

ROADSIDE SIGNIFICANT NATURAL AREAS (SNAs)

TIMARU DISTRICT



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1.0 INTRODUCTION

This report lists and describes Significant Natural Areas (SNAs) on roadsides in the part of Low Plains Ecological District that lies within Timaru District (i.e. south of the Rangitata River). The SNAs described in this report support indigenous vegetation that is significant under section 6(c) of the Resource Management Act 1991, as assessed against the criteria in the Timaru District Plan.

These SNA descriptions are collated together in this report because they all lie on public land (legal road) that is administered and/or managed by Timaru District Council or Transit New Zealand. Other SNAs, on privately-owned land in Timaru District, are described in separate reports for each privately-owned property.

The purpose of this report is to provide information on the location of these roadside SNAs so that management and use of these areas is sympathetic to the ecological values that are present. These SNAs represent some of the last remnants of the indigenous plant communities that were once widespread on this part of the Canterbury Plains. Timaru District Council is required, under the Resource Management Act 1991, to provide for the protection of these areas as a matter of national importance.

2.0 ECOLOGICAL CONTEXT

The SNAs described in this report lie in the southern part of Low Plains Ecological District, within Canterbury Plains Ecological Region, as defined by McEwen (1987). Indigenous plant communities in this ecological district are substantially depleted (Steven and Meurk, 1996). Less than 1% of the original extent of grassland and/or tussockland remains in Low Plains Ecological District and only very small areas are formally protected (Harding, 2009a).

This part of Low Plains Ecological District lies within three Level III Land Environments (LENZ), as defined by Leathwick *et al* (2002): L1.2 and L2.1 (Southern Lowlands) and N2.1 (Eastern South Island Plains). These three Level III Land Environments support less than 10% of the original extent of indigenous vegetation and are regarded as 'acutely threatened' (Walker *et al*, 2006). Indigenous vegetation associated with threatened land environments is regarded as a national priority for protection of indigenous biodiversity on private land (Ministry for the Environment, 2007). The Proposed National Policy Statement on Indigenous Biodiversity requires local authorities to regard indigenous vegetation associated with threatened land environments as significant under section 6(c) of the Resource Management Act 1991.

3.0 SURVEY METHOD

The roadside SNAs described in this report were surveyed as part of a District-wide survey of significant indigenous vegetation and significant habitats of indigenous fauna. The nature and purpose of this survey is outlined in Natural Values Policy 8 of Timaru District Plan (page B2-10). Areas of indigenous vegetation on privately-owned land in the part of Low Plains Ecological District within Timaru District have also been surveyed or are proposed for survey.

Potentially significant roadside sites were determined by a vehicle-based survey. This survey was guided by a schedule of indigenous roadside vegetation compiled by Colin Meurk between 1993 and 1999. Roadsides were surveyed between early February and mid-April 2011, a period during

which seed heads of indigenous grasses are conspicuous. Sites where conspicuous indigenous species (grasses, shrubs and trees) were observed were then inspected more closely. All species present at these sites were recorded in a field notebook. A list of species present at each site, including notes on species' dominance, is contained within each SNA description.

The method employed for this survey has limitations. Sites that support only inconspicuous indigenous species may have been overlooked. A detailed (and time-consuming) foot survey of all roadsides would be required to overcome this limitation. Also, indigenous species that are only conspicuous at certain times of the year, such as orchid species, may have been missed during this late-summer survey.

Furthermore, this survey focussed primarily on vegetation, rather than fauna. Observations of indigenous animal species were recorded but no particular effort was directed to survey of indigenous fauna. Identification of the importance of roadside habitats for lizard and invertebrate populations would require targeted surveys.

This report should not be regarded as a full and comprehensive description of roadside SNAs in this part of Timaru District. Other significant sites may be identified following further survey or assessment of ecological values.

4.0 SIGNIFICANT NATURAL AREAS (SNAs)

The significance of indigenous vegetation on roadsides was assessed against the criteria on pages B2-16 to B2-19 Timaru District Plan, using the Guidelines for Application of the District Plan Criteria (Harding, 2009b). Under these guidelines, any site that supports an indigenous species, habitat or community that is acutely threatened is regarded as significant. All this part of Timaru District comprises acutely threatened land environments, so any sites with indigenous vegetation in this area are significant.

Indigenous vegetation, for the purposes of this survey, is defined as vegetation in which indigenous plant species are structurally dominant or comprise a significant proportion of the plant species present. Therefore, sites with only one or two indigenous species that are only a minor component of the plant community are not regarded as indigenous vegetation in this assessment.

The sites identified in this report, and the boundary of the Low Plains Ecological District, are illustrated in Figure 1 (SNAs = blue lines; ED boundary = red line).

Figure 1: Roadside SNAs within Low Plains ED, Timaru District



TIMARU DISTRICT SNA SURVEY

SNA 111d

Road: Palmer Road (both sides)**Nearest Locality:** Orari Bridge/Coopers Creek**From: (map ref.):** K37: 729-839 (Rangitata Orari Bridge Highway)**To: (map ref.):** K37: 732-832 (road corner at Coopers Creek)**Approximate size:** 1.2 hectares**Adjoining properties:** 24640/292.01 (west); 24640/289.00 (east)**Ecological District:** Low Plains**Land Environment:** L1**Surveyors:** Mike Harding**Survey Date:** 8th February 2011**Vegetation Description:** (indigenous species in **bold** font)

Grassland dominated by browntop, Chewings fescue and sweet vernal. Other important species are catsear, haresfoot trefoil, narrow-leaved plantain, *Muehlenbeckia ephedroides*, yarrow, white clover, viper's bugloss, cocksfoot, **moss** and **creeping pohuehue**. Other species present are broom (mostly sprayed), mouse-ear hawkweed, sheep's sorrel, **patotara**, tall oat grass, Yorkshire fog, **blue wheat grass** and two small (sprayed) **matagouri** bushes.

Notable Species:

Six indigenous plant species are present, including a shrub (matagouri). The site supports a very healthy population of an at-risk (declining) species: *Muehlenbeckia ephedroides*.

Condition/Management:

Recent spraying has affected the remnant matagouri bushes.





Palmer Road, looking towards Rangitata Orari Bridge Highway (SH 79)



The at-risk sub-shrub, Muehlenbeckia ephedroides, sprawling through the grassland.

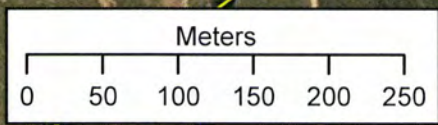


Palmer Road
SNA 111d

Rangitata-Orari Bridge Highway

111d

Palmer Road



1:5,000

TIMARU DISTRICT SNA SURVEY

SNA 111e

Road: Seaward Road (south side) **Nearest Locality:** Bellfield
From: (map ref.): K38: 744-799 (Coopers Creek ford)
To: (map ref.): K38: 748-800 (terrace scarp)
Approximate size: 0.5 hectares
Adjoining properties: 24640/305.00 (southwest); 24640/283.00 (southeast)
Ecological District: Low Plains **Land Environment:** L1
Surveyors: Mike Harding **Survey Date:** 8th February 2011

Vegetation Description: (indigenous species in **bold** font)

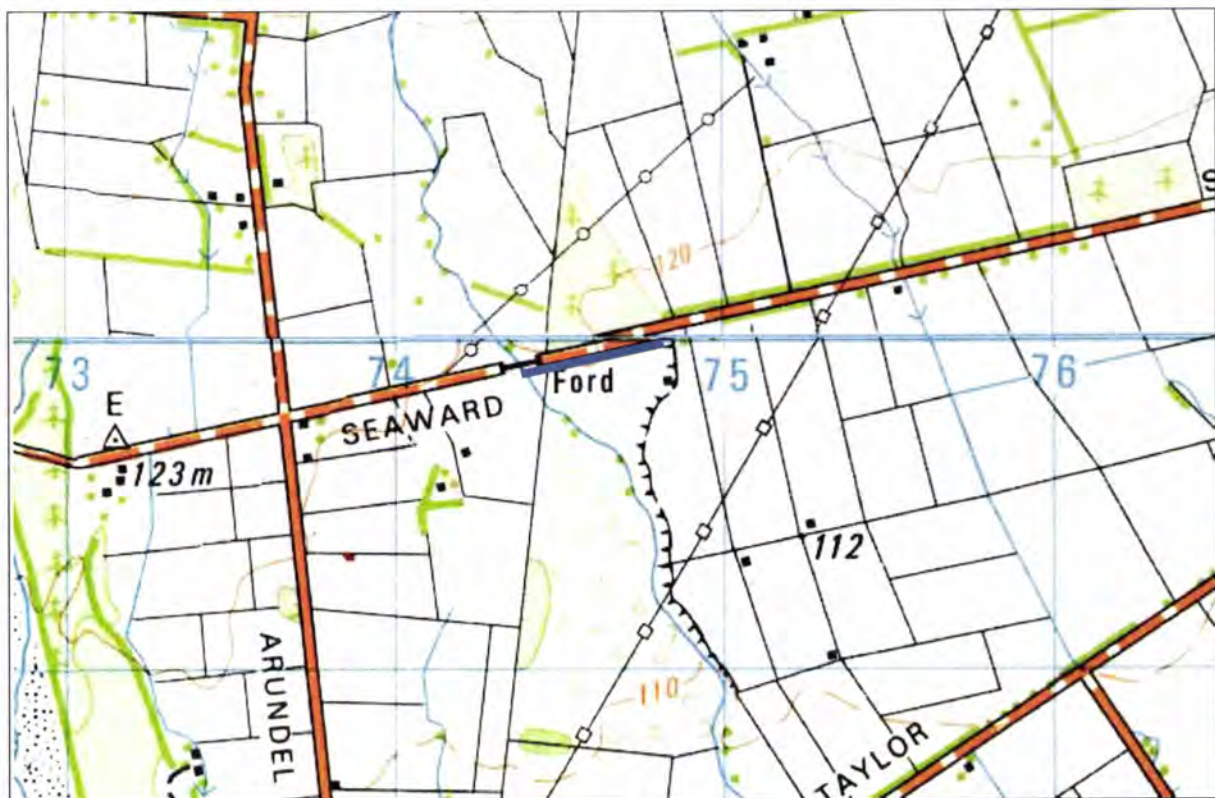
Grassland dominated by browntop, narrow-leaved plantain, yarrow and **moss**. Other species present are **blue wheat grass**, *Muehlenbeckia ephedroides*, **woolly moss**, *Rytidosperma clavatum*, sheep's sorrel, vulpia hair grass, viper's bugloss, cocksfoot, Chewings fescue and haresfoot trefoil.

Notable Species:

Five indigenous plant species are present, including a small population of the at-risk (declining) sub-shrub, *Muehlenbeckia ephedroides*.

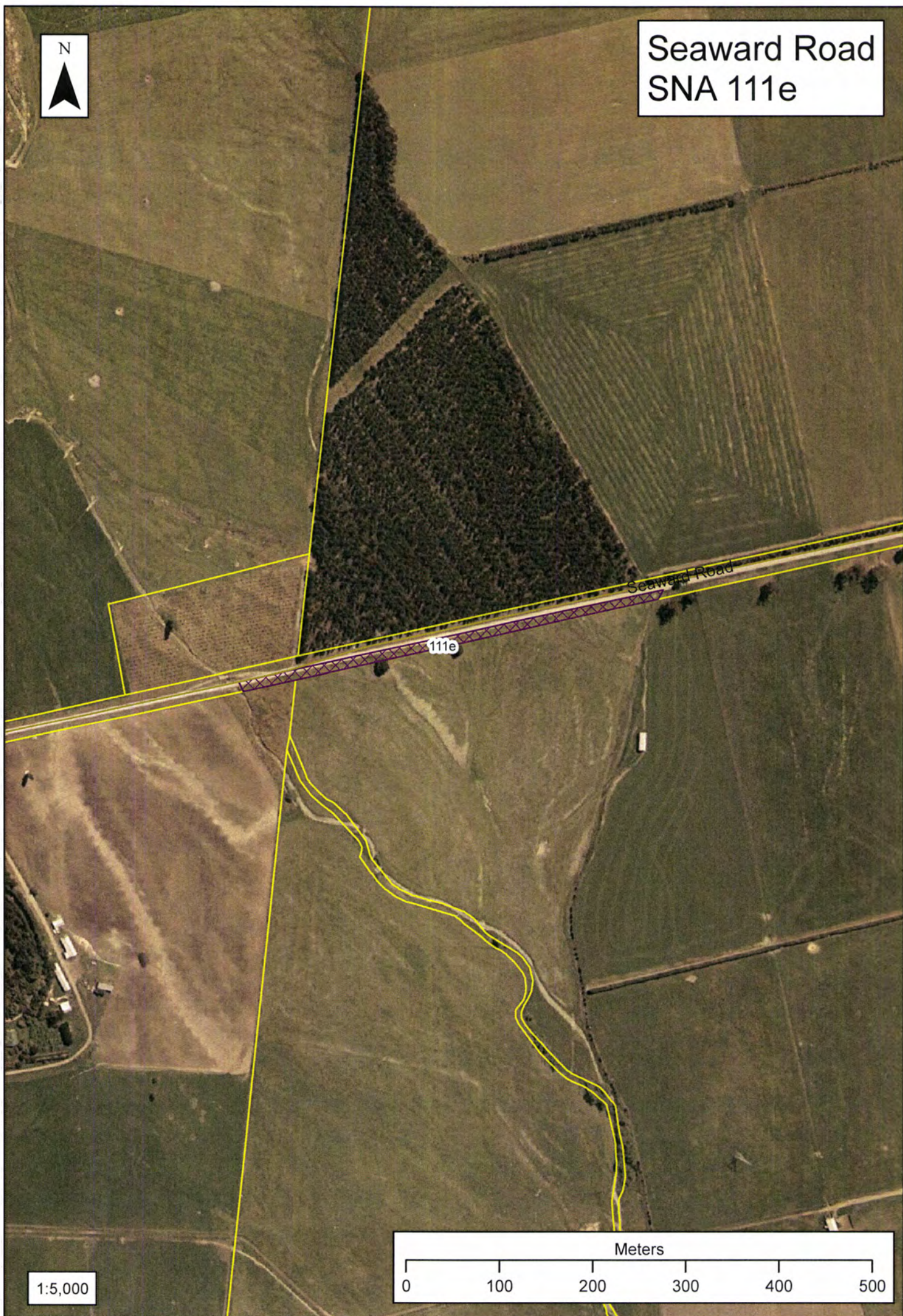
Condition/Management:

Woody weeds are present nearby.

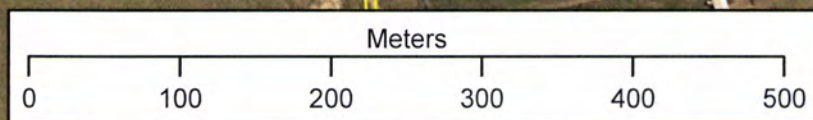




Seaward Road
SNA 111e



1:5,000



TIMARU DISTRICT SNA SURVEY

SNA 114b

Road: Pit Road (southwest side)**Nearest Locality:** Coopers Creek**From: (map ref.):** K37: 720-861 (adjacent to northwest corner of Pit Road Reserve)**To: (map ref.):** K37: 728-857 (adjacent to northeast corner of Pit Road Reserve)**Approximate size:** 0.7 hectares**Adjoining properties:** 24640/277.03 (southwest); 24640/214.00 (northeast)**Ecological District:** Low Plains**Land Environment:** L1**Surveyors:** Mike Harding**Survey Date:** 11th February 2011**Vegetation Description:** (indigenous species in **bold** font)

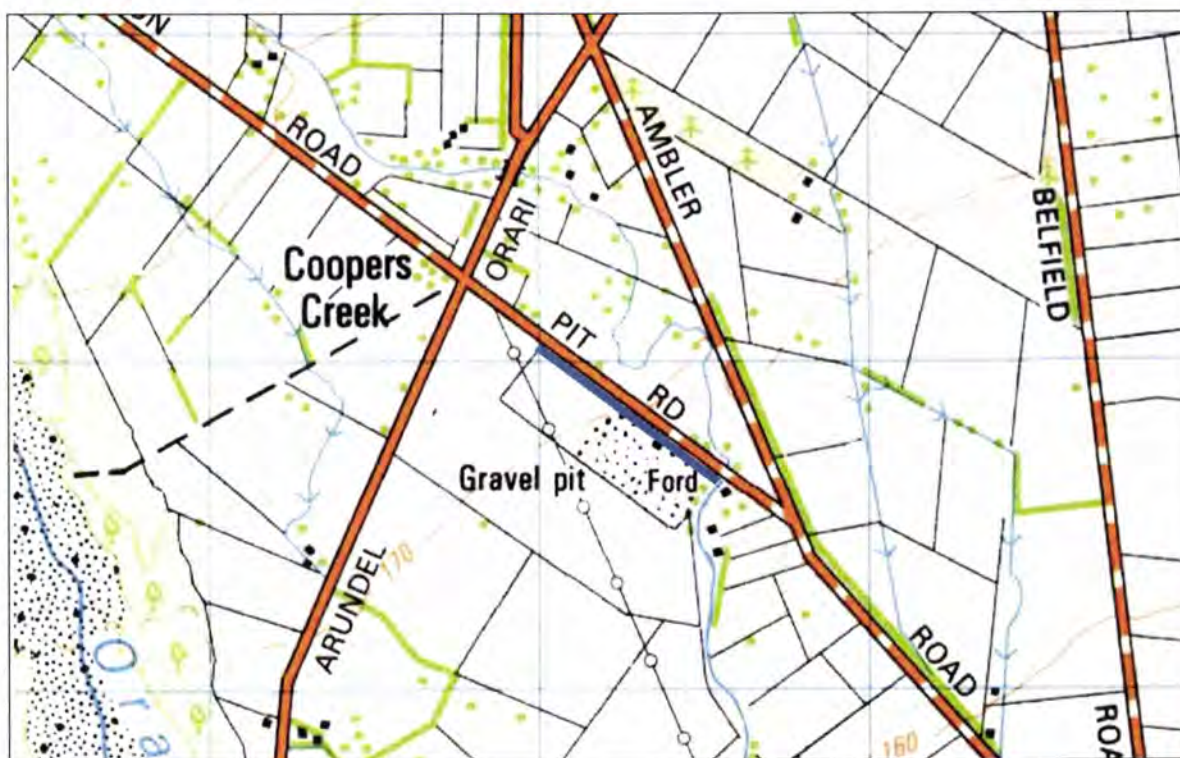
Grassland dominated by browntop, sweet vernal, yarrow and **moss**. Other species present are *Muehlenbeckia ephedroides*, haresfoot trefoil, catsear, white clover, sheep's sorrel, Chewings fescue, cocksfoot, tall oat grass, *Rytidosperma clavatum*, *blue wheat grass* and narrow-leaved plantain. Less commonly present are broom, woolly mullein and St John's wort.

Notable Species:

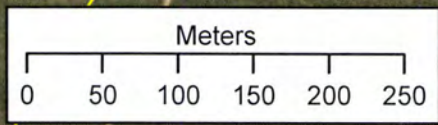
Four indigenous plant species are present, including a small population of the at-risk (declining) sub-shrub, *Muehlenbeckia ephedroides*.

Condition/Management:

Management of this roadside grassland should be coordinated with ecological management of the adjacent Pit Road Reserve.



Pit Road
SNA 114b



1:5,000

TIMARU DISTRICT SNA SURVEY

SNA 115

Road: State Highway 1/Farm Road**Nearest Locality:** Orari**From: (map ref.):** K38: 751-744 (south end of grassed roadside Rest Area)**To: (map ref.):** K38: 751-746 (north end of grassed roadside Rest Area)**Approximate size:** 0.7 hectares**Adjoining properties:** 24710/178.00 (south)**Ecological District:** Low Plains**Land Environment:** L1**Surveyors:** Mike Harding**Survey Date:** 3rd February 2011**Vegetation Description:** (indigenous species in **bold** font)

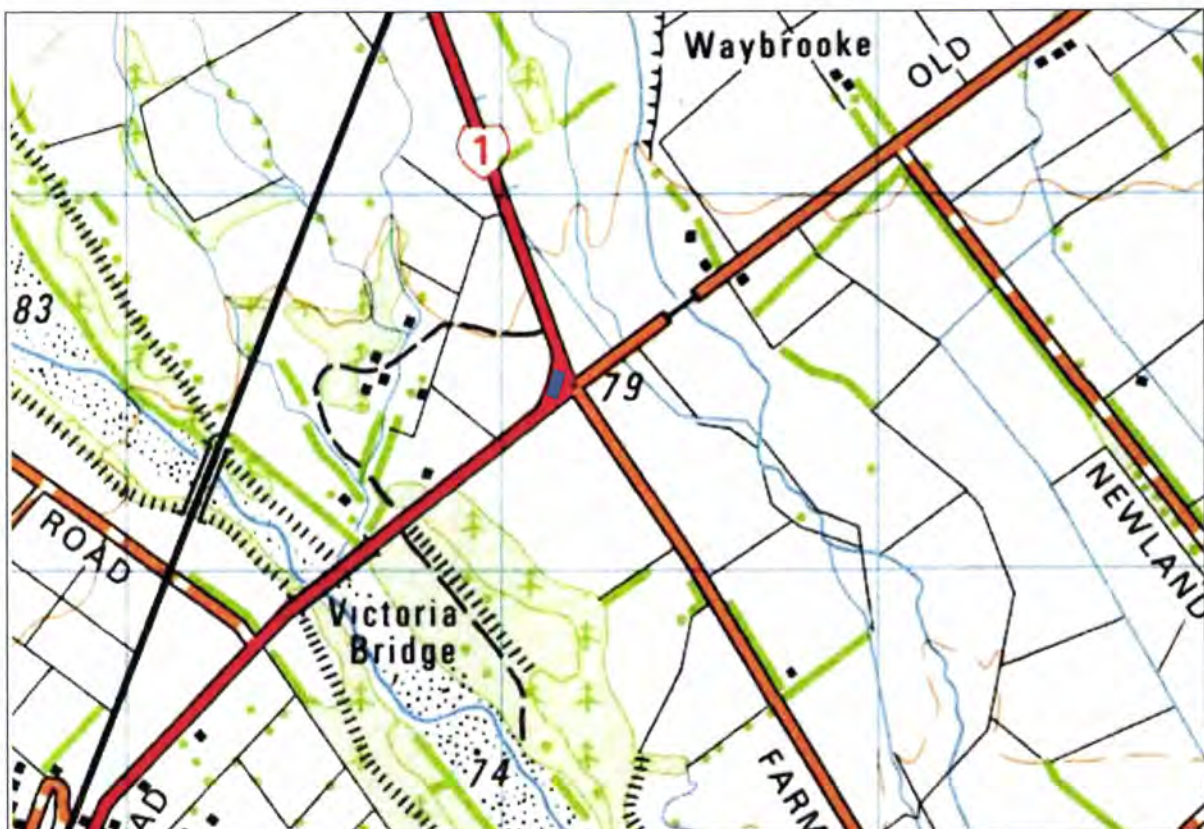
The site is a roadside Rest Area with mown grass. Plant species present are browntop, *Rytidosperma clavatum*, catsear, **moss**, stonecrop, viper's bugloss, sheep's sorrel, narrow-leaved plantain, yarrow, *Muehlenbeckia ephedroides*, **creeping pohuehue**, broom and the lichen, *Chondropsis semiviridis*.

Notable Species:

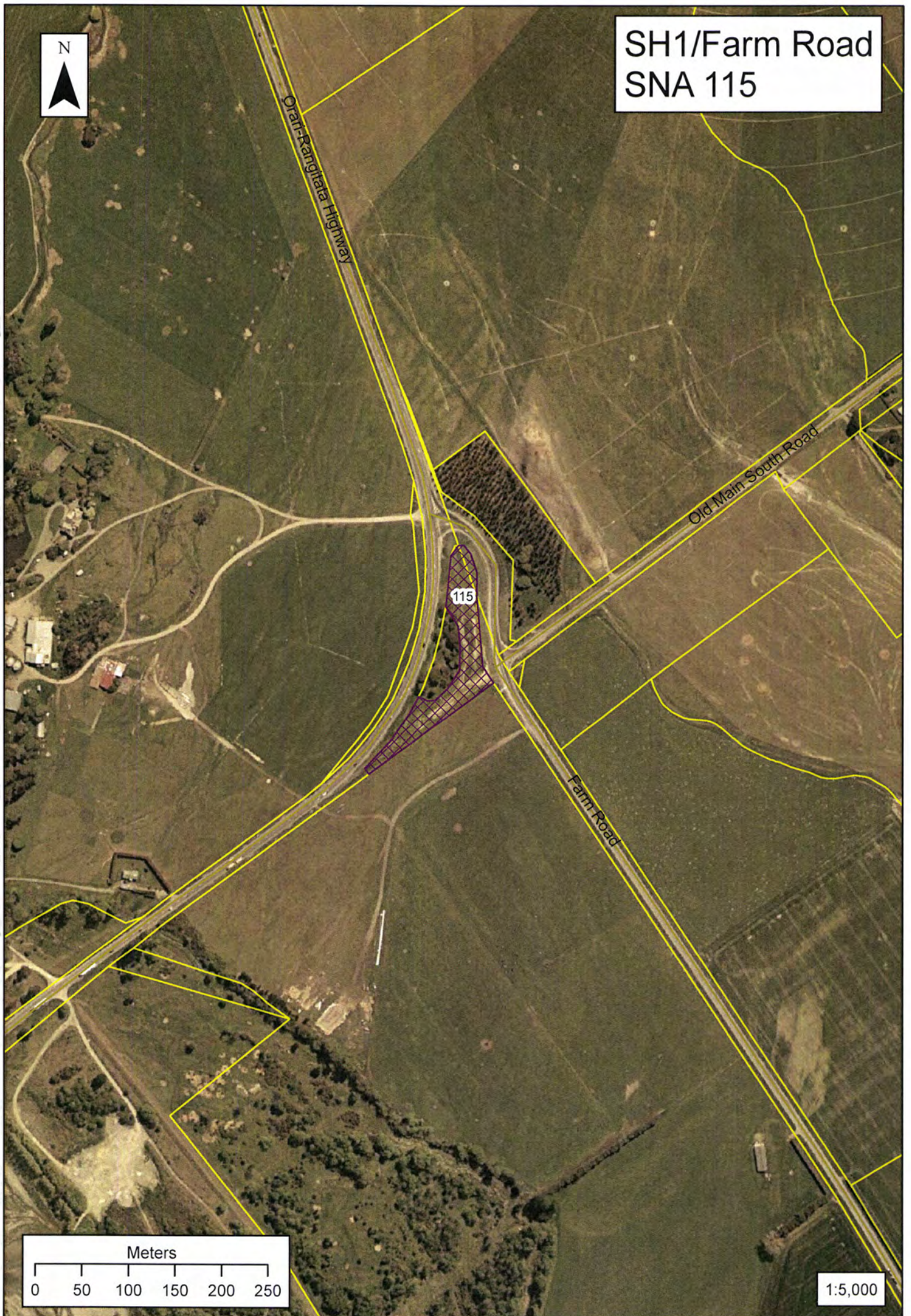
Five indigenous plant species are present, including a relatively healthy population of the at-risk (declining) sub-shrub, *Muehlenbeckia ephedroides*.

Condition/Management:

Regular mowing appears to allow survival of *Muehlenbeckia ephedroides*, though may hinder growth of the indigenous grass, *Rytidosperma clavatum*.



SH1/Farm Road
SNA 115



Meters
0 50 100 150 200 250

1:5,000

TIMARU DISTRICT SNA SURVEY

SNA 680

Road: North Boundary Road (north side) **Nearest Locality:** Arundel
From: (map ref.): K37: 721-906 (near Coopers Creek Peel Forest Road)
To: (map ref.): K37: 723-906 (adjacent to southwest corner of Arundel Cemetery)
Approximate size: 0.2 hectares
Adjoining properties: 24640/175.00 (north); 24640/203.00 (south)
Ecological District: Low Plains **Land Environment:** N2
Surveyors: Mike Harding **Survey Date:** 3rd February 2011

Vegetation Description: (indigenous species in **bold** font)

Two main plant communities are present:

Low-stature open grassland is present nearer the road. It is dominated by browntop, Chewings fescue and *Rytidosperma clavatum*. Other important species are catsear, white clover, yarrow, sweet vernal, **moss** and broom.

Taller grassland dominated by tall oat grass is present along the fence. Other important species are cocksfoot, Chewings fescue, **blue wheat grass**, browntop, broom, **bracken** and small battered bushes of **matagouri**.

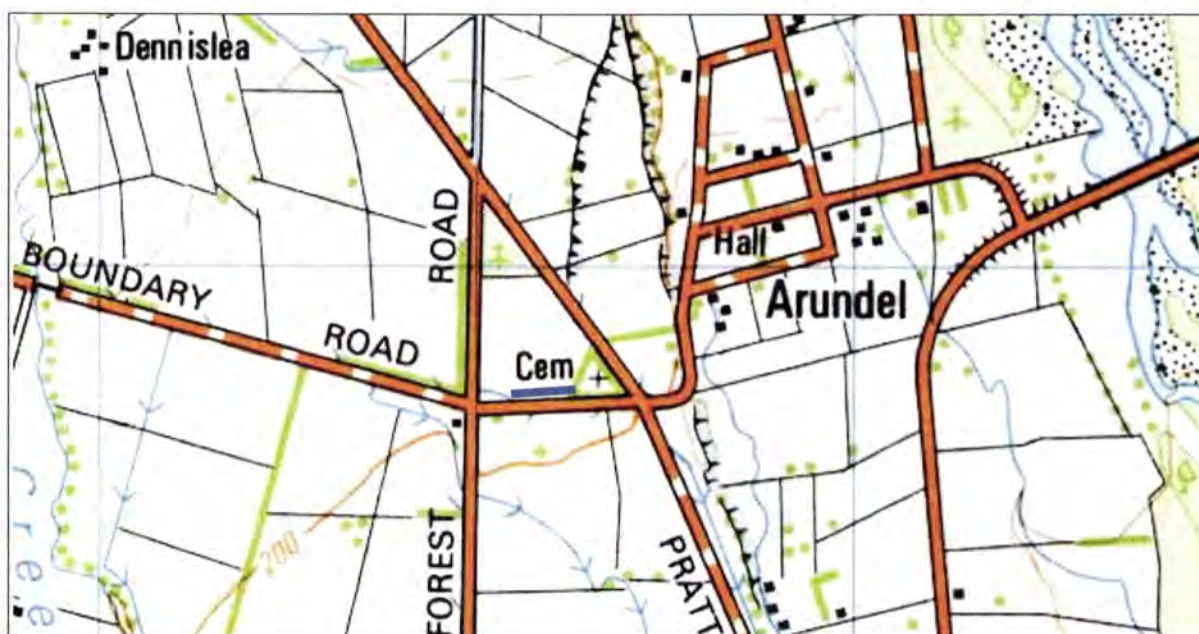
Also present are lotus, narrow-leaved plantain, haresfoot trefoil, mouse-ear hawkweed and a single hawthorn bush. Clumps of blue wheat grass are present on the other side of the road.

Notable Species:

Five indigenous plant species are present, including a shrub (matagouri).

Condition/Management:

Broom poses a significant threat.





Looking west along North Boundary Road



The indigenous grass Rytidosperma clavatum



A clump of the indigenous blue wheat grass (Elymus solandri)



North Boundary Road
SNA 680



Orchard Road

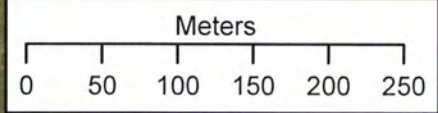
Peel Street

Peel Road

Peel Forest Road

680

North Boundary Road



1:5,000

TIMARU DISTRICT SNA SURVEY

SNA 728

Road: Arundel Rangitata Road (southwest side) **Nearest Locality:** Arundel

From: (map ref.): K37: 733-888 (Arundel Orari Bridge highway)

To: (map ref.): K37: 734-887 (Arundel Bellfield Road)

Approximate size: 0.2 hectares

Adjoining properties: 24640/204.01 (south; Chips Park)

Ecological District: Low Plains

Land Environment: N2

Surveyors: Mike Harding

Survey Date: 24th February 2011

Vegetation Description: (indigenous species in **bold** font)

Grassland dominated by brown top, *Rytidosperma clavatum*, yarrow and **blue wheat grass**. Other species present are sweet vernal, cocksfoot, Chewings fescue, **moss**, catsear, white clover, mouse-ear hawkweed, sheep's sorrel, *Carex breviculmis*, silvery hair grass, vulpia hair grass, **wire moss**, viper's bugloss and woolly mullein. Small plants of broom and gorse are present.

Notable Species:

Five indigenous grassland species are present. Blue wheat grass is abundant in places.

Condition/Management:

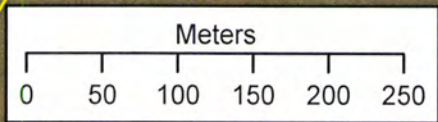
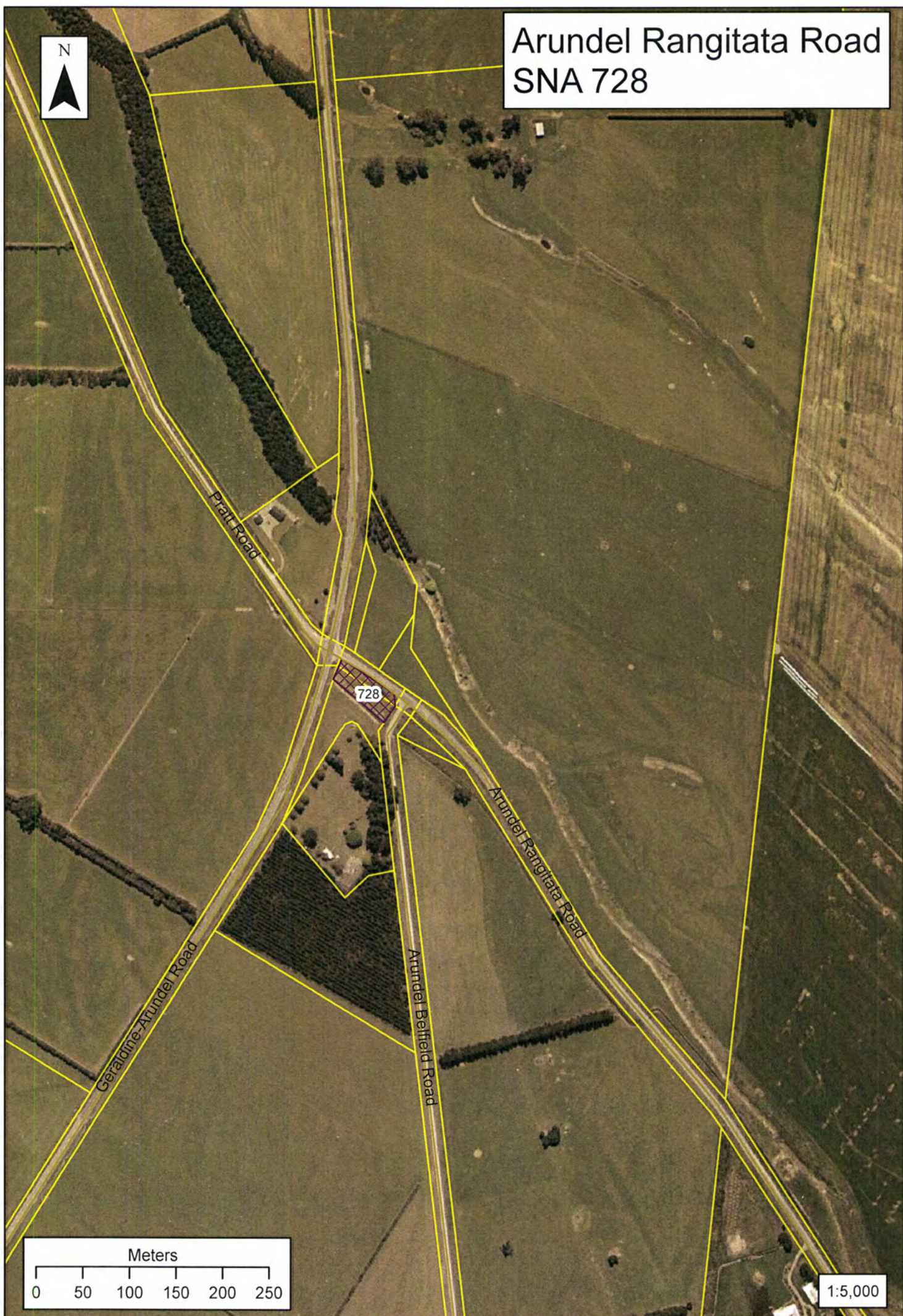
This is a disturbed site alongside an excavated water race. It adjoins Chips Park.





Dense danthonia (Rytidosperma) at SNA 728

Arundel Rangitata Road SNA 728



1:5,000

TIMARU DISTRICT SNA SURVEY

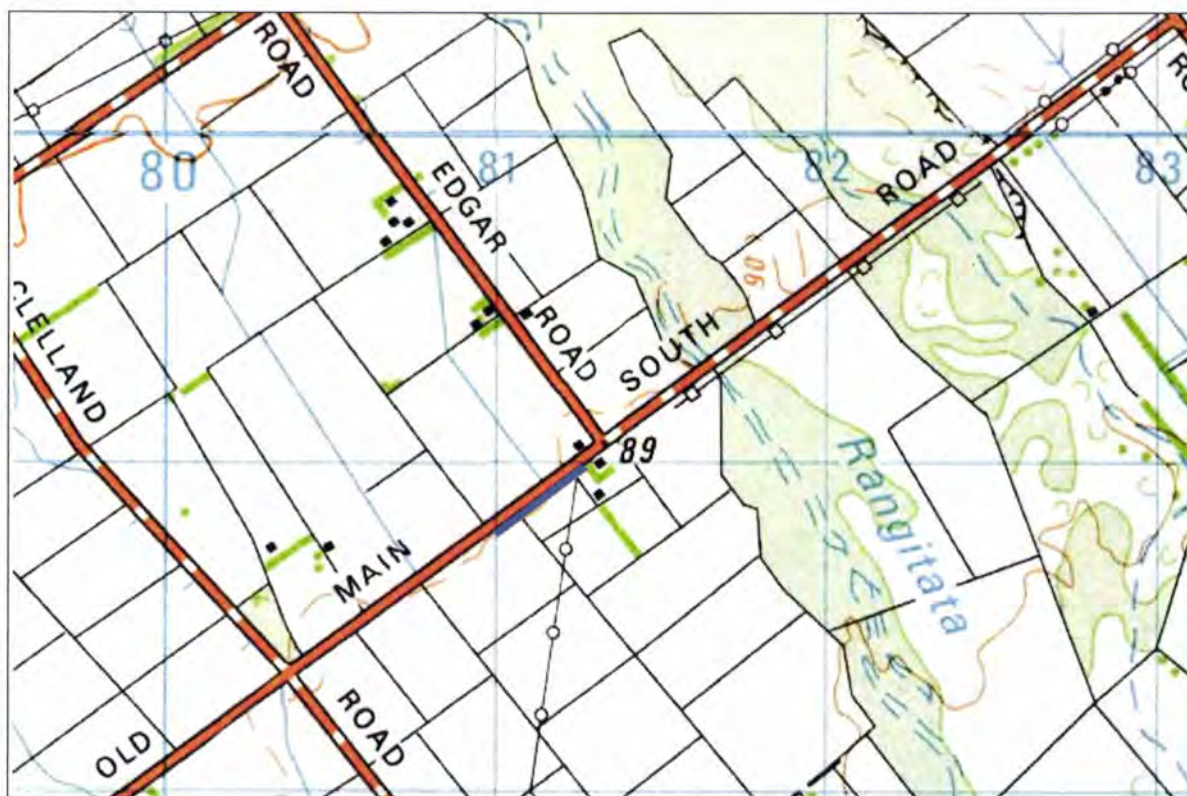
SNA 730

Road: Old Main South Road (east)**Nearest Locality:** Rangitata**From:** (map ref.): K38: 810-788**To:** (map ref.): K38: 813-790 (Edgar Road)**Approximate size:** 0.3 hectares**Adjoining properties:** 24710/040.00 (north, east and south); 24710/041.02 (west)**Ecological District:** Low Plains**Land Environment:** N2**Surveyors:** Mike Harding**Survey Date:** 30th March 2011**Vegetation Description:** (indigenous species in **bold** font)

Grassland dominated by browntop and cocksfoot. Other species present are *Rytidosperma clavatum*, **blue wheat grass**, *Lachnagrostis* sp., Chewings fescue, red clover, yarrow, timothy, Yorkshire fog, narrow-leaved plantain, tall oat grass, **moss** and two small **matagouri** bushes.

Notable Species:

Five indigenous species are present, including two small matagouri bushes.

Condition/Management:

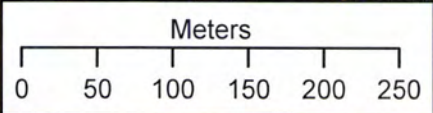


SNA 730; matagouri bushes at centre of photo (against fence)



SNA 730; blue wheat grass at left

Old Main South Road (east)
SNA 730



1:5,000

TIMARU DISTRICT SNA SURVEY

SNA 731

Road: Old Main South Road (west)**Nearest Locality:** Rangitata**From: (map ref.):** K38: 796-777 (Orton Rangitata Mouth Road)**To: (map ref.):** K38: 803-783 (McClelland Road)**Approximate size:** 2.2 hectares**Adjoining properties:** 24710/041.04 (northwest); 24710/048.00 (southeast)**Ecological District:** Low Plains**Land Environment:** N2**Surveyors:** Mike Harding**Survey Date:** 30th March 2011**Vegetation Description:** (indigenous species in **bold** font)

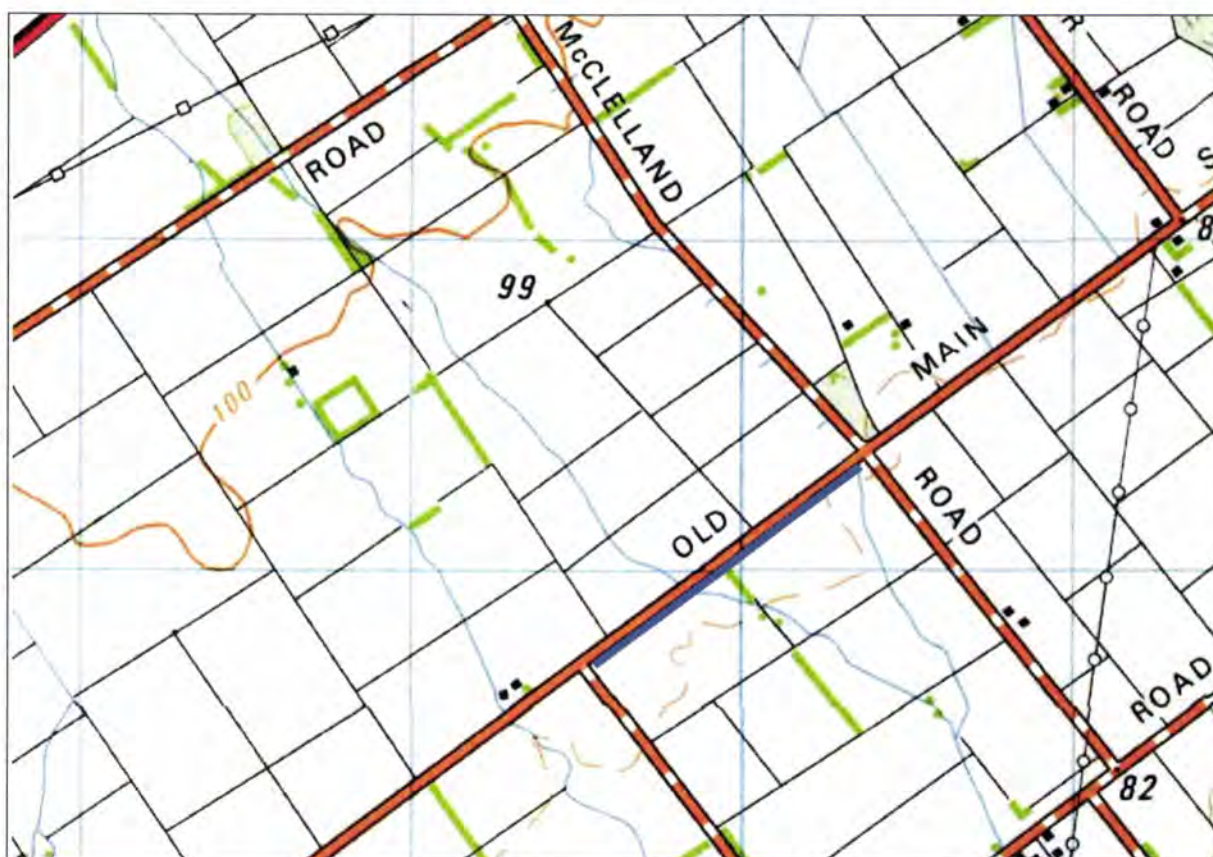
Grassland dominated by **blue wheat grass** and/or browntop (depending on location). Other species present are yarrow, *Rytidosperma* sp. (*unarede?*), cocksfoot, Chewings fescue, narrow-leaved plantain, broom, **creeping pohuehue**, couch, **wire moss**, catsear, vulpia hair grass, white clover, hawksbeard, broad-leaved dock, dandelion, timothy and a single **silver tussock** (on the northwest side of the road).

Notable Species:

Five indigenous species are present, including a single silver tussock.

Condition/Management:

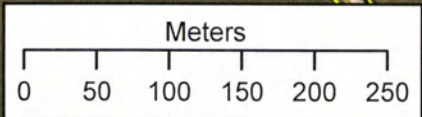
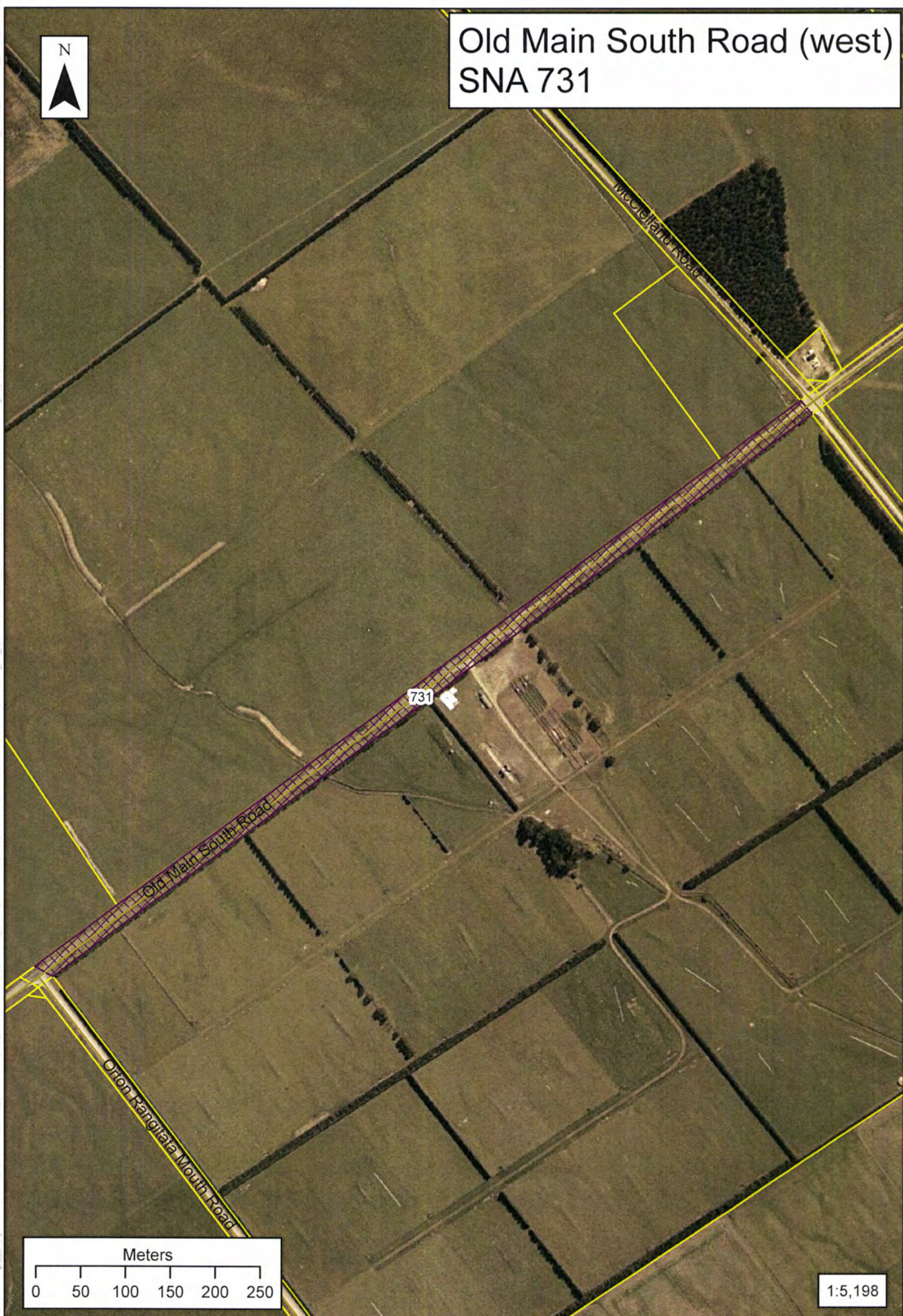
Broom poses a threat to the grassland.





SNA 731

Old Main South Road (west)
SNA 731



TIMARU DISTRICT SNA SURVEY

SNA 732

Road: Bennett Road (north side)**Nearest Locality:** Geraldine**From: (map ref.):** K38: 718-800 (Orari Back Road)**To: (map ref.):** K38: 720-799 (swale/ford on road)**Approximate size:** 0.2 hectares**Adjoining properties:** 24660/328.00 (north and south)**Ecological District:** Low Plains**Land Environment:** L1**Surveyors:** Mike Harding**Survey Date:** 11th April 2011**Vegetation Description:** (indigenous species in **bold** font)

Grassland dominated by browntop, Chewings fescue and **moss**. Other important plant species present are *Rytidosperma clavatum*, creeping pohuehue, *Muehlenbeckia ephedroides*, viper's bugloss, catsear, **lichen**, cocksfoot, tall oat grass, haresfoot trefoil, sweet vernal, Yorkshire fog, **blue wheat grass**, narrow-leaved plantain, red clover, mouse-ear hawkweed and *Acaena* sp. Occasionally present are broom, yarrow and St John's wort.

Notable Species:

Six indigenous species are present, including an at-risk (declining sub-shrub, *Muehlenbeckia ephedroides*).

Condition/Management:

Broom poses a significant threat.





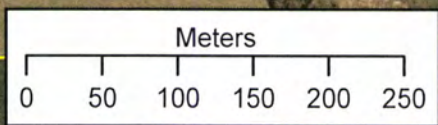
Rytidosperma seedheads protruding above the grassland at Bennetts Road (SNA 732)



The at-risk sub-shrub *Muehlenbeckia ephedroides* sprawling through grass at SNA 732.



Bennett Road
SNA 732



1:5,000

TIMARU DISTRICT SNA SURVEY

SNA 734

Road: Payne Road (both sides)**Nearest Locality:** Orari**From:** (map ref.): K38: 724-741 (near Coach Road)**To:** (map ref.): K38: 723-738 (towards Bates Street)**Approximate size:** 0.5 hectares**Adjoining properties:** 24660/383.00 (west); 24660/384.00 (east)**Ecological District:** Low Plains**Land Environment:** L1**Surveyors:** Mike Harding**Survey Date:** 11th April 2011**Vegetation Description:** (indigenous species in **bold font**)

East side of road: Grassland/herbfield dominated by browntop, yarrow, viper's bugloss, *Rytidosperma clavatum*, *Muehlenbeckia ephedroides* and narrow-leaved plantain. Other plant species present are catsear, red clover, **patotara**, **moss**, Deptford pink, haresfoot trefoil, stonecrop, *Chondropsis semiviridis*, Chewings fescue, **lichen**, *Crassula* sp., sand spurrey, **creeping pohuehue**, **lichen** and occasionally gorse and woolly mullein.

West side of road: Grassland dominated by browntop, Chewings fescue and **moss**. Other plant species present are *Rytidosperma clavatum*, catsear, **patotara**, **creeping pohuehue**, *Muehlenbeckia ephedroides*, woolly moss, *Chondropsis semiviridis*, yarrow, sheep's sorrel and occasionally broom.

Notable Species:

Nine indigenous plant species are present, including an at-risk (declining) sub-shrub, *Muehlenbeckia ephedroides*.

Condition/Management:

Prone to disturbance by vehicles, as there is a gateway to an old gravel pit on this stretch of road. The site is threatened by gorse and broom.





Grassland at Payne Road (SNA 734)



The at-risk sub-shrub Muehlenbeckia ephedroides sprawling through grass at SNA 734.

Payne Road
SNA 734



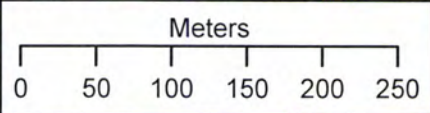
Williams Road

Coach Road

734

Payne Road

Bates Street



1:5,000

TIMARU DISTRICT SNA SURVEY

SNA 735

Road: Bates Street (both sides)	Nearest Locality: Orari
From: (map ref.): K38: 724-736 (Payne Road)	
To: (map ref.): K38: 727-735 (ford)	
Approximate size: 0.7 hectares	
Adjoining properties: 24660/384.00 (northwest); 24660/388.00 (northeast); 24660/389.00 (south)	
Ecological District: Low Plains	Land Environment: L1
Surveyors: Mike Harding	Survey Date: 11 th April 2011

Vegetation Description: (indigenous species in **bold** font)

South side of road: Grassland dominated by browntop, Chewings fescue and *Rytidosperma clavatum*. Other important species present are *Muehlenbeckia ephedroides*, white clover, **wire moss**, two other species of **moss**, Deptford pink, *Chonodropsis semiviridis*, catsear, viper's bugloss, sheep's sorrel, haresfoot trefoil, **patotara**, **creeping pohuehue**, narrow-leaved plantain, **blue wheat grass** and, in denser pasture swards, cocksfoot and tall oat grass. Occasionally present are Australian sheep's bur, *Carmichaelia corrugata*, woolly mullein, stonecrop, *Crassula* sp., **woolly moss**, field speedwell, **matagouri** (one small old shrub and one seedling), **porcupine shrub** (one patch of low plants) and broom.

North side of road: Grassland dominated by Chewings fescue and browntop. Other plant species present are *Rytidosperma clavatum*, **moss**, yarrow, catsear, **blue wheat grass**, cocksfoot, sheep's sorrel, viper's bugloss, Deptford pink, white clover, narrow-leaved plantain, *Chondropsis semiviridis*, stonecrop, sand spurrey, **wire moss**, **woolly moss**, **creeping pohuehue**, *Muehlenbeckia ephedroides* and **patotara**.

Notable Species:

Thirteen indigenous plant species are present, including two shrub species (matagouri and porcupine shrub) and one at-risk (declining) sub-shrub, *Muehlenbeckia ephedroides*.

Condition/Management:

At the time of survey, a row of baleage was present on the north side of the road and small plants of porcupine shrub on the south side of the road, adjacent to the baleage, had been flattened (temporarily?) by heavy vehicle tracks. Broom poses a threat at the site.

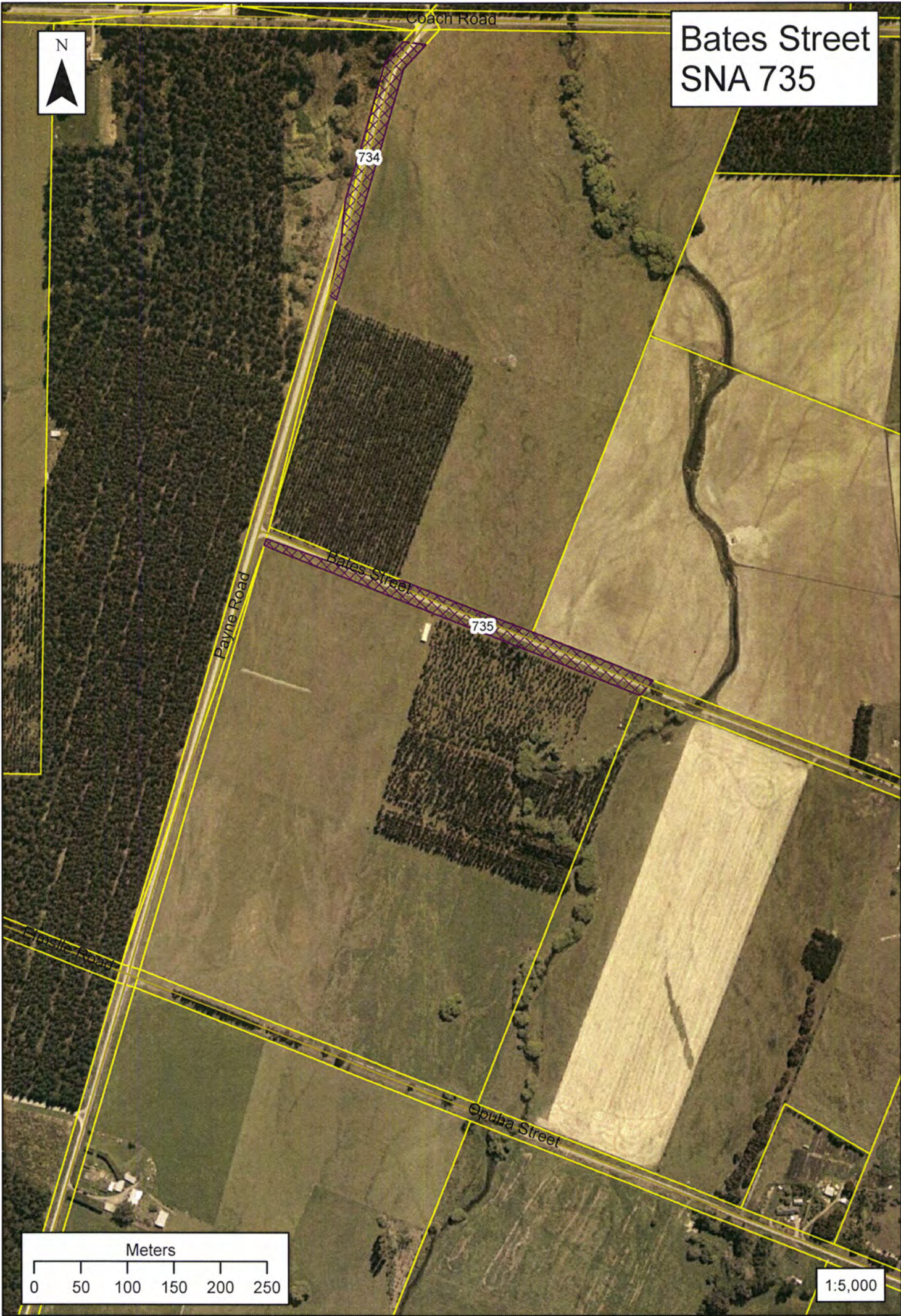




Porcupine shrub at Bates Street (SNA 735)



Carmichaelia corrugata at SNA 735



TIMARU DISTRICT SNA SURVEY

SNA 737

Road: Parke Road**Nearest Locality:** Clandeboye**From: (map ref.):** K38: 856-655 (Maori Reserve Road)**To: (map ref.):** K38: 858-656 (beyond ford)**Approximate size:** 0.3 hectares**Adjoining properties:** 24710/080.00 (north and south)**Ecological District:** Low Plains**Land Environment:** L1**Surveyors:** Mike Harding**Survey Date:** 11th April 2011**Vegetation Description:** (indigenous species in **bold font**)

Grassland dominated by browntop and yarrow. Other plant species present are *Rytidosperma clavatum*, cocksfoot, catsear, white clover, narrow-leaved plantain and scattered clumps of silver tussock.

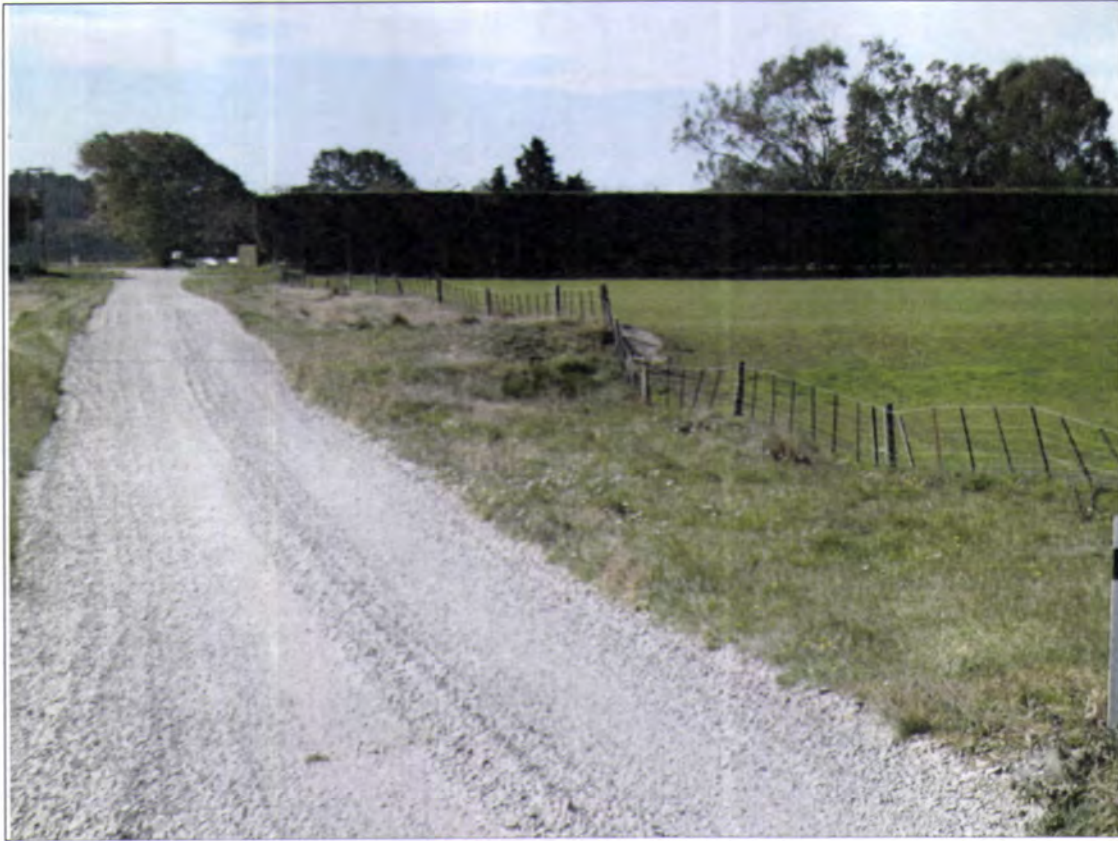
Notable Species:

A rare occurrence of silver tussock on the low plains.

Condition/Management:

No obvious threats, apart from disturbance such as cultivation or road works



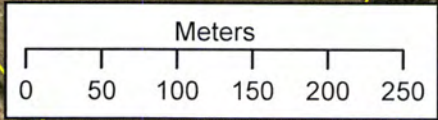


Silver tussock at Parke Road (SNA 737)



Silver tussock at SNA 737

Parke Road
SNA 737



1:5,000

TIMARU DISTRICT SNA SURVEY

SNA 740

Road: Station Road**Nearest Locality:** Arowhenua**From: (map ref.):** J38: 659-599 (Station Road)**To: (map ref.):** J38: 649-600 (Lyon Road)**Approximate size:** 1.4 hectares**Adjoining properties:** 24680/040.00 (west and south); 24680/072.00 (north)**Ecological District:** Low Plains**Land Environment:** L1**Surveyors:** Mike Harding**Survey Date:** 17th May 2011**Vegetation Description:** (indigenous species in **bold font**)

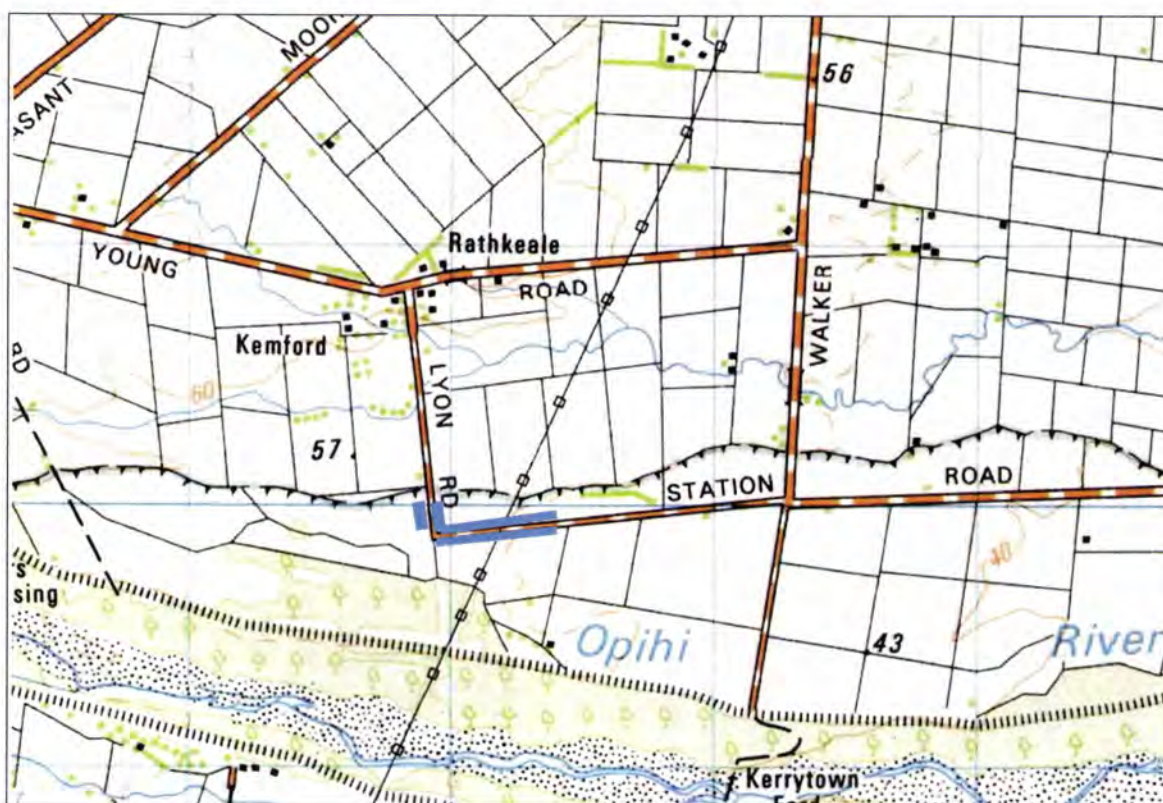
Rough grassland dominated by browntop, cocksfoot and other naturalized grasses, with patches of **cabbage trees** and **flax**. Dense clumps of **bracken** and **pohuehue** along fences. Damper areas of pasture have dense patches of *Carex coriacea*. Other plant species present are broom, gorse, elderberry, blackberry, Californian thistle, Scotch thistle, nodding thistle, yarrow and broad-leaved dock. Old man's beard is present nearby. Several scattered kowhai and cabbage trees are present further east on Station Road.

Notable Species:

A good number of cabbage trees. Flax is now relatively uncommon in the Low Plains ED.

Condition/Management:

The vegetation is threatened by woody weeds and at risk of infestation by old man's beard.





Station Road (SNA 740)



Kowhai on Station Road

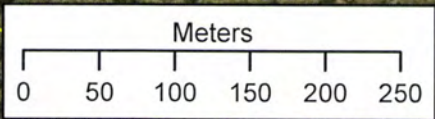


Station Road
SNA 740

Lyon Road

Station Road

740



1:5,000



Station Road Significant Trees

Young Road

Walker Road

Station Road

Meters

0 100 200 300 400 500

1:10,000



5.0 ECOLOGICAL MANAGEMENT

These roadside SNAs support modified remnants of the original plains plant communities. These indigenous plant communities are threatened by more competitive naturalized species, especially grasses. It appears that components of the original vegetation have survived at these sites because the sites have escaped cultivation and intensive grazing.

Protection and restoration of indigenous plant communities at these sites will require control of naturalized plant species. Few lowland grassland sites in Canterbury are managed for protection of indigenous plant species and there is little research data to guide such management.

Results of monitoring of paired grazed and un-grazed plots in silver tussock grassland on relatively fertile soils on Christchurch's Port Hills showed a decrease in the number and abundance of indigenous species following the removal of sheep grazing (Lord, 1990). In a separate study on poorer lighter soils, where vegetation was more stressed, both indigenous and naturalized vascular plant cover was reduced by grazing, with a corresponding rise in the dominance of non-vascular (moss and lichen) species. When grazing was removed from sites with poorer soils, the cover of naturalized species increased, generally at the expense of indigenous species (Meurk *et al*, 1989). The authors of this study warn that grazing does not discriminate against palatable native species and that other methods, such as cutting, mowing, weeding or burning, may be preferable to grazing. In summary, management effects are poorly understood and are often site-specific.

Particular plant species or plant communities at these roadside SNAs may require different management methods. For example, the sub-shrub *Muehlenbeckia ephedroides* is surviving well at roadside sites on Palmer Road (SNA 111d) and State Highway 1 (SNA 115) that are regularly mown. However, indigenous grasses are virtually absent from these sites. Indigenous grasses (notably *Rytidosperma clavatum*) appear to be surviving well at areas of open (un-shaded) grassland. Other indigenous plants, such as creeping pohuehue and wire moss are frequently present at stony sites, including disturbed surfaces.

The main threats to these plant communities are the colonization and invasion of naturalized grasses, in particular browntop and Chewings fescue, and woody plants such as broom and gorse. Activities that are most likely to encourage or facilitate this change are cultivation and intensive grazing. Careless use of herbicides also poses a threat, especially to remnant indigenous shrubs such as matagouri and porcupine shrub.

Management of these roadside SNAs for protection or restoration may require experimentation. Ideally, the effects of management should be monitored and, if resources permit, a range of management methods should be trialled.

6.0 APPENDICES

6.1 Scientific Names of Species

Scientific names of species cited by common name in this report

(Note: this is not a complete species list; it is a list only of species cited by common name in this report)

Common Name Scientific name

(* = naturalised species)

Australian sheep's bur*	<i>Acaena agnipila</i>
blackberry*	<i>Rubus fruticosus</i> agg.
blue wheat grass	<i>Elymus solandri</i>
bracken	<i>Pteridium esculentum</i>
broad-leaved dock*	<i>Rumex obtusifolius</i>
broom*	<i>Cytisus scoparius</i>
browntop*	<i>Agrostis capillaris</i>
cabbage tree	<i>Cordyline australis</i>
Californian thistle*	<i>Cirsium arvense</i>
catsear*	<i>Hypochoeris radicata</i>
Chewings fescue*	<i>Festuca rubra</i> ssp. <i>commutata</i>
cocksfoot*	<i>Dactylis glomerata</i>
couch*	<i>Elytrigia repens</i>
creeping pohuehue	<i>Muehlenbeckia axillaris</i>
dandelion*	<i>Taraxacum officinale</i>
Deptford pink*	<i>Dianthus armeria</i>
elderberry*	<i>Sambucus nigra</i>
field speedwell*	<i>Veronica arvensis</i>
flax	<i>Phormium tenax</i>
gorse*	<i>Ulex europaeus</i>
haresfoot trefoil*	<i>Trifolium arvense</i>
hawksbeard*	<i>Crepis capillaris</i>
hawthorn*	<i>Crataegus monogyna</i>
kowhai	<i>Sophora microphylla</i>
lotus*	<i>Lotus pedunculatus</i>
matagouri	<i>Discaria toumatou</i>
mouse-ear hawkweed*	<i>Hieracium pilosella</i>
narrow-leaved plantain*	<i>Plantago lanceolata</i>
nodding thistle*	<i>Carduus nutans</i>
old man's beard*	<i>Clematis vitalba</i>
patotara	<i>Leucopogon fraseri</i>
pohuehue	<i>Muehlenbeckia australis</i>
porcupine shrub	<i>Melicytus alpinus</i>
red clover*	<i>Trifolium pratense</i>
sand spurrey*	<i>Spergularia rubra</i>
Scotch thistle*	<i>Cirsium vulgare</i>
sheep's sorrel*	<i>Rumex acetosella</i>
silver tussock	<i>Poa cita</i>
silvery hair grass*	<i>Aira caryophyllea</i>
St John's wort*	<i>Hypericum perforatum</i>
stonecrop*	<i>Sedum acre</i>
sweet vernal*	<i>Anthoxanthum odoratum</i>
tall oat grass*	<i>Arrhenatherum elatius</i>
timothy*	<i>Phleum pratense</i>
viper's bugloss*	<i>Echium vulgare</i>
vulpia hair grass*	<i>Vulpia bromoides</i>
white clover*	<i>Trifolium repens</i>
wire moss	<i>Polytrichum juniperinum</i>
woolly moss	<i>Racomitrium</i> sp.

woolly mullein*	<i>Verbascum thapsus</i>
yarrow*	<i>Achillea millefolium</i>
Yorkshire fog*	<i>Holcus lanatus</i>

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