area is well within the Pakiri embayment parallel to the Pakiri shoreline at about 25 metres depth.

[495] Mr McDonald was not himself, nor was the Mahurangi and Gulf Islands Collective that he represented, an appellant before the Court. By notice under section 274 lodged on 1 June 2005, he became a party to the appeals by Sea-Tow and McCallum Bros as a person who has an interest in the proceedings greater than the public generally, and as a person representing a relevant aspect of the public interest.

[496] By the version of section 274 then in force, parties under that section are limited to appearing and calling evidence on matters within the scope of the appeal.[164]

[497] The scope of these appeals is whether the appellants' resource-consent applications should be granted or refused, and if granted, what conditions (if any) should be imposed. The appeals do not, and could not, extend to the coastal permit issued previously to Kaipara Limited in respect of a different, offshore, area off Pakiri Beach; let alone to the question whether the holder of that consent should enter into an agreement with the appellants to carry out the sand extraction on its behalf, and to sell the plant.

[498] So we find that Mr McDonald was not entitled to appear on these appeals to challenge the agreement made by Kaipara Limited with McCallum Bros Limited over the exercise of the offshore coastal permit.[165]

[499] In addition, the authority of this Court on these appeals is to confirm, amend or cancel a decision granting or refusing resource consent. The Environment Court does not have power to 'decline' agreements for want of consultation, or for lack of notice.

[164] RMA, s274(4)(a).
[165] Cf *Beasley v Wellington City Council* Environment Court Decision W027/06.

[500] Accordingly we hold that in these appeals it is not relevant or reasonably necessary for the Court to have regard to the agreement between Kaipara Limited and McCallum Bros Limited; and we decline to do so.

Summary

[501] We have now addressed the various matters to which, parties argued, it would be relevant and reasonably necessary to have regard to determine the resource-consent applications. In the result we judge that it would not be relevant or reasonably necessary to have regard to any of them.

Term and conditions of consent

[502] We will now consider the terms and conditions of the proposed consents so that we can apply our findings to the planning instruments and come to forming a judgement on the applications by reference to our findings on the terms and conditions that would be appropriate.

Term of consent

The parties' cases

[503] The appellants submitted that the coastal permits should be granted for terms of 20 years, because–

(a) The Court can be confident that the reduced volumes of extraction will not have any adverse effects:

(b) Pakiri sand is a very valuable resource which, in the absence of unacceptable adverse effects, should be available to contribute to the economic and social well-being and health and safety of people and communities in the Auckland region;

(c) The economies of extraction and distribution from Pakiri are consistent with RMA principles; and

(d) The appellants are proposing a monitoring regime which would more accurately identify any effects of extraction on the beach and coastline, and a review condition which would enable appropriate action if signs of significant adverse effects became apparent.

[504] The appellants' request for 20 year-terms was opposed by the Friends of Pakiri and by Te Uri o Hau.

[505] Counsel for the Friends of Pakiri Beach remarked that there was no evidence that the appellants require a term of 20 years for economic reasons; and that as all infrastructure needed to exercise the consents is already owned, there is no apparent need for a 20-year term to protect investment and provide business certainty. They acknowledged that the appropriateness of the 20-year term would flow from the Court's findings on the evidence on the actual and potential effects of the extraction, and any remaining scientific uncertainty in that regard; and the risk of significant effects that the proposed review conditions might not be able to address. They submitted that the terms should be no longer than would be necessary for the appellants to complete transition to alternative sources, and that 12 months should be sufficient.

[506] Counsel for Te Uri o Hau observed that 20-year terms would represent two-fold increases over the expiring terms, and contended that the appellants had not provided a sufficient basis for the increase. They too remarked that there had been no evidence of need for a longer term to protect investment; that there had been evidence of the rather limited operational requirements to enable extraction of the sand; and evidence of other sources of supply available to the appellants. They argued that significant potential adverse effects on the environment of continued extraction warrant a substantially shorter term, and contended that 2-year terms would be sufficient for the appellants to secure alternative sources of supply.

[507] The appellants responded that reductions in the amount of sand that could be extracted, and in the size of the extraction site, would be within the scope of the Council's powers on review.[166]

Consideration

[508] We start our consideration of this topic by identifying the applicable law.

[166] Citing *Kuku Mara v Marlborough District Council* Environment Court Decision W25/02.

[509] By section 123(c) of the Resource Management Act, the period for which the coastal permits may be granted may be specified in the consents, and is not to exceed 35 years. If no term is specified, the term is 5 years from commencement.

[510] The cases on the duration of resource consents were reviewed in *PVL Proteins v Auckland Regional Council.*[167] Unlike the proposals now before the Court, that was a case of discharge to air, so we adapt the following passages from that decision to make them applicable to this case:

> A decision on the appropriate term is to be made for the purpose of the Act, having regard to the actual and potential effects on the environment and relevant provisions of applicable instruments under the Act, the nature of [the activity], the sensitivity of the [environment affected], the applicant[s'] reasons, and any possible alternative [sources], including [from] another ... environment.
>
> Uncertainty for an applicant of a short term, and an applicant's need (to protect investment) for as much security as is consistent with sustainable management, indicate a longer term. Likewise, review of conditions may be more effective than a shorter term to ensure conditions do not become outdated, irrelevant, or inadequate.
>
> ... expected future change in the vicinity has been regarded as indicating a shorter term. Another indication of a shorter term is uncertainty about the effectiveness of conditions to protect the environment (including where the applicant's past record of being unresponsive to effects on the environment and making relatively low capital expenditure on alleviation of environmental effects compared with expenditure on repairs and maintenance or for profit. In addition, where the operation has given rise to considerable public disquiet, review of conditions may not be adequate, as it cannot be initiated by affected residents.
>
> The [Auckland] Regional Council submitted that an activity that generates known and minor effects on the environment on a constant basis could generally be granted consent for a longer term, but that one which generates fluctuating or variable effects, or which depends on human intervention or management for maintaining satisfactory performance, or relies on standards that have altered in the past and may be expected to change again in future should generally be granted for a shorter term. We accept that in general those propositions might influence decisions on the term of ... consents.[168]

[511] We now consider the application of the various factors identified in those passages to the circumstances of this case.

[167] Environment Court Decision A061/01.
[168] Ibid, paras 27, 30-32.

[512] The appellants' reasons for seeking 20-year terms include the quality and value of Pakiri sand which, in the absence of unacceptable adverse effects, should be available to contribute to the economic and social well-being and health and safety of people and communities in the Auckland region. As we have found that the proposal would not have significant adverse effects on the environment, we accept that this is relevant to the purpose of the Act.

[513] We are not aware of any indications in the applicable statutory instruments to guide setting the term of coastal permits for sand extraction. The nature of the activity is extraction of sand from a broad embayment from which sand has been extracted for 85 years without any causative link with any adverse environmental effect having been established. The environment that could be affected is sensitive, and it is possible that sand of similar quality may be available from other sources, although the environmental effects of doing so are not known to us.

[514] The appellants proposed revised monitoring and review conditions, and they were supported by the opponents. This is a case in which those conditions may be more effective than shorter terms to ensure that the consent conditions do not become outdated, irrelevant or inadequate.

[515] There is no basis for expecting future change in the vicinity that would indicate shorter terms, nor is there uncertainty about the effectiveness of proposed consent conditions to protect the environment. There is no record of the appellants having been unresponsive to adverse effects on the environment reliably attributable to previous extraction. Although there has been some public disquiet, the Regional Council's participation in these appeals gives us to expect that it would itself initiate review of conditions if it possessed evidence justifying that course. Further, one or more of the other opponents could apply for an enforcement order if relevant evidence was available of adverse effects caused by the sand extraction beyond those recognised by the grantor.[169]

[516] There is no basis for finding that sand extraction generates fluctuating or variable effects, nor that it depends on human intervention or management for maintaining satisfactory performance, nor that it relies on standards that may be expected to change in future.

[169] RMA, s319(2).

[517] Overall there are several respects indicating longer terms than the default term of 5 years, or even that of the 10 years of the grants being replaced. Even so, it is our judgement that, in the absence of a demonstrated need for longer terms to protect capital investment in plant, terms for as long as 20 years would not be justified. We judge that terms of 14 years from commencement would be appropriate in the circumstances.

[518] To avoid any wrong inference that we have reduced the terms from the 20 years sought because of uncertainty about the effects, this decision should be read in full. It is simply that in our opinion, terms of 20 years are not warranted. Effectively the appellants will have continued extraction for over 16 years, as the previous consents being replaced expired on 8 February 2004, and extraction has continued meanwhile (presumably under section 124 of the Act).

Consent conditions

[519] We now address the consent conditions proposed by the appellants, and the submissions on them by other parties. We do so on the basis that we should evaluate the applications as if appropriate conditions would be attached to the consents sought, if they are granted.

[520] In general terms the appellants sought coastal permits on the same terms and conditions as those of the existing coastal permits. However they proposed some alterations to the conditions of the previous consents. The first difference between the existing consent and the application now before us was in the annual volumes of sand extraction sought. These are listed below:

	Existing permit:	New application:
McCallum Bros.	45,000m^3	49,000m^3
Sea-Tow	25,000m^3	27,000m^3

[521] In addition the appellants also proposed slight amendments to the area of the extraction sites. The extraction sites authorised by McCallum Bros' existing coastal permit comprise two areas which are approximately 4.5 kilometres long and half a kilometre wide, located to the north and south of Te Arai Point. The Sea-Tow coastal permit identifies a separate site adjoining the McCallum Bros' site to the south of Te Arai Point. The applications propose minor amendments to the location

of the extraction sites, principally to give a wider berth to Te Arai Point. Both applications extend to the same areas north and south of Te Arai Point.

[522] The appellants also propose revised monitoring and review conditions. When the previous coastal permits were granted, monitoring of the beach profiles was adopted as an appropriate mechanism for identifying observable physical changes in the foreshore, and significant variations in the volumes of sand on the beach and in the dune system.

[523] The appellants' case was that the Sand Study and other evidence had not identified that the extraction had caused any such changes; and had not resulted in any significant erosion of the coastline. Nevertheless, the appellants accepted that the monitoring regime is an appropriate safeguard, and should continue.

[524] However, as a result of modern advances in technology and, particularly, the increased access to satellite technology, more accurate information can now be obtained relatively easily and the costs of that are not prohibitive. The appellants were willing to accept revised conditions to require monitoring of that kind. They also proposed a review condition that would enable appropriate action to be taken if signs of adverse effects become apparent.

[525] Mr Benson presented evidence commenting on the appellants' proposed conditions, and presenting suggestions of his own.

[526] Mr Benson accepted that a topographical survey method proposed by Mr Todd would be able to survey a large number of points over a large area in short period of time. However the witness questioned what that survey would be aimed at achieving; and whether it would allow parties to distinguish the effects of sand extraction from natural variability. Mr Benson observed that the survey would not cover the entire area over which adverse effects may occur (the whole embayment); and remarked that the frequency of monitoring and spatial resolution would yield limited value, especially offshore bathymetric surveys; that the methods for analysis of data were not specified; that the triggers for review are based on part of the beach where long-term data are required even to discern natural variability; and that the further data that would be gained would not have sufficient detail.

[527] Mr Benson proposed an alternative monitoring programme, adopting an adaptive approach, and a short-term intensive monitoring programme adjacent to the extraction site and at control sites.

[528] In cross-examination, Mr Benson agreed that one of the problems of the alternative approach he had suggested would be the difficulty of obtaining sufficiently precise measurements of external inputs to the system. He acknowledged that the range of estimated total volume of sand in the dunes is from 92 million to 552 million cubic metres; and offshore from 82 million to 142 million cubic metres of Holocene sand, and between 1.7 million and 3 billion cubic metres of Pleistocene sand essentially of the same composition.[170] The witness agreed that the margins of error are likely to exceed the proposed level of sand extraction;[171] and agreed that monitoring should be to detect whether longer-term shore-line retreat is occurring.[172]

[529] Mr Benson agreed that he had not made any assessment of the cost to the appellants of the surveys that he had suggested, nor of the difference between the cost of that programme and the survey programme that would be required by the conditions proposed by the appellants; nor of the cost of the additional bathymetric survey.[173]

[530] Mr Benson also proposed a condition confining extraction during the first two years of the terms to an area south of Te Arai Point, to mitigate potential effects on fairy terns.[174] He agreed in cross-examination that these birds adapt to the natural variability that occurs on the coast; and that the part of the beach south of Te Arai Point is subject to different natural processes in that the groyne effect starves it of sand, and it does not get the benefit of long-shore drift of sand.[175] He also agreed that the means by which he sought to maximise the potential for determining adverse effects is to require concentration of sand extraction there to maximise the effects over the two –year period (doubling the amount extracted); and also to maximise the monitoring effort.[176] In cross-examination his criticisms of the appellants' proposed monitoring regime amounted to very little.[177]

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[170] Tranbscript, p 649.
[171] Idem.
[172] Ibid, p651.
[173] Ibid, pp655.
[174] Ibid, p658.
[175] Ibid, p659.
[176] Ibid, pp 660, 661.
[177] Ibid, pp 668-672.

[531] We are not satisfied that the additional cost of complying with the alternative conditions proposed by Mr Benson would be justified; nor are we satisfied that imposing that additional cost on the consent-holder would be reasonable. Further, we understand the appellants' questioning of the proposed requirement confining extraction during the first two years to the area lying to the south of Te Arai Point. That would not benefit the fairy terns, and would not fairly relate to the exercise of the proposed coastal permits. We are not persuaded that the alternative monitoring programme proposed by him would be commensurately better than that proposed by the appellants for the purpose of identifying and measuring any effects of the proposed extraction.

[532] The Friends of Pakiri Beach suggested that the review conditions could be supplemented by a condition stating that a premise of consent is the appellants' contention that sand extraction will not have adverse effect on coastal processes.

[533] We do not consider that would be appropriate. We have stated in this document our findings on the claims of adverse environmental effects of the proposed extraction. There are conditions specifically designed to ensure that no adverse effects occur. If evidence of adverse environmental effects becomes available, the Regional Council could initiate review of conditions, or it or any other party could apply for an enforcement order.

[534] The Friends of Pakiri Beach also proposed that the appellants be required to undertake a monitoring programme to measure external inputs of sediment into the embayment, and that the review conditions be amended to link extraction volumes with external inputs. However we have not identified any evidence of how that could be done. The appellants have also contributed substantially to the Sand Study, which they contend was unable to accurately measure external inputs. Although the results of any such monitoring might be of public interest, it seems to us to be an impractical and inappropriate imposition on consent-holders, given that the proposed extraction is in such a relatively small part of the whole embayment.

[535] Much was made about the accuracy of the monitoring methods used on the beach. With technological advances, the methods available and their accuracies have improved since the Sand Study, and are much better than was contemplated when the previous permits were granted. If modern measuring equipment is used, any changes in beach or dune volumes that are too small to measure would have negligible effect.

[536] Te Uri O Hau proposed a condition requiring that a further biological assessment be imposed, and questioned why the condition to that effect in the conditions of the previous coastal permits is proposed to be dropped. Te Uri O Hau presented no expert evidence to support this proposal.

[537] We find that the original condition related to a 'one-off' survey to be completed within three years of the consents commencing, that this survey was undertaken, and that nothing of significance was found. Dr Grace, a consultant specialising in marine biology, confirmed that there is nothing to find. We consider that a condition requiring a further biological survey would not be warranted.

[538] Te Uri o Hau also submitted that the appellants should be required (presumably by way of a condition of consent) to convene a community liaison group to address community concerns, meetings to be six-monthly.

[539] The appellants responded that the significant issues in this case involve complex matters of engineering and sand science, rather than matters of community interest. They observed that the operations of the barge are well understood and have been experienced by the residents for many years, and that no significant changes are anticipated. In addition McCallum Bros have had informal contact with residents over many years, and this would continue.

[540] The concerns of the Maori expressed to us by witnesses relate to two main questions: their claim to ownership of the sand resource, and their concern (in common with the Friends of Pakiri Beach and others) that sand extraction is a cause of depletion of the sand resource, and likely to result in erosion of sand dunes and retreat of the shoreline, with various consequential effects.

[541] Ownership of the sand resource is not a resource-management issue, and a condition of resource consent would not be a valid or effective way of addressing disputes about it. Whether the sand resource is depleted by extraction as proposed is a difficult scientific question, as was apparent in the expert evidence already referred to. Having analysed and considered the evidence of several expert witnesses on the topic, we have given our findings. We are not persuaded that a consent condition requiring six-monthly community liaison meetings to address community concerns would be valid or appropriate. Such a requirement would simply impose burdens of time and expense that would not be justified.

[542] In the closing stages of the hearing, Mr Tahitahi suggested further conditions. He sought that the appellants be required to fund the Manuhiri Omaha Kaitiakitanga Ora (MOKO) Trust Board to commission a study to identify waahi tapu and other taonga that might be adversely affected by the extraction.

[543] There was no evidence before the Court about the location of any waahi tapu or other taonga that could conceivably be affected by exercise of the coastal permits sought. We find the proposed condition to be unjustified and inappropriate.

[544] The other condition sought on behalf of the MOKO Trust was to the effect that the appellants provide it with advance copies of any monitoring reports, so that they could have input that would then be incorporated as an appendix to the reports before they are lodged with the Auckland Regional Council.

[545] The appellants stated that they are willing to provide the MOKO Trust with copies of monitoring reports lodged with the Auckland Regional Council, and would do so on request. However they opposed the imposition of the proposed consent condition.

[546] We consider that the proposed condition would interpose the MOKO Trust between the appellants and the consent authority in respect of expert scientific and engineering matters. That would be inappropriate. The appellants (or their professional consultants) should present the reports direct to the Regional Council, as the authority responsible for administering the consent conditions. If the MOKO Trust wished to present comments on any such report to the Regional Council, they could no doubt do so in the normal course of democratic process; but that would not be a valid or appropriate requirement of a consent condition.

[547] In summary, we find that our consideration of the applications should proceed on the basis that if the consents are granted, they would be for 14-year terms, and on the conditions proposed by the appellants, but not including the modifications proposed by the Regional Council, the Friends of Pakiri Beach, Te Uri o Hau, or the Manuhiri Omaha Kaitiakitanga Ora Trust Board.

Applications of findings to planning instruments

[548] We now apply the relevant provisions of the planning instruments to the case. Evidence bearing on that was given by three resource management consultants, Ms Leijnen, Mr Benson, and Mr Serjeant.

[549] Mr Serjeant prefaced his evidence on that topic with the observation that the proposed activity can only be undertaken viably within the coastal marine area, because although sand can be extracted from river-beds or from land, that sand is not of equivalent quality or quantity, is difficult operationally, and the activity has more environmental effects.

[550] This witness had prepared his evidence on the combined opinions of Dr Barnett, Dr Goring and Mr Todd that the extraction would not have significant effects on the beach and dunes. Mr Serjeant applied the relevant policies of the New Zealand Coastal Policy Statement, and the Auckland Regional Policy Statement; and also the relevant objectives and policies of the Auckland Regional Plan: Coastal. Mr Serjeant formed his opinion on the basis of the evidence that the extraction activity would not adversely affect the beach and dunes, and on the proposed limit in the amount of sand to be extracted, and in the time over which it can be extracted; and the proposed conditions including a monitoring regime. He gave the opinion that the proposal would not be inconsistent with the regional policy regime, and would be consistent with the purpose of the Resource Management Act. He observed that the lack of primary effect determines that secondary effects on natural character, on important flora and fauna, and important resources of tangata whenua, would remain unaffected.

[551] Mr Benson's evidence applying the relevant planning provisions to the case was predicated on the activity having potential adverse physical effects on the environment, relying on the opinion evidence of Drs Hume, Hilton and Dowding. He considered that those effects would lead to degradation of the natural character and landscape of the coastal environment; degradation of areas of significant indigenous vegetation and significant habitats of indigenous fauna; adverse cultural effects on tangata whenua; and degradation of amenity values, including public access and recreational activities.

[552] On those bases, Mr Benson methodically identified the relevant planning provisions; and considered that the proposed extraction would be contrary to a number of key policies in the New Zealand Coastal Policy Statement, the Auckland Regional Policy Statement, and the Auckland Regional Plan: Coastal; and would not give effect to the Hauraki Gulf Marine Park Act. He also considered that there are alternative sand sources, and that any adverse effect on industry of refusing the applications would most likely be short term. The witness concluded that 'ultimately' sand extraction is not sustainable, and inappropriate in this part of the coastal marine area.

[553] Ms Leijnen relied on the opinions of Dr Dean and Mr LaBonté that the sand resource is a closed system, and that sand extracted would result in a net loss of sand to the system, leading to likely cumulative degradation of it. In her evidence-in-chief she identified many relevant planning provisions, and given the technical evidence on which she relied, concluded that the proposal runs contrary to, and is not supported by, them.

[554] In cross-examination, Ms Leijnen stated that she had accepted that sand extraction contributes to the social and economic wellbeing of people and communities in the region, but was unable to identify where that had been stated in her evidence-in-chief.[178] She also accepted that she had not in her evidence-in-chief referred to provisions in the Auckland Regional Policy Statement that supported the appellants' case; and had not discussed the economic efficiency of the proposal.[179]

[555] Of course the resource management experts were entitled to form their opinions on the proposal in reliance on the opinions of technical experts who were called to give evidence. However an expert witness's independence of the case of the party who calls the expert is more evident if the witness expressly refers to and assesses factors that may favour another party's case. And of course in this case we have not ourselves accepted the opinions of the witnesses relied on by Mr Benson and Ms Leijnen, so the basis of their own opinions as resource management experts is undermined.

[178] Ibid, pp502-503.
[179] Ibid, pp504-505.

[556] In the event, our findings on the closed system question, and on the alleged adverse physical effects of the extraction on the volume of sand in the beach and dunes, were a general acceptance of the opinions of the experts relied on by Mr Serjeant; and an unwillingness to accept the opinions of the experts relied on by Mr Benson and Ms Leijnen. Neither of the latter witnesses gave evidence on the application of the planning instruments to the case on the hypothesis of those findings. But Mr Serjeant did, and having reviewed his evidence we accept his opinions.

[557] In summary, we find that the proposed sand extraction would serve some of the relevant provisions of the applicable planning instruments; and would not be contrary to others relied on by Mr Benson and Ms Leijnen.

Evaluative judgement of proposal

[558] We now come to the evaluative judgement of whether the purpose of the Act is better served by granting the applications or by refusing them. In doing so, we have duties under Part 2 of the Act, which states its purpose and principles.

[559] By section 6, we are to recognise and provide for the preservation of the natural character of the coastal environment (including the coastal marine area), and its protection from inappropriate use; the protection of areas of significant indigenous vegetation and significant habitats of indigenous fauna; the maintenance and enhancement of public access to and along the coastal marine area; and the relationship of Maori and their culture and traditions with their ancestral lands, water, sites, waahi tapu, and other taonga.

[560] By section 7, we are also required to have particular regard to kaitiakitanga; the efficient use of natural and physical resources; the maintenance and enhancement of amenity values; maintenance and enhancement of the quality of the environment; and any finite characteristics of natural and physical resources.

[561] Parties opposing the appeals called opinion evidence to the effect that the sand system is closed, and the consequential effects on the coastal environment. If we had accepted those opinions, carrying out our duties of recognising and providing for the preservation of the natural coastal character, protecting it from inappropriate use, protecting habitats of valued indigenous bird species, and recognising and

providing for Maori relationships might all have been substantial elements to be weighed against the positive and beneficial effects of the proposal. So might carrying out our duties of having particular regard to kaitiakitanga; and to the maintenance of amenity values, of the quality of the environment, and of finite characteristics of sand in a closed system.

[562] However in the event we did not accept those opinions. Our findings were to the contrary. The elements of our duties under Part 2 that apply arise from our findings about the efficient use of natural and physical resources; and maintenance of the quality of the environment, to which we have particular regard.

[563] We return to the single purpose of the Act set out in section 5. The meaning of the term "sustainable management" is stated in section 5(2). We accept the appellants' submission that as sand is a mineral, we are not required, in making that judgement, to consider sustaining the potential of the sand to meet the needs of future generations.[180] We also accept the Director-General's submission that this does not exclude application of the other elements of sustainable management.[181]

[564] The positive or beneficial effects of the proposal, in the absence of adverse effects such as those described by the opponents' experts that were not accepted by us, demonstrate that the rate of the proposed use of the sand resources would enable people and the community to provide for their social, economic and cultural well-being and for their health and safety. On our findings, the activity would not imperil the life-supporting capacity of air, water, soil or ecosystems; and on the proposed conditions would avoid and mitigate any adverse effects on the environment.

[565] Therefore it is our judgement that the purpose of promoting the sustainable management of natural and physical resources (as those terms are defined) would be better served by granting the coastal permits sought for 14-year terms on the conditions proposed, than by refusing them.

Determinations

[566] The Court therefore makes the following determinations:

(a) The appeals are allowed:

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[180] *Sea-Tow v Northland and Auckland Regional Councils* [1994] NZRMA 204.
[181] *Gebbie v Banks Peninsula District Council*[2000] NZRMA 553 (Panckhurst J).

(b) The respondent's decision is cancelled:

(c) The applications are granted:

(d) Coastal permits are authorised for 14-year terms on conditions to the effect of those proposed by the appellants at the appeal hearing:

(e) Draft formal orders to give effect to this decision may be prepared by counsel for the appellants, lodged with the Registrar, and served on the other parties. The respondent and any other party has leave to lodge and serve written submissions, on matters of drafting only, within 10 working days of receiving the appellants' draft orders, the appellants having leave to lodge and serve written replies within 10 working days of receipt.

(f) The question of costs is reserved. Any application may be made in writing, and lodged and served within 20 working days of the date of this decision. Any response may be made in writing, and may be lodged and served within 15 working days after receipt of the application. A party applying for costs may reply within 10 working days.

DATED at Auckland this 30th day of May 2006.

For the Court:

D F G Sheppard
Alternate Environment Judge

THE SEAL OF THE ENVIRONMENT COURT NEW ZEALAND

TAB 5

ORIGINAL

Decision No. A96/98

IN THE MATTER	of the Resource Management Act 1991
AND	
IN THE MATTER	of two appeals under clause 14 of the First Schedule to the Act
BETWEEN	**WINSTONE AGGREGATES LIMITED**
	(RMA 162/95)
AND	**AUCKLAND REGIONAL COUNCIL**
	(RMA 174/95)
	Appellants
AND	**PAPAKURA DISTRICT COUNCIL**
	Respondent

BEFORE THE ENVIRONMENT COURT

Environment Judge R G Whiting (presiding)
Environment Commissioner J R Dart
Environment Commissioner R F Gapes

HEARING at AUCKLAND on 1, 2, 3, 4 & 5 December 1997 and 18,19 & 20 February 1998

APPEARANCES

Mr F G Herbert for the Papakura District Council
Mr J M Savage for the Auckland Regional Council
Mr M R G Christensen and K J Catran for Winstone Aggregates Limited
Mr J Kingston for the K L Richardson Estate

THE SEAL OF THE ENVIRONMENT COURT NEW ZEALAND

CONTENTS

DECISION

1. Introduction

[1] These appeals concern the appropriate objectives, policies, methods and rules in the Papakura District Council's ("the Council") proposed plan to address the effects arising from the extraction of aggregate. Winstone Aggregates Limited ("Winstone") owns a relatively large portion of land at Hunua. According to present-day planning, this contains two areas wherein the extraction of aggregate is expected to be economically viable. They are the "Hunua Excavation" and "Symonds Hill Excavation" areas. The Hunua excavation is an existing quarry, whilst the Symonds Hill excavation area has potential for future quarrying operations. The evidence established that other nearby areas may be investigated in the future for their aggregate potential and be found economically extractable. The evidence established that the aggregate reserves at Hunua and Symonds Hill constitute a resource of some significance.

[2] It was clear from the evidence that quarries, by their very nature, commonly have adverse effects on the surrounding land and that activities such as residential, educational and community activities are particularly sensitive activities in proximity to them.

[3] The potential conflict between quarrying activities and other land use activities that are sensitive to their effect, creates important resource management issues associated with quarrying. The first is, to what extent should the environment be protected from the adverse effects of quarrying. The second is, to what extent should aggregate and its extraction sites, as natural and physical resources, be protected from the adverse effects of incompatible activities.

[4] These two management issues reflect, on the one hand, the extent to which a quarry operator should be required to internalise the adverse effects of quarrying and, on the other hand, the extent to which adjacent landowners should have the use of their land constrained.

[5] The two management issues, of their very nature, lead to conflicting interests between quarry operators and adjacent landowners. But the heart of this case is a consideration of the two issues from a resource management perspective, to ensure that the appropriate objectives, policies and rules reflect the purpose and intent of the Resource Management Act 1991 ("the Act").

2. Appeals

[6] These are references to the Environment Court under clause 14 of the First Schedule to the Resource Management Act 1991. The Auckland Regional Council ("the ARC") has referred the matter to the Court on the grounds that the objectives, policies and rules of the proposed plan of the Council do not cater adequately for the protection of mineral resources. The ARC also requested an Aggregate Resource Protection Area (a buffer area surrounding the quarry), hereinafter referred to as the "ARPA", in which to treat as discretionary activities all those subdivision and other uses, such as residential, educational and community activities, which would be sensitive to the effects of the quarry.

[7] Winstone has appealed, on the grounds that the objectives and policies provided for in the proposed district plan fail to provide for the sustainable management of minerals and, specifically, fail to facilitate the identification of mineral resources and their protection from encroachment by other potentially conflicting land uses. Their reference also requests a change to the rules, and to provide for an ARPA around the company's existing Hunua Quarry zone, similar to that requested by the Auckland Regional Council. They maintain that there should be some restriction on activities

which locate near the company's quarry, because of the potential conflict between the quarry and such other activities which may be sensitive to the effects of quarrying. They also request exclusion of the proposed Nature Conservation zone from land owned by Winstone within the quarry zone, as the inclusion of such land within the Nature Conservation zone could compromise the long term productive use of the mineral resource.

3. Background

(a) Aggregate Resources

[8] There are two major quarries in the Papakura District. The first is operated by the referrer, Winstone, and is located in Hunua Gorge; and the other by W Stevenson & Sons Limited, situated in Drury. Both are well established activities, which have long been given planning recognition through specific quarry zoning in previous planning schemes. To the north of the existing quarry, is a further area of potential resource, known as the Ardmore Quarry Road Rock Resource, presently designated for defence purposes. Winstone is presently discussing the future of that rock reserve with the Ministry of Defence.

(b) Transitional plan

[9] Both of the major quarries have been zoned Rural 6 in the transitional plan. A copy of the Rural 6 zone is attached as "Attachment A". The purpose of the Rural 6 zone is to cover areas where quarrying is undertaken on a large scale in the district. It provides also for uses associated with quarrying, and industries using quarried material. The zone contains a limited number of rules (or ordinances as they were then known) limiting the quarrying activities. These include a rule containing the effect of explosive blasting outside the quarry zone (a ground vibration standard), and a rule providing that all excavation and stockpile areas are to be kept at least 30 metres from any boundary of the zone. The rules of the zone do not contain any special

requirements about noise. Quarrying is a permitted activity, subject only to the restrictions of the yard and vibration standards.

[10] The land surrounding the Rural 6 zone at Hunua is in the Rural 1 zone of the transitional plan. This is the general rural zone applying to most rural land in Franklin County. As previously mentioned, land to the north of the quarry is designated for defence purposes. A Rural 4 zone provided for rural-residential development near Ponga Road and Coal Mine Road to the south-west of the quarry. Additional land in this area was zoned Rural 4 by Change No. 17, which became operative in 1988.

(c) Proposed Plan

[11] The respondent decided to prepare its proposed plan in sections of which there were two in the plan as publicly notified – **Section 1, Rural Papakura and Section 2, Urban Papakura**. Later, as a consequence of the hearing of submissions, the Council decided to reformat the proposed plan so that there are now 3 sections: **Section 1, General; Section 2, Rural Papakura; and Section 3, Urban Papakura**. The Council decided the two existing quarries in the district (Winstone's Hunua Quarry and Stevenson's Drury Quarry), would be included in the urban part of the proposed plan, and would be given a zoning of "Quarry". Quarrying in the quarry zone is subject to a range of controls. For completeness we attach as "Attachment B", a copy of the rules for the quarry zone, following the decisions of the respondent on submissions. Quarrying is subject to considerably more controls than was the case under the transitional plan.

[12] Quarry operations are to be constrained by the need to comply with noise, vibration and air blast standards, which relate to nearby dwellings. The quarry zone rules use the notional boundary technique, which controls noise and vibration only near dwellings. The rules also provide that when a quarry activity moves over to Symonds Hill, a quarry management plan will be required to be submitted "to the Council for its retention".

[13] The quarry zone at Hunua is an isolated island of "Urban" zoning, surrounded by land zoned in the rural section of the proposed plan. In the proposed plan as notified, all land surrounding Hunua Quarry continued to be in a general rural zone, the Rural Papakura zone. The designations for defence purposes in the transitional plan were carried on into the proposed plan. With regard to the issue of protecting aggregate resources, the planning implication of the designated land in close proximity to the quarry is, that there is practically no threat of the designated land being used for activities which are sensitive to the effects of quarrying, because such activities are incompatible with the purpose for which the land is designated. Designated land near the quarry is therefore a natural buffer or protection area for the quarry.

[14] Likewise, but for different reasons, the General Rural zoned land surrounding the Hunua quarry also acts as a natural buffer or protection area for the quarry because of the limited potential for the carrying on of activities (particularly residential activities) which are sensitive to quarrying.

[15] Following the public notification of the proposed plan, ARC made a number of submissions. The ground for one of those submissions was: that insufficient provision had been made for the identification of mineral resource areas and the protection of mineral resources through objectives, policies and rules. The ARC also requested that a nature conservation zone be applied over areas of indigenous bush in the district.

[16] Winstone was also a submitter. Its submission was, essentially, that provision should be made for a 500 metre buffer around a quarry zone, and around significant resources (particularly on the north side of Hunua Gorge Road) and that subdivision and certain uses within the buffer area which could be adversely affected by quarry operations, should not be permitted.

The company suggested that those activities adversely affected by quarry operations should have discretionary activity status within the buffer zone.

[17] Judge K L Richardson (now deceased) was also a submitter. Judge Richardson's submission sought that the zoning of Ponga Road be reviewed and that the same zoning should be applied to both sides of the road, or as much of it as the Council deemed appropriate. That submission also opposed the appropriateness of using the Richardson land as a buffer for the quarry. A submission similar to that of K L Richardson was lodged by Mr N B Richardson, the son of the judge, who was then living next door.

[18] The land is now owned by the estate of the late judge; we will refer to it as "the Richardson land". The Richardson land is next to the Winstone quarry zone, and is separated from it in part by the Symonds Stream. It lies to the south and west of the quarry zone. Symonds Hill, in the quarry zone, is elevated above the Richardson land.

[19] Winstone did not oppose the two Richardson submissions by way of further submission. However, the Auckland Regional Council did lodge further submissions opposing the Richardson submissions, and stated that "the reasons for opposition included adverse effects of rural-residential development on quarry operations and potential mineral resources".

[20] In its decisions on submissions, the respondent changed the proposed zoning on the Richardson property to rural-residential, and imposed also, a nature conservation zone on areas of indigenous bush along Symonds Stream and to the north of Hunua Gorge Road. On behalf of the respondent, Mr Herbert submitted that, except for the proposed quarrying of Symonds Hill, the Richardson land is suitable for the proposed rural-residential zoning. To that extent, the respondent does not contest the Richardson estate zoning.

[21] The respondent rejected the submissions of the ARC and of Winstone, essentially, on the grounds that it was unrealistic for the Council to provide for an unidentified potential mineral area, and that the objectives and policies of the plan adequately recognise mineral resources in the district. The respondent considered that it was inappropriate for the Council to restrict activities on land which is not held by the quarry industry. So far as the latter reason is concerned, the Council said:

"The effects of present and future quarry operations should be restricted to the site of those operations. That is, the responsibility for mitigating the effects of quarries rests with the quarry operator".

[22] The Council, by its decision, recognised the first management issue (internalisation of effects), but rejected the second management issue,(constraints on adjacent land).

[23] Following the release of the decisions of the respondent, references were lodged by Winstone and the ARC on the grounds that the respondent had not granted the relief sought by the appellants..

(d) Zoning of lands surrounding Hunua Quarry

[24] The details relating to the zoning of land surrounding Hunua Quarry are unchallenged. Those details were provided for us in the evidence of Ms C Crampton, a consultant planner, who gave evidence on behalf of Winstone. She told us that the zoning pattern of land around Hunua Quarry which arises from the decisions on submissions, is more complicated than the single Rural Papakura zone of the proposed plan as it was notified. As a result of the Council's decisions, the land surrounding the quarry zone is now in 3 zones: Rural Papakura, Rural-Residential and Nature Conservation. Nearly all the land in the Rural-Residential zone which is in the proposed ARPA, is south-west of the quarry zone and separated from it by Symonds Stream. Also, there is a strip of Nature Conservation zoned bush along the Symonds Stream. The land in the Rural-Residential zone

which is also in the proposed ARPA, is almost entirely on the Richardson land.

[25] The decision by the respondent to change the Richardson land from Rural Papakura zone to Rural-Residential zone has not been referred to this Court by either of the appellants. However, it was urged upon us, both by Winstone and by the ARC, that the decision to change the zoning gives additional development potential to and near Hunua Quarry. This could jeopardise the Symonds Hill Quarry, which has been planned for quarrying and specifically zoned as such in the district plan for many years. Both appellants were opposed to the rural-residential zoning because of the effect it may have on the quarry operation and on mineral resources in the area, and because it is contrary to the regional perspective expressed in the proposed regional policy statement.

[26] It was submitted to us, both by Mr Christensen, counsel for Winstone, and by Mr Savage, counsel for the ARC, that we should recognise the inappropriateness of the rural-residential zoning on the Richardson estate land, and direct a change to the proposed plan, requiring it to be zoned Rural Papakura under section 293 of the Resource Management Act 1991.

(e) Section 274 parties

[27] There are two Section 274 parties. The K H Richardson Estate, and W Stevenson & Sons Limited. The respondent has agreed with W Stevenson & Sons Limited to undertake a study of the effects that sensitive activities would have upon its quarry, following the outcome of the decision in this case. W Stevenson & Sons Limited did not pursue their right to take part in this hearing.

[28] The Richardson estate is opposed to the ARPA and, through its counsel, Mr Kingston, mounted a determined attack on the appellants' case It was also contended by Mr Kingston, that the rules of the quarry zone as proposed

provided neither sufficient control, nor for a quarry management plan which in turn would make adequate provision for the control of adverse effects. He submitted that we should direct a change to the proposed plan, requiring noise and vibration limits to be applied at the quarry boundary instead of at the notional boundary.

(f) The draft consent order

[29] Following the filing of the appeals the respondent, Winstone and the ARC met with the object of reaching a consensus on changes which could be made to the proposed district plan. This was finally achieved, and the amended provisions consented to are annexed as "Attachment C". The effect of the consent order, if incorporated in the proposed plan, would be to amend the objectives, policies and rules, in a way which would make it clear that the extraction of minerals and the operation of existing quarries was not to be unduly compromised. This includes provision for prospecting, where the effects would not be more significant than are permitted for normal farming activity.

[30] The draft consent order also proposes that rules in three of the zones in the proposed district plan – the Rural Papakura zone, the Rural-Residential zone, and the Nature Conservation zone - are to be amended. The new rules provide that an ARPA (or buffer area) extending 500 metres from the boundary of the present and future operations of the Hunua Quarry is to be imposed. Within this "buffer area", subdivision, residential, educational and community activities are to be regarded as sensitive activities. Whereas they would otherwise be permitted or controlled activities elsewhere in the zone, they would be discretionary activities within the ARPA.

[31] The effect of the draft consent order is to incorporate into the objectives, policies and rules of the proposed plan, the second management issue constraining the use of land owned next to the quarry. This negates the Council's view expressed in its decisions, that it is the responsibility of the

quarry operator to mitigate effects and restrict them to the site of quarry operations. It also negates the Council's view that it is inappropriate to restrict activities on land not held by the quarry industry.

(g) Proposed Auckland Regional Policy Statement

[32] Section 74 of the Act provides that a territorial authority shall have regard to any proposed regional policy statement when preparing and changing its district plan in accordance with its functions under section 31, the provisions of Part II, its duty under section 32 and any regulations.

[33] We therefore consider the present position regarding the proposed Auckland regional policy statement (PARPS). The PARPS is subject to references to the Environment Court.

[34] Mr H D Jarvis, the Senior Planning Co-ordinator with the Auckland Regional Council, gave evidence on behalf of that body. He told us that, so far as the present appeals are concerned, the relevant provisions of the proposed statement are contained in Chapters 2 and 13. Chapter 2 provides an overview of the major resource management issues facing the region, and provides a strategic framework to achieve integrated management. References relating to the strategic direction and the urban provision have been settled by the various parties and are recorded in an interim decision of the Court A94/96.

[35] Chapter 13 of the PARPS relates to minerals. It is one of ten chapters which set out the objectives, policies and methods to achieve sustainable and integrated management of major natural and physical resources, and of the regionally significant activities in the region. Chapter 13 is also subject to references to this Court. Parties which have appealed are Winstone, the NZ Mineral Industry Association and I H Wedding & Sons Limited. These appeals are concerned mainly with Policy 13.4(1) which relates to the avoidance of mineral prospecting exploration, extraction and processing in

locations where those activities would have an adverse effect on such matters as natural heritage values, cultural heritage values, the natural character of the coastal environment, the natural character of rivers, lakes and wetlands, elite land and locally significant heritage resources. These appeals have now been settled by consent of all parties. The main effect of the settlement is to add the word "significant" to references to effects and values.

[36] Mr Jarvis in his evidence pointed out the relevant parts of Chapter 2 and Chapter 13 (decisions version) so far as these appeals are concerned. As his evidence on this matter was essentially unchallenged, we set out in full those parts which are relevant. As to Chapter 2, Mr Jarvis said:

> *3.4 Chapter 2 identifies issues of strategic significance to the Auckland region. Issue 2.3.5 states:*
>
> ***"2.3.5 Some of Auckland's rural land is being adversely affected by inappropriate subdivision, use and development and this is compromising rural productivity, amenity values, rural character, soils and land resources". (Pages 2-8)***
>
> *3.5 The adverse effects of dispersing countryside living throughout rural areas are discussed:*
>
> ***"The dispersion of residential activities throughout the rural area can inhibit the efficient operation of rural activities and lead to a conflict between incompatible activities and expectations about the level of amenities in the rural areas". (Pages 2-9)***
>
> *3.6 The PARPS recognises that countryside living has the potential to undermine the policies of urban containment and intensification and the rural resource management policies. Accordingly, the countryside living policies of the PARPS reinforce the strategic direction:*
>
> ***"2.6.1 Policy: Urban containment and consolidation***
>
> ...
>
> ***3. Countryside living (see Appendix D) may only be provided for in defined locations in rural areas in ways that are consistent with the Strategic Direction, and so that: ...***
>
> ***(xiv) the extraction of regionally significant mineral resources will not be compromised;***
>
> ***(xv) conflicts do not arise between incompatible land uses". (Pages 2-16, 17)***
>
> *Countryside living is defined in Appendix D as:*
>
> ***"low density residential development on rural land. It includes the concepts of rural-residential development, scattered rural-residential lots, farmlets, residential bush lots, retirement lots, large-lot residential development and the***

like. It is similar to low density residential development where it occurs within urban areas".

3.7 *The subsequent methods state:*

"2.6.2 Methods

1. Provision shall be made in district plans for the urban development and countryside living of the Auckland Region to be contained within:

(ii) rural and coastal settlements and countryside living areas as defined by either: (b) ... in accordance with a change, variation or review to a district plan prepared on the basis of a district development strategy which is not inconsistent with the resource protection policies of the RPS ...

(v) takes into account the availability of countryside living areas and other low density residential areas in the district and the district of adjoining TAs

... "(Pages 2-17).

3.8 *Reasons 2.6.3 list effects of countryside living and includes the following explanation:*

"In order to limit these effects, areas for countryside living should be defined in strategic plans and district plans as provided for in Method 2.6.2-1 and through a structure planning process as provided for in Method 2.6.2.-3. This means that only limited and selected parts of the rural region, that can best function as suitable areas for countryside living, should be identified in district plans". (Pages 2-22)

[37] As to Chapter 13, Mr Jarvis said:

4.2 *Minerals, primarily aggregates, are essential for the development of the Auckland region. The PARPS states there are two issues:*

"13.2.1. Mineral extraction can have a range of adverse effects on the environment.

13.2.2 Competing activities and values can impose increased environmental and monetary costs on the community for minerals which are needed for development in the region. This also gives rise to inter-regional issues, as the Auckland region becomes increasingly dependent on the minerals of adjacent regions". (Pages 13-1,2)

The first issue recognises that the extraction of minerals involves processes which create effects such as sediment discharge, noise and vibration. The second issue recognises that extractive activities can be curtailed because of nearby urban development and rising community expectations regarding environmental quality. In my experience most value conflicts concerning mineral development can either be conventional urban development as near the Mt. Wellington Quarry or rural residential, otherwise known as countryside living, near quarries in rural zones.

4.3 *In my opinion the key policy in Chapter 13 in relation to these references is 13.4.1.2 which reads:*

"The development and use of land in the region will be managed so as to:

(i) Protect existing mineral extraction sites from activities which would unduly limit their operations, to the detriment of the regional environment, including its economy.

> *(ii)* ***Protect areas of minerals which have the potential to provide most effectively for the region's future needs from activities which may compromise the ability to extract, or provide access to, those deposits***
>
> ***..." (Pages 13-3)***

Method 13.4.2 states:

> *(4)* ***District plans and any relevant regional plans will make provision for the management of mineral prospecting, exploration, extraction, processing and the transportation of minerals.***
>
> *(5)* ***District plans and any relevant regional plans will contain provisions requiring mineral extractors to provide for the use of the site after extraction processes cease, so as to minimise present and future adverse effects on the environment. The fulfilment of such rehabilitation and aftercare responsibilities shall be secured by means of bonds or like measures.***
>
> *(6)* ***District plans and any relevant regional plans will include appropriate measures to protect existing or known potential mineral extraction sites, from the establishment of activities in adjacent areas, where they are likely to be sensitive to the adverse effects of extraction and processing***
>
> ***..." (Pages 13-3,4)***

[38] We were urged by Mr Savage, counsel for the ARC, to ensure that the district plan is not inconsistent with the proposed regional policy statement. He submitted that :

> *"In implementing those functions, the district council is obliged to ensure that a district plan is not inconsistent with any regional policy statement (section 75(2)(c). While it is accepted that the references to the regional policy statement in section 75 is to an operative document, the relevant provisions referred to by Mr Jarvis are beyond challenge and as indicated earlier the changes resulting from outstanding references do not detract from the specific provisions in the PARPS directed at protecting existing mineral resources from the establishment of activities likely to be sensitive to quarrying." (Paragraph 22).*

[39] While the Act requires that particular level of coherence between a regional policy statement and a district plan, the requirements are not the same for a proposed regional policy statement. By section 74(2)(a), a *"territorial authority"* shall have regard to —

> *(a) Any proposed regional policy statement or regional plan on a matter of regional significance in respect of its district; ...*

[40] Given the perceptivity of the plain words of section 74 [1], it would be incorrect to read the section in the manner suggested by counsel.

[41] The meaning of ("have regard to") has been considered in a number of decisions, notably in the context of section 104(1) of the Act. "To have regard to" a matter means that it is of material consideration, but that does not mean such rules or policies necessarily must be followed; *R V Westminster City* [2]. As was found in R V C D [3], these words are not synonymous with "shall take into account". The decision-maker does not have to strictly apply the policies or rules; they are required only to "have regard to". In "having regard to" the PARPS, we consider that the sections relevant to this reference are more or less settled, and that we can therefore expect the PARPS (once operational) to promote the protection of the aggregate resource. However, the Act does not require that a proposed district plan be consistent with a proposed regional policy statement. Should a district plan be found to be lacking in consistency at some future time, mechanisms exist within the Act for initiating changes, where appropriate. Having regard to the PARPS, we are mindful of the desirability of striking a balance between obligations and functions now and in the future.

4. THE REGIONAL SIGNIFICANCE OF AGGREGATE AS A REGIONAL RESOURCE

[42] The introduction to the Minerals Chapter of the PARPS (Chapter 13) states:

> *"Minerals are essential for the development of the region. Minerals of economic value which occur in the Auckland region are primarily aggregates which are used by the construction industry".*

[43] And:

> *"Most mineral deposits are fixed in location, unevenly distributed, and generally a non-renewable resource. The transportation of minerals involves high monetary costs and a*

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[1] We note (for completeness) that this section that was amended by the 1997 Amendment Act, and that the amendment retains the same requirements.
[2] 1991 QB 87.
[3] 1976 1 NZLR 436, 437 Summers J.

significant environmental impact. Adverse environmental effects may also result from the extraction of minerals, and some of these effects may be significant. Consumption of aggregates and other mineral product is correlated with population growth, and the form and rate of urban development. Even during periods of low growth, the maintenance of infrastructure and buildings ensures a continuing demand for mineral products. Average consumption of 5.7 tonnes per person per annum occurred in the 1986 to 1991 period. With the Region's population already in excess of 1 million by 1995 and expected to grow, a sustained demand for aggregates is expected.

There are some 60 quarries in the region, producing rock, sand and shingle. Most of these are small, with the great majority of production coming from a few large quarries. Construction for housing, industrial development and infrastructure, to support continued growth of the Region's population, gives rise to steady demand for aggregates within the region.

[44] These words reflect to a large extent the evidence of Mr Compton and Mr Happy, both of whom gave evidence on behalf of Winstone. Mr Compton is the Resource Development Director with the company and has been employed in the civil engineering and construction industry for 28 years, the last five with Winstone. Mr Happy has the position of Resource Scientist and Environmental Co-ordinator with Winstone; his professional qualifications include a Master of Science Degree with Honours in Geology, and he is a Fellow of the Institute of Quarrying and a Member of the Australasian Institute of Mining and Metallurgy. He has been employed by Winstone companies for 22 years. Both witnesses gave extensive evidence, including, inter alia, evidence relating to:

- A description of Winstone Aggregates and relevant company policies,
- A description of the Hunua Quarry zone site and current operation,
- The importance of the aggregate resources at Hunua,
- An outline of the distribution and availability of potential aggregate resources in the Auckland and the northern Waikato regions,
- Evidence relating to the constraints which are likely to severely limit or prevent the development of most potential quarry sites in the area,
- A description of quarrying operations and their effects,
- The costs of extracting, processing and delivering aggregate.

[45] Although both witnesses were cross-examined at considerable length by Mr Kingston, their comprehensive evidence left us in no doubt as to the significance of aggregate as an important regional resource.

[46] Mr Compton had this to say:

"Although aggregate is a commodity upon which everyone depends, the importance of aggregate resources to district and regional economies is generally not fully appreciated.

The aggregates industry provides a number of economic, social and environmental benefits to the community. They range from the immediate local benefits to those of regional importance:

- *There are economic benefits for and created by Hunua Quarry's 17 employees, as well as for and by contractors and consultants involved directly with aspects of quarrying.*
- *The quarry's products provide downstream employment for a great number of people in roading and construction, as well as being extensively used in manufacturing.*
- *Manufactured products include ready mixed and asphaltic concrete, precast concrete beams and panels, blocks, pavers, pipes, wallboards, and the like.*
- *To construct a significant road or building without the use of aggregates would be totally impracticable.*

Aggregates literally form the foundations on which our community is built".

[47] He told us that, currently, about 7-8 million tonnes of aggregates are being consumed annually in greater Auckland. That is over 7 tonnes per person per year. It is predicted that this may increase to 8½ tonnes by the year 2001. We were told that the Hunua Quarry aggregate resource contains approximately 30 years' supply of aggregates, if taken at a production rate of 1 million tons per annum. The Symonds Hill resource is expected to include a further 25 years' supply, at 1 million tons per annum.

[48] It is clear from the evidence, that the Hunua Quarry is already a vital aggregate resource for the Auckland region. Production and sales last year exceeded 400,000 tonnes. Output is planned to increase to over 1 million tonnes per annum, or about 12.5% of the Auckland region's consumption, within the next six years.

[49] We were told also of the limitations to the supply of aggregate from within the Auckland region, having regard to the anticipated demand and the potential high costs of sourcing aggregate from outside the Auckland region.

[50] We are satisfied on the evidence, that aggregate is a resource of primary significance to our society in general and in particular to the Auckland region. It is required in very large quantities for roading and construction. Demand is expected to increase over the next decade. It is a finite resource,

and some current major quarries in the Auckland region are already close to being worked out.

5. ISSUES

[51] The proposed district plan recognises aggregate as a significant natural resource. The introduction to Part 6.6 of section 2 says:

> *"The Hunua range constitutes a valuable natural and physical resource in the district and the Auckland region. Among other attributes it constitutes a major source of aggregate for the region. As quarries nearer the centre of the metropolitan area are worked out the potential for the Hunuas to supply the demand for aggregate will assume even greater significance".*

[52] Objective 6.6.1 in the proposed district plan (as notified and after amendments from submissions) for quarrying and mineral extraction, recognises the significance of the aggregate resource. It states:

> *"6.6.1 To promote the development of the mineral resources of the Hunua area in an environmentally and culturally acceptable manner".*

[53] The appellants' case, particularly Winstone's, was succinctly put by Ms Crampton in her evidence, when she said:--

> *"While the significance of the district's aggregate resources is recognised at the issue and objective level, the policies and subsequent provisions of the proposed plan are concerned with the adverse effects of quarrying. I consider that they deal with only one arm of the two arms of the management of mineral resources which, in my opinion, is required by the RMA. The protection of the environment including people from adverse effects of mineral extraction is dealt with in the proposed plan's policies and rules. The other arm of the management of minerals, the protection of minerals and extraction sites as natural and physical resources from being adversely affected by other activities, is missing from the plan. It is my opinion that the proposed plan is neglecting the Council's function under section 31(b) RMA with respect to the control of the effects of the use and development of land in close proximity to valuable aggregate resources.*
>
> *It is my opinion that by considering only one side of mineral resource issues, the proposed plan is not managing the resources of the district in an integrated manner. It takes no account of the issue of costs imposed on the community for minerals which are needed for development in Auckland. This is identified as a regional and inter-regional issue in issue 13.2.2 of the Minerals Chapter of the PARPS. Transporting heavy bulky aggregates imposes high environmental and monetary costs. Unless conflict between aggregate extraction and activities which are sensitive to it is managed by district plan provisions, the Auckland community will have to pay increased transport charges, road maintenance costs and energy consumption costs of transporting aggregate from sources at a greater distance from Auckland. Loss of existing investment in the physical resources of quarry development is another cost.*
>
> *The expansion of countryside living on the periphery of Auckland means, in my opinion, that the encroachment of residential activity into the rural area in the vicinity of a long-established*

quarry has become a more significant resource management issue and a special rule to restrict countryside living is now justified".

[54] Overall, the submissions raised by counsel centre on two main issues:

1. Whether providing for an ARPA zone (reverse sensitivity buffer zone) is within the jurisdiction of this Court; and

2. Whether (if it could be imposed) it is appropriate, in the circumstances of this case, to provide such a zone.

[55] The first is solely a legal issue.

[56] The second is one of mixed law and fact. It requires a consideration of the two management issues, i.e., on the one hand, the extent to which adverse effects should be internalised and, on the other, the extent to which those effects should be controlled externally.

[57] We consider each of those issues in turn.

6. REVERSE SENSITIVITY JURISDICTION

[58] Before considering whether the buffer zone requested by the appellants is appropriate, it must be determined whether the Court has the jurisdiction to provide for such a zone, given that it is based on the principle of reverse sensitivity. This jurisdiction is based on the ability of the Council to deal with the matter.

[59] The term 'reverse sensitivity' was defined in the recent decision *Auckland Regional Council v Auckland City Council* [4](10/97) in this way:

"The term "reverse sensitivity" is used to refer to the effects of the existence of sensitive activities on other activities in their vicinity, particularly by leading to restraints in the carrying on of those activities".

[4] [1997] NZRMA 205; 3 ELRNZ 54

[60] We respectfully adopt this definition. We also note the useful points raised by counsel for the Wellington District Council, noted by Environment Judge Kenderdine in the ***Wellington Airport*** decision (at 44):

> *"The council's response to this issue was to argue that the use of the term "reverse sensitivity" should not obscure either of two things. First, it is not a term which is used in the Act or given any particular status. Second, it is no more than a description of a class of effect - the sensitivity of a person quite lawfully creating adverse effects to pressure from people who may be potentially affected by those effects. But like any other "effect", reverse sensitivity needs to be considered in the context of all effects.*
>
> *As Mr Mitchell pointed out all of the cases referred to by Mr Nolan involve one significant difference to the present. They all concern the possible entry of potentially sensitive people into an area where they may be affected by existing adverse effects which are not only lawfully created within the area, but for which the area is indeed designed. That is not the case here. It would be if we were looking at residential activity within the Airport Precinct, or within land zoned by WIAL. But we are not. We are assessing an activity which is generally considered acceptable within a zone (as it is elsewhere in the city), but for the activities in a neighbouring zone. We agree with Mr Mitchell none of the authorities referred to by Mr Nolan advance the proposition that far."*

[61] There have been a very small number of decisions concerning the topic of reverse sensitivity. None of the decisions have considered the sort of situation which is raised here (and described more fully earlier in this decision): a quarry zone ringed by a number of differently zoned properties (including some designations for public works or defence), where the appellants seek to impose what is effectively a 'buffer zone' around the quarry, measured outwards from the quarry boundary.

[62] The closest factual situation is that which arose in the ***Wellington Airport***[5] matter, where Wellington International Airport sought to constrain (by "tacit prohibition") acceptable activities in one zone, because of activities in another. Apart from the suburban centres issue, the matter was settled by consent order. The consent order noted the agreement that all new dwellings in residential areas within the air noise boundary are to achieve noise attenuation, and multi-unit residential activity in this area was changed in status from discretionary (restricted) to discretionary (unrestricted). Importantly, a more stringent package of noise controls consisting of an air noise boundary, a ban on non-noise-certified and

[5] See the record of determination at 5.

chapter 2 aircraft, a curfew, ground noise controls, and land use controls, was also instituted.

[63] As previously stated, the appellants propose that activities located in the ARPA which would be sensitive to the operation of the quarry, should become discretionary activities, to be assessed against the list of proposed criteria for consent. The purpose of the proposed buffer overlay is to protect the quarry activity from possible complaint and constraint flowing from the establishment of any sensitive activity. Targeted 'sensitive' activities include residential dwellings, educational and community institutions. Ms Crampton noted in her evidence that: *"It is probable that granting consent for subdivision and consequential housing would be inappropriate on much of the proposed Protection Area on the Richardson land, in the opinion of those giving technical evidence for Winstone"*. (at 18.2.1).

[64] Consequential amendments to the objectives and policies are also proposed, to reflect the proposed reverse sensitivity provisions. The proposed amendments to the objectives and policies are designed to constrain the encroachment of those sensitive activities which might compromise the extraction and processing of minerals.

[65] As noted above, the proposed ARPA provides that hitherto permitted activities should be assigned a different status (discretionary), if they are within the so-called 'buffer zone'. The Act provides for the status of activities by section 76. These rules are one of the 'methods' contemplated by the functions in section 31(a) to achieve integrated management.

[66] The import of these functions was discussed by Chief Environment Judge Sheppard in the ***Auckland Regional Council v Auckland Regional City Council*** (supra) decision. It had been suggested that the Council did not have the ability to provide for reverse sensitivity in a district plan. The facts of the case concerned the status of "sensitive" activities within the business 5 and 6 zones (heavy industry). Judge Sheppard said: (emphasis in original)

> *"We acknowledge, as Mr Kirkpatrick submitted, that the Resource Management Act contains references to effects ON the environment. Sections 5(2)(c) and 104(1)(a) are notable examples. However the references to effects in the description of the functions of territorial authorities are not so qualified. Section 76(3) provides:*
>
> ***"In making a rule, the territorial authority shall have regard to the actual or potential effects on the environment of activities including, in particular, any adverse effect; and rules may accordingly provide for permitted activities, controlled activities, discretionary activities, non-complying activities, and prohibited activities".***
>
> *The direction in that subsection is that a territorial authority, in having regard to the actual or potential effects on the environment of activities, may provide for discretionary activities (among other classes of activity). The authority to provide for controlled and discretionary activities (and other classes) is not limited to the classes of activity that give rise to the actual or potential effect. It is consistent with our understanding of a territorial authority's functions (already stated) that in having regard to actual or potential effects on the environment of activities, district rules might provide for other activities to be any of the classes of activities listed in the subsection, as the performance of the authority's functions may indicate is appropriate in achieving the purpose of the Act.*
>
> *In summary, we do not accept that the provisions proposed by the regional council should be rejected on the ground that they provide for reverse sensitivity".*

[67] The last paragraph explains the jurisdiction of a territorial authority to provide for an activity as a particular status, taking into account adverse effects which may be generated by another activity. As noted above, the authority to provide for a discretionary (or other) activity *is not limited to the classes of activity which create the actual or potential effect.*

[68] In that case the appellant ARC succeeded, and permitted activities within the business 5 and 6 zones which were likely to be adversely affected by air discharges from other activities within those zones were accordingly reclassified as discretionary activities, with criteria as prescribed in the decision.

[69] We have been urged by the appellants to adopt the outcome in the *Auckland Regional Council* decision above, and accordingly to provide that sensitive permitted activities in the proposed ARPA be reclassified as discretionary, with criteria that reflect the possibility of undesirable conflict with neighbouring activity in the 'quarry' zone.

[70] Mr Kingston, counsel for the Richardson Estate, submitted that the reasoning used in the ***Auckland Regional Council*** case is specific to a

situation within a zone (intra-zone). We accept this submission, as one of the reasons given by the Court for their decision was that *"such amendments would implement more fully the objectives and policies stated in the plan for the business 5 and 6 zones..."*. However, we consider that the interpretation of the functions of the territorial authority, and in particular section 76(3), does not exclude inter-zonal applications of reverse sensitivity where this is consistent with the overall functions and obligations of the territorial authority.

[71] Therefore the Council, and hence the Court, does have the jurisdiction to provide for a zone in order to cater for reverse sensitivity.

7. IS AN ARPA ZONE (REVERSE SENSITIVITY BUFFER ZONE) APPROPRIATE

(a) Adverse effects of quarries

[72] Both Mr Compton and Mr Happy gave evidence relating to the constraints in quarrying operation. The nature of quarrying operation is such that they have significant potential effects which include:

- Ground vibrations from blasting;
- Air blasts,
- Noise from quarry operations and vehicles,
- Dust,
- Heavy vehicle traffic flows,
- Visual impacts,
- Release of sediment to water from earthquakes,
- Potential risks from storage and use of hazardous substances particularly for blasting.

[73] These effects can be annoying to other nearby activities which are sensitive to them, in particular residential and community facility-type activities.

[74] Ms Crampton described a quarry as a "NIMBY" (not in my back yard) activity because of its effects, particularly noise, vibration, visual impact and heavy traffic. She pointed out that unlike activities which are provided for

in the Public Works Act, there are no provisions aimed specifically at providing for quarries, nor are they provided for in the designation procedure. As noted by Ms Crampton, consequences flow from this. One is, that there is no compulsory process for acquiring land which may be required as a buffer, nor one for paying compensation. Another is, that quarries are subject to the same sorts of controls over their effects as any other activity. We must assume that the exclusion of quarries is deliberate. WE should not seek to create replicas of the designation process or the Public Works Act, but deal with the issues in the manner provided for in the Act, in order to achieve the purpose of the Act.

[75] In addition to Mr Compton , Mr Happy and Ms Crampton, six further witnesses gave evidence for Winstone Aggregates Limited, to address the potential conflict between the quarry operations and sensitive uses which may establish in close proximity to it. Their evidence was predicated on the foundation that aggregate is a significant regional resource and that it is appropriate to provide controls in the district plan to avoid the conflict which may result in the "sterilisation" of much of the resource. The Richardson Estate also called a number of witnesses to address the same issues, but from the perspective of adjacent landowners.

[76] We are satisfied on the evidence, that quarrying has the potential to produce adverse effects. We are satisfied that it is important that sensible planning be put in place, not only to ensure the availability of the extraction of the resource, but also to avoid unnecessary conflict between quarry operators and persons living nearby; and to protect the environment.

[77] The appropriate and fair balancing of the competing interests of the quarry operators, the community at large and adjacent landowners, in a way which gives effect to the interest and purpose of the Act, is the central focus of this appeal.

[78] A considerable amount of evidence was adduced to address the adverse effects and the difficulty of confining those effects within the quarry boundary. Many of the effects can be mitigated or confined on site, albeit at some cost. For example, measures can be taken to prevent dust annoyance. Measures can also be taken to prevent sediment entering waterways.

[79] It is clear from the evidence that the most difficult and costly effects to mitigate are noise and the effects of blasting. For this reason we heard extensive and detailed expert evidence relating to both noise and vibration.

[80] Noise and vibration can be mitigated or, it was suggested, noise can be internalised. The issue is, to what extent is it reasonable to expect a quarry operator to internalise those effects? This involves a careful consideration of the evidence, including an assessment of the practicable mitigation measures available with present technology, and the economics of implementing those measures.

[81] Before looking at the evidence relating to noise and to vibration we first consider the resource management issues that arise in this appeal.

(b) Resource Management Issues

(i) General

[82] The plans may make provision for such of the matters set out in the Second Schedule to the Act. The purpose of the plan is stated to be, to assist the Council to carry out its functions in order to achieve the purpose of the Act[6] Section 5 sets out the purpose of the Act, which is, to promote the sustainable management of natural and physical resources. Sustainable management is defined. The definition contains matters of relevance as it seeks to manage the use, development and protection of natural and physical resources in a way, or at a rate, which enables people and

[6] s 72

communities to provide for their social, economic and cultural well-being, while, inter alia, avoiding, remedying or mitigating any adverse effects of activities on the environment. [7] In achieving the purpose of the Act, we must also recognise and provide for the matters of national importance in section 6, have particular regard to the matters in section 7 (of particular relevance are subsection (b), (c), (f) & (g)).

[83] Included in section 7 are the efficient use and actual development of resources. [8] This could lead to the necessity for an activity to be able to emit a reasonable level of adverse effects (such as noise and vibration). But section 7 also includes the maintenance and enhancement of amenity values [9] and the quality of the environment [10]. These matters would support the incorporation of suitable restrictive controls to achieve those ends.

(ii) Integrated management

[84] One of the functions of the territorial authority is to achieve integrated management of the effects of the use, development, or protection of land and associated physical resources of the district through the establishment, implementation and review of objectives, policies and methods in order to give effect to the Act, as set out under Section 31(a).

[85] Judge Kenderdine discussed the issue of integrated management in Wellington International Airport (supra), and usefully summarised it (at 48 of the record of determination):

"In our view integrated management envisages that the council must bring together all separate but similar parts of the plan to form a consistent whole to ensure the sustainable management of its resources".

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[7] see definition of effects in section 3
[8] section 7(b)
[9] section 7(c)
[10] section 7(f)

[86] Integrated management requires that the constituent parts of a district should be considered in a fair and balanced way, consistent with the purpose of the Act.

[87] The status of activities within each zone must implement the objectives and policies of that specific zone, as well as enable integrated management across zones, be necessary in achieving the purpose of the Act; be the most appropriate means of exercising the function of controlling actual or potential effects of use, development or protection of land; be in accordance with the other functions of section 31, the provisions of Part II, section 32, any regulations, and any appropriate heed to the requirements of section 74, section 75, and (with regard to rules) section 76.

[88] Counsel for the ARC submitted that there was clearly conflict between quarrying activities and rural/residential activities on surrounding land, including the Richardson land. We agree with this as a matter of fact. However, we do not consider that it follows necessarily, that the territorial authority "ought to include in the district plan measures to protect the mineral resources from that potential conflict" Nor do we accept that this is "the only way in which the district council can give effect to its functions under section 31 in order to achieve the purpose of the Act." As we have explained above, the equation is somewhat more complex. The protection of mineral resources is important, but it cannot be the only matter which must be considered when making rules in a district plan. This is particularly so when the matters averred to are matters solely within the provisions of a proposed regional policy statement.

[89] The expressed functions of district councils are clearly relevant in the context of this case. We have already referred to the adverse effects generated by the extraction and the processing of aggregate, and that many of those adverse effects can be contained on site, albeit at some cost. It is the appellants' contention that the adverse effects of noise, vibration and visual impact cannot reasonably and economically be contained on the site. As a

consequence, sensible planning dictates that it is appropriate to make provision for avoiding unnecessary potential conflict between those effects that cannot reasonably be contained on the site, and those uses of the land by sensitive activities within the perimeter of those effects.

[90] We have already held that the Council and this Court have jurisdiction to make provision for rules to control effects in the way submitted. We are of the view that in appropriate cases, such provision amounts to sensible planning, in that it gives effect to the sustainable management of our natural and physical resources. We have also said that this is not the only way in which the district council can give effect to its functions under section 31 in order to achieve the purpose of the Act. We must consider whether the proposed restrictions are the most appropriate means of exercising the territorial authority's functions.

[91] One of the guiding approaches of the RMA is internalisation of effects, as a way of avoiding, remedying or mitigating effects of an activity. This approach is not absolute[11]. We note that this is in keeping with the *Environment 2010 Strategy*[12], which sets out the 11 principles for integrated management, one of which is internalisation of external costs. The principle as defined in the *Strategy* reads[13]:

> *"Resource management should ensure that the unpriced environmental effects (or external costs) associated with the production, distribution, and consumption of goods and services are 'internalised', that is, they are assessed and consistently charged to users and consumers who benefit from them."*

[92] The principle was adopted by the High Court in *Machinery Movers v ARC* [1994] 1 NZLR 492, where it was expressed (in relation to pollution costs) in this manner (p.502):

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[11] We agree with the approach contended by Mr Kirkpatrick in *ARC v ACC* :..."that the Act follows a "polluter pays" approach, requiring creators of adverse effects to internalise those effects rather than force the rest of society to bear the burden of dealing with them. However he agreed that the approach described is not absolute."

[12] *Environment 2010 Strategy: A statement of the Government's Strategy on the Environment* (September 1995).

[13] Ibid, at 15.

"As to the economic aspect, the economic reason why our society may not in the absence of regulation strike a balance between economic output and environmental quality is that the costs of pollution are not borne by polluters but by somebody else. As a result, these "external" costs will not, in general be taken into account by those who cause pollution. Insofar as pollution costs are not borne by those who cause pollution, or by the purchasers of their products, some part of the total benefits resulting from economic activity in the community is wrongly redistributed away from the victims of pollution to other groups in society. In order to correct this market failure, the government must intervene to impose financial costs or penalties which bring the external costs back to the polluter. These concepts were discussed in the First report of the United Kingdom Royal Commission on Environmental Pollution, Cmnd. No. 4585 at 4-6 (1971) and are now encapsulated in Principle 16 of the Rio Declaration on Environment and Development adopted at the United Nations Conference on Environment and Development adopted at the United Nations Conference on Environment and Development, Rio de Janeiro 3-14 June 1992, [1992] International Legal Materials 876,879. New Zealand has signed the Declaration.

Principle 16 states:

"National authorities should endeavour to promote the internalisation of environmental costs and the use of economic instruments, taking into account the approach that the polluter should, in principle, bear the cost of pollution, with due regard to the public interest and without distorting international trade and investment."

The RMA explicitly recognises the importance of having environmental laws which are economically efficient. Thus s7 provides in part:

"7. Other matters - in achieving the purpose of this Act, all persons exercising functions and powers under it in relation to managing the use, development, and protection of natural and physical resources, shall have particular regard to - ...

(b) The efficient use and development of natural and physical resources."

Section 32(1)(b) also requires the use of cost-benefit analysis in achieving the purpose of this Act".

[93] As we have said, the principle is not absolute, but there is a clear analogy between the approach favouring the internalisation of pollution costs and the approach to other adverse effects of an activity.

[94] In *Boddy v Grey District Council* (W88/94) (a mining application) the (then) Tribunal noted the decision *Tonks, Colville & Brand v Ashburton District Council,* and *Keating & Tonks v Christchurch Regional Council* (Decision C29/91 and C60/92) in these words:

... "a case which the zoning allowed for subdivision into allotments of 8 hectares and upon which dwellings were permitted uses. That application proposed a large scale piggery. The Tribunal held that although the zoning itself was rural, the provision for 8 hectare allotments with dwellings contemplated more than a simple rural use. In that instance the Tribunal considered separation distances between the proposed disposal of pig effluent from the adjoining properties as opposed to dwellings as insufficient, because it felt that property owners were entitled to be protected from any adverse effects anywhere within their property

boundaries. Thus the external effects of the applicant's proposal should as far as possible be confined to the site where those activities giving rise to the effects are carried out. The district council in this case, considered the same should occur on these applications but it was not effectively possible to achieve it because of the nature of the operation."

[95] And later (at 25):

"Elsewhere in the decision (Tonks) and referring to the need to create greater separation distances, the Tribunal held that adjoining property owners are entitled to be protected from any adverse effects anywhere within their property boundaries. Put another way, the external effects of the applicants' use should, as far as possible, be confined to the site where the activities which give rise to those effects are carried out. If this cannot be done then regardless of whether the use was a conditional use or a specified departure, consent should be refused."

[96] After due consideration, the Tribunal held that consent for the mining could take place alongside the rural/residential sites, but subject to conditions regarding noise and visual amenity, and with an internal buffer zone between sites "so that no mining is to take place within 100 metres of the Ross boundary".

[97] We remind ourselves that we are currently considering a reference, rather than an appeal for resource consent. The statute requires different things of a territorial authority in the formulating of a district plan. Nevertheless, we are of the view that in promoting the sustainable management of natural and physical resources, particularly having regard to s.32(1)(c), the adverse effects of quarrying should, as far as possible, be confined to the site within which those activities causing the effects are carried out. We consider that this is in accord with the purpose of the Act. When Part II of the Act is taken as a whole, there is a clear mandate for controls to be included in plans which will prevent undue adverse effects and reduction in amenity values.

[98] We consider that in controlling undesirable effects, territorial authorities should impose restrictions to internalise adverse effects as much as reasonably possible. It is only where those effects cannot be reasonably controlled by restrictions and controls aimed at internalisation, that the sort of restrictions on other sites (as sought by the appellants) might be

appropriate. Those are relatively rare circumstances, and will vary from site to site.

(iii) Necessity test

[99] As was explained in *Nugent Consultants v Auckland City Council* 2 ELRNZ 254 (at 257), in reference to the functions of a territorial authority under the Act, relating to rules in a district plan (sections 5, 31, 32, 75, 76):–

> *"In summary, a rule in a proposed plan has to be necessary in achieving the purpose of the Act, being the sustainable management of natural and physical resources (as those terms are defined); it has to assist the territorial authority to carry out its function of control of actual or potential effects of the use, development or protection of land in order to achieve the purpose of the Act; it has to be the most appropriate means of exercising that function; and it has to have a purpose of achieving the objectives and policies of the plan."*

[100] "Necessary" has been defined, in *Green v McCahill* [1997] NZRMA 519 (HC), *Countdown v Dunedin City Council* [1994] NZRMA 145, IB ELRNZ 150 as being that which is "expedient or desirable" rather than 'essential'.

[101] That the district plan should contain objectives, policies and methods to control the effects of quarrying, is not in dispute. It is whether those objectives, policies and methods should be directed at internalising all of the adverse effects, or whether a combination of those restrictions should be combined with restrictions constraining the use of land owned by adjacent landowners. We have already held that we are of the view that adverse effects should be internalised where possible, but that such restrictions should be reasonable. In the event of adverse effects escaping from the site after the imposition of reasonable controls, then restrictions constraining adjacent landowners can and should be implemented. It is only when reasonable controls for the containing of effects at the boundary of the quarry site have been implemented can it be properly and adequately assessed that the perimeter of effects extends beyond the quarry zone thus making it necessary to impose restrictions on adjacent landowners.

(iv) Economic considerations

[102] Section 7 requires that, among other factors, particular regard be had to the efficient use and development of natural and physical resources. This section was highlighted as a key issue by counsel for Winstone, who urged upon us that the Estate could not implore the Court not to consider the financial implications of the appellant adopting particular mitigation measures while, at the same time, claiming it was entitled to maximise the financial gain from subdividing its own land.

[103] It was submitted by counsel for the Estate that the only justification put forward by the appellant for putting the Richardson Estate's rights at risk, was the cost of mitigation. It was emphasised that there is no implication in the Act that section 5 requires the consideration of the financial viability of rock extraction, and section 7 cannot be seen to introduce such a goal, as it is limited to achieving the purpose of the Act.

[104] It was submitted by counsel for the appellants, that any additional constraint on the quarry's potential use and development by allowing sensitive uses to proceed as permitted activities, would jeopardise the efficient use of the resource. It was Ms Crampton's evidence that, "the proposed amendments will facilitate efficient production and transportation of aggregates and efficient allocation of land resources for the benefit of the community of Auckland".

[105] We have held that the aggregate from the quarry is a regionally significant resource, and it is of great public benefit to have the facility available. The Hunua resource was seen as particularly important, being one of only five existing major quarries which will be capable of continuing supply to the region when all other regional basalt quarries halt production in about the next five years.

[106] The economic evidence presented to the Court, focused on the increased costs to the quarry if it was required to internalise to a reasonable degree, particularly about reducing explosive charge weights. However, this evidence was not definitive, and was based on extrapolation from hypotheticals rather than probative tests [14]. Clearly, an internalisation of costs will increase the cost of extracting the aggregate, but no conclusive evidence was put forward to quantify these costs. There was insufficient evidence for a determination that the proposed plan provisions would constitute an efficient use and development of resources.

[107] Even if increased costs for the quarry had been established with sufficient specificity, it should be remembered that, as stated in *New Zealand Suncern Construction Limited v Auckland City Council* [1996] NZRMA 411, 424:

> *"... efficient use and development of natural and physical resources does not necessarily imply maximum financial yield for a developer. Judge Sheppard and Commissioner Catchpole accept Mr Cooper's submission that efficient use and development can be assessed more broadly".*

[108] The financial viability of a particular venture is not a relevant consideration for the Court even in considering a resource consent, let alone at district plan level. Relevant caselaw – *Warbrick v Whakatane District Council* [1995] NZRMA 303; *Burling v Horowhenua District Council* Decision No. W99/97.

[109] In *NZ Rail Limited v Marlborough District Council* [1994] NZRMA 70, 88, Greig J stated that economic considerations arise as a factor in the definition of sustainable management in s.5(2), and the efficient use and development of natural resources in s.7(b). However, he stated that:

> *"... in any of these considerations it is the broad aspects of economics rather than the narrower consideration of financial viability which involves the consideration of the profitability or otherwise of a venture and the means by which it is to be accomplished. Those are matters for the applicant developer and, as the Tribunal appropriately said, for the boardroom".*

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[14] See our later discussion on the evidence relating to the costs arising from modifying the blasting regime.

[110] Justice Greig continued, stating that the Tribunal had had sufficient regard to the economic evidence put before it in terms of the costs, the economics, and the potential viability of the proposal for the reclamation and construction of all works and buildings required. He then stated that:

> *"The Tribunal took into account economic questions, as it was bound to do, in a broad sense and in a narrower sense upon the projected development itself. In the result they came to the conclusion that the evidence was not 'sufficiently persuasive to justify refusing consent on economic grounds".*

[111] In *Marlborough Ridge Limited v Marlborough District Council* 3 ELRNS 483 Environment Judge Jackson saw both the broader economic aspects and the narrower aspects (including viability of a project and/or the benefits to a developer) as being relevant when considering economic issues raised under section 5 and section 7(b). He determined that the economic effects on the environment of a proposal are to be considered only to the extent that they affect the community at large, and not the effects on the expectation of individual investors. However, no determination was made as to whether or not the benefits of a proposal for its promoter should be considered.

[112] In the current situation, it seems that the evidence is such that there can be no finding as to the viability of the quarry (similar to the finding of the Tribunal in *NZ Rail*). Accordingly, there is no opportunity to place the financial viability of one venture over the broader community concerns. Clearly, neither the quarry nor the Richardson Estate should be favoured on the grounds of financial maximisation of an individual venture.

[113] In terms of seeing efficiency in perspective, it was submitted by counsel for the Estate, that section 7(b) is only one of six factors to which particular regard should be paid. Equal regard is to be had for section 7(c) - being the maintenance and enhancement of amenity values; and section 7(f) - being the maintenance and enhancement of the quality of the environment. Further, it was submitted that all these factors are to be regarded in

"achieving the purpose of the Act". It is settled law, that section 5 has primacy, and this should not be overlooked.

[114] We are clearly of the view that it is appropriate to take into account the cost to the quarry owner of implementing restrictions imposed to internalise effects, in the circumstances of this case. When we have regard to the importance of aggregate to the community, any unreasonable costs to the operation will be absorbed by the community at large. However, for reasons that will become clear in our discussion on the evidence, we hold that the evidence is inconclusive, and not sufficiently probative for us to make a determination on the economic issue.

(v) Measuring points

[115] The need to implement reasonable controls to internalise effects leads to a further issue, which arose in this case, being the physical location at which noise and vibration limits should be met. It was submitted by Mr Kingston on behalf of the Richardson Estate, that the appropriate measuring point for noise and vibration is, at the quarry boundary.

Noise

[116] With regard to noise, the submissions of Mr Kingston were reflected in a more refined and detailed manner in the evidence of Mr Hart, the acoustical engineer called to give evidence on behalf of the Richardson Estate. Mr Hart drew an analogy between the present case and the New Zealand Standard which has been introduced to provide guidance on how airport noise should be managed and land use planning carried out near airports. He was of the view that if the ARPA applied and the quarry is not required to comply with normal noise limits at the site boundary but at some more distant boundary, then it is still necessary to have some noise limits applying at or close to the site boundary, as long as the land is not owned by the quarry operator.

[117] While the Estate challenged the notional boundary rules, it did not appeal the notional boundary rules contained in the proposed plan. Mr Kingston submitted that, pursuant to section 293 of the Act, we should direct a change to the proposed plan, requiring noise (and vibration) limits to be applied at the quarry boundary instead of the notional boundary.

[118] Mr Christensen, on behalf of Winstone, made submissions to the contrary. He submitted that in rural areas it has been a common practice to use "notional boundaries" as a measuring point. He submitted that the notional boundary approach is central to NZS6802:1991 and the reason for this approach is the perceived inappropriateness of protecting open fields and unoccupied areas from noise. He referred us to *Pilcher, Irvine and Ors v Timaru District Council and Ors* (C53/97) and *Westway Contractors Limited v Christchurch City Council* (C72/93) as two examples of cases where the notional boundary was used as the measuring point. He submitted that to depart from the notional boundary would be contrary to a number of decisions of this Court.

[119] We have reviewed a number of recent decisions [15] and it appears to us that the question of 'notional boundary versus site boundary' has no definite answer. The measurement sites are chosen as best suit the circumstances of a particular case and these include the plan provisions, the zoning, the type of activity on the land surrounding the activity, who was first there, and the economics of the issue.

[120] We also consider, for reasons already given, that as a whole the Act (and in particular Part II) gives a clear mandate for preventive controls to be included in plans to avoid undue adverse effects and reductions in amenity values. We are also conscious of the need not to unnecessarily constrain the

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[15] McKenzie v Dunedin City Council (C42/95) and (C83/95); Cooks v Invercargil City Council (C81/97); Solid Energy v The Grey District Council (A8/98); Port Otago Limited v Dunedin City Council (C97/92); New Zealand Rail Limited v Marlborough District Council (C36/93); Bird v South Canterbury Car Club and Timaru District Council (C27/94)

use of adjacent land, particularly when there are no measures whereby an adjacent owner can seek compensation.

[121] Taking all of these matters into account, we are of the view that a measurement should be imposed on the quarry zone boundary, defining the reasonable noise constraints imposed on the quarry operator. These levels will depend on the circumstances of each case. In other words, they are site specific, and will depend on such factors as technology, cost, geography and the geological structure of the site and its surrounds.

[122] When the control at the interface boundary is set, it can then be determined whether a buffer zone is necessary, and the extent of any such buffer zone.

[123] In *Port Otago Limited v Dunedin City Council* the Planning Tribunal (as it was then) stated that rural and residential zone boundaries were appropriate places for measurement because:

> *"Those occupying properties in those zones are entitled to the enjoyment of the amenities provided for by those zones anywhere within their properties and not just within their dwellings".* [16]

[124] The primary responsibility on the owners and occupiers of a site is to internalise the effects of an activity as much as they can. Only where it is unreasonable (having regard to all the circumstances of each particular case) to internalise should other methods of controlling effects be considered.

Vibration

[125] So far as standards setting vibration controls are concerned there was little evidence in this regard. While Mr Kingston submitted that such controls should be applied at the site boundary, he called no evidence to support that contention. In fact he called evidence to the contrary. The only expert witness to touch on this issue was Dr St George who said:

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[16] (C97/92) p. 120.

"Most standards use a limiting peak particle velocity (PPV) which is either independent of frequency e.g. AS2187.2 1993 (PPV = 10 mm/s) or a frequency dependent scale eg. DIN 4150 (PPV = 5-20 mm/s: frequency 0-100 H_z). These levels usually apply at the property rather than the site boundary as wave transmission paths are almost impossible to predict, therefore compliance at the boundary might not ensure compliance at a greater distance, even along the same radial line from the source. To meet compliance levels the operators adjust the charge weights, shot geometry and timing".

[126] We are of the view that the adverse effects should be internalised as much as is reasonably practicable in the circumstances. Our tentative view is, that to adequately achieve this, there should be controls at the interface boundary. However, as this is an interim decision, in the event of the matter requiring our determination, we wish to hear further evidence on the matter.

8. THE EVIDENCE

[127] The principal effects which give rise for the need for controls are noise and vibration. To a lesser extent the visual effects of quarrying are also relevant. However the significance of aggregate as a resource is such that, where the circumstances warrant, visual effects (subject to reasonable mitigation measures) are an unfortunate but nevertheless permissible by-product.

[128] We heard a considerable amount of expert evidence directed at the effects of noise and vibration and the appropriate means of mitigating those effects. We have given careful consideration to all the evidence and the extensive cross-examination of counsel. Because the matter was part-heard and there was a two and a half month gap between hearings we have carefully re-read all the evidence and the notes of cross-examination. We have also taken account of the submissions of counsel.

(i) Noise

[129] On the topic of noise we heard from two experienced acoustical consultants, Mr P A Heinze for Winstone, and Mr M D Hart for the Richardson estate.

[130] It was generally common ground as between the two experts that the source of noise relating to the quarry operations can be grouped into two main categories:

- General Plant
- Blasting

[131] The general plant activities include:-

- Site clearing
- Over-burden stripping
- Product extraction
- Rehabilitation

[132] The site is first cleared of vegetation. Generally speaking over-burden is then removed from the site in progressive stages, and the product is extracted from the areas exposed. Over-burden removal and product extraction may occur contemporaneously at different locations on the site. At the completion of product extraction the site is then rehabilitated. The evidence established that site clearing and rehabilitation are relatively insignificant compared with the other two stages.

[133] The main noise sources are:

- Excavators and loaders
- Trucks
- Rock drills
- Product processing
- Blasting

[134] The first two sources are common to both over-burden removal and the product extraction, though the equipment used may vary. Drilling and blasting occur only during product extraction. The rock drills and the excavators and loaders normally remain close to the active work site.

Trucks move about the site transporting materials. Product processing generally involves crushing and screening and is generally performed using stationary plant.

[135] Measurement and assessment of noise produced by blasting is different than for noise produced by the other four sources. The difference was clearly set out in the evidence of Mr Hart where he said:-

> ***"The first four sources are measured and assessed using New Zealand Standards NZS 6801:1991 Measurement of Sound and NZS 6802:1991 Assessment of Environmental Sound, and the sound descriptors used are L_{10} and L_{max}. The L_{max} is less of a potential problem than the L_{10} in terms of compliance with noise criteria, and has therefore not been addressed in depth.***
>
> ***Blasting noise is impulsive in character, and is outside the scope of NZS 6801:1991. Blasting requires special measurement and assessment techniques, and the sound descriptor normally applied is the peak level, L_{peak}. The L_{peak} is an entirely different descriptor to L_{max}. Both L_{max} and L_{10} are measured using "A" frequency-weighting (as per NZS 6802:1991) and denoted as "dBA". The L_{peak} is normally measured without frequency-weighting (also referred to as "unweighted" or "linear"), denoted as dB, or alternatively using "C" frequency-weighting, denoted as dBC (which for our purposes may be regarded as equivalent)".***

[136] The proposed district plan sets maximum noise levels for a quarry zone (Part VI), where the limits measured at or within 30 metres from any dwelling are:-

55 dBA L_{10}	**Monday to Friday**	**Between the hours of 0700 and 1800**
	Saturday	**Between the houses of 0700 and 1600**
45 dBA L_{10}	**At all other times including Sundays and Public Holidays**	

[137] With regard to noise produced by blasting the proposed plan provides:-

> *"F. Vibration and blasting*
>
> *(i) The noise created by the use of explosives measured at a notional boundary of 20 metres from occupied dwellings shall either not exceed a peak overall sound pressure of 128 dB or alternatively a peak sound level of 122 dBC".*

[138] Mr Heinze was of the view that the more stringent Australian Standard of 120 dB AS2187.2 (1993) is more appropriate than the district plan limits.

[139] Mr Heinze gave evidence of predicted levels of noise. He said this:-

> ***"I have carried out noise level predictions at the proposed buffer zone boundary or ARPA which is 500m from the quarry zone. My analysis has shown that when quarry activity is located on the top of Symonds Hill, the noise level would be in the range of 50-55 dBA L_{10} at the ARPA outer boundary which is likely to just comply with the noise limit of 55 dBA. This is one of the reasons why a 500m buffer area has been selected. However, at distances closer to the quarry face (less than 500m) the levels would exceed the limit of 55 dBA by up to 10dB with the subsequent possibility of complaints and litigation. My calculations are based on noise measurements of individual items of plant at existing quarries.***
>
> ***With operations on the lower portions of the quarry, the noise level would be lower at around 45-50 dBA due to the greater screening effect of the quarry face. While there is unlikely to be a problem with noise from activity on the power portion of the quarry, it must be remembered that the material on the lower portion can only be removed once the material on the upper portion is removed (which produces noise at 50-55 dBA). Furthermore, I am instructed, it would take a long time to remove the material on the upper portion of the quarry - years rather than weeks or months.***
>
> ***Noise levels from quarry operations are predicted to exceed the measured background noise levels of 30 and 35 dBA by 20 dBA at 500m from the quarry zone and up to 35 dB inside the buffer zone".***

[140] Mr Hart made a number of criticisms of Mr Heinze's evidence, including Mr Heinze's failure to produce evidence as to the noise levels that could be expected at the site boundary.

[141] In this regard he said:-

> ***"I have not found any evidence as to the noise levels that could be expected at the site boundary. During our meetings I indicated to Mr Heinze and Mr Happy that this information would be useful, but due to the short time between these meetings and the preparation of this evidence, I have not received further information. Mr Heinze has supplied the raw data that he used for his predictions, and from some basic calculations (and from experience elsewhere) I believe that it would be reasonable to expect levels on the order of 85 dBA L_{10} and 150 dBA L_{peak} at the site boundary. These levels are without mitigation measures applied.***
>
> ***For non-operational activities i.e. site clearing, over-burden removal and rehabilitation it would be reasonable to consider whether the limits recommended by NZS 6803P: 1984 and NZS 6803P: 1984, the Measurement and Assessment of Noise from Construction, Maintenance and Demolition Work, should be applied."***

[142] With regard to non-operational activities he applied the various criteria set out in the code to NZS 6803P:1984. He referred us to previous cases he had been involved with concerning quarrying or related activities such as mines and landfills where it had been argued that operational limits may be

relaxed for non-operational activities that occur for a limited proportion of the project. However it became clear to us during cross-examination that Mr Hart's knowledge of the detailed workings of the quarry, the subject of these proceedings, was somewhat limited.

[143] He opined that there are further options that should be considered before it could be said that the proposed activities represent the best practicable option for the purposes of section 16 of the Act. These included using larger equipment, using more items of equipment, working in more than one location at a time, working during the hours contemplated in NZS 6803P:1984 rather than hours proposed in Papakura District Scheme. In this regard he concluded by saying:-

"Further investigation into the options available for equipment selection and screening could enable product extraction to be undertaken so that it complied with 55 dBA L_{10} at the site boundary, or at least at a distance considerably less than the 500 metres proposed by Mr Heinze. Until there has been a comprehensive consideration of the options available, I could not support the view that the proposed activities represented the best practicable option for the purposes of section 16 (I note that neither Mr Heinze nor Mr Happy discuss section 16 in their briefs of evidence).

[144] Mr Christensen, in his closing submissions, levelled a number of criticisms at Mr Hart's evidence. He pointed out also that some major points were not put to Winstone's witnesses. Some of Mr Christensen's criticism is valid. Mr Hart's evidence was essentially of a negative character being a critique of the evidence of Mr Heinze. Perhaps this is a consequence of Mr Hart being brought into the case at a late stage. Unfortunately, he was not able to provide answers, but nevertheless, some of the matters raised by him are of sufficient concern to us to cause us to defer making a final decision.

[145] After a careful evaluation of the evidence, we are satisfied that there has not been a full consideration of options for noise management, and that the best practicable option may not have been selected. We agree with Mr Hart that further work is required to establish what are the best practicable options. Before we reconsider justifying the imposition of restrictions on residents' rights to use their own land, we need to be satisfied that all reasonable and practicable steps have been taken to internalise effects.

[146] Also, we have already decided that the concept of a "notional boundary" (as defined for noise measuring techniques) is not appropriate to the type of difficulty faced in this appeal. It is imprecise, given that there are presently no buildings in the potentially affected zone, and the "notional boundary" is a moving target. We find that it is necessary to consider the data at the actual property boundary. Consideration can then be given to the extent (if any) to which the generator of the adverse noise effects (in this case, the quarry) may be permitted to exceed standards at that actual boundary. This brings with it the possibility of some certainty in predicting the likely state of affairs, which in turn leads to a definable future, with ability both to monitor noise effects, to modify operations accordingly, and to deal with a proper evaluation of complaints or enforcement proceedings.

[147] The evidence adduced did not address this issue other than a query raised by Mr Hart in his evidence. It is therefore not possible for us on the evidence presently presented to make a determination as to the appropriate standards to be set at the quarry boundary.

(ii) Vibration Caused by Blasting

[148] We heard detailed expert evidence on the effects of vibration caused by blasting and the measures that can be implemented to mitigate the effects. For the appellant Winstone, Mr P J Millar, the geotechnical engineering manager of Tonkin and Taylor Limited, gave evidence. Mr J Russell, a blasting consultant and mining engineer, and Dr J D St J George, a senior lecturer in mining engineering at the University of Auckland, gave evidence on behalf of the Richardson estate.

[149] All three witnesses were extensively cross-examined. We again heard detailed submissions by counsel, particularly Mr Kingston, Mr Christensen and Mr Catran.

[150] A brief and succinct account of the cause, effects and attenuation of vibration was given to us by Dr St George when he said in evidence:-

> ***"Ground vibrations from blasting are caused when part of the explosive energy released during detonation, is transferred to the rock in the form of shock waves. Vibrations resulting from these waves passing through the ground are characterised by their amplitude, frequency and duration. All three are important when considering the effect of ground vibrations to structures. Damage to structures is related to the movement (strain) imparted by the motion of the ground waves. The maximum velocity of a particle (PPV) is widely accepted as correlating well with damage criteria and is used in determining compliance levels.***
>
> ***As the shock wave travels away from the source it attenuates and therefore the effects are reduced at locations further from the blast source. This attenuation is a complex process and is a function of geological structure, rock properties, ground water and surface topography. These are essentially all site specific variables and therefore beyond the control of the operator. It seems purely arbitrary to me, to select a 500m buffer without defining site characteristics. Quite often the attenuation is dependent on direction which would mean that some properties in close proximity to the site would be less sensitive to vibrations than others further away.***
>
> ***The main factors which influence ground vibrations for design are: type of explosive, charge weight per delay, charge distribution, hole diameter, burden, spacing, delay intervals and number of holes blasted. Of these the charge weight/delay has been found to be most influential parameter affecting blast vibrations. This is not surprising since it determines the amount of energy imparted to the rock. The charge weight is directly proportional to hole diameter and therefore can be adjusted to meet optimum production levels as well as vibration criteria".***

[151] Part 6.5.5.1(f) of the proposed district plan contains standards which define limits for blast induced ground vibrations. These are:-

> *(i) The noise created by the use of explosives measured at a notional boundary of 20m from occupied dwellings shall either not exceed a peak overall sound pressure of 128 dB or alternatively a peak sound level of 122 dBC.*
>
> *(ii) All blasting shall be restricted to between 9am and 5pm Monday to Friday except where necessary because of safety reasons.*
>
> *(iii) Blasting shall be confined to two occasions per day except where necessary for safety reasons.*
>
> *(iv) Where because of the irregular or infrequent nature of blasting startling of the neighbouring tenants is likely then adequate public notification shall be given to those affected by this.*
>
> *(v) When blasting the limit of particle velocity (peak particle velocity) measured on any foundation of an adjacent building not connected with the site, shall not exceed 20 mm/s for commercial buildings or 5 mm/s for dwellings and buildings of a similar design. Peak particle velocity means the maximum particle velocity in any of three*

mutually perpendicular directions. The units are millimetres per second (mm/s).

(vi) Every blast shall be recorded with particular attention to details of charge weight and delay practises. Monitoring using reliable and appropriate methods representative of all blasts, at varying distances and various sites of differing sensitivity shall be carried out to ensure the limits set out in rule (v) are not exceeded. Blast records and monitoring results shall be made available to the Council on request.

[152] According to Mr Millar the controls particularly in clauses (v) and (vi) are tighter than the widely used German DIN 4150 Standard Part III (1986). The DIN 4150 permits and increases the levels of vibration measured in terms of peak particle velocity with increasing frequency whereas in clauses (v) and (vi) the limits are constant. Further the rule provides that vibration from quarry activities shall not exceed 5 mm/sec PPV for 100% of the time. All the experts agreed that 97.5% compliance at 5 mm/sec PPV is a generally accepted rule. We agree that the rule should be amended accordingly.

[153] The geology of the Hunua area and descriptions of blasting procedures adopted at the existing Hunua quarry were given in detail by Mr Peter Millar. He said that the usual hole diameter for the placement of charges was 102mm, with explosive charges usually between 80 and 160kg per hole, 160kg being the maximum used. He produced figures from 4 explosions at the Hunua greywacke quarry for which seismic acts were recorded and suggested that this information be used to derive figures upon which to base our decisions as to effects upon the quarry's neighbouring property.

[154] On the other hand, Mr J Russell drew attention to the absence of past vibration records from the Hunua quarry referred to in Mr Millar's evidence. Mr Russell took issue with the use of data based on readings at the Stevenson quarry (Drury) and the Winstone quarry (Lunn Avenue, Auckland). He felt the readings to be useless, being based upon differing rock type. He said:-

"In order to obtain a reasonable accurate approximation of the vibration characteristics of this particular site at Symonds Hill, there should, in my view, be a proper vibration study undertaken. In my opinion, Mr Millar is, given the absence of relevant information, forced to make assumptions about assumptions, and apply statistical analysis to the result. I would consider this to be a thoroughly unsatisfactory method of predicting vibration characteristics as they would affect the Richardson estate property. I stress the desirability of a proper vibration study being undertaken before conclusions can be drawn in this respect.

In my opinion, the seismic information from the Lunn Avenue quarry and the estimation charts from Australian Standards (AS2187.2 - 1993) should likewise be ignored, as they simply add confusion to the results".

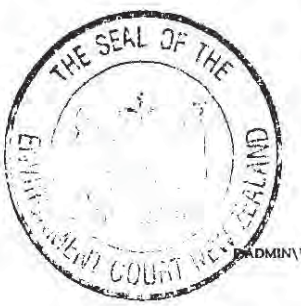
[155] He continued later, saying:-

"For reasons I have advanced above, I am of the opinion that it is totally unsatisfactory to seek to raise to conclusions based on 4 sample blasts only, because the actual vibrations experienced in the particular site, may in fact be considerably different and may invalidate either Mr Millar's conclusions or my conclusions, or produce a compromised result between either argument".

[156] Mr Christensen made a constructive analysis of the dichotomy between the evidence Mr Millar and Mr Russell. We do not intend to discuss this matter at great length. While many of the issues raised by Mr Christensen were thought provoking and exercised our minds we were left at the end of the day with some considerable disquiet. We find it unsatisfactory for us to consider reaching a conclusion when the empirical data on which Mr Millar's extrapolations are based have been so cogently criticised by Mr Russell, a criticism with which we have considerable empathy.

[157] We are unable to conclude the matter without having appropriate data and expert opinions based on it.

[158] It is clear from the evidence that vibration effects are significantly dependent upon the blasting regime. As Dr St George said in the passage quoted from his evidence the charge/weight delay has been found to be the most influential parameter affecting blast vibration. The use of smaller charge weights require the reduction in the height of benches. Mr Millar pointed out that this practice increased the costs of post-blast processing but he did not give us any figures. The costs of modifying the blasting regime were also touched upon by Mr R G Compton the resource development director with Winstone. He said:-



"Mr Millar's evidence will discuss the relationship between the "charge weight" of explosive and the noise/vibration generated. The relationship between drilling and blasting means that the unit cost of production for blasted rock is lower when higher charge weights are used. At our Mt Wellington quarry, the encroachment over the years of residential and commercial development on the surrounding land has meant that a more intensively managed blasting programme involving more complex procedures using lower charge weights and "decked" patterns of explosives have had to be adopted. Apart from the increased direct costs associated with implementing this programme at Mt Wellington there are also significant additional indirect costs. These include the provision of extra resources to monitor effects and to deal with complaints about the perceived effects I have referred to.

Direct costs are also still increasing. The quarry manager has recently engaged overseas consulting expertise which has resulted in the introduction of laser profiling and bore hole logging. These tools survey the face profile and drill holes allowing accurate definition of critical blasting design parameters. This is intended to further reduce the effects of blast vibration even though the present practice results in compliance with the district plan. These initiatives introduce a cost that need not be associated with quarrying where an appropriate distance allows the attenuation of vibration effects.

It is clear there is a significant difference in cost as the result of having to adopt "urban" blasting practice at Mt Wellington because of the proximity of neighbours. On the basis of direct costs alone I estimate that the unit cost of blasting at Mt Wellington in the June 1997 financial year was almost double that achieved at Hunua where usual quarry practice for the most efficient operation is still possible".

[159] Again from the evidence we have no definitive calculation.

[160] Mr Russell and Dr St George attempted to quantify the cost effect of modifying the blasting regime. But to be fair to Winstone the evidence is based to some extent on assumptions and as Mr Russell said the increase in drilling and blasting costs is directly related to the inadequacy of any proper vibration information in the way of a vibration study.

[161] There is insufficient evidence on which we can make an informed value judgment. We say value judgment because costs so far as they affect the community is only one factor that has to be taken into account.

[162] We regret to say that, on the evidence, we are unable to make determinations about the issue arising from the vibration effects of blasting. We will require further evidence in this regard.

9. OBJECTIVES AND POLICIES

[163] The objectives and policies have been amended to make provision for "reverse sensitivity" type rules to protect aggregate extraction from sensitive activities that 'can unduly limit the ability to extract the resource'. It was submitted by Mr Kingston, that without defined standards drawing the line between an appropriate level of control at the noise and vibration source, there is nothing to define a requirement that 'will unduly limit' extraction. We agree. We have already referred to the need to have defined standards at the pollution source to properly and adequately determine the need for, and the size of, an ARPA (buffer area). Similarly, those standards will properly and adequately determine whether any sensitive activity will unduly limit the extraction of aggregate.

[164] Because we are of the view that there must be defined standards setting a reasonable noise and vibration limit at the quarry boundary, consequential amendments will need to be made to the objectives and policies reflecting this.

10. INTERIM DECISION

[165] We summarise our interim findings as follows:-

(i) We find that there is jurisdiction for territorial authorities to make provision for reverse sensitivity rules (compatible land use planning) by the implementation of an ARPA (buffer zone) in zones other than the quarry zone.

(ii) The purpose of the Act and the provision of Part II when taken as a whole, give a clear mandate for controls to be included in plans which will prevent undue adverse effects and reduction in amenity values.

(iii) In promoting the sustainable management of natural and physical resources, particularly having regard to s.32(1)(c), the adverse effects of quarrying should be confined as far as possible to the site where those activities giving rise to the effects are carried out.

(iv) In controlling undesirable effects, territorial authorities should impose restrictions to internalise adverse effects as much as reasonably possible. It is only where those effects cannot be reasonably controlled by restrictions and controls aimed at internalisation, that compatible land use planning as sought by the appellants might be appropriate. Those are relatively rare circumstances and will vary from site to site.

(v) In the circumstances of this case, it is appropriate to take into account the cost to the quarry owner of implementing restrictions imposed to internalise effects. When we have regard to the importance of aggregate to the community, any unreasonable costs to the operation will be absorbed by the community at large. However, we hold that the evidence is inconclusive and not sufficiently probative for us to make a determination on the economic issues.

(vi) The datum for the set noise standard should be at the quarry boundary, and it is that which will determine the reasonable noise constraints that the quarry operator will need to work within. Again, the evidence was inconclusive on this matter, as was the evidence as to the appropriate quarry management to achieve the best practical option of noise level.

(vii) It is our tentative view that a vibration standard should be set at the quarry boundary, defining the reasonable restraints that should be imposed on the quarry operator. The evidence relating to vibration

was inclusive, both on the issue, and on the appropriate blasting regime.

[166] This means that the matter will have to be adjourned, to allow the parties to address this evidential need. We regret this course. But to impose restrictions of the kind contemplated on the use of land, such as the Richardson land, which may have quite serious consequences for the landowners without balancing compensation rights, should be done only when there is a clear evidential foundation.

[167] We are also conscious that to allow the appeal would result in serious consequences and further delays to the appellants, particularly Winstone.

[168] Therefore, the appropriate course is to adjourn the matter sine die. This will enable the appellants, the respondent and the third party ,to consider the appropriate amendments that need to be made to define the appropriate controls at the interface boundary, and if need be the appropriate restrictions on adjacent land.

[169] On the matter coming back before us, and having regard to our interim determination, we would require:

(a) Planning evidence on the appropriate changes to the objectives, polices and rules.

(b) Noise evidence on the appropriate level to be imposed at the interface property boundary and if necessary the extent of any ARPA noise zone.

(c) Further evidence on the issue of vibration including:-

- Site specific empirical data

- Whether it is appropriate to impose levels at the interface boundary
- The necessity for and the extent of any ARPA vibration zone

(d) Quantitative evidence on cost.

[170] No doubt, this will require further empirical study by the noise and vibration specialists on both sides. We hope that, at least, they will be able to agree on the empirical data and, preferably, also on the conclusions to be drawn from them.

[171] Leave is reserved for either party to refer the matter back to the Court on two weeks notice. In any event we direct that the proceedings are to be given a callover during the first general sitting of this division of the Court after 1 November 1998.

DATED at AUCKLAND this 14th day of August 1998.

R Gordon Whiting
Environment Judge

THE SEAL OF THE ENVIRONMENT COURT

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ORDINANCE 66 RURAL 6 ZONE

661 ZONE STATEMENT:

The purpose of this zone is to cover areas where quarrying is undertaken on a large scale in the District. It provides also for uses associated with quarrying and industries using quarried material.

662 PREDOMINANT USES:

The following shall be predominant uses and buildings in the Rural 6 Zone:

(a) Farming, including bee keeping, but excluding the following; animal feed lots, wintering barns, poultry farming, pig farming, horse training centres and stables, veterinary hospitals, boarding and breeding kennels, greyhound training grounds and factory farming.

(b) Forestry including production forests, protection forests, farm forestry and tree nurseries.

(c) Portable sawmills, and the operation thereof; provided that such use is of a seasonal or temporary nature.

(d) The quarrying, mining and winning of materials occurring naturally in the zone provided that:

(i) Explosives shall be used only between the hours of 6 a.m. and 7 p.m. on normal working days.

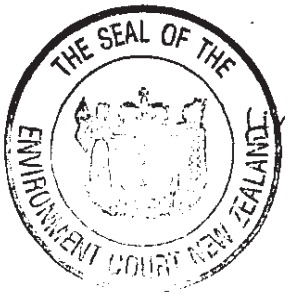
(ii) The provisions of the Quarries Act 1944 and of Section 77 of the Town and Country Planning Act 1977, the Water and Soil Conservation Act 1967, and the Water Pollution Act 1953, shall be complied with in all respects in regard to quarrying operations.

(iii) Explosives shall not be used to cause, outside the Quarry Zone, an amplitude of ground vibration related to frequency of vibration in excess of that set out in the following table.

Table of Frequency Frequency of ground motion in cycles per second -	Amplitude Relations Maximum amplitude of ground motion in millimetres.
Up to 10	0.203
10 - 15	0.152
15 - 20	0.102
20 - 30	0.076
30 - 40	0.051
40 - 60	0.038

The maximum amplitude is the maximum displacement of the ground from its mean or "at rest" position in the longitudinal direction between the blast and the measuring point.

The quarry operator shall carry out such vibration measurements as the Council may from time to time require and should the quarry operator fail or neglect to do so, then the burden of



proof that the quarry operator has in any case not exceeded at any relevant point of measurement outside the quarry an amplitude or ground motion related to frequency of vibration in excess of the table set out under (iii) above, shall be upon such quarry operator.

(v) All quarrying is carried out in a manner that when all materials have been extracted from any area of the quarry as is possible and practicable, the area covered by the quarry shall be left in such a condition as the Council considers suitable for the land to be used for farming or forestry purposes.

(e) The crushing, screening, stockpiling and washing of quarried material; provided that adequate control measures are taken to prevent the pollution of any watercourse, drain, stream, river or underground water.

(f) Buildings for the crushing and screening of stone, and for the maintenance of plant, vehicles and machinery associated with the permitted uses in this zone.

(g) Canteens, diningrooms, ablution blocks, recreation rooms, or other facilities, for the convenience of those engaged in this zone.

(h) Workshops, offices, garages and stores.

(i) Accessory buildings for any of the foregoing purposes.

663 CONTROLLED USES:

Nil

664 CONDITIONAL USES:

The following shall be conditional uses in the Rural 6 Zone:-

(a) Residential accommodation accessory to a use permitted in this zone, and used exlusively as the household unit of any person whose duties require him to live on the premises.

(b) Works of public utility not deemed to be predominant uses by virtue of Section 64 of the Act.

(c) Accessory buildings for any of the foregoing purposes.

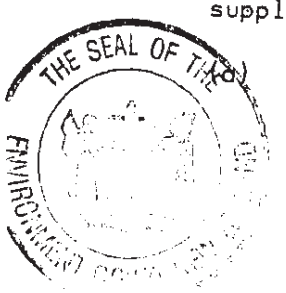
665 SUBDIVISION REQUIREMENTS:

665.1 Subdivision for Quarry Sites:

665.1.1 General Requirements

In conjunction with any scheme plan of subdivision to create a site for an existing or proposed quarry, the following information shall be supplied to Council:-

(a) an indication of the economic life of the quarry or extraction area.



(b) the location of all existing and proposed buildings

(c) the provision of services, including disposal of stormwater and groundwater runoff

(d) access to and through the site

(e) the method of disposal of wastes, including tailings

(f) pollution control measures

(g) proposals for the restoration of spent areas, overburden disposal areas, and ultimate use of the site

(h) erosion control measures.

665.1.2 Minimum Area

No minimum area is specified, however all new boundaries shall be sited at least 30m clear of any excavation or filling areas.

665.2 Subdivision for Farming or Forestry Uses:

Any proposal to create a lot for farming purposes shall comply in all respects with the requirements for these uses specified in Ordinance 616 of this scheme.

665.3 Boundary Adjustments:

In this zone, the requirements of this Ordinance shall not apply to a subdivision if the Council is satisfied that the subdivision is intended solely for the adjustment of boundaries which will leave the new lots with similar areas to that of the original lots; provided that consent to such subdivision is made subject to a provision requiring the issue of one Certificate of Title on that boundary adjustment.

The provisions of this ordinance shall apply to adjoining sites within this zone, and with adjoining sites in the Rural 1 Zone.

665.4 General Clauses Relating to Subdivisions:

For general clauses relating to subdivisions, see Ordinance 1218.

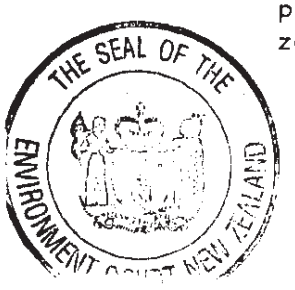
666 BULK AND LOCATION REQUIREMENTS:

666.1 Predominant Uses:

666.1.1 Maximum building height

All buildings 10 metres; provided that this shall not apply to conveyor belts and similar structures, and that at all times the height restrictions for airports are met (see Ordinance 1217).

666.1.2 Yards for quarries All excavation and stock pile areas shall be kept at least 30 metres from any boundary of the zone.



666.1.3 Yards for buildings

(a)	Front yards	12 metres
(b)	Side and rear yards	10 metres

666.2 Conditional Uses:

The bulk and location requirements in respect of any conditional use shall be determined by Council in the light of factors pertaining to each application; provided that where no such requirements are specified in the decision, the bulk and location requirements for predominant uses on the site shall apply.

666.3 Residential Uses as a Conditional Use:

666.3.1 Minimum site area

A residential building permitted as a conditional use in this zone shall have a minimum site area of 1000 square metres and a minimum frontage of 18 metres for a front site, or 3.6 metres for a rear site.

666.3.2 Yards

(a)	Front yards	12 metres
(b)	Rear yards	6 metres, except in the case of a rear site where the yard requirements shall be a continuous yard 3 metres wide from all boundaries.
(c)	Side yards	1.65 metres for dwellings 1.2 metres for accessory buildings.

666.3.3 Maximum building height — 9 metres

No part of any building shall exceed a height equal to 3 metres plus the shortest horizontal distance between that part of the building and the nearest site boundary; provided that at all times the height restrictions for Airports are met. (see Ordinance 1217)

666.4 Dispensation and Waiver from Bulk and Location Requirements:

For dispensation and waiver requirements see Ordinance 1215.

667 PARKING REQUIREMENTS:

667.1 Obligation of Owner or Occupier:

Every owner or occupier who constructs, or substantially reconstructs, alters or adds to a building or changes the use of any land or building in this zone shall make provision, in accordance with the requirements of this ordinance, for vehicles used in conjunction with the site (whether by occupiers, their employees or invitees or other persons) to stand on or, in the opinion of the Council, sufficiently close to that site but not on a road while being loaded or unloaded or awaiting use.

667.2 Number of Parking Spaces Required:

(a) The number of parking spaces required for any use in the zone is as follows:-

Dwellinghouses	1 to each household unit
Quarrying uses	1 to every 3 persons employed in and around the quarry.
Industrial uses	1 to each 45 sq metres of open space used for such purposes and 1 to each 45 sq metres of gross floor area: or 1 to every 3 persons to be employed, whichever requirement is the greater.

(b) Notwithstanding the provisions of this ordinance, adequate parking spaces shall be provided for all trucks and other vehicles required for the operation of the quarry which are housed on the site whilst the quarry is not in operation i.e. at night and weekends.

667.3 General Provisions:

For general provisions relating to parking of motor vehicles, and dispensation and waiver provisions, see Ordinance 171.

668 SIGNS AND HOARDINGS:

668.1 Signs not Permitted:

(a) No signs shall be erected so close to any part of the road, or any corner or intersection as to:-

(i) obstruct or be likely to obstruct the view of users of the road, or

(ii) distract or be likely to distract the attention of users of the road, or

(iii) constitute or be likely to constitute in any way a danger to the public.

(b) Signs on any site shall only relate to the uses undertaken on that site.

668.2 Permitted Signs:

Signs shall be permitted in respect of the total property, or separate use areas, as follows:-

(a) One only single sided sign of not more than $0.5m^2$ in area, which may identify the name and occupier of the quarry.

(b) One sign not exceeding $1m^2$ in area indicating the name of any other premises on the site used for any permitted or existing use.

A sign, or signs, each of not more than $0.55m^2$ in area, as may be required for the direction and control of vehicular and pedestrian traffic.

(d) A temporary sign, or signs, of not more than $1m^2$ in area, erected on a construction site for the duration of the construction project, to indicate the nature of the project, the owner, the architect and other consultants, and contractors.

668.3 General Policies Relating to Advertising:

For general policies relating to advertising, see section 1102 hereof.

Change No.3 Operative 9.12.85

For general provisions relating to dispensations and waivers from signs ordinances, refer Ordinance 1215.

6.48 QUARRY ZONE

6.49 DESCRIPTION

Quarrying is an activity which occurs at two principal locations within the District and the Quarry Zone is applied to these long-established areas of aggregate extraction. The provisions of the zone are designed to provide for the continuation of quarrying and associated uses in these areas subject to strict environmental controls on the operation of the quarry and the ultimate use of the lot. This is achieved through the provisions of the General Quarry Rule which requires the preparation of a Quarry Management Plan where any quarrying activity is undertaken.

Further, there is the on-going possibility that quarrying may occur beyond the boundaries of the present Quarry Zone. Therefore, the General Quarrying Rule will have application throughout the District. Any quarrying activity will be subject to the provisions of the rule to ensure that, while operations continue, nuisance elements are minimised and finally that restoration and final levels are co-ordinated through the Quarry Management Plans.

6.50 RESOURCE MANAGEMENT ISSUES

- The continuation of quarrying and protection of important resource areas as a significant economic activity in the District.
- The sustainable management of the landscape and landforms of the District.
- The avoidance and mitigation of any adverse effects of quarrying.
- The need to control the effects of particular activities associated with quarrying, such as blasting, vibration and noise.
- The need to ensure that the general environmental impacts and effects on amenity due to quarrying operations are minimised.
- The need to provide for site restoration and preparation for subsequent activities.
- The recognition of the need to minimise any adverse effects on water quality.
- The recognition and protection of cultural and heritage values of sites, buildings, places and areas.

6.51 RESOURCE MANAGEMENT STRATEGY

The resource management strategy for this zone is:

- to enable continued quarrying activities within clearly defined management guidelines so that visual and noise amenity and natural environmental values are appropriately managed.

- to ensure that quarried areas are reinstated with vegetation so that the amenities of surrounding areas are maintained and enhanced.

- to place specific controls on those aspects of quarry operations which are likely to lead to detrimental effects.

- to ensure that any quarry operations do not result in the lowering of the water quality or quantity of natural water systems on the land or ultimately surrounding coastal waters.

- to require the production of a Quarry Management Plan showing re-instatement proposals for all areas subject to quarrying activities.

6.52 OUTCOMES

The principal outcome sought by the strategy is to ensure that any significant adverse effects of quarrying and mining activities on the surrounding environment are managed to have a minimal impact on surrounding areas.

6.53 OBJECTIVES AND POLICIES

Objectives

6.53.1 To provide for the careful management and extraction of mineral resources and the restoration of exhausted quarries.

Policies

6.53.1.1 To implement a comprehensive set of rules for quarrying and to provide for the establishment, maintenance and operation of quarrying activities.

6.53.1.2 To require a Quarry Management Plan for all land within the zone and which outlines operational matters and which gives an indication of the proposed end-state of the land once quarrying has ceased.

6.53.1.3 To require all new quarry operations to indicate ~~the~~ a potential end-use of the land before operations commence.

Objective

6.53.2 To impose controls which protect the environmental quality and amenity of the quarry site and of neighbouring properties.

Policies

6.53.2.1 To impose amenity controls at site boundaries.

6.53.2.2 To restrict hours during which explosives may be used in quarry operations.

6.53.2.3 To adopt controls designed to prevent or reduce vibration, dust, noise, and soil and water contamination and degradation.

6.53.2.4 To require the establishment and maintenance of buffer areas between quarry operations and adjacent activities.

6.53.2.5 To require significant historic places and areas to be protected from quarry operations.

6.54 EXPLANATION

Mineral extraction is a temporary activity and restoration of a quarry is required to prepare the land for the establishment of subsequent activities. To this end, the provisions of this zone include a comprehensive set of rules for quarrying. The purpose of these rules is to ensure that, during the course of quarrying, adverse effects on amenity are minimised and that site restoration and final levels are properly planned and co-ordinated. Such planning is required through the preparation of Quarry Management Plans.

Quarry Management Plans are required to show the proposals for the operation and restoration of quarried areas. In particular, Quarry Management Plans are required to show and describe a number of operational and managerial aspects of a quarrying operation. These include the area to be quarried, the location of buildings and plant, areas for the stockpiling of over-burden and existing and final contour levels.

6.55 RULES

6.55.1 Permitted Activities

Any quarry activity or industrial activity and any activity ancillary to the Quarry activities shall be regarded as a permitted activity in the Quarry Zone where it complies with the rules for permitted activities set out below.

1. General Quarrying Rule

(a) Height of buildings

No part of any building shall exceed a height equal to 3 metres plus the shortest horizontal distance between that part of the building and the nearest site boundary provided that:

~~no building shall exceed a maximum height of 10.5 metres except where the Council is satisfied that a greater height is in the best interest of the quarry and the community and is not detrimental to the amenities of the area.~~

No building shall exceed a height of 24 metres. Any proposals to exceed this limitation shall be subject to assessment as a Discretionary Activity.

(b) Yards.

(i) Quarrying Uses

~~Except with the permission of the Director of Regulation and Planning~~ No quarrying shall be carried out within 30 metres of each site boundary [redacted] obtained. Such distance is to be measured at right angles to the boundary or boundary to where the quarry is worked on the site except the excavation may be undertaken in this yard where:

- final levels will coincide with existing levels or proposed final levels on adjoining sites; and
- the site will be graded or batters formed which will ensure the stability of the land and that on adjoining sites for such purposes to which it may be subsequently put.

(ii) [redacted] Uses Other Than Quarrying

The following yards are required for uses other than quarrying.

Front yard - 30 metres provided that:

in the case of any ~~residential, recreational or canteen~~ [redacted] building the minimum front yard requirement shall be 12 metres.

Side yard - 15 metres

Rear yard - 15 metres

Notes:

1. Where any yard is affected by a building restriction yard, that which has the greater dimension will apply.

(c) Lot coverage.

Lot coverage shall not exceed 30% of lot area.

(d) Quarry Management Plan.

The operators and owners of each quarry shall furnish a Quarry Management Plan to the Council for its retention provided that in the case of existing quarries where a quarry plan has been submitted under any provision of an earlier requirement no further plan shall be required except where quarrying is proposed to be extended outside the area shown on that plan, and the Council's consent to such an extension is necessary.

Where the Plan requires the Council's consent to quarrying operations the Council may grant to refuse its consent or require any changes to be made to the Quarry Management Plan or impose other conditions as it sees fit.

All quarrying and restoration shall be carried out in accordance with the Quarry Management Plan which shall include the following information in plan form and in explanatory material:

(i) demarcation of the area to be quarried;

(ii) existing contours;

(iii) an indication of final contours and floor levels including the proposals for the coordination of final levels of adjoining land;

(iv) proposed ultimate drainage of quarried lands and outside any water courses that it may be necessary to obtain;

(v) an indication of the period over which quarrying will continue, and of staged development;

(vi) provision for the disposal and/or stockpiling of overburden, waste and quarried material, including the areas to be used for stockpiling;

(viii) areas for stockpiling topsoil (where applicable);

(ix) provision for screening unsightly features from public view and fencing dangerous of potentially dangerous features;

(x) description of methods to be employed to prevent contamination of air or natural water and to comply with the Noise and Vibration provisions of these rules;

(xi) an indication of the route by which quarried material is to be removed from the lot;

(xii) provision for the progressive restoration of the lot such that the land will be left in such condition as the Council considers suitable for the establishment of those uses to which that land may subsequently be put; and

(xiii) description of methods to be employed to avoid, remedy or mitigate any adverse effects on identified significant places and areas.

(e) Noise.

The L10 noise level as measured at or within 30 metres from any dwelling shall not exceed the following limits:

Monday to Friday between the hours of 0700 - 1800 and Saturday between the hours of 0700 - 1600.

~~50 dBA~~ 55 dBA

At all other times including Sundays and Public Holidays: ~~38~~ 45 dBA.

The noise levels shall be measured and assessed in accordance with the requirements of the New Zealand Standard NZS 6801:1991 Measurement of Sound and NZS 6802:1991 Assessment of Environmental Noise.

The noise shall be measured with a sound level meter complying with the International Standard IEC 651 (1979): Sound Level Metres Type 1.

[redacted]

(f) Vibration and Blasting.

(i) The noise created by the use of explosives measured at ~~the boundary of the site~~ [redacted] shall either not exceed a peak overall sound pressure of 128dB or alternatively a peak sound level of 122dBC.

(ii) All blasting shall be restricted to between 9.00 am and 5.00 pm Monday to Friday except where necessary because of safety reasons.

(iii) Blasting shall be confined to two occasions per day [redacted].

(iv) Where because of the irregular or infrequent nature of blasting starting of neighbouring tenants is likely than adequate public notification shall be given to those affected by this.

(v) When blasting the limit of particle velocity (peak particle velocity) measured on any foundation ~~(or uppermost full storey)~~ of an adjacent building not connected with the site, ~~related to the frequency of the ground vibration,~~ shall not exceed ~~the limits of Table 1 of DIN Standard 4150 Part (1986)~~ [redacted]. Peak particle

6.1.9 *Objective*

To provide for a range of rural living environments as appropriate for people who wish to live in rural areas.

Reasons for Objective

The reason for this objective is that the Council is aware that there is a desire for a variety of rural living lifestyles. Some people seek a residential style of site, others seek a site where they can graze a few animals or grow crops. Others again are looking for small to medium sized holdings where farming can be a supplement to their main employment. The Council considers that it is appropriate to provide for a wide range of lifestyles, in appropriate areas. The location of living environments above or in close proximity to an aggregate resource can make that resource unavailable. Therefore such land is considered to be an inappropriate area for rural living.

6.1.10 *Policies*

~~*a) The Council will make provision in a number of areas in the District for rural residential, semi rural, and small lot rural living. These will be areas where the soil is not of the highest quality for the production of food or areas which are already fragmented by subdivision for part time farming.*~~

a) *Areas for rural living environments (including rural residential and small lot rural) shall avoid areas of highest quality for the production of food and areas likely to be adversely affected by aggregate extraction activities in the Quarry Zone and from identified potential aggregate resources.*

Reasons for Policies (i.e. policies under 6.1.10)

The Council considers that direction should be given to the location of different styles of rural lifestyle so that the land which has less productive potential is given a greater priority for rural living than more productive land. The residential farm park concept has the potential to encourage the retention or formation of larger farm units while increasing the choice in respect of rural residential living types and potentially reducing the demand for lifestyle properties of 4 hectares or less. Residential activity in close proximity to existing quarries and rock resources identified for future quarrying may unduly limit the extraction of valuable aggregate resources. For this reason the plan's rules include special restrictions on residential activities on land in Aggregate Resource Protection Areas which are identified on the Planning Maps and explained in part 6.6.2.

Anticipated Results (i.e. results of policies under 6.1.10)

The demand for rural ~~residential~~ living environments will be met without putting unnecessary pressure on the highest quality land ~~for such activity~~ and without unduly limiting the operations of existing quarries or compromising the future ability to extract known potential aggregate resources.

6.6 *Quarrying/Mineral Extraction*

The Hunua Range constitutes a valuable natural and physical resource in the District and the Auckland Region. Among other attributes it constitutes a major source of aggregate for the region. As quarries nearer the centre of the metropolitan area are worked out the potential for the Hunua's to supply the demand for aggregate will assume even greater significance.

Quarrying and mineral extraction can have significant effects on the environment. Not only do these activities change permanently the physical form of the land on which they are situated. They also can have off site effects which include noise, dust, traffic, contamination of ground and surface water, and visual detraction.

Other activities including residential and community activity can be sensitive to noise and vibration generated during quarrying and to adverse visual effects. The location of such sensitive activity in proximity to an aggregate resource can unduly limit the ability to extract the resource.

The Papakura District Plan - Section Three, Urban, makes specific provision for existing quarries or mineral extraction activities in future. ~~The District Plan does not attempt to predict or provide for this eventuality since it is possible for proposers of any such activity to seek a Change to the District Plan or to apply for a resource consent for a non complying activity~~. Any new mineral extraction activity shall require a change to the district plan or a resource consent.

6.6.1 Objectives

To promote the development of mineral resources of the Hunua area in an environmentally and culturally sensitive manner and to ensure that the extraction of mineral resources is not unnecessarily compromised by other activities which would be detrimentally affected by extraction and processing activities.

Reasons for Objectives

Papakura District contains important mineral resources, particularly rock aggregate which it is important to recognise and protect, and in respect of which it is important to determine whether they are to be exploited or to be preserved.

Add a new clause (e) to policy 6.6.2 and amend reasons and anticipated results as follows:

e) *Mineral resources shall not be compromised by the encroachment of activities which would be detrimentally affected by extraction and processing activities which would, in turn, unduly limit quarry operations or the ability to extract in the future.*

Reasons for Policies

The Council has determined that the development of its mineral resources is appropriate with respect to its duties to sustainably manage the resources of the District. ~~*Further, the Council considers that the policies are necessary to regulate any exploitation and to minimise any adverse environmental effects.*~~ *Further, the policies are necessary to regulate extraction and to avoid, remedy or mitigate any adverse effects from quarrying or from the encroachment of residential, educational and community activities on significant mineral resources. Aggregate minerals are a finite and non-renewable resource. The location of mineral extraction activities is limited to where the minerals are found. Development in close proximity to existing or future quarries may create conflicts which impede the efficient long-term extraction of aggregate resources. For these reasons the planning maps show Aggregate Resource Protection Areas in which rock resources will be protected by limiting other activities as follows:*

(i) *In a buffer area surrounding land planned for quarry activity in the Quarry zone in Hunua Gorge Road;*

(ii) *On land on the north side of Hays Stream which contains a potential resource for future extraction.*

The plan's rules include special restrictions on subdivision and on residential, educational and community activities on land in Aggregate Resource Protection Areas.

Anticipated Results

Mineral exploitation in Papakura will occur only as a result of thorough investigation and assessment of its effects and a decision that these effects are acceptable or can be sufficiently mitigated. Important aggregate resources will not be compromised.

Rule 7.1.2 (Permitted Activities in the Rural Papakura Zone) is amended,

(a) By adding a proviso to the following activities as shown:

- *One single household unit on each certificate of title.*

  (Proviso - on land in an Aggregate Resource Protection Area this is a discretionary activity.)

- *A single household unit on a lot created pursuant to the subdivision rules of this plan.*

  (Proviso - on land in an Aggregate Resource Protection Area this is a discretionary activity.)

- *A temporary household unit complying with rule 8.4.*

  (Proviso - on land in an Aggregate Resource Protection Area this is a discretionary activity.)

- *Farmstay accommodation provided that the farmer and family live on the premises and no more than 10 persons, inclusive of occupiers, family and staff are accommodated in the dwelling.*

  (Proviso - on land in an Aggregate Resource Protection Area this is a discretionary activity.)

- *Educational institutions which are not directly associated with and ancillary to farming activity, provided that such institutions are not permitted on land which has a classification, in terms of the NZ Land Use Capability Surveys I or II or III.*

  (Proviso - on land in an Aggregate Resource Protection Area this is a discretionary activity.)

(b) By adding the following new activity:

- *Prospecting and exploration as defined in the Crown Minerals Act 1991 and water well drilling, provided that the activity does not involve the removal or excavation of more than 100m^3 of material, does not result in any increase in sediment flows to streams and rivers, complies with the NZ Standard NZS 6803P 1984 Measurement and Assessment of Noise from Construction, Maintenance and Demolition Work, and does not cause dust nuisance.*

Rule 7.1.3 (Controlled Activities in the Rural Papakura Zone is amended by adding a proviso to the following activity:

- *Papakainga housing on Maori land up to a maximum of four dwelling units at a density of not more than one unit per hectare complying with the special provisions stated in rule 8.6*

  (Proviso - on land in an Aggregate Resource Protection Area this is a discretionary activity.)

Rule 7.1.4 (Discretionary Activities in the Rural Papakura Zone) is amended by the addition of the following new activities:

- *Any activity listed as a permitted or controlled activity which is annotated "On land in an Aggregate Resource Protection Area this is a discretionary activity".*

- *Prospecting and exploration as defined in the Crown Minerals Act 1991, and water well drilling which do not comply with the requirements for a permitted activity.*

Rule 7.1.5.2 (Controlled Activities under the heading of Subdivision in the Rural Papakura Zone) is amended by the addition of the following proviso at the end of the rule:

(Proviso - on land in an Aggregate Resource Protection Area subdivision is a discretionary activity.)

Rule 7.1.5.3 (Discretionary Activities under the heading of Subdivision in the Rural Papakura Zone) is amended by the addition of the following new activity.

- *Any activity listed as a permitted or controlled activity which is annotated "On land in an Aggregate Resource Protection Area this is a discretionary activity" and subject to the assessment criteria setout in Rule 8.14.*

Rule 7.3.2 (Permitted Activities in the Rural - Residential zone) is amended:

(a) By adding a proviso to the following activities as shown:

- *One single household unit on each certificate of title.*

  (Proviso - on land in an Aggregate Resource Protection Area this is a discretionary activity.)

- *Temporary household units complying with rule 8.4.*

  (Proviso - on land in an Aggregate Resource Protection Area this is a discretionary activity.)

- *Doctor's surgeries.*

  (Proviso - on land in an Aggregate Resource Protection Area this is a discretionary activity.)

(b) By adding the following activity:

- *Prospecting and exploration as defined in the Crown Minerals Act 1991 and water well drilling provided that the activity does not involve the removal or excavation of more than 100m^3 of material, does not result in any increase in sediment flows to streams and rivers, complies with the NZ Standard NZS 6803P 1984 ~~The~~ Measurement and Assessment of Noise from Construction, Maintenance and Demolition Work, and does not cause dust nuisance.*

Rule 7.3.4 (Discretionary Activities in the Rural Residential Zone) is amended by the addition of the following new activities.

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- *Any activity listed as a permitted or controlled activity which is annotated "On land in an Aggregate Resource Protection Area this is a discretionary activity".*

- *Prospecting and exploration as defined in the Crown Minerals Act 1991, and water well drilling which do not comply with the requirements for a permitted activity.*

Rule 7.3.5.2 (Controlled Activities under the heading of Subdivision in the Rural Residential Zone) is amended as follows:

7.3.5.2 Controlled Activities

Subject to assessment against the relevant criteria set out in Rule 8.13 subdivision to a minimum lot size of 1 hectare provided that lot sizes may be reduced to a minimum of 4000m^2 if, for every lot of less than 1 hectare there shall be a corresponding lot of at least 2 hectares. (Proviso-on land in an Aggregate Resource Protection Area this is a discretionary activity).

Rule 7.3.5 (Subdivision in the Rural Residential Zone) is amended by the addition of a new rule as follows:

Rule 7.3.5.4 Discretionary Activities

- *Any activity listed as a permitted or controlled activity which is annotated "On land in an Aggregate Resource Protection Area this is a discretionary activity" and subject to the assessment criteria set out in Rule 8.14.*

Rule 7.5.2 (Permitted Activities in the Nature Conservation Zone) is amended as follows:

(a) By altering the first part of the fourth bullet point to read as follows:

- *Provided that a safe and stable building platform, outdoor living area, access, on-site effluent disposal, and network utilities can be provided without the damage or removal of indigenous trees and vegetation, the following activities are permitted:*

  (i) A single household unit on each certificate of title.

  (Proviso - on land in an Aggregate Resource Protection Area this is a discretionary activity.)

  (ii) A temporary household unit complying with rule 8.4.

  (Proviso - on land in an Aggregate Resource Protection Area this is a discretionary activity.)

(b) By adding the following activity:

- *Prospecting and exploration as defined in the Crown Minerals Act 1991 and water well drilling, provided that the activity does not involve the removal or excavation of more than 100m^3 of material, does not result in any increase in sediment flows to streams and rivers, complies with the NZ Standard NZS 6803P 1984 The Measurement and Assessment of Noise from Construction, Maintenance and Demolition Work, and does not cause dust nuisance.*

Rule 7.5.4 (Discretionary Activities in the Nature Conservation Zone) is amended by the addition of the following new activity.

- *Any activity listed as a permitted or controlled activity which is annotated "On land in an Aggregate Resource Protection Area this is a discretionary activity".*

- *Prospecting and exploration as defined in the Crown Minerals Act 1991, and water well drilling which do not comply with the requirements for a permitted activity.*

Rule 8.2.6.1 (General Subdivision Requirements) is amended as follows:

In approving any subdivision application in the rural areas of the District the Council will need to be satisfied that the physical characteristics of the site in terms of factors which include geology, slope, liability to flooding and liability to slipping, are suitable for the proposed subdivision layout and its intended purpose and will not result in adverse environment effects beyond the subdivision. The subdivision rules of Part 7 include special provisions for subdivision in the Aggregate Resource Protection Area.

Rule 8.13.1 (Controlled and Discretionary Activity Assessment Criteria - Nature Conservation Zone) is amended by the addition of the following clause.

8.13.1 Controlled and Discretionary Activity Assessment Criteria Nature Conservation Zone

In addition to the general matters outlined in Rule 8.14 and Rule 8.15, in granting a consent for a controlled activity or considering a discretionary activity in the Nature Conservation Zone the Council will assess the activity in terms of the following matters over which it has reserved control, and conditions of consent may be imposed in relation to these matters.

c) In respect of a land use consent application, effects on utilisation of aggregate resources.

d) In respect of residential activity located within any Aggregate Resource Protection Area identified on the planning maps:

- *the effect of the activity on potential utilisation of the mineral resource*
- *whether quarry operations will be unduly limited or future extraction compromised*
- *whether the building is located on the site and designed and constructed to mitigate any adverse effects of its proximity to existing and probable future quarry operations.*

Rule 8.14 (Discretionary Activity Assessment Criteria) is amended by the addition of the following clause

8.14 Discretionary Activity Assessment Criteria

In deciding whether to grant or refuse consent to a discretionary activity application and in imposing conditions if consent is granted, the Council will have regard to:

(q) In respect of a land use consent application, the effects on utilisation of aggregate resources.

r) in respect of residential, education or community activity located within any Aggregate Resource Protection Area identified on the planning maps:

- *the effect of the activity on potential utilisation of the aggregate resource.*
- *whether quarry operations will be unduly limited.*
- *whether the building is located on the site and designed and constructed to mitigate any adverse effects of its proximity to existing and probable future quarry operations.*

(s) In respect of a subdivision consent application the extent to which activities consequential upon subdivision would result in effects which unduly compromise existing or potential quarrying of aggregate on any land in the Aggregate Resource Protection Area.. Factors which serve to mitigate effects, for example topography or resource consent conditions, may be taken into account in determining the desirability of a buffer requiring the separation of likely consequential activities from the aggregate resource.

Rule 8.19 (Effect of Quarry Operations on surrounding Activities) is amended as follows:

Activities which are located in close proximity to existing quarries can expect to experience occasional noise vibration and dust as a result of the operation of the quarry. Any residential, educational or community activity located within any Aggregate Resource Protection Area identified on the planning maps and any subdivision for such purposes of land which is located or partly located within any Aggregate Resource Protection Area shall be assessed as a discretionary activity.

Activity in the Quarry Zone is controlled by the zone rules. Quarries are also controlled by other legislation. The noise level from construction maintenance and demolition activities within the Quarry Zone shall comply with and be assessed in accordance with the New Zealand Standard NZS 6803P: 1984, Measurement and Assessment of Noise from Construction, Maintenance and Demolition Work.

Planning Map No. 1 in the Rural Section of the Proposed District Plan is to be amended to show the location of an Aggregate Resource Protection Area.

Planning Map No. 1 in the Rural Section of the Proposed District Plan is to be amended to remove the Nature Conservation Zone from the land owned by Winstone Aggregates Ltd being Lot 1 DP60065, being the land comprised and described in Certificate of Title 18D/1181.