EPA Day 16

ORIGINAL

BEFORE THE ENVIRONMENT COURT

Decision No. A 132 /2009

IN THE MATTER of appeals under Section 120 of the Resource Management Act 1991

BETWEEN

CREST ENERGY KAIPARA LIMITED
(ENV-2008-AKL-000292)

ENVIRONS HOLDINGS LIMITED
(ENV-2008-AKL-000282)

A & C McGILLIVRAY
(ENV-2008-AKL-000291)

DIRECTOR GENERAL OF CONSERVATION
(ENV-2008-AKL-000293)
Appellants

AND

NORTHLAND REGIONAL COUNCIL
Respondent

CREST ENERGY KAIPARA LIMITED
Applicant

Hearing: Whangarei on 8th – 11th, 15th – 18th June 2009 (various further memoranda and submissions received from the parties up to 16th September 2009)

Court: Environment Judge L J Newhook
Environment Commissioner R M Dunlop
Environment Commissioner D Bunting

Appearances: S J Simons for Crest Energy Kaipara Limited
R M Bell and J Collins for Northland Regional Council
K M Anton for Director-General of Conservation
J Mason and P Agius for Environs Holdings Limited

ENVIRONMENT COURT NEW ZEALAND THE SEAL OF THE

M van Kampen for Winstone Aggregates (given leave to retire from the hearing)
J P Ferguson and K T Lloyd for Te Ohu Kai Moana Trustee Limited

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INTERIM DECISION OF THE ENVIRONMENT COURT

A. Indication of a possible positive recommendation to the Minister of Conservation concerning restricted coastal activity applications, and possible consents to the balance of activities applied for. Both subject to the court being satisfied about proposed conditions of consent and draft environmental monitoring plan; further evidence needed.

B. Costs reserved.

REASONS FOR DECISION

Introduction

[1] The applicant (Crest) applied to the Northland Regional Council for a number of consents in order to establish on a staged basis an "array" of 200 turbines on the seabed of the Kaipara Harbour as a renewable electricity power source, and connect them by two cables to a land-based substation at Pouto Point, plus a Northern Wairoa river crossing. The ultimate maximum estimated generating capacity of the array is estimated to be approximately 200MW after establishment of all proposed stages.

[2] Activities which relate to the occupation of space in the coastal marine area, and disturbance of the seabed from the burial of the cables, are restricted coastal activities (RCA), the former falling under the criteria of Section 1.9(a) and 1.9(c) of the New Zealand Coastal Policy Statement (NZCPS), and the second under Section 1.6(b)(iii) of the NZCPS. Employing the terminology of those two sections, the array *would exclude or effectively exclude public access from areas of the coastal marine area over 10 hectares*; the second, the array *would involve occupation or use of areas greater than 50 hectares of the coastal marine area and such occupation or use would restrict public*

access to or through such areas; and the third, because the cables would entail *seabed disturbance [occurring] within a 12-month period and extending ... 1000 metres or more over foreshore or seabed.*

Land use consents have already been granted for land-based components of the proposal.

[3] We note that since we conducted the hearing, Parliament has passed the Resource Management (Simplifying and Streamlining) Amendment Act 2009, significantly modifying for the future, processes that must be undertaken in relation to RCAs. However, the relevant transitional provision Section 156 of the Amendment Act preserves the prior provisions of the Act in relation to RCA procedures where applications have not been decided by the Minister of Conservation prior to the commencement of the amendment (1st October 2009).

The Appeals

[4] Crest is the applicant and one of the appellants. It gained consent from NRC for approximately half of the total number of turbines sought. The proposal was in fact for two arrays, a *western* and *eastern*. The western array was declined, in Crest's view for ill-defined reasons and based on no evidence. The second part of its appeal was against the requirement to establish something to be called the Kaipara Harbour Environmental Trust, but that ground of appeal has subsequently been modified and limited to a relatively minor concern about the constitution of the board of that body.

[5] Environs Holdings Limited appealed against the recommendations to the Minister of Conservation but not those where NRC had jurisdiction to grant consent.

[6] The Director General of Conservation appealed a number of conditions. During the hearing, it appeared that its dispute with Crest was narrowing to an issue of whether baseline monitoring for marine fauna should be undertaken for three years instead of one. However, the dispute actually became somewhat more fundamental as the court drilled further into matters of monitoring pursuant to a proposed Environmental Monitoring Plan ("EMP").

[7] The McGillivrays withdrew from participation in the hearing on the basis of agreement reached amongst the parties that a certain advice note should be inserted in

any consent that was forthcoming. Their counsel has maintained a watching brief on the proceedings and briefly entered the fray again taking an interest in a flurry of memoranda about proposed conditions of consent aired after the hearing.

The Applicant and Background to the Proposal

[8] Crest is a company expressly formed to foster commercial development of marine energy generation. It has undertaken four years of research and assessment at the site in the northern part of the entrance to the Kaipara Harbour, having particular regard to the strong tidal movements there. It describes the harbour as *large and relatively sparsely used*, and emphasises the potential for electricity to be generated in the heart of Northland where electricity supply is presently vulnerable.

[9] The case for Crest was predicated on the basis that the project would have no, or minimal, actual adverse effects on the environment on account of a proffered adaptive management regime. It said that it would avoid any potential adverse effects as being of low, almost negligible probability, but some with possibly high impact, for instance on the rare and endangered Maui dolphin.

[10] We shall describe the technical aspects of the proposal in more detail in the engineering section of this decision, but suffice it to record on an introductory basis that each proposed turbine would be similar (except in its dimensions) to an existing product known as the OpenHydro Turbine which is configured as a large wheel comprising two concentric rings, with an outer ring about 20m in diameter and an inner ring of approximately 7m diameter. The inner ring circumscribes a 7m diameter central void, thought to be beneficial to the passage of marine fauna. The two rings are interconnected with turbine blades. This turbine wheel, the only moving part, rotates at about ten revolutions per minute within the outer housing, with electricity being generated via a solid state permanent magnet generator, and passed through cables to the shore station.

[11] The outer housing is attached at its base to a triangular support structure resting on the seabed.

[12] The total height of the structures would be about 24m above the seabed. All turbines would be located in water at least 31m deep, leaving a depth of at least 7m clear between them and the surface of the water column.

[13] It was the case for Crest, largely developed through the evidence of its director Mr A J Hopkins, that tidal current power generation is a particularly effective form of generation of non-renewable energy, noting that the country's daily electricity demand typically peaks in early morning and evening, one of which can be well served by reasonably closely coinciding with one of those, because of the (approximate) 12 hour tidal cycle with its 2 peak strength flows, each at mid-tide. The energy would complement other sources and reduce demand on fossil fuels. An academic study had been undertaken comparing the full carbon cycles of 4 sustainable energy sources in NZ[1], showing tidal to be the cleanest in CO_2 terms.

[14] Crest's planning had led it to estimate that the project would produce expenditure in its first 10 years, of around $600 million, and call for the employment of skills akin to shipbuilding and large construction projects. Labour would be substantially sourced regionally and nationally, although a moderately high content of the physical infrastructure might have to be sourced offshore. About 66% NZ sourcing is estimated for the inputs overall.

[15] Mr Hopkins also considered that not only would new jobs be created regionally and nationally, but $18 million of extra tax revenue would be created, $31 million of extra purchasing power, and $19 million of savings on government welfare benefits.

[16] Evidence highlighted the relative fragility of electricity supply in Northland, the bulk of which passes through infrastructure on the Auckland Isthmus. Mr Hopkins was asked by Ms Mason in cross examination to concede that recent upgrades on that route by Transpower would fix the problems. His response was that they would help but not cure. In any event it is well known that efficiency in transmission is enhanced the closer the generating source is to the area of consumption.

Planning issues

[17] National and region planning provisions did not of themselves provide significant contest in the case, except to the extent, as is so often the case, that they mirrored concerns in relation to other topics, for instance sustainable management of fisheries, marine fauna, and Maori cultural interests. Key findings on matters in contention will

[1] Tidal, wind, hydro and geothermal

therefore generally be found in the sections of this decision that deal with those topics, so in this early part of the decision we simply provide an indication of the nature of the relevant planning provisions. Further, although we do not refer extensively to each and every relevant planning provision mentioned to us in evidence or submissions, we record that we have comprehensively considered them across the board, while considering the evidence of the relevant witnesses, and submissions made on behalf of the various parties.

[18] The principal witnesses in this area were Mr M B Chrisp, a well qualified resource management practitioner called by Crest, Mr A G Richards, a chartered professional engineer employed by NRC and called by that party, Mr J A Riddell, an experienced resource management planner employed by the Department of Conservation, and to a limited degree, Mr P R Nuttall, a geographer and sometime resource management planner[2].

[19] Because, as we have said, the instruments themselves did not come in for a lot of contentious debate, we will satisfy ourselves by dealing with them in a fairly brief fashion.

[20] In terms of the operative Regional Coastal Plan for Northland, the proposed infrastructure would be placed in a Marine 1 (Protection) Management Area. The basket of consents sought are inherently linked, and the legal position is that the most restrictive activity classification will apply to the proposal overall[3].

[21] Those parts of the application that relate to the occupation of space by the array and disturbance of seabed caused by burial of cables, are Restricted Coastal Activities, as they would exclude or effectively exclude public access from areas of the CMA over 10 hectares (section 1.9(a) NZCPS), and would involve occupation or use of areas greater than 50 hectares of the Coastal Marine Area and such occupation or use would restrict public access to or through such areas (section 1.9(c)). We have taken the conservative position of inferring as relevant for those purposes, that the exclusion and restriction that

[2] We say "limited degree" in the case of Mr Nuttall, because his evidence focussed primarily on other matters such as the Cultural Impact Assessment, and effects on navigation, marine mammals, and fish migration. There was but scant mention of statutory instruments in his evidence.

[3] See for instance *Body Corporate 970101 v Auckland City Council* [2000] NZRMA 202 (HC); [2000] NZRMA 64 (CA).

would occur here would be that which results from the exercise by the Harbourmaster of his powers of exclusion under other legislation for the purposes of navigation safety.

[22] The transmission cable burials will be a restricted coastal activity under section 1.6(b)(iii) of the NZCPS because the seabed disturbance will occur within a 12-month period and extend 1000 metres or more over foreshore or seabed.

[23] Mr Richards identified several provisions from the introduction to the NZCPS which he said were applicable, which do not call for detailed comment. He also identified and discussed the following provisions from Chapters 1, 2, 3 and 4 NZCPS, which again do not call for debate, for reasons given above:

> Policy 1.1.4, Policy 2.1.1, Policy 3.2.2, Policy 3.2.4, Policy 3.2.5, Policy 3.2.8, Policy 3.3.1, Policy 3.5.1, Policy 4.1.3, Policy 4.2.1, Policy 4.2.2.

[24] It will come as no surprise when other sections of this decision are read, that we agree with the observation by Mr Richards that in general the application is not contrary to the general principles and policies expressed in the NZCPS provided that such significant adverse effects on marine fauna and dynamic processes can be avoided, remedied or mitigated.

[25] We have considered as well provisions from the Regional Policy Statement for Northland ("RPS"), from sections 22 (Coastal Management – in particular preservation of natural character, allocation of space in the Coastal Marine Area, and public access); and section 28 (Energy).

[26] From the Regional Coastal Plan for Northland we have considered, amongst other provisions, section 9 (Protection of the Habitats of Significant Indigenous Fauna), section 10 (Public Access), section 11 (Recognition of and Provision for Maori and their Culture and Traditions), section 12 (Cultural Heritage), section 13 (Water Quality), section 17 (Structures), section 19 (Discharges of Water), section 24 (Network Utilities and Services), and section 25 (Marine 1 Protection Area).

[27] This proposal being classified overall as a non-complying activity under the Regional Coastal Plan, we have had to consider whether we can be satisfied that there is jurisdiction to consent under s104D on the basis that either—

(a) The adverse effects of the activity on the environment (other than any effect to which s104(3)(b) applies) will be minor; or

(b) The application is for an activity that will not be contrary to the objectives and policies of—

(i) the relevant plan if there is a plan but no proposed plan in respect of the activity; or

(ii) the relevant proposed plan, if there is a proposed plan but no relevant plan in respect of the activity; or

(iii) both the relevant plan and the relevant proposed plan, if there is both a plan and a proposed plan in respect of the activity.

[28] Here, in terms of subs.(b)(i), there is a relevant plan.

[29] Whether or not there is jurisdiction to grant consent under s104D will essentially depend on resolution of some issues about effects that we hold require further evidence and other input from parties. In consequence of certain plan provisions dealing with the same issues, the answer on the second gateway will largely be the same as concerning the first.

[30] Mr Richards, amongst others, dealt with sections 105 (Discharge of Contaminants to Water) and 107 (Effects on Receiving Waters of Certain Discharges), however we agree with him that issues do not effectively arise in this case on those sections.

New Zealand Energy Policy

[31] Evidence and submissions were directed to a number of statements of national energy policy which we consider can be included amongst matters that we may have regard to under Section 104(1)(c) of the Act *(any other matter the consent authority considers relevant and reasonably necessary to determine the application)*. Some of these statements of national policy also have the potential to assist to inform us about matters in Part 2 of the Act.

[32] Amongst those matters of national energy policy drawn to our attention were included:

- The adoption by New Zealand of the Kyoto Protocol ratified in December 2002 concerning the reduction of average net emissions of greenhouse gases over the period 2008 – 2012, to 1990 levels.

- The New Zealand Energy Strategy 2015 *Powering Our Future – Towards a Sustainable Low Emissions Energy System*, in order to facilitate compliance with the Kyoto Protocol and take sustainability to new levels, by for instance championing renewable energy in connection with power generation, amongst other things.

- The setting of a government target of 90% of electricity to be generated from renewable sources by 2025.

- The New Zealand Energy Efficiency and Conservation Strategy 2007 providing a contestable fund to encourage development of wave and tidal energy.

- The May 2008 announcement by the Minister of Energy that Crest had been granted the whole of the 2008 Contestable New Zealand Marine Energy Deployment Fund provided for under that strategy.

- The gazetting in March 2008 of the National Policy Statement on Electricity Transmission, the purpose of which in summary is to acknowledge the national significance of the national grid and to emphasise that the efficient transmission of electricity on the national grid is important to the well-being of New Zealand, its people and the environment.

Contested Issues

[33] Numbers of issues in the appeal were resolved by caucusing amongst groups of expert witnesses and negotiations amongst parties. However, of those that remained live,

one at least became more contentious. Some issues were frankly outside the jurisdiction of RMA processes.

[34] A list of unresolved issues within jurisdiction, in no particular order, is recorded as follows:

- Sustainable management and regional/national economic issues
- Navigation
- Aspects of electrical and civil engineering
- Coastal processes
- Maori cultural issues
- Marine mammals
- Noise impacts for marine life
- Fish, fisheries, and fishing
- Formation and constitution of a body to be called the "Kaipara Harbour Trust"
- Baseline monitoring and adaptive management/staging/review conditions

Sustainable Management and national/regional economic issues

[35] The two main witnesses in this area apart from Crest's own officers, were an economist Mr P T Donnelly called by Crest, and an energy sector consultant Mr B E Cox, called by Environs.

[36] Despite coming to these issues from rather differing professional backgrounds, these witnesses caucused and provided a joint statement. Possibly on account of their different training, elements of agreement between them were limited. This was surprising in one sense however, because the extent of Mr Cox's opposition to the Crest proposal was really quite limited, as was established readily in cross-examination of him by Ms Simons.

[37] It will therefore be sufficient to describe the evidence of these two witnesses in somewhat summarised form, because the findings we are able to make on their issues flow from evidence that when analysed in the round, was not, as to matters of importance in the case, the subject of real controversy.

[38] Mr Cox has 33 years' experience in the energy sector, with emphasis on electricity generation by various means, renewable and non-renewable. He examined in quite brief fashion, the issue of "need" for additional generation or transmission capability north of Auckland, impacts of that on the cost of electricity, and options available for assisting security of supply and reducing costs and covering cost risk.

[39] Mr Cox sensibly conceded that there are present risks that the proposal could help mitigate, and that electricity costs could be reduced.

[40] However, he was critical of the "intermittent" nature of supply from tidal flows, while conceding that there was more reliability about such supply than from wind, such that planning could be undertaken for appropriate harnessing.

[41] Mr Cox considered that there were some "better" options in prospect for meeting needs and enhancing security, and that some of those could be said to be more "viable". Viability is not an issue for us in this case, and in any event the suggested alternatives were largely speculative, being mainly at early stages of planning, excepting perhaps Transpower's various plans for improving transmission lines into Northland from other parts of the national grid. The latter aspect is acknowledged, but does not, as all witnesses who gave evidence touching the matter conceded, solve all problems (eg. natural disaster such as earthquake cutting all lines through the Auckland Isthmus), and does not address the undoubted benefits for sustainable management of resources, of having generation close to locations of consumption.

[42] Mr Cox was critical, almost in passing, of an alleged lack of "economic efficiency" on the part of the proposal. We think he meant viability, and we have already

dealt with that issue. However, if he meant efficiency, we significantly prefer the evidence of Mr Donnelly, accompanied as it was by cogent reasons that went largely unchallenged.

[43] Such of Mr Cox's evidence as remained of help after our above analyses, was in fact somewhat supportive of the proposal.

[44] Mr Donnelly has 40 years experience in applied economics. He provided evidence that was quite extensive on sustainable management from an economic perspective (s5), the relevance of efficiency to the RMA, an overview of the electricity industry in these terms, potential national/local benefits to be obtained from the proposal, and any positive or negative externalities arising. His evidence was barely challenged, and raised no issues of concern in our minds. By and large, the positives in these areas were clearly apparent, even trite or uncontroversial in some instances. And any negatives were few and relatively small by comparison. We therefore do not need to analyse his evidence in great depth.

[45] Mr Donnelly considered that economic considerations relevant to the promotion of sustainable management (s5) would be strongly promoted. Equally, aspects of s7 of the Act, to which we must have particular regard, will be met in very positive ways. These include s7(b) – efficient use and development of natural and physical resources; s7(ba) – the efficiency of the end use of energy; and s7(j) – the benefits to be derived from the use and development of renewable energy.

[46] Drawing, from amongst other sources, on relevant findings of the Environment Court in ***Marlborough Ridge Limited v Marlborough District Council***[4], Mr Donnelly described economic efficiency as it is understood under the Act. In very much summarised form, he said that the economic benchmark for determining whether an allocation of resources is efficient is gauged by determining whether there is a net gain to society's economic well-being, given that that is synonymous with economic efficiency. He considered that the relevant part of s5(2) and of s7(b) are promoted by the proposal, and we agree.

[47] Mr Donnelly also discussed the application of the recently enacted s7(ba), (the efficiency of the end use of energy) in his evaluation of the proposed project. Concerning electricity he said that the end use could theoretically be a commodity or service, for

[4] [1998]NZRMA 73; 3 ELRNZ 483

example in home heating or the manufacture of goods. But he was of the view that consideration of the "end use" in that context could be very problematic as it would require the evaluation of a very broad spectrum of potential end uses, and that logic therefore suggested that this was not Parliament's intent. Instead, a more likely scenario was that particular regard should be given to how efficiently given types of energy are used as an intermediate input into production processes (eg. efficiency in the use of energy in production from a geothermal plant, or from a thermal plant (gas or coal)). Further, this could extend to consideration of loss minimisation of the generated electricity in the transmission process.

[48] We are much attracted to this hypothesis. If applied to the Kaipara project, the production of electricity from the harnessing of tidal flows would appear to us to represent a particularly efficient use of the tidal energy. In addition, the efficiency would be further enhanced through the location of the plant close to significant energy demand, thereby minimising transmission losses.

[49] Overall, the proposal would then respond very positively to satisfying s7(ba) of the Act.

[50] Mr Donnelly described the importance of reasonably priced electricity to the country's international competitiveness, with consequent benefits for employment, household incomes, and public spending on social services.

[51] He described industry characteristics, examined power and energy margins, described probable types of new generation and alternative sources (noting a Government objective driven in part by its international obligations, to increase renewable energy generation to high levels, ie 90% by 2025, and noting some shortcomings and difficulties for hydro, wind, and geothermal production), and relative cost implications.

[52] Mr Donnelly identified potential benefits in efficiency gains for the national grid, and potential savings in greenhouse gas emissions. He went effectively unchallenged on all these matters, and we have no difficulty in recording positive findings.

[53] We also accept his evidence and conclusions in the following areas :

- *Assistance with avoidance of future electricity shortages.*

- *Reduction of transmission losses compared with electricity imported from other parts of the grid.*
- *Substantial reduction in the need to import electricity from elsewhere in the grid.*
- *Assistance with ensuring that there will be adequate capacity to meet growth in demand on a cost-efficient basis.*
- *Tendency to lower nodal prices in Northland and nationally.*
- *Reduction in CO_2 emissions.(Addresses s7(j)).*

Electrical and civil engineering issues

[54] Engineering and construction evidence in support of the proposed development was provided by Mr G C Teear, a civil engineer with 35 years experience in offshore, subsea, coastal and port engineering works, and Mr W T H P Woods an electrical engineer with over 30 years electricity industry experience covering high and low voltage systems, contracting, project supervision, inspections, and certifications[5]. Electrical engineering evidence opposing the proposal was given by Dr N G Yee, a senior staff member of the Unitec Institute of Technology and a lecturer in electrical engineering and control systems.

[55] In addition, a general overview of the engineering and construction was included in the evidence of Mr A J Hopkins, director and shareholder of Crest Energy Ltd.

[56] We were told by Mr Hopkins that Crest proposes to use marine technology based around an "effects envelope" similar to that of the OpenHydro turbine and that several possible turbine designs would fit within this envelope. The OpenHydro turbine has the configuration of a large wheel comprising two concentric rings, an outer ring about 20 metres in diameter and an inner ring about 7 metres in diameter. The inner ring circumscribes a 7 metre diameter central void. The two rings are interconnected with the turbine blades. This turbine wheel, which is the only moving part, rotates at about 10

[5] Mr Woods was a Crest witness (along with others) who has a small shareholding in the company. This aspect troubles the Court because it can cut across the requirements of objectivity and independence of expert witnesses. The issue can go to weight, particularly if other aspects of dispute amongst witnesses in a particular field are evenly balanced (less critical on this occasion). It may be that these witnesses provided input in the case, receiving shares as consideration, to assist the company's present cash-flow. Parties need to understand the risks described above if that practice is undertaken.

revolutions per minute within an outer housing. The outer ring of the turbine forms a self-contained rotor. Electricity is generated as the rotor moves past the solid state permanent magnet generator which is embedded in the outer housing.

[57] This outer housing is attached at its base to a triangular support structure which rests on the sea bed. This support structure impedes the free flow of the tidal currents and can cause the seabed to scour in its immediate vicinity. It is therefore necessary to anchor the structure to the seabed with receptor piles founded below the scour level. Rock armouring is placed on the seabed around the structure to control the scouring.

[58] The support structure is installed on the seabed before the turbine is lowered and secured in place with fixings of a type that allow the turbine to be uncoupled and raised to the surface for periodic maintenance. Mr Hopkins indicated to us that each turbine may need to be lifted for maintenance about once every four years.

[59] We were told that the turbines plus support structures would have a height of about 24 metres above the seabed. All of the turbines will be located in water at least 31 metres deep. This will mean that the top of each turbine will always be at least 7m below the surface of the sea.

[60] Mr Teear described for us a typical procedure for transporting and installing the turbines from their source of manufacture. This would involve road transport of turbine segments to a staging area alongside the Kaipara Harbour where the segments would be assembled into a completed turbine. The turbines would then be loaded onto a purpose built catamaran barge, transported to the turbine array area, and lowered and connected onto the support structure. Mr Teear provided much detail on this procedure including indicative equipment and technology which could be used, but we do not need to repeat that here. He assured us that all of the equipment and technologies were well proven in the construction of major off-shore marine structures. None of this was disputed.

[61] A map was produced showing the area at the harbour entrance where it is proposed to install the turbines. The installation area is sub-divided into two trapezoidal areas identified as the western array and the eastern array. These two arrays are separated by a gap of just over 2 kilometres. We were advised that decisions had not yet been made as to where individual turbines would be located within each array, including as to the 20 turbines proposed in the first stage. We were however advised through the evidence of

Mr Venus that the spacing between the turbines could be between 30 to 50 metres across the direction of the tidal current and between 120 to 200 metres along the current.

[62] Mr Woods advised that clusters of about 40 turbines would be linked through inter-connection cables to a central junction box. These interconnection cables would have a diameter of around 60mm and be laid directly onto the sea-bed and held down with concrete ballast blocks spaced at between 30 and 50 metres. The central junction box would be connected to a shore sub-station via two 150mm diameter high voltage direct current (DC) transmission cables wrapped together and laid in a single trench 1 to 1.5 metres deep.

[63] Mr Woods considered that the DC transmission cables would emit extremely low strength electric and magnetic fields. The temperature rise from heat dissipation at the bottom of the cable trench adjacent to the cables has been estimated at less than 1^0C. The cables would be installed using well proven construction techniques at a rate of up to 1.5 km per day.

[64] The cables would be buried to protect them from potential damage from anchors, or interference from marine life. Burying also provides a physical constraint against any displacements which might occur from the effects of tidal currents.

[65] The onshore link at Poutu Point and the under river crossing at Raupo-Tikinui would be installed using horizontal directional drilling. This well proven sub-surface installation technology eliminates disturbance which could otherwise result to the foreshore or river bed from more traditional trench excavation methods.

[66] Mr Woods advised that the cables would have a design life of about 40 years. They would be required to be checked every five years for safety compliance under the New Zealand Electricity Regulations. The need for lifting the cables for maintenance or repairs was considered to be very low. If such a need did arise (eg for repairing a faulty cable joint), the trench would be excavated over the length of the fault, the cable lifted, the repair undertaken, the cable reinstalled and the trench backfilled. This should have no more impact on the surrounding environment than the initial cable installation.

[67] We note from Ms Anton's legal submissions that DOC chose not to make a submission on the effects of the installation of the transmission cables across the foreshore and seabed, even though this would be classified as a restricted coastal activity.

[68] DC transmission cables do not contain oil and Mr Hopkins also told us that the turbines have no need of oils, greases and other lubricating fluids.

[69] The draft conditions of consent contain specific provision for the turbines to comply with the "effects" envelope described by Mr Hopkins. They also provide for both biosecurity protection and the control of contaminants from construction equipment (as well as from the permanent facilities). There is also a draft condition covering the minimum depth of burial for the cable crossing of the Poutu foreshore zone. None of these draft conditions was disputed.

[70] Other effects from the transport and installation of the turbines and undersea transmission cables would include some temporary disruption to navigation for other boats using the harbour. Mr Gowing, a marine ecology expert, told us that the natural processes at work in this region of the harbour are so large that the effects of construction generated turbidity on biological resources and fishing activity in the harbour would be no more than minor. Dr J C Montgomery, an expert in fish sensory biology and behaviour, called by Crest, said that there was no reason to suspect that the electric and magnetic fields emitted from the DC cables would detrimentally affect marine life. None of this was disputed.

[71] During the hearing we indicated concern that the draft conditions of consent did not provide for any peer review of the design or installation of the turbines, nor for any related council approvals. We are pleased to note that this was responded to in the revised set of draft conditions, where a new condition has been included requiring the consent holder to submit certified final design details and installation methodology for the turbines, cables and ancillary structures together with peer reviews, followed by certification by the council's Chief Executive Officer or his/her delegate.

[72] Overall we have concluded that the proposed methods for the construction and installation of the turbines, transmission cables and ancillary facilities allied with the proposed conditions of consent relating to these, would result in effects which will be less than minor.

[73] Dr Yee expressed the view that tidal turbine generation technology was still in its infancy. He was sceptical as to whether the performance from a single prototype tidal turbine in the Orkney Islands off the coast of Scotland could be extrapolated to a successful multi-turbine generation facility in the Kaipara Harbour. He also raised doubts over grid connection constraints.

[74] Dr Yee's opinions were refuted by Mr Wood who pointed out that in early 2008, OpenHydro had successfully connected a field-validated turbine for the supply of electricity into the UK grid. This same manufacturer has also signed commercial turbine supply contracts with electricity companies in the UK, Canada, France and the USA. Mr Wood considered that Dr Yee had applied a purely theoretical perspective without the benefit of practical experience.

[75] Having read the evidence of both experts and listened carefully to the cross-examination of Dr Yee, we have drawn a similar conclusion. Dr Yee has based much of his evidence on information obtained from articles in technical journals. On the other hand, Mr Wood has been involved for over three years in investigating the technical and commercial viability of the Crest proposal, in a very thorough fashion. We find on balance that we should give substantially more weight to the evidence of Mr Wood than that of Dr Yee.

[76] In any event, if the resource consents are ultimately granted, the decision on the (technical and commercial) viability of proceeding will be for the consent holder to make.

Navigation

[77] We are satisfied from the evidence of the Harbourmaster Captain I S W Niblock and submissions from Mr Bell, that the discretion to impose navigation exclusion zones lies with the NRC Harbour Master under the Local Government Act. We also note that Crest did not apply under the RMA for exclusive occupation, and so long as we do not find a need for imposition of conditions amounting to such, the RMA consent if forthcoming would not have that quality. We consider that we must however take into account the effects from any such proposed navigation exclusion zones, we having been alerted to the likelihood of the Harbourmaster imposing them.

[78] Captains Varney for Crest, Hawkins for Environs and Niblock for NRC submitted evidence on the impact of the proposed development on navigation and safety at the entrance of the Kaipara Harbour. Following caucusing, the three captains reached agreement on proposed permanent exclusion zones. Their joint statement of agreement reads as follows:

> Following further analysis a 300m wide navigation channel has been identified and agreed by all three witnesses. The channel lies between the northern shore 10m contour and the northern boundary of the restricted area. The restricted area extends 500m west and east of the turbines and 250 m north of the northernmost turbine.

[79] We note that if consent was to be granted and these restricted areas were to be imposed by the Harbourmaster, all vessels other than the consent holder's maintenance vessels would be prohibited from entering these restricted areas.

[80] Ahead of our site visit, we were provided with the co-ordinates of the four corners of each of the two generation arrays. These co-ordinates were entered into the GPS of the helicopter to assist us in identifying the approximate extent of the arrays. From our observations during the site visit, we were concerned as to whether there was adequate width to accommodate the proposed 300m navigation channel. We acknowledge that our observations were purely visual and from a moving helicopter.

[81] At the reconvened hearing following the site visit, we requested Crest to undertake a survey to confirm that there was indeed sufficient width available for the proposed 300m navigation channel of minimum 10m depth, in addition to a 250m buffer around the northern side of the western array.

[82] The applicant arranged a bathymetric survey and produced a statement by a hydrographic surveyor, Mr P R Wallen, experienced in the field in the Royal New Zealand Navy and in private consultancy. He described the further survey work and the results. What has been demonstrated is that there is adequate space for both areas, there being a distance of more than 550m from the 10m depth contour line around North Head, to the western array. Indeed, it was contended that the array could be moved a little northwards to take advantage of the slightly greater currents available. It has also been confirmed from bathymetric surveys in recent years that the northern edge of the mouth of the harbour is trending northwards. We agree with the submission of Mr Bell that to move the western array slightly northward would be within the scope of Crest's original

application. Were movements in the harbour mouth to trend southwards in future, impacts on the channel and the buffer area could be addressed through a review of conditions of consent.

[83] We note that there is a draft condition of consent authorising the consent holder to prohibit anchoring along the main DC transmission cable route, both during its installation and subsequently. This leads us to consideration of the inter-connection cable across the two kilometre gap between the western and eastern arrays. In response to a question from the Court, Ms Simons advised that this cable would be buried in the same way as the main DC transmission cables. On this basis, we have assumed that the consent holder would seek to have an equivalent anchoring restriction over this inter-array cable. Such a restriction would impact on the completely unrestricted use of this inter-array area which had earlier been suggested.

[84] On the basis of there being no objection from DOC or harbour users to the proposed anchoring restriction over the main DC transmission cable, we have presumed that, given its very limited extent, there would also be little objection to an equivalent anchoring restriction along the inter-array cable. If consent is to be granted, the conditions would need to be modified if this anchoring restriction is indeed sought.

[85] In her submissions, Ms Anton set out DOC's position on the proposed navigational restricted areas or exclusion zone. She advised that the Director General had adduced no evidence on the exclusion of passage along the coastal marine area as there was no scope for this level of exclusion. She went on to submit that it was accepted that any navigational exclusions through by-laws under the Local Government Act could produce a consequential effect to be considered under the RMA if consent was to be granted.

[86] Ms Anton cross-examined Mr Wiremu Wright, a director of Environs, called by that party. He provided answers concerning traditional navigation activities in the harbour entrance that he said were still practised by himself and others to this day. We do not need to address the practicalities of enforcement by the Harbourmaster of any navigation restrictions he might impose.

[87] We do say however that to the extent that safety is an issue before us, there are proposed conditions restricting fishing, diving and anchoring. Further, the turbines would

be placed at depths well below the drafts of vessels of the sort employed by Mr Wright and others whether for recreational or charter fishing. So any issue of want of safety would only arise on the limited occasions when turbines were being deployed or serviced. In comparison to the very limited boating use of this remote and often wild part of the harbour as was clear to us from the evidence, the effects would in our view be no more than minor. Steps in mitigation could be deployed to satisfactory effect, including if necessary the use of visual and sound signals on the servicing barge when low visibility circumstances dictated. Appropriate conditions of consent might be called for.

[88] Ms Anton quoted from Section 6 (d) RMA under which the maintenance of public access to and along the coastal marine area is a matter of national importance. It was her submission on behalf of the Director General that the Court, in reaching its decision, would need to weigh the effects of the proposed exclusion of the public from a part of the coastal marine area against other relevant considerations in its Part 2 assessment.

Coastal Processes

[89] The four expert witnesses on coastal processes caucused and produced an agreed statement concerning many aspects. In particular, they saw no coastal process reason for excluding the western array, and that the proposed development generally was unlikely to have significant effects on physical coastal processes; although there would be a need through conditions to deal with some level of uncertainty if the full eastern array was developed. Modelling and monitoring would be important concerning the eastern array, and they recommended that Stage 1 (20 units) be installed with spacings consistent with the likely final density for the 100 units.

[90] Of importance, agreement was reached concerning modelling with the Working Party of the Kaipara Harbour Entrance Monitoring Programme (originally commissioned by sand mining interests in the harbour). Interpretation of outputs from the transport model would also contribute to an understanding of shoreline stability and should be undertaken as part of the proposed baseline environmental monitoring programme.

[91] The experts agreed that a one year strategy for baseline monitoring as presented in the evidence of Dr Kench, was appropriate, and we agree. In particular we find that the bathymetric aspect has now largely been dealt with by recent the work described in the navigation section of this decision.

Marine Fauna and Fisheries

[92] A considerable amount of evidence was called by the parties concerning the rare and endangered Maui's dolphin, recreational fishing opportunities, sharks, and the potential effects of underwater noise that might be produced by the turbines. To a somewhat lesser extent, evidence in chief was advanced about potential impact on commercial fisheries off the West Coast of the North Island, an existing multi-million dollar industry. This became a particularly important feature of the case in our view, and we shall commence this section of the decision with that topic.

Commercial Fisheries

[93] Despite the fairly considerable depth of research on various matters over 3 to 4 years on the part of Crest, we were unfortunately left less than satisfied with the extent of evidence offered by it in this important area. We reiterate important, because it is an existing multi-million dollar industry, and there are key s5 issues at large.

[94] Various suggestions were made by Crest witnesses that they were aware of the topic and the importance that attached to it. They did not however discuss it in anything like sufficient detail.

[95] For instance, Mr L Gowing, a marine ecology and resource management consultant called by Crest having experience with marine ecological surveys, monitoring programmes, and assessments of effects throughout New Zealand, did little more than note that *"the Kaipara Harbour is significant for the West Coast fishery"*. Apart from recording some detail of the size and bio-diversity of the harbour in terms of benthic ecology and bird life, his approach to the issue of commercial fisheries was confined to commercial fishing operations known to exist in the harbour itself. He then moved to a fairly detailed analysis of the relative extent of recreational fishing within the harbour and its entrance, without addressing any aspect of what we understood from other evidence to be important, the movement of certain fish species in and out of the harbour, their spawning, and the subsequent movement of juveniles. This is particularly notable in relation to snapper as a species. He touched on Maori customary fishing and a shell fishery in brief fashion, again within the confines of the harbour, before raising and dismissing any potential concerns about the placement of the structures on the seabed, heat and other emissions from cables, sedimentation, bio-fouling, and other aspects of

water quality. He was dismissive of the decision of the respondent to delete the western array based on its brief reason that there could be "an extent of potential adverse effects on recreational and charter fishing activity", presumably on the basis that the concern was only with fishing activities within the harbour and entrance.

[96] Crest's lead environmental consultant for the preparation of the applications, Mr G C Venus, is experienced in marine biology and resource management projects. From amongst his wide-ranging descriptions of the history of research and preparation of the applications, we struggled to learn any more about potential effects on commercial fisheries. His work had clearly been thorough in some areas, but although by way of introduction he said that he would address perceived risk to marine megafauna and fish in general, he discussed the former, but not the latter.

[97] Mr Venus's rebuttal statement was prepared with the benefit of a caucusing of the planning witnesses, being himself, Mr A Riddell, Mr A Richards, and Mr M Chrisp. From this platform he proceeded to discuss the adaptive management proposals that Crest was in the process of developing and modifying.

[98] Mr Venus noted the definition of adaptive management from the New Zealand Bio-diversity Strategy[6] which reads as follows:

> **Adaptive Management**: an experimental approach to management, or "structural learning by doing". It is based on developing dynamic models that attempt to make predictions or hypotheses about the impact of alternative management policies. Management learning then proceeds by systematic testing of these models, rather than by random trial and error. Adaptive management is most useful where large complex ecological systems are being managed and management decisions cannot wait for final research results.

[99] Mr Venus compared the approach in this case to that taken in cases concerning major marine farming proposals.

[100] We are inclined to the view that the definition in the Strategy might be deficient in a failure to focus on the need on such occasions for robust baseline monitoring.

[101] We have more empathy with the following extract taken from the agreement at the planning witness caucus meeting:

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[6] http://www.biodiversity.govt.nz/picture/doing/nzbs/index.html

> Andrew Riddell, Alan Richards, Mark Chrisp and Garry Venus, all agreed that the project is a candidate for application of the adaptive management regime, however there needs to be applied a set of robust consent conditions reflecting the matters set out in paragraphs 5.1 of Andrew Riddell's evidence [on behalf of the Director General] viz:
>
> > *Features of adaptive management are (i) that stages of development are set out; (ii) the existing environment is established by robust baseline monitoring; (iii) there are clear and strong monitoring, reporting and checking mechanisms so that steps can be taken before significant adverse effects eventuate; (iv) these mechanisms must be supported by enforceable resource consent conditions which require certain criteria to be met before the next stage can proceed; and (v) there is real ability to remove all or some of the development that has occurred at that time if the monitoring results warrant it.*

[102] Mr Venus offered the view that these elements were incorporated in the draft conditions of consent that had been placed before us. We doubt that however, particularly in the area of baseline monitoring of commercial fisheries. He appeared to content himself with the view:

> In my opinion, it should be feasible to obtain resource consent baseline information on distribution of fish and elasmobranchs in the harbour within a one year period, relying on background data on fish catch to supplement records.

[103] The issues came into greater focus in the evidence-in-chief of Dr M P Francis, a principal scientist with the National Institute of Water and Atmospheric Research Limited (NIWA), called by NRC. Dr Francis is a fisheries scientist and marine ecologist with 33 years experience specialising in zoology. He has carried out original scientific research into the biology, ecology, and population dynamics of many marine fish species in New Zealand, including snapper, rig, school shark, great white shark, porbeagle shark, mako shark, blue shark, and skates. He has also conducted research into the habitat requirements of fish in estuaries and harbours throughout New Zealand.

[104] Dr Francis considered that amongst other species, fish have highly developed sensory systems and should be able to navigate and feed in very turbid water, and at night. He considered that they would be able to detect and avoid the turbines. He recommended some conditions of consent concerning burial of the cables to cut down electro-magnetic field emissions. He also offered some observations on issues of underwater noise, which we shall come to.

[105] In an important and succinctly stated section of his evidence, he dealt with loss of habitat and physical obstruction of migration as potential effects. He said that the entrance makes up but a small part of the overall area of the Kaipara Harbour, but in terms of depth, current and sediment characteristics, it is unlike any other part of the harbour. Therefore, it offers a very different habitat type.

[106] Dr Francis told us that the harbour entrance is an essential conduit for species migrating between the harbour and the open sea. Relevant migratory species include orca, rig, school shark, grey mullet, and snapper. He indicated that the Kaipara Harbour is critical habitat for juvenile snapper, producing about 98% of all the juvenile snapper that recruit into the adult snapper populations of the West Coast of the North Island[7]. He noted that a similar situation appeared to apply to trevally populations, with juveniles being abundant in the harbour.

[107] Dr Francis said in evidence-in-chief that there was no information on how fish and sharks migrate into and out of Kaipara Harbour – whether along the seabed or at the surface, or whether in the shallows or via the deep channel. He said that it was therefore impossible to predict what proportion of migrating fish and sharks would encounter the turbine units, and how they would respond to such large physical obstructions if they do. Any significant obstruction of migratory patterns could have major impacts on regionally or nationally important commercial and recreational fisheries, and it was not known whether the power station would cause significant habitat loss or obstruct migration patterns of any key species. He did however concede that the footprint of the proposed power station would be relatively small in the entrance. He recommended a comprehensive Environmental Monitoring Plan as part of the conditions of consent, to include baseline monitoring and on-going monitoring. He told us that the purpose of baseline monitoring was to determine the situation existing prior to construction of the power station so that this could be used as a reference against which future changes, if any, could be measured.

[108] Dr Francis noted that Crest proposes baseline monitoring for twelve months. He noted that other witnesses recommended varying periods up to three years. He appeared reticent about his own view on a desirable period for baseline monitoring of fish, turning

[7] Taken from an unpublished report, of which Dr Francis was one of several authors, about problems deriving from environmental degradation in estuaries.

instead to recommend a minimum of three years of baseline monitoring in relation to marine mammal use of the harbour because of their importance on account of rarity.

[109] Questioned by Ms Anton, counsel for the Director General, Dr Francis confirmed that "statistically meaningful" information about fish populations would need to take account of inter-annual variation.

[110] The burden of the questioning on these issues was left to Mr Ferguson, counsel for Te Ohu Kai Moana Trustee Limited, with commercial fisheries interests.

[111] Dr Francis was questioned about the report just referred to. He acknowledged that it related to a study carried out over four years from 2003 – 2007, and a series of trawl surveys carried out between 1986 and 1999. None of the surveys entered the Kaipara Harbour.

[112] Of some importance to the issue of appropriate baseline modelling for the present project, Dr Francis acknowledged the 98% juvenile snapper figure previously referred to, although he indicated that that part of the study took place over only one year, and because of inter-annual variance the percentage could change amongst years. He agreed that if one was to account for inter-annual variations, a period of three years would probably be required (that is another two). However, he said that he did not think the conclusion already reached would change with more study. It would remain a fact that this harbour, containing as it does great bio-diversity, would be an exceptional habitat for juvenile snapper. On being asked whether the extra two years of survey work would give a more solid base against which to assess potential future changes, Dr Francis said that if there were the potential for only a small adverse effect, a very substantial amount of new work would be needed to detect it. On the other hand, if there were to be a very large adverse effect, then the information already to hand would be sufficient as a baseline to detect it.

[113] Dr Francis was asked about the nature of the survey work, (which is based on studying the otolith or ear bones of snapper caught). It appeared that there was a high degree of probability of accurate identification of fish that had originated in particular harbours including the Kaipara.

[114] Mr Ferguson suggested that if there were to be some calamitous event that affected the habitat of the juvenile snapper in the Kaipara Harbour today, one would have to wait four years to assess the impact on juvenile snapper through the otolith micro-chemistry technique. Dr Francis agreed, although he indicated that one would obtain a "prior inkling" at about three years, from commercial fishing statistics. These periods of time relate to the time for juvenile fish to reach legally "takeable" size.

[115] Subsequent detailed cross-examination by Mr Ferguson tended, in our view, to blur the issues of baseline monitoring and on-going monitoring after establishment of the first turbines. Dr Francis was pressed quite hard to concede that a two or three period would be necessary for the former, followed by something of the order of four years for the latter after establishment of the first turbines.

[116] An important passage of questioning occurred as follows[8]:

MR FERGUSON: Just to clarify in terms of what is or is not required in terms of the baseline period pre-installation of Stage 1, you indicated before that in order to get a better, more accurate ..... you would be running your existing, or sampling that was done over another two to three year period, is that correct? (sic)

DR FRANCIS: Correct.

MR FERGUSON: And so that is a two to three year period there to get your good baseline figures and in this additional sampling that there is abundance for the more precise otolithic analysis that would be important between one to stage one before one assessed whether one should go to stage two and what the adverse effect potentially were on the fishery?

DR FRANCIS: In terms of the sampling of the age structure of the population, the baseline information has already been collected and has been for a number of years, perhaps a decade or more. So there is no concern about how many years of baseline data we will have through examining the age structure of the snapper population. The important issue would be that that sampling would continue after installation in order to be able to provide a measure of any change that has occurred.

[8] At page 259 of the transcript.

[117] An ability on our part to make findings on this issue, is, we think, a very important part of the case. We have analysed this evidence, and the extensive questions and answers around it, with as much care as we can bring to bear. Unfortunately, we have not been assisted by the draft conditions and draft EMP because they are unacceptably vague on this issue. We believe that it remains critical to ascertain whether Dr Francis is of the view that all necessary baseline information is already to hand, or whether the baseline information that is to hand is confined to just one part of that, possibly something termed "age structure of the snapper population". Also, greater clarity might well be needed around any possible need for "out of harbour" monitoring, given the potential for effects beyond the Kaipara.

[118] The issue is too important for us to endeavour to resolve the apparent ambiguities in the evidence at this stage, caused in large measure by the line of questioning blurring the issues of baseline monitoring and on-going monitoring. We consider that there is a need for some further evidence from Dr Francis, and it would be proper to allow other witnesses who touched on the area to provide input as well. There should also be caucusing in the interests of obtaining clarity, and if possible, agreement. For instance, witnesses called on behalf of Environs placed some considerable emphasis on their concerns about perceived shortcomings with adaptive management as offered by Crest[9].

[119] At the same time, the opportunity can be taken to sharpen up the draft conditions and the draft EMP. We have in mind in particular that the various methods of survey described by Dr Francis under cross-examination (otolith micro-chemistry being just one) could be further refined and built into the conditions and draft EMP.

[120] Our last comments may apply with equal force concerning on-going monitoring, even though the concern about baseline monitoring is at present uppermost in our minds.

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[9] Ms J Chetham, the Manager of Environs Holdings and involved in coastal management as a geographer and marine biologist, and Mr P Nuttall, a geographer and resource management consultant, both offered evidence about this, but generally from the point of view of drawing on the evidence of others more qualified in ecology, fish, and marine mammals than they would claim to be. The emphasis that we are looking for in further caucusing is therefore primarily amongst such specialist consultants, but those involved in planning and coastal management might usefully caucus amongst themselves subsequently to the first group. We also need to sound a caution that a person in the position of Ms Chetham, while having recorded that she would honour the obligations incumbent on an expert witness in the Court's Practice Note, cannot properly be said to be an independent expert.

[121] As to on-going monitoring, Dr Francis was asked a number of questions about potential noise impacts on fish, cross referencing to evidence that had been given by Mr N I Hegley and Dr S M Dawson. We will return to that evidence in more detail shortly. Various hypotheses, particularly in terms of numbers of turbines deployed, were put to Dr Francis who expressed a view that Mr Hegley's projections might not have been based on the actual final design of the array, but rather some parts of it. He agreed that the assessment needed to be critically linked to actual design in order for one to rely on a predicted outcome, although he reminded us that he was not an engineer. Dr Francis quite logically offered the opinion that it would be important to measure the noise following installation, through the on-going monitoring requirements of the EMP.

Potential Effects of Noise on Marine Fauna

[122] As just indicated, Crest called evidence on acoustic issues from Mr Hegley, who is an experienced acoustic engineer, while Environs called the evidence of Associate Professor Dawson. Additional evidence was also provided by Dr Francis on behalf of NRC.

[123] It would be helpful at the start of this section to define some of the terms used in the evidence to describe the different species and characteristics of marine fauna. Elasmobranch is a common name for sharks and rays. Mr Hegley employed the term adontocete species to describe dolphins and whales, with these also being described as cetaceans and marine mammals. Dr Dawson also pointed out that there are several taxonomic groups of dolphins which have fundamental anatomical and ecological differences such that the hearing characteristics of one group could not be assumed to apply to another. This could be particularly relevant when considering the potential effects on Maui's dolphin.

[124] It became obvious as we heard the evidence on noise that attempting to apply theoretical methods to assess the potential effects of underwater generated noise from tidal turbines on marine fauna is based on science which is very much in its infancy. For example, endeavouring to extrapolate the data contained in much of the published literature and applying this in a meaningful way to the proposed Kaipara tidal energy farm needs to be made with caution. This is because of the differences which exist between the scope, scale and environmental conditions applying at the very few noise generating sources on which much of the literature is based and those on the proposed

Kaipara tidal energy project. Dr Dawson also indicated that this is further complicated by differences in the characteristics of the marine fauna inhabiting sites in different parts of the world.

[125] Mr Hegley has in the past been involved in issues concerning the effects of noise on fish from power generation projects in South Island rivers and the effects of dredging noise on whales and dolphins in Lyttleton Harbour. He described the general nature of the proposed turbines and discussed potential noise levels on frequencies from such equipment. He offered evidence about studies on the effects of noise from pleasure craft on bottle-nose dolphins. He described examples of shipping traffic noise, and the result of a study of underwater noise from an OpenHydro Tidal Turbine located off the island of Eday in Orkney, Scotland. He also described comparative frequency ranges and background noise levels measured. He had researched audiogram evidence concerning some dolphin and whale species in Northern Europe, and graphed one particular porpoise audiogram against the noise frequencies from the Open HydroTidal Turbine. He had researched as well audiograms of selected Northern European fish. He expressed the view that the effect of surf in and around the Kaipara Harbour entrance would generate more noise than would the open sea, and hence increase background sound comparatively. Hence, he considered his analyses of the information from the northern hemisphere, to be conservative. He offered the confident opinion that there would be no hearing hazard, behavioural issue or communication masking from turbine noise for sea life in the vicinity of the proposed turbines, and that therefore there would be no change in the migration or lifestyle of sharks, rays, fish, porpoise, or dolphins.

[126] Dr Francis noted that while he has undertaken original scientific research into the biology, ecology of marine fish species in New Zealand, he had not undertaken any original research into the effects of noise on marine megafauna, nor had he conducted any research on marine mammals. His evidence on noise was based on his review of international research. From this research he concluded that given the lack of information on turbine noise data and how New Zealand species of megafauna might respond, it was not possible to form a view as to whether one or more species might prove sensitive to the noise and in turn whether this might affect their migratory behaviour. From his literature research, he noted however, that the potential impact of turbine noise is likely to be mitigated by a number of factors including the likely high ambient noise, the likelihood that elasmobranchs will show little response to the steady noise which the turbines are likely to produce, that elasmobranchs generally only respond

to sounds that are 15-25 dB above ambient, and that marine mammals are highly intelligent and may become "habituated" to the presence of the proposed turbines.

[127] We note that Dr Francis was critical of the absence from Mr Hegley's assessment (in his evidence in chief), of any measurement of background underwater noise. Accordingly, by the time of preparation of his rebuttal evidence, Mr Hegley had arranged for such to be undertaken. This was done during the course of one day, in sea conditions that were not particularly rough, but with approximately maximum current flow given that the tide was approximately halfway in. Mr Hegley assessed that this would represent a period when the highest noise from the turbines would occur. The measurements were undertaken at depths of 10m and 20m.

[128] From this, Mr Hegley provided a table setting out his predictions of the noise from the total 200 turbine array and the relationship of these predictions to ambient noise levels as follows:

Distance (m)	Predicted Noise dB (re 1µPa)	Level Above Ambient (dB)
20	156	35
50	149	28
100	143	22
200	137	16
400	132	11
600	128	7
800	126	5
1000	124	3
1500	121	0

[129] Under cross examination, and in response to a concern raised by Dr Dawson, Mr Hegley explained that, because of the proposed large spacings of the turbines within each turbine array, the predicted noise levels shown in the above table would be those generated from a single turbine, and that there would be no incremental effect on this noise level from the noise being generated from any other turbine in the array.

[130] For elasmobranchs, Mr Hegley predicted that the noise level 200m from the turbine array would be 16dB above the existing noise environment. He compared this with Dr Francis's evidence that the sound needs to be 15-25dB above background noise to elicit any response from any elasomobranch.

[131] For mammals, Mr Hegley considered that if mammals choose to swim amongst the turbines the noise exposure would be as high as 165dB within 4m of a turbine, with the turbine-supporting structure restricting access much closer than this. He went on to say that he has seen dolphins playing apparently without distress for periods of up to 10 minutes in the very high noise environment of the wake of high speed motor launches, as close as 3m to the propeller.

[132] In his primary evidence, Mr Hegley concluded that for fish, noise from the turbines was not expected to generate any negative effects.

[133] Dr Dawson claims 28 years experience as a bio-acoustician during which he has carried out and supervised research on dolphin and whale sounds, echolocation, and communication. He has also worked closely with Dr Slooten[10] on research concerning Maui's dolphin. In his evidence, Dr Dawson disagreed with a number of the conclusions drawn by Mr Hegley, which Mr Hegley subsequently responded to in his rebuttal evidence. Dr Dawson and Mr Hegley then met in an endeavour to reconcile the outstanding differences between them. These are addressed below. Dr Dawson did in fact conclude that masking of the Maui's dolphin sonar signal by turbine noise is not likely to be significant and that it is unlikely that turbine noise will be sufficiently loud to cause temporary or permanent hearing damage.

[134] It became evident however that Dr Dawson was strongly critical of Mr Hegley's work in many respects, and in his turn, Mr Hegley was strongly critical of the approach taken by Dr Dawson. It was suggested by Mr Hegley that Dr Dawson's approach was unduly academic. But the recent underwater sound measuring apart, a similar comment could be made about some of Mr Hegley's reliance on information and data from overseas.

[135] Caucusing between them ultimately produced some common ground, while leaving significant differences of opinion on some issues. In particular, they noted that the table provided by Mr Hegley in his rebuttal concerning the predicted noise from a total array of up to 200 turbines was based on assumed spherical propagation, absorption and propagation losses as measured at Orkney, and not based on any measured data from

[10] Introduced in the next section of this decision.

the Kaipara site. This was not surprising given that turbines have yet to be installed at Kaipara.

[136] They also agreed that fouling, if significant (that is in the order of 5-10mm of vertical weed growth projection) would be likely to change source level and frequency content of the turbines, and that it would potentially decrease low frequency content and increase high frequency content. However, they disagreed as to whether it would be possible to predict changes in noise levels from this.

[137] Dr Dawson pointed out that the dolphin audiogram used in Mr Hegley's evidence would not apply, as it related to a dolphin belonging to a different taxonomic group which had fundamental anatomical and ecological differences.

[138] Mr Hegley stuck to his view that the acoustic characteristics of a larger turbine could be predicted from data gained from the smaller prototype, and from engineering theory. Dr Dawson considered that it was far preferable to gain empirical data from a full sized turbine.

[139] They debated whether a 35dB difference between a predicted turbine noise level and ambient noise level was significant.

[140] They also differed over Mr Hegley's claim in his rebuttal evidence that 200 turbines are likely to generate a noise level of 35dB above ambient at 20m from the closest turbine, for the reason that other nearby turbines would contribute to the sound field at that point. This was subsequently responded to by Mr Hegley under cross examination as discussed above.

[141] Dr Dawson did not accept as relevant Mr Hegley's observation that dolphins sometimes tolerate relatively high levels of noise when bow-riding alongside boats. He did not consider that this implied tolerance of high levels of environmental noise.

[142] Regrettably, Dr Dawson was not happy to discuss potential conditions should the project be approved, on the basis that there was "too little information available to be able to rationally proceed with the proposed installation of the first 20 turbines".

[143] If Dr Dawson's opinion that the turbine noise would be unlikely to cause temporary or permanent hearing damage to Maui's dolphin could be extended to apply to other marine fauna which use the Kaipara Harbour, (we do not know if this is so), then the potential effects from turbine noise could well be limited to possible changes in the migratory behaviour of marine fauna seeking to avoid the noise.

[144] In this context, Mr Hegley predicted that there could be an increase in the ambient noise level of 16 dB, 200m from the nearest turbine. We are left wondering whether the extensive width across the harbour entrance (up to 1.5km) over which the noise level is predicted to exceed 16dB, would influence the migratory behaviour of elasmobranchs at least, given Dr Francis' evidence that an increase in sound level above 15dB could well elicit a response from them.

[145] For mammals and fish, we have no reliable evidence to assess their likely response to the turbine noise, or for that matter as to how they might respond to the presence of the turbines as an obstruction to their free passage through the harbour.

[146] We confirm our view that attempting to apply the theoretical methods adopted in the evidence to reliably assess the potential effects of the noise from tidal turbines on marine fauna, has been based on science which is somewhat in its infancy. Instead, in order to obtain information on the likely effects which is in any way reliable, we perceive a need for actual noise monitoring in both baseline monitoring and the ongoing EMP. We reiterate as well the need for the setting of objectives in monitoring programmes.

[147] Dr Dawson's reluctance to discuss potential conditions was unduly and inappropriately conservative. We have formed the view that it is reasonable to expect that conditions could be developed to define the potential effects of noise including a method for measuring these effects both in the baseline monitoring programme and in the ongoing EMP. If the most significant effect is shown to be a change in migratory behaviour, we acknowledge that it might ultimately prove difficult to differentiate between the relative contributions to it by noise and the physical obstruction presented by the turbine array, respectively. But the overall outcome in terms of effects is more important than identifying which of the 2 factors is the cause, except in relation to an ability to design mitigation measures. If further work on that aspect is anticipated or thought possible, that should feature in redrafted conditions of consent and the EMP.

Maui's Dolphin and Other Marine Mammals

[148] Expert evidence on marine mammals was provided by Mr M W Cawthorn on behalf of Crest, Dr S P Du Fresne on behalf of the Director General of Conservation, and Associate Professor Dr E Slooten on behalf of Environs. This evidence focussed particularly on Maui's dolphin.

[149] First, drawing on the evidence of Dr Slooten we provide some general background on Maui's dolphin. In 1970 the total population of the dolphin was estimated to be more than 1700 but by 2004 the number had declined to just over 100. Of these, half could be expected to be females, with half again expected to be of breeding age. Female Maui's dolphin breed every two to four years such that the maximum population growth rate is estimated to be about 1.8% per year. The average lifespan of this dolphin is estimated at about 20 years.

[150] With its low numbers and the threats to its continued existence, Maui's dolphin is listed internationally as being critically endangered, this being defined as "facing a very high risk of extinction".

[151] The Department of Conservation (DOC) and the Ministry of Fisheries have prepared a Threat Management Plan for Hector's and Maui's dolphins. The threats identified include fishing and in particular gillnet and trawl fisheries, pollution, and sand mining. In addition, DOC has put in place a Marine Mammal Sanctuary to protect Maui's dolphin, covering the area along the west coast of the North Island from Maunganui Bluff north of Dargaville to New Plymouth in the south, including the Kaipara Harbour. Dr Slooten advised that, even with these protection measures, gillnet fishing is still allowed inside the Kaipara and other harbours, and trawling is allowed beyond two nautical miles from the shore.

[152] Mr Cawthorn is a zoologist with 45 years experience in marine mammal research. Whilst agreeing with Dr Slooten's estimate of the number of Maui's dolphin and their geographical range, a key thrust of Mr Cawthorn's evidence was that the number of the dolphins recorded as having entered the Kaipara Harbour over recent years could be described as virtually nil. In support of this, on a broader front, Mr Cawthorn referred to several independent surveys which have established that approximately 70% of the overall Maui's dolphin population is in fact concentrated between Manukau Harbour and

the mouth of the Waikato River. In addition, from 2001 to 2007, for the Kaipara Harbour there were only seven sightings of a possible nine dolphins submitted by members of the public to DOC and the University of Auckland. He noted that none of these observers were trained in dolphin identification.

[153] Mr Cawthorn also quoted a 2007 press release from Te Runanga a Iwi o Ngapuhi which stated that "Maui's dolphin does not come into harbours, and has never been seen inside a harbour". In his rebuttal evidence Mr Cawthorn referred to a DOC chart which summarised sightings from all sources from 1970 to March 2008. From this chart, he concluded that there has been no recorded sighting of a Maui's dolphin inside the Kaipara Harbour over this period and that in the last six years there has been only one group of Maui's dolphin at one time recorded at the entrance to the harbour. His overall conclusion is that Maui's dolphin visit the harbour entrance infrequently and that they very rarely travel through the entrance into the harbour.

[154] Mr Cawthorn was also of the view that the proposed gaps between the turbines would be sufficiently large as not to impede the movement of any cetaceans into and out of the harbour, and further that the configuration of the proposed turbines themselves with their enclosed blades and large central opening would provide little obstacle for a 1.6m Maui's dolphin. He also stated that in all of his experience he has yet to see dolphins suffering trauma from collisions with permanent underwater objects fixed to the seabed.

[155] He did, however conclude that it is not possible to state unequivocally that the turbines will have no effect on cetaceans and that he supports staged deployment with a properly designed monitoring plan. We will return to this plan and in particular its duration, after we have covered the evidence of the other experts.

[156] Dr Du Fresne was awarded his doctorate in 2005. His graduate research focussed on Hector's dolphin. His analysis in evidence of the Maui's dolphin "sightings" database suggested to him that Maui's dolphins may have been seen near and occasionally in, the Kaipara Harbour particularly near the southern entrance and in the channel near North Head. Dr Du Fresne had been unable to find any published studies assessing the potential effects of marine turbines on marine mammals.

[157] Much of Dr Du Fresne's evidence discussed the options for baseline and post deployment monitoring. In this context, he was of the view that the current lack of information on marine tidal turbines combined with the lack of site-specific information on marine mammal activity should not be seen as an impediment to appropriate development. He supported Crest's staged installation proposal provided that it was accompanied by a properly designed monitoring programme. It was his view that the effects from the proposed marine energy farm on marine mammals including Maui's dolphin were likely to be minor but that this view should be revisited on completion of the baseline monitoring programme and also if any other relevant additional information should become available from overseas.

[158] Dr Slooten, called by Environs, is an Associate Professor in the Department of Zoology of the University of Otago where she has worked since 1990. She has been undertaking research on Hector's dolphin since 1984. Having published a book and over 40 papers on the biology, behaviour and conservation biology of Hector's and Maui's dolphins, she is an acknowledged expert on these mammals. Her key focus is on the conservation status of Maui's dolphin.

[159] In her evidence, Dr Slooten addressed the threats to Maui's dolphin and other marine mammals including injury or death resulting from collision with the turbines, potential disturbance to marine mammal habitats affecting the dolphins and/or their prey and changes in behaviour or movement. In an ideal world, she said, the recovery of Maui's dolphin from its critically endangered status would require the removal of all human impacts to the greatest extent technically possible. Dr Slooten considered that there was insufficient information currently available to assess the risk of marine mammals (and particularly Maui's dolphin) colliding with the proposed turbines.

[160] The statement of matters agreed between experts in this field recorded, with reference to marine mammals and Maui's dolphin in particular, that Dr Du Fresne and Mr Cawthorn agreed that staged implementation was an appropriate approach for the proposed project.

[161] Dr Slooten did not agree as she believed that for marine mammals, including Maui's dolphin, it is not technically possible to detect potential effects within the adaptive management timescale proposed by Crest. She believed that it would take more than ten years to detect changes in population size and that to estimate survival and

reproductive rates would also take more than ten years of baseline research followed by more than ten years of research after each of the proposed installation stages.

[162] The statement also recorded the views of each of the experts on the proposed periods for the initial baseline monitoring but it is not clear as to what they consider the monitoring period should be after each installation stage.

[163] Focussing on Maui's dolphin and other marine mammals, it was Mr Cawthorn's view that a minimum of two years of intensive monitoring would be sufficient to establish a baseline for distribution and movements. Dr Slooten and Dr Du Fresne maintained that a minimum period of three years was required to establish this baseline. As described above, Dr Slooten, supported by Dr Du Fresne, went on to state that to gather sufficient data on key population parameters such as survival and reproductive rates would take much longer.

[164] In submissions, Ms Mason for Environs pointed out that the decision as to whether to preserve the species or let them face extinction has already been made through the release of the DOC/Ministry of Fisheries Threat Management Plan and the establishment by DOC of the Marine Mammal Sanctuary. She therefore contended that it is not for the Court to make a decision on that. We do not disagree, and note that Ms Simons conceded that even one death of one Maui's dolphin would be one too many.

[165] We perceive that there is general agreement among the experts that while the number of Maui's dolphin entering the Kaipara Harbour would appear to be at most very low, entry cannot be discounted. However, with the numbers of these dolphins already being at such a critically low level, the death of even one dolphin through contact with the proposed turbines could apparently impact on the survival of the species.

[166] The experts agree that the potential effects of the turbines on Maui's dolphin (and indeed on other cetaceans) need to be assessed through a properly designed monitoring programme. Where they differ is on the length of the period over which this programme needs to be conducted, whether this should be for two or three years in order to establish distribution and movements, or up to ten years to provide additional information on population parameters such as survival and reproduction rates.

[167] In considering the conservatism of Dr Slooten's stance, we feel bound to record some surprise that, in comparison say to studies and species rescue attempts of land-based fauna like the Kakapo, the Department of Conservation has not yet pursued studies and protection of Maui's dolphin with greater vigour. We are aware of conditions of consent imposed by this Court on renewal of sand mining permits east of the harbour entrance, requiring visual monitoring for the presence of the mammal and reporting of any sightings. Even with that regime in place, reported sightings in the general area remain at a level of virtual non-existence.

[168] We consider in light of these factors that Dr Slooten's view that the monitoring programme should also include population parameters such as survival and reproduction rates, should be seen as overly conservative, and that a properly designed baseline monitoring regime, complete with objectives recording amongst other things the importance of not further endangering survival of the species, should be for a 2 year period.

[169] Our view at this stage is equally that intervals between stages of establishment and ongoing monitoring, should be of a similar order. Further work is required to fine tune the monitoring regimes, with perhaps further evidence and caucusing called for. We have real doubts at this stage about any value likely to come from placing untrained or partly trained amateur observers on the shoreline for extended periods, and doubt that there are sufficient well-trained persons in the field with the time to undertake this instead of other work in the field.

Maori Cultural Issues

[170] Environs Holdings Limited is a wholly owned subsidiary of Te Uri o Hau Settlement Trust, described by its counsel as responsible for the implementation of activities that advance the wellbeing of people and their environment within the Te Uri o Hau rohe. Te Uri o Hau is a Northland hapu of Ngati Whatua, and its rohe includes the land, coast and shoreline of the northern Kaipara region. They claim status as mana whenua, mana moana, tangata whenua, kaitiaki, ahi kaa, and hau kainga. As asserted by their counsel, and essentially confirmed by the decisions on adjournment proceedings in this court and of the High Court prior to the substantive hearing, a key basis for the involvement of Te Uri o Hau rests on an underlying assertion of customary proprietary

ownership of the seabed. Their appeal was based on the further assertion that to grant consent would be contrary to the relevant provisions of the Sections 6, 7 and 8 RMA.

[171] Te Uri o Hau (TUOH) this year lodged a claim in the High Court seeking an award of Territorial Customary Rights. A key plank of the Environs case before us was that any consent would be likely to prejudice any such redress that they might be able to obtain. This assertion was expanded to include a complaint that any grant of consent would severely impact on any future commercial developments that TUOH might wish to pursue in the harbour.

[172] More particular concerns revolved around restrictions on navigation, on customary and commercial fishing, and the safety of marine mammals. Some of these aspects have been dealt with elsewhere in this decision.

[173] Mr W R Wright is a director of Environs, and is closely involved in Ngati Whatua claims processes. Others described him as kaumatua. He offered us information about whakapapa and the history of his people in the area, of long-standing. These matters attracted the acceptance and respect of all parties who spoke about them. There were no issues of disputed mandate in the case, and the existence of certain kinds of Maori cultural relationship with the waters of the harbour and surrounding land were essentially not disputed.

[174] Mr Wright described the Waitangi claims process which resulted in the passing by Parliament of Te Uri o Hau Claims Settlement Act 2002, by Section 59 of which the Crown acknowledged the cultural, spiritual, historic and traditional association of Te Uri o Hau with the Kaipara Harbour. The Crown further acknowledged historic loss of control over land that has prejudiced TUOH, and hindered its economic, social and cultural development. The Crown acknowledged that this had impeded their ability to exercise control over their taonga and waahi tapu, and maintain and foster spiritual connections with their ancestral lands. The accompanying Deed of Settlement recorded amongst many other things that it "*is not possible to fully compensate Te Uri o Hau for all loss and prejudice suffered*".

[175] The evidence of Mr Wright and others confirmed that there is on-going unhappiness on the part of TUOH. Crest has essentially stepped into the middle of this

situation, and perhaps unwittingly by its very proposal, raised passions. However, it must be remembered that Crest is not the Treaty partner. The Treaty partner is the Crown.

[176] Mr Wright explained that it was the aspiration of his people to follow in the footsteps of Ngati Porou on the East Coast and obtain declarations under the Foreshore and Seabed Act 2004 "in order to gain effective right of veto over development proposals". Unless and until such claims bear fruit, TUOH fears, said Mr Wright, "that if the Crest proposal was approved [our] proprietary rights would be severely prejudiced".

[177] This theme was taken up by Ms E Gray, the recently resigned chief executive of the Te Uri o Hau Settlement Trust. She advanced a concern that if Crest were granted the consents, the "*Northland Regional Council would be irrevocably extinguishing our proprietary rights in the Kaipara Harbour*".

[178] That cannot be the position as a matter of law. First, Section 122(1) of the Act provides "*a resource consent is neither real nor personal property*". Secondly, Section 75(3) of the Foreshore and Seabed Act 2004 provides:

> (3) For the purpose of subsection (2)(c), a resource consent that relates to an area of the public foreshore and seabed specified in an application for a customary rights order does not, of itself, extinguish a right to carry on, exercise, or follow an activity, use, or practice.[11]

[179] It was confirmed in the cross-examination of Mr Wright, Ms J C Chetham, the manager of Environs, and Mr P R Nuttall, a resource management planner engaged by Environs, that TUOH held certain commercial aspirations ("in due course") over the waters of the harbour for ventures such as marine farming and tourism. There were even some mixed and imprecise messages about whether TUOH might have aspirations to undertake a development such as that proposed by Crest. These issues being in our view at the heart of the appeal by Environs, caused us to examine all claims and assertions made by it when assessing the veracity of them and assessing whether they can be met to the varying extents required by Sections 6, 7 and 8 RMA.

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[11] Subsection (2)(c) provides that, for the purpose of the previous section, "*a right to carry on, exercise, or follow an activity, use, or practice has been extinguished if, in relation to the area of the public foreshore and seabed specified in the application,— an interest has been established that is legally inconsistent with the activity, use, or practice for which a customary rights order is sought.*"

[180] Notably, Ms Chetham was persuaded by Ms Simons in cross-examination to concede that the situation surrounding the current application did somewhat constitute a "race for space".

[181] We turn to consider the strength of the claims of Maori cultural significance. We can do this quite briefly because, as conceded in the evidence of Mr B Mikaere, a consultant in tangata whenua consultation and cultural issues arising from development under the RMA, called by Crest, the claims were largely indisputable. Such is not surprising, given the confirmation in general terms by the Crown in the 2002 settlement legislation.

[182] The evidence of Mr Wright included advice from oral history about the arrival of ancestors on the shores of the Kaipara. Oral history also recounts many stories about boat travel on the harbour by the people, fishing and gathering of kaimoana, and a famous ancestress, Tehana and others swimming some of the channels in hazardous conditions. The sheer dynamic energy of the harbour is understandably interwoven through many stories.

[183] Mr Wright spoke of the degradation of the waters of the harbour on account of various practices on the land and in the water over many decades, describing the Kaipara as a "sick man". This led to concerns on the part of his people as kaitiaki, and concerns for their mana and that of the harbour. He expressed concerns about limitations likely to be imposed on navigation in and out of the harbour through the area of the proposal, to say nothing of difficulties that would be caused for any agriculture or tourism ventures that iwi might propose.

[184] Suggestions were made about the need for any territorial customary rights order to be complied with, and possible treaty claims in compensation as an alternative.

[185] Mr Nuttall spoke of his involvement facilitating the cultural impact assessment (CIA) brought about by the promulgation of the proposal. This is evidently a very comprehensive document, funded by the applicant. The various Maori cultural issues mentioned above were described in it in great detail. One of Mr Nuttall's principal complaints was that in some way the regional council did not take adequate account of it, and that Crest had belittled the matters assessed. He also complained that since the CIA

was completed, the possibility of the harbourmaster prohibiting navigation to some extent has arisen, such that it was not the subject of assessment in the CIA.

[186] Mr Nuttall also raised concerns about limited understanding of potential effects on megafauna and other marine life.

[187] He noted that background papers and a "roadmap" agreed to by Crest prior to undertaking the CIA included statements to the effect that a successful cultural effects assessment in this instance would not be narrowly confined to matters such as waahi tapu or heritage, but having recorded an understanding of the proposed activity and all supporting information from documentation and workshops, and having identified relationships of TUOH with the resource in relation to the RMA provisions in Part 2, and having identified the effects on TUOH and determined whether they would be no more than minor or would be significant, should assess whether effects could be avoided, remedied or mitigated, construct recommendations on measures that Crest could take to counteract any adverse effects and report back to TUOH and Crest on the results.

[188] Mr Nuttall was inclined to the view that the CIA process had been successfully used to identify relationships, effects, and tangata whenua responses. However, he questioned its usefulness as a vehicle for ongoing dialogue, being critical of the quality of discussion subsequently.

[189] He appeared to have an expectation that the regional council should in some way have followed up concerning alleged treaty obligations, which we consider questionable at best, and hardly a criticism of Crest, it not being a treaty partner.

[190] We were left with the view that Mr Nuttall and his client appeared to have an expectation that consultation before, during and after the preparation of the CIA was required to produce agreement amongst the parties in order for it to be successful; and more particularly that the criticisms were actually borne of disappointment at there having been no outcome satisfactory to TUOH, namely that the proposal be withdrawn or consent refused. We will comment more on this shortly. Included in this raft of concerns was that potential effects on significant species such as Maui's dolphin and juvenile populations of snapper, should result in the application of some sort of "precautionary principle" carrying a further outcome of refusal of the proposal.

[191] Mr Nuttall proceeded to describe in summary form various cultural effects including effects on Mauri (loosely translated as life force or life energy), effects on Mana, (it being suggested that any further adverse physical effects could contribute to cumulative pressure on the harbour, the fisheries and kaimoana beds, and have an adverse cultural effect on the ability of haukinga to feed their families and manuhiri); effects on kaitiakitanga (with criticism of a focus in the RMA on particular effects on waahi tapu or sites of cultural significance), and mention of a taniwha, Pokopoko who guards the entrance to the harbour, amongst others; the various hapu being kaitiaki for the dolphins and of waahi tapu and other sites. In the later regard, he said that shifting sands had uncovered koiwi (human remains) from many tragedies, ancient and more recent.

[192] Ms Gray spoke of the large rohe of TUOH, the work of Environs, and endeavours to seek territorial customary rights which have been slowed by a change of government and review of the relevant legislation.

[193] Ms Chetham stressed her consideration that there was a need for a precautionary approach (citing NZ Coastal Policy Statement Principle 12), leading to a request that the application be declined. She noted however that there had been decisions of the Environment Court and the High Court to the effect that the precautionary principle should not necessarily be reason in itself to decline an application, but remained critical of the adaptive management approach suggested by Crest in circumstances where there were uncertainties about the full effects of the activity, and an assertion by TUOH of property rights in the area. She suggested that if there were to be adaptive management, there should be "*no actual or potential significant adverse effects identified*", the preparation of a comprehensive baseline, a set of monitoring parameters across the full spectrum of the environment including biophysical, economic, social and cultural, followed by staged deployment and rigorous reviews.

[194] In connection with cultural effects she returned to the theme that partnership between local government and TUOH would need to be established, recognising the intention of TUOH and Ngati Whatua to be the future managers of the harbour, and advising that Ngati Whatua would seek a Treaty Settlement that gives them at least equivalent status in harbour management as Tainui in relation to the Waikato River.

[195] Mr Wright and Ms Chetham in particular complained about lack of consultation, particularly on the part of the regional council, but also by Crest. Ms Chetham

complained that she disagreed with the lengthy and detailed record of consultation described in the evidence of Mr Venus, and commented on in the evidence of Mr Mikaere. Allegations and counter-allegations were made concerning who sought meetings and when, who didn't, whether there should have been more meetings, and a myriad of other criticisms.

[196] We have considered the evidence of Mr Venus, as well as that of Mr A J Hopkins, a director of Crest (qualified in environmental biology), and the detail of consultation undertaken.

[197] As so often happens in these cases, consultation appears to be described by opponents as some kind of end in itself, borne, we infer, of an expectation that it should lead to agreement amongst the parties. That has been held by Courts clearly not to be correct.[12] Consultation by an applicant or a consent authority is not an absolute requirement of the Act, but is something on which information is invited when applications are put forward, because it assists the consent authority and the court to understand the extent to which (amongst other things) assessment of effects on the environment might have been undertaken. That is, it assists the consent authority to decide whether it is confident that actual and potential effects are adequately understood, assessed, and dealt with in terms of proffered avoidance, remediation, or mitigation. Consultation must be undertaken with an open mind, and consequently may often result in modifications, concessions, and conditions designed for those ends.

[198] We have the distinct impression that at some stages the parties have been talking past each other, but we hold that attempts by Crest to consult were extensive, considerable and meaningful. They led to concessions, involving modifications to the proposal and proposed conditions, never mind that we consider that more are required.

[199] One particular feature of the application is that Crest appears to have to avoided seeking RMA consent to exclusive occupation of the water column and seabed, for instance, through an absolute prohibition on navigation[13]. It appears to us to have offered sensitivity to concerns in this area, commensurate with other Part 2 issues that are often important in the case such as safety. The staging and adaptive management aspects of the

[12] See for instance *Water Care Services v Minhinnick* [1998] 1NZLR294; [1998] NZRMA113(CA)
[13] The likely action of the Harbour master to restrict navigation under other legislation is of course noted and is discussed elsewhere in this decision (see [77] to [79]).

proposal that have been developed during the life of the case, are a further reflection of a responsiveness to information gathered, albeit as we have said, that more is required.

[200] We are mindful of decisions of superior courts concerning the definition "environment" in Section 2 of the Act, and for the relevant provisions in Sections 5, 6, 7 and 8 in Part 2 of the Act. In particular, we have considered the decision of the Court of Appeal in ***Friends & Community of Ngawha Inc and Ors v Minister of Corrections***[14] and the earlier decision of the High Court in the same matter under the same name,[15] particularly to the effect that the considerations of a consent authority are not confined to biophysical manifestations of the environment, but can extend to beliefs and other cultural matters described in the Act. We have been mindful as well of the decision of the Privy Council in ***McGuire v Hastings District Council***[16], including (but not confined to) the following passage at para [556]:

> ... the statutory provisions quoted (ss 5, 6, 7 & 8 of the Act) do mean that special regard to Maori interests and values is required in such policy decisions as determining the routes of roads. Thus, for instance, their Lordships think that if an alternative route not significantly affecting Maori land which the owners desire to retain were reasonably acceptable, even if not ideal, it would accord with the spirit of the legislation to prefer that route.

[201] We do not consider that alternatives arise in this case in the manner described above. The site of the proposal has been carefully selected after much research documented for us in evidence, and while it might be stretching matters to suggest that it is *unique*, the situation has special and important qualities suitable, even necessary, for undertaking the proposal, which could not possibly be compared with locations for more common activities such as the laying out of roads. What is called for, when we come to weigh matters under Part 2 of the Act, is an assessment of the relative importance of the Maori interests and values in the present case, with other matters required to be considered. We can assure the parties we have given the fullest consideration to all of them, in the terms required by the introductory words to the various sections in Part 2.

[202] In his evidence-in-chief and rebuttal evidence, Mr Mikaere spoke of a number of cultural issues, including spiritual beliefs, as being personal and subjective in nature, meaning that they had an intangible quality and posed a real challenge for an applicant in

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[14] [2003] NZRMA274
[15] [2002] NZRMA401
[16] [2001] NZRMA557

contrast to its ability to respond to tangible ones. He correctly identified that some tangible effects such as potential injury to marine mammals, could have a cultural component as well, as had been recited by witnesses for Environs.

[203] Mr Mikaere correctly said that two steps are required under Section 6(e) of the Act, first recognition, then provision for "the relationship of Maori and their culture and traditions with their ancestral lands, water, sites, waahi tapu and other taonga". We agree with him that the recognition aspect is not an issue in this case, but that providing for the recognised relationship could be more complex. He pointed to the offer of a Memorandum of Understanding (and the apparent rejection of that by TUOH). It is clear to us that Crest has continued to make tangible offers of that sort, coupled with proposed conditions of consent (albeit that more work is needed in that area), even going to the lengths of proposing to fund a trust for environmental restoration in and around the Kaipara Harbour. Two things are notable; first, on the evidence the entrance is probably the least degraded part of the harbour, most damage having occurred close to the foreshore and on land; and consequently, that the offer of the establishment and funding of the trust appears to us to be more akin to an offer of environmental compensation than mitigation. That said, the offer can be seen to address aspects of cultural offence deriving from biological and physical degradation of past land and water management practices, and together with satisfactory conditions of consent addressing ecological and other biophysical matters, should, if those things are adequately addressed, amount to adequate provision for the matters the subject of Section 6(e).

[204] We hold similarly in relation to the issue of kaitiakitanga, to which we are required to have particular regard under Section 7(a). Matters under Section 8 have already been the subject of discussion and findings concerning treaty principles, inclusive of matters of consultation.

Part 2 RMA Assessment

[205] At this stage of the decision, we must assemble and weigh the matters that call for decision making in terms of the overarching provision of the Act, its purpose described in s5, informed by the principles in ss6, 7 and 8.

[206] We have elected to proceed with the exercise at this time, tentative though it might be until some identified uncertainties are resolved through further evidence,

drafting of conditions, and the EMP. That is, we think it appropriate to let the parties know of some positive answers pointing powerfully in the direction of consent being granted, while sounding a note of caution that one of the areas of uncertainty at least, could tip the balance if not dealt with to the Court's satisfaction.

[207] Sustainable management of natural resources (s5(2) and related provisions of Part 2 is where the proposal, perhaps not unexpectedly, scores strongly. As to s5(2), the evidence has satisfied us without doubt that to harness the energy of the tides in the Kaipara Entrance will result in the protection of resources in a way and at a rate that will enable people to provide for their economic wellbeing (as well as to some degree for their social wellbeing and their health), while sustaining the potential of natural and physical resources (with one possible exception) to meet the reasonably foreseeable needs of future generations. It logically follows that we can make parallel positive findings under s7(b) (the efficient use and development of natural and physical resources), s7(ba) (the efficiency of the end use of energy), and s7(j) (the benefits to be derived from the use and development of renewable energy).

[208] In like vein, a strong positive in the case for Crest in terms of reference to the provisions of s104(1)(c), (not of course a Part 2 provision), is found in the encouragement the proposal receives from the matters of national (and indeed international) energy policy listed in an early section of this decision.

[209] The issue of people and communities being enabled to provide for their safety (s5(2)) is one that has been addressed to our satisfaction in the evidence if confirmed by adequate conditions of consent. It is fair to say that this issue is relatively neutral in our weighing of matters in the case overall.

[210] Similarly for matters under s6(d) (the maintenance and enhancement of public access to and along the coastal marine area). In particular we consider from the evidence that public access to this remote and wild area is very limited, involving for instance a handful of boats on the day of an annual fishing contest each summer, but apparently few at any other time. A clear 300m navigation channel is to be maintained to the north of the arrays plus a 250m buffer along their north side. Concerns that that might be somewhat narrow for purposes of safe passage in rough wind and sea conditions are mitigated or allayed on the basis that if conditions drive boats out of the channel and into the buffer area, and then beyond into the array, the infrastructure will be at least 7m below the

surface, a depth significantly greater than the draft of the relatively small vessels that use the harbour.

[211] The potential for adverse effects on the commercial fishery on the West Coast of the North Island, and related fish stocks and relevant related ecosystem, is the big question mark. This brings economic, social, cultural, and effects-related matters under s5(2) into high relief. We have called for more evidence in this area, in order that we can be satisfied to the appropriate extent as to whether these issues should weigh ahead of the strong positives identified in the proposal. We do not presently understand that Crest seeks to play down the importance of these issues, and we would be rather surprised if a contrary view emerged, although we do not close the door to evidence on them.

[212] The issue of potential acoustic impacts on marine fauna is somewhat related to the above, but we find ourselves closer to holding that it can be dealt with by appropriate conditions of consent, and well-drawn EMP provisions.

[213] In similar vein to the acoustic matter, is the issue surrounding mammals, particularly Maui's dolphin. The issue of course arises under s5(2)(b) and (c), together with s7(d).

[214] We have held that Maori cultural issues are strongly in the mix under Part 2, deriving from particular parts of all of sections 5, 6, 7, and 8. We have held that they have been adequately and appropriately addressed by Crest, subject only to clear conditions of consent to cement some of them in place for the future.

Adequacy of Conditions of Consent and Proposed Environmental Monitoring Plan

[215] At the conclusion of the hearing, members of the court conferred concerning the most recent version of draft conditions of consent circulated by the applicant and respondent, and a their latest draft Environmental Management Plan (EMP) flowing from it.

[216] We had a concern that we expressed in a detailed Minute to the parties. That concern had to do with aspects of qualitative assessment, in particular, the measuring of outcomes in a clear and enforceable way.

[217] In that Minute we set out detailed concerns about certain of the draft conditions, including but not limited to some ill-defined terminology such as *"acceptable versus unacceptable effects"*, and *"very probable"*. We also criticised aspects of the draft EMP. We directed the parties to confer and deliver submissions on how these problems might be solved, having particular regard to existing case law about adaptive management.

[218] The respondent filed a detailed memorandum advising in summary that the draft EMP had been amended to modify references to acceptable or unacceptable effects, and that instead it provided for monitoring to be carried out and for the provision of monitoring results from which assessments might be made, whether the results of monitoring showed acceptable or unacceptable results. As will be seen, we still have our concerns.

[219] Submissions on behalf of the Director General of Conservation were to the effect that it might in some areas be difficult to establish precise or any quantifiable thresholds for acceptable or unacceptable effects, however in such situations some type of qualitative threshold might be specified.

[220] The Director General submitted that the revised EMP would, as it stood, be no more than a starting point for satisfying the relevant conditions of consent, submitting that it was wholly insufficient for the detailed methodology to be left to the consent holder to prepare and the respondent to consider within 3 months after the issue of consent, via a detailed draft EMP lodged for certification. In effect, the Director General was submitting that crucial issues before the court were left unanswered.

[221] We agree with that view. Draft condition 44(d) is at the heart of this issue, and should be reworded along the following lines:

> Technical criteria which define thresholds for acceptable and unacceptable adverse effects for each of the criteria set out in Condition 46. Where possible, thresholds shall be quantitative. Where this is not possible or not appropriate for a monitoring parameter on the advice of an independent expert, thresholds may be qualitative or descriptive.

[222] In other words, we support the position that a fully fleshed out EMP should be prepared at this juncture. Too many questions are left presently unanswered, with parties including the respondent indicating that there may even be some difficulty in defining them. The question of whether consent should be granted at all hinges on an ability to

create an EMP that will adequately address the issues. We are not prepared to effectively transfer responsibility for this crucial area of assessment to a delegated officer of the respondent.

[223] At the heart of the issue is the concept of adaptive management, which is what the parties have generally had in mind when debating some uncertainties of effects in the case.

[224] The concept of adaptive management has developed through a number of decisions of the Environment Court, for instance, ***Golden Bay Marine Farmers v Tasman District Council***[17], ***Clifford Bay Marine Farms v Marlborough District Council***[18], and ***Lower Waitaki River Management Society Inc v Canterbury Regional Council***[19]. The concept has arisen in a range of situations, often involving uncertainties about potential impacts of proposed mussel farms, but including in the recent Lower Waitaki decision, issues of riverbed geomorphology and riverbed vegetation.

[225] The problems of modelling ecological responses to changes in conditions introduced by new technologies for water management regimes have led to the use of the technique, very often through the imposition and subsequent refinement of management plans of various kinds.

[226] Important in the design of such management plans is the collecting of baseline knowledge upon which management plans can build in an on-going and cycling process. Steps have been identified in some such plans,[20] that involve setting objectives, design and planning for management of the resource, the managing of the resource, monitoring, evaluation of monitoring results, reviewing and refining hypotheses, the management plan and programme to better meet the objectives. After that point the process will often start again at the design and planning level.

[227] We have deliberately stressed the setting of objectives, because, as was said in the Lower Waitaki River decision, the Court will always be careful to ensure that the objectives for adaptive management are reasonably certain and enforceable, and

[17] W19/2003 at [405] and [407 – 408]
[18] C131/2003
[19] C80/2009
[20] See for instance [381] of the ***Lower Waitaki River*** decision.

sometimes will call for further detail in draft management plans so as to be reasonably confident of their success.

[228] We are mindful of the findings of the court in ***Director General of Conservation v Marlborough District Council and Ors (Clifford Bay)***[21], that we should not place the applicant in the position of having to have carried out all necessary research before making an application or before a hearing by the court, simply because it is seeking a privilege from the Crown. It would be unfair and unreasonable to hold that an applicant must try to anticipate and research all hypotheses that may occur to someone during the course of an application process[22].

[229] The converse is that the applicant must establish sufficient of a case to persuade the court to grant consent on the basis of allowing the adaptive management processes to be embarked upon. That is, the court must be satisfied that the environmental management plan can operate in a way that will serve the purpose of the Act.

[230] We will now offer detailed comments on the latest draft conditions of consent. We will preface our remarks by commenting that the critical area in our view is found in conditions 44 – 48 of the resource consents, leading to the setting up the EMP. In particular, as will have been observed from another part of the this decision, the major concern for us in this case is the North Island/West Coast fishery stocks, and in particular, snapper.

[231] We will start with the Restricted Coastal Activities, and then move to the matters the subject of the general consents.

Draft Recommendation to the Minister of Conservation

[232] Introduction (01) The co-ordinates in the draft consent may need to be updated to contain the latest co-ordinates, be they from Exhibit 4, 4205D, or from whatever source. We require them to be cross-checked and mapped as part of the condition. Our earlier comments about moving the northern boundary of the western array have relevance here.

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[21] C113/2004

[22] See [40] of that decision.

[233] Introduction (02) The proposal for two arrays should probably be spelled out. There is also a transmission cable connecting the two arrays. This should be referred to throughout the conditions to ensure all necessary steps are taken in relation to it, including burial, navigation constraints, and the like.

[234] Condition 1, second paragraph We are concerned about the suggested means of resolving internal inconsistencies by a presumption that the document which is the most recent in time and/or the most specific, will prevail. What would occur if a document which is most recent in time is the more general? We are also concerned at the Advice Note suggesting that the documents referred to in Condition 1 "*include*" those on the list. An exhaustive list would appear to be called for.

[235] Condition 4 First, we are presently uncertain about the desirability of the first stage comprising 20 units, or instead 3 units as may be funded by the 2008 Government Grant, or something in between. There may be a need for evidence about the pluses and minuses of establishing differing numbers between 3 and 20. At the present time, virtually all we have to go on is an assertion by Crest that less than 20 might not be commercially viable. An impression that we have is that the more that are established in the first stage, when least is known about effects, the harder it would be for the consent holder to face any emerging reality of necessity for removal, should that prospect arise. On the other hand, we recognise that it might be argued that the Stage 1 turbines should be of sufficient number to ensure that meaningful or measurable effects are observed by the end of that stage. There might also be the added consideration as to whether the first stage turbines should be installed across the flow rather than in line with it so as to better model the barrier effect. The same consideration could also apply to the number and alignment of turbines in the subsequent stages. All of this points to the need for more evidence on the numbers and alignment of turbines in each stage of the installation programme.

[236] The Advice Notes on condition 4 are appropriate, and have importance in relation to matters in Section 132(4) of the Act concerning the potential for consent to be cancelled. The Advice Notes however need to be extended to make reference to the North Island/West Coast fishery. The phrase "*uncertainties available*" is inelegant.

[237] Conditions 5(a) and (b) These conditions should also refer to fish generally, and in particular, juvenile snapper, given the importance of the latter to the North Island/West Coast snapper fishery.

[238] Condition 7 We remain concerned at the reference to *"unacceptable adverse effects"* which is not a term encountered in the Act, and would seem unacceptably vague. It would probably be preferable to refer to *"more than minor"*, and/or to effects identified in various stages of the EMP. There should probably also be a reference to the inter-array cable. We suggest as well cross-referencing to Condition 32 (which itself needs to do more than refer to *"inaccuracies"* but include omissions and more importantly lack of scientific knowledge).

[239] Condition 8 What is meant by the *"provisional generation array area"*?

[240] Condition 9 The authorisation should, for clarity, also refer to the extent to which the Harbourmaster authorises navigation limitations pursuant to bylaws and the Local Government Act.

[241] Condition 10(b) Once again, the western array co-ordinates may need to be checked and updated.

[242] Condition 11 Plan 4205D is not attached. That should be undertaken, and it should be amended to show the inter-array cable as well its other detail.

[243] Condition 12 Plan 4205E is not attached, but should be. Once again, we do not understand the reference to the term *"provisional"*.

[244] Condition 15(b) There should be reference to the inter-array cable.

[245] Condition 17(a) Engineer-certified appears unnecessarily vague. A relevant qualification could be specified. For instance, CPEng or equivalent.

[246] Condition 21 After *"has been provided with"*, add *"and approved"*.

[247] Conditions 26 & 27 The obligations should probably be bonded in the manner of Conditions 75 and following in the NRC consent, or at the very least there could be suitable cross-referencing.

Draft Regional Coastal Consent

[248] Title This should be amended to show that the decision has been made by the Environment Court on appeal from Northland Regional Council.

[249] Condition 1 We consider that the phrase *"in general accordance"* implies too much flexibility. The word *"general"* should be deleted. Once again, the list of documents in the Advice Note should be listed exhaustively, not inclusively. We do not understand the term *"provisional"*, this time found in the first bullet point of the Advice Note.

[250] Condition 2 The somewhat general content of this condition is understood in light of the evidence, but it could probably be expanded by inclusion of a rather more detailed description, such as that found early in this decision.

[251] Condition 5 Same comments as for Condition 4 of the Recommendation for the Minister of Conservation.

[252] Condition 6 Same comment as for Condition 5 of the Recommendation.

[253] Condition 8 Same comments as for Condition 7 of the Recommendation. Also, Condition 8 should be expressly linked to the review in Condition 7 to provide better context.

[254] Condition 9 Once again, the issue about *"unacceptable adverse effects"*.

[255] Condition 10 Once again, the issue about *"unacceptable adverse effects"*. Also, we wonder at the reference to *"installation proposal"*, in comparison to *"proposal"* in the third line of Condition 8. Should they not both be the same, and record *"proposal and/or installation process"*?

[256] Condition 10A In (a) and (b) there should presumably be a reference to cables where plural.

[257] Condition 11 Need for a check on co-ordinates.

[258] Condition 12 The plans need attaching. We consider that the word *"generally"* can remain in this particular Condition.

[259] Condition 14(a) The party undertaking the review should first be approved by NRC. Again, there should be a reference to an appropriate engineering qualification.

[260] Condition 14(b) The terms *"certified"* and *"for the certification of ....."* , are unclear. That latter should probably be *"approval"*. Is the term *"certified"* linked to Advice Note 2? Clarification is probably necessary. The July 2007 Section 92 document listed in Advice Note 1 should probably also be added to the list in the Advice Note Condition 1.

[261] Condition 19(e) The *"suitably qualified persons"* should be subject to approval by NRC. Once again, a benchmark qualification should be specified.

[262] Condition 21 Add at the end *"or adverse effect"* on the environment.

[263] Conditions 23 & 24 Is *"ballast"* the material to be placed to prevent or mitigate scour? Greater clarity might assist.

[264] Condition 29 Attach the plan, and again, we query the use of the term *"provisional"*.

[265] Condition 30 Cable marks will probably also be required at either end of the Tikinui-Raupo crossing.

[266] Condition 32(d) What does *"additional"* mean?

[267] Condition 35(d) The condition should suggest the time in which the council is to receive the explanation (see by way of example, Condition 42(d)).

[268] Condition 36 *"Suitably qualified and experienced person"* could be tighter, and *"approval by NRC"* added. *"Unwanted or risk species"* should probably be generically identified by reference to authoritative, published materials. (The same issue arises in Conditions 37 & 38).

[269] Condition 44 **This area of monitoring is key to the question of whether consent can be granted.** Conditions 44 – 48 do not seem to express matters with adequate certainty as to what the EMP is to cover. Conditions 44 – 48 in the First Schedule may be reasonably certain in themselves, but the other references seem to provide a recipe for uncertainty. Work is needed to tighten these provisions up.

[270] Condition 45(d) Definition of *"acceptable vs unacceptable effects"* seems to be the very thing that Mr Bell, counsel for NRC, asserts cannot be done satisfactorily. Further, there could usefully be cross-referencing to the draft EMP, where the particular topic of interest for the Court is potential effects on fish stocks, spawn, spawning, and juvenile fish.

[271] Condition 46 We consider that related matters in this list should be grouped together so that a coherent overview is possible. Also, we are somewhat mystified by absence of reference to fish stocks in the above terms, even though it might be inferred that items (c), (d) and (l) refer to the topic somewhat indirectly. It also occurs to us that it might be necessary to monitor effects on juvenile snapper beyond the harbour entrance. We query the use of the term *"provisional"* in item (t). Item (v) seems extremely broad, but perhaps something of that nature is necessary in circumstances where new outcomes or even new science might emerge from ongoing monitoring steps.

[272] Condition 47 There seems to be something of a muddle as between Condition 46 and Condition 47. For instance, how does 47(c) differ from 46(m)? If Condition 47 comprises *"matters of the highest priority"*, we consider that it should include fish, and in particular, snapper.

[273] Condition 52 Again, we are concerned at the absence of mention of fish species, particularly snapper, in the first of the two bullet points towards the end of the Condition.

[274] Condition 55 As for Condition 52.

[275] Condition 56 The condition implies a period of monitoring after the commencement of each deployment stage, but fails to specify one.

[276] Condition 57 This is not particularly well integrated with Condition 54, or at all. Could the two conditions be usefully combined?

[277] Condition 58 This should include provision for necessity of cable repair at times.

[278] Conditions 67 and 68 These are also key provisions in our view. Subject possibly to further evidence, twelve months may be an inadequate period of time for base monitoring, as we have discussed elsewhere in the decision[23]. The condition as drafted also presupposes that the approval of the draft EMP will be left over to the respondent or a delegated officer, and as we have also held elsewhere in the decision, that is not appropriate.

[279] Conditions 72 – 74 We have commented earlier on the slightly unclear basis for the establishment of this trust, which seems to have a particularly broad objective "*to provide environmental benefit to the Kaipara Harbour community*". It seems that the payments intended are for some form of environmental compensation, slightly ill-defined. We infer for present purposes that they are for occupying harbour space and limiting navigation, albeit to what we consider to be a minor degree. It seems to us from the evidence that in the course of moving from stage to stage the consent holder will be substantially increasing the body of scientific knowledge about the harbour, and thus make significant social and economic contributions to the local community. We infer that the condition is put forward as an additional "sweetener"; that is, it has the appearance of comprising the basis of a settlement with some party or parties opposing. If so, it may be appropriate to note that the condition is offered on an "Augier" basis.

[280] Condition 75 – 84, and Schedule 2. There appears to be a certain amount of repetition, overlap, and some potential for inconsistency, as between the conditions and the schedule. A simpler approach might be to have one condition referring to a comprehensive schedule. The contents of Conditions 80 & 82 could be combined to

[23] See paras [108] to [119].

ensure that it is understood that they concern the same subject matter. It is not understood what is meant by *"registration"* in Condition 81.

[281] Condition 85 This provides for what appear to be discretionary reviews under Section 128 of the Act. It should be recalled that Condition 7 also relates to the topic of reviews, that is, compulsory reviews between staged deployments. A cross-reference in Condition 85 to Condition 7 would assist reading and recall. The mechanisms involved in Section 130 of the Act should probably be mentioned in Condition 7.

Draft Environmental Monitoring Plan

[282] Introduction Appendices A and B have not been written. Consequently, references to them, such as are found in the Introduction, are nugatory. Appendix B is intended to set out information on the existing Kaipara Harbour environment. We would have imagined that that should have been informed, at least, by the intended pilot survey. We will have more to say about the timing of the intended stages of the EMP.

[283] Section 2.1 & 2.2 The proposed pilot survey is *"to define the components of Baseline and Operational Monitoring ...."*. We note in particular Objective 3 in Section 2.2: *To provide evaluation criteria and data for use by the consent authority for determining the acceptability of environmental effects associated with the project.* This seems to us to be confirmation of our concern that, to put it colloquially, the cart has been put before the horse. The criteria and data obtained from the pilot survey will ultimately be critical to the Adaptive Management outcome. Until the pilot survey is undertaken, objectives set, and evaluation criteria framed, we do not feel sufficient confidence that the Adaptive Management regime will be appropriate or satisfactory. Further, there is a disconnect between what Objective 3 is said to derive from, and the wording of Condition 45(d) in the draft conditions. The condition is said in 2.2 to read *"technical criteria to assist the consent authority in its determination of the acceptability of environmental effects associated with the project"*, whereas all it says is *"definition of acceptable vs unacceptable effects"*. Quite apart from the critical need for consistency between the conditions and the draft EMP, this tends to demonstrate that if matters were left as currently drafted, critical information about potential effects on the environment is not being adequately addressed at the present time.

[284] Section 2.4 (last sentence) The EMP is said to provide criteria that the consent authority may apply when considering the deployment of successive stages. We consider that this discretion should be removed, but scope left for the addition of further criteria to be added, as the state of knowledge advances.

[285] Section 3.2 We infer that Figure 3 probably started life as a coloured drawing. From the black & white copy provided it is difficult to see where the 8 Pilot Survey samplings are proposed. A single round of fish/megafauna sampling and 5 replicates. As the figure doesn't cover much of the harbour beyond the entrance, presumably no sampling is proposed in the arms or inter-tidal areas. We wonder whether this may limit the potential to investigate spawning grounds. Other sites (three) are to be established in nearby parts of the Hokianga Harbour for use as control or reference sites. Given the preponderance of West Coast/North Island snapper juvenile originating the Kaipara, we have a concern about whether this part of the proposal is adequate.

[286] Section 3.4 Distribution and abundance of fish are to be determined using *"sonar devices"*. Can these differentiate between species? Are the proposed 8 sampling sites adequate? Over what time periods is this evaluation to occur? Will it relate to spawning times and/or times of adult return to the harbour? As to the proposed marine mammal surveillance from an elevated position on the North Kaipara Head, we consider from the evidence that this has an element of futility about it, and we wonder about its necessity.

[287] Section 3.5 (Data Analysis) It seems to us to be appropriate for there to be a peer review of project design and statistical evaluation of biological data by the named senior academic. We are however concerned at the expression *"as appropriate"* concerning qualitative data, because much of the data appears to be potentially in this category, and it is not clear whether the peer review was to include the qualitative component.

[288] Section 4.1 (Baseline Introduction) This schedule of key components introduces considerable, but possibly unavoidable uncertainty. It occurs to us that this is particularly a product of the pilot survey not yet having been carried out, which we think is a concern. Key components of the Baseline and Operating Monitoring Study include *"fisheries resources and commercial fishing"* as set out in Table 2. That table tells us that commercial fisheries are to be baseline monitored annually across the deployment area

using catch per unit effort, tag and recapture, *"sample parameters"*. Based on the outcomes, various EMP elements may need to be extended to further far-field monitoring sites within the harbour, however, there is no present indication of this and we are concerned as to whether annually is sufficiently frequent to disclose any relevant seasonal and/or life-cycle effects. The baseline sampling has been set *"provisionally"* at 12 months for the purposes of the draft EMP, the actual period to be *"defined in resource consents granted for the project"*. Subject to any further evidence that we may need to hear, it might be that two, or three, years might be necessary for baseline monitoring in relation to fish and fisheries.

[289] Section 4.3 This gives methodologies for various subjects. Before – After – Control – Impact (BACI) Monitoring is proposed for benthic biota, benthic sediments and water quality, which seems suitable. An important aspect is stated to be an attempt to ascertain naturally occurring variability. Quarterly monitoring is proposed, which seems in some contrast with the proposed frequency in relation to fish. Is this because benthic animals are more easily sampled, and methods better understood than for wet fish? Evidence might be necessary.

[290] Noise - Section 4.3.2 There is a reference to a Section 5.2.3, but the version provided to us does not have one.

[291] Section 4.3.3 (Marine Mammals) Following Stage 1 deployment, it is proposed to *"explore the use of underwater cameras mounted on a turbine"*. *"Explore"* is somewhat equivocal, and if there were to be an adverse effect post-deployment, might that be too late? We also wonder whether cameras could be used to monitor other species such as snapper. Evidence might be necessary.

[292] Section 4.3.5 (Fisheries Resources and Commercial Fishing) In the first sub-paragraph we are uncertain what *"review"* means in this context. Is it desktop, in the field, or both? What would *"spawning requirements"* cover (ability of adults and juveniles to swim past turbines safely in either direction)? It seems that fish samples wouldn't be collected if the near field weren't identified as an area important to spawning. Again, there is uncertainty. The near field may be unimportant in terms of where spawning physically occurs, but important in the sense that fish need to be able to navigate through it. In the second sub-paragraph we question absence of mention of spawning seasons. If a *"season"* weren't identified, would recreational fishers go

unmonitored? Is an explicit BACI component required to establish what proportion of adults are spawning prior to and post-deployment, with reference to a controlled site, if relevant? All things being equal, that might allow conclusions to be drawn about the effect of the deployment? In the third sub-paragraph the approach for commercial fishing may be appropriate, but it is not clear over what area commercial fishing data is to be collected. Is not the whole West Coast/North Island snapper fishery potentially affected? How robust is the catch per unit effort concept? What is the intended unit? In a multi-variable equation, how does one identify cause and effect? Should the NIWA research be continued, funded by the consent holder, to determine if the number and proportion of Kaipara snapper and the total catch are maintained? In relation to the fourth sub-paragraph, it is appropriate that juvenile snapper are specifically addressed. Is it relevant to acquire about whether one should distinguish a migratory snapper from a non-migratory snapper? Or do they all migrate? What does *"confirm recapture rates"* mean? Is it intended that a proportion of in-harbour fish be tagged and compared with the proportion of tagged emigrating fish recaptured outside the entrance past the deployment? If so, could the same thing be done for in-coming fish? Once again, far greater emphasis would seem to be needed at the Pilot Survey stage, with a requirement that it be concluded before a decision is made as to whether to grant resource consent. Further, should there be a qualitative aspect to the monitoring to gather anecdotal evidence from commercial fishers (similar to 4.3.7 for recreational fishers)? Further, we note as a positive that a side-scan sonar and video technology are to be used to monitor behaviour of fish in proximity to deployed units. Evidence on these several sub-topics seems called for.

[293] Section 4.4 (Evaluation Criteria) No quantitative measures are given, notwithstanding that for some matters, for example water quality, this would appear relatively straight-forward. Similarly, no qualitative measures are given for matters like effects on recreational and commercial fishing and effects on marine biota. There does not appear to be an express requirement for NRC to sign off on the criteria, although Conditions 59 & 60 may assist? Referring back to those conditions, we approve of the provision in Condition 60 for the NRC to seek expert advice from a third party on the adequacy of the *"fleshed out"* EMP, but we consider that to be far too late in the process, particularly with the Pilot Survey work having not been undertaken as yet.

Conclusion

[294] We have called quite extensively for Crest to prepare further evidence on some matters, and undertake significant revision of the draft conditions of consent and the EMP. We imagine that it will want to work collaboratively with some other parties, particularly the council. To the extent that it does not do so however there must be adequate opportunity for evidence and input from other parties, and it goes without saying that even parties that work collaboratively may wish to file evidence.

[295] Crest is to consult the other parties and prepare a timetable from here, for the Court's consideration. A judicial conference can be sought if necessary. The Court will offer every realistic opportunity for the earliest possible final resolution of the case.

[296] Costs are naturally reserved at this time.

DATED at Auckland this 22nd day of December 2009.

L J Newhook
Environment Judge

THE SEAL OF THE ENVIRONMENT COURT NEW ZEALAND