HEA Heatherdale Land System

Strongly dissected hills extending from Mount Terrible to Yankalilla

Area: 64.7 km^2

Annual rainfall: 535 – 900 mm average

Geology: More than 90% of the system is underlain by basement rocks. These include:

- Metasiltstones, metasandstones and marbles of the Strangway Hill and Sellicks Hill Formations.
- Highly calcified metamorphosed siltstones, limestones and dolomites of the Fork Tree and Rapid Bay Formations.
- Siltstones and slates of the Tapley Hill and Saddleworth Formations;
- Shales and quartzitic shales of the Tapley Hill, Brachina and Tarcowie Formations.
- Quartzites and quartzitic shales of the ABC Range Formation.
- Calcareous siltstones and limestones of the Brighton Limestone Formation.

The rocks are sporadically mantled by carbonates of aeolian origin. These are more common in the lower rainfall areas nearer the coast.

In the south, the rocks are mantled by a thin veneer of weakly indurated or unconsolidated sediments which appear to be the last remnants of sediments laid down in ancient glacial valleys (large areas of the Fleurieu Peninsula were glaciated during the Permian geological period). These sediments include weakly indurated sandstones and partly ferruginized sandy clays. There are minor lateritic residuals on crests in the north.

Topography: The land system is a strongly dissected range of hills abutting the south eastern side of the Sellicks Hill Range and continuing south westwards to the coast, ending at an ancient glacial valley (now occupied by the Bungala River) at Yankalilla. The characteristic feature of the System is the degree of dissection, resulting in very steep deep rocky gullies, and the widespread occurrences of landslips, gully and tunnel erosion. These features are partly attributable to the System's coastal exposure, but more to the composition of the main underlying rock formations. Most water courses are short, and they flow from the range in all directions, but westward flows directly to the sea are predominant. The only major water course is the Myponga River which has carved a 150 m deep gorge across the landscape between the Myponga Reservoir and the sea.

Elevation: 0 m at sea level to 387 m at Mount Terrible in the north

Relief: Up to 150 m

Soils: Soil variation reflects the nature of the underlying material. Calcareous rocks and sediments give rise to soils which are either calcareous throughout, or at least have a prominent subsoil carbonate layer. Non calcareous rocks give rise to texture contrast, gradational or skeletal soils with sandy loam or clay loam surfaces. There is a considerable range, depending on rock type. The remnant glacially deposited sediments are associated with mostly sandy to clay loamy texture contrast soils. There are minor ironstone soils.

Main soils

L1a Shallow stony loam over basement rock
C2 Shallow gradational red loam over calcareous rock
K2b Loam to clay loam over dispersive brown clay on basement rock
K2a Loam to clay loam over red clay on basement rock
B4 Shallow gradational red loam over calcreted rock or limestone

Minor soils

Soils formed on calcareous rocks or rocks mantled by secondary carbonate
A2 Shallow calcareous loam - on fresh rock
B2 Shallow calcareous loam - on calcreted rock
D1 Shallow loam over red clay
Soils formed on non calcareous rocks
K1 Gradational loam – brown (**K1a**) or red (**K1b**)
K2d Loam to clay loam over mottled red clay
K4a Sandy loam over brown clay
L1 Shallow stony soil - sandy loam (**L1b**) or clay loam (**L1c**)
Soils formed on deeply weathered rocks
K1c Gradational loam
J2 Deep acidic loamy ironstone soil
K2c Loam over red clay on highly weathered rock
K4b Sandy loam over poorly structured brown clay on quartzite
Soils formed on remnant glacial valley deposits (clays and sandstones)
C5 Dark gradational clay loam
D5 Hard sandy loam over red clay
F2 Clay loam over poorly structured brown clay
G3 Thick sand over clay

Main features: The Heatherdale Land System is characterized by strongly dissected moderately steep to very steep hillslopes. The steeper slopes are very rocky. Widespread areas are degraded by landslips, gully and tunnel erosion, features which are attributable to the underlying rocks and associated dispersive soils. The soils in the central and eastern parts are typically loamy to clay loamy with dispersive brown or red heavy clay subsoils. Shallow stony loams occur on steeper rocky slopes. Although inherently fertile, their instability and steep topography limit land use options. On the slopes facing the coast, a range of calcareous loams and loamy gradational soils on calcareous rocks is predominant. These soils are moderately deep, well drained and fertile, but severe coastal exposure restricts their use. Some areas are arable, but the dissection of the landscape hinders accessibility and limits the size of workable areas.

Soil Landscape Unit summary: 30 Soil Landscape Units (SLUs) mapped in the Heatherdale Land System:

SLU	% of area	Main features #
ACD ACI ACJ	1.3 6.7 6.3	Moderate to very steep hillslopes formed on metasiltstones, metasandstones and marbles (sometimes calcified), of the Strangway Hill and Sellicks Hill Formations. Relief is 70-100 m and slopes are 20-100%. There are sporadic landslips. Rock outcrop is extensive. Water courses are very well defined and commonly eroded. **ACD** Steep hillslopes with relief of 40-70 m and slopes of 30-50%. **ACI** Rolling low hills and moderate slopes with relief of up to 70 m, slopes of 20-30% and eroded water courses. **ACJ** Steep rocky gullies with slopes of 30-100%, up to 100 m high, and with eroded water courses. Most soils: shallow stony loams, but deeper profiles with clayey subsoils are common. Sporadic soft carbonate occurs in lower subsoils. On calcareous rock strata, loamy

		surface soils overlie massive soft to semi-hard carbonate. Main soils: Shallow stony loam - **L1a** (E) } on non calcareous rocks Acidic loam over red or brown clay - **K2a/K2b/K2c** (C) } Shallow calcareous loam - **A2** (L) } on calcareous rocks Shallow gradational red loam - **C2/B4** (L) } These soils are inherently fertile, although often shallow. The steep terrain, most of which is inaccessible to machinery, limits land use to grazing. There is severe potential for erosion including landslips if the surface is disturbed or bared off by over-grazing.
ADD ADI	0.7 3.1	Moderately steep slopes and ridges formed on highly calcified metamorphosed siltstones, limestones and dolomites of the Fork Tree and Rapid Bay Formations. Rock outcrop is very extensive on steeper slopes. There is extensive surface calcrete, lime coated siltstone and limestone. **ADD** Steep rocky dissected ridge, 30-70 m high, with slopes of 30-50%. **ADI** Moderately steep slopes running towards the sea, and commonly ending in near vertical cliffs. Slopes are 20-30%. The soils are shallow over thick soft, semi-hard, rubbly or occasionally sheet-rock carbonate, grading to calcareous weathering rock. They are medium textured; some are calcareous throughout, others have red clayey subsoils. Main soils: Shallow calcareous loam - **A2/B2** (E) Shallow gradational red loam - **C2/B4** (E) These soils are all fertile and well drained, although often shallow. However, the moderately steep slopes and westerly exposure of ADI and the steep slopes of ADD limit land use options to grazing only.
AaI	8.2	Rolling low hills formed on siltstones, slates, calcareous siltstones and quartzites of the Tapley Hill, Saddleworth and Brighton Formations. Slopes are 16-30% and relief is up to 60 m. Water courses occupy well defined and often eroded channels. Soils are loamy and usually gravelly and stony, with either red clay subsoils grading to weathering rock (sometimes calcareous), or dispersive brown clay subsoils forming in quartzitic shale. Shallow loams formed directly on rock or soft carbonate are common. Main soils: Loam over red clay - **K2a** (L) } on non calcareous rocks Clay loam over dispersive brown clay - **K2b** (L) } Shallow stony loam - **L1a** (C) } Loam over red clay on highly weathered rock - **K2c** (L) } on upper slopes Gradational brown loam - **K1a** (L) } Shallow gradational red loam - **C2/B4** (L) on calcareous rocks The soils are inherently fertile and generally moderately deep. Although too steep for many uses, the land has potential for perennial horticulture and viticulture, although caution is needed to avoid tunnel and gully erosion and landslip on the dispersive soils.
AdC AdI AdJ Add	0.8 27.7 2.7 10.9	Moderately steep to steep slopes formed on shales, quartzitic shales and limited limestones of the Tapley Hill Slate, Brachina Shale, Tarcowie Siltstone and Brighton Limestone Formations. Rock outcrop is minor on moderate slopes but extensive on steeper slopes. Surface quartzite is common throughout. Water courses occupy very narrow valleys, are well defined and often eroded. Landslips and tunnel erosion are particularly prevalent on the steeper slopes. **AdC** Moderately steep hillslopes with relief to 80 m and slopes of 12-30%. **AdI** As for **AdC**, with eroded water courses. **AdJ** Steep rocky hillslopes, 30-100%, up to 100 m high with eroded water courses. **Add** As for **AdJ**, but with relief to 150 m (Myponga River Gorge) and significant land slip. The most common soils have dark clay loamy surfaces over brown dispersive clay subsoils forming in weathering quartzitic shale. Shallow variants have no subsoil. Other soils are redder, with loamy surfaces over red clay subsoils. Shallow red loams over soft carbonate overlying calcareous rocks are limited in extent. Main soils: Clay loam over dispersive brown clay - **K2b** (E) } on quartzitic shales Shallow stony clay loam - **L1c** (L) } Loam over red clay on highly weathered rock - **K2c** (C) } on shales Shallow stony loam - **L1a** (L) } Shallow gradational red loam - **C2/B4** (L) } on calcareous rocks Shallow loam over red clay - **D1** (M) } This land is highly susceptible to erosion due to its dispersive soils and steep slopes. Rill, gully and tunnel erosion are common and there are sporadic landslips. Any uses involving soil disturbance are risky. Revegetation may be the only long term option for the most

		susceptible slopes. Grazing pressure must be controlled to ensure adequate protective surface cover.
Asc Asd	0.8 1.4	Steep to very steep hillslopes and ridges formed on quartzites and quartzitic shales of the ABC Range Formation. Slopes are 30% to 75% and relief is up to 200 metres, with slopes down to 15% on occasional flatter upper slopes and crests. Water courses are very well defined in narrow valleys. They are commonly severely eroded. There is extensive quartzite outcrop, most common on steeper slopes. Landslips are common. **Asc** Rounded moderately inclined upper slopes and crests with slopes of 15-30%. **Asd** Steep to very steep rocky hillsides with relief to 200 m and slopes of 30-75%. The most common soils have dark clay loamy surfaces overlying brown dispersive clay subsoils grading to weathering bedrock. These are associated with shallow stony soils and deep sandy loam texture contrast soils over highly weathered rock. Main soils: Clay loam over dispersive brown clay - **K2b** (E) Shallow stony clay loam - **L1c** (E) Sandy loam over poorly structured brown clay - **K4b** (E) This land is highly susceptible to gullying, tunnelling and landslip and has little productive potential. Management strategies need to concentrate on stabilization measures.
AvC AvD AvJ	2.8 0.9 2.1	Dissected south east facing slopes of old glacial valleys. The slopes are 50-100 m high. Underlying rocks are mixed siltstones, sandstones and quartzites. **AvC** Moderate slopes of 18-30%. **AvD** Steep slopes of 30-50%. **AvJ** Steep dissected valleys with eroded water courses within **AvC**. Main soils: texture contrast types on weathering rock. They are: Acidic loam over red mottled clay - **K2d** (E) Acidic sandy loam over brown clay - **K4a** (C) Acidic gradational red loam - **K1c** (C-L) Shallow stony sandy loam - **L1b** (M-L) on steep slopes Although most soils are moderately deep and relatively fertile, the land is too steep for cultivated agriculture. **AvC** is well suited to perennial crops and pastures but **AvJ** is too steep and stony for any uses other than light grazing or revegetation.
BHD	3.6	Gently rolling rises and low hills with relief to 50 m and slopes of 8-16% formed on siltstones, slates, calcareous siltstones and quartzites of the Tapley Hill, Saddleworth and Brighton Formations. The soils are similar to those in **AaI** (above), which is geologically similar. The main difference is the gentler slopes in **BHD**. This improves land use options as the risk of erosion is reduced. The land is not generally suitable for annual crops, but there is potential for perennial crops.
BII	1.5	Gently inclined slopes with relief to 20 m and slopes of 6-12% formed on shales, quartzitic shales and minor limestones of the Tapley Hill Slate, Brachina Shale, Tarcowie Siltstone and Brighton Limestone Formations. The soils are similar to those for the Ad* landscapes (above), but the land is less steep. It has productive potential for a range of crops and pastures, but the risk of erosion is the main issue, even on these gentle slopes.
DkI	2.6	Moderately inclined upper slopes formed on metasiltstones, metasandstones and marbles (sometimes calcified), of the Strangway Hill and Sellicks Hill Formations. The land lies on the higher ground between the deeply dissected slopes of **ACJ**. The water courses which flow through the steeper country originate on this land. Channels are commonly eroded to the watershed. The soils are similar to those for **ACD**/**ACI**/**ACJ**, but with less shallow stony profiles and more texture contrast types. The land is inherently fertile and the soils moderately deep, but the potential for erosion is severe.
EIC EID EII	2.9 3.0 1.2	Gentle to moderate slopes formed on highly calcified metamorphosed siltstones, limestones and dolomites of the Fork Tree and Rapid Bay Formations. The slopes typically face the sea and are usually characterized by sporadic surface calcrete stones. **EIC** Gently inclined slopes of 5-12%. **EID** Moderate slopes of 12-20%. **EII** Moderate slopes of 12-20% and an eroded water course. Soils are shallow, and overlie thick soft, semi-hard, rubbly or occasionally sheet-rock carbonate, grading to calcareous weathering basement rock. The soils may be medium textured and calcareous throughout, non-calcareous in the surface, or have a well defined red clay subsoil. Main soils: Shallow gradational red loam - **C2**/**B4** (E-V) Shallow calcareous loam - **A2**/**B2** (E) These soils are all fertile and well drained, although often shallow. The slopes are mostly

		arable, and there is some potential for cropping and viticulture. The shallow limestone and coastal exposure limit horticultural options.
FcZ	0.9	Isolated summit surfaces formed on the last remnants of an old deeply weathered land surface, now almost completely eroded away. The underlying materials are kaolinized and lateritized basement siltstones and phyllites. The soils are deep and loamy with ironstone gravel and kaolinitic subsoils. Main soils: Deep acidic loamy ironstone soil - **J2** (E) Acidic gradational loam - **K1c** (C) Acidic gradational red loam - **K1b** (L) Loam over red clay on highly weathered rock - **K2c** (L) These soils are moderately deep and reasonably fertile on gentle slopes, but they are very exposed and surrounded by steep slopes, so uses other than grazing are unlikely.
HGC HGD HGZ	0.5 0.2 2.2	Rounded crests and gentle to moderate slopes with a veneer of weakly indurated sandstones overlying basement rock. The sandstones are probably derived from residual sediments originally laid down in ancient glacial valleys. A striking feature is a thick lime layer blanketing the sandstone. **HGC** Undulating slopes of 3-10%. **HGD** Moderate slopes of 10-20%. **HGZ** Summit surfaces with slopes of 0-8%. There are two main soils, a reddish sandy loam and a dark clay loam, both formed on heavily calcified sandstone. Main soils: Hard sandy loam over red clay - **D5** (E) Dark gradational clay loam - **C5** (E) The clay loams are fertile and potentially productive; the sandy loams are less fertile and erodible. Most of the land occurs as small isolated and exposed patches surrounded by steeper country, so opportunities for more intensive use are limited.
JRB	0.5	Flats, gentle slopes and drainage depressions formed on sandy clay to clay alluvial sediments. **JRB** Very gently sloping outwash fans with slopes of 1.5-3%. The soils are mainly sandy to sandy loam texture contrast types, with deep uniform or gradational sandy loams to clay loams. Main soils: Sandy loam over red clay - **D2** (E) Loamy sand over dispersive brown clay - **F2** (E) Deep loamy sand - **M1** (L) Gradational dark clay loam - **M2** (L) These soils are all deep but have variable characteristics. The D2 and M2 soils are naturally fertile, and are moderately well (D2) to imperfectly (M2) drained. The F2 and M1 soils are less fertile, but whereas the M1 soils are well drained, the F2 soils with dispersive clay subsoils tend to perch water and are imperfectly drained. The better drained soils are suitable for irrigated uses, but F2 and M2 soils are at risk of waterlogging and salt build up.
PvZ	3.2	Slightly rounded summit surfaces, flat to gently inclined, grading to slopes of 8% at the margins, formed on a thin veneer of unconsolidated sandy clays, partly ferruginized, overlying basement rock. This landscape is a remnant glacial deposit, outside the main valley system. The soils have sandy to clay loamy surfaces with some ironstone gravel, and friable to firm clay subsoils, some with fine carbonates or ironstone. Main soils: Thick sand over clay - **G3** (E) Clay loam over poorly structured brown clay - **F2** (E) These soils are deep, but the sandy soils are infertile and the clay loams are imperfectly drained. A further limitation is the high level of exposure of the landscape.
WB-	0.5	Basement rock coastal cliffs. Cliffs are often unmappable but anywhere that a basement rock landscape meets the ocean, cliffs may occur. Cliffs are of variable height to 100 metres and slopes range from 100% to vertical.
WEW	0.2	Complex of coastal dunes and beaches.
XJJ	0.6	Flat at the mouth of the Myponga River. Deep multi-layered medium grained alluvial soils are typical of three quarters of the land. The rest comprises the river channel and Myponga Beach. The alluvial soils are potentially productive, but the area is very small.

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

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

Detailed soil profile descriptions:

A2 Shallow calcareous loam on basement rock (Paralithic, Hypercalcic Calcarosol)
Calcareous dark brown loam to clay loam, overlying a highly calcareous brown clay loam to light clay grading to a Class III A carbonate layer in weathering metasiltstone or limestone at about 50 cm.

B2 Shallow calcareous loam on calcreted basement rock (Paralithic, Petrocalcic Calcarosol)
Medium to thick reddish brown calcareous loam to clay loam with increasing fine and nodular carbonate, overlying nodular to massive sheet calcrete, grading to softer carbonate underlain by calcareous weathering siltstone or limestone by 100 cm.

B4 Shallow gradational red loam on hard limestone or calcrete (Petrocalcic, Red Dermosol)
Medium thickness well structured loam to clay loam grading to a red friable clay loam to clay over limestone, marble or dolomite, or other calcreted basement rock within 70 cm.

C2 Shallow gradational red loam on calcareous rock (Hypercalcic, Red Dermosol)
Medium to thick dark reddish brown granular loam to clay loam, grading to pale brown massive soft carbonate with clay loam texture and abundant siltstone fragments, over soft weathering calcareous siltstone at about 70 cm.

C5 Dark gradational clay loam (Hypercalcic, Black Dermosol)
Medium thickness dark brown loam to clay loam with strong granular structure, overlying a black clay loam with semi-hard carbonate fragments throughout. At 40 cm is a very highly calcareous white massive sandy clay loam, grading to soft sandstone at depths between 60 and 100 cm.

D1 Shallow loam over red clay on calcareous rock (Hypercalcic, Red Chromosol)
Thick reddish brown well structured loam grading to a reddish brown very well structured clay, abruptly overlying either soft very highly calcareous clay, or semi- hard carbonate, grading to calcareous siltstone deeper than 100 cm.

D5 Hard sandy loam over red clay (Hypercalcic, Red Sodosol)
Medium thickness hard brown loamy sand to light sandy clay loam with a pink A2 horizon, overlying a red sandy clay to heavy clay with strong blocky structure grading to a yellowish very highly calcareous sandy clay to clay over sandstone at depths between 70 and 100 cm.

F2 Clay loam over poorly structured brown clay (Hypocalcic, Brown Sodosol)
Medium thickness dark brown sandy loam to clay loam with a bleached and hard A2 horizon, overlying a dark grey brown and yellow brown mottled heavy clay with strong prismatic structure, grading to a light grey, yellow and red massive sandy clay to clay with minor soft carbonate segregations from 85 cm.

G3 Thick sand over clay (Eutrophic, Brown Chromosol)
Thick soft grey brown sand to light sandy loam with a bleached (or yellow ironstone gravelly) A2 horizon, overlying a yellow brown, grey and red mottled clay with coarse prismatic structure, grading to grey and yellow mottled sandy clay from 100 cm.

J2 Deep acidic loamy ironstone soil (Ferric, Eutrophic, Red Chromosol)
Medium thickness dark brown loam with a pink A2 horizon containing abundant fragments of ferruginized siltstone, overlying a red and yellow brown clay with blocky structure, grading to grey mottled kaolinitic silty clay. Hard siltstone is deeper than 200 cm.

K1a Gradational brown loam (Eutrophic, Brown Kandosol)
Medium to thick hard loam with a pale coloured and gravelly A2 horizon, overlying a reddish yellow to brown massive clay loam, grading to a yellow light clay, with abundant rock fragments throughout. Highly weathered siltstone occurs between 50 and 100 cm.

K1b Acidic gradational red loam (Eutrophic, Red Dermosol)
Medium thickness dark brown loam with a paler coloured clay loamy A2 horizon containing abundant ferruginous rock fragments, overlying a red clay with polyhedral structure and increasing rock fragments with depth, grading to soft weathering siltstone at about 100 cm.

K1c Acidic gradational loam (Mesotrophic, Red Dermosol)
Thick fine sandy loam with minor ironstone grading to a brown or red coarsely blocky clay loam to clay, siltier with depth, grading to kaolinized phyllite or siltstone, continuing to depths of 200 cm or more.

K2a Loam over red clay (Eutrophic, Red Sodosol / Chromosol)
Medium thickness dark brown loam to clay loam with a paler coloured and gravelly A2 horizon, overlying a dark red (sometimes dispersive) heavy clay with strong blocky structure, grading to weathering metamorphosed siltstone or schist at about 100 cm.

K2b Clay loam over dispersive brown clay (Eutrophic, Brown Sodosol)
Thick dark clay loam with a bleached quartz gravelly A2 horizon, overlying a brownish yellow and brown coarsely prismatic dispersive heavy clay, grading to weathering quartzitic shale at about 100 cm.

K2c Loam over red clay on highly weathered rock (Eutrophic, Red Chromosol / Sodosol)
Medium thickness hard brown loam with a paler gravelly subsurface layer overlying a coarsely structured (sometimes dispersive) red, brown and yellow clay grading to highly weathered basement rock continuing below 200 cm.

K2d Acidic loam over red mottled clay on rock (Bleached-Mottled, Eutrophic, Red Kurosol)
Thick hard sandy loam to loam with a bleached and gravelly A2 horizon, overlying a red, yellowish brown and brown well structured clay grading to weathering siltstone or fine sandstone by 100 cm.

K4a Acidic sandy loam over brown clay on rock (Bleached, Mesotrophic, Brown Kurosol)
Medium to thick gravelly loamy sand to sandy loam with a bleached and very gravelly A2 horizon, overlying a yellowish brown, red and brown sandy clay to clay grading to weathering medium to fine sandstone by 100 cm.

K4b Sandy loam over poorly structured brown clay (Eutrophic, Brown Chromosol)
Thick loamy sand to loam with a bleached and quartz gravelly A2 horizon, overlying a very firm, brownish yellow heavy clay over quartzitic rock.

L1a Shallow stony loam (Paralithic, Leptic Tenosol)
Thick dark brown loam with a paler brown clay loam A2 horizon containing up to 50% rock fragments, grading to metamorphosed siltstone or phyllite by 50 cm.

L1b Shallow stony sandy loam (Lithic, Bleached-Leptic Tenosol)
Thick greyish very gravelly loamy sand to sandy loam with a bleached A2 horizon, grading to hard metasandstone by 50 cm.

L1c Shallow stony clay loam (Paralithic, Leptic Tenosol)
Thick dark clay loam with abundant shaly and quartzite fragments, overlying weathering quartzitic shale before 50 cm.

Further information: DEWNR Soil and Land Program