# The first hydrogeological and geological maps of Jersey, Channel Islands: work by Walther Klüpfel in 1942 and Richard Nelson *c.* 1828

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ROSE, E. P. F. 2005. The first hydrogeological and geological maps of Jersey, Channel Islands: work by Walther Klüpfel in 1942 and Richard Nelson *c.* 1828. *Proceedings of the Geologists' Association*, **116**, 107–116. Groundwater maps for Jersey were prepared by the military geologist Walther Klüpfel in 1942, during the Second World War German occupation of the Channel Islands. Previously deemed untraceable, these maps are currently preserved in Germany at the *Bundesarchiv-Militärarchiv*, Freiburg-im-Breisgau, and include arguably the earliest hydrogeological map prepared at a scale of 1: 25 000 for any part of the British Isles. This antedates publication of a British hydrogeological map of the island by some 50 years, but follows a long tradition of geological mapping, the earliest geological map of Jersey having been made by a Royal Engineer officer, R. J. Nelson, about 1828. Also hitherto reported as untraceable, Nelson's field map and a fair copy intended for publication are preserved in the archives of the Geological Society, London.

**Key words:** geological maps, German army, groundwater, history of geology, Jersey, military geology, World War II

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## 1. INTRODUCTION

Early in the Second World War, German military geologists assisted preparation for an invasion of Britain by compiling water-supply and other specialist maps for southeastern England (Rose *et al.*, 2002b; Rose & Willig, 2002, 2004a, b). Compilation was achieved essentially between late July and mid September 1940 and without access to the region through extensive use of Ordnance and British Geological Survey publications. German forces began to occupy the Channel Islands at this time, from the end of June 1940. The Islands had been outside the scope of geological mapping undertaken on the United Kingdom mainland by the Geological Survey of Great Britain, so lacked Survey maps and memoirs. Therefore, German geologists were soon required to produce both geological and geotechnical maps at scales sufficiently detailed for military engineering use. The work involved the only German military geologists ever to be deployed for operational fieldwork on British terrain.

Jersey, the largest of the Channel Islands, is now regarded authoritatively as a classical area of British geology (Bishop & Bisson, 1989). Features of its bedrock (Fig. 1) and superficial deposits (Fig. 2) have been of interest since the early nineteenth century, when geological observations were pioneered by MacCulloch (1811). Contemporary study is facilitated by relatively recent publication of a 1: 25 000-scale geological map (Institute of Geological Sciences, 1982) and a new field guide (Bishop *et al.*, 2003).

Jersey had a military geologist on its resident German Fortress Engineer staff from at least August 1941 until June 1944: Lieutenant (later Captain) Walther Klüpfel (1888–1964). Many of his Jersey notebooks and associated papers are now preserved in the archives of the British Geological Survey, Keyworth, and much of his work on the island has been documented from them by Bishop & Launert (1977, 1979), providing a uniquely detailed record of the work of a German military geologist over a three-year time span. Additionally, some of his reports and maps have now been studied in Germany at the Federal military archives (*Bundesarchiv-Militärarchiv*), at Freiburg-im-Breisgau. Maps from these hitherto uncited geological records are described here and include arguably the earliest hydrogeological map prepared at a scale of 1: 25 000 for any part of the British Isles.

## 2. GERMAN GEOLOGICAL WORK ON JERSEY

When German troops landed on Jersey, on 1 July 1940, they seized an island for which excellent topographical maps had been published – but not geological maps at similarly large, detailed scale. From 1941 (and, more intensively, 1942) to 1944 the Germans carried out major construction work to make Jersey and other Channel Islands into impregnably fortified outposts, as part of Adolf Hitler's Atlantic Wall policy. Siting of fortress installations was influenced mainly by geomorphology, but significant use was made of

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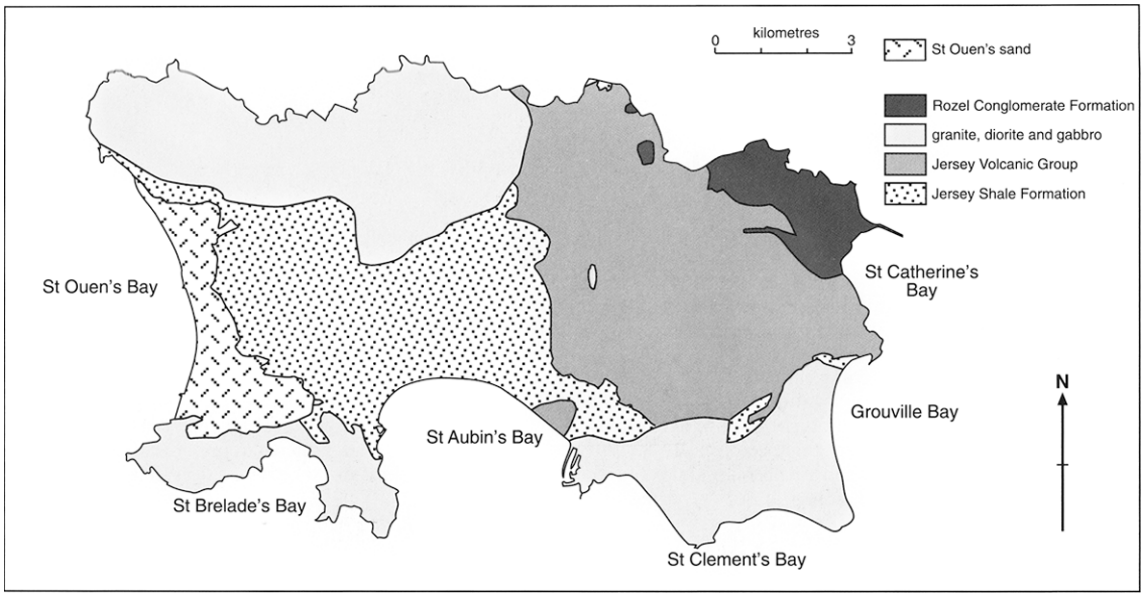


**Fig. 1.** Bedrock (solid) geological map of Jersey, redrawn from British Geological Survey (1992), simplified from Institute of Geological Sciences (1982), Bishop & Bisson (1989). The Jersey Shale Formation and Volcanic Group are Late Proterozoic (Precambrian) in age, plutonic igneous rocks later Proterozoic to Ordovician, and the Rozel Conglomerate is arguably Cambrian or Ordovician. Holocene sand obscures the bedrock in St. Ouen's Bay. Minor intrusions and faults cannot conveniently be illustrated at this scale. From Rose *et al.* (2002a), courtesy of Springer Science and Business Media. 

military geologist expertise: to predict foundation characteristics; develop adequate supplies of potable water for military sites; site camps for the fortification workforce where adequate water supplies could be developed; and locate sources of the considerable quantities of aggregate required for construction (Rose *et al.*, 2002a).

Klüpfel's proficiency in military hydrogeology began in the First World War (Klüpfel, 1916). He served as a military geologist for part of the war, winning the Iron Cross (2nd Class) for water-supply work on the Western Front (Bishop & Launert, 1977, 1979). After the war he followed a career in academic life and as a consultant to the quarrying industry. Conscripted in 1941 and posted briefly to France, then longer term to Jersey, his first tasks were concerned with the preparation of reports which were to include maps illustrating the geology of the island, its building material, mineral resources and water supply. Initial priorities were to aid the selection or development of sites for gun emplacements, observation towers, strongpoints, command centres and storage areas. Secondary priorities were then to determine sources of construction materials (aggregate, sand and water) and help to select or develop sites for accommodation of the workforce.

Klüpfel was able to compile a geological database initially from published maps and literature available in France, later supplemented by publications available on Jersey itself, his own field studies and discussions with a local amateur geologist, Micia Casimir, whose delight in finding a kindred academic enthusiasm in the war-isolated island outweighed the convention not to associate with an enemy. (Their geological correspondence was to continue postwar, until the then Professor Klüfpel died on 16 September 1964.)

Copies of Klüpfel's reports and maps have not been found within the Channel Islands, presumably because the German armed forces based there systematically destroyed most military records before surrender in May 1945 (Cruickshank, 1975, p. 296). Bishop & Launert (1977, pp. 53, 54), confirming Mourant (1973), recorded that Klüpfel's 'maps have so far remained untraced' and that his reports were 'official documents which, to our knowledge, have not been preserved'.

However, it is now known (Rose, 2005a) that Klüpfel had, by late 1942, generated five reports – all of them at least partly preserved:

- the first is an outline of the geology of Jersey, dated 30 August 1941, and essentially a literature-based review;
- the second report, eight pages of double-spaced typescript on the 'military geology' of Jersey, is dated 29 September 1941;
- the third, a 30-page explanation to accompany a 1: 25 000-scale raw materials map of Jersey (but now lacking the map itself), is dated 25 December 1941;