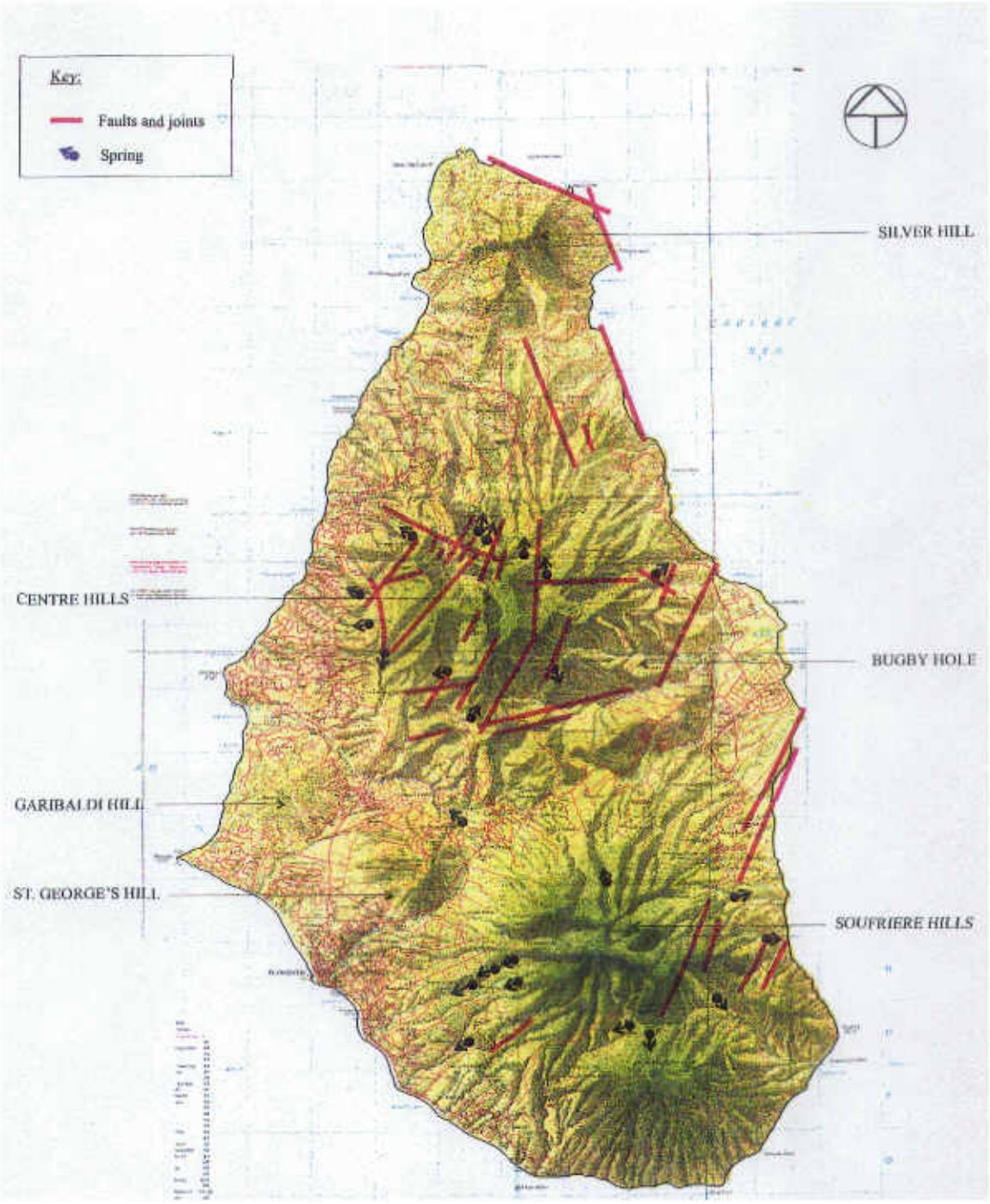
3.0
Existing Water Systems and Their Vulnerability

Killiecrankie Spring



PAN AMERICAN HEALTH ORGANISATION

VULNERABILITY ASSESSMENT OF THE DRINKING WATER SUPPLY INFRASTRUCTURE OF MONTSERRAT

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Figure 10- Spring Locations in relation to Faults

The springs in the Centre Hills are thus being fed by infiltrating rainfall on the highest and steepest areas of the Centre Hills, where the volcanic core is exposed. In April 1985 it was estimated that approximately 10% of the rainfall was reappearing in spring flows, with little over 10% from the Centre Hills and a little under 10% from the Soufriere Hills. It is estimated that a major portion of the infiltrated rainfall in Centre Hills and Soufriere Hills reappears in the springs. It is therefore expected that a proportion is not collected by the present collecting systems and there is a degree of seepage bypassing the collection systems as was indicated during inspection.

Besides entrapment of current losses of water by-passing the spring intakes, the potential for enhancement of water supplies must be focused into the main valleys especially the Belham Valley in the west. The Farms/Trant's Valley in the east should also be given consideration despite the recent impact of the volcano, as Belham also faces a risk from a major eruption and pyroclastic flows. These valleys are infilled with considerable depths of alluvial gravels and volcanoclastic deposits which support intergranular flows. These areas are recharged by infiltrating stream flow and small diverse springs and offer potential for ground water development.

3.2 Sources

3.2.1 Water Availability

Over 90% of the available water is obtained from 16 springs, with the remainder coming from two wells on the eastern side of the island, located in the Unsafe Zone.

Some of the springs are susceptible to contamination by surface water at times of heavy rainfall. Water from the wells is subject to saline intrusion and pumping has to be carefully controlled.

There has been no continuous period of records made available, although it is understood that flow measurements have been taken by the Water Authority over time, but with periods of interruption. Utilisation of results however appears to relate to requests at times of investigation by external sources.

In 1984-85, which were years of average rainfall in Montserrat, investigations and studies by Seetagri estimated flows based particularly on measurements undertaken during that period. It is these estimates that have been used as the basis in the vulnerability analysis for this project. In comparison to other estimates available, the only major variations are those for Monkey and

Hope sources. Estimates however, do not appear to be radical in nature taking into account the limited range of records. It should be noted however that this report is based on the estimated average flows and conditions would have to be adjusted in dry periods

Figure 11 indicates the ranges of average individual spring flows in relation to the safe and Unsafe Zones. Approximately 17% of the sources, including the two wells in the east, fall within the Unsafe Zone. However, Killiecrankie and Monkey are just within the Safe Zone limits but access to these two sources is through the Unsafe Zone.

Since the events of the end of June 1997 there has not been any access to Killiecrankie and Monkey and hence maintenance has not been carried out. Of pertinence here is the perennial problem of roots from vegetation penetrating the intake structure which could have adverse impact on flow into the pipelines.

As would be noted from Figure 11 the sources at Killiecrankie and Monkey are the two single largest spring sources. Their loss would account for approximately 35% of the average daily capacity

In summary, 17% of the average daily flow is currently unavailable and, with the access problems to Killiecrankie and Monkey, over 50% could be unavailable in time if maintenance procedures cannot be implemented

3.2.2 Water Quality

While results of rainwater analyses have indicated acid rainfall with pHs in the vicinity of 2 to 3, to date there is no reflection of this in the spring sources, with pH levels being in the vicinity of 6.5 to 7.5. Other indications of sulphates, chlorides and fluorides are also within acceptable limits. These results are subsequent to the late June 1997 eruptions. It has however been strongly recommended that samples continue to be monitored to obtain an indication of any trends for the lag periods between rainfall and issue at the springs is reported to vary between 2 to 7 months amongst the springs, and heavy ash falls north of Belham have been recent. However, water analysis results of water overflowing at Trials Reservoir on the west flank of the Soufriere Hills Volcano, which has been exposed to ash falls from commencement of the activity and is assumed to be receiving water from the Amersham area, which is currently not used, are favourable with pH's over 7 and total dissolved solids, fluorides, chlorides and sulphates all within acceptable potable water quality limits