

when molten rock underneath a fissure-volcano is injected up a vertical crack in the Earth's crust. The rock is a quartz-dolerite, with small crystals of feldspar and pyroxene and is believed to be of late Carboniferous age (about 300 million years old). There were quite a few volcanoes like this in the Midland Valley of Scotland at that time.

The flat fields ahead used to be a beach. The raised beach and relic cliff line were cut by the sea, when the sea level was higher level than it is today about 6,000 years ago. The sea rose as the main North American ice sheet finally melted, and the land has since risen in response to the unloading of about 1 km of ice.



Continue on the coastal path for about 150 m to a small inlet.

Locality 4 [NS 1761 4940]

Inlet (1)

The inlet trends SW to NE, formed by erosion along a fault. The rocks on the south side are the Portencross Sandstones, but across the fault is a bed of conglomerate (known as the Skelmorlie Conglomerate) containing a jumble of large boulders and pebbles. It is assigned to the Upper Old Red Sandstone and was deposited after the Acadian Orogeny. The conglomerate contains clasts of quartzite, sandstone, vein quartz, cherts and lava fragments and was probably deposited by a sub-aerial debris-flow.



Above the conglomerate are some bedded sandstones, siltstones and mudstones of the basal beds of Kelly Burn

Sandstone Formation, which are succeeded in turn by more cross-bedded sandstones and thin pebble beds.



Continue for 50 m N to another inlet.

Locality 5 [NS 1759 4951]

Inlet (2)



Here a vertical dyke of harder basaltic rock trends NW. It is considerably younger at a mere 60 million years - the same age as the Arran volcanic centre across the water.

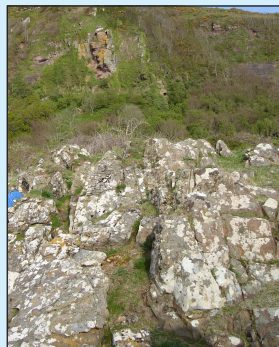
The coastal path continues north; about 100 m after the turn to the houses at Northbank there are some prominent rocks known as Jenny's Dyke

Locality 6 [NS 1762 4973]

Jenny's Dyke)

This dyke extends from the cliff face to the shoreline and is oriented east-west. It is the same type and age as the one seen earlier at Locality 3.

Return to the car park by the outward route.



PORTENCROSS

A SHORELINE GEOLOGICAL TRAIL



**Strathclyde
Geoconservation
Group**

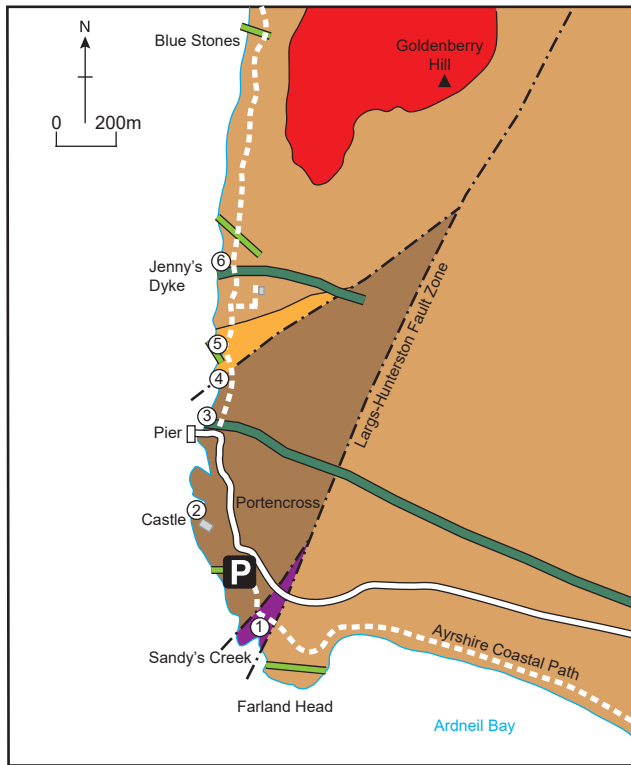


**THE
GEOLOGICAL
SOCIETY OF
GLASGOW**

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More information at: www.geologyglasgow.org

Trail Map



Upper Old Red Sandstone

- Kelly Burn Sandstone
- Skelmorlie Conglomerate

Lower Old Red Sandstone

- Portencross Sandstone
- Sandy's Creek Mudstone

Igneous Rocks

- Paleocene basalt dyke
- Carboniferous basalt dyke
- Carboniferous felsite
- Fault
- Road

Portencross is at the end of the B7048, some 1.5 miles off the A78 to the south of Largs. There is a large carpark at the end of the road. The nearest facilities are in West Kilbride. The trail will take about 2 hours.

The rocks exposed around Portencross are mainly sandstones (known across the UK as the 'Old Red Sandstone' or ORS) dating back to the Devonian Period (420 to 360 million years ago). They were deposited in desert environments in the aftermath of the Caledonian Orogeny (mountain-building episode) when Scotland (on part of the North American continent called Laurentia)

collided with England and Wales (on part of the European continent called Avalonia), closing the intervening Iapetus Ocean. The collision was marked by major strike-slip faulting (like the San Andreas Fault) and considerable local volcanism. Later in the Devonian there was a further period of mountain building (the Acadian Orogeny) when Iberia collided into Avalonia further south. This resulted in more uplift and renewed sandstone deposition. The Portencross area is a Lower ORS inlier in a wider Upper ORS outcrop.

The first locality is 200 m to the south of the carpark on the coastal path at a small bay called Sandy's Creek.

Locality 1 [NS 1774 4860]

Sandy's Creek

At Sandy's Creek there are some deformed mudstones and siltstones which contain spores indicating they belong to the lowest part of the Old Red Sandstone. They occur here in a small triangular area within the Largs-Hunterston Fault Zone with sandstones exposed on either side. There



is a deformed basaltic dyke in the centre of the bay.

To the SE on Farland Head, red sandstones are part of the Upper Old Red Sandstone. On the headland there is a prominent E-W trending basaltic dyke of Paleocene (60 Ma) age.

Walk back to the carpark looking at the rocks on the foreshore.

Locality 2 [NS 1755 4892]

Portencross Castle

From Sandy's Creek north to the Castle and up to the pier there is a broad outcrop area of red sandstone, known as the Portencross Sandstone. It is assigned to the Lower Old Red Sandstone and here contains thin beds of conglomerate - recognisable by abundant large rounded pebbles. The main castle walls are made from this sandstone, but the corners are made from a harder yellow sandstone which is not local. In places mudcracks can be seen and there are a large number of beds of sandstone showing cross-bedding created by water currents moving sand downstream in a

braided river system.

When these rocks formed, Scotland was about 10 degrees north of the equator. The climate was much warmer and drier than today. Torrential rain often occurred, which caused flash flooding.



The pebbles in the conglomerates are mainly of volcanic rock (andesite and andesitic ash) as well as basalt. These are thought to have been locally derived and not - as was once thought - from the Caledonian Mountains to the north which are made of different (and older) rocks. The cross-beds show that rivers came from the south, and it is now thought that the rivers were eroding a line of active volcanoes which stretched from Ayr north-eastwards to the Ochils and Sidlaw Hills.

These sandstones were laid down in horizontal layers. Today, the sandstone layers dip steeply towards the north. This shows that the rocks at the site have been tilted by earth movements since they formed.

From the castle follow the path northwards on the west (seaward) side of the houses and join the track which leads to the pier. At the sharp right turn near the pier continue north and after a few metres the track passes through a narrow cutting.

Locality 3 [NS 1759 4925]

Road Cutting

This track is cut through a narrow E-W ridge. The rock that formed this ridge is different and is much harder than the surrounding sandstone. This feature is called a dyke, formed

