IN THE MATTER of the Resource Management Act 1991

AND

IN THE MATTER of the hearing by ENVIRONMENT CANTERBURY of a resource consent application by SOUTHDOWN HOLDINGS LIMITED, FIVE RIVERS AND KILLERMONT RUN LTD and for water take consents in the Upper Waitaki Basin.

STATEMENT OF EVIDENCE OF ROBERT LESTER ENGELBRECHT

1. INTRODUCTION, QUALIFICATIONS AND EXPERIENCE

1.1 My name is Robert Lester Engelbrecht. I am a Registered Farm Management Consultant and Registered Valuer based in Ashburton. I am director of Bob Engelbrecht Consultancy Ltd. The principal areas of my practice are providing advice to farmer clients on all aspects of farm and business management and providing consultancy services to associated service industries over the whole of Canterbury (and from time to time in other parts of New Zealand), with particular emphasis in the Ashburton District.

1.2 I have a Diploma of Agriculture – Lincoln College 1965 [with Distinction – Gold Medallist] and a Diploma of Valuation and Farm Management – Lincoln College 1966 [with Honours – Gold Medallist].

1.3 I am involved with all forms of livestock [sheep, beef, cattle, deer, dairy cattle, pigs] cash cropping and seeds, and also horticulture. I have particular skills and experience in all aspects of irrigation, including planning, construction, operation and management of irrigation schemes – including overhead sprinkler, surface flood irrigation and solid set irrigation systems. I have been consulting in the agriculture industry for nearly 43 years. Further details of my relevant experience are contained in my CV in Appendix 1.

1.4 In preparing this evidence, I acknowledge that I have read the code of conduct for Expert Witnesses in the Environment Court Consolidated Practice Note (2006). I agree to comply with this Code of Conduct. This evidence is within my area of expertise, except where I state I am relying on what I have been told by another person. I have not omitted to consider material facts known to me that might alter or detract from the opinions that I express.

1.5 My statement of evidence relates to the water take applications lodged in relation to Glen Eyrie Downs (Southdown Holdings Limited), Killermont Station (Southdown Holdings Limited), Ohau Downs (Five Rivers Limited), and Killermont Station (Thomas) ("Applicants") to Environment Canterbury ("ECan").

2. INVOLVEMENT IN PROJECT

2.1 I was retained in January 2009 to advise Killermont (WHL), Glen Eyrie Downs and Ohau Downs, and in early July to advise Killermont Station.

2.2 I first visited WHL Killermont, Glen Eyrie Downs and Ohau Downs properties on 16 February 2009 and again on 25 February and 12 May 2009. I visited Killermont Station on 27 July 2009.

Glen Eyrie Downs

2.3 Approximately 1,200 hectares of the 2,135 hectare Glen Eyrie Downs property has been recently cleared from wilding pines [weed trees]. In the first season (2008/09) 1,500 hectares was leased to Bio Diesel NZ, a subsidiary of Solid Energy. Most of this area was sown in canola oil seed for harvest. This crop was almost totally unsuccessful because of poor plant establishment. The block was then re-sown in barley and wheat for grain. From April 2009 the whole of Glen Eyrie Downs has been leased to Bio Diesel NZ for a further three years.

2.4 The proposed development of Glen Eyrie Downs is to almost fully irrigate the property using predominantly centre pivot irrigators (with some use of K-lines), developing the land into six cubicle barn intensive dairy farm units, using mostly a "cut and carry" feed supply from permanent pastures on the land, but with direct grazing by the dairy cows for up to 4 months of the year, when soil conditions are suitable.

2.5 On my three visits to this block, I inspected the soils throughout the property, as well as other physical features. I subsequently researched and read other relevant information, including rainfall, evapotranspiration and other climatic data as well as a soils report. I have also read the reports and evidence prepared by other experts involved on behalf of the applicants.

WHL Killermont

2.6 On these same visits I inspected the 1,200 hectares WHL Killermont block. This property is virtually unfarmed aside from occasional sheep grazing. Its present cover is sparse native grasses and other species, hieracium and occasional wilding pines. It is very exposed to the prevailing north-west winds and in the dry land state likely to continue to lose soil through wind-blow events.

2.7 My experience over many years throughout low rainfall South Island plains land confirms to me that any shallow soils with low organic matter levels and little protection from high wind events because of the limited plant cover, will continue to deteriorate over time, so long as they continue to have low organic matter levels and limited protection by poor quality, thin pastures or other species. Under these conditions, livestock grazing and movement tends to exaggerate the windblow risk, rather than to reduce it. The use of irrigation is almost always the only means of reversing these destructive effects of high wind conditions.

2.8 The proposed development of WHL Killermont is to almost fully irrigate the property using predominantly centre pivot irrigators (with some use of K-lines), developing the land into three cubicle barn intensive dairy farm units, using mostly a "cut and carry" feed supply from permanent pastures on the land, but with direct grazing by the dairy cows for up to four months of the year, when soil conditions are suitable.

2.9 I have also studied and researched relevant soil and climatic data available for Killermont, and read the relevant reports provided by the experts retained by the applicant.

Ohau Downs

2.10 I inspected Ohau Downs on the same three visits to the Mackenzie Basin including inspecting the canola and cereals growing on the property, the improved pastures on part of the farm, (currently grazing sheep, beef cattle

and dairy herd replacements), as well as inspecting the undeveloped part of the total 5,000 hectare property.

2.11 I have also studied and researched relevant soil and climatic data available for Ohau Downs, and read the relevant reports provided by the experts retained by the applicant.

2.12 The proposed development of Ohau Downs is to initially irrigate 1,493 hectares (according to Ian's project outline) of the property, (ultimately 2,000 hectares) using predominantly centre pivot irrigators (with some use of K-lines). The irrigated part of the land will be developed into seven cubicle barn intensive dairy farm units, using mostly a "cut and carry" feed supply from permanent pastures on the land, but with direct grazing by the dairy cows for up to four months of the year, when soil conditions are suitable.

2.13 There is also a proposed option of intensively farming with beef cattle using the same cut and carry approach or a conventional intensive beef and sheep operation.

2.14 The remaining dry land area of Ohau Downs will be used [as at present] to graze finishing lambs and beef cattle as well as replacement dairy heifers and non-milking cows but, on a somewhat more intensive basis than at present, on improved ryegrass white clover pastures.

Killermont Station (Thomas)

2.15 I visited Killermont Station (Thomas) on Monday 27 July for a full inspection. The 2,500 hectare farm property involved in this project already has some irrigation, but proposes to upgrade and extend it over a greater area of the farm. The proposed development on this property is to expand the sheep and beef cattle enterprises, as well as provide some cut and carry feed supply to dairy farming operations in the immediate locality.

3. SCOPE OF EVIDENCE

3.1 My evidence provides the following:

(a) A description of the importance of farm management in New Zealand and the Upper Waitaki.

(b) A peer review of the Farm Environment Management Plans ("FEMP") prepared by GHD [for Glen Eyrie Downs, Ohau Downs and WHL Killermont and Killermont Station. An assessment of the practicality and feasibility of the proposed farm management techniques outlined in the FEMPs.

(c) An assessment of the practicality of the auditing and monitoring proposed in the conditions/FEMP.

4. IMPORTANCE OF FARM MANAGEMENT

Farming in New Zealand

4.1 In the past 25 years particularly, New Zealand farming has become part of a global market, based on export primary production. Farm costs and prices are very much determined by what happens throughout the rest of the world. Internationally, most farm commodity prices have been trending downwards progressively over the past 40 to 50 years.

4.2 New Zealand is the only country in the OECD that depends on land-based industries, predominantly agriculture, as the main driver for its central economy. It depends on successful exporting of primary products. Compared with most of its trading partners, New Zealand is a long distance from many of its major markets. It is small in scale relative to other major farming nations, including the United States, Canada, Russia, Europe and Australia.

4.3 Markets for New Zealand agricultural produce are predominantly in the northern hemisphere, including Europe, United States, Japan and [more recently] Asia and the Middle East. With increasing costs (particularly energy and international freight costs), as well as quality control and other related costs for many [if not most] of the products we supply, New Zealand tends to be a shortfall supplier to many markets throughout the world.[1]

4.4 Only by responding to the key factors that today's sophisticated market demands [that is, high quality, precise quantities and delivery on time], will New Zealand be able to retain its place in the world market, while at the same time maintaining individual farm business viability.

[1] A shortfall supplier is one (usually in a different country) that is used to source products, only during times when there is a shortage or inadequate supply from local domestic producers, to meet the demands of the market.

4.5 The success of the New Zealand farming industry has been limited by having to compete against countries with agricultural subsidies. Following the "Rogernomics" era commencing in late 1984, subsidies to farming in New Zealand were removed to the present level where now we have the lowest degree of farm subsidies of any country in the developed world. Those subsidies that remain mostly concern food protection and quality control (for example meat inspection fees). Most of our competitors still receive the benefit of subsidies, to a greater or lesser degree.

4.6 Despite this, land based industries account for between 65 and 70% of New Zealand's export income. Over the past 15 to 18 years, agriculture, forestry and related industries have increased their productivity at more than double the rate of the rest of the New Zealand economy (Statistics Dept).

Local Markets

4.7 It is only New Zealand farmers' improvements in productivities and efficiencies that have allowed them to remain competitive in their export markets over the past 40 years. To maintain business viability farmers in New Zealand have had to progressively intensify their farming practices and/or expand their farm businesses.[2]

4.8 Without doubt, in low and/or unreliable rainfall regions, the development of irrigation had the greatest impact in improving farm business viability.

4.9 Over the past year or two the volatility and uncertainty in farming (in almost all categories of production) has been extreme. Prior to late 2008, farmers under increasing financial pressures had three main options to improve their long term financial position:

a) firstly, to expand the farm scale. This option is very difficult given the relatively small farm sizes to begin with. Even if it were possible, a larger area of dry land with the additional indebtedness involved is more likely to increase risk and future vulnerability.

b) the second option is, to sell and relocate to another district (an option that usually has no advantages), or to move out of farming into an alternative investment.

[2] Intensification of farming has been aided by new technologies for increased plant and animal performance (that is, increased crop and seed yields, higher lambing percentages, wool weights, lamb carcass weights, etc).

c) thirdly, to irrigate the existing farm, so as to capitalise on the intensification and/or diversification opportunities, and to improve reliability and certainty of farm performance, productivity and financial viability.

Farming in the Mackenzie Basin

4.10 In the Mackenzie Basin there are, of course, relatively limited alternatives for improving farm profitability, other than rely on what the market may deliver. Most of the district has the additional disadvantages of low "per stock unit" performance, high farm costs (mostly as a consequence of its remote location from markets) and a high risk of extreme climatic events, particularly long and harsh winters and, sometimes heavy snowfalls.

4.11 For a limited number of farmers in this locality, development of irrigation is one of the few options available to provide prospects of increased farm profitability or, perhaps even long term survival. However, there are some significant and major constraints on an individual farmer's ability to develop the irrigation option.

4.12 The first and most significant concern is the increased risk of farm nutrient loss to ground water, streams, rivers and lakes, as a consequence of land intensification.

4.13 Another concern for many people, particularly tourists and travellers through the area is the impact of land intensification on landscape values [as they perceive them to be]. The actual plains land plant cover is, for the most part, not as tourists/travellers perceive it to be (see below). In spite of the general perception held by many travellers through the Mackenzie Country, little of the land cover on the plains land is, nowadays, in its original natural state. This is mostly as a consequence of the damage caused by rabbits in the area over many, many years and then subsequently by the ingress of hieracium (hawk weed). Frequently, nowadays, hieracium is the dominant species growing on undeveloped land, along with low quality grass species. These plant species provide little protection for the soil, so that there is an ongoing loss of soil as a consequence of wind erosion.

4.14 A logical and practical means of stabilising the soil in many wind prone localities is to enhance the soil moisture holding capability of such soils, firstly, on an interim basis so that pasture plants may establish strongly and protect the soil from wind erosion, and in the longer term, the soils may

enhance their soil organic matter content, thus enabling them to retain greater and greater amounts of soil moisture and nutrients, both for the benefit of the individual farmers in the district, as well as to reduce, if not eliminate, the risk of soil being windblown,

4.15 While many plains-land soils in this locality are light and fluffy and therefore, prone to windblow, with irrigation development and good quality management they may be improved to the extent where soil organic matter may be increased substantially, over a relatively short time, thus minimising the soil erosion risk. Farm plant development (mostly pasture), will improve and, ultimately so too will farm stocking rates and profitability.

4.16 Generally dry land pastures on a farm that is mostly irrigated will be of better quality and produce more dry matter, than pastures on a non-irrigated dry land farm. This is because on an irrigated farm, the dry land pastures are better able to be managed effectively, by removing livestock from them under very dry conditions, and grazing them again following adequate rainfall, so that they are not grazed under drought or near drought conditions.

4.17 The development of irrigation on the subject properties would also provide advantages to dry land farms in the district. Further irrigation on the Thomas property and part of Ohau Downs will provide better opportunities for local dry land farmers to sell their store stock (lambs, cattle and deer) for finishing on the irrigated farms. (Obviously, this does not apply to the dairy farms.)

4.18 As the pressures on farming from various influences continue to increase, farmers will continue to look for ways to improve farm productivity and maintain survival. In areas of low and erratic rainfall, such as the Mackenzie Basin, with extremes, both between and within seasons, these pressures significantly impact upon the on-farm production risks. Highly stocked farms are very vulnerable to even short term drought events. Targeting other land use options may create the circumstances for poor physical and financial performance from time to time by pushing “the envelope” too far.

Irrigation

4.19 Farming is a biological production system (notoriously unpredictable, particularly in its response to environmental factors) and, in Canterbury,

Otago and even more so in the Mackenzie Basin, farmers, operate in a very harsh and uncertain climate.

4.20 Innovative farmers began developing basic irrigation systems in many parts of low rainfall New Zealand, in the 1950's and 1960's. In fact, irrigation had been trialled in some parts of New Zealand as early as the late 1800's.

4.21 The advent of "Rogernomics" in the mid 1980's effectively stopped irrigation development entirely for a period of nearly ten years before regaining its impetus from the mid 1990's onwards.

4.22 Farmers recognised that irrigation of their properties not only gave them certainty and reliability of farm production, but provided options to diversify into other land use alternatives away from traditional production options.

4.23 Over time, farmers throughout New Zealand have had to expand and/or intensify their farming operations, to enable them to remain financially competitive and economically viable in the face of increasing economic cost pressures.

4.24 For example, over the past 40 years of my consulting experience, the standard economic farm unit (particularly relating to sheep, beef cattle and deer) has increased from between 1,000 to 1,200 stock units to between 3,500 to 4,000 stock units in livestock terms. The ability to increase numbers of stock units per labour unit is always limited by the need for individual tasks required to be addressed on a "per animal or per stock unit" basis. [3]

4.25 By comparison, with dairy farming, major advances in technology, such as centre pivot irrigators and rotary dairy sheds (including cup removers), milk meters, heat detectors, etc) have enabled large increases in output per labour unit, increases that have not been possible with other forms of conventional livestock farming.

4.26 While up until just over a decade ago a gross farm income in excess of $100,000 was considered adequate for a reasonable living standard, it is generally recognised nowadays that any farm business requires a gross farm income greater than $250,000 for a farmer to have a net income that

[3] For example, such tasks as drenching, ear tagging, pregnancy testing etc most of which are not able to be automated to any extent.

achieves a reasonable living standard [unless he had some special individual circumstances].

4.27 The advent of centre pivot irrigators particularly, and technical development of them in the past five years has made an enormous improvement in the ability of irrigation to be viable on shallow and/or low moisture holding capability soils. These new improvements in centre pivot irrigation technology now allow applicators to apply as little as 5 mm of water to the soil in one pass (without compromising the viability and economics of the system), as well as to vary the speed of travel within parts of the centre pivot circle. It is possible nowadays, to apply nutrients and even weed, pest and disease control chemicals through the pivot to provide a much greater control of individual paddock management compared with even five years ago.

4.28 The major advantages of centre pivot irrigation include a low labour requirement (often great enough savings to service the debt on the irrigator), water savings of between 20 and 40%, energy savings of a similar magnitude, and generally higher pasture dry matter production compared with other types of spray irrigation applicators. With the corner arms, they can achieve a very high percentage coverage, depending upon the shape of the area being irrigated. Subject to the skills of the operator, the centre pivot should also have low maintenance requirements and low depreciation.

4.29 The use of GPS technology in tractors, header harvesters, fertiliser spreaders and spray rigs has also allowed farmers to be increasingly selective in their soil and plant management objectives. It is likely that, in the next five years and beyond, there will be an even greater range of capabilities available in farm equipment and machinery, including irrigators, in order to minimise applications of fertilisers, chemicals and other crop and soil requirements, primarily, to reduce on-farm costs but, also to minimise any negative effects on the environment.

Future Prognosis

4.30 Without irrigation, there are, on many farms, now almost impossible demands on the biological production system in what is an uncertain climatic environment from an economic viability point of view. Irrigation provides some opportunities for farmers to at least partially reduce some of these production risks.

4.31 What is happening in the Mackenzie Basin is, in my experience, representative of other parts of Canterbury and North Otago particularly, and increasingly, in fact, the whole of New Zealand.

4.32 As the pressures on farmers have increased progressively over the last 40 or 50 years, the margin at which irrigation becomes viable has moved further into higher rainfall areas as well as shallower soils and more fragile environments. Farmers move into irrigation to enhance their opportunities for survival by improving profitability (or at least maintaining profitability) through intensification and diversification. There is no other way.

4.33 Over recent years farms have become larger and larger. Without irrigation only dry land farming is possible and this process of increasing scale will become more and more rapid in years to come. The negative impacts of irrigation water not being available will be just as great, if not greater, on the servicing towns and businesses servicing farming. Not only will this result in reduced economic activity, but a more erratic level of business activity both between and within seasons.

4.34 If irrigation is no longer available (for example, where consents are not renewed), the land developed through irrigation to date will not remain at its current production level. The land will progressively decline and deteriorate over time, returning to the dry land environment and production level from which it once came.

4.35 On any class of land the margin between dry land and irrigation performance widens over time, as irrigated land potential improves (through increasing soil fertility, soil organic matter levels, and moisture holding capability), whereas dry land productivity remains more or less the same, limited always by climatic conditions, specifically rainfall patterns.

4.29 A general comment from many farmers and advisers working in low rainfall districts is, “in any three years we have one year of progress, one of year holding the status quo and one year of decline”, making it very difficult to achieve progress in the medium to long term.

4.36 Intensifying dry land farming, particularly in low and unreliable rainfall environments frequently results in decreases in productivity and profitability

rather than increases, as individual animals compete with one another for a limited feed supply. [4]

4.37 This principle is also confirmed by the continuing development of irrigation in districts that, only 10 to 15 years ago, would have been considered uneconomic for irrigation development.

4.38 It is rare for me nowadays, to encourage a farmer client to purchase a dry land farm, unless it is located in a high and/or reliable rainfall locality, or has the opportunity to develop irrigation.

Conclusion

4.39 Clearly, land uses and farming practices have changed over time, particularly in recent years, as a result of changes in global markets, national industry practices, and other pressures. New Zealand farmers have confronted these challenges by using innovative farming practices, applying their increased skills and expertise and by "pushing the envelope" thus enabling them to remain competitive to date.

4.40 A principle that I need to remind my farming clients at least once annually involves two comments –

a) Firstly, if you wish to survive in farming, you need to be a "better than average" performer, and

b) Secondly, that you need to be a better performer in a year's time than you are now, as the bar is constantly being raised.

4.41 However, for a farmer in an unreliable or low rainfall environment to attempt such performance and production increases, without some particular advantages, will usually lead to a decrease in performance and profitability, rather than the reverse.

4.42 I expect that any further decline in farm profitability will drive more farmers towards irrigated farming, where this is possible, rather than continue with their dry land enterprises. In my opinion without irrigation development, the outlook for dry land farming in the Mackenzie Basin is bleak.

[4] A very good example of this principle was commonly experienced during the late 1970's with the central government sponsored Livestock Incentive Scheme, which encouraged farmers to overstock their properties in environments where no increased pasture production was readily achievable.

4.43 If there is no irrigation available then, the low rainfall plains land in the Mackenzie Basin is likely to result, ultimately, with fewer farms with increased stock numbers, but a lower total number of stock units and a decrease in farming families within the community.

4.44 People's lives, families and futures are at stake. The future of rural New Zealand in low and unreliable rainfall areas, and the wider community in which farming operates, depend on irrigation. Without irrigation, the only choice is to return to the extensive farming practices of yesteryear. Such a move will have major implications, not only for individual farmers but districts, regions, and the New Zealand economy as a whole.

4.45 As well, farmers attempting to increase livestock numbers in low rainfall environments where such dry land options are risky and difficult to achieve, there is theother issue (identified above) of further loss of soil through windblow, with the negative consequences that such a process involves, especially during seasons of more extreme drought conditions.

5. MY ASSESSMENT OF FARM ENVIRONMENTAL MANAGEMENT PLANS

5.1 The Farm Environmental Management Plan [FEMP] is prepared to, firstly, ensure that the proposed farming will meet the nutrient mitigation requirements as set out in the water quality study and secondly, to identify and mitigate other farm specific environmental risks that arise from the particular characteristics of the farm and/or from the proposed farming system and the management involved.

5.2 In my opinion, the FEMPs developed for the four individual farm properties involved in this irrigation project are more advanced than any other I have seen developed in New Zealand. The scope and detail of these FEMP's is extremely comprehensive and provides the appropriate templates and guidelines to ensure, as much as is humanly possible, the ability to carry out the necessary tasks of identification, compliance, monitoring, auditing and therefore the management of environmental issues involved with irrigation in the Mackenzie Basin. They more than adequately cover the nine environmental risks to be addressed, that is; soil, water, fertiliser, chemicals, run-off, tracking, livestock, effluent and bio-diversity.

5.3 These farm specific risks may include uncontrolled discharges that are not identified in a farm nutrient budget modelling but that may still have a negative effect on the environment.

5.4 Thorough farm management planning and the use of best farm management practices and methods of mitigation are used to reduce pollution on farms, pollution that may come from a number of different sources (diffuse pollution), and for this reason is difficult to both measure and trace, In such circumstances emphasis is placed on the use of techniques to reduce the pollution

5.5 While I am not an expert on the formulation of farm environmental management plans and the use of such computer models as Overseer, my practical experience indicates that the proposals recommended by Dr John Bright and Dr Melissa Robson for FEMP's based on the Water Quality Study (WQS) funded by Mackenzie Water Research Ltd (MWRL) are very comprehensive and robust. The WQS identifies the surface and groundwater values potentially affected by irrigated land uses, particularly nutrient losses, identifies the appropriate methods and sites for measuring and monitoring and specifies in detail the thresholds between acceptable and unacceptable levels of effects. It quantifies the expected Nutrient Discharge Allowance (NDA) from each farm property and specifies programmes of corrective actions designed to ensure that the proposed land use activities remain environmentally sustainable, by effectively managing the individual farming operations.

5.6 Recent generations of farmers are generally better educated and informed than were their predecessors, as well as more familiar and experienced in computer management technology. Accordingly, they adapt quite quickly to the requirements and expectations of the wider population in respect of issues such as environmental protection as it applies to farming industry and other businesses operating in today's world. The more innovative farmers in older generations are equally adaptable to these changes that are necessary to achieve sustainability.

5.7 The objective of the WQS is to ensure that an appropriate level of water quality is maintained in the Mackenzie Basin. Dr Bright and Dr Robson explain in detail how the desired outcome may be properly achieved.

5.8 In my experience, farm businesses need to be strong financially to encourage farmers to take adequate care of environmental issues. In circumstances where farmers are under constant financial pressure, particularly from factors beyond their individual control, they are much more likely to overlook or ignore environmental considerations even where it may be to their long term financial disadvantage.

5.9 I understand the approach taken in the preparation of both the WQS and FEMPs and fully support this detailed method of addressing the critical environmental issues.

5.10 For almost all of the mitigation monitoring and auditing options proposed in the individual property FEMP's there is a financial advantage (often, significant) in compliance; usually on-farm cost savings, without any loss of productivity, will complement the necessary environmental advantages.

5.11 The tables of mitigation options involve very practical considerations. Farmers [and their staff] who keep thorough and accurate records understand more closely the value of, and need for, precisely assessing the farm inputs, and the resultant cash savings that may be made through proper and adequate attention to detail. For example, measurement of residual nutrients in the soil, the availability of organic nutrients from animal effluent and the accurate assessment of plant/crop nutrient requirements can lead to reduced fertiliser requirements and cost savings.

5.12 Virtually all these environmental risks have a financial benefit for the farmer and his business by being managed properly and adequately, either immediately, or in the medium to long term. With the advantage of computers and other technology available nowadays it is relatively easy and with minimal cost to record, measure and monitor the information required.

5.13 Many of the actions required are "common sense" to high performing farmers and are often standard practice for them because of the financial benefits available. Ongoing monitoring and auditing of these actions may provide additional information (and education) to enable even better decisions to be made in future. Where tractors and other high-tech farm equipment are involved, Global Positioning Systems (GPS) may provide additional opportunities to achieve precise management outcomes.

5.14 It is my very clear view that the FEMPs produced are very robust, will work and can be effectively monitored and adjusted when and where necessary.

5.15 My leading farmer clients are always “hungry” for new information. They eat, drink and breathe their farming businesses. They generally have the same approach to their family and social life, as well as their recreational and leisure activities. They continue to be eager for new ideas and information, not necessarily to apply immediately to their businesses, but to consider and assess any value they may add to their business in the future.

5.16 Good agricultural practices don’t necessarily need to be mandatory. For leading farmers they just become an accepted part of their daily tasks and routines, including furthering their education. The mandatory part means that at least there is a minimum level (base line) for the less capable and/or less experienced farmers.

5.17 The clear message from the above comments is that a high quality of management and staff will be necessary for these farm development and management projects, from senior management level right through to less experienced junior staff.

5.18 Another factor is the need for co-operation between farmers/managers, particularly those in the same catchments or sub-catchments, to ensure that all farming businesses are monitored and protected over time, and that when contingency plans need to be established to quickly address an unexpected negative event, it may be addressed and dealt with as expeditiously as possible.

<u>WHL Killermont, Glen Eyrie Downs, and Ohau Downs – Use of Cubicle Stables</u>

5.19 The use of cubicle stables for dairy cows enables much more accurate and precise management of dairy effluent than is possible under normal dairy farming conditions, both in terms of gathering and holding the dairy slurry (no water added) from the cubicle barn as well as the appropriate storage, management and spreading of it back onto the land under the most suitable soil and climatic conditions to ensure minimum environmental effect.

5.20 With modern farm technology and understanding by farm management and staff, of the environmental issues and day to day management requirements, it is now relatively straight forward and well understood and able to be carried out to a high degree of accuracy.

5.21 Virtually all of the mandatory good agricultural practices identified will save the individual farmer money, as well as achieve the prime objective of managing environmental issues, particularly those relating to nutrient loss.

5.22 All of the mitigation options for Glen Eyrie Downs (33), Killermont (30) and Ohau Downs (29) are readily able to be addressed effectively, subject only to adequate staff training and understanding and the availability of appropriate technology.

5.23 While many, if not most of the environmental issues are relatively new in terms of practical farming, in fact, dairy farmers and their staff are adopting such techniques, increasingly from a profit improvement point of view, even where the environmental issues are less demanding. Many of the measures identified in the FEMP's have become standard farm practice on top performing dairy farms.

5.24 Measures such as zero winter applications of fertiliser, fertiliser nitrogen applications of 50 kgs per hectare or less, fertiliser storage in covered areas and accurate recording of cultivation, nutrient inputs, crop management details and crop and pasture yields are standard for most farmers nowadays, while precise fertiliser applications (GPS), fencing of riparian margins and increased dairy effluent storage capacity are progressively being accepted as standard farm management techniques.

5.25 For Glen Eyrie Downs, WHL Killermont and Ohau Downs the Farm Environmental Management Plans and mitigation measures are similar on all three properties, in respect of good farm management practices, mitigation, monitoring and auditing options.

Glen Eyrie Downs

5.26 The main site specific environmental risks for Glen Eyrie Downs have been identified as those relating to –

(1) Wind or water erosion - No ground cover on cultivated soils over the winter, therefore at risk of wind or water erosion. Unquestionably, throughout a vast area of east coast South Island plains land, the development and use of irrigation has enabled significant reductions (in many cases, elimination) of soil losses through windblow, as a consequence of both increased soil organic matter levels and elevated soil moisture levels, with the benefits that these allow. As

pasture plants (especially) establish, grow and develop, they progressively add to the soil organic matter levels, enhancing the ability of the soil to retain moisture and nutrients, as well as minimise the risk of loss of soil through windblow.

(3) Trafficking of soil - There will be no livestock on this land in the immediate future so that trafficking is not yet a risk under wet soil conditions.

(4) Run-off - Because of the better soil organic matter levels in these soils, the run-off risk is equally reduced, particularly under the expected rainfall in this locality. While there are no livestock running on the property the risk of run-off from tracks into water courses is also significantly minimised as is the risk of livestock walking through or close to water courses.

(5) Bio-diversity - As noted above, while there is no livestock run on the property, the bio-diversity risks are minimised on riparian margins and in water courses.

<u>WHL Killermont</u>

5.27 The main site specific environmental risks for WHL Killermont are very similar to those for Glen Eyrie Downs, with the main risks identified as follows –

(1) Wind erosion and loss of soil - as well as the lack of ability of the soil to retain moisture and nutrients. Prior to any attempt at cultivating or levelling the soil, the centre pivot irrigation system should be in place and operating. With limited ground cover at present, exposing the soils to wind erosion is a significant risk. Establishment of adequate ground cover (pasture) is fundamental to the successful development of this block. Enhancement of soil organic matter levels on this property is a top priority.

(2) Trafficking - There will be no livestock on this land in the immediate future so that trafficking is not a risk under wet soil conditions. Equally, the risk of run-off from tracks into water courses is minimised, if not virtually eliminated.

(3) Fertiliser use - Until soil organic matter levels are improved and the soil's ability to retain increased moisture and nutrients, fertiliser applications will need to be kept to low levels and irrigation applications based on a "little and often" approach.

(4) Soil compaction - Providing that livestock is not grazed on this land until pastures are well established, soil compaction should not become a problem.

As identified in the schedule of mitigation options, any problems and issues will be addressed by adhering to good quality agricultural practices.

Ohau Downs

5.28 For the proposed irrigated area of Ohau Downs, the main site specific environmental risks are quite similar to those identified for Glen Eyrie Downs and WHL Killermont, as the undeveloped land on this property would be seen as intermediate between those two farms:

(1) Soil risks - The current soil risks are clearly those associated with wind erosion, so that here again the centre pivot irrigation system should be in place and operating prior to any land levelling and/or pasture establishment.

(2) Run-off - Excluding livestock from water courses will be a high priority, as will be taking a low fertiliser application approach in the early years of development, along with low irrigation applications. Nutrient and water run-off risks should be readily addressed as a consequence of the cubicle barn farm management system.

(3) Use of chemicals - The appropriate and careful use of farm chemicals, specifically, weed, pest and disease control applications to the land, along with the permanent identification of "no spray" areas should minimise environmental risk from chemicals.

(4) Stock management - Providing that suitable farm tracks are constructed and maintained, the need to operate farm machinery in circumstances where soil compaction may occur, should be minimal. Preventing stock encroachment onto waterways and management of riparian zones, once determined, should avoid any risks in this regard.

Killermont Station

5.29 Given the undulating nature of parts of Killermont Station and the proposed livestock programme (including sheep, beef cattle and deer) the main site specific environmental risks may be identified as -

(1) Soil risks - The current soil risk are clearly those associated with wind erosion, so that here again the irrigation systems should be in place and operating prior to any land levelling and/or pasture establishment.

(2) Fertiliser use - The need for low irrigation and fertiliser application rates in the early development stages both to enable the soil to retain nutrients and water, as well as to minimise the risk of irrigation or fertiliser run-off.

(3) Management of run-off - To ensure that livestock are kept out of waterways and riparian margins. Given that some areas of the farm have already had fertilisers applied in recent years, to ensure that all sources of nutrients have been accounted for.

6. FEASIBILITY OF IRRIGATION DEVELOPMENT

6.1 Changes that have occurred in recent weeks/months, both upwards and downwards, in both farm commodity prices and exchange rates against our trading partners, highlight very clearly the issues referred to earlier in my evidence. The volatility and fluctuations have occurred in both farm inputs and outputs, over the past two or three years, much more than had been the case in earlier years.

6.2 Accordingly, I have attempted to use conservative income estimates in my Farm Viability Assessments for the four subject properties.

6.3 For my status quo farm budget estimates (both pre-development and post-development, where applicable), I have used a debt servicing interest rate of 7.0% throughout.

Glen Eyrie Downs

6.4 The proposed dairy farm development for Glen Eyrie Downs involves six similar sized units (average 345 hectares), carrying an average of 1,205 milking cows each (3.5 cows per hectare equivalent), with replacement heifers grazed off site. While I have used an average production per cow of

400 kgs milk solids, I believe that higher production is probable, but the choice of target production will depend upon the milk solids payout relative to the cost of imported supplementary feeds.

6.5 The return on the very substantial investment made in the cubicle barn dairy farms is very satisfactory (compared with other conventional farming systems), both on total farm capital, and on owners' equity in the businesses.

6.6 While there is a very significant total capital investment in the development of the cubicle barn dairy farms, the return on total farm capital (which involves land and buildings, livestock, plant and equipment, dairy company shares, and an allowance for seasonal finance) shows a satisfactory result, compared with most conventional farming businesses in recent years, even at a $4.50 per kg milk solids payout. The recently announced change by Fonterra from $4.55 payout (May) to $5.10 per kg milk solids (September), for the Glen Eyrie Downs dairy farms, (whether using robotic milkers or conventional rotary milking platforms) shows a significant increase in cash surplus. However, in practice, this increase in surplus will be offset (to a degree) by some increases in costs (for example, dairy livestock values), as well as increase in farm operational costs.

<u>WHL Killermont</u>

6.7 The proposed dairy farm development on this property assumes three cubicle barn dairy farms (average 366 hectares) each carrying 1,280 milking cows at an average production of 400 kgs milk solids per cow.

6.8 Here again, the returns on the substantial individual farm investments are very satisfactory. So too, are the effects of changes in forecast milk solids payout by Fonterra from that announced earlier in 2009 and increased more recently.

<u>Ohau Downs</u>

6.9 The proposal for 2,000 hectares of irrigation on Ohau Downs is to develop eight cubicle barn dairy farms (without robotic milkers) averaging 250 hectares and 875 milking cows, each at a production of 400 kgs milk solids per cow.

6.10 The replacement dairy heifers and, probably, the dry (non-milking) cows will be grazed on the dry land area of the farm.

6.11 For Ohau Downs irrigation and dairy farm development, the returns to the cubicle barn dairy farm proposal are similar.

6.12 Here again, the effect of an increase in milk solids payout has significant cashflow improvements, ultimately depending on any factors that increase the components of farm capital and changes in operating costs.

6.13 Following the development of centre pivot irrigation, as proposed for the dairy farm units for Ohau Downs, a conventional beef and sheep farming system would be possible and profitable (depending on the level of indebtedness), but would produce a lower return on investment than a dairy farming enterprise. Also, it would, almost certainly have a greater degree of variability in returns, from season to season. Assuming the sheep and beef farming system was based on purchasing store lambs, hoggets and beef cattle yearlings, satisfactory returns could be achieved. This would be less likely with a partial or total breeding flock or herd enterprise.

6.14 Over time, with the progressive development and enhancement of the soils, increasing soil organic matter levels and consequently, soil moisture and nutrient holding capability, profitability would increase further, as greater numbers of sheep and cattle were able to be carried and improved performance per stock unit was achieved.

Note:

For all three of the above properties, the proposed development is quite feasible and practical (as evidenced from similar dairy farming operations developed and operating throughout parts of the South Island), with the added benefits of being better able to manage the issue of nutrient losses and associated challenges, as identified elsewhere in my evidence.

<u>Killermont Station Ltd (Thomas)</u>

6.15 The proposed irrigation enhancement and further development of Killermont Station is both feasible and practical with the farm programmes as outlined. However precise livestock management will be required, since the sheep, beef cattle and deer will be run in a conventional farming system. All of the farm's livestock will be carried on the three blocks (Woolshed, Manuka

Creek and Frosty Gully blocks), located on the southern side of State Highway 8, with the management of these enterprises being similar on all the land irrigated from these three irrigation water sources.

6.16 The Pebbley Block, on the north side of State Highway 8, will be run exclusively as a cut and carry operation (with no livestock to be grazed on this area). The pasture dry matter from the Pebbley Block will be sold, mostly, but not exclusively, to other farmers in the Omarama district.

7. MITIGATION, MONITORING AND AUDITING OF FARM ENVIRONMENTAL MANAGEMENT PLANS

7.1 The measures necessary to achieve the objectives of the Farm Environmental Management Plans are quite similar for all of the four farm properties involved in this project.

7.2 With the Farm Environmental Management Plans, farmers will be required to monitor the necessary and recommended issues as outlined by Dr Bright and Dr Robson.

7.3 If and when it is necessary, farmers are very good at following and complying with these types of rules provided that they always understand the logic of the recommendations. For this reason, a detailed and thorough education programme needs to be undertaken, firstly with farm owners and/or managers and secondly with senior staff, if not all farm staff over time.

7.4 These factors are the compelling reason why the cubicle barn dairy farming system provides a real opportunity to solve many of the potential problems identified in the table of mitigation options, using the monitoring and auditing rules.

7.5 The FEMP, in respect of mandatory good agriculture practices, is usually a balance of management, monitoring and experience. The first requirement is to have a thorough understanding of the basic principles involved with the management practices concerned.

7.6 In any event all of the nine tasks should be undertaken from a farm profitability point of view. There is an economic advantage in each and every category.

7.7 The new generation of farmers usually have better familiarity and understanding of the techniques required and the confidence to use appropriate computer programmes.

8. USE OF OVERSEER NUTRIENT BUDGETS

8.1 I understand from Dr Robson that the model has been calibrated and validated by Ag Research and is being updated continually but, that there is not a requirement to calibrate it on every farm with measured values. I also understand that in the Basin, there are proposals to use lysimeters to provide a long term measured data set with which to correlate OVERSEER outputs.

8.2 The Overseer programme should be continually reviewed throughout the season on individual farm properties, and different areas of those farms, when and where appropriate, to ensure that there is no excess use of fertiliser, after fully accounting for the contributions made by livestock and/or (in the case of the cubicle barn dairying operations) dairy effluent, whether liquid (via the centre pivot irrigators) or solids (spread over the land by machinery) to ensure that the nutrient budgets are maintained in the appropriate balance relative to soil nutrient reserves and pasture requirements.

9. CUBICLE BARN DAIRY FARMING

9.1 While I have attached an appendix identifying the pros and cons of cubicle barn dairy farming, along with some other relevant features, I shall emphasise below, the key advantages of such a farm management system, as I see them:

(a) The almost complete control of effluent management that provides the opportunity for very accurate application of dairy effluent to the land in a controlled and precise manner.

(b) Reduced fertiliser and lime requirements through more effective return of dairy effluent to the pastures.

(c) More efficient conversion of feed (both pasture and supplements) as a result of the minimum of wastage, both on the pasture and in

the barn itself, as well as the more favourable environment in which the cows are kept.

(d) Improved pasture dry matter production through the correct timing of harvest and the avoidance of livestock damage to pastures under adverse soil conditions.

(e) The opportunity to capitalise on a significant winter milk premium, a premium that is difficult to obtain with conventional dairy farming, even in more favourable (climatically) dairy farming localities.

(f) Improved animal health and thrift, as a consequence of the more controlled and favourable environment for the milking cows.

10. CONCLUSION

10.1 It is my genuine belief that, providing there is full co-operation between the parties involved, which includes the scientists, the experts that have prepared the numerous reports relating to the Mackenzie Basin Irrigation Project, the farm owners, farmers and their staff and their relevant advisers and consultants, particularly in the key areas identified throughout this hearing, then the appropriate mitigation measures can be put in place and measured and monitored to ensure the objectives are fully achieved, that the necessary modifications to the overall programme can be made to correct any shortcomings or inadequacies and that internal and external auditing may be used to ensure that all the targets are met and satisfactory outcomes will be achieved for all those with an interest in the irrigation and farm development project.

APPENDIX

PROS AND CONS OF CUBICLE BARNS FOR DAIRY COW MANAGEMENT

PROS	
1.	More efficient conversion of feed into milk solids by the dairy cows (perhaps, 25 to 50% more efficient)
2.	Better cow condition, especially at the end of lactation – improved milk production potential following next calving
3.	Better cow condition and therefore increased carcass value as cull cows
4.	No loss of milk production from cows walking long distances (perhaps a litre per kilometre)
5.	More pasture dry matter production and less pasture wastage, will all lead to an increase in milk solids production with zero pasture damage under wet conditions - pasture production may increase by 20% or more.
6.	Much more control of effluent spreading, leading to better environmental management and much less nutrient loss
7.	Less farm infrastructure, for example, cow lanes, fences, water supply, etc, on the farm leading to a significant saving of capital expenditure.
8.	All year round milking (a quarter of the herd calving at three month intervals) providing a flatter milk curve (so savings in dairy factory processing capacity, and possibly farmer costs in future). Also, provides for an emphasis on winter milk production (presently, with a premium of $3.50 per kg milk solids) – that is for the period mid May to mid August.
9.	Cows not in-calf for their normal calving date may continue to be milked, as these cows have the opportunity to get in-calf three months later, so they continue to produce milk solids in the meantime.
10.	Calf rearing is made easier (particularly if automated) being spread throughout the year, so that the normal staff can more easily rear the replacement heifers with calving in four separate stages, rather than all concentrated in the normal early spring period.
11.	Reduced fertiliser (and lime) requirements through the more effective return of dairy effluent to the pastures. It is significantly easier to manage nutrients and

	nutrient loss on a farm where milking cows are housed part time or full time.
12.	It is more effective to select, mix and manage the volume and quality of feed supply for the cows on a daily basis, with lower feeding costs.
13.	It is easier to manage and achieve strong and productive pastures. "Cutting and carrying" the pasture dry matter at the correct stage of growth from a plant point of view, will increase pasture dry matter compared with production from grazing the pastures when the cows require the feed.
14.	As dairy farm staff and the milking cows are operating within a very confined area, so that the constant contact between cows and staff results in more precise attention to animal health and thrift, feeding and associated needs, than is possible on a conventional dairy farm.
15.	High-tech equipment – ("the up market bells and whistles") allows close monitoring and measurement of individual cows, whether from an animal health, milk production or mating point of view.
16.	Such milking systems should attract a higher quality of staff, as they tend to get more involved with the animals, the milking and management process
17.	Improvement in "consumer-related" issues – reference Morgan Williams PCE [Parliamentary Commissioner for the Environment) – Growing for Good publication (October 2004)
18.	Less area of land required per unit of production – therefore, lower capital involvement per kg of milks solids produced, both in terms of capital expenditure and annual expenditure.
19.	The availability of supplementary feedstuffs, such as grain, cereal silage, palm kernel, as well as hay, silage, straws and molasses to achieve an appropriate feed mix
20.	Lower staff requirements in a cubicle barn with only 50 to 60% of the staff numbers required. Generally more contented staff, as a consequence of the more interesting and challenging management system
21.	More economic use of silage making/processing, handling machinery, operating on a year round basis
22.	Don't need separate milking shed but can have robotic milkers (at 1 per 75 cows) in a smaller milking area at the end of the cubicle barn.

23.	An advantage of winter milk premium ($3.50 per kgs/milk solids) 2009 winter
24.	Cows kept under cover protected from harsh climatic conditions are more able to gain liveweight during the non-milking period.
25.	With less stress on cows, they may have a longer lactation period, as well as producing more kgs milk solids per cow per day
26.	Greater control of feed inputs can enhance cow condition during milk production, as well as during the dry (non-milking) period, leading to higher milk solids production the following year and less animal health issues and lower per head animal health costs
27.	Micronutrients, if required, are more readily and more accurately provided to the cows.
28.	Less feet problems in the cubicle barn, (subject to appropriate resting mattresses) compared with cows walking long distances on farm tracks, that can lead to quite a high percentage of feet problems and therefore lower milk solids production.
29.	Opportunity to develop systems to capture and store methane gas from cows while inside cubicle barn and within slurry/effluent holding ponds by using pond covering systems
30.	Minimum water use in the robotic milking part of the shed – perhaps, less than 10,000 litres per day
31.	Dry (non-milking cows) may be kept off-site or in the cubicle barn depending on the particular farm management system employed.
32.	In a harsh climate such as the Mackenzie basin, the cubicle barns and robotic milking systems are likely to have their greatest advantages, being able to deal with both extremely high and extremely low temperatures, along with being able to better manage the extreme variability in pasture growth rates (from 0 kgs per hectare per day for June/July and August while up to 130 or 140 kgs per hectare per day during the most growthy pasture months (January/February), so can better manage the compressed feed supply curve that occurs in the Mackenzie Basin as a consequence of temperature gradients, also can better manage the milking cows in a more controlled environment.

CONS	
1.	A higher capital cost structure. A cubicle barn dairy shed is more sophisticated and therefore costly than a standard rotary dairy shed. Also require more sophisticated and efficient effluent management, mixing, sorting and spreading equipment.
2.	Dairy cows in cubicle barn will require closer monitoring.
3.	Will require high-tech measuring and monitoring equipment, to achieve optimum production performance.
4.	Processing and management of pasture and other feed stocks, including storage, still needs to be of a very high standard.
5.	Need a larger dairy farm operation to be economic (minimum of 500 milking cows).
6.	Perhaps needs a reasonable milk solids payout to be economic, although our computer income/expenditure analysis suggests there are significant advantages for the cubicle barn dairy farm system, even at low milk solids payout.
7.	Need to be able to store and handle much more feed dry matter than on a normal dairy farm, although that is usually not too difficult or expensive. The plant and equipment required to cut, process and harvest the pastures for silage needs to be well maintained and managed on a daily basis but can probably service a very large number of cows through a number of separate cubicle barns or dairy sheds.
8.	More feed harvesting, handling and processing plant required compared with a normal dairy farm, but (collectively) may be able to spread some of this capital over a number of dairy farms, so long as they are in close proximity.
9.	Need more farm plant and equipment, such as silage wagons and feed mixers, compared with cows grazing directly on the pastures.
10.	Need to be able to store a lot more silage/supplements than in other more climatically favourable localities.
11.	Once in the stack, silage management needs to be of very high quality; must not let air into the bunker; should use double covering of the silage to ensure

	total protection and high feed quality silage.