IN THE MATTER OF The Resource Management Act 1991

AND

IN THE MATTER OF Resource Consent Applications to Allow development of the Waihao Downs Irrigation Scheme.

EVIDENCE OF DAVID STEWART ATTEWELL

1. My name is David Stewart Attewell. I am Director of Attewell Irrigation Consultants Limited, a consultancy that specializes in the development of irrigation schemes.

2. I have previously been the Project Manager for several irrigation schemes including Waimakariri Irrigation Limited and have been responsible for overseeing the design, construction and commissioning of the community based Waimakariri Irrigation Scheme, which irrigated 18,000 ha within a command area of 40,000ha. I was also Project Manager for the Glenroy Community Irrigation Scheme, a pressurized piped scheme feed from the Rakaia River and supplying 3500 hectares. Previously for over 20 years, I was Senior Engineering Officer in the Water and Soil Division of the Ministry of Works designing and developing irrigation schemes. This included work on the Lower Waitaki Irrigation Scheme, also design and commissioning work for the Maniototo Irrigation Scheme. Since starting up my consultancy in 1988 I have acted as the engineer to the completion of the Maniototo Irrigation Scheme.

3. I have been involved in assessing the feasibility of the Waihao Downs Irrigation Scheme and I have managed the preparation of the engineering design report for that scheme. I have also contributed information to the Assessment of Environmental Effects report for these consent applications.
4. The evidence that I will present describes the conceptual design of this irrigation scheme and provides and indication of how it will operate. Figure 1 attached to my evidence shows the scheme location as presented in the consent application and incorporating the alternative intake. It comprises two possible intakes for the Waitaki River and a water distribution system that pumps the water up pipelines to the top of the terrace and into the Waihao Basin to provide irrigation water to 6800 ha of farmland within a larger command area that is shown in Figure 2 a total of around 14,000ha.ie only about half of the command area is to be irrigated.

WATER REQUIREMENTS

5 The scheme is being designed to provide irrigation water to 6,800 ha of land.

6 This land area comprises deep silt loams soils with available water holding capacities ranging from 70 – 130mm.

7 Effective Irrigation Season Rainfall across the scheme area ranges from 220 mm in the west to approximately 180 mm in the east.

8 An irrigation water demand assessment for the area has been carried out based on rainfall and evapotranspiration records for the area and a soil moisture balance model for the soilt types that occur in the area.

9 This shows that a peak abstraction rate of 3.06 m^3/s is required from the Rakaia River and that annual water application rate 3.9 mm/day.

SCHEME DESIGN

10 In order to supply this water to the scheme, the following design has been developed based on two possible separate intake locations, shown schematically in Figure 1 & 2.

The abstraction rate was based on:

a. The soil types and their respective infiltration capacities in the area to be irrigated;

b. The overall area to be irrigated and the funding derived from the participating members (estimated to be about 6,800ha or 68,000,000 m^2);

c The topography of the areas to be irrigated;

d The costs associated with infrastructure and construction of the irrigation scheme;

e Comparison of irrigation rates used by farmers in adjoining areas.

Rate of abstraction = {(0.0039m/day) x (68,000,000m2)}/(86,400 s/day) = 3-6m^3/s.

Assuming that there will be 141 days of irrigation per year at this rate:

(3.06 m3/s) x (141 days of irrigation) x (86,400s/day) = 37,278144 m^3 or about 38 million m3/year.

SCHEME DETAIL

11 Waihao Downs Irrigation Ltd will either utilize the existing Morven-Glenavy Irrigation intake and open race or an alternative pumped supply from the Waitaki River.

Existing Morven-Glenavy Intake and Open Race Design.

12 Figure 3 shows the layout of the existing Morven-Glenavy Irrigation Scheme. Please note that this is an existing intake structure and race system. The current layout of this scheme takes water from a gallery braid and stores it in an adjacent pond. The water is then fed to the existing race by a gate structure. The existing scheme has a coarse control at the pond with more accurate control to the race through the gate. These gates feed flow into the main race, which runs parallel to the main road.

13 If the existing Morven-Glenavy intake and race system is used, an additional intake would be constructed beside the existing structures. The intake would consist of a gallery, with a hydraulically-operated control gate. The intake gallery would be constructed with a buried steel mesh drum covered in screened rock to act as a fish barrier. Details of the intake gallery can be seen in Figure 4.

14 The existing intake gate is automated and the new intake would include an automated gate also linked to that control system.

15 Again, should the existing Morven-Glenavy system be used, the races and pipe crossings would need to be upgraded. The races and pipe crossings would need to be enlarged by approximately 20% from the point of abstraction to the pump location (about 5km). The section of race requiring an upgrade can be seen in Figure 5.

Alternative New Intake from the Waitaki River

16 The alternative intake design is based on pumped supply from the Waitaki River below Pub Road at Ikawai . The irrigation system will be fully

piped and pressurized from the pumps and will be automatically controlled to match irrigation demand. There will be no open races.

Diversion

17 Some works in the bed may be required to maintain the intake channel following a flood. This is similar to other irrigation schemes and is normally of short duration. A schematic diagram showing these works is attached (figure 6.)

18 The works will be limited to guiding the flow from an active braid past the fish barrier. This will be achieved by maintenance of a channel approximately 4m wide and 1m deep. This channel would be excavated and maintained by a 20 tonne excavator. Maintenance can be required on a weekly basis, but at times may be less based on the river conditions. The cannel will mimic the existing braids, but will be maintained at a single location. The channel will have a very minor impact on the existing river activities.

Intake

19 The proposed abstraction or take point is located at Ikawai approximately 40km downstream of the Hakataramea Bridge and below Black Point. The river intake is located at the end of the paper road (an extension of Pub Road) leading to the Waitaki River. The location of the river intake can be seen on Figure 7. With this option there is no connection between the Waihao Downs Irrigation Ltd scheme and the Redcliffs Irrigation Scheme race.

20 Water will be diverted into a channel containing a series of fish barriers (Figures 8 & 9). The barrier consists of a bank constructed of rocks with a

21 Water will then be pumped from the buffer pond into a pressurized pipeline system. The build of the proposed intake works is carried out along the line of the existing bank. This will involve the excavation of the bank and the construction of the fish barrier. These works will occur away from channels currently carrying water and the actual diversion will be undertaken only when the works are complete.

22 The fish barrier will require maintenance after significant floods to replace rock, and at times to clean silt build-up. This work will be undertaken mechanically. Access for maintenance of the fish barrier will be made using the access track across the top of the rock bank. The top of the track has been designed wide enough to allow access for the appropriate

equipment. Maintenance of the fish barrier will be undertaken using an excavator which can easily clear or repair the fish barrier from this location.

Buffer Pond

23 The buffer pond construction will involve excavating soil to a depth of 1.0m and constructing batter no higher than 1.0m above the ground elevation. A freeboard allowance of 0.3m has been allowed for the pond sizing. The batter slop for the pond will be set at 2 horizontal:1 vertical. A cross-section of the pond is shown on Figure 10.

24 The main pumps are installed at the pond and these provide pressurized water into the main supply pipeline. The pumps are automated to provide pressurized water to meet the irrigation demand at each property.

Pipe System

25 From the river intake water will flow through a pressurized pipeline constructed of either steel or HDPE pipe. Typical siphon cross-sections can be seen in Figure 11.

26 At both pumping locations, the pumps will be housed inside a concrete structure. Soundproofing in the roof will minimise noise levels so that they will comply with the Permitted Activity rules of the Waimate District Plan.

27 Self-cleaning/washable intake screens are proposed around the suction end of each of the main pumps. The screens are made of 3mm square stanless steel mesh.

28 Along each of the water distribution routes there are some water races and driveway/road crossings. The water is continuously pumped in pipes throughout the scheme including at all water race crossings. There are no open races in the scheme. The pipes will be completely buried beneath the bed of the race with 1.0m minimum cover over the top of the pipe. The pipe will have a 0.6m cover at the approaches to the crossing and will have the necessary bends welded to the pipe to achieve a profile that matches the slope of the embankment and bed. The pipe will then be backfilled with suitable backfill material and where possible, suitable compaction will be carried out. All embankments, levees and river protection and topsoil will be reinstated at the completion of the crossing.

29 It is envisaged that the pipe laid under water races will be laid during the winter months when water races are at their lowest flows. It is proposed that the crossings under the water aces will be carried out in sections allowing the flow to be diverted from the working sections. It is not possible to divert the water race then the crossing will be trenched, siphon welded and lowered into position and submerged by filling with water.

30 Driveway crossings will be piped with a minimum cover of 0.7m. The pipe will be backfilled with suitable backfill material and where possible, suitable compaction will be carried out. The driveway will be re-instated at the completion of the crossing.

31 Road crossings will be piped with a minimum cover of 0.8m. The pipe will be backfilled with a suitable backfill material and suitable compaction will be carried out. The road will be re-instated at the completion of the crossing.

32 It is expected that most water race, driveway and road crossings should each be completed in one day.

33 There are also several locations where the pipeline must cross steams and rivers. The pipes will be completely buried beneath the bed of the river 1.0m minimum cover over the top of the pipe. In cases where bed degradation is likely, greater cover (1.5m to 2.0m will be provided. The pipe will have a 0.6m cover at the approaches to the crossing and will have the necessary bends welded to the pipe to achieve a profile that matches the slope of the embankment and bed. The pipe will then be backfilled with suitable backfill material and where possible, suitable compaction will be carried out. All embankments, levees and river protection and topsoil will be reinstated at the completion of the crossing. It is envisaged that the pipe siphons at all river and stream crossing will be Laid during the summer months when the river and stream flows are at a minimum. If the river is not dry, it is proposed that the crossing will be carried out in section with the water flow diverted. If it is not possible to divert the water course then the crossing will be trenched, siphon welded and lowered into position and submerged by filling with water.

34 It is expected that the crossings of the stream should each be completed in one day, however larger stream and rivers may require 2 to 3 days.

Pipeline location – Waihao River

35 The proposed pipeline will cross the North Branch of the Waihao River at NZMG J40:4712-0030. The expected location can be seen in Figure 9. The proposed pipeline will cross the South Branch of Waihao River at NZMGJ40:4652-0000 (also seen on Figure 12).

36 The preferred method of crossing the North and South Branches of the Waihao River is to attach the pipeline to existing bridge structures. Approval will be required from Waimate District Council. Discussion

37 The installation of the pipeline at river and stream crossings has been described in detail above. It is envisaged that the pipe siphons at the Waihao River crossings will be laid during the summer months when the river flows are at a minimum. If the river is not dry, it is proposed that the crossing will be carried out in sections with the water flow diverted. If it is not possible to divert the watercourse then the crossing will be trenched, siphon welded and lowered into position and submerged by filling with water. Working in flowing water will be avoided if at all possible but temporary works in flowing water my have to occur in order to complete the installation. Therefore any condition about not working in flowingwater needs to be prefaced with the words "where possible'. It is expected that the crossings of the Branches of the Waihao Rivers should each be completed in two to three days.

Pipeline Reticulation

38 The proposed pipeline layout is shown on figures 1 & 2. The layout is based on supplying water to each property at a minimum operating pressure of 400kpa (40 metres head). This will enable most irrigation systems to operate without further pumping.

39 The pipelines will be either; Steel, UPVC or HDPE depending upon pressure, size and cost. All pipelines will be buried with a minimum of 600mm cover.

40 The final layout may vary as the scheme is optimized for performance and cost. Because this is a buried pipe system it would only have a short term

impact on the landscape .This system is effectively a closed pressurized network therefore a bywash is not required. It is not anticipated that any water will need to be released from the piped sections because as soon as the pumps cease to operate, water pressure drops and delivery ceases.

Construction Timetable

41 The construction timetable will be dominated by material supply considerations and ground conditions. I would expect the scheme to take 12 to 18 months to complete but availability of some materials could impact on this.

Scheme Management

42 I have prepared a Scheme Management Plan as a draft which is appended to this evidence.

Farm Management

43 I have prepared a Farm Management Plan as a draft which is appended to this evidence.

IMPACT ON NORTH BANK TUNNEL

44 This proposal would not impact on the NBTC the two possible intake sites are both down steam of the tunnel discharge.

45 The first possible intake is beside the existing Redcliffs intake which I understand Meridian have undertaken to maintain supply to.

46 The second possible intake is adjoining the main channel of the Waitaki River below where the first NBTC outflow joins the river.

IMPACT ON MORVEN GLENAVY IKAWAI IRRIGATION SCHEME

47 If the second possible intake direct from the Waitaki River below Pub Road is used, there will be no impact on MGIIS.

48 If the first intake site is used there would need to be up-grading of part of the Redcliffs race system. This would need to be negotiated in detail with MGIIIS.

EFFECTS ON WATER QUAILITY AND PROPOSED MITIGATION

Construction Methodology

49 I have prepared a Draft Construction Methodology which is appended this addresses such aspects as:

- Construction Methods
- Silt management
- Sediment and Erosion Control Plan
- Proposed Specification

50 Effects on other intakes such as the Lower Waitaki Scheme and Invernia Holdings will not occur because they are feed from river braids on the southern side of the river.

CONCLUSION

51 I believe from experience that this is a viable irrigation scheme which will be efficient and will provide substantial benefits to the users with minimal impact.

Dave Attewell