**SAFETY INFORMATION**

This trail (one-way) is about 1km long.

It requires a low tide.

Wear clothing and footwear appropriate for the terrain and prevailing weather conditions.

**TRAVEL INFORMATION**

By bus:
Stagecoach service 95 serves Elie from St. Andrews and from Anstruther and Leven.
Stagecoach service X60 connects St. Andrews and Edinburgh via Anstruther and Elie.

By road:
Elie lies on the A917 St. Andrews to Leven road.
There is free car parking at Ruby Bay car park.

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**geoHeritage Fife**

was set up in 2000 to:

* publicise Fife's geological heritage
* provide educational resources in geology
* promote geotourism

If you would like to assist with these aims, consider joining the group by contacting geoHeritage Fife

T: 01334 828623
W: http://earthsci.st-andrews.ac.uk/outreach

Scottish Charity No. SC 032509

**Fife RIGS/LGS**

RIGS were Regionally Important Geological (and Geomorphological) Sites, but are now known as Local Geodiversity Sites (LGS).

Fife LGS is concerned with identifying and assessing important sites and notifying the statutory planning authority of these sites.

Fife RIGS was incorporated into geoHeritage Fife in 2005.

**GLOSSARY**

**Basalt**: A fine-grained dark igneous rock
**Dolerite**: A coarser grained variety of basalt
**Dyke**: Magma injected into pre-existing rocks
**Igneous**: Molten rock generated at high temperatures
**Limestone**: A rock made mostly of calcium carbonate and formed under water
**Magma**: Molten rock
**Sandstone**: A rock formed by the accumulation of sand grains, mostly quartz
**Shale**: A fine-grained sedimentary rock formed mostly of mud
**Tuff**: Ash erupted by a volcano

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**Geological Trail of Elie**

Examine the sedimentary and volcanic rocks that underlie Elie

330 million years old local rocks

Rocks folded by tectonic forces 305 million years ago

Walk through the remnants of an extinct volcano 298 million years old
**Geological setting**

Around 330 million years ago, Scotland lay near the Equator. River sands, estuarine muds and marine lime were deposited in large river deltas, forming sandstone, shale and limestone. Coal formed from the decay of tropical forests. Later violent volcanic activity punched through these rocks, which had also been folded by crustal compression. Erosion has now revealed the underground volcanic “plumbing”, known as a volcanic neck. Thus the rocks seen on this trail were once deep underground.

< From Ruby Bay car park take the Fife Coastal Path to the east, away from Elie Harbour. Follow the coastal path signs to take the left fork at the first set of concrete blocks, and then left at the next junction. 10m along this path look down to the shore below the seat. >

### 1. Folded Sandstones

Looking down at the beach, to the left you can see dramatic folding of layers of sandstone. This folding resulted from crustal plate movements 305 million years ago which created continental Europe. To the right are greenish-grey rocks with no layering. This is volcanic ash, now compacted to form tuff. At this point you are standing on the contact zone of a volcanic neck.

< From this point, look seaward towards an exposure of curved sandstone. >

The sandstone here forms a dome which was probably caused by magma rising up and deforming the overlying layers. Dark volcanic rock lies inside the dome.

< From Locality 2 walk 25m to the south-west, towards the rocky cliff and grassy slope at the edge of the beach, as shown below. >

### 2. Volcanic Ash Deposits

Here tuff has intruded the local sandstone as ash from a volcano that erupted 298 million years ago. Fragments of sandstone and shiny black coal in the tuff were ripped from the outer edges of the pipe during eruption.

< On the way to the cliff, notice large boulders of dark rock on the beach. >

Look at the blocks scattered around the beach. The dark coloured blocks are dolerite, identified by their very dark grey colour and pits on the surface. The pits represent holes left where some crystals were corroded out. These blocks were probably brought here by moving glaciers about 10,000 years ago. Similar rock occurs nearby to the west at Chapel Ness and Kincraig.

< Continue to the rock cliff that marks the edge of the beach. >
3. Dyke and Shale

On the cliff is the contact zone between the host sedimentary rocks and the volcano. Layers of shale have been intruded by basalt forming a dyke. Tuff lies above the shale beds.

4. Stones and Volcanoes

The Lady's Tower is built on an exposure of coarse tuff. The Tower itself is built mostly of rounded boulders of sandstone and dark basalt from the beach. Pale brown boulders with many round pits are limestones which have been drilled by a clam-like sea creature called a piddock. The limestone blocks also contain fossils of crinoids, seen as small white rings and tube-like stems.

5. Calcite Veins

The tuff in this area is cut by calcite (calcium carbonate) veins, which are up to 3cm wide. These veins formed by fluids intruding the ash layers after they cooled.

On the headland, the installation of an information board which describes the general geological evolution of the area, is pending (at the time of publication). This board has been designed by a geologist, based at the University of Southampton, who has worked on the rocks around Elie.

Explosive volcanic eruptions at Elie Ness

< Retrace your steps to regain the Coastal Path, walk west and take the left-hand path to the Lady's Tower. >

< Return to the path and continue following it around the Ness to the car park from which you began. >
6. Wave-Cut Platform

Returning to the car park, look west to the former granary house at the harbour. On the left side of the harbour is a large plateau of rocks. This is known as a wave-cut platform, formed between high and low water marks, due to sea level falling after the last ice age.

< Return to the car park entrance by the height barrier and go left. At the bottom of Admiralty Lane turn left along the harbour road towards the old granary building. Take the slipway on the left side of the building, on to the wave-cut platform mentioned in Locality 6. >

8. Concentrically Dipping Tuff

Looking around the wave cut platform, concentrically-dipping layers can be seen in the tuff which forms this dark coloured landscape. Here we are inside a volcanic neck which was collapsing inwards on itself. Each layer of ash represents a volcanic eruption, showing that there were multiple eruptions.

The tuff contains many blocks of basalt from previous eruptions, as well as calcite veins.

< Walk to the centre of the plateau then turn east 30m to view a large beige-coloured outcrop. >

9. Sandstone raft

A large block of sandstone (the lighter coloured rock) is here welded to the tuff below (the dark grey rock). As the volcanic cauldron collapsed, lumps of the surrounding rock fell inside it and became embedded in the tuff. The sandstone raft was part of the Carboniferous sedimentary rocks through which the volcano erupted. The steep dip of the surrounding tuffs suggests the sandstone block fell into the centre of the volcano.

< Return to the car park, or your starting point. >