Site name: Pen Park Hole **Unitary Authority:** City of Bristol

Status: Site of Special Scientific Interest (SSSI) notified under Section 28 of the Wildlife and Countryside Act 1981, as substituted by Schedule 9 to the Countryside and Rights of Way Act 2000.

Local Planning Authority: Bristol City Council

National Grid reference: ST585792 **Area:** 0.72 ha

Ordnance Survey Sheets: **1:50,000:** 172 **1:10,000:** ST 57 NE

Notification date: 4 August 2016

Reasons for notification:

Pen Park Hole is of special interest for its nationally important hydrothermal cave system and cave invertebrate community.

General description:

Pen Park Hole is a large cave system within a buried Carboniferous limestone ridge in Southmead on the northern edge of Bristol. The cave is approximately 60 metres deep and consists of a large main chamber, which contains a lake, and several passages which branch off from it.

The cave system contains abundant evidence of hydrothermal dissolution and mineralisation by thermal groundwater rising up along a steeply inclined fault within the limestone. The branching (dendritic) cave passage morphology along a fault line provides clear evidence of geological control on its development. Diagnostic features, including a thick coating of 'dog-tooth' calcite crystals (elongated diamond-shaped crystal polyhedrons, known as scalenohedral), locally with lead sulphide (galena), indicate that the cave was formed by ascending thermal waters rather than descending ground waters more typical of other caves. Considerations of the local geology and regional mineralisation suggest it formed during the Jurassic and is a very rare example of an extant cave of any type of that age. The cave is also of significant historical interest and was the subject of the world's first published survey of a natural cave. The accessible nature of the site offers considerable potential for research and study.

The site supports a nationally important community of cave invertebrates, including a population of the shrimp *Niphargus kochianus*, which is more typically found as a spring seepage or chalk aquifer species. Known from surveys of the cave lake since 1957, it is also recorded from the smaller water-filled depressions in the surrounding passages. This species is not reliably known from any other cave system in Great Britain, and is effectively not available for study in its core habitat, making Pen Park Hole a key resource for cave biology studies. The presence of the related *N. fontanus* in addition to *N. kochianus* shows the site supports an important community of crustaceans that are only found in cave systems (stygobitic species).

Both species are now considered to be genetic endemics: species having distinct and unique genetic lineages which set them apart from close European members of the same species. *N. kochianus* is considered to have split from its European counterparts some 2.9 million years ago. The persistence in Great Britain of both *N. kochianus* and *N. fontanus* strongly suggests that they survived the multiple glaciations of the Quaternary period within the connecting aquifer, making them some of the longest surviving species in Great Britain.

Overall though, the cave invertebrate fauna is not rich and is possibly impacted by lead in the water. Other community members are the copepods *Acanthocyclops vernalis*, historic records of both *Diacyclops bicuspidatus* and *Megacyclops viridis*, and the widespread and common isopod *Asellus aquaticus*. A number of other taxa could not be identified to species level, including Enchytraeidae worms, a *Pisidium* snail (recorded as an empty shell) and the Ostracod *Mixtacandona*. Nearer the surface, the cave system held the widespread carabid ground beetle *Trechoblemus micros*, as well as Collembola (springtails) and Diptera (fly) species.