IN THE MATTER	of the Resource Management Act 1991 ("the Act")
AND	
IN THE MATTER	of applications by the Central Plains Water Trust (CPWT) and the Ashburton Community Water Trust (ACWT)

Statement of Evidence of Timothy John Hazledine

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1 INTRODUCTION

1.1 My name is Timothy John Hazledine. I am Professor and Head of the Department of Economics at the University of Auckland.

1.2 I have Masters Degrees in Economics from the Universities of Canterbury and Otago and PhD in Economics from Warwick University. I have held teaching positions at the Universities of Otago, Warwick, Balliol College Oxford, Queen's University Ontario and the University of British Columbia, in Vancouver. From 1975 to 1977 I was an economist at the Federal Department of Agriculture, in Ottawa. From 1983 to 1992 I was first Associate then Full Professor in the Department of Agricultural Economics at UBC. Since 1992 I have been a Professor at the University of Auckland.

1.3 I have consulted on resource management and related issues for the Electricity Commission, the NZ Institute of Economic Research, Waitakere City Council, North Shore City Council and others.

1.4 I confirm that I have read the "Code of Conduct for Expert Witnesses" contained in the Environment Court Consolidated Practice Note 2006. My evidence has been prepared to comply with that code

Mr Donnelly's evidence

1.5 Although the main focus of my evidence will be the presentation of my own cost-benefit analysis of the economic efficiency implications of the Central Plains Water Scheme (CPWS) proposal, to get to this I have to deal with the economic evidence presented on behalf of Central Plains Water Trust by Mr Phillip Donnelly.

1.6 Mr Donnelly presents three sorts of quantitative evidence:

- The contribution of the scheme to national exports which would 'enable an expansion of national GDP of up to $2.9billion per annum'.
- An 'Economic Impact Analysis' (EIA) of the effect of the scheme on the regional economy, with an increase in regional output of $1.3billion per annum and an increase in regional employment of about 2,700 jobs per annum.
- A Cost-Benefit Analysis extending over 35 years yielding the prediction that the present value of the net economic benefits of the scheme is $375 million.

1.7 In my opinion, the economic implications of the CPWS in so far as they are relevant to a hearing such as this under the Resource Management Act 1991 are both simpler and different to those presented by Mr Donnelly.

1.8 The material on the value of the contribution of the scheme to national exports did not appear in the earlier (May 2007) economic assessment tabled by Mr Donnelly and it is, in my opinion, not helpful for the Commissioners that it appears now. I would describe this analysis as half baked at best. It is, in my opinion, of absolutely no value to this Hearing. Mr Donnelly's evidence displays no expertise in macroeconomic matters. The Commissioners should have no regard to this material in his evidence.

1.9 The methodology used to generate the Economic Impact Analysis is a standard methodology which in my opinion is badly flawed because it is literally one-sided: it considers only the demand side determinants of economic activity, ignoring the supply side resource constraints that also determine outcomes. However, be this as it may or may not, a regional impact analysis is really only relevant to local authorities and others concerned with planning matters, not to hearings such as this which have a national welfare focus.

1.10 I will go into more detail on this matter, and the failed export analysis, in section 5 below, but I can summarise the essence of the point thus. The numbers generated by the EIA would in my view be better expressed as follows: "The scheme will divert $xxx millions of resources from other valuable uses in the economy. The scheme will move yyy thousands of workers from their present productive employment."

1.11 This perspective then leads us on to the key question, which is simply this: will the diversion of these resources and workers be of net national benefit? That is, will the resources and workers be *better* deployed in this scheme than in their alternative uses? And this question, of course, is the question answered by a cost-benefit analysis, which is all that economists can usefully contribute to this matter. Before moving on to the CBA, however, I would like to make some comments on the use and mis-use of the numbers in this and other cases.

Big number numbness

1.12 Whether I am correct or not that Mr Donnelly's impact numbers are either wrong or irrelevant, it is a matter of fact that they are (a) very large, and (b) presented with a minimum of supporting evidence and documentation (especially the EIA). Yet, large and largely unsubstantiated numbers of this sort are almost inevitably repeated, with no critical assessment, in the media.

1.13 So, just in the editions of the newspapers I happened to read when in this region I found the following:

- "Irrigating the [Central Plains] region will boost NZ's exports by $2.9 billion each year." (*The Press*, 20/02/08).
- "Proponents say the scheme would boost the national economy by more than $2 billion a year." (*The Press*, 20/02/08).
- "The Waitaki, Waimate, Mackenzie and Timaru districts will be the biggest beneficiaries [of Waitaki River irrigation schemes], their economies boosted by up to $800 million a year". (*Otago Daily Times*, 12/01/08).

1.14 A full search of other newspapers and media would yield dozens of examples of stories such as these. It is a worry because it must be very easy for readers to equate a "boost" to a benefit, as indeed the ODT report does explicitly. And *The Press* story of 20 February is in fact a not a correct reading of Mr Donnelly's report – he actually predicts a boost to *national* GDP of $2.9 billion/year, not exports.

1.15 It seems that numbers like these are so far outside of most peoples experience (including journalists' experience) that they are simply numbed by them into suspension of disbelief; people lose their everyday scepticism. Suppose, for example, a reporter had been told by someone advocating putting in a roundabout at dangerous intersection that the new roundabout would save twenty traffic fatalities every year. The reporter would probably say, as most of us would: "That's got to be nonsense. There's no way a single roundabout could save twenty lives." These are numbers we have some empirical sense of; have a feel for their realistic values. But the number reported in *The Press* is presented with no such scepticism, though $2.9 billion in additional exports from the CPW proposal is just as fantastic as the twenty claimed saved road deaths.

1.16 As for getting the numbers wrong: to move the metaphor down the road, suppose the proposal was for a pedestrian crossing on a wide and busy street, and a reporter had written that this would save several drivers' lives each year. No no, we would cry, pedestrian crossings actually *increase* motor vehicle accidents (more collisions from sudden stops) – the lives that they save are of pedestrians. Yet a report mistakenly switches 2.9 billion dollars of national output to 2.9 billion dollars of exports, and nobody even notices apart from one Auckland economist who happened to read *The Press* that day.

1.17 Hopefully, the Commissioners in this Hearing will be more careful and tough-minded in their assessment of very large numbers presented with very little evidential support.

Layout of this evidence

1.18 In section 2 I will set out what I believe is an appropriate framework for the cost-benefit analysis of the CPWS. In section 3 I will document my data and parameter choices. Section 4 will then report running of the model and the outcomes. In Section 5 I will substantiate my criticisms of Mr Donnelly's other numbers. Section 6 concludes.

2 THE APPROPRIATE FRAMEWORK FOR ECONOMIC ASSESSMENT OF THE SCHEME

2.1 All the economists involved in this case (Donnelly, Brown, Butcher, Hazledine) actually agree that cost-benefit analysis based on economic efficiency considerations is what is required for assessment of the merits of this scheme under the Resource Management Act. Mr Donnelly has carried out such an analysis, and I accept that he does know what he is doing here. However, the problem I see is that the Donnelly CBA goes too far in one direction, and not far enough in others. Specifically, the 35-year time horizon of his projections is really well beyond the bounds of our capability to make useful quantitative predictions. And the scope of his analysis is restricted in that quite a long list of considerations, which go against the economic viability of the scheme, are not included. Also, a key but unwarranted assumption about improvements in dairy farmer productivity makes a big difference to his results.

2.2 I will deal with the excluded considerations and the assumptions in the next section. Here I would like to approach the problem of the time horizon, in a matter such as this in which, because of the effective irreversibility of a decision to approve, the long-term implications cannot simply be ignored. I will not claim to have all the answers to the very real difficulties of this situation, but will try to come up with something manageable and useful for the Commissioners.

2.3 Mr Donnelly uses a 35 year time horizon because that apparently is the life of water permits. Yet we all know that one thing we do not know is what land will be used for in thirty five years. It was Mr Donnelly himself, I believe, who made the point in oral testimony that no-one could have predicted 35 years ago that the predominant land use in the Marlborough region would now be vineyards.

2.4 In any case, Mr Donnelly is not really attempting to predict long-term land use in his model. What he does is predict that the medium term impact of the CPWS would be a more-than doubling of dairy farming acreage (and some other land-use switches), that this would be in place in year 6 of the thirty five years, and then repeats the year six numbers without change for the next 29 years.

2.5 So, if the annual net benefits in year 6 are positive, so will they be for the next 29 years. If they are negative, they will stay negative. It is just a matter of what discount rate to use to aggregate the thirty years of net benefits or disbenefits to a net present value (NPV).

2.6 In my opinion there is little justification for using NPV methods to aggregate a long time series of numbers around which the uncertainty grows over time such that we can have little faith in their values further than a decade or so out.

2.7 Instead, I suggest that we calculate the annual net benefits of the scheme on an "up and running" basis, and compare these with the up-front costs of building the scheme and the associated disruptions to peoples' lives. That is, the up-and-running benefits could be taken as the return on the upfront costs.

2.8 One benefit of doing this is that we do not have to get into arguments about the appropriate discount rate.

2.9 The Commissioners may still have to make a judgement on the direction of likely long run trends. Without predicting actual land use in the long run, it is relevant to form an informed (if possible) opinion of the likely impact, in particular, of climate change and resource depletion trends in New Zealand and in the world. Is water likely to get more or less valuable in the long term? Are food prices likely to continue to rise long term? Then they could judge whether the up-and-running net benefits of the scheme are likely to get larger or smaller in the more distant future.

2.10 These are big issues which cannot be avoided in the present case because of the irreversibility of the CPWS. If we were considering, say, the net benefits to a city of holding an annual 'supercar' street race, then we could stay within a short time horizon for the decision because there is no long term commitment of resources -- the streets can quite quickly be restored to their original state if the event is discontinued.

2.11 But the Central Plains scheme is a mega-project. The cost of dismantling it and returning the land to its original state would surely be huge – at least as large as the construction costs. And some things – old mature trees, hundred year old homesteads, the lives of people dislocated -- could never be restored to their original state.

2.12 This means that the Commissioners must both consider the long-term future and take a cautious approach to it – a decision to not proceed can be reversed later, but a decision to proceed cannot.

2.13 So, bearing in mind what appear to be significant negative up-front impacts, if the up-and-running net benefits of the scheme are small or negative, then authorisation should probably be declined, or, at most, deferred until longer term trends become more apparent. If the up and running net benefits are substantial, but the long term outlook not sanguine, then the decision should probably be deferred. Only if both up-and-running benefits and the long term

outlook are strongly positive could the Commissioners feel confident about issuing an authorisation now.

3 DATA AND PARAMETERS

3.1 In this section I first document the numbers I will use in my up-and-running cost benefit analysis. Then I will then briefly discuss the up front costs.

Land use

3.2 I have accepted the medium term land use scenario proposed by Macfarlane Rural Business and adopted by Donnelly. This features a more-than doubling of dairy farming acreage from 22,000 to 46,500 hectares; the elimination of dryland livestock farming; and the introduction of partially irrigated mixed farming, irrigated livestock finishing, and irrigated intensive cropping. I also make use, with the single exception of the assumption on post-scheme dairy productivity, of all the updated farm budget numbers prepared by Macfarlane as given in Appendix 2 of Donnelly's 31/01/08 report. In my 'base-case' scenario I will make use of the scheme capital cost estimates used by Donnelly.

Scheme construction and maintenance costs

3.3 It makes things simpler if we convert the capital cost (on- and off-farm) estimate for the scheme of $682 million into an annual flow. That is, we suppose that the shareholders take out long-term loans to fund the scheme. As the base-case interest rate for this loan I use the figure for the cost of capital used by Macfarlane Rural Business, which is 7.5%. Of course this figure is well below current interest rate levels.

3.4 One major expense missing from Donnelly's analysis is the cost of maintaining the scheme. This assumption comes over from the Macfarlane Rural Business Reports in which it is stated; 'The irrigation cost is calculated as 100% capital hence no [annual] charges are calculated' (eg para 4.6 in the Report of 24th April, 2006). But the scheme will not run itself. It will need to be managed, maintained and depreciated, and this must be costed in to the calculations of net benefits.

3.5 I do not have expertise in civil and construction engineering matters. A Google search revealed the information that, over a long period of time, the maintenance costs of roads in Australia has been around 14-20% of their construction cost. I found that bridges have maintenance of costs of 2% of construction costs. Perhaps bridges -- like dams – have to be built to a more durable standard because failure would be more catastrophic than the damage done by deterioration of roads. The New Zealand Inland Revenue Department allows depreciation rates of 2%, 10% and 12.5-20% on buildings, plant & machinery, and motor vehicles, respectively. These depreciations in capital value are on the assumption that normal maintenance is carried out, which is an additional cost.

3.6 The Macfarlane Rural Business farm accounts set (without any discussion or supporting data) annual depreciation rates for a dairy farm at $122.5/ha, and allow repairs and maintenance expenditures of $120/ha. In total, these two numbers are just about 3% of the capital investment value of more than $7000/ha (excluding land and livestock). This percentage seems implausibly low.

3.7 In my spreadsheet analyses I will set the annual costs of managing, maintaining and depreciating the off-farm scheme (reservoir, dam, canals, tunnels and related machinery and fittings), along with the on-farm costs not fully accounted for in the Donnelly/Macfarlane analyses, at 5% of the total capital value. This seems to me likely to be a low rather than high estimate.

Environmental impacts

3.8 The Donnelly analysis has no entry for the environmental damage caused by the increased dairy acreage. MAF ("Projected Impacts of the NZ Emissions Trade Scheme at the Farm Level") costs the emissions of methane and nitrous oxide from dairy cows and associated nitrogen fertiliser, fuel and electricity use at 16.1 cents/kg if the carbon tonne equivalent price is $15 and 53.4 cents/kg if the carbon price is $50.[1] These are of course early days in the assessment and pricing of greenhouse gas emissions, but numbers like these seem to be quite widely used. I will use a carbon price of $30/tonne for my base-case scenario. Note that the damage is only calculated on the increased dairy acreage made possible by the CPWS, not on the existing operations which would continue as before.

3.9 The other main negative environmental impact of dairying appears to be pollution of waterways and aquifers from run-off of cow excrement and fertiliser. There is some promise by the promoters of the scheme that such effects will be 'mitigated' but I can find no sign of any provision for doing such in the budgets. I have set the cost of mitigation plus any unmitigated damage at $5million/year, which is about $200/ha/year for the additional approx. 24,000 hectares converted into dairying as a result of the scheme.

Value of the water at source

3.10 No extraction charge is presently levied on the holders of water rights. However, this does not necessarily mean that the water has no economic value. Scheme proponents argue that indeed their water would have no positive opportunity cost because it would be extracted at a time when there was plenty of water in the rivers for other users and so would have no value unless stored, which would only be possible under the CPWS, with its reservoir lake.

3.11 I can see their point, but I am also aware that there is an alternative use for the water which many opponents of the scheme appear to value quite highly, which

[1] I am using these figures as estimates of the actual damage, not necessarily of the costs of these born by dairy farmers, which are dependent on the allocation of property rights to pollute. Independent estimates of external effects from Canterbury dairying are presented by Peter Tait and Ross Cullen of Lincoln University, in 'Some External Costs of Dairy Farming in Canterbury' (undated).

is to leave it in the rivers, where it will have direct amenity value, enhance the long-term health of the river systems, and replenish aquifers.

3.12 Kerr *et al* used survey and related methods to estimate short-run present values of recreation and preservation values of the Rakaia and Waimakariri rivers, the latter of which in particular is an extremely popular fishing and boating resource.[2] Their numbers, which they consider likely to be underestimates, are in the tens of millions of dollars (present values). Of course, loss of water to the CPRS may diminish but will not eliminate the recreational value of the river.

3.13 There is also the possibility (certainty?) that if the Central Plains Trust application is denied others will come forward to claim the extraction rights, implying that the right to extract must have economic value to them (though this value might not necessarily exceed the leave-it-in-the-river value, which includes, of course, the option value of deciding at some future time to allow extraction, once long-run trends in water supply and demand become more clear).

3.14 In this first draft I will simply assign a base-case value of $10million/year to the opportunity value of the water. That is about 2½ cents per cubic metre, based on the planned extraction flow from the rivers of 410 million m^3 per year. Less than 100 kilometres away, water from the tap is sold to city households at more than $1/$m^3$ – fifty times more. How little can it be worth at source?

3.15 As far as I can make out from the Macfarlane farm budgets, dairy farmers in the region currently spend around 3-4 cents/cubic metre extracting water from their wells. The question is what 'rent' they get from that water. Would they be prepared to pay another 2½ cents in extraction fee rather than close down their dairy operations? If so, then a figure of $10 million/year as the opportunity value of the water at source is not too high.

3.16 During Mr Donnelly's oral testimony at the Hearings (23/04/08) Commissioner Milne expressed considerable interest in the issue of comparing the CPWS use of the water with the value of the water in other possible schemes. Mr Donnelly's response to this was that the "Coase Theorem" makes comparison unnecessary: 1st-in-first-served determines the initial allocation of the rights, then, if some other user could find a higher value use they will simply make it worth the while of the initial holder to sell them the rights. Efficiency, if not necessarily justice, will be served by the market. To this Commissioner Milne made the observation (I paraphrase) that if that were the case then, apart from the environmental effects, the Commissioners should just say "Do it", with no further analysis needed. That is a pertinent point, and one which many opponents of the RMA process might well applaud heartily. However, it is my understanding that the process – rightly or wrongly – does require the approval of the proposed *use* by the applicants of the water and in this setting it is indeed desirable that any opportunity cost of the 'raw' water be identified and quantified.

[2] Geoffrey N. Kerr, Basil M.H. Sharp and Kenneth L. Leathers, 'Instream Water Values: Canterbury's Rakaia and Waimakariri Rivers', Lincoln University, Agribusiness and Economics Research Unit, Research Report September 2004.

3.17 I note that the Coase Theorem applies in full only in situations where all decisions are freely reversible. This is not the case for the CPWS, which as noted above, is in effect an irreversible investment once built. So, if building it were a mistake, the costs might be mitigated by the shareholders in the scheme selling out to some other higher value user, but such would not be likely to lead to the optimal allocation of resources on a *de novo* basis.

3.18 Also, while it is correct that the consents are transferable, it is my understanding that it is the consents for the project as approved as a whole which can be transferred, not the right to draw the water in isolation. This further reduces the value of the Coase Theorem in this case.

3.19 I note that Judge Jackson, in *Rangitata*, quoted my economist colleague Dr Basil Sharp, who had appeared as an expert:

> 'History has shown, repeatedly, that natural resources that are not priced are over utilised and their sustainable use compromised…I was unable to find a cost-benefit study that explicitly prices water…failure to properly account for the opportunity costs of scare water resources biases the results in favour of development and represents an uncompensated transfer from the market' (2004, section 3.2)

Farm productivity

3.20 One feature of the Macfarlane/Donnelly calculations which has attracted considerable criticism -- even, scorn – is the assumption that the yields of irrigated dairy farms in the region with the scheme would be substantially higher – about 21% -- in terms of kilograms of milk solids per hectare than present yields. This is assumed to occur partly through increases in per hectare stocking rates and partly from more milk per cow. No good reason is given for this massive increase in productivity, which has led to one opponent of the scheme, Mr Brian Thompson, to refer to CPWS water as "magic water". Actually, it is not quite like that, because Mr Macfarlane does state that the productivity of existing farmers (who will switch, by assumption, to the new water source) will not alter[3]. This means that the new dairy farmers must achieve productivity rates nearly 40% higher than the current operators, which if not magic seems at the least hard to swallow. In the analysis below I will not assume any change in dairy farmers' productivity.

3.21 Since apart from dairying no pre-scheme farm type is assumed to continue post-scheme, I cannot ascertain from the farm budgets whether any "magic water" effects have been built in to the productivity assumptions about the non-dairy post-scheme farm operations. I will assume not.

3.22 A difference between Mr Macfarlane's 2006 and 2007 dairy farm budgets is that the number of cows per hectare is quietly increased by 0.25 -- from

[3] Macfarlane (30/04/07, para 2.3): 'Our dairy budgets assume an increase in milk solids production of 279 kg/ha. For a number of existing farms with an existing allocation of reliable [well] water, such and increase will not occur.'

3.25/3.50 (pre/post scheme) to 3.5/3.75. I cannot find any documentation or justification for this, but will use the higher initial number (3.5) in my basecase.

3.23 Wells (2001)[4] surveyed 150 dairy farms over the 1997-99 period and analyses data from this survey as well as twenty years of aggregate dairy sector data. Wells found that both herd size and stocking rates (cows/ha) had risen since 1980, but that there was no trend in productivity (kgMS) per cow, and that in particular large-herd farms did not have systematically higher productivity per cow than smaller farms.

3.24 Wells determines that a 'national average' irrigated dairy farm in 1997-99 would produce at 917 kgMS/ha. The Macfarlane/Donnelly assumption is for 1330 kgMS/ha (= 380x3.5). Wells takes as a specific case "Farm J" which is an irrigated Canterbury dairy farm producing at 1176 kgMS/ha – a performance level apparently placing this farm in the top quartile of dairy operations.

3.25 Even allowing continuation since 1999 of what appears to be about a 0.5% per year trend increase in farm output/ha due to increased stocking rates, it seems that the Macfarlane/Donnelly assumption is that Central Plains dairy farms are unusually productive. And note that this is without adding on top any "magic water" assumption of yields further increased post-scheme.

3.26 I note that a careful reading of the Macfarlane and Donnelly reports reveals that they are both actually quite gloomy about the viability of the scheme, from the farmer's perspective, which includes paying for the farm land, which is not a factor in the CBA, since the same land is in use with and without the scheme. Basically, in order to screw up the returns to something approaching financial viability, they have to assume that farmers of way above average ability will accept well below average returns.[5]

Milk price

3.27 An important variable in determining the economic efficiency of the scheme is the price of milk solids. The Fonterra payout has increased sharply over the past twelve months, and in the 31/01/08 version of his Cost Benefit Analysis Mr Donnelly appears to have used a price of $5.50/ kg MS, which is up from figures of $4 and $4.20 used in earlier reports. Mr Butcher argues that lower figures should be used, based on long term historical averages. I do not agree with this. Unfortunately, it seems likely now that NZ and the world has entered a new regime of higher food prices, due to crop prices increased by climate

[4] Colin Wells, 'Total Energy Indicators of Agricultural Sustainability: Dairy Farming Case Study', MAF Technical Paper 2001/3, August 2001.

[5] Donnelly (July 2007, para 4.7: 'it is assumed that new irrigated land will operate at the top end of performance levels reflecting the need for farmers to perform efficiently so as to service the debt levels that will incur as a consequence of the scheme's development'.
Macfarlane (revised 19 April 2007, para 3.2): 'any costings above [option 5] will be outside most farmers' psychological comfort zone and very difficult for them to service'.
Macfarlane (24/10/07, paras 3.7, 3.8): 'cost of debt and equity will need to be low…need to reduce the cost of capital'.

change, population pressure and the current fad for converting crops into biofuels to replace petrol in motor vehicles.

3.28 Note, however, that the currently very high dairy prices (well above even $5.50) are unlikely to be sustained. This is because these high prices are themselves a signal and an inducement for actions which will in the medium term result in supply increasing and demand falling, as both farmers and consumers respond to higher returns and costs. In particular, there is a huge amount of inefficiency built-in to world dairying industries, including those of Europe and North America, because of the restrictive regulations dairy farmers have secured for themselves in almost every country apart from NZ. At the higher prices, pressures from the more efficient farmers to break through those regulations will eventually become irresistible, and the NZ dairy industry can expect to be competing with suppliers more productive than they have to deal with at present.

3.29 I note that the NZ MAF forecasts for annual dairy average payouts from 2008 through 2011 are 5.50, 5.18, 5.04 and 5.22 dollars per kg MS.

3.30 In my base case scenario I will use the latest Donnelly figure of $5.50/kg MS and I will then show results for higher and lower prices.

Other price and cost increases

3.31 In a high dairy price scenario it is reasonable to expect higher farm input prices, since the only long run reason for higher dairy prices (apart from carbon etc taxes) is higher world feed and fertiliser costs, which will trickle through to NZ prices. In the Central Plains farm budgets feed and fertiliser accounts for around 40% of all cash farm working expenses.

3.32 It is also prudent to investigate the possibility of cost overruns in construction of the schemes. It is a 'stylised fact' that just about all large building and civil engineering projects end up costing more than planned, and that very few come in under-budget.

Loss of farm land

3.33 The scheme itself will have a large footprint, most of this taken from farmland. My 'back-of-the-envelope' calculation is that the reservoir will cover 1200 ha, the headraces 400 ha, the distribution canals 1200 ha, plus there will be a "large hole" excavated for dam fill and other yard etc requirements. The total land required seems to be around 3000 ha, most of which is currently farmed. This is about 4% of the scheme area. In the basecase I will use the figure 3% for the loss of productive farmland due to the scheme.

Up-front impacts

3.34 There can be little argument that the construction period of the scheme will be unpleasant and costly. Mr Taylor's report gives a remarkably detailed inventory of the local impacts, most of them negative. Some of these unpleasantnesses

and costs can be quantified, some are intrinsically qualitative. In the former category, we could put a value on the money tied up building the scheme before the returns kick in, assumed to be in year 6 in the Donnelly analysis. We could possibly put some sort of quantitative value on the noise, dust, danger etc to the local community of the construction work. The value of lost farm output due to interference from construction activities might be estimated by an expert. But how do we quantify the distress -- which may be literally heart-breaking – caused to families forced to leave the land they have lived on and farmed for generations? That is a nasty business which I would rather avoid. The Commissioners will have read, heard and absorbed huge amounts of evidence on the up-front impacts of the scheme: it will be their difficult job to assess the overall magnitude of the effects.

3.35 I will just note that any compensation for and/or mitigation of harmful effects that might be proposed or promised will have costs, which must be included in the assessment of impact effects.

4 NET BENEFITS OF THE SCHEME, UP-AND-RUNNING

4.1 In this section I report the results of my cost benefit analysis of the changes to the Central Plains farm sector that, it is assumed, would result from the availability of scheme irrigation water. I will show on Table 1 results for a number of scenarios: a 'base-case' which might be taken as representing a cautiously optimistic view of the economics and environmental impacts of the scheme; then various other scenarios which "tweak" the assumptions or parameters of the model in a more or a less optimistic direction. In the different scenarios the parameter which has been changed from the base-case is highlighted in yellow.

Base-case scenario

4.2 Column A is the base-case, with a $5.5/kg MS dairy price and a middling carbon tonnes-equivalent price of $30. The scheme is responsible for an annual increase in farm cash flow (profits or earnings before interest and tax) of $106.8 million. (Note that this is for all farms, not just dairying.) Servicing the capital required to build the scheme would then absorb $51.2 million of this, with another $34.1 million for scheme maintenance. The CO2 equivalent damage due to the addition dairy farming is costed at $9.8 million and water quality detriments plus the opportunity cost of the water used by the scheme (both rather arbitrarily measured here) lop off another $15 million. The bottom line is that the annual net benefits of the scheme, up-and-running, are about zero.

Differing milk prices

4.3 Columns B and C explore the implications of lower and higher milk prices -- $4.50 and $6.50 per kilogram of milk solids. In the higher price scenario, farm working expenses are increased by 5% from their present levels, reflecting the almost inevitable link between world dairy prices and feed and/or fertiliser prices. With lower prices net benefits turn quite strongly negative, at -

$33.7million/year; higher prices deliver a $20.7 million/year positive net benefit.

Scheme cost over-runs

4.4 Unsurprisingly, a 20% cost over-run on the building of the scheme hits the bottom line (Column D). The harmful effect on net benefits is amplified by the assumption that the percentage of scheme costs required each year for maintenance is constant.

Fewer cows/lower yields

4.5 If we restore the original Macfarlane estimate of the number of cows per hectare on Central Plains dairy farms (Column E) then $6.6 million is clipped off the base-case net benefits. This is because, with fewer cows/ha, the value of the additional dairy land (compared to the pre-scheme non dairy returns on this land) is slightly reduced.

4.6 Reducing yield per cow by about 9%, from 380 to 350 kg MS, to bring the yield numbers closer to national averages for NZ dairying, along with the lower cows/ha number, reduces annual net benefits to -$21.5 million (column F).

Environmental damage scenarios

4.7 Columns G and H run lower ($15/tonne) and higher ($50/tonne) carbon price scenarios. The difference in net benefits between the two scenarios is $11.5 million/year. Different numbers for water quality detriments and water opportunity value do not require formal modelling: they can just be added directly to the base-case bottom line.

Farm cost squeeze

4.8 Column I shows a scenario in which farmers are caught in a cost squeeze due to higher input prices – set 10% above the Macfarlane levels. Predictably, this has its harmful effect on the bottom line.

Extreme scenarios

4.9 Finally, columns J and K bend the scenarios to be as “bad” and “good” as is reasonably possible within this set of parameters. With milk prices not far above historical levels, 10% farm input cost increases, 20% construction cost overrun, smaller herd size and lower milk yield and a $50/tonne carbon equivalent cost, net benefits plummet to -$82.5 million/year. In the other direction, with $6.50 milk solid prices, no increases in costs and a $15/tonne carbon price, annual net benefits are up to $32 million/year.

5 THE DONNELLY EXPORT BENEFITS AND ECONOMIC IMPACT ANALYSIS

5.1 I have asserted above that Mr Donnelly's analysis of the export-related benefits of the Scheme is invalid, and that the Economic Impact Analysis is not relevant to this Hearing under the Resource Management Act. I now explain the basis for these assertions.

Value of additional exports to the New Zealand economy

5.2 Mr Donnelly contends (e.g. his paras 4.6 - 4.8) that most of the increased dairy output made possible by the scheme would be exported, that the additional exports would 'provide the foreign exchange to purchase [a similar value of] imports, and that these imports 'could enable a sustainable expansion in national economic activity of $2.2 billion to $2.9 billion or an expansion of around 2 percent in New Zealand's GDP'.

5.3 [I note that in Mr Donnelly's oral evidence the "could enable" became an unqualified "would". He stated that the CPI scheme 'in my estimate will increase NZ's gross domestic product by more than 2 percent per annum" (Hearing, 23/04/08, Hazledine transcript).]

5.4 Mr Donnelly's suggestion that increased exports from the central plains dairy farms would be spent on additional imported goods, which would 'enable' NZ's national output to be increased by a multiple of those imports, is apparently based on a model dating back to the 1960s.

5.5 In this model a very poor country needs to export to pay for imports of capital goods that are necessary for it to increase its production. So, if only subsistence farmers could export more of their output, they could use the foreign exchange to purchase an imported tractor, which would then enable them to increase productivity and output. (Their problem is that, without the tractor they are too poor to produce a surplus that can be exported – they need someone to give them a tractor first.) This model had some relevance to the underdeveloped societies of Asia and Africa of the 1950s and 1960s. It even had some relevance to the NZ of that period in which import controls meant that there was, in effect, a premium on foreign exchange earnings. But it has absolutely no relevance to the modern developed market economy in which currencies are exchanged freely on open markets. There is no shortage of foreign exchange in NZ and therefore no premium value to be attached to selling something overseas rather than domestically. Indeed, if a marginal kilogram of milk fat solids is worth as much to a NZ consumer as to an overseas customer, then it is more efficient to sell it locally, because transaction and transportation costs are less.

5.6 Mr Donnelly and others who talk-up exports from the supply side are getting the causation around the wrong way. It is true that there is an empirical correlation between high performing businesses and success in export markets, but the reason for this is that firms export because they are good, they are not good because they export. Here we have a scenario of some additional milk production, which would be passed through the processors and on to Fonterra,

who will eventually find a market for the product, somewhere in the world, albeit at the cost of having to slightly shade its price for all dairy products (the negative terms of trade effect of an increase in export supply). There is no particular merit in that.

5.7 As for the macroeconomics of Mr Donnelly's proposal, whereby the additional exports would be of value in reducing our large current account deficit: I do not want to get into all the theory here, but will just report that the economists and policymakers who are expert in these matters believe that the current account deficit is really a capital account issue: the necessary consequence of a capital account surplus which is caused by the inflow of foreign borrowings needed to make up for our low national savings rate. It is not about a shortfall in exports at all.

5.8 To give an indication of the difficulties Mr Donnelly has got himself into here: in his story all the additional exports are used to pay for additional imports to "enable" the increase in GDP, so there would be no change in the current account deficit from this source anyway.

Economic Impact Analysis

5.9 What are called 'economic impact analyses' (EIAs) make use of off-the-shelf Input-Output tables plus "multipliers" to predict the impact on economic activity (output, value added) and employment in various sectors of an autonomous event, such as a Rugby World Cup or a mega project irrigation scheme. Because of the multipliers, these studies are very popular with public and private sector clients keen to puff-up the apparent value of their schemes.

5.10 I consider these analyses to be generally of little use, because they pay no heed to the supply side of the story. They rarely note that economic activity or employment "boosted" in one region must be reduced by a nearly equivalent amount somewhere else. Apart from adjustment costs, there are no particular normative implications to a change in location of activity, at least not at the national level relevant under the RMA.

5.11 I should note that Mr Donnelly (and Mr Butcher) are fully aware of the limitations of EIA, and are careful to note these[6] – the problem is that their clients (and the media, as noted above) are not so careful.

5.12 In my opinion, in the present case, an economic impact analysis that would have been of more practical use to the district and regional planners would use a micro-level case study approach, rather like that adopted by Mr Taylor in his exhaustive listing of socio-economic impacts of the CPWS. So, it would be

[6] So, in para 5.1 of Mr Donnelly's January 2008 evidence: 'Cost benefit analysis (CBA) is the standard, generally accepted, tool for assessing whether a project or policy is efficient (i.e., whether a specific allocation of resources results in a net improvement to society's economic well-being). Economic impact analysis, however, examines how the policy or project will change the economy, assessed in terms of snapshots of different points in time."
Mr Butcher's his written evidence for this case does not cover Economic Impact Analysis, but from conversations with him I am sure that he is aware of the limitations of this methodology.

quite useful from the planning perspective to know if the additional dairy output will require a new processing plant, or whether this can be accommodated in existing processing capacity. If a new plant is needed: where best should it be built? An Input-Output based EIA cannot answer questions like these.

6 CONCLUSION

6.1 I have examined the assumptions underpinning analysis of the Central Plains Water Scheme and carried out my own Cost-Benefit Analysis of its impact. Table 1 records my findings that on most scenarios annual net benefits generated by the scheme when it is up-and-running are small or negative. Given the various up-front costs and disturbances of the scheme, my conclusion is:

- Mr Donnelly's analysis significantly overstates the economic benefits of the scheme, and

- under a reasonable range of assumptions a negative net benefit is more than likely than a positive one , and

- even under scenarios that deliver positive net benefits, these benefits are unlikely to be large enough to compensate for significant adverse environmental effects.

Timothy John Hazledine
15 May 2008

Table 1	A	B	C	D	E	F	G	H	I	J	K	L
Cost-Benefit analysis of Central Plains Water Scheme: "Up-and-Running" annual basis (excludes disruption etc costs)												
(all figures $millions)/year	base case	lower milk price	higher milk price	20% scheme cost over-run	fewer cows per ha	fewer cows and lower yield	lower carbon price	higher carbon price	10% operating cost inflation	all bad	all good	you choose
change farm cash flow	106.8	76.4	130.8	106.8	99.4	87.2	106.8	106.8	94.0	48.9	137.2	106.8
capital costs	51.2	51.2	51.2	61.4	51.2	51.2	51.2	51.2	51.2	61.4	51.2	51.2
scheme maintenance	34.1	34.1	34.1	40.9	34.1	34.1	34.1	34.1	34.1	40.9	34.1	34.1
change carbon price equivalents	9.8	9.8	9.8	9.8	9.1	8.4	4.9	16.4	9.8	14.0	4.9	9.8
water quality detriment costs	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
value water best alternative use	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
NET BENEFITS	-3.3	-33.7	20.7	-20.4	-9.9	-21.5	1.6	-9.9	-16.1	-82.5	32.0	-3.3
PARAMETERS												
price milk, $/kg MS	5.5	4.5	6.5	5.5	5.5	5.5	5.5	5.5	5.5	4.5	6.5	5.5
operating cost inflation factor	1	1	1.05	1	1	1	1	1	1.1	1.1	1	1
scheme cost over-run factor	1	1	1	1.2	1	1	1	1	1	1.2	1	1
scheme maintenance cost %	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
cost of capital	0.075	0.075	0.075	0.075	0.075	0.075	0.075	0.075	0.075	0.075	0.075	0.075
land shrinkage factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
cows/hectare	3.5	3.5	3.5	3.5	3.25	3.25	3.5	3.5	3.5	3.25	3.5	3.5
kg MS/cow	380	380	380	380	380	350	380	380	380	350	380	380
cows/ha cost factor	1.00	1.00	1.00	1.00	0.96	0.96	1.00	1.00	1.00	0.96	1.00	1.00
carbon price per tonne, $	30	30	30	30	30	30	15	50	30	50	15	30
carbon price effect, cents/kg	32.04	32.04	32.04	32.04	32.04	32.04	16.02	53.4	32.04	53.4	16.02	32.04