

BEFORE THE ENVIRONMENT COURT

Decision No. [2011] NZEnvC

26

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

Court: Environment Judge L J Newhook
 Environment Commissioner R M Dunlop
 Environment Commissioner D Bunting
(Decision on the papers by agreement of the parties)

Representation: S J Simons for Crest Energy Kaipara Limited
 W McKean for Northland Regional Council
 M Moodie for Director-General of Conservation
 D R Clay for Environs Holdings Limited

**FINAL DECISION OF THE ENVIRONMENT COURT BEING RECOMMENDATION TO
THE MINISTER OF CONSERVATION CONCERNING RESTRICTED COASTAL ACTIVITY
APPLICATIONS, and CONSENTS TO APPLICATIONS FOR OTHER ACTIVITIES**



Introduction

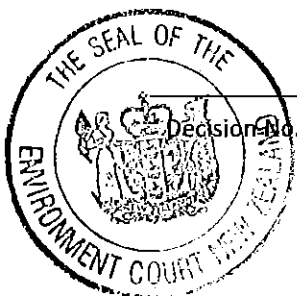
[1] On 22 December 2009 we issued an interim decision¹ indicating a possible positive recommendation to the Minister of Conservation concerning restricted coastal activity applications and possible consents to the balance of activities applied for. Both were subject to the court being satisfied about proposed conditions of consent and significant modifications being made to the draft Environmental Monitoring Plan much discussed in evidence. We recorded that further evidence might be needed.

[2] The applicant had 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 near the mouth of the Kaipara Harbour as a renewable electricity power source, and connect them by two cables to a land-based substation at Poutu Point, plus a Northern Wairoa River cable crossing. The ultimate maximum estimated generating capacity of the array was intended to be approximately 200MW after establishment of a number of proposed stages on an incremental basis. We have summarised the consents sought in paragraph [26] of this decision.

[3] Certain of the applications in the coastal marine area were deemed to be Restricted Coastal Activities (RCA) having regard to the provisions of the New Zealand Coastal Policy Statement 1994. That Policy Statement has now been replaced by the New Zealand Coastal Policy Statement 2010, but the sole transitional provision in relation to the two policy statements appears to preserve the special approach to consenting RCAs, hence a portion of this decision comprising a recommendation to the Minister in that regard. The provisions of the 2010 policy statement relevant in this regard, are Policy 29(3) and (4), which stand as exceptions to sub-clauses (1) and (2). Policy 29 provides as follows:

Policy 29 Restricted Coastal Activities

- (1) The Minister of Conservation does not require any activity to be specified as a restricted coastal activity in a regional coastal plan.
- (2) Local authorities are directed under sections 55 and 57 of the Act to amend documents as necessary to give effect to this policy as soon as practicable, without using the process in Schedule 1 of the Act, with the effect that:
 - (a) any activity specified as a discretionary activity and a restricted coastal activity becomes a discretionary activity only;
 - (b) any activity specified as a non-complying activity and a restricted coastal activity becomes a non-complying activity only.
- (3) Any application for a coastal permit for an activity specified as a restricted coastal activity that has been publicly notified before the date the amendments in clause (2) are made shall continue to be treated as an



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application for a restricted coastal activity for the purposes of section 117 of the Act.

- (4) Any other application for an activity specified as a restricted coastal activity made before the date of the amendments in clause (2), shall be considered as a discretionary or non-complying activity in accordance with the regional coastal plan or proposed regional coastal plan's classification and section 117 does not apply.

[4] As we held in our interim decision, the array would, in various respects, qualify as an RCA as it would *exclude or effectively exclude public access from areas of the coastal marine area over 10 hectares;... 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;... and ...entail sea bed disturbance [occurring] within a twelve month period and extending ... 1,000 metres or more over the foreshore or seabed.*

[5] In the interim decision, having described the case for each of the parties, and analysed the evidence and the law quite extensively, we indicated tentative approval for the proposal. In particular at paragraph [206], this was expressed to be subject to some uncertainties being resolved through further evidence, drafting of conditions, and changes to the draft Environmental Monitoring Plan. We did this by reference to relevant aspects of Part 2 RMA, amongst other provisions.

[6] At the conclusion of our 2009 hearing, and prior to issuing our interim decision, we issued a detailed Minute to the Parties concerning shortcomings, as we perceived them, with draft conditions of consent and the latest in the line of several drafts of an EMP.

[7] The applicant responded constructively, and submissions were received on behalf of the Director General of Conservation, and by the time we delivered our Interim Decision, there were a number of crucial issues remaining unanswered. We catalogued these towards the end of the decision. Key amongst them were that the EMP should be finalised for consideration by us in the course of deciding whether to grant consent, rather than being left for approval by a delegated officer of the respondent. We were particularly concerned that the EMP, if it was to provide a suitable platform for consents, should robustly offer a programme of adaptive management, the concept of which had been developed in a number of decisions that we cited at page 51 of the Interim Decision.

[8] In particular we considered that an EMP should provide for the collection of baseline knowledge upon which the proposal could build in an ongoing process, set objectives, design and plan for management of the resource, monitoring, evaluation of monitoring results,



reviewing and refining hypotheses; all in the interests of better meeting the objectives. After each stage, the process should often start again at design and planning level. We were mindful, having regard to the decision cited in paragraph [228] (*Clifford Bay*) that we should not, however, place the applicant in the position of having to have carried out all necessary research before making an application or before a hearing occurs in court, simply because it is seeking a privilege from the Crown. We held that the applicant should nevertheless persuade the Court to grant consent on the basis of adaptive management processes put forward, such that the purpose of the Act would be served.

[9] We offered detailed commentary on the latest draft conditions of consent and EMP, drawing on earlier findings in the decision, and recording the necessity for a full and adequate approach to overcoming our concerns about the North Island/West Coast fishery stocks, and the survival of rare mammals, particularly Maui's dolphin. We noted at the same time that Maori cultural issues, while strongly "in the mix" under Part 2, had been adequately and appropriately addressed by Crest, subject only to clear conditions of consent to cement some of them in place for the future. (Submissions recently received by the appellant Environs Holdings Ltd, needed to be seen in the context of that finding).

[10] We then set out in considerable detail the items that we felt the need to requisition before we could finally consider granting consent. The important issues that arose included iterative staging of the proposal (timing, monitoring, numbers of units in each stage, and related matters). Full development of the EMP was also crucial, as we have mentioned, and we described a number of key issues to be solved in relation to that.

Steps taken subsequently

[11] The parties worked cooperatively, and in the main constructively, throughout 2010, on the issues raised by the Court. This work occupied a timeframe that normally would be uncomfortably long from the Court's perspective, but the case was the subject of regular progress reporting against a timetable set and occasionally adjusted.

[12] The parties were able to reach agreement in a number of areas, but 13 issues remained unresolved by November. The parties then attended a Court-sponsored mediation in early December, where constructive input was again forthcoming, and disputed issues reduced to 7.

[13] The parties then agreed that they wished to approach final resolution by the filing of one further statement of evidence on behalf of NRC, and legal submissions from each of them, before seeking our determination "on the papers".



[14] The statement of evidence then filed was from Dr M P Francis, a principal scientist with the National Institute of Water and Atmospheric Research Ltd (NIWA), called by the respondent. Dr Francis is a fisheries' scientist and marine ecologist with 34 years' experience specialising in zoology, having 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. His evidence particularly addressed the issue of the minimum period for operational monitoring that should occur between the end of stage 1 of the development, and the commencement of stage 2.

[15] The legal issues were to be addressed by way of written submissions, without prejudice to the position of Environs Holdings Ltd which continued to seek that consent be refused.

[16] Counsel for Crest helpfully produced a written record of the 13 matters discussed at the 7 December mediation, and Commissioner Dunlop (who conducted the mediation with the consent of the parties, bearing in mind that he is a member of the hearing panel) produced a Minute concerning matters that particularly occurred to him arising out of the mediation.

[17] The matters discussed at mediation, and a summary note of the outcome in each case, are as follows:

1. **That a minimum of three years operational monitoring be undertaken between completion of each stage and initiation of the next.**
 - Partially resolved.
2. **Background electro-magnetic fields to be measured during baseline monitoring.**
 - Resolved on the basis that no change required, as relevant data would not be available until transmission commenced.
3. **The EMP to identify additional consultation with the parties.**
 - Amendments proposed by Director General of Conservation accepted by all parties, with additional consultation steps being added at various stages of the EMP.
4. **The suggestion (coming originally from the Court in its Interim Decision) that all references to effects as being "less than minor" should be "no more than minor".**
 - Issue unresolved at mediation.



5. **Clarify ongoing consultation commitments in EMP**
 - Changes proposed by Director General of Conservation, agreed.
6. **Lapse period, and extension sought by Crest.**
 - Not resolved at mediation.
7. **Quantum of turbines at each stage.**
 - Not resolved at mediation.
8. **Expansion of scope of environmental effects to be monitored.**
 - Not pursued by any party.
9. **EMP review process to be independent of Crest.**
 - This issue was resolved on the basis that the respondent as regulatory authority could require an independent peer review of any EMP changes proposed by Crest prior to the Council exercising its certification function.
10. **Term of consent.**
 - Crest continued to seek 35 years. Not resolved at mediation. Environs Holdings sought that the term be reduced to ten years.
11. **Benchmarking of dollar values for the proposed bond, and concerning the intended Kaipara Harbour Trust.**
 - The benchmarking of the bond was agreed to be against 2007 dollars. Issue concerning financial benchmarking of the operations of the Trust by way of environmental compensation, not resolved at mediation.
12. **Timing of the establishment of Kaipara Harbour Trust.**
 - This is an "*Augier*" (volunteered) condition, and the matter was not pursued.
13. **Copyright statement.**
 - Crest believed resolved at mediation by the insertion of certain wording into the copyright statement in the EMP.
 - This issue further addressed however in subsequent written submissions.

[18] On 12 January 2011, written submissions were received from counsel for Crest, the Director General of Conservation, and NRC as respondent. On 17 January 2011, submissions were received from counsel for Environs Holdings.



Written Submissions on behalf of Parties, Analysis, and Decision on Disputed Aspects

[19] In this section of the decision, we will address each of the 7 remaining disputed matters that were not resolved at mediation. We will number them in accordance with the numbering of the 13 issues listed in the previous section of this decision.

1. *That a minimum of three years operational monitoring be undertaken between completion of each stage and initiation of the next stage.*

On the basis of information received from Dr Francis, Crest agreed to a minimum of three years operational monitoring between the end of stage 1 and the commencement of stage 2. Crest however disputed the need for such a period between subsequent stages, and Environs maintained that there should be at least three years between all stages. The Director General did not oppose Crest's position, and the respondent agreed with it.

Subsequent to the mediation, Dr Francis produced supplementary evidence suggesting 3 to 4 year timeframes, but offering the opinion that this could be reduced to 1 to 2 years through the use of dedicated sampling trips to sample sub-adult snapper prior to their becoming vulnerable to commercial fisheries.

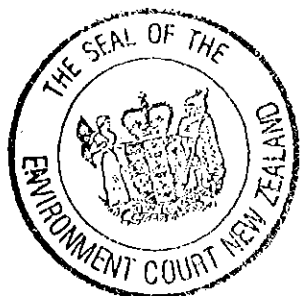
Crest therefore proposed insertion of a new condition 7(i) into the Consent, and a new condition 6(a) into the Recommendation, as follows:

The consent holder shall undertake operational monitoring for a minimum period of one year after the conclusion of stage 1 to provide sufficient data on actual and potential fisheries effects to inform the Northland Regional Council's decision on transition from stage 1 to stage 2 as required in condition [7].

Crest submitted as follows:

- The minimum period of one year after stage 1 will ensure that stage 2 cannot commence until and unless the fisheries effects are identified and have been confirmed as no more than minor.
- There would be sufficient data to make a realistic evaluation of the likely level risk of moving to subsequent stages, after stage 2.
- As agreed at the mediation, the relevant Advice Note should be amended expressing the expectation that reviews under S 128 RMA would be processed "on notice".

Of the three possible monitoring methods identified by Mr Francis, the respondent submitted that if the "dedicated sampling trips" method was selected, the period could indeed be reduced to 1 to 2 years. The respondent noted that pursuant to that kind of adaptive management approach, the respondent would be "gate-keeper" as to when and indeed whether the next stage should be implemented. The respondent, through the use of consultants, would make a determination on whether the monitoring period was adequate in the circumstances, so that minimum periods of monitoring would not be



essential for that purpose. We infer that the submission is that the offer by Crest of a minimum one year monitoring period between stages 1 and 2 is conservative in that context.

The Director-General took a different approach, supporting a minimum three years operating monitoring between the end of stage 1 and the commencement of stage 2, and “not opposing” the Environs’ approach seeking at least three years of monitoring after the completion of each subsequent stage. That was qualified with the submission, however, that the Director-General was of the view that condition 9 of the Regional Council resource consent would set an appropriate control on the implementation of any stage past stage 1a, without the need to specify the length of operational monitoring between stages, because there would be an onus on the consent holder to carry out sufficient monitoring to show that “*any subsequent stage is not likely to have any more than minor adverse effects either by itself or cumulatively with earlier stages*”, before any subsequent stage could be commenced.

It is important to note here, that one of the advances through the iterative process of dispute resolution amongst the parties, was that Crest’s initial proposal that stage 1, involving the installation of 20 turbines, came to be modified to the establishment of an initial stage 1a (with up to 3 turbines) followed by the balance of stage 1 (with up to 17 more turbines). This was put forward by Crest on the basis that the monitoring required before stage 1a would be carried out in order to satisfy the regulatory authority that it is very probable that implementation would give rise to effects that are “less than minor” on cetaceans (particularly Maui’s dolphin), fish (particularly snapper), elasmobranchs, and the North Island/West Coast commercial fishery. After the stage 1a deployment, it was proposed that the monitoring results should satisfy NRC that it would be very probable that the development beyond that stage would give rise to effects which were no more than minor on those species. Deployment of subsequent stages would be subject to the approval of NRC following reviews provided for in detail in the Consent, including public notification, submissions and hearing as set out in S130 RMA, and including consultation with tangata whenua. The reviews referred to would be those enabled by S128 RMA. The review could be initiated for any one of a number of stated purposes, including importantly as an option, to require the adoption of the best practicable option to remove or reduce any adverse effect on the environment; and further potentially to deal with any material inaccuracies, omissions, or lack of scientific knowledge that may in future be found in the information made available with the application. Such constraints or limitations have been put forward on an “*Augier*” basis, that is on a voluntary basis, acknowledging that the jurisdiction of S128 RMA would not normally extend to removal of the consented activities in their entirety.

The conditions of consent, and the draft EMP, have come a tremendous distance since the first draft reviewed by the Court. Assisted considerably by the latest evidence from Dr Francis, which no party sought to cross examine, and combined with the now very appropriately drafted conditions and EMP, inclusive of the mechanisms offered voluntarily as just described, we are now able to endorse the position latterly taken by Crest, and included in the revised conditions as 6(a) Recommendation and 7 (a) Consent.



4. *All references to the effects as being “less than minor” should be “no more than minor”?*

Crest accepted that “less than minor”, a term discussed by the Court in its interim decision as not being found in the Act, but obviously more conservative than “no more than minor”, would be an appropriate basis for moving from the 3 turbine Stage 1a. However, in relation to subsequent stages, on account of increasing knowledge as deployment and monitoring advanced, it submitted for the test to become the standard “no more than minor”.

Environs sought employment of the more conservative test, throughout. The respondent accepted the Crest draft, and the Director General sought the naming of species throughout the consent. The relevant conditions already specify “cetaceans, fish (particularly snapper, elasmobranches, and the North Island/West Coast commercial fishery’). We comment at this point that that means of identification seems appropriate, and would even allow of consideration of new species found at a later time, for instance in relation to the commercial fishery. The description would seem best kept generic.

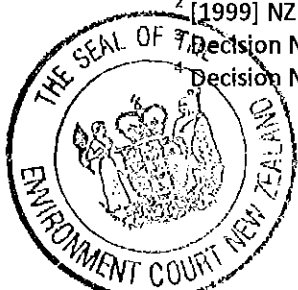
The respondent noted that the Court in its interim decision had recommended use of the words “no more than minor”, which are familiar to it and regulatory bodies. Submissions on behalf of the respondent identified that context would be important, as noted by the Court in *Stokes v Christchurch City Council*², where it was concluded that the contexts in which a word appears can give it a different meaning. Citing *Bethwaite v Christchurch City Council*³ and *Taylor v Murray*⁴, counsel submitted that in the context of s104D RMA, the word “minor” has been interpreted expansively so that wider considerations such as the whole context with all its conditions can be taken into account in assessing whether the effects will be more than minor. This could be on a scale from “minute or slight”, to “less than major”. It was submitted however that the use of the term “no more than minor” in conditions such as 6 and 9 of the Consent, would attract a more narrow and confined consideration than in relation to s104D, and in the current context would relate to the adaptive management approach in which the NRC would be the gatekeeper as to when and whether the application could progress to the next stage, and the NRC is comfortable with that. That is, the NRC obviously perceives the potential for strict and conservative control coming from the conditions as now drafted, and we agree.

The Director-General, pointed to policy 11 of the NZCPS 2010 about the protection of indigenous biological diversity in the coastal environment including the **avoidance** of adverse effects of activities on *taxa* that are listed as threatened in New Zealand or internationally, and accordingly submitted that that the inclusion of conditions requiring that adverse effects on such species of the proposed activity be “less than minor” would be appropriate and necessary. In relation to effects on other species, the Director General was

² [1999] NZRMA409

³ Decision Number C85/93

⁴ Decision Number C22/96



unable, based on the evidence currently available, to pursue an argument that the threshold suggested by Crest of “no more than minor” would be inappropriate.

Counsel for Environs Holdings submitted for the more conservative test. He argued that effects relevant under the Act are not limited to those which are minor or more than minor, and that effects above those which could be described as *de minimus*, are relevant. He submitted that the duty to avoid, remedy or mitigate effects under s17 RMA applies to all effects, including effects that are less than minor. We consider however, that s17 (“*duty to avoid, remedy, or mitigate adverse effect*”) is a general provision about “*any adverse effect...*”, and cannot be said to assist with gradation of effects.

Environs’ counsel submitted that in the context of the scale and uncertainties of effects of the present application, and the applicability of the “precautionary approach”, an appropriate threshold would be the more conservative of the two tests under discussion.

It is our view, as already recorded, that the state of knowledge about the environment in the mouth of the Kaipara Harbour, and potential effects of Crest’s proposed activities on it, will advance progressively as the proposal advances. The lesser quantities and quality of knowledge available in the earliest stages has encouraged Crest to offer the very conservative test “less than minor” as the appropriate basis to be allowed to move forward from stage 1a. That conservative offer is accepted in the spirit in which it is offered. As knowledge is developed, and having regard to the context as thoroughly explained in great detail in the conditions and the EMP, we accept that the well recognised test “no more than minor” is appropriate in the later stages. For these reasons, we consider that policy 11 of NZCPS 2010, will be honoured. The revised version of conditions 6 and 9 (Consent) are upheld.

6. *Lapse Period*

S125 RMA provides the resource consent lapses on the date specified in the consent, or if no date is specified, five years from the date of commencement of the consent, unless, before it lapses, [certain things are undertaken by the consent holder].

Crest sought a ten year lapse period in relation to this very large project, and NRC and the Director General agreed with that. Environs opposed and said that five years should apply. Crest submitted that with a project of this scale and national importance, and given the lengthy and exacting consenting process (and we infer, the significant processes to be imposed when moving between stages) there appears to be no logical basis for reducing the lapsed period to five years.

The submissions filed on behalf of Environs did not really take this matter any further. We agree that the ten year lapse period proposed by Crest, and supported by the other two parties, is entirely appropriate for the reasons advanced by Crest. Condition 4 (Consent) is upheld.



7. *Quantum of turbines at each stage*

The controls offered by Crest contemplate 3 turbines in stage 1a, 20 at stage 1, 40 at stage 2, 80 at stage 3, and finally 200. Environs contends for 3 turbines, progressing to 6, then to 12, to 20, to 40, to 80, and 200.

Counsel for Crest submitted that there could be no basis for there being more than 4 stages, and that there was no jurisdiction for more than 4 stages in terms of the relief sought in the appeals. That, however, overlooks the fact that the Environs' appeal sought that the consents be refused, and that of course sets the outer limits of jurisdiction. Ms Simons submitted that the onus is on Environs to persuade the Court that the adaptive management regime, with its latest proposal in relation to the EMP, is inadequate. She submitted that no evidence had been produced to support that proposition.

Mr McKean for NRC, noted that the respondent is neutral on the issue, simply recording however that the number of turbines installed at each stage should be consistent with the recognised need for an adaptive management approach.

Mr Moodie on behalf of the Director General, offered the constructive submission that the increase, and initially more conservative, staging of the proposal, coupled with an improved EMP, is an appropriate application of the precautionary approach directed by Policy 3(1) of NZCPS 2010 as follows:

“(1) Adopt a precautionary approach towards proposed activities whose effects on the coastal environment are uncertain, unknown, or little understood, but potentially significantly adverse.”

We agree with the submission on behalf of Crest and the Director General, that by an iterative approach through the life of this case, Crest has come to the point of offering careful and conservative conditions and EMP, such that there is no basis now in the evidence for the even more cautious approach advocated by Environs. We agree with the submission on behalf of the Director General that the package is now an appropriate application of the precautionary approach directed by policy 3(1). Condition 5 : Table 4-1 (Consent) is upheld.

10. *Term of consent*

Crest, the respondent, and the Director General, agreed that the term should be the maximum provided by S123(c) RMA, 35 years. Environs submitted that the term should be 10 years.

Crest contended that a 10 year period would be illogical, because the adaptive management regime would result in full implementation of the resource consent taking more time than that term.

Mr Clay, on behalf of Environs, submitted that Crest's reliance on the allegedly powerful S128 review conditions, was misplaced because the High Court had held in “**Minister of Conservation v Tasman District Council**”⁵



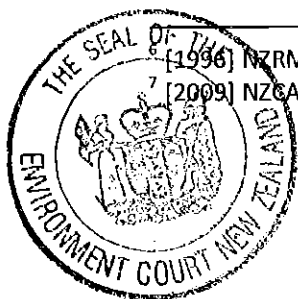
that S128 does not allow consents to be terminated. As already noted in this decision, Crest has offered on a lawful and voluntary basis identified in the English decision "*Augier*", noted above, and regularly applied in this country, the provision for effective cancellation (Consent condition 8(a)), already discussed, and bonding in relation to subsequent remediation of the environment (Consent condition 79).

Environs submitted that Crest's concern about alleged commercial viability issues is not relevant to the proper assessment and management of environmental effects, and should not outweigh or influence the importance of safeguarding the environment. In this regard it noted a decision of the court in "*Mangakahia Maori Komiti v Northland Regional Council*"⁶:

"As a footnote, if the term of six years is such that the applicants ... feel unable to proceed, given the capital cost of establishment against the risk of non renewal, that commercial decision must rest with them."

There are a number of decisions of the Courts on this issue, some of them quite notable. It is disappointing in the circumstances, that Environs has pointed to but one of them, and a particularly old one at that. The most notable, and of course binding in its statement of the law and persuasive in relation to obiter dicta, is the decision of the Court of Appeal in "*Ngati Rangi Trust and Ors v Genesis Power Limited and Manawatu-Wanganui Regional Council*"⁷, in which a decision of the High Court was affirmed which referred back to the Environment Court a similar aspect of its decision, on that occasion concerning consents granted in relation to the Tongariro Power Development Scheme. A key part of the Environment Court decision had been that to require further applications to be made for operation beyond the ten year period, might allow of a "meeting of the minds between expert witnesses and Maori witnesses, to establish with particularity the locations and concerns that are of particular significance to iwi". By inference at least, in relation to the purpose of the Act, the following statement by William Young P, seems instructive as acknowledging an energy-producing project of significant scale:

"[44] I cannot see a credible basis for concluding that an appropriate duration for the consent was only 10 years. It is, for instance, inconceivable that the Environment Court consider that the TPD should cease operating at the expiry of its 10 year consent. So the key issue is mitigation.... In the normal course of these events these considerations would be likely to have resulted in a 35 year term along with a review condition. In any event, given that the case was about mitigation, it is difficult to see what was wrong with the review condition suggested by Genesis."



[1996] NZRMA 193 at 217

[2009] NZCA222

In "*PVL Proteins Ltd v Auckland Regional Council*"⁸, a case concerning air and water discharges from a slaughter house in South Auckland, it was held that a decision on what is the appropriate term for a resource consent is to be made for the purpose of the Act, and that relevant factors in making a decision on the term would include that conditions may be imposed requiring adoption of best practicable option, requiring supply of information relating to the exercise of the consent, requiring observance of minimum standards of quality in the receiving environment, and reserving power to review the conditions. The Court further said at paragraph 30:

"Uncertainty for an application of a short term, and an applicant's need (to protect investment) for as much security as is consistent with sustainable management, indicate a longer term. Likewise, review of conditions may be more effective in the shorter term to ensure conditions do not become outdated, irrelevant or inadequate."

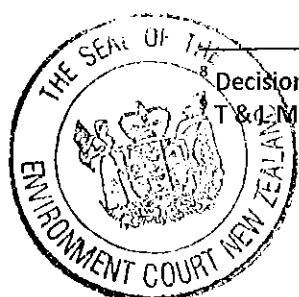
That statement was contrasted with situations in which a review of conditions might not be considered adequate, but which we do not consider to be apposite in the present case. In paragraph [67], the Court recorded that in the context of a statutory process that includes (among other things) enabling people to provide for their economic wellbeing the economic effects on the consent holder of a particular consent term, is a relevant factor, to be considered along with all others. At paragraph [85], reference was made to the reasonable needs of the [consent holder] for security for investment and future development.

Another recent decision of the Environment Court concerned an application for consents for a pulp and paper mill at Kawerau⁹, and in light of discussion of other decisions including the Court of Appeal in "*Genesis*" above, the length of time needed for security of investment was accepted as one factor for consideration.

We have previously held that the proposal is a very significant one in terms of its contribution to power generation, and the national economic interest. Having regard to those factors, and to a lesser extent (but not unimportantly) the need for security of investment for the applicant, a term of 35 years is indicated. There is no basis in the evidence or submissions, for reducing the term, let alone to 10 years.

11. *Benchmarking of dollar values for the bond and the Kaipara Harbour Trust*

In its Record of Mediation, filed after 7 December 2010, Crest asserted that these issues were resolved. In particular, it recorded that it had agreed to benchmark the bond against 2007 dollars, and given that it had removed the date from the conditions related to the Kaipara Harbour Trust, an "*Augier*", condition, that further relief was not pursued.



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The submissions on behalf of the respondent suggest that the latter aspect was not resolved. It seeks that the benchmarking be restored.

The condition is indeed, in our view, one put forward on the "*Augier*" principle, and to relate to environmental compensation as opposed to the issue of mitigation that is central to the purpose of the Act. It is not one that we have considered to be critical to whether or not the consent should be granted. We consider that matters should be left as they now stand, as latterly offered by Crest. (We note that condition 77 of the Consent provides that the annual amount shall be adjusted for inflation each year (movement of CPI) from the date of installation of the first turbine for Stage 1a, which we find satisfactory).

13. *Copyright statement and EMP*

At an earlier stage of the proceedings, Crest proposed that the EMP would bear a copyright statement limiting the use of the EMP by parties other than itself, in significant ways.

At the December mediation, Crest proposed to modify the copyright statement to allow of its use by "*the person to whom it is provided in relation to monitoring associated with [the] Marine Turbine project*".

The respondent continued to complain about that, noting that NRC has statutory obligations in relation to other parties, for instance under the Official Information Act, and the Local Government Official Information and Meetings Act.

We consider that this kind of limitation is inappropriate in consent documents, where many parties have rights of access to documentation concerned with the implementation and operation of consents.

We note that Crest has now (belatedly) deleted the copyright statement, and we think that that is entirely appropriate.

Should there be a refusal of the consents?

[20] Although it was Environs' prime contention in the case, and in its most recent submissions, that consent should be refused, we have deliberately kept this topic to last in this decision. We have done so on the basis that our Interim Decision gave strong pointers as to where a decision might ultimately rest, that is with consents being granted, subject however to some heavy-duty amendments being made to Conditions of Consent and the EMP. We have therefore proceeded to consider whether those changes have been made to our satisfaction. As will have already been seen, many of the provisions of the new NZCPS 2010, have played an important part in our consideration of these issues. We have already mentioned in particular, policy 3 on the precautionary approach, and made a finding in favour of the proposal. Environs had placed particular emphasis on that policy in its most recent

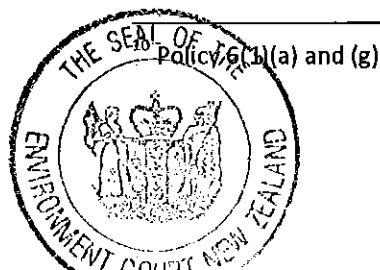
submission.



[21] Mr Clay for Environs submitted on their behalf that “*given the lack of comparable projects on which to base empirical evidence of potential effects and the significant scale of the proposal, the application calls for the adoption of a cautious approach.*” Taken on its face, application of such an approach could mean that innovative or pioneering projects might never receive consent. That is not the law

[22] Mr Clay then submitted in detail concerning the relationship that Te Uri o Hau has with the Kaipara Harbour, being strong and longstanding, and one of kaitiakitanga. In effect that submission, and several succeeding paragraphs, seek effectively to relitigate that which we had already substantially decided in paragraph [214] of our Interim Decision. We had been made aware by Environs’ previous counsel that claims are in train in the High Court on behalf of iwi interests to which Environs is linked, to rights to foreshore and seabed. There were a number of attempts by those earlier representatives to delay or terminate the processes in train before us, in order to await an outcome in those other proceedings, probably quite some time in the future. We have held that the Maori interests, deriving from Part 2 of the Act in this case, are important. In our ultimate weighing of matters, and in light of the significant advances in the construction of the proposed conditions and EMP, we have found that other matters outweigh them, and/or they are recognised and provided for, or had particular regard for, or taken into account, to use the relevant wording of sections 6, 7 and 8 RMA respectively.

[23] Before passing from the issue of whether consent should be granted, we recognise the wide-ranging topics now set out in the new NZCPS 2010. Not unexpectedly, they cover the full gamut of matters provided for in Part 2 of the Act, including matters already discussed, and some not expressly recorded, in relation to activities in the coastal environment, bio-diversity, natural character, water quality, coastal hazards, and many others. As submitted by Ms Simons on behalf of Crest, policy 6 includes mention of the provision of infrastructure including the generation and transmission of electricity as activities important to the social, economic and cultural wellbeing of people in communities, and the potential of renewable resources in the coastal environment such as energy from ... currents and tides, to meet the reasonably foreseeable needs of future generations.¹⁰ Additionally, policy 6 (2)(a) and (c) reiterate issues about the potential contribution of renewable marine energy to meeting the energy needs of future generations as a contribution to the social, economic and cultural wellbeing of people in communities, and the fact that there are activities that have a functional need to be located in the coastal marine area.



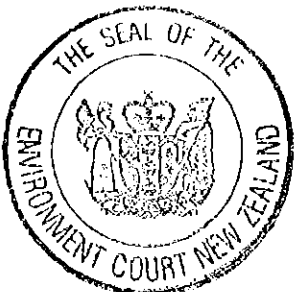
Conclusion

[24] As we have already noted, after extensive consultative processes and a mediation, and in particular on account of extensive and constructive input from Crest, NRC, and the Director General of Conservation, many aspects of this important and interesting proposal have been agreed. We should stress however that the matters agreed have been considered by us with care, and found adequately to serve the purpose of the Act.

[25] In respect to the remaining matters, we have also found in favour of the applicant after consideration of the further evidence, detailed submissions from the four remaining active parties, and close consideration of the now proposed Conditions of Consent and Environmental Monitoring Plan.

[26] We are now therefore placed to make the requisite recommendations to the Minister, and to grant consent to the balance of the consents, and this we do, subject to the imposition of the attached conditions and implementation of the Environmental Monitoring Plan, all of which are attached. The consents allow for the following (very much in summary form):

- (a) Activities subject to Recommendation to the Minister of Conservation:
 - (i) To occupy the coastal marine area with up to 200 marine turbine generating units located on the bed of the Kaipara Harbour within two array areas defined by co-ordinates, together with ancillary structures (including navigation structures and cabling).
 - (ii) To disturb the foreshore and seabed during the installation of two seven kilometre electricity transmission cables linking the turbine arrays to land at Pouto (within defined co-ordinates) and cables (2) connecting the array areas.
- (b) Activities for which consent is granted in the coastal marine area:
 - (i) The installation of up to 200 marine turbine generating units located on the bed of the Kaipara Harbour in two arrays within defined co-ordinates, and ancillary structures (navigation structures, cable junction units), for the purpose of extracting energy from tidal currents.



- (ii) Place, use and occupy the CMA with two seven kilometre electric transmission cables linking the turbine arrays to land at Pouto (within defined co-ordinates), cables (2) connecting the two array areas, and a conduit containing electric transmission cables under the bed of the Northern Wairoa River between Tikinui and Raupo.
- (iii) Disturb the seabed during the placement of said structures and to discharge suspended sediments during related installation and maintenance work.
- (iv) Discharges in conjunction with ballasting seabed structures, maintaining marine turbines, bio-fouling of submerged structures, operating generator units and cables (heat).

[27] In light of the extensive and largely constructive engagement by all parties in the last stages of the process, we feel that costs may not be an issue. However, we reserve leave for any applications as may be forthcoming, to be made within fifteen working days of the date of this decision.

DATED at Auckland this *3rd* day of *February* 2011.

For the Court



L J Newhook
Environment Judge





Recommendation pursuant to the Resource Management Act 1991

RESOURCE CONSENT NO. CON20061607601 - 02

Pursuant to Section 104B of the Resource Management Act, the Environment Court, following hearing an appeal of a recommendation from the Northland Regional Council, recommends that the Minister of Conservation grants consent to:

**CREST ENERGY KAIPARA LIMITED, C/O TODD ENERGY LIMITED, LEVEL 15
THE TODD BUILDING, 95 CUSTOMHOUSE QUAY, PO BOX 3141. WELLINGTON
6140**

To carry out the following activities:

- (01) Occupy the coastal marine area (CMA) with a generator array in two parts of up to 200 marine turbine generating units and ancillary structures (including navigation structures, cabling and cable junction unit(s)) on the bed of the Kaipara Harbour, within two generator array areas, the boundaries of which are defined by co-ordinates shown in Table 1.1 and as set out in NRC plan 4205 D2:

Table 1.1: Generator Array Co-ordinates

Site	NZ Transverse Mercator	
	Easting (m)	Northing (m)
A	1697775	5970825
B	1703095	5970795
C	1703080	5969700
D	1697820	5970115
E	1694150	5970585
F	1695770	5970765
G	1695780	5970320
H	1694150	5970400
I	1694945	5970615

- (02) Disturb the foreshore and seabed during installation of:
- Two, seven kilometre long, electric transmission cables between a generator array at the entrance to the Kaipara Harbour and a landfall at Pouto at or about location co-ordinates 1706025E 5975140N.
 - Two cables connecting the Western and Eastern Array Areas shown in NRC plan 4205 D2

Advice Note: All location co-ordinates in this document refer to Geodetic Datum 2000, New Zealand Transverse Mercator Projection.

Subject to the following conditions:

ACTIVITIES IN ACCORDANCE WITH APPLICATION

- 1 Subject to compliance with the conditions of this consent the activities authorised by this consent shall be undertaken in accordance with the application and documents submitted as part of the application.

For the avoidance of doubt, where information contained in the application documents is contrary to the conditions of these consents, or where



information contained in the application documents is contrary within itself, the conditions shall prevail.

Advice Note: The documents referred to in Condition 1 comprise:

- *Resource Consent Applications and Assessment of Effects on the Environment, July 2006, Crest Energy Limited*
- *Revised Application for Resource consents and Further Information Pursuant to S 92 RMA, September 2006, Crest Energy Limited;*
- *Consent Applications and Assessment of Effects - Subsea Cables to Pouto Point and Wairoa River Crossing at Tikinui, July 2007, Crest Energy Limited*
- *Project Update and Further Information pursuant to Section 92 RMA, July 2007, Crest Energy Limited*
- *S92 Response January 2008, Crest Energy Limited;*
- *Flow Modelling Report No.2 January 2008, Crest Energy Limited;*
- *Crest Energy Limited Response re Decommissioning Costs 2008 - email from Crest Energy Limited to NRC 31 March 2008;*
- *Crest Energy Limited Comment on Dr Paul Kench comments February 2008 - 11 February 2008 email from Crest Energy Limited to NRC and Department of Conservation.*
- *DTec Consulting Limited: "Assessment of Effects on Coastal Processes of change in current velocities January 2008"; 11 February 2008 email from Crest Energy Limited to NRC and Department of Conservation.*
- *DTec Consulting Limited: "Review of Coastal Processes Information by Dr. Paul Kench on behalf of the Department of Conservation", 11 February 2008 email from Crest Energy Limited to NRC and Department of Conservation;*
- *Crest Energy Limited Feedback on Department of Conservation Review by Jonas Teilmann 2008 - 11 February 2008 email from Crest Energy Limited to NRC and Department of Conservation.*
- *Crest Energy Limited evidence presented at the Northland Regional Council Hearing in May 2008 and at the Environment Court Hearing in July 2009.*
- *Statement of Evidence of Bruce Ross Wallen (Bathymetry Survey) August 2009.*
- *Supplementary information on the Environmental Monitoring Plan provided in May 2010 and subsequently in August 2010.*

LAPSE

- 2 Except as provided for in Condition 3, this consent shall not lapse until ten years after the date of commencement of the consent.
- 3 The works for each Stage shall be undertaken in accordance with the construction timetable required in Condition 17 (c). If this condition is not met the Northland Regional Council may initiate a Section 128 Review for the purposes of determining whether these consents will be:
 - (a) Amended to continue to the extent to which effect has been given to the consent, but lapse for the undeveloped portion of the area authorised for activities under this consent or;

Under section 125 of the Resource Management Act 1991:



- (b) Be considered to have lapsed or;
- (c) Be extended.

STAGING OF DEPLOYMENT

4 The consent shall be exercised in a staged manner as follows:

Pre-operational

Implementation of the Baseline Monitoring component of an Environmental Monitoring Plan in accordance with Condition 63 of Resource Consent CON20061607603-13, comprising a minimum of two years monitoring and evaluation; and preparation of an Operations and Maintenance Plan and a Biosecurity Management Plan required by Conditions 32 and 40 respectively of Resource Consent CON20061607603-13.

Operational

Turbine instalment stages, based on an adaptive management process are set out in Table 4-1:

Table 4-1: Turbine Installation Staging

Stage	Number of Units per Stage	Cumulative Maximum Number of Units
1a	Up to 3	3
1	Up to 17	20
2	Up to 20	40
3	Up to 40	80
4	Up to 120	200

- Advice Note: 1. Staging is a component of the adaptive management regime under which the Project is to be developed.*
- 2. It is recorded that this coastal permit was granted on the basis of evidence from the applicant that the Crest Kaipara Harbour Marine Turbine Generation Project (the Project) will have no adverse effect on Maui's dolphin with respect to breeding, nursing, feeding or shelter and that Maui's dolphin rarely venture into the Kaipara Harbour; and that the Project will have no adverse effect on the North Island West Coast Commercial Snapper fishery.*

5 This consent is subject to the conditions precedent:

- (a) That the monitoring required before Stage 1a, is carried out, and that the results satisfy the Northland Regional Council that it is very probable that implementation will give rise to effects that are less than minor on cetaceans, fish (particularly snapper), elasmobranchs or the North Island West Coast commercial fishery.
- (b) That after Stage 1a deployment, the monitoring results satisfy the Northland Regional Council that it is very probable that the development beyond Stage 1a (up to 3 turbine units) will give rise to effects which are



~~less no more~~ than minor on cetaceans, fish (particularly snapper), elasmobranchs or the North Island West Coast commercial fishery.

- 6 Deployment of each Stage following Stage 1a shall be subject to the Northland Regional Council's approval following reviews as provided for in Condition 31 of this consent. These reviews shall be undertaken in accordance with the mechanisms for public notification, submissions and hearing set out in Section 130 of the Act, and shall include consultation with Te Uri o Hau.

Advice Note: Development of the generation array by the Consent Holder from Stage 1a to subsequent stages will be based on an adaptive management regime. .

Monitoring results and other sources of information will be used to inform decisions on continuation to the next stages. Components of monitoring will be assessed against agreed criteria as set out in the Environmental Monitoring Plan [Condition 63 of Resource Consent CON20061607603-13]. Other more general information may be used to provide a broader context for understanding actual or probable effects. As part of this assessment, the Council, after consultation with the Consent Holder, may require the Consent Holder to provide further information to assist its determination.

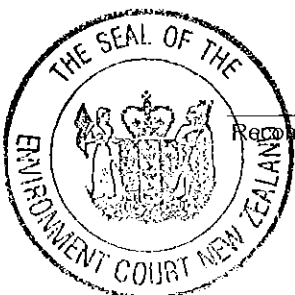
This assessment will result in one of the following decisions by the Northland Regional Council:

- a. The level of effect is considered to be no more than minor, and development to the next Stage may proceed.*
- b. The level of effect is considered to be more than minor, and design modification or down-scaling of any existing array is required to reduce effects to be no more than minor.*
- c. The level of understanding of turbine effects is considered insufficient, and further development will be put on hold until additional assessment or investigations provide information suitable to support either decisions (a) or (b).*

Any Section 128 Review of this Consent should be undertaken on a fully notified basis

- 6A The Consent Holder shall undertake operational monitoring for a minimum period of one year after the conclusion of Stage 1 to provide sufficient data on actual and potential fisheries effects to inform the Northland Regional Council's decision on transition from Stage 1 to Stage 2 as required in Condition 7.

- 7 In the event that the Northland Regional Council, pursuant to a review as provided for in Condition 6 of this consent, determines that activities authorised under this consent are having more than minor adverse effects, the Consent Holder, after consultation with the Northland Regional Council, shall adapt its activities to the extent necessary to avoid those identified



adverse effects. The adaptation of activities shall include, as necessary, but not be limited to, the following:

- (a) Removal of some or all of the deployed turbines, inter-turbine cables, inter-array cables and/or transmission cables;
- (b) Not implementing subsequent stages in whole or in part.

OCCUPANCY

8 The occupancy area authorised by this consent is restricted to those parts of the generation array areas where turbines and ancillary structures including junction boxes are installed.

9 The Consent Holder is, by this consent, authorised to:

- (a) prohibit anchoring, fishing and diving within the array area; and
- (b) exclude navigational passage within elevations above minus seven metres below Chart Datum (on NZ Chart 4265 Kaipara Harbour) within the array area during installation and maintenance.

The exclusion in (b) is to be exercised for the minimum time necessary and apply over the minimum area necessary.

Advice Note: Other than as described in this condition, this coastal permit does not enable the Consent Holder to exclude all or any class of persons from the array area. Notwithstanding this, the Harbourmaster may determine to impose navigational limitations pursuant to bylaws and the Local Government Act.

GENERATOR ARRAY AND CABLES

10 The generator array shall be located within the two areas defined by the co-ordinates shown in Table 10.1 and as set out in NRC plan 4205 D2.

Table 10.1: Generator Array Co-ordinates

Array Area	Site	NZ Transverse Mercator	
		Easting (m)	Northing (m)
Eastern	A	1697775	5970825
Eastern	B	1703095	5970795
Eastern	C	1703080	5969700
Eastern	D	1697820	5970115
Western	E	1694150	5970585
Western	F	1695770	5970765
Western	G	1695780	5970320
Western	H	1694150	5970400
Western	I	1694945	5970615

11 The location of the transmission cable route between the Western and Eastern Generation Arrays and between the Eastern Generation Array and Pouto shall be generally as shown on NRC plan 4205 D2 attached.



- 12 Navigation marks defining the generation array areas, any buffer zone and any adjacent navigation channel shall be placed by the Consent Holder as required by the harbour authority. The Consent Holder shall maintain all such navigation marks.

Advice Note: Any buffer zone or navigation channel will be identified in accordance with the principles illustrated on Plan 4205 E, attached.

CONSTRUCTION

- 13 The Consent Holder shall install that section of transmission cabling which crosses the foreshore zone at Pouto, by directional drilling or similar method. The transmission cabling so installed shall be located at least two metres below the upper surface of any sandstone or similar material that is exposed at the time of installation or which could be exposed as result of normal coastal processes at the location. In the event that no such sandstone or similar material is present, then the transmission cabling shall be located no less than three metres below the lowest foreshore level that may exist as a result of normal coastal processes at the location. Trenching of the foreshore shall not occur.

Advice Note: This condition recognises that this location is used for a variety of activities, such that it is appropriate to locate the transmission cabling more remotely from the surface of the foreshore.

- 14 The Consent Holder shall provide a copy of the plan of the proposed cable route across the foreshore and the intended depth of burial, together with details of the geomorphic stratification at the site, to the Northland Regional Council no later than one month before the intended date of installation of this section of the transmission cable.
- 15 At least six months prior to commencing installation of turbines, cables or ancillary equipment for each stage, the Consent Holder shall notify the Northland Regional Council in writing of the intended date of commencement of each of:
- (a) Foundations for turbines and turbine placement;
 - (b) The installation of the inter-turbine and inter-array cables; and
 - (c) The installation of the transmission cable between the generation array and Pouto; and
 - (d) ~~The installation of transmission cable between Tikinui and Raupe.~~
- 16 At least 20 working days prior to the commencement of installation works for each stage of the development the Consent Holder shall notify the Northland Regional Council of the exact locations of the components (turbine units, cabling and ancillary equipment) to be installed during that stage and shall provide a plan showing the components with their location co-ordinates (Geodetic Datum 2000, New Zealand Transverse Mercator Projection).



- 17 At least 20 working days prior to the commencement of installation works for conductor cables, replacement cables or substitution cables, the Consent Holder shall submit to the Northland Regional Council the following:
- (a) Finalised engineering designs certified by a Chartered Professional Engineer (CPEng) or equivalent;
 - (b) Construction methodology for the cable installation, and scour protection; and
 - (c) A Construction Timetable for (a) and (b) above.
- 18 The Consent Holder shall, at least 10 working days prior to the proposed start date for each of the generator installation Stages 1a, 1, 2, 3 and 4, notify the Northland Regional Council in writing of the proposed date of commencement and the timetable for the proposed stage works to be installed.
- 19 At least 10 working days before the date of first installation of turbines, the Consent Holder shall notify the Northland Regional Council in writing, of the commencement date of first installation of turbines.
- 20 At least 10 working days prior to the commencement of installation of turbines, cables and ancillary structures, the Consent Holder shall notify Maritime New Zealand and Land Information New Zealand in writing to the specification standards of those organisations of:
- (a) The proposed works;
 - (b) Their geographical location;
 - (c) Placement and type of navigation marking; and
 - (d) Any installation or action which may affect bottom contours, navigation aids or safe navigation.
- 21 No works in the coastal marine area (including installation) shall take place until the Northland Regional Council has been provided with and certified the Operations and Maintenance Plan and the Biosecurity Management Plan in accordance with Conditions 34 and 40 of Consent CON20061607603 - 13.
- 22 The Consent Holder shall within one month after each year from the date of commencement of this consent, provide the Northland Regional Council with an Annual Report on what was done in that year and is proposed for the following year including:
- (a) Engineering and construction work;
 - (b) Programmed maintenance and fixtures replacement, substitution and removal;
 - (c) Generation capacity and power utilisation of the installation over the year; and
 - (d) Supply location and plans of any updates to "as built" in respect of all relocations of turbines, ancillary installations or cables.

OPERATIONS

Contaminant release



- 23 The Consent Holder shall exercise this consent in a manner which ensures that the quality of the receiving waters at any point:
- (a) 200 metres outside the generation array area, and
 - (b) 100 metres either side of the position of the transmission cable route to Pouto, where outside the 200 metre mixing zone for the generation area, and
 - ~~(c) 100 metres either side of the transmission cable crossing at Tikinui/Raupo,~~

as a result of exercise of these consents, always meets the following standard:

Natural pH	Not changed by more than 0.2 units
Concentration of Dissolved Oxygen	Not reduced below 80% saturation
Natural Visual Clarity	Not reduced more than 20%
Natural Hue	Not changed more than 10 Maunsell units
Oil/grease Film, Scum, Foam, Odour	No conspicuous oil or grease film, scums or foams, floatable or suspended materials, or emissions of objectionable odour

- 24 Where from any cause any contaminant escapes from the Consent Holder's operations otherwise than within limits in this consent the Consent Holder shall:
- (a) Immediately take such action, or execute such work as may be necessary, to stop and/or contain such escape;
 - (b) Immediately notify the Northland Regional Council by telephone of an escape of contaminant;
 - (c) Take all reasonable steps to remedy or mitigate any adverse effects on the environment resulting from the escape; and
 - (d) Within seven days report to the Northland Regional Council in writing on the substances and volume of the contaminant, the cause of the escape and the steps taken or being taken to effectively control or prevent such escape.

Maintenance

- 25 The Consent Holder shall ensure that any structure permitted to occupy the coastal marine area by this Consent is maintained in a good and sound condition, and shall make any repairs that are necessary.

Advice Note: Further resource consents may be required before some repairs can be undertaken.

- 26 Prior to the expiry, cancellation, or lapsing of this consent the Consent Holder shall remove all generating and other plant, structures, cables, navigation and cable marks and other materials and refuse associated with this consent from the consent area, and shall restore the consent area to the satisfaction of the Northland Regional Council, unless an application for a replacement consent has been properly made beforehand.



- 27 In the event that generation is permanently ceased in part or all the generation array during the term of this consent, then the Consent Holder shall remove all relevant plant, structures, cables, navigation and cable marks and other materials and associated refuse from the coastal marine area.

BOND

- 28 The Consent Holder shall enter into a Bond with the Northland Regional Council as set out in Condition 79 of Consent CON20061607603-13, to cover the potential costs to the Northland Regional Council of removal of materials and restoration required under Conditions 26 and 27 of this Consent.

Advice Note: For the avoidance of doubt, compliance with this condition will be met by the Bond required by Condition 79 of Consent CON20061607603-13 being in place.

MONITORING

Cable Burial

- 29 The Consent Holder shall, as part of the Environmental Monitoring Plan referred to in Condition 63 of Consent CON20061607603-13, at no more than two yearly intervals monitor the depth below seabed of the transmission cables to Pouto Point and shall, within one month of each survey, provide the results to the Northland Regional Council. Except where cables are temporarily exposed for repair purposes or where the transmission cables are covered by a protective matting, if the cables are exposed at the seabed at any point, then remedial work shall be undertaken to:

- (a) Return the burial depth to no less than one metre; or
- (b) Install protective matting over the cable.

- 30 If, after any five year period of records, there has been no incident of monitored cable exposure, then the required survey interval shall extend to five years. Should any subsequent survey show cable exposure at the seabed at any point on the cable, other than where cables are temporarily exposed for repair purposes or where cables are covered by protective matting, then the survey interval shall return to two yearly.

REVIEW

- 31 The Northland Regional Council, may, in accordance with Section 128 of the Resource Management Act, and subject to Section 119A of the Act, serve notice on the Consent Holder of its intention to review the conditions of this consent. Such notice may be served at the following times:

- (a) Annually within one month commencing after each anniversary of the date of commencement of this consent; or
- (b) Within one month commencing after the date of receipt of any report or estimate required from the Consent Holder by the conditions of this consent; or



- (c) At any time after the date reasonably required by the Northland Regional Council for supplying by the Consent Holder to the Northland Regional Council any report or estimate or validation of any report or estimate.

The review may be initiated for any one or more of the following purposes:

- (a) To deal with any adverse effects on the environment that may arise from the exercise of the consent and which it is appropriate to deal with at a later stage, or to deal with any such effects following assessment of the results of the monitoring of the consent and/or as a result of the Northland Regional Council's monitoring of the state of the environment in the area;
- (b) To require the adoption of the best practicable option to remove or reduce any adverse effect on the environment;
- (c) To deal with any material inaccuracies, omissions or lack of scientific knowledge that may in future be found in the information made available with the application. (Notice may be served at any time for this reason);
- (d) To determine whether the consents will be considered under Condition 3 if the consent has not been exercised within required time or time agreed by the Northland Regional Council.
- (e) To determine for the purposes of Condition 6 whether:
- (i) The level of adverse effect is considered to be no more than minor and development of the next stage may proceed; or
- (ii) The level of effect is considered to be more than minor and design modification or downscaling of any existing array is required to reduce adverse effects to no more than minor; or
- (iii) The level of understanding of turbine effects is considered insufficient, and further development is to be put on hold until additional assessment or investigations provide information suitable to support either decisions (i) or (ii) above.

The Consent Holder shall meet all reasonable costs of any such review.

EXPIRY DATE: 30 AUGUST 2045 (35 years after date of grant of consents)



Insert:

- NRC Plan 4205 D2
- NRC Plan No. 4205 E, and
- NRC Plan No 4206
- Environmental Management Plan



Granted pursuant to the Resource Management Act 1991

Resource Consent CON20061607603-13

Pursuant to Section 104B of the Act, the Environment Court on appeal of a decision from the Northland Regional Council grants consent to:

**CREST ENERGY KAIPARA LIMITED, C/O TODD ENERGY LIMITED, LEVEL 15
THE TODD BUILDING, 95 CUSTOMHOUSE QUAY, PO BOX 3141. WELLINGTON
6140**

To carry out the following activities:

- (03) Install a generator array in two parts of up to 200 marine turbine generating units (total) and ancillary structures (including navigation structures and cable junction unit(s)) on the bed of the Kaipara Harbour, within two generator array areas, the boundaries of which are defined by co-ordinates shown in Table 1.1 and as set out in NRC plan 4205 D2:

Table 1.1: Generator Array Co-ordinates

Site	NZ Transverse Mercator	
	Easting (m)	Northing (m)
A	1697775	5970825
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E	1694150	5970585
F	1695770	5970765
G	1695780	5970320
H	1694150	5970400
I	1694945	5970615

- (04) Occupy the seabed with electric circuit and transmission cables located in the vicinity of the generator array.
- (05) Extract energy from tidal currents by using rotating discs within each marine turbine unit.
- (06) Disturb the seabed during placement of structures.
- (07) Discharge suspended sediments arising from seabed disturbance when placing structures within the generation area and during installation and maintenance of submarine cables along the transmission cable route.
- (08) Discharge biological residue and sediment arising from ballasting of seabed structures and cleaning and maintenance of marine turbines.
- (09) Discharge contaminants arising from bio-fouling management of submerged marine structures.
- (10) Discharge heat to natural waters in the coastal marine area from the generator units and cables.



- (11) Place, use and occupy the coastal marine area with:
- two, seven kilometre long, electric transmission cables in the seabed from a generator array at the entrance to the Kaipara Harbour to a landfall at Pouto at or about location co-ordinates 1706025E 5975140N.
 - two cables connecting the Western and Eastern Array Areas shown in NRC plan 4205 D2.
- (12) Place, use and occupy the coastal marine area under the bed of the Northern Wairoa River between Tikinui and Raupo, with a 200 millimetre diameter plastic conduit, approximately 700 metres long, containing electric transmission cables.
- (13) Discharge heat to natural waters within the coastal marine area from two, seven kilometre long, electric transmission cables to Pouto; and from the plastic conduit containing electric transmission cables, between Tikinui and Raupo.

Advice Note: All location co-ordinates in this document refer to Geodetic Datum 2000, New Zealand Transverse Mercator Projection.

Subject to the following conditions:

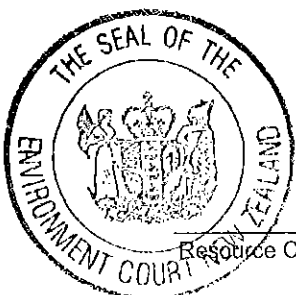
ACTIVITIES IN ACCORDANCE WITH APPLICATION

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For the avoidance of doubt, where information contained in the application documents is contrary to the conditions of these consents, or where information contained in the application documents is contrary within itself, the conditions shall prevail.

Advice Note: The documents referred to in Condition 1 comprise:

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- *Flow Modelling Report No.2 January 2008, Crest Energy Limited;*
- *Crest Energy Limited Response re Decommissioning Costs 2008 - email from Crest Energy Limited to NRC 31 March 2008;*
- *Crest Energy Limited Comment on Dr Paul Kench comments February 2008 - 11 February 2008 email from Crest Energy Limited to NRC and Department of Conservation.*



- DTec Consulting Limited: "Assessment of Effects on Coastal Processes of change in current velocities January 2008"; 11 February 2008 email from Crest Energy Limited to NRC and Department of Conservation.
- DTec Consulting Limited: "Review of Coastal Processes Information by Dr. Paul Kench on behalf of the Department of Conservation", 11 February 2008 email from Crest Energy Limited to NRC and Department of Conservation;
- Crest Energy Limited Feedback on Department of Conservation Review by Jonas Teilmann 2008 - 11 February 2008 email from Crest Energy Limited to NRC and Department of Conservation.
- Crest Energy Limited evidence presented at the Northland Regional Council Hearing in May 2008 and at the Environment Court Hearing in July 2009.
- Statement of Evidence of Bruce Ross Wallen (Bathymetry Survey) August 2009.
- Supplementary information on the Environmental Monitoring Plan provided in May 2010 and subsequently in August 2010.

MARINE TURBINE TECHNOLOGY

- 2 The marine turbine technology used shall be an open vane turbine unit (e.g. Openhydro) or equivalent device which has a similar environmental effects envelope.

Advice Note: Evidence provided by Crest set out that the Consent Holder 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 effects envelope.

Crest evidence described the OpenHydro turbine as having 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 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.

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 add ballast to the structure to increase its mass, and 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.

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. Crest advises that each turbine may need to be lifted for maintenance about once every four years.

The turbines plus support structures would have a height of about 24 metres above the seabed, with the top of each turbine always at least 7m below the surface of the sea.

LAPSE

- 3 Except as provided in Condition 4, this consent shall not lapse until ten years after the date of commencement of the consent.
- 4 The works for each stage shall be undertaken in accordance with the construction timetable required in Condition 14(c). If this condition is not met the Northland Regional Council may initiate a Section 128 Review for the purposes of determining whether these Consents will be:
- (a) Amended to continue to the extent to which effect has been given to the consent but lapse for the undeveloped portion of the area authorised for activities under this consent; or
- Under section 125 Resource Management Act 1991:
- (b) Be considered to have lapsed; or
- (c) Be extended.

STAGING OF DEPLOYMENT

- 5 The consent shall be exercised in a staged manner as follows:

Pre-operational

Implementation of the Baseline Monitoring component of an Environmental Monitoring Plan in accordance with Condition 63 of this consent, comprising a minimum of two years monitoring and evaluation; and preparation of an Operation and Maintenance Plan and a Biosecurity Management Plan required by Conditions 32 and 40 respectively of this consent.

Operational

Turbine instalment stages, based on an adaptive management process are set out in Table 4-1:

Table 4-1: Turbine Installation Staging

Stage	Number of Units per Stage	Cumulative Maximum Number of Units
1a	Up to 3	3
1	Up to 17	20
2	Up to 20	40
3	Up to 40	80
4	Up to 120	200

Advice Note: 1. *Staging is a component of the adaptive management regime under which the Project is to be developed.*



2. *This consent was granted on the basis of evidence from the applicant that the Crest Kaipara Harbour Marine Turbine Generation Project will have no adverse effect on Maui's dolphin with respect to breeding, nursing, feeding or shelter and that Maui's dolphin rarely venture into the Kaipara Harbour; and that the Project will have no adverse effect on the North Island West Coast Commercial Snapper Fishery.*

6 This consent is subject to the conditions precedent:

- (a) That the monitoring required before Stage 1a is carried out, and that the results satisfy the Northland Regional Council that it is very probable that implementation will give rise to effects that are less than minor on cetaceans, fish (particularly snapper), or elasmobranchs or the North Island West Coast commercial fishery and
- (b) That after Stage 1a the monitoring results satisfy the Northland Regional Council that it is very probable that the development beyond Stage 1a (up to 3 turbine units) will give rise to effects that are less-no more than minor on cetaceans, fish (particularly snapper), elasmobranchs or the North Island West Coast commercial fishery.

7 Deployment of each stage following Stage 1a shall be subject to the Northland Regional Council's approval following reviews as provided for in Condition 80 of this Consent. These reviews shall be undertaken in accordance with the mechanisms for public notification, submissions and hearing set out in Section 130 of the Act, and shall include consultation with Te Uri o Hau.

Advice Note: Development of the generation array by the Consent Holder from Stage 1a to subsequent stages will be based on an adaptive management regime.

Monitoring results and other sources of information will be used to inform decisions on continuation to the next stages. Components of monitoring will be assessed against agreed criteria as set out in the Environmental Monitoring Plan [Condition 63 of this consent]. Other more general information may be used to provide a broader context for understanding actual or probable effects. As part of this assessment, the Northland Regional Council, after consultation with the Consent Holder, may require the Consent Holder to provide further information to assist its determination.

This assessment will result in one of the following decisions by the Northland Regional Council:

- (a) *The level of effect is considered to be no more than minor, and development to the next Stage may proceed.*
- (b) *The level of effect is considered to be more than minor, and design modification or down-scaling of any existing array is required to reduce effects to be no more than minor.*
- ~~(c)~~ *(e) The level of understanding of turbine effects is considered insufficient, and further development will be put*



on hold until additional assessment or investigations provide information suitable to support either decisions (a) or (b).

Any Section 128 Review of this Consent should be undertaken on a fully notified basis

7A The Consent Holder shall undertake operational monitoring for a minimum period of one year after the conclusion of Stage 1 to provide sufficient data on actual and potential fisheries effects to inform the review provided for in Condition 80 of this Consent.

8 In the event that the Northland Regional Council, pursuant to a review provided for in Condition 7, determines that activities authorised under this consent are having more than minor adverse effects, the Consent Holder, after consultation with the Northland Regional Council, shall adapt its activities to the extent necessary to avoid those identified adverse effects. The adaptation of activities shall include, as necessary, but not be limited to, the following:

- (a) Removal of some or all of the deployed turbines , inter-turbine cables, inter-array cables and/or transmission cables;
- (b) Not implementing subsequent stages in whole or in part.

9 The Consent Holder may not progress to or commence any stage beyond Stage 1a until advised in writing by the Northland Regional Council of its decision that:

- (a) The current number of turbines is having ~~less~~ no more than minor adverse effects; and
- (b) The results of environmental monitoring and/or other relevant information indicate that is is very probable show ~~that~~ any subsequent stage is not likely to have any more than minor adverse effects either by itself or cumulatively with earlier stages.

GENERATOR ARRAY AND CABLES

10 The occupancy area is restricted to the routes of transmission cables, inter-array cables and inter-turbine cables.

The Consent Holder is, by this consent, authorised to:

- (a) prohibit anchoring along the routes of transmission cables, inter-array cables and inter-turbine cables; and .
- (b) exclude navigational passage in the immediate vicinity of worksites along of the routes of transmission cables, inter-array cables and inter-turbine cables during installation and maintenance.

The exclusion in (b) is to be exercised for the minimum time necessary and apply over the minimum area necessary.

11 The generator array shall be located within the two areas defined by the co-ordinates shown in Table 12.1 and as set out in NRC plan 4205 D2.

Table 12.1: Generator Array Co-ordinates



Array Area	Site	NZ Transverse Mercator	
		Easting (m)	Northing (m)
Eastern	A	1697775	5970825
Eastern	B	1703095	5970795
Eastern	C	1703080	5969700
Eastern	D	1697820	5970115
Western	E	1694150	5970585
Western	F	1695770	5970765
Western	G	1695780	5970320
Western	H	1694150	5970400
Western	I	1694945	5970615

- 12 The location of the transmission cable routes between the Western and Eastern Generation Arrays, between the Eastern Generation Array and Pouto and between Tikinui and Raupo shall be generally as shown on NRC plans 4205 D2 and 4206 **attached**.

CONSTRUCTION

- 13 At least six months prior to commencing installation of turbines, cables or ancillary equipment for each Stage, the Consent Holder shall notify the Northland Regional Council in writing of the intended date of commencement of each of:
- (a) Foundations for turbines and turbine placement;
 - (b) Installation of inter-array and inter-turbine cables
 - (c) Installation of the transmission cable between the generation array and Pouto; and
 - (d) Installation of transmission cable between Tikinui and Raupo.
- 14 At least 20 working days prior to the commencement of installation of turbines, cables or ancillary equipment for each stage, the Consent Holder shall provide to the Northland Regional Council:
- (a) Finalised engineering designs for the following matters, certified by a Chartered Professional Engineer (CPEng) or equivalent, for the certification (see Advice Note 2 of this Condition) of the Northland Regional Council's Chief Executive Officer or his/her delegate:
 - (i) All engineering design aspects of that stage including, but not limited to, appropriate information on geotechnical conditions at each turbine placement location, including analysis of settlement, scour and displacement of turbine structures;
 - (ii) The installation methodology for the turbines, cables and ancillary structures.
 - (b) The findings of a peer review of the design information in Condition 14(a)(i) undertaken by a Chartered Professional Engineer (CPEng) or equivalent qualified peer reviewer approved by Northland Regional Council.



- (c) A Construction Timetable for the matters covered in (a) above.
- (d) Survey grid co-ordinates of locations plotted on a plan showing the exact location of the components to be installed during that stage.

Advice Note: 1. This consent is granted on the basis of the Consent Holder's evidence that final engineering design of the turbines and support structures will provide for acceptable stability, with appropriate offshore factors of safety (see Project Update and Further Information pursuant to section 92 RMA July 2007, 3.1.2 and DTec Consulting Ltd comment on review of coastal processes information by Dr Paul Kench 7 February 2008 p 2).

2. The term 'certification', where used in this condition, means that the designs and design details are considered by the Northland Regional Council's Chief Executive Officer or his/her delegate to be likely to result in adequate stability and factors of safety.

15 At least ten working days prior to the commencement of installation of turbines, cables and ancillary structures, the Consent Holder shall notify Maritime New Zealand and Land Information New Zealand in writing to the specification standards of those organisations of:

- (a) The proposed works;
- (b) Their geographical location;
- (c) Placement and type of navigation marking; and
- (d) Any installation or action which may affect seabed contours, navigation aids or safe navigation.

16 No installation of turbines, cables and ancillary structures, shall take place until the Northland Regional Council has been provided with the information required by the conditions of this consent and the council certification required by condition 14(a) has been received by the consent holder.

17 Within 10 working days of completion of installation works for each stage, the Consent Holder shall notify the Northland Regional Council in writing that each of the following has been installed in accordance with information provided to the Northland Regional Council under this consent:

- (a) Generation turbines; and
- (b) The transmission cables between the Western and Eastern Generation Arrays; and
- (c) The transmission cables between the generation array and Pouto; and
- (d) The transmission cables between Tikinui and Raupo,
- (e) Verification of the date of completion of works for Condition 19 of this consent.

18 The Consent Holder shall, within one week following the completion of each Stage, remedy to the extent practicable, all damage and disturbance from the construction works.



- 19 The Consent Holder shall within three months of completion of works for each stage, provide a copy of the following to the Northland Regional Council:
- (a) As-built plan(s) of submarine transmission cable routes, showing way-points that are sufficient, in the opinion of the Regional Harbourmaster, to show the actual position of the cables at all points along the length;
 - (b) As-built turbine layout plans, with location co-ordinates and footprint of each turbine;
 - (c) As-built cable layout within the generation array, showing positions of all cables, junction boxes and all other ancillary plant and equipment;
 - (d) A description of the standard daily operational parameters, procedures and general operating conditions of the turbines and cables; and
 - (e) Confirmation in writing from a person(s) qualified as a Chartered Professional Engineer (CPEng) or equivalent and approved by Northland Regional Council that the works are in accordance with design plans and drawings submitted to the Northland Regional Council.
- 20 The Consent Holder shall within one month after each year from the date of commencement of this consent, provide the Northland Regional Council with an Annual Report on what was done in that year and is proposed for the following year regarding:
- (a) Engineering and construction work;
 - (b) Programmed maintenance and fixtures replacement, substitution and removal;
 - (c) Generation capacity and power utilisation of the installation over the year;
 - (d) Supply location and plans of any updates to "as built" in respect of all relocations of turbines, ancillary installations or cables.
- 21 The Consent Holder shall maintain all facilities authorised by this consent in good order and repair and shall also, notwithstanding the generality of the foregoing, ensure that they are restrained and secure at all times so as not to create a navigational hazard or adverse effect on the environment.
- 22 All turbine structures shall have a minimum clearance of at least seven metres below Chart Datum on NZ Chart 4265 Kaipara Harbour.
- 23 Total ballast placement in any twelve month period shall not exceed 50,000 cubic metres.
- 24 All ballast used in the facilities shall be of sufficient dimension and density and placed so as to preclude its movement away from its placed position under the most extreme action the sea is likely to impart.

Advice Notes:

1. *The term "ballast" as used in Conditions 23 and 24 refers to heavy material placed inside and on the turbine support structure to increase the mass of the turbine and support structure unit, thereby ensuring their adequate stability.*



2. *The volume specified in Condition 23 is the trigger volume for a Restricted Coastal Activity, for which a notified consent application would be required.*

25 The Consent Holder may relocate generation units, within the generation array boundaries, under this consent provided that:

- (a) The Consent Holder shall inform the Northland Regional Council of each proposed relocation, together with the reason for relocation at least three months in advance of the proposed relocation date;
- (b) If the relocation is not in the location that has been notified to Northland Regional Council under Condition 14 of this consent then Northland Regional Council may notify the consent holder of an intention to review the relocation under Section 128;
- (c) All conditions of this consent shall apply to any relocated turbine, and the Northland Regional Council shall be provided with amended "as built" plans for the turbine showing the site of removal as well as the relocated placement.

26 The Consent Holder shall, immediately upon completion of each Stage of the works associated with this consent, notify in writing:

Nautical Information Advisor	Maritime New Zealand
Land Information New Zealand	P O Box 27-006
Private Box 5501	Wellington
Wellington	

The Kaipara District Council	Northland Regional Council
Private Bag 1001	Private Bag 9021
Dargaville	Whangarei

The Consent Holder shall include scale plans of the completed works or stage, including generation array layout and transmission cable routes, with the notification.

Advice Note: These addresses are as at the date of this consent, but the Consent Holder must ensure that a current address is used for these notifications.

27 The Consent Holder shall keep the coastal marine area free of debris resulting from the Consent Holder's activities.

28 In the event of archaeological sites or koiwi being uncovered, activities in the vicinity of the discovery shall cease. The Consent Holder shall then consult with Te Uri o Hau and Waikaretu Marae and the New Zealand Historic Places Trust, and shall not recommence works in the area of the discovery until the relevant Historic Places Trust approvals to damage, destroy or modify such sites have been obtained.

29 Navigation marks defining the generation array areas, any buffer zone and any adjacent navigation channel shall be placed by the Consent Holder as required by the harbour authority. The Consent Holder shall maintain all such navigation marks.



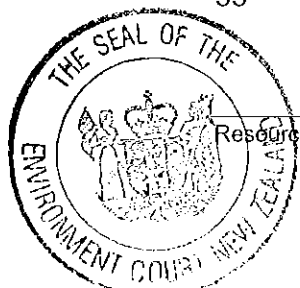
Advice Note: Any buffer zone or navigation channel will be identified in accordance with the principles illustrated on Plan 4205 E, attached.

- 30 Cable marks indicating the location of the landfall of the transmission cabling, and the location of the crossing at Tikinui, shall be placed as required by the harbour authority for the cable routes.
- 31 The Consent Holder shall liaise with the Regional Harbourmaster, at least six months prior to installation of the generation array and transmission cables, to arrange:
- (a) Any Notices to Mariners; and
 - (b) The type and positions of navigation marks; and
 - (c) The marking of the positions of facilities on navigation charts.

OPERATIONS AND MAINTENANCE

Operations and Maintenance Plan

- 32 The Consent Holder shall prepare and follow an Operations and Maintenance Plan (OMP) for each Stage of the Project. The OMP shall be prepared in consultation with Te Uri o Hau and the Department of Conservation and shall include but not be limited to:
- (a) Diagrams, details and dimensions associated with the turbines and ancillary structures;
 - (b) Diagrams, details, dimensions and composition of the power cables;
 - (c) Standard operational parameters, procedures and general operating conditions of the structures and cables while in the coastal marine area;
 - (d) A description of the measures that will be undertaken to avoid, remedy or mitigate the effects of monitoring equipment, specifically lighting and acoustic equipment;
 - (e) A description of the emergency procedures that will be undertaken should an emergency occur, with particular regard to the retrieval of an unscheduled detachment or displacement of the turbines and ancillary structures from the seabed and the movement of any turbines and ancillary structures from their intended locations;
 - (f) A description of the processes that will be used to install and remove the turbines and ancillary structures from the seabed;
 - (g) A description of the process that will be used to remove the turbines, ancillary structures and power cables from the seabed, with particular focus on the interface between the coastal marine area and land.
 - (h) A description of the consultation undertaken with Te Uri o Hau and with the Department of Conservation, including the identification and discussion of areas of agreement and disagreement.
- 33 If the Northland Regional Council considers it necessary, the OMP shall be reviewed by an appropriately qualified person acceptable to the Northland Regional Council. The Consent Holder shall address any findings of this



review, in consultation with the Northland Regional Council, prior to adopting the OMP.

- 34 The draft OMP for each stage of the project shall be submitted to the Northland Regional Council for the certification of the Northland Regional Council's Chief Executive Officer or his/her delegate a minimum of three months prior to the commencement of installation of the power cables, turbines and ancillary structures for each Stage.

Advice Note: The term 'certification', where used in this condition, means that the proposed Operations and Maintenance Plan is considered by the Northland Regional Council's Chief Executive Officer or his/her delegate to be likely to meet the conditions of this consent.

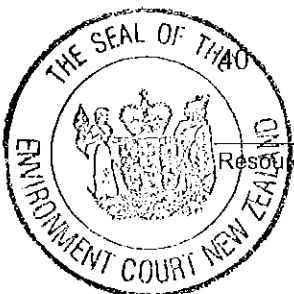
Displacement of Structures

- 35 Should the turbine(s) and/or ancillary structures become displaced, the Consent Holder shall:
- (a) Inform the Northland Regional Council immediately;
 - (b) Inform the Regional Harbourmaster immediately;
 - (c) Apply the emergency retrieval procedures as outlined in the OMP; and
 - (d) Within 7 days report to the Northland Regional Council in writing with an explanation as to why the turbine(s) and/or ancillary structures became detached from the seabed and the steps taken to ensure that the turbine(s) and/or ancillary structures will not become displaced or move again.

Biosecurity

- 36 Prior to the first use of any vessel, marine turbine or ancillary plant including cables in the Kaipara Harbour pursuant to this consent, the Consent Holder shall arrange inspection of the vessel, marine turbine or ancillary plant including cables, for infestation of any unwanted or other risk species identified as such by Biosecurity New Zealand
- 37 The Consent Holder shall, if any unwanted or other risk species are found in the inspection required under Condition 36, arrange for treatment and/or removal of the species.
- 38 The Consent Holder shall provide Northland Regional Council with certification by a person experienced in marine biosecurity management, and approved beforehand by Northland Regional Council, that the vessel, marine turbine or ancillary plant including cables, have been inspected and treated as required under Conditions 36 and 37.
- 39 The Consent Holder shall not allow the use in the Kaipara Harbour of any vessel under its control or direction, or ancillary plant including cables, which have not been certified as having been inspected and treated as required by under Conditions 36 and 37, or showing any indication of being infected with any unwanted or risk species. .

The Consent Holder shall prepare and submit a draft Biosecurity Management Plan (BMP) for the certification of the Northland Regional



Council's Chief Executive Officer or his/her delegate. The BMP shall be prepared in consultation with Te Uri o Hau and the Department of Conservation. There shall be no installation of any structures prior to the certification of the BMP. The BMP shall address measures to avoid the introduction of any unwanted or risk species identified as such by Biosecurity New Zealand, through the installation and operation of the turbines and ancillary equipment and transmission cables and minimise any impacts through propagation on the turbines or transmission cable if such species are introduced and shall include details regarding the cleaning and inspection of vessels brought into the Kaipara Harbour and on staff training, monitoring and reporting mechanisms. The draft BMP shall include a description of the consultation undertaken with Te Uri o Hau and with the Department of Conservation, including the identification and discussion of the areas of agreement and disagreement.

Advice Note: The term 'certification', where used in this condition, means that the proposed BMP is likely to result in outcomes indicated by this condition and meets the objectives in Condition 41.

- 41 The BMP shall have the following objectives relating to unwanted or risk species identified as such by Biosecurity New Zealand:
- (a) To avoid the introduction of any unwanted or risk species into the Kaipara Harbour through the marine turbine power generation activities;
 - (b) To detect any introduced populations of any unwanted or risk species established in the Kaipara Harbour as a consequence of the Consent Holder's activities;
 - (c) To reduce any unwanted or risk species spreading from the turbine structures and ancillary equipment to the Kaipara Harbour should any such species establish at the marine turbine power generation site;
 - (d) To eliminate any unwanted or risk species from the permit area if any such species are detected on the marine turbines and ancillary equipment;
 - (e) To ensure effective treatment of all the equipment used in association with the marine turbine power generation activities to ensure it does not become a vector for the spread of any unwanted or risk species;
 - (f) To set out a staff biodiversity monitoring and reporting system.
- 42 The BMP shall be reviewed annually by an appropriately qualified person acceptable to the Northland Regional Council for the purpose of determining whether the plan is adequate to meet the objectives set out in Condition 41, having regard to any change in circumstances and the review shall be lodged with the Northland Regional Council within one month after each year from the commencement of this consent. The BMP may only be modified with the written agreement of the Northland Regional Council's Chief Executive Officer or his/her delegate but the Northland Regional Council may require modification using the information in the review.

Antifoulant

- 43 Use of antifoulant shall be confined to only the:
- (a) Disc/vane within the collar of each turbine and,



- (b) Inside of the collar to the disc and,
 - (c) Inside of any venturi fitted to enhance flows through any turbine disc.
- 44 If biocidal antifoulant coatings are used on any part of the installation then all material that is removed during cleaning or removal of marine growth shall be contained and disposed of to an authorised on shore disposal site.

Contaminant Release

- 45 The Consent Holder shall exercise this consent in a manner which ensures that the quality of the receiving waters at any point:
- (a) 200 metres outside the generation array area;
 - (b) 100 metres either side of the position of the transmission cable route to Pouto, where outside the 200 metre mixing zone for the generation area;
 - (c) 100 metres either side of the transmission cable crossing at Tikinui/Raupo,

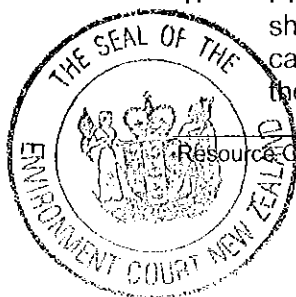
as a result of exercise of these consents, always meets the following standard:

Natural pH	Not changed by more than 0.2 units
Concentration of Dissolved Oxygen	Not reduced below 80% saturation
Natural Visual Clarity	Not reduced more than 20%
Natural Hue	Not changed more than 10 Maunsell units
Oil/grease Film, Scum, Foam, Odour	No conspicuous oil or grease film, scums or foams, floatable or suspended materials, or emissions of objectionable odour

- 46 Where from any cause contaminant escapes from the Consent Holder's operations, otherwise than within limits in this consent, the Consent Holder shall:
- (a) Immediately take such action, or execute such work as may be necessary, to stop and/or contain such escape;
 - (b) Immediately notify the Northland Regional Council by telephone of an escape of contaminant;
 - (c) Take all reasonable steps to remedy or mitigate any adverse effects on the environment resulting from the escape; and
 - (d) Within 7 days report to the Northland Regional Council in writing on the substances and volume of the contaminant(s), the cause of the escape and the steps taken or being taken to effectively control or prevent such escape

Decommissioning

- 47 Prior to the expiry, cancellation, or lapsing of this consent the Consent Holder shall remove all generating and other plant, structures, cables, navigation and cable marks and other materials and refuse associated with this consent from the consent area, and shall restore the consent area to the satisfaction of the



Northland Regional Council, unless an application for a replacement consent has been properly made beforehand.

- 48 In the event that generation is permanently ceased in part or all the generation array during the term of this consent, then the Consent Holder shall remove all relevant plant, structures, cables, navigation and cable marks and other materials and associated refuse from the coastal marine area.

Advice Note: For the avoidance of doubt, this condition does not apply to any relocation of generation plant within the generation array.

MONITORING

- 49 The Consent Holder shall undertake monitoring and assessment of effects on the environment of activities authorised under both this consent and Consent CON20061607601-02, in the following subject areas:

- (a) Benthic Habitat and Benthic organisms
- (b) Harbour Sediment
- (c) Water quality
- (d) Noise
- (e) Marine Mammals (movement) - effects on marine mammals using the harbour entrance, including species, numbers and timing;
- (f) Marine Mammals (impingement) effects and risk of collision of marine mammals with Project components, particularly turbines
- (g) Harbour hydrodynamics - currents
- (h) Fish movement - the degree to which turbines and structures are an impediment to the movement of marine species;
- (i) Fish movement - effects on migration of Snapper (*Pagrus auratus*).
- (j) Fish Biology (spawning) - effects on important spawning areas within the harbour and array area;
- (k) Fish Biology (elasmobranch behaviour, physiology and habitat) - effects of the main transmission cables on elasmobranch behaviour, physiology and habitat;
- (l) Fish Behaviour (impingement) - effects and risk of collision of elasmobranchs and teleost fish with Project components, particularly turbines;
- (m) Commercial fishing - effects on commercial fishing generally, and on the North Island West Coast Commercial Snapper Fishery in particular;
- (n) Recreational fishing
- (o) Coastal Processes and shoreline morphological changes
- (p) Sedimentation within the generation array and along the transmission lines;
- (q) Seabed sediment dynamics;
- (r) Seabed bathymetry and bathymetric change (including historic bathymetric and shoreline change to provide an improved context against which to evaluate future changes);



- (s) Electro magnetic Field (EMF) production by turbines and cables - effects on marine life in general and on elasmobranch movement in particular.
- 50 The Consent Holder shall address, as matters of the highest priority, monitoring for effects on:
- (a) Marine mammals;
 - (b) Fish (particularly snapper);
 - (c) Commercial and recreational fishing (particularly for snapper);
 - (d) Coastal processes and shoreline morphological changes; and
 - (e) Bathymetric changes over potentially affected parts of the harbour.

and the Consent Holder shall provide for studies in these areas to cover the greatest time practicable prior to commencement of the operational phase and thereafter. Given the relatively short period available for baseline monitoring, investigation of historic bathymetric and shoreline change using available information shall also be carried out to provide an improved context against which future bathymetric and shoreline changes can be evaluated.

- 51 The Consent Holder shall give particular recognition to the monitoring matters set out in Conditions 52 to 62.

Water/Sediment Quality

- 52 If the Consent Holder opts to utilise antifoulant coatings containing copper and/or zinc, the Consent Holder shall monitor total copper and total zinc levels in seabed sediments at the far-field and control sites identified in the Environmental Monitoring Plan referred to in Condition 63 below, every two years and shall report on the results to the Northland Regional Council within one month of sampling. Reports shall include an assessment of the results as well as comment on any changes from previous results.

Impediment to Fish Movement

- 53 The Consent Holder shall monitor potential turbine-related effects on movement of fish (particularly snapper and elasmobranchs) and cetaceans during turbine operation, following installation of the first turbines (during Stage 1a) and during successive Stages, with monitoring to include but not necessarily be limited to the following:
- (a) Measurements of noise at a variety of current speeds and positions both within and outside the array and with both clean and fouled turbine blades. (A fouled blade is defined for this purpose as one that has been left in situ for the maximum anticipated lag time between turbine cleaning operations, and thus has accumulated the maximum anticipated amount of fouling);
 - (b) Placement of underwater video cameras, sound recording, or other devices for detection of fish and cetaceans, on or around randomly chosen turbine units to monitor any effects on the movement of fish and cetaceans (eg avoidance behaviour);
 - (c) Undertaking other monitoring studies to determine whether impediment to movement of marine species represents a more than



minor adverse effect or not. These studies may comprise, but not be limited to, tagging and catch per unit effort (CPUE) studies for commercially fished species in the harbour, and observational monitoring for elasmobranchs, large fish and cetaceans, to provide evidence of the ability of animals to pass through the harbour entrance in the presence of the turbine array;

The monitoring required by this condition shall be carried out with the objective(s) of determining:

- (d) Whether there are any adverse effects on fish (particularly snapper and elasmobranchs) and/or cetacean movement in and out of the harbour as a result of turbine operation; and
- (e) Whether or not these effects are consistent with environmental performance criteria identified in the Environmental Monitoring Plan (EMP) referred to in Condition 63.

Fish Spawning

- 54 The Consent Holder shall engage an appropriately qualified and experienced marine scientist (fish), acceptable to the Northland Regional Council to carry out investigations in the Kaipara Harbour to determine if the generation array is located in an area important for spawning and feeding of key fish species (particularly snapper).

Elasmobranch Behaviour

- 55 The Consent Holder shall measure electromagnetic field (EMF) production by the turbines and cables, both within the generation array and between the array and the landfall at Pouto, during turbine operation following installation of Stage 1A up to 3 turbines, and at each deployment stage thereafter.
- 56 The Consent Holder shall, if monitoring EMFs under Condition 55 indicates EMF levels above background, monitor elasmobranch behaviour in the region northwest of the main transmission cable, between the transmission cable and the northern shoreline, after each stage has been made operational to determine whether any channelling of elasmobranch movement occurs.
- 57 The monitoring required in Conditions 55 and 56 shall be carried out with the objective of determining whether any adverse effects on elasmobranchs are due to EMF and whether or not these meet environmental performance criteria identified in the EMP referred to in Condition 63.

Impingement (Collision)

- 58 The Consent Holder shall, carry out monitoring of impingement (collision) of fish (particularly snapper and elasmobranchs) and cetaceans for at least two years following the implementation of each Stage shown in Condition 5 of this Consent as follows:
- (a) Deploy video cameras, sound recording or other devices for detection of fish and cetaceans, to record impingement (collision) events, and the fate of affected animals, at randomly selected turbines;
 - (b) Other monitoring study to assist in determining whether or not impingement of marine species occurs.



The monitoring required by this condition shall be carried out with the objective(s) of determining:

- Whether any adverse effects on fish (particularly snapper and elasmobranchs) and/or cetaceans are attributable to impingement on the turbine array; and
- Whether or not these effects are consistent with environmental performance criteria identified in the EMP referred to in Condition 63.

Tidal Flows, Morphology and Sediment Characteristics

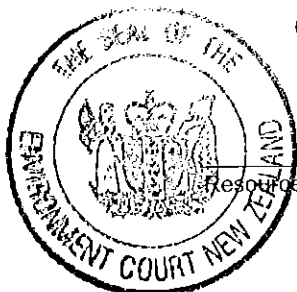
59 The Consent Holder shall monitor tidal flows, seabed bathymetry and sediment characteristics and movement in and near the generation array during turbine operation following installation of Stage 1a (up to 3 turbines), and at each deployment stage thereafter, with monitoring being undertaken on a biannual basis (6 monthly). The monitoring shall be carried out with the objectives of determining:

- (a) Whether there have been significant differences between the actual currents and those predicted by the modelling at the time consent was sought, and
- (b) Whether there have been significant changes in bathymetry since the installation of turbines, and
- (c) Whether there have been changes in sediment characteristics;
- (d) And, if there have been changes, whether or not the effects of such differences or changes meet environmental performance criteria identified in the EMP referred to in Condition 63.

Advice Note: If more than minor changes in coastal processes or morphology are detected following Stage 1a or successive stages, this will signal the need for improved numerical modelling of coastal processes and sediment transport to be considered prior to the next deployment stage.

60 Notwithstanding the general provisions in Condition 59 above, the Consent Holder shall, as part of the Baseline Monitoring required under Condition 64:

- (a) Prepare a numerical model to quantify the change in sand transport through the harbour entrance as a result of the turbine arrays, and assess the effects of the staged deployment of the turbines on tidal flows and sand transport in the broader harbour environment, including the consented sand extraction areas; and
- (b) Undertake a quarterly topographic survey from North Head to Pouto Point using GPS or photogrammetry for one year;
- (c) Undertake a quarterly bathymetric survey from North Head to Pouto Point, carried out at high tide to the 10 metre depth contour, for one year;
- (d) Analyse the profile data to establish whether geomorphic changes are consistent between new and existing profile locations;



- (e) Analyse the existing 20 years of datasets of coastal profiles for the Kaipara Harbour to determine the magnitude of shoreline variability (in terms of horizontal position and sediment volumes) within years and between years; and establish the magnitude of decadal-scale variability in shoreline position over the entire survey record;
- (f) Undertake a historic analysis of shoreline change to better resolve multi-decadal to century scale changes in the coastline.

Following the baseline monitoring in (b) to (f) above the long term (ongoing) monitoring of the shoreline shall be undertaken between North Head and Pouto Point in accordance with the requirements of the monitoring programme included in the EMP.

Cable Burial

61 The Consent Holder shall, as part of the Environmental Monitoring Plan referred to in Condition 63 below at no more than two year intervals, monitor the depth below seabed of the transmission cables to Pouto Point, and the cable crossing from Tikinui to Raupo, and shall, within one month of each survey, provide the results to the Northland Regional Council. Except where cables are temporarily exposed for repair purposes or where the transmission cables are covered by a protective matting, if the cables are exposed at the seabed at any point, then remedial work shall be undertaken to:

- (a) Return the burial depth to no less than one metre; or
- (b) Install protective matting over the cable.

62 If, after any five year period of records, there has been no incident of monitored cable exposure, then the required survey interval shall extend to five years. Should any subsequent survey show cable exposure at the seabed at any point on the cable, other than where cables are temporarily exposed for repair purposes, or where cables are covered by protective matting, then the survey interval shall return to two yearly.

ENVIRONMENTAL MONITORING PLAN (EMP)

63 The Consent Holder shall implement the Environmental Monitoring Plan (EMP) (attached as Schedule 1) as the primary means of complying with Conditions 49-62 of this consent.

64 The EMP, and any variation of the EMP prepared pursuant to Conditions 68 to 70 of this consent, shall incorporate the following components:

- (a) Baseline Monitoring, including a pilot survey to define sampling parameters and techniques;
- (b) Ongoing Operational monitoring;
- (c) Environmental performance criteria to assist the Consent Authority in its evaluation of environmental effects associated with the project. Criteria will vary according to each matter being addressed.
- (d) Reporting requirements;
- (e) Variation procedures;
- (f) Methodology of gathering data;



- (g) Provision to the public of data, reliability, accuracy and veracity of information drawn from data;
 - (h) Public access to data for independent analysis and reporting;
 - (i) Sharing information with and accommodation of other harbour interests, including sand extraction, commercial and recreational fishing and inhabitants such as Te Uri o Hau
- 65 All survey and monitoring programmes associated with the EMP shall be carried out by suitably qualified personnel with appropriate (recognised) experience in the matters being surveyed or monitored.
- 66 All costs of surveys and monitoring associated with the EMP, including the design, provision of equipment, payment of researchers, and payments associated with obtaining peer reviews, shall be met by the Consent Holder.
- 67 Reports on the findings of the EMP shall be made available to the Northland Regional Council and to other parties in accordance with reporting protocols specified in the EMP, to enable public access to the data and to information on the protocols for collection, classification and analysis of data.

Annual Review of EMP

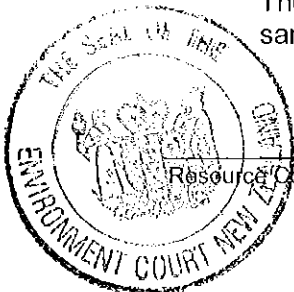
- 68 The EMP shall be reviewed annually by the Consent Holder for the purpose of determining whether the monitoring is adequate to address the matters set out in conditions to this consent, having regard to any change in circumstances, or where additional monitoring is necessary as a consequence of outcomes which have emerged from ongoing monitoring or where new scientific information has become available.
- 69 Any review of the EMP pursuant to this Condition, shall be prepared in consultation with Te Uri o Hau, the Department of Conservation and the Working Party of the Kaipara Harbour Monitoring Programme (the Working Party) and shall include a description of the consultation undertaken with Te Uri o Hau, the Department of Conservation and the Working Party, including the identification and discussion of areas of agreement and disagreement.
- 70 The EMP shall only be amended upon certification of the Northland Regional Council's Chief Executive Officer or his/her delegate that the amended EMP is likely to continue to address the matters set out in the conditions of this consent to at least the same extent as in the previous EMP.

Advice Note: The Northland Regional Council, in determining whether monitoring is adequate and whether the EMP should be amended, has the discretion to request further information including an independent peer review report.

Baseline Monitoring prior to the implementation of Stage 1a

- 71 The Consent Holder shall undertake a Baseline Monitoring Programme prior to the implementation of Stage 1a.

The Baseline Monitoring Programme shall include a pilot survey to define sampling parameters and techniques.



- 72 The Baseline Monitoring for all matters set out in the EMP shall be undertaken over a minimum of a 2 year period --prior to, and 1 year following, the installation of the first turbine for Stage 1A of turbine deployment.

Ongoing Monitoring

- 73 During (as far as relevant) and following commencement of implementation of Stages 1a to 4 of turbine deployment the Consent Holder shall carry out the Operational Monitoring Programme set out in the EMP.

Reporting requirements

- 74 Notwithstanding any relevant reporting requirement stipulated in the EMP, within three months of the completion of the Baseline Monitoring Programme the Consent Holder shall provide a report to the Northland Regional Council which sets out details of the monitoring results and an assessment of the likely potential effects of activities authorised under this consent, and any changes proposed by the Consent Holder to avoid, remedy or mitigate such effects. This report shall be accompanied by a peer review report prepared by an appropriately qualified and experienced marine scientist(s), who is acceptable to the Northland Regional Council.
- 75 Reports on the findings of the environmental monitoring shall be submitted to the Northland Regional Council by the Consent Holder in accordance with the reporting protocol set out in the EMP, and in any case as follows:
- (a) Progress Reports at yearly intervals, and
 - (b) Report, no later than six months prior to the commencement of installation of the first and any subsequent stage.

Advice Note: The results of the EMP will be used by the Northland Regional Council in undertaking reviews under Section 128 of the Resource Management Act to assess whether activities authorised under this consent are having any unforeseen and more than minor adverse effects on the environment (see Conditions 7, 8, 9 and 80), to review the scale, location, orientation and layout of any existing and further development and to satisfy the Northland Regional Council that development from one stage to the next will not give rise to more than minor adverse effects on cetaceans, teleost fish (particularly snapper) or elasmobranchs.

COMMUNITY INVOLVEMENT

Kaipara Harbour Environmental Trust

- 76 The Consent Holder shall establish a Kaipara Harbour Environmental Trust with the objective of providing environmental benefit to the Kaipara Harbour Community. It will achieve this objective by, among other things, financially supporting projects and initiatives to:
- (a) Improve the environmental health and enhance the mauri and vitality of the Kaipara Harbour; and
 - (b) Provide associated socio-economic opportunities.



Advice Notes: (1) Projects involving appropriate scientific study could be candidates for such financial support.

- 77 The Consent Holder shall fund the Kaipara Harbour Environmental Trust in the amount of at least \$100,000 per annum from 12 months after the date of installation of the first turbine for Stage 1a up to the date of installation of the first turbine unit for Stage 2, and thereafter \$250,000 per annum for the balance of the term of this consent; subject to funding being discontinued if it is decided to decommission the project. The annual amount shall be adjusted for inflation each year according to the movement of the Consumer Price Index from the date of installation of the first turbine for Stage 1a.
- 78 The Kaipara Harbour Environmental Trust shall operate generally in accordance with the following procedures:
- (a) The Consent Holder shall establish and convene the first meeting of the Kaipara Harbour Environmental Trust within six months of the date of installation of the first turbine for Stage 1a. Further meetings shall be convened as determined by the Kaipara Harbour Environmental Trust.
 - (b) The Kaipara Harbour Environmental Trust shall initially comprise eight members as follows:
 - Three representatives nominated by Te Uri o Hau;
 - A local community representative from the Pouto area;
 - A representative of the Kaipara recreational fishing community;
 - A representative of the Consent Holder;
 - A representative of the commercial fishing/charter boat operator community; and
 - A representative of the regional business development community.
 - (c) It shall be the responsibility of the Consent Holder to convene the meetings and to provide administrative support to arrange the running of the meetings.
 - (d) The Kaipara Harbour Environmental Trust may review and if desired, change the composition and procedures of the Trust, only by unanimous agreement.
 - (e) The Consent Holder shall provide an annual report to the Northland Regional Council and Kaipara District Council by 30 June each year on the outcomes of the Kaipara Harbour Environmental Trust activities over the preceding year. The report shall include, but not necessarily be limited to:
 - Statements on achievements resulting from the application of the funds by Kaipara Harbour Environmental Trust in the past year and comparison of these with those planned; and
 - The actual total expenditure by the Kaipara Harbour Environmental Trust in the past year and comparison with that planned; and



- The planned programme for the next year in respect of the Kaipara Harbour Environmental Trust and the budgeted funds to achieve this.

- Advice Notes:*
- 1 *The Kaipara Harbour Environmental Trust is intended to be an ongoing point of contact between the Consent Holder and the interest groups represented by the membership, to ensure that development (both now and in the longer term) is carried out in an appropriate way and that channels of communication are kept open.*
 - 2 *The initial Kaipara Harbour Environmental Trust could consist of tangata whenua representatives nominated by Te Uri o Hau, an appointee of the people of the Pouto area (e.g. through a community group, if any), an appointee from one of the various Kaipara Harbour recreational fishing groups, an appointee of the commercial fishing/charter boat operator community and an appointee of the regional business development community. Membership is suggested here to assist in enabling the initial meeting to get under way promptly. Following this, the Kaipara Harbour Environmental Trust can, by unanimous agreement set its own protocols for the future makeup of the Trust.*

BOND

- 79 The Consent Holder shall enter into a Bond with the Northland Regional Council to cover the potential costs to the Northland Regional Council of decommissioning the units (refer conditions 47 and 48). The Consent Holder shall comply with the mechanisms for establishment and management of the Bond as set out in Schedules 2 and 2A of this Consent.

REVIEW

- 80 The Northland Regional Council shall undertake reviews in accordance with Section 128 of the Resource Management Act, to determine whether the Consent Holder may proceed from any one Stage of the Project to any subsequent Stage, or otherwise, as set out in Conditions 7, 8 and 9 of this consent, based on the findings of monitoring required under conditions of this consent, and any other relevant information relating to environmental effects.

Each review will determine whether:

- (i) The level of adverse effect is considered to be no more than minor and development of the next stage may proceed; or
- (ii) The level of effect is considered to be more than minor and design modification or downscaling of any existing array is required to reduce adverse effects to no more than minor; or
- (iii) The level of understanding of turbine effects is considered insufficient, and further development is to be put on hold until additional assessment or investigations provide information suitable to support either decisions (i) or (ii) above.

Advice Note: Refer also to Advice Note to Condition 75



81 In addition to the mandatory reviews referred to in Condition 80, the Northland Regional Council may, in accordance with Section 128 of the Resource Management Act, serve notice on the Consent Holder of its intention to review the conditions of this consent. Such notice may be served at the following times:

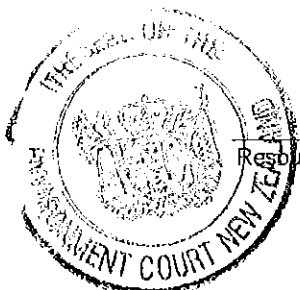
- (a) Annually within one month commencing after each anniversary of the date of commencement of consent; or
- (b) Within one month commencing after the receipt of any report required from the Consent Holder by the conditions of this consent; or
- (c) At any time after the date reasonably required by the Northland Regional Council for supplying by the Consent Holder to the Northland Regional Council any report or validation of any report

The review may be initiated for any one or more of the following purposes:

- (d) To deal with any adverse effects on the environment that may arise from the exercise of the consent and which it is appropriate to deal with at a later stage, or to deal with any such effects following assessment of the results of the monitoring of the consent and/or as a result of the Northland Regional Council's monitoring of the state of the environment in the area.
- (e) To require the adoption of the best practicable option to remove or reduce any adverse effect on the environment.
- (f) To deal with any material inaccuracies, omissions or lack of scientific knowledge that may in future be found in the information made available with the application. (Notice may be served at any time for this reason.)
- (g) To alter the scale, location, orientation and layout of the established turbines.
- (h) To review the adequacy of and the necessity for monitoring undertaken by the Consent Holder.
- (i) To determine whether the consent will be considered under Condition 4 if the consent has not been exercised within the required time, or other time agreed by the Northland Regional Council.
- (j) To determine the value of the Bond for each Stage successive to Stage1a.

The Consent Holder shall meet all reasonable costs of any reviews undertaken under Conditions 80 and 81 of this Consent.

EXPIRY DATE: 30 AUGUST 2043 (35 years after date of grant of consents)



Crest December 2010 Consent - Proposed Wording of Resource Consent - CON20061607603 - 13
Base document - "October 2010 Version"
"Red-line" changes proposed by Crest in response to matters raised in relation to mediation

Insert:

- NRC Plan 4205 D2
- NRC Plan No. 4205 E, and
- NRC Plan No 4206
- Environmental Management Plan

SCHEDULE 1

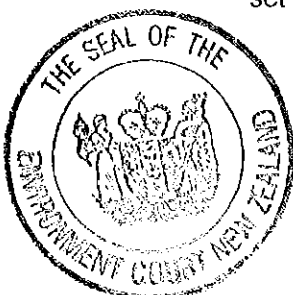
ENVIRONMENTAL MONITORING PLAN



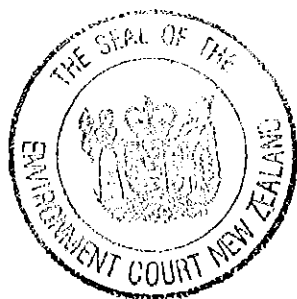
SCHEDULE 2

Mechanism for Establishment and Management of Bond required under Condition 79 of Resource Consent - CON20061607603-13

- 2.1 Prior to the first exercise of the consent, the Consent Holder shall cause a financial institution of good repute to enter into a bond or similar commercial arrangement (Bond) for Stage 1a (initial 3 turbine units), securing the performance of the Consent Holder under conditions 47 and 48 of the consent.
- 2.2 The Bond for Stage 1a (initial 3 turbine units) shall be ~~\$(2007)~~ 3,100,000.
- 2.3 The amount of the Bond shall be increased prior to the consent holder proceeding to any stage subsequent to Stage 1a. The amount of the Bond for Stage 1a, and the sum by which the Bond shall be increased for each subsequent Stage shall be determined by the Northland Regional Council on the basis of accurate cost estimates for decommissioning. To this end, the Consent Holder shall provide the Northland Regional Council with an estimate of predicted turbine and transmission decommissioning (removal) costs to the Northland Regional Council if the Northland Regional Council were to decommission and remove the facilities. Each estimate shall have been peer reviewed by an appropriately qualified and experienced marine quantity surveyor, marine engineer or marine architect acceptable to the Northland Regional Council.
- 2.4 If at any time the Consent Holder decommissions part but not all of the facilities constructed pursuant to the consent, then the amount of the Bond will be adjusted downwards, by applying the same procedure as described at clause 2.3.
- 2.5 The Consent Holder shall not proceed to any stage subsequent to Stage 1A, even if all other requirements for proceeding have been met in accordance with this Consent, until the Northland Regional Council has approved in writing, the Bond for the existing installation and the proposed installation stage.
- 2.6 The value of the bond shall be adjusted for inflation at five yearly intervals and the Consent Holder shall provide any additional bond amount required as a result of this.
- 2.7 Should the numbers of turbines installed at any Stage vary from that indicated, then, notwithstanding any variation to consent that may be necessary, the level of bond required shall be proportioned accordingly.
- 2.8 The form of the bond shall be a cash amount or a bank or other security acceptable to the Northland Regional Council. The total bond may comprise combinations of the above alternatives. The Consent Holder shall advise the Northland Regional Council in writing of its chosen form of the initial bond within three months prior to the installation of the first turbine for Stage 1a..
- 2.9 If a bond is provided by a bank or other security, then it shall be in a form reasonably acceptable to the Northland Regional Council's solicitor,. All costs associated with the preparation and registration of the bond shall be met by the Consent Holder. The bond shall be in accordance with the principles and terms set out in Schedule 2A (attached).



- 2.10 If the coastal permit is transferred in part or in whole to another party or person, the transferor Consent Holder shall not be entitled to the release, if sought, of any part of its bond until the transferee Consent Holder has a replacement bond of the same value, or proportional value in the case of partial transfer, and which is fully compliant with this consent, in place with the Northland Regional Council.
- 2.11 The bond will be released to the Consent Holder upon the expiry of this consent, provided that, prior to the expiry date of this consent, the Consent Holder has removed the generating and other plant, structures, cables, navigation and cable marks and other materials and refuse associated with this consent from the coastal marine area and has restored the consent area to the satisfaction of the Northland Regional Council, in compliance with the conditions of this consent.



SCHEDULE 2A

I BOND AGREEMENT PRINCIPLES

Purpose of Bond

The purpose of this bond is to provide the Northland Regional Council with the funds to decommission the facilities if the Consent Holder fails to do so.

II TERMS OF BANK BOND OR OTHER SECURITY

The terms of the bond or security shall include a provision that the bond or security is available to the Northland Regional Council on demand, accompanied by documentary proof that; (a) the Northland Regional Council has given the Consent Holder written notice requiring it to comply with condition 79; and (b) the Consent Holder has failed within a reasonable time to commence or complete such compliance.

The bond or security shall have a period sufficient to ensure that the funds are available for the purpose described above, until removal of the facilities is complete, at which time any funds remaining shall be reimbursed to the Consent Holder.

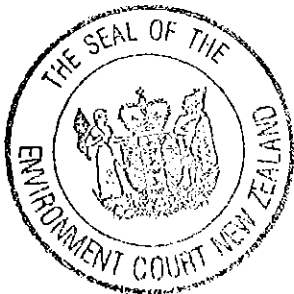
Upon decommissioning of all the facilities by the Consent Holder in accordance with condition 79 the Northland Regional Council shall execute in favour of the Consent Holder a full release of the Bond and / or effect a refund in full in favour of the Consent Holder of the balance of all moneys then held.

III PAYMENT OF NET INTEREST TO CONSENT HOLDER AND DEFAULT

Interest on the Consent Holder's accrued bond will be paid to the Consent Holder annually by 30 August for the previous year (July to June).

The interest paid will be interest earned at the average 90 day cash deposit rate over the financial year.

If the Consent Holder defaults on any payment of any increase in bond required as a result of project staging or inflation, then payments of interest, up to the value of any outstanding bond amount, will immediately cease until the default payment is rectified by the Consent Holder.



Notes for Version KA221210 of this EMP.

This version incorporates revisions arising from feedback on the October 2010 Version at the Environment Court mediation session of 7th December 2010 and in the Court Minute dated 14 December 2010.

Revisions are inserted as "red-line" changes against Version KA221010 Dated October 2010.

CREST ENERGY LIMITED

Kaipara Harbour Marine Turbine Power Generation Project



~~Draft~~ Environmental Monitoring Plan

*as Approved by Environment Court
in its Final Decision February 2011.*

Document Reference: KA1221010KA1221210

October-December 2010

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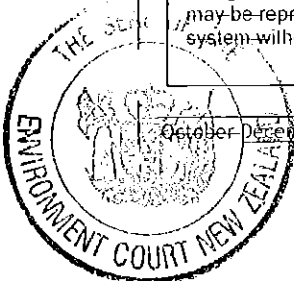
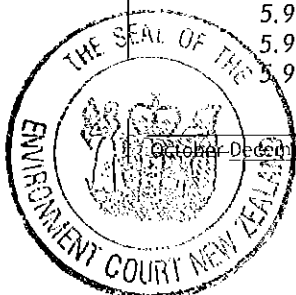
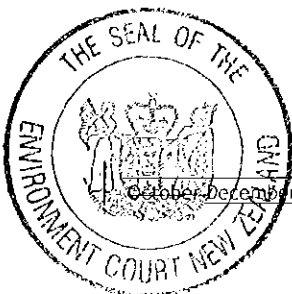


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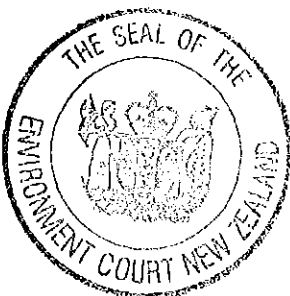


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1. Introduction

1.1 Purpose of Environmental Monitoring Plan (EMP)

CREST Energy Limited (CREST) proposes to establish a marine turbine generation project (the CREST Project) in the Kaipara Harbour in northern New Zealand.

This Environmental Monitoring Plan (EMP) sets out the environmental monitoring programme associated with the CREST Project, within the context of an Adaptive Management framework (see Section 2 below).

1.2 Background

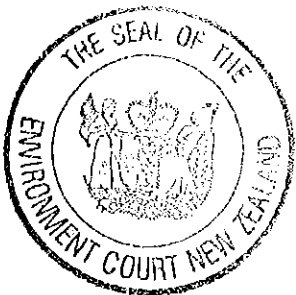
In July 2006 and July 2007, CREST applied for a suite of resource consents associated with the CREST Project^{1,2}, which comprises up to 200 completely submerged marine tidal turbines located near the entrance to the Kaipara Harbour, a sub-sea cable extending from the generator array to Pouto Point, and a cable conduit beneath the bed of the Wairoa River at Tikinui (Figure 1 & Figure 2). The turbine units are proposed to be deployed in stages as follows:

- Stage 1a Up to 3 units
- Stage 1 Up to 20 units (total);
- Stage 2 Up to 40 units (total);
- Stage 3 Up to 80 units (total); and
- Stage 4 Up to 200 units (total).

CREST proposes that the environmental effects of each stage will be monitored to ensure that effects are consistent with those predicted in resource consent application material and that the scale of effects does not exceed the threshold of acceptability established for each aspect being monitored. It is proposed that this monitoring information be subject to a series of reviews under s128 of the RMA prior to moving from one stage to the next.

Baseline data will be collected prior to the Stage 1a deployment (up to 3 turbines). Once Stage 1a has been deployed, environmental effects of operation will be monitored prior to a s128 Review. If results of Stage 1a monitoring are acceptable to the consent authority, CREST would be authorised to complete Stage 1 (up to 20 turbines). A similar process will follow for transition from Stage 1 to Stage 2; from Stage 2 to Stage 3; and from Stage 3 to Stage 4.

Monitoring of a wide range of environmental indicators before, during and after installation of the various stages will allow verification of the level of actual environmental effects attributable to the CREST project and will provide a basis for developing measures to avoid, remedy or mitigate any adverse effects, as appropriate.



¹CREST Energy Ltd 2005. Kaipara Harbour marine turbine power generation project. Resource consent applications and assessment of effects on the environment. July 2006.

²CREST Energy Ltd 2005. Kaipara Harbour marine turbine power generation project. Resource consent applications and assessment of effects on the environment - Transmission Cable. July 2007.

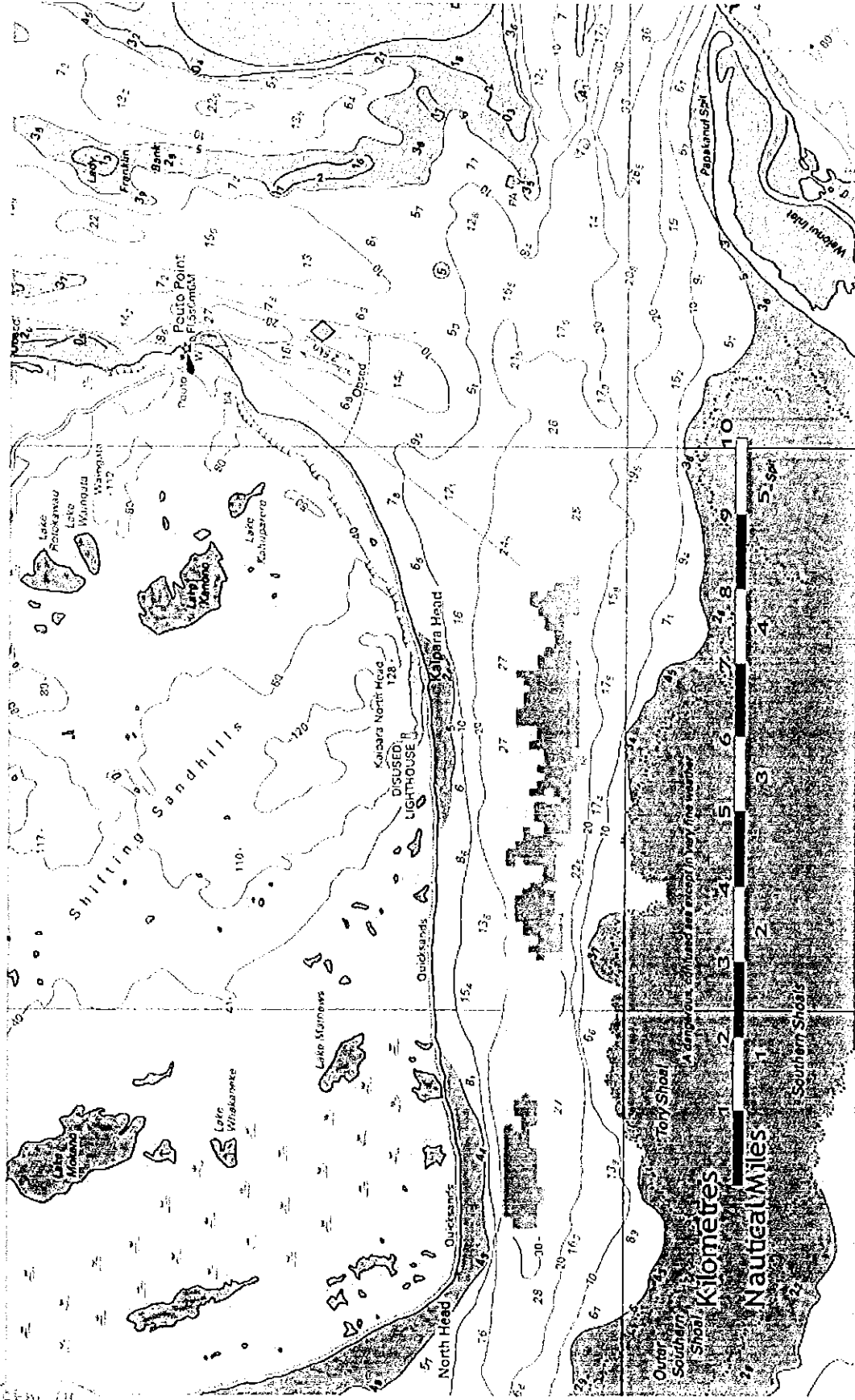
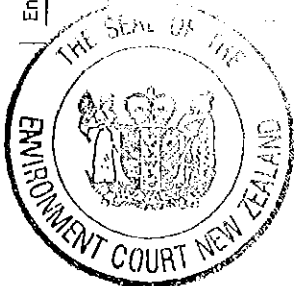


Figure 1: Location of the proposed Generator Array (blue box) and cable pathway from the Generator Array to Pouto Point (red line).

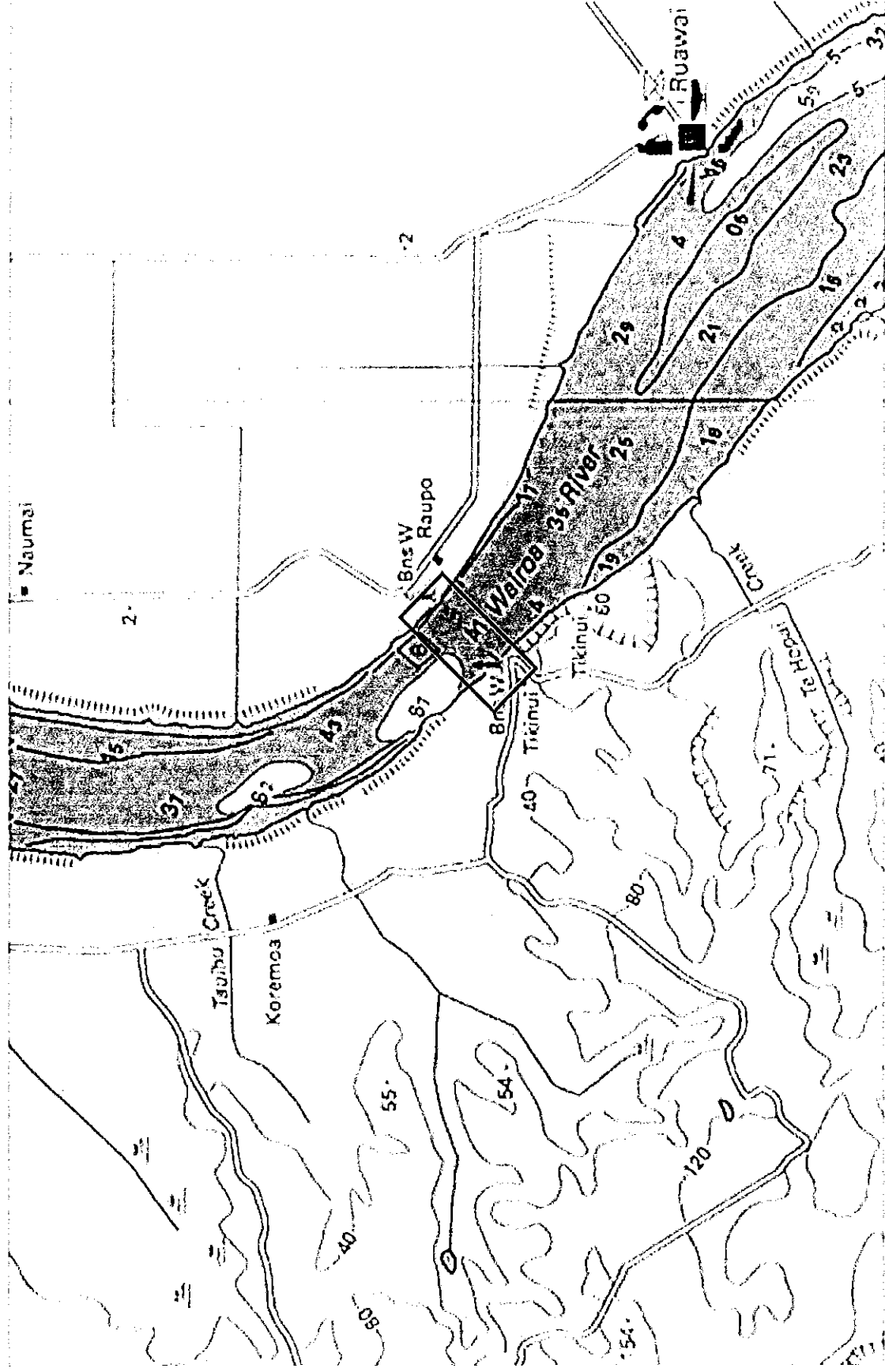
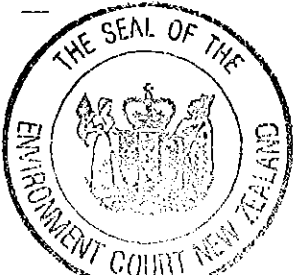


Figure 2: Location of the proposed cable crossing (black box) across the Wairoa River at Tikuini

1.3 Relationship between EMP and Project Operational Elements

Project Engineering and Project Operation will be managed to comply with an Operation and Maintenance Plan (OMP) as required under Condition 32 of Consent CON20061607603-13. Particular operational elements to be covered in the OMP include:

- turbine location;
- management of turbine stability;
- control and removal of floating debris;
- management of boat traffic within the proposed deployment location;
- development of protocols for addressing maritime archaeological artefacts;
- navigational matters;
- integrity of shoreline cable crossing;
- substation noise; and
- signage (to promote awareness of the presence of the generator array and subsea cables).

A Biosecurity Management Plan (BMP) will be developed in consultation with the Northland Regional Council (NRC).

In practice the EMP and BMP will be managed as components of the OMP, to ensure integration between the plans.

1.4 Stakeholders

This EMP has been developed in consultation with, and will be used by a range of stakeholders as set out in Table 1 ~~Table 4~~.

Table 1: Stakeholders associated with this EMP

Stakeholder	Relationship with EMP
CREST Energy Limited	Project Developer: EMP sets out agreed procedures and protocols for monitoring, environmental performance criteria and agreed response pathways.
Northland Regional Council	Consent Authority: The EMP and resource consent conditions define compliance requirements expected of CREST. NRC role is to enforce compliance and manage s128 RMA review process.
Te Uri o Hau	<p>Tangata Whenua:</p> <p>(i) [Consent CON20061607603-13 Condition 63 ^{Note 1}] Nominated as party to be consulted with in OMP development (Consent CON20061607603-13 Condition 32);</p> <p>(ii) Nominated as party to be consulted with in BMP development (Consent CON20061607603-13 Condition 40);</p> <p>(iii) Party for consultation in event of discovery of archaeological sites or koiwi (Consent CON20061607603-13 Condition 28);</p> <p>(iv) Nominated party for "sharing and accommodation of interests" with the Project (Consent CON20061607603-13 Conditions 64(i))</p> <p>(v) Party to be consulted with by NRC as part of s128 process (Consent CON20061607603-13 Condition 7; Consent CON20061607601-13 Condition 6)</p> <p>(vi) Party to be involved in annual review of EMP (Consent CON20061607603-13 Condition 69)</p> <p>(vi)(vii) Party to be consulted with in finalisation of methodology in</p>



	relation to various aspects of monitoring under the EMP
Department of Conservation	<p>Government Agency - Coastal and Marine Mammals</p> <p>(i) [Consent CON20061607603-13 Condition 63 ^{Note 1}] Nominated as party to be consulted with in OMP development (Consent CON20061607603-13 Condition 32);</p> <p>(ii) Nominated as party to be consulted with in BMP development (Consent CON20061607603-13 Condition 37);</p> <p>(viii) Party to be involved in annual review of EMP (Consent CON20061607603-13 Condition 69))</p> <p>(vii)(ix) Party to be consulted with by NRC as part of s128 process (Consent CON20061607603-13 Condition 7; Consent CON20061607601-13 Condition 6)</p> <p>(viii)(x) Party to be consulted with in finalisation of methodology in relation to various aspects of monitoring under the EMP</p>
Working Party of the Kaipara Harbour Monitoring Programme	<p>(i) [Consent CON20061607603-13 Condition 63 ^{Note 1 & 2}]</p> <p>(xi) Party to be involved in annual review of EMP (Consent CON20061607603-13 Condition 69))</p> <p>(ix)(xii) Party to be consulted with in finalisation of methodology in relation to various aspects of monitoring under the EMP</p>
Other parties to Environment Court Appeal	To be consulted with in respect of finalising EMP development
General Public	<p>(i) EMP to include provision for providing public access to "data, reliability, accuracy and veracity of information drawn from data" (Consent CON20061607603-13 Conditions 45h)</p> <p>(ii) EMP to include provision for public access to data for independent analysis and reporting (Consent CON20061607603-13 Conditions 45i);</p> <p>(iii) Prospective involvement in s128 Review Process</p>

Note 1: An original consent condition required these parties to be involved in development of the EMP - this was superseded by Para 222 of the Interim Decision - all parties have been involved in finalising the EMP through their involvement in the Appeal.

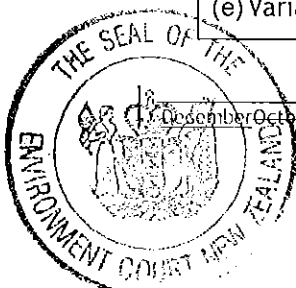
Note 2: The full Working Party has not been involved in the development of the present version of the EMP, but the process has involved several of its members as parties to the appeals. However, the Working Party will be involved in the development of any subsequent revisions of the EMP as required under the conditions of consent.

1.5 Contents of this EMP

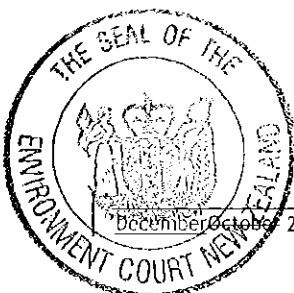
Condition 64 of Resource Consent CON20061607603 - 13 states that this EMP, and any variation shall incorporate the components set out in Table 2 ~~Table 2~~. Each component is cross-referenced against the relevant section in this EMP:

Table 2: Content of this EMP

(a) Baseline monitoring, including a pilot survey to define sampling parameters and techniques	Section 5
(b) Ongoing monitoring	Section 6
(c) Environmental performance criteria to assist the Consent Authority in its evaluation of environmental effects associated with the project.	Section 7
(d) Reporting requirements	Section 9
(e) Variation procedures;	Section 10



(f) Methodology of gathering data, specifications and units;	Sections 5 and 6
(g) Provision to the public of data, reliability, accuracy and veracity of information drawn from data;	Section 9
(h) Public access to data for independent analysis and reporting;	Section 9
(i) Sharing information with and accommodation of other harbour interests, including sand extraction, commercial and recreational fishing and inhabitants such as Te Uri o Hau	Section 9



December October 2010

2. Adaptive Management Context

2.1 Introduction

CREST's consent application material proposed that the environmental management and overall development of the Kaipara Harbour Marine Turbine Project should be based around the concept of Adaptive Management (AM).

AM involves monitoring the environmental effects of an activity, and adapting that activity, through process changes, design modification or operational changes, to address any environmental effects observed.³

In the field of marine energy generation there is increasing recognition of the relevance of incorporating principles of AM in project development. In this context:

"...adaptive management is an important tool, because it allows development to move forward responsibly, even where uncertainty about impacts exists".

*In the absence of adaptive management, marine energy developers might be forced to study project effects for three or five years, merely to try to prove a negative, i.e., that impacts will not result."*⁴

As noted in the Interim CREST Decision⁵, the concept of adaptive management has been accepted in the NZ RMA context and has developed through a number of decisions of the Environment Court.

The following Section of this EMP sets out various definitions of AM as a basis for developing a robust management regime for the CREST Project.

2.2 Definition of Adaptive Management

Adaptive Management has been widely adopted world-wide for projects where full environmental information is not necessarily available, but where it is considered appropriate to proceed with development on a staged basis.

A frequently cited definition of AM in New Zealand is that contained in the NZ Biodiversity strategy⁶:

"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 impacts 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 when large complex ecological systems are being managed and management decisions cannot wait for final research results."

However, as indicated in the CREST Interim decision [at paragraph 100], this definition "might be deficient in a failure to focus on the specific need for robust baseline monitoring".

In both North America and Europe, AM has been accepted as providing a basis for developing marine energy projects and it is helpful to consider recent applications of AM in coastal management to provide guidance as to how the concept might be applied to the CREST Project.



³ Adapted from definition adopted by the Ocean Renewable Energy Coalition, a US based association exclusively dedicated to promoting marine and hydrokinetic energy technologies - see <http://www.oceanrenewable.com/>

⁴ OREC submission to US Department of Interior mineral management service's draft programmatic environmental impact statement (eis) for alternate energy development and production and alternate use of facilities on the outer continental shelf <http://www.oceanrenewable.com/wp-content/uploads/2007/11/orecmmcomments520.pdf>

⁵ CREST Energy Kaipara Limited & ors v Northland RC (Interim Decision) A132/2009 at [223]

⁶ New Zealand Biodiversity Strategy, <http://www.biodiversity.govt.nz/picture/doing/nzbs/index.html>

In December 2006, the European Union released a Report on Integrated Coastal Zone Management (ICZM) in Europe⁷ which identified Adaptive Management as one of eight principles of Good Integrated Coastal Zone Management. In June 2007 the EU recommended that these principles be adopted by member states⁸.

In North America, a December 2009 report on the potential environmental effects of marine and hydrokinetic energy technologies was prepared by the US Department of Energy⁹, describing AM as

"...a system of management practices based on clearly identified outcomes and monitoring to determine whether management actions are meeting desired outcomes. If not, management changes are facilitated to ensure that outcomes are met or re-evaluated."

This AM approach is shown diagrammatically in Figure 3:

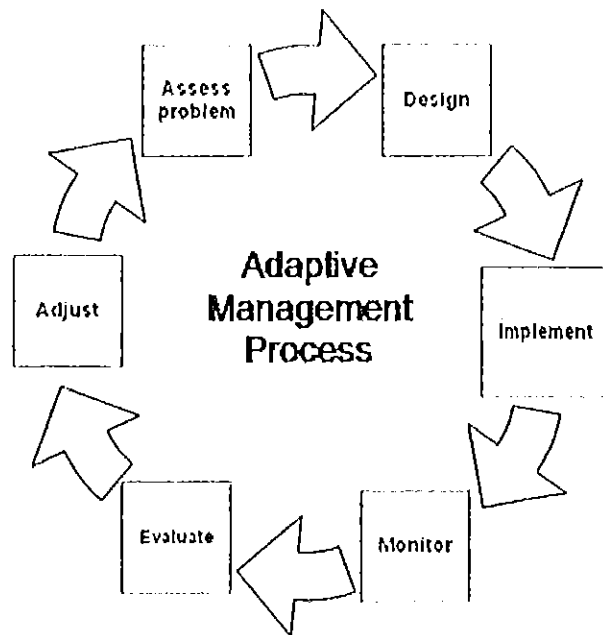
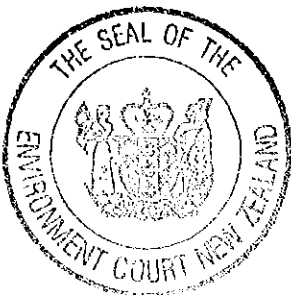


Figure 3: Diagram of Adaptive Management Process (from DOE, 2009)

DOE (2009) concludes that:

Adaptive management strategies included as part of a proposal can assist applicants of marine and hydrokinetic renewable energy projects develop an adequate operating conservation program and improve its effectiveness. An adaptive management strategy for such projects could:

- (1) identify the uncertainty and questions that need to be addressed to resolve the uncertainty;*
- (2) develop alternative strategies and determine which ones to implement;*
- (3) include a monitoring program that is able to detect the information necessary to evaluate the strategy; and*



⁷ http://ec.europa.eu/environment/iczm/pdf/evaluation_iczm_report.pdf

⁸ <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2007:0308:FIN;EN;PDF>

⁹ DOE (2009) "Report to Congress on the Potential Environmental Effects of Marine and Hydrokinetic Energy Technologies December 2009" Report by the US Department of Energy under the Wind and Hydropower Technologies Program, prepared in response to the Energy Independence and Security Act of 2007, section 633(b).

(4) incorporate feedback loops that link implementation and monitoring to a decision-making process (similar to a dispute resolution process) that results in appropriate changes in management.

The US Department of Interior (DOI) (Williams et al. 2007)¹⁰ recommends implementation of AM in a series of steps, divided into a set-up phase and an iterative phase as follows:

Set-up phase

(1) Stakeholder involvement - ensure that the stakeholders are committed to adaptively manage the enterprise for its duration;

(2) Management objectives - identify clear, measurable, and agreed-upon management objectives to guide decision making and evaluate effectiveness over time;

(3) Management alternatives - identify a set of potential management actions for decision making;

(4) Predictive models - identify models that characterize different ideas/hypotheses about how the system works;

(5) Monitoring plans - design and implement a monitoring plan to track resource status and other key resource attributes;

Iterative phase

(6) Decision making - select management actions based on management objectives, resource conditions, and understanding;

(7) Monitoring responses to management - use monitoring to track system responses to management actions;

(8) Assessment - improve understanding of resource dynamics by comparing predicted and observed changes in resource status;

(9) Adjustment to management actions - go back to step 6 as necessary.

2.3 Adaptive Management - CREST Interim Decision

As noted in Section 2.2 above, the CREST Interim Decision indicated that the definition of AM in the NZ Biodiversity Strategy "might be deficient in a failure to focus on the need on such occasions for robust baseline monitoring". That Interim Decision indicated a preference for the following AM definition taken from an agreed statement of planning witnesses involved with Environment Court appeals associated with the Project

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.

The CREST Interim Decision, also indicated a preference for the explicit setting of objectives in an EMP, as in the Lower Waitaki Decision¹¹.



¹⁰ Williams, B.K., R.C. Szaro, and C.D. Shapiro. 2007. Adaptive Management: The U.S. Department of the Interior Technical Guide. Adaptive Management Working Group, U.S. Department of the Interior, Washington, DC.

¹¹ C80/2009 "Lower Waitaki River Management Society Inc. vs CRC, Environment Court, September 2009"

In the CREST Interim Decision, the Court [paragraph 226] emphasised the following points as important in the AM approach for the CREST Project:

- the collecting of baseline knowledge upon which management plans can build in an on-going and cycling process.
- Setting objectives, design and planning for management of the resource,
- 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.

These points were based on matters set out in the Lower Waitaki Decision [paragraph 381] which described elements of AM as comprising an ongoing and cyclic process, with feedback loops so that management can improve over time.

The Lower Waitaki Decision identified the key stages in the cycle as:

Setting Objectives	The issue is identified and defined, and the resource information is reviewed. Hypotheses can then be developed about how the resource will respond to management. Once the objectives are set specific indicators of management success (or failure) can be identified.
Design and planning	The preparation of management plans and programmes for managing the resource.
Managing the resource	Implementing management actions and methods
Monitoring	Monitoring the effects of management on indicators
Evaluation	Analysis of monitoring results in relation to objectives and the management programme i.e. are the objectives being achieved.
Review and response	Reviewing and refining the hypothesis, management plan and programme to better meet the objectives. There may also need to be adjustment of policies, programmes, and budgets ... After this stage the process starts again with design and planning.

These elements closely reflect the approach set out in the USDOE 2009 Report (see Figure 3 above), and provide a useful Adaptive Management framework for use in the CREST Project.



2.4 Adaptive Management Framework for the CREST Project

The above elements have been used to provide the basis for the CREST Project AM framework as shown in Table 3.

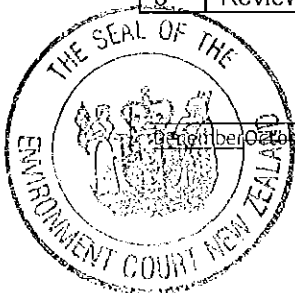
Table 3: Adaptive Management Framework

	Adaptive Management Element	Source Reference
1	Stakeholder involvement – ensure that the stakeholders are committed to adaptively manage the enterprise for its duration;	Williams et al 2007
2	Project definition including clear identification of stages of development, and likely scope of associated environmental issues.	CREST Planning Caucus Lower Waitaki Decision Williams et al 2007
3	Definition of Management Objectives - identify clear, measurable, and agreed-upon management objectives to guide decision making and evaluate effectiveness over time; incorporating requirements set out in enforceable resource consent conditions.	Williams et al 2007 Lower Waitaki Decision
4	Design and planning - preparation of management plans and programmes for monitoring and managing the resource.	Lower Waitaki Decision Williams et al 2007
5	Identify management actions required for decision making;	Williams et al 2007 Lower Waitaki Decision
6	Monitoring and Assessment - design and implement a monitoring plan - establish existing environment by robust baseline monitoring - monitoring the effects on indicators; develop clear and strong monitoring, reporting and checking mechanisms so that steps can be taken before significant adverse effects eventuate; – improve understanding of resource dynamics by comparing predicted and observed changes in resource status; use monitoring to track system responses to management actions;	Lower Waitaki Decision Williams et al 2007 CREST Planning Caucus
7	Evaluation and Decision making – analysis of monitoring results in relation to objectives and the management programme i.e. are the objectives being achieved - select management actions based on management objectives, resource conditions, and understanding;	Williams et al 2007 Lower Waitaki Decision
8	Review and response reviewing and refining the hypothesis, management plan and programme to better meet the objectives. There may also need to be adjustment of policies, programmes, and budgets ... After this stage the process starts again with design and planning; incorporating requirements set out in enforceable resource consent conditions which require certain criteria to be met before the next stage can proceed; there is real ability to remove all or some of the development that has occurred at that time if the monitoring results warrant it	Lower Waitaki Decision Williams et al 2007 CREST Planning Caucus

These AM elements are referred to in this CREST Kaipara Project EMP as shown in Table 4.

Table 4: Location of Adaptive Management elements in this EMP

	Adaptive Management Element	Reference in EMP
1	Stakeholder involvement	EMP Section 1.4
2	Project definition	EMP Section 1.2
3	Environmental Management Objectives	EMP Section 3
4	Design and planning	EMP Section 4
5	Management actions	EMP Section 5-8
6	Monitoring and Assessment	EMP Section 5-6
7	Evaluation and Decision making	EMP Section 7
8	Review and response	EMP Section 8

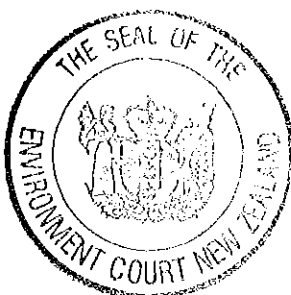


3. Environmental Management Objectives

Any sound management system will incorporate clear objectives against which effects and management progress can be measured. An AM-based monitoring programme is no exception. The following environmental management objectives in Table 5 have been identified for each environmental component being monitored:

Table 5: CREST Environmental Management Objectives

Environmental Component	Objective
Benthic Habitat	No change in benthic habitat attributable to the Project, at a distance greater than 30m from any turbine.
Benthic organisms	No change in distribution and abundance of benthic organisms attributable to the Project, at a distance greater than 30m from any turbine.
Sediment - Physical	No change of sediment physical characteristics attributable to CREST Project, at distances greater than 30m from any turbine.
Sediment Transport	No change of sediment transport in the Kaipara Harbour attributable to CREST Project, at distances greater than 30m from any turbine.
Water quality	Demonstrated compliance with Condition 23 of CON20061607601-02
Noise	Noise emission associated with turbines such that marine biota are not adversely affected at any distance greater than 100m from any individual turbine.
Marine Mammals	All cetaceans, and particularly Maui's dolphin - CREST Project not to adversely affect any individual. Maui's dolphin - CREST Project not to further endanger survival of the species.
Harbour hydrodynamics	No change of harbour hydrodynamics attributable to CREST Project, at distances greater than 30m from any turbine.
Fish movement	No measurable impedance to the movement of fish as a result of the presence of turbines.
Commercial fishing	No measurable change caused by the CREST Project to commercial fishing inside or adjacent to the Kaipara Harbour, including the West Coast Snapper fishery.
Recreational fishing	No adverse effect from the CREST Project on the ability to undertake recreational fishing in the Graveyard area.
Shoreline profiles	No change of shoreline profiles attributable to CREST Project.
Harbour bathymetry	No change of harbour bathymetry attributable to CREST Project, at distances greater than 30m from any turbine.
EMF	No EMF from turbines or cables such that marine biota adversely affected at distances over 1m from turbines or cables. EMF from any turbine or cabling to be materially indistinguishable from background levels within 1m from turbines or cables.



4. Scope of Environmental Monitoring Programme

4.1 Introduction

This Environmental Monitoring Plan (EMP) provides a framework for monitoring natural and physical resources in the Kaipara Harbour, as the basis for evaluating environmental effects associated with the CREST Project.

The EMP comprises the following elements:

- Pre-deployment (Baseline) environmental monitoring; and
- Post-deployment (Operational) environmental monitoring.

This section defines the overall scope of the EMP programme in terms of:

- i. Objectives.
- ii. Monitoring strategy.
- iii. The identification and assessment of change attributable to the installation and/or operation of the marine turbines.

4.2 Monitoring Plan Objectives

The two primary objectives of this EMP are:

- Objective 1 - To set out a framework of survey and analytical methods for the Baseline Environmental Monitoring Programme and the Operational Monitoring Programme.
- Objective 2 - To identify Evaluation Criteria for use by the consent authority when determining the acceptability of environmental effects associated with the Project

Objective 1 relates to the design and implementation of Baseline and Operational Environmental Monitoring as presented in Sections 5 and 6 respectively of this EMP. Baseline and operational environmental monitoring will be designed to detect changes in the character and nature of "near field" (within the application area) and "far field" (outside the application area) physical/habitat characteristics and biological communities.

Objective 2 stems from Consent CON20061607603-13 Condition 45(d) which states that the EMP shall include as a component:

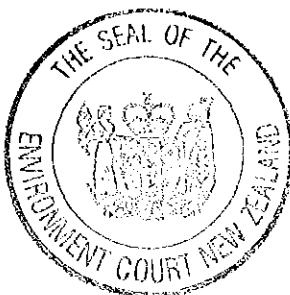
"Environmental Performance criteria to assist the consent authority in its determination of the acceptability of environmental effects associated with the project."

4.3 Monitoring Strategy

Study boundaries, and the various target resources and components of the Kaipara Harbour environment, have been selected on the basis of the anticipated range of effects associated with the CREST Project.

Environmental monitoring undertaken as part of this EMP will address the following environmental components potentially affected by the deployment and operation of the proposed turbines and cable:

- Benthic Habitat and Benthic organisms
- Harbour Sediment
- Water quality
- Noise
- Marine Mammals (movement) - effects on marine mammals using the harbour entrance, including species, numbers and timing;



- Marine Mammals (impingement) effects and risk of collision of marine mammals with Project components, particularly turbines
- Harbour hydrodynamics - currents
- Fish movement - the degree to which turbines and structures are an impediment to the movement of marine species;
- Fish movement - effects on migration of Snapper (*Pagrus auratus*).
- Fish Biology (spawning) - effects on important spawning areas within the harbour and array area;
- Fish Biology (elasmobranch behaviour, physiology and habitat) - effects of the main transmission cables on elasmobranch behaviour, physiology and habitat;
- Fish Behaviour (impingement) - effects and risk of collision of elasmobranchs and teleost fish with Project components, particularly turbines;
- Commercial fishing - effects on commercial fishing generally, and on the North Island West Coast Commercial Snapper Fishery in particular;
- Recreational fishing
- Coastal Processes and shoreline morphological changes
- Sedimentation within the generation array and along the transmission lines;
- Seabed sediment dynamics;
- Seabed bathymetry and bathymetric change (including historic bathymetric and shoreline change to provide an improved context against which to evaluate future changes);
- Electro magnetic Field (EMF) production by turbines and cables - effects on marine life in general and on elasmobranch movement in particular.

4.4 Identification and Assessment of Change Attributable to the Project

4.4.1 General

One of the important components of an AM regime is deciding what and how much change associated with an activity is acceptable.

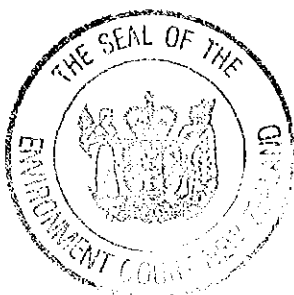
Four generic features should be incorporated into the design of any EMP to enable identification of change, as follows:

- i. The location of 'control' sites that will remain unaffected by the potential effects arising from the proposed development.
- ii. The location of 'impact sites' that will potentially be affected by the proposed development.
- iii. Matching the physical and biological characteristics of Control and Impact sites so that comparisons are valid (Note: if there are confounding factors between sites, these should be taken into account where ever possible).
- iv. Evaluation criteria whereby changes attributable to the subject development can be identified and assessed as to their acceptability

It is necessary to take into account the level of natural environmental variability when designing monitoring programmes.

4.4.2 CREST Project

Within the context of the AM framework adopted for the CREST Project, determination of whether an environmental effect is (a) attributable to the installation/operation of the turbines, and (b) acceptable or not, is properly



made by the consent authority in its role of undertaking s128 reviews (see section 1.2 above). This EMP is designed to provide sufficient information to enable the consent authority to fulfil this role.

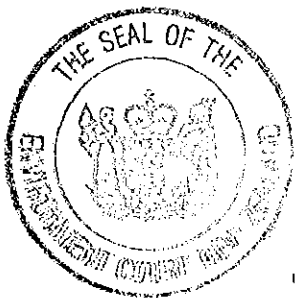
The guiding philosophy for sampling design in this EMP is the Before-After-Control-Impact (BACI) approach.

This is intended to detect changes between impact and control areas arising from the deployment and operation of the marine turbines. The BACI design assesses effects by comparing trends over time between the impacted and control areas, taking into account the level of underlying variation in the system so that changes from baseline conditions (i.e. attributable to the installation or operation of the turbines) can be detected¹². This is particularly important as the control area may not be a perfect match to the potentially impacted area.

As there may be a great deal of natural variability in this system, it is important to adequately measure the 'between sites' variability before deployment so that it can be appropriately incorporated into the methods used to detect pre- and post-deployment differences.

Therefore it is necessary to collect adequate levels of baseline or pre-deployment data. Baseline monitoring is required because the ability to detect changes in long term monitoring programmes is largely dependent on the quality and extent of the baseline data. This implies that programmes that gather baseline information need to be repeated several times within a year so that changes associated with seasonality can be understood and incorporated in any subsequent evaluation.

For each environmental component or issue under consideration in this EMP, specific management objectives are identified (Section 3), and a list of relevant indicators or evaluation criteria is provided, which may be applied by the Consent Authority in its assessment of the acceptability of any environmental changes identified by the monitoring programme (Section 7).



¹² Underwood, A.J. 1991: Beyond BACI: Experimental designs for detecting human environmental impacts on temporal variations in natural populations.

5. Baseline Environmental Monitoring

5.1 Introduction

This section of the EMP sets out the Baseline Environmental Monitoring component of the monitoring programme.

The objective of Baseline Monitoring is to establish the range of natural variability in respect of key environmental matters against which the actual effects of the turbines can be determined.

The specific details (e.g., number of replicates required, etc) will be updated as preliminary data are collected during the early stages of the Baseline Monitoring. There will be consultation with the Department of Conservation, Te Uri o Hau, and the Working Party of the Kaipara Harbour Monitoring Programme as the specific details are developed.

The key environmental components to be subject to Baseline Monitoring are:

- Benthic Habitat and Benthic organisms
- Harbour Sediment
- Water quality
- Noise
- Marine Mammals
- Harbour hydrodynamics - currents
- Fish movement
- Fish movement - effects on migration of Snapper (*Pagrus auratus*)
- Fish Biology (spawning)
- Commercial fishing
- Recreational fishing
- Coastal Processes and shoreline morphological changes
- Seabed sediment dynamics
- Seabed bathymetry and bathymetric change

Depending on the outcomes of the preliminary data collection during the early stages of Baseline Environmental Monitoring (Baseline Pilot Survey - see Table 6), some elements of the EMP may need to be extended to include additional far-field monitoring sites within the Kaipara Harbour, so that acceptable levels of precision can be achieved. The programme set out below (see Table 7) indicates the likely scope of Baseline Monitoring, based on information presently at hand.

5.2 Monitoring Duration

The duration of baseline monitoring is set at 2 years prior to installation of the first turbine for stage 1a plus 1 year post installation of the first Stage 1A turbines

5.3 Sampling Sites

In consultation with the Department of Conservation, Te Uri o Hau, and the Working Party of the Kaipara Harbour Monitoring Programme, eight sites will be established within the Kaipara Harbour for sampling of a range of



variables including benthic biota and sediments, water quality and PODs (Figure 4/4Figure-4). These sites comprise:

- 3 sites within the proposed generator array ('near field')
- 5 sites adjacent to the proposed generator array('far field')

In addition, 3 sites in the Southern Kaipara Harbour will be established (and sampled) as "control" or reference sites.

5.4 Benthic Biota, Benthic Sediments and Water Quality

5.4.1 Introduction

The operation of the marine turbines could affect the deposition and erosion of seabed sediments in their immediate vicinity or further away. In addition, there are macro-scale changes currently occurring within the Harbour that are unrelated to turbine installation. It is therefore necessary to obtain baseline data on harbour benthic sediment characteristics.

Benthic invertebrates can be used as indicators of change in habitat and nature of sediments. In addition, benthic invertebrates constitute a significant biological resource in the Kaipara Harbour. They are important as they form part of the Harbour food chain and are often taken for human consumption.

Data on the quality of seawater will be collected, to monitor the type and extent of associated water quality effects and to provide data on consent compliance. The primary focus of water quality sampling will be directed to measuring variables identified in Condition 23 of CON20061607601-02 and Condition 45 of CON20061607603-13.

5.4.2 Detailed Methodology

Sampling for benthic biological and sediment characteristics will be undertaken on a quarterly basis at each of the 8 sites in Figure 4 along with the 3 control sites.

In addition a multibeam survey of the turbine array area to assess potential changes in benthic habitat characteristics will be undertaken on an annual basis.

Benthic Biology

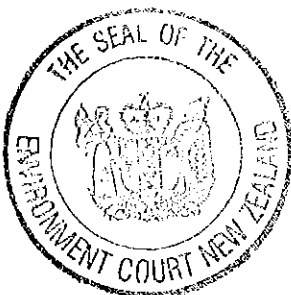
The Pilot Survey, during the early stages of Baseline Monitoring, will determine the number of replicate samples to be collected from each of the 11 sites in the Kaipara Harbour (8 far field and near field and 3 control sites). Five replicate samples will be collected from each site using a biological dredge. Two tow lengths will be used; 3 and 5 minutes to determine the effect length of tow has on *intra* site variability. Based on the analysis of these data the appropriate number of samples necessary to provide statistically robust data (to be collected during further baseline sampling) will be determined in consultation with the Department of Conservation, Te Uri o Hau, and the Working Party of the Kaipara Harbour Monitoring Programme.

Sediments

The physical characteristics of the seafloor sediments will be monitored by collecting five replicate samples at each site using a grab. Based on previous sampling this number of samples should achieve an acceptable level of precision that will detect changes with a reasonable level of sensitivity.

Sediment samples will be analysed for grain size distribution to help confirm the respective benthic habitat characteristics. The key parameters for analysis will be the mud (<0.063 mm), sand (0.063 - 2mm) and gravel (>2mm) components.

Water Quality

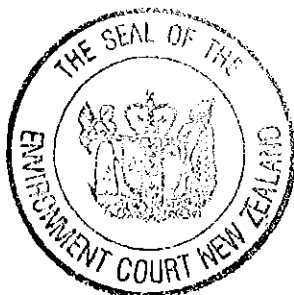


Water quality characteristics at three depths will be determined by collecting three replicate samples at each site using a water sampling tube and analysing for the following variables: pH, temperature, dissolved oxygen, conductivity/salinity, clarity, total suspended solids, turbidity and visible oil/grease, films, scums, foams or odour. At each site clarity will also be measured using a secchi disc.

Water quality sampling has been identified in Condition 23 of the CON20061607601-02 and Condition 45 of CON20061607603-13. Monitoring will be undertaken to confirm compliance.

For benthic biota, sediments and water quality, the hypothesis to be tested will be whether there is a statistically significant difference between control and impact locations after the turbines are deployed. Therefore, it is critical to estimate the *intra* site differences at baseline and the variation around these differences to assist evaluation against environmental objectives and evaluation criteria (Sections 3 and 7 of this EMP).

A range of univariate (e.g., mean total and species abundance, diversity, grain size, etc) and multivariate (e.g. ANOVA, regression) statistics will be used to describe the benthic invertebrate communities, grain size composition and water quality to establish a statistically robust baseline to compare with equivalent data that will be collected post-deployment.



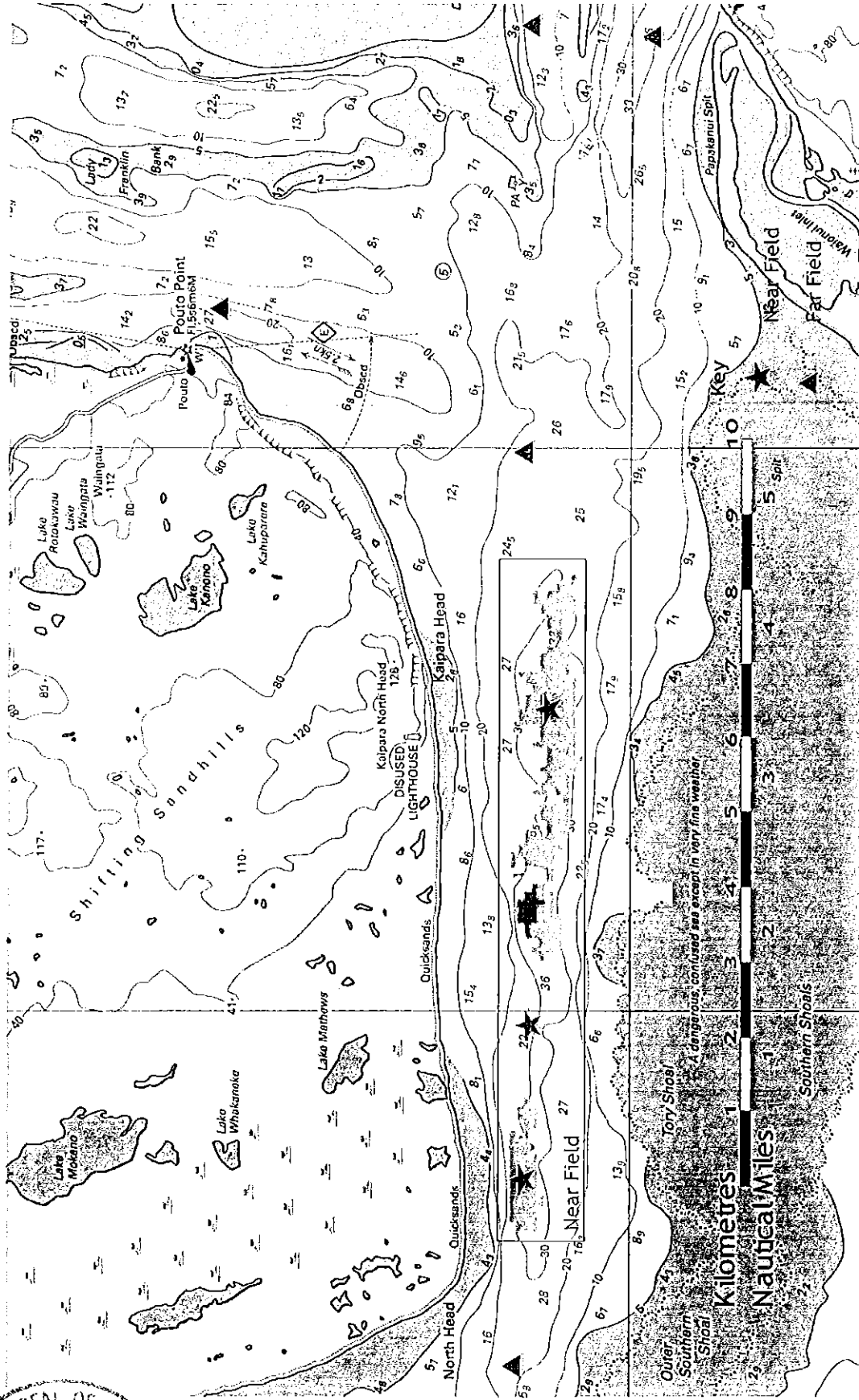
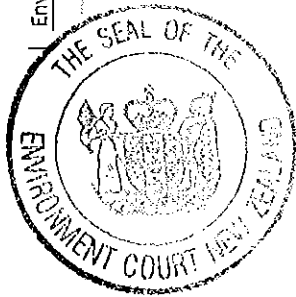


Figure 4: Kaipara Harbour entrance showing areas greater than 31m and indicative sampling locations in the 'near' and 'far' field Note: Additional POD Far Field site to be included following consultation with Department of Conservation.

Table 6: Summary of proposed pilot survey to be conducted during the early stages of the Baseline Monitoring

Type	Frequency	Near Field	Far Field	Control Site	Methodology / Parameters
1. Benthic fauna	1 round	3 sites x 6 tows each	5 sites x 6 tows each	3 sites x 6 tows each	3 & 5 min. tows. Macrofauna #/diversity.
2. Sediments	1 round	3 sites x 5 replicates	5 sites x 5 replicates	3 sites x 5 replicates	Grain size, organic matter content
3. Water Quality	1 round	3 replicates x 3 sites x 3 depths	3 replicates x 5 sites x 3 depths	3 replicates x 3 sites x 3 depths	ph, temperature, dissolved oxygen, conductivity/salinity, clarity, total suspended solids, turbidity
4. Fish/Megafauna Distribution	1 round				Trialling of equipment / techniques

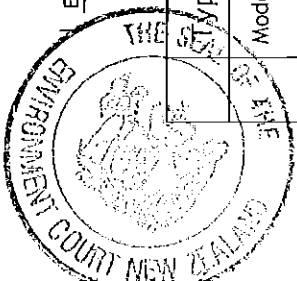
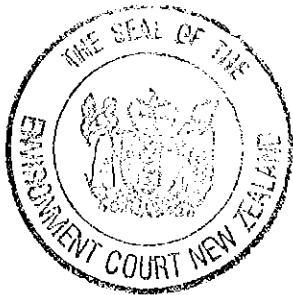


Table 7: Baseline Monitoring

Stakeholder	Frequency	Near Field	Far Field	Control	Sampling parameters
Modelling	Ongoing	-	-	-	Coastal processes, sediment dynamics, energy
2 Benthic	4 rounds (quarterly sampling)	3 sites x 5 tows	5 sites x 5 tows	3 sites x 5 tows	3 or 5 min tows. Macrofaunal abundance and diversity. Shellfish size / frequency
3 Sediments	quarterly	3 sites x 3 replicates	5 sites x 3 replicates	3 sites x 3 replicates	Grain size, organic content, fall rate
4 Noise	Annually	Across turbine array area			Multi - beam survey
5 Water Quality	Multiple to capture representative range of environmental conditions.	3 sites	3 sites	3 sites	Noise - hydrophones
6 Mammals	quarterly	3 sites x 3 depths	5 sites x 3 depths	-	ph, temperature, dissolved oxygen, conductivity/salinity, clarity, total suspended solids, turbidity
7 Currents	Ongoing	3 sites (PODs)	6 sites (PODs)	-	PODs (6 units) , review DoC data re public sightings; Collect incidental observations from work boats, commercial and recreational fishers.
8 Recreational fishing	Monthly (aerial) stratified	Harbour, and coast north and south of the harbour entrance			Aerial survey;
9 Fish Movement	Quarterly	Turbine array			Encounter model
	ADP mid generator region for - 3-7 months - period can be reduced to 3 months if hydrodynamic model producing correct tidal currents	3 sites		-	ADP (x2), Aquadopp,
	Monthly (aerial) stratified	Across general harbour entrance area -			Aerial survey
	Quarterly	Across general harbour entrance area			Interception, Tagging, Aerial Surveillance

10	Commercial Fisheries	Annual	West Coast Fishery	CPUE, other
11	Bathymetry/seabed profiling	quarterly	Across general harbour entrance area	Echosounder
12	Shoreline profiling	quarterly	6 sites	Shoreline survey, aerial photos



5.5 Underwater Noise

5.5.1 Introduction

Noise generated as a result of the installation and operation of the proposed marine turbines has the potential to affect marine fauna such as fish and marine mammals. These effects could manifest themselves in many ways including disruption to migration and settlement cues, attraction, etc.

The turbine array location is considered to be a naturally 'noisy' location due to wave action on the bar at the entrance to the Harbour. It is thus important to determine ambient noise levels so that they can be compared with levels post-deployment.

POD data analysis requires an understanding of ambient noise levels.

5.5.2 Detailed Methodology

Background underwater noise will be monitored by hydrophone

The noise monitoring sites will comprise 3 near, 3 far field monitoring locations, and 3 control sites.

Noise monitoring will be undertaken to capture a representative range of environmental conditions (i.e., rough and calm sea states, during rainfall events, etc).

5.5.3 Data Analysis

A baseline noise profile for a range of conditions will be established for comparison with post deployment noise levels.

5.6 Marine Mammals

5.6.1 Introduction

A range of marine mammals (including Maui's dolphin) have been observed on the open coast offshore from the Kaipara Harbour, and in the vicinity of the Kaipara Harbour entrance. Project-related effects on marine mammals could potentially arise from changes in ambient noise levels, EMFs and collision.

5.6.2 Detailed Methodology

Marine mammals will be monitored using the following methods:

- POD (Porpoise Detection Device) or hydrophone.
- Monthly aerial survey of the Kaipara Harbour and wider coast to 20 nm north and south of the Harbour entrance and 4nm out to sea.
- Review of DoC data re public sightings.
- Construct an encounter model for Maui's dolphin using monitoring data (noise and abundance / distribution)
- Collection of incidental observations from work boats, commercial and recreational fishers.

In addition, all personnel on the Harbour undertaking other monitoring work or research programmes will be asked to actively observe marine mammal activity and record findings using DOC protocols for recording data and where possible taking photographs of the marine mammals and recording the position using GPS where possible.



The sampling sites for the PODs will consist of a sub-set of those proposed for near field monitoring (3 PODs), and far field monitoring (3 PODs) where PODs will be regularly rotated between sites. POD deployment and use shall be determined on the basis of consultation with the Department of Conservation, POD use shall include an understanding of background acoustic characteristics of the area and will involve concurrent visual observation

A series of monthly flights over the area will be undertaken prior to turbine installation, to identify Maui's dolphins in the vicinity of Kaipara Harbour and entrance. Such surveys will be undertaken by personnel experienced in observation of Maui's dolphins.

During aerial surveys undertaken for marine mammals as set out above, and consistent with the stated priority that such flights are being undertaken with a primary focus on observation of marine mammals, observations are also to be made for the identification and abundance of sharks, other fish species, birds and recreational fishing activities. .

A gradient design will be adopted where survey effort is reduced with distance from the Harbour entrance, and design will be based on an understanding of dolphins' range. Given limited knowledge of Maui's dolphin, data for Hector's Dolphin may validly be used. For example transects at ½ Nautical Mile (NM) spacings up to 15 nautical miles (nm) North and South of the entrance, and Transects at 1 nm spacings from 15-20 nm North and South of the entrance. Transects to extend out to a maximum of nm out to sea.

An Encounter Model for Maui's dolphin, as further noise and abundance / distribution data become available through monitoring, will allow prediction of the potential effect of turbine deployment. It is possible that temporary or permanent threshold shifts, as well as zones of audibility and masking could be estimated. The parameters for the Encounter Model will be developed in consultation with the Department of Conservation, Te Uri o Hau, and the Working Party of the Kaipara Harbour Monitoring Programme.

5.6.3 Data Analysis

Data from all sources monitored will be analysed and reviewed continuously from the beginning of the project to establish baselines which would inform decisions on installation of the first turbines and enable informed evaluation against environmental objectives and evaluation criteria.

5.7 Currents and Sediment Dynamics

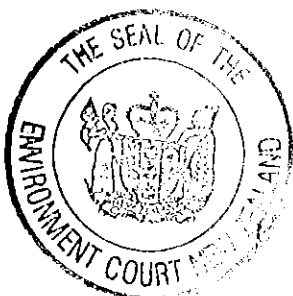
5.7.1 Introduction

Current data is required to be collected to allow calibration of the existing hydrodynamic model and enable prediction of longer term effects, and to allow evaluation against environmental objectives and evaluation criteria.

Existing current meter measurements show that flows in the region vary through the depth of the water column. Such variations potentially make the modelling of environmental effects more difficult, and therefore it is important to understand the vertical dynamics as early as possible.

5.7.2 Detailed Methodology

Current measurements will be undertaken using a recording device such as an Acoustic Doppler Profiler (ADP). For Baseline Monitoring, a current meter and temperature sensing string will be placed in the centre of the generator region for a period of 3-7 months (spring-neap tidal cycle). The deployment period



can be reduced to the 3 month duration if data show that the hydrodynamic model is producing the correct tidal currents¹³.

The ADP current meter will measure currents through the water column while the temperature string will record the vertical stratification in the water column.

Short-term fluctuations in turbulence in the water column play a critical role in the efficiency of the marine turbines and in sediment transport. Accordingly a third current meter will be deployed, recording instantaneously and at high frequency. This instrument (an Aquadopp) will be mounted on a frame at 2-3 m above the seabed at the same location as the ADP for 2 weeks.

Baseline sediment monitoring shall include:

- (a) Develop a numerical model to quantify the change in sand transport through the harbour entrance as a result of the turbine arrays, and assess the effects of the staged deployment of the turbines on tidal flows and sand transport in the broader harbour environment, including the consented sand extraction areas; and
- (b) A quarterly topographic survey from North Head to Pouto Point using GPS or photogrammetry for one year; and
- (c) A quarterly bathymetric survey from North Head to Pouto Point, carried out at high tide to the 10 metre depth contour, for one year; and
- (d) Analysis of the profile data to establish whether geomorphic changes are consistent between new and existing profile locations; and
- (e) Analysis of the existing 20 years of datasets of coastal profiles for the Kaipara Harbour to determine the magnitude of shoreline variability (in terms of horizontal position and sediment volumes) within years and between years; and establish the magnitude of decadal-scale variability in shoreline position over the entire survey record; and
- (f) A historic analysis of shoreline change to better resolve multi-decadal to century scale changes in the coastline.

Following the baseline monitoring in (b) to (f) above, long term monitoring of the shoreline shall be undertaken between North Head and Pouto Point in accordance with the requirements of the resource consent and ongoing Operational Monitoring Programme as determined in subsequent versions of this EMP, amended in accordance with the conditions of the resource consent.

5.8 Fish Movement

5.8.1 Introduction

A number of important commercial and recreational fish species travel through the Kaipara Harbour entrance in the course of spawning or feeding migrations. Various species travel through the entrance as larvae, juveniles, and / or as adults. The direction of travel (inwards or outwards) depends on the species and life history stage.

Most of the commercially and recreationally important fish species found in Kaipara Harbour (e.g. snapper, trevally, school shark, rig, kahawai) are part of larger, wide-ranging populations that also occur on the open west coast of



¹³ paragraph 38 of Environment Court evidence of D Goring, as agreed at caucus of coastal processes witnesses.

North Island. Rig and school shark migrate large distances throughout New Zealand. Other species (yellow-belly flounder, grey mullet) are probably also part of regional populations. Thus Kaipara Harbour may be regionally or nationally important to the overall populations.

The turbines have the potential to impede or interfere with passage of fish with consequent effects on fishing (Section 5.9). Evaluation of direct effects on movement of fish is therefore an important element of understanding broader scale effects on fisheries.

NIWA and the University of Auckland are currently (2010) undertaking studies into fish distribution and abundance through the Kaipara Harbour including the entrance. The outcomes of these investigations will provide valuable information and potentially assist in refining the CREST monitoring methodology.

This section of the EMP sets out information on Baseline Monitoring of fish movement in the area of the Kaipara Harbour entrance. A variety of fish monitoring tools are available for assessing whether the turbine array affects the movement of fish into or out of Kaipara Harbour. The appropriate tool(s) will depend on the species and on the life history stage (e.g. juvenile or adult). Multiple monitoring methods allow for the possibility that one or more tools may prove more effective than others at measuring abundance or movement.

5.8.2 Quantitative Surveying

Interception surveys will be undertaken to estimate the relative abundance of juvenile and adult fish passing by the turbine installation site. During the preliminary baseline period (Pilot Survey) a number of various gear methodologies and survey designs will be trialled so that the most effective tool can be selected for the remainder of the baseline monitoring period. Setnet, drift net, beach seine, otter trawl and beam trawl methods will be investigated in a range of configurations and applications.

Final fish sampling methodologies will be selected in consultation with the Department of Conservation, Te Uri o Hau, and the Working Party of the Kaipara Harbour Monitoring Programme to avoid undue fish, marine mammal and seabird mortality, particularly focussing on minimising net deployment times, using longlines for fish sampling where possible, and avoiding use of set nets in the harbour entrance channel to minimise risk to Maui's dolphins either while fishing or if lost out to sea (likely given the strength of the tidal flows in this part of the harbour).

Hook size and bait type will be standardised if long-lining is adopted as a monitoring methodology.

Monitoring will be undertaken on a seasonal basis, initially being repeated every 2 months, with sites located both on the seaward and harbour side of the proposed turbine array.

Whitebait species will be identified if collected as part of general fish monitoring at the harbour entrance.

5.8.3 Tagging

Tagging, involves the tracking of individually marked fish (such as migrating rig, school shark eels or snapper) with an acoustic tag with an appropriate receiver. Because acoustic tags are relatively large (being battery-based), it is probably not possible to attach these tags to juvenile fish and small fish species.

Hammerhead Sharks, Rays and Bronze Whaler Sharks to be tagged if they are caught as by-catch in the targeted programme set out above.

Where possible use will be made of internal acoustic tags.



Tagging will be undertaken during baseline monitoring to observe how tagged fish pass through the entrance in the absence of the array. To account for seasonal and species variation, tagging will be repeated four times within each year across a range of the key species and size classes.

5.8.4 Video Cameras / Sonar Equipment

Video cameras and sonar equipment can be used to observe fish and their responses to the turbines. These techniques will be developed in consultation with the Department of Conservation, Te Uri o Hau, and the Working Party of the Kaipara Harbour Monitoring Programme and trialled during the Baseline Monitoring period for deployment during the Operational Monitoring period post turbine deployment.

These methods provide direct observational information on fish behaviour, but may be limited on spatial scale (e.g. near one or a few turbines).

5.8.5 Data Analysis

Relevant data will be compiled and analysed to establish a baseline condition to compare with post deployment.

5.9 Fisheries Resources and Commercial Fishing

5.9.1 Introduction

Commercial fishing on the West Coast of the North Island has been linked with the productivity of the Kaipara Harbour. It is therefore necessary to give attention to potential effects on the commercial fishery arising from the CREST Project. The evaluation of effects on fish movement as set out in Section 5.8 will provide a more direct indication of effects. This section addresses methods to assess potential effects on commercial fishing outcomes on the West Coast.

5.9.2 Catch per unit effort

Catch per unit effort (CPUE) analysis measures the catch rates of key fish species in a commercial fishery, based on data on catch and effort provided by commercial fishermen, and is used to monitor the relative abundance of commercially captured fish species over time. This measure of abundance applies to the wider population and consequently serves only as an indirect monitoring tool for effects stemming from Kaipara Harbour.

The historical time series of CPUE abundance indices serve as the baseline for this monitoring tool.

5.9.3 Year Class Strength Analysis

Year Class Strength (YCS) analysis is used to determine the relative abundance of different year classes of fish. This information is taken from the ageing of otoliths (that have been collected from a fishery), which are then processed through a statistical age-structured stock assessment model. Knowledge of YCS is also essential for the interpretation of the CPUE monitoring tool.

Catch-at-age sampling has been undertaken for: snapper (SNAB) annually since the 1989-90; trevally (TRE7) in most years; and grey mullet in Kaipara Harbour (GMU 1) in 2003-04 and 2004-05.

The historical time series of YCS indices may serve as a baseline for this monitoring tool for snapper, trevally and grey mullet.

~~Subject only to~~ ^{having secured} the agreement of MFish to do so, otoliths



collected from recruited (adult) snapper in the course of year class strength analysis of snapper caught by commercial vessels fishing off the west coast of North Island will be stored for subsequent otolith microchemistry analysis if other monitoring identifies any apparent more than minor effects of Crest's activities on commercial snapper fisheries.

Otoliths will also to be collected from snapper caught inside the Kaipara Harbour as part of other work programmes associated with the EMP and/or other work programmes in the harbour. These otoliths are to be stored for subsequent otolith microchemistry analysis if other monitoring identifies any apparent more than minor effects of Crest's activities on commercial snapper fisheries.

The otoliths referred to in the previous paragraph will be collected from juveniles and from the same year class of adults from which otoliths are collected outside the harbour.

5.9.4 Data Analysis

All the relevant data will be compiled and analysed to establish a baseline condition to compare with post deployment.

5.10 Recreational Fishery

5.10.1 Introduction

The area known as the "Graveyard", in relatively shallow water to the north of the proposed turbine array, is a popular destination for harbour fishers. Concern was raised at the NRC hearing regarding the potential for exclusion of fishers from the turbine array areas to create recreational fishing pressure elsewhere. Consequently CREST agreed at the hearing to monitor recreational fishing activity at the Harbour entrance. As a consequence, recreational fishing interests were not involved in the Environment Court Appeal.

5.10.2 Detailed Methodology

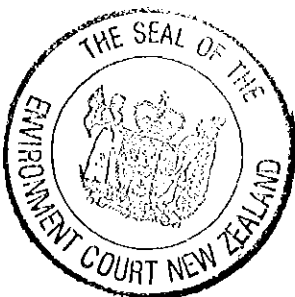
One possible approach to monitoring recreational fishing activity in the Harbour entrance area is to track the distribution of recreational effort throughout the entire Harbour, both before and after the installation of the turbine array and compare distribution of fishing effort.

However, it will be difficult to separate the annual and seasonal variations in the distribution of recreational effort from any effects caused by the presence of the turbine array. Instead, frequent monitoring will be undertaken of the main areas of recreational interest throughout the year in the vicinity of the array prior to installation. In that way, direct monitoring of the effect of the array on locations of high recreational activity will be possible.

Counts of the recreational activity in the vicinity of the turbines and the Graveyard will be undertaken in the course of aerial marine mammal observations (Section 5.6.2). Recreational fishing observations will be undertaken on a stratified sampling basis with more effort focussed on summer and times of potentially higher recreational activity at the Harbour entrance. Baseline period counts, including seasonal variation, can be compared with equivalent counts after installation.

5.10.3 Data Analysis

All the relevant data will be compiled and analysed to establish a baseline condition to compare with post deployment.



6. Operational Environmental Monitoring

6.1 Introduction

This section of the EMP sets out the ongoing Operational Monitoring Programme following installation of the turbine array.

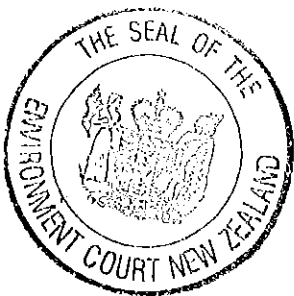
The final details of operational monitoring to be developed in consultation with the Department of Conservation, Te Uri o Hau, and the Working Party of the Kaipara Harbour Monitoring Programme, are contingent on the outcomes of the Baseline Monitoring, [NRC]-in particular the Pilot Survey (see Section 5.1 above).

The key environmental components to be subject to Operational Monitoring are

- (a) Benthic Habitat and Benthic organisms
- (b) Harbour Sediment
- (c) Water quality
- (d) Noise
- (e) Marine Mammals (movement) - effects on marine mammals using the harbour entrance, including species, numbers and timing;
- (f) Marine Mammals (impingement) effects and risk of collision of marine mammals with Project components, particularly turbines
- (g) Harbour hydrodynamics - currents
- (h) Fish movement - the degree to which turbines and structures are an impediment to the movement of marine species;
- (i) Fish movement - effects on migration of Snapper (*Pagrus auratus*).
- (j) Fish Biology (spawning) - effects on important spawning areas within the harbour and array area;
- (k) Fish Biology (elasmobranch behaviour, physiology and habitat) - effects of the main transmission cables on elasmobranch behaviour, physiology and habitat;
- (l) Fish Behaviour (impingement) - effects and risk of collision of elasmobranchs and teleost fish with Project components, particularly turbines;
- (m) Commercial fishing - effects on commercial fishing generally, and on the North Island West Coast Commercial Snapper Fishery in particular;
- (n) Recreational fishing
- (o) Coastal Processes and shoreline morphological changes
- (p) Sedimentation within the generation array and along the transmission lines;
- (q) Seabed sediment dynamics;
- (r) Seabed bathymetry and bathymetric change (including historic bathymetric and shoreline change to provide an improved context against which to evaluate future changes);
- (s) Electro magnetic Field (EMF) production - effects on marine life in general and on elasmobranch movement in particular.

6.2 Monitoring Intensity and Duration

The operational monitoring component of the EMP comprises a "routine" monitoring component following deployment of turbines at each Stage, with an



“intensive” monitoring component prior to the s128 review before moving to the next Stage if appropriate.

The purpose of the “Intensive Survey” is to ensure that prior to the s128 review, a recent data set is collected. Some parameters are only monitored on a 2 yearly basis for Routine Monitoring which could continue for a prolonged duration . If a Stage progression was proposed it might coincide with year in which routine monitoring was not undertaken for a particular parameter. The Intensive Monitoring phase will ensure that a recent data set is collected for all parameters prior to the s128 Review. In addition, for some parameters, the opportunity will be taken to collect supplementary data to augment the routine dataset.

Tables 8 and 9 summarise Operational Monitoring for the CREST Project.

6.3 Benthic Biota, Benthic Sediments and Water Quality Characteristics

As described in Section 4.4, a BACI design has been adopted as the basis for the monitoring programme to monitor change in benthic macroinvertebrate communities / populations, sediment and water quality characteristics.

Sampling for benthic biological, sediment and water quality characteristics will be undertaken on a quarterly basis for intensive monitoring; and on a six-monthly basis for routine monitoring.

The same sites will be sampled, the same sample numbers will be collected and the same range of parameters determined as established for the Baseline Monitoring.

The multibeam survey of the area in the vicinity of the turbine array will continue to be undertaken on an annual basis to assess changes in benthic habitat characteristics. If changes in benthic habitat are detected immediately adjacent to turbines further benthic sampling will be undertaken to confirm the nature and extent of these changes. This would consist of a transect(s) away from the turbine(s) along which sediment samples would be collected by divers.

6.4 Noise

Noise will be monitored by hydrophone.

The sampling sites will comprise near and far field monitoring locations.

Noise monitoring will be undertaken on a one-off basis for each turbine deployment, to verify individual and cumulative noise effects.

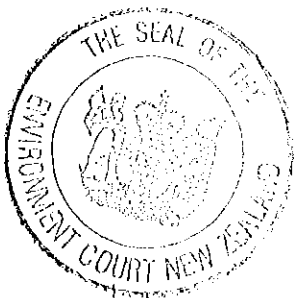
Prior to each s128 review a discrete field-wide noise survey will be undertaken.

6.5 Marine Mammals

Marine mammals will be monitored using a variety of methods as described in Section 5.6.

- ~~Error Reference source not found~~ POD (Porpoise Detection Device) or hydrophone.
- Monthly aerial survey of the Kaipara Harbour and wider coast to 20 nm north and south of the Harbour entrance and 4nm out to sea.
- Monthly aerial survey of the Kaipara Harbour and entrance.
- Review of DoC data re public sightings.
- Collection of incidental observations from work boats, commercial and recreational fishers.

All Project personnel on the Harbour undertaking other monitoring work or research programmes will be asked to actively observe marine mammal activity

and record findings using DOC protocols for recording data and where possible taking photographs of the marine mammals and recording the position using GPS where possible.-

During aerial surveys undertaken for marine mammals as set out above will be undertaken by personnel experienced in observation of Maui's dolphins. During these surveys, and consistent with the primary objective of such surveys to observe marine mammals, additional observations are also to be made for the identification and abundance of sharks, other fish species, birds and recreational fishing activities.

Should Maui's dolphin be found to frequent the Harbour entrance more intensive behavioural monitoring is proposed. This would involve the use of a helicopter to monitor the behaviour of Maui's dolphin in and around the turbine array.

The POD sampling sites will consist of those proposed for near and far field monitoring. . POD deployment and use shall be determined on the basis of consultation with the Department of Conservation, POD use shall include an understanding of background acoustic characteristics of the area and will involve concurrent visual observation.

Aerial surveys will be undertaken on a monthly basis. All other techniques will be undertaken on an ongoing basis with POD devices being rotated between sites.

Following turbine deployment the use of underwater cameras mounted on a turbine(s) will be investigated to visually monitor the encroachment of marine mammals. This will depend on in situ visibility which is known to be very low near the entrance - (<1m at all depths).

An Encounter Model for Maui's dolphin, as further noise and abundance / distribution data become available through monitoring, will allow prediction of the potential effect of turbine deployment. It is possible that temporary or permanent threshold shifts, as well as zones of audibility and masking could be estimated. The parameters for the Encounter Model will be developed in consultation with the Department of Conservation, Te Uri o Hau, and the Working Party of the Kaipara Harbour Monitoring Programme.

6.6 Currents and Sediment Dynamics

Current and sediment data post turbine deployment will be collected, with detailed methodology based on the outcome of the Baseline monitoring. The final programme will be designed in consultation with Te Uri o Hau, the Department of Conservation and the Working Party of the Kaipara Harbour Monitoring Programme.

In broad terms, operational environmental monitoring will involve deployment of current meters and temperature sensing strings both up-harbour and down-harbour from individual turbines initially, and a distance from turbine array clusters once deployed. The actual (far-field) deployment distance will be calculated on the basis of in-situ monitoring in relation to individual units. Deployment duration is a nominal 2 week period (spring - neap cycle) on a twice yearly (routine) and quarterly (intensive) basis.

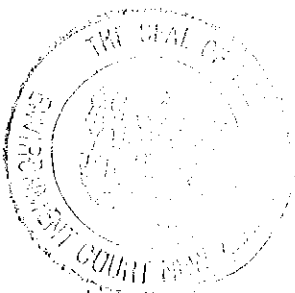


Table 8: Operational Monitoring - Routine

	Frequency	Near Field	Far Field	Control	Sampling parameters
1	Ongoing	-	-	-	Coastal processes, sediment dynamics, energy
2	2 rounds (6 mthly)	3 sites x 5 tows	5 sites x 5 tows	3 sites x 5 tows	3 or 5 min tows. Macrofaunal abundance and diversity. Shellfish size / frequency
3	2 rounds (6 mthly)	3 sites x 3 replicates	5 sites x 3 replicates	3 sites x 3 replicates	Grain size, organic content
	1 round (annual)	Area of installed turbines			Multi - beam survey Grain size analysis if changes detected
4	Survey each time new turbine deployed	3 sites	5 sites	3 sites	Noise- hydrophone
5	2 rounds (6 mthly)	3 sites x 3 depths	5 sites x 3 depths	-	ph, temperature, dissolved oxygen, conductivity/salinity, clarity, total suspended solids, turbidity
6	Ongoing	3 sites (PODs)	6 sites (PODs)	-	PODs (2 units), review DoC data re public sightings; Collect incidental observations from work boats, commercial and recr. fishers.
	Monthly	Harbour, and coast north and south of the Harbour entrance			Aerial survey
7	2 rounds (6 mthly)	3 sites		-	ADP (x2), Aquadopp
8	Monthly (aerials) stratified	Across general harbour entrance area			Aerial surveys
9	Annual	West Coast Fishery-related			CPUE, YCS
10	Quarterly - if confirmed avoidance then only intermittent (spot) monitoring thereafter	Across general harbour entrance area			Interception, Tagging, Video Surveillance
11	Bi-annual survey (2 yrly)	Across general harbour entrance area			Echosounder
12	Annual survey (Jan - Mar)	-	6 sites	-	Shoreline survey, aerial photos
13	Survey at each stage of deployment	10 Sites	n/a	n/a	Where reading registered above background include uncoupling of

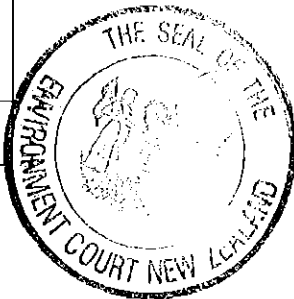
14	Cable Burial	Every 2 yrs (review after 5 yrs then go to 5yrlly if no exposure)	Cable route	5 sites	generation to derive respective contribution from various sources
15	Antifoulant	Every 2 yrs - if Cu or Zn used		3 sites	Monitor depth below seabed Total Cu and Total Zn in sediments



Table 9: Operational Monitoring - Intensive (12 month period prior to s128 review)

Type	Frequency	Near Field	Far Field	Control	Sampling parameters
1	Ongoing	-	-	-	Coastal processes, sediment dynamics, energy
2	4 rounds (quarterly sampling)	3 sites x 5 tows	5 sites x 5 tows	3 sites x 5 tows	3 or 5 min tows. Macrofaunal abundance and diversity. Shellfish size / frequency
3	4 rounds (quarterly sampling)	3 sites x 3 replicates	5 sites x 3 replicates	3 sites x 3 replicates	Grain size, organic content
	1 round	Area of installed turbines			Multi - beam survey Grain size analysis if changes detected
4	Field-wide survey pre s128 review	3 sites	5 sites	3 sites	Noise - hydrophones
5	4 rounds (quarterly sampling)	3 sites x 3 depths	5 sites x 3 depths	-	ph, temperature, dissolved oxygen, conductivity/salinity, clarity, total suspended solids, turbidity
6	Ongoing	3 sites (PODs)	6sites (PODs)	-	PODs (2 units), review DOC data re public sightings; Collect incidental observations from work boats, commercial and recreational fishers.
	Monthly	Harbour, and coast north and south of the Harbour entrance			Aerial survey
7	12 rounds (monthly)	3 sites		-	ADP (x2), Aquadopp
8	Monthly (aerials) stratified	Across general harbour entrance area -			Aerial surveys
9	Annual	West Coast Fishery-related -			CPEU, YCS
10	Quarterly - if confirmation of avoidance then only intermittent (spot) monitoring thereafter	Across general harbour entrance area			Interception, Tagging, Video Surveillance;
11	Annual survey (Jan - Mar)	Across general harbour entrance area			Echosounder

12	Shoreline profiling	Annual survey (Jan - Mar)	-	6 sites	-	Shoreline survey, aerial photos
13	EMF	One off survey	10 Sites	n/a	n/a	
14	Cable Burial	One off survey	Cable route			Monitor depth below seabed
15	Antifoulant	One off survey - if Cu or Zn used		5 sites	3 sites	Total Cu and Total Zn in sediments



6.7 Fish Movement

6.7.1 Introduction

Once installed, the turbines have the potential to impede or interfere with passage of fish with consequent effects on fishing (Section 6.8). Evaluation of direct interactions between the turbines and the movement of fish will inform understanding the broader scale effects on fisheries.

As noted in Section 5.8, a variety of fish monitoring tools is available for assessing whether the turbine array affects the movement of fish into or out of Kaipara Harbour. The appropriate tool(s) will depend on the species and on the life history stage (e.g. juvenile or adult). Multiple monitoring methods allow for the possibility that one or more tools may prove more effective than others at measuring abundance or movement.

6.7.2 Quantitative Surveying

Interception surveys (see section 5.8.2) will be undertaken to estimate the migration timing and relative abundance of juvenile and adults of important fish species. The design of these surveys will be established during the Baseline Monitoring period.

An important design component of this method will be a seasonal component, with the survey, using sites located both on the seaward and harbour side of the proposed turbine array.

Survey data collected during the Operational Monitoring phase will be compared with the equivalent data collected during the Baseline Monitoring phase.

Whitebait species will be identified if collected as part of general fish monitoring at the harbour entrance.

6.7.3 Tagging

Tagging will be repeated several times within a year across a range of the key species and size classes during the operational monitoring period. Detailed Operational Monitoring methodology is subject to the outcome of Baseline Monitoring.

Quantitative and qualitative comparisons of the migration of tagged fish passing through the entrance in the absence of the array, observed during the period of baseline monitoring, will be made with equivalent information collected during the operational phase.

6.7.4 Video Cameras / Sonar Equipment

Video cameras and sonar equipment will be used to observe fish and their responses to the turbines, subject to Baseline Monitoring confirmation that the methodology works. This equipment will be deployed during turbine installation to provide direct observational information on fish behaviour.

Sonar and video equipment would be deployed on turbines to determine how fish (and other megafauna) respond to them, and at upstream and downstream locations.

6.8 Fisheries Resources and Commercial Fishing

6.8.1 Introduction

As noted in section 5.9, existing MFish-derived historical CPUE and year class strength data will provide baseline information for the Project. Sections 6.8.2 and 6.8.3 below explain the need for (ongoing) consultation between CREST and MFish in respect of the ongoing monitoring of these indicators.



6.8.2 Catch per unit effort (CPUE)

As MFish is likely to carry out regular CPUE updates, post-installation monitoring of this indicator by CREST will only be required if the monitoring schedule falls within a gap between MFish analyses.

Liaison with MFish will be undertaken to determine when they will be commissioning CPUE analysis during the Operational Monitoring period for species of interest. CPUE analyses for some key species which are independent of the MFish cycle will be undertaken independently by CREST as necessary.

A comparison between baseline CPUE data and that collected during operation will be undertaken, taking into account factors other than the installation when interpreting the results.

6.8.3 Year Class Strength (YCS) Analysis

Post-installation monitoring would only be required if the monitoring schedule falls within a gap between MFish analyses, or if MFish discontinues YCS analyses for some key species. As stated in Section 5.95-9, YCS analysis for snapper (SNA8) is presently undertaken annually, but may be reduced in frequency in future years; trevally (TRE7) is presently scheduled for three consecutive years in every five; and grey mullet in Kaipara Harbour (GMU 1) is presently scheduled for two consecutive years in every five.

Liaison with MFish will be undertaken to determine when they will be commissioning YCS analysis during the Operational Monitoring period or whether independent YCS analysis for key species will be required to be undertaken independently by CREST.

A comparison between Baseline YCS data and that collected during Operational Monitoring will be undertaken, taking into account factors other than turbine installation when interpreting the results.

Subject only to Crest securing the agreement of MFish to do so, otoliths collected from recruited (adult) snapper in the course of year class strength analysis of snapper caught by commercial vessels fishing off the west coast of North Island will be stored for subsequent otolith microchemistry analysis if other monitoring identifies any apparent more than minor effects of Crest's activities on commercial snapper fisheries.

Otoliths will also be collected from snapper caught inside the Kaipara Harbour as part of other work programmes associated with the EMP and/or other work programmes in the harbour. These otoliths are to be stored for subsequent otolith microchemistry analysis if other monitoring identifies any apparent more than minor effects of Crest's activities on commercial snapper fisheries.

The otoliths referred to in the previous paragraph will be collected from juveniles and from the same year class of adults from which otoliths are collected outside the harbour.

6.9 Recreational Fishery

Frequent "stratified" counts of the number of vessels fishing in the "Graveyard" will be made, with the frequency of counts matching the design used during the baseline monitoring period. This programme will rely on aerial surveys undertaken with the priority of collecting data for marine mammal observation. Consistent with this priority recreational use will be surveyed, with a particular focus on times of likely high recreation fishing activity - weekends, public holidays, fishing contests etc. During each survey a record will be kept of weather and sea conditions to help interpret boat use data

A comparison between boat count data collected during Baseline Monitoring and that collected during Operational Monitoring will be undertaken.



6.10 Electromagnetic Frequency Generation

A survey of potential EMF associated with the transmission cable and turbine array will be undertaken following installation of turbines for Stage 1a. This would be implemented at several sites along the cable route and at control locations within the Harbour, with attention directed at 10 sites around the generator array and subsea cable area.

If monitoring EMFs as above indicates EMF levels are above background, elasmobranch behaviour will be monitored in the region northwest of the main transmission cable (between the transmission cable and the northern shoreline) after each stage has been made operational to determine whether any channelling of elasmobranch movement occurs.

The EMF survey for Stage 1A, will be repeated during all project developmental stages (i.e. Stages 1, 2 3 and 4) to investigate any potential cumulative effects.

If EMF levels above background are identified and if adverse effects on elasmobranch movement are determined, Crest will undertake an investigation of the effects of decoupling generation so that the turbines operate but minimal current flows in the cables. This will assist to separate the effects of noise from the effects of EMF.

The acoustic receiver array for the movement tracking (pre turbine deployment) will include the near-shore area where the cable comes ashore as this would be the place the sharks/rays might turn up if they were heading into the harbour and reluctant to cross the cables. If an impact is observed, this Section of the EMP captures the possibility of decoupling noise and cable EMF as the causal mechanism.

6.11 Cable Burial

At no more than two year intervals, undertake a programme to monitor the depth below seabed of the transmission cables to Pouto Point.

If, after any five year period of records, there has been no incident of monitored cable exposure, then the required survey interval shall extend to five years. Should any subsequent survey show cable exposure at the seabed at any point on the cable, other than where cables are exposed for repair purposes, or where cables are covered by protective matting, then the survey interval shall return to two yearly.

6.12 Antifoulant

If the Consent Holder uses antifoulant coatings containing copper and/or zinc - monitor total copper and total zinc levels in seabed sediments at the far-field and control sites every two years.

7. Evaluation Criteria

Section 3 sets out Environmental Objectives for the environmental components under consideration in this EMP. The Consent Authority will receive monitoring data for each component and will need to assess the significance of any changes between pre-operational and post-operational states and between the different stages of development.

This section of the EMP sets out Evaluation Criteria or indicators which the Consent Authority can apply to such considerations, as required in Consent CON20061607603-13 Condition 64c:

Environmental Performance criteria to assist the Consent Authority in its determination of the acceptability of environmental effects associated with the project.



A series of quantitative (and qualitative) evaluation criteria have been developed for the monitoring tools identified in Section 5 and Section 6 of this EMP.

The Evaluation Criteria are outlined in Table 10.

8. Review and Response

It is intended that the evaluation criteria be treated as “trigger values” to guide the need for management intervention, in a similar way that ANZECC Guidelines are applied¹⁴. In this way an Adaptive Management response can be initiated if evaluation criteria are triggered. These AM responses will include process changes, design modification or operational changes (See Section 2.3 above).

The Northland Regional Council, as regulatory authority, will decide whether management action is warranted. In some instances the decision may be clear-cut but in others (eg effects on fish movement or commercial fisheries) the Council may need to take into account more than one criterion or indicator, and it may need to seek expert assistance in the interpretation of monitoring data.

Regular reviews of the EMP will be undertaken in the course of the s128 Review process. At each review stage the Environmental Objectives and Evaluation Criteria will be assessed as to their ongoing appropriateness and modified as necessary.



¹⁴ See Australian and New Zealand Guidelines for Fresh and Marine Water Quality (2000) - Volume 2 - Chapter 8 - Aquatic Ecosystems - Section 8.3.5

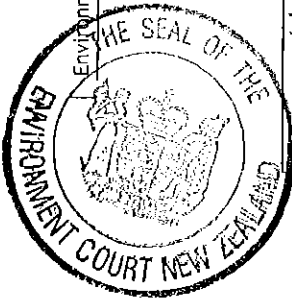
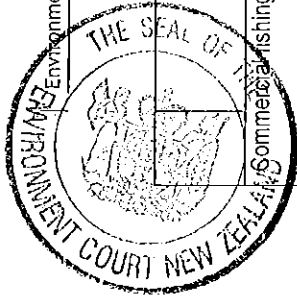


Table 10: Evaluation Criteria for Identified Environmental Objectives

Environmental Component	Objective	Evaluation Criteria
Benthic Habitat	No change in benthic habitat attributable to the Project, at a distance greater than 30m from any turbine.	±0.05 (95%) probability level of effect
Benthic organisms	No change in distribution and abundance of benthic organisms, attributable to the Project, at a distance greater than 30m from any turbine.	±0.05 (95%) probability level of effect
Sediment Physical characteristics	No change of sediment physical characteristics attributable to CREST Project, at distances greater than 30m from any turbine.	±0.05 (95%) probability level of effect
Sediment Transport	No change of sediment transport in the Kaipara Harbour attributable to CREST Project, at distances greater than 30m from any turbine.	±0.05 (95%) probability level of effect
Water quality	Demonstrated compliance with Condition 23 of CON20061607601-02	Standard Methods
Noise	No noise emission associated with turbines such that marine biota are adversely affected	No observed impact; measured sound levels at 150m from any one turbine not likely to give rise to adverse effects - based on expert interpretation to satisfaction of consent authority.
Marine Mammals	All cetaceans, and particularly Maui's dolphin - CREST Project not to adversely affect any individual	No observed impact
Harbour hydrodynamics	Maui's dolphin - - CREST Project not to further endanger survival of the species No change of harbour hydrodynamics attributable to CREST Project, at distances greater than 30m from any turbine.	No observed impact Background ±20%
Fish movement	No measurable impedance to the movement of fish as a result of presence of turbines	Observation and expert interpretation - qualitative evaluation of scale of effect Evaluation criteria associated with the surveying and acoustic tagging will depend on the design of the survey established during the baseline monitoring period and how well tagging can be perfected during baseline monitoring. However, this surveying should be able to detect changes in the timing and relative abundance of a range of fish species and size categories after the turbine installation becomes operational, and tagging should be able to directly observe changes in fish behaviour after installation. For both methods the capacity to detect changes will depend on the level of precision which has been achieved (and number of observations made during the baseline period), with greater precision leading to an increased detection capability. At this stage it is not possible to confirm specific criteria and therefore reliance must be given to expert analysis and interpretation. Direct observation of fish behaviour in the vicinity of the turbine installation should be relatively easy to evaluate: they will probably either ignore the presence of the turbines or will be visibly affected by their presence. As many of these observations as possible should be made across a range of species and size categories of interest as well as over an



	<p>Commercial fishing</p>	<p>extended time period. Specific criteria may be added subsequent to s.128 and/or EMP reviews</p>
	<p>No measurable change caused by the CREST Project to commercial fishing inside or adjacent to Kaipara Harbour, including the West Coast Snapper fishery.</p>	<p>Observation and expert interpretation - qualitative evaluation of scale of effect. Changes in CPUE and YCS for key species observed after the turbine series has been installed must be interpreted in the context of the overall abundance/population dynamics of the population being monitored. This is because abundance changes in the wider population and year class abundance can be the result of factors other than a curtailment of productivity in Kaipara Harbour. For this reason, it will not be possible to establish specific evaluation criteria which can be used to determine if the Kaipara installation is affecting CPUE and YCS and reliance must be given to expert analysis and interpretation.</p>
<p>Recreational fishing</p>	<p>No adverse effect from the CREST Project on the ability to undertake recreational fishing in the Graveyard area</p>	<p>Observation and expert interpretation - qualitative evaluation of scale of effect. The number and distribution of recreational effort in the vicinity of the turbine installation and the Graveyard fishing grounds should be compared with equivalent values collected during the baseline period. Any observed differences should be evaluated in the context of weather patterns existing during the two evaluation periods. In this way, differences in the deployment of recreational fishing effort may be detected post-installation. It may be necessary to repeat the post-installation observations over a period of several years.</p>
<p>Shoreline profiles Harbour bathymetry</p>	<p>No change of shoreline profiles attributable to CREST Project No change of harbour bathymetry attributable to CREST Project, at distances greater than 30m from any turbine.</p>	<p>Observation and expert interpretation - qualitative evaluation of scale of effect Observation and expert interpretation - qualitative evaluation of scale of effect</p>
<p>EMF</p>	<p>No EMF from turbines or cables such that marine biota adversely affected at distances over 1m from EMF from any turbine or cabling to be materially indistinguishable from background levels within 1m.</p>	<p>Background $\pm 20\%$ Background $\pm 20\%$</p>

9. Reporting

9.1 Requirements

The following reporting requirements have been defined in Resource Consent - CON20061607603 - 13:

- 52 If the Consent Holder opts to utilise antifoulant coatings containing copper and/or zinc, the Consent Holder shallreport on the results to the Northland Regional Council within one month of sampling. Reports shall include an assessment of the results as well as comment on any changes from previous results.
- 67 Reports on the findings of the EMP shall be made available to the Northland Regional Council and to other parties in accordance with reporting protocols specified in the EMP, to enable public access to the data and to information on the protocols for collection, classification and analysis of data
- 74 Within three months of the completion of the Baseline Monitoring Programme the Consent Holder shall provide a report to the Northland Regional Council which sets out details of the monitoring results and an assessment of the likely potential effects of activities authorised under this consent and any changes proposed by the Consent Holder to avoid, remedy or mitigate such effects. This report shall be accompanied by a peer review report prepared by an appropriately qualified and experienced marine scientist(s), who is acceptable to the Council.
- 75 Reports on the findings of the environmental monitoring shall be submitted to the Northland Regional Council by the Consent Holder in accordance with the reporting protocol set out in the EMP, and in any case as follows:
 - (a) Progress Reports at yearly intervals, and
 - (b) Report, no later than six months prior to the commencement of installation of the first and any subsequent stage.

9.2 Reporting Protocols

Reporting protocols are set out in Table 11.



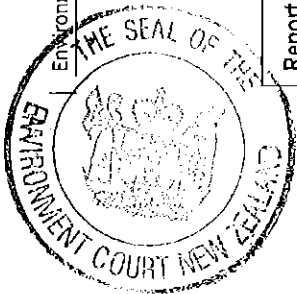
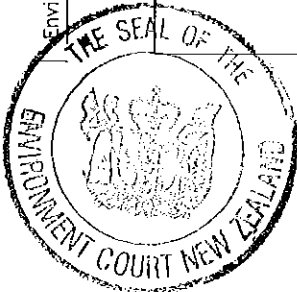


Table 11: Reporting Protocols

Report Category	Content	Timing
Report delivery:	In all cases reports are to be delivered to Northland Regional Council, TUOH, DOC and parties identified in Section 10.1 below. Reports are also to be made available for download as pdf documents on a website to be set-up and administered by CREST for that purpose.	
Specific Reports		
Antifoulant report [Condition 52]	"If antifoulant coatings containing copper and/or zinc are used" Assessment of results of sediment Total Cu and Zn sampling plus comment on any changes from previous results.	Report within one month of sampling - once every 2 years post installation.
Baseline monitoring [Condition 74]	Details of Baseline monitoring results and an assessment of the likely potential effects of activities authorised under this consent and any changes proposed by the Consent Holder to avoid, remedy or mitigate such effects. Information in report to be based on programme set out in Table 7 of this EMP - content to include: <ul style="list-style-type: none"> • Methodology • Personnel involved • Timing • Results • Ongoing validity of evaluation criteria set out in Table 10 of this EMP 	Annual progress report - deliverable on date of anniversary of granting of consent Final Baseline Report within three months of the completion of the Baseline Monitoring.
Peer Review Report - Baseline monitoring [Condition 74]	Report to accompany Final Baseline Monitoring Report - to be prepared by "an appropriately qualified and experienced marine scientist(s), who is acceptable to the Council". Report to review and comment on content and conclusions in Baseline Monitoring Report.	At same time as Final Baseline Monitoring Report.
Stage 1a Initiation Report [Condition 75b]	Findings of environmental monitoring evaluated as basis for progression to Stage 1a of Project - report to provide a basis for NRC determination of whether applicant may proceed with Stage 1a development. Information in report to be based on Baseline monitoring data and any data collected after completion of Baseline monitoring Report above. Content to include: <ul style="list-style-type: none"> • Methodology • Personnel involved 	No later than six months prior to the commencement of installation of the first stage.

Formal

Formal



	<ul style="list-style-type: none"> • Timing • Findings • Interpretation of findings in relation to: <ul style="list-style-type: none"> o Potential adverse effects associated with Stage 1a of the Project. o Likely compliance with evaluation criteria from Table 9 • Cross-reference to Operation and Management Plan (Condition 32) - ensure all design and operational elements in OMP are addressed in terms of potential environmental effects. 	
General Reports		
<p>Annual Reports [Condition 75a]</p>	<p>Findings of routine environmental monitoring undertaken in the year prior to the report, and an assessment of the likely potential effects of activities authorised under the consent and any changes proposed by the Consent Holder to avoid, remedy or mitigate such effects.</p> <p>Information in report to be based on programme set out in Table 7 of this EMP - content to include:</p> <ul style="list-style-type: none"> • Methodology • Personnel involved • Timing • Results • Interpretation of findings in relation to: <ul style="list-style-type: none"> o actual and potential adverse effects associated with the Project. o Compliance with evaluation criteria from Table 10 o Comment on ongoing validity of evaluation criteria set out in Table 10 	<p>Annual Report - except that a Stage Progression Report can represent the Annual Report for those years when a Stage Progression Report is prepared.</p>
<p>Stage Progression Report [Condition 75b]</p>	<p>Findings of Intensive Operational Monitoring as set out in Table 7 of this EMP.</p> <p>Report content to include:</p> <ul style="list-style-type: none"> • Methodology • Personnel involved • Timing • Results • Interpretation of findings in relation to: <ul style="list-style-type: none"> o actual and potential adverse effects associated with existing Stages of the Project. o Potential adverse effects associated with proposed next Stage of the Project o Existence and projected compliance with evaluation criteria from Table 10 o Comment on ongoing validity of evaluation criteria set out in Table 10 • Cross-reference to Operation and Management Plan (Condition 32) - ensure all design and operational elements in OMP are addressed in terms of potential environmental effects. 	<p>No later than six months prior to the commencement of installation of any subsequent stage.</p>
<p>Monitoring Review Report [Condition 68 and 69]</p>	<p>Report to NRC on findings of annual review to determine whether monitoring is adequate to address the matters set out in conditions to this consent, having regard to any change in circumstances, or where</p>	<p>Annual Report</p>

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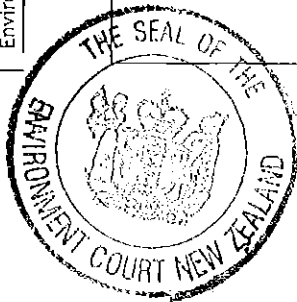
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	<p>additional monitoring is necessary as a consequence of new outcomes which have emerged from ongoing monitoring or where new scientific information has become available.</p> <p>Any such review, shall be prepared in consultation with Te Uri o Hau, the Department of Conservation and the Working Party of the Kaipara Harbour Monitoring Programme (the Working Party) and shall include a description of the consultation undertaken with Te Uri o Hau, the Department of Conservation and the Working Party, including the identification and discussion of the areas of agreement and disagreement.</p>	
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10. Provision to the public of data - Stakeholder Register

10.1 Requirements

Condition 64 of Resource Consent CON20061607603-13 states that this EMP, and any variation shall incorporate the following components

“Provision to the public of data, reliability, accuracy and veracity of information drawn from data; and

Public access to data for independent analysis and reporting”

“Sharing with and accommodation of other harbour interests, including sand extraction, commercial and recreational fishing and inhabitants such as Te Uri o Hau”

10.2 Procedures

1. In all cases, CREST shall deliver reports to Northland Regional Council, TUOH and DOC.
2. CREST shall establish and maintain a website where any party may download all monitoring reports as pdf format documents.
3. In addition, any party can directly seek copies of pdf format documents by applying to CREST for inclusion on a “Stakeholder Register” [Table 12], to be maintained by CREST and updated on a monthly basis. Note that this Table has been initially populated with the names of parties involved in the appeal process. Others may be added at any time.

Table 12: Stakeholder Register - parties additional to NRC, TUOH and DOC who have expressed an interest in receiving Monitoring Reports

Name of Party	Email contact
McGillvray	
Winstones Aggregates, a division of Fletcher Concrete & Infrastructure	Operations manager, Northern Area
Rodney Economic Development Trust	
Enterprise Northland	
Te Ohu Kai Moana Trustee Limited	
AWATEA	
Farmers of New Zealand	
Commercial fishing interests - to be named	
Local Pouto Residents - to be named	
Recreational fishing interests - - to be named	
Kaipara District Council	
Working Party of the Kaipara Harbour Monitoring Programme	Auckland Regional Council
Guardians of the Kaipara?	
Integrated Kaipara Harbour Management Group	



Others - to be named	
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11. Variation of EMP

11.1 Requirements

Conditions 68-70 of Resource Consent CON20061607603-13 set out provisions for a mandatory Annual Review of EMP

- 68 The EMP shall be reviewed annually by the Consent Holder for the purpose of determining whether the monitoring is adequate to address the matters set out in conditions of this consent, having regard to any change in circumstances, or where additional monitoring is necessary as a consequence of new outcomes which have emerged from ongoing monitoring or where new scientific information has become available.
- 69 Any review of the EMP pursuant to this Condition, shall be prepared in consultation with Te Uri o Hau, the Department of Conservation and the Working Party of the Kaipara Harbour Monitoring Programme (the Working Party) and shall include a description of the consultation undertaken with Te Uri o Hau, the Department of Conservation and the Working Party, including the identification and discussion of the areas of agreement and disagreement.
- 70 The EMP shall only be amended upon certification of the Council's Chief Executive Officer or his/her delegate that the amended EMP is likely to continue to address the matters set out in the conditions of this consent to at least the same extent as in the previous EMP.

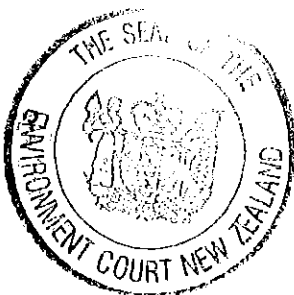
In addition Condition 64(i) of Resource Consent CON20061607603-13 states that this EMP, and any variation shall incorporate :

“Sharing information with and accommodation of other harbour interests, including sand extraction, commercial and recreational fishing and inhabitants such as Te Uri o Hau”

11.2 Procedures

The process for review and proposed amendment of the EMP by CREST shall follow the procedures set out below:

1. CREST shall circulate Annual Reports in accordance with protocols set out in this EMP.
2. CREST shall prepare a Draft EMP Review Report for the purposes of determining whether the monitoring performed under the EMP is adequate to address the matters set out in conditions of Consents held by CREST, having regard to any change in circumstances, or where additional monitoring is necessary as a consequence of new outcomes which have emerged from ongoing monitoring or where new scientific information has become available over the previous year.
3. No later than 30 days after providing each Annual Report, CREST shall circulate the Draft EMP Review Report to Te Uri o Hau, Department of Conservation and the Working Party of the Kaipara Harbour Monitoring Programme (“Consulted Parties”).
4. Within 30 days of circulating the Draft EMP Review Report, CREST shall undertake consultation with the “Consulted Parties” in regard to the content of a Final EMP Review Report.
5. CREST shall revise the Draft EMP Review Report into a Final Review Report, incorporating the outcomes of consultation with the “Consulted Parties” as considered appropriate by CREST.



6. CREST shall prepare a separate Consultation Record of all matters raised by the "Consulted Parties", noting how each matter has been addressed by CREST in the Final Review Report.
7. Within 30 days of completing consultation in 4 above, CREST shall provide a copy of the Consultation Record and the Final Review Report to each of the "Consulted Parties" and to the Northland Regional Council (NRC).
8. The NRC shall review the Final Review Report and shall certify the EMP for revision if the NRC's Chief Executive Officer or his/her delegate is satisfied that the amended EMP is likely to continue to address the matters set out in the conditions of this consent to at least the same extent as in the current EMP.

