



South Wales RIGS Group Site Record

RIGS Description

SECTION A

General	South Wales
Site Name: Nant Ffrwd	File Number: AH_48
RIGS Number: 780	Surveyed by: AJ Humpage / R Kendall
Grid Reference: SO 02949 07600	Date of Visit: 9 June 2011
RIGS Category: Scientific, Educational	Date Registered: Unknown
Earth Science Category: Geomorphological, Sedimentological	
Site Nature: Incised wooded gorge	Documentation prepared by: AJH
Unitary Authority: Merthyr Tydfil CBC	Documentation last revised: 19 August 2011
OS 1:50,000 Sheet: 160	Photographic Record: See images attached to this report
OS 1:25,000 Explorer Sheet: 166 / OL12	
BGS 1:50,000 Sheet 231(Merthyr Tydfil)	

RIGS Statement of Interest: This site forms a unique landscape feature in a tributary of the Taff valley which may have been initiated with the fluctuating climate during the Late Glacial Interglacial Transition at the end of the last (Devensian) Ice Age, and has continued to develop during the Holocene.

Nant Ffrwd is a narrow deeply incised gorge cut into the bedrock of Bishopston Mudstone Formation. The narrow, wooded gorge is difficult to access but the feature is impressively laid out as the gorge is ascended. This site was first identified by the NCC in the 1970's but no formal designation was suggested until the present time. As well as the gorge development, the walls in the upper part of the gorge towards the Head of the Valleys road bridge are coated in many places by extensive calcareous tufa deposits, which are continuing to form to the present. There are no recorded faults in the upper part of the gorge so the source of the carbonate is uncertain, and consideration must be given to extending the RIGS westwards to protect any potential unrecorded source.

Whilst the area was covered by ice during the Late Devensian, there is nothing to indicate this gorge formed as a sub-glacial channel. Instead, it is proposed that this channel is the consequence of rapid downcutting by meltwater after the ice had retreated from the site and water was eroding down to a new base level in the glacially overdeepened Taff valley. A well developed waterfall and plunge pool is present at the head of the gorge just west of the road bridge which marks the current knick point.

Geological setting/context:

Remarkably, little has been written on the glacial evolution of the Taff Valley, the most relevant account being within the earlier editions of the BGS memoir (Strahan *et al* 1904; Robertson 1933). Charlesworth (1929) referred to the valleys east of the Taff being buried by “Brecon ice” and this is reinforced by Bowen (1970, 2005) who highlighted the presence of Old Red sandstone, Carboniferous limestone and Millstone Grit erratics in the Taff Valley.

There is uncertainty regarding the time of formation of the gorge. Its narrow, vertical sided form suggests it has not formed under high pressure sub-glacial conditions, although its sloping upper part may have been influenced in this fashion. Rather, it seems that the gorge is the response to the Nant Ffrwd stream downcutting during LGIT or early Holocene times in response to lowered base levels in the Taff valley, possibly during periods of elevated fluvial discharge. The sandstone within the Bishopston Mudstone Formation initially formed a competent surface but once breached, the stream was able to erode swiftly through the underlying sandstone.

This resulted in the formation of a waterfall which has gradually retreated upstream as the river grades itself, leaving downstream the narrow incised gorge. Blocks periodically fall from the gorge walls.

Modern calcareous tufas are encountered within Nant Ffrwd. **Tufa** is a variety of limestone, formed by the precipitation of carbonate minerals from ambient temperature water bodies. Modern tufa is formed from supersaturated alkaline waters, with raised concentrations of dissolved CO₂. On emergence, waters de-gas CO₂ due to the lower atmospheric pCO₂, resulting in an increase in pH. Since carbonate solubility decreases with increased pH, precipitation is induced. Supersaturation may be enhanced by factors leading to a reduction in pCO₂, for example increased air-water interactions at waterfalls may be important, as may photosynthesis.

Recently it has been demonstrated that microbially induced precipitation may be more important than physico-chemical precipitation. Pedley et al. (2009) showed with flume experiments that precipitation does not occur unless a biofilm is present, despite supersaturation.

Calcite is the dominant mineral precipitate found; however, the polymorph aragonite is also found.

References:

British Geological Survey (1979). *Merthyr Tydfil. England and Wales Sheet 231. Solid and Drift Geology. 1:50,000*. British Geological Survey, Keyworth, Nottingham.

Bowen, D.Q. (1970). South-east and Central South Wales. In: CA Lewis (Ed). *The Glaciations of Wales and Adjacent Regions*. Longman, London.

Bowen, D.Q. (2005). South Wales. In: CA Lewis and A.E. Richards (Eds). *The Glaciations of Wales and Adjacent Regions*. Logaston Press, Logaston, Herefordshire.

Charlesworth, J.K. (1929). The South Wales End Moraine. *Quarterly Journal of the Geological Society of London*. 85, p335-358.

Pedley, M., Rogerson, M. and Middleton, R. (2009). Freshwater calcite precipitates from in vitro mesocosm flume experiments: a case for biomediation of tufas. *Sedimentology* **56** (2): 511–527.

Strahan, A.H., Gibson, W. and Cantrill, T.C. (1904). The geology of the South Wales Coalfield. Part V: Merthyr Tydfil (1st edition). *Memoir of British Geological Survey, Sheet 231*. 132pp.

Robertson, T. (1933). The geology of the South Wales Coalfield. Part V: Merthyr Tydfil (2nd edition). *Memoir of British Geological Survey, Sheet 231*. 283pp.

SECTION B

PRACTICAL CONSIDERATIONS:

Please score Accessibility and Safety Red Amber or Green

Accessibility:

X

Comment: Not easily accessible. Permission will be required to access land. No access from main roads. Access is most easily achieved from footpath beneath Cefn Coed railway viaduct

Safety:

X

Comment: Narrow gorge with slippery rocks and steep sides. High potential for falling rocks from gorge walls. Extreme care must be taken.

Conservation status:

There are no known conservation designations on this RIGS.

OWNERSHIP/PLANNING CONTROL:

Owner/tenant: Unknown / various

Planning Authority: Merthyr Tydfil County Borough Council

Planning status/constraints/opportunities: There are no known planning constraints or opportunities

CONDITION, USE & MANAGEMENT:

Present use:

Site condition: This site is in a narrow rocky gorge.

Potential threats: Fly tipping from A465 road bridge above site is a potential hazard. Changes to drainage pattern may affect tufa development.

Site Management: This site needs careful maintenance and possibly some form of access agreement negotiated.

SITE DEVELOPMENT:

Potential use (general): This site could be useful to show the formation of gorges in non limestone areas. However, access would have to be obtained from landowners as there are no public rights of way.

Potential use (educational): A potentially accessible site to view and explain erosion processes and waterfall formation. With schools in the nearby town, a range of activities could be developed to exploit this site for educational purposes, provided landowner permission were to be forthcoming.

Other comments:

Detailed scientific research and geomorphological mapping would benefit this site to understand source of water for tufa development.

Photographic Record



Access the site from the path below Cefn Coed Viaduct



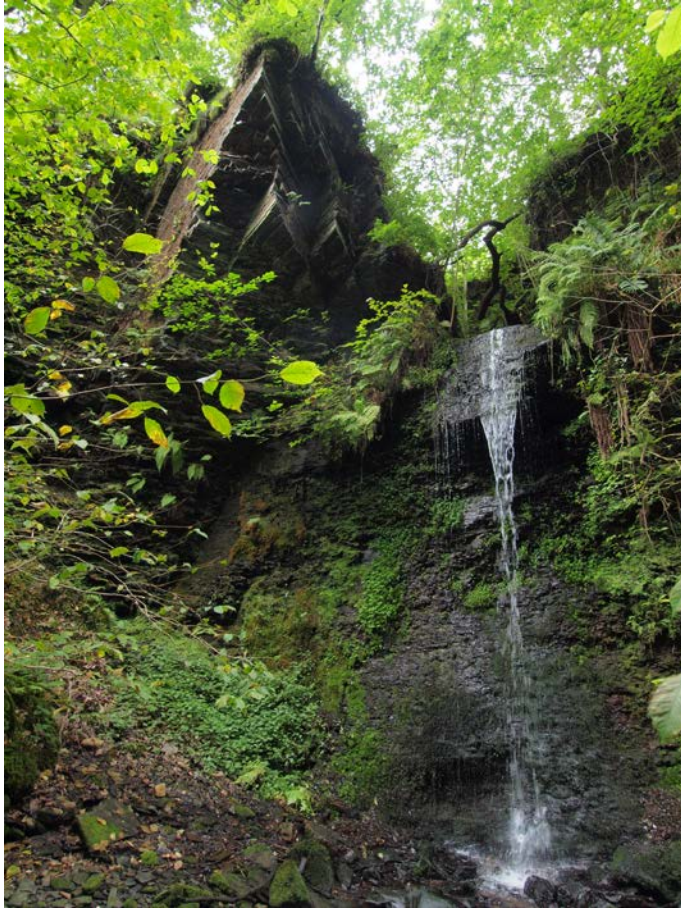
The gorge is wholly within mudstones of the Bishopston Mudstone Formation



The sides of the Nant Ffrwd gorge are vertical, with loose overhanging sections



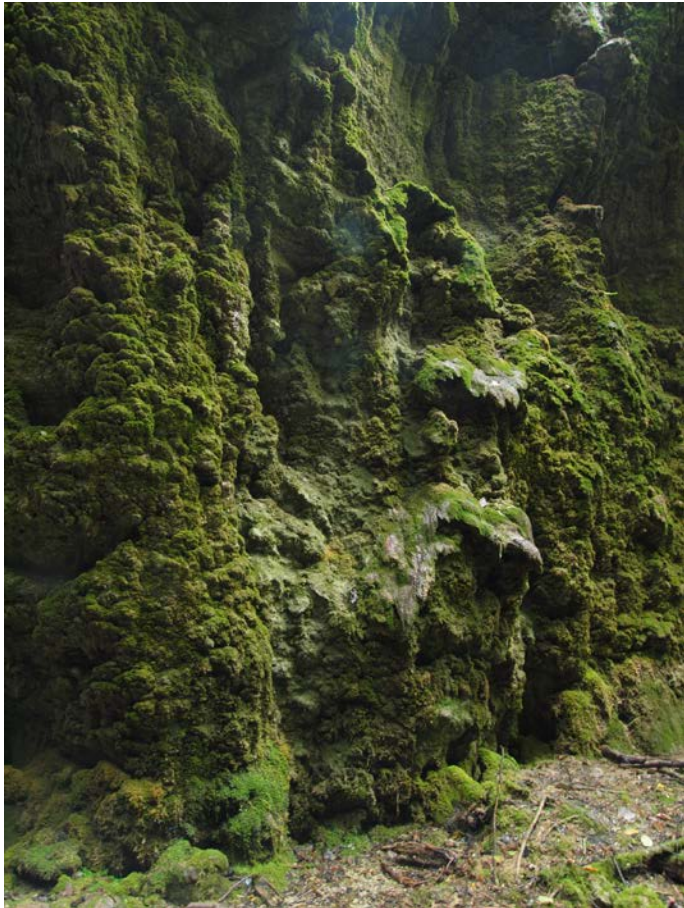
The narrow, deeply incised, wooded nature of the gorge



At the top of the gorge on the south side, is a massive sandstone bed within the Bishopston Mudstone Formation which forms overhanging crags



The narrow Nant Ffrwd gorge, with the bridge of the Heads of the Valleys road above.



Well developed calcareous tufa deposits on the gorge wall



Tufa is continuing to develop



In places, the gorge is no more than 2 -3 metres across. Note road cones probably from road above



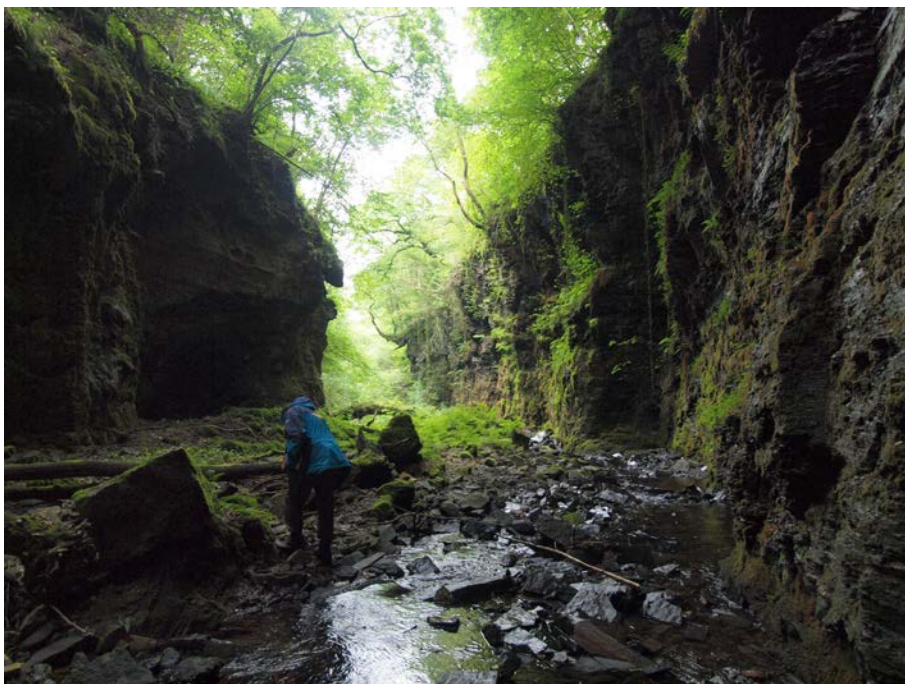
The waterfall and plunge pool



The waterfall at the head of the gorge, almost directly beneath the road bridge.



The exit from the pool into the gorge



The main part of the gorge looking downstream



Iron minerals leaching from the mudstone