APPENDIX 6

KAPITI COAST DISTRICT COUNCIL WATER SUPPLY PROJECT

TECHNICAL ADVISORY GROUP REPORT

17 August 2010

A. INTRODUCTION

Since the establishment of the Technical Advisory Group (TAG) in October 2009 it has met virtually on a fortnightly basis. In addition individual members have attended meetings with the Project Manager and the consultants. In total and including meeting preparation, reading and emailing, TAG has contributed hundreds of person hours to the project.

Broadly speaking the Group has been able to cover its Terms of Reference (attached at Annex A) although some tasks remain to be dealt with during the next phases of the project. The Group has worked effectively with the Project Team and the consultants, the one difficulty from our perspective being the rush over the past few weeks to complete the investigations (some still remain to be completed), finalise the data required to make recommendations and assess the risks of the "preferred option" compared with those of the other finalist**. As a result TAG has had to reserve its position until the scheduled investigations have been completed and the risks considered more deliberately**. This should not hold up the project since the additional work will be necessary even if the consultants' "preferred option" is selected.

We should record here that two of our members have resigned - one as a result of other commitments and the other to avoid a potential conflict of interest situation which could not have been predicted and arose as the options narrowed to the final two. We wish to record here our appreciation of the work done by these two members.

Throughout its existence TAG has ensured that its deliberations have been confined to technical matters. We have seen the wider political and community issues as being the responsibility of the Council and have recognised that the Council has been dealing with the cultural implications through a parallel process - and the decision to restrict the project to in-catchment solutions reduced the complexities of these matters. It should be noted, however, that even though TAG has adopted a technical approach it should not be seen as supplanting the normal peer review process which should be applied to both final options, groundwater and dam.

We should also mention that while TAG accepts the importance of the environmental aspects of the project, it has largely left detailed examination of them to the experts commissioned by the Project Manager, and in particular, NIWA. Obviously further consideration of the environmental implications of the chosen option will be necessary in the lead-up to the consenting process.

Overall the consultants and the Project Team have produced an excellent result and they are to be commended for what they have achieved within the strict timeframe set by the Council. We now know a great deal more about the water supply options for the District and in particular the borefield; we know an in-catchment solution is viable - indeed is preferable on several grounds to an out-of-catchment one; based on a set of reasonable assumptions we know we have more than enough water within the Waikanae, Paraparaumu and Raumati (WPR) area to cope with normal peak demand as well as a 50 year drought up to the design boundary of 2060; we have an acceptable option within or close to, the Council's planning figure for base capital works of $23M; we can have a solution in place and operating within the Council's target date of 2015; we have listened carefully to the views of stakeholders and the public and incorporated those views within the scope of the project; and we have given detailed consideration to the issues which will be crucial to obtaining resource consent to the chosen option.

B. PROBLEM DEFINITION

The Council has decided that, in response to public demand, it must provide the District with greater certainty of high quality water supply looking ahead over the next 50 years. This applies particularly to the central part of the District - Waikanae, Paraparaumu and Raumati(WPR) - where the problem is at its most acute. Simultaneously the Council has also decided to embark on a programme of demand management and conservation with the intention of stabilising daily WPR consumption at 400 litres per person per day (lpppd) plus an allowance of 90lpppd, the current estimate of daily loss through leakage. The aim is to have in place a system which is capable of delivering 490lpppd to an estimated population of 50736 by 2060. The system must also be capable of coping with 1-in-50-year drought conditions.

At 490lpppd the existing population of WPR of 37932 needs 18,586m3 per day (although it should be noted that our current consent to take 23,000m3 per day has almost been reached during peak demand periods over the last few years). The current system of drawing water from the Waikanae River and processing it through the Waikanae Treatment Plant has been providing up to the consented limit of 23,000m3 per day when it has been required, but has a practical operating capacity of approx. 30,000 m3 per day. Based on the 50 year timeframe adopted by the Council and the medium population growth rate incorporated in the District Plan, normal peak demand would require a system able to deliver 32,000m3 including headroom per day by 2060.

Records over the past 35 years have established that a 1-in-50-year drought would result in the river flow being low, requiring continuous drawing from a dam or groundwater, for a typical period of 60 days. The mean annual low daily flow in the Waikanae River of 950 l/s would fall to 517l/s in a 50 year drought. It has been calculated that any emergency storage solution must be able to contain 1.9 million m3 of water to be drawn down over a maximum period of 149 days.

Current WPR normal peak demand is met comfortably within the Wellington Regional Council's consent limit of 23,000m3 per day as long as the borefield is operated in dry years. The greater demand of any enhanced system will require an increase in the Wellington Regional Council's consented daily ceiling. The consenting process is likely to be complex.

Any solution must not only be able to meet projected rates of demand but also must meet the quality expectations of the community, be sustainable and environmentally responsible and manageable within the financial limits imposed by the Council - at present set at $23M for the base capital cost.

C. DESIGN SPECIFICATIONS

At our request the consultants prepared a table which tested each of the final four options against the design specifications agreed by the Council. This table is attached at Annex B. It is clear from this table that any one of the four final options is technically feasible so that wider criteria will need to be applied in order to narrow down the field. What the table does show is the greater technical uncertainty in respect of Aquifer Storage and Recovery (ASR) as compared with the other three options. On those grounds we think it can be removed from the list although we consider the concept should not be discarded altogether and some elements of this option should be included in any future supply scheme.

When the base capital costs are considered alongside the design specifications it is apparent that the Borefield Treatment option is the most expensive of the four. However it is important that the Council should recognise that the cost of this option is high because in its present form it incorporates considerable expenditure on further treatment works in order to overcome the community's antipathy to drinking the bore water. If at some future time it became apparent that the community was prepared to accept untreated water from the borefield, the cost of this option would be reduced almost to the same level as the river recharge option.

For the purposes of the present decision-making process, we have agreed that there is sufficient uncertainty over the public's attitude to the use of bore water in the supply chain, to eliminate the borefield extension option.

D. DECISION CRITERIA

Having set aside two of the options we have applied a set of criteria to the remaining two. These are as follows:

(a) Water quality. The consultants have defined this as meeting the Drinking-water Standards for NZ 2005 (as revised 2008). After treatment water entering the treatment plant from the Waikanae River both meets this standard and is acceptable to the community. The limited tasting test (only 9 people were involved) indicated that the public's prejudice against drinking the borefield water could be misplaced. However there is no doubt of the existence of such a prejudice and it would take some persuasion to convince the public otherwise. In terms of the final two options, water quality is not an issue since both are based on the use of water taken directly from the river - of course, this assumes that the water entering the river from the dam after being stored, is not appreciably different from the normal river flow (there will be some change due to storage and release in the first few years until silt movement settles down). In respect of the recharge option while water quality is not an issue so far as public consumption is concerned, the question will be whether the borefield water will be acceptable to the public and the consenting authorities as a replacement for the river water below the treatment plant.

(b) Security of Supply. This has been expressed as the yield capacity of any storage option and has been set at 1.9m3. The normal peak demands for the next 50 years can be met from the normal Waikanae River flows provided the Wellington Regional Council approves the increased extraction rate which will be needed by 2060. In terms of the two storage options to cope with severe drought conditions - dam or borefield - both have been designed to provide the 1.9m3 requirement. It is the view of TAG that there is less technical risk attached to the dam option (given that there remain considerable unknowns about the performance of the borefield) but that there are other factors which balance the equation.

(c) Cost. We have considered the base capital costs, comparative net present values and the uncosted risks. The recharge option is a clear leader on this basis: the cost of this option and the burden on rate payers could be further reduced by staging whereas the dam option would require the full outlay when it is built. The cost of the land for the dam can only be estimated roughly at this stage. The Council has set a budgetary limit of $23M on the base capital cost. This does not take account of operational costs nor does it cover uncosted risk for any option. The evidence would suggest that there is much greater certainty of the recharge option being contained within the current budget but one can never be entirely certain that some unforeseen circumstance, which will blow out the final cost of any option, will not arise . The recharge option also has the distinct advantage of making the maximum use of the sunk cost of the borefield.

(d) Consentability. Both options would require lengthy and complex consent procedures. Both would require consent to increased extraction rates from the Waikanae River for normal peak demands. The recharge option will need consent to replace river water with bore water below the treatment plant - there is no doubt that river recharge is something of an unknown in this respect but the NIWA report indicates that the composition of the borefield water is comparable with other river systems around New Zealand which have not caused environmental problems. In the case of the dam, in addition to consent for the structure itself, there will have to be negotiations with DOC on the current covenants over parts of the proposed dam site. On the basis of our present knowledge, the river recharge option would be the less environmentally intrusive of the two.

(e) Commonsense. It is our impression of the attitudes expressed at the various public meetings, that the community would place a great deal of emphasis on any solution appearing to be sensible and sustainable from the ordinary ratepayer's point of view. A major factor in this respect will be the evidence that an in-catchment option is not only possible but indeed, preferable. Whichever option is chosen, it is clear that if a start is made next year, the project could be implemented by 2015 as planned - although the recharge option which requires less significant works would be more rapidly installed. It is probable that more effort will be needed to persuade the public of the efficacy of the recharge option since it requires something of a leap of imagination, but the twin benefits of cost and simplicity could well appeal to the community. On the other hand, the appeal of a defined storage facility which is sanctioned by experience, clearly visible and capable of being constantly monitored, such as is offered by the dam, cannot be underestimated.

(f) Environmental considerations. These have been covered above under "consentability". It is sufficient to note here the fact that the failed past efforts to find a solution to the District's water problems led to the report by the Parliamentary Commissioner for the Environment. It will be sensible to ensure that there is no repetition of that and that the Council is seen to give weight to these matters (as it is doing).

(g) Cultural considerations. We have taken the view that the Council's decision to seek an in-catchment solution (now reinforced by the new evidence on the Otaki River options) and its own actions in discussing the issues directly with the stakeholders, including particularly Te Ati Awa, has removed the need for us to consider cultural matters. We assume the Council will build these into its decision-making processes.

(h) Risk. It is perhaps in this area that there is the greatest divergence between the views of the consultants and TAG. For this reason we have produced a separate section on the issues raised by the uncertainties which will have to be identified, mitigated and managed. On balance we have concluded there is more risk with the recharge option than the dam.

E.RISK ANALYSIS

(a) Technical issues

The consultants have carried out risk assessments at several stages of the project. These have covered factors such as construction costs, legal fees, land purchase, design etc which can be costed. More qualitative factors such as public perception of water quality, environmental impacts, consenting difficulties, geological uncertainties etc have also been assessed. The latter risks are not readily amenable to formal costing. Let us refer to them as non-costed risks. Both costed and non-costed risks were assessed at various stages and were material, but not the only factors, used in the decisions on which options to reject and which to carry forward. Eventually the option list was reduced to four. On these four, more detailed cost analysis was carried out with statistical methods being applied. This enabled formal risk estimates to be produced for costs. (See below under "cost issues"). The non-costed risks have also been considered in some detail for the final four options and the consultants discuss these. We consider that the consultants have been diligent in their approach to both costed and non-costed risks. However we point out that TAG does not have the technical expertise, nor time, to examine these risk analyses in detail. We rely on the professional judgment of the consultants and their sub-consultants.

There is however an overarching assessment that is not easy to quantify or even precisely state. This is: “What trade offs are the Council and community prepared to make between the costs and the certainties of reliable clean water supply?”

The consultants engineering, environmental and risk analyses show that the cost of a dam is high but the technical and non-costed risks are relatively low. Dam technology is well proven - albeit roller compacted concrete construction is new to New Zealand and there are always risks with major earthworks.. The environmental issues are understood and can be either mitigated or offset. Water quality and security of supply are well defined. In simple terms the dam is a lower risk option than river recharge.

The river recharge with groundwater is lower cost than a dam. Uncertainties around further development of the bore field have been costed where practical e.g. allowance for some failed or non-productive wells. The cost of mitigating salt water intrusion by injecting river water is costed but the environmental risk of salt water intrusion cannot readily be costed. Neither is it simple to cost the uncertainties in understanding the whole acquifer system. Knowledge of the security of supply and impacts of pumping, particularly in future, is largely based on modeling. The consultants have made best endeavours to produce a good model. However only a limited number of model runs have been done and they acknowledge that more data, including from more bores and pump tests, is required. However, no matter how much we understand it today or model it, there are non-trivial uncertainies in security of long-term acceptable supply. This introduces significant risk. The risk can be reduced by having the groundwater modelling work peer reviewed. In simple terms the groundwater option is a medium or possibly high risk option.

The uncertainities in the river recharge option can be reduced and the consultants list a series of further studies. Similarly more analysis of a dam is required. Some of these studies will take significant time. Notwithstanding further work, the risk profile of a groundwater option is likely to remain higher than that of a dam.

The choice between options is fundamentally a risk trade off. Do we want a higher cost/ lower risk dam or a lower cost/ higher risk groundwater option? TAG does not have a consensus position but Council needs to recognize that it is making a trade- off decision.

(b) Cost issues

Beca's Summary Report - Section 4.1 discusses the risk-based capital cost estimates for the four options including the fact that that their calculations use for the best case and worst case inputs, the 10th percentile and 90th percentile cost estimates. The resulting risk-based cost estimates from 1000 iterations of the triangular probability distribution (using QERA and @risk) are given in Table 4.1 as:

Option	Dam	Borefield	ASR	RR with GW
Base Estimate	$23.5M	$28.2M	$20.8M	$18.5M
Expected Estimate – 50th Percentile	$28.6M	$34.1M	$24.8M	$21.9M
90th Percentile	$33.2M	$37.3M	$26.9M	$23.8M

TAG members are in agreement that these estimates are as accurate as can be done on current knowledge, with the cost data and other assumptions and the processes used unable to be improved. The detailed technical output from QERA/@risk also gives information on which are the fifteen most important/sensitive risks in terms of impact on total cost for each option.

Beca rightly commented that if an item makes it on to the resulting sensitivity table it should have its own risk mitigation action plan to enable the project team to focus on mitigating the risk/reducing its impact.

However, it is important to emphasise the meaning of the 90th percentile – there is still a 10% chance of a higher cost - which in turn would feed through to a higher Present Value (PV) for the option - the 90th percentile is not a maximum. Such a high cost would arise if a rare risk event with low probability but high cost consequences eventuated. An example will be useful here. On the RR with GW, the most favoured option, the most expensive potential risk (which tops the sensitivity table) is that of poor water quality during algal blooms in the river being unable to be treated by PAC & BAC, and needing ozone

treatment. This risk is regarded as small (2%) and if it were to arise, the associated costs are estimated as: (best, most likely, worst) - $2,500,000 3,500,000 5,000,000. Mainly because of this rare possibility, the summary statistics show a MAXIMUM cost of $29.6M on the 1000 iterations. Decision makers need to be aware of this small risk - almost all projects would have something similar to deal with. And it is reassuring to note that on this option the maximum still comes out much lower than on alternative options (where the maxima are over $41M for dam and for borefield extension). The maximum for the RR with GW is only just above the $28.6M 50th percentile for the dam. Hence this element of risk reinforces the rankings rather than casting doubt on them - but it does mean that in the worst outcome on this risk, the capital cost budget could be exceeded in order to secure high quality water.

The discussion above concentrates on risks for which the potential costs could be estimated. In Section 15.2 of Beca's it is pointed out that in addition, there are a number of risks assessed as being too difficult to cost, termed (somewhat oddly as they could still be costly) non-cost risks and for the four short-listed options, those risks which are “live”, and have either a “high” or “very high” risk priority, are listed in that section. The table includes the status of the risk in the light of the completion of the design and investigations to date and what further work will be undertaken in Stages 4 & 5 to understand and/or mitigate the risk should the particular option be preferred. These risks are also discussed in the main reports under each option, but it is important to recognise that they are not included in the costs and so further work on them is critical at the next stage before final decisions are made.

F.COMMENT ON CONSULTANTS RECOMMENDATIONS

TAG's views on each of the four recommendations by the consultants are as follows:

Recommendation 1:

Agreed, but with the riders mentioned above, first, that the Council needs to recognise the elimination of the extended borefield on grounds of cost is predicated on the assumption that the community finds untreated borewater unacceptable for drinking and must therefore be treated, and second, that some provision for experimenting with injection into the borefield should be incorporated into the District's forward planning;

Recommendation 2:

Not agreed as currently worded. Given that there are seven conditions which have to be met through further work and that there is a risk that this work could demonstrate this option could be "unfeasible" and "unconsentable", we consider it to be premature to describe it as a "preferred solution". At the same time, apart from one of our members who is strongly supportive of the dam option as being the "preferred solution", TAG agrees with the consultants' ranking of the options.

The first bullet point ("Establish a monitoring programme etc") is not clear to us and should be tightened. To reduce the risk of the river recharge option we believe the first step should be a peer review of the groundwater model by an experienced independent hydrogeologist.

We certainly agree with the fourth bullet point, the consultants' proposal to "optimise the approach to staging". In our view the base estimate for the river recharge option is likely to be too high and a value engineering exercise would be worthwhile. We are not convinced that cost saving has been maximised (e.g. shortening the pipeline by drawing on possible sources from the south bank of the Waikanae River). A more thorough investigation of staging could not only reduce the risks of this option but significantly reduce costs by delaying expenditure until there was a proven need to expand capacity. This in turn will be influenced by the success of the conservation programme, especially if there is a shift in public opinion which would permit the introduction of metering - the evidence world-wide is overwhelming that metering leads to better water management and substantial reductions in per head consumption.

Recommendation 3.

Agreed, but TAG would prefer that future-proofing is not seen as a precaution against events and changes which will occur over 50 years hence, but as part of a formal water management programme going forward (see below).

Recommendation 4.

Agreed that an Otaki River option should not be pursued in the current context of ensuring supply to the central part of our district, but if a holistic approach is taken, as it should be, to managing Kapiti's water resources in future, then the Otaki River must be an integral part of that system.

G. TAG CONCLUSIONS AND RECOMMENDATIONS

The consultants have produced an impressive report which gives the Council a sound basis on which to make further decisions. The field has been narrowed to two options, only one of which remains within the financial parameters desired by the Council (and even in that case costs could escalate if some of the potential risks eventuate). The choice lies, therefore, between a lower risk/ higher cost option (the Lower Maungakotukutuku Dam) and a higher risk/ lower cost option (River Recharge with Groundwater).

Whichever option is chosen, further investigation and risk assessment work will be necessary. The consultants' view is that there is sufficient certainty based on the information available to make that choice now and has opted for River Recharge. One of our TAG members is firmly of the view that the Dam option is preferable. The remaining six TAG members would prefer to avoid commitment to a single solution until the further investigation work has been completed and even then would want "the solution" to be one element in a comprehensive water management plan.

Accordingly the TAG majority recommends that;

1) the ranking of the options by the consultants should be agreed;

2) the programme of further work proposed by the consultants should be approved:

3) once that work has been done, the consultants, the Project Team and TAG should undertake further risk assessment in order to establish the viability and therefore the pre-eminent ranking of the River Recharge option;

4) assuming the River Recharge option's first ranking is confirmed and that its staging could substantially reduce its cost, the Project Team should draw up a draft water management plan which covers the whole of the Kapiti district and incorporates the following elements:

- an approach which integrates both conservation and supply measures;

- a 50 year timeframe which manages implementation in the most cost effective manner and on a staged basis which matches supply with proven demand;

- a modified River Recharge system to ensure supply to Waikanae/ Paraparaumu/Raumati which will then be developed to the consentability stage;

- the purchase of the site for the Lower Maungakotukutuku Dam to be held as a water reserve to enable a decision to be made at an appropriate time in the future whether to extend the River Recharge system or construct the dam;

- the clarification of all the consent and covenant issues for both the river recharge and dam options (including all the legal issues);

- an ongoing programme of research into the borefield which would include constant monitoring of its behaviour and experimenting with injection

- a risk assessment process which would ensure annual review of the effectiveness of the district's water management.

D K Hunn

Chairman

Technical Advisory Group