Toitu te Land whenua Information New Zealand

Crown Pastoral Land Tenure Review

Lease name : OBELISK STATION

Lease number : PO 264

Conservation Resources Report - Part 1

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

DOC CONSERVATION RESOURCES REPORT ON TENURE REVIEW OF

OBELISK STATION PASTORAL LEASE

PAL 14-04-264

UNDER PART 2 OF THE CROWN PASTORAL LAND ACT 1998

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PART 1

INTRODUCTION

1.1 Background

Obelisk Station Pastoral Lease (PL) was inspected on 6 October 2009 and 8 – 12 February 2010 as part of the pastoral lease tenure review. The review was requested by the lessees of the PL, Earnscleugh Station Ltd and is being undertaken under the provisions of the Crown Pastoral Land Act 1998. As part of the tenure review process, a range of specialists visited the PL and their reports, identifying the significant inherent values on the PL, have been incorporated into this Conservation Resources Report.

The Obelisk PL is located on State Highway 8, some 12 km to the south of Alexandra. The 2774 ha PL is run in conjunction with freehold paddocks and the adjoining Earnscleugh Station. Earnscleugh Station is situated to the north and Obelisk Creek adjoins to the south. The PL is in two parts.

Approximately 846 ha located to the east, but not adjoining SH8 and is known as Flat Top Hill (it forms the southern end of this hill). The eastern aspect includes part of the steep sided Roxburgh Gorge down to the edge of Lake Roxburgh. It ranges in altitude from 140 m to 529 m. It is semi arid, with an annual rainfall of 450 mm. It is poorly productive country prone to weed and rabbit invasion. It is characterised by thyme, briar rose and numerous schist tors.

The larger portion of around 1928 ha runs from the lower Fruitlands valley at 500 m altitude to the top of the Old Man Range at 1690 m. There is a very strong rainfall gradient with altitude with rainfall up to 1250 mm at the top of the range. Symes Road bisects this portion of the PL and is a popular public vehicle access route to the top of the range. Contour is medium steep on the front face of the range with the top being easy rolling. It is broken by the catchments of Coal, Obelisk and Butchers Creeks. These have been historically worked for gold, and the alluvial and reef mining as well as the numerous water races is well documented. Lower altitude vegetation consists of topdressed grasslands with significant matagouri shrubland, with tall tussock grasslands higher up the face and alpine fellfield at the top.

The close proximity, accessibility and visibility from Alexandra make this a strategically important PL of high public interest.

The upper parts of the PL are surrounded by the 15000 ha Kopuwai Conservation Area (CA) which stretches across the summit crests of the Old Man, Obelisk and Old Woman Ranges. The Flat Top Hill portion adjoins the 800 ha Flat Top Hill Conservation Area to the north.

The PL is situated within the Old Man Ecological District (ED) and is one of 8 districts in the Central Otago Ecological Region. A Protected Natural Areas Programme survey was published in 1986 for the Old Man ED (Brumley et al. 1986?). The report noted that parts of two recommended areas for protection (RAP) are within the PL. The relevant extracts from the ED survey report are attached (Appendix 1).

PART 2

INHERENT VALUES: DESCRIPTION OF CONSERVATION RESOURCES AND ASSESSMENT OF SIGNIFICANCE

2.1 Landscape

Landscape Context:

The Obelisk and adjoining Old Man Ranges are some of the highest of the block mountain ranges in Central Otago. They form part of a spectacular domed crest plateau.

The schist block mountain ranges represent the eastern edge of Otago's glaciated landscape. Periglacial features occur on the range crest. To the west are the Garvie Mountains and to the northwest the Hector and Remarkables Ranges. Unlike the block mountain ranges further east, these ranges are characterised by previously glaciated peaks and alpine basins.

The western, high-altitude part of the PL covers the eastern edge of the broad domed shaped summit ridge of the Old Man Range. The central part of the PL covers the moderately-steep mid-altitude slopes descending east to the Clutha Valley. The Flat Top Hill portion of the PL is a low-altitude ridge which descends into the steep-sided Roxburgh Gorge.

The PL is in the heart of the range and basin, rocky arid landscape of Central Otago. Schist rock outcrops and tors are ubiquitous and occur from the Clutha valley floor to the range crest, and on surrounding land to the north and south. To the south east is the aptly named Knobby Range and adjoining rocky upland ranges. Flat Top Hill is a distinctive landform between Fruitlands and the Roxburgh Gorge. The southern end of the hill is within the PL. The valley floor known as Fruitlands is a cultural landscape forming an oasis of irrigated pasture, historic stone buildings and structures, rows of poplar shelterbelts and exotic trees including fruit and nut trees. This green oasis is set within and surrounded by arid, rocky and tussock covered slopes.

Upper basin slopes are predominantly a mixed tall tussockland. These grade into cushionfield and short tussock at around 1300 m. Towards the summit the land cover becomes sparse cushionfield and gravel. Rock outcrops, periglacial landform patterns and impressive rock tors are features of the upper slopes and crest.

The large rock tor known as Obelisk/Kopuwai and the television translator on Obelisk summit (both outside the lease) are landmarks on the range top and visible over a wide area.

The PL contains a wide range of landscape types. This is partly a reflection of the wide altitudinal range and topographical variation, but also the human imprint on the land.

Methodology

The assessment process includes the following steps:

1. Landscape units of the PL are defined. The landscape units reflect areas of similar landscape character.

2. The landscape character of each unit is described.

3. The visual and scenic values of individual units are described.

4. An assessment of each unit's vulnerability is given.

5. Landscape values are then assessed using the 5 criteria outlined below.

6. From the above, a determination is made about the significance of the reviewable land.

The definitions of the 5 criteria used to assess individual units are:

Naturalness: Refers to the condition of the natural vegetation, patterns and processes and the degree of modification present.

Legibility: Refers to its expressiveness - how obviously the landscape demonstrates the formative processes leading to it.

Aesthetic Factors: Include criteria such as distinctiveness - the quality that makes a particular landscape visually striking. Frequently this occurs when contrasting natural elements combine to form a distinctive and memorable visual pattern. A further criteria assessed under aesthetic factors is coherence. This is based on characteristics including intactness, unity, continuity, and compatibility. Intrusions, alterations, disruptions tend to detract from coherence.

Historic Values: Refers to historically valued attributes in the context of a high country landscape.

Visibility: Refers to the visibility from public places such as highways, waterways or local vantage points.

Landscape Units

The following units have been identified based on how the land looks and attributes such as visible geology/formative processes, water bodies, vegetation type and pattern and any cultural use by humans.

The identified units include: (refer Map 4.2.3).

- LU1- Obelisk Crest and Upper Slopes
- LU2- Obelisk Mid slopes
- LU3- Fruitlands faces
- LU4- Flat Top Hill
- LU5- Roxburgh Gorge Scarp

Landscape Analysis and Evaluation

Obelisk/Old Man Crest and Upper Faces (LU1) – (Refer to Landscape Photos Appendix 4.3.1)

C**haracter Description**
This upper zone of the lease includes the crest and upper eastern slopes of the range down to approximately 1300 m.

The fenced boundary of the lease is close to the eastern edge of the ridge crest. The fence bisects and forms a dominant, stand out feature in the highly natural crest landscape. Even more so on the upper northern boundary with the addition of a deer fence in recent years.

The ridge is within the broad remnant peneplain surface and is part of a distinctive periglacial landscape comprising a smooth, gently rounded, undulating surface with a carpet of sparse, tundra-like cushionfield and alpine fellfield. It is interspersed with lag gravels, freeze-thaw features and punctuated by isolated large and imposing rock tors which stand vertical in stark contrast to the gently rounded topography.

A key characteristic of the crest is its exposed barren, tundra-like appearance and the sense of remoteness and isolation it imparts. Views are outstanding and panoramic in all directions including along the range and views to surrounding mountains and basins. Views west include to the Garvie, Hector and Remarkables Ranges and as far as Mount Aspiring on clear days. Other views are north across the Manuherikia Basin and the Alexandra Basin to Leaning Rock and the Hawkdun Range and east and south east to the Knobby Range.

Below the summit the main vegetation is mixed cushion/herbfield and induced short tussock (predominantly blue tussock) and scattered sparse snow tussock. These plant communities are associated with nivation and solifluction landform features. Rock outcrops are increasingly common away from the crest and often form random clusters of boulders and rock tors surrounded by low herbfield/cushionfield. Species composition has been significantly altered by grazing and burning in this zone and tall tussock has been depleted.

Visual and Scenic Values
Visual and scenic values in this high alpine zone are at the high end of the scale. The PL occupies the edge of the ancient broad peneplain surface. The physical features of gently undulating landform punctuated by imposing and curious shaped tors rising above the lunar-like surface are visually striking and highly memorable and distinctive to the Old Man Range. The

sparse vegetation cover highlights the climatic extremes experienced in this environment and the impact of human induced changes.

Added to this are the spectacular and diverse views obtained from the crest. These include highly natural montane views across the upper Fraser Basin to the skyline of the Garvie and Hector Mountains and the panoramic views across almost the whole of Central Otago. Also the lower Clutha and south east to the Lammerlaw Range.

Both the physical attributes of the landscape, and the views are outstanding.

The boundary fence and road along the crest, with its associated erosion (outside the lease), are discordant factors which impact negatively on the landscape as a whole. Below the crest a concrete tank housing equipment for telecommunications and aerials also detract from landscape values.

Landscape Vulnerability
This high alpine environment is extremely vulnerable to change or any form of human use or activity. Structures are particularly difficult to absorb in this landscape. Physical alteration such as earthworks also impacts severely on naturalness and therefore degrades the experience of this landscape.

Table 1: Evaluation of LU1 - Obelisk/Old Man Crest and Upper Faces

Criteria	Value	Comment
Naturalness	High	All natural processes and patterns intact. Some modification to vegetation below the crest
Legibility	High	Block mountain range and rock tors emphasise erosion processes and climatic extremes
Aesthetic Factors	High	Physical features are highly distinctive, striking and memorable.
Historic Factors	Unknown.	Not obviously expressed
Visibility	High	Forms an iconic view from the Alexandra Basin and beyond. Symes Road is a popular and a frequently used public road

Obelisk Mid Faces (LU2) – (Refer to Landscape Photos Appendix 4.3.1)

Character Description
This unit does not represent a true landscape unit being a continuation of the eastern face of the range as a whole. However, for the purpose of this assessment it forms a logical descriptive boundary.

The unit is fairly uniform and includes the moderately steep, dissected mid altitude slopes from approximately 1300 m down to 800 m. It is characterised by rippled slump topography and dominated by mixed short tussock/snow tussock. The predominant cover of tussock is

interrupted intermittently by extensive rock outcrops and rubbly schist. With descending altitude, exotic pasture, speargrass and mat forming hieracium becomes an increasing component. The snow tussock continues down to about 800 m where it becomes increasingly sparse and stunted.

On the far spur adjoining Obelisk Creek PL, tall tussock appears more fragmented on the sunny north faces than other areas of the lease of similar altitude.

Gold mining has left a significant imprint in this unit and LU3 below it. South of Symes Road and near the lower end of LU2 is the site known as Whites Reef, a significant and important early mining site.

The excavations and tailings have softened and revegetated with time. Whites Hut built by the same stonemason as the iconic Mitchells Cottage has been partially restored and is in good condition. The surrounding tall tussock maintains the historic context for these workings which is an important factor. Other mining sites with water races, reservoirs and excavations can be found below. These are Whites Reef and extending down into the Fruitland faces; notably Exhibition Mine (north east of Whites Reef) and Excelsior Mine (Grays Reef) on the ridge between Coal Creek and Obelisk Creek.

Visual and Scenic Values

Visually these mid altitude slopes are significant as part of the range face as a whole. The tussock covered slopes form the context and backdrop to Fruitlands, Alexandra and surrounding area and are a distinctive and iconic feature.

At close range, viewed from Symes Road, the tall tussock and associated large rock outcrops and rubbly schist are distinctive and visually impressive.

The views from this unit are also an important part of visual and scenic resource values. Views to Fruitlands, Butchers Dam, the Alexandra Basin and up the Hawkdun Ranges are interesting and impressive.

Landscape Vulnerability

The dominant tall tussock is the most vulnerable attribute of this unit. The tussock cover is vulnerable to further modification and fragmentation which would have a negative effect on landscape values. Threats to values include:

- Wilding tree spread
- Burning
- Large scale earthworks
- Structures
- Overgrazing or uneven grazing patterns

Table 2: Evaluation of LU2 - Obelisk Mid Faces

Criteria	Value	Comment
Naturalness	Medium	Appears natural. Tussock is predominantly continuous. Some modification by grazing and burning especially with descending altitude.
Legibility	Medium	Slump topography clearly expressed.
Aesthetic Factors	Medium to High	Landform and vegetation pattern typical of mid altitude eastern slopes of the Obelisk/Old Man Range.
Historic Factors	Medium	Remnant mining activity contributes to landscape values.
Visibility	High	Faces highly visible and form the context to the Alexandra Basin and Roxburgh section of the Clutha Valley.

Fruitland Faces (LU3) - (Refer to Landscape Photos Appendix 4.3.1)

Character Description
This lower portion of Old Man Range face includes from around 800 m down to the lower Fruitlands boundary forming the lower shirtfront of the PL.

The characteristics and features across this fairly large area are similar. It includes a central basin of Obelisk Creek, a smaller southern sector draining to Coal Creek and a northern sector draining to Butchers Creek.

Obelisk Creek is a broad central basin and supports predominantly a short tussock/pasture/grey shrubland mix. Grey shrubland forms a prominent belt across much of the lower faces appearing as brownish/black shrubland contrasting in late summer with the dry grass and tussock. The lowest areas are more patchy with open pasture, scattered grey shrubland and some briar. As with elsewhere rock outcrops are scattered across the lower slopes. On the true right of Butchers Creek landform is lumpy rocky ridge topography with predominately pasture and patchy shrubland. Some patch burning and/or chemical spraying of shrubland has occurred.

The lower slopes of the range are more culturally modified with tussock more depleted and signs of human activities dominant over natural values. Short tussock however remains a significant component across most of the lower slopes apart from highly modified areas in lower Obelisk Creek and lower slopes north of Symes Road.

The Last Chance water-race built to provide water for early gold mining and now used for irrigation traverses the PL and continues beyond the PL. Significant upgrading of the water race in recent years has destroyed much of its historic integrity, particularly around Obelisk Creek. Raw earthworks occur on cut and fill batters.

Other cultural features include historic plantings (mainly black poplar and elm) south of Obelisk Creek marking the site of settlement and another being the site of Grays Hut on the eastern

boundary of the main block. It includes the remains of a stone fireplace and chimney hidden within large old macrocarpa and willow trees, and the remains of another stone structure further away.

Numerous water-races (some disused), dams, ruins and early plantings occur across the lower Old Man Range face. Together they form part of a significant Fruitlands historic/cultural or heritage landscape which extends into the adjoining freehold and wider Fruitlands area.

Visual and Scenic Values
These lower slopes are typical lower range mountain slopes. They are not distinctive or stand out. The primary visual resource value is as the setting for the extensive historic sites both on Obelisk PL but also in the Fruitlands area including Mitchells Cottage Historic Reserve. As with all the eastern range face they form the visual backdrop and context for the Fruitlands valley and the Alexandra Basin. The tussock covered range slopes and rocky outcrops are important contextually both as the historic setting and as iconic Central Otago landscape.

Table 3: Evaluation of LU3 – Fruitland Faces

Criteria	Value	Comment
Naturalness	Low	Short tussock and grey shrubland contribute to landscape character.
Legibility	Medium	Formative processes expressed but not obviously.
Aesthetic Factors	Medium	Not visually distinctive or striking but typical of lower slopes of the Old Man Range.
Historic Factors	High	Reservoirs, water-races, mining sites, ruins and plantings are dotted across the landscape and contribute to the historic/cultural landscape.
Visibility	High	Visible as the lower range backdrop to Fruitlands and Alexandra Basin.

Flat Top Hill (LU4) - (Refer to Landscape Photos Appendix 4.3.1)

Landscape Character
This small unit is located on the separate portion of the PL east of SH8. It comprises a narrow ridge separating the Roxburgh Gorge and Fruitlands Valley and forms the southern part of Flat Top Hill, a well known local landmark in the area.

The western side is ridge landform typical of the Alexandra area with rocky outcrops contrasting with smooth slopes of predominantly purple/grey thyme, scattered short tussock and low producing exotic grasses. Scattered briar occurs within gullies.

The top, while appearing at first flat topped, is very gently undulating and forms a simple rock studded grassland landscape. The groundcover is scattered short tussock, low exotic grasses and herbs including a significant native component of low mat forming plants. A further feature is numerous shallow ephemeral wetlands with specialised plant associations. The lichen covered

rock tors and outcrops are of impressive proportions and form a surreal landscape of strange and intriguing shapes in association with the grassland.

Isolated kanuka, and on the eastern edge, shrubs such as cottonwood, occur. Broom and wilding pine are spreading in places such as the western face and the southern end of the ridge.

Apart from introduced plants however, human intervention is minimal and confined to fences, some featuring schist strainer posts and rusty No. 8 wire. Also a derelict timber building and yards used as a film set for a western movie remains.

Visual and Scenic Values
The Flat Top Hill part of the lease has high visual and scenic values. The rock tor landscape forms a distinctive and coherent Central Otago landscape. Though ecological values are modified it retains the essence of its pre-European natural landscape. The rock outcrops and tors are by far the dominant feature and are visually highly impressive. The colours and shapes of the rock contrast with the low grassland vegetation. Views west towards Fruitlands and Old Man Range are also impressive as are views east to the rocky, barren landscape of the Knobby Range and adjoining rocky landscape.

Landscape Vulnerability
Flat Top Hill appears a reasonably robust landscape. The thin soils and density of rock outcrops will reduce options for alternative land use which might compromise landscape values. The most obvious and likely threat is from the spread of weeds, in particular broom and wilding confers. Rabbits have been a long term threat to ecological values and will continue to be a threat. The introduction of large structures such as wind turbines would impact on the integrity of the rock tors and outcrops.

Table 4: Evaluation of LU4 – Flat Top Hill

Criteria	Value	Comment
Naturalness	Medium	Natural values modified but significant indigenous component remains. Potential for recovery.
Legibility	Medium	Ancient rock tors emphasise erosion processes that have revealed them.
Aesthetic Factors	High	Striking and distinctive. Visually impressive.
Historic Factors	Medium	Evidence of some Maori presence-rock artefacts. Rock shelters occupied by Maori and Europeans.
Visibility	Medium	Western face highly visible. Crest is largely hidden.

Roxburgh Gorge Scarp (LU5) - (Refer to Landscape Photos Appendix 4.3.1)

Landscape Character
The Roxburgh Gorge scarp is a part of the steep-sided western face of the Gorge. The gorge is part of the ancient steep-sided gorge cut down by the Clutha River/Matau-au (now part of the

Roxburgh Dam). The most dominant and memorable feature is the scale of the gorge and its extremely rocky barren appearance.

The upper part features very distinctive and prominent rocky bluffs and buttresses projecting out along the edge and upper slope of the gorge. Below is the steep sided gorge face. Extensive and regenerating shrubland is associated with the bluffs most notably the rounded soft olive/green form of cottonwood. Below the bluffs are smooth steep slopes to the waters edge with purple/grey thyme being the dominant cover.

Visual and Scenic Values
The scarp is part of the indisputably outstanding landscape of the Roxburgh Gorge. The gorge is impressive in every way. It is a dramatic and spectacular hidden surprise within the surrounding rocky landscape. The bluffs and buttresses referred to above form an extremely impressive rampart at the upper edge of the gorge. The views up the gorge to the Dunstan Range and beyond are also outstanding.

Landscape Vulnerability
As with Flat Top Hill unit the most obvious threat is from wilding tree spread, broom and fire. Damage to regenerating shrubland from grazing either by domestic animals or feral animals is a further threat to landscape values

Table 5: Evaluation of LU5 – Roxburgh Gorge Scarp

Criteria	Value	Comment
Naturalness	Medium	Natural values modified but significant indigenous shrubland remains. Potential for recovery.
Legibility	High	Gorge landscape highly legible.
Aesthetic Factors	High	Striking and distinctive. Visually impressive and spectacular.
Historic Factors	Low	Pre-European and early gold mining activity. Dredging for gold occurred in the riverbed.
Visibility	Low	Not easily visible. Future Clutha walkway and increasing boat use including tourist use will increase opportunities for public access.

2.1.1 Significance of Landscape

The Old Man/Obelisk Crest and Upper Slopes down to 1100 m.

The ridge crest and upper slopes include part of the broad remnant peneplain surface and part of a highly distinctive periglacial landscape at the top of the range. The area is part of the extensive upper slopes and crest of the Old Man Range, much of which is now included in land managed by the Department of Conservation. All natural characteristics and patterns are intact despite significant alteration to species composition. The spectacular dome shaped crest with tundra-like lag gravels and rock tors are an outstanding natural feature. The Old Man Crest is also part

of the wider upland landscape that stretches to the west to include the Old Woman, Garvie and Hector Mountains.

The tussock clad slopes below the crest down to 1100 m retain their iconic natural character with tussock grassland remaining dominant and continuous despite some exotic component within the lower fringes.

Both the physical attributes of the landscape, and the views are outstanding. Adding to the significance is the relatively easy accessibility via Symes Road.

Obelisk historic/cultural sites and their settings.

This area takes in Whites Reef and various other quartz and sluicing gold mining sites within Obelisk Creek (below Whites Reef) and another centred on the ridge between Obelisk Creek and Coal Creek (Excelsior Mine/Grays Reef). It also includes the site of early settlement with the large poplar and other exotic trees. Significant areas include the actual site of mining and their setting.

These areas are important historic/cultural sites resulting from human land use which contributes to landscape character on Obelisk PL. The area includes the rocky, tussock covered setting which provides a context for the historic sites, that is little different from the time they were worked.

The sites include excavations, spoil heaps, sluicings, stone buildings, water-races, mining equipment, reservoirs and stone revetment walls. Together these features and their setting are an important part of the landscape of the Obelisk Range face and the wider Fruitlands area.

Flat Top Hill

Flat Top Hill is a distinctive local landmark. The rock tor landscape is an iconic and striking Central Otago landscape. The rock outcrops and tors are by far the dominant feature and are visually highly impressive. The shallow ephemeral wetlands are also a significant landscape feature. Views west towards Fruitlands and Old Man Range are equally impressive as are views east to the surrounding rocky, barren landscape of the Knobby Range and the adjoining rocky landscape.

Clutha Scarp

The scarp is part of the outstanding landscape of the Roxburgh Gorge. The gorge itself is impressive in scale and appearance. The steep-sided western face is both dramatic and spectacular hidden between Flat Top Hill and northern end of the Knobby Range. The bluffs and buttresses lining the upper edge and associated shrublands are a distinctive feature and rare in Central Otago. The views up the gorge to the Dunstan Range and beyond are also outstanding.

2.2 Landforms & Geology

The Old Man Range is an uplifted schist plateau, inherited from the Cretaceous to Cenozoic Otago Peneplain (Turnbull 2000), and eroded to form a classic block-mountain range characteristic of Central Otago. The western part of the PL rises to 1660 m and covers the eastern edge of the broad gently-sloping summit ridge of the Old Man Range. The central part of the PL covers the moderately-steep mid-altitude slopes descending east to the Clutha Valley at around 500 m.

Landforms are characterized by the gentle and exposed peri-glacial surface of the ridge crest, slump and solifluction areas on the upper slopes, steep dissected mid-altitude slopes. The Old Man Fault traverses north-south across the PL along the low-altitude bench in the Clutha Valley (Turnbull 2000). The PL is drained by tributaries of Butchers Creek, Obelisk Creek and a number of smaller streams on the lower northern slopes, all of which drain into the Clutha River system at Lake Roxburgh.

Basement rocks of the PL are predominantly Haast schist, comprising greenschist of the Rakaia Terrane on the western (Old Man Range) part of the PL (west of the Old Man Fault) and undifferentiated sandstone and siltstone of the Caples Terrane on the lower hill and Flat Top Hill part of the PL.

Flat Top Hill is an elongated, flat crested foothill of the Old Man Range. It extends from Lake Roxburgh (140 m) in the east, rises to 570 m on the crest and drops to 300 m in the west. Periglacial weathering has left many schist tors along its summit and western side. There are alluvial and outwash fans at lower altitudes; all are distinctive features of Central Otago landforms.

A significant feature of this portion of the PL is the paleosols (prehistoric soils) which have been exposed by sluicing. The red clay paleosol is rare in the Central Otago landscape, its layers contrasting strikingly against the weathered schist. There is also a relatively undisturbed saline soil site, now rare in the Central Otago landscape.

Soils on the PL are predominantly Obelisk, Carrick Hill, Dunstan and Tawhiti upland yellow-brown earths at higher altitudes, Blackstone Hill and Arrow yellow grey-earths at mid-altitudes to low-altitude sites. Some Chasm Hill yellow grey earth soils are within Holding and Dam farm blocks. Soil fertility is moderate with poor drainage on upper slopes, and low-moderate with good drainage on mid and low-altitude slopes. Flat Top Hill soils are Conroy with Alexandra yellow grey earth soils on the river face. (Otago Regional Council 2004, Grow Otago Climate and Soil Maps).

2.2.1 Significance of the Landforms and Geology

The PL covers an altitudinal sequence of landforms representative of the Otago block mountains, including the broad remnant-peneplain surface at the ridge crest, the rippled slump and solifluction landforms of the upper slopes, the moderately-steep dissected mid-altitude slopes, down to almost the valley bottom. The separate dry Flat Top Hill portion includes the steep gorge-side of the Roxburgh Gorge. The Old Man Fault is a prominent and interesting landform feature.

New Zealand Geopreservation Inventory

The aim of the New Zealand Geopreservation Inventory (Arand *et al.* 1991) is to identify and document all landforms, geological sites and soil sites of international, national and regional, scientific and educational significance.

Obelisk Station has 2 geopreservation sites (Kenny and Hayward 1993)

Old Man Range summit tors and sheath folds:

This area has an abundance of very large greyshist and greenschist tors, many exhibiting island tafoni (wind scalloping). It is classified as an extremely well defined landform of scientific/educational and scenic value. The site is one of the best and most accessible exposures of sheath folds in New Zealand. Its location is on the Old Man and Obelisk Range summits from Omeo Gully to Hyde Rock and is assessed as being of international significance.

Old Man Range peneplain:

This is a sequence of lowland, mid altitude and summit peneplain landforms on down warped peneplain. It is classified as an extremely well defined landform of scientific/educational and scenic value. The site is located on the east side of Symes Road and is assessed as being of national significance.

2.3 Land Environments of New Zealand (LENZ)

Description (See LENZ Plan 4.2.6)

The environmental distinctiveness of this area has been assessed through the Land Environments of New Zealand (LENZ). This is a classification of New Zealand landscapes using a comprehensive set of climate, landform and soil variables chosen for their roles in driving geographic variation in biological patterns (Leathwick et al. 2003). It is presented at four levels of detail containing 20, 100, 200 or 500 environments nationally. The data in this report is presented at Level IV which more adequately reflects the distribution of biodiversity, past clearance and current vulnerability across the landscape than higher levels of LENZ (e.g. level

II). Threat classification at level IV results in substantially more effective and efficient identification of threatened remaining indigenous cover.

When the Level IV LENZ information is combined with information describing the area of unprotected indigenous cover in threatened land environments, as identified in the national land cover database (LCDB), the biodiversity most likely to be lost can be identified. Five categories identify those threatened environments containing indigenous biodiversity at most risk of loss. These categories which are derived from a combination of measures for the percentage of biodiversity legally protected and percentage of remaining indigenous vegetation cover, are described as follows:

Table 6: Land Environments of New Zealand Threat Classification Categories

Threat Classification	Description
Acutely threatened	<10% indigenous vegetation cover remaining
Chronically threatened	10-20% indigenous vegetation remaining
At risk	20-30% indigenous vegetation cover remaining
Critically underprotected	> 30% indigenous vegetation cover remaining and <10% protected
Underprotected	>30% indigenous vegetation cover remaining and 10-20% protected
No threat	>30% indigenous vegetation cover remaining and >20% protected

Two LENZ environments (N & Q) (Leathwick et al. 2003) are present on the PL. At Level IV classification the lease comprises N3.2a, N3.1d, N4.1b, N4.1c, N4.1d, N4.1e, N5.1a, Q1.1a, Q1.1b, Q1.1c, Q1.1d, Q1.2a, Q2.2a, Q3.3a, Q3.3b, and Q3.3c. Table 7 presents a full LENZ analysis for Obelisk PL.

Table 7: LENZ environments present on Obelisk PL

Threat Category	LENZ Level IV units	Area of LENZ unit on Obelisk PL (ha) (Approx. only)	Area of LENZ unit as a % of Obelisk PL
Acutely Threatened	N3.2a	0.27	0.01
	N5.1a	0.60	0.02
Chronically Threatened	N3.1d	40.80	1.48
	N4.1b	478.06	17.30
	N4.1d	3.75	0.14
At Risk	N4.1e	244.50	8.84
Critically Underprotected	N4.1c	153.92	5.57
	Q1.1b	27.55	1.00
	Q2.2a	792.51	28.68
	Q3.3b	108.64	3.93

Underprotected	Q1.1c	308.98	11.18
	Q3.3c	4.12	0.15
No threat category	Q1.1a	272.86	9.88
	Q1.1d	0.14	0.01
	Q1.2a	8.39	0.30
	Q3.3a	318.32	11.52
Total		**c. 2763.41**	**c. 100**

2.3.1 Significance of LENZ

Attributing significance to LENZ units, while a useful exercise, must be treated with caution. Work is currently underway to improve the accuracy of underlying spatial data. For example, soils data is being upgraded, as median patch size for polygons sourced from the Land Resource Inventory is currently between 10,000 and 100,000 hectares, while at Level IV resolution, LENZ units cover areas as small as 10 hectares. Also underway, albeit as lesser priority, is ongoing work relating to continuous improvements of the underlying classification process which generates LENZ units.

National priority 1 in "Protecting our Places" (MfE 2007) is to protect indigenous vegetation associated with land environments (defined by Land Environments of New Zealand at Level IV) that have 20% or less remaining in indigenous cover. Of the Level IV land environments on Obelisk PL N3.2a, N5.1a, N3.1d, N4.1b and N4.1d have less than 20% indigenous vegetation remaining nationally.

- A total of 0.9ha is an "acutely threatened" environment.
- A total of 505ha is a "chronically threatened" environment.

The main areas where these environments with indigenous vegetation remain are along the plateau summit of Flat Top Hill block. Note that the areas on the LENZ Plan 4.2.6 are approximate only.

2.4 Climate

Marked differences in altitude result in wide variations in climate. The summit ridge has a mean annual temperature close to freezing point and the low country experiences sweltering summer temperatures. The climate is strongly continental and whilst days can be very warm, frosts can and do occur throughout the year. Mean annual precipitation varies from 400 mm at Fruitlands to over 1800 mm on the summit ridge where it mostly falls as snow. Snow forms a near continuous cover for four to six months and some snowbanks persist throughout summer and autumn, especially in leeward cirques. Wind speeds recorded at the summit have reached a comparatively high average velocity of 20 km per hour and are predominantly from the north-west or south-west.

The summit plateau is regarded as being one of the harshest alpine environments in New Zealand.

2.5 Vegetation

Since European settlement tussock grasslands have been the dominant vegetation across the Old Man Range with forest and woodland associations forming a very minor component of the Old Man Ecological District. Silver beech forest extends up the East Branch of the Waikaia River and an area of celery pine and Hall's totara occurs in the West Branch Waikaia. Kanuka, manuka and kowhai are the main woodland species found in the district but there are also numerous secondary shrublands dominated by matagouri, *Olearia* and *Coprosma* spp. Prior to human settlement it is likely these woody components would have been widespread on the range up to the natural tree-line.

Until recently little had been recorded of the general ecological features of the District although scientists had long shown interest in the botany of higher parts of the Old Man Range. An attempt was made to collate known biological values of the District in Maturin (1984) and this was soon followed by the Old Man Ecological District survey report for Protected Natural Areas Programme (PNAP) (Brumley et al. 1986) which greatly expanded knowledge of the District's vegetation. Subsequently there have been several conservation resources reports (CRR) prepared for PLs that have entered the High Country Tenure Review process.

The botanical survey was undertaken on 6 October 2009 and 8 – 10 February 2010. Survey was carried out in October on the hill crest of the Flat Top Hill portion of the lease to coincide with peak emergence of spring annuals. Descriptions were made of the composition of major plant communities. Threatened plants were searched for in potentially suitable habitats. Digital photographs were taken of particular species, communities and landscapes to aid in interpretation. Specimens were collected of noteworthy or uncertain taxa for herbarium accession and determination.

For the purposes of describing the vegetation the PL has been divided into two major blocks; that part of the PL located on the eastern slopes of the Old Man Range (further split into its two major catchments), and that part of the PL located at the southern end of Flat Top Hill (further split into three land units).

Old Man Range block

Butchers Creek

The northern half of Obelisk PL constitutes the main stem of Butchers Creek catchment. The catchment arises from the crest of the Old Man Range above 1600 m where periglacial landforms and extensive fellfield communities dominate. This is the realm of cushion and mat forming alpine plants, of which there is high species richness. *Dracophyllum muscoides* predominates but other common species include *Raoulia hectorii, Hebejeebie densifolia, Celmisia brevifolia, C. sessiliflora, C. viscosa, Abrotanella inconspicua, Phyllachne rubra, Hectorella caespitosa, Kelleria childii* and *Scleranthus uniflorus.*

Wetter snowbank communities are dominated by *Gaultheria nubicola* with abundant *Plantago lanigera, Raoulia subulata, Ourisia glandulosa, Leptinella goyenii, Celmisia laricifolia,*

Ranunculus pachyrhizus and *Psychrophila obtusa*. More disturbed gullies that hold snow until late in the summer have *Chionohebe glabra* and *Cardamine debilis*.

Small alpine wetlands are dominated by mosses and other bryophytes. Common associated herbs include *Leptinella* "seep", *Epilobium komarovianum, Abrotanella caespitosa, Ranunculus gracilipes, R. maculatus, Euchiton traversii, Oxalis magellanica* and *Schizeilema cockaynei.* A small forget-me-not, *Myosotis* aff. *tenericaulis*, is occasionally present. Similar wetland communities form the immediate margins of the numerous nivation and solifluction gullies that eventually cascade down the steepening tussock-clad slopes.

A belt of short tussock with clumps of cottonwood (*Ozothamnus vauvilliersii*) gives way to tall narrow-leaved snow tussock (*Chionochloa rigida*) at c. 1300 m. This continues virtually to the valley floor at 700 m, over ripply slump topography, but with noticeable aspect differences. Upper and south-facing slopes are most densely covered while drier north-facing slopes have a much reduced tall tussock cover that includes short tussock, pasture grasses and golden Spaniard (*Aciphylla aurea*).

An old alluvial surface at the base of the ripply slopes is covered by hard tussock (*Festuca novaezelandiae*), silver tussock (*Poa cita*), browntop (*Agrostis capillaris*) and Maori onion (*Bulbinella angustifolia*).

Patchy matagouri (*Discaria toumatou*) dominated shrubland, surrounded by short tussockland and pasture, occurs on the lower north-facing slopes and in the riparian zone. Other associated shrubs include mingimingi (*Coprosma propinqua),* desert broom (*Carmichaelia petriei*), *Corokia cotoneaster, Olearia lineata,* and koromiko (*Hebe salicifolia*). These are often intertwined with the lianoid bush lawyer *Rubus schmidelioides* var. *subpauperatus*. Much less commonly around rock outcrops are *Coprosma crassifolia* and coral broom (*Carmichaelia crassicaulis* subsp. *crassicaulis*). Similar shrubland further down valley appears to be dead following herbicide spraying.

<u>Obelisk Creek (and headwaters of Coal Creek)</u>

The southern half of Obelisk PL includes the catchment of Obelisk Creek and the upper-most reaches of Coal Creek. These catchments also begin on the high crest of the Old Man Range where fellfields similar to those described for Butchers Creek prevail. An additional feature is the presence of several distinctive shaft tors. Crevices and ledges on these support *Pachycladon novaezelandiae* while their more sheltered bases support a range of alpine herbs and grasses including *Acaena tesca, A. saccaticupula, Myosotis drucei, Ranunculus enysii, Montia sessiliflora*, little hard fern (*Blechnum pennamarina*) and blue tussock (*Poa colensoi*).

Snowbanks and small alpine wetlands, similar to Butchers Creek, occupy nivation hollows and solifluction gullies. Outside of these damper areas are extensive herbfields dominated by *Celmisia viscosa* with scattered clumps of slim snow tussock (*Chionochloa macra*).

A series of lichen encrusted rock outcrops near the uppermost dividing fence support the small alpine fern *Grammitis poeppigiana*. Blue tussock dominated grassland nearby has a range of

herbs and shrubs including *Raoulia parkii, Hebejeebie densiflora, Myosotis pulvinaris, Celmisia lyallii, Pentachondra pumila* and cottonwood. Rocky colluvium has *Hebe hectorii* and *Raoulia subsericea*.

Below this, on hummocky slump topography on the dividing ridge between Coal Creek and Obelisk Creek, is a small ephemeral wetland with *Myriophyllum triphyllum* and *Isolepis* spp. Other nearby wet hollows are dominated by *Sphagnum* sp., or comb sedge (*Oreobolus pectinatus*), with *Euchiton traversii* and *Plantago unibracteata*.

With decreasing altitude, narrow-leaved tussock cover increases and remains strong down to at least 1000 m at which point tall tussock becomes sparser on north-facing slopes with more prominence of hieracium species and short tussock/pasture. Patchy matagouri dominated shrubland is prevalent on the dry north-facing slopes of the true right of Obelisk Creek, repeating the pattern described for Butchers Creek. The Obelisk Creek shrublands also include considerable *Olearia odorata, Muehlenbeckia complexa, Clematis marata* and occasional shrubs of elderberry (*Sambucus nigra*), sweet briar (*Rosa rubiginosa*) and gooseberry (*Ribes uva-crispa).* These shrublands extend down Obelisk Creek below the major water race, particularly on north-facing slopes.

Flat Top Hill block

Western slopes

A wide band of rock outcropping distinguishes the upper western slopes from the mid and toe slopes. These rocks have acted as refuges for a wide range of shrubs and herbaceous plants. Native shrubs present include porcupine shrub (*Melicytus alpinus*), mingimingi, *Olearia bullata, Coprosma tayloriae, Helichrysum lanceolatum* and occasional *Olearia lineata* and *Pimelea aridula.* Rocky clefts and ledges support *Anisotome cauticola, Senecio quadridentatus*, and *Pellaea calidirupium*.

On the footslope an area of possibly saline soil exposed by mining sluicing has *Rytidosperma maculatum,* desert poa (*Poa maniototo*), silver tussock, *Raoulia beauverdii* and cottonwood.

Elsewhere depleted dry slopes are dominated by mouse-ear hawkweed (*Hieracium pilosella*) with occasional patches of both native and exotic herbs and grasses.

Range crest

The vegetation of the broad and gently sloping range crest is a mosaic of hard and silver tussock interspersed with dry-tolerant pasture grasses and pastoral weeds. Shallowly-incised gully heads extend into the crest and much of the surface is dotted with tors and rock outcrops. Occasional shrubs such as *Olearia lineata,* porcupine shrub, kanuka (*Kunzea ericoides*), *Pimelea aridula,* desert broom and *Hebe pimeleoides* subsp. *faucicola* are present on or around rock outcrops.

A series of small, ephemerally wet shallow depressions, are scattered over the plateau-like range crest. These support a flora of predominantly annual herbaceous plants in silty substrate

overlying basement schist. Community composition varies between depressions but common native species include mousetail (*Myosurus minimus* subsp. *novaezelandiae*), *Crassula multicaulis, Myosotis brevis, Crassula sinclairii* and *C. colligata*. These are often in association with exotic herbs such as *Sedum acre*, sheep's sorrel (*Rumex acetosella*), and whitlow grass (*Erophila verna*).

The tiny buttercup *Ranunculus brevis* also extends into surrounding dry habitats which it shares with the exotic *Trifolium arvense*, white clover (*T. repens*) and *Erodium cicutarium*.

Eastern lake faces

As with the western faces, a band of rock outcropping separates the upper face from the lower face. Shrubland often surround the larger outcrops and is dominated by mingimingi, *Olearia odorata*, bush lawyer, sweet briar and with occasional *O. lineata* and koromiko. The understorey of one such shrubland has the threatened sedge *Carex inopinata*. Ledges and crevices on rocks support *Anisotome cauticola, Pimelea aridula* and *Hebe pimeleoides* subsp. *faucicola*. Larger benches and terraces, where soil has accumulated, have a dense cover of short tussock and pasture grasses.

Mid and lower slopes are predominantly covered in thyme (*Thymus vulgaris*) dominated shrubland along with a range of other dry-tolerant exotic herbs and shrubs such as sweet briar, Californian poppy (*Eschscholzia californica*) and wild mignonette (*Reseda luteola*). Especially depleted areas amongst the thyme support mats of native *Raoulia australis*. Extensive ribbons of tall cottonwood line the damper gully sides and, in places, extend out into the thyme. Patches of the native broom *Carmichaelia compacta* are dotted over the dry faces.

2.5.2 Problem Plants

At least 58 exotic species of plants are present on the lease but relatively few are of conservation concern. Many are plants of agricultural importance or are common pastoral weeds. Most are present only at the lower elevations of the lease. At least three hawkweed species are present but are seldom common except in localised dry sites where all taller vegetation has been removed. Of most serious concern are the broom (*Cytisus scoparius*) and wilding pine (*Pinus* spp.) infestations that occupy the western slopes of Flat Top Hill.

The continued unchecked spread of broom particularly presents a serious risk to indigenous biodiversity, natural character and recreational access. Williams (1981) in his study on the ecology of broom in Canterbury noted that the altitudinal limit of broom in New Zealand, as in Europe, appears to be limited by winter cold or winter drought affecting the previous season's growth. There would appear to be few natural impediments to a much wider extension of its range. Without intervention, many of the Significant Inherent Values (SIVs) identified on Flat Top Hill are at risk of invasion by broom in the short to medium term.

2.5.3 Significance

Vegetation (See plan Appendix 4.2.4 for areas of ecological significance)

Obelisk PL falls within the Old Man Ecological District (ED), one of seven ecological districts that constitute the wider Central Otago Ecological Region. The Old Man ED was surveyed as part of the PNAP over two successive summers 1983/84 and 1984/85 with the results published in Brumley et al. (1986). Two recommended areas for protection (RAPs) are located wholly or in part on the Obelisk PL.

RAP 2/3 is a second priority RAP that includes the middle and upper catchment (640 to 1370 m) of Butchers Creek. It is an example of a steep eastern Old Man catchment and a fold/fault scarp with discrete zones of landform features and an even moderate gradient. It is located to the north of Symes Road and finishes at the northern PL boundary making it entirely within Obelisk.

RAP 1/7 is partly located on Obelisk and includes all the alpine land above 1370m. This RAP includes a diverse and outstanding landscape, representative of the East Old Man land system and much of the Waikaia land system. It contains the easternmost portion of the uplifted alpine schist plateau of the Old Man ecological district. It includes the steep Old Man fold-fault scarp, high periglacial summit and westward sloping dissected plateau of the Fraser/Waikaia catchments.

At least 203 native vascular plant species (See Appendix 4.5.1) are present representing approximately 40% of the indigenous vascular plant diversity recorded for the much larger (137 000 ha) and ecologically diverse Old Man ED.

Threatened and At Risk species

Of the native vascular plant species present, five are listed as ‘Threatened’ and 15 as ‘At Risk’ in the most recent threat classification system listing (de Lange et al. 2009). A list of these species with their threat of extinction status and distribution within Obelisk PL is provided below in Table 8 and Appendix 4.2.5.

The New Zealand Threat Classification System provides a tool for assigning a threat status to candidate taxa. Species listed in the super category ‘Threatened” are grouped into three categories: ‘Nationally Critical’, Nationally Endangered’, and ‘Nationally Vulnerable’. Taxa in these three categories are facing a very high risk of extinction in the wild.

The latest revision (Townsend et al. 2008) of the 2002 system includes the addition of the new categories ‘Declining’, ‘Naturally Uncommon’, ‘Recovering’ and ‘Relict’ within a super category ‘At Risk’. Declining taxa do not qualify as ‘Threatened’ because they are buffered by a large total population size and/or slower decline rate. However, if the declining trends continue, these taxa may be listed as ‘Threatened’ in the future. The category ‘Naturally Uncommon’ is adopted to distinguish between biologically scarce and threatened taxa. ‘Recovering’ allows for threatened taxa whose status is improving through management action and ‘Relict’ is used to

encompass taxa that have experienced very large historic range reductions and now exist as remnant populations that are not considered unduly threatened.

Table 8: Threatened plant species found on Obelisk PL

Super Category	Threat Category	Species	Location on PL
Threatened	Nationally Critical	*Crassula multicaulis*	Ephemeral wetlands on Flat Top Hill
		Myosurus minimus ssp. *novae-zelandiae*	Ephemeral wetlands on Flat Top Hill
	Nationally Endangered	*Carex inopinata*	Shrubland on Flat Top Hill
		Myosotis brevis (=*Myosotis pygmaea* var. *minutiflora*)	Herbfields on Flat Top Hill
	Nationally Vulnerable	*Kirkianella novaezelandiae*	Gully amongst tussockland on Old Man Range
At Risk	Declining	*Carmichaelia compacta*	Eastern slopes of Flat Top Hill
		Carmichaelia crassicaulis subsp. *crassicaulis*	Montane shrublands on Old Man Range
		Olearia lineata	Montane shrublands on Old Man Range and Flat Top Hill
		Pimelea aridula	Around rock outcrops Flat Top Hill
	Naturally Uncommon	*Acaena tesca*	Around rock outcrops Old Man Range
		Anisotome cauticola	On rock outcrops Flat Top Hill
		Carex pterocarpa	Fellfield Old Man Range
		Chionohebe glabra	Damp herbfields old Man Range
		Colobanthus brevisepelaus	Herbfield Flat Top Hill
		Hebe pimelioides subsp. *faucicola*	On rock outcrops Flat Top Hill
		Luzula crenulata	Fellfield Old Man Range
		Myosotis aff. *tenericaulis*	Wetlands Old Man Range
		Ranunculus maculatus	Wetlands Old Man Range
		Raoulia hectorii var. *mollis*	Damp herbfields Old Man Range
		Raoulia beauverdii	Herbfields Flat Top Hill

In addition, three species that are uncommon in Otago (Regionally Significant) were found (Table 9).

Table 9: Regionally significant and locally notable plants found on Obelisk PL

Status	Species	Location on PL
Regionally significant	*Carex resectans*	Flat Top Hill ephemeral tarns
	Coprosma virescens	Butchers Creek montane shrublands
	Myosotis drucei	Old Man Range tors and rock outcrops

Rare Ecosystems

Terrestrial ecosystems that were rare before human colonisation of New Zealand often have highly specialised and diverse flora and fauna characterised by endemic and nationally rare species. Rare ecosystems are defined as those having a total extent less than 0.5% (i.e. < 134 000 ha) of New Zealand's total area (268 680 km2). A framework has been developed (Williams et al. 2007) based on descriptors of physical environments that distinguish rare ecosystems from each other and from more common ecosystems. Using this framework 72 rare ecosystems have been defined using pertinent environmental descriptors selected from soil age, parent material, soil chemistry and particle size, landform, drainage regime, disturbance, and climate

On the PL four rare ecosystems were identified, all in the wetland category (cushionbog, ephemeral wetlands, seepages and flushes, and snowbanks).

Sustainability and Ecosystem Services

The Land Use Capability (LUC) system is a nationally consistent land classification system based on physical sustainability that has been used in New Zealand to help achieve sustainable land development and management since 1952. The LUC system has two key components. Firstly, Land Resource Inventory (LRI) is compiled as an assessment of physical factors considered to be critical for long-term land use and management. Secondly, the inventory is used for LUC classification, whereby land is categorised into eight classes according to its long-term capability to sustain one or more productive uses (Lynn et al. 2009).

Analysis of LUC for the PL reveals that for the Old Man Range block above c. 900 m the land falls predominantly into two classes. Land at highest altitude is classified as class 8 and that below as class 7. Class 8 land has severe to extreme physical limitations or hazards which make it unsuitable for arable, pastoral, or commercial forestry use. Erosion control, water management and conservation of flora and fauna are the main uses of this land (Lynn et al. 2009). Class 7 land has severe physical limitations and consequently it is high risk land requiring active management to achieve sustainable production. These classes have a subclass 'e' or 'c' which indicates that erodibility and climate are the main kinds of physical limitation or hazard to use that have been identified.

The sustainability of the mid altitude shrublands is dependent mainly on the absence of fire. Heavy grazing especially by cattle could also impact on these shrublands.

In the unimproved tussock grasslands, burning has the greatest impact as it interrupts nutrient cycles and removes tightly held nutrients from the low to very low fertility of the Dunstan Steepland soils. Stock also change vegetation by selectively grazing palatable species and moving nutrients to stock camps. Gradual degradation of tall tussock grasslands is the result of ongoing pastoral use where nutrients removed are greater than those returned by natural processes. Under good rainfall tall tussocks are persistent and without burning nutrient depletion would be slow.

The alpine fellfields are represented by Carrick Hill and Obelisk soils. These areas have very little available grazing and most of this is in the blue tussock belt.

Most of the land on the Flat Top Hill block is also classified as class 7 with the same physical limitations or hazards to use. The north-west aspect is severely depleted and is prone to wind sheet and frost activated erosion. Additionally the river faces suffer from a southerly funneling wind which pushes up the Clutha River. This area is extremely rabbit prone and its future health is dependent on keeping rabbits at low levels. The neighbouring Flat Top Hill Conservation Area has revegetated with grasses after removal of rabbits and stock and the control of weeds. From a sustainability perspective spelling from grazing would benefit this part of Obelisk PL.

Much of the existing tussockland and shrubland has potential for further carbon sequestration. The full potential of lower altitude tussocklands to increase in density and stature and ultimately to succeed to indigenous woody cover, is currently retarded by stock grazing. The succession of montane shrublands to forest is also limited by stock grazing, shrubland clearance and very limited seed sources.

The upper slopes and wetlands on the Old Man Range block play an important role in the provision and regulation of water for a variety of downstream uses (Mark & Dickinson 2008).

Scientific Values

The relatively easily access to higher altitude parts of the PL has led to it being a popular site for scientists investigating the Central Otago block mountain environment. Researchers at the University of Otago in particular have conducted numerous botanical investigations over several decades and have published research findings on a range of topics. These include the ecology of narrow-leaved tussock (Mark 1965a, Mark 1965b, Mark 1965c, Payton et al. 1979, Payton et al. 1986); effects of management practices on snow tussock (Mark 1965d, Mark 1994), cushionfield succession (Roxburgh et al. 1988, Brown et al. 2006) and water yield with indigenous non-forest vegetation (Mark & Dickinson 2008).

This general site also features in many other publications describing alpine vegetation and climate (Bliss & Mark 1970, Mark 1965, Mark 1969, Mark 1974, Mark 1992, Halloy & Mark 2003) and conservation values of southern landscapes (Mark 1992).

At lower altitude, Flat Top Hill has also been an important site for research on semi-arid vegetation (Walker et al. 1995, Walker et al. 1999).

An overview of research on Obelisk PL since 1959 has been provided by Sir Alan Mark and is attached Appendix 4.5.3.

2.6 Fauna

2.6.1 Invertebrate Fauna

Introduction

The PL has been the subject of a formal ecological survey under the PNAP (Brumley et al. 1986) in which entomology was covered. The PNAP study commented on the high degree of endemism of the insect fauna of the Obelisk – Old Man Range RAP and noted the large number of Type Localities for native insects there too.

Numerous casual observations and collecting of insects has been done alongside Symes Road because of its close proximity to alpine communities. A popular book Wild Central (Peat & Patrick 1999) covers and illustrates some of the key ecological and entomological values of the Old Man Range and Flat Top Hill that are relevant to the Obelisk Station.

Habitats

The Old Man Range part of Obelisk Station contains the following natural habitats for native insects:

- High alpine herbfield, snowbanks, schist tors and fellfield
- High alpine seepages, wetlands and streams
- Alpine tall tussock grassland
- Alpine wetlands and streams
- Alpine to montane schist tors and rock debris
- Montane shrublands
- Montane short tussock grasslands

Flat Top Hill provides a range of dryland faunal habitats characteristic of Central Otago including shrubland, short tussock grassland, large tors and seasonal wetlands.

In general the PL is a mosaic of these habitats with much inter-mingling. At low altitude on the Old Man Range, including Flat Top Hill, the natural habitats are often best described as semi-natural with varying degrees of exotic plant species. With increasing altitude on the Old Man Range, the habitats for native insects become increasingly dominated by indigenous plants with very few exotic plant species in the high alpine zone.

The vast majority of insects present at all altitudes on both the Old Man Range and Flat Top Hill blocks are native.

Species

Native insects are diverse by order and species on the Old Man Range. For example, 226 species of Lepidoptera are recorded from this PL from the Flat Top Hill portion to the summit plateau of the Old Man Range. The list attached as Appendix 4.5.2 only contains the characteristic and significant orders and species that were observed. Where a species was first described from the Old Man Range it is noted as Type Locality. These are important sites for the species and act as a benchmark for defining the species.

2.6.2 Significance of Invertebrate Fauna

(See plan of significant ecological values 4.2.4)

High alpine zone – Top Block down to around 1300m

- This block has a high diversity of high alpine native insects and contains the characteristic species of the Old Man Range including beetles, grasshoppers, cicada, moths and ground weta, in good numbers in herbfield, snowbank, streams, seepages and fellfield.
- This zone on the Old Man Range is the Type Locality for many native insects that are found here, and therefore is a benchmark for those species in fixing their identity.
- Threatened insect species are present in this Block.
- This block has a high degree of naturalness, despite modification from its original condition.

Alpine grasslands – Obelisk Basin and bottom of Top Block

- These two Blocks have extensive tall tussock slopes intersected by steep-sided streams and perched wetlands of reasonable diversity of distinctive native insects.
- There is much modification and naturalness is variable, and the native insects closely reflect this.
- There is reasonable diversity of native insects present, with several regional endemic present.
- The native insect species present are widespread species of this altitude and vegetation type.
- Aquatic insect diversity is high in streams and seepages, with regional endemics present.
- Many insect species have their Type Localities on the Old Man Range in this zone, and are found on the PL.

Montane shrublands and short tussock grasslands – Blocks below 700m

- The grasslands and shrublands are highly disturbed with a predominance of exotic plant species especially inter-tussock.

- The native insects reflect the disturbance with fragmented populations and overall low diversity in some communities (grasslands), and moderate diversity in the most intact and diverse shrublands.
- Some of the native shrubs here support high numbers of native insects that are special to Central Otago; eg. *Olearia odorata, Muehlenbeckia complexa, Melicytus, Carmichaelia petriei* and *Corokia cotoneaster*.
- Streams are highly modified and variable in quality with widespread aquatic insect species only.

Flat Top Hill Block

- Modified grasslands on the western slope and summit contain widespread native insect species.
- Eastern steep slopes of shrublands and tors are of interest for native insects as some regional endemics are present with viable populations**.**
- Some threatened moth species are present in these shrublands.

Table 10: List of threatened insect species present on Obelisk PL

Species	Insect group	Location	Threat status
Hypsithocus hudsonae	shield bug	high alpine	Range restricted
Sigaus obelisci	grasshopper	high alpine	Range restricted
Maoritenes new species	tortricid moth	Montane shrubland on lower Old Man Range and eastern Flat Top Hill blocks	Gradual decline
Meterana exquisita	noctuid moth	Montane shrubland on lower Old Man Range and eastern Flat Top Hill blocks	Gradual decline
Bityla sericea	noctuid moth	montane shrubland on eastern Flat Top Hill block	Gradual decline

2.6.3 Herpetofauna

The Old Man Range portion of the PL was searched in sunny and warm conditions with some high cloud. Areas searched were near Butchers Creek at around 600 m elevation, and tors and outcrops near Symes Rd between 1340 and 780 m.

McCanns skinks (*Oligosoma maccanni*) were found at the lowest altitude site, although they are likely to be present above and below this altitude as well. Geckos (including shed skins) were found at altitudes from ca. 1050 to 780 m. Their appearance and snout-vent length means they

were all most likely to have been the Central Otago gecko (*Hoplodactylus* "Central Otago"). These may not extend much above this range, but will be present at lower altitudes.

The Flat Top Hill portion was surveyed in generally overcast and cool conditions. A system of ridges and gullies covering the altitudinal range of the Top Hogget block, and ridges and gullies from ca. 340 to 530 m on the River Faces block were inspected. McCanns skinks and Central Otago geckos were common in all areas where rock outcrops were present.

2.6.4 Significance of Herpetofauna

Both of the lizard species found are not threatened. Geckos are common in Central Otago and McCanns skink is common across the drier areas of the South Island (Jewell, 2008).

2.6.5 Avifauna

Table 11: Birds species recorded during the inspection were:

Common name	Scientific name	Threat Status
Banded Dotterel	*Charadrius bicinctus bicinctus*	Nationally Vulnerable
New Zealand Falcon	*Falco novaeseelandiae* "eastern"	Nationally Vulnerable
New Zealand Pipit	*Anthus novaeseelandiae novaeseelandiae*	Declining
New Zealand Pied Oystercatcher	*Haematopus finschi*	Declining
Southern Black Backed Gull	*Larus dominicanus dominicanus*	Not Threatened
Grey warbler	*Gerygone igata*	Not Threatened
Silvereye	*Zosterops lateralis lateralis*	Not Threatened
Swamp Harrier	*Circus approximans*	Not Threatened
South Island Fantail	*Rhipidura fuliginosa fuliginosa*	Not Threatened
Chukar	*Alectoris chukar*	Introduced
California quail	*Callipepla californica*	Introduced
Greenfinch	*Carduelis chloris*	Introduced
Skylark	*Alauda arvensis*	Introduced
Turkey	*Meleagris gallopavo*	Introduced
Yellow hammer	*Emberiza citronella*	Introduced
Pheasant	*Phasianus colchicus*	Introduced

Additional species will be present at times, including ducks on the irrigation ponds (e.g. mallard and paradise shelduck), and small passerines such as dunnock, redpolls and goldfinches.

Banded dotterel nest in open cushion and herbfield areas on the higher slopes and summit of the Old Man Range. They feed on ground-dwelling invertebrates and to a minor degree on the berries of prostrate plants (Heather and Robertson 1996).

New Zealand falcon may be seen over any part of the Old Man Range and Flat Top Hill parts of the PL. They feed mainly on small birds and mammals, and large insects (Heather and Robertson 1996). Owing to the broad dietary range of falcons all parts of the lease may be used when hunting, but areas of shrubland and tussock are likely to be especially important as habitat for small passerines. There are ample nesting opportunities on the faces above the Roxburgh Gorge, and is adjacent to the expanding diverse native shrubland of Flat Top Hill. For these reasons it is likely to be especially important as falcon habitat.

New Zealand pipit inhabits open country where they feed on invertebrates and occasionally grass, clover and weed seeds (Heather and Robertson 1996). They are more common in 'rough' country than in developed pasture (Heather and Robertson 1996). They will be present throughout Obelisk PL.

New Zealand pied oystercatcher nest on the summit plateau and have the same habitat requirements as the dotterel.

2.6.6 Significance

The following threatened bird species are significant:

- Banded dotterel
- New Zealand falcon
- New Zealand pipit
- New Zealand pied oystercatcher**.**

2.6.7 Aquatic Fauna

A number of sites were fished using an Kainga backpack electric fishing machine and stop net. Previous records referred to are taken from the New Zealand Freshwater Fish Database (http://fwdb.niwa.co.nz).

Sites fished were as follows: Refer Table 12. No fish were found during the survey.

Table 12:

Sampling site	Stream features	Riparian features	Fish previously recorded (NZFFD)	Current survey
Last Chance Irrigation Company Ltd. water-race: 1308764 4973011 (NZTM)	Generally ca. 1 m wide, 0.3 m deep. Sand and fine gravel bottom, 100% run habitat.	100% grass and tussock.	Nil	Nil. Given the lack of fish found in Butchers and Obelisk Creeks none would be expected.
Obelisk Creek: 1307510 4972046 (NZTM)	Generally 0.8 m wide, 0.1 m deep. Fine gravel and cobble substrate, 10% pool, 30% run, 50% riffle and 10% rapid habitat.	100% grass and tussock.	Nil	Nil
Obelisk Creek: 1307713 4972233 (NZTM)	Generally 0.5 m wide, 0.05 m deep. Mud, fine and coarse gravels, and cobble substrate, 40% run, 40% riffle and 20% rapid habitat.	100% grass and tussock.	Previous records indicate upland bully (*Gobiomorphus breviceps*) to be present in Obelisk Creek downstream of the PL.	No fish were found at either Obelisk Creek site. At this altitude, the creek appears to be too fast and steep to be suitable for the native or introduced fish species that are present in Central Otago.
Butchers Creek: 1307802 4974389 (NZTM)	This was a series of pools with no surface flow connecting them. Coarse gravel and cobble substrate,	100% grass and tussock.	Previous records from Butchers Creek in the vicinity of Butchers Dam indicate trout, perch (*Perca fluviatilis*) and common bully (*Goboimorphus cotidianus*) to be present.	No fish were found at this site. The ephemeral nature of the creek at this point may preclude fish from occupying it.

2.6.8 Significance of Aquatic Fauna

No significance is accorded to the fish values of Obelisk PL.

2.6.9 Problem Animals

Hares may pose a threat to the natural vegetation of Obelisk PL. At lower altitude and on Flat Top Hill rabbits and possums are a problem with their differential browsing and disturbance of the vegetation. Much of the lower altitude land is extremely rabbit prone requiring ongoing

control. Flat Top Hill has seen many rabbit plagues in the past which accounts to a large extent for the current low stature vegetation.

Goats are present on Flat Top Hill from time-to-time, and along with rabbits, could pose a threat to the natural values.

2.7 Historic

The history of the PL is primarily related to 19th and early 20th century pastoral and gold mining activity. The PL lies within a much wider mining landscape. The two main catchments within the PL being Obelisk and Butchers Creeks were extensively mined both within the PL and in their lower reaches. Fruitlands (previously known as Bald Hill Flat) below the PL was extensively mined. Mitchells Cottage Historic Reserve on Symes Road almost adjoins the PL.

This report presents a summary of the historical and archaeological information currently available for the PL, and new data gathered during the tenure review field survey of the Obelisk block. The significance of the remaining historic features, and recommendations for their protection, are described.

Historic records and Previous Archaeological Surveys

Pre-contact Maori Sites

Maori chisels, wooden bowls and ovens were found at a depth of 9-16 feet (Dunstan Times 30 June 1882: 2; AJHR 1897: C-3 page 133) at Obelisk Creek at the base of the Obelisk Range on the mining claim of Wilkinson and Mitchell. The location of this find is not confirmed. Hamel (1995: 4) suggested Wilkinson's cottage and claim to be opposite Mitchell's cottage at Obelisk Creek which places it outside of the PL.

Four New Zealand Archaeological Association (NZAA) records exist for Maori sites in the Fruitlands-Coal Creek area: the Court Hill site (G42/2), the Coal Creek site (G43/51), and the porcellanite quarries at Coal Creek (G43/30) and Mt Benger (G43/4) (Hamel (1988: 16, 22). A test pit of a moa-hunter site near Coal Creek (Roxburgh) revealed moa bone and flakes (Anderson and Ritchie 1984). Hamel (1988) noted the two porcellanite sites were at risk from mining and agricultural activities.

Gold Mining and Pastoral Farming

Books by John McCraw (2000, 2003, 2005a) and reports by Jill Hamel (1988, 1989, 1994, 1995) give detailed gold mining and farming histories of the area. Gold mining sites within the PL have been extensively reported in 'Gold on the Dunstan' (McCraw 2003) and 'A Fruitful Land' (McCraw 2005a) which provides detailed plans and photos of key sites, as well as the individuals and companies involved in mining. Parts of the book 'Gold on the Dunstan' have been reproduced in Appendix 4.5.4 as they provide a detailed insight into activities in and around the PL.

The early history of the Obelisk PL is from the mid-1800s, when the 35000 acre Run 369 at Obelisk Creek was granted to W.H. Teschemaker. John Cargill and Archibald Anderson were running 17,940 sheep on Runs 369 and Run 425 (Campbell's Creek a tributary of the Waikaia) in 1871. The PL boundaries ran from the Obelisk (tor) on the Old Man Range and Butchers Creek to the north and south down to Mt Benger below Roxburgh (Beattie 1979: 368, 379, Sinclair 2003).

The NZAA database holds 22 site records for pastoral, gold recovery and other activities on the PL. Four sites occur west of the main highway: Last Chance water race (G42/258), chimney site (G42/276), Dr Hyde's water race (G42/267), White's Reef (G42/294), and 18 sites, predominantly rock shelters, were recorded during the Clutha Valley Development in 1980 (Harrison 1982) on the true right bank of the Clutha/Matau-au River (G42/56-57, G42/59-65, G42/76-77, G42/81-82, G42/84-85, G42/87, G42/98). Alexander Don had noted Chinese dwellings in caves at Doctors Point around 1890 (1900-01: 26 cited in Harrison 1982: 8). Hamel (1995: 14) recorded a hamlet (G42/276) just above the fence line demarcating the Dunbier Freehold sections, but as the lessee at that time did not permit access no details were obtained.

Both alluvial mining and hard rock quartz crushing were undertaken on the PL and both produced high yields of gold. Important alluvial mining sites are in Obelisk Creek up to White's Reef, Butchers Creek, Coal Creek, and on Flat Top Hill. Hard rock mining took place in upper Obelisk Creek (White's Reef) and upper Coal Creek (Gray's Reef).

The Department's unpublished Obelisk Creek PL Conservation Resources Report (1995: 6) refers to the deteriorating nature of the early Butler sod farmhouse and corrugated iron woolshed on Obelisk Creek, although the farmstead is not on the Obelisk PL. The report also mentions quartz mines high in Obelisk Creek and on the spur beside Coal Creek.

Dr. Hyde's water race, and any un-modified sections of the Last Chance water race, were noted as key significant conservation features in the adjoining Obelisk Creek PL Conservation Resources Report (1995: 9). The Last Chance Hydraulic Elevating Company [James Hesson and James Simmonds (Symonds)] became an important gold recovery company on Bald Hill Flat in 1891. A network of water races and dams were constructed to service the workings (AJHR 1897: C-3 page 133; DOC Obelisk Creek PL Conservation Resources Report 1995: 5, Hamel 1995, McCraw 2000: 158-163, 290-294, McCraw 2005a: 336-348). Archaeological assessments of the Last Chance Company's water races are provided by Briden (2006) and SPAR (2007).

Other claims were taken up from the 1880 onwards, by notable characters such as brothers John and Andrew Mitchell, George Wilkinson, McClosky and John Ewing, Carroll and Lynch. The Mitchell brothers worked up the hill at the quartz mines with their cousins George and James White. The Mitchell brothers built Mitchell's Cottage now located on Symes Road (Hamel 1989: 1, 1994).

Gold dredges were active on the Clutha/Matau-au River alongside the PL boundaries. The access road along Flat Top Hill was originally constructed to bring coal to dredges above Doctor's Point (McCraw 2000: 185). Coal was sledged down zig zag tracks to the gorge (Moore

1953: 44). Hut sites or rock shelters along the west bank of the river may have been used by people involved with supplying coal to the dredges.

Survey Method

Historic records helped identify sites for closer inspection during the survey conducted on 8-12th February 2010. A second inspection was undertaken on 21st April 2010 to inspect settlement sites at White's and Gray's Reefs. Further work was done on 23rd April 2010 at White's Reef and two settlement sites.

Archaeological/historic sites and features inspected were marked with GPS waypoints See Appendix 4.2.7); details are held in the DOC database. Site records for newly recorded archaeological sites or features have been lodged with the NZAA.

Historic Heritage Description

The archaeological/historic features on the PL include rockshelters, earthen walled reservoirs, water race systems, gold sluiced gullies, hut sites, trig stations, fence lines, pack/dray tracks and roads, a coal road, and associated site artefacts. Sites (G42/258, G42/267, G42/276, G42/294, G42/327, G42/329-331, G42/333) are pre-1900, although some may still have been in use into the early 20th century.

Table 13: Significant archaeological and historic features and sites inspected during 2010 field surveys of the Obelisk PL.

NZAA sites	Description	New GPS ID Numbers	Plates
G42/258	Last Chance water race	45, 47, 161,164, 174	
G42/258	Last Chance Dam	254	7
G42/267	Dr Hyde's water race	11?	
G42/276	Chimney/Hamlet site	248, 250, 266-267	1
G42/294	White's Reef	122	
G42/294	White's hut	123	2
G42/294	2 x huts below White's hut	99, 348	3, 4
G42/333	Gray's Reef	78	hut 5, reef 6
G42/330	Gray's Dam	159	9
	Crossan's Dam	357	
G42/326	Ewing's Dam	179	8
G42/326	Hut site and two other structures above Ewing's Dam	336-338	8, 19-20
G42/330	Gray's Hut and two other structures	hut 150, 151, 356	16-18

Pre-contact Maori Sites

Maori historic sites were located on Flat Top Hill by the Ngai Tahu archaeologist. Ngai Tahu will report separately to LINZ on sites found. A Statutory Acknowledgement area (SO 24727) applies to the Clutha/Matau River (Schedule 40, Kai Tahu ki Otago 2005: 192-193) as a major pathway and as a food gathering resource.

Pastoral

Buildings

The chimney (G42/276) recorded by Hamel (1995: 14, Figure 3) was inspected (Historic Photos 4.3.2 - Plate 1). These buildings may have been for squatters avoiding Dunbier's freehold land.

Fence lines

Remnant 19th-20th century fencelines were found on the PL that included wood post, flat standards, and schist uprights.

Gold Mining

Features of importance are described briefly below.

Bald Hill Flat

The gold workings located on Bald Hill Flat are not on the Obelisk PL, although some of the water races required for that mining do cross the PL (AJHR 1893: C-3 page vii, McCraw 2003: 54-84). Most of the races were constructed from 1891 to1893. Dams associated with the water supply systems that reside within the PL, Ewing's (GPS 179), Last Chance (254), Gray's (159), and Crossan's Dams (357).

White's Reef Company (G42/294)

White's Reef (GPS 122) is located close to Symes Road and White's Hut (Historic Photos 4.3.2 - Plate 2) stands alone a few hundred metres from the road. It is in good order, having been built with much skill by Andrew Mitchell in the same manner as Mitchells Cottage further down Symes Road.

Two other well built stone huts are located within 160m of each other adjacent to the old road alignment below White's Reef. One is a two roomed hut (Plate 3, GPS 348) and the other a single roomed hut (Historic Photos 4.3.2 - Plate 4, GPS 99). Both huts are mostly intact but without roof coverings. One of these may have been a mining office.

The surrounding slopes show numerous *in situ* tracks, dams, races, stamper battery sites, sluicings and artefacts.

In November 1883, James White and Andrew Mitchell formed a company to work the quartz reef found by White while alluvial sluicing. Sixteen other leases were also granted (AJHR 1884: H-9 page 37, AJHR 1888: C-6 page 30). Andrew Mitchell found the quartz reef in the early 1880's and formed the White's Reef Gold Mining Company with John Mitchell, James White and George White (Hamel 1989: 1). Various companies were formed to work the three main quartz reefs, White's, Exhibition, and Gray's, all in the vicinity of Obelisk Creek (Galvin ed. 1906: 160, Moore 1953: 32-33, Otago Witness 1883: 12). Survey Office (SO) Plan 3502 (dated November 1883: QuickMap Landonline) shows some of the company claims granted around White's Reef, White's Co., Lythgoe and Gray, Last Chance Co., Wookey's, and Advance Co. SO 3507 (dated February 1884) shows other claims being taken up, Just in Time Co., Southern Cross Co., Last Chance No.2, Orion Co., and Surprise Co. A plan of these claims is shown in McCraw (2003: 101, Figure 6.5) and reproduced in Appendix 4.5.4.

A water race was constructed bringing water from Gorge Creek over six miles in length to White's Reef (AJHR 1884: H-9 pages 37-38). A five head crushing battery driven by a Whitelaw turbine was erected near the mouth of the adit entrance (AJHR 1887: C-5 page 41, McCraw 2005b: 63-66). James White formed a rough dray track from the main highway to within a few chain of his claim. A separate bridle track from the dray road was the recommended means of visiting the reefs. This dray track may be that shown on SO 268 (dated June 1879) running from J. Mc Cambridge's freehold Section 59.

W. Wookey and James Gavin worked the Exhibition Reef until 1888 when it passed to Robert and Henry Symes along with the White's Reef claim. Robert Symes was mine manager of White's Reef prior to the change of ownership. The claim came with a five head stamper battery, a chilian mill, a McQueen's patent grinder and amalgamators, water rights, mining tools, and buildings. White's Reef was worked through to the early 1920's (AJHR 1891: C-4 page 181, AJHR 1892: C-3 page 59, Moore 1953: 33). Henry Symes was town clerk in Alexandra from 1893-1899 and served as Mayor from 1900-1901 (McGraw 2000: 161). Some of the machinery used at this site is still present much of it stamped to identify Crown ownership. Unfortunately the Whites Reef stamper battery was removed some years ago, but the site it was taken from is clearly evident with timbers still present.

George Lythgoe and James Gray held a 10 acre PL ca. 200 yards below White's and other companies included Kenard and party, and Baker and others (AJHR 1891: C-4 page 181).

Gray's Reef (G42/333)

Gray's reef workings (Historic Photos 4.3.2 - Plate 5) are clearly visible on the ground although shafts and drives appear filled in. Stamper sites, hut ruins and some artefacts are still present.

Frank Gray and Hugh Crossan worked on a rich quartz reef (Excelsior mine) on Coal Creek spur from 1891-1898 (Historic Photos 4.3.2 - Plate 6). The proprietor of the hotel and store at Bald Hill Flat, Mr Kemp, cut a water race in 1865 to the South Dam (McCraw 2003: 69-70, Figure 4.1) to supply water for prospecting the ground on Bald Hill Flat and a shaft was sunk. The warden reported fine gold in a free state that was easily amalgamated where as at White's Reef it was of a coarse nature. The company used a stamper battery of three heads, brought over from

the Conroys Quartz Mining Company in 1880, to drive a pelton hurdy-gurdy. They worked the reef for a distance of 170 yards on the surface and tested to a depth of 42 feet by shafts (AJHR 1893: C-3 page 86, AJHR 1893: C-3 page viii, Moore 1953: 32-33). The ore was lifted by a hand windlass, of which two remain on site (GPS 90 and 92), and sledged to the battery site (AJHR 1898: C-3A page 104). The Excelsior mine produced more gold than any other quartz mine in the district with a return of 256 ½ oz from 118 tons of rock crushed (more than 2 oz per ton) in December 1892 (McCraw 2003: 111-114, Otago Witness 29 December 1892: 14). Further mining occurred in 1903 with 62 oz recovered from 28 tons of crushed ore. A great drawback was the lack of a road to the mine.

Dr Hyde's water race (G42/267)

The Hyde water race runs at an altitude of nearly 1,360 m diverting water from the head of Gorge Creek into the headwaters of Coal Creek. The race was built by the Old Man Water Company in 1872 supplying water to miners working on Bald Hill Flat. The race is named after Dr James G. Hyde a well respected medical practitioner of Clyde and Superintendent of the Hospital from 1886 to 1914. Dr Hyde acquired the water race and offered two heads of water to the Alexandra Borough Council in 1901 to supply the town of Alexandra and for irrigation at Fruitlands. Hyde founded the successful Clyde Gold Dredging Company which helped establish the dredging industry in Otago (McCraw 2000: 159-160, McCraw 2003: 71).

It is not clear at what altitude the race runs along the Old Man Range. The Alexandra Topomap (1990) shows Dr Hyde's race at 1,260 m while McCraw (2000: 159-160) notes the race at nearly 1,360 m. Hamel (1988: 16) notes the Hyde water race at an altitude of 1,200 m. A large race was recorded on the 1,158 m contour (see map) although it is not confirmed if this is Dr Hyde's race.

The Last Chance water race (G42/258)

This race is still in use for irrigation and has had recent works to remove a piped siphon built after 1954 (McCraw 2000: 341-344, SPAR 2007:3) across Obelisk Creek.

The Last Chance Company was founded by James Simmonds, Stephen Foxwell, Sam Simmons, James Hesson, and Peter Jacobs. William McNeish was the manager (Moore 1953: 33). Hesson, Simmonds and party extended their race from Shingle Creek over a distance of 17 miles delivering 15 heads to keep two elevators in operation (AJHR 1893: C-3 page viii).

A dam shown as the "Last Chance Dam" lies under the race towards the lower boundary of the PL at GPS 254 (Historic Photos 4.3.2 - Plate 7). It has recently been modified, possibly to remove silt from the floor or to improve the water tightness. Internal historic rock linings are still intact (Appendix 4.5.4, See Figure 4.5 McCraw 2003: 76).

Water from the race also fills the dams known as Ewing's (Historic Photos 4.3.2 - Plate 8, GPS 179) near the bottom of Symes Road and Gray's Dam (Historic Photos 4.3.2 - Plate 9, GPS 159) near Gray's hut site.

Obelisk Creek

Significant alluvial mining was recorded in Obelisk Creek. Recorded features include tailing piles, dams, stone revetted water races, stacked schist plinths presumably to support fluming or the siphon.

Butchers Creek

Charles Goltz was the first to discover a quartz reef in the district on a ridge between Chapmans and Butchers Creeks. Various parties sunk shafts in Butchers Creek including the Belle and Beau Reef, and the nearby Great Western Reef and Day Dawn Reef, collectively known as the Butchers Gully Reefs. The Day Dawn reef was actively worked again in 1907 although none of these reefs met with much success (McCraw 2003: 96).

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The Bell and Beau claim of Kemp and Symes located at the side of Butchers Gully showed fair prospects but on sinking it did not prove payable (AJHR 1890: C-3 page 60). The location of this claim is not confirmed although features are recorded in Butchers Creek.

Parallel water races were recorded diverting from the true right bank of Butchers Creek (GPS 194) and tailing piles were noted below the race intake (GPS 194, 197, and 199). Robert Mitchell's race from Butchers Creek was constructed in 1864 to feed his workings on Obelisk Creek (McCraw 2003: 56-58, Figures 4.1 and 4.2 pp 69-70).

Flat Top Hill

Alluvial ground sluicing and water supply systems were recorded on Flat Top Hill (G42/327). Very little water is available here but water may have been piped across the valley. Sluicing gulches were noted at GPS 283 (Historic Photos 4.3.2 - Plate 10), below an earthen raised dam wall at GPS 282 (Historic Photos 4.3.2 - Plate 11), and in a tributary of Butchers Creek north-west from Trig C at GPS 265 (Historic Photos 4.3.2 - Plate 12).

The access road along Flat Top Hill was a road constructed to bring in coal to the gold mining dredges on the Clutha/Matau-au River above Doctor's Point (McCraw 2000: 185, Figure 17.2).

Two buildings from a movie set are located on Flat Top Hill at GPS 249 and 271. They consist of an old corrugated iron hut and rather impressive stables built by locals in the 1970s for the TV series "Gold" (Historic Photos 4.3.2 - Plate 13).

Trig stations

Two 19th century Trig stations are located on the PL: Trig C (G42/329 Historic Photos 4.3.2 - Plate 14) on Flat Top Hill and Trig D (G42/331 Historic Photos 4.3.2 - Plate 15) north of the access track south of Bald Hill. Both Trig stations are shown on SO 3482 dated to 1868 (QuickMap Landonline).

Buildings

Two settlement sites were found on the PL that appear to have clear associations with gold mining. A hut site (G42/330 Historic Photos 4.3.2 - Plate 16) and two other structures (Historic Photos 4.3.2 - Plates 17-18) are located among trees on the eastern boundary north of Symes Road at GPS 150. These have previously been identified as Gray's hut (McCraw 2003: 76). Also a hut site and two other structures (G42/326 Plates 6, 19-20) were located adjacent to Symes Road above the Last Chance Race and Ewing's Dam at GPS 336-338. They are likely to be associated either with the race/dam or gold mining on the flat below. Some miners preferred to live above the winter fog.

Other Features

A probable sub-fossil site was recorded on Flat Top Hill at GPS 281. Three weathered Moa bones were collected by DOC staff, a partial shaft of a probable Tibiotarsus, a partial vertebrae, and a foot bone.

Small rock shelters were noted on the PL some that display modification by the addition of rock stacked walls. A stacked schist hut site at GPS 200 (Plate 21) is built up against a rock tor in Butchers Creek although the function is not known.

Various pits are located on the PL that probably relate to gold prospecting. Stacked revetted dray tracks providing access between sites were recorded.

A feature of the PL are the numerous mining artefacts which include stampers and stamper heads, shafts, turbines and camshafts, many of which are depicted in McCraw (2003: 101-116 reproduced in Appendix 4.5.4).

2.7.1 Significance

The above review of the history and archaeological sites recorded during the Tenure Review field survey of the Obelisk PL illustrate some of the rich history of this PL. These sites attain significance because they are well documented, easily accessible and form part of a wider mining history of the area. Of most significance is the remaining fabric of gold mining activity undertaken on the PL and the record of pastoral history related to the early run, for example, the notable people involved in the running of the PL include W.H. Teschemaker, John Cargill, and Archibald Anderson. All were prominent Otago entrepreneurs, business men, land and company owners.

Obelisk PL contains key significant features associated with alluvial and hard rock mining including dams, reservoirs, water races, sluice faces, tailings, hut sites, stamper battery sites, mines office, rock shelters, and portable artefacts. The presence of a range of artefacts and sites sets these mining sites apart from many others.

The hard rock mining sites of White's Reef, Exhibition Reef, and Gray's Reef are significant. Prominent persons involved with working the quartz reefs include James White, George White, James Hesson, James Simmonds, Frank Gray, Hugh Crossan, Andrew Mitchell, John Mitchell and Robert Symes, however only the latter three could be considered prominent in the district.

White's hut site (G42/294) has links with Mitchells Cottage on Symes Road. Of significance is the relative intactness of the whole system of dams, water races, workings and occupation sites, along with the association of the White's Reef. Significance is the association of the Mitchell Brothers of Mitchell's Cottage with the White Brothers of White's Reef.

Gray's hut (G42/330) is significant because of its association with the Excelsior Mine at Gray's Reef (G42/333). The hut site has a standing chimney with eroding mud brick walls and associated structures. It is flanked to the northwest by Gray's Dam which supplied water to alluvial mining on Bald Hill Flat. Frank Gray worked at Gray's Reef and daily walked the 4 km to his claim. Gray's Reef produced the highest yields of gold in the district (Dunstan Times 20 January 1893, McCraw 2003: 111, Otago Witness 29 December 1892: 14).

The 19th century surveyor Trig stations 'C' (G42/329) and 'D' (G42/331) are important features related to land parcel subdivision for the early pastoral runs and for delineating gold mining claims.

2.8 Public Recreation

Physical Characteristics

Located close to Alexandra and Roxburgh the lower, more accessible sections of the PL are used by recreationalists on an almost daily basis. The lease is located in an area which is used extensively by residents of the wider Southland and Otago area over the summer period. Recreational opportunities on the PL provide for the extension and enhancement of the existing opportunities within the adjacent Kopuwai and Flat Top Hill Conservation Areas and with the nearby Mitchells Cottage Historic Reserve. See a plan of the recreation opportunities Appendix 4.2.8.

Old Man Range block

This block is bound to the east by the flats associated with the Bald Hill gold mining and now commonly called Fruitlands. Kopuwai Conservation Area forms the western boundary and the northern and southern boundaries above approximately 1400 m. Below 1400 m the PL is bound on both the northern and southern boundaries by lands freeholded following tenure review of adjacent pastoral leases. This block is bisected by a prominent ridge that extends from the valley floor to the range crest. The remainder of the PL are the majestic gullies and basins associated with the headwaters of Obelisk Creek to the south and Butchers Creek to the north.

Flat Top Hill block

The northern boundary of the Flat Top Hill block abuts the Flat Top Hill CA. The eastern boundary is a combination of Lake Roxburgh Marginal Strip and LINZ managed lakebed. A Contact Energy operating easement is also in place adjacent to Lake Roxburgh. The PL Gorge Creek II forms the southern boundary of the block while on the western boundary is a series of freehold sections with various owners. This block rises steeply from both the Lake Roxburgh and SH8 sides of the PL to a raised plateau which runs from north to south. The area epitomises the undeveloped dry and rocky landscape of Central Otago, but which is becoming increasingly rarer due to the spread in recent years of large scale irrigation projects, vineyards and lifestyle blocks.

The low altitude sections of both blocks lie within the 'rural' recreational opportunity setting in the Department's Otago Conservation Management Strategy (CMS) (1998). The CMS defines the rural recreation experience as focused on "…companionship with family and friends and relaxation."

The high altitude section of the Old Man block lies within the 'backcountry' recreation opportunity setting in the CMS. The CMS defines the backcountry experience as being characterised by a "…feeling of relative remoteness from populated areas, yet has good recreational facilities. The highly natural setting is a valued part of the experience and may be associated with motivations of "escape from town", education, exercise and/or a sense of being close to nature".

The recreation opportunities for the area are further described in the Otago Conservancy Recreation Opportunity Spectrum (ROS) (Harper 1992) as ranging from 'rural' for the lower altitude lands transitioning to 'backcountry' as the altitude increases. The area provides both 'backcountry drive-in' and 'backcountry 4x4 drive-in' during the summer and also includes 'backcountry walk-in' opportunities during the winter. The highest altitude areas are also classified as 'remote' during the winter months. Harper's ROS describes the entire Conservancy regardless of land tenure and were classified and mapped according to setting, activity and recreational experience characteristics. The Recreation Strategy: Otago Conservancy (Springer 1993) referred to the need for "extended walking, mountain biking, cross country skiing, off road vehicle and horse riding opportunities" in Central Otago, while noting that the closure "of legal formed and unformed roads (e.g. closure of Symes Rd)" was a threat. Although these works are under revision their commentary on this area holds true.

In 1988, Federated Mountain Clubs compiled an outdoor recreation plan for the Central Otago block mountains (Mason 1988). The plan indicates the Old Man Range as having a long history of cross country skiing and other snow related activities. This included plans by the Vincent Ski Club to develop a ski ground on the slopes of the lease in 1953. Whites hut was re-roofed as part of this plan but no further development was undertaken due to lack of snow. The ease of access and the presence of one of very few public roads that reaches the snowline has resulted in the Old Man and adjacent Old Woman ranges being among the most frequently used snow areas in Otago. The construction of an "all weather access" up Symes Rd to the Kopuwai/Obelisk repeater in 1974-75 by the New Zealand Broadcasting Corporation (NZBC) has facilitated both four wheel drive and during the summer, two wheel drive access to the range crest. With the access came the increased opportunity for nature and historic appreciation as well as recreation.

Opportunities for pubic recreation in the area encompassed by the Obelisk PL arise from the following:

- The proximity of the lease to Alexandra and Roxburgh, the residents of which use the area winter and summer.
- The proximity of the lease to SH8 allowing for easy access from coastal Otago and Southland.
- Outstanding views over the Central Otago block mountain and basin landscape.
- Provision of legal access to Kopuwai CA via Symes Rd.
- Access to points of interest and provision of scenic amenity adjacent to the proposed New Zealand Cycle Trail from between Alexandra and Roxburgh
- Access to significant historic sites

Legal Access

Symes Rd

The most important legal alignment within the PL is that associated with Symes Rd which runs from the eastern boundary of the Old Man Range block to the crest of the Old Man Range/Kopuwai. Symes Rd connects to SH8. The road appears on survey maps from June 1879 (SO 268) and there is ground evidence of this alignment in many places. SO268 indicates that the alignment was surveyed below Whites hut. The NZBC formed road does not follow the legal alignment in many places. The Central Otago District Council does not maintain the road beyond Mitchells Cottage but recognises that it provides existing vehicle access to a point of commercial and public interest.

The formed road provides for important access (motorized and non-motorized) to the slopes of the Old Man Range year round and to the crest when snow is absent (CODC 2010). Symes Road is one of only a few alpine roads in Central Otago that has been constructed to a standard capable of sustaining all year round use. It is maintained periodically by Kordia (previously NZBC) to service the television translator at Kopuwai/Obelisk (a large rock tor on the summit to the north of the PL boundary). Ensuring year round as-of-right legal access to the current Symes Rd alignment is vital for both DOC management and recreational users of the Kopuwai CA.

Although regarded and used by many as a public road the presence of up to six closed gates including a deer gate at the bottom, means that non locals are dissuaded from use of the road.

Other legal roads Old Man Range block

The eastern boundary of the Old Man block is bound along almost its entire length by a legal road that provides road frontage for the sections on the Bald Hill Flats.

A legal road runs from the Symes Rd alignment just above trig D (728m) and runs northeast to the lease boundary. The legal road continues through the flats until it reaches SH8.

A legal road also runs from Whites hut to the eastern boundary adjacent to freehold enclave (sec 59). This alignment is still visible on the ground in places.

Legal roads Flat Top Hill block

The legal access from SH8 to the PL boundary is via a road immediately south of Bald Hill. A legal road runs from the boundary to another legal road that bisects the PL north to south. The track formation is off the legal alignment in places. The legal road that bisects the PL is not formed except where it runs north of the SH8 link road. A third unformed legal road runs west from Lake Roxburgh to connect the legal alignment that bisects the block this however does not provide a practical alignment to access the lake edge.

Marginal strips

There are currently marginal strips over Butchers Creek up to an altitude of 700 metres and an intermittent fixed marginal strip along Lake Roxburgh. It is likely disposal of land through tenure review would result in marginal strips being created on lower altitude sections of Obelisk Creek over 3 m wide where they lie within the lease boundaries.

Activities

The CMS identifies the activities most often associated with the 'backcountry zone' as including hunting, tramping, camping, mountain biking, outdoor education and nature appreciation. Day trips are common. Activities associated with the 'rural zone' include driving for pleasure, horse riding, walking and picnicking. The area surrounding and including Obelisk PL is considered by most Alexandra basin residents to be their recreational 'back yard'. The area is also used extensively by residents of the wider Otago and Southland region. Some of the forms of recreation are not focused on particular tracks/localities but rather tend to be activities involving roving through the landscape.

Cross country skiing

The alpine portion of the PL is small in relation to the total expanse of the Old Man-Obelisk Ranges summit; however it is traversed by almost all cross country skiers using the Kopuwai CA. Most skiers using the Kopuwai CA drive up Symes Rd to the snow line before using the basins in the headwaters of Coal and Butchers Creeks to access the range crest. Most years vehicle access is possible to the 'snow gate' [approximately 1250m above sea level (asl)] but it is not unusual for the snow to be as low as 1100 m. The importance of Symes Rd and the need for associated winter hardened parking areas is recognised in the draft Central Otago Recreation Strategy (CODC, 2010)

Walking, tramping, running, mountain biking & horse trekking

The Central Otago District Council (CODC) has been funded to undertake a feasibility study for part of the New Zealand Cycle Trail to run from Alexandra to Roxburgh. Preliminary work

indicates that the route will not largely be in the PL but in some parts the best location is within the PL. Operators of the trail are also likely to want to use the unformed legal roads through the PL from SH8 to the trail for construction, maintenance and possibly visitor access. The amenity value associated with dryland vegetation, schist rock landscape and a feeling of being 'in the middle of nowhere' is a key feature of the currently proposed route adjacent to the PL.

While recreational use of many parts of the PL area is common the following routes/places are of particular importance:

- The legal alignment from SH8, Bald Hill access rd, formed track south of trig C, formed track / legal road north to Flat Top Hill CA.
- Symes Rd alignment for both access and mountain biking particularly the track below the Last Chance Race, north to the PL boundary that connects with a track (through Earnscleugh Station freehold land) to Sheephead Station Rd.

Off road vehicles & motorcycles

Other than extensive use of Symes Rd existing use is very limited within the lease. Snow mobiles also use the upper basins of the lease to access the range crest. The importance of Symes Rd and the Old Man Range for snow mobiles and tracked snow cats is recognised in the draft Central Otago Recreation Strategy (CODC 2010).

Botanising and naturalising

The PL contains the full altitudinal sequence of plants associated with a dryland tussock grassland including alpine cushion and herbfield communities and the presence of Symes Rd means that they are easily accessible to all. It is not uncommon to see road users exploring the various biological and geological features directly adjacent to the road.

Hunting

The size of the PL means that only limited numbers of big game occur in the area. Red and fallow deer occur in limited numbers within the Old Man block and goats in the Flat Top Hill block. Small game including rabbits and game birds are present in lower altitude sections of the PL.

Cultural history

While there are many historic sites on the PL Whites Hut and its associated workings would be the ones most likely to be visited. The remainder of the sites are currently of more specialist interest with users seeking permission to visit particular sites.

Gold mining

Currently this occurs to a very limited extent, although there is potential for the provision of gold panning opportunities in either Obelisk or Butchers Ck. Before recreational mining can occur an

area needs to be designated as such by Crown Minerals. Recreational gold mining was identified as desirable during recent consultation with the Central Otago public (CODC 2010) and is identified in the CMS.

PART 3

OTHER RELEVANT MATTERS & PLANS

Consultation

There was an early warning NGO meeting on the 10 September 2009. Matters raised by NGOs:

- Forest and Bird (F&B) - potential for an attitudinal sequence? Need for some sort of access to Flat Top Hill.
- Federated Mountain Clubs (FMC) - Old Stone Hut up Symes Road - Historical significance? May be off lease?
- F&B - noted OM2/3 no longer what it was. Suggested using existing fence which runs below historic hut right across PL as boundary i.e. ~ 750m. Noted importance of fenced exclosure plots (since 1960's?)
- Central Otago Recreational Users Forum (CORUF) note Symes road on legal road as far as hut - if CA boundary started here there would be no issue with legality.
- Flat Top Hill Spring Annual potential noted.
- F&B noted importance of Lake Roxburgh landscape values protection of subdivision, pines and other development required.
- FMC also provided additional written points suggesting legal public access up Symes Road and protection for RAPs.

The following comments were made at the meeting with NGO's in Alexandra on 27 April 2010.

General Comments

- Flat Top Hill wetlands, there is a case for continued grazing. Covenant suggested, there would be no need for a stock limit? No information on impacts known. Too dry to intensively graze?
- Need to provide for wander at will public access.
- Need weed control (broom).
- Lake face of value for recreation (Clutha Trail)
- Goat control is needed
- Symes Rd is the most important SIV but is not a legal road
- In 1974 a road to translator was constructed. BCNZ maintain the road – question, do they have an easement.
- A lot of scientific research done on the PL – McCaw, Mark, Hamel etc
- Sir Alan Mark's series of plots illustrate altitude/climate influence on vegetation.
- CORUF have a register of last 2 years recreational use
- Information also contained in NZ Geographic Society 1965 publication on Central Otago.

Additional written submissions (attached in Appendix 4.4) have been made by:

- Royal Forest and Bird Protection Society of NZ (Central Otago – Lakes Branch and Dunedin Branch)
- Federated Mountain Clubs
- New Zealand Deerstalkers Association
- Central Otago Recreational Users Forum

3.2 Regional Policy Statements & Plans

Within the Otago Regional Council Regional Plan: Water for Otago, there no significant wetlands or waterways sensitive to suction dredging are identified as being within the PL.

3.3 District Plan

The western half of the PL is identified in the fully operative Central Otago District Council District Plan (Plan) as being within an Area of Outstanding Landscape Value (Old Man, Old Women and Garvie Range Complex, hereby termed "OLA"), with the remaining eastern 1/2 being located in the Rural Resource Area (RU) of the said Plan.

Under the fully operative provisions subdivision of less than 8ha in the RU requires a resource consent, as does buildings within 20m of any waterbody; while a resource consent is required for any earthworks, deposition of sediment, earthworks greater than 20m3 and the removal of vegetation within 10m of any waterbody. Earthworks not exceeding an area of greater than 2000m2 or quantity of 3000m3 from any one site also require resource consent.

The clearance of indigenous vegetation in any Significant Natural Area or if the area or type triggers specified thresholds (in any part of the district, irrespective of zone) requires a resource consent. Note however that these provisions do not apply to land that is freeholded via tenure review.

Planting of greater than 2ha of specified exotic species requires a resource consent, please note that the planting of species with a high wilding potential have higher restrictions placed on their planting than those with less such potential.

Within the areas identified as OLA, resource consent is required for earthworks which breach specified thresholds, activities including but not limited to the cutting of new road etc, subdivision (except for the creation of legally protected land) and the planting of exotic forest/woodlots/shelterbelts. Again note however that these provisions do not apply to land that is freeholded via tenure review

`Under proposed plan changes 5A-5W (publicly notified on 10 October 2008) the section of the Roxburgh Gorge within the Pl were identified as being *Significant Landscape Features*, whilst the remainder of the PL was identified as being a landscape of *significant sensitivity*. The provisions in the fully operative plan as described in my paragraph 5 (above) apply in total to areas identified as *Significant Landscape Features*.

3.4 Conservation Management Strategy & Plans

The Otago Conservancy of DOC has prepared a Conservation Management Strategy (CMS) which was approved by the New Zealand Conservation Authority in August 1998. The CMS identifies 41 special places of conservation interest in Otago Conservancy.

The Old Man – Garvie area is identified as a special place. The CMS says:

Objective for Old Man - Garvie
To protect the entire high altitude range crests for their landscape, nature conservation, cultural and recreational importance, to improve legal access to them and to ensure that recreational and commercial users are managed to sustain resources and ensure quality recreational experiences, including the remote quality of the Old Woman – Garvie area.

Implementation
(b) Pastoral lease tenure review on adjacent properties will provide opportunities to negotiate to protect the entire range crest. Overall management of these new areas with the existing areas will confer net conservation and management benefits (eg, rationalise fencing).
(f) Continued identification of key natural and historic resources to enable well informed decision making in pastoral lease tenure review process.

Priorities for Old Man - Garvie
Completion of protection negotiations, including tenure reviews, will be a priority in this Special Place.

General Objectives for Central Otago Species

To establish the presence and status of rare and vulnerable plant and animal species of Central Otago and to ensure their continued survival.

Implementation
(b) Habitats will be protected through purchase, pastoral lease tenure reviews and covenant where possible and through advocacy and the Resource Management Act.

3.5 New Zealand Biodiversity Strategy

The New Zealand Government is a signatory to the Convention on Biological Diversity. In February 2000, Government released the New Zealand Biodiversity Strategy which is a blueprint for managing the country's diversity of species and habits and sets a number of goals to achieve this aim. Of particular relevance to tenure review, is goal three which states:

Maintain and restore a full range of remaining natural habitats and ecosystems to a healthy functioning state, enhance critically scare habitats, and sustain the more modified ecosystems in production and urban environments, and do what is necessary to:-

Maintain and restore viable populations of all indigenous species across their natural range and maintain their genetic diversity.

The strategy outlines action plans to achieve this goal covering terrestrial and freshwater habitat and ecosystem protection, sympathetic management, pest management, terrestrial and freshwater habitat restoration, threatened terrestrial and freshwater species management, etc.

3.6 Protecting Our Places

In April 2007 the Ministry for the Environment produced a policy document titled 'Protecting Our Places' which was jointly launched by the Minister of Conservation and the Minister for the Environment. This publication introduces four national priorities for protecting rare and threatened native biodiversity on private land. The national priorities identify the types of ecosystems and habitats most in need of protection.

The policy statement supports the government's pledge to maintain and preserve New Zealand's natural heritage. This began in 1992 when New Zealand signed the United Nations Convention on Biodiversity; followed in 2000 with the release of the New Zealand Biodiversity Strategy.

The four national priorities for biodiversity protection are listed below. They are based on the most up to date scientific research available.

National Priority 1:
To protect indigenous vegetation associated with land environments, (defined by Land Environments of New Zealand at Level IV), that have 20 percent or less remaining in indigenous cover.

National Priority 2:
To protect indigenous vegetation associated with sand dunes and wetlands; ecosystem types that have become uncommon due to human activity.

National Priority 3:
To protect indigenous vegetation associated with 'originally rare' terrestrial ecosystem types not already covered by priorities 1 and 2.

National Priority 4:
To protect habitats of acutely and chronically threatened indigenous species.

These priorities are relevant to the values found on the PL. The national priorities provide a useful measure for assessing tenure review recommendations and outcomes.

PART 4

ATTACHMENTS

4.1 Additional Information

4.1.1 References

Appendices to the Journal of the House of Representatives (AJHR). (1884-1897)

Beattie, H. (1947): Early Runholding in Otago. *Dunedin: Otago Daily Times and Witness Newspapers Co. Ltd.*

Beattie, H. (1948): Otago Place Names. Dunedin: *Otago Daily Times and Witness Newspapers Co. Ltd.*

Beattie, H. (1948): Otago Place Names. *Dunedin: Otago Daily Times and Witness Newspapers Co. Ltd.*

Beattie, J.H. (1979): The Southern Runs. *Invercargill: Southland Times Co. Ltd.*

Bliss, L.C., Mark, A.F. (1970). The high-alpine vegetation of Central Otago, New Zealand. *N.Z.J. Bot. 8*: 381-451.

Briden, S. (2006): Last Chance Irrigation Co. Ltd., Obelisk Station Pastoral Lease.

Brown, C.S., Mark, A.F., Kershaw, G.P., Dickinson, K.J.M. (2006). Secondary succession 24 years after disturbance of a New Zealand high-alpine cushionfield. *Arct., Antarct. & Alp. Res. 38*: 325-334.

Brumley, C.F., Stirling, M.W. & Manning, M.S. (1986) Old Man Ecological District. *Survey Report for the Protected Natural Areas Programme*. Department of Lands and Survey, Wellington.

Central Otago District Council (CODC) (2010): Central Otago Outdoor Recreation Strategy 2010 – 2015 *Draft, Central Otago District Council, Alexandra*

de Lange, P.J; Norton, D.A; Courtney, S.P; Heenan, P.B; Barkla, J.W; Cameron, E.K; Hitchmough, R; Townsend, A.J. (2009). Threatened and uncommon plants of New Zealand (2008 revision). New Zealand Journal of Botany 47: 61-96.

Department of Conservation (1998): Otago Conservation Management Strategy: August 1998. *Otago Conservancy CMS Series No. 7.* Department of Conservation, Dunedin.

Department of Conservation. (1996): Management Prescription Document for a Conservation Covenant over the Dunbier Fruitlands sites issued under Sec 77 of the Reserves Act 1977.

Department of Survey and Land Information. (1990): Alexandra sheet 260-G42. Edition 1.

Galvin, P. (ed). (1906): The New Zealand Mining Handbook. *Wellington: John MacKay, Government Printer.*

Halloy, S.R.P., Mark, A.F. (2003): Climate-change effects on alpine plant biodiversity: A New Zealand perspective and quantifying the threat. *Arct., Antarct & Alp. Res. 35*: 248-254

Hamel, J. (1988): Survey of Cultural Values on Pastoral Leases in the Old Man Ecological District'. Unpublished Report for the Department of Conservation, Otago Conservancy.

Hamel, J. (1989): Report on Upper Mitchells Cottage and mining area, Symes Road, Old Man Range. Unpublished Report for the Department of Conservation, Otago Conservancy.

Hamel, J. (1994): Notes re Historic Gold Workings – Fruitlands. Unpublished report to the Department of Conservation, Otago Conservancy.

Hamel, J. (1995): The mining landscape of Fruitlands. Unpublished Report for the Department of Conservation, Otago Conservancy.

Harper, RK (1992): Otago Recreation Opportunity Spectrum. *Otago Conservancy Miscellaneous Series No. 10*. Department of Conservation, Dunedin.

Harrison, A.P. (1982): Lake Roxburgh Archaeological Survey. Unpublished Report for the Department of Conservation, Otago Conservancy.

Heather, D. and Robertson, H.A. (1996): The field guide to birds of New Zealand. Penguin books NZ Ltd.

http://www.linz.govt.nz/geodetic/geodetic-database/search/index.aspx?mode=text
Kai Tahu ki Otago. 2005: Natural Resource Management Plan.

Leathwick, J; Wilson, G; Rutledge, D; Wardle, P; Morgan, F; Johnston, K; McLeod, M; Kirkpatrick, R (2003): Land Environments of New Zealand. Ministry for the Environment

LINZ: Geodetic database. Search for Geodetic marks.

Lynn IH, Manderson AK, Page MJ, Harmsworth GR, Eyles GO, Douglas GB, Mackay AD, Newsome PJF (2009): Land Use Capability Survey Handbook – a New Zealand handbook for the classification of land 3rd ed. Hamilton, AgResearch; Lincoln, Landcare Research; Lower Hutt, GNS Science. 163 p

Mark, A.F. (1965). Vegetation and mountain climate. *In* R.G. Lister ed."Central Otago". N.Z. Geogr. Soc. Spec. Pub. pp. 69-91.

Mark, A.F. (1969): Ecology of snow tussocks in the mountain grasslands of New Zealand. Vegetatio 18: 289-306.

Mark, A.F. (1974a): The Old Man Range. N.Z. Nature Heritage 19: 524-31.

Mark, A.F. (1990): Ecological and nature conservation values of the Southern Landscapes: the case for a conservation park in the uplands of the Old Man, Remarkables, Umbrella and Nokomai Ecological Districts. In Fitzharris, B.B.and Kearsley, G.W. (Eds.) Southern Landscapes: Essays in Honour of Bill Brockie and Ray Hargreaves. Univ. of Otago, Dunedin. pp. 233-273.

Mark, A.F. (1992): Indigenous grasslands of New Zealand. In Coupland, R.T. and Goodall, D.W. (Eds.) Grasslands: Ecosystems of the World. Vol. 8B Elsevier, Amsterdam. pp.372-410.

Mark, A.F. (1994): Effects of burning and grazing on sustainable utilisation of upland snow tussock (*Chionochloa* spp.) rangelands for pastoralism in South Island, New Zealand. Aust. J. Botany 42: 149-161.

Mark, A.F. (1965a): The environment and growth rate of narrow-leaved snow tussock, *Chionochloa rigida*, in Otago. *N.Z.J. Bot. 3*: 73-103.

Mark, A.F. 1965b. Flowering, seeding and seedling establishment of narrow-leaved snow tussock, *Chionochloa rigida. N.Z.J. Bot. 3*: 180-193.

Mark, A.F. (1965c): Ecotypic differentiation in Otago populations of narrow-leaved snow tussock, *Chionochloa rigida. N.Z.J. Bot. 3*: 277-299.

Mark, A.F. (1965d): Effects of management practices on narrow-leaved snow tussock, *Chionochloa rigida. N.Z.J. Bot.3*: 300-319.

Mark, A.F. (1968): Factors controlling irregular flowering in four alpine species of snow tussock. Proc. N.Z. Ecol. Soc. 15: 55-60.

Mark, A.F. (1974b): The snow tussock grasslands. N.Z. Nature Heritage 35: 976-81.

Mark, A.F. (2005): Fifty years of snow tussock grassland research applied to high country landscape management. Proc. High Country Landscape Mgmte Forum, Queenstown. 12-3 Sept., 2005. Otago Regional Council, Dunedin. Pp. 43-53.

Mark, A.F., Dickinson, K.J.M. (2008): Maximizing water yield with indigenous non-forest vegetation: a New Zealand perspective. *Frontiers in Ecol. and the Environ. 6*: 25-34 (see Fig. 2).

Mason, B. (1988): Outdoor Recreation in Otago: A conservation plan. Vol 1 Central Otago's Block Mountains. Federated Mountain Clubs of New Zealand Inc. Wellington

Maturin, SE (1984): Known Biological & Cultural Values of the Old Man Ecological District. Unpublished report to lands and Survey Field Officers and Reserves Rangers for Joint Inspection of Pastoral Leases.

McCraw, J. (2000): Mountain Water & River Gold. Stories of Gold Mining in the Alexandra District. *Dunedin: Square One Press.*

McCraw, J. (2003): Gold on the Dunstan. *Dunedin: Square One Press.*

McCraw, J. (2005): A Fruitful Land. The Story of Fruit growing and Irrigation in the Alexandra-Clyde District. *Dunedin: Square One Press.*

McGovern-Wilson, R. (1991): Report on Dr. Hyde's water race. Unpublished Report for the Department of Conservation, Otago Conservancy.

Mines Department Reports including Gold Wardens reports.

Ministry for the Environment (2007): Protecting our Places. Introducing the national priorities for protecting rare and threatened native biodiversity on private land. Ministry for the Environment, Wellington.

Moore, C.W.S. (1953): The Dunstan: A History of the Alexandra-Clyde District. *Dunedin: Holcombe & Tombs Ltd.*

New Zealand Archaeological Association Site Recording Scheme: ArcSite database.

Ng, J. (1999): Windows on a Chinese Past. Volume 3. *Dunedin: Otago Heritage Books.*

Obelisk Creek Pastoral Lease Conservation Resources Report. (1995): Unpublished report to the Department of Conservation, Otago Conservancy.

Otago Witness. (1883): Issue 1666, 27th October. http://paperspast.natlib.govt.nz/cgi-bin/paperspast?a=d&d=OW18831027&e=-------10--1----0-all

Payton, I.J., Lee, W.G., Dolby, R., Mark, A.F. (1986): Nutrient concentrations in narrow-leaved snow tussock (*Chionochloa rigida*) after spring burning. *N. Z. J. Bot. 24*: 529-537.

Payton, I.J., Mark, A.F. (1979): Long-term effects of burning on growth, flowering and carbohydrate reserves in narrow-leaved snow tussock (*Chionochloa rigida*). *N. Z. J. Bot.17*: 43-54.

Peat, M. & Patrick, B.H. (1999): *Wild Central*. University of Otago Press, Dunedin.

Perrett, T. (1995): Obelisk Creek Pastoral Lease Conservation Resources report.

Unpublished Report for the Department of Conservation, Otago Conservancy.

QuickMap: Survey Office Plans. Land Information New Zealand.

Report to the Department of Conservation, Otago Conservancy.

Roxburgh, S., Wilson, J.B., Mark, A.F. (1988): Succession after disturbance of a New Zealand high-alpine cushionfield. *Arct., Alp. Res. 20*: 230-236.

Sinclair, John. (2003): The early pastoral runs of Otago and Southland. Index and biographies. Hocken Library Archives, Dunedin.

SPAR (Southern Pacific Archaeological Research). (2007): Archaeological Assessment of Last Chance Water Race, Central Otago. Prepared for the Last Chance Irrigation Co, Ltd.

Springer, K (1993): Otago Conservancy Recreation Strategy. *Otago Conservancy Miscellaneous Series No. 18*. Department of Conservation, Dunedin.

Townsend, AJ; de Lange, PJ; Duffy, CAJ; Miskelly, CM; Molloy, J;Norton, DA (2008): New Zealand Threat Classification System manual. Science & Technical Publishing, Department of Conservation, Wellington.

Walker, S., Mark, A.F., Wilson, J.B. (1995): The vegetation of Flat Top Hill: An area of semi-arid grassland/shrubland in Central Otago, New Zealand. *N. Z. J. Ecol. 19*: 175-194.

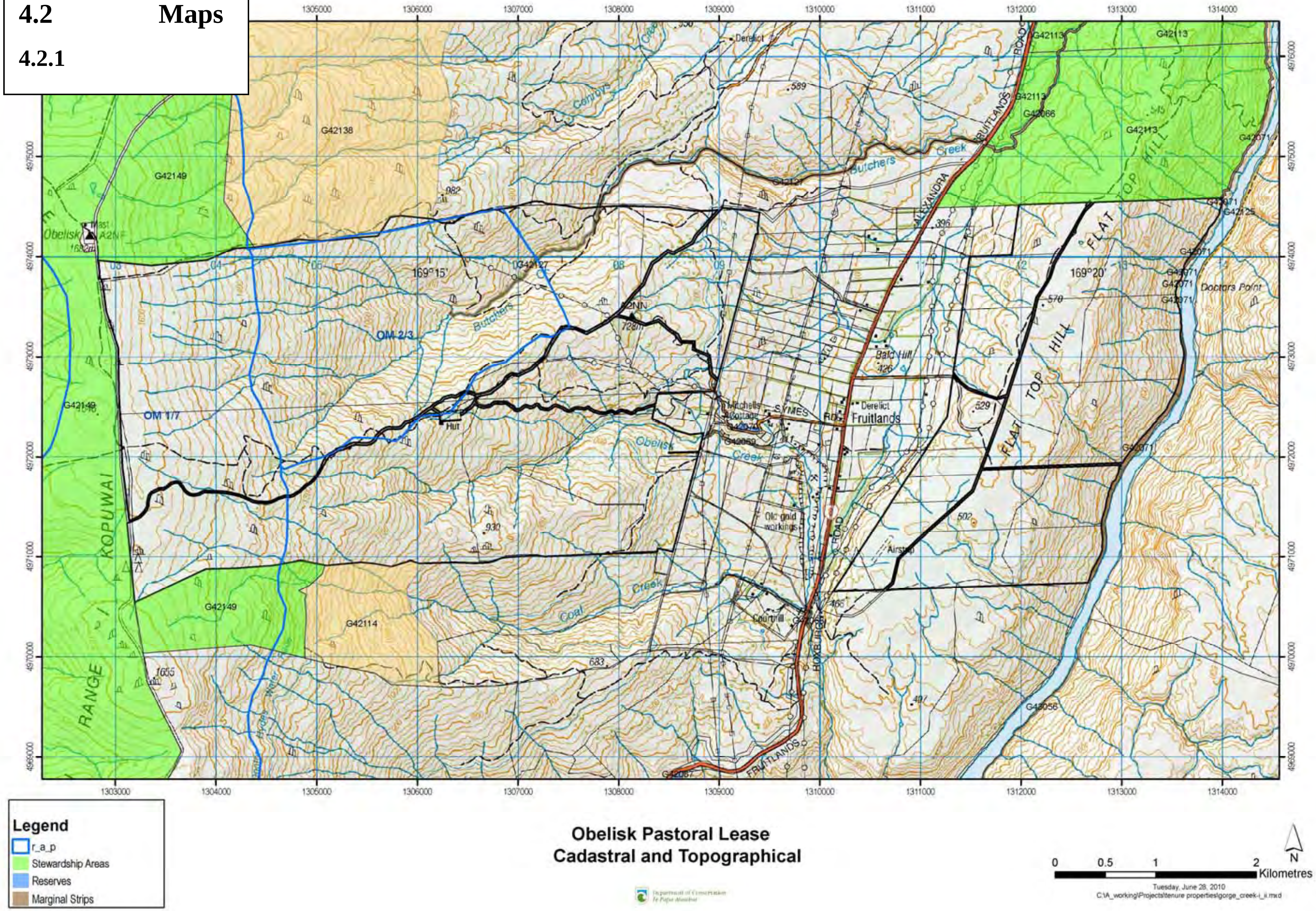
Walker, S.W., Wilson, J.B., Mark, A.F. (1999): Seasonal changes in semi-arid vegetation of Central Otago, New Zealand. *N. Z .J. Bot. 37*: 479-493.

Williams, P. A. (1981): Aspects of the ecology of broom (Cytisus scoparius) in Canterbury, New Zealand. *New Zealand Journal of Botany, Vol 19*: 31-43

Williams, PA, Wiser S, Clarkson B, Stanley MC (2007): New Zealand's historically rare terrestrial ecosystems set in a physical and physiognomic framework. New Zealand Journal of Ecology 31(2): 119-128

4.2 Maps

4.2.1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FLAT TOP HILL
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Butchers Creek
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Coal Creek
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ROXBURGH ROAD
SYMES RD
Bald Hill
Mitchells Cottage
Old gold workings
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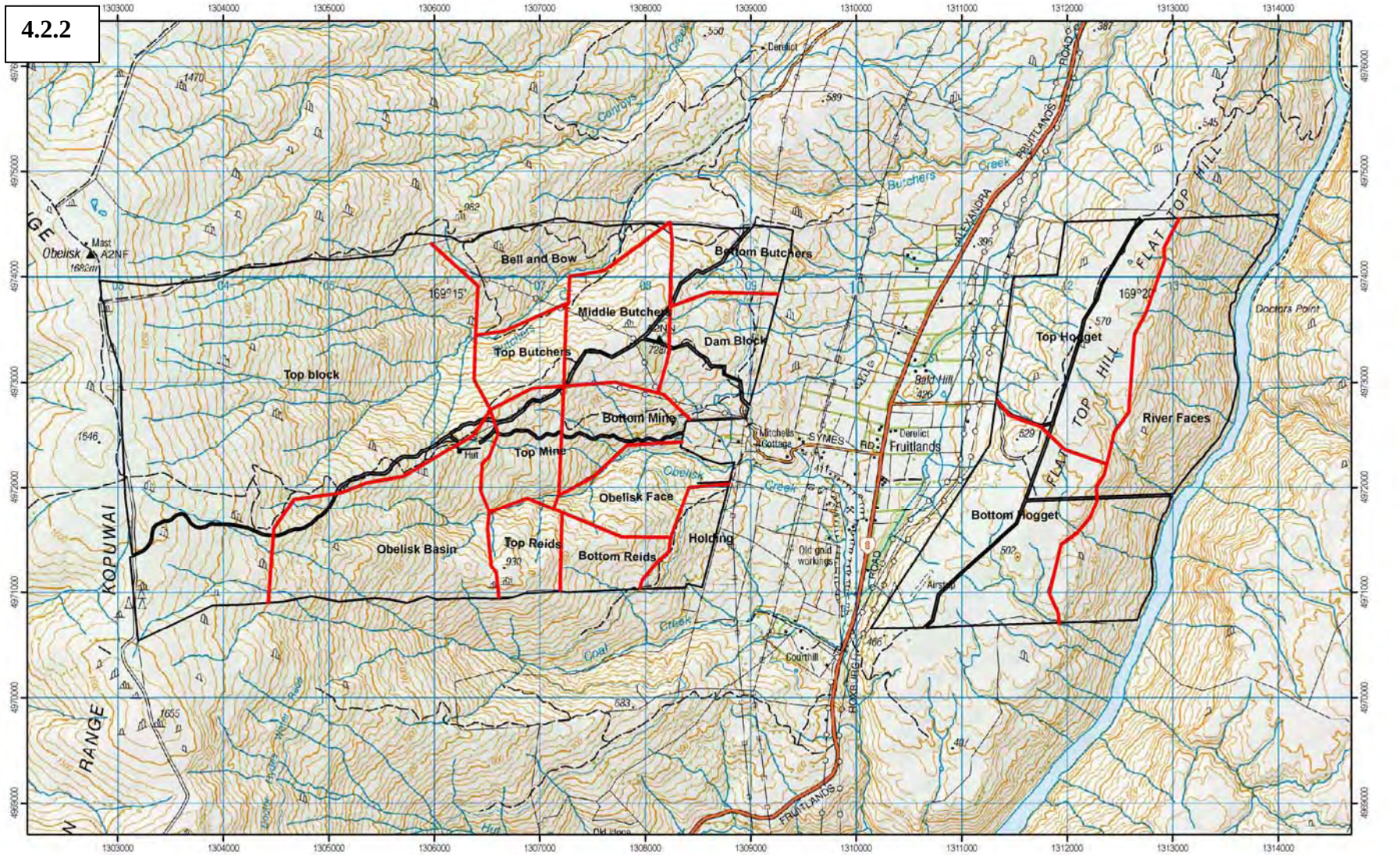

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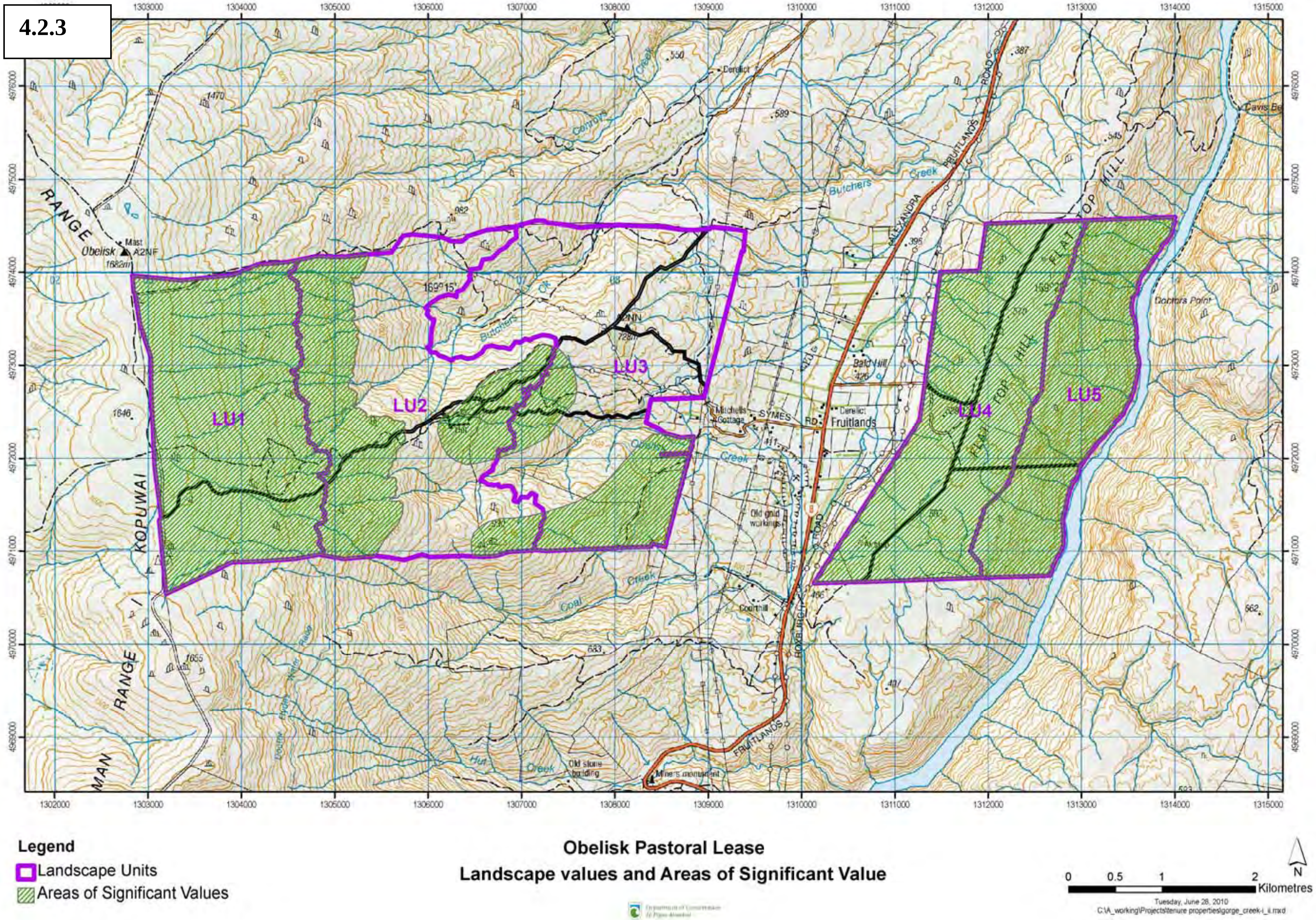
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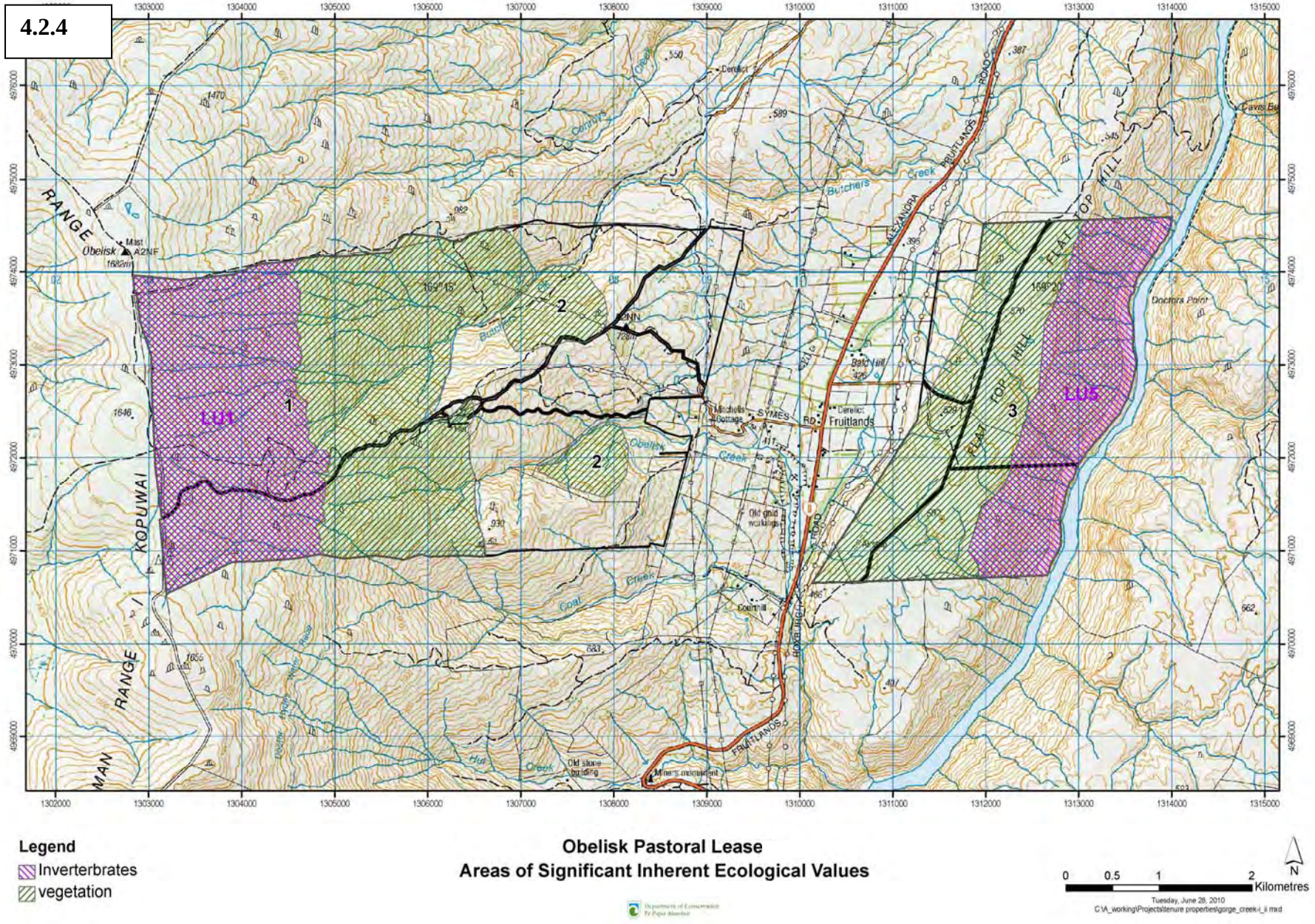
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Mitchells Cottage
SYMES RD
Derelict
Fruitlands
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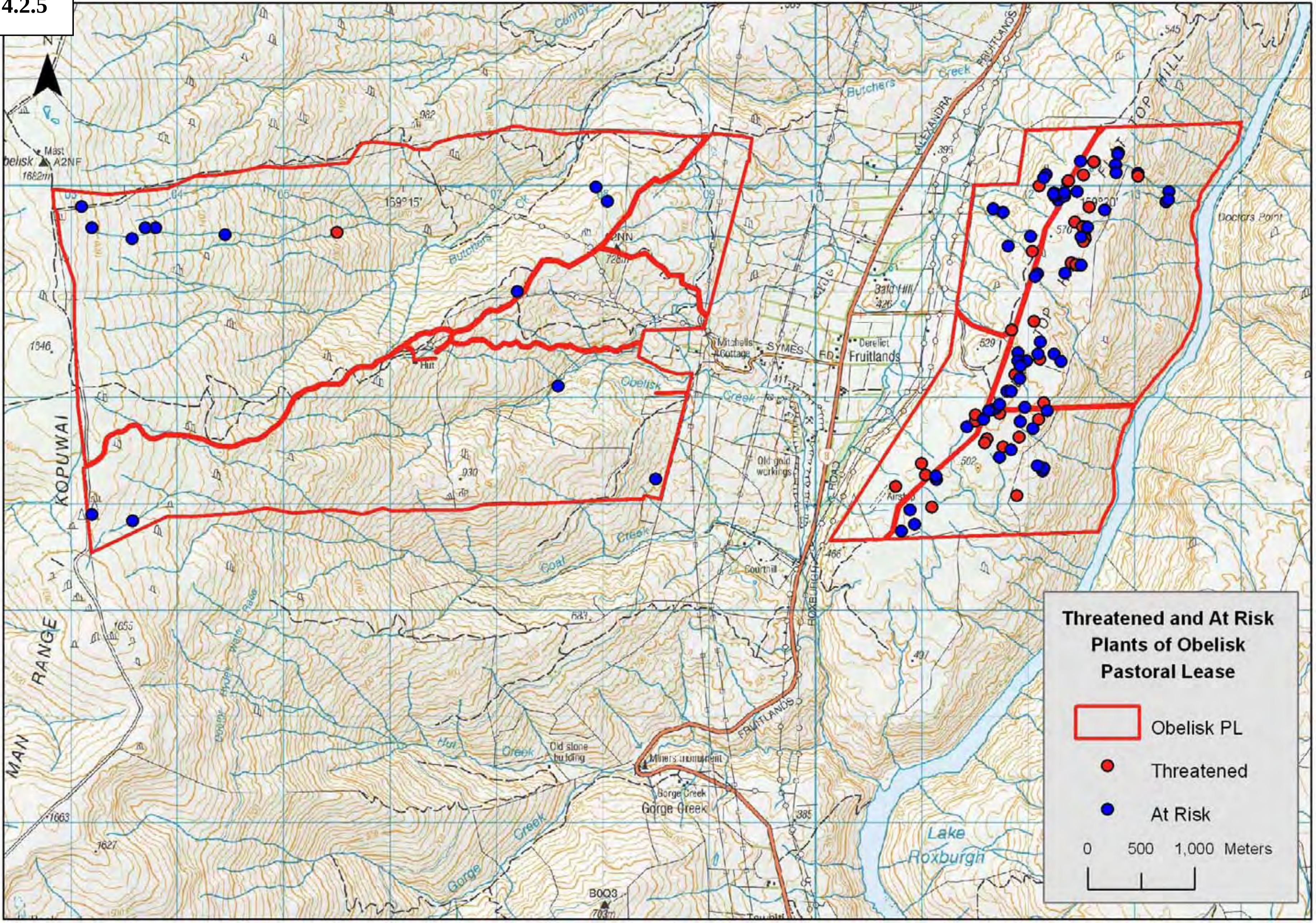
Threatened and At Risk Plants of Obelisk Pastoral Lease
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Bald Hill
Mitchells Cottage
Derelict
Old gold workings
Gorge Creek
Old stone building
Miners monument
Lake Roxburgh
Doctors Point
KOPUWAI
RANGE
Obelisk Creek
Butchers Creek
Goat Creek
Hut