A465 HEADS OF THE VALLEY DUALLING
SECTION 2: GILWERN TO BRYNMAWR

SUMMARY OF PROOF OF EVIDENCE

GEOLOGY AND SOILS
DOCUMENT WG 014B

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EXPERT WITNESS FOR THE WELSH GOVERNMENT

February 2014
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Author – Personal Introduction

1. My name is Lesley Campton. I am an Associate of CH2M Hill a multi-disciplinary consultancy practice and I am based in its Cardiff office. I have an Upper Second Class BSc (Hons) degree in Geography and Geology from Lancaster University (1986) and an MSc degree in Engineering Geology from the University of Newcastle-upon –Tyne (1987). I have been a Chartered Engineer of the Institution of Materials, Minerals and Mining since 1996 and I am also a Chartered Geologist of the Geological Society since 1992.

2. My evidence describes the effects of the construction and operation of the published scheme on the geology and soils.
1. **Baseline Conditions**

**Geology**

1.1 The geology underlying the scheme is complex. The scheme runs in a west-east direction along the northern margin of the South Wales Coalfield and also along a large syncline structure which becomes younger in age to the south and west. The following strata are anticipated to be encountered within the scheme:

- Topsoil
- Made Ground (predominantly waste from mining activities)
- Alluvium
- Glacial Till
- Bedrock (South Wales Coal Measures Group, Marros Group (Millstone Grit), Carboniferous Limestone Super Group, Upper Old Red Sandstone and Lower Old Red Sandstone)
2. Geological Designations

2.1 On a national scale, statutory protection of the geological environment is achieved primarily by designating areas or sites as Areas of Outstanding Natural Beauty (AONBs), National Parks, Sites of Special Scientific Interest (SSSIs), and National Nature Reserves (NNRs). Within the scheme boundaries there is a National Park and 2 sites of Special Scientific Interest (SSSIs) designated wholly and partly on their geological interest.

Brecon Beacons National Park (BBNP)

2.2 The published scheme is almost entirely within the BBNP boundary apart from the Brynmawr roundabout and Main Road link from the existing roundabout to the Gateway Bridge.

Brynmawr Sections SSSI

2.3 The Brynmawr Sections SSSI, located on the south side of the existing A465 immediately east of Brynmawr Roundabout represents the best exposure of the Lower Coal Measures bedrock in South Wales and has been designated as a site of outstanding stratigraphical and palaeogeographical significance.

Mynydd Llangatwg SSSI

2.4 The Mynydd Llangatwg SSSI lies within the vicinity of the published scheme and is situated to the north of the existing road between Blackrock and Brynmawr. Beneath the Mynydd Llangatwg Plateau lies more than 50km of caves. The caves are of regional and national importance. Four known caves run underneath the existing A465 the roofs of which lie within 5 to 10m of the existing running surface of the road.
3. **Methodology**

3.1 The detailed assessment of the effects of the published scheme on the geological resources is presented in Chapter 12 of the Environmental Statement that has been submitted in support of the Draft Orders. The assessment was carried out in line with all appropriate guidance, most specifically the methodology described in DMRB 11.3.11 *Geology and Soils* (HA205/08) (DD315).

3.2 The Environmental Impact Assessment (EIA) process began with collation of baseline information for the geology and soils assessment. The data was collected through a variety of methods, including the collation of existing third party data, field surveys and ground investigations, consultations with relevant parties and desk based assessments.

3.3 The potential for impacts to occur on the geology and soils as a result of construction or operation of the published scheme was then assessed. The EIA assessed potentially significant effects on receptors, be these beneficial or adverse.

3.4 For geology and soils, the receptor or receiving environment was identified and the vulnerability of that receptor assessed.

3.5 The EIA process comprised a four-stage approach:

   i. establish the presence and value of the geological assets within the defined study area;

   ii. assessment of the potential impacts associated with the scheme design;
iii. identification of design development or mitigation measures to avoid or reduce the impacts; and

iv. identification of potential residual impacts, assuming that the design and mitigation measures identified are to be incorporated into the scheme design or management of activities.

3.6 The above methodology provided a process to assess the potential geological character effects.

3.7 Potential effects on individual designated geological sites included adverse effects on the Brynmawr SSSI and the Mynydd Llangatwg SSSI resulting from the loss of rock exposures and potential disturbance to caves through proposed cutting and filling operations in the formation of the earthworks for the scheme.
4. The Effects of the Published Scheme on Geology and Soils

4.1 The detailed assessment of the effects of the published scheme on the geological resources is presented in Chapter 12 of the Environmental Statement that has been submitted in support of the Draft Orders.

4.2 As detailed in Section 3 of this Summary Proof, two SSSIs, so designated because of their geological significance have been identified within the scheme boundaries and thus the sensitivity of the geology and soils to construction and operational impacts is therefore considered to be high. The effects on these sites are detailed below.

**Brynmawr SSSI**

4.3 The published scheme has been developed to minimise the impacts on this high sensitivity site by realigning the scheme to the north of the Brynmawr SSSI (the 1999 scheme was aligned to the south of the Brynmawr SSSI). However, direct physical impacts would still be experienced in two localities, namely between scheme Ch 29700 and 29750 and between Ch 30040 and 30450. Between Ch 29700 and 29750 localised excavation of the hummocky slopes at the most westerly end of the SSSI will be required, as will some minor filling operations in the area of the disused petrol filling station. This is to accommodate the construction of the new access road from Brynmawr to the former Anacomp Magnetics site. The filling operations in particular will partially cover up existing rock faces originally excavated to accommodate the construction of the petrol filling station.

4.4 Between Ch 30040 and 30450 localised excavation of rock faces adjacent to the existing road will be required to accommodate the proposed alignment, which at this point has additional widening to accommodate directional traffic.
signs on the approach to Brynmawr Junction. The current proposals indicate that most rock would be removed around Ch 30400, where a new rock face up to 8m in height will be required, although from on-site inspections undertaken by CH2MHiIl and NRW staff in December 2013, it was agreed that the existing topographic survey of the scheme in this area is inaccurate and is currently indicating a much greater impact to the existing SSSI than would actually be realised. Nevertheless the current scheme proposals indicate that there will be major adverse effects within the SSSI through the loss of sections of rock that have been designated as being of stratigraphical and palaeogeographical significance.

4.5 Where land required for the published scheme necessitates new rock cuttings, not only within the SSSI but elsewhere along the scheme, this previously undisturbed land has the potential to contain and expose new geological sequences of equal stratigraphical and palaeogeographical significance as the current exposures. The level of effects on such sequences will depend on the nature of the exposures and their extent within the scheme footprint.

4.6 Overall the published scheme has been assessed to have a major adverse effect on the Brynmawr SSSI.

Mitigation ahead of construction

4.7 Since publication of the Environmental Statement, ongoing design work has continued to seek ways to minimise the impacts on the SSSI. This has been realised recently by the re-positioning of 3No. directional traffic signs that were situated within the verge immediately adjacent to the SSSI between Ch. 30200 and 30500. This has resulted in the overall verge width being reduced
in this area of the scheme, which will result in the reduction of rock excavation in the SSSI.

4.8 A programme of topographical survey, geological mapping and intrusive ground investigation of the lengths of the Brynmawr SSSI directly impacted by the works would be undertaken ahead of construction and as part of the detailed design of the published scheme in order to accurately assess the impacts on the SSSI. This programme would be described in detail in a Geological Management Plan.

4.9 Following this programme of survey, intrusive investigation and geological evaluation, the subsequent design of any new rock slopes would focus on improving the access to the SSSI in relation to meeting recreational and educational objectives of the local authority and NRW. Much of the existing SSSI is inaccessible on safety grounds, due to precipitous slopes and overhanging rock ledges. Where excavation into such areas is required, all efforts would be taken to replicate what is already there, whilst at the same time providing permanent access to a safe and stable slope.

4.10 Taking into account the proposed mitigation ahead of construction, I conclude that the assessed major adverse effects of the construction of the scheme on the SSSI could be reduced to a minor to moderate effect, with the potential in some areas for a beneficial effect following exposure of new rock faces.

**Mynydd Llangatwg SSSI**

4.11 As detailed in Section 3 of this Summary Proof, the caves which underlie the Mynydd Llangatwg SSSI are of regional and national importance. Between scheme Ch 31000 and 31800, four caves cross beneath the A465 at relatively shallow depth (5 to 10m). The proposed widening of the existing A465 over
this 800m length was, in the early stages of the scheme development, assessed as being very likely to significantly impact on the caves by causing collapse/disturbance of the caves/karst features that cross underneath the existing road and by burying some of the lesser known/smaller cave entrances likely to be present either side of the road. Overall the published scheme has been assessed to have a major adverse effect on the caves of the Mynydd Llangatwg SSSI.

4.12 During the scheme development the main carriageway from Brynmawr to Blackrock (some 2km) was designed as “split level carriageway” to reduce the excavation into difficult rock in this area and to minimise the impact on the limestone caves underlying the road. To better understand the potential impacts of the scheme on the caves, a programme of investigation and surveying has been undertaken during the development of the design. This work is described in the following paragraphs.

**Mitigation ahead of construction**

4.13 Investigations to accurately determine the location, size and extent of the caves below the proposed road were undertaken in 1997 during the preliminary studies for the 1999 Scheme. The method of investigation used was Ground Penetrating Radar. This survey method produced mixed results with only the shallowest caves being identified by the survey.

4.14 Earlier physical surveys had also been completed by caving clubs, but during Key Stage 3 of the Early Contractor Involvement, it was considered that additional information and up to date condition surveys of the caves would be required ahead of the proposed construction of the published scheme.
Liaison, Advice and Recent Surveys

4.15 Caving Clubs and Limestone Specialists have been engaged and consulted throughout the preparation of the outline design. Advice has been sought from Limestone Research and Development Consultants in the production of the Environmental Statement and on other matters relating to the Limestone (karst) areas that will be affected by the proposed works.

Advanced Ground Penetrating Radar

4.16 A Ground Penetrating Radar (GPR) survey was undertaken in April 2013 (RSK, 2013) (DD555) along the existing A465 and Main road between Ch 30700m and 31850. The results of this survey showed a number of anomalies consistent with the presence of rockhead, disturbed ground (possibly faulted) and possible voided areas. In terms of the areas of voids, these are generally consistent with previous data with respect to the larger cave systems and overall depth assessments have been refined.

Physical Dimensional Surveys and Digital Photographic records

4.17 During Summer and Autumn 2013, full internal dimensional surveys were undertaken of the caves in the vicinity of the construction proposals. This entailed verification of cave datum and orientation in relation to the proposed works. The surveys were carried out in accordance with British Cave Research Association requirements and accuracy. Additionally, a full record on internal condition has been compiled for each cave with reference markers from which future comparison surveys will be undertaken during and after the proposed construction works have been completed.
Use of Survey Data

4.18 The resultant survey information has been published in a report to interested parties and acts as a full record of the condition and of areas where existing features may be of concern. Such areas would be monitored further ahead of construction. The information gained from the survey exercise would also be used to inform the construction proposals during the detailed design stage for the new highway works and allow further mitigating and protection measures to be considered.

Design and Construction Features limiting the interface with the Cave Network

4.19 To date, the published scheme design has been progressed featuring the split level carriageway, thereby reducing the requirement to excavate in the vicinity of many of the caves within the Gorge. Hybrid retaining wall designs have also been developed in this area of the scheme to minimise the requirement to excavate for foundations in close proximity to the caves and in areas where the cave roof rock cover is likely to be reduced, protection slabs and bridging elements are proposed.

4.20 In addition to these design features, methods of work to reduce the impacts on known caves have been developed along with a protocol to establish appropriate ‘hold points’ to control work activities in the limestone areas of the scheme in the event that previously unidentified cave related features (conduits, avens, sinkholes etc.,) are encountered during the works.

4.21 Following the implementation of the proposed mitigation measures, I conclude that the assessed major adverse effects of the construction of the published scheme on the SSSI can be reduced to a negligible to minor effect.
Other Potential Effects on the Geology and Soils

4.22 Another potential effect on the geology and soils is landslip potential along the scheme as historically a number of landslips, particularly the Maesygwartha Landslip in October 2000, have occurred that have impacted on and actually closed the A465.

4.23 During design development of the published scheme a survey of the land areas located within and immediately upslope of the scheme corridor was carried out by a team of geotechnical specialits. This survey confirmed that were are no significant existing landslide features that might feasibly be reactivated during or as a result of the construction of the scheme. Further construction phase investigation/survey will be completed during detailed cutting design and full-time on-site technical supervision of cutting excavations would also ensure that the risk of landslides being triggered in adjacent areas during scheme construction is eliminated.

4.24 With reference to the historical Maesygwartha Landslip I confirm that the published scheme does not involve a requirement to significantly cut into, or otherwise significantly unload or truncate, the toe of the valley slope located below the site of the landslide, therefore the probability that slope instability in this area might be increased as a direct result of scheme construction is extremely low.
5. **Conclusions**

5.1 In this Summary Proof of Evidence, I have described the potential effects of the published scheme on geological resources and that these have been identified adequately and in line with the approved methodology.

5.2 Detailed desk-based assessment augmented by site visits and surveys have led to the identification of geological resources that could potentially be affected by the published scheme. Effects on high sensitivity resources have been minimised where possible through considered scheme design, and a programme of further appropriate mitigation is planned and would be undertaken ahead of and during construction.

5.3 Issues raised following publication of the published scheme on matters pertaining to the geological conditions have also been examined and discussed within this Summary Proof.