IN THE MATTER OF	the Resource Management Act 1991
AND	
IN THE MATTER OF	applications by Central Plains Water Trust to: Canterbury Regional Council for resource consents to take and use water from the Waimakariri and Rakaia Rivers and for all associated consents required for the construction and operation of the Central Plains Water Enhancement Scheme Selwyn District Council for resource consents to construct and operate the Central Plains Water Enhancement Scheme
AND	
IN THE MATTER OF	a notice of requirement by Central Plains Water Limited to: Selwyn District Council for the designation of land for works associated with the construction and operation of the Central Plains Water Enhancement Scheme

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BRIEF OF EVIDENCE OF CHRISTOPHER RAYMOND GLASSON

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INTRODUCTION

1. My name is Christopher Raymond Glasson. I have a Bachelor of Arts from Otago University, a diploma in Landscape Architecture from Lincoln University, and I am a Fellow and Registered Member of the New Zealand Institute of Landscape Architects.

2. I have practised as a Landscape Architect for the past 28 years, the last 21 as Director of Chris Glasson Landscape Architects Ltd, and have undertaken projects throughout New Zealand and overseas.

3. I have undertaken planning and design for numerous infrastructure projects throughout the South Island. Work complementary to this project includes power schemes at Lake Wahapo, Westland National Park and Ashburton – Stour River; wind farms for Gebbies Pass and Mt Cass; roading in Nelson, West Coast, and Canterbury; mine restorations in Otago and the West Coast, and various residential subdivisions in the rural landscape of the South Island.

4. I have a thorough understanding of the Canterbury plains and high country landscape, having lived in Canterbury most of my life, and having undertaken activities and holidays in these places.

5. I have read the Environment Courts' Code of Conduct for Expert Witnesses, as set out in the Environment Court Practice Note, and confirm that I have complied with the code in the preparation of my evidence.

SCOPE OF EVIDENCE

6. I have been engaged by Central Plains Water Ltd (CPW) to undertake a landscape and visual assessment of the effect of this project. I undertook this assessment in late 2005 and made several site visits to the various locations in the Central Plains.

7. My evidence concentrates on the rural character of the landscape, the effects of the Scheme on this and the amenity values, and the likely benefits as a result of enhancement and mitigation measures.

PROPOSAL OVERVIEW

8. The base scheme includes a 54km main headrace canal, designed to deliver the allocated flows of water across the width of the plains and into a network of distribution canals that will transport irrigation water to farms.

Water is supplied to the canal system from intakes on both the Rakaia and Waimakariri Rivers, and from the Waianiwaniwa storage reservoir when flow restrictions prevent river supply. The headrace canal is designed as a level canal, and water is induced to flow in either direction by raising the water level at the inflow location, and draining outflows into the distribution canals.

9. In addition to the main canal, CPW intends pumping water from the upper Waimakariri intake under the Kowai River into a headrace canal to Russell's Flat, in order to provide a water supply to the Springfield / Sheffield area, and from the Rakaia intake into a canal to supply water to the Windwhistle area.

(See graphic supplement plans 12.1 – 12.7)

LANDSCAPE CHARACTER

10. The components of the landscape which affect, and are in turn affected by changes in the landscape, are its character and quality. I shall firstly discuss landscape character.

11. The Canterbury plains, between the Rakaia and Waimakariri Rivers, are part of a large and flat landmass sweeping down from the Southern Alps to the sea. It is a very dominant element of the Canterbury landscape. This landscape has unique forms, colours, vegetation, structures, climate, and the constant horizontality sets off the dramatic backdrop of the Southern Alps. For the inhabitants of the plains it is a landscape that is both found and made, and is constantly under change, with its distinctive weather patterns, colours, activities and uses. Above all, the plains are a unique component in the mindset of New Zealanders.

12. The Scheme is located in the upper part of the Canterbury plains of Canterbury, and between the Rakaia and Waimakariri Rivers. This is a part of a large region of ancient coalescing fans bounded by the sea and the foothills. The plains consist mainly of quaternary outwash gravels and recent alluvial deposits, and the soils are mainly yellow-grey earths to yellow-brown earths, recent gley and organic soils. The alluvial soils range from stony sands to deep silt loams on the river flats and low terraces. The higher terraces and rolling downs are of deep clay soils with slow internal drainage.

13. The region has largely developed into pasture or cropping land with only a few patches of native vegetation remaining.

14. The vegetation cover is a remnant of its original glory. Essentially, the whole area was forested with short tussock as well as stands of kanuka and small leafed coprosma.

15. Today, little of the indigenous vegetation remains due to the conversion to pasture and crops. Some stands of beech still exist in the hill gullies, and mixed scrub and hardwoods can be found along the riverbanks and terrace edges of the Rakaia, Selwyn and Waimakariri Rivers. Plants here include kowhai, kohuhu, cabbage trees, coprosma and ribbonwood.

16. The high plains, located between 150 to 400m (approximately) above sea level, experience higher rainfall than the low plains, with more northwest winds giving rise to higher temperatures, and frequent frosts and occasional snow falls.

17. While the hill country has modifications, it is the plains which have undergone a dramatic change to become a more modified landscape. The contrast between the less modified natural downs and hills, and the patchwork landscape of the plains and the braided rivers are a distinctive phenomenon and, as stated before, this is a highly recognisable landscape. The symmetry and simplicity of the plains create a lasting impression.

18. It is a linear landscape, not only with the horizontality of the plains but the long straight roads, conifer shelterbelts, water races and fence lines. There is a repetition of the components throughout the plains' landscape.

19. In the vicinity of Coalgate and the Waianiwaniwa River area, the landscape is more convoluted and this culminates with the indented narrow river valleys and steep hillsides and winding roads.

20. The lower plains reflect a drier climate as seen in the vegetation types of short tussock land, matagouri and small leafed *Coprosmas* and *Olearias*. The settlement patterns are more intensive and frequent on the lower plains.

21. The overall character of the plains reflects diversity of development in the farming industry, settlements, and planting. The patterns on the plains are geometric as compared to the foothills which are more random. There is

very low visual intricacy on the plains whereas it is more complex in the foothills of the Malvern Hills.

(See graphic supplement photographs 1.0 – 6.0)

LANDSCAPE QUALITY

22. Landscape quality provides the information about whether a certain type of change is appropriate. It refers to the location's degree of naturalness, whether the site is vulnerable to change, if it is an important location in the district, and whether it has potential for development, improvement, or enhancement.

23. Quality is an important landscape determinant because it indicates that comparisons can be made and values derived between the existing situation and proposed development. For this scheme the changes include canals, dam, storage reservoir, batter slopes, structures, intakes, tunnels, roads, and vegetation removal.

24. The Canterbury plains reflect a high level of human modification and development. The most frequently noted characteristics are the low relief, the high producing grassland, the dry pasture and moderate to low density of settlement. There are no significant landform changes while the most frequently occurring positive elements are the watercourses, shelterbelts and exotic forests. The frequency of straight lines reflects the pattern of land subdivision, alignments of roads, shelterbelts and watercourses.

25. The following discussion describes the attributes used to determine the landscape quality, their definition and the ranking for this site. The criteria and values discussed below were essentially established by the Ministry of Works and Development in 1983 for the report, "Nature Resources of the Canterbury Region".

26. ***Naturalness:*** This reflects the degree of modification and the extent of human intervention. The more natural the existing site is, then the more vulnerable the site is to change and therefore changes need to be undertaken in a sensitive manner.

27. The criteria are:

    (a) High naturalness: Lack of modification to landform and vegetation and any modification is of a small scale.

(b) Moderate: Some modification to the landform and vegetation, some man-induced additions to the landscape, and a lack of native vegetation.

(c) Low: Considerable modification with structure and roads.

28. The area is of *low to moderate naturalness* due to the high degree of modification, industrial and residential structures, settlements, roads and fences. While the pastoral grassland and exotic shelterbelts have a strong presence there has been a very high loss of indigenous vegetation which diminishes the area's potential for a higher ranking. The higher plains are considered to be more natural than the lower plains.

29. ***Sensitivity:*** This refers to areas where the visual effect of change would be very noticeable. Coastlines and ridges are particularly likely to be highly sensitive areas. The criteria for assessing visual sensitivity of an area are:

(a) High: The site has extensive areas of sensitivity.

(b) Moderate: The site is limited as to the number of areas of sensitivity.

(c) Low: No areas of sensitivity exist.

30. The plains area has low sensitivity due to its flatness, presence of shelter trees and changes that have already occurred, while the Malvern Hills have moderate sensitivity to change.

31. ***Rarity:*** Rarity and coherence determine the importance of the site. Rarity is a measure of how common a landscape is within a district or region. If a landscape is highly rare then it is a distinctive landscape in the region. A moderately rare landscape means that there are other similar types, while low rarity means that there are many landscapes of the same type.

32. The area has a moderate to high rarity value due to its unique and recognisable landform throughout the region and New Zealand.

33. ***Coherence:*** Coherence of a landscape is a determination of unity and harmony within that landscape:

(a) High coherence: implies a landscape with a very harmonious relationship amongst the components of the landscape.

(b) Moderate coherence: means that there is some harmony amongst the landscape components of the site.

(c) Low coherence: implies a lack of harmony in the landscape.

34. For this area there is a moderate to high degree of coherence as the components consist of an intact landform, rural open space, shelterbelts and plantations, and small settlements. This is a common theme throughout.

35. ***Visibility***

(a) High visibility: implies a site that is easily seen and close to the viewpoint, near populated centres, roads, recreation areas.

(b) Moderate visibility: implies a site visible from secondary roads, small settlements, and scenic areas.

(c) Low visibility: implies a site not visible from settlements or roads.

36. The location has *moderate visibility*. The plains are less visible than the elevated slopes of the Malvern Hills. There is decreasing naturalness, sensitivity and visibility as one descends from the foothills to the lower plains. The latter is more modified and less sensitive to change because of more intensification of farming (smaller farms with more human elements in them) and a greater presence of settlements.

37. Because the foothills and parts of the higher plains (river gorges) have greater naturalness and sensitivity, then these landscapes would have a greater visual impact and are more vulnerable to changes in the landscape. Therefore, special care is required in these places when introducing new elements into the foothills and higher plains landscape.

38. Due to the location being of moderate to high rarity and coherence then these elements contribute a greater level of importance to the landscape. Again, care is required as to the location of the components of the development and how these changes are managed.

THE HUMAN IMPACT ON THE PLAINS LANDSCAPE

39. Man has modified the plains landscape since his arrival. Sometimes this has been with deliberate intent, but often with careless lack of forethought. In gaining a living and developing his economy, man has organised his life around the natural environment in terms of the techniques available to him, and the values that he sets. The modification that man has initiated on the plains has increased with the length of occupation, development of skills,

and growth of numbers. "Over much of Canterbury man has become the ecologic dominant".[1]

40. From the beginning of man's presence on the plains the natural environment became modified, although it was more localised, especially where he exploited the forest for building materials. Fire was used often by both Maori and European, sometimes destroying and modifying the vegetation.

41. The European settlers assessed resources in a different light from Maori and exploited them. They also experimented with using the land for cattle and agriculture. After 1840 the Canterbury plains were ready for more permanent settlement as the era of the pastoralist had arrived and the race for land was on. Extensive pastoral leases of thousands of acres were soon developed. Farming settlements rather than pastoral runs were also selected such as in the Waimakariri District where forests were cleared and swamplands drained.

42. Farm settlement spread rapidly across the plains culminating in a great expansion of small farms in the 1870s. This was due to government policy encouraging immigration and the building of railways across the plains. Small farms, 20 acres to several hundred acres in size, continued to make inroads into the leasehold runs and changed the character in terms of the farms' scale and intensification from the big runs. This occurred throughout the late 19th century.

43. Between 1863 and 1906, water races made a mark on the plains as did the need to settle returned servicemen, and farms became smaller. Canterbury has always depended on the use of soil as opposed to the extraction of mineral resources. As a result, the establishment of modern farming taxed the ingenuity of the occupants of the plains. In the process of this development, the appearance of the landscape changed.

44. One of the main transformations was the removal of tussock grassland which covered most of the plains and high country. It was not easy to use or occupy land with large clumps of tussock, spiky matagouri and wild spaniard. The farmer then fired the country, and after over a century of this practice there was a progressive deterioration of tussock cover. It also destroyed the succulent herbage, which grew amongst the tussock cover.

[1] WB Johnston, "The Natural History of Canterbury".

One hundred and fifty years of sheep grazing has accentuated the disturbance of the ecological balance i.e. the persistent grazing by sheep and rabbits depleted vegetation cover, and was assisted by fire in exposing the soil to extreme climatic conditions. Not only was grassland destroyed, but so, too, were areas of forest on the edge of the plains and intermontane basins like Cass.

45. Other uses, mostly on the upper plains and high country, were the developments for hydroelectricity, irrigation, flood control, and water supply.

46. The areas of mixed podocarp and kanuka forest on the plains were subjected to milling and clearing (e.g.: Harewood forest). By 1900 forest removal was complete and in its place exotic grasses were sown, responding to the enhanced fertility of the bush burns.

47. Many of the smaller settlements of Canterbury originated as saw milling centres such as Rangiora, Oxford and Hororata. With the destruction of the indigenous forest, Canterbury became deficient in timber. At the beginning of the 20th century the government embarked on a programme of planting exotic forests. Hence another transformation of the plains landscape occurred with large blocks of exotic forest namely pines, Douglas fir, larch and macrocarpa.

48. Further changes occurred with large belts of crop farms – the farm being ploughed and planted year after year in wheat, leading to declining yields and soil structure damage. Topsoil was exposed and blown out to sea. Shelterbelts and hedgerows were then planted to counteract the soil erosion and generally these were exotic species.

49. The introduction of refrigeration opened large overseas markets to meat, stimulating the development of a mixed agricultural economy. Crop rotation, top dressing with fertilizers, improvement of grasses, introduction of clovers and lucerne produced a new appearance to the plains. The dominant land use became exotic grassland.

50. Part of the agricultural revolution was the subdivision of large estates into the current pattern of farm holding. With this process, man needed to bring water to the dry plains, which generally lay well above the deeply entrenched riverbeds of the Waimakariri, Rakaia, Rangitata and Selwyn. The water race was the technique used to bring water to the high plains.

51. Tapping rivers as they emerged from the hills and forming large water races which in turn become an intricate system of channels radiating out across the plains was the system devised. Such schemes included the Rangitata Diversion Race flowing from the Rangitata River and culminating in hydroelectric power generation at the Rakaia River. Irrigation in the forms of canals, ditches, border dykes all caused the modification of plant growth patterns as well as the configuration of the land surface due to this complex network.

52. In the process of draining the land, streams were turned into man-made drains, rivers were controlled within stop banks and new outlets have been dug (e.g. Eyre River diversion).

53. In recent years, the increase in dairy production has seen the advent of new objects across the plains in the form of pump sheds, and the large irrigation pivots. As a result of these large industrial systems needing to be mobilised within farms it has become common to see shelterbelts and woodlots removed. This has opened up farmland and exposed the pasture to the climatic elements, as well as widening the views to the distant mountains.

54. It is in the nature of man to alter and transform himself and this process is a never-ending one. As man has modified his environment in an endeavour to gain a living, he has created new problems that have lead to new developments, for example improving crop quality and rotation has lead to a more sustainable intensification of farming on the plains. The extension of the application of proven techniques has brought further change as seen with irrigation for dairying on droughty soils, never in the past dreamed of as suitable for such production and lifestyle.

55. The rural landscape of the Canterbury plains has undergone many forms of modification since man first arrived and settled in the area. The current irrigation proposal continues that trend of modification for an improved quality of farm production.

IMAGERY OF THE CANTERBURY PLAINS

56. The image of the plains has been an important topic portrayed by many artists, writers, poets and photographers. It is the experience gained by them being on the plains that contributes to their responses.

57. The patterned character of the land, the weight of the blue sky, the volume of space, the horizon dividing land and sky, the simplicity of form and the

green-ochre colour of the land are some of the key elements in the composition of artists like McCahon, Sutton, Spencer Bower, Moffit, Angus, Lovell-Smith and Deans.

58. The colours of fawns, reds, greys, green and ochres are generic to the plains and attracted the likes of Bill Sutton as he portrayed the changing pattern and textures of light and shade upon the tussocks. The abstract concept behind his works called "Landscape Synthesis" of the 1980s portrays repetitive schematic horizontal bands of colour in a land/sky/land/sky pattern. This abstract concept removes the identifiable location and place, and creates a generalised image of land character.

59. Photographers like Chance, Kent and Johns; poets Dowling, Langford, and Glover; and writers like Marsh, Butler, Bethel and France have all been influenced by the landscape of the plains in some compelling works.

60. Canterbury is a province which has been seen by writers as a point where the green and gold bisect. It is place where the landscape is clearly not static. The landscape of golden tussocks and aboriginal grooves offers one image to literature. The landscape of green cultivations and scented plantations offers another. This means that one of the most common themes in writing has been a sense that change is constant, a constant which writers have seen as suggestive of the nature of human life – some feel sadness, a powerful sense of loss for the old landscapes - a desire to return to the world as it was when the colonists first came - while others find pleasure or solace in the change, and want more change, more colonisation or reshaping of what has already been made.

SCHEME COMPONENTS

61. The main components of the Scheme are located at the two river gorges (two of the three intakes), at the base of the foothills between the gorges (main canal), and a large storage reservoir near Coalgate. There will be a plethora of water races crossing the plains through to State Highway 1. While these elements are utilitarian in shape and use, there will be recreational and ecological opportunities, as well as amenity values, associated with the main canal, the reservoir, and bywashes.

Rakaia and Waimakariri Intakes

62. The intakes at both the Rakaia and Waimakariri locations will be located on the edge of the riverbed and at the toe of the batter slopes. The Rakaia

canal from the intake will bisect the river terrace slopes for a distance of up to 5km before reaching the top of the terrace and the high plain.

63. The canal from the upper Waimakariri intake will run parallel with the river at a level just above the riverbed for approximately 2km until it reaches the Kowai River. At a distance of approximately 1km from the confluence with the Waimakariri, the canal will be piped under the Kowai River and then become a canal for a further 1km. From this point, and in order to traverse the river terraces, the water is then tunnelled, bypassing Sheffield until it reaches the Waianiwaniwa valley and the storage reservoir.

64. The intake and canals structures will be of concrete construction. These structures are similar in construction to the Balmoral-Amuri Scheme, constructed in the 1970s, but are of a much larger size with a 20 to 30-cumec flow. The location is of a pastoral grassland type with beech trees prevalent in the Waimakariri location while on the terraced slopes there is a limited mix of native plants (cabbage tree, kohuhu, manuka), pine trees and weedy growth of gorse and broom.

(See graphic supplement 7.1-7.5 Rakaia and 11.1 – 11.3 Waimakariri)

Main Canal

65. The main canal will link the Rakaia and the Waimakariri Rivers with the storage reservoir at Coalgate. The alignment will be from each intake through to Te Pirita in the south, then to Racecourse Hill in the north. The canal passes through the rolling foothills and high plains landscape of pastoral grazing, shelterbelts, woodlots and the small town of Coalgate and settlement of Glenroy. The structure, for most of its length, will be 25m wide with softly sloping and vegetated batter slopes and it will pass under the Hawkins, Selwyn and Horarata Rivers. For all the other streams and creeks, the streams will pass under the race. In key locations, I expect the race will be widened to allow for recreational usage as well as increasing the ecological diversity of the area with potential amenity and riparian plantings.

(See graphic supplement 8.1-9.6)

Dam

66. A dam is proposed to contain the water of the Waianiwaniwa reservoir and is located at Coalgate. The dam will provide farmers with a reliable source

of water in dry periods when the Waimakariri and Rakaia River levels are low.

67. The dam structure will be approximately 55m high (maximum height) at 280m above sea level and 2km long, of earth construction and spanning the narrow neck of the Waianiwaniwa River at Coalgate. Its close proximity to the Coalgate township (0.5km) means that changes to the landform here will be of considerable impact. The crest of the dam will be 10m wide and a road will be provided on top of this, which will be 3m above the highest water storage level.

68. As a result of the dam structure, the reservoir will inundate the whole of the valley floor and parts of the side gullies in the Waianiwaniwa Valley. A new access road would be required above the lake level.

Storage Reservoir

69. The proposed reservoir is located in a sheltered valley between Coalgate and Sheffield. It is a narrow and well-defined valley with a discrete entry-exit near Coalgate. The Waianiwaniwa River is narrow and incised as it meanders across the flood plain within this contained valley. There is one significant side valley which leads into an old coal mining area. Part of this side valley will be flooded.

70. Throughout the main valley there are several farm homesteads and facilities which will be affected by the dam construction, as well as the dam location.

71. The location is generally of pastoral farming with conifer woodlots and shelterbelts. Some of the homesteads like “Kirkstyle” and “Tara” have fine stands of mature exotic trees, which enhance the location. It is a very tranquil scene which one can enjoy while driving between Coalgate and Sheffield.

72. The presence of the reservoir will allow the opportunity for recreational pursuits such as boating, sailing, picnicking, and camping, while the lake edge ecology could be enriched and made more diverse for wildlife.

Water Races

73. Across the high and low plains from the main canal to State Highway 1 a network of water races will be constructed to distribute water to farms and

bywashes from the larger canals. The water surface will be between 5 to 10m wide, depending on location, something which currently occurs on the plains although most of these are of a smaller dimension, such as at Kirwee. The sides of the races will have batter slopes with as few waterfalls present as possible. In most instances the races will follow the roading network, making for easier construction and maintenance.

74. As has happened with previous schemes these races will integrate well with the landscape as they occur at ground level, are linear and horizontal and follow the existing roading alignments.

(See graphic supplement 14.1 – 14.3)

Earthworks

75. The main canals and dam will create the most significant earthworks of the scheme. The cuts through the Waimakariri and Rakaia River terraces and the canal between Coalgate and Glenroy will require some deep cuts.

76. All cuts and batter slopes will be treated with oversowing, hydroseeding and planting so as to integrate these stretches into the landscape.

Pump Stations

77. Pump stations are required at various locations throughout the scheme. These will be of various forms and sizes and are proposed to be located at:

(a) Coalgate, below the dam and adjacent to the headrace;

(b) Upper Waimakariri pump station downstream from the Kowai River;

(c) Lower Waimakariri pump station downstream of the Gorge bridge;

(d) Rakaia pump stations near Windwhistle.

78. Other pump stations will be located on canals to extract water for each farm. A large number of these pump sheds exist throughout the plains in the vicinity of the roads crossing the plains.

Canals

79. There will be a diverse range of water canals across the plains. These will vary in width between 14 to 27m, with most being 14 to 16m wide. The

difference compared with what currently exists on the plains is that these carry more water and will be more visible, especially where the changes in level occur.

POTENTIAL EFFECTS ON THE LANDSCAPE

80. When dealing with the sustainability of the development to this location the issues to be concerned with are the detailed effects on the landscape. Under the RMA, the possible matters to address include section 6(a), recognising and providing for outstanding natural features and landscapes, and section 7(c), maintaining and enhancing amenity values.

Outstanding Natural Features and Landscapes

81. The Canterbury Regional Council Landscape Study (1993) did recognise both the lower Waimakariri and Rakaia Rivers and Gorges as being regionally outstanding natural landscapes.

82. This study considered that these braided rivers are unique features of the New Zealand landscape. It is therefore important that this element remains intact. At the intake points, both rivers meander over shingle beds, but the braided rivers begins downstream, well beyond the intake structures of the Scheme. The intake structure of the Rakaia is also well below the gorge, while for the Waimakariri River there is an existing intake structure and canal at the gorge.

83. The Environment Court (*WESI v QLDC* C180/99) defined relevant criteria for assessing landscapes as being: the natural science factors – geology, topography, ecological and dynamic components of the landscape; aesthetic values, including memorability and naturalness; expressiveness (legibility); how obviously the landscape demonstrates the formative processes leading to it; transient values, such as occasional presence of wildlife; or its values at certain times of the day or year; whether the values are shared and recognised; its value to tangata whenua and its historic associations.

84. Based on the assessment criteria for outstanding landscapes, as mentioned above, in my opinion the landscape in which the CPW is located within is not an outstanding one. Although there is the river gorge landscape, the upper Waimakariri River beyond the gorge, and the downlands landscape, these are all picturesque, with much modification and would not be considered to be outstanding landscapes.

85. The attraction of the higher plains is as a pleasant and modified environment as well as a frontispiece to the hills and mountains beyond.

86. Consistent with this assessment, the Proposed Selwyn District Plan does not recognise the Scheme area as an outstanding landscape.

Amenity Value

87. Under section 7(c) of the RMA, particular regard must be shown for *"the maintenance and enhancement of amenity values".* In relation to this proposal, amenity values include rural ambience, tranquillity and recreational opportunities. Such qualities can be retained if the built development is integrated into the landscape and the rural character is retained.

88. The foothill area, in which some of the Scheme's components are located, is generally an area where there is medium to high natural character with the dominant elements being landforms, pastoral grassland and exotic vegetation. The built environment is limited to farm dwellings and roads and fences for the majority of the Scheme. The settlement of Coalgate, which will be in close proximity to the reservoir structure, is obviously a location of more diversity with public facilities, housing, industry and open space.

89. Due to its lack of landform diversity, the plains' landscape on the other hand has a dominant grassland cover and landuse character of pastoral farming. The landscape is seen as less natural than the foothills because it is more modified by human intervention. There are limited remnant natural features such as wetlands, forest, scrubland, and grassland. The braided rivers of the Waimakariri, Selwyn and Rakaia are the most natural features within the Scheme's location.

90. The Waimakariri River is used more for recreation than the Rakaia but the latter is a better fishing river. Both rivers are dramatic, and unpredictable even though they are partly contained, and discharges and irrigation draw offs occur in them. The gravel bed provides habitat for several rare and endangered endemic birds and the rivers are a focus for reflection, relaxation, fishing and jet boating.

91. The Waimakariri River is of great significance to the tangata whenua while both rivers are a link between the mountains and sea. The issues of sustainability and inappropriate development apply on both rivers. It is

therefore important that any development has regard for the naturalness and simplicity of the river landscape especially at the gorges, where there is a sequence of grassed terrace flats and scrub clad cliff faces. These structures must be integrated into the environment so as to minimise the impact on the natural dominance of the landscape.

92. Creating places for recreation and ecological enhancement, especially along the main canal and at the lake, will enhance the value of the Scheme in terms of natural character. The planting of native species adjacent to the lake edge could provide a high degree of quality to this environment thus enhancing the natural character.

93. During the construction process and for several years after the Scheme is operable, many of the Scheme's components will be raw-looking and have high impact, thus affecting the degree of natural character. This will be especially true of the intakes and the canal as it bisects the river terraces, and of the dam structure. With appropriate enhancement measures in place these components will soften and become integrated so that the natural character is restored.

94. Both intake locations are memorable places for the legibility of the landscape of the well defined linear terraces and the steep batter slopes, the geometry of the paddocks and shelter belts on the river flats offset by the randomness of the rivers and the clarity of the colour (grey shingle, dark green trees, light green pasture and the gold of the gorse). The naturalness is punctuated by the Highbank power station and pylons on the Rakaia, isolated buildings, roads and fence lines. To assess the potential effects on amenity values, it is important to know about the visibility of the proposal, who will be affected and how significant any adverse effects will be.

Visibility

95. Visibility is a determination of how easily and regularly a landscape is seen by people. This can contribute to the importance of a particular landscape. The Environment Court has recognised that it is not just a numbers game, *Steffan Browning v Marlborough DC and NZ Marine Farming Assoc* W20/97 (Annie Bay). In other words, it is not about how many see a landscape but the significance of seeing that landscape.

96. Visual effects are determined by:

(a) *The visual catchment*. Each component of the Scheme can be viewed from different view points.

(b) *Viewing audience*. These could be travellers in vehicles, recreationalists on water and land, and land owners.

(c) *Anticipated visual changes*. Visual change to a landscape can be assessed over a lengthy period of time from the onset of development when a site is at its most vulnerable and additions can be seen in a raw state, through to the maturation of enhancement measures.

VISUAL EFFECTS

97. The following is a discussion of the visual effects of the various components of the Scheme.

Rakaia River

98. The proposed intake system will consist of the following structures and works:

(a) A low diversion bank, if required, across part of the riverbed to direct water towards the intake area.

(b) A low-level breachable gravel weir, if required, to turn water into the intake channel.

(c) An excavated channel, (approximately 25 m wide) as required, off a major braid to ensure water enters the intake channel.

(d) Works to protect the intake system from erosion and flooding, such as stopbanks, rock groynes, rock lined banks and vegetative protection.

(e) A gated intake structure and box culvert at the downstream end of the intake channel (5m x 5m x 3m height) surrounded by a stop bank.

(f) A short sluicing race, about 1km downstream from the intake gate, to settle fine gravels and sands and then discharge them back to the river via a sluice gate and side channel.

(g) Fish screens shortly downstream from the sluicing race to exclude (particularly) downstream migrating fish from the Scheme works and return them to the river.

(h) A settling pond about 400m long and 100m wide starting soon after the fish screens and sluicing race, to settle fine sediments.

(i) A control gate at the downstream end of the settling pond to fine-tune the rate of flow into the Scheme and prevent backflow from the Scheme canal into the intake.

(j) A pump station about 6km downstream from the control structure to lift water up the terraces for the Windwhistle areas that are higher than can be served by the gravity intake. This will be a concrete structure of 5m x 5m x 3m.

(k) A sidling canal to carry water to the top of the river terraces and into the main scheme canal.

99. The majority of the intake works upstream of the sidling canal would be on a relatively undeveloped river berm.

100. The beginning of the intake structure is located 8km downstream of the gorge bridge, at 245 metres above sea level. From the public viewpoint, on the upper terrace of the river of the north bank, a view can be gained of the intake area. This is at a distance of approximately 5km; a considerable distance to detect Scheme details, but a change from what currently exists where there are no man made elements. The intake structures are located in the riverbed at the toe of the embankment slope and due to this location will be in shadow for part, if not much of the morning time, given that it is a south facing location.

101. This makes the site less visible as the detail cannot be discerned if it is in shadow. As well, the intake structure is small in comparison with the vastness of the riverbed and the presence of weedy riverbed growth partially screens and subdues its presence.

102. A closer view can be gained from the Rakaia River Road on the true right embankment; at a distance of approximately 2.5km. Again, the vastness of the riverbed and light conditions reduce visibility of the structure.

103. From the intake structure, a canal will traverse the embankment and terrace in order to reach the high plain, a distance of 5 to 6km. This structure will cause a significant landscape and visual effect during and at the completion of construction, due to the reshaping of the embankment and the removal of the existing vegetation. As well, the canal will form a line across the

embankment landscape which will be incongruous compared to the lines of the terrace and the river gradient. All of this will be very visible for the construction phase and up to approximately 10 years.

104. The mitigation measures of grassing and planting the batter slopes will screen and integrate this structure. The planting will take place 6m below the lip of the canal structure because no tree roots should penetrate the canal structure at water level. The top 5m of the canal will be grassed.

105. The amenity of the location will be impacted upon during the construction phase and for a further 5 years, depending on the vegetation growth, especially for jet boaters and fishermen, who frequent the river adjacent to the intake and canal. It will be a localised loss of amenity and more of a change to the embankment.

(See graphic supplement photos of Rakaia Intake and Canal 13.9 and 13.10)

Upper Waimakariri River Intake

106. The location is a remote one, experienced by jet boaters, trampers and fishermen and, while there are points of contact from roads to the river on both sides of the river, there are few public viewpoints. It is the beginning of a narrow and sinuous part of the river which is essentially experienced by the railway, upstream of the intake.

107. The intake is on the true right embankment at 300m above sea level, approximately 3km upstream of the confluence of the Kowai and Waimakariri Rivers. There is also an alternative location 1km further upstream.

108. At the intake for the alternative upper site a tunnel is required so as to protect the intake channel from flooding. Downstream from this intake channel / tunnel the works are similar to the proposed Rakaia intake, where the components consist of sluice race, sluicing structure (1 km downstream), fish screens, sediment settling ponds (about 5ha in area), and a control structure. The settling pond will be located on an undeveloped river berm or low terrace. From the canal the water is piped under the Kowai River then into a short stretch of open canal and into a 3.5m diameter tunnel which will then travel for 10km to the Waianiwaniwa storage reservoir. At the junction, between the canal and tunnel, a

submerged concrete portal structure 5.0m wide and 5.0m in height will be constructed.

109. Essentially, the intake structures through to the sediment pond areas will occupy a distance of 3km through to the Kowai River.

110. As with the intake structures of the Rakaia, these will occupy either riverbed or low river terrace. The visual effect will be limited to specific locations and viewers who are recreationalists (fishermen, jet boaters, and those who use Rubicon Road, as well as viewers from Woodstock Station on the opposite side of the river). The road users will be limited in numbers.

111. The effect will be a transformation of pastoral grassland, shelterbelt and indigenous forest environment and a few scattered farm dwellings into a more industrialised landscape. The modification will create a visual effect but with the advent of 5 to 7 years, the effect will have been reduced due to regrading, grassing, and planting similar to the existing vegetation pattern and species. The landscape and visual effects will be minimal at this stage.

(See graphic supplement 13.7-13.8)

Lower Waimakariri Intake

112. A second water intake will occur near to the Waimakariri River Gorge bridge on the true right bank, at 250m above sea level. There are two possible intake sites, both upstream of the bridge. It is proposed to construct a 300 to 500m-length tunnel through the rock adjacent to the stock water race, which was tunnelled through the rock some time ago. The tunnel will exit on the site of the present stock water race.

113. Downstream of the tunnel, the structures and works will be similar to the Rakaia River intake, i.e. sluice race and sluicing structure at 1km downstream from the intake, fish screens and return channels, sediment settling ponds (about 5ha), control structure, sidling canal to take water up the terrace on to the plains. Apart from the sidling canal all the visible structures and works will be on underdeveloped river berm and coincide with the existing stock water race alignment.

114. This is a location with reasonably high visual effect due to the gorge bridge and public viewpoints both at bridge level and in the riverbed. It is a popular spot for launching jet boats or kayaks, for fishermen and the

congregation of many competitors and support crews for the Coast-to-Coast race in March each year.

(See graphic supplement 13.7 and 13.8)

Headrace Canal

115. The canal passes between the Waimakariri and Rakaia Rivers for a distance of 54km at a level of 235 asl. This system compromises a canal, embankments, siphons under rivers (eg: Hororata, Selwyn and Hawkins), pipes for small streams and water race crossings, and bridges for roads and railway crossings. In some places like the Harper Hills (between Selwyn River and Hororata River) there will be a need for cuttings, at an unknown depth until precise design work is undertaken. The total footprint of the canal structure and embankments will be generally about 50m.

116. The canal will generally integrate in the plains' landscape as the embankment forms a linear appearance in the vicinity of the Waimakariri and Rakaia Rivers. In these locations the canal will be visible to the public where the road crossings are made. For much of its journey over the high plains the embankment height will vary between 1 and 4m and the visual effect will be experienced by landowners, where the embankments could divide their farm landscape both visually and physically. Where the headrace crosses roads the embankment tops will be at road level, so there will be no interruption to sight along the roads, except for the SH77 and Coaltrack Road crossings at Coalgate.

117. When traversing the foothill country the canal will take on a more sinuous and curvilinear form so as to fit into the forms of the landscape. The canal will be an incongruous structure when viewed from above, such as from Maffeys Road and the full extent of the structure will be realised as it cuts across farmland.

118. Where the canal crosses over small streams, or is siphoned under the main rivers, or where roads cross over it, then these are the most visible locations. In these places concrete abutments, culvert entrances, or bridge structures will be visible as well as alerting the traveller or farmer of the presence of the canal.

119. When viewed at eye level the canal will reinforce the linearity of the plains landscape, but where it traverses the base of the hills and makes crossings,

then these points will alter the existing amenity value of the rural landscape by creating a line across an otherwise pastoral grassland landscape.

120. Initially the canal construction will encompass major earthworks and these will cause a scar on the landscape. The embankments will be grassed and this will relate to the existing pastoral grassland. The headrace will pass through low hills or ridges as mentioned. The two most significant cuttings occur southeast and northeast of Coalgate. The cutting through a spur of Harper Hills will be 1km long and up to 10m deep. By locating the headrace here it will avoid homesteads at The Bend and Glendore. In a short time the batter slopes will be grassed, and only a line will be evident in the landscape.

(See graphic supplement 13.13 and 13.14)

121. The same occurs on the lower slopes of Homebush Ridge where the cut will be 1.1km long and 25m deep, thereby avoiding the historic Homebush homestead. The canal will register as a line bisecting the hill landscape from the main road, although it will be at some distance. I believe this will be visible only from within Homebush Station and the adjacent property, and not from the road.

(See graphic supplement 13.11 and 13.12)

122. There are 12 small streams to be crossed on the lower slopes of the Harper Hills, and 6 stream crossings along the Homebush Ridge. The structure will be a concrete culvert which will carry the flows of these two mainly ephemeral streams beneath the headrace.

123. There will be 18 water race crossings and the races will be piped beneath the headrace, 19 crossings of the roads requiring 2 lane bridges, while 20 one-lane bridges are required for farm tracks. The most visible crossing will be where the headrace crosses the main West Coast road and railway line near The Oaks, 4.5km northwest of Darfield. At this point the railway is adjacent to SH73. Both crossings will be bridged.

124. Throughout the length of the headrace there will be about 10 radial gate outlets, 5 between the Rakaia and Selwyn Rivers and 5 between the Selwyn and Waimakariri Rivers. These will be of steel construction. These will be industrial type structures and form part of the rural pastoral landscape.

Crossings

125. At the Kowai, Hawkins, Selwyn and Hororata Rivers, the canal will be siphoned under the river. Concrete structures will be required at each bank of the rivers. Each of the locations' visibility will be low, hence the adverse effect on amenity values will also be low.

126. Where there are small crossings, such as for streams and races, these will be piped beneath the canal. At each end a small concrete structure will visible, and these will have a minor effect on the amenity.

127. Where roads pass over the canals the latter will be bridged, similar to the RDR scheme.

Waianiwaniwa Dam

128. The dam construction at the neck of the Waianiwaniwa River will be a highly visible change to the existing landform and land use pattern when viewed from Coalgate township and the SH77. This will also change the township's sense of place in the landscape given that the dam will be 55m high and encloses Coalgate's view and outlet into the Waianiwaniwa Valley.

129. The visual effect of the dam wall could only be partially mitigated by soiling and grassing, integrating the dam wall junction with the adjacent hill slopes and by the planting of trees at the base of the dam and valley floor which could increase a degree of naturalness.

130. A dam wall is a significant statement in the landscape. Over a period of time it will become an accepted element, but mitigation is difficult to achieve.

131. The construction period will see the time of worst visual impact. The existing trees will be removed, the dam structure will form a uniform structure of 2km to the neck of the valley, there will be bare ground, and heavy machinery operating adjacent to the township. This increased activity and initial change will be a temporary impact until growing on the slope and amenity planting takes place. The planting will take some considerable time if the landscape is to be compatible with its existing state i.e. deciduous and coniferous exotic trees.

132. The landform of the dam once finished will appear to have a lineal and flat ridge when viewed from Coalgate. Trees will line the foreground but traffic

will be seen occasionally going across the top of the dam. Buffer planting of tall trees placed between the existing highway (Homebush Road, SH77) and the dam will reduce the visual impact. For these trees to mature and have full effect may take approximately up to 20 years depending on the species chosen and anticipated growth rates.

133. The dam structure itself will remain grassed and unplanted. This and the ancillary dam structure such as the tower, spillway pump station and outlet canal will also add an industrial appearance to the existing tranquil pastoral scene. Over time, these structures will soften and be screened with planting.

(See graphic supplement 13.1-6, 13.15 and 13.16)

Storage Reservoir

134. The reservoir behind the dam will flood 12km² of the Waianiwaniwa Valley. This reservoir will cause a dramatic change to the pastoral landscape that currently exists.

135. Gone will be the stock, trees, grassland, river and general bucolic character of the location. In place of this will be a body of water which could provide an important recreational amenity for central Canterbury in the form of boating, sailing, swimming, camping and picnicking. Before the valley is filled with water the removal of trees, fences, structures and the reshaping of the shoreline will be undertaken.

136. With time, the water's edge will mature with grassy flats, amenity trees, picnic spots, launching pads, jetties and facilities for camping and picnicking. This will add considerable appeal to the newly formed lake, just as Lake Benmore has provided improved amenities and facilities for holidaymakers and travellers.

137. The visibility of this valley is relatively low, with the land in private ownership although public roads exist. A reservoir will transform this valley from a typical pastoral environment with a small river to one that has a large body of water. The reservoir will flood 12km of the Waianiwaniwa Valley. This reservoir will be subject to potential drawdowns.

138. The visual effect of this could be dramatic, such as occurs at Lake Opuha near Fairlie, where there is a large rim of soil and mud exposed around the lake. Draw down can lead to problems in terms of visual amenity value.

The worst situation is one where the natural slopes adjoining the reservoir are the same throughout its perimeter. The result is that a regular sloping beach completely surrounding the reservoir is exposed. However, where the landform of slopes surrounding the reservoir are more varied, the exposed beaches will be less monotonous, as will occur with this site.

139. With projecting headlands and shallow areas of limited length the visual effect will be acceptable. In some instances and in key public areas, colonisation by suitable plant material (such as rushes and sedges) can improve the appearance of the exposed areas. Another factor worth considering is the elimination of less desirable shallow areas where small islands are left during maximum drawdown period.

140. Where drawdown conditions persist for more than a few weeks, vegetation colonisation may take place in some areas. Should there be strong wave action, then this will reduce the potential for colonisation. As most of the landscape is of grassland then removal of this will not be a problem for the exposed perimeter during drawdown periods.

141. Rehabilitation could occur in key roading and public areas such as boat launching, fishing and picnic places, as occurs at Lake Benmore. This could be in the form of battering and grassing the slopes of the access track, creating a defined car park, picnic area and lake access for boats.

142. Roads affected within the dam and reservoir area are:

(a) Malvern Hills Road from approximately 0.4km from SH77 to approximately 1.7km beyond the Malvern Hills Road/Waianianiwniwa Road intersection;

(b) All of Bush Gully Road;

(c) Approximately 1.9km of Auchenflower Road from Malvern Hills Road; and

(d) Approximately 3.3km of Waianiwaniwa Road beyond the Malvern Hills Road/Waianiwaniwa Road intersection.

143. The dam and reservoir will reduce the access to the upper part of the Waianiwaniwa Valley and eliminate access to a number of properties bounding the shore of the proposed reservoir.

144. The reservoir will make a substantial change to the existing landscape. However, its presence will enable public recreation to take place in this sheltered valley. It is envisaged that such activities as boating, fishing, swimming, sailing and picnicking could take place, just as they have at Lake Benmore and Opuha.

145. Associated with the reservoir are other ancillary structures such as the outlet, a headrace system and headrace route. The visibility of the reservoir is low, due to its location away from the main routes and screened by the Malvern Hills.

Pump Stations

146. Pump stations are required for 2 areas i.e. in between the western end of the Harper Hills and towards the Rakaia gorge, and the Sheffield to Springfield area. Five pump stations are required and these are located at Coalgate, Upper Waimakariri (downstream of the Kowai River confluence), lower Waimakariri (below the Gorge bridge) and two at Rakaia (Windwhistle).

147. The Coalgate pump station would be about 50 x 20m, and 4m above ground. The Coalgate and second Windwhistle pump stations will be readily visible from roads. Probably only the Coalgate pump station will be a concrete structure as the others will look like an enlarged farm pump house.

Water Channel Network

148. A network of water races will occur across the Canterbury plains through to SH1. These will generally be located along the roading network or fence lines. The races will be most visible when driving along the road, and will be at ground level, but will be much larger than the existing races, with a width of 10m depending on design capacity. The structures will be constructed by cut and fill excavation. To accommodate the land gradient, low falls will be placed in the races. A similar structure can be seen in the Ashburton-Lyndhurst scheme.

149. The visual effect of these structures is minor as there are many kilometres of canals existing throughout the plains today. The only difference is the width of the structure and the ability for the public and farmers to conveniently cross them.

150. There is an air of freshness associated with the races, contrasting with the parched ochre grassland of the road berm. There is also a fascination of tumbling water over the low falls.

151. The visual effect will be low as the structures are at ground level and there is currently a common acceptance of water races across the plains.

Bywashes canal and settling ponds

152. Small volumes of surplus water will be discharged from the end of the network into the wetlands, to existing stock races, or the headrace.

153. These are on the edges of the whole scheme. There will be little adverse visual effects other than creating a larger water body in wetlands and refuge for wildlife. This will be a positive effect for the rural farmland. Because of the ephemeral nature of these areas, the wetlands could become dry during summer periods.

154. The bywash canals are the end point for the whole system and there will be a number of these throughout, so the same visual effect will apply to these as to other channels.

155. In most instances the bywash races will empty into settling ponds before discharging underground to the main rivers. With the addition of wetland planting, such components will add to the ecological diversity of the river terraces creating a positive visual effect.

Construction

156. The visual and landscape effects also relate to the construction period. Components such as cofferdams, river and stream diversion, tunnelling equipment, concrete batching plants, earthworks at intake sites, the removal of vegetation (mainly exotic and weedy growth), dumpsites, site equipment (cranes, scrapers, excavators, compactors, drilling equipment etc), movement of equipment, building of haul roads will all have an effect on the immediate and surrounding locality. This will of course be a temporary change to the amenity value at the various sites. On conclusion, all machinery and stockpiles will be removed, graded, grassed or planted.

Excavated material

157. Material excavated from tunnels will be disposed of in the Waianiwaniwa Valley, contoured, grassed and or planted. Construction of the headrace will be cut to fill so there should be no extraneous material to be dumped.

ENHANCEMENT MEASURES

158. Some mitigation and enhancement matters have been discussed already in order to integrate changes into the landscape. Great care is required in siting and constructing the intake canal structures of the two main rivers as they bisect the embankments. As a result the preparation of the reservoir edge is very necessary for future public usage, and the main canal requires judicious siting and rehabilitating.

159. Even though much of the landscape within the Scheme's area is a modified one, it is still a very open and visible landscape and therefore the correct placement and restoration of the Scheme components is paramount in maintaining a coherent and harmonious landscape. The following are recommended measures to improve the Scheme's integration into the landscape:

Rakaia and Waimakariri Intakes

(a) Leave the concrete structures to weather naturally.

(b) Any timber and iron components of the structure should be painted in recessive colours (see colours).

(c) The batter slope of the embankment across which the canal route is made should first be grassed and then planted with colonising native plants such as kohuhu, coprosma, toetoe, NZ broadleaf and manuka.

(See graphic supplement 15.6)

The Main Canal

(a) A sinuously aligned canal especially at the base of the foothills.

(b) Grassed batter slopes above and below the canal.

(c) In several places along the alignment and in flatter areas, create larger free form areas as part of the canal, as local amenity and ecological

places which integrate to the existing landform and near to road access points.

(d) Increase the vegetation diversity with native plants and amenity shade trees. The latter will link to existing trees throughout the foothills and river systems.

(See graphic supplement 15.5)

Waianiwaniwa Dam

(a) Integrating the dam structure into existing landforms.

(b) Grassed dam batter slopes, facing Coalgate township.

(c) Buffer planting below the dam near Coalgate township and around the structures and canal.

The Storage Reservoir

160. This component of the Scheme offers the greatest opportunity for amenity, recreational and ecological values. The lake edge is the key area where the enhancement measures can take place i.e.:

(a) Grassed dam batter slopes, facing Coalgate.

(b) Significant areas of exotic tree planting to relate to the existing situation of a pastoral landscape.

(c) Lake edge to be accessible in places (beaches, board walk/jetties, grassed areas) and to be ecologically diverse (range of native plants, gradients, and habitats) and shade trees.

(d) Picnicking, boat launching and camping areas to be developed.

(e) Shade trees and shelter areas.

(See graphic supplement 15.1-15.4)

Canals and Water Races

(a) Grassed batter slopes.

Bywash Canals

(a) Gentle batter slopes.

(b) Soft edges with native planting.

(See graphic supplement 15.6)

(c) Removal of some willow and weed growth.

Ancillary Structures

(a) Leaving the concrete structures to weather naturally.

(b) Painting the small pump sheds in recessive colours.

(c) Grading excess excavated material and grading the batter slopes.

(d) Planting around highly impacting structures and stockpiles.

Tunnels

(a) Gradual slope angle for tunnel entrance and exit points.

Vegetation Enhancement

161. Contouring and enlarging of water bodies for recreation and ecological values are important enhancement measures, but it is the plantings which can link areas together, screen, shelter, shade and provide wildlife habitats and amenity areas for people to enjoy.

162. Planting types could include:

(a) *Exotic deciduous trees* (suitable for Canterbury conditions):

(i)	oak	ash
(ii)	plane	box elder
(iii)	birch	willow
(iv)	poplar	elm

(b) *Native vegetation* (colonising species):

(i)	NZ beech	cabbage tree
(ii)	coprosma	manuka
(iii)	kanuka	kowhai
(iv)	kohuhu	lemonwood

(v)	lacebark	ribbonwood
(vi)	rush sedge	toetoe
(vii)	flax	sedge

THE LONG TERM LANDSCAPE AND VISUAL EFFECTS

163. I have discussed the landscape and visual effects of each component of the Scheme. I now wish to discuss the overall and long-term effect of the Scheme on the landscape in which it is located.

164. The most noticeable and significant effect from the outset will be the change to the Waianiwaniwa Valley and to Coalgate township environs. Gone will be the pastoral landscape of the valley floor and in its place a large waterbody. The innocuous existing neck of the valley fronting Coalgate will become the site of a 2km long and 55m high dam wall.

165. Both these elements will produce significant changes to the function of the landscape. These changes can be expressed as form, colour and texture. The reservoir will represent an opportunity for a bold design statement. By developing an earth dam, the visual effect will be reduced by the integration of the form to the existing landforms and appropriate over sowing and vegetation. The edges of the reservoir represent an opportunity to create a scalloped alignment suitable for recreational spaces and use. It is therefore important that the edges of the dam wall and reservoir are undertaken correctly through good design and implementation. Changes can be accommodated, as they have been throughout the history of the plains, but it must result in an environmental benefit to those living in the district as well as visitors.

166. For canals and water races the effect of these structures is experienced the same way as for roads, through line and colour. Changes associated with canals, and races are more easily accepted on the plains than on hillsides where a canal is an arbitrary pattern traversing across the landform. The canals are only narrow components passing through a large scale landscape. Because changes have occurred before in land cover and land use, and as they are similar in size to roads then they are relatively easily accommodated. With the implementation of a revegetation scheme the impact of the canals bisecting the river embankments can be reduced.

167. The character of the plains' landscape has been changing with the advent of irrigation via central pivot systems. The grassland is greener all year, there has been a reduction in shelter belts, woodlots and commercial plantations to a more open and uncluttered landscape. There has been an increase in industrial structures throughout the landscape in the form of pivots, pump sheds, different fencing patterns, and milking sheds. With the proposed scheme there will be a continuation of this theme with the addition of canals and races. The overall impression will be one of a green landscape with less of the summer ochre colour, and the open landscape with less coniferous shelter trees and woodlots. There will be benefits to the landscape with ecological enhancement through riparian plantings, revegetation schemes for river embankments, and for extensive recreational opportunity associated with the reservoir. The latter in itself will allow for larger view shafts to the mountains.

168. The plains' landscape has been evolving for 150 years and this proposed scheme will continue the changing pattern.

CONCLUSION

169. The rural character of the pastoral farmland, cropping, forestry and shelterbelts is a landscape valued and accepted by both inhabitants and visitors to Canterbury. This is a landscape that has developed over the past 150 years and it is now a landscape that people can enjoy, appreciate and participate in. Importantly too, the plains set off the grandeur of the mountains beyond. The sheer scale of the horizontal plains can display the array of mountains and high country from the Rakaia to the Waimakariri Rivers and beyond. Its horizontality, colour range, components, land use and influence on its inhabitants makes it a unique landscape in New Zealand.

170. It is in the nature of man to alter things and in so doing to transform himself and this process is never-ending. As man has modified his environment in his endeavour to gain a living he has created new problems which in turn have led to new developments.

171. The increasing intensification of farming and turning of attention to features hitherto regarded as minor have produced many advances. These advances include the provision of critical trace elements in the soil and the application of insecticides to control pests in crops and pasture, both of which have increased production. Changing sources of power have seen a

retreat of the ploughed land from steep slopes with the replacement of the horse by tractor. The extension of application of proven techniques will bring further changes, as instanced by the potential for pasture irrigation of droughty soils and for aerial topdressing and oversowing.

172. The water enhancement scheme will result in some changes to the landscape of the high and low plains and lower slopes of the Malvern Hills. This change will be most noticeable at the outset, especially during construction. Like all large schemes they mellow with time due to appropriate enhancement measures which integrate the components into the landscape and then become an accepted part of the landscape. We have been aware of irrigation canals on the plains for over 100 years, and more latterly with centre pivot and pump stations. Where the greatest change will take place, the dam, storage reservoir and headrace, is where the greatest opportunities exist for recreation, for increasing ecological diversity and for amenity values. With time these areas could become a real asset to those who frequent the high plains.

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