

# GEOLOGY OF THE MCLAREN VALE WINE REGION



MCLAREN VALE GRAPE WINE & TOURISM ASSOCIATION



We acknowledge and respect the Kaurna people as the traditional custodians of the land that this map represents. We pay respect to their Elders past and present. We recognise and respect their cultural heritage, beliefs and relationship with the land. We acknowledge that they are of continuing importance to the Kaurna people today.

## INTRODUCTION

The McLaren Vale wine region is one of the most geologically complex wine regions in the world. Ongoing investigations by geologists and other scientists have provided a thorough understanding of the geological units present, how they were deposited and how their properties influence the vines from the region.

The McLaren Vale Wine region is located approximately 30 km south of Adelaide and lies within two triangular basins, the Willunga and Noarlunga Embayments of the St Vincent Basin. These were formed by down-faulting along the Ochre Cove of the Clarendon and Willunga Faults when Australia and Antarctica separated in Eocene time, about 45 million years ago. They were subsequently filled with layers of sediment deposited during repeated advances and retreats of the sea.

The Geology of McLaren Vale map has been revised since it was first produced in 2008 due to significant changes to areas under vine and grape varieties planted. Additionally, geological investigations since 2008 have provided new information leading to revisions of some geological descriptions and unit boundaries.

## VITICULTURE

The earliest vineyards in the McLaren Vale wine region were planted by John Reynell and Thomas Hardy soon after they settled in the region in 1838. The Seaview and Hardy vineyards were in operation as early as 1850. Plantings in the region have expanded to include much of the suitable soil types for grape production with 7324 hectares under vine.

Viticultivists have long recognised the importance of soil types for grape

production. Soils develop by the weathering of geological units, and consist of the resultant mineral particles (clay, silt, sand, gravel and carbonates), organic matter (decaying plant and animal material), water and air. Whilst organic matter, air and water can be added or removed, the weathered products derived from the underlying geological formation remain a major differentiator in defining the soil type within an area. In McLaren Vale, soils are generally thin and the underlying rocks are often accessed by plants for water and nutrients, with the plant roots providing a link between geology and fruit.

## WATER AND IRRIGATION

In the early days of grape growing in the region, vines were almost exclusively grown without irrigation. This led to viticulture being established preferentially in areas of light soil and higher rainfall. Agriculture in areas with heavier (clay) soils and lower rainfall was generally restricted to cereal cropping, grazing and almonds, except in swampy areas or areas where surface runoff could be captured in dams and used for irrigation.

Geological and hydrogeological investigations carried out in the 1970's, 80's and 90's led to the identification of a series of aquifers that could be used for irrigation, subsequently increasing vineyard plantings in the region.

The continued growth of the domestic and international market for McLaren Vale wine saw further expansion of vineyards, placing stress on the aquifer system through increased salinity and reductions in supply. In response, controls were placed on withdrawals in an effort to manage this finite resource.

Increasingly, McLaren Vale vineyards now rely on reticulated water using recycled water from urban wastewater treatment plants. Approximately half of all the water used in McLaren Vale vineyards comes from this source and the use of reclaimed

water is spreading as the network spreads out to new vineyards.

## TERROIR

No account of wine and geology would be complete without some understanding of the French term "terroir" which translates into English as "earth". However, terroir means much more than soil as it encompasses other factors that influence the growth and quality of the vines, including some winemaking factors.

Terroir also takes into account the small similarities that link different vineyards. This includes the vine plant, physical and chemical characteristics of the soil and the rock formation from which it was derived, as well as drainage, aspect, rainfall, evaporation, temperature, water availability and quality and irrigation method. If two vineyards are of the same terroir, there must be a commonality of factors that makes its way into the wine. For McLaren Vale, while there is climatic variation across the region, the greatest similarities occur when vines have the same soil type and underlying geology.

The McLaren Vale wine region does not formally group different vineyards using terroir as would be the case in France, but rather by referencing the McLaren Vale Geology Map.



## GEOLOGICAL UNITS

This map divides the geological units in the McLaren Vale wine region into the following groups:

- The Ancient Rocks
- Tertiary Age units
- Quaternary Age units (Pleistocene)
- Quaternary Age units (Holocene)

Brief descriptions of geological units followed by a summary of how geology influences viticulture in McLaren Vale are illustrated using the symbols below.



## THE ANCIENT ROCKS

The Ancient Rocks were deposited between 800 and 500 million years ago and form of the Adelaide Geosyncline (Adelaide Rift Complex). This was a large trough that developed in the ancient Australian landmass that became filled with a range of sediments including sands, silt, gravel, clay and limestone. The Adelaide Rift Complex was deeply buried and eventually uplifted to form the Mt Lofty and Flinders Ranges.

The Ancient Rocks are visible in elevated positions throughout the region, including the Sellicks Hill Range from Sellicks Hill to Clarendon and Mount Bold, at Onkaparinga Hills and Aberfoyle Park, and at Old Noarlunga. They also occur beneath younger sediments in the Willunga and Noarlunga Embayments. Geological units of the Ancient Rocks include:

- Heatherdale Shale (slaty siltstone)
- Fork Tree Limestone (grey limestone)
- ABC Range Quartzite (white quartzite)
- Brachina Formation (siltstone and sandstone)

- Bunyeruo Formation (siltstone)
- Sturt Tillite (pebbly and boulder siltstone)
- Tapley Hill Formation (calcareous siltstone and sandstone)

Few vineyards were planted on Ancient Rocks prior to the establishment of irrigation in the 1960s. Soils developed on the Ancient Rocks are often very thin, leading to the vine roots penetrating cracks and joints in the underlying weathered rock. Plantings on the Ancient Rocks occur near Clarendon and between Coriole and Chapel Hill, near Oliver's Taranga and at Mollydooker on Seaview Road. At Chapel Hill, clayey soils contain fragments of shale and quartz gravel which enhance drainage and facilitate deeper penetration of vine roots into fractured rocks below.

Other notable vineyards on the Ancient Rocks include the Hillside Shiraz Vineyard at Kay Brothers Amery and plantings at the gateway vineyard at Paxton Wines.



Vines growing on the Ancient Rocks on the high side of the Willunga Fault north east of Willunga.

## TERTIARY AGE UNITS

Tertiary Age units consist of sedimentary formations deposited in the Noarlunga and Willunga Embayments of the St Vincent Basin between 45 million and 2.6 million years ago.

### Maslin Sands

The North Maslin Sand occurs throughout the Willunga and Noarlunga Embayments and consists of red, orange and brown sand, silt, clay and gravel deposited by ancient rivers. During the Eocene Epoch, a marine transgression occurred and the sea advanced over the land, with wave action winnowing out the finer materials and introducing a marine component, the mineral glauconite. This marine influenced succession is called the South Maslin Sand.

The North Maslin Sand is exposed in cliffs along the coast, in sand quarries at Maslin Beach and McLaren Vale and in numerous road cuttings near

Seaview Road. The South Maslin Sands is also exposed in coastal cliffs and in pit excavations at Kay Brothers Winery.

The Maslin Sand units are important aquifers for water supply in the Blewitt Springs and Kangarilla areas.

Many of the oldest vineyards were planted on the Maslin Sand. As a result of geological variation in this unit, soils vary considerably from sandy loams to ironstone pebble and clayey horizons.

Some of these vineyards do not require irrigation, especially where deep soils occur. These soils can have a high water holding capacity providing vines access to moisture during summer.



North Maslin Sands at Chapel Hill Road, Blewitt Springs

### Blanche Point Formation

The Blanche Point Formation was also deposited in the Eocene Epoch as the sea advanced easterly into the Willunga and Noarlunga Embayments. It consists of a succession of siliceous, calcareous and glauconitic clays and mudstones, often referred to as 'marls'. It is exposed in cliffs along the coast, where the Tortachilla Limestone and Chinaman Gully Formation are also present, in the Willunga Embayment in road cuttings along Olivers Road on California Road and also in the Noarlunga Embayment along River Road adjacent to the Onkaparinga River at Old Noarlunga.

Vineyards were established on the Blanche Point Formation in the 19th century as it resembles other famous limestone-based wine sites such as "Terra Rossa" in the Coonawarra. One of the best places to view the Blanche

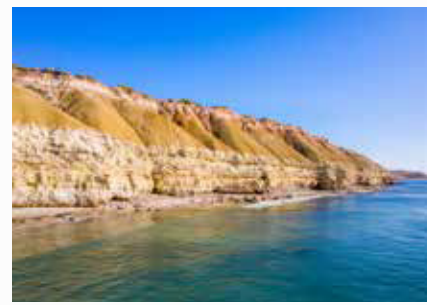
Point Formation is at Maxwell Wines. The vineyards at this site have a clay soil that has good moisture retention properties sitting above free draining limestone.



Blanche Point Formation on Olivers Road, McLaren Vale

## Port Willunga Formation

This unit occurs extensively throughout the Willunga and Noarlunga Embayments and is exposed in cliffs at Port Willunga and Seaford, but occurs only at the subsurface inland. It consists of fossiliferous sandy and silty limestone and calcareous sandstone deposited in a marine environment as the sea level continued to rise in the Oligocene period, about 34 – 23 million years ago.



Ngalinga Formation overlying Hallett Cove Sandstone and Port Willunga Formation at Port Willunga

## QUATERNARY AGE UNITS (PLEISTOCENE)

These are sedimentary formations deposited in the Pleistocene period 2.6 million to 10,000 years ago.

### Pirramimma Sandstone / Seaford Formation

The Pirramimma Sandstone is considered an equivalent of the Seaford Formation, a unit that occurs extensively in the Noarlunga Embayment. It is a buff coloured, fine-grained, well-sorted and poorly consolidated sandstone with common

fossil wood fragments and it occurs extensively in outcrop and shallow subsurface from south of McLaren Vale to north east of McLaren Flat. It was initially considered to be of Oligocene age and to have been deposited in a marginal marine environment. However, recent research suggests the Pirramimma Sandstone to be younger (Pleistocene age) and having been deposited in a south westerly flowing stream channel.

The Pirramimma Sandstone / Seaford Formation was once extensively planted north of the Onkaparinga River when the township of Reynella hosted large wineries. Remnants of vineyards remain at Chateau Reynella and Mount Hurtle.

In the Willunga Embayment, vineyards are planted on this unit in areas from Chapel Hill Winery to the Pirramimma Winery and as far east as Douglas Gully Road in McLaren Flat. Some vineyards in areas between Aldinga and McLaren Vale are also planted on Pirramimma Sandstone. In some areas, mature vines grow with minimal irrigation due to deep penetration of vine roots into the unit. Exposed Pirramimma Sandstone is visible



Vineyards planted on Kurrajong alluvial fan sediments east of McLaren Flat

at d'Arenberg Wines and in cuttings along the walking trail between McMurtrie Road and Kangarilla Road, McLaren Vale.

### Kurrajong Formation

The Kurrajong Formation is of Pleistocene age and consists of alluvial gravel, silica cemented conglomerate, yellow-brown clayey sandstone and clay deposited as alluvial fans by watercourses flowing across the Willunga Fault. It was originally defined as an old land surface linked to an ancient sea level rise. The Kurrajong surface is a major feature of the landscape west of the Willunga Fault between McLaren Flat and Kangarilla. Surface exposures of the Kurrajong Formation occur in a relatively small strip of land at the base of the Sellicks Hill Range, from east of McLaren Flat to north of Kangarilla. Silica cemented conglomerates of this unit are visible in the banks of watercourses near the Victory Hotel at Sellicks Hill and at the eastern end of McMurtrie Road.

Soils derived from this unit have good water retention properties and moderate fertility. Vineyards are located near Hugo Wines along Trot Road and between Pertaringa and Kangarilla Road between.

### Ochre Cove Formation

The Ochre Cove Formation is an alluvial unit that crops out in coastal cliffs at Ochre Point, Moana and Blanche Point, Maslin Beach. It is a coarse grained mottled pebbly sandstone of Pleistocene age. Inland, the Ochre Cove Formation is exposed in road cuttings on Old Coach Road north of Aldinga.

Vines were established on Ochre Cove Formation in the 1980's and 1990's when irrigation became available closer to the coast. Soils derived from the Ochre Cove Formation are suitable for viticulture, however the rocks are often very thin and weathered, requiring regular water application.

### Ngalinga Formation

The Ngalinga Formation is a Pleistocene age unit that consists of grey to olive-green massive clay, and clayey sand with occasional sandy interbeds. It occurs extensively at Seaford and Old Noarlunga in the Noarlunga Embayment and in the Willunga Embayment from the coast at Maslin Beach, Port Willunga, Aldinga Beach and Silver Sands to areas south east of McLaren Vale. It is thought to have been deposited by the overbank flooding of stream channels and possibly by wind.

Soils of the Ngalinga Formation are typically heavy clays with high fertility. Vines need to be well-watered as heavy clay soil dries out and cracks during summer. Vineyards planted on Ngalinga Formation include those at Fox Creek and Penny's Hill, with extensive areas of vines planted south east of Main South Road, Aldinga.



Ngalinga Formation on Malpas Road, Willunga

### Christies Beach Formation

The Christies Beach Formation consists of a sequence of red brown alluvial fan clays, sands and gravels that extend from Sellicks Beach to the east of McLaren Flat. These fan sediments were deposited about 125,000 years ago in the Pleistocene Epoch by watercourses flowing across the Willunga Fault from the Sellicks Hill Range.

This unit is easily identified on the ground by its red colouring and often an abundance of tabular slaty pebbles and cobbles. Viewing locations include



Christies Beach Formation on Rogers Road, Sellicks

### Sellicks Beach and many incised watercourses throughout Willunga.

This formation is well drained and ideal for development of vine roots. Soils of the Christies Beach Formation are of moderate fertility and need to be frequently watered during summer. Wines produced from grapes grown on this formation include Battle of Bosworth, Fox Creek, Hedonist, Noon, Pertaringa, Leonfield, and Hug Hamilton.

## QUATERNARY AGE UNITS (HOLOCENE)

### Alluvial Clays of Valleys

This unit includes dark grey and brown clay, silty clay, and sand and gravel deposited by streams flowing from the Willunga Escarpment toward the coast. Vines are cultivated on this unit along Pedler Creek and tributaries as well as along some tributaries of the Onkaparinga River including Baker Gully and parts of Willunga Creek and Maslin Creek.

### Sand Dunes, Drapes and Spreads.

Unconsolidated quartz sands are common in many areas, particularly from south of McLaren Flat to Kangarilla. These deposits have formed by the winnowing, transport and deposition of materials most likely derived from underlying formations including the North Maslin Sands, the South Maslin Sands and the Pirramimma Sandstone.



Alluvial Clays of Valleys at Blewitt Springs Road, McLaren Flat



Unconsolidated wind-blown sand at McMurtrie Road

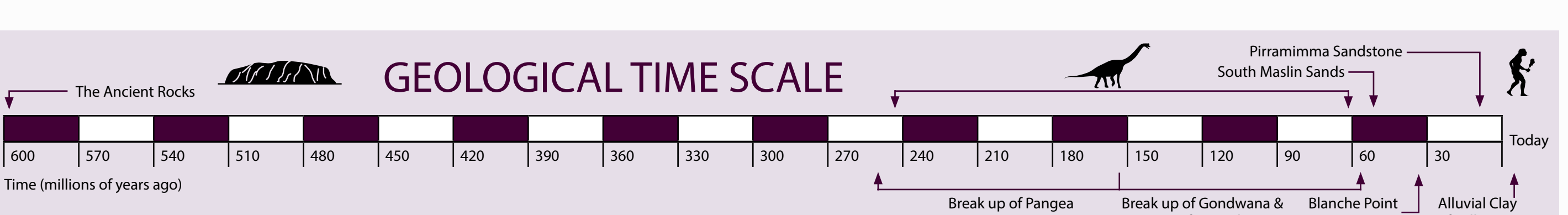


Geology Pits: L-R Paxton Wines, Kay Brothers Amery Winery, Maxwell Wines, d'Arenberg Wines, Wirra Wirra Vineyards.

## McLaren Vale Geology Pits

Examples of the region's unique geology can be viewed at geology pits, excavated to display some of the major geological units including:

- The Ancient Rocks at Paxton Wines
- South Maslin Sands at Kay Brothers Amery Winery
- Blanche Point Formation at Maxwell Wines
- Pirramimma Sandstone at d'Arenberg Wines
- The Alluvial Clays of Valleys at Wirra Wirra Vineyards

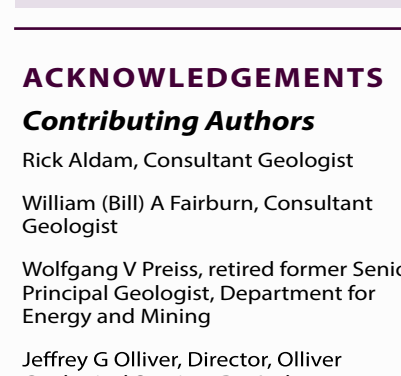


## Glossary of terms used:

- Aeolian:** Geological formations resulting from wind action
- Alluvial:** The deposition of sediment in river and creek channels and on floodplains
- Alluvium:** Deposits consisting of unconsolidated gravel, sand, and smaller sediment
- Alluvial fans:** An often triangular-shaped wedge of sediment. Alluvial fans are usually created when flowing water interacts with mountains, hills, or canyons walls
- Basin:** A low-lying area
- Calcareous:** Soil derived from rock containing calcium carbonate
- Channel lag conglomerate:** Coarse material that accumulates in the channel of a stream
- Down-faulting:** the downthrown side of a fault
- Embayment:** The formation of a bay in the coastline
- Fluvial:** Landforms or deposits formed by the movement of watercourses
- Fossiliferous:** Rocks or soils that contain fossils
- Incised:** A river that has cut downward through a riverbed
- Interbeds:** Interbedding occurs when beds of a particular geological unit lie between or alternate with beds of another geological unit
- Marginal marine environments:** Environments that form the boundary between the land and the sea such as lagoons, estuaries and tidal zones
- Massive soil structure:** A soil that has no structure
- Succession:** A series of strata or rock units in chronological order (newer units sit above of older units)
- Transgressive dune fields:** Dune systems form by the movement of wind and or migrate due to wind action
- Tributary:** A river or stream that flows into a larger river or lake
- Unconsolidated:** When particles or sediment in a geological unit are loose or not cemented together
- Winnowing:** The removal of fine sediments from coarse material by wind

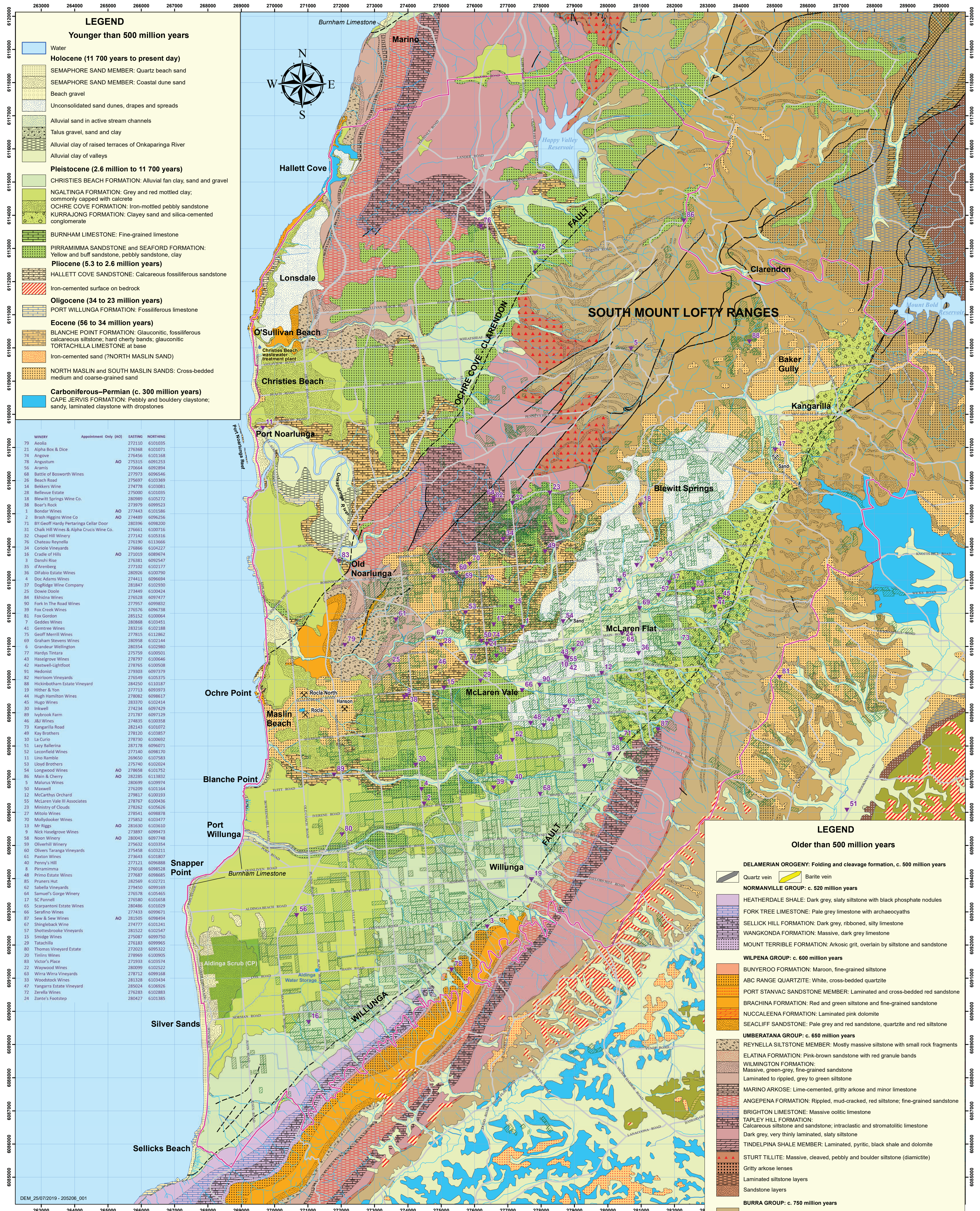
## McLaren Vale Districts Tasting

The annual McLaren Vale Districts Tasting focuses on identifying and illustrating the differences of Shiraz blends from 19 hypothetical sub-districts within the McLaren Vale Wine Region. These sub-districts have been defined using detail from the McLaren Vale Geology map and other attributes such as topography, aspect, soil and rainfall. Each year McLaren Vale viticulturists and winemakers submit samples of single block Shiraz from grapes produced in these sub-districts for blind tasting by a panel of experts. The closed Districts Tasting is critical to increasing our understanding of the differences that potentially exist between the 19 sub-districts.



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**Contributing Authors**  
 Rick Aldam, Consultant Geologist  
 William (Bill) A Fairburn, Consultant Geologist  
 Wolfgang V Preiss, retired former Senior Principal Geologist, Department for Energy and Mining  
 Jeffrey G Olliver, Director, Olliver Geological Services Pty Ltd  
 Philip White, Wine Writer  
 James Hook, Viticulturist  
 Districts of McLaren Vale Working Group  
 Jock Harvey and Dudley Brown  
**Photography**  
 Isaac Foreman and Duy Dash  
**Map of vineyards**  
 Vine Health Australia  
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**LEGEND**

**Younger than 500 million years**

- Water
- Holocene (11 700 years to present day)**
  - SEMAPHORE SAND MEMBER: Quartz beach sand
  - SEMAPHORE SAND MEMBER: Coastal dune sand
  - Beach gravel
  - Unconsolidated sand dunes, drapes and spreads
  - Alluvial sand in active stream channels
  - Talus gravel, sand and clay
  - Alluvial clay of raised terraces of Onkaparinga River
  - Alluvial clay of valleys
- Pleistocene (2.6 million to 11 700 years)**
  - CHRISTIES BEACH FORMATION: Alluvial fan clay, sand and gravel
  - NGALTINGA FORMATION: Grey and red mottled clay, commonly capped with calcareite
  - OCHRE COVE FORMATION: Iron-mottled pebbly sandstone
  - KURRAJONG FORMATION: Clayey sand and silica-cemented conglomerate
- Pliocene (5.3 to 2.6 million years)**
  - BURNHAM LIMESTONE: Fine-grained limestone
  - PIRRAMIMMA SANDSTONE and SEAFORD FORMATION: Yellow and buff sandstone, pebbly sandstone, clay
- Oligocene (34 to 23 million years)**
  - HALLETT COVE SANDSTONE: Calcareous fossiliferous sandstone
  - Iron-cemented surface on bedrock
- Eocene (56 to 34 million years)**
  - PORT WILLUNGA FORMATION: Fossiliferous limestone
  - BLANCHE POINT FORMATION: Glauconitic, fossiliferous calcareous siltstone; hard cherty bands; glauconitic TORTACHILLA LIMESTONE at base
  - Iron-cemented sand (?NORTH MASLIN SAND)
  - NORTH MASLIN and SOUTH MASLIN SANDS: Cross-bedded medium and coarse-grained sand
- Carboniferous-Permian (c. 300 million years)**
  - CAPE JERVIS FORMATION: Pebbly and bouldery claystone; sandy, laminated claystone with dropstones

WINERY	Appointment Only (AO)	EASTING	NORTHING
79 Aeolia		272110	6101035
21 Alpha Box & Dice		276368	6101071
74 Angove		276566	6101168
78 Angustum	AO	275315	6091253
56 Aramis		270664	6092894
68 Battle of Bosworth Wines		277973	6096546
26 Beach Road		275697	6103369
14 Bekkers Wines		274778	6103881
28 Bellevue Estate		275000	6101035
18 Blewitt Springs Wine Co.		280989	6105272
38 Boar's Rock		273979	6099523
1 Bordar Wines	AO	277443	6101586
2 Braah Higgins Wine Co	AO	274489	6096256
71 BY Geoff Hardy Partinga Cellar Door		282396	6098200
31 Chalk Hill Wines & Alpha Crucis Wine Co.		276661	6100716
32 Chapel Hill Winery		277142	6105316
76 Chateau Reynella		276190	6113666
63 Conole Vineyards		278686	6104227
16 Cradle of Hills	AO	271019	6098974
3 Danchi Rise		276381	6092547
35 d'Arenberg		277102	6102177
36 DiFabio Estate Wines		280926	6100790
4 Doc Adams Wines		274411	6096694
74 Dogdige Wine Company		281949	6102390
25 Dowle Doole		273449	6100424
84 Ekhidna Wines		276528	6097477
90 Fork In The Road Wines		277957	6099832
39 Fox Creek Wines		276576	6096738
81 Fox Gordon		285152	6100064
7 Geddes Wines		280868	6103451
41 Gemtree Wines		283216	6102188
75 Geoff Merrill Wines		277815	6112862
69 Graham Stevens Wines		280958	6102144
6 Grandeur Wallington		280554	6102800
77 Hardys Tintara		275759	6100501
42 Hasegrove Wines		278797	6100646
42 Hastwell-Lightfoot		278765	6100508
91 Hedonist		279308	6097379
82 Heilsum Vineyards		276549	6105375
88 Hickinbotham Estate Vineyard		284250	6101187
19 Hither & Yon		277713	6093973
44 Hugh Hamilton Wines		278082	6098617
45 Hugo Wines		283370	6102414
30 Itakwall		274234	6097429
89 Ivybrook Farm		271787	6097129
46 J&J Wines		274835	6100358
73 Kangarilla Road		282143	6101072
49 Kay Brothers		278120	6103857
10 La Curio		276730	6100692
51 Lazy Ballerina		287178	6096071
52 Leconfield Wines		277140	6098170
11 Lino Rumble		266650	6107583
53 Lloyd Brothers		275740	6102024
12 Longwood Wines	AO	278658	6101752
86 Main & Cherry	AO	282298	6113832
5 Malurus Wines		280699	6109974
50 Maxwell		276209	6101164
12 McCarthy Orchard		279817	6100193
55 McLaren Vale III Associates		278767	6100436
23 Ministry of Clouds		278262	6105626
27 Mitolo Wines		278541	6098878
70 Mollydooker Wines		275852	6103477
13 Mr Riggs	AO	281630	6103610
9 Nick Hasselgrove Wines		278897	6099473
58 Noon Winery	AO	280043	6097748
59 Oliverhill Winery		275632	6103354
60 Olivers Taranga Vineyards		275458	6103211
61 Paxton Wines		273643	6101807
40 Penny's Hill		277121	6096888
8 Pirramimma		276018	6098528
48 Primo Estate Wines		277687	6098685
85 Pruners Hut		282569	6102721
62 Sabella Vineyards		279450	6099169
64 Samuel's Gorge Winery		276578	6105465
17 St Pannell		276280	6101658
65 Scarpantoni Estate Wines		280486	6101029
66 Serafino Wines		277433	6099671
87 Sew & Sew Wines	AO	281505	6098494
67 Shingleback Wine		274777	6101241
57 Shottersbrook Vineyards		281222	6102547
15 Snidger Wines		275087	6099750
29 Tatchilla		276183	6099965
20 Thomas Vineyard Estate		272023	6095322
20 Tinlins Wines		278969	6100905
83 Victor's Place		271933	6103574
22 Waywood Wines		280099	6102522
63 Wirra Wirra Vineyards		278712	6099168
33 Woodstock Wines		281328	6103434
47 Yangarra Estate Vineyard		285024	6108926
72 Zarella Wines		276283	6102883
24 Zonte's Footstep		280427	6101385

**LEGEND**

**Older than 500 million years**

- DELAMERIAN OROGENY:** Folding and cleavage formation, c. 500 million years
  - Quartz vein
  - Barite vein
- NORMANVILLE GROUP: c. 520 million years**
  - HEATHERDALE SHALE: Dark grey, slaty siltstone with black phosphate nodules
  - FORK TREE LIMESTONE: Pale grey limestone with archaeocyaths
  - SELICK HILL FORMATION: Dark grey, ribbed, silty limestone
  - WANGKONDA FORMATION: Massive, dark grey limestone
  - MOUNT TERRIBLE FORMATION: Arkosic grit, overlain by siltstone and sandstone
- WILPENNA GROUP: c. 600 million years**
  - BUNYEROO FORMATION: Maroon, fine-grained siltstone
  - ABC RANGE QUARTZITE: White, cross-bedded quartzite
  - PORT STANVAC SANDSTONE MEMBER: Laminated and cross-bedded red sandstone
  - BRACHINA FORMATION: Red and green siltstone and fine-grained sandstone
  - NUCCALEENA FORMATION: Laminated pink dolomite
  - SEACLIFF SANDSTONE: Pale grey and red sandstone, quartzite and red siltstone
- UMBERATANA GROUP: c. 650 million years**
  - REYNELLA SILTSTONE MEMBER: Mostly massive siltstone with small rock fragments
  - ELATINA FORMATION: Pink-brown sandstone with red granule bands
  - WILMINGTON FORMATION: Massive, green-grey, fine-grained sandstone
  - Laminated to rippled, grey to green siltstone
  - MARINO ARKOSE: Lime-cemented, gritty arkose and minor limestone
  - ANGEPENA FORMATION: Rippled, mud-cracked, red siltstone; fine-grained sandstone
  - BRIGHTON LIMESTONE: Massive oolitic limestone
  - TAPLEY HILL FORMATION: Calcareous siltstone and sandstone; intraclastic and stromatolitic limestone
  - Dark grey, very thinly laminated, slaty siltstone
  - TINDELPINA SHALE MEMBER: Laminated, pyritic, black shale and dolomite
  - STURT TILLITE: Massive, cleaved, pebbly and boulder siltstone (diamictite)
  - Gritty arkose lenses
  - Laminated siltstone layers
  - Sandstone layers
- BURRA GROUP: c. 750 million years**
  - BELAIR SUBGROUP: Laminated, grey siltstone
  - Quartzite layers
  - MITCHAM QUARTZITE: Massive, coarse-grained, feldspathic quartzite
  - SADDLEWORTH FORMATION: Laminated dark grey and green siltstone
  - Quartzite layers
  - STONYFELL QUARTZITE: Feldspathic quartzite, sandstone, siltstone
  - Brecciated WOOLSHED FLAT SHALE
  - WOOLSHED FLAT SHALE: Laminated and sandy grey-green siltstone
  - MONTACUTE DOLOMITE: Blue-grey, thinly bedded dolomite with black chert lenses
  - ALDGATE SANDSTONE: Feldspathic, pebbly sandstone; heavy mineral cross-laminations
- PALAEOPROTEROZOIC BASEMENT (c. 1600 million years)**
  - BAROSSA COMPLEX: Gneiss, schist

**Scale: 1:50 000**

Kilometres 1 0 1 2 3 4 5 6 7 8 9 10 Kilometres

**Geological boundary and fault**

- Fault
- - - Concealed fault
- - - Erosional contact
- - - Conformable contact
- - - Intrusive contact

**Topographic detail**

- Roads
- - - Secondary road
- - - Track
- River
- - - Watercourse

**Other symbols:**

- ▼ Winery
- ⊗ Sand or clay pit
- Water storage
- Wastewater treatment plant
- ▨ Vineyard
- McLaren Vale Wine Region
- Aldinga Scrub Conservation Park
- ▨ Holocene sand

**GDA**  
Geographic Data Australia  
GDA 94  
Map projection  
Transverse Mercator  
Zone 54

# GEOLOGY OF THE MCLAREN VALE WINE REGION