Toitu te whenua
Land Information New Zealand

Crown Pastoral Land Tenure Review

Lease name : OBELISK STATION

Lease number : PO 264

Conservation Resources Report - Part 4

As part of the process of Tenure Review, advice on significant inherent values within the pastoral lease is provided by Department of Conservation officials in the form of a Conservation Resources Report. This report is the result of outdoor survey and inspection. It is a key piece of information for the development of a preliminary consultation document.

Note: Plans which form part of the Conservation Resources Report are published separately.

These documents are all released under the Official information Act 1982.

December 10

4.5 Appendicies

4.5.1 Vascular plant list

– Vascular plant species recorded from Obelisk Pastoral Lease

Current name	Family (Tribe)	Threat ranking (2009)	Common name
Abrotanella caespitosa	Asteraceae	Not threatened	
Abrotanella inconspicua	Asteraceae	Not threatened	
Acaena agnapila var. *aequispina*	Rosaceae	Exotic	
Acaena anserinifolia	Rosaceae	Not threatened	bidibid
Acaena buchananii	Rosaceae	Not threatened	Buchanan's bidibid
Acaena caesiiglauca	Rosaceae	Not threatened	bidibid
Acaena juvenca	Rosaceae	Not threatened	bidibid
Acaena novae-zelandiae	Rosaceae	Exotic	bidibid
Acaena saccaticupula	Rosaceae	Not threatened	bidibid
Acaena tesca	Rosaceae	Naturally Uncommon	bidibid
Aciphylla aurea	Apiaceae	Not threatened	spaniard
Aciphylla hectorii	Apiaceae	Not threatened	dwarf spaniard
Aciphylla scott-thomsonii	Apiaceae	Not threatened	spaniard
Agrostis capillaris	Agrostidinae	Exotic	browntop
Agrostis muscosa	Gramineae (Agrostidinae)	Not threatened	pincushion grass
Anagallis arvensis subsp. *arvensis* var. *arvensis*	Primulaceae	Exotic	scarlet pimpernel
Anaphalioides bellidioides	Asteraceae	Not threatened	
Anisotome aromatica	Apiaceae	Not threatened	
Anisotome cauticola	Apiaceae	Naturally Uncommon	
Anisotome flexuosa	Apiaceae	Not threatened	
Anisotome imbricata var. *imbricata*	Apiaceae	Not threatened	
Aphanes arvensis	Rosaceae	Exotic	parsley piert
Arctium minus	Asteraceae	Exotic	burdock
Argyrotegium mackayi	Asteraceae	Not threatened	
Arthropodium candidum	Liliaceae	Not threatened	

Asplenium appendiculatum subsp. *appendiculatum*	Aspleniaceae	Not threatened	
Asplenium flabellifolium agg.	Aspleniaceae	Not threatened	necklace fern
Asplenium flaccidum	Aspleniaceae	Not threatened	hanging spleenwort
Asplenium richardii	Aspleniaceae	Not threatened	
Blechnum montanum	Blechnaceae	Not threatened	mountain kiokio
Blechnum penna-marina subsp. alpina	Blechnaceae	Not threatened	
Brachyglottis bellidioides var.	Asteraceae	Not threatened	
Brachyglottis haastii	Asteraceae	Not threatened	
Brachyscome sinclairii	Asteraceae	Not threatened	
Bulbinella angustifolia	Liliaceae	Not threatened	maori onion
Cardamine debilis agg.	Brassicaceae	Not threatened	
Carex breviculmis	Cyperaceae	Not threatened	
Carex coriacea	Cyperaceae	Not threatened	
Carex gaudichaudiana	Cyperaceae	Not threatened	
Carex hectorii	Cyperaceae	Not threatened	
Carex inopinata	Cyperaceae	Nationally Endangered	
Carex kaloides	Cyperaceae	Not Threatened	
Carex ovalis	Cyperaceae	Exotic	oval sedge
Carex pterocarpa	Cyperaceae	Naturally Uncommon	
Carex pyrenaica var. *cephalotes*	Cyperaceae	Not threatened	
Carex resectans	Cyperaceae	Regionally Significant	
Carex secta	Cyperaceae	Not threatened	niggerhead
Carex wakatipu agg.	Cyperaceae	Not threatened	
Carmichaelia compacta	Fabaceae	Declining	
Carmichaelia crassicaulis subsp. *crassicaulis*	Fabaceae	Declining	coral broom
Carmichaelia petriei	Fabaceae	Not threatened	Desert broom
Celmisia (g) (CHR 274779; "rhizomatous")	Asteraceae	Not threatened	
Celmisia brevifolia	Asteraceae	Not threatened	
Celmisia gracilenta agg.	Asteraceae	Not threatened	

Celmisia haastii var. *haastii*	Asteraceae	Not threatened	
Celmisia laricifolia	Asteraceae	Not threatened	
Celmisia lyallii	Asteraceae	Not threatened	false spaniard
Celmisia prorepens	Asteraceae	Not threatened	
Celmisia sessiliflora	Asteraceae	Not threatened	
Celmisia viscosa	Asteraceae	Not threatened	
Centaurium erythraea	Gentianaceae	Exotic	centaury
Centella uniflora	Apiaceae	Not threatened	
Cerastium fontanum subsp*. vulgare*	Caryophyllaceae	Exotic	mouse-ear chickweed
Chaerophyllum colensoi agg.	Apiaceae	Not threatened	
Chaerophyllum ramosum	Apiaceae	Not threatened	
Cheilanthes sieberi subsp*. sieberi*	Pteridaceae	Not threatened	rock fern
Chionochloa macra	Gramineae (Danthonieae)	Not threatened	slim snow tussock
Chionochloa rigida subsp. *rigida*	Gramineae (Danthonieae)	Not threatened	narrow-leaved snow-tussock
Chionohebe glabra	Plantaginaceae	Naturally Uncommon	
Cirsium arvense	Asteraceae	Exotic	Californian thistle
Cirsium vulgare	Asteraceae	Exotic	Scotch thistle
Clematis marata	Ranunculaceae	Not threatened	
Clematis tangutica	Ranunculaceae	Exotic	oriental clematis
Colobanthus brevisepalus	Caryophyllaceae	Naturally Uncommon	
Colobanthus strictus	Caryophyllaceae	Not threatened	
Conium maculatum	Apiaceae	Exotic	hemlock
Coprosma atropurpurea	Rubiaceae	Not threatened	
Coprosma cheesemanii	Rubiaceae	Not threatened	
Coprosma crassifolia	Rubiaceae	Not threatened	
Coprosma dumosa	Rubiaceae	Not threatened	
Coprosma perpusilla subsp*. perpusilla*	Rubiaceae	Not threatened	creeping coprosma
Coprosma propinqua var. propinqua	Rubiaceae	Not threatened	
Coprosma tayloriae	Rubiaceae	Not threatened	
Coprosma virescens	Rubiaceae	Regionally Significant	
Coriaria sarmentosa	Coriariaceae	Not threatened	tutu
Corokia cotoneaster	Escalloniaceae	Not threatened	corokia
Cortaderia richardii	Gramineae (Cortaderiinae)	Not threatened	South Island toetoe
Crassula colligata subsp. colligata	Crassulaceae	Not threatened	

Crassula multicaulis	Crassulaceae	Nationally Critical	
Crassula sinclairii	Crassulaceae	Not threatened	
Crepis capillaris	Asteraceae	Exotic	hawksbeard
Cyathodes pumila	Epacridaceae	Not threatened	
Cytisus scoparius	Fabaceae	Exotic	broom
Cytisus scoparius	Fabaceae	Exotic	broom
Dichelachne crinita	Gramineae (Agrostidinae)	Not threatened	long-hair plume grass
Discaria toumatou	Rhamnaceae	Not threatened	matagouri
Dracophyllum muscoides	Epacridaceae	Not threatened	prostrate inaka
Echium vulgare	Boraginaceae	Exotic	viper's bugloss
Eleocharis acuta	Cyperaceae	Not threatened	sharp spike-sedge
Elymus solandri	Poaceaea (Hordeeae)	Not threatened	
Epilobium glabellum	Onagraceae	Not threatened	
Epilobium komarovianum	Onagraceae	Not threatened	
Epilobium macropus	Onagraceae	Not threatened	
Epilobium pernitens	Onagraceae	Not threatened	
Epilobium pubens	Onagraceae	Not threatened	
Epilobium tasmanicum	Onagraceae	Not threatened	
Erodium cicutarium	Geraniaceae	Exotic	storksbill
Erophila verna	Brassicaceae	Exotic	whitlow grass
Eschscholzia californica	Papaveraceae	Exotic	Californian poppy
Euchiton audax	Asteraceae	Not threatened	
Euchiton traversii	Asteraceae	Not threatened	
Euphorbia peplus	Euphorbiaceae	Exotic	milkweed
Festuca novae-zelandiae	Poaceaea (Poeae)	Not threatened	hard tussock
Festuca rubra subsp. commutata	Poeae	Exotic	Chewings fescue
Galium aparine	Rubiaceae	Exotic	cleavers
Galium perpusillum	Rubiaceae	Not threatened	
Gaultheria depressa s.s.	Ericaceae	Not threatened	snowberry
Gaultheria nubicola	Ericaceae	Not threatened	
Gentianella amabilis	Gentianaceae	Not threatened	
Gentianella bellidifolia	Gentianaceae	Not threatened	
Geranium (d) (aff. *G. microphyllum*; "mainland"*)*	Geraniaceae	Not threatened	
Geranium brevicaule	Geraniaceae	Not threatened	
Geum leiospermum	Rosaceae	Not threatened	
Grammitis billardierei	Grammitidaceae	Not threatened	
Grammitis poeppigiana	Grammitidaceae	Not threatened	

Hebe buchananii	Plantaginaceae	Not threatened	
Hebe imbricata	Plantaginaceae	Not threatened	
Hebe pimeleoides subsp. faucicola	Plantaginaceae	Naturally Uncommon	
Hebe propinqua	Plantaginaceae	Not threatened	
Hebe rakaiensis	Plantaginaceae	Not threatened	
Hebe salicifolia	Plantaginaceae	Not threatened	koromiko
Hebejeebie densifolia	Plantaginaceae	Not threatened	
Hectorella caespitosa	Hectorellaceae	Not threatened	
Helichrysum filicaule	Asteraceae	Not threatened	
Helichrysum lanceolatum	Asteraceae	Not threatened	niniao
Hieracium lepidulum	Asteraceae	Exotic	tussock hawkweed
Hieracium pilosella subsp. pilosella	Asteraceae	Exotic	mouse-eared hawkweed
Hieracium praealtum	Asteraceae	Exotic	king devil
Hydrocotyle (a) (*H. novae-zeelandiae* var. *montana*)	Apiaceae	Not threatened	
Hypochoeris radicata	Asteraceae	Exotic	catsear
Hypochoeris radicata	Asteraceae	Exotic	catsear
Hypolepis millefolium	Dennstaedtiaceae	Not threatened	thousand-leaved fern
Juncus articulatus	Juncaceae	Exotic	jointed rush
Juncus effusus	Juncaceae	Exotic	soft rush
Juncus novae-zealandiae	Juncaceae	Not threatened	
Kelleria childii	Thymelaeaceae	Not threatened	
Kelleria croizatii	Thymelaeaceae	Not threatened	
Kelleria dieffenbachii	Thymelaeaceae	Not threatened	
Kelleria paludosa	Thymelaeaceae	Not threatened	
Kelleria villosa var. *villosa*	Thymelaeaceae	Not threatened	
Kirkianella novae-zelandiae	Asteraceae	Nationally Vulnerable	
Koeleria novozelandica	Gramineae (Aveninae)	Not threatened	
Kunzea ericoides s.l.	Myrtaceae	Not threatened	kanuka
Lagenifera cuneata	Asteraceae	Not threatened	
Leptinella (b) (L. squalida subsp. *mediana)*	Asteraceae	Not threatened	
Leptinella (f) (; "seep")	Asteraceae	Not threatened	
Leptinella goyenii	Asteraceae	Not threatened	
Leptinella pectinata subsp*. villosa*	Asteraceae	Not threatened	
Leucopogon fraseri complex (mountain ecotype)	Ericaceae	Not threatened	

Limosella lineata agg.	Plantaginaceae	Not threatened	mudwort
Lobelia angulata	Lobeliaceae	Not threatened	
Lobelia macrodon	Lobeliaceae	Not threatened	
Lotus pedunculatus	Fabaceae	Exotic	lotus
Lupinus arboreus	Fabaceae	Exotic	lupin
Luzula banksiana var. *rhadina*	Juncaceae	Not threatened	
Luzula crenulata	Juncaceae	Naturally Uncommon	
Luzula pumila	Juncaceae	Not threatened	woodrush
Luzula rufa	Juncaceae	Not threatened	woodrush
Luzula traversii	Juncaceae	Not threatened	
Lycopodium fastigiatum	Lycopodiaceae	Not threatened	mountain clubmoss
Marrubium vulgare	Lamiaceae	Exotic	horehound
Melicytus alpinus agg.	Violaceae	Not threatened	porcupine shrub
Mentha cunninghamii	Lamiaceae	Not threatened	NZ mint
Mimulus moschatus	Scrophulariaceae	Exotic	musk
Montia fontana subsp*. montana*	Portulacaceae	Not threatened	blinks
Montia sessiliflora	Portulacaceae	Not threatened	
Muehlenbeckia complexa agg.	Polygonaceae	Not threatened	small-leaved pohuehue
Myosotis drucei (ex *Myosotis pygmaea* var *drucei)*	Boraginaceae	Regionally Significant	Druce's forget-me-not
Myosotis (hh) (AK 7570; aff. *M. tenericaulis*; Garvie)	Boraginaceae	Naturally Uncommon	
Myosotis brevis (ex *Myosotis pygmaea* var. *minutiflora*)	Boraginaceae	Nationally Endangered	small-flowered pygmy forget-me-not
Myosotis discolor	Boraginaceae	Exotic	grassland forget-me-not
Myosotis pulvinaris	Boraginaceae	Not threatened	
Myosurus minimus subsp. novaezelandiae	Ranunculaceae	Nationally Critical	mousetail
Myriophyllum propinquum	Haloragaceae	Not threatened	
Myrsine nummularia	Myrsinaceae	Not threatened	
Olearia bullata	Asteraceae	Not threatened	
Olearia lineata	Asteraceae	Declining	
Olearia odorata	Asteraceae	Not threatened	
Oreobolus pectinatus	Cyperaceae	Not threatened	comb sedge
Ourisia glandulosa	Plantaginaceae	Not threatened	
Oxalis exilis	Oxalidaceae	Not threatened	creeping oxalis
Oxalis magellanica	Oxalidaceae	Not threatened	native oxalis
Ozothamnus vauvilliersii	Asteraceae	Not threatened	tauhinu

Pachycladon novae-zelandiae	Brassicaceae	Not threatened	
Pellaea calidirupium	Pteridaceae	Not threatened	
Pentachondra pumila	Epacridaceae	Not threatened	
Phyllachne colensoi	Stylidiaceae	Not threatened	
Phyllachne rubra	Stylidiaceae	Not threatened	
Pimelea aridula	Thymelaeaceae	Declining	
Pimelea oreophila	Thymelaeaceae	Not threatened	alpine daphne
Pinus sp.	Pinaceae	Exotic	
Plantago lanigera	Plantaginaceae	Not threatened	hairy swamp plantain
Plantago unibracteata	Plantaginaceae	Not threatened	
Poa cita agg.	Poeae	Not threatened	silver tussock
Poa colensoi s.l.	Poeae	Not threatened	blue tussock
Poa maniototo	Gramineae (Poeae)	Not threatened	desert poa
Poa pratense	Gramineae (Poeae)	Exotic	Kentucky bluegrass
Polystichum cystostegia	Dryopteridaceae	Not threatened	alpine shield fern
Polystichum neozelandicum subsp*. zerophyllum*	Dryopteridaceae	Not threatened	
Polystichum vestitum	Dryopteridaceae	Not threatened	prickly shield fern
Prunella vulgaris	Lamiaceae	Exotic	selfheal
Psychrophila obtusa	Ranunculaceae	Not threatened	white caltha
Pteridium esculentum	Dennstaedtiaceae	Not threatened	bracken
Ranunculus enysii	Ranunculaceae	Not threatened	
Ranunculus gracilipes	Ranunculaceae	Not threatened	
Ranunculus maculatus	Ranunculaceae	Naturally Uncommon	
Ranunculus multiscapus	Ranunculaceae	Not threatened	
Ranunculus pachyrrhizus	Ranunculaceae	Not threatened	
Raoulia (f) (*R. hectorii* var. *mollis*; Garvie bog)	Asteraceae	Naturally Uncommon	scabweed
Raoulia australis	Asteraceae	Not threatened	scabweed
Raoulia beauverdii	Asteraceae	Naturally Uncommon	scabweed
Raoulia grandiflora	Asteraceae	Not threatened	
Raoulia hectorii	Asteraceae	Not threatened	scabweed
Raoulia parkii	Asteraceae	Not threatened	Celadon mat daisy
Raoulia subsericea	Asteraceae	Not threatened	
Raoulia subulata	Asteraceae	Not threatened	
Reseda luteola	Resedaceae	Exotic	wild mignonette
Ribes uva-crispa	Grossulariaceae	Exotic	gooseberry
Rosa rubiginosa	Rosaceae	Exotic	sweet briar

Rubus schmidelioides var. *subpauperatus*	Rosaceae	Not threatened	bush lawyer
Rumex acetosella	Polygonaceae	Exotic	sheep's sorrel
Rytidosperma maculatum	Poaceaea (Danthonieae)	Not threatened	
Rytidosperma pumilum	Gramineae (Danthonieae)	Not threatened	
Rytidosperma unarede	Gramineae (Danthonieae)	Not threatened	cliff fairy grass
Sagina procumbens	Caryophyllaceae	Exotic	procumbent pearlwort
Sambucus nigra	Caprifoliaceae	Exotic	elder
Schizeilema cockaynei	Apiaceae	Not threatened	
Schoenus pauciflorus	Cyperaceae	Not threatened	bog-rush
Scleranthus uniflorus	Caryophyllaceae	Not threatened	
Sedum acre	Crassulaceae	Exotic	stonecrop
Senecio jacobea	Asteraceae	Exotic	ragwort
Senecio quadridentatus	Asteraceae	Not threatened	cotton fireweed
Senecio wairauensis	Asteraceae	Not threatened	groundsel
Sonchus oleraceus	Asteraceae	Exotic	sow thistle
Spergularia rubra	Caryophyllaceae	Exotic	sand spurrey
Stellaria gracilenta	Caryophyllaceae	Not threatened	
Taraxacum officinale	Asteraceae	Exotic	dandelion
Thymus vulgaris	Lamiaceae	Exotic	culinary thyme
Trifolium arvense	Fabaceae	Exotic	haresfoot trefoil
Trifolium dubium	Fabaceae	Exotic	suckling clover
Trifolium repens	Fabaceae	Exotic	white clover
Trisetum (f) (; aff. *T. spicatum*)	Gramineae (Aveninae)	Not threatened	
Ulex europaeus	Fabaceae	Exotic	gorse
Uncinia divaricata	Cyperaceae	Not threatened	hookgrass, bastard grass
Uncinia rubra	Cyperaceae	Not threatened	red hookgrass
Urtica urens	Urticaceae	Exotic	nettle
Verbascum thapsus	Scrophulariaceae	Exotic	woolly mullein
Verbascum virgatum	Scrophulariaceae	Exotic	moth mullein
Veronica verna	Scrophulariaceae	Exotic	spring speedwell
Viola cunninghamii	Violaceae	Not threatened	
Vittadinia australis agg.	Asteraceae	Not threatened	white fuzzweed

4.5.2 Invert Fauna List

High alpine zone

Orthoptera	**Threat Status**	**Distribution**
grasshoppers and weta		
Sigaus obelisci	Type Locality here – yes	widespread in herbfield
Alpinacris tumidicauda	none	widespread in snowbanks
Hemiandrus focalis	none	widespread in fellfield
Blattoidea		
cockroach		
Celatoblatta quinquemaculata	none	widespread in herbfield
Coleoptera		
beetles including weevils		
Prodontria capito	none	widespread in herbfield
Scythrodes squalidus	none	widespread in herbfield
Lyperobius hudsoni	none	widespread in herbfield
Lepidoptera		
moths		
Orocrambus cultus	none	local in fellfield
Tawhitia glaucophanes	none	common in fellfield
Tauroscopa gorgopis	Type Locality - none	common in herbfield
Gelophaula palliata	none	locally common in fellfield
Hierodoris gerontion	none	common in fellfield
Notoreas ortholeuca	none	common in fellfield
Aponotoreas anthracias	none	common in herbfield
Aponotoreas orphnaea	none	local in wetland
Asaphodes dionysias	none	common in herbfield
Dasyuris austrina	none	local in fellfield
Aletia panda	none	
Hemiptera		
cicada		
Maoricicada nigra frigida	none	widespread in fellfield

Hemiptera		
bug		
Hypsithocus hudsonae	yes	rare in herbfield
Ephemeroptera		
mayfly		
Deleatidium atricolor	none	high alpine streams

Alpine grassland and herbfield zone

Hemiptera		
bug	none	
Dictyotus caenosus		common in herbfield
Plecoptera		
stoneflies		
Zelandobius childi	none	local in streams

Zelandobius alatus	none	local in streams
Zelandobius patrick	none	local in streams
Zelandobius foxi	none	common in streams
Zelandoperla pennulata	none	common in streams
Vesicaperla celmisia	Type Locality - none	local in riparian zone
Trichoptera		
caddis		
Hydrobiosis chalcodes	none	local in streeams
Hydrobiosis johnsi	none	rare in streams
Hydrobiosis torrentis	Type Locality - none	common in streams
Psilochorema cheirodes	none	common in streams
Zelolesica meizon	none	local in snowbank streams
Tiphobiosis childi	none	local in snowbank streams
Tiphobiosis cataractae	none	local in waterfalls
Periwinkla childi	none	local in snowbank streams
Philorheithrus lacustris	none	local in streams
Mecoptera		
scorpionfly		
Microchorista philpotti	none	common in tarns
Coleoptera		
Mecodema n.sp.	none	widespread in grassland
Lepidoptera		
Orocrambus crenaeus	none	widespread in tall grassland
Orocrambus heliotes	none	local in wetland
Orocrambus scoparioides	none	common in wetland
Eudonia xysmatias	Type Locality - none	common in wetland
Eudonia deltophora	none	grassland
Gelophaula tributaria	Type Locality - none	herbfield
Heloxycanus patricki	none	wetland
Aoraia macropis	Type Locality - none	wetland
Aoraia senex	Type Locality - none	herbfield and grassland
Aoraia rufivena	none	tall grassland
Aponotoreas insignis	none	tall grassland
Asaphodes cinnabari	none	wetland
Arctesthes siris	Type Locality - none	wetland
Dasyuris leucobathra	none	grassland
Notoreas chioneres	Type Locality - none	herbfield
Notoreas paradelpha	none	herbfield
Notoreas galaxias	Type Locality - none	herbfield
Xanthorhoe orophylla	none	herbfield and grasslands
Ichneutica ceraunias	none	tall grasslands
Ichneutica nervosa	none	wetlands
Graphania nullifera	none	grassland
Argyrophenga janitae	none	tall grassland

Montane shrubland and short tussock grassland zone

Lepidoptera		
Orocrambus tritonellus	none	grassland
Orocrambus corruptus	none	grassland
Scoriodyta suttonensis	none	tors
Harmologa petrias	none	shrubland
Harmologa new species	none	shrubland
Maoritenes new species	yes	shrubland
Izatha new species	none	tors
Hierodoris frigida	none	shrubland
Tingena maranta	none	grassland
Graphania phricias	none	shrubland
Graphania lithias	none	shrubland
Graphania homoscia	none	shrubland
Aletia sistens	none	grassland
Bityla sericea	yes	shrubland
Meterana exquisita	yes	shrubland
Meterana coeleno	none	shrubland
Arctesthes catapyrrha	none	grassland
Asaphodes prasinias	none	grassland
Pasiphila sandycias	none	shrubland
Pseudocoremia indistincta	none	shrubland
Pseudocoremia colpogramma	none	shrubland
Pasiphila new species	none	shrubland
Asaphodes chlamydota	none	shrubland
Dichromodes ida	none	tors
Dichromodes simulans	none	tors
Lycaena boldenarum	none	grassland
Lycaena salustius	none	shrubland
Zizina oxleyi	none	grassland
Argyrophenga antipodum	none	grassland
Hemiptera		
cicada		
Kikihia angusta	none	grassland
Plecoptera		
Zelandobius uniramus	none	common in streams
Zelandoperla decorata	none	common in streams
Trichoptera		
Hudsonema aliena	none	common around pools

4.5.3 - History of monitoring on the Old Man Range – Alan Mark

Ecological research on Obelisk Station and nearby areas on the Old Man Range
by Alan F. Mark, Botany Department, University of Otago: 1959-2010

As an employee of the Otago Catchment Board and member of their 2-person High-country Research Team, I established 15 climate stations along three altitudinal transects on the Old Man Range, the central one on Obelisk Station Road from 498 m to the range crest, in 1959, to determine the overall pattern on the range and also its relation with the vegetation pattern. Daily fog patterns on the range were also monitored from Alexandra. The early results (Mark 1965a) were published as one of 11 chapters, in the N.Z. Geographic Society's special publication, "Central Otago", together with others, particularly on landscapes and soils, which used the Old Man Range as a 'typical range' of the region. Four years of monthly recordings were published later (Mark, 1974) and confirmed the general pattern of strong altitudinal gradients of moisture and temperature and a lesser moisture gradient along north-eastern face the range, as well as frequent fog on the upper slopes. The engineers of the Catchment Board expressed some concern with the rain-snow gauge design, particularly at the higher altitudes where snow and frequent high winds were complicating factors. These were constructed from milk cans with a bevelled brass cylinder of standard dimension, but no funnel (to allow snow to be caught), mounted with the orifice 60 cm above ground level, with a measured quantity of saturated Calcium chloride added over the winter months as an anti-freeze. The engineers established three additional 'stand-pipe' gauges at the site, two at ca 5 m height (one with an Alto wind-shield attached to reduce wind speed) and the third at ca 4 m height. Painted in red, yellow and black 1 ft sections and fitted with a tap at the base, these gauges are still present at the 1590 m site. However no anti-freeze was ever used so no measurements were ever made during winter and no results have ever been published for these gauges. The engineers also erected similarly painted wooden poles (10 x 10 cm x ca 4 m tall) around the Fraser catchment, including the upper slope of Obelisk Station near the access 4WD track, for periodic measurements of snow depth with periodic aerial surveys but, after the initial, very turbulent flight, no more wer attempted. Many of these poles remain.

An experimental snowfence was built in 1960 for the Catchment Board on the upper western slope of the range about 500m SSW of Obelisk, to assess its ability to trap and hold snow within the Fraser Basin, to be available for hydro-electric generation and irrigation in the lower catchment. Although the snowfence was successful (Smith, et al., 1995) no more were built and the eventual development of a snowbank plant community has been followed up to the present and an interpretation panel was erected there in 1999.

I continued to monitor the climate stations on Obelisk Station as part of a comprehensive ecological study of upland snow tussock grassland for the Hellaby Indigenous Grasslands Research Trust from 1960. This involved detailed studies at three sites on the Station, at 910, 1220 and 1590 m along Symes Road where 20 x 20 m wire-netting exclosures were erected in 1960. These were used in conjunction with two on Maungatua and three on Coronet Peak to measure growth rates in relation to several environmental factors (Mark 1965b), as well as flowering and seeding patterns (Mark 1965c), genetic variation between the altitudinal populations of snow tussock (Mark 1965d) and the effects of the management practices of burning combined with grazing, mostly at the 1220 m site (Mark, 1965e). These initial publications were followed by two others based on long-term monitoring of growth, flowering and nutrient responses to burning, initiated at the 1220 m site and later involving some of my students and colleagues (Payton & Mark 1979; Payton et al. 1986). The two upper exclosures (1220 m and 1590 m) had cyclone deer fencing erected around them in 2004 by the lessees without consultation and for no obvious purpose and with considerable impact caused by the vehicle used to drive the large wooden posts.. The upper fence induced unnatural accumulation of snow within the exclosure which I discussed with Mr Bert Elstob (co-lessee) and he agreed to reduce it to the height of the existing netting fence and I suggested I would be interested in placing an interpretive sign at this site. He expressed an interest in this suggestion. However, I eventually got his permission to do this myself though the posts still remain. When Mr Alister

Campbell became the new lessee I discussed the interpretive sign with him and one was prepared and established in 2009.

Upgrading and some realignment of Symes road as far as the Obelisk in 1974, associated with the construction of the TV tower for the N.Z. Broadcasting Corporation at Obelisk resulted in some serious damage to the high-alpine cushionfield vegetation on both Obelisk and Earnscleugh Stations which resulted in the Otago Catchment Board (of which I was an elected member at the time) issuing an injunction on the contractor. Harliwich Ltd of Roxburgh. A $10,000 payment from BCNZ was used to plant in 800 narrow-leaved snow tussocks from 1250 m on Symes Road to a 20 x 40 m roadside plot about 500 m south of Obelisk and also establish ten line transects across representative disturbed sites and adjacent undamaged cushionfield, three on Obelisk Station and the remainder on Earnscleugh Station (now Kopuwai Conservation Area (see Fig. 1). The transects were monitored in 1975, 1976, 1977, 1978, 1986, 1990, 1999 (see Brown, et al., 2006), and most recently in 2009 (unpublished). An interpretation panel was erected alongside this plot in 2008.

Several studies on water yield from the upland snow tussock grasslands on the Rock & Pillar and Lammerlaw-Lammermoor Ranges were integrated into a comprehensive review of upland water yield as a function of the type of ground cover which confirmed the role of a tall natural snow tussock cover in maximising water yield and the importance of assessing trade-offs with alternative types of cover, particularly exotic conifer forest. The climatic information from the Obelisk Station sites were used in this review (see Fig. 2 from Mark & Dickinson 2008; below).

A review paper on the effects of pastoral practices (burning and grazing) on the sustainable utilisation of upland snow tussock rangelands, requested for an Australian journal (Mark 1994), was based on much of the information from the Obelisk Station sites, including the legal issues which surfaced in relation to the application to burn much of the snow tussock grassland on this part of the property by the Sanders family when they held the lease. I believe the outcome of this legal issue were largely responsible for the inclusion of the discretionary clause on land use impacts in the Crown Pastoral land Act 1998.

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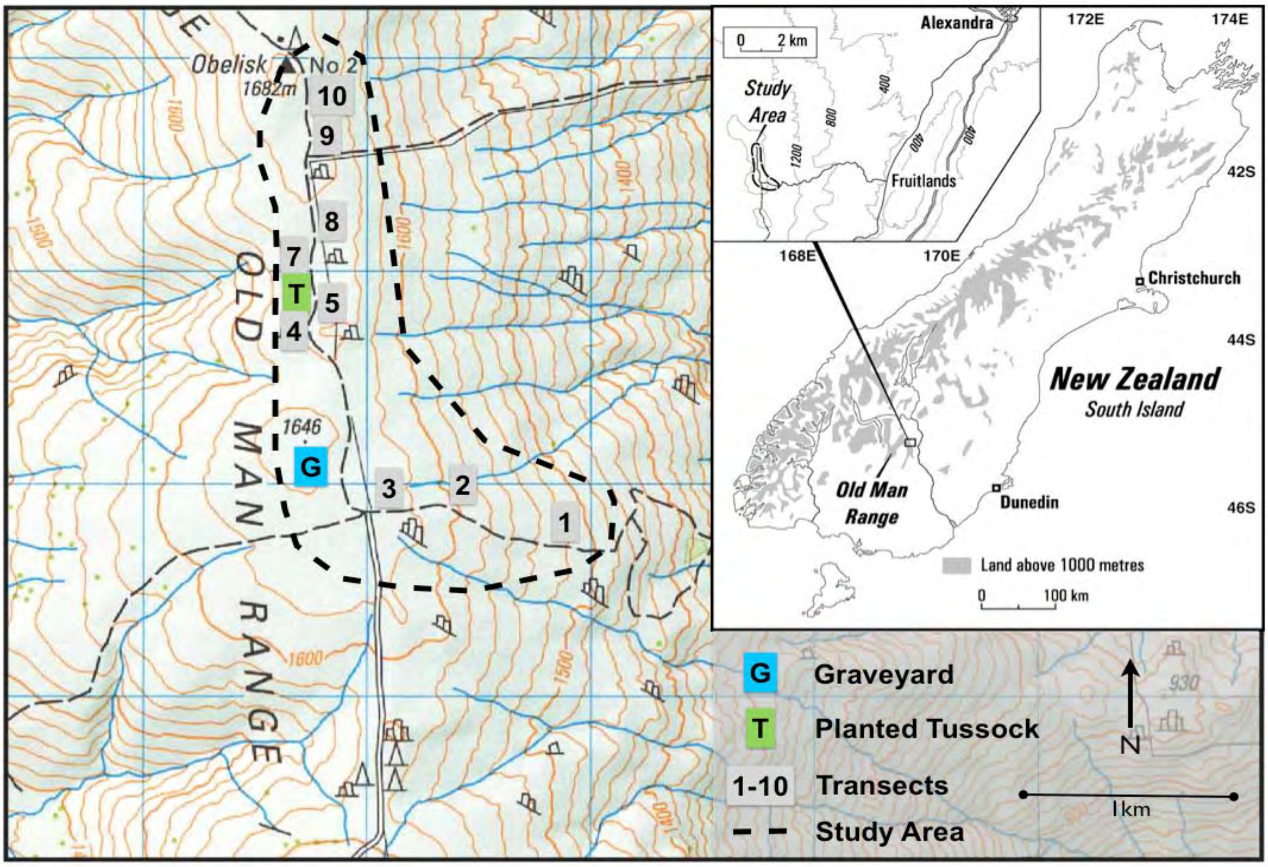
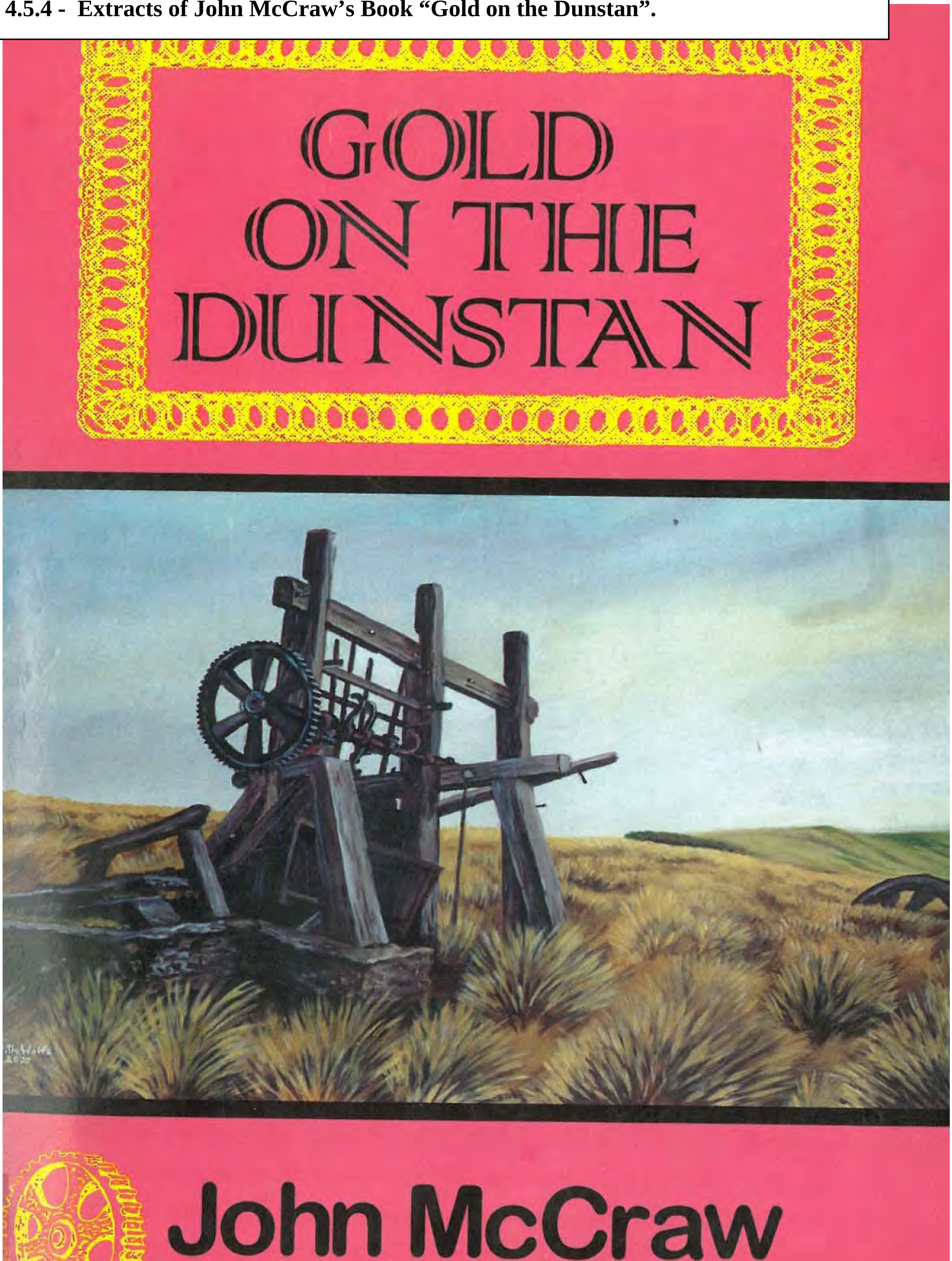


Figure 1. Map showing location of the study site on the Old Man Range, which includes the sheep graveyard (G), the bladed (disturbed) site where tussocks were planted (T), and the 10 paired transects on adjacent disturbed and undisturbed sites. Note, Transects 1-3 are in Obelisk Station. Transect 6 is associated with the transplanted tussocks. The site portion of the map is sourced from NZMS 260, G42. Alexandra. Crown copyright reserved.

Figure 2. Copy of Figure 2 from Mark & Dickinson (2008). *View up the eastern slope of the Old Man Range (1650 m), Central Otago, from 750 m on the lower slopes, showing mixed fescue-snow tussock montane grassland (foreground) which gives way to pure snow tussock subalpine grassland above about 900 m. Snow-lie areas in the high-alpine zone on the upper slopes above about 1300 m, have remnant slim snow tussock, blue tussock, herbfield and cushionfield. Values for annual precipitation and mean annual air temperature are shown for this altitudinal sequence (right), with those for the town of Alexandra (150 m) on the valley floor (bottom values) indicate the importance of the upper slopes for water yield.*

4.5.4 - Extracts of John McCraw's Book "Gold on the Dunstan".



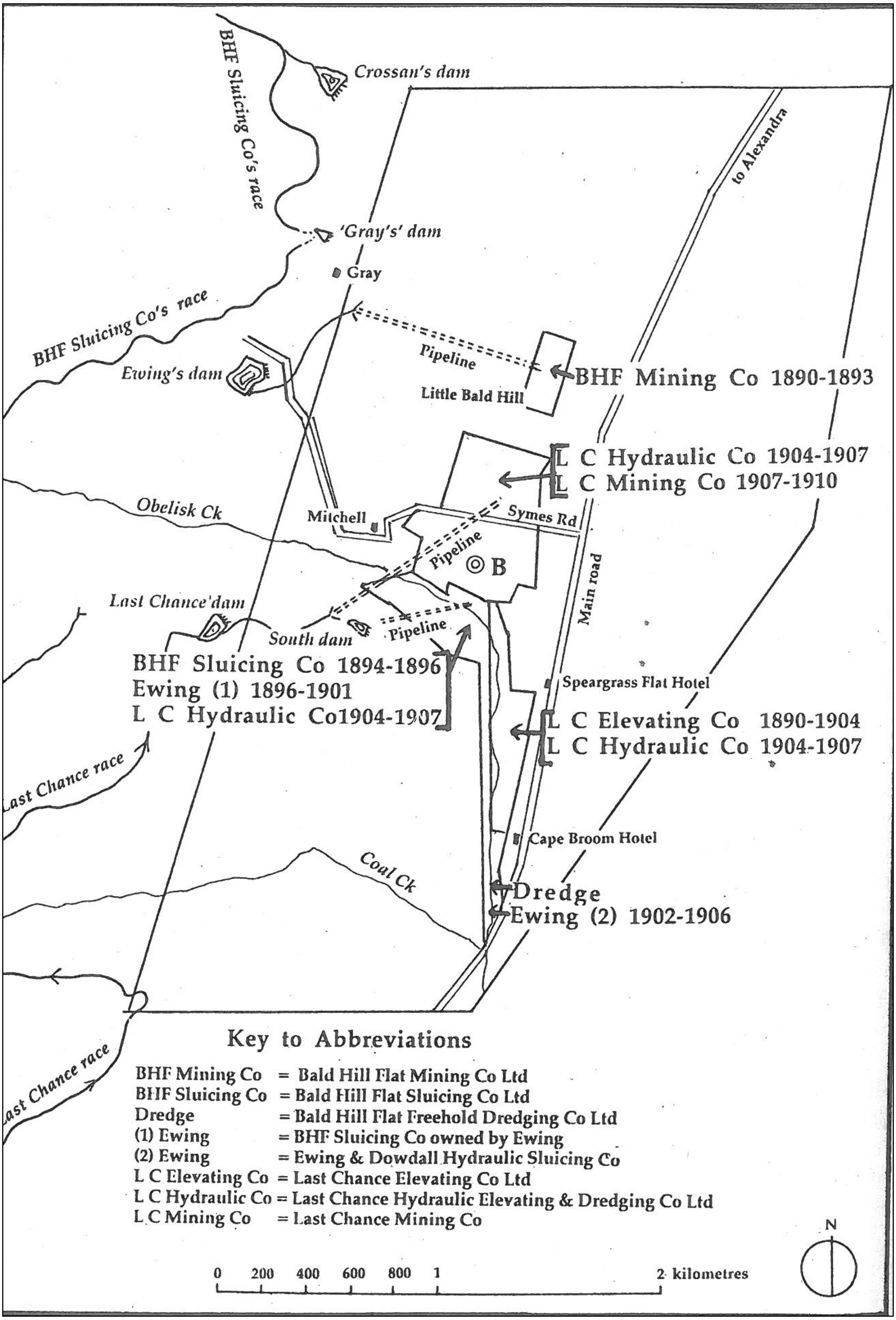

Crossan's dam
BHF Sluicing Co's race
to Alexandra
'Gray's' dam
Gray
BHF Sluicing Co's race
Pipeline
Ewing's dam
BHF Mining Co 1890-1893
Little Bald Hill
L C Hydraulic Co 1904-1907
L C Mining Co 1907-1910
Obelisk Ck
Mitchell
Symes Rd
Pipeline
B
Main road
Last Chance'dam
South dam
Pipeline
BHF Sluicing Co 1894-1896
Ewing (1) 1896-1901
L C Hydraulic Co1904-1907
Speargrass Flat Hotel
L C Elevating Co 1890-1904
L C Hydraulic Co 1904-1907
Last Chance race
Cape Broom Hotel
Coal Ck
Dredge
Ewing (2) 1902-1906
Last Chance race
Key to Abbreviations
BHF Mining Co = Bald Hill Flat Mining Co Ltd
BHF Sluicing Co = Bald Hill Flat Sluicing Co Ltd
Dredge = Bald Hill Flat Freehold Dredging Co Ltd
(1) Ewing = BHF Sluicing Co owned by Ewing
(2) Ewing = Ewing & Dowdall Hydraulic Sluicing Co
L C Elevating Co = Last Chance Elevating Co Ltd
L C Hydraulic Co = Last Chance Hydraulic Elevating & Dredging Co Ltd
L C Mining Co = Last Chance Mining Co
N
0 200 400 600 800 1 2 kilometres

Figure 4.5: The claims of the companies which worked on Bald Hill Flat. The water races, dams and pipelines are shown where they can be identified.

6.

GOLD IN THE ROCK

Quartz Mining

There was something about a gold-bearing quartz reef* that set it apart from other sources of gold in the minds of the public and investors. Perhaps it was the reports of huge amounts of gold won from the famous quartz mines of California, Australia and South Africa. Perhaps it was the perceived permanence of quartz mining as compared with the more ephemeral alluvial mining. Or perhaps it was just the romantic thoughts of dark tunnels with gold shining from the wet rock surfaces. Whatever the attraction, miners were always on the lookout for signs of a reef, especially in the headwaters of the gold-rich streams falling from the eastern slopes of the Old Man Range. It was believed that somewhere up there lay the 'mother lode' — the mythical rich lode that was supposed to be the source of the gold in the streams. So when something that looked like a reef was found, there were plenty who were ready to peg it out, form a syndicate, and begin sinking a shaft, often on only the slimmest evidence of the presence of gold.

Reef mining was not for the individual. Sinking shafts down through rock required explosives, winches, pumps and other expensive equipment. If the initial exploratory shaft showed that the gold continued at depth and the mine was worth developing, then a stamper-battery* to crush the gold-bearing quartz would have to be obtained. A water wheel to drive the stamper was needed, and this in turn required water races with a plentiful supply of water. Then there was the equipment needed to save the gold by amalgamating it with mercury, and then to recover the gold from the amalgam.

The Alexandra district was envious of places such as Skippers Creek, Carrick Ranges and Bendigo in the Upper Clutha valley where fabulously rich lodes* had been discovered. So it is hardly surprising that the reported finding of a reef in the local district, no matter how vague the information, was always given prominence in the newspapers. Each discovery reinforced the popular prediction that the Old Man Range was packed full of gold-bearing reefs just waiting to be discovered, and miners were constantly extolled to renew their efforts to locate them.

In fact, as more and more reefs, or what were thought to be reefs, were discovered along the foothills of the Old Man Range, it began to look as if the predictions were correct. Reefs were reported from the vicinity of Butchers Gully, from Conroys Gully, Blackmans Gully, the head of Aldinga Creek, and even from the other side of the range at Campbells

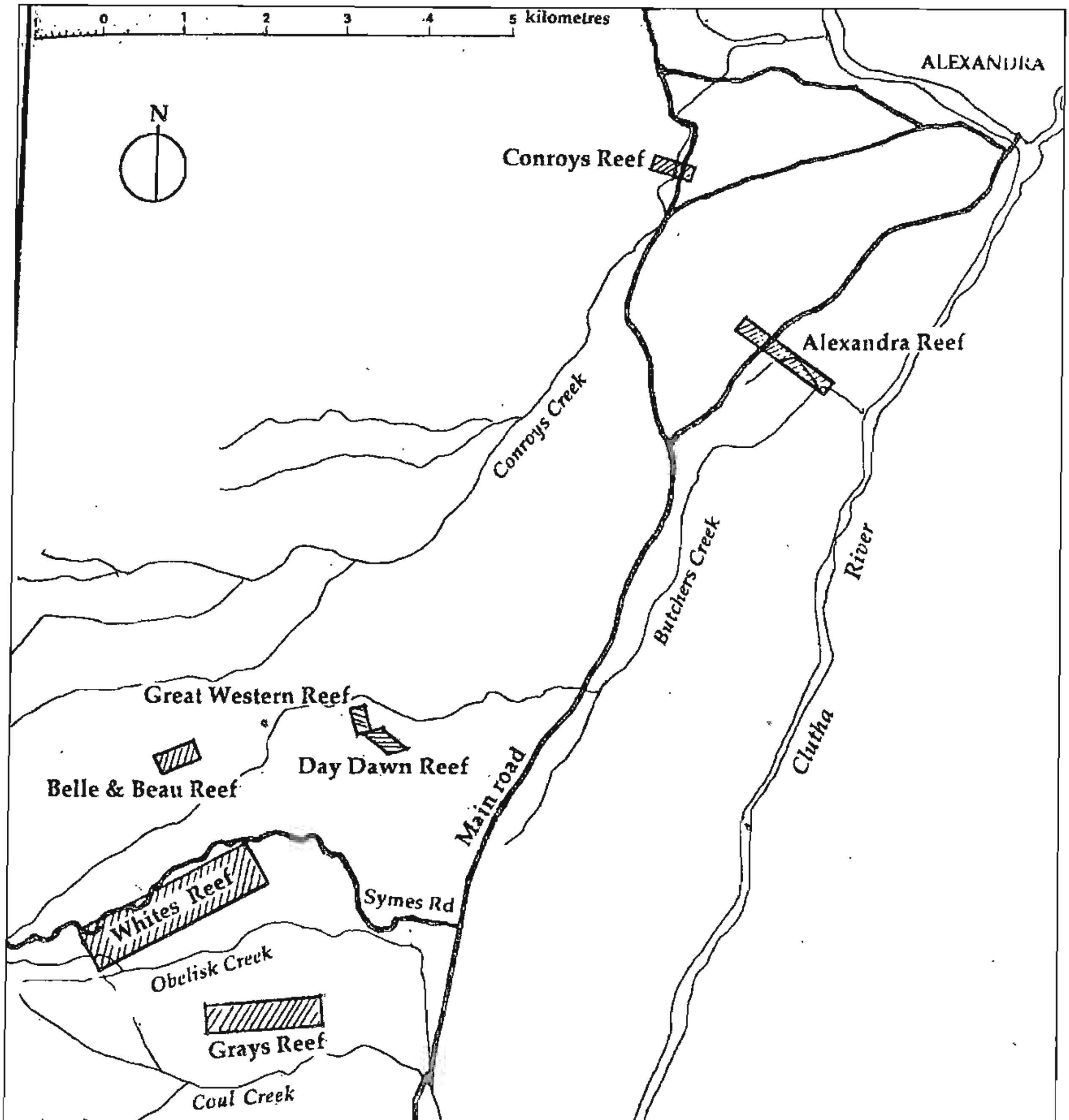


Figure 6.1: Location of reefs in the Alexandra district.

BUTCHERS GULLY REEFS

It seems that the quartz reef Charles Goltz found on the ridge between Chapmans and Butchers Creeks[1] in March 1866 was the first to be discovered in the district. As was often the case, the reef was reported to be 3 feet wide and rich in gold. Further investigation disclosed that the gold was confined to a few narrow inch-wide 'stringers,' and much effort was expended in searching for the supposed 'main reef.'

Edmund Jones, a local mining entrepreneur, financed the sinking of a shaft to a depth of 50 feet (16 m), but soon after it was completed Goltz fell to the bottom and was permanently crippled. Shortly afterwards Jones died and the mine was abandoned.

William Jack and Ed Halliday, calling themselves the Alexandra Gold mining Company, pumped out the shaft, and starting in October 1869 with eight employed men, soon had enough ore at the surface to justify crushing. The very satisfactory return of 2 oz 6 dwt for 1.5 tons of 'stone,'[2] brought about a rush during which nine different parties pegged out claims along the line of the reef. Then there was silence.

This became the common story of the Butchers Gully reefs. Over the next 30 years several other reefs were discovered along the banks of Butchers Creek, and a few were opened up. Someone would find a likely looking seam and would collect a piece of schist rock with gold visible to the naked eye. A claim would be pegged out, a shaft sunk, and that would be the last that was heard of the strike. So it was with the Alexandra reef in the late 1860s and early 1870s, and with the nearby Great Western, the Belle and Beau and the Day Dawn reefs, collectively referred to as the Butchers Gully Reefs.

There are always slow learners when it comes to gold reefs. As late as 1907 a party was giving the Day Dawn reef 'another trial,' and another party in 1910 was using an oil engine to pump out the old shaft of the Alexandra Reef. The results were as before.

OLD MAN RANGE

High up on the slopes of the Old Man Range behind Bald Hill Flat, two prospectors, James White and Andrew Mitchell, found gold in a deposit of soft brown, rubbly schist full of quartz fragments. They applied for a Prospecting Claim in November 1876 and began ground-sluicing the loose debris. By August 1880 they had sluiced a chasm 250 yards (80 m) long and run 500 tons of reef material through their gold-saving sluices. At a depth of 36 feet (11 m), they reached the bottom of the deposit and exposed schist bedrock, but to their surprise they found that the gold-bearing rubble continued down into the rock as a seam about 10 feet (3 m) wide. The two partners had reputedly won £8,000 worth of gold from the reef debris, but George Lythgoe on a claim further down the slope, boasted of having extracted 30 shilling's worth of gold a day from Mitchell and White's tailings.

Professor Park examined the seam several years later[10] and described it as a 'mullock-lode' formed from schist crushed by the movement of a minor fault running in an east to west direction. The southern side of the lode was a near- vertical wall of hard schist that marked the fault. To the

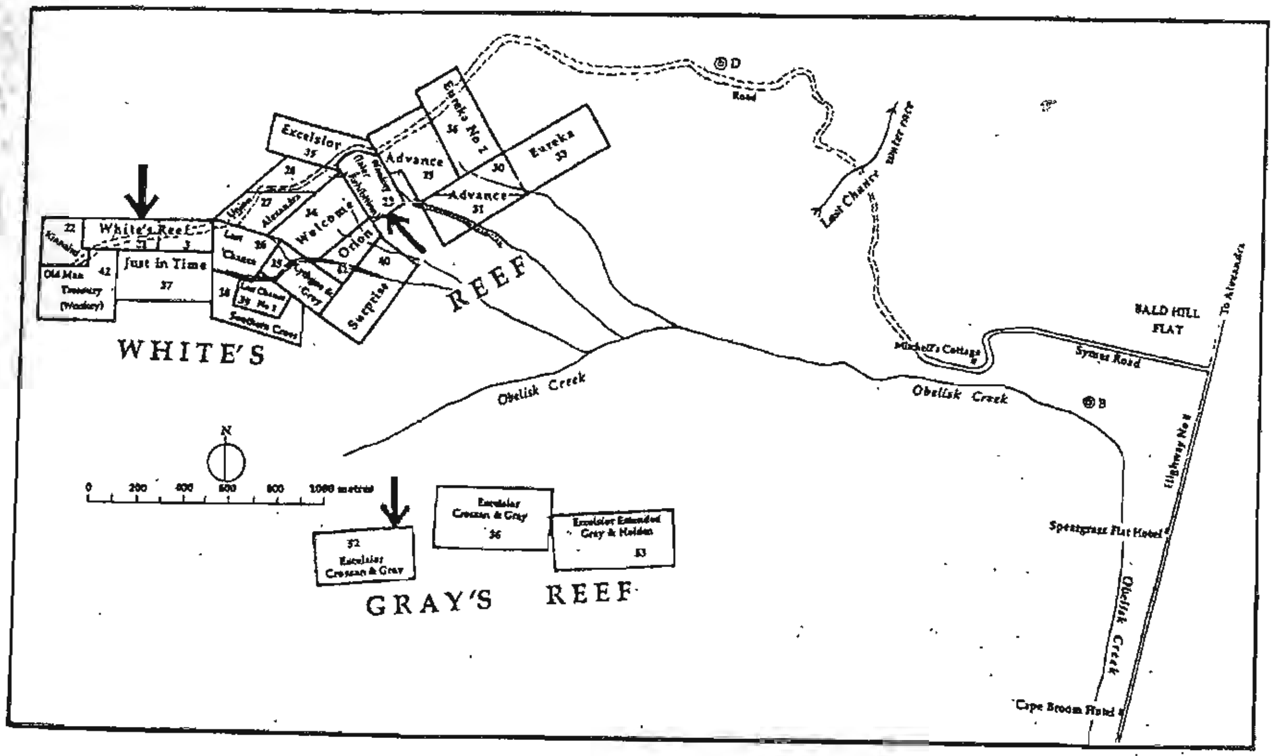


Figure 6.5. Location of claims on the Old Man Range registered during the rush of 1883-84. Arrows point to claims which produced payable quantities of gold.

north the brown, crushed and weathered schist, which could be remov by pick without using explosives, gradually passed into unaltered schis Park found that the seam of mullock* ranged in width from a few inche up to more than 3 feet. It contained loose gold, which was more plentif near the surface.

The Rush

The public announcement of White and Mitchell's discovery led to a frenzy of activity during the spring and summer of 1883-84, when no fewer than 20 applications were made for claims.Ü

The competition between parties to get their hands on desirable ground is illustrated by a story related in the newspaper. A party of men from Clyde pegged out a likely claim near White's reef on a Saturday and later in the day another party, already camped on the range, pegged out a portion of the same area. Who would be awarded the claim depended on who was first able to lodge an application at the Warden's Office in Clyde, and then fasten a copy of the application to a peg on the claim.

The local party assumed, correctly, that because the Clyde party lived next door to the Warden's office, they would think that they had plenty of time to put in their application. So the locals made sure that they were on the Warden's doorstep when his office opened on Monday morning.

When the Clyde party got around to making their application they found they had been forestalled. They still had a chance. One jumped on his horse and set off in pursuit of the leader of the local party who was still making his way back to the Old Man Range with his application in his firm grasp. At last he was overtaken and the two men discussed the matter while riding neck and neck. Finally the leader of the local group turned off into the gateway of a friendly farmer as if giving up, only to reappear a few minutes later on a fresh horse. He passed his competitor easily and shortly afterwards fastened the all-important application to a peg on the disputed claim.[11]

As a result of all this activity, it became clear that there were a number of patches of this mullock on the eastern face of the Old Man Range. The greatest concentration was a cluster at an elevation of 1,000 metres on the ridge between Obelisk and Butchers Creeks. The relationship between them is unclear. It has never been properly established whether they were entirely separate entities, or were part of a single structure broken up by earth movements.

Some claims were selected because the presence of rubbly schist on the surface indicated that there might be a buried reef, but a number were taken up simply because the ground was near White's original discovery.

Ü The claims pegged out are listed in an Appendix at the end of the chapter.

Some of these claim-holders had little intention of mining. They were simply waiting in the hope that success in nearby claims would enhance the value of their own properties so they could be sold at a large profit. Others proceeded to sink shafts or commence drives, but it was soon evident that in most claims there was no reef, or if there were, the gold content was far below expectations, or the reef simply 'pinched out.'

There were two great difficulties in mining these reefs. The first was that the reefs were not continuous but were broken up, the result probably of dislocation by landslides. The second difficulty was that the gold was not distributed evenly throughout the mullock but tended to be in patches or 'bunches,' as they were called. Some of these bunches were very rich but were often separated for considerable distances by barren material.

In the end only three claims produced gold in any quantity.

WHITE'S REEF

Shortly after James White and Andrew Mitchell discovered the reef under their claim, White bought Mitchell out for £500, perhaps as a result of a disagreement over the best way to proceed. Mitchell went off and formed a partnership with George Wilkinson in his alluvial claim in Obelisk Creek.

White then made the decision to form a public company to work the mine. A prospectus was published in late 1883[12] and White's Reef Gold-Mining Company Ltd was registered on 13 November. White received 3,000 fully paid up £1 shares for his mine and the remaining 7,000 shares were quickly taken up. Of the 61 shareholders, more than half

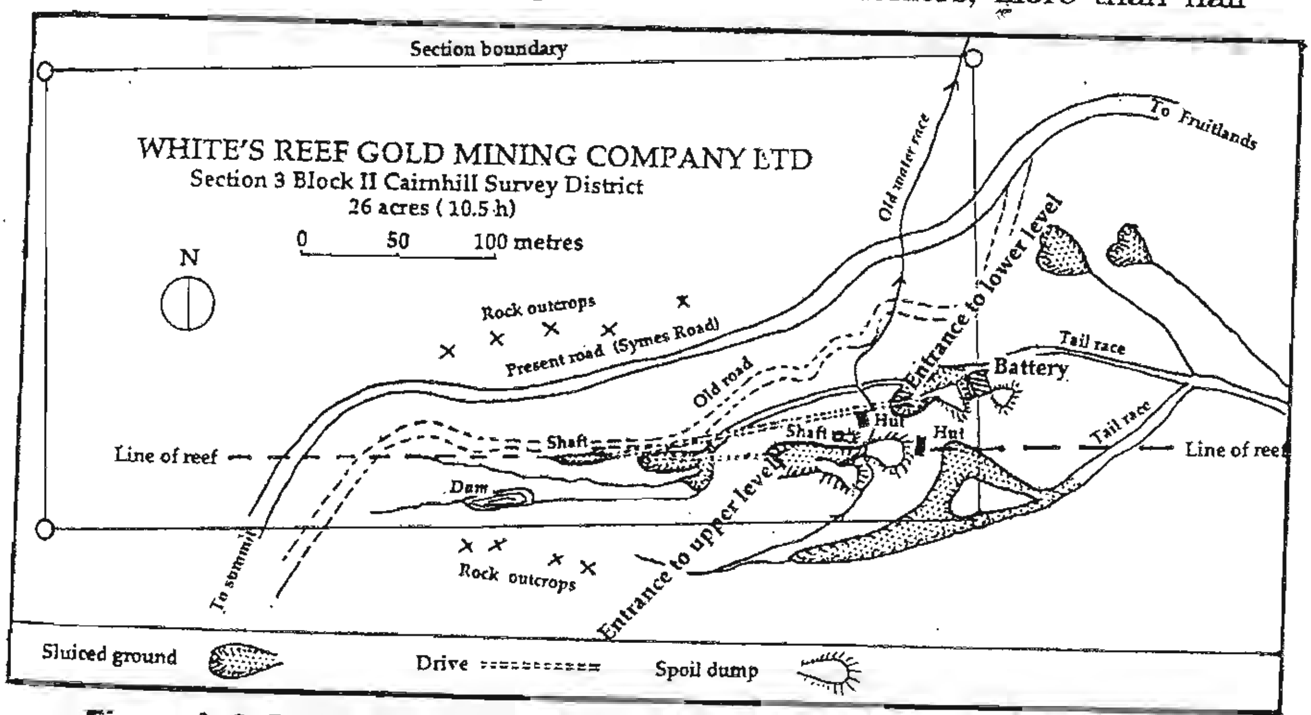


Figure 6. 6. Plan of White's reef drawn from air photographs, field sketches and descriptions.

were from Alexandra or Bald Hill Flat but the directors were mainly Dunedin businessmen. J. B. Neal was appointed manager.

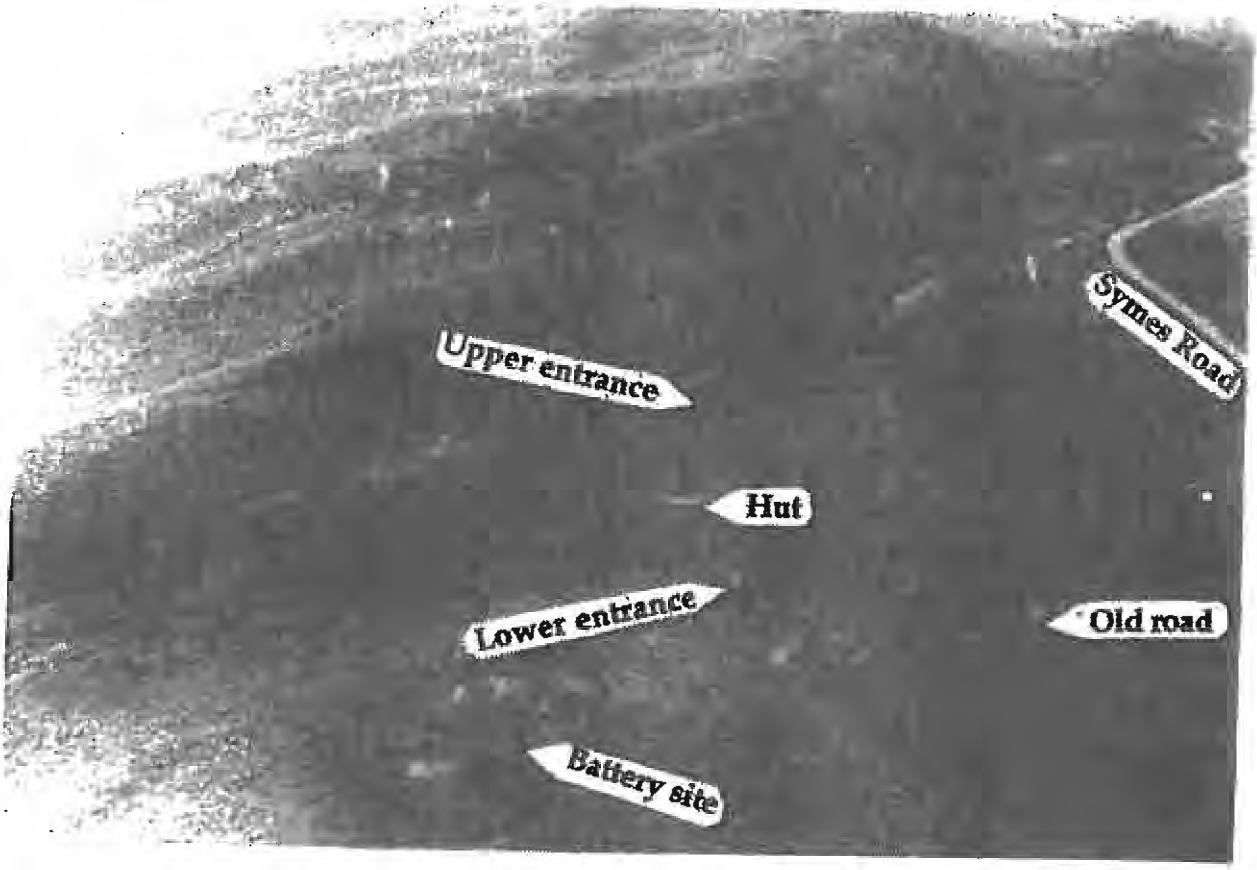


Figure 6. 7. White's reef workings from the air.

A blunder was made at the very beginning. The position selected for the adit was at too shallow a depth so that there was only a small amount of gold-bearing material between the drive and the surface. Even though he had received instructions from Dunedin as to where exactly to place the adit, Neal, the manager, was blamed for the mistake and sent on his way. Thomas Andrew, of the neighbouring Advance Company, was the next manager and a man with a gift for writing optimistic reports. He asked repeatedly for a stamper-battery to crush the ore but the directors refused to consider one until 500 tons of ore were 'at grass.' It was not long before just such a quantity had been accumulated at the mouth of the tunnel and the directors were reminded of the battery deal.

The 5-head stamper battery from the Lucknow mine at Bendigo in the Upper Clutha Valley was bought and erected by February 1886. It was to be driven by a Whitelaw water turbine fed by water races from Obelisk and Butchers Creeks, but they proved inadequate and the battery could only operate for about six hours each day — if it did operate at all.

Shareholders were greatly looking forward to the results of crushing the stockpile,as they had been led to believe that it contained large quantities of gold that would clear all debts and pay a handsome dividend. So it was particularly frustrating when the battery suffered one breakage after another. There was at least one holdup every week until the middle of the year. And after all this the results of the crushing were very poor. It seemed that the 500 tons of so-called 'ore' contained a great deal of stone that was short on gold.

It was reported after this crushing that Mr Andrews was encouraged to seek fresh fields where there were no batteries, and most of the men were sent with him. A temporary manager, J. Mitchell, succeeded in finding some rich ore, but after a difference of opinion with the directors he resigned after a few months. As the newspaper remarked, 'Management from a distance does not work.' Taking advantage of Mitchell's find, the next manager, J. Bennett of Conroys Gully, appointed in early 1887, managed an excellent return of 580 oz of gold from 600 tons of ore. It cleared all debt and the company was even able to pay a small dividend. Then in late 1886, two men who were to greatly influence the future of the company were appointed to the staff, the brothers Robert and Henry Symes.

For the next four years the White's Reef Company prospered. Employing 20 men and boys the mine was producing gold at the rate of 1,000 oz each year. Ore was averaging 1 1/2 oz of gold per ton and the mine was paying dividends. Shares on which 10 shillings had been paid up and which previously could not be given away were selling at 12 shillings. It was during this period that White's reef gained its reputation as one of Otago's foremost gold mines. There were very few other quartz reef mines that were consistently returning over one ounce to the ton of stone crushed. Nevertheless dividends were small.

Professor Park examined the mine in November 1888 and wrote a scathing report.[13] At this stage the main drive was 740 feet (225 m) long with three vertical ventilation shafts spaced along its length. Because of the shortage of material overhead, the company was forced to mine from below the floor of the drive — a most difficult task as material had to be hoisted up a 40 foot (12 m) shaft, and because of lack of drainage, miners had to work in very wet conditions. Park listed the main reasons for the poor returns to shareholders as the short working year owing to closing the mine during the winter, and the heavy maintenance of the long drive[14] which was a serious drain on the resources of the company. To these he added the narrowness of the lode, and the shattered and dangerous nature of the country which required the use of much heavy, high-priced timber.

At the beginning of 1889, Robert Symes was appointed manager in place of Bennett, who had resigned through ill health. Then suddenly the gold ran out.

The directors ordered the men's wages reduced from 10 shillings a day to 8 shillings, so they went on strike. There were plenty of others to take

Figure 6. 8 This sluiced gully is probably the site where White and Mitchell discovered White's reef. The rock wall on the left side is a fault scarp. Schist debris in the foreground is from a shaft.

their places but the newcomers also demanded 10 shillings a day and got it.

It was decided by the directors to extend the drive a further 200 feet (60 m) at a cost of £250, in the hope of finding gold again. Hopes were raised when a rich patch was encountered, but it was only a pocket yielding £95 worth of gold. Manager Symes advised against spending any more money, so all hands were discharged, and as the losses already amounted to £2,500, the mine closed in September 1890. The following month, the mine and other assets were sold by auction amid questions asked by shareholders about the legality of the sale, as they had not been consulted by the directors beforehand.[15] Robert and Henry Symes bought the mine and with it a five-stamp battery and other machinery, mining tools, buildings and water rights, all for £250.

Symes' Mine.

The Symes brothers set about remedying many of the deficiencies in management that had plagued this mine, rich in gold but poor in dividends. New gold-saving machinery, a more efficient turbine, timber obtained from Waikaia Bush at half the price of that from Tapanui, and a system of re-using mine timber that was a great financial saving, were some of the improvements. Robert Symes was mine manager and brother

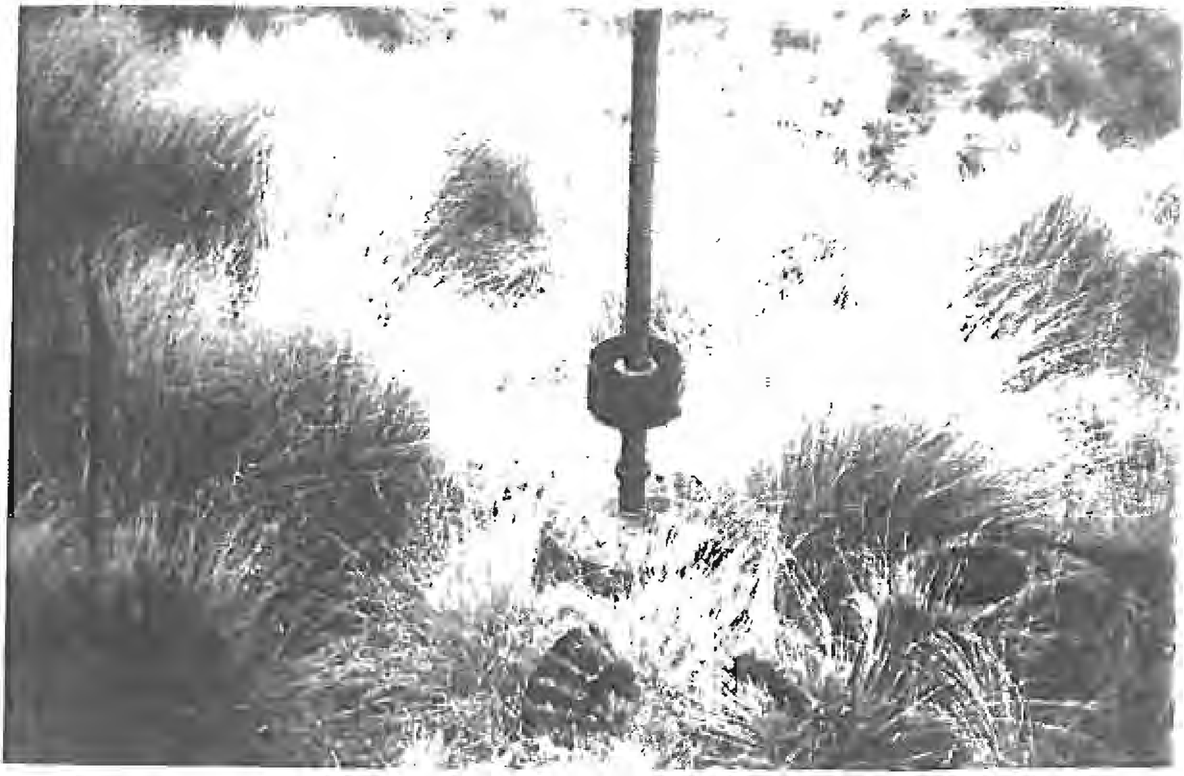


Figure 6. 9. Symes' battery at White's reef.
Upper: Battery site. The vertical shaft (centre) is the Whitelaw turbine. The Excelsior reef is on the ridge in the background.
Lower: The Whitelaw turbine runner (centre) and its base (right).

Henry managed the stamper-battery which included the gold-saving devices.

They were not able at this stage to open up new ground to search for the missing reef, so concentrated on cutting out pockets of good ore that had been overlooked. In this way they recovered £1,000 worth of gold over the next 12 months. To strengthen the partnership financially, they sold one third of their holdings to Thomas Andrew of Tasmania, the former manager, for £280.

In 1893 Symes was able to sink a shaft about 250 feet (80 m) ahead of the old workings and was fortunate to strike the reef again at a depth of 30 feet (9 m). The original drive was then extended to cut this shaft, so ore could be run out to the battery. This year 130 tons of ore yielded 119 oz of gold.

It was unfortunate that in 1896 a workman, C. E. Jones, was killed while stripping surface material by sluicing. He was working alone and details are scarce but it is assumed that he was struck by falling debris.

Meanwhile the reef continued to be worked by sinking shafts and then driving between them. In 1897, perhaps the last good year, 200 tons of stone were crushed to give 270 oz of gold.

The closeness of the main drive to the surface, which forced Symes to extract ore from deep below the floor, was a great disadvantage to the working of the mine.

Finally a decision was made to excavate a small, prospecting drive from about 130 feet (40 m) further down the hill. In anticipation of the arrival of much gold-bearing stone, the stamper-battery was, in 1898, shifted down to the proposed mouth of the new tunnel. The extra fall also increased the power from the turbine. In 1899 six men began work on the new adit.

This new drive had to pass through a considerable distance of solid 'dead' rock before the lode could be reached, but by 1901 it had been driven 400 feet (120 m) and had reached the reef. It was then continued

Figure 6. 10. Robert Symes.

along the lode, and a year later was in 650 feet (200 m) but still no substantial body of gold-bearing stone had been encountered. There was a delay while a necessary ventilation shaft was cut up to the original drive 70 feet above but by 1903 the new drive was in 750 feet (230 m). However, payable gold was sparse. Symes kept coming across small 'stringers' of gold-bearing quartz that had the effect of leading him on and encouraging him to continue with this hard, time-consuming and dangerous work.

Symes finally abandoned underground working at White's reef in 1906. But this did not mean that he had finished with the mine. He went back to ground sluicing, working his way along White's reef, and then began work on the Advance claim half a mile (720 m) east of White's reef. It was not long before he unearthed a patch of good stone in a corner of this claim and could not resist the temptation to put in a short drive. He bought the small battery from Gray's claim, which had closed down, and set it up in a gully on the Advance claim.

For the next 20 years, with two employed men, Symes continued sluicing wherever he thought there might be gold bearing ore, saving any he uncovered for crushing in his little stamper battery. He finally gave up mining in 1927.

White's Reef today

The most conspicuous feature of the workings at White's Reef today is a well-constructed stone hut that stands about 100 metres to the south of Symes Road. The present corrugated iron roof was put on by the newly formed Vincent Ski Club during the 1950s. Uphill from the hut are two deep, narrow gashes in the hillside. The upper one, about 150 metres above the hut, may well have been the site where White and Mitchell first discovered gold. It appears to have been formed by sluicing only, as the absence of any spoil dumps indicates that there was no drive from this chasm. The lower excavation, closer to the hut, does have spoil dumps associated with it, and was almost certainly the site of the White's Reef Gold Mining Company's drive. The original site of the stamper-battery was close by.

In the gully which lies between the hut and Symes Road and less than 100 metres down the hill from the hut, is a sluiced excavation and a spoil heap which mark the site of the entrance to the lower level drive. Just below the spoil heap is a flattened platform which marks the site of Symes' main battery. Lying about are the remains of machinery, including the runner of a Whitelaw turbine.

On all sides of the workings, sluiced excavations mark places where prospectors, including perhaps Robert Symes in his later years, attempted to find the continuation of known reefs or to discover new ones.

Over 700 metres in a north-easterly direction from White's Reef hut, in another gully, lies debris of mining activity including the remains of a small building which may have housed a Pelton wheel, a sluiced

Figure 6. 11. Remains of two stamper-batteries on the Old Man Range.
Upper: Small structure that probably housed the Pelton wheel which drove Syme's last battery.
Lower: 3-head stamper camshaft and stamper shoes probably from Exhibition battery.

excavation and a small spoil heap. This probably marks the site of Robert Symes' small mine on the Advance claim.

EXHIBITION REEF

In December 1882, William Wookey and James Gavin, encouraged by White's success, began sluicing an outcrop of rubbly schist with loose gold 650 yards (600m) north-east of White's claim. They had the experience of James White to guide them, so they set up a dam to catch their gold-rich quartz tailings. It was known by this time that White had lost much gold in the small fragments of quartz he had discarded. Wookey and Gavin were sufficiently convinced of the value of their ground to apply for a 10-acre lease in July 1883.

The mine underwent a series of changes of ownership as partners bought in and dropped out, but some stability was reached in 1887 under Hugh Crossan and James Gavin. Using the battery at White's Reef, they managed to recover 2 oz of gold from each ton of ore. It was at this time that the claim was named 'Exhibition Reef.' It was at this time also that one of the men, swirling some of the crushed ore from the mine around in his hat, suddenly collapsed. It was surmised that he was overcome from fumes from the arsenopyrite, one of the minerals occurring with the gold.

Crossan went bankrupt in February 1891 and the claim was bought by Dr Hyde and Henry Symes. Finally Henry Symes became the sole owner. A small 3-head stamper, driven by a small wooden water wheel, was erected in September 1893 and found itself busy day and night when a shaft, sunk to 30 feet, came across a very rich patch. In 1895 the mine closed down pending the purchase of the 10-head battery erected 12 years before in the head of the Fraser River by the Alpine Quartz Company. It was never installed in the Exhibition mine, which did not reopen. The claim was abandoned in 1898.

Exhibition Claim today.

About 600 metres north-east of White's reef and about 100 metres up the gully from Symes battery site on the Advance claim, are the remains of a 3-head stamper-battery. A camshaft with its three cams, a few stamper shoes, sheets of iron and some timber are scattered about on low stone walls. A sluiced excavation and a spoil heap indicate that here was once a drive or shaft nearby. This is almost certainly the remains of the Exhibition battery .

EXCELSIOR MINE (Grays Reef)

Hugh Crossan and Frank Gray discovered a reef, which over its short life produced more gold than any other quartz mine in the district. It was on the ridge between Coal Creek and Obelisk Creek about a mile due south of White's Reef, and 200 metres lower in altitude. They applied for the claim in January 1891.

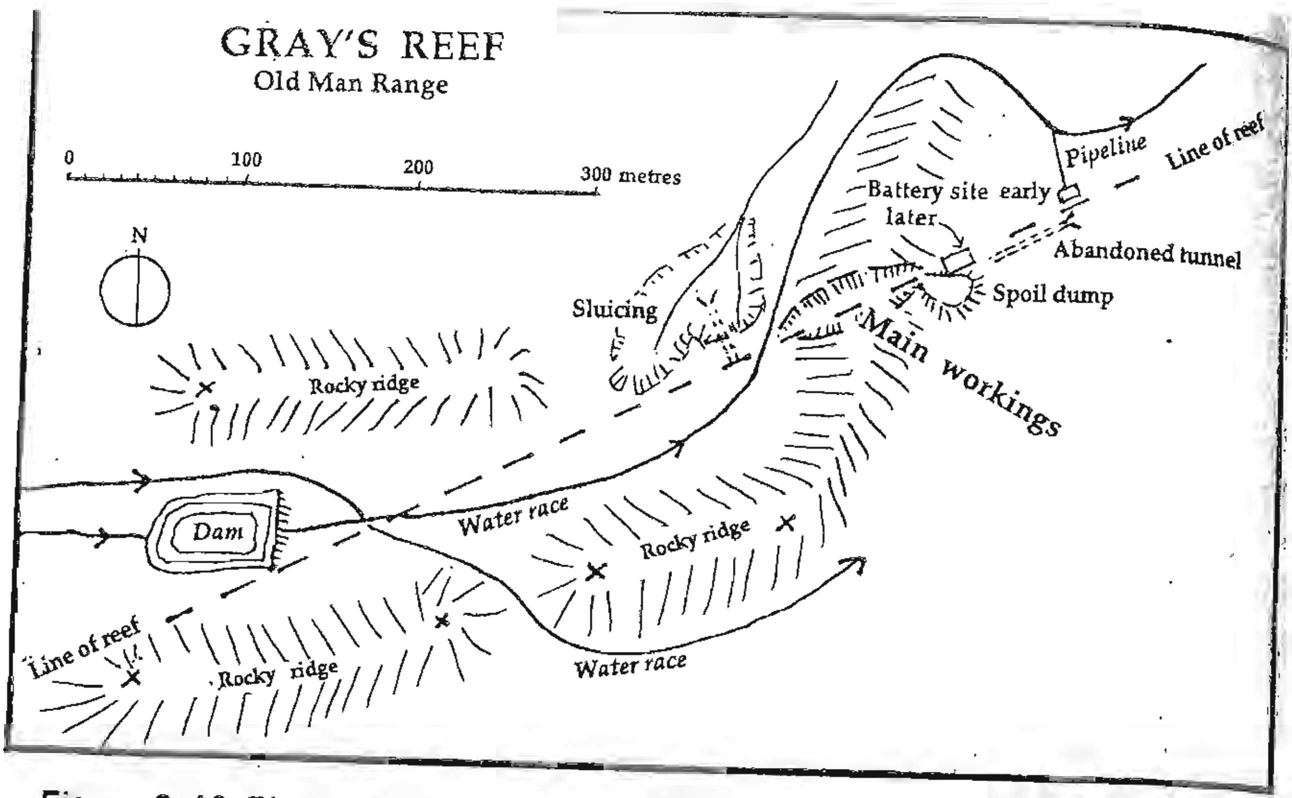


Figure 6. 12. Plan of Excelsior mine drawn from air photographs, field sketches and descriptions.

Using Kemp's water race for sluicing, they exposed, at a depth of 16 feet and over a length of 100 yards (90 m), a lode of friable quartz in soft schist, confined between hard schist walls 3 to 10 feet apart. They sank a shaft 20 feet (6 m) into this lode and began to lift ore by means of a hand windlass. In six months they recovered 766 oz of gold from 315 tons of mullock. Including the 114 oz from the sluicing, this gave a total of 880 oz recovered for the year.

As a result of tests carried out after sinking a shaft 65 feet (20 m) deep, the partners went over to Conroys Gully and brought back the small 3-head stamper battery that had been set up by the Conroys Quartz Mining Company in 1880. Water piped from a water race 100 feet above, produced 3 horsepower from a Pelton wheel about three feet in diameter. This battery could crush up to 3 tons of ore in an 8-hour day.

Now that the gold-bearing quartz from the lode could be crushed, the return of gold increased remarkably. A return of 256 oz from 118 tons of rock crushed (more than 2 oz to the ton) was reported in December 1892, and from mid-October 1892 to mid May 1893, 918 oz of retorted gold worth over £3,700 was obtained. Little wonder this mine was described by an enthusiastic correspondent as 'the most valuable mining property in New Zealand.'[16] Work stopped for the months June, July and August when the water sources were frozen.

The mine in 1893 was still being worked by primitive methods and with a minimum of labour. Shafts up to 40 feet deep were sunk at intervals along the reef with drives connecting them. Only one man worked in the drive breaking out ore which was lifted to the surface by hand windlass. It was then sledded to the battery that Gray had located some distance down the hill from the mine in anticipation of starting a low-level drive. In late 1893 work on this began. The intention was to drive, from the steep slope below the mine near the battery, along the reef at a depth of 100 feet (30 m) below the surface workings. Some 250 feet (75 m) in, however, the ground became unstable, and earth movements caused the heavy mine timbers to shatter so work was stopped. Nevertheless after a slow start, 1896 turned out to be a good year with 270 oz of gold produced by two men over a few months. More than 2,000 oz of gold had been produced since the mine opened. The low-level drive was abandoned in 1898 and a disappointed Hugh Crossan sold his share of the mine to his partner for £250 and went off to buy the Beaumont Hotel.

Figure 6. 13. Sluicing the reef material left this large trench, about 80 metres long and 6 metres deep. It cuts right through the ridge and is the most conspicuous feature of the Excelsior mine today.

It is interesting to note that during all the time Frank Gray was working at this claim, he continued to live high up on the hillside above Bald Hill Flat ('above the fog' he was reputed to have said), so each morning he had not only to walk two and a half miles (4 km) but also descend 100 metres into Obelisk Creek and then climb 300 metres up to his claim.

After the low-level drive was abandoned, the battery was moved up the hill to a more convenient site, and Frank Gray went back to sinking shafts and lifting the material laboriously by hand. One disadvantage of working down from the surface was that all the rainwater and melting snow ran into the shafts.

In 1903 another attempt was made with four employed men to drive into the reef. This time a 'cross-drive,' as it was called, was driven at right angles to the reef from the steep northern slope of the ridge. After cutting through 300 feet of broken schist the men finally reached the reef and then proceeded to drive along it. Some good gold was obtained — one of the best returns was 62 oz of gold for 28 tons crushed but the lode then pinched out. Francis Gray sold the little battery to Robert Symes and abandoned the mine. £9,800 worth of gold had been recovered for the seven seasons worked and when Gray retired in 1907, he was a wealthy man.

Excelsior Claim today

The most noticeable feature of the old Excelsior claim is a large gash in the ridge. This gash looks not unlike the cutting made for a railway, but

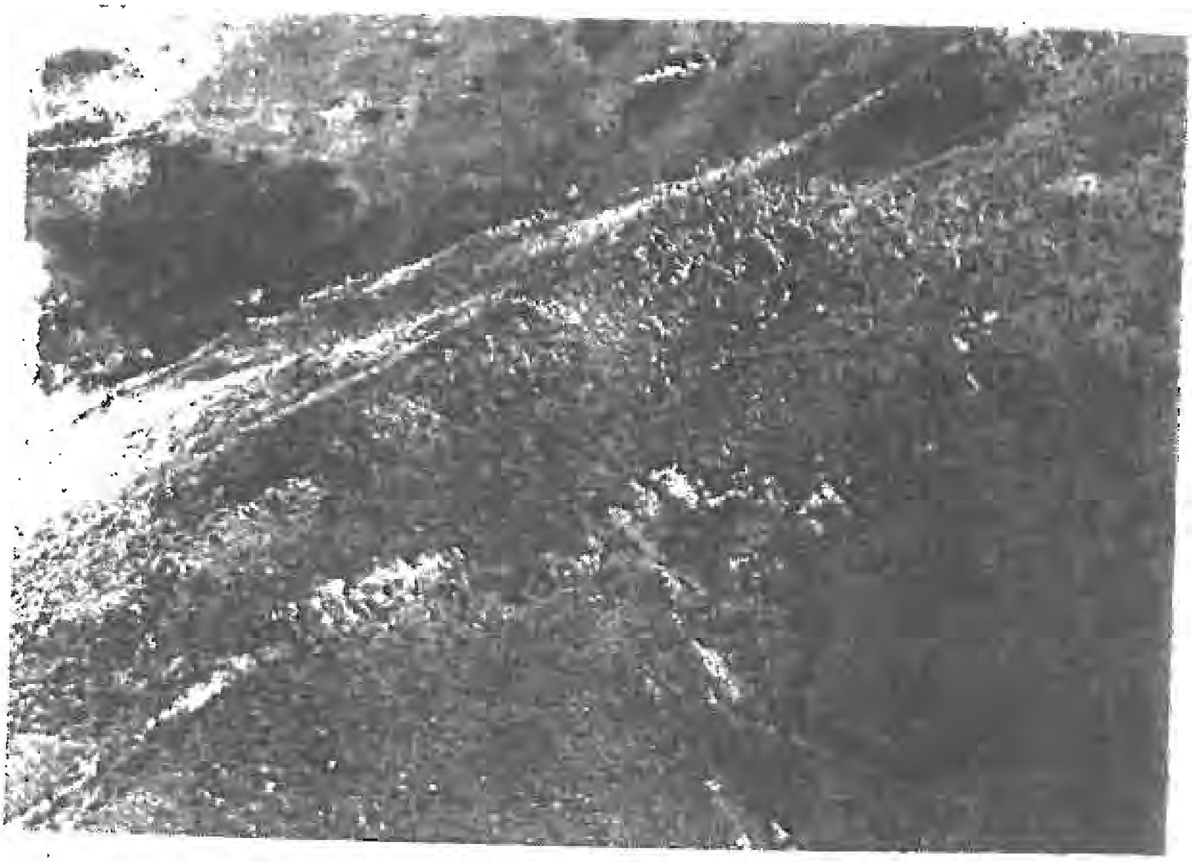


Figure 6. 14. Air view of Excelsior mine.

was formed by Gray and Crossan as they sluiced away the soft material of the reef. A dump of spoil at the eastern end of the cut was derived from sinking shafts in the floor of the cutting and from the drives running away from the bottom of the shafts. Below the dump is a flat platform that was the latest site for the stamper-battery. An earlier battery site was 100 metres down the steep hillside near another large dump of spoil derived from the various attempts to excavate a low-level drive along the reef. Sluicing on the north side of the ridge conceals the entrance to the cross-drive. Several hundred metres west is the dam that supplied the water for driving the pelton wheel of the battery and for sluicing.

NOTES

1. The site of the main shaft is shown on some old mining maps. It was less than 200 metres from the Alexandra – Butchers Creek road on the western side. Other prospecting shafts overlooking the gorge of Butchers Creek are still visible.
2. The material containing the gold and set aside for crushing, was always referred to as 'stone' whether it was hard quartz or soft decomposed schist.
3. The members of the party were: Iversen, C. Iversen, W. Grindly, Stephen Foxwell, William Beattie, and Thomas Oliver.
4. *Otago Daily Times* 30 August, 1871.
5. *Otago Daily Times* 6 November, 1872.
6. Ulrich Votes & Proceedings Vol XXXIV 1875 Appendix pp. 76-77.
7. J. Park 1906 pp. 30-31.
8. *Dunstan Times* 25 April and 22 August 1879.
9. *Dunstan Times* 20 April 1880.
10. J. Park 1890 pp. 32-33.
11. *Dunstan Times* 15 February 1884,
12. *Otago Daily Times* 12 October 1883.
13. J. Park 1890 pp. 32-33.
14. A report by the Inspector of Mines commented: "The upper level was constructed on such a serpentine course that it seemed to any one acquainted with mining that those in charge of the work at that time had no idea where the lode was to be found." AJHR 1895 C—3 p. 87.
15. *Dunstan Times* 7 November 1890.
16. *Dunstan Times* 20 January 1893.

APPENDIX

Applications for reef claims on the slopes of the Old Man Range above Bald Hill Flat are listed in alphabetical order with dates when they were first granted and principal applicants. On most of these claims prospecting showed no signs of a reef and the claims were never worked:

Advance Quartz Mining Co: October 1883

James White, Geo Wilkinson, Thomas Rahill, John R. Kemp, William Fraser, Ewen Pilling, James Gavin, Robt Kinnaird

Worked again by Robert Symes in the 1920s up to 1927 which is the last record of any work on the Old Man Range reefs.

Alexandra Gold Mining Co: December 1888

Took over the Union claim below Whites Reef. By March 1889 a tunnel was in 310 ft and they were prepared to go another 100 ft but there are no