

MMK Mount McKenzie Land System

Undulating rises, low hills and valley flats of the Flaxman Valley between Craneford and Angaston

Area: 62.0 km²

Annual rainfall: 555 – 685 mm average

Geology: The land is underlain by metasandstones, phyllites and schists of the Backstairs Passage Formation, with inclusions of gneisses of the Rathjen Formation. There are substantial areas of locally derived alluvium as valley fill. This is variable, but is commonly medium to coarse grained, with less common finer material.

Topography: The Mount McKenzie Land System comprises undulating to rolling rises and low hills with substantial areas of valley flats. The System includes a large part of the Flaxman Valley catchment. Slopes range from 1 - 2% on some flats to 30% on some short steep slopes. Rock outcrop is extensive on some slopes, to non-existent on flats. Sporadic saline seepage on lower slopes, and occasional stream bank erosion, are typical.

Elevation: 350 m to 500 m

Relief: Up to 70 m

Soils: Most soils are sandy and moderately shallow over weathering rock. Many have clayey subsoils. Deeper sands are common in drainage depressions.

Main soils

Soils formed over basement rock on hillslopes

- L1a** Shallow stony loamy sand on schistose rock
- K4a** Loamy sand over brown clay on schistose rock
- K5** Gradational sandy loam on rock

Soils formed over alluvium on lower slopes and flats

- F2** Sandy loam over dispersive clay

Minor soils

Soils formed over basement rock on hillslopes

- K4b** Loamy sand over brown clay on sandstone
- K4c** Loamy sand over hard brown clay on quartzite
- L1b** Shallow stony loamy sand on sandstone or quartzite

Soils formed over alluvium on lower slopes and flats

- F1** Sandy loam over brown clay
- G3** Thick sand over brown clay
- M1** Deep gradational sand
- M3** Gravelly sandy loam

Main features: The Mount McKenzie Land System comprises undulating to rolling land formed on medium to coarse grained rocks, with sandy surface soils, often with clayey subsoils. These soils have moderate to low fertility and waterholding capacity, and are acidifying. They are also highly erodible. Between the rising ground are flats characterized by deeper soils with sandy to loamy surfaces and either poorly structured clayey subsoils, or medium to coarse textured subsoils. Waterlogging and salinity are important features together with low fertility and acidification. Stream bank erosion is a problem in places.



Soil Landscape Unit summary: 11 Soil Landscape Units (SLUs) mapped in the Mount McKenzie Land System:

SLU	% of area	Main features #
AIB	0.4	<p>Rises up to 30 m high formed on metasandstones of the Tappanappa Formation. Slopes range from 10% to 20%. There is 10-20% surface stone and rock outcrop.</p> <p>Main soils: <u>loamy sand over poorly structured brown clay</u> - K4c (E) and <u>shallow gravelly loamy sand</u> - L1b (E). This land is characterized by sandy infertile soils either with tight clay subsoils or shallow over rock. Clayey subsoils impede water percolation. Potential for erosion, particularly by water is high, although disturbed surfaces are also prone to wind erosion. Surface rock and stone limits accessibility in places. Horticultural potential is moderate to high depending on accessibility and soil depth.</p>
AmB AmC	3.1 3.2	<p>Undulating rises to rolling low hills with sporadic rock outcrop formed on metasandstones, phyllites and schists of the Backstairs Passage Formation, with inclusions of gneisses of the Rathjen Formation. There is 10-20% surface stone and rock outcrop and minor watercourse erosion.</p> <p>AmB Rises up to 30 m high with slopes of 10-20%.</p> <p>AmC Low hills from 30 to 70 m high with slopes of 15-30%.</p> <p>The soils, although variable, are usually sandy surfaced and formed over micaceous rocks. Clay subsoils occur in many types, their characteristics being determined by the nature of the parent rocks. Deeper soils are restricted to lower slopes and creek flats.</p> <p>Main soils: <u>loamy sand over brown clay</u> - K4a and K4b (E) and <u>shallow stony loamy sand</u> - L1a (E). The soils are moderately to well drained, depending on presence of clay subsoil. Deeper soils on lower slopes with tighter clay subsoils develop perched water tables and are imperfectly drained. Inherent fertility is moderate (where clayey subsoils occur) to low (shallow soils over rock). Most soils are acidic and all are prone to acidification. Surface soils are generally friable, but are liable to compaction under intensive use. Clayey subsoils are usually well structured, although on lower slopes they are often dispersive and restrictive to root growth. Water holding capacities are moderate to low depending on depth to rock. Soil salinity is generally low, but there are sporadic saline seepages, usually on lower slopes, but occasionally on mid slopes. Potential for water erosion is moderate to high due to the slope and high soil erodibility.</p> <p>This land is moderately steep and rocky with moderately deep to shallow stony sandy surfaced soils. The land is unsuitable for cultivated agriculture, but has some potential for perennial horticulture if water is available. Grazing is the predominant land use. Main issues are fertility maintenance, acidity control and salinity in places.</p>
AnB AnC	5.1 8.0	<p>Rocky to very rocky undulating to rolling low hills formed on metasandstones, phyllites and schists of the Backstairs Passage Formation, with inclusions of gneisses of the Rathjen Formation. Relief ranges from 30 to 100 m and slopes range from 2% to 30%, but are generally more than 10%. Some short slopes are as steep as 50%. There is 20% or more rocky outcrop and surface stone. Watercourses occupy narrow depressions. They are sporadically eroded. AnB/AnC are rocky variations of AmB/AmC.</p> <p>AnB Undulating rocky low hills with relief from 30 m to 40 m and slopes of 5-12%.</p> <p>AnC Rolling rocky low hills with relief from 20 m to 100 m and slopes of 12-30%.</p> <p>The soils are predominantly shallow and stony, with coarse textures. Deeper profiles with clayey subsoils are less common. Variations in the clay reflect differences in the parent rocks. On lower slopes and creek flats, a range of deep texture contrast and sandy alluvial soils occurs, but these are minor overall.</p> <p>Main soils: <u>shallow stony loamy sand</u> - L1a (V) with <u>loamy sand over brown clay</u> - K4b and K4a (C) and <u>gradational sandy loam</u> - K5 (L). The soils are well to moderately well drained depending on subsoil. Inherent fertility is low to moderately low, due to low clay contents. Most soils are acidic, and all are susceptible to acidification. Surface soils are generally friable, but are liable to compaction under intensive use. Clayey subsoils are usually well structured. Waterholding capacities are low to moderately low due to generally shallow depth. Soil salinity is usually low, but sporadic saline seepages occur, mainly on lower slopes. Potential for water erosion is moderately high to high.</p> <p>This land is moderately steep and very rocky. The rockiness and associated shallow soils are the main limitations to land use, which is restricted almost entirely to grazing. Fertility and acidity are the main issues.</p>



CQC CQD	13.7 44.5	<p>Undulating rises to rolling low hills with sporadic rock outcrop formed on metasandstones, phyllites and schists of the Backstairs Passage Formation, with inclusions of gneisses of the Rathjen Formation. Relief ranges from 10 m to 70 m and slopes range from 2% to 25%. There is up to 5% outcrop and up to 10% surface stone. Watercourses occupy broad depressions and are eroded in places.</p> <p>CQC Undulating rises with relief to 30 m and slopes of 4-8%. CQD Undulating rises and low hills with relief from 20 m to 70 m and slopes of 6-15%.</p> <p>The soils are usually sandy surfaced and formed over micaceous rocks. Clay subsoils often occur, their characteristics being determined by the nature of the parent rocks. Deeper soils are restricted to lower slopes and creek flats.</p> <p>Main soils: <u>loamy sand over brown clay</u> - K4a (E) and <u>shallow stony loamy sand</u> - L1a (E) with <u>loamy sand over brown clay</u> - K4b (L) and <u>gradational sandy loam</u> - K5 (L). <u>Sandy loam over dispersive clay</u> - F2 (L), <u>sandy loam over brown clay</u> - F1 (M), <u>thick sand over brown clay</u> - G3 (M) and <u>deep gradational sand</u> - M1 (M) occur on lower slopes. <u>Gravelly sandy loam</u> - M3 (M) occurs sporadically throughout on weathering rock and alluvium. The soils are moderately to well drained, depending on presence of clay subsoil. Deeper soils on lower slopes with tighter clay subsoils develop perched water tables and are imperfectly drained. Inherent fertility is moderate (where clayey subsoils occur) to low (shallow soils over rock). Most soils are acidic and all are prone to acidification. Surface soils are generally friable, but are liable to compaction under intensive use. Clayey subsoils are usually well structured, although on lower slopes they are dispersive and restrictive to root growth. Water holding capacities are moderate to low depending on depth to rock. Soil salinity is generally low, but there are sporadic saline seepages, usually on lower slopes and occasionally on mid slopes. Soils are highly erodible, so even gentle slopes are susceptible to water erosion.</p> <p>This land is characterized by gentle to moderate slopes with mixed loamy sand over clay soils and shallow stony soils. Erodibility is high, so cultivated agriculture is risky. Horticultural potential is moderate to high, although water availability is commonly limiting. The land is extensively used for grazing. Fertility maintenance and acidity correction are the main management issues, with salinity control required in places.</p>
CZL CZM	4.9 1.7	<p>Lower slopes formed on a complex of basement metasandstones, phyllites and schists, deeply weathered rocks and locally derived alluvial sediments. There is less than 2% outcrop and up to 10% surface stone. This land is transitional between CQC and LUO.</p> <p>CZL Gentle slopes of 2-4%. CZM Moderate slopes of 4-10%.</p> <p>The soils have features in common with those found in CQC and LUO - i.e. a mixture of moderately shallow to shallow soils on basement rocks, and deeper sandy surfaced soils on alluvium.</p> <p>Main soils: <u>loamy sand over brown clay</u> - K4a (C), <u>shallow stony loamy sand</u> - L1a (L) and <u>loamy sand over brown clay</u> - K4b (L) on basement rock, with <u>sandy loam over dispersive clay</u> - F2 (L), <u>deep gradational sand</u> - M1 (L), <u>sandy loam over brown clay</u> - F1 (L) and <u>thick sand over brown clay</u> - G3 (L) on lower slopes. <u>Gravelly sandy loam</u> - M3 (M) occurs sporadically on weathering rock and alluvium. The soils are moderately well to imperfectly drained. Perching of water on subsoils, particularly on lower slopes, causes waterlogging. Inherent fertility is moderately low to low. Most soils are acidic and all are prone to acidification. Surface soils are generally friable, but are liable to compaction under intensive use. Clayey subsoils are commonly dispersive (especially on deeper lower slope soils) and restrictive to root growth. Waterholding capacities are high to low depending on depth of soil. Surface soil salinity generally low, but subsoil salinity may be high. Saline seepages affect 2-10% of the land. Soils are highly erodible, so even gentle slopes are susceptible to water erosion.</p> <p>This land is characterized by gentle to moderate slopes with mixed loamy sand over clay soils and shallow stony soils. Fertility maintenance, acidity correction, waterlogging management and salinity control are the main management issues. Soil erodibility is high, so cultivated agriculture is risky. Horticultural potential is moderate to low depending on position in relation to waterlogged and/or saline soils. Irrigation water availability is commonly limiting. The land is extensively used for grazing.</p>



LCe	1.1	<p>Drainage depressions formed on gritty sandy clay and sandy alluvium derived from the adjacent rises and hills. Watercourses are commonly eroded, and there are isolated saline seepages. Main soils: <u>deep gradational sand</u> - M1 (E) and <u>sandy loam over dispersive clay</u> - F2 (E), with <u>sandy loam over brown clay</u> - F1 (L) and <u>thick sand over brown clay</u> - G3 (L). Surface soils are sandy, stony and infertile with high acidification potential. Subsoils have low permeability, causing subsurface waterlogging. Run on water from steeper adjacent slopes creates an erosion hazard in watercourses.</p>
LUO	14.3	<p>Drainage depressions and valley flats with well defined watercourses, occasionally eroded, formed on coarse, medium, and to a lesser extent, fine grained alluvial sediments derived from metasandstones of the Backstairs Passage Formation. Maximum slopes are 5%. There are minor low rises formed on bedrock throughout the landscape. Sporadic saline seepages where water tables are forced to the surface affect up to 10% of the land area. The dominant soils have massive sandy surfaces overlying dark grey or yellow brown mottled clayey subsoils, usually deep, but sometimes moderately shallow over bedrock. Other soils include deep sands and shallow stony loamy sands on rock.</p> <p>Main soils: <u>sandy loam over dispersive clay</u> - F2 (E), <u>deep gradational sand</u> - M1 (E), <u>sandy loam on brown clay</u> - F1 (L) and <u>thick sand over brown clay</u> - G3 (L) on flats, with <u>loamy sand over brown clay</u> - K4a (M) and <u>shallow stony loamy sand</u> - L1a (M) on basement rock highs. The soils are imperfectly to poorly drained due to perching of water on clayey subsoils, or shallow seasonal water tables on low lying ground. Inherent fertility is moderate to low, depending on clay content. Most soils are acidic, and all are susceptible to acidification. Surface soils do not usually have structural problems, although they are susceptible to compaction which can occur if the soils are worked or over-grazed when wet. Subsoils in the main soil (F2) are dispersive and impede water movement and root growth. Water holding capacities are moderate to high. Potential for water erosion is low to moderate, but erosion by run off water from adjacent slopes or from upstream is always a threat.</p> <p>This land is all low lying and characterized by deep sandy surfaced soils which are prone to waterlogging. Some are also affected by salinity. Fertility maintenance and acidity amelioration are key management issues, together with selection of appropriate pasture varieties to cope with wet and possibly salty conditions.</p>

PROPORTION codes assigned to soils within Soil Landscape Units (SLU):

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| (D) Dominant in extent (>90% of SLU) | (C) Common in extent (20–30% of SLU) |
| (V) Very extensive in extent (60–90% of SLU) | (L) Limited in extent (10–20% of SLU) |
| (E) Extensive in extent (30–60% of SLU) | (M) Minor in extent (<10% of SLU) |



Detailed soil profile descriptions:

- F1** Sandy loam over brown clay (Eutrophic, Brown Chromosol)
Thick grey massive sandy loam with a paler or bleached A2 layer, over a brown or dark coloured friable sandy to medium clay grading to alluvium. Minor, on valley floors and lower slopes.
- F2** Sandy loam over dispersive clay (Eutrophic / Calcic, Brown Sodosol)
Thick grey massive sandy loam to loamy sand with a bleached A2 horizon, overlying a yellow brown and grey mottled prismatic structured clay, sometimes with soft or nodular calcareous segregations with depth, grading to alluvium. Limited, on lower slopes and drainage depressions.
- G3** Thick sand over brown clay (Eutrophic, Brown Sodosol)
Thick greyish sand with a bleached A2 layer, sharply overlying a brown mottled dispersive sandy clay to clay, grading to coarser grained material with depth.
- K4a** Loamy sand over brown clay (Bleached-Sodic, Eutrophic, Brown Chromosol)
Thick grey brown loamy sand with a bleached and gravelly A2 horizon, overlying a dark brown, grey, yellow and red mottled clay with strong blocky structure, grading to weathered sandy schist or micaceous sandstone by 100 cm. Common on slopes throughout, particularly in red gum areas.
- K4b** Loamy sand over brown clay (Bleached, Mesotrophic, Brown Chromosol)
Medium thickness grey loamy sand with a quartz and sandstone gravelly bleached A2 horizon, overlying a brown, red and yellow sandy clay loam to sandy clay grading to weathering micaceous sandstone by 100 cm. Limited in blue gum areas on very sandy rocks.
- K4c** Loamy sand over poorly structured brown clay (Bleached-Mottled, Mesotrophic, Brown Kurosol)
Thick grey loamy sand with a bleached and quartz gravelly A2 horizon, overlying a yellowish brown and grey mottled clay subsoil with coarse blocky structure, grading to quartzitic sandstone. Minor on slopes in the west.
- K5** Gradational sandy loam on rock (Mesotrophic, Brown Kandosol / Acidic, Paralithic, Brown-Orthic Tenosol)
Thick to very thick loamy sand to sandy loam becoming slightly more clayey at depth with variable gravel, over weathering rock at about 100 cm. Limited on slopes.
- L1a** Shallow stony loamy sand (Paralithic, Leptic Rudosol)
Thick dark brown loamy sand, with up to 50% rock fragments, overlying sandy schist or micaceous sandstone at about 50 cm. Common in association with rock outcrop.
- L1b** Shallow gravelly loamy sand (Acidic, Lithic, Bleached-Leptic Tenosol)
Thick grey gravelly loamy sand with a bleached and very quartz stony A2 horizon overlying quartzitic sandstone within 50 cm of the surface. Minor on rocky slopes in the west.
- M1** Deep gradational sand (Bleached-Sodic, Eutrophic, Grey / Brown Kandosol)
Very thick brown sand to sandy loam with bleached and rusty mottles, overlying a massive brown clayey sand to light sandy clay loam at about 100 cm, grading to coarse textured alluvium. Limited on alluvial flats.
- M3** Gravelly sandy loam (Bleached-Orthic Tenosol)
Thick very gravelly (usually quartz) sandy loam with a bleached or paler coloured A2 layer, overlying coarse grained weathering rock or alluvium. Minor throughout.

Further information: [DEWNR Soil and Land Program](#)

