La Soufrière Volcano
La Soufrière is the youngest volcanic centre on St. Vincent. It occupies the northernmost third of the island and is considered to be the only volcano that is likely to erupt in the future. No detailed geological map of the volcano exists although the principal formations have been identified (Robson and Tomblin 1966; Rowley 1978; Sigurdsson 1981; Robertson 1992). The volcanic edifice consists of an older strato-cone or Somma (2.5 km diameter), which forms a steep arcuate ridge to the north, and a younger pyroclastic cone, which has been the source of historic (post-1700) eruptions, nestled within this crater. The older stratovolcano is thought to have been active during the late Pleistocene (~700 ka). The main crater of the Soufrière is about 1.6 km in diameter and is 300-600 m in depth. Located immediately to the northeast is the 1812 crater an oval-shaped depression (~450 m diameter and 60 m depth), from which the volcano erupted once (27 April to 6 June 1812).

Geologic map of La Soufrière Volcano in St. Vincent showing the main deposits that make up this volcano.	The crater of La Soufrière volcano taken in 1972 (top) and 1988 (below).

Four principal rock formations have been identified in the crater (Sigurdsson 1981). The ***Debris Flow*** formation is the lowest exposed formation and is a massive matrix supported deposit consisting of angular basaltic blocks (max. 3m diameter), in a poorly sorted sandy matrix. . Overlying this is the ***Brown Tuff***, a 20 m thick, well-bedded succession of ash and scoria air fall deposits and minor surge layers, which contain angular basaltic lithic fragments. Thick basaltic andesite and andesite lava flows, which form the lower half of the vertical eastern and northern crater walls, are called the ***Crater Lavas*** formation. The topmost deposit exposed in the crater consists of a thick sequence of pyroclastic flow and air fall deposits, which are called the ***Pyroclastic Formation***.

The oldest formations exposed on the flanks of the volcano are basaltic lavas, which form the remnants of the pre-historic Somma crater. These are overlain by beds of pumiceous yellow tephra (the Yellow Tephra Formation), which have been correlated with yellow pyroclastic fall deposits that mantle the island (Hay 1959a; Rowley 1978b). The yellow tephra units are often reversely graded and contain airfall beds made up of black scoria and yellow lapilli-sized pumiceous tuff that range in composition from basalt to andesite. In the river valleys, the Yellow Tephra is overlain unconformably by alluvial deposits, basaltic andesite pyroclastic flow deposits s and mudflow deposits. The mudflow deposits are massive, thick (up to 25m) and contain angular blocks of basalt and basaltic andesite. On the lower flanks of the volcano, the mudflow deposits are overlain and interbedded with basaltic andesite pyroclastic flow deposits, thin tephra-fall deposits and minor alluvial deposits. The pyroclastic units are discontinuous, channel-fill deposits that show little variation in lithology. There is little distinction between deposits erupted during historic eruptions, apart from deposits from the 1979 eruption which are distinctively rich in basaltic andesite.

Historical Eruptions
During the past 4000 years, the volcano has had an average of one explosive eruption every 100 years.

The Soufrière volcano has displayed two distinct types of eruptions in the past (Aspinall, Sigurdsson, and Shepherd 1973):

Explosive eruptions: These are the typical “Soufrière” eruptions. They are highly explosive magmatic eruptions1 usually preceded by frequent, strong earthquakes. Rapid rates of production result in the ejection of large volumes of new material in ashfalls from eruption columns2 and as pyroclastic flows and surges3. This type of activity is exemplified by the 1902-03 and 1979 eruptions.

Nonexplosive or Effusive eruptions4: This type of eruption is effusive, unaccompanied by earthquakes, and involves smaller volumes of new material than type 1. This type of eruption is exemplified by the 1971-72 eruption. A cyclical pattern of eruptive activity during the past 250 years with alternate explosive and effusive eruptions has been suggested for the volcano (Aspinall et al. 1972).

Future Eruptions
Short-term eruptive activity
In the short-term (i.e. <100 years), the volcanic hazard at the volcano is expected to be quite similar to that experienced in the historic past. The volcano would become hazardous during periods of eruptive activity, remaining for the intervening periods a threat that must be catered for in national development plans. Activity in the short term could be either explosive or effusive or both. Both events may be separated in time but can be regarded as part of a two-phase pattern of the eruption. The scale of the explosive phase is expected to range from that of a 1979-type event to that of a 1902-type event. The effusive phase is expected to be quite similar to the 1971-72 eruption. The specific characteristics of these phases, as well as the hazards they are expected to pose, are outlined below.

Long-term or worse case scenario
In the longer term, allowances must be made for the possibility of cataclysmic Plinian to Ultraplinian activity fluctuating with Strombolian type eruptions. Although there are no historical records of such activity, the presence of thick late Pleistocene ashfall deposits throughout St Vincent as well as thick scoriaceous ashfall on the lower flanks of the volcano demonstrates that the Soufrière has the capacity for events of this kind.

Glossary
1 Magmatic eruption. Eruptions involving the release of magma (molten rock) at the surface of the Earth. Magmatic eruptions may be either explosive or effusive. Explosive magmatic eruptions occur when dissolved gases in a rising magma expand to form gas bubbles which then burst as the magma nears the Earth’s surface, leading to explosive fragmentation of the magma.

2 Pyroclastic flows and surges. A pyroclastic flow is a hot (100-600 0C), fast-moving (>100km/hr) mixture of ash, rock fragments and gas. They usually travel down valleys and cause total destruction of the area over which they flow. Pyroclastic flows have been the main cause of destruction and loss of life in Montserrat since 1995. A pyroclastic surge is a dilute turbulent cloud of gases and rock debris that moves above the ground surface at great speeds. These form in a similar way to pyroclastic flows, but their effects are more widespread. Pyroclastic surges can be either hot or cold.

3 Eruption column. Explosive eruptions generate abundant ash and other volcanic particles which are carried up into the atmosphere by expanding hot gases to produce a buoyant eruption column.

4 Effusive eruption. Effusive eruptions occur when molten rock (lava) reaches the Earth’s surface and erupts passively. The products of these eruptions are lava flows and lava domes. They generally occur when the gas content of the magma is low.