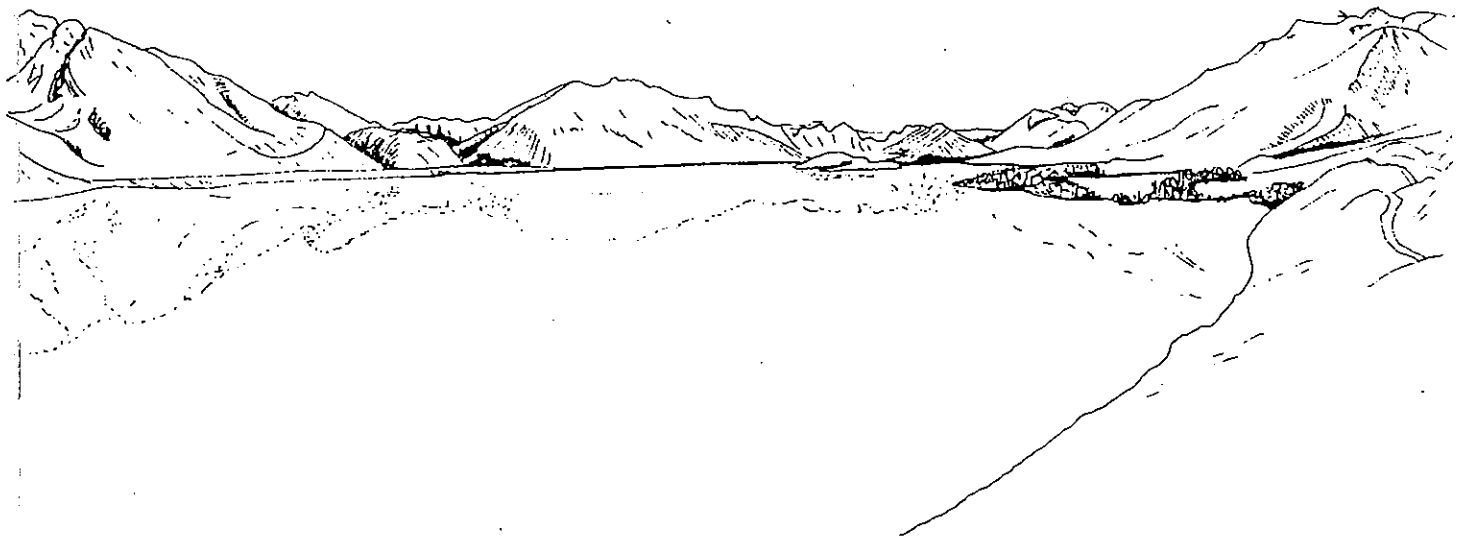


UPPER LAKE WAKATIPU RESERVES MANAGEMENT PLAN DRAFT



Department of Lands & Survey
Dunedin

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UPPER LAKE WAKATIPU RESERVES .

DRAFT
MANAGEMENT PLAN

Department of Lands and Survey
Box 896
DUNEDIN

OCTOBER 1985

PREFACE

Under the Reserves Act 1977 and former statutes a comprehensive system of public reserves has been built up in New Zealand with the aim of protecting and preserving natural features of scenic beauty and scientific importance, significant historical features and providing open space areas for public enjoyment and recreation.

The group of reserves located around the upper Lake Wakatipu shoreline incorporate all of these values. By virtue of their location and predominantly natural state they provide an important visual backdrop to the scenic splendour of the lake. They act as a stabilising buffer between the land and water, protecting and enhancing soil conservation and water quality values while providing wildlife habitat and a source of food and shelter for the lakeshore fishery. For those pursuing outdoor and water based recreational opportunities the reserves provide shelter and open space for camping and access to the lakeshore. They also contain several features of regional historical significance.

As the administering agency for the reserves the Department of Lands and Survey recognises that their full potential for public use will only be realised under carefully considered management and development. The department is aware that there has been considerable growth in summer visitor numbers to the Wakatipu region in recent years which has placed pressure on other public reserves in the district, particularly those near Queenstown and Frankton. The Department believes that the upper Lake Wakatipu reserves offer an opportunity to absorb some of this pressure. However, it is important that management of the reserves for public recreational use is balanced against the need to protect their natural features which determine to a large extent the high quality of the lakeshore environment.

It is the goal of this management plan to achieve this balance between management for public use and environmental protection. The plan describes and assesses the special values of the reserves, reviews their classification and sets out the basic management objectives (what management is trying to achieve) and the policies and implementation measures by which these will be achieved. The plan also looks at the role of the reserves and their management in the wider regional context and comments on the need for co-ordinated management with adjacent ~~landholders~~ and local authorities.

An effort has been made to strike a balance between making the policies rigid enough to provide direction and cohesion in management but flexible enough to adapt to changing conditions and an increasing understanding of the reserves and patterns of public use.

Public involvement in the management plan is ensured under the Reserves Act 1977 and is actively encouraged by the department. Comments and submissions are invited from the public on any aspect of the plan or reserves management and these should be forwarded to:

The Commissioner of Crown Lands
Department of Lands and Survey
PO Box 896
DUNEDIN

Persons or organisations making a submission should indicate if they wish to be heard in support of their submission by the Commissioner. It should be noted that submissions may be made public in part or in full without further consultation with the authors.

The closing date for submissions is 31 January 1986.

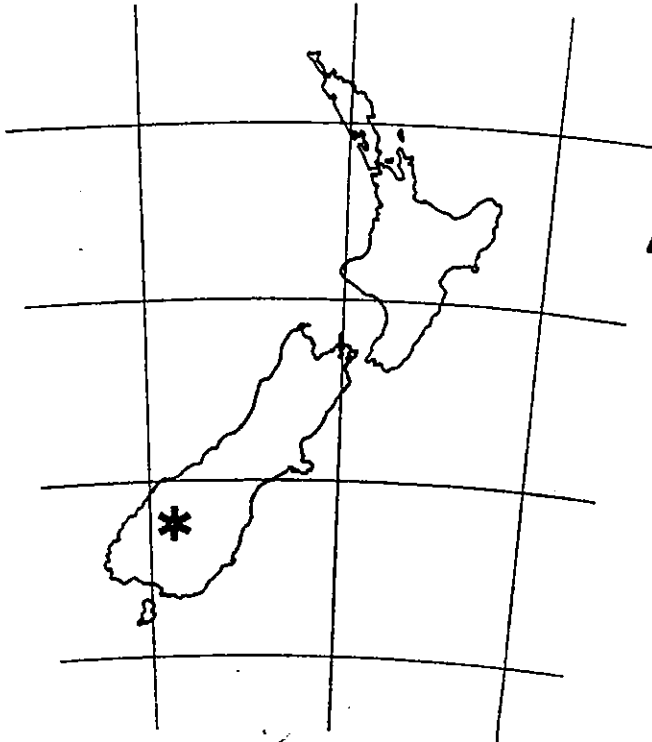
J N Rodda
Commissioner of Crown Lands
DUNEDIN

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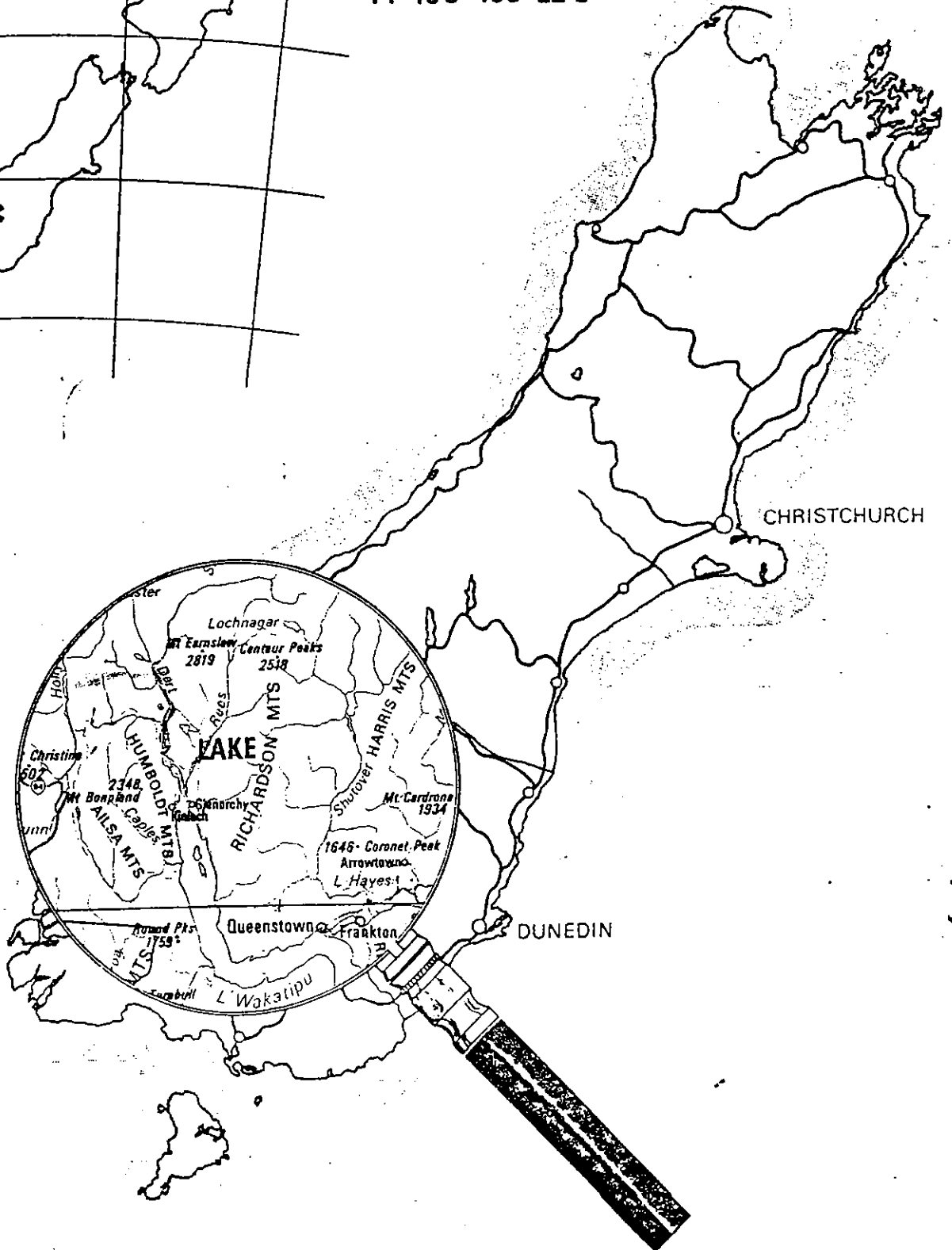
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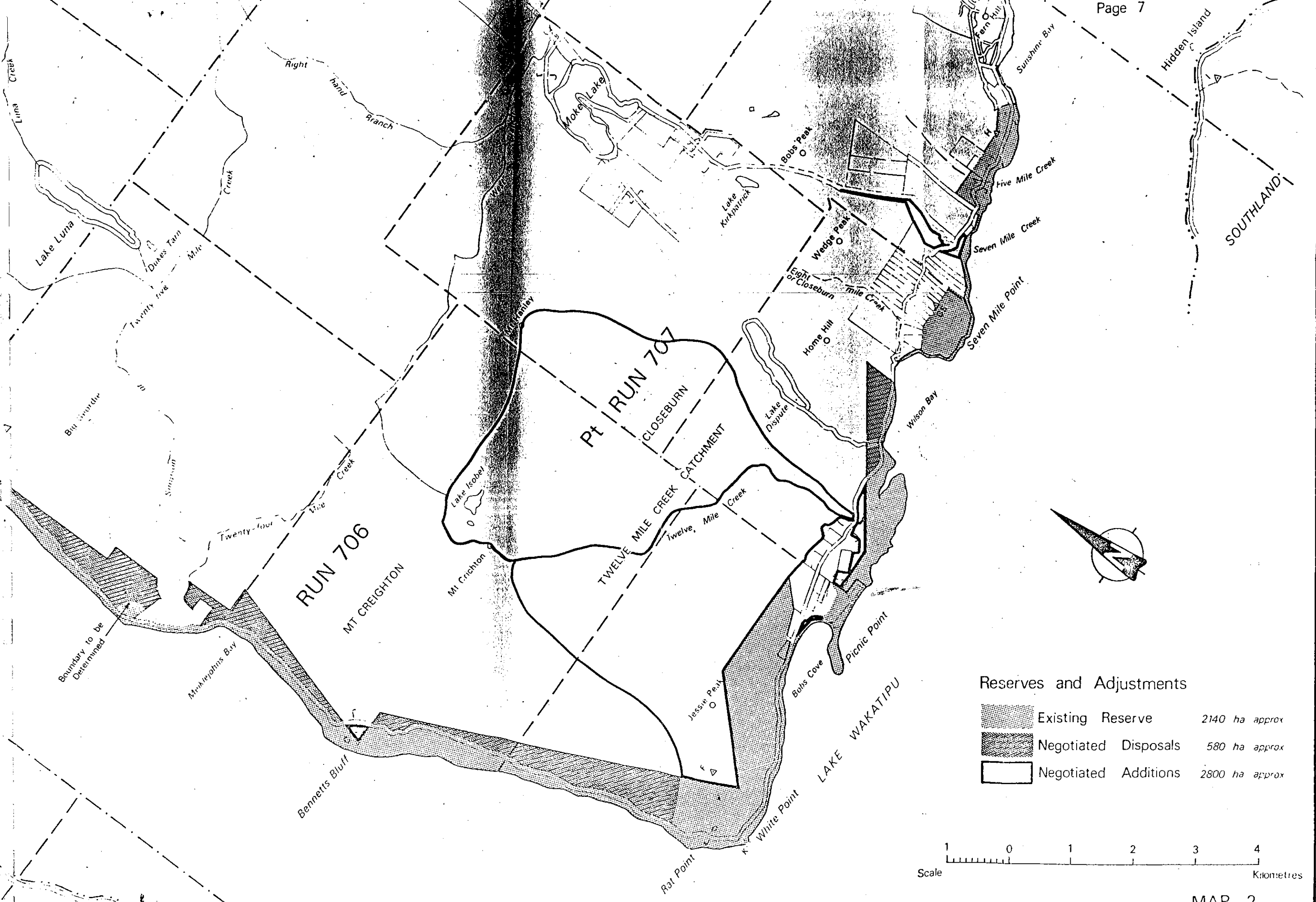
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locality

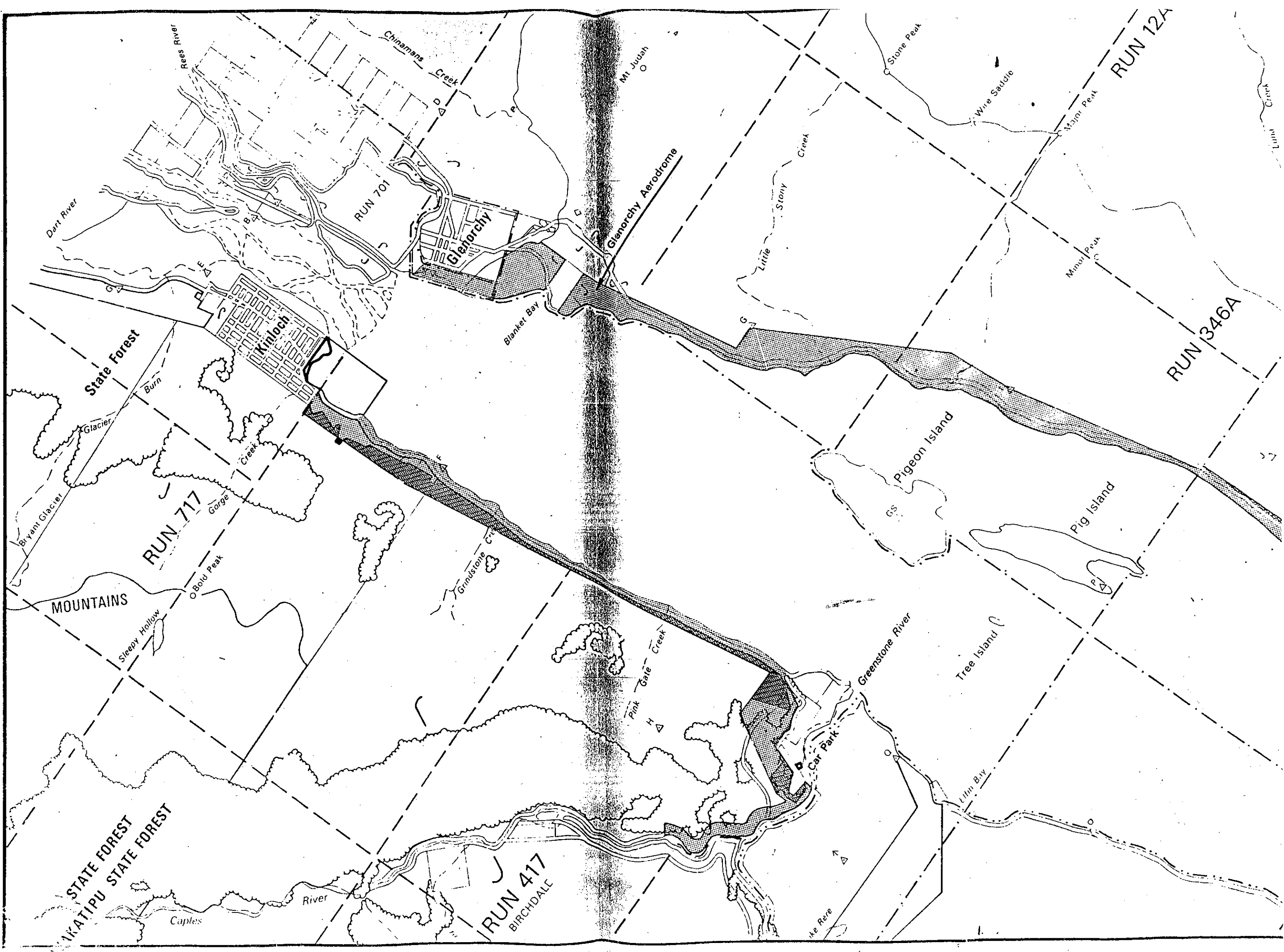


Upper Wakatipu
44° 45'S 168° 22'E





MAP 2



Dart River

Rees River

Chinamans Creek

Mt Judah

Stone Peak

Wire Saddle

Major Peak

RUN 12A

RUN 701

Glenorchy

Glenorchy Aerodrome

Little Stony Creek

Minor Peak

RUN 1346A

State Forest

Burn

Blanket Bay

Kinloch

Pigeon Island

Pig Island

Glacier

RUN 717

Gorge

Bold Peak

Greenstone

MOUNTAINS

Sleepy Hollow

Pink Gate Creek

Greenstone River

Tree Island

STATE FOREST
WAKATIPU STATE FOREST

Caples

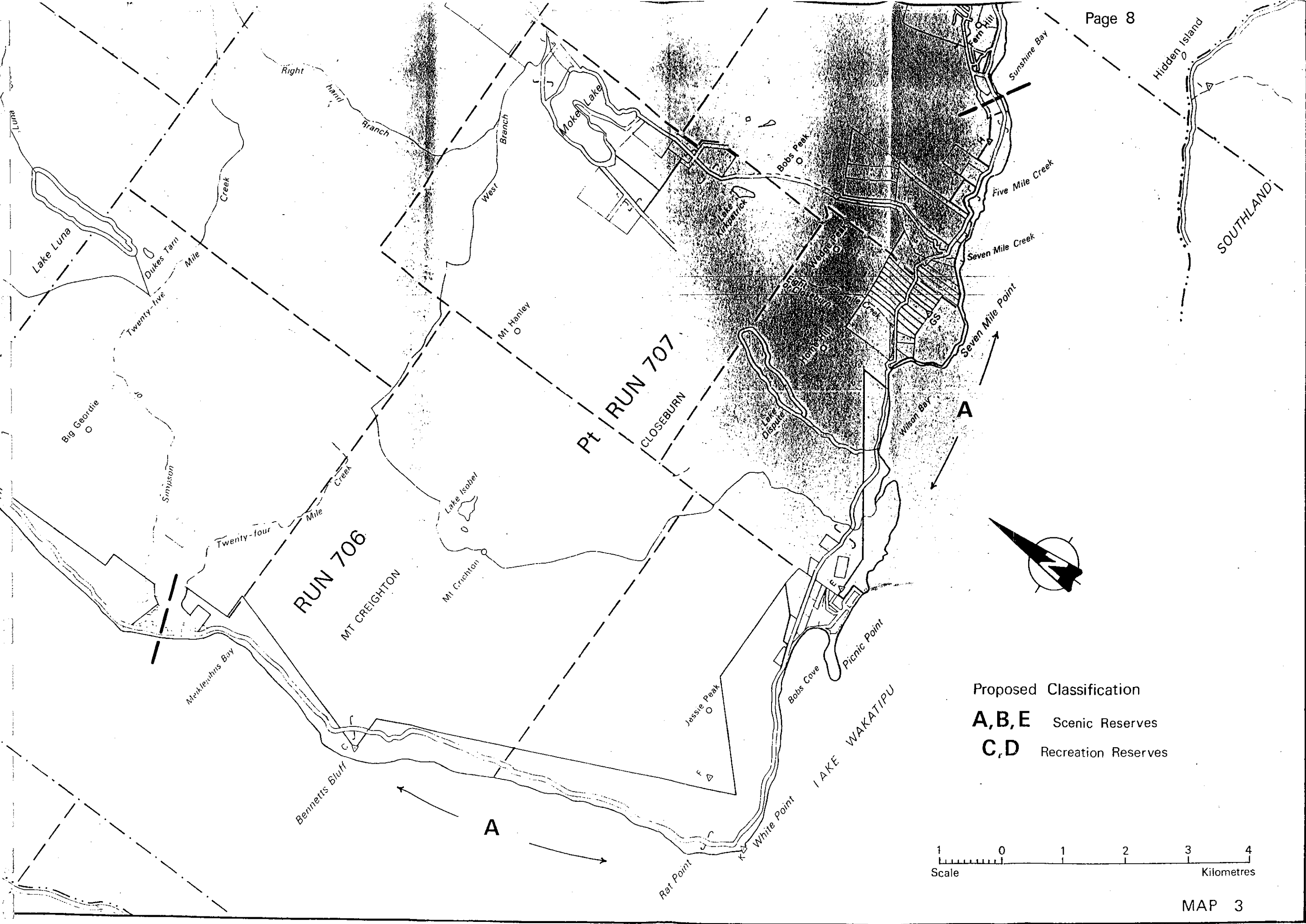
River

RUN 417
BIRCHDALE

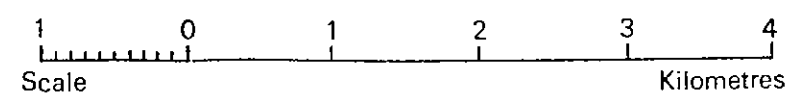
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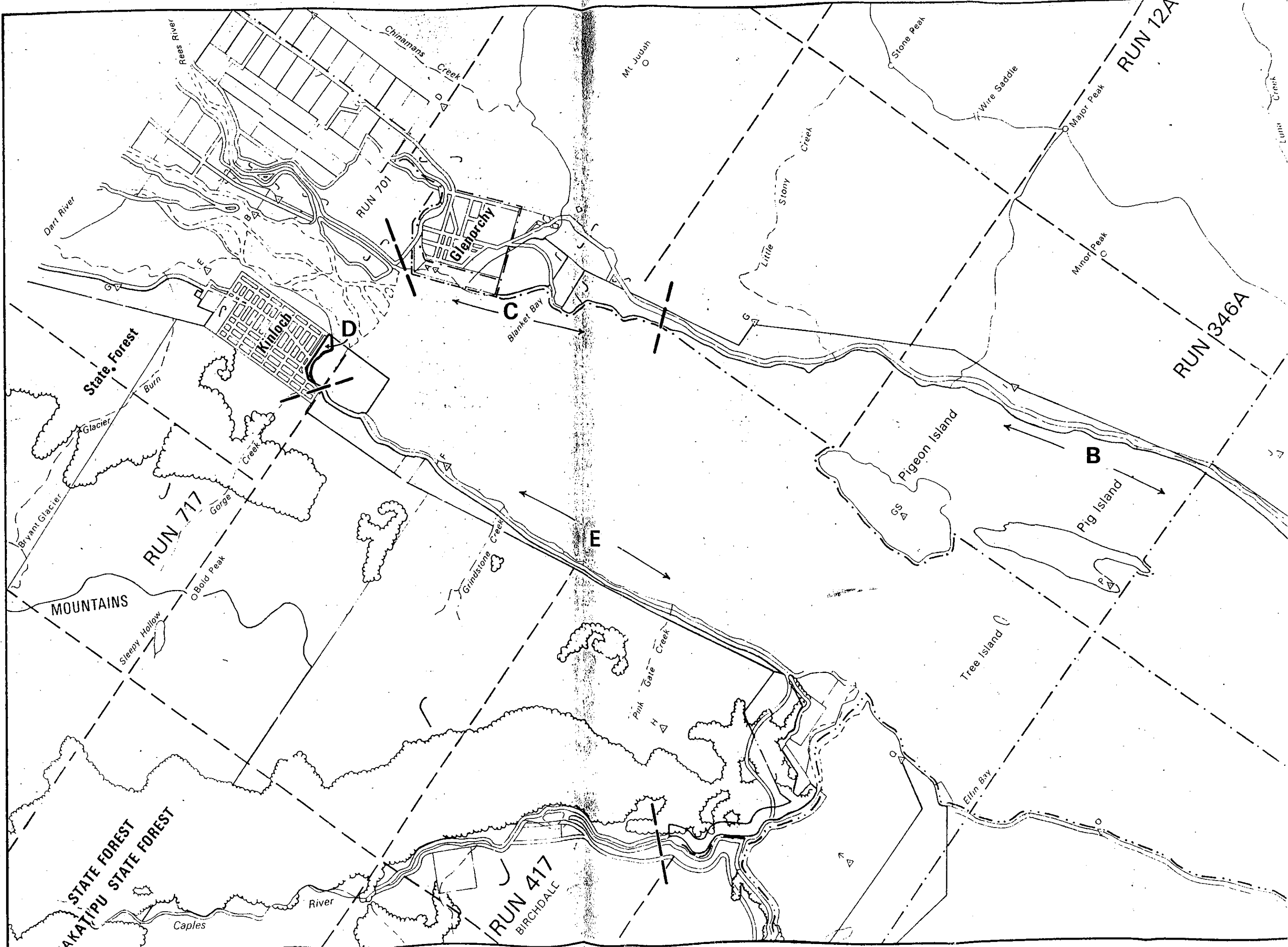
Le Rere

Tim Bay



Proposed Classification
A, B, E Scenic Reserves
C, D Recreation Reserves





1 INTRODUCTION

1.1 Background

The area of reserves (approx 5300 ha) is shown on Map 2 and forms a very long and narrow strip of predominantly undeveloped land surrounding the shores of Lake Wakatipu from Queenstown to Glenorchy on the east and from Kinloch to Greenstone River on the west. Situated in one of New Zealand's major tourist areas the lake and its environs contribute to some of the country's most spectacular and panoramic scenery and is widely appreciated by the people who visit the region.

The reserves are historically interesting as well as having scientific, scenic, botanic and geological features which should be preserved for present and future generations. Although settlement of the Wakatipu region has taken place since the mid-nineteenth century, they have remained relatively undeveloped and in general have been subject to only moderate public use. Access is via the Queenstown-Glenorchy and Glenorchy-Kinloch Roads which generally pass through an arc adjacent to the reserves.

In the last decade there has been an increase in mobility and the amount of leisure time and greater demands have been placed on recreational facilities as more and more New Zealanders and overseas tourists visit the back country mountain and bush regions. Many utilise the amenities of recreation and scenic reserves including their walkways, tracks, picnic and camping sites and there is a greater awareness amongst agencies administering these lands of the need to provide this type of amenity.

The impact of visitors on the Wakatipu area is considerable especially during the summer months when the area bounds with people pursuing numerous active and passive recreational activities. These include fishing, tramping, camping, goldmining, hunting, waterskiing, sunbathing, sightseeing, daytripping, boating and visiting places of interest. Many of these people utilise the reserves for their recreational needs and observation by departmental staff has shown that the existing facilities in some reserve areas are at times inadequate.

This plan assesses the attributes and present uses of the reserves and aims at resolving the management problems described above. It provides guidelines for the balanced development of the reserves aimed at improving the opportunities for their public use and enjoyment and preserving their natural qualities. In the broader regional context the plan recognises the importance of these reserves to the scenic and recreational values of the Lake Wakatipu basin and aims to preserve and enhance these values wherever possible.

The majority of the area subject to the management plan was set apart in terms of the Land Act 1890 as Recreation Reserve and is now subject to the Reserves Act 1977. Most of the reserves are now classified as scenic reserves and are controlled and managed by the Commissioner of Crown Lands, Department of Lands and Survey, Dunedin. The remaining reserves are classified as recreation reserves.

1.2 Land Tenure

The area of the Wakatipu region under study is in the main land owned or otherwise administered by the Crown as scenic and recreation reserve or pastoral leasehold. There are no significant areas of freehold although there are four areas of settlement adjacent to the area, ie Queenstown, Bobs Cove, Glenorchy and Kinloch.

1.3 Reserves Areas and Negotiated Adjustments

The following table sets out the area of reserves and additions and disposals which have been negotiated as at 1.12.84. See Map 2.

Approximate Current Area of Reserves	2140 ha
Approximate Negotiate Additions	+2800 ha
Approximate Negotiated Disposals	- 580 ha
Approximate Proposed Total Reserve Area	4360 ha

1.3.1 Schedule of Proposed Classificatons - refer Map 3 Page 8

Areas A, B and E

From Sunshine Bay to the boundary as shown in Reserve D south of the Glenorchy Aerodrome including proposed additions and from the Town of Kinloch to the Greenston River as Reserves for Scenic Purposes pursuant to Section 19(1)(a) of the Reserves Act 1977.

Areas C and D

From the boundary as shown in Reserve D south of the Glenorchy Aerodrome to Glenorchy and part of the Town of Kinloch as Recreation Reserve pursuant to the Reserves Act 1977.

1.4 Present Use

The existing reserves have been designated as either recreation, scenic or unclassified under the Lakes Queenstown, Wakatipu Combined District Scheme.

The reserves are largely in a semi-modified natural state and receive only relatively minor use. This includes limited grazing under licence from the Commissioner of Crown Lands to adjoining runholders, informal camping in isolated areas, scenic bush walks, sightseeing and other recreational activities. There is an airstrip at Glenorchy and isolated quarry operations are undertaken by the Lake County Council. Of these the main use of the study area is that of visual appreciation by tourists and vacationers both from the land and the lake.

The predominant use on adjoining land is extensive and semi-extensive pastoralism with isolated sites of scheelite and goldmining and at higher altitudes land retired for water and soil conservation.

1.5 Classification

The majority of the reserve areas have significant natural values, ie scenic, flora, fauna, water and soil conservation and some also have historical values. The central management consideration is to protect these values from the influence of human activity both within and adjacent to the reserves while at the same time realising their recreational potential.

The need for reserves to be managed for multiple purposes is recognised in the Reserves Act 1977 which also requires that all reserves be classified according to their principal use as either recreation, scenic, historic, nature, scientific, government or local purpose reserves. Each of these classifications carries with it a statutory code of management which broadly determines the balance between protection of intrinsic reserve values and public use.

Of the available classifications, scenic and recreation are of the most applicable for the lakeshore reserves. Under the scenic classification (Section 19 (1) (a) Reserves Act 1977) reserves are managed "for the purpose of protecting and preserving in perpetuity for their intrinsic worth and for the benefit, enjoyment and use of the public, suitable areas possessing such qualities as scenic interest, beauty, or natural features or landscape that their protection and preservation are desirable in the public interest".

Under the recreation classification (Section 17 Reserves Act 1977) the principal purpose is to provide areas "for the recreation and sporting activities and physical welfare and enjoyment of the public and for the protection of the natural environment and beauty of the countryside with emphasis on the retention of open spaces and on outdoor recreational activities, including recreational tracks in the countryside".

The shoreline reserves between Queenstown and Glenorchy and the Twelve Mile Creek catchment contain remnant or regenerating indigenous forest which has significant botanical value and is an integral part of the lakeshore zone and protecting soil and water conservation values. Their protection is therefore overriding management consideration and the most appropriate classification for these areas is scenic reserve. ✓

There are two reserves near Glenorchy and at Kinloch in which the protection of the vegetation is less important and where providing for their recreational use should be the focus of management activity. In these cases the appropriate classification will be recreation reserve. A schedule of proposed classifications appears under 1.3.

1.6 Statutory Planning

The District Scheme

The Queenstown-Wakatipu Combined District Scheme observes that "the two primary activities of the district upon which most of the inhabitants depend for their livelihood are tourism and farming" and it states that the scheme will "place particular emphasis on meeting the needs" of those sections. Lake Wakatipu is a major part of the tourist industry in the area, and therefore the development and conservation of its natural resources to meet public demands is in accord with the objectives of the District Scheme.

The reserves subject to this plan are designated as recreational, scenic and unclassified in the District Scheme and therefore the underlying zoning in the scheme (landscape and Rural B and C) has no effect on reserve management for classified reserves. Section 125 of the Town and Country Planning Act 1977 requires that an outline plan for any proposed development on designated land is to be served on the Council for consideration before construction commences. ✓

The Regional Scheme

The Clutha Central Otago United Council has recently publicly notified the draft of Section One of its Regional Planning Scheme. The draft scheme is still subject to amendment, however the objectives of this management plan are generally consistent with the Council's draft environmental objectives and policies.

2 RESOURCE INFORMATION

2.1 Landscape

The present character of Lake Wakatipu and its environs is the combination of a distinctive landform sculptured by ancient glacial processes and the impact the cultural activities of early settlers have had on the natural environment. Lake Wakatipu itself is a special feature. It has many moods and can change within a short time from a peaceful calm water surface to a dangerous and stormy sea. The lake's vast area, and its many inlets, bays and islands, make it, along with the surrounding mountains, a dominant feature of the general landscape.

The major proportion of the lake's margin is covered with extensive vegetation which provides a buffer between the lake and the adjoining pastoral land. Much of this is land included within the reserves and its vegetation is largely unmodified. These areas are an important and integral part of the Lake Wakatipu shoreline and contain high quality natural and scenic features as well as being of prime recreational value. Where the reserves have been modified, they add to the diversity of the culturally modified character of the Upper Lake Wakatipu basin landscape with its spectacular lake and mountain scenery.

Viewed from the Queenstown-Glenorchy Road, the wide expanse of Lake Wakatipu is the dominant feature. A marginal strip of indigenous vegetation along the lakeshore gives way to open tussock slopes on the flanks of the surrounding mountains. On a good day the view of the head of the lake from Bennetts Bluff is dominated by Mt Alfred and the magnificence of Mt Earnslaw and the Cosmas Peaks. The upper lake landscape is broad in scale and is characterised by ribbons and islands of indigenous beech along the lakeshore and in gullies where it has escaped early and subsequent fires.

2.2 Geology and Geomorphology¹

The geology of most of the reserve land in this region is simple, consisting of a schist basement overlain by thin to very thick deposits of Quaternary glacial debris and alluvium. At Bobs Cove, Tertiary sediments are preserved in an unusual situation of particular geologic interest. Several very large but inactive faults cross the area. Deposits of gold and probably scheelite may occur in some reserves.

Schist

All the reserve land in this area is underlain by low grade schist. Most schists have a distinct platiness or foliation. Meta-volcanic rocks occur mainly in Reserve B, west of Sunshine Bay.

Tertiary Sediments

The area between Bobs Cove-Picnic Point and Twelve Mile Creek contains one of New Zealand's most interesting occurrences of marine Oligocene sediments.

The Bobs Cove Tertiary beds are down-faulted along the Moonlight Fault, a major fault which can be traced from the Haast area south to the Te Wae Wae Bay. A second fault, the Two Mile Creek Fault, runs through Sunshine Bay.

1 Turnbull I M, DSIR, Geological Survey Division, Dunedin. 1981 Unpublished Report "The Geology of Reserves in Upper Lake Wakatipu Area."

The Bobs Cove beds consist of a 450m thick sequence of tertiary sediments, tightly folded and lying on crushed schist within the Moonlight Fault Zone. Several horizons within the sequence are fossiliferous and the area is often visited by geologists and school parties for collecting purposes. Specimens have been obtained from the locality.

The limestone which underlies the high scarp (Trig E) has previously been worked for building stone, agricultural purposes, and old buildings related to these workings are preserved on the lakeshore south-east of Trig E. These buildings make an interesting addition to the history of the reserve and the Wakatipu area in general.

Quaternary Deposits

Lake Wakatipu lies in an ice-scoured trough; the reserves along the lake margin and in the Glenorchy area are covered, to a greater or lesser extent, with deposits associated with the last major ice advance some 10-15000 years ago.

- ✓ a Beach gravels. Well washed, wave-worn schist gravel formed during an old higher level of Lake Wakatipu is preserved in many reserves, for example north of Mt Creighton, at White Point, Bobs Cove, and toward Wilson Bay. In places (as on the terraces about the Buckler Burn) successive lower lake levels have cut benches which are very well preserved, in the beach gravels and alluvial fans.
- b Till, or moraine deposits. Pockets of jumbled bouldery and sandy gravels deposited by ice occur in small areas throughout the reserves but none have any great significance.
- ✓ c Outwash gravel. Sandy bedded gravel deposits laid down by melt-water streams are present in several areas and together with alluvial fan gravels make up most of the larger terraces in the reserve. In the area from Bobs Cove eastward, some may contain gold.
- ✓ d Alluvial fan gravel. Recent streams (post-last glaciation) have deposited considerable amounts of gravel along the shores of Lake Wakatipu. Steep fans along the Elfin Bay-Kinloch shore, and around the larger streams south of Glenorchy are particularly good examples. Recent alluvial material may be of economic interest in that it may contain gold (Five, Seven and Twelve Mile Creeks) or scheelite (Buckler Burn).

Fault Lines

Several major faults cross Lake Wakatipu, the Moonlight Fault being the largest. Others pass through Sunshine Bay, Bennetts Bluff, and Glenorchy. All are large, but only very small seismic movements are known from the region and none of these faults should influence future management of reserves.

Economic Geology

Gold

✓ Alluvial gold has been worked from the outwash and alluvial fan gravels along the lakeshore in several places, notably Twelve and Five Mile Creeks. An increase in prospecting activity is likely in some of the reserves.

Scheelite

The Glenorchy scheelite lodes have shed scheelite into alluvial fans in the Rees and as far south as Twelve Mile Creek. While no major alluvial scheelite workings are known in reserves on the east shore of Lake Wakatipu, these fans remain potential prospects.

Road Metal

Several road metal quarries have been, or are presently used within the reserves (eg Sunshine Bay, Seven Mile Creek, Twelve Mile Creek, Twenty-five Mile Creek and Little Stoney Creek). Of these the Twelve Mile Creek quarry produces the best quality road metal in the area and is an important resource.

Limestone

It is highly unlikely that the Bobs Cove beds will ever be economic for the extraction of agricultural lime, and it is equally unlikely they will be used as building stone when the Wakatipu area abounds in more suitable, highly coloured and easily worked schist varieties.

2.3 Soils²

The soils of the reserves are upland and high country yellow-brown earths with related hill and steepland soils, and isolated pockets of flood plain and young fan alluvium. In their virgin state they are low in fertility. The stability of the lakeshore and steep lake face soils is largely dependent on the maintenance of a sound vegetation cover and in this respect protection of the indigenous vegetation in the reserve is vital.

The following soils occur within the study area.

Queenstown Soils (48b)*

These vary from sandy to stony loams consisting of the schist gravels of the terraces, fans and glacial till. They occur on easy rolling and sloping fans and dissected terraces at altitudes 300m-400m. Their fertility is low to very low with sheet erosion occurring where the surface is exposed by grazing or burning off.

Dunstan Steepland Soils (57d)*

These are soils varying from silt to stony loams. They are composed of schist, slope deposits and local loess occurring on steep to moderately steep slopes (18° - 30°) and sometimes on very steep slopes at altitudes 550m-1800m. These soils are low to very low in fertility, thus wind and sheet erosion, frost heaving and landslips are characteristic.

Moonlight Steepland Soils (57e)*

These soils vary from sandy to silt loams, and are often stony. They occur on steep to very steep (ie over 30°) slopes. Their altitude range is 300m-1700m. Fertility is very low with severe wind and sheet erosion, landslips and frost heaving occurring on bare surfaces.

2 NZ Soil Bureau, DSIR, Dunedin. 1981 - unpublished report.

* NZ Soil Bureau Bulletin 27 - General Survey of the Soils of the South Island New Zealand.

Alpine Steepland Soils (100)*

These soils are derived from greywacke, schist, granite and diorite and appear on steep to very steep slopes at altitudes between 1500-2500 metres.

2.4 Climate³

The climate for the Lake Wakatipu region is a varied one. The mean annual rainfall for Queenstown is 600-700mm, Glenorchy 1230mm, Kinloch-Greenstone River 2160mm, and Mt Earnslaw Station 1460mm. Queenstown experiences approximately 130 ground frosts per year and the situation in the lower Dart is likely to be similar. The climate is heavily influenced by the prevailing south west winds around Queenstown and the west-north west air movements in the Upper Wakatipu region.

The east-west rainfall gradient is influenced by the dominating pattern of north-south tending valley systems which funnel and fractionate the lower surfaces of circulations and compound the importance of aspect.

In the Upper Wakatipu region apart from the effect of disturbed southwesterly airstreams which give a continuous pattern of precipitation during late December and late January, there is a tendency for troughs of low pressure and associated cold fronts to bring heavy northwest rain every ten days with clearing southerly showers. Long dry periods are experienced during the first few weeks of April, followed by strong south-westerly airstreams in April and May.

Sunshine hours are high during the summer months which make this region a desirable vacation area.

2.5 Vegetation⁴

An understanding of the dynamic processes that are effecting change in the existing vegetation of the Upper Lake Wakatipu reserves is fundamental to appreciating its increasing biological and aesthetic value.

2.5.1 Historical Background

The evidence suggest that beech forest originally dominated the Upper Wakatipu. It seems likely that its composition would have been similar to that which remains at Bobs Cove and in the Twelve Mile catchment, where mountain beech (*Nothofagus solandri* var *cliffortioides*) is more common on the hillsides and red beech (*Nothofagus fusca*) on the more fertile valley floors.⁵ Throughout, a variety of smaller broadleaved trees occur below the canopy, especially at moist sites. Rocky outcrops and exposed ridges where the soil is too thin to support forest probably provided a habitat favouring Rata (*Metrosideros umbellata*) and a short shrubby vegetation including species such as mingimingi (*Cyathodes juniperina*) and possibly manuka (*Leptospermum scoparium*). Manuka might also have been common in poorly drained localities such as Lake Dispute and Twelve Mile Delta. Rata, kowhai (*Sophora microphylla*) and tree fuchsia (*Fuchsia excorticata*) are common in many places along the lake edge and are probably part of a previously more extensive lacustrine association.

* NZ Soil Bureau Bulletin 27 - General Survey of the Soils of the South Island New Zealand.

3 McGann, R. pers comm. 1981 NZ Meteorological Service, Dunedin.

4 Prepared by Miss P. Smith, Department of Lands and Survey, Queenstown.

5 Biological Survey of Reserves. Otago Land District. Department of Lands and Survey. In prep.

The present vegetation is quite different from this. Repeated fires, possibly over several centuries have been the principal modifying agent but grazing has also been a factor since settlement. Large areas of forest have been replaced by a monospecific 'fern heath'⁶ dominated by bracken (*Pteridium esculentum*). Bracken is a light demanding fern with efficient spore dispersal and stout underground storage rhizomes. It is these adaptations that make it particularly tolerant of repeated burning. However beech forest in cool moist gullies and components of the lacustrine associations have survived, and it is these areas that act as a seed source for the seral fern-shrubland that is currently developing throughout the reserves.

2.5.2 Existing Vegetation

Where remnants of the original lacustrine association have survived more or less intact, especially between Queenstown and Twelve Mile Creek, there is a narrow broken ribbon of broadleaved forest with a high species diversity and a canopy height of up to eight metres. But with increasing distance from the shoreline the vegetation falls away in diversity, density and stature to the point where scattered shrubs of a few pioneer species such as kohuhu (*Pittosporum tenuifolium*), *Coprosma* spp and slower growing broadleaf (*Griselinia littoralis*) emerge from the bracken canopy. Alternatively nitrogen-fixing tutu (*Coriaria arborea*) may be locally dominant. The characteristic that these pioneer species have in common is efficient seed distribution over long distances principally by birds. This characteristic is shared by the variety of other shrub species that follow the pioneers such as:

three finger	<i>Pseudopanax colensoi</i>
lancewood	<i>Pseudopanax crassifolius</i>
putaputaweta, marble leaf	<i>Carpodetus serratus</i>
mahoe, whiteywood	<i>Melicytus ramiflorus</i>
tree fuchsia	<i>Fuchsia excorticata</i>
willow leaved hebe	<i>Hebe salicifolia</i>
corokia	<i>Corokia cotoneaster</i>
niniaio	<i>Helicrysum aggregatum</i>

and which includes several adventive weed species.

Native podocarps do not appear to be an important feature of the changing vegetation although there are some hall's totara (*Podocarpus hallii*) near the lake edge and in the Twelve Mile catchment and a few stunted matai (*Podocarpus spicatus*) at Bob's Cove. Old and senescent kowhai frequently occur but a marked paucity of younger trees has been observed. Lake Wakatipu's large water body has a significant moderating effect on the local climate favouring the survival of less frost hardy species such as mahoe (*Melicytus ramiflorus*) close to the lake.

Superimposed on this basic vegetation pattern are local variations and features. Between Nine Mile Creek and Bob's Cove manuka scrub has replaced bracken. Manuka is well known as a nurse crop because while it can tolerate dry conditions it provides a shady, sheltered, moist microclimate below its canopy for seedlings of forest species, which eventually grow to overtop the manuka. At Twelve Mile Bush a large area of beech forest remains, apparently little disturbed by fires probably because of its shady southerly aspect. The stately red beech on the lower slopes around Bob's Cove are 25 metres tall. Along the western lakeshore a narrow ribbon of remnant beech survives between Kinloch and Marshalls Creek. This exposed strip seems particularly vulnerable to windthrow. Beech forest has also survived the fires along many creek channels. In many cases these remnants although small are regenerating satisfactorily.

2.5.3 Postulated Future Changes

The vegetation over much of the reserves area can be interpreted as (spatially) representing stages of a (temporal) "secondary succession". Succession is the result of the different dispersal, growth and survival strategies of species adapted to grow under different conditions. Consequently it is possible to envisage the type of vegetation that, in the absence of further disturbance, will develop towards a state of equilibrium throughout most of the Lake Wakatipu reserves.

Because of its height advantage longevity and dense canopy, Broadleaf is the species which seems most likely to dominate; however other species may dominate locally such as the small trees of *Coprosma linariifolia* at Sunshine Bay. Mahoe and putaputaweta are also likely canopy species. The resulting shrub forest vegetation may have a canopy height of about seven metres and is likely to be quite diverse, with many species of trees and shrubs, lianes and epiphytes, and understorey herbs and ferns. Beech species reproduce by large heavy nuts which, unless carried away by water, germinate only a few metres from the parent plant. In the long term absence of fire, beech which is taller and longer lived than the broadleaved species might be expected to slowly reclaim its original status as dominant species.

2.5.4 Exotic Plant Species

A variety of adventive plant species can be found in the Upper Lake Wakatipu reserves. Under the Reserves Act 1977 (Section 19 (2) (a)) the general rule in scenic reserves is to preserve indigenous flora and exterminate the exotic. Small areas of low producing browntop (*Agrostis capillaris*) and sweet vernal (*Anthoxanthum odoratum*) pasture occur within the reserve boundaries, the largest being from the aerodrome to Glenorchy. Exotic scrub weeds such as:

himalayan honeysuckle	<i>Lycesteria formosa</i>
broom	<i>Cytisus scoparius</i>
gorse	<i>Ulex europaeus</i>
sweet briar	<i>Rosa rubiginosa</i>
spanish heath	<i>Erica Lusitanica</i>
hawthorn	<i>Crataegus monogyna</i>
blackberry	<i>Rubus fruticosus</i>

occur as scattered individuals throughout the reserves but in most cases will be overtopped and suppressed as the shrub forest develops. Where infestations are more serious as at the Blanket Bay delta control measures may need to be undertaken. Wilding conifers have become established from windborne seed around the lake between Queenstown and Wilsons Bay. The species include larch (*Larix decidua*), Douglas fir (*Pseudotsuga menziesii*), logepole pine (*Pinus contorta*) and corsican pine (*Pinus nigra var maritima*). Early action taken against conifers to limit their spread will give native vegetation time to form a complete forest cover making it more difficult for conifers to become established.⁷ It is considered that the extensive native forest at Bob's Cove and in the Twelve Mile catchment may be of value in preventing the spread of pines towards the head of the lake. Spread of wild seedlings downwind from two existing pockets further up the lake at Bennetts Bluff and the Glenorchy Aerodrome must be guarded against.

The eucalypts (*Eucalyptus* sp.) at Bob's Cove are of historical interest and are a recognised characteristic of the reserve. Despite being periodically knocked back by frost, they are regenerating but do not appear to impede the regeneration of native species. There is a case for ministerial dispensation under the Reserves Act 1977 section 19 (2) (a) to allow these and the eucalypts between

⁷ Cleary, E., 1982 on Douglas fir invading Mountain Beech Forest in Ben Lomond Reserve. Honours Thesis.

Kinloch and Birchdale Station to remain.

2.5.5 Conclusion

Both beech forest and developing broadleaved shrub forest in the reserves are of botanical significance particularly as they represent an eastern limit of forest types which do not extend into drier Central Otago. In addition to scenic and scientific values, the shoreline vegetation in the reserves is important as a buffer zone between the lake and surrounding pastoral land, intercepting the passage of organic phosphates and other nutrients which might otherwise enrich the lake and lead to a deterioration in water quality. The vegetation plays an important role in preventing soil erosion and stabilising the steep lakeshore faces. It also contributes to the food source of the lakes fisheries. The on-going changes in the reserves vegetation mean that these biological and scenic values are improving as time passes. Research into the vegetation changes, and the rate at which these changes are taking place would be helpful in identifying specific management options. Notwithstanding this need the current vegetation trends are sufficient to indicate that, in the continued absence of fire, the long term viability of the reserves vegetation is assured.

2.6 Water

Lake Wakatipu has one of the highest water quality ratings of its type in New Zealand.

The recreational and habitat value of the lake and environs is based on this high water quality and its protection is essential for the fishery, aquatic recreational activities and most importantly, as a town water supply source.

The high water quality of Lake Wakatipu in relation to other New Zealand lakes is illustrated in Table 4 which is contained in a report prepared for the Officials Committee on Eutrophication. The eutrophication level of the lake is very low, and it is essential that the vegetation of the reserves is preserved to provide a buffer zone to protect the lake against an influx of nutrients from the increased phosphate applications related to adjoining pastoral land development.

TABLE 4

ASSESSMENT OF LAKE TROPHIC
CONDITION
(maximum penalty points 18)

LAKE	PENALTY POINTS	LAKE	PENALTY POINTS	LAKE	PENALTY POINTS
Wakatipu	0	Thompson's	6	Foxton No 1	9
Taupo	1	Haupiri	6	Waiparera	10
Wanaka	1	Waiau	6	Kopureherehe	10
Hawea	1	Kereta	6	Rerewhakaaitu	10
Rotorua (Nelson)	1	Oturi	6	Rotokakahi	11
Aratiatia	1	Herengawe	6	Rotowhero	11
Ohau	1	Waipori	6	Westmere	11
Rotoma	2	Tarawerea	7	Brewer's	11
Okataina	2	Hochstetter	7	Heaton	11
Waikaremoana	2	Okareka	7	Rotorua	12
Rotoiti (Nelson)	2	Kuwakatai	8	Rotoehu	12
Brunner	2	Rerewhakaaitu	8	Pokoroa	12
Kaniere	2	(crater)		Phakuri	12
Ototoa	3	Okaihau	8	Waitawa	13

Tekapo	4	Papaitonga	8	Ngapouri	13
Tikitapu	4	Atiamuri	8	Waingata	13
Roerua	4	Whakamaru	8	Horowhenua	14
Ngatu	4	Waipapa	8	Ngahewa	14
Kanono	4	Karapiro	8	Tomahawk Lagoon	14
Mahinerangi	5	Rotamahana	9	Okaro	15
Kangaroo	5	Rotoaira	9	Hayes	15
Lady	5	Swan	9	Johnson	15
Ahura	5	Muir's	9	Rotongaio	16
Pukaki	5	Rotoiti	9	Tutira	17
		Rotokawau	9		
		(Northland)			

From: White, E. 1976, A Multiple Classification for NZ Lakes,
Ecology Division, DSIR, Taupo.

2.7 Fauna

2.7.1 Introduced Animals

Red deer, fallow deer, goats, possums, hares, rabbits, feral cats, stoats, ferrets, rats, mice and hedgehogs are all present in or around the reserves. Red and fallow deer and goat numbers are generally low throughout the area and they are mainly confined to forested areas such as the Twelve Mile Creek catchment. Their present populations are considered tolerable, ie numbers are not sufficiently great to constitute a threat to the regeneration of the existing vegetation.

Populations of the other animals tend to fluctuate. Possums are subject to seasonal trapping and poisoning by commercial operations throughout the area and rabbits and hares are controlled by the local Wakatipu Pest Destruction Board.

2.7.2 Native Species

There is a lack of information on native species present but it is likely that skinks, geckos, frogs and an array of invertebrates inhabit the reserves. Further research into the identification of native fauna populations is required.

2.7.3 Birdlife⁸

The reserves bordering Lake Wakatipu are important to many species of native and introduced birdlife. They contain native species including the South Island tomtit, South Island robin, grey warbler, silvereye, fantail, bellbird, tui, wood pigeon, yellowhead, brown creeper, rifleman, yellow crowned parakeet and falcon.

Many kowhai, fuchsia and rata border Lake Wakatipu especially in those areas between Two Mile Creek and Five Mile Creek and between Bobs Cove and Rat Point. These species are of primary importance to nectar feeding birds such as bellbirds and tuis. The tender shoots of the kowhai and fuchsia are also utilised as a source of food by wood pigeons.

8 Marquand, R.C. 1982. Unpublished Report "The Importance of Lake Wakatipu Reserves with regard to Wildlife, Department of Internal Affairs Wildlife Division, Queenstown.

The river flats at the outlets of the Dart, Rees and Greenstone Rivers provide breeding grounds for black fronted terns, banded dotterels, South Island pied oystercatchers, spurwing plovers, pied stilts, black backed gulls, black billed gulls, Canada geese and mallard, grey, teal and paradise ducks.

Exotic species seen in the area include the sparrow, blackbird, thrush, starling, goldfinch, yellow hammer and skylark.

The main threats to the bird habitat are fire and grazing, both of which could reduce or damage the vegetation cover.

2.8 Fisheries⁹

Lake Wakatipu has three species of introduced Salmolids, the brown trout (*Salmo trutta*), the rainbow trout (*Salmo gairdnerii*) and the quinnat salmon (*Oncorhynchus tshawytscha*).

There are also upland bullies (*Gobimorphys breviceps*), the koaro (*Galaxias brevipinnis*) and the long finned eel (*Anguilla dieffenbachii*), all of which are native species.

Because Lake Wakatipu was formed by glacial action, it is a deep lake with very steep lake edges and narrow beaches. The steep lake edge restricts the littoral zone and hence the productivity of the lake is low.

In the littoral zone the main food sources for trout are invertebrates, bullies and galaxiids and these are mainly taken by adult fish utilising this part of the environment.

On the open lake the juvenile trout feed on zooplankton and larval fish (ie bullies and galaxiids).

Because of the relatively low productivity of the littoral zone, the shoreline vegetation is of major importance to the future viability of the whole of the fishery. Most of the vegetation along the lake edge is indigenous and it provides an excellent buffer zone between the lake and developing farm lands. It also protects against erosion occurring on the steep lake faces and along the shoreline.

The vegetation also provides an excellent habitat for many different species of terrestrial insects, which are a very important food source for the fishery as they are blown or fly onto the water surface.

There are several lakeshore areas associated with the reserves between Queenstown and Glenorchy which are of special interest to anglers.

The Twelve Mile Creek is the first major inflow into the lake between Queenstown and Glenorchy. Anglers come here to fish the stream mouth but at the present time access from the road is by a very roughly formed track. Should this access be upgraded to allow ordinary vehicle access, it is envisaged that utilisation of the area by anglers and other recreational users including those seeking more isolated camp sites, would increase. Another popular area is Bobs Cove, about 2 km west of the Twelve Mile Creek. It is a relatively shallow area of water, the shoreline of which is heavily forested with bluegums and beech trees. During the summer months (January-March) tortoise shell beetles which feed on the gum trees are prolific in this area.

9 Hutchinson, R.D. 1982 Angling Opportunities : Lake Wakatipu and Recreational Fisheries Dart and Rees Catchments. Unpublished Report Department of Internal Affairs, Wildlife Division, Queenstown.

The shoreline from White Point north to the Twenty Five Mile Creek includes several excellent fishing stretches suitable for both fly and trolling anglers. The riparian vegetation is very dense in places, extending to the waters edge and making access difficult. A walking track from Double Gullies to the sand and gravel beaches immediately south of Bennetts Bluff would improve recreational use of this area.

Other popular fishing areas are the stream mouth at Twenty Five Mile Creek and the mouths of the Rees and Dart Rivers which can provide excellent salmon fishing near the end of the season.

2.9 History

2.9.1 Prehistory¹⁰

Lake Wakatipu and the upper lake (northern arm) region in particular has an interesting history of human habitation spanning prehistoric Maori occupation, pioneer settlement and the gold rush period of the late nineteenth century.

Two factors stand out with regard to the prehistoric occupation of the inland areas of central and western Otago. Favoured locations around the inland lakes appear to have served as foci for Maori occupation and the known sites tend to occur in concentrations separated by extensive areas largely devoid of evidence of occupation.

Based on the evidence of transient camp sites, ovens and artifact find-spots, travel between these favoured locations, of which the upper Lake Wakatipu area was one, was generally via the line of least resistance up the main river valleys, taking to the tops occasionally to avoid obstacles. About 30 pre-historic sites are known to exist in the upper lake region, one of the most significant being the nephrite (greenstone) factory at Slip Stream which is protected in the Specifically Protected Area of Mt Aspiring National Park. Much of the pre-European occupation and activity in the upper lake area is attributed to the movement of transient groups of Maoris exploiting this resource and travelling to and from the West Coast. Another is the occupation site in the Dart Valley, below the Glenorchy-Kinloch Road bridge where several large ovens were discovered.

2.9.2 History¹¹

Following the establishment of early coastal farming settlements in Otago and Southland in the 1840's, pastoralists cast their eyes to the extensive grazing lands in northern Southland and inland Otago. From 1848 to 1860 many extensive sheep and cattle stations were established and heralded the beginning of the period of European occupation and history in the inland areas.

The first European to extensively explore and navigate Lake Wakatipu was Donald Hay after whom Lake Hayes is named. In 1859 he sailed from Kingston on a frail home-made raft and spent the next 14 days sailing, rowing and exploring the lake and its environs. He went as far north as the Von River which stopped his progress along the western shore of the lake and crossed to Bobs Cove on the eastern shore, thus becoming the first European to set foot on this delightful little beach.

10 Ritchie, N.A. 1983 Archaeology and Prehistory of the Upper Wakatipu Region, Bobs Cove - Twelve Mile Creek Archaeological and Historic Sites Survey, Department of Lands and Survey, Dunedin.

11 McKenzie, F. 1948 The Sparkling Waters of Whakatipua, A.H. & A.W. Reed.

In 1860 Messrs William Rees and Nicholas Von Tunzelman, after whom the Rees and Von Rivers are named, travelled overland from Oamaru to Queenstown Bay and became the first pastoralists to take up land around the lake. While standing on Whites Point the two reputedly tossed a coin to see who would apply for the Queenstown Bay run, which included much of the land on the eastern side of the north arm of the lake. Rees won and Von Tunzelman claimed Fern Hill on the other side of the lake from where they were standing.

In October 1862, shortly after Rees had settled into life at Queenstown Bay gold was discovered in the nearby Arrow River and in the Shotover River in November 1862. By 1863 goldmining had taken hold in the district, leading to a huge influx of people and the development of a mining village at Queenstown. Up to 25,000 people were involved with mining within a 16 km radius of Rees' homestead in Queenstown Bay, dramatically changing the previous isolation of the area.

2.9.2.1 Bobs Cove ¹²

Of the reserve areas, Bobs Cove and the Twelve Mile Creek have particularly interesting histories and these two areas include most of the 46 historic sites known to exist in the upper lake region. Bobs Cove (also formerly known as Fortunes Cove) is named after Bob Fortune who was employed by William Rees. Fortune sailed and maintained a whale boat for Rees which was used for transport between Rees' homestead at Queenstown Bay and various destinations around the lake. The cove is one of the few sheltered moorings on the north arm of the lake (as Donald Hay discovered) and Fortune regularly sheltered there during gales. Gradually it became associated with his name.

In the 1860's the Cove was utilised for pastoral farming (on the Cove Flat) and in the 1870's the Bobs Cove area was surveyed into small pastoral holdings. Although several of these blocks were taken up, few people have lived at the Cove during the twentieth century and there is now little trace of the early homestead sites.

Since the earliest days of settlement the Cove has been recognised as one of the picturesque gems of the lake and has been a favourite picnic spot for local people and visitor alike. Prior to the opening of the Queenstown-Glenorchy Road regular stopovers and picnic excursions to the Cove were serviced by the lake steamers and the Queenstown launch fleet. These were a feature of the tourist attractions of the area. These activities have declined in recent years with the improved access around the lake and the increase in privately owned power boats.

In 1880 the Wakatipu Lime Company was formed to quarry and process limestone at Bobs Cove and to ship it to Queenstown. The exact date operations commenced is not known however, it is clear that several kilns were built along the shoreline and a jetty and substantial stone dwelling were constructed. The Wakatipu Lime Company ceased operations before the turn of the century but the remains of seven of the kilns are still evident today. Also evident are schist stone revetments along the shoreline just north of Bobs Cove which are part of the early shoreline bridle track linking Queenstown and Glenorchy.

2.9.2.2 Twelve Mile Creek ¹³

The Twelve Mile Creek was originally called Few's Creek after a Mr Few who at one stage grazed cattle at Bobs Cove. It has a strong history of goldmining activity.

12 Ritchie, N.A. Op. cit.

13 Ritchie, N.A. Op. cit.

Although the first miners to win gold from the creek are unknown it is likely that the gravels of the creek along with that of most of the other creeks bordering Lake Wakatipu had been well sampled by the end of 1863. After 1866, Chinese miners moved into the area in increasing numbers and established themselves in the creeks along the north shore of the lake including the Twelve Mile, as it came to be known during this period (an overestimation of the distance from Queenstown).

Two main types of terrain were worked in the Twelve Mile. The gravels of the creek bed and the thick deposits of outwash gravels on the terraces above the creek. Understandably the easily won creek bed gold was sought first but later (c 1870) ground and hydraulic mining were brought into play. These workings, with their associated races, dams and stone revetted tailraces have left substantial and enduring marks on the Twelve Mile Creek landscape. Mining continued intermittently in the Twelve Mile particularly during the depression until the outbreak of World War II. A wide variety of mining related sites and examples of mining activity have been recorded in this catchment which adds to its interest as a recreational area.

Of the other reserve areas around the upper lake there is little recorded history. On the shoreline of the western lakeshore at Mill Creek (between Kinloch and Elfin Bay) are found the remains of an old (1880's) sawmill settlement where one of the first lake steamers, the Antrim, was built. The remains of a stone "bread" oven, an old stone house and some stone terracing associated with this settlement are evident.

3.1 Natural Resource Protection

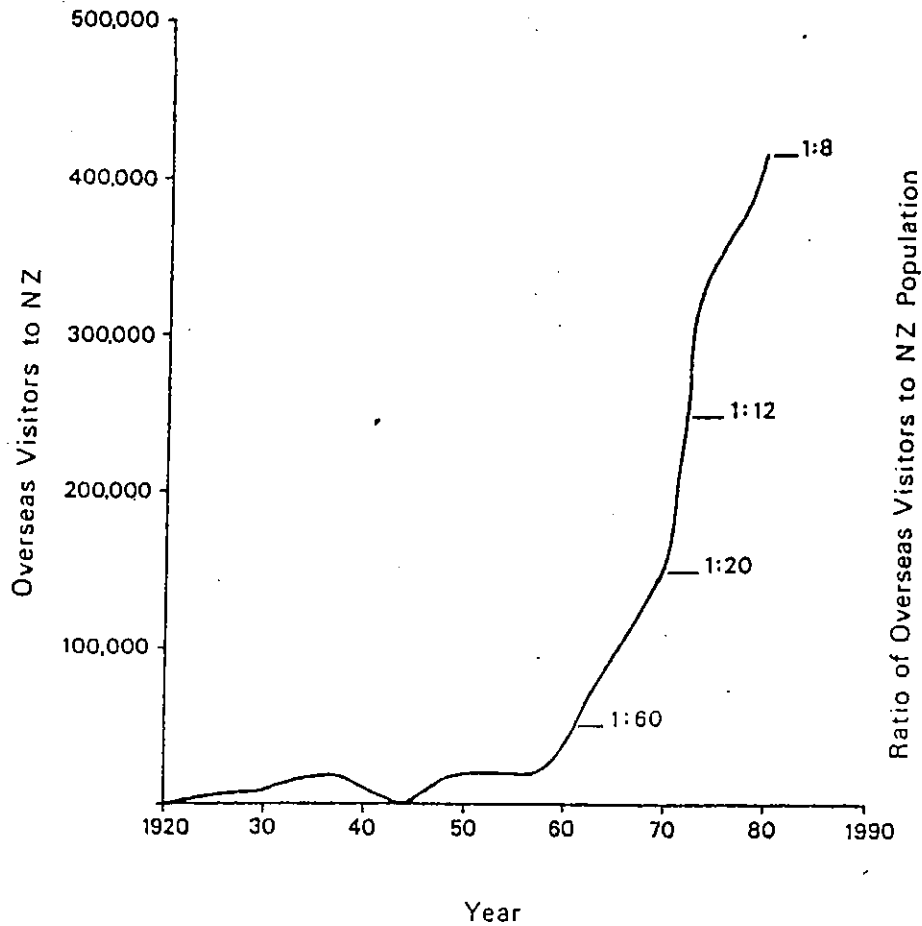
The majority of the reserve areas have significant natural values (ie scenic, flora, fauna, fisheries, wetlands, water and soil) which should be protected through sympathetic management. While most of the areas requiring protection are already under Crown title, there are adjacent leasehold or freehold lands which are also suitable for protection. The values associated with soil and water conservation, fauna, flora and fisheries are strongly inter-related and the maintenance of the natural vegetation cover on these lands is the most important prerequisite for their preservation. It is also important to recognise the value of areas of bracken fern and emerging secondary growth in the reserves and on adjacent lands. Protection of these areas will, through the natural process of succession, eventually lead to the re-establishment of native shoreline vegetation which will further enhance the present scenic character and recreational value of these areas.

Archaeological and historic sites such as those at Bobs Cove occur independent of other conservation values. They are relatively few in number but are important elements of the regions heritage. For this reason all such sites should be considered significant and protected for the benefit of present and future generations.

By virtue of their lakeshore location the reserves have good recreational potential which, to the fully realised, will require some reserve development in the form of improved access and facilities such as toilets, fireplaces, etc. At all times such development must have regard to the conservation of the natural features of the reserves and must be compatible with this primary objective. This will require the careful assessment of compatible levels of public use and appropriate facilities in order to minimise the environmental and human impact associated with such recreational development.

3.2 Recreation and Tourism

In the past decade there has been a rapid increase in the numbers of overseas tourists visiting New Zealand (see Figure 1). New Zealand's popularity as a tourist destination results largely from its scenic and recreational assets of which Lake Wakatipu and its environs are an important part. It is therefore important to ensure that these assets are conserved and managed wisely if the growth of this industry and its contribution to the national economy is to be sustained.



NZ Yearbook 1980

Figure 1: This illustrates the growth in tourist travel to New Zealand. Since tourists inject finance into the local and regional economy it is important that the natural assets which attract them to the area are protected.

The Otago region offers a diverse range of recreation and tourist attractions and the Queenstown-Lake Wakatipu area is the main focus of tourist and vacationer interest. Indeed, Queenstown is regarded as one of New Zealand's major tourist and holiday resorts. The township and its immediate surrounding areas have a variety of interesting recreational facilities, but the majority are highly commercialised and cater mainly for overseas tourists. The cost of participation in most of these activities is high for the average person and it is this, combined with the changing recreational habits, that has resulted in many people now seeking opportunities to do "their own thing" away from the main stream recreational facilities in commercialised tourist centres. ✓

The lakeshore reserves are ideally situated to meet this demand owing to their location close to such a centre. Visitors to the area are able to utilise the amenities and special attractions of the tourist centre while experiencing the aesthetic charm of the natural settings of the reserves.

In 1981, the Lakes District Waterways Authority carried out a study¹⁴ of recreational areas in the Wakatipu area which involved interviews each day in various popular lakeside locations from 29 December to 3 February of that year. The study indicated that at the peak holiday period from 10-26 January the popular lakeshore recreational areas (Kelvin Heights, Frankton Brach, St Omers Park, Queenstown Bay, Sunshine Bay and Lake Hayes) become overcrowded.

The report identified the numbers using these areas and in nearly all cases the problems identified were:

- (i) insufficient parking to meet peak summer demands;
- (ii) the lack of good vehicular access to lakeside areas;
- (iii) overcrowding which diminished the recreational experience;
- (iv) potential risk of accidents resulting from the intense use of a limited area for both shoreline and aquatic activities.

The proposed development of the shoreline reserves for informal recreational use should to some degree reduce the pressure on these popular areas and overall, will improve the recreational resources of the area.

There is thus considerable demand and potential for future development of recreation opportunities in the Lake Wakatipu reserves and surrounding areas for both visitors and local residents. At present the facilities are inadequate for the demands placed upon them especially during peak holiday periods. The plan attempts to assess the future potential of each reserve and to indicate the manner in which they can be developed to cater for public recreational needs. The approach to development will be to provide for informal public use of the reserves and will focus on the improvement of access, the provision of picnic and toilet facilities and tracking and onsite interpretation.

3.3 Adjacent Land Uses

3.3.1 Farming

Pastoral farming is the dominant use of the mainly undeveloped or moderately improved land adjacent to the reserves. Much of this land is presently undergoing development involving the conversion of scrub and bracken fern to improved pasture through the subdivision, oversowing, topdressing and mob stocking of blocks.

The soils are moderately low in fertility, have a low stability and are classified between classes VIe-VIIIe. They require careful management under the traditional methods of high country grazing management and during their development if their soil and water conservation values are to be protected. Traditional management practices still include early spring burning and this activity poses a threat to adjacent reserve lands. It is the responsibility of the landholder to exercise

14 Gosney, J.J. 1981 Survey of Recreational Spots in the Lake Wakatipu Area, Lakes District Waterways Authority, Queenstown.

care when burning in the vicinity of a reserve and to ensure such fires do not spread onto the reserve and destroy the indigenous flora. Under the Forest and Rural Fires Act the reserves are State Areas and a permit to burn with a 1.5 km wide fire safety margin around them must be obtained from the New Zealand Forest Service before a burn commences. This permit is required in addition to the standard Catchment Board permit.

There are opportunities to effect boundary adjustments between the adjoining pastoral leases and some reserves and considerable progress has been made with these rationalisations over the past two years. These are now all but completed. Further negotiations are required to improve access to several reserves.

3.3.2 Forestry

The majority of the upper Lake Wakatipu area has been evaluated by the New Zealand Forest Service for forestry use as it falls within the general altitude requirements for exotic afforestation (ie below 600m asl). The planting of exotic species in this region was however, discarded due to the steepness of the terrain, the potential for erosion after clear-felling operations, the visual impact of plantations and felling operations on the landscape and the probability of exotic plantations adding to the already serious spread of exotics into tussock and indigenous forest lands.

In recent years the spread of exotic conifer tree species on the hill slopes surrounding and to the north of Queenstown has accelerated leading to a significant change in the landscape away from the open tussock and indigenous forested slopes towards a conifer dominated landscape of the type found in European alpine regions.

The soils and climate of the Lake Wakatipu area are favourable for the prolific establishment of wilding conifers and their effect is most noticeable on Closeburn Station where they threaten to make farming on parts of the property uneconomic in ten to twenty years.

The trees have also established in most of the reserve areas between Queenstown and Twelve Mile reserve and are particularly prolific in the Seven Mile Point and Closeburn areas. Although the exotics near Queenstown have become well established their spread farther up towards the head of the lake should be guarded against as they will eventually dominate and smother the indigenous lakeshore vegetation.

In this respect one of the values of the beech forest above Bobs Cove may be to prevent their spread towards the head of the lake.

3.3.3 Mining

Historically mining and quarrying activities have always been associated with the reserves between Queenstown and Glenorchy. The present level of activity is light compared to that of the past with the only operations of likely impact being those of goldmining at Five and Twelve Mile Creeks and road metal quarries at Twelve and Twenty Five Mile Creeks and Little Stoney Creek. Scheelite mining is undertaken near Glenorchy.

Some future prospecting for gold and scheelite within or adjacent to the reserves is likely however the probability of any significant mining being undertaken is uncertain.

In all cases where mining privileges are sought over reserve land the consent of the Minister of Lands is required before the privileges can be issued. In the case of these reserves, the Department considers large scale mining to be incompatible with their natural and recreational values and would be generally opposed to such ventures. Small scale commercial mining would be considered on its merits but in general, the department considers the reserves suitable only for recreational mining using traditional manual methods.

The Lake County Council and Queenstown Borough Council have been working five quarry sites in the area. These are located at Sunshine Bay, Twelve Mile Creek, Twenty Five Mile Creek, White Point and Little Stoney Creek. These operations at present have a significant visual impact. The road metal quarried from the Twelve Mile site is considered the best available between Queenstown and Glenorchy and is an important resource in view of the proposed upgrading and sealing of the Queenstown-Glenorchy Road. However, the operations at present have a significant and undesirable visual impact and if they are to continue they will have to be screened from public view and their visual impact minimised by careful planting and landscaping.

3.3.4 Roading

All the reserves are adjacent to unsealed roads which are identified in the District Scheme for extension or upgrading. Roadworks have the potential to seriously detract from the scenic and natural values of the reserve and should be undertaken sensitively, with a view to minimising their impact. This can best be achieved through closer liaison with the Lake County Council and the close County supervision of subsequent works to ensure high standards of construction and rehabilitation work are undertaken.

4

OBJECTIVES

The following objectives conform with the principles embodied in sections 17 and 19 (1) (a) of the Reserves Act 1977 for the management of Scenic and Recreation Reserves.

Conservation

To protect the indigenous flora and fauna and other natural, historical, archaeological and recreational features of the reserves for the benefit of the lakeshore environment and its future public use.

Visual

To protect and enhance the scenic quality of the reserves and their environs.

Function

To manage the Lake Wakatipu scenic and recreation reserves for the physical and aesthetic appreciation and enjoyment of the public to the extent compatible with conservation and preservation values.

Use

To encourage and facilitate the wise use of the reserves for a wide variety of recreational pursuits to an extent compatible with preservation and conservation objectives.

5 GENERAL MANAGEMENT POLICIES

5.1 Administration

5.1.1 Administrative Control

This management plan is formulated to cover all the public lakeshore lands listed in the schedule under Section 1.3 and its administrative effect is confined to those areas which are existing reserves pursuant to the Reserves Act 1977. The plan will take effect over proposed lakeside reserves as and when these areas are declared reserve. The remaining reserves around the western and southern shores of the lake are the responsibility of the Commissioner of Crown Lands, Invercargill. In the long term it will be desirable to achieve the co-ordination of management for all the lakeshore reserves and closer liaison will be fostered with the Invercargill office with this end in mind.

Policy

1 Administration and control of the existing and proposed Lake Wakatipu described in Section 1.3 of this plan shall be the responsibility of the Commissioner of Crown Lands, Department of Lands and Survey, Dunedin, with the day-to-day management being carried out by reserve rangers, in accordance with the provisions of the Reserves Act 1977 and this management plan.

2 To co-ordinate and rationalise the management of the lakeshore reserves in both the Otago and Southland Land Districts.

Implementation

1 The Commissioner of Crown Lands' approval of any development or concession is required before commencement is authorised in or on the reserves covered by this plan.

2 Where appropriate the Commissioner of Crown Lands shall refer development and concession proposals to the appropriate local or regional authority, eg the Otago Catchment Board, Lake County Council or Lakes District Waterways Authority for comment on matters within these authorities' jurisdiction.

3 The Department will work towards the co-ordination of lakeshore reserves management and the development of a complementary management plan for the reserves under the control of the Commissioner of Crown Lands, Invercargill or expansion of this plan to embrace all reserve and unoccupied Crown land areas around the Lake Wakatipu shoreline.

5.1.2 Classification

Policy

To classify the reserves as either scenic or recreation reserves in accordance with Section 16 of the Reserves Act 1977 and as set out in the schedule under Section 1.3 of this plan.

5.1.3 Plan Amendment and Review

Policy

The management plan shall be reviewed as necessary and generally at 5 yearly intervals in accordance with the procedures described in Section 41 of the Reserves Act 1977.

5.1.4 Reserve Boundary Adjustments

In the summer of 1980/81 the Department of Lands and Survey carried out an internal investigation into the future use of Crown land in the Upper Wakatipu region. As a result of this investigation some areas of Crown land were identified as having significant biotic, scenic and biological qualities which should be given protection and some parts of the existing reserves not possessing significant features were identified as not warranting preservation under reserves status. Negotiations are underway with adjoining landowners and leaseholders to effect appropriate boundary adjustments.

Policy

To continue negotiation for the acquisition or disposal of areas with a view to rationalising the boundaries of the reserves.

5.2 Conservation

5.2.1 Vegetation

The Botany Division, DSIR, and the Department of Internal Affairs supports the department in the view that indigenous vegetation of the reserves must be retained for its scientific values, the protection of soils and water quality, as habitat for animal and birdlife and as a vital component of the Lake Wakatipu fishery.

Most of the reserves between Sunshine Bay and Wilson Bay have been invaded by undesirable exotic species, particularly wilding conifers. These will, if left unchecked, eventually dominate the indigenous vegetation and efforts must be made to control their spread and achieve their eventual eradication.

To a large extent the long term success of this programme will depend on close co-operation with adjoining landowners and the implementation of a complementary control programme on neighbouring lands.

In some reserves exotic trees are a traditional element of the landscape and do not threaten vegetation. In these cases the trees will be retained.

Grazing stock can cause damage to important vegetation in the reserves and this activity is incompatible with reserves objectives.

Policy

1 To provide and maintain a healthy and regenerating indigenous vegetation cover.

2 To aim for the long term, planned control of wilding conifers within the reserve areas.

- 3 To allow the continued presence of exotic trees in the reserves where these are an important component of the traditional landscape character and do not inhibit regeneration of the indigenous vegetation.
- 4 To control and where practicable, eradicate noxious plants in the lake-shore reserves.
- 5 To seek the co-operation of property owners adjoining the reserves in the control of exotic trees and undesirable exotic plants on their land and to assist in control where it would be of benefit to the reserve.
- 6 To undertake revegetation in the reserves where warranted using only those plants which are in keeping with the above policies and those that harmonise with adjacent vegetation.
- 7 To use sprays and herbicides in such a manner that they do not harm indigenous flora or fauna.
- 8 To liaise with the local authorities responsible for vegetation management along roadsides and under power lines with the aim of achieving complementary and sympathetic management.
- 9 To exclude grazing in the reserves except for part of the Twelve Mile Creek catchment.

Implementation

- 1 Where possible and practicable, control of exotic vegetation will be by hand-pulling and grubbing of seedlings. Any spraying will take place only where other control measures are impractical and when climatic conditions are suitable.
- 2 The removal and salvage of mature or large exotic trees will only be undertaken where this can be achieved without permanent damage to the indigenous flora or without jeopardising soil and water conservation values. To avoid dramatic changes to the landscape removal of exotic conifers from the reserves will be phased over a period of years and carried out in consultation with the department's landscape architect, Queenstown.
- 3 It is considered that exotic trees in some reserves are an integral and traditional part of the landscape, eg the very old eucalypts at Bobs Cove and along the lakeshore between Kinloch and Birchdale Station, and the department will seek Ministerial approval under Section 19 (1) (a) of the Reserves Act for them to remain.
- 4 New planting may include native species characteristic of the locality and the seed source for plant materials will be collected from the area to be planted in order to protect the genetic diversity of the vegetation.
- 5 Where grazing stock are likely to enter the reserve, the boundaries will be fenced.

5.2.2 Water and Soil

Any management plan dealing with reserve land surrounding Lake Wakatipu must consider land and water management jointly.

The department recognises that the Lake Wakatipu reserves with their indigenous vegetation play an important role in maintaining the stability of the lakeshore

and the quality of the lake waters, particularly in the ecologically important littoral zone. The principal purpose of this plan is to establish management policies for the reserves, particularly on matters such as recreation, wildlife and fishery conservation, all of which are directly affected by soil conservation and water quality standards. The following policies recognise this inter-relationship and reflect the department's desire to ensure that reserve management activities protect and where possible, enhance soil conservation and water quality values.

Policy

- 1 To maintain the present high quality of the water of Lake Wakatipu for the health of the fishery/wildlife habitat and recreational environments.
- 2 To maintain soil stability of the reserves.

Implementation

- 1 The efforts of the Otago Catchment Board, the Regional Water Board and the Water and Soil Division of Ministry of Works and Development to maintain the water quality of Lake Wakatipu and its tributaries will be encouraged and supported.
- 2 In erosion prone areas protection planting and other methods including fencing will be investigated and implemented if appropriate.

5.2.3 Native Fauna

The reserves are an important habitat for a wide variety of native fauna including many species of birds and invertebrates. Detailed information on the species and populations which are present is not available however it does not appear that there are any rare or endangered species requiring specific management or protection.

Policy

- 1 To preserve the native fauna of the reserves through the protection and enhancement of the shoreline environs of Lake Wakatipu and the provision of suitable habitat.
- 2 To promote further investigation into the status of native fauna populations in the reserve and to liaise with the Wildlife Division, Department of Internal Affairs should specific fauna management be required.

Implementation

Protection of the habitat will be achieved through active pursuit of the physical and botanical conservation policies of this plan. The department will initiate further investigation of reserves fauna through Otago University, the DSIR Ecology Division or specialist staff as funds and priorities permit.

5.2.4 Introduced Animals

Animals which are present and of greatest concern are deer, goats and possums. Recreational hunting and commercial trapping can assist with the control of these animals and permits for hunting and trapping will be issued at the discretion of the Commissioner of Crown Lands at designated times.

Policy

- 1 To maintain introduced animal populations at levels which are compatible with the protection and regeneration of the indigenous flora.
- 2 To permit recreational and commercial hunting and trapping in the reserves at the discretion of the Commissioner of Crown Lands.

Implementation

- 1 The department will liaise with the New Zealand Forest Service and the local Pest Destruction Board to ensure a satisfactory level of animal control is achieved.
- 2 Permits for hunting and trapping will be issued by the Commissioner through the Senior Rangers, Queenstown and Glenorchy and will be subject to any conditions necessary to safeguard public safety and reserve values.

5.2.5 Fisheries

The lake holds brown and rainbow trout and quinnat salmon and provides good fishing opportunities calling for a variety of angling techniques. The protection of this fishery is of regional and national importance especially to the tourist industry.

Lake Wakatipu is a deep lake with steep lake edges and narrow beaches. The steep lake edge restricts the littoral zone and reduces the productivity of the lake. The vegetation of the shoreline reserves is therefore very important to the condition of the fishery as it is an important source of food and provides shade and cover.

Policy

To co-operate with the Conservator of Wildlife, Department of Internal Affairs, Queenstown, in the protection and enhancement of the Lake Wakatipu fishery.

Implementation

- 1 Protection of the shoreline vegetation for shade and bank stability and as a sustainable source of food will be achieved through the implementation of the physical and biological conservation policies of this plan.
- 2 Where appropriate fencing will be established to protect spawning areas within and adjacent to the reserves in co-operation with the Conservator of Wildlife and adjacent landowners.

5.2.6 Landscape

The reserves and their distinctive vegetation, form an integral part of the Upper Lake Wakatipu landscape. In order to maintain the balance between the landscape components described in Section 2.1, it is important that management of the reserves does not significantly alter their visual appearance. However, maintenance of the visually striking upper lake landscape cannot be achieved by the department alone. Also required is recognition by landowners and local authorities that the landscape is a feature to be protected for the benefit of the region and that they have an important role in achieving that protection. In this respect, the department will seek to promote the need for landscape protection in liaison with the local authority and landholders.

Policy

- 1 To actively promote recognition of the upper Lake Wakatipu landscape as a visual resource of national significance and to encourage its protection through the co-operative efforts of local authorities and landholders and the use of statutory planning procedures.
- 2 To preserve the natural features of the reserves and minimise the visual impact of management activities, particularly those involving earthworks.
- 3 To ensure that all earthworks carried out in and within close proximity of the reserves will not unduly detract from the value of the landscape nor cause any significant erosion or deterioration in water quality.

Implementation

- 1 The department will produce an inventory of the Lake Wakatipu landscape and will highlight the need to integrate landscape conservation with development if the regional character is to be retained. The inventory will be made available to the public and interested organisations.
- 2 Structures shall be designed and sited so they do not detract from or contrast unduly with the surrounding landscape and where necessary, will be screened from view by planting of species characteristic of the area.
- 3 All earthworks will be carried out in harmony with the surrounding landform and roads, tracks, carparks and camping sites will be shaped and revegetated to blend with the surroundings.
- 4 Before any major development proposal is embarked on an assessment of the environmental effect shall be prepared and the approval of the Commissioner of Crown Lands obtained.
- 5 When negotiating reserve boundary adjustments along roadlines, consideration will be given to the feasibility of achieving a corridor of reserve either side of the roadline to enhance the scenic quality of the highway.

5.2.7 Historical and Archaeological Sites

The reserves contain a number of sites of historical or archaeological interest, particularly those at Bobs Cove and Twelve Mile Creek. The protection of these historic sites coupled with their presentation to the public is important as they provide a means by which present and future generations can gain a sense of the early history of the region. The protection of archaeological sites, ie those over 100 years old, is required under the Historic Places Act 1980.

Policy

To protect and preserve significant sites of historical and archaeological interest within the reserves.

Implementation

- 1 The department will identify and record historic and archaeological sites within the reserves in liaison with the New Zealand Historic Places Trust.
- 2 Following identification, an assessment of appropriate protection measures will be carried out and where necessary, implemented.

3 Where appropriate, access to a site will be provided or improved and onsite interpretative information provided.

5.2.8 Fire Control

The area has a history of fires and this has been the most significant factor affecting the botanical composition of the reserves. Increased public use and regeneration of indigenous and exotic vegetation increases the potential fire hazard particularly during the hot dry summer months. It is important therefore that the management of the reserves is aimed at minimising the risk of fire.

The reserves are State areas under the Forest and Rural Fires Act 1977 and the control of any fire within the reserves and an adjoining 1.5 kilometre wide safety margin is the responsibility of the New Zealand Forest Service. In all cases where burning is contemplated within 1.5 km of a reserve a permit is required from the New Zealand Forest Service in addition to that normally obtained from the Otago Catchment Board.

Policy

1 To assist the New Zealand Forest Service and the Otago Catchment Board in the prevention of fires within the reserves.

2 To prohibit the lighting of fires within the scenic reserves other than in fireplaces provided or, in the case of recreation reserves only, in suitably protected fireplaces in areas cleared of combustible material.

Implementation

1 The department will provide the New Zealand Forest Service and Otago Catchment Board with a list and plan of reserves in the Lake Wakatipu area to assist those organisations in identifying areas where special conditions on burning near reserves may apply.

2 In the event of a fire within the reserve the New Zealand Forest Service will be notified and departmental staff will, wherever possible, provide practical assistance to bring it under control.

3 The department will encourage the public to use the fireplaces provided or portable stoves and barbeques.

5.3 Reserve Development and Use

5.3.1 Recreational Development

Lake Wakatipu offers opportunities for a wide variety of recreational activities utilising the water and shoreline. The shoreline reserves have potential for facilitating active and passive recreation activities such as yachting, wind-surfing, boating, fishing, swimming, walking, picnicking and camping.

The department recognises the need to develop the recreation potential of the reserves and has identified a number of sites suitable for low impact development and the provision of basic facilities. Recently the Lakes District Waterways Authority has been established to co-ordinate management of foreshore areas for commercial and recreational boating and it has overall jurisdiction for Lake Wakatipu. The department supports the Authority in this role and will work with it to achieve co-ordinated shoreline development.

The department's main development proposals are discussed in Section 6.

Policy

1 To develop the recreation potential of reserves to meet public demand and to the extent compatible with the overall objectives and policies contained in this plan and the availability of resources.

2 To recognise the jurisdiction of the Waterways Authority over Lake Wakatipu and to liaise with Authority over the use of the reserves foreshore areas for the erection of structures and facilities.

5.3.2 Facilities and Tracking

The need to provide facilities such as fireplaces, toilets and water will be carefully assessed against the known or anticipated public use of the reserve, maintenance and servicing requirements and the protection of natural features. Tracking will be necessary to provide access to and within the reserves and could involve the re-establishment of historic tracks or the development of new routes. Where it is decided to proceed with facility or track development, careful consideration will be given to siting and design to ensure a minimum visual and physical impact and to meet the requirements of the Health Department and local authorities.

Policy

1 To provide and maintain only those facilities and tracks required for proper management and use of the reserves as generally outlined in Section 6 of this plan and as resources permit.

2 The design and siting of any facility will be in accordance with the following criteria:-

- i The form, design and location of the facility should have minimal impact on vegetation, topography, other natural features.
- ii The site chosen should not dominate the physical, visual or aesthetic qualities of the immediate environment.
- iii The materials and colours used must be in harmony with the natural surroundings.

Implementation

Development as outlined in Section 6 will be gradually implemented according to perceived need and the availability of finance and labour.

5.3.3 Vehicles and Parking

In a number of places vehicular access to and within the reserves is required but in any development of this type the objectives of this plan must be considered and the natural values retained. Therefore the careful assessment of vehicle access needs is required and the location of carparking must be sensitively planned.

Policy

1 To provide access and carparking within the reserves to the extent compatible with the retention of the natural and scenic values of the area and as resources permit.

2 To permit motor vehicles and motorcycles only on the access roads and defined parking areas within the reserves.

Implementation

- 1 See Development Proposals (Section 6).
- 2 Where necessary engineering and landscape studies will be undertaken to determine the most suitable route or site.

5.3.4 Unauthorised Structures

In the past, reserves and Crown owned land around Lake Wakatipu have received scant supervision. Partly because of this and partly because of confusion as to the location of legal boundaries, structures have been erected on public land without authority or licence. In some cases these structures do not detract from the amenity of the reserve but in other cases amenity values are diminished. Each case should be assessed on its merits and the occupation or structure be either licensed or removed.

Policy

To assess with a view to removal, all unauthorised and unwanted structures which detract from the amenity value of the reserves.

Implementation

- 1 The owners of the unauthorised structures will be given notice of the department's requirements and a period of 5 years to remove them where this is required.

5.3.5 Fencing

Some fencing may be required where stock can gain access to a reserve to protect the vegetation. In other cases fencing may be required as a result of negotiations to rationalise reserve boundaries.

Policy

To erect and maintain boundary fences around the reserves where this is necessary for the protection of reserve values and for boundary definition.

Implementation

- 1 The need for fencing will be assessed as part of the on-going management of the reserves and budgeted for accordingly.
- 2 The co-operation of adjoining landowners will be sought on fencing matters and in reporting any damage to boundary fences.
- 3 Existing fences will be inspected regularly and where necessary, maintenance will be carried out.

5.3.6 Camping

The popularity of the Wakatipu region for holiday making and recreation is growing. However, due to the nature of land tenure in the region there are few areas of publicly owned land in reasonable proximity to Queenstown where people have a right of access and can camp outside the commercial campgrounds which are often fully committed during peak holiday periods.

Several areas within the lakeshore reserve are suitable for informal camping and are already used to a limited extent for this purpose. The department considers camping to be a legitimate use of the reserves but is also conscious of its limited resources and inability to control and service expanded camping activities. Therefore, it will not be actively encouraging this activity. Any development will be basic and limited to that which the department would normally provide for day users and can carry out and maintain without additional requirements for increased staff or resources.

Policy

- 1 To allow informal camping on the lakeshore reserve areas at Twelve Mile Creek, Twenty Five Mile Creek, Little Stoney Creek and at Kinloch subject to the requirements of Policy 3 below.
- 2 To monitor the use of these areas for both day use and camping and to provide only limited facilities where these are warranted for normal day use and can be maintained without the need for additional resources.
- 3 To review this policy regularly with a view to determining the need to restrict or control camping activities because of overuse or potential public health risks.

Implementation

- 1 To carry out the limited development work described in Section 6 of this plan as resources permit and conditions dictate.
- 2 To regularly inspect and record the level of use and impact of camping on those reserve areas approved for camping throughout the year and particularly during high use holiday periods.
- 3 The Senior Rangers Glenorchy and Queenstown will regularly assess the impact on camping activities, particularly during the peak holiday periods, and will, if they consider it necessary, impose restrictions on this activity.

5.3.7 Mining

Although small quantities of gold are present in the Twelve and Five Mile Creeks and other streams flowing through the reserves it is unlikely that this or other minerals of economic value are present in commercially viable quantities. However, it is possible that applications for mining or prospecting licences in the reserves will be sought in the future, particularly for gold and scheelite which are the high value minerals traditionally found in the region.

Mining in reserves is governed by the Mining Act 1971 under which the consent of the Minister of Lands is required before a mining or prospecting licence can be issued over a reserve. As the administering agency for reserves the Department of Lands and Survey has the opportunity to report on mining privilege applications and make recommendations to the Minister on appropriate

conditions of operations and performance standards or whether to grant or withhold his consent.

The department is not opposed to low impact recreational and small scale mining and recognises that mining may be a legitimate land use in some reserve areas. However, the department reserves the right to consider each application for a commercial prospecting or mining licence on its merits and to make appropriate recommendations to the Minister of Lands. In such cases, the department would be willing to discuss the proposed operation with the applicant with a view to establishing mutually satisfactory operational standards prior to making its recommendation to the Minister. In general the department would oppose large scale commercial mining ventures which are likely to have a significant impact on the reserves.

In recent years the only significant mineral extraction taking place in the vicinity of the reserves has been the quarrying of road metal by the Lake County Council from sites at Sunshine Bay, Twelve Mile Creek, Twenty Five Mile Creek, White Point and Little Stoney Creek. The department recognises that good road access to this area is essential if its economic, recreational and tourist potential is to be fully realised and that readily accessible supplies of road metal are important if this objective is to be achieved. However, the department is concerned that the quarrying is carried out without sufficient regard to the impact on the landscape and restorative measures.

Policy

1 The department recognises low impact recreational mining and gold fossicking as a legitimate recreational activity within the reserves.

2 The department will assess all applications for mining and prospecting privileges in the reserves on their merits and if desired will discuss these with the applicants before making a recommendation to the Minister of Lands.

3 The department will generally oppose large scale mining operations in reserves which are likely to have a significant environmental impact.

4 The department will seek to minimise the impact of roading or quarrying operations within or adjacent to the reserve and will require appropriate mining licences to be obtained.

Implementation

1 The department will assess all prospecting or mining licence applications for their likely environmental impact.

2 Where significant environmental modification is likely to arise the department will offer to discuss appropriate conditions of operation, performance standards and restoration with the applicant prior to making its report to the Minister.

3 The department will liaise with the Lake County Council on the matter of future roading or gravel quarrying operations in or in close proximity to the reserves with a view to minimising their impact and establishing agreement on restorative procedures and for incorporation in the conditions of any mining licence which may be issued.

5.3.8 Research

A complete inventory of the physical, biological and cultural features of the reserves and their public use would be desirable aid for reserve management purposes however further research in these reserves is a low priority and will be determined by the availability of resources.

Policy

To support further investigation of the reserves and their use which will be of benefit in their management. ✓

Implementation

- 1 Under-graduate and post-graduate project research into all aspects of the reserves and their use will be encouraged, particularly where this is orientated towards identifying and quantifying recreational use and needs.
- 2 Where priorities and resources permit and specific research is required to aid management decision making, the department will commission appropriate agencies to undertake the necessary work.
- 3 Some possible topics of research are:
 - (i) Investigation into successional patterns of vegetation within the reserves and the influence of cultural activities on the vegetation.
 - (ii) Investigation into the native fauna of the reserves and in particular the invertebrate fauna.
 - (iii) User survey and investigation of public perceptions of the biological recreational value of the reserves.
 - (iv) An assessment of the importance of the reserves in the public recreation opportunity spectrum for the Lakes Queenstown region. ✓

The basic concept underlying the development and management of the Upper Lake Wakatipu reserves is that they form a local complex which have in common a distinctive lakeshore character and considerable recreational potential. It is therefore intended to manage them for public use as a unit and to gradually undertake development aimed at achieving their recreational potential.

Co-ordination between the Queenstown and Glenorchy ranger stations will result in standardisation of such things as signs, track construction, facility design, plant materials and interpretative and publicity material and will serve to ensure that consistent standards of management are achieved.

The following proposals cover the principle areas considered suitable for further development and are proposals only. Any development or the provision of facilities is entirely dependent on available resources both for the capital stage and subsequent maintenance.

Proposal 1 Twelve Mile Creek

(i) Delta Area

Upgrade the access track to allow vehicle access to the Twelve Mile Creek delta and facilitate its use as a picnic area. Allow informal camping and provide toilet facilities. Develop a shoreline walking track to Bobs Cove.

(ii) Old Road Bridge Area

Develop this as a picnic area. Develop a track up Twelve Mile Creek to Sam Sumners hut and Lake Isabel. Liaise with Lake County Council to minimise the impact of the road metal quarry.

Proposal 2 Bobs Cove

(i) Develop as a day use/picnic area only and provide toilet facilities.

(ii) Improve tracking from present car parks to the Cove. Investigate possible additional roadside carparking with Lake County Council.

(iii) Emphasise features such as the old lime kilns and establish a viewing point on the peninsula.

(iv) Establish a nature walk through the red beech forest at the northern end of the Cove.

(v) Begin development of the old shoreline bridle track between Bobs Cove and Meiklejohns Bay and link with carpark.

Proposal 3 Old Bridle Track

Develop the old bridle track from Bobs Cove to Meiklejohns Bay as a walking track. Safety considerations may mean a deviation from the original route in several areas.

Proposal 4 Twenty Five Mile Creek

- (i) Develop day use area on lakeshore area north of the creek mouth.
- (ii) Provide fireplaces and possibly a toilet as needs dictate.

Proposal 5 Lake Face Creek

Develop the area south of the mouth of Lake Face Creek for day use only.

Proposal 6 Little Stoney Creek

- (i) Develop the lakeshore area north of Little Stoney Creek for day use and limited informal camping.
- (ii) Discuss relocation of gravel dumps in the reserve and the restoration of the existing gravel quarry with Lake County Council.

Proposal 7 Kinloch Water Front

Develop the lakeshore area for day use and informal camping and provide toilet facilities.

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Dunedin

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Ministry of Transport, Marine Division, Christchurch

New Zealand Forest Service, Invercargill, Queenstown

Otago Catchment Board, Dunedin

Lake County Council, Queenstown

Lakes District Waterways Authority, Queenstown

Otago Council, Dunedin

Queenstown Borough, Queenstown

Southland Museum, Invercargill

Otago Museum, Dunedin

University of Otago - Department Geography, Dunedin

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