South Wales RIGS Group Site Record
RIGS Description

SECTION A

General	South Wales
Site Name: Fire Tower Hill forestry track cutting	**File Number:** Site_RAW_JRD_10
RIGS Number: 647	**Surveyed by:** RA Waters & JR Davies
Grid Reference: SN 8534 3848 to 8540 3843	**Date of Visit:** September 2010
RIGS Category: Scientific	**Date Registered:**
Earth Science Category: Sedimentology	**Owner:** Forestry Commission **Planning Authority:** Carmarthenshire County Council
Site Nature: Forestry track section	**Documentation prepared by:** Jerry Davies
Unitary Authority: Carmarthenshire County Council	**Documentation last revised:** 27th January 2011
OS 1:50,000 Sheet: 160	**Photographic Record:** Attached
OS 1:25,000 Explorer Sheet: 188	
BGS 1:50,000 Sheet: E213 (Brecon)	

RIGS Statement of Interest: This site forms part of a network of early Silurian (Llandovery) sites (RIGS and GCR) in the international type area for the Llandovery Series. Collectively, these sites represent the key sections in the local geology that underpin its international importance and demonstrate significant recent scientific discoveries.

The Fire Tower Hill forestry track cutting exposes distinctive shallow water sandstones rich in Pentamerid brachiopods that were deposited during mid Llandovery times in the north of the Type Llandovery area. These sandstones are included in the Derwyddon Formation of Cocks et al. (1984). They rest unconformably on Ordovician (mid Ashgill) rocks and are conformably overlain by green mudstones of the Cerig Formation. New graptolite discoveries (Davies et al. 2010) from near its base confirm that the Cerig Formation at this locality is of *guerichi* (lower *turriculatus*) Biozone age and underpin its selection as new type section for the formation (see RAW_JRD_12).

The section is located in part of the Type Llandovery area where movements along the Penywaun Fault Belt during sedimentation influenced the preservation, composition and thickness of Llandovery units. It provides an accessible section in highy fossiliferous sandstones that accumulated in a shallow water setting above the fault zone which contrast with Llandovery lithologies and fossil assemblages deposited in deeper settings to the west. Together with the new graptolite date, the section contributes to the revised sedimentary architecture for the Type Llandovery succession advanced by Davies et al (2010; and in press).

Geological setting/context:

A number of geological studies in the Type Llandovery have shown that the succession in the central part of the area thins both to the north-east and south-east (Jones, 1925, 1949; Cocks et al., 1984; Barclay et al., 2005). Cocks et al. (1984; see also Woodcock, 1987) recognised that this thinning, and commensurate changes in sedimentary facies, were influenced by intra-Llandovery activity along the Penywaun Fault Belt. West of this fracture zone, thicker and more off-shore Llandovery facies accumulated, but uplift along and to the east promoted shallower, more proximal water conditions and periodic emergence. In this area, Cocks et al. showed that Llandovery sandstones of Aeronian age unconformably overlay their mid Ashgill (Rawtheyan) Tridwr Formation. They obtained the graptolite *Monograptus runcinatus* from the mudstone-dominated Cerig Formation overlying the sandstones. However, the specimen was subsequently lost and the age of this division remained unproven.

The Fire Tower Hill track cutting provides an accessible exposure in the shallow water Derwyddon Formation sandstones of the Penywaun area and their transition into the overlying Cerig Formation (Photos 1& 2). The section exposes a south-westward plunging anticline with the sandstones in the core and the Cerig Formation exposed on the eastern limb. The lowest sandstones are buff and yellow, variably burrowed, gritty and pebbly with some cross-bedding preserved. These beds are richly fossiliferous containing bivalves, corals and crinoid debris, but most notably coquinas and pavements of the distinctive brachiopod *Pentamerus oblongus* (Photo. 3). Upper parts of the Derwyddon Formation are darker, more muddy and strongly burrow mottled. The entry of green mudstone beds signals the rapid transition into the burrow-mottled Cerig Formation, but in which thin fine-grained cross-laminated sandstone beds and laminae persist.

During the BGS study of the section, a single specimen of the graptolite *Spirograptus guerichi* was recovered from about 3 m above the base of the Cerig Formation (Figure 1). This is diagnostic of the *guerichi* Biozone (= lower *turriculatus* Biozone of earlier accounts) and confirms the dating of Cocks et al. (1984). This is the only graptolite dated locality in the Cerig Formation in the Type Llandovery area and, in the light of problems recognised with the current Cerig Formation type section (RIGS_RAW_JRD_12), Davies et al. (2010) offered the Fire Tower Hill section as a better alternative.

The revised sedimentary architecture put forward by Davies et al. (2010; and in press) recognised that Rhuddanian to Aeronian parts of the Type Llandovery succession comprises a series of upwards shallowing progradations each of which overlies a marine flooding surface. These flooding events record rises in sea level believed to be linked to periods of polar ice retreat; the progradations, in contrast, may record episodes of ice advance and sea level lowering. Uplift along the Penywaun Fault Belt was effective in excluding the deposition of early Llandovery strata or promoting its erosion. Davies et al. (in press) suggest that inundation of this area was only achieved by deepening events during the late *convolutus* and *sedgwickii* biozones. Widespread changes in the post sedgwickii Biozone period which saw the previous pattern transgressions and regressions abandoned and blanket deposition of the Cerig Formation mudstones ensue. The Fire Tower Hill section affords critical and dated exposure of this key transition in the proximal

Penywaun setting.

References:

BARCLAY, W J, DAVIES, J R, HUMPAGE, A J, WATERS, R A, WILBY, P R, WILLIAMS, M and WILSON, D. 2005. Geology of the Brecon district. *Sheet explanation of the British Geological Survey*. Sheet 213 (England and Wales).

COCKS, L R M, WOODCOCK N H, RICKARDS R B, TEMPLE, J T and LANE P D. 1984. The Llandovery Series of the Type Area. *Bulletin of the British Museum (Natural History), Geology Series* Vol. 38, 131-182.

DAVIES, J R, WATERS, R A, ZALASIEWICZ, J A, MOLYNEUX, SG, VANDENBROUCKE, T R A and WILLIAMS, M. 2010. A revised sedimentary and biostratigraphical architecture for the type Llandovery and Garth areas, Central Wales: a field guide. *British Geological Survey Open Report*, OR/10/037.

DAVIES, J R, MOLYNEUX, SG, WATERS, R A, WILLIAMS, M, ZALASIEWICZ, J A, VANDENBROUCKE, T R A, SCHOFIELD, D I and WILSON, D. In press. A revised sedimentary and biostratigraphical architecture for the Type Llandovery area, Central Wales. *Geological Magazine*

JONES, OT. 1925. The geology of the Llandovery district: Part I. The southern area. *Quarterly Journal of the Geological Society, London*, Vol. 81, 344-388.

JONES, OT. 1949. The geology of the Llandovery district: Part II. The northern area. *Quarterly Journal of the Geological Society, London,* Vol. 105, 43-64.

WOODCOCK, N. H. 1987. Structural geology of the Llandovery Series in the type area, Dyfed, Wales. *Geological Journal*, Vol. 22, 199–209.

SECTION B

PRACTICAL CONSIDERATIONS:
Please score Accessibility and Safety Red Amber or Green

Accessibility:			X
Comment: Easily accessed via forestry tracks; may be inaccessible periodically during forestry operations and military manoeuvres on the adjacent SENTA site			
Safety:			X
Comment: The track cutting is quite high in places but well battered; need to be aware of forestry operations and traffic and of military traffic during exercises			

Conservation status:

There are no known conservation designations of this RIGS

OWNERSHIP/PLANNING CONTROL:

Owner/tenant: Forestry Commission

Planning Authority: Carmarthenshire County Council

Planning status/constraints/opportunities:

There are no known planning constraints or opportunities

CONDITION, USE & MANAGEMENT:

Present use: Forestry cutting

Site condition: Good at the moment, but the Cerig Formation part of the section will be prone to become overgrown and degraded

Potential threats: Renewed forestry excavation could alter the nature of the site and access to critical levels.

Site Management: Periodic scrapping of the Cerig Formation part of the section to keep vegetation at bay

SITE DEVELOPMENT:

Potential use (general):

Potential use (educational): Very good section showing plunging anticline and fossiliferous shallow water sandstones, including Pentamerid brachiopod coquinas

Other comments:

Photographic Record

Photograph 1. Derwyddon Formation sandstones exposed in the core of steep, south-west plunging anticline, Fire Tower Hill forestry section

Photograph 3. Thick beds of southward dipping Derwyddon Formation sandstones (centre) overlain to right by Cerig Formation mudstones, Fire Tower Hill forestry section

Photograph 3. Coquina of distinctive *Pentamerus oblongus* brachiopod valves in Derwyddon Formation sandstone, Fire Tower Hill forestry section

Annotated Sketch

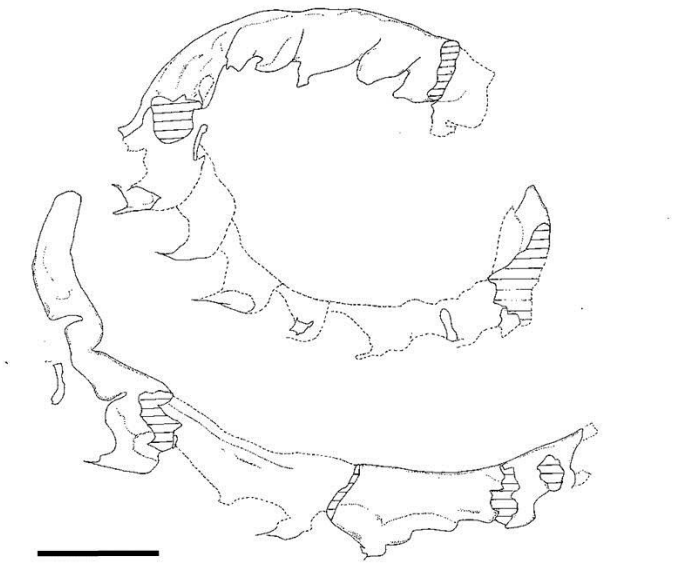

Figure 1. *Spirograptus guerichi* from near the base of the Cerig Formation in the Fire Tower Hill track section. Scale bar is 1mm. Line drawing by Mark Williams.