South Wales RIGS Group Site Record
RIGS Description

SECTION A

General	South Wales
Site Name: Ystradwalter Quarry	**File Number:** Site_RAW_JRD_7
RIGS Number: 644	**Surveyed by:** RA Waters and JR Davies
Grid Reference: SN 8471 3962? Or SN 7886 3561?	**Date of Visit:** September 2009
RIGS Category: Scientific	**Date Registered:**
Earth Science Category: Stratigraphical, Sedimentological	**Owner:** Ystradwalter Farm **Planning Authority:** Carmarthenshire County Council
Site Nature: Farm quarry	**Documentation prepared by:** J R Davies
Unitary Authority: Carmarthenshire County Council	**Documentation last revised:** 27th January 2011
OS 1:50,000 Sheet: 160	**Photographic Record:** Embedded in text
OS 1:25,000 Explorer Sheet: 187	
BGS 1:50,000 Sheet: E212	

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 the significance of recent discoveries.

Ystradwalter Quarry, discovered during the recent BGS survey of the Llandovery area, was described in detail by Davies et al. (2009) and is the type locality of the Ystradwalter Member of the Chwefri Formation (Schofield et al., 2009). It was one of the key exposures in the Hirnantian (Late Ordovician) rocks of the Llandovery area which demonstrated that existing stratigraphical models were flawed and required major revision. In particular, fossils recovered from the quarry showed that the strata could be correlated with a level much lower in the main Welsh Basin succession to the north-west than previously accepted (e.g. Jones, 1909, 1925; Cave & Hains, 1986; Davies et al., 1997). The revised correlation provided a new insight into the events and processes that affected the deep-water basin and its marginal shelf during and following the Late Ordovician glacial epoch. The Ystradwalter Member and its basinal correlative, the Mottled Mudstone Member, record a major environmental change linked to a rising sea level which allowed both planktonic and bottom dwelling biota to rapidly colonise the basin and its marginal seas.

Geological setting/context:

Ystradwalter Quarry is the type locality for the Ystradwalter Member, a distinctive unit of burrow-mottled, silty mudstones at the base of the Chwefri Formation, a succession of colour-banded mudstones with common small diameter *chondrites* burrows and rare graptolites (Davies et al., 2009) (Figure1; Photos 1 & 2). The formation is exposed in the Llandovery and nearby Garth areas of mid Wales and records distal shelf deposition during an interval that spanned Ordovician-Silurian boundary. It succeeds a succession of smooth grey mudstones, with lenticular sandstones, barren of fossils, now recognised as the Garth House Formation (Schofield et al., 2004; Barclay et al., 2005). In his seminal studies of the Type Llandovery succession, Jones (1925, 1949) included these strata in his basal Silurian A1 (or Aa) division. His view that this correlated with a unit in the Welsh Basin succession to the north-west, which contains the lowest *persculptus* Biozone graptolites, went unchallenged and this unit was subsequently named the Mottled Mudstone Member (Cave & Hains, 1986; Davies et al., 1997). Following international changes to the definition of the Silurian System, Cocks et al. (1984) labelled Jones' A1 (Aa) division 'Scrach Formation' and assigned it to the Late Ordovician Hirnantian stage. This time interval is widely acknowledged to coincide with a period polar ice cap expansion and lowered global sea level and Cocks et al. (1984; see also Woodcock & Smallwood, 1987) interpreted the Scrach Formation as deposited in shallow water at the time of greatest sea level fall.

The discovery of *persculptus* Biozone graptolites at Ystradwalter Quarry from a level in the Chwefri Formation c.5 m above the top of the Ystradwalter Member (Figure1; Photo. 3) allowed Davies et al. (2009) to advance a radically new correlation and interpretation for the Hirnantian succession in the Type Llandovery area and in the basin. The morphology of the graptolites allowed comparison with assemblages collected in the basin by Blackett et al. (2008) and confirmed that it is the Ystradwalter Member and not Jones' A1 (Aa) division that correlates with the Mottled Mudstone Member. In addition, another site in the Llandovery area (RAW_JRD_6) exposes relationships which undermine the concept and definition of the term Scrach Formation and show that the in part equivalent Garth House Formation was deposited during an initial period of deepening water that followed the glacial maximum lowstand. Accordingly, Davies et al. (2009) reasoned that the coeval transgressive strata in the basin must underlie and pre-date the Mottled Mudstone Member; there they are represented by the comparably barren Brynglas Formation and its synonyms.

This revised correlation has further implications. The bases of the Mottled Mudstone and Ystradwalter members record the synchronous colonisation of the sea floor both in the basin and on the shelf of burrowing benthos, and the return of planktonic graptolites to the water column. Davies et al. (2009) speculate that this event may record the re-establishment of connections between the Welsh basin and the open ocean, but international correlations point to the possible impact of global changes to climate and sea level.

The lithologies and fossils present at Ystradwalter Quarry have been critical in allowing a radical re-appraisal of the Hirnantian strata that underlie the Llandovery (early Silurian) succession in its type area. Significantly, this has permitted more accurate correlations not only with the adjacent Welsh Basin, but with other

Hirnantian successions around the world, paving the way for a refined Hirnantian sequence stratigraphy and an improved understanding of the impact of climate changes and rising sea levels during a post glacial period.

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SECTION B

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

Accessibility:			X
Comment: By foot from Ystradwalter Farm or using 4x4 vehicle via farm tracks; farming operations may periodically prevent access			
Safety:			X
Comment: Shallow quarry with no high or unstable faces; farming operations (stock , use of chemicals) may have an impact periodically			

Conservation status:

There are no known conservation designations of this RIGS

OWNERSHIP/PLANNING CONTROL:

Owner/tenant: Ystradwalter Farm

Planning Authority: Carmarthenshire County Council

Planning status/constraints/opportunities:

There are no known planning constraints or opportunities

CONDITION, USE & MANAGEMENT:

Present use: Farm quarry intermittently used to provide aggregate for tracks

Site condition: Good; key levels of the local stratigraphy are well exposed and assessable.

Potential threats: Farmer may infill the quarry

Site Management: A very important fossil-yielding site that requires conservation. Extension of the current excavation particularly to the west could expose further potentially important geological contacts with the underlying stratigraphy.

SITE DEVELOPMENT:

Potential use (general): This site is of great importance to academics wishing to understand the geological evolution of the region.

Potential use (educational):

Other comments:

Photographic Record

Photograph 1. Ystradwalter Quarry

Photograph 2. Ystradwalter Quarry; hammer lies on the contact between the Ystradwalter Member and overlying Chwefri Formation

Photograph 3. Graptolite-bearing rusty weathering mudstone unit in Chwefri Formation, Ystradwalter Quarry

Photograph 4. Graptolite *Normalograptus? parvulus* from rusty weathering unit in photograph 3, Ystradwalter Quarry

Annotated Sketch

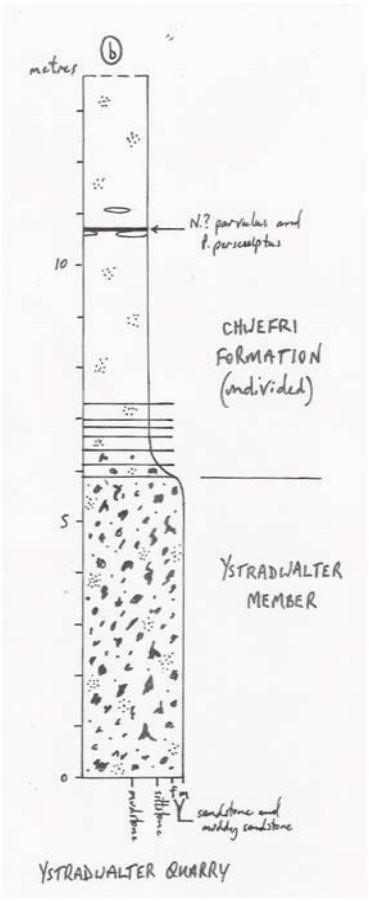

Figure 1. Modified field log of Ystradwalter Quarry (see Davies et al., 2009); see Site RAW_JRD_6 for key)