A465 Heads of the Valleys
Section 2: Gilwern - Brynmawr

COSTAIN

Llywodraeth Cymru
Welsh Government

EC HARRIS
BUILT ASSET CONSULTANCY

A465 Heads of the Valleys
Section 2

Assessment of Implications (of highways and/or roads projects) on European sites (including Appropriate Assessment) (AIES)

Statement to Inform an Appropriate Assessment under the Conservation of Habitats and Species Regulations 2010

October 2013

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1. Introduction and Purpose of the Assessment

1.1 Background and purpose of this report

1.1.1 This report has been prepared to provide information to the Welsh Ministers ("the competent authority") on the implications of the proposed upgrade of the existing single three-lane carriageway section of the A465 Heads of the Valleys Road between Gilwern and Brynmawr (referred to as Section 2) to dual carriageway standard (hereafter referred to as 'the Scheme') on European Sites. The location of the Scheme is shown on Figure 1. The locations of all sections of the A465 upgrade are shown on Figure 2.

1.1.2 The European Community Habitats Directive 92/43/EEC on the Conservation of Natural Habitats and Wild Flora and Fauna (the Habitats Directive) provides legal protection for habitats and species of European importance. The Directive is transposed into UK law by the Conservation of Habitats and Species Regulations 2010 (the 'Habitats Regulations').

1.1.3 Regulation 61 of the Habitats Regulations requires the competent authority, before deciding to give consent for a plan or project which:

(a) is likely to have a significant effect on a European site (either alone or in combination with other plans or projects); and

(b) is not directly connected with or necessary to the management of that site,

to make an 'appropriate assessment 'of the implications for that site in view of its conservation objectives. In the light of the conclusions of the assessment, the competent authority may agree to the plan or project only after having ascertained that it will not adversely affect the integrity of the European site'.

1.1.4 The A465 Heads of the Valleys road and the M4 Motorway form the main east/west highway routes across South Wales. The A465 also forms part of the Trans-European Road Network (TERN-T) linking South Wales and West Wales with Ireland, the Midlands, North of England and Europe.

1.1.5 The existing A465 was built in the 1960s as a single three-lane carriageway and generally has two lanes marked in the uphill direction and one in the downhill direction. Upgrading the A465 between Abergavenny and Hirwaun to dual carriageway standard will bring its entire length to this standard, linking with the A40 at Abergavenny and the M4 at Llandarcy. This will not only improve safety but will also improve transport connectivity. These improvements are seen as critical to the social and economic regeneration of the Heads of the Valleys area.

1.1.6 The Welsh National Transport Plan (Welsh Assembly Government (2010) states that (p28):

"The A465 Heads of the Valleys road provides a strategic link for the northern Valleys, supporting regeneration and providing an alternate link between west Wales and the Midlands. The dualling of this route will be completed by 2020."

1.1.7 This is identified as Intervention 82 in the plan as follows (p29):

"Complete the dualling of the A465 Heads of the Valleys road from Brynmawr to Tredegar and start from Gilwern to Brynmawr (by 2014), and complete the remaining sections from Dowlais Top to the A470, and from the A470 to Hirwaun (by 2020)."

1.1.8 The Prioritised National Transport Plan (Welsh Government, 2011) confirms Intervention 82 to

"Complete the dualling of the A465 Heads of the Valleys road (by 2020)"

1.1.9 The projects identified for 2014 – 2015 include:

"Start A465 Heads of the Valleys Road, section 2 Gilwern to Brynmawr"

1.1.10 The A465 Section 1 (Abergavenny to Gilwern) and Section 4 (Tredegar to Dowlais Top) have now been completed. An Early Contractor Involvement (ECI) contract has been awarded for Section 3 Brynmawr to Tredegar for which Draft Orders accompanied by an Environmental Statement (ES) and a Statement to Inform an Appropriate Assessment (SIAA) for the Usk Bat Sites Special Area of Conservation (SAC) and the Cwm Clydach Woodlands SAC have been published (September 2011).

1.1.11 In June 2011 the Welsh Government let an ECI Design and Build Contract to Costain Ltd to widen the existing three-lane carriageway to D2AP (dual 2 all purpose) standard between Gilwern and Brynmawr. Atkins, Halcrow and RPS are Costain's designers.

1.1.12 A draft line order for the whole A465 from Abergavenny to Hirwaun (including Section 2) was published in 1997 along with an accompanying ES. Following a Public Inquiry in 1998 the line order was confirmed in 1999. That scheme is referred to in this document as the 1997 scheme. Following a review of the proposed scheme and following best practice a new environmental impact assessment (EIA) is being undertaken for Section 2 by the ECI contractor. That assessment will be reported in a new ES for Section 2.

1.1.13 Section 2 is dominated by the steep-sided and wooded Clydach Gorge (Cwm Clydach) within which the River Clydach flows eastward to join the River Usk north of Gilwern. Large parts of the gorge are protected for their wildlife and habitats including the Cwm Clydach Woodlands Special Area for Conservation (SAC) and the Usk Bat Sites SAC (which extends across much of the neighbouring Mynydd Llangatwg) designated under the European Directive 92/43/EEC of 21 May

1992 on the conservation of natural habitats and of wild fauna and flora (the Habitats Directive). A plan of the scheme design is shown on Figure 3.

1.1.14 Part of Section 2 of the A465 in Clydach Gorge is within the Usk Bat Sites SAC, and the Cwm Clydach Woodlands SAC is close by to the south. The River Clydach which flows though the gorge is a tributary of the River Usk which is designated as the River Usk SAC.

Previous Appropriate Assessment work undertaken

National Transport Plan (NTP)

1.1.15 The National Transport Plan Habitats Regulations Assessment - Statement to Inform an Appropriate Assessment (Welsh Assembly Government, 2010) was undertaken in order to identify whether the NTP was likely to have a significant effect upon European sites designated under the EC Birds and Habitats Directives as well as sites designated under the Ramsar Convention and if so, to assess the plan's implications for those sites, having regard to their conservation objectives.

1.1.16 Having undertaken an initial screening process 29 elements of the NTP remained to be taken forward to a Second Stage Screening process. These included the A465 Gilwern to Brynmawr.

1.1.17 Following this further screening, three sites were found to be likely to be significantly affected by elements in the NTP. These were the Usk Bats Sites SAC, Cwm Clydach Woodlands SAC and the River Usk SAC.

1.1.18 For the Cwm Clydach Woodlands SAC and the River Usk SAC it was concluded that there were no likely significant effects either alone or in combination with other plans or projects.

1.1.19 The likely effects identified for the Usk Bat Sites SAC were on the following qualifying interest feature:

Lesser Horseshoe Bats - Damage to flightlines and loss of breeding sites;

1.1.20 Since the findings of the HRA screening assessment were that it was not possible to conclude that there would be no likely significant effect on the Usk Bats Site SAC, the Appropriate Assessment stage assessment was undertaken for the site.

1.1.21 The overall conclusion of this assessment was that:

"…the A465 road widening may have some adverse impacts on the integrity of the Bat feature of the Usk Bat Sites SAC, and that a final statement on scale and significance of impacts cannot be made until more detailed project information and survey information (i.e. type and significance of known roosts, significance of commuting routes, significance of the risk of vehicle collisions foraging habitat used and distances flown, and availability of alternative foraging habitat) is available. However, appropriate mitigation has been identified that should reduce and possibly remove any adverse impacts.

Therefore, the assessment concludes that it appears feasible to carry out the proposed intervention (A465 widening) in a way such that there should be no adverse impact on the integrity of the Bat Feature of the SAC. However, given the absence of detailed supporting information, it is recommended that if this proposal is considered in the future then it will be subject to the requirements of Regulation 48 of the Habitats Regulations and will undergo a detailed appropriate assessment at the scheme level."

1.1.22 Based on these conclusions it was considered necessary to adopt mitigation at a policy level within the NTP in line with TAN5 in order to ensure that adverse effects on site integrity are avoided whilst still achieving the NTP's aims and objectives. Therefore, an additional commitment was added to the NTP, which states that relevant elements in the NTP would be subject to project level HRA, and would not obtain the relevant approvals without completing that HRA process successfully.

1.1.23 The wording for this commitment is:

"No project arising from the National Transport Plan which is likely to have a significant impact on a Natura 2000 site when assessed by consideration of its implications of the site's conservation objectives, can proceed unless it has been subject to a Habitats Regulations Assessment (or for road projects an Assessment of the Implications on European Sites (AIES). If that assessment concludes that the project would have an adverse effect on the integrity of the site it can only proceed, in the absence of alternative solutions, if there are imperative reasons of overriding public interest. In addition, compensatory measures must be taken to maintain the coherence of the Natura 2000 network."

1.1.24 This commitment is accompanied by a footnote that states:

"The project based Habitats Regulation Assessments (HRA) will be informed by the HRA undertaken for this Plan."

A465 upgrade

1.1.25 The A465 upgrade has been the subject of previous AIES work. A draft line order for the whole A465 from Abergavenny to Hirwaun (including Section 2) was published in 1997 along with an accompanying ES and an evaluation and assessment of effects on the the then candidate Usk Bat Sites cSAC.

1.1.26 This assessment concluded that on balance, even allowing for some uncertainty about the impacts and the success of mitigation measures, the proposals would not adversely affect the integrity of the cSAC.

1.1.27 A screening report for Section 2 was produced in 2007. This concluded that significant effects were likely on the Usk Bat Sites SAC, and that an Appropriate Assessment would be necessary to assess whether an adverse impact on the integrity of the SAC would occur.

1.1.28 A 'Ghost' Statement to Inform the Appropriate Assessment for Section 2 was produced for the purposes of consulting with the Bat Technical Advisory Group in 2008. The conclusion of this document was that it could not be concluded that the proposals would not adversely affect the integrity of the Usk Bat Sites SAC, but that this conclusion was based on an outline scheme design and did not include detailed design of mitigation measures. The final SIAA was considered likely to have a different overall conclusion and therefore was likely to conclude that the proposals would not adversely affect the integrity of the Usk Bat Sites SAC.

1.1.29 This document sets out the project level SIAA for Section 2.

Stages within the AIES process

1.1.30 All plans and projects should identify any possible impacts early in the plan-making process and then either alter the plan to avoid them or introduce mitigation measures to the point where no adverse impacts remain. The competent authority shall agree to the plan or project only after having ascertained that it will not adversely affect the integrity of the site concerned and, if appropriate, having obtained the opinion of the general public.

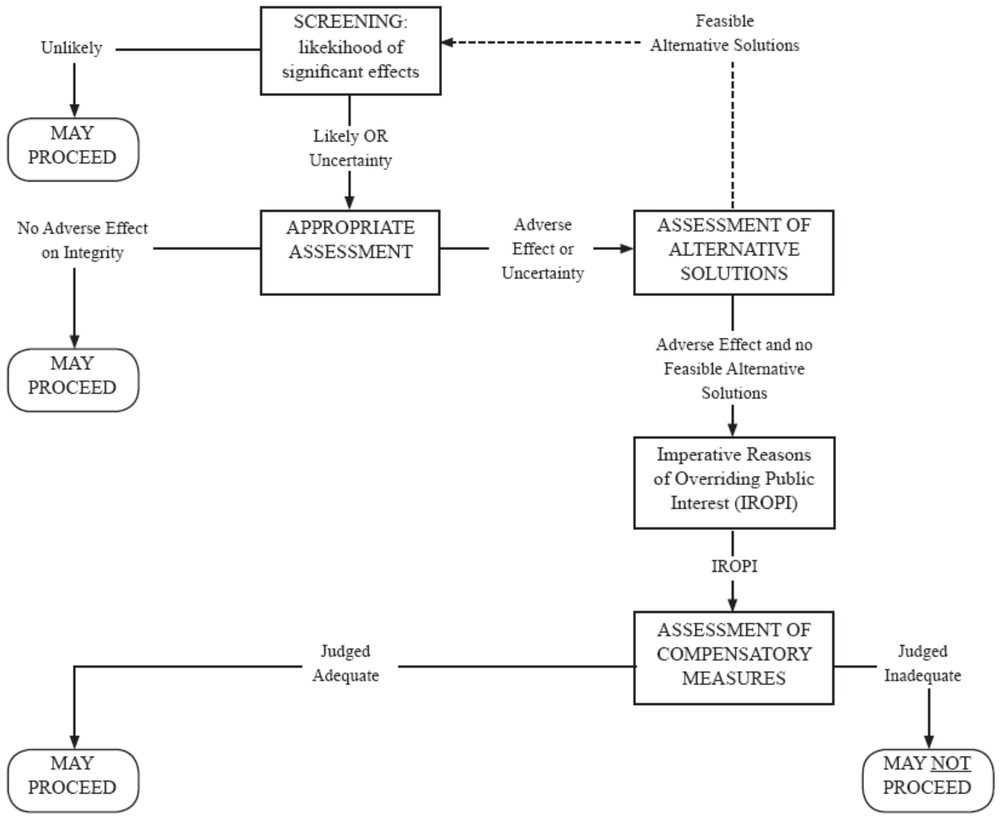
1.1.31 This report provides the Statement to Inform an Appropriate Assessment (SIAA), which covers the Screening and Appropriate Assessment stages.

1.1.32 The Design Manual for Roads and Bridges (DMRB) in Volume 11, Section 4, Part 1 (HD44/09) (Highways Agency 2009) provides guidance for the assessment of transport schemes known as Assessment of the Implications for European Sites (AIES).

1.1.33 AIES is a five stage process. These stages are:

- Stage 1: Screening
- Stage 2: Appropriate Assessment
- Stage 3: Alternative Solutions
- Stage 4: Imperative Reasons of Overriding Public Interest (IROPI)
- Stage 5: Compensatory Measures

1.1.34 The diagram below is from the DMRB Vol 11, Section 4, HD44/09 and shows the relationship between these stages in the overall AIES process.



Screening

1.1.35 A screening exercise was carried out in May 2012, which identified that the following European Sites would be likely to be affected by the Scheme:

- Usk Bat Sites SAC
- Cwm Clydach Woodlands SAC
- River Usk SAC

1.1.36 A summary of the screened in LSEs is provided below and in Table 1.1. The primary reason for the designation of the Usk Bat Sites SAC was the presence of the Annex II species Lesser Horseshoe Bat *Rhinolophus hipposideros*.

Usk Bat Sites SAC

1.1.37 The primary reason for the designation of the Usk Bat Sites SAC was the presence of the Annex II species Lesser Horseshoe Bat *Rhinolophus hipposideros*.

1.1.38 Other qualifying features include the following Annex 1 habitats:

- European dry heaths;
- Degraded raised bogs still capable of natural regeneration;
- Blanket bogs;
- Calcareous rocky slopes with chasmophytic vegetation;
- Caves not open to the public; and
- *Tilio-Acerion* forests of slopes, screes and ravines.

1.1.39 Of these, 'Blanket bogs' and '*Tilio-Acerion* forests of slopes, screes and ravines' are Priority Features.

1.1.40 A review of the SAC Core Management Plan identified that of the qualifying interest habitats, those present in the part of the SAC that could be affected by the scheme are 'Caves not open to the public' and 'Tilio-Acerion forests of slopes, screes and ravines'.

1.1.41 The screening exercise concluded that there was no likelihood of significant effects on the other qualifying habitat types, and these features were therefore screened out.

1.1.42 Potential effects were identified for 'Caves not open to the public', 'Tilio-Acerion forests of slopes, screes and ravines' and Lesser Horseshoe Bat.

1.1.43 The screening assessment therefore concluded that the Scheme could result in significant effects on the SAC, and potential effects are outlined below for the three interest features.

1.1.44 The potential effects on Lesser Horseshoe Bats identified during the screening process were:

- habitat loss – loss of roosts;
- habitat loss – loss of foraging habitat;
- disturbance to species – mortality during construction
- disturbance to species – damage or obstruction of access to roosts
- disturbance to species – noise and vibration during construction
- disturbance to species – lighting during construction
- habitat fragmentation – severance of flightlines
- habitat deterioration - dust generation during construction

- habitat deterioration - discharge of pollutants to watercourses during construction;
- disturbance to species – mortality during operation;
- disturbance to species – noise during operation;
- disturbance to species – lighting during operation;
- habitat deterioration - discharge of pollutants to watercourses during operation;
- habitat deterioration – aerial emissions during operation;

1.1.45 The potential effects on *Tilio-acerion* woodland identified during the screening process were:

- habitat loss – direct land take;
- habitat loss – changes in hydrology during construction;
- Habitat deterioration – generation of dust during construction;
- habitat deterioration - aerial emissions during operation.

1.1.46 The potential effects on Caves not open to the public identified during the screening process were:

- habitat loss – direct land take;
- habitat loss – indirect construction effects; and
- habitat deterioration – changes in hydrology during construction
- habitat deterioration – changes in airflow during construction
- effects on Lesser Horseshoe Bats during construction and operation (considered above) and other bat species using the caves, including Greater Horseshoe *Rhinolophus ferrumequinum,* Brandt's *Myotis brandtii*, Whiskered M*. mystacinus*, Natterer's *M. nattereri*, Daubenton's *M. daubentonii* and Brown Long-eared Bats *Plecotus auritus*.

Cwm Clydach Woodlands SAC

1.1.47 The Cwm Clydach Woodlands SAC was designated for the presence of two woodland Annex 1 habitats:

- *Asperulo-Fagetum* beech forests; and
- Atlantic acidophilous beech forests with Ilex and sometimes also *Taxus* in the shrub layer (*Quercion robori-petraeae* or *Ilici-Fagenion*).

1.1.48 The potential effects on both these habitat types identified during the screening process were:

- habitat deterioration – generation of dust during construction; and
- habitat deterioration - aerial emissions during operation.

River Usk SAC

1.1.49 The River Usk SAC was designated for the presence of the Annex 1 habitat 'Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation' and for the following Annex II species: Sea Lamprey *Petromyzon marinus*, Brook Lamprey *Lampetra planeri*, River Lamprey *Lampetra fluviatilis*, Twaite Shad *Alosa fallax*, Atlantic Salmon *Salmo salar* and *Bullhead Cottus gobio* and Otter *Lutra lutra*. The Annex II species Allis shad *Alosa alosa* is also present as a qualifying feature, but was not a primary reason for site selection.

1.1.50 The screening assessment concluded that the Scheme could result in significant effects on 'Water courses of plain to montane levels' from:

- habitat deterioration - discharge of sediment and pollutants to watercourses during construction; and
- habitat deterioration – discharge of pollutants into watercourses during operation.

1.1.51 Potential effects on the fish species could occur from:

- mortality and habitat deterioration - discharge of sediment and pollutants to watercourses during construction; and
- mortality and habitat deterioration – discharge of pollutants into watercourses during operation.

1.1.52 Potential effects on Otter could occur from:

- disturbance to species – noise and vibration during construction;
- disturbance to species – lighting during construction;
- mortality and habitat deterioration - discharge of pollutants to watercourses during construction;
- disturbance to species – noise during operation; and
- disturbance to species – lighting during construction.
- disturbance to species – mortality during operation;

- mortality and habitat deterioration - discharge of pollutants into watercourses during operation.

Table 1.1: Summary of LSEs identified at screening stage

Site	Feature	Likely Significant Effect
Usk Bat Sites SAC	Lesser Horseshoe Bat	Habitat loss – loss of roosts
		Habitat loss – loss of foraging habitat
		Disturbance to species – mortality during construction
		Disturbance to species – damage or obstruction of access to roosts
		Disturbance to species – noise and vibration during construction
		Disturbance to species – lighting during construction
		Habitat fragmentation –severance of flightlines
		Habitat deterioration – dust generation during construction
		Habitat deterioration – discharge of pollutants to watercourses during construction
		Disturbance to species – mortality during operation
		Disturbance to species – noise during operation
		Disturbance to species – lighting during operation
		Habitat deterioration - discharge of pollutants to watercourses during operation
		Habitat deterioration – aerial emissions during operation
	Tilio-acerion Woodland	Habitat loss – direct land take
		Habitat loss - changes in hydrology during construction
		Habitat deterioration – dust generation during construction
		Habitat deterioration – aerial emissions during operation
	Caves not open to the public	Habitat loss – direct land take
		Habitat loss – indirect construction effects
		Habitat deterioration – changes in hydrology during construction
		Habitat deterioration – changes in air flow during construction
		Impacts on bats (construction / operation)
Cwm Clydach Woodlands SAC	*Asperulo-Fagetum* beech forests and Atlantic acidophilous beech forests with *Ilex* and sometimes also *Taxus* in the shrub layer	Habitat deterioration – dust generation during construction
		Habitat deterioration – aerial emissions during operation
River Usk SAC	Water courses of plain to montane levels	Habitat deterioration – discharge of silt and chemical pollutants to watercourses during construction
		Habitat deterioration – discharge of chemical pollutants to watercourses during operation
	Sea Lamprey, Brook Lamprey, River Lamprey, Twaite Shad, Allis Shad, Atlantic Salmon, Bullhead	Mortality and habitat deterioration – discharge of silt and chemical pollutants to watercourses during construction
		Mortality and habitat deterioration – discharge of chemical pollutants to watercourses during operation

Site	Feature	Likely Significant Effect
	Otter	Disturbance to species – noise and vibration during construction
		Disturbance to species – lighting during construction
		Mortality and habitat deterioration – discharge of silt and chemical pollutants to watercourses during construction
		Disturbance to species – noise and vibration during operation
		Disturbance to species – lighting during operation
		Disturbance to species – mortality during operation
		Mortality and habitat deterioration – discharge of chemical pollutants to watercourses during operation

Purpose of this report

1.1.53 The purpose of this report is to identify whether or not the Scheme is likely to have an adverse effect on the integrity of any of the SACs. This is to be determined by a consideration of whether the achievement of the conservation objectives that have been set for the sites will be affected. In doing so, the statement provides information on the relevant qualifying interests of the SACs, examines the likely nature and scale of the Scheme's impacts on these features, proposes mitigation for reducing the severity of the impacts, and proposes monitoring and reporting measures to determine the success of the mitigation measures that are implemented.

1.1.54 It is intended that this assessment will allow a decision to be made by the Competent Authority on whether the Scheme could have an adverse effect on the integrity of any of the SACs (i.e. whether the achievement of one or more conservation objectives for the sites could be affected).

1.2 Guidance used in preparing this report

1.2.1 This SIAA follows the methodology set out in DMRB Volume 11, Section 4, Part 1, HD 44/09 *Assessment of implications (of highways and/or roads projects) on European Sites (including appropriate assessment) (Highways Agency, 2009).* It also takes account of the guidance provided in WG TAN 5: *Nature Conservation and Planning, in particular Section 5: Development affecting designated sites and habitats*.

1.2.2 Insofar as Lesser Horseshoe Bats are a qualifying interest of the Usk Bat Sites SAC, it also has regard to the guidance of Interim Advice Note (IAN) 116/08(W) Nature Conservation Advice in Relation to Bats (Welsh Government, 2009).

1.2.3 Reference is also made to the Guidelines on Ecological Impact Assessment produced by the Chartered Institute for Ecology and Environmental Management (CIEEM, 2006).

1.3 Experience of the surveyors and authors of this report

1.3.1 The authors of this report are Richard Green and Matthew Fasham. The report was reviewed by Dr Keith Jones. Surveys were carried out by a team of ecologists managed by Brian Chilcott, and by Barry Stewart and Peter Smith.

1.3.2 Richard Green is a consultant ecologist with 21 years professional experience, who holds CCW and Natural England scientific licences to disturb bats. Richard is a Chartered Environmentalist with the Society for the Environment and a full member of the Chartered Institute of Ecology and Environmental Management. He has extensive experience of bat ecology and surveys, particularly on trunk road schemes. Most notably, he undertook a review of bat mitigation in relation to highway severance for the Highways Agency in 2011 and was ecological coordinator on A487 Porthmadog Bypass, a scheme which also potentially affected Lesser Horseshoe Bats and required Appropriate Assessment. He is also a Natural England bat warden trainer and is the Bat Conservation Trust representative for the Devon Bat Group.

1.3.3 Matthew Fasham is a Principal Consultant with RPS, with 15 years of professional experience. Matthew a Chartered Environmentalist with the Society for the Environment and a full member of the Chartered Institute of Ecology and Environmental Management. He has extensive experience of the ecological impact assessment of road schemes, and he co-ordinated the ecological survey programme and produced the ecological chapter of the Environmental Statement for the A3 Hindhead Improvement Scheme in Surrey. He also produced the SIAA for this road scheme on behalf of the Highways Agency.

1.3.4 Keith Jones is Senior Director (Environmental Sciences) at the RPS Oxford office. He is a Chartered Biologist with some 25 years experience as an environmental consultant. He is responsible for the Oxford Ecology Team and is involved in environmental planning work, ecological assessments, management of EIAs and expert witness work. His work has has included major projects for the Ministry of Defence, Highways Agency, Local Authorities and many property companies, surveyors and other clients. He has particular experience in undertaking and agreeing with English Nature (now Natural England), Appropriate Assessments under the Habitats Regulations, including the assessment of the Oakham Bypass with respect to Rutland Water SPA, MoD's proposals for Warcop Training Area, and the London Gateway Port proposals.

1.3.5 Brian Chilcott is a Principal Ecologist with RPS, having 16 years experience as an ecological consultant. Brian is a Chartered Environmentalist with the Society for the Environment and a full member of the Chartered Institute of Ecology and Environmental Management Responsible for most aspects of ecological work including field survey, Environmental Impact Assessment, design and implementation of mitigation works, licensed mitigation work for protected species including badgers, dormice, bats and great crested newts, mitigation schemes for reptiles. He has acted as expert witness at public and Local Plan Inquires, with evidence relating to impacts on protected species, and sites with statutory designations. He has been responsible for the design and implementation of monitoring and management plans and is a holder of licences relating to protected species from Natural England, Countryside Council for Wales, DEFRA, the Welsh Assembly Government, Northern Irish Environment and Heritage Service (EHS), and Irish National Parks & Wildlife Service (NPWS). He has been Project Ecologist for a number of road and large infrastructure schemes, and Environmental Liaison Officer for large scale sensitive construction and mineral extraction projects.

1.3.6 Barry Stewart is a specialist ecologist with Pryce Consultant Ecologists. Barry has a first class degree in Environmental Biology and has more than 25 years experience in ecological positions, having worked for the WWT prior to joining Pryce Consultant Ecologists in 1997. He is an accomplished ornithologist, entomologist, with expertise in habitat assessment and plant identification. Barry has been responsible for identification and assessment of habitats such as Tilio-Acerion woodland in relation to the A465 Section 2 scheme and the identification of particularly rare species such as rare whitebeams (*Sorbus* spp.) and hawkweeds (*Hieracium* spp.).

1.3.7 Bat surveys have been undertaken by a team from Smith Ecology, led by its Director, Dr Peter Smith who is a Chartered Environmentalist with the Society for the Environment and a full member of the Chartered Institute of Ecology and Environmental Management. Peter is a bat specialist with over 19 years consultancy experience who has been involved with the monitoring of Lesser Horseshoe Bats in the Clydach Valley and in relation to this scheme since at least 1997, reporting to either SGS Environment, Babtie Group, Jacobs UK Ltd and currently RPS.

1.3.8 In addition to the work carried out by Peter Smith, a team of ecologists from RPS have been involved with bat activity surveys and review of potential roosting trees related to the scheme. This team was led by Brian Chilcott.

1.4 Project Objectives

Welsh Government’s Objective

1.4.1 The Welsh Assembly Government’s objective for the Scheme is to improve the A465 Heads of the Valleys Road between Gilwern and Brynmawr (Section 2 of the overall project) from a single 3-lane carriageway to dual 2-lane carriageways in accordance with the made Line Order and its associated Environmental Statement and to deliver the scheme to programme and budget.

Scheme-specific objectives

1.4.2 The Scheme-specific objectives are:

- To maintain the current level of service and to carry out improvements.
- To reduce journey times for private and commercial road users.
- To facilitate economic regeneration.
- To enhance road safety and reduce casualties.
- To do all this with proper care for the environment.
- To deliver a scheme that is sustainable.
- To improve NMU provision, providing opportunity for healthy lifestyle.
- To deliver a scheme which minimises future maintenance and disruption to the network.
- To reduce journey time variability and improve resilience on the A465.
- To use the A465 to manage traffic effectively and improve resilience on the strategic road network in South East Wales.
- To deliver a scheme that integrates with public transport and the local transport network.
- To improve access to healthcare, education and leisure facilities.
- To reduce community severance.

1.5 Project description

1.5.1 The boundaries of the SACs in the vicinity of the Scheme are shown in Figure 1. The Scheme design is shown on Figure 3 (a-f).

1.5.2 The western edge of the Usk Bat Sites SAC meets the Scheme at the point where Cwm Nantmelyn tributary flows into the River Clydach at ch. 30200 (Figure 3 (a)). The southern boundary of the Usk Bat Sites SAC runs adjacent to the north boundary of the existing A465 carriageway until ch. 30410.

1.5.3 The SAC boundary follows the River Clydach as it flows back under the A465 at ch 30410, and from this point eastwards until ch. 32310 (Figure 3 (c)), the eastern edge of the Usk Bat Sites SAC, the existing A465 and the Scheme are entirely within the Usk Bat Sites SAC boundary.

1.5.4 The northern boundary of the Cwm Clydach Woodlands SAC is contiguous with the southern boundary of the Usk Bat Sites SAC from ch. 30550 (Figure 3 (a)) until ch. 32310 (Figure 3 (c)). The

Cwm Clydach Woodlands SAC boundary continues eastwards along the River Clydach until ch. 32580. No parts of the scheme are within the Cwm Clydach Woodlands SAC boundary.

1.5.5 The River Clydach flows north through Gilwern and joins the River Usk SAC at Glangrwyney, approximately 0.53km to the north of the scheme.

1.5.6 For descriptive purposes the Scheme is divided into four parts:

- Brynmawr (ch. 29200 to 30500) - Figure 3 (a).
- Clydach Gorge (ch. 30500 to 33050) - Figure 3 (a-c).
- Sale Yard (ch. 33050 to 34800) - Figure 3 (c-d).
- Gilwern (ch. 34800 to 37000) – Glanbaiden - Figure 3 (d-f).

Brynmawr

1.5.7 The proposed scheme at Brynmawr involves an all movements grade separated junction, the construction of 1.3km of dual carriageway offline and new side roads to link the junction with the local road network (see Figure 3(a)).

1.5.8 The scheme commences towards the eastern end of the Clydach Dingle at ch. 29000, and cuts through part of the site of the former Anacomp Factory to the south of Brynmawr Foundation School. From ch. 29450 to ch. 30000 the proposed road would be constructed offline in new cutting, thus avoiding the existing Brynmawr roundabout.

1.5.9 To reduce the amount of rock removal required on the north side of the road the dual carriageways would be built split level with the eastbound (north side) carriageway being constructed at a higher level than the westbound (south side) carriageway. This arrangement would continue until ch. 31580 at the eastern end of the Clydach Gorge.

1.5.10 On the north side of the new A465 a new eastbound off-slip would be constructed across the southern part of the former Anacomp Factory site to a new 4-arm roundabout (Main Road Roundabout) opposite ch. 30000.

1.5.11 All construction from ch. 29000 to 30200, including the new roundabout and connection to local roads is outside the Usk Bat Sites SAC boundary.

1.5.12 From ch. 30200 to the Pont Harri subway at ch. 30500, the new carriageway is tight to the southern boundary of the Usk Bat Sites SAC. The Pont Harri subway would become redundant as a subway but would be extended and maintained as a bat crossing and as a watercourse, accepting flows from the north hillside that currently drain beneath the subway.

1.5.13 East of ch. 30500 the Scheme is entirely within the Usk Bat Sites SAC. Cwm Clydach Woodlands SAC abuts the southern edge of the Usk Bat Sites SAC from ch. 30550.

Clydach Gorge

1.5.14 The proposed scheme through the Clydach Gorge involves alternating asymmetrical widening to the north, then south, then north of the existing road (see Figure 3 (a-b)). This is within the Usk Bat Sites SAC.

1.5.15 The first part of the alignment through the Clydach Gorge as far as ch. 31600 has the eastbound carriageway being constructed immediately to the north of the existing carriageway and away from the Clydach Viaduct (i.e. asymmetrical widening to the north). There is a Lesser Horseshoe Bat maternity roost located under the Clydach Viaduct at ch. 30800.

1.5.16 The dual carriageways would be built split level along the length of the gorge with the eastbound (north side) carriageway being constructed at a higher level than the westbound (south side) carriageway. Retaining walls would be required between the eastbound and westbound carriageways. The majority of the eastbound carriageway will have cut slopes to the north with localised walls to protect infrastructure in the Sewage Works and Water Works. Between ch. 31200 and 31600, the local road above the A465 (Main Road) will require diverting and a 200m length of retaining wall.

1.5.17 Between ch. 31600 and 32000 the proposed alignment involves asymmetrical widening to the south. This will require the building out of embankments on the south side of the road. These will be steepened and reinforced to reduce land-take within the Usk Bat Sites SAC.

1.5.18 The Blackrock subway (ch. 31630) would be replaced by a new footbridge but the redundant subway would be extended and maintained as a bat crossing.

1.5.19 Between ch. 32000 and 32700 the proposed alignment involves asymmetrical widening to the north. This will require cut slopes to the north side of the road between ch. 32000 and 32500. The Scheme passes beyond the eastern boundary of the Usk Bat Sites SAC just past ch. 32300, and hence no further construction occurs within the SAC beyond this point.

1.5.20 Between the village of North Clydach and Saleyard (ch 32700 to 33400), the new scheme requires widening to both the north and south of the existing A465 (i.e. symmetrical widening).

1.5.21 Throughout the Clydach Gorge the River Clydach is located to the south of A465. Seven north to south flowing tributaries of the River Clydach cross under this part of the road (Nant yr Hafod, Nant Gwyn, five unnamed) in culverts, all of which would be extended.

Sale Yard

1.5.22 The proposed scheme from opposite the Clydach Iron Works to Gilwern involves off-line construction to the south of the existing A465 (see Figure 3 (c-d)). The eastbound off-slip and on-slips utilise the existing A465 carriageway.

1.5.23 Between ch. 33400 and 34000 the new scheme would include a new road bridge over the River Clydach (ch. 33700) as well a new underbridge (Clydach Link Underbridge at ch. 33875). The location of the mainline carriageway, the Saleyard River crossing structure, provision of a retaining wall and the position of the junction allows the River Clydach to flow along its existing path.

1.5.24 The Pant Glas Subway (ch. 33400) would become redundant as a subway but would be extended and maintained as a bat crossing. A new footbridge is to be constructed at ch. 33430

Gilwern

1.5.25 From ch. 34800 to 35150 the proposed scheme opposite Gilwern involves a short length of asymmetric widening to the south followed by a short length of asymmetric widening to the north. The scheme is then constructed off-line to the south of the existing A465 between ch. 35250 and 35900 before joining the line of the existing road to the Glanbaiden Junction (see Figure 3 (d-f)).

1.5.26 The slip roads and the circulatory carriageway of the current Glanbaiden junction together with some earthworks for the main A465 carriageway were completed as part of Section 1 (Abergavenny to Gilwern) of the A465 Heads of the Valleys road. As part of Section 2 the required earthworks would be completed and the dualled main carriageway would be completed over the roundabout from approximately ch. 35900 to approximately 37000. The Gilwern Canal Bridge (ch. 36130) which takes the A465 over the Monmouth to Brecon canal was rebuilt as part of Section 1 and would not require any further structural works.

1.5.27 On the north side of the road, to the east of Glanbaiden junction, the slip road tie-in between existing and proposed requires the slip road to be raised by up to 1m. In order to minimise impacts on Hopyard Underpass culvert, a low retaining wall above the top of the culvert will be used so that the majority of the vegetation planted as part of Section 1 can be retained.

Land take required for the Scheme

1.5.28 The land take required for the Scheme, broken down by Phase 1 habitat category, is provided below in Table 1.2. Figures are provided for both inside and outside the Usk Bat Sites SAC boundary. There is no land take within the Cwm Clydach Woodlands SAC and River Usk SAC.

1.5.29 Area calculations are are based on habitat data from 2007 updated with additional surveys and assessment of extent of habitats carried out for the Scheme.

1.5.30 Estimates of habitat losses have been separated into land required for the Scheme footprint; a 5m construction buffer; and land-take required for temporary works such as work compounds, haul routes, service diversions etc.

Table 1.2: Estimated land-take requirements for the Scheme (without mitigation)

Habitat type	Habitat requirement inside Usk Bat Sites SAC				Habitat requirement outside Usk Bat Sites SAC				Total habitat requirement			
	Scheme	Construction buffer	Temporary works	Total	Scheme	Construction buffer	Temporary works	Total	Scheme	Construction buffer	Temporary works	Total
Broadleaved semi-natural woodland	1.344	0.796	0.248[1]	2.388	5.131	1.714	2.407	9.252	6.475	2.510	2.655	**11.640**
Broadleaved plantation woodland	0.065	0.016	0	0.081	1.868	0.531	0.057	2.456	1.933	0.547	0.057	**2.537**
Coniferous plantation woodland	0	0	0	0	1.166	0.185	0.009	1.359	1.166	0.185	0.009	**1.359**
Mixed plantation woodland	0	0	0	0	2.027	0.459	0.047	2.532	2.027	0.459	0.047	**2.532**
Dense / continuous scrub	1.097	0.310	0.125	1.532	2.682	0.169	0.552	3.404	3.780	0.480	0.677	**4.936**
Scattered scrub	0.479	0.068	0	0.547	2.030	0.362	0.429	2.821	2.509	0.430	0.429	**3.368**
Unimproved calcareous grassland	0.026	0.012	0.001	0.039	0.083	0	0	0.083	0.109	0.012	0.001	**0.122**
Unimproved acid grassland	0	0	0	0	0.001	0.026	0.027	0.054	0.001	0.026	0.027	**0.054**
Semi-improved acidic grassland	0.155	0.094	1.938	2.187	0.003	0.014	0.034	0.051	0.158	0.108	1.972	**2.237**
Semi-improved calcareous grassland	0.040	0	0	0.040	0	0	0	0	0.040	0	0	**0.040**
Semi-improved neutral grassland	0	0	0	0	0.085	0.054	0	0.139	0.085	0.054	0	**0.139**
Marshy grassland	0	0	0	0	0.002	0.008	0.333	0.344	0.002	0.008	0.333	**0.344**
Poor semi-improved grassland	0	0	0	0	9.909	1.216	5.321	16.446	9.909	1.216	5.321	**16.446**
Amenity grassland	0	0	0	0	1.683	0.116	0.635	2.434	1.683	0.116	0.635	**2.434**
Improved grassland	0.010	0.016	0.056	0.083	7.544	1.517	11.201	20.262	7.555	1.533	11.257	**20.345**
Dry heath / acid grassland mosaic	0	0	0	0	0.243	0.004	0.001	0.248	0.243	0.004	0.001	**0.248**
Dry acid heathland	0	0	0	0	0.030	0.005	0.055	0.090	0.030	0.005	0.055	**0.090**
Bracken (continuous)	0.034	0.026	0.070	0.130	0.102	0.025	0.106	0.233	0.136	0.051	0.176	**0.363**
Tall ruderal	0	0	0	0	0.007	0	0	0.007	0.007	0	0	**0.007**

[1] This figure comprises an area of woodland designated as a 'water management area' on the south side of the road between approximate Ch 31800 and Ch 32300. The woodland would not be lost, nor would it be affected in any significant or long term way.

Habitat type	Habitat requirement inside Usk Bat Sites SAC				Habitat requirement outside Usk Bat Sites SAC				Total habitat requirement			
	Scheme	Construction buffer	Temporary works	Total	Scheme	Construction buffer	Temporary works	Total	Scheme	Construction buffer	Temporary works	Total
Running water	0.010	0.056	0.021	0.087	0.444	0.066	0.033	0.543	0.454	0.122	0.054	**0.629**
Inland basic cliff	0.182	0.005	0	0.187	0.001	0	0	0.001	0.184	0.005	0	**0.188**
Rock exposure (acid)	0.204	0.003	0	0.208	0.078	0.067	0.026	0.170	0.282	0.070	0.026	**0.378**
Quarry	0	0	0	0	0	0.015	0.009	0.024	0	0.015	0.009	**0.024**
Arable	0	0	0	0	0	0.015	2.224	2.239	0	0.015	2.224	**2.239**
Defunct hedge with trees	0	0	0	0	0	0	0.006	0.006	0	0	0.006	**0.006**
Intact species-poor hedge	0	0	0	0	0.061	0.023	0.144	0.228	0.061	0.023	0.144	**0.228**
Intact species-rich hedge	0	0	0	0	0	0	0	0	0	0	0	**0**
Intact species-rich hedge with trees	0	0	0	0	0.021	0.005	0.088	0.114	0.021	0.005	0.088	**0.114**
Bare ground	0	0	0	0	2.123	0.018	0.270	2.411	2.123	0.018	0.270	**2.411**
Hardstanding	2.064	0.126	0.054	2.244	8.387	0.790	0.347	9.524	10.452	0.916	0.401	**11.768**
Unknown	0.876	0.296	0	1.173	0	0	0	0	0.876	0.296	0	**1.173**
Other	0.058	0.073	0.021	0.152	1.770	0.192	0.153	2.115	1.828	0.265	0.174	**2.267**
Total	**6.645**	**1.896**	**2.536**	**11.077**	**47.482**	**7.595**	**24.514**	**79.591**	**54.127**	**9.491**	**27.050**	**90.668**

1.5.31 The total area of land-take within the Scheme footprint is estimated at 54.13 ha. The total area required for construction (assuming a constant 5m construction buffer zone) is 9.49 ha. A total of 27.05 ha would be required for temporary landtake. Total landtake is therefore 90.67 ha.

1.5.32 Approximately 11.77 ha of the total Scheme landtake comprises the existing carriageway, buildings and other hard standing. The remaining area comprises various habitat types, including semi-natural broadleaved woodland (11.64 ha), dense and scattered scrub (8.30 ha), broadleaved, coniferous and mixed plantation woodland (6.43 ha), various grassland types (42.16 ha) and bare ground (2.41 ha)

1.5.33 Approximately 6.65 ha of the Scheme is within the Usk Bat Sites SAC, with a 5m construction buffer of 1.90 ha and temporary landtake of 2.54 ha, giving a total landtake within the SAC of 11.08 ha.

1.5.34 Of the total landtake within the SAC, approximately 2.24 ha comprises the existing carriageway and other hard standing, and therefore total loss of all habitats within the SAC is approximately 8.83 ha. This figure comprises a range of habitats including semi-natural broadleaved woodland (2.39 ha), dense and scattered scrub (2.08 ha), various grassland types (2.31 ha) and bare basic or acid cliff faces (0.40 ha).

1.6 Key stages of the project and timescales

1.6.1 Subject to the satisfactory completion of the statutory procedures and the availability of finance construction would begin in late 2014 following a short construction mobilisation period. This assumes that the inquiry process into the draft Orders would take approximately 9 months commencing in February 2014, with the draft Orders being confirmed no later than end of September 2014.

1.6.2 The following text is based on the description of the construction programme in the Construction Methodology report prepared by the ECI Contractor (see Section 10 of Appendix 6.1 in the Environmental Statement) with additional information pertinent to the Usk Bat Sites SAC added as appropriate.

1.6.3 It is anticipated that the construction programme would take approximately 3 years such that the Scheme would be completed and open to traffic in late 2017 or early 2018. However, programmed dates and construction periods may be subject to change depending, for example, on the actual start date, engineering conditions experienced on site and weather conditions.

1.6.4 Key programme dates for the project are:

- October 2013: Publication of Orders
- Late 2014: Start of construction

- 2018: End of construction
- 2018 - 2023: Aftercare period

1.6.5 The Scheme is 8.1km long, of which some 2.1km is within the Usk Bat Sites SAC. Construction work within the SAC is scheduled to take up to 24 months encompassing three winters (or parts thereof) and two summers.

1.6.6 The key to the Scheme is the construction of the Brynmawr Junction elements of which are expected to take place throughout the three year construction period. Whilst this is outside of the SAC its construction programme has implications for the timing of construction activities within the SAC. During the first 15-18 months of the works, construction of the Main Road, Hafod Road and the eastbound slip roads together with associated bridges, including the new Gateway Bridge over the A465 and the new Hafod Footbridge, would take place. Construction of the new split level eastbound carriageway through the junction would commence thereafter until mid 2017. The westbound carriageway would be constructed later from mid 2016 to late 2017.

1.6.7 The remaining 1.6km long split level eastbound carriageway between Brynmawr and Blackrock footbridge through the SAC would be constructed during a 9–12 month period commencing in summer 2015. Associated structures would be built and major utilities diverted during the same period. The westbound carriageway over the same section would not be constructed until the second half of 2017.

1.6.8 Activities scheduled for Year 1 Winter (2014/2015) within and adjacent to the SAC include:

- Building and commissioning of the Nant Hafod bat roost (pM1, see Figure 10a).
- Preparation and planting of woodland areas outside of the highway engineering footprint to replace bat foraging areas to be lost to the Scheme.
- Preparations for diverting the VS01 gas main.
- All site clearance at the Brynmawr interchange to Ch 31100 of which some 880m is within the SAC.
- Extension to culvert RC4 southward including vegetation clearance (see Figure 4a).
- Extension to culvert BC4 northward including vegetation clearance (see Figure 4b).
- Excavation of earthworks on the north side of the A465 within the SAC from Ch 30500 to Ch 30800.
- Site clearance for earthworks within the SAC from Ch 31600 to Ch 32500 (north side).

- Site clearance for earthworks outside the SAC from Ch 32650 to Ch 32900 (south side).
- Diversion of Main Road northward.

1.6.9 The construction and commissioning of the Nant Hafod bat roost together with the extension of culvert BC4 which links to the new roost is designed to be in place at least 12 months before any works are undertaken on the Clydach viaduct which is scheduled for late 2016.

1.6.10 Site clearance of vegetation would involve cutting to a low level initially (to minimise the risk of soil erosion) but areas would only be completely cleared when works are required to take place, utilities diverted, and/or temporary localised widening to provide safe working areas established. Other environmental mitigation measures in the form of exclusion fencing and pollution control measures would be installed before construction works commence and throughout the works as appropriate. During the first winter period (2014/2015) mitigation planting in the form of replacement woodland for bat foraging outside of the highway footprint would commence. Elsewhere, landscape planting would be planted as and when the receiving areas had been created (e.g. new embankments) and/or prepared within the overall construction programme.

1.6.11 Activities scheduled for Year 1 Summer (2015) within and adjacent to the SAC include:

- Earthworks on the north side of the A465 within the SAC between Ch 30800 to 31600.
- Extension of culvert BC5 within the SAC northward (see Figure 4b).
- Extension of culvert BC8 southward adjacent to the SAC (see Figure 4c).
- Extension of culvert BC7 southward outside of the SAC (see Figure 4c).
- Earthworks on the south side of the A465 mostly within the SAC from Ch 32500 to Ch 31600.
- Extension of culvert BC1 on the edge of the SAC southward (see Figure 4a).
- Earthworks to cutting on south side of A465 between Pont Harri Isaac and Ch 30100.

1.6.12 Activities scheduled for Year 2 Winter (2015/2016) within and adjacent to the SAC include:

- Earthworks on the south side of the A465 within the SAC from Ch 30800 to Ch 30500.
- Extension of culvert BC2 within the SAC northward (see Figure 4a).
- Extension of culvert BC3 within the SAC northward (see Figure 4b).

- Construct and commission new roost in embankment at Ch 31850 (pM2, see Figure 10a).

1.6.13 Throughout the construction period the extension of individual culverts used by bats would take (on average) between 6 and 8 weeks to complete. In addition extension works to culverts would be phased such that extensive work on adjacent culverts being used by Lesser Horseshoe Bats would not take place at the same time. Both the length of time required to undertake the works and the phasing of the works would provide bats with time to habituate to the new extended structures, and to enable bats to use alternative culverts to cross under the A465 during the construction period. Where practicable, and as permitted by the overall programme, culvert work would be undertaken during periods when bats are less active.

1.6.14 As outlined above earth moving would be required at various locations along the Scheme until mid 2016. During this time substantial volumes of earth and rock would be removed from the area of the Brynmawr Junction and transported to the false cuttings opposite Maesygwartha and Gilwern at the eastern end of the Scheme.

1.6.15 Between Blackrock and Clydach North the westbound carriageway would be widened over a 15 month period between mid 2015 and mid 2016, followed by widening of the eastbound carriageway over a similar period until mid 2017.

1.6.16 The main bridge structures at the eastern end of the Scheme (Saleyard, Navigation Inn, Glanbaiden) would be commenced during the first year together with the enabling earthworks for the offline section past Saleyard and Maesygwartha. There are no significant implications for the SAC or the movement of Lesser Horseshoe bats as a result of these works. The construction of the westbound carriageway past Saleyard would occur at the same time as the widening between Blackrock and Clydach North. The eastbound carriageway would be built at the same time but is unlikely to be completed before mid 2017.

1.6.17 The offline section at Gilwern would be constructed over a 2 year period (2015 – 2016) during which alterations to the eastbound and westbound carriageways would be completed.

1.6.18 Throughout the construction period highway lighting would be maintained along the entire length of the Scheme for road safety purposes and to deter Lesser Horseshoe Bats from crossing the highway at grade during the works. This would be achieved by a combination of retaining the existing highway lighting, providing temporary construction lighting, and the provision of new highway lighting as part of the Scheme.

1.7 Resource requirements throughout the lifetime of the project

1.7.1 Resource requirements during construction are likely to include, but are not limited to:

- Materials for construction
- Manpower resources
- Water abstraction for dust suppression

1.7.2 Imported material for the proposed scheme would include road construction aggregates together with reinforcement steel, concrete, cement, pipes and fencing materials.

1.7.3 Part of the Scheme is within the Usk Bat Sites SAC, but no materials required for construction are sourced from the Usk Bat Sites SAC; there will be excavation required within the SAC as described above but excavated materials will be re-used to construct embankments, and there is no additional excavation within the SAC beyond that required to establish the Scheme.

1.7.4 Standard highway operation and maintenance procedures would be carried out during the lifetime of the new road on a suitably regular basis. Typical activities would be likely to include, but are not limited to:

- winter maintenance, such as de-icing/gritting;
- line painting;
- resurfacing;
- repairs to damage;
- maintenance of the highway drainage network;
- management and maintenance of roadside grass areas and vegetation trimming to comply with the environmental objectives; and
- management of nature conservation (habitat and protected species) measures.

1.8 Waste products arising during construction and operation

Scheme construction

1.8.1 The earthworks is currently estimated to require 1,212,000m^3 of material to be excavated, of which 1,170,000m^3 is required for embankments construction.

1.8.2 Some of the excavated material will need to be processed at designated areas on site but outside of the SACs prior to being transported for use elsewhere within the scheme (e.g. as structural fill, facing material to retaining walls and pavement construction).

1.8.3 Approximately 340,000m^3 of the excavated material will also be used to create screening bunds in the east of the scheme, outside of the Usk Bat Sites SAC.

1.8.4 The approximate quantity of material required to construct the proposed scheme is summarized in Table 1.3.

1.8.5 An estimated 45,250 m^3 of aggregate may need to be imported for surfacing materials. Where possible this material will be imported from a local source, but not from within the Usk Bat Sites SAC, nor any other SAC.

Table 1.3: Estimated volumes of site won and imported materials required for construction

Material type	Total (m3)	Site won (m3)	To be imported (m3)
General fill	574,057	574,057	0
Landscaping material including topsoil	321,500	321,500	May need to be a small volume of import
Fill material for strengthened earthworks	275,000	275,000	0

General waste management during construction

1.8.6 In order to meet sustainable construction objectives and to minimise the environmental impacts of waste, measures will be taken to minimise the amount of waste generated during construction of the scheme.

1.8.7 Excavated uncontaminated soil (topsoil and subsoil) and Made Ground will be re-used on the site where possible. Source segregated materials (e.g. concrete, aggregates, asphalt) resulting from the demolition of existing structures will also be re-used. Pre-treatment such as screening and crushing may be required before these materials are suitable for re-use. This will be undertaken by mobile plant under an appropriate Environmental Permit.

1.8.8 A Materials Management Plan (MMP) will be prepared for the scheme in accordance with the approach set out in Definition of Waste: Development Industry Code of Practice (2011). The MMP will demonstrate that these materials will be managed and re-used according to the CoP and therefore, will not be classified as "waste‟. Materials which are be covered by the MMP will be identified within a Site Waste Management Plan (SWMP).

1.8.9 The SWMP will identify the types and volumes of waste that will be generated during the construction process and set project specific targets for diverting key waste streams from landfill.

The SWMP will establish waste management procedures based on the waste hierarchy principle and legal requirements (e.g. the Duty of Care obligations). It will provide a framework for recording the movements and destination of waste from the site and will be a “working document‟ to be regularly updated throughout the construction process.

1.8.10 In areas where old mine workings and potentially contaminated land have been identified, specific mitigation measures will be implemented to manage contaminated soils, groundwater and run-off.

Waste products during operation

1.8.11 The operation of the Scheme would not give rise to significant waste volumes.

1.9 Any other services (e.g. pipelines, electricity, traffic management/technology, lighting, signage etc) which will be required as part of the project

1.9.1 No additional landtake within the Usk Bat Sites SAC or other SACs beyond that set out in Table 1.2 will be required for construction of gantries or variable message signs, as none are planned for Section 2.

1.9.2 The construction of the Scheme will involve a number of Statutory Utilities diversions.

1.9.3 Service diversions range from small localised re-routing to major underground diversions and all require individual solutions. Typical constraints for construction of service routes include traffic management, reduced working space, land take, exchange land issues, and height restrictions.

1.9.4 Work within or close to SACs will also be constrained to avoid damaging these sites.

1.9.5 Service diversions include:

- High Pressure Gas Mains: two high pressure gas mains (owned and operated by Wales and West Utilities) require diversion to accommodate the new Brynmawr junction and elevated eastbound carriageway. The existing gas mains partly run in the Usk Bat Sites SAC, and as such the diversion has been designed to minimise construction impacts on the SAC.

- Saleyard River Crossing: construction of this structure will affect the Dwr Cymru combined sewer overflow into the River Clydach. Any re-alignment of the outfall point would require new consents from NRW. This is outside the Usk Bat Sites SAC.

- Brynmawr Sewer: construction issues associated with this major sewer involve achieving the fall to the treatment plant as well as maintaining the existing sewer whilst construction of the new A465 is undertaken. This is outside the Usk Bat Sites SAC.

2. European Protected Sites potentially affected by the Proposals

2.1 Usk Bat Sites SAC

2.1.1 The location of the Usk Bat Sites SAC in relation to the Scheme is shown on Figure 1.

2.1.2 The Usk Bat Sites SAC covers a total area of some 1686ha and includes land designated within the following Sites of Special Scientific Interest (SSSI):

- Mynydd Llangatwg (Mynydd Llangattock) SSSI;
- Siambre Ddu SSSI;
- Buckland Coach House and Ice House SSSI; and
- Foxwood SSSI

2.1.3 The Countryside Council for Wales (CCW), now Natural Resources Wales (NRW) Core Management Plan for these sites (CCW, 2008a) provides the following overall description of the SAC:

"The site encompasses a series of Lesser Horseshoe Bat roosts, upland habitats, woodlands and cave systems located around the valley of the River Usk near to Abergavenny.

Mynydd Llangatwg is an area of open moorland and bog, with an impressive limestone escarpment along the northeastern edge, and is one of the largest exposures of upland limestone crag in south Wales. The Craig y Cilau National Nature Reserve (NNR) covers a large proportion of this escarpment area, including most of the unquarried scarp, with areas of limestone grassland, scree and quarry spoil, woodland and scrub. A small raised bog (Waun Ddu) bordered by two small streams has developed below the escarpment. An extensive system of caves lies beneath Mynydd Llangatwg and the plateau is peppered with sinkholes.

The main reason for the presence of the NNR is to help control and manage access to the cave system to protect the bat roosts and the underground geology and also the surface habitats, which support an outstanding assemblage of plants. Species include large and small-leaved lime, several species of whitebeam (including least whitebeam (Sorbus minima) which is unique to this area of Brecknock), limestone fern, endemic hawkweeds and alpine enchanter's-nightshade.

The chasmophytic vegetation encompasses the various crevices, nooks and crannies on the cliffs, boulders and partially vegetated unstable slopes of the limestone escarpment. It supports a typical range of ferns, bryophytes and calcareous lichens; these include ferns such as maidenhair *spleenwort, mosses like Tortella tortuosa, and liverworts like Scapania aspera. This site is known to support a number of notable lichen species and provides some of the best examples in the area of calcicolous lichen communities, which include the jelly lichen Collema cristatum and examples of lichen communities like the Leproplacetum chrysodetae and Aspicilion calcarea.*

Patches of Tilio-Acerion forest are also scattered along the length of the cliffs on Mynydd Llangatwg and intermixed with beechwood in the Clydach gorge. These areas also support a number of rare whitebeams (Sorbus spp.)."

2.1.4 Within Clydach Gorge the main SAC features are a number of caves which provide roosts for Lesser Horseshoe Bats, and areas of Tilio-Acerion woodland.

Conservation Objectives

2.1.5 The Core Management Plan sets out the conservation objectives for each of the features for which the Usk Bat Sites SAC is designated. Each conservation objective consists of the following two elements:

- Vision for the feature
- Performance indicators

2.1.6 The performance indicators are aspects of the conservation objectives that are measureable, and are thus part of, not a substitute for, the conservation objectives.

2.1.7 The visions for each feature for which likely significant effects were identified during the screening process are set out below, as taken from the Core Management Plan. The performance indicators for each feature are provided in Appendix A.

Lesser Horseshoe Bat

2.1.8 The conservation status of this feature within the site is considered to be 'Favourable' as of 2006.

2.1.9 The vision for Lesser Horseshoe Bat is that:

- *The site will support a sustainable population of Lesser Horseshoe Bats in the River Usk area;*
- *The population will be viable in the long term, acknowledging the population fluctuations of the species;*
- *Buildings, structures and habitats on the site will be in optimal condition to support the populations;*

- *Sufficient foraging habitat is available, in which factors such as disturbance, interruption to flight lines, and mortality from predation or vehicle collision, changes in habitat management that would reduce the available food source are not at levels which could cause any decline in population size or range;*

- *Management of the surrounding habitats is of the appropriate type and sufficiently secure to ensure there is likely to be no reduction in population size or range, nor any decline in the extent or quality of breeding, foraging or hibernating habitat;*

- *There will be no loss or decline in quality of linear features (such as hedgerows and tree lines) which the bats use as flight lines - there will be no loss of foraging habitat use by the bats or decline in its quality, such as due to over-intensive woodland management; and*

- *All factors affecting the achievement of the above conditions are under control.*

Tilio-Acerion forests of slopes, screes and ravines

2.1.10 The conservation status of this feature within the site is considered to be 'Favourable, maintained' as of 2006.

2.1.11 The vision for Tilio-Acerion forests of slopes, screes and ravines is that:

- *There are extensive patches of semi-natural woodland on the cliffs of the Llangatwg escarpment and hillsides in the Clydach gorge;*

- *The woodland canopy is dominated by locally native species, including lime* Tilia spp*, ash* Fraxinus excelsior*, pedunculate oak* Quercus robur*, hazel* Corylus avellana*, birch* Betula spp.*, whitebeams* Sorbus spp*. and, in the Clydach gorge, beech* Fagus sylvatica*. Rare whitebeams are a significant component of the canopy;*

- *Saplings of locally native species dominate the tree regeneration and there is evidence of sufficient regeneration to maintain the canopy in the long term;*

- *There is an accumulation of standing and fallen deadwood as the woodland develops;*

- *The woodland ground flora is composed of a range of typical native plants including enchanters-nightshade* Circaea lutetiana*, dog's-mercury* Mercurialis perennis*, wood-sorrel* Oxalis acetosella*, hart's-tongue* Phyllitis scolopendrium *and wood sage* Teucrium scorodonia*;*

- *The populations of rare whitebeams are stable or increasing;*

- *Young sycamore* Acer pseudoplatanus *trees are rare, as are beech* Fagus sylvatica *in areas away from the Clydach gorge;*

- *Plants indicating disturbance and nutrient enrichment, such as nettles, cleavers and weeds, are not dominant in the ground flora of the woodland; and*

- *All factors affecting the achievement of the above conditions are under control.*

Caves not open to the public

2.1.12 The conservation status of this feature within the site is considered to be ‘Favourable’ as of2006.

2.1.13 The vision for caves not open to the public is that:

- *The cave system provides a winter hibernation site for large numbers of Lesser Horseshoe Bats and other bat species, including Brandt’s, whiskered, Daubenton’s, Natterer’s, brown long-eared and, occasionally, greater horseshoe bats;*

- *Numbers of roosting bats are stable or increasing in the system as a whole; and*

- *All factors affecting the achievement of the above conditions are under control.*

Vulnerability

2.1.14 The Core Management Plan includes performance indicators for condition of the qualifying features (Appendix A).

2.1.15 For Lesser Horseshoe Bats, performance indicators for condition of the lesser horseshoe bat population include roost counts, the condition of roosts, and the quality of foraging habitat. Identified factors affecting the bat population include maintenance of roost structures in a suitable condition, maintenance of the cave system in a suitable condition (including management of access and disturbance), and habitat management, including maintenance of habitat connectivity and management of bat foraging habitat to maximise invertebrate prey abundance and canopy cover.

2.1.16 Performance indicators for Tilio-acerion woodland relate to extent, location, canopy cover, species composition (canopy and ground flora) and management. Most of the woodland occupies cliffs and steeply sloping ground, such that active woodland management is not a practical or desirable option and many of the cliff ledges are not accessible to grazing stock. No grazing occurs in the management unit affected by the Scheme, and as far as possible, natural ecological processes will be allowed to operate.

2.1.17 Performance indicators for caves not open to the public are defined in terms of maintaining their suitability for bats as summarised above.

2.1.18 Performance indicators for factors affecting woodlands relate to their grazing, presence of non-native species, humidity, management, and use for leisure activities.

2.1.19 In addition to these specific issues flagged up in the Core Management Plan, the assessment of effects needs to take account of the possible effects on qualifying interests of climate change, which may alter their abundance and distribution.

2.1.20 The potential effects of climate change in the Welsh uplands (specifically SSSIs) and which are more widely relevant have been reviewed by Jones (2007). She reports that:

“Climate change will result in significant seasonal changes in temperature, rainfall and wind which will impact upon most habitats to a greater or lesser extent in the future. The models predict with some certainty that we will have warmer wetter winters with much less snow and frost, while summers will be hotter and drier. However, the extent or rate of climatic changes are difficult to determine owing to the limitations of climate change models and the range of greenhouse gas emission projections for the future. More significant still are the uncertainties of the impacts upon species, soils and the wider ecosystem…..”

2.1.21 In addition to the uncertainties of modelling and prediction of impacts, she reports that:

“…there is so much we do not know about these habitats, their response to changing conditions and interactions between climate change and changes in management. Furthermore, the genetic diversity of species and their inherent ability to adapt to a changing climate are as yet largely unquantified for most species; without this we cannot make predictions about their fate under changed climatic conditions…”

2.1.22 She goes on to state that whatever the outcome, the larger and better condition a habitat is in, the more effectively it will be able to withstand changes in climate.

2.1.23 It is thus important that development proposals, such as the proposed improvements to Section 2 of the A465, do not adversely affect the condition and area of important habitats, and thus compromise their capacity for buffering against the effects of climate change, and other stresses on wildlife, to ensure that they do not become less resilient in the longer term.

2.1.24 The Monarch (Modelling Natural Resource Responses to Climate Change) project (Berry *et al.,* 2007) identified that Lesser Horseshoe Bat was one of fifteen species projected to gain substantial potential climate change space with no significant loss. Warmer winters may allow more bats to survive and to be in better condition for breeding the following year.

Existing Conservation Initiatives

2.1.25 In contrast to ‘vulnerability’, it is also possible that there are conservation initiatives taking place within the SAC or the local area that will have a beneficial effect on SAC qualifying features and thus influence the impacts of the Scheme proposals. However, other than the management specified in the Core Management Plan, no conservation initiatives have been identified by NRW during the consultation process, and it is not therefore considered that this will be an issue.

2.2 Cwm Clydach Woodlands SAC

2.2.1 The location of the Cwm Clydach Woodlands SAC in relation to the Scheme is shown on Figure 1.

2.2.2 The Cwm Clydach Woodlands SAC covers an area of some 29ha designated within the Cwm Clydach SSSI. The CCW (now NRW) Core Management Plan (CCW, 2008b) for the site provides the following overall description:

"The site is situated on the southern side of the River Clydach valley, approximately 2km east, north east of Brynmawr. The underlying geology varies across the site, consisting of sedimentary rocks that range from Old Red Sandstone through Carboniferous Limestone into shales and sandstones of the Millstone Grit and Coal Measures. Soils mainly consist of typical brown earths and humo-ferric podsols. Altitude ranges from 170m by the River Clydach to 350m in Cwm Llammarch.

Cwm Clydach is of special interest for its stands of broadleaved woodland dominated by beech, intergrading with more open habitats, which together support a number of rare and scarce vascular plants including whitebeams Sorbus spp. and soft-leaved sedge Carex montana. There are important woodland and grassland fungi assemblages with rare species such as Squamanita paradoxa. The site also includes two localities of national geological importance.

2.2.3 The Core Management Plan sets out the conservation objectives for each of the features for which the Cwm Clydach SAC is designated. The visions for each feature are set out below.

Asperulo-Fagetum beech forests

2.2.4 The conservation status of this feature within the site is considered to be 'Favourable' as of 2006.

2.2.5 The vision for Asperulo-Fagetum beech forests is that:

- *At least 50% of the canopy-forming trees are beech.*
- *The canopy cover is at least 80% (excluding areas of crag) and composed of locally native trees.*
- *The woodland has trees of all age classes with a scattering of standing and fallen dead wood.*
- *Regeneration of trees is sufficient to maintain the woodland cover in the long term.*
- *The shrub layer and ground flora can be quite sparse, but where present consist of locally native plants such as yew, hawthorn, wych elm, ash, hazel, field maple and elder, bramble,*

dog's mercury, enchanter's-nightshade, lords-and-ladies, woodruff, male fern, sanicle, wood melick, ivy, false brome, violets, herb robert, wood avens, and tufted hair-grass.

- *Scarcer plants, such as soft-leaved sedge and bird's-nest orchid are locally frequent and, more rarely, yellow bird's-nest orchid can be found.*
- *All factors affecting the achievement of the above conditions are under control.*

Atlantic acidophilous beech forests with *Ilex* and sometimes also *Taxus* in the shrub layer (*Quercion robori-petraeae* or *Ilici-Fagenion*)

2.2.6 The conservation status of this feature within the site is considered to be 'Favourable' as of 2006.

2.2.7 The vision for Atlantic acidophilous beech forests with Ilex and sometimes also Taxus in the shrub layer (Quercion robori-petraeae or Ilici-Fagenion) is that:

- *At least 10% of the canopy forming trees are beech.*
- *The canopy cover is at least 80% and composed of locally native species.*
- *The woodland has trees of all age classes with a scattering of standing and fallen dead wood.*
- *Regeneration of trees is sufficient to maintain the woodland cover in the long term.*
- *The shrub layer and ground flora can be quite sparse, but where present consist of locally native plants.*
- *All factors affecting the achievement of the above conditions are under control.*

Vulnerability

2.2.8 The Core Management Plan includes performance indicators for condition of the qualifying features (Appendix A).

2.2.9 For both woodland types, performance indicators for condition include extent, canopy cover and composition, regeneration, ground flora and amount of dead wood present. Identified factors affecting the woodland are livestock grazing (required to be sufficiently low to enable regeneration of tree species) and presence of non-native and invasive species (particularly Japanese Knotweed spreading along the river corridor) and Bracken.

2.2.10 In addition to these specific issues flagged up in the Core Management Plan, the assessment of effects needs to take account of the possible effects on qualifying interests of climate change, which may alter their abundance and distribution.

2.2.11 A review of the effects of climate change on trees by the Forestry Commission (Berry *et al*., 2012) concluded that Beech was a likely to see an overall slight loss in climate space over the whole of the British Isles by 2080, in the region of 2% for the whole of the British Isles, but that large gains in Scotland would be offsite by "quite dramatic" potential losses in Wales.

Existing Conservation Initiatives

2.2.12 In contrast to 'vulnerability', it is also possible that there are conservation initiatives taking place within the SAC or the local area that will have a beneficial effect on SAC qualifying features and thus influence the impacts of the Scheme proposals. However, other than the management specified in the Core Management Plan, no conservation initiatives have been identified by NRW during the consultation process, and it is not therefore considered that this will be an issue.

2.3 River Usk SAC

2.3.1 The location of the River Usk SAC in relation to the Scheme is shown on Figure 1.

2.3.2 The River Usk SAC covers an area of some 1008ha designated within the following SSSIs.

- River Usk (Upper Usk) SSSI
- River Usk (Lower Usk) SSSI
- River Usk (Tributaries) SSSI
- Penllwyn-yr-hendy SSSI
- Coed Dyrysiog SSSI
- Coed Nant Menascin SSSI
- Coed Ynysfaen SSSI

2.3.3 The CCW (now NRW) Core Management Plan for the site (CCW, 2008c) provides the following overall description:

2.3.4 "The River Usk SAC rises in the Black Mountain range in the west of the Brecon Beacons National Park and flows east and then south, to enter the Severn Estuary at Newport. The overall form of the catchment is long and narrow, with short, generally steep tributaries flowing north from the

Black Mountain, Fforest Fawr and Brecon Beacons, and south from Mynydd Epynt and the Black Mountains. The underlying geology consists predominantly of Devonian Old Red Sandstone with a moderate base status, resulting in waters that are generally well buffered against acidity. This geology also produces a generally low to moderate nutrient status, and a moderate base-flow index, intermediate between base-flow dominated rivers and more flashy rivers on less permeable geology. The run-off characteristics and nutrient status are significantly modified by land use in the catchment, which is predominantly pastoral with some woodland and commercial forestry in the headwaters and arable in the lower catchment. The Usk catchment is entirely within Wales.

2.3.5 The ecological structure and functions of the site are dependent on hydrological and geomorphological processes (often referred to as hydromorphological processes), as well as the quality of riparian habitats and connectivity of habitats. Animals that move around and sometimes leave the site, such as migratory fish and otters, may also be affected by factors operating outside the site."

2.3.6 The Core Management Plan sets out the conservation objectives for each of the features for which the River Usk SAC is designated. The plan states that the ecological status of the water course is a major determinant of favourable conservation status for all features. The conservation objective for the water course is defined as follows:

- The capacity of the habitats in the SAC to support each feature at near-natural population levels, as determined by predominantly unmodified ecological and hydromorphological processes and characteristics, should be maintained as far as possible, or restored where necessary.

- The ecological status of the water environment should be sufficient to maintain a stable or increasing population of each feature. This will include elements of water quantity and quality, physical habitat and community composition and structure. It is anticipated that these limits will concur with the relevant standards used by the Review of Consents process.

- Flow regime, water quality and physical habitat should be maintained in, or restored as far as possible to, a near-natural state, in order to support the coherence of ecosystem structure and function across the whole area of the SAC.

- All known breeding, spawning and nursery sites of species features should be maintained as suitable habitat as far as possible, except where natural processes cause them to change.

- Flows, water quality, substrate quality and quantity at fish spawning sites and nursery areas will not be depleted by abstraction, discharges, engineering or gravel extraction activities or other impacts to the extent that these sites are damaged or destroyed.

- The river planform and profile should be predominantly unmodified. Physical modifications having an adverse effect on the integrity of the SAC, including, but not limited to, revetments on active alluvial river banks using stone, concrete or waste materials, unsustainable extraction of gravel, addition or release of excessive quantities of fine sediment, will be avoided.

- River habitat SSSI features should be in favourable condition. In the case of the Usk Tributaries SSSI, the SAC habitat is not underpinned by a river habitat SSSI feature. In this case, the target is to maintain the characteristic physical features of the river channel, banks and riparian zone.

- Artificial factors impacting on the capability of each species feature to occupy the full extent of its natural range should be modified where necessary to allow passage, e.g. weirs, bridge sills, acoustic barriers.

- Natural factors such as waterfalls, which may limit the natural range of a species feature or dispersal between naturally isolated populations, should not be modified.

- Flows during the normal migration periods of each migratory fish species feature will not be depleted by abstraction to the extent that passage upstream to spawning sites is hindered.

- Flow objectives for assessment points in the Usk Catchment Abstraction Management Strategy will be agreed between EA and CCW as necessary. It is anticipated that these limits will concur with the standards used by the Review of Consents process.

- Levels of nutrients, in particular phosphate, will be agreed between EA and CCW for each Water Framework Directive water body in the Usk SAC, and measures taken to maintain nutrients below these levels. It is anticipated that these limits will concur with the standards used by the Review of Consents process.

- Levels of water quality parameters that are known to affect the distribution and abundance of SAC features will be agreed between EA and CCW for each Water Framework Directive water body in the Usk SAC, and measures taken to maintain pollution below these levels. It is anticipated that these limits will concur with standards used by the Review of Consents process.

- Potential sources of pollution not addressed in the Review of Consents, such as contaminated land, will be considered in assessing plans and projects.

- Levels of suspended solids will be agreed between EA and CCW for each Water Framework Directive water body in the Usk SAC. Measures including, but not limited to, the control of suspended sediment generated by agriculture, forestry and engineering works, will be taken to maintain suspended solids below these levels.

Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation

2.3.7 The conservation status of this feature within the site is considered to be 'Unfavourable (unclassified)' as of 2006.

2.3.8 The conditions which define favourable conservation status for this feature are:

- The conservation objective for the water course as defined above must be met.
- The natural range of the plant communities represented within this feature should be stable or increasing in the SAC. The natural range is taken to mean those reaches where predominantly suitable habitat exists over the long term. Suitable habitat and associated plant communities may vary from reach to reach. Suitable habitat is defined in terms of near-natural hydrological and geomorphological processes and forms eg. depth and stability of flow, stability of bed substrate, and ecosystem structure and functions eg. nutrient levels, shade. Suitable habitat for the feature need not be present throughout the SAC but where present must be secured for the foreseeable future, except where natural processes cause it to decline in extent.
- The area covered by the feature within its natural range in the SAC should be stable or increasing.
- The conservation status of the feature's typical species should be favourable. The typical species are defined with reference to the species composition of the appropriate JNCC river vegetation type for the particular river reach, unless differing from this type due to natural variability when other typical species may be defined as appropriate.

Fish species

2.3.9 The vision for the following fish species for which the SAC is designated is a collective one. The conservation status of the individual fish species features is also listed below.

- Sea Lamprey *Petromyzon marinus.* Conservation status 'Unfavourable, unclassified' as of 2006
- Brook Lamprey *Lampetra planeri* and River Lamprey *Lampetra fluviatilis.* Conservation status 'Favourable' as of 2006

- Twaite Shad *Alosa falla* and Allis Shad *Alosa alosa.* Conservation status 'Unfavourable, unclassified' as of 2006

- Atlantic Salmon *Salmo salar*. Conservation status 'Unfavourable, unclassified' as of 2006

- Bullhead *Cottus gobio.* Conservation status 'Unfavourable, unclassified' as of 2006

2.3.10 The vision for the feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied:

- *The conservation objective for the water course as defined above must be met.*

- *The population of the feature in the SAC is stable or increasing over the long term.*

- *The natural range of the feature in the SAC is neither being reduced nor is likely to be reduced for the foreseeable future. The natural range is taken to mean those reaches where predominantly suitable habitat for each life stage exists over the long term. Suitable habitat is defined in terms of near-natural hydrological and geomorphological processes and forms eg. Suitable flows to allow upstream migration, depth of water and substrate type at spawning sites, and ecosystem structure and functions eg. Food supply. Suitable habitat need not be present throughout the SAC but where present must be secured for the foreseeable future. Natural factors such as waterfalls may limit the natural range of individual species. Existing artificial influences on natural range that cause an adverse effect on site integrity, such as physical barriers to migration, will be assessed.*

- *There is, and will probably continue to be, a sufficiently large habitat to maintain the feature's population in the SAC on a long-term basis.*

Otter

2.3.11 The conservation status of this feature within the site is considered to be 'Favourable' as of 2006.

2.3.12 The vision for this feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied:

- *The population of otters in the SAC is stable or increasing over the long term and reflects the natural carrying capacity of the habitat within the SAC, as determined by natural levels of prey abundance and associated territorial behaviour.*

- *The natural range of otters in the SAC is neither being reduced nor is likely to be reduced for the foreseeable future. The natural range is taken to mean those reaches that are potentially suitable to form part of a breeding territory and/or provide routes between breeding territories. The whole area of the Usk SAC is considered to form potentially suitable breeding habitat for otters. The size of breeding territories may vary depending on prey abundance. The population size should not be limited by the availability of suitable undisturbed breeding sites. Where these are insufficient they should be created through habitat enhancement and where necessary the provision of artificial holts. No otter breeding site should be subject to a level of* *disturbance that could have an adverse effect on breeding success. Where necessary, potentially harmful levels of disturbance must be managed.*

- *The safe movement and dispersal of individuals around the SAC is facilitated by the provision, where necessary, of suitable riparian habitat, and underpasses, ledges, fencing etc at road bridges and other artificial barriers*

Vulnerability

2.3.13 The Core Management Plan includes performance indicators for condition of the qualifying features (Appendix A).

2.3.14 For fish species, performance indicators for condition include maintenance of suitable habitat conditions in spawning sites, flow rates, sediment density and particle size.

2.3.15 Identified factors affecting condition are presence of barriers to migration and movement, and flow depletion and entrainment as a result of abstraction. Acoustic (noise / vibration) and chemical / sediment barriers from development projects are also highlighted as a potential factor. Diffuse pollution and siltation impacts and contamination from pollution events could also affect condition. Discharges from sewage treatment works, urban drainage, engineering works such as road improvement schemes, contaminated land, and other domestic and industrial sources can also be significant causes of pollution, and must be managed appropriately.

2.3.16 For Otters, key factors affecting condition are habitat condition, including connectivity, availability of prey and contamination of rivers with toxins.

2.3.17 Management should aim to ensure that there is sufficient undisturbed breeding habitat to support an otter population of a size determined by natural prey availability and associated territorial behaviour.

2.3.18 For Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation, factors that are important to the favourable conservation status of this feature include flow, substrate quality and water quality, which in turn influence species composition and abundance. Favourable management for this feature is therefore largely dependent on ensuring that sufficient depth, velocity and duration of flow and sufficiently low phosphate levels are maintained within the natural range of the vegetation. Management of non-native invasive species is also required.

2.3.19 In addition to these specific issues flagged up in the Core Management Plan, the assessment of effects needs to take account of the possible effects on qualifying interests of climate change, which may alter their abundance and distribution.

2.3.20 The Monarch (Modelling Natural Resource Responses to Climate Change) project (Berry *et al*., 2007) identified that Otter was projected to gain <10% substantial potential climate change space, as most of Britain and Ireland was simulated as potentially suitable under various climate change scenarios, hence no significant change being predicted.

2.3.21 Research by the Environment Agency (Davidson & Hazlewood, 2005) on potential effects of global warming on Salmon fisheries in England concluded that indicate that on rivers in the south-west and north, freshwater growth rates could generally improve under the 'low emissions' scenario but may fall below current levels under the 'high-emissions' scenario as temperatures exceed optimum levels in the latter half of the century. On rivers in the south-east (represented by the Thames) - where warming is expected to be greatest - declining growth rates may result with adverse consequences for abundance and survival. However, warming is only one aspect of climate change that might prove detrimental at extreme levels; expected increases in the frequency of summer droughts and winter floods could also adversely affect survival and abundance, and it is possible that other fish species might be similarly affected.

Existing Conservation Initiatives

2.3.22 In contrast to 'vulnerability', it is also possible that there are conservation initiatives taking place within the SAC or the local area that will have a beneficial effect on SAC qualifying features and thus influence the impacts of the Scheme proposals. However, other than the management specified in the Core Management Plan, no conservation initiatives have been identified by NRW during the consultation process, and it is not therefore considered that this will be an issue.

2.4 Assessment techniques and significance criteria

2.4.1 Information collected during the screening stage and during specialist surveys carried out over a number of years (summarised in Section 3.2 below), and which is reported in detail in the Environmental Statement for the Scheme, has been used to predict the likely effects of the project on the three potentially affected SACs and on the delivery of their conservation objectives.

2.4.2 The nature of the potential effects are described in Section 3.3-3.4 in terms of the list of factors presented in Annex F of DMRB Vol 11 Section 4: HD44/09. In addition, in accordance with the CIEEM Guidelines on Ecological Impact Assessment, effects have been characterised in terms of the following variables:

- Positive or negative.
- Extent - the area over which the effect occurs.
- Duration - the time for which the effect is expected to last prior to recovery or replacement of the resource or feature.

- Reversibility - whether an effect is ecologically reversible, either spontaneously or through specific action, and whether such an outcome is intended.

- Timing and frequency - the timing and frequency of effects in relation to important seasonal and/or life cycle constraints.

2.4.3 In addition to the assessment of effects on each ecological feature, the CIEEM Guidelines require the probability of each effect occurring to be considered in accordance with the following scale:

- Certain/near-Certain: probability estimated at 95% chance or higher.

- Probable: probability estimated above 50% but below 95%.

- Unlikely: probability estimated above 5% but less than 50%.

- Extremely Unlikely: probability estimated at less than 5%.

2.4.4 Following the CIEEM Guidelines, for the purposes of this assessment, effect significance, in general terms, has been defined as follows:

"an ecologically significant impact is one which is defined as an impact (negative or positive) on the integrity of a defined site or ecosystem and/or the conservation status of habitats or species within a given geographical area".

2.4.5 This assessment of impact significance has focused on qualifying features of the SACs, and the sites' conservation objectives. For the purposes of this assessment it is considered that effects not assessed as significant as defined in Section 2.4.4 cannot adversely affect the integrity of an SAC.. Integrity is defined as "*the coherence of its ecological structure and function, across its whole area, that enables it to sustain the habitat, complex of habitats and/or the levels of populations of the species for which it was classified".*

2.4.6 Assessment of whether there will be an adverse effect on integrity before mitigation is based on the characterisation of the impacts including ecological structure and function; the consideration of these against the conservation objectives of the site, and the ability to maintain the qualifying features in a favourable condition..

2.4.7 The judgement of whether an adverse effect on integrity occurs takes into account evidence, assessment of uncertainty, balance of probabilities of conflicting evidence, and the use of professional judgement.

2.4.8 Where an effect is considered to prevent the ability of the site to maintain a qualifying feature (i.e. the effect would undermine the conservation objectives for the site), this is considered to be an adverse effect on integrity

2.4.9 Where measures are proposed to mitigate adverse effects on integrity of qualifying features, an assessment of residual ecological effects has been undertaken. Assessment of whether these residual effects constitute an adverse effect on integrity are assessed in the same way as effects before mitigation.

The use of professional judgement

2.4.10 Professional judgement has been used in the interpretation of results in relation to assessment of potential impacts, the significance of impacts, and consequences for conservation objectives. Extensive surveys have been undertaken to help assess the effects of the scheme on the relevant conservation objectives related to Lesser horseshoe bats. However, it is impractical to collect perfect evidence of the effects on populations which, along with a shortage of detailed information available on the success of mitigation used in other highways schemes, has led to the need to use professional judgment in this instance. The reliability of professional judgment can be quantified to some extent by reference to the experience of the professionals concerned (see Section 1.3).

2.4.11 The approach has been to identify risks on the basis of the precautionary principle. The precautionary principle has been applied to ensure that any assessment errs on the side of caution, without being overly cautious. This principle means that the conservation objectives should prevail where there is uncertainty or that harmful effects will be assumed in the absence of evidence to the contrary. A high standard of proof is required at all stages of the assessment. Objective evidence is required to justify the assessment. It will be important to provide sufficient evidence to support conclusions “beyond any reasonable scientific doubt.”

2.5 Summary of mitigation incorporated in scheme design

2.5.1 Several plainly established and uncontroversial (PEU) measures to avoid ecological impacts have been incorporated in the design of the Scheme considered in this document.

2.5.2 The Scheme has been subject to an iterative series of design reviews which has optimised the Scheme alignment minimise the impact of land-take within Usk Bat Sites SAC, and land take within the Cwm Clydach Woodlands SAC has been avoided altogether.

2.5.3 A brief summary of PEU and other mitigation measures is provided below:

Usk Bat Sites SAC

2.5.4 All existing subways and culverts under the road will be retained and modified as necessary so that they can continue to be used by bats at times when they are active.

2.5.5 Detailed lighting and landscape design will ensure that light spill does not illuminate the culvert mouths, as much as possible of the existing vegetation and connectivity for bats will be retained, temporary measures/features will be used during and post-construction to provide connectivity between retained vegetation and culverts and carefully designed planting of trees and shrubs will be implemented to guide bats into the culverts and away from the carriageway.

2.5.6 As the existing road is lit, lighting of the new carriageway is proposed to maintain existing conditions which are considered likely to deter Lesser Horseshoe Bats from attempting to cross the road at carriageway level (Stone *et al*. 2009). The scheme would also be lit during construction to mimic existing lighting conditions as far as practicable, to deter bats from crossing at carriageway level during the construction phase.

2.5.7 Replacement woodland planting will be provided as replacement for habitat lost to the Scheme, at a ratio higher than 1:1.

2.5.8 Destruction of bat roosts unavoidably lost to the scheme would be carried out when bats are least likely to be present, avoiding the breeding and hibernation periods as appropriate to minimise disturbance to bats and prevent injury and mortality of bats. This would be carried out under NRW licence and alternative roosts would be provided for bats.

2.5.9 Where bat roosts have to be destroyed, alternative roosting provision will be designed to provide an ecological function of equal or better value within a similar spatial context. Where it is feasible and practicable to do so new and replacement roosts would be constructed before the roost they are replacing is removed. In all cases however new and replacement roots would be constructed as soon as practicable.

2.5.10 Additional roost structures will be provided along the Scheme to mitigate for effects associated with loss of foraging habitat, i.e., a purpose built Lesser Horseshoe Bat maternity roost (Nant Hafod) will be constructed at the western end of the scheme as advanced works north of the Welsh Water Waterworks. Another maternity roost will be provided near the Saleyard river crossing. This structure would be artificially heated to provide suitable conditions for breeding Lesser Horseshoe Bats and located next to the river and woodland habitat so that bats easily find it. Lesser Horseshoe Bats are well known to breed in structures with artificial heat sources, such as boiler rooms (http://www.bio.bris.ac.uk/research/bats/britishbats/batpages/lesserhorseshoe.htm) and provision of an artificial heat source to provide suitable breeding roost conditions is a plainly established and uncontroversial mitigation technique.

2.5.11 This will give bats better access to abundant quality foraging habitat close to a maternity roost during pregnancy and raising young.

2.5.12 Several underground roosts, using pipes and chambers will be built into the Scheme embankment, with construction taking place as soon as is practicable. A Construction Environmental Management Plan (CEMP) has been produced which sets out procedures to prevent effects during construction from dust, silt and accidental pollution incidents etc. More details are provided in the relevant parts of Chapter 4 of this report.

River Usk SAC

2.5.13 The current road discharges untreated road run-off into the River Clydach, which in turn flows into the River Usk. The drainage design for the Scheme will improve the quality of discharge through use of petrol interceptors and other measures to prevent pollution from entering the watercourse.

2.6 Alternative solutions

2.6.1 This section summarises the main options (alternatives) that have been studied by the Welsh Government and its advisors leading to the preferred option and the Scheme which is assessed in this document. Further details of the proposals are provided in Chapter 4 of the Environmental Statement for the Scheme.

Route Selection

2.6.2 The broad alignment of the selected route is based on studies undertaken in the 1990's which investigated a number of different route options in relation to the entire Heads of the Valleys Dualling project (Abergavenny to Hirwaun). These included a 'Red Route', a 'Purple Route', a 'Blue Route' and an 'Orange Route'. The four route options were, at that time, subject to detailed comparison which involved assessment of the grounds of cost, traffic engineering, economic and environmental considerations. The purpose of this was to identify a 'Preferred Route' to be taken to the detailed design stage.

2.6.3 In relation to the Scheme, only the Red and Orange Routes are relevant as Purple route was a bypass option to the north of Hirwaun, at the western end of the entire A465 Dualling project, and the Blue Route was an alternative off-line widening option for Section 3 between the industrial estate at Rassau and Garn Lydan.

2.6.4 Brief descriptions of the Red and Orange Options are provided below.

Red Route

2.6.5 The Red Route was a widening of the existing A465, 40 km in length, with 12 grade separated junctions in total, of which three (Brynmawr, Saleyard and Gilwern) would have been within the length of Section 2. Widening would have been mainly by asymmetrical widening to one side or other of the existing road, apart from areas where it would be necessary to widen on both sides of the existing road or to deviate slightly from the existing line.

2.6.6 Within Section 2 property demolition was proposed at Blackrock and Lion Terrace, Gilwern. The latter has occurred subsequently. The demolition proposals also included one building at Clydach School, and the relocation of part of Clydach Cemetery.

2.6.7 Retaining walls were proposed below the Anacomp site (now disused and demolished) and Cheltenham, as well as a retaining wall and viaduct over Clydach Gorge between Blackrock and Cheltenham.

Orange Route

2.6.8 The Orange Route involved a new off-line route to accommodate eastbound traffic, and the improvement of the existing A465 to accommodate westbound traffic. The eastbound section would be approximately 6 km in length.

2.6.9 The new off-line route would run north of the existing road between Waun Rydd (north west of Brynmawr) and Gilwern. Eastbound traffic would leave the Red Route near Clydach Terrace and pass to the north of Brynmawr Comprehensive School, Craig Ddu Water Treatment Works, Blackrock, Cheltenham and Maes-y-Gwartha. It would then cross the River Clydach and pass through Clydach Wood before re-joining the Red Route west of Gilwern.

2.6.10 Deep cuttings and high embankments would be required all along the off-line route, and two viaducts were proposed:

- above Blackrock and Cheltenham; and
- across the River Clydach and through Clydach Wood.

2.6.11 The existing A465 would be improved between Waun Rydd and Brynmawr, through the Clydach Gorge and as far as Gilwern. This improvement would require the demolition of properties at Rhyd Clydach (in Brynmawr) and at Blackrock.

2.6.12 Two new grade-separated junctions were proposed, at Waun Rydd and Saleyard, for westbound traffic only.

1995 Preferred Route

2.6.13 Following a public consultation exercise, the then Secretary of State for Wales announced the preferred route in July 1995. This comprised the Red Route with a modification at Brynmawr which would have involved moving the line of the Red Route to the east and changing the junction arrangements.

2.6.14 The Secretary of State identified the environmental objectives to be achieved during the detailed design of the preferred route and its junctions. These were that:

"……the overall environmental objective of route design would be to minimise (as far as practicable) the impact on SSSIs, particularly in the Clydach Gorge, whilst at the same time taking account of community, commercial and business interests. The objective of junction design would be to seek to balance the needs of trunk road traffic with those of providing safe and convenient

access to local communities, whilst minimising impact on adjacent properties and the environment."

2.6.15 In environmental terms, the detailed objectives for both route and junction design included:

- to minimise impact;
- to minimise land take; and
- to maintain access to businesses and properties, where viable.

1997 Scheme

2.6.16 Following the preferred route announcement in 1995 further design work was undertaken and the draft Line Order and an Environmental Statement for the entire 40km length of the project (Abergavenny to Hirwaun) were published in 1997.

2.6.17 The 1997 scheme for Section 2 was 6.5km long, comprising dual two-lane carriageway with an additional climbing lane uphill (westbound) through the Clydach Gorge. Running lanes, verges and hard strips below standard widths were proposed. Grade separated junctions would be provided at Brynmawr, Saleyard and Glanbaiden. The existing junction at Navigation Inn would be stopped up and replaced with an underbridge.

2.6.18 Following the 1998 Public Inquiry the Inspector recommended in his report that the scheme be constructed and the made Line Order was published in 1999.

2.6.19 In his report the Inspector noted that five grade separated junctions within the whole improvement, including the Brynmawr and Glanbaiden junctions in Section 2, and also those at Rhymney, Nant-y-Bwch and the junction with the A470 had been the subject of specific criticism because of their impact on the environment. He suggested an interim period provision for at-grade junctions with the situation examined in five years when the need for grade separation could be reassessed in the light of traffic growth actually achieved.

2.6.20 In their Decision Letter dated 22 June 1999 the Welsh Office decided that the balance of argument for grade separated or at-grade provision at these five junctions rested with the published scheme. However the design of the grade separated junction at Glanbaiden was re-assessed accepting an eastwards extension of the 85kph design speed and mandatory 50mph speed limit through the Clydach Gorge. That enabled the height of the embankment at the junction to be lowered. Subsequently in 2000 the Welsh Government undertook to review the five junctions to ensure that they offered the most appropriate solution to both the interim and permanent situation between each phase of development.

2.6.21 The Inspector also recommended that within the Clydach Gorge, the climbing lane and any lay-bys other than for bus stops be deleted. He also recommended that the proposed 'narrow lanes' be retained. The Secretary of State noted these recommendations but recognised it as being a matter of detailed design that would be the subject of consideration when the Compulsory Purchase Order for Section 2 is drafted.

Option development

2.6.22 As part of the ECI Contract to design and construct the Scheme, work has taken place over the last two years on the development of the scheme design to minimise the footprint and impact on the environment, in particular within the Clydach Gorge, and to review the type and provision of junctions and structures. This has been carried out through a design options appraisal process guided in part by views expressed during consultation with local communities, statutory consultees and other stakeholders, including Public Information Exhibitions held in October 2011 in Brynmawr, Clydach, and Gilwern. The appraisal also considered comments made in the 1998 Inspector's report as reported above.

Option appraisal

2.6.23 The option appraisal process has been carried out to develop and seek to add value to the 1997 Scheme design, using current option appraisal guidance, Welsh Transport Appraisal Guidance (WelTAG) and to meet the Welsh Government's commitment in 2000 referred to above. The appraisal of options was carried out in respect of compliance with WG's Scheme Objectives (see Chapter 1), against WelTAG appraisal criteria for environment, social and economic aspects, and deliverability criteria, including effects on SACs.

2.6.24 Workshops were held to identify possible options for initial appraisal. This led to the following improvement options being appraised in more detail:

- Option O/MC1: Dual 2 Lane All Purpose (D2AP) full standard carriageway cross section, with grade separation junctions at Brynmawr and Glanbaiden.
- Option O/MC2: Dual 2 Lane All Purpose (D2AP) with reduced carriageway cross section (lane width, hard strip and verge), with at-grade junctions at Brynmawr and Glanbaiden.
- Option O/MC7: Dual 2 Lane All Purpose (D2AP) with reduced carriageway cross section (lane width, hard strip and verge), with grade separated junctions at Brynmawr and Glanbaiden.
- Option O/MC12: Dual 2 Lane All Purpose (D2AP) with reduced carriageway cross section (lane width, hard strip and verge), with grade separated junctions at Brynmawr and Glanbaiden. Option includes a section of Wide Single (WS2+1) standard carriageway for approximately 1.4km through Clydach Gorge.

2.6.25 A Do Minimum option (O/MC20) including the provision of vehicle message signs (VMS), speed control safety cameras (CCTV), minor improvements to road lighting, road pavement, road markings and minor changes to junctions to remove conflicting turning manoeuvres were also considered as a baseline or comparator.

2.6.26 The option appraisal process also involved consultation with key stakeholders and consultees on the four improvement options.

2.6.27 The result of the appraisal led to Options O/MC 1, 2 and 12 being rejected for a number of reasons including increased impact on SACs. Option O/MC7 was taken forward into the preliminary design stage of the Scheme.

Scheme design

2.6.28 Preliminary scheme design followed the option appraisal process. The current Scheme has a number of improvements in terms of effects on European Sites when compared to the 1999 Made Line Order.

- The Brynmawr Junction has been amended by relocating the eastbound entry slip road, which has avoided loss of vegetation in the Usk Bat Sites SAC.
- The 400m diversion of the River Clydach east of Brynmawr has been deleted as it was no longer required, resulting in reduced impact on connectivity for bats and otters..
- Revisions have been made to the main alignment through Cheltenham, Blackrock and Clydach to reduce the effect on existing vegetation within the Usk Bat Sites SAC.
- An enforced 50mph speed limit has been introduced throughout, which would minimise bat mortality compared with a faster traffic speed.

2.7 Possible In-combination effects from other plans and projects

2.7.1 When considering the reasonably foreseeable plans or projects to be assessed for in-combination effects, DMRB guidance states that ‘reasonably foreseeable’ is interpreted to include other projects that are ‘committed’. These should include (but not necessarily be limited to):

- Trunk road and motorway projects which have been confirmed (i.e. gone through the statutory processes).
- Development projects with valid planning permissions as granted by the local planning authority, and for which a formal EIA is a requirement or for which non-statutory environmental impact assessment has been undertaken.

2.7.2 In addition, David Tyldesley Associates (2011) HRA guidance recommends that the following should be considered where relevant:

- Projects started but not yet completed;
- Projects consented but not yet started;
- Projects subject to ongoing review e.g. annual licences;
- Applications lodged but not yet determined;
- Refusals subject to appeal procedures not yet completed;
- Known projects that do not need consent;
- Proposals in adopted plans; and
- All proposals in draft plans formally published for consultation.

2.7.3 In-combination assessment for AIES includes effects resulting from incremental changes caused by other present or reasonably foreseeable projects and plans together with the project. In addition, the Conservation Regulations 2010 require the assessment of cumulative and in-combination effects to include the entire project assessed together (including ancillary works and any of its component parts, even if subject to other consenting regimes), as well as other plans and projects that are completed but are still having a residual effect, projects that have consent and which are in various stages of implementation but not yet completed, and projects that are formally seeking consent or in formal pre-application stages.

3. Potential impacts on European sites

3.1 Introduction

3.1.1 Initial screening matrices for the European sites potentially affected by the Scheme are provided in Appendix B.

3.1.2 This section considers the potential impacts of the Scheme, in the absence of detailed mitigation proposals, on each of the interest features for the SACs for which Likely Significant Effects were identified at the screening stage, and their potential effect on the achievement of conservation objectives. Mitigation incorporated into Scheme design is not taken into account in the assessment of impacts in this Section unless it is fully established as PEU and sufficiently detailed.

3.1.3 Where it is considered that an adverse impact would occur, mitigation measures (Chapter 4) have been proposed, together with an assessment of residual impacts.

3.2 Sources of information used in the assessment

Baseline information - Desk Study

3.2.1 The following sources of information have been used in the preparation of this report:

- CCW (2008a). Core Management Plan for Mynydd Llangatwg (Mynydd Llangattock) Site of Special Scientific Interest (SSSI), Siambre Ddu SSSI, Buckland Coach House and Ice House SSSI and Foxwood SSSI, which together comprise Usk Bat Sites Special Area of Conservation (SAC).

- CCW (2008b). Core Management Plan for Cwm Clydach Site of Special Scientific Interest (SSSI), incorporating Cwm Clydach Woodlands Special Area of Conservation (SAC).

- CCW (2008c). Core Management Plan for River Usk Special Area of Conservation (SAC).

- CCW (2012). The Availability and Quality of Lesser Horseshoe Bat Foraging Habitat at Critical Times – Usk Bat Sites SAC / HoV works in Section 2. Draft unpublished report.

- Highways Agency (2009). Assessment of implications (of highways and/or roads projects) on European Sites (including appropriate assessment). DMRB Volume 11, Section 4, Part 1, HD 44/09.

- Jacobs (2007). A465 Abergavenny to Hirwaun Dualling: Section 2 DMRB Stage 3: Ecology Factual Report.

- Jacobs (2007). Usk Bat Sites SAC / Cwm Clydach Woodlands SAC: Appropriate Assessment Stage 1, Screening report. (Draft).

- Jacobs (2008). A465 Abergavenny to Hirwaun Dualling Section 2 Appropriate Assessment Process: “Ghost” Statement to Inform the Appropriate Assessment.

- Jacobs (March 2008). Radio Tracking of Lesser Horseshoe Bats 2005-2006.

- Jacobs (March 2008). Lesser Horseshoe Bat Roosts in the Clydach Gorge Summary of Survey Work and Monitoring to Date.

- Jacobs (October 2008). Strategic Study of Potential for Impacts on Lesser Horseshoe Bat: Mitigation Strategy and Register of Commitments, draft.

- Jacobs (December 2008). Project Summary of Strategic Study of Potential for Impacts on Lesser Horseshoe Bat 1997-2008.

- Jacobs (February 2009). Strategic Study of Potential for Impacts on Lesser Horseshoe Bat: Baseline Monitoring Report 2008.

- Jacobs (March 2009). Eliciting Expert Views on Risks to the Integrity of the Usk Bat Sites SAC: General Questionnaire 3 (GQ3) Assessment.

- Jacobs (2010). A465 Abergavenny to Hirwaun Dualling: Section 2 Strategic Study of Potential for Impacts on Lesser Horseshoe Bat Baseline Monitoring Report 2009.

- Jacobs (March 2011). Strategic Study of Potential for Impacts on Lesser Horseshoe Bat: Baseline Monitoring Report 2010.

- Jacobs (February 2012). Strategic Study of Potential for Impacts on Lesser Horseshoe Bat: Baseline Monitoring Report 2011.

- Jones, B. (2007). A Framework to set Conservation Objectives and achieve Favourable Condition in Welsh Upland SSSIs. Countryside Council for Wales.

- Smith Ecology Limited (March 2006). Swarming Survey of Lesser and Greater Horseshoe Bats on A465 Section 2 Gilwern to Brynmawr 2005.

- Welsh Government (2009). Interim Advice Note (IAN) 116/08(W) Nature Conservation Advice in Relation to Bats.

3.2.2 In summary, the following have been recorded with regard to Lesser Horseshoe Bats: four maternity roosts (Clydach House, Auckland House, Llanwenarth House & Clydach Viaduct); two individually notable hibernacula (Craig-y-ffynnon & Pylon Cave); twenty-seven other hibernacula; eighteen summer roosts; twenty night roosts; and eighteen roosts that are summer and also possibly winter roosts. Locations are shown on Figure 4.

3.2.3 For the purposes of this report, the definitions of each type of roost referred to are as follows. It should be noted that some roost sites will be used for more than one of these uses. Roost types are listed in order of value and the highest value of each roost identified given in the report. It is assumed that maternity roosts are also used as summer roosts by males and non-breeding females, as well as being used as night roosts; and that winter roosts may also be used as summer roosts and night roosts:

- Maternity roost – confirmed breeding site, i.e., where females give birth and/or raise their offspring.

- Hibernaculum / hibernation roost/winter roost – where bats spend extended periods of torpor during the winter months.

- Notable hibernacula – hibernacula where the maximum count of Lesser Horseshoe Bats is over 10 individuals.
- Summer roost – used by one or a number of bats outside of the winter hibernation period but not for breeding.
- Night roost – a place of shelter used by bats to rest during the night but where conditions are not suitable for roosting in the day, e.g., they may be too light and exposed.

3.2.4 With regard to other bat species the following has been recorded; three maternity roosts (and one ancillary roost, i.e., also used by pipistrelles from a main maternity roost); three hibernacula; seven summer roosts; and two possible summer roosts.

3.2.5 A mixture of species (including Lesser Horseshoes) have been recorded at various structures along the route, including at four subways (including Hopyard underpass; a previous underpass converted into a designated Lesser Horseshoe Bat crossing as part of Section 1 works); four over road points; five river culverts; and nine other culverts. All of these locations are shown in Figure 4.

3.2.6 A summary of Lesser Horseshoe Bat records from previous surveys is provided in Tables 3.1 to 3.3.

3.2.7 A summary of structures of value to bats is provided in Table 3.4.

3.2.8 The sources of Information for Tables 3.1 to 3.4 are maximum count data and number of contacts from the following reports:

- Strategic Study of Potential for Impacts on Lesser Horseshoe Bat: Baseline Monitoring Report 2009 (Jacobs May 2010).
- Lesser Horseshoe Bat Roosts in the Clydach Gorge: Summary of Survey Work and Monitoring to Date (Jacobs March 2008).
- A465 Abergavenny to Hirwaun Dualling: Section 2, DMRB Stage 3: Ecology Factual Report Volumes 1 (2007).
- A465 (T) Heads of the Valleys Dualling Section 1: Abergavenny to Gilwern Usk Bat Sites SAC Monitoring of Lesser Horseshoe Bats Summary Report Surveys(2005-2012). TACP

3.2.9 Features of importance were taken from an overall map drawn by Dr Peter Smith.

Table 3.1: Lesser Horseshoe Bat maternity roosts

Name	Use	Max Count (all months)	Max Count (pre-parturition survey)[2]
Clydach Viaduct East Span (M1)	Maternity Roost (LHB)	43	43
Clydach House (M2)	Maternity Roost (LHB)	86	59
Auckland House (M3)	Maternity Roost (LHB)	164	126
Llanwenarth House (M4)	Maternity Roost (LHB)	232	142

[2] Pre-parturition counts: 29 May – 17 June

Table 3.2: Lesser Horseshoe Bat hibernation roosts

Name	Use	Note	Frequency of presence (no. of occasions bats recorded out of total counts)	Max Count (all months)	Max Count (Jan / Feb)	Median Count (all months)	Median Count (Jan / Feb or pre-parturition survey)
Pylon Cave (H1)	Notable Hibernaculum (LHB) and Cave	29 counts between 1995 & 2012	25/29	33 LHB	33 LHB	4	6
Ogof Craig a Ffynnon (H2)	Notable Hibernaculum (LHB) and Cave	88 counts between 1995 & 2012	62/88	25 LHB	25 LHB	6	17
Coal Tar Adit	Hibernaculum (LHB)	43 counts between 1995 & 2012	11/43	3 LHB	1 LHB	0	0
Elled Coal Adit (East)	Hibernaculum (LHB)	50 counts between 1995 & 2012	2/50	3 LHB	1 LHB	0	0
Ogof Nant Rhin	Hibernaculum (LHB)	18 counts between 1995 & 2012	5/18	3 LHB	3 LHB	0	0
Ogof Pont Gam	Hibernaculum (LHB)	13 counts between 1995 & 2012	7/13	8 LHB	8 LHB	1	1
Rolling Mill Leat	Hibernaculum (LHB)	20 counts between 1995 & 2012	2/20	1 LHB	1 LHB	0	0
Water Wheel Leat	Hibernaculum (LHB)	30 counts between 1995 & 2012	15/30	3 LHB	1 LHB	1	0
Brynmawr Old Dig	Hibernaculum (LHB) in a Cave	26 counts between 1995 & 2012	7/26	1 LHB	1 LHB	0	0
Overhang Cave	Hibernaculum (LHB) in a Cave	23 counts between 1995 & 2012	0/23	0 LHB	0 LHB	0	0
Waterfall Cave	Hibernaculum (LHB) in a Cave	91 counts between 1995 & 2012	41/91	5 LHB	5 LHB	0	2
Ogof Rhaeadr DdU	Hibernaculum (LHB) in a Cave	20 counts between 1995 & 2012	13/20	7 LHB	7 LHB	1	1
Ogof Clogwyn	Hibernaculum (LHB) in a Cave	28 counts between 1995 & 2012	20/28	4 LHB	3 LHB	1	1
Beech Tree Cave	Hibernaculum (LHB) in a Cave	32 counts between 1995 & 2012	3/32	1 LHB	0 LHB	0	0
Elm Hole	Hibernaculum (LHB) in a Cave	32 counts between 1995 & 2012	8/32	1 LHB	1 LHB	0	0

Name	Use	Note	Frequency of presence (no. of occasions bats recorded out of total counts)	Max Count (all months)	Max Count (Jan / Feb)	Median Count (all months)	Median Count (Jan / Feb or pre-parturitio n survey)
Devil's Bridge Cave	Hibernaculum (LHB) in a Cave	23 counts between 1995 & 2012	4/23	2 LHB	1 LHB	0	0
Ogof Capel	Hibernaculum (LHB) in a Cave	93 counts between 1995 & 2012	54/93	6 LHB	6 LHB	1	2
Ogof Gellynnen	Hibernaculum (LHB) in a Cave	93 counts between 1995 & 2012	51/93	3 LHB	3 LHB	1	1
Shakespeare's Cave	Hibernaculum (LHB) in a Cave	32 counts between 1995 & 2012	12/32	4 LHB	4 LHB	0	1
UB40	Hibernaculum (LHB) in a Cave	36 counts between 1995 & 2012	9/36	1 LHB	1 LHB	0	0
Ogof Craig a Ffynnon II	Hibernaculum (LHB) in a Cave	34 counts between 1995 & 2012	7/34	3 LHB	1 LHB	0	0
Small Cave (Blackrock Quarries)	Hibernaculum (LHB) in a Cave	91 counts between 1995 & 2012	24/91	7 LHB	7 LHB	0	0

Table 3.3: Other Lesser Horseshoe Bat roosts

Name (see Figure 4 for locations)	Use
Hidden Cave	Roost Summer (LHB)
Clydach Viaduct Span 8	Roost Summer (LHB)
Clydach Viaduct Pump House Span	Roost Summer (LHB)
Rock Fissures	Roost Summer (LHB)
Platform Building 1	Roost Summer (LHB)
Coal Depot R025	Roost Summer (LHB)
Rock Shelter	Roost Summer (LHB)
Beech Tree	Roost Summer (LHB)
Derelict Garage RO82	Roost Summer (LHB)
Rustic Bungalow RO80	Roost Summer (LHB)
Lean to at Wenallt RO75	Roost Summer (LHB)
Gilwern Rectory Coach House	Roost Summer (LHB)
Chapel (disused)	Roost Summer (LHB)
Gilwern Viaduct West End	Roost Summer (LHB)
Gilwern Viaduct East End	Roost Summer (LHB)
Pump House	Roost Summer (LHB)
Upper Mill Ruin Chimney	Roost Summer (LHB)
Clydach Ironworks	2 x Roost (LHB) Summer and possibly Winter, 1 x Roost Night (LHB)
Unknown roost location ch. 30550	Roost Night (LHB)
Unknown roost location ch. 30700	Roost Night (LHB)
Probable Cave	Roost Night (LHB)
Platform Building 2	Roost Night (LHB)
Tree R032	Roost Night (LHB)
Silver Birch Tree	Roost Night (LHB)
Llam March House Farm Lower Barn R026	Roost Night (LHB)
Shelter	Roost Night (LHB)
Old Bridge/ Saleyard Bridge	Roost Night (LHB)
New Bridge	Roost Night (LHB)
Tree	Roost Night (LHB)
Tree/Bridge	Roost Night (LHB)
Tree	Roost Night (LHB)
Dan-y-Lan Farm	Roost Night (LHB)
Ivy House Barn	Roost Night (LHB)
Pantybeiliau Farm Wood Shelter R004	Roost Night (LHB)
River Culvert Under Canal	Roost Night (LHB)
Aberbaiden Farm	Roost Night (LHB)
Hopyard Farm	Roost Night (LHB)

Name (see Figure 4 for locations)	Use
Rail Viaduct R044	Roost Night (LHB)
Rift	Roost (LHB) Summer and possibly Winter
Alcove nr Gellyfelen Railway Tunnels	Roost (LHB) Summer and possibly Winter
Haymans Cottage Cellars/Ynys-y-Garth	Roost (LHB) Summer and possibly Winter
Llwyd Newydd R043	Roost (LHB) Summer and possibly Winter
Road Drain	Roost (LHB) Summer and possibly Winter
Old Iron Works	Roost (LHB) Summer and possibly Winter
Road Drain 1	Roost (LHB) Summer and possibly Winter
Stone Drainleat (Disused)	Roost (LHB) Summer and possibly Winter
Road Drain 2	Roost (LHB) Summer and possibly Winter
Road Drain 3	Roost (LHB) Summer and possibly Winter
Road Drain 4	Roost (LHB) Summer and possibly Winter
Tree	Roost (LHB) Summer and possibly Winter
Road Drain 5/S18	Roost (LHB) Summer and possibly Winter
Auckland House Lime Kilns	Roost (LHB) Summer and possibly Winter
Storm Drain (SD1)	Roost (LHB) Summer and possibly Winter
Stone Storm Culvert	Roost (LHB) Summer and possibly Winter
Tecweld Factory	Roost (LHB) Summer and possibly Winter
Small Cave	Roost (LHB) Summer and possibly Winter

Table 3.4: Road crossing structures potentially used by bats.

Name (see Figure 4 for locations)	Use	Note	Number of contacts recorded (not max count)	Max LHS Bat Activity Index (BAI)
SW1	Subway	1 survey effort nights	1 LHB, 5 Myotis, 1 BLE	13.33
SW2/M15	Subway	21 survey effort nights - 20/07/1995, 29/06/2006, 06-12/08/2012, 13-28/09/2012	1 LHB	34.39
SW3/M26	Blackrock Subway	12 survey effort nights - 26/06/1995, 20/07/1995, 08-14/08/2013, 06-08/09/2013	1 GHB	0
SW4/M33	Pant Glas Subway	18 survey effort nights - 26/06/1995, 05/07/1995, 15-21/08/2012, 23-30/08/2012, 06-08/09/2012	2 LHB	16.67
Clydach Gorge East, Layby	Over road flyway	Over Road Survey recorded - p45, p55, Noctule, LHB, Myotis	Rarely used by LHB	N/a
Clydach Gorge East, Bus Stop	Over road flyway	Over Road Survey recorded - p45, p55, Noctule, GHB	Not used by LHB	N/a
Gilwern Bus Stop	Over road flyway	Over Road Survey recorded p45, p55 and Noctule	Not used by LHB	N/a
Gilwern Footbridge	Over road flyway	Over Road Survey recorded p45, p55, LHB and Myotis	Rarely used by LHB	N/a
BC1/C3	Bat Culvert (used by bats)	5 survey effort nights - 27-28/06/2006, 07-08/07/2006, 22/08/2006	1 LHB, 6 Myotis, 4 p45	8.33
BC2/C10	Bat Culvert (used by bats)	4 survey effort nights - 07-08/07/2006, 22-23/08/2006	1 Myotis, 10 p45, 1 p55, 5 Noc/ser	0
BC3/C11	Bat Culvert (used by bats)	Potential bat flyway under bridge at Clydach Viaduct roost	Not surveyed but assumed to be used by LHB	n/a
BC4/M20	Bat Culvert (used by bats)	72 survey effort nights - 20/07/1995, 01-05/07/1998, 01-05/08/1998, 05-07/07/2005, 12-14/09/2005, 15-16/07/2008, 26-	17 LHB, 1 BLE, 1 p45	525

Name (see Figure 4 for locations)	Use	Note	Number of contacts recorded (not max count)	Max LHS Bat Activity Index (BAI)
		28/08/2008, 08-11/09/2008, 20-21/07/2009, 30/07/2009, 05/08/2009, 07-09/09/2009, 12-15/07/2010, 13-16/09/2010, 17-20/07/2011, 18-21/09/2011, 12/08/2008, 23/07/2009, 21/06-01/07/2012, 14-21/08/2012		
BC5/M22	Bat Culvert (used by bats)	51 survey effort nights - 03-04/07/2006, 07-08/07/2006, 15-17/07/2008, 12/08/2008, 26-28/08/2008, 08-11/09/2008, 10-11/09/2008, 20-22/07/2009, 30/07/2009, 05/08/2009, 07-10/09/2009, 12-15/07/2010, 13-16/09/2010, 17-20/07/2011, 18-21/09/2011, 07-08/07/2006 20-21/06/2012, 31/08-04/09/2012	19 LHB, 30 p45	79.17
BC6/M28	Bat Culvert (used by bats)	16 survey effort nights - 27-28/06/2006, 12-21/08/2012, 06-11/09/2012	1 p45, 3 p55, 13 noc/ser (records likely to be from outside of culvert)	4.17
BC7/C17	Bat Culvert (used by bats)	Used as a roost only as closed with mesh at north end 52 survey effort nights - 27-28/06/2006, 15-16/07/2008, 09-11/09/2008, 20/07/2009, 12-15/07/2010, 13-16/09/2010, 17-20/07/2011, 18-21/09/2011, 27-28/06/2006, 04-05/09/2006, 26/08/2008, 23/07/2009, 30/07/2009, 05/08/2009, 07-09/09/2009, 14-21/08/2012, 13-21/09/2012	5 LHB	62.5
BC8/M29	Bat Culvert (used by bats)	25 survey effort nights - 27-28/06/2006, 07-08/07/2006, 22-23/08/2006,	2 p45, 1 p55, 6 noc/ser (records likely to be from outside of culvert)	0

Name (see Figure 4 for locations)	Use	Note	Number of contacts recorded (not max count)	Max LHS Bat Activity Index (BAI)
		07-12/08/2012, 13-25/09/2012		
BC9/C15	Bat Culvert (used by bats)	27 survey effort nights - 05-07/07/2005, 12-14/09/2005, 03-05/10/2005, 27-28/06/2006, 04-05/09/2006, 22-23/08/2006, 06-12/08/2012, 31/08-04/09/2012	2 p55, 1 noc/ser (records likely to be from outside of culvert)	0
BC10	Bat Culvert (used by bats)	79 survey effort nights - 01-05/07/1998, 01-05/08/1998, 01-05/09/1998, 05-08/07/2005, 12-14/09/2005, 03-05/10/2005, 15-16/07/2007, 14-16/07/2008, 12/08/2008, 26-28/08/2008, 08-10/09/2008, 20-23/07/2009, 30/07/2009, 05/08/2009, 07-10/09/2009, 12-15/07/2010, 13-16/09/2010, 17-20/07/2011, 18-21/09/2011, 20-28/07/2012, 23-29/08/2012	12 LHB, 28 Myotis, 2 p45, 153 p55, 2 Noc/ser	75
RC1	River Culvert (used by bats)	5 survey effort nights - 07-08/07/2006, 22-23/08/2006, 17/08/1995	2 LHB, 292 Myotis, 1 BLE, p45 445, p55 118, noc/ser 393	13.33
RC2	River Culvert (used by bats)	22 survey effort nights - 03-04/07/2006, 07-08/07/2006, 22-24/08/2006, 31/08-05/09/2012, 13-21/09/2012	4 LHB, 234 Myotis, p45 130, p55 11, noc/ser 6	16.67
RC3 / M12	River Culvert (used by bats)	2 survey effort nights - 07-08/07/2006	3 LHB	25.00
RC4 / M14	River Culvert (used by bats)	20 survey effort nights - 07-08/07/2006, 22/08/2006, 04-05/09/2006, 20/07/1995, 22-29/08/2012, 06-11/09/2012	3 LHB, 34 Myotis, 44 p45	26.67
RC5	River Culvert (used by bats)	Considered to be the most important crossing point under Section 2.	48 LHB, Myotis 60, 2 p45, 210 p55, 1 Noc/ser	2044.44
Hopyard underpass	Bat underpass	Considered to be the most important crossing point under Section 1.	Regularly over 100 passes per night. Max count of 395	3292

Name (see Figure 4 for locations)	Use	Note	Number of contacts recorded (not max count)	Max LHS Bat Activity Index (BAI)
		Monitored since 2005 following construction of Section 1.	in September 2007. Count of 144 in September 2012.	

Cwm Clydach Woodlands SAC

Beech woodland distribution

3.2.10 The distribution of the two woodland habitat features (‘Atlantic acidophilous beech forests with *Ilex* and sometimes also *Taxus* in the shrublayer’ and ‘Asperulo – Fagetum beech forests’ within the Cwm Clydach Woodlands SAC is shown on Figure 5, based on NVC data supplied by NRW.

Baseline information – Scheme-specific surveys

Usk Bat Sites SAC

Bats

3.2.11 As a continuation of the extensive surveys undertaken since the 1990s and reviewed in the Desk Study Section 3.2, further scheme–specific surveys have been undertaken for bats, including the following:

- Monitoring of known Lesser Horseshoe Bat roost sites, including Clydach House, Auckland House, Saleyard Bridge, Cave at Blackrock Quarry, Beech Tree Cave, Clydach Viaduct, Coal Tar Adit, Devil’s Bridge Cave, Elm Hole, Old Brynmawr Dig, Ogof Capel, Ogof Craig a Ffynnon, Ogof Clogwyn, Ogof Gellynen, Overhang Cave, Ogof Nant Rhin, Ogof Pont Gam, Ogof Rhaedr Ddu, Pylon Cave, Shakespeare’s Cave, UB40 Cave, Waterfall Cave.

- Review, inspection and further monitoring of buildings and structures likely to be affected by the proposed scheme for bat roosting (Buildings at Risk Survey and Assessment for Bats, December 2012 & Bat survey of structures, December 2012), including: the Anacomp Factory “bat house” (Lesser Horseshoe Bat roost present), Drum and Monkey Pub (no roosts identified), disused Chapel (occasional Lesser Horseshoe Bat day and night roost), Lion Hotel (pipistrelle roost), Rose Cottage (pipistrelle roost), pump house beneath Clydach Viaduct (no roost in building, occasional use of associated tank by Lesser Horseshoe Bats), 1&2 School Houses (pipistrelle roost), Caravan Site Building (Lesser Horseshoe Bat and pipistrelle roost), Former Conoco Filling Station Site (no roost identified), Vale View House (pipistrelle roost), Sewage Works Buildings (no roosts identified), Clydach Culverts including canalised section (some potential for minor roosting identified) and sections of retaining wall (which also have some potential for minor bat roosts).

- Review of trees likely to be affected by the proposed scheme for bat roosting potential (Preliminary Bat Roost Assessment (Trees), October 2012). This has reviewed 191 trees, finding 5 category 1* trees (trees with multiple, highly suitable features capable of supporting larger roosts), 50 Category 1 trees (trees with definite bat potential, supporting fewer suitable features than category 1* trees or with potential for use by single bats) and 136 Category 2 trees (trees with no obvious potential, although the tree is of a size and age that elevated surveys may result in cracks or crevices being found; or the tree supports some features which may have limited potential to support bats). A further 6 groups of trees have been assessed, with a single group falling into Category 1 and the remainder in Category 2. As the assessment was undertaken in the summer a precautionary approach was taken when surveying trees whose canopies were not fully visible from the ground. Large, mature trees which were considered likely to have potential even though no signs of bat use or suitable features were visible were classified as category 2 trees if they could not be fully assessed. Parts of the survey area comprised very steep banks which made accessing all sides of some trees difficult. Areas of dense scrub vegetation also prevented the close inspection of some trees. If a tree could not be fully assessed on all sides and was considered to be of a size and condition suitable for bat roosts, it was classified as a category 2 tree.

- Transect and static remote recording of bat flightlines and potential crossing points (Bat Activity Survey, January 2013). In general the River Clydach and linear woodland-edge features along the scheme are all considered to be extremely valuable as bat flight-lines and foraging habitat. In addition, a considerable number of features have been shown to be used by Lesser Horseshoe Bats (and other species in some cases) as crossing points across the existing A465 road. Lesser Horseshoe Bat was recorded on four of the six transects but few contacts were detected and those that were, were brief. The exception to this was along Transect 2 where Lesser Horseshoes were recorded more frequently within mature beech woodland and along a footpath south of the HOV road. Foraging was frequently recorded in this area. The brief contacts in other locations were located within or along areas of dense woodland. Lesser horseshoes were also recorded using Pont Harri subway under the HOV road at the eastern end of Transect 2 near to where the majority of the activity was recorded. Lesser horseshoes were recorded infrequently within the survey area and were associated with areas of woodland where there was no artificial light. No Lesser Horseshoe Bats were confirmed over the HOV road. Two brief contacts were recorded along the edge of the road but were likely to have been located within woodland beside it, as Lesser Horseshoe Bats are considered unlikely to fly over a lit road (refer to 3.3.70 and Stone *et al*. 2009). Lesser Horseshoe Bat

Tilio-Acerion woodland

3.2.12 The JNCC description for Tilio-Acerion woodland (see Appendix C for full details) states that:

'Tilio-Acerion ravine forests are woods of Ash *Fraxinus excelsior*, Wych Elm *Ulmus glabra* and lime (mainly Small-leaved Lime *Tilia cordata* but more rarely Large-leaved Lime *T. platyphyllos*). Introduced Sycamore Acer *pseudoplatanus* is often present and is a common part of the community in mainland Europe, where it is native. The habitat type typically occurs on nutrient-rich soils that often accumulate in the shady micro-climates towards the bases of slopes and ravines.

Therefore it is found on calcareous substrates associated with coarse scree, cliffs, steep rocky slopes and ravines, where inaccessibility has reduced human impact. It often occurs as a series of scattered patches grading into other types of woodland on level valley floors and on slopes above, or as narrow strips along stream-sides. More extensive stands occur on limestone and other base-rich rocks. This habitat type is ecologically variable, particularly with respect to the dominant tree species.

The main NVC types conforming to Tilio-Acerion forests are the 'western' forms (subcommunities d-g) of W8 *Fraxinus excelsior – Acer campestre - Mercurialis perennis* woodland, and the equivalent north-western community W9 *Fraxinus excelsior – Sorbus aucuparia – Mercurialis perennis* woodland.

3.2.13 The distribution of W8 and W9 in the vicinity of the Scheme was established by unpublished CCW surveys from 2008). It should be noted, however, that whilst these communities can be indicative of Tilio-Acerion woodland, there is no direct relationship between the two classification systems and the broader description of Tilio-Acerion embraces a wider range of woodland communities. Discussions with NRW failed to yield clear objective criteria that could be used to define what constitutes Tilio-Acerion woodland, and published guidance is rather subjective. Given the limitations in determining if units of woodland qualify as Tilio-Acerion woodland, each of the areas surveyed were placed into one of the following categories:

- strongly conforms to Tilio-acerion;
- moderately conforms to Tilio-acerion;
- weakly conforms to Tilio-acerion; or
- does not conform to Tilio-acerion.

3.2.14 The criteria used to assign each woodland unit to one of these listed categories are provided in Appendix C. The results of this survey are shown in Figure 6.

3.2.15 In addition, targeted surveys of bryophytes and liverworts in tufa flushes within Tilio-acerion woodland were carried out in 2013 (Bosanquet & Motley, 2013). This surveyed a colony of the moss *Orthothecium rufescens* on the north bank of the River Clydach within the Usk Bat Sites SAC. *Orthothecium rufescens*, is a distinctive red pleurocarpous moss which is Red Listed and therefore nationally scarce in Wales. This species is not referred to in the performance indicators for Tilio-acerion woodland, but another species associated with calcareous flushes is listed (*Ctenidium molluscum*).

3.2.16 The flush containing the colony of *Orthothecium rufescens* is located on a large (5m high x 3m wide) deposit of partially dried out tufa at grid reference SO21362143, near to the bottom of the

Clydach Gorge at approximately Ch 31366 opposite Blackrock Quarry, approximately 30 metres below the level of the existing A465.

Caves not open to the public

3.2.17 Beneath the Mynydd Llangatwg Plateau lies more than 40km of caves which run in a NNW to SSE direction through the Carboniferous Limestone and from the plateau down to the River Clydach. Locations of known cave systems are shown in Figure 7.

3.2.18 A number of the caves run underneath the existing A465, and some of the cave roofs lie within 5-10m of the surface of the existing road.

3.2.19 The cave system trends NNW to SSE reflecting the flow direction of groundwater controlled by the regional faults.

3.2.20 Investigations to more accurately determine the location, size and extent of the caves below the proposed road were undertaken in 1997 during the preliminary studies for the scheme. The method of investigation used was Ground Probing Radar.

3.2.21 Due to advances in technology and improvements in the penetration depth of radar over the last 10 years a further Ground Penetrating Radar survey was undertaken in April 2013. The results of this survey show 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 but overall depth assessments have been refined. The investigation only highlighted one additional area of possible fractured /voided ground outside of those general areas previously identified. The results of the Ground Probing Radar survey are outlined in Table 3.5 below.

Table 3.5: Principal Cave Locations that are within Influencing Distance of the Scheme.

Name	Entrance Coordinates	Surface Level m	Length	Approx chainage cave below A465	Approx Depth below A465	Comment
Ogof Nant Rhin	SO2104012420	250	346m	Ch31000 to Ch31050	13m	Narrow passage way crossing the carriageway in an approximate N-S direction. Depth of cave below carriageway reported as 13m. Not picked up by geophysics conducted in 1996. May 2013 GPR survey suggests a cavity at 11m at Ch 31045.
Ogof Nant Gam	Ogof Pont Gam	-	-	Survey details unknown	Depth/ survey details unknown.	Reported to pass beneath A465 and join Ogof Nant Rhin.
Overhang Cave	SO2124412331	239	39m	Ch31225 to Ch31240	13m	Narrow single passageway passing at a depth of approximately 13m below the existing carriageway. Not picked up by geophysics conducted in 1996. May 2013 GPR survey suggests a cavity at 5 to 8m depth at Ch 31260.
Waterfall Cave	SO2127412497	248	105m	Ch31160 to Ch31300	8m	Single stream passage from SW edge of Blackrock Quarry. System opens into a chamber approximately 10m long by 10m wide and about 3m high. Roof approximately 8 below carriageway of existing A465. Interpolation based on Cave survey data. May 2013 GPR survey suggests fracture zone between Ch 31300 to 31310. Open fractures most likely at depth of between 5 and 7m.

Name	Entrance Coordinates	Surface Level m	Length	Approx chainage cave below A465	Approx Depth below A465	Comment
Daren System linking to Elm Hole Resurgence Cave	SO2150112457	209	680m	Ch31450 to Ch31500	>30m	Cave connected to a series of flooded stream channels. Not accurately surveyed. Reported as >30m below carriageway level. Not picked up by geophysics conducted in 1996. May 2013 GPR survey suggests no clear cavity feature at depths shallower than 10m. A possible fracture zone is identified between Ch 31450 and Ch31490.
Ogof Capel	SO2165612593	219.5	796	Ch31650 to Ch31700	6 to 8m	Resurgence cave linked to the Craig Y Ffynnon cave system.Series of passages that cross the A465 at relatively shallow depth (<8m). Depth based on interpretation of cave survey undertaken by Chelsea Spelaeological Society (1989-2001). May 2013 GPR survey suggests a possible void at Ch 31690 to Ch31705.
Ogof Gelynnen	SO2167912612	220.5	35	Unknown	6 to 8m	Linked to Ogof Capel Depth based on interpretation of cave survey undertaken by Chelsea Spelaeological Society (1989-2001)
Possible cave or Fracture Zone						May 2013 GPR survey suggests a possible void or fractured ground at Ch 31000 to Ch31030. Depth range 3m to 5m located around the western lay-by area. The anomalies are typical of fractured limestone with occasional larger fractures.

River Usk SAC

Otter

3.2.22 Locations of Otter signs found during surveys are provided on Figure 8 (a-f). Surveys have confirmed that otters are present on the River Clydach and tributaries and the Monmouthshire and Brecon canal. Bridge surveys over a wider area also show a strong otter presence on the nearby sections of the River Usk. Evidence of otters along the Clydach was not as common as appeared to be the case with the Usk, however, and was more substantial along the more easterly section of the scheme (from Clydach Village to Gilwern). This seems to reflect the evidence found in the 2006 surveys, which identified evidence of otters along the River Clydach eastward from Devils Bridge. In the case of the 2012 survey little evidence for the presence of otters was identified any further west than had been previously, however a possible slide location was noted further westwards in the Clydach Dingle areas, suggesting that otters may occasionally, at least visit this section of the river. A single probable spraint was also identified at River Clydach Culvert 2. These are thought to represent evidence of very occasional exploratory behaviour by otters from the downstream section of the River Clydach, rather than evidence that otters from further upstream may be utilising these reaches of the river.

3.2.23 This view is supported by the survey work associated with the A465 Heads of the Valleys Improvement Scheme Section 3, which found no evidence of otter activity in water courses associated with that section of the road, which lies at the western end of Section 2.

3.2.24 Access for otters along the River Clydach is affected by a number of structures which may deter otter presence to a greater or lesser extent. The presence of a culverted section of the river at Clydach Village does not seem to have significant effects on otter permeability. However, access to the more westerly sections of the river for otters is encumbered by the presence of a particularly deep natural chute with very steep rock walls at Devil's Bridge, a concrete weir associated with River Clydach culvert 3, which has a vertical section of around 2.5m and no steps or other means for otters to pass through it. A further vertical drop of some 2.5-3m exists in the culvert under the existing Brynmawr Roundabout. The combination of these features along with difficult adjacent terrain (or the need to effectively leave the line of the water course and cross roads) may explain the relative paucity of results in the recent survey and that in 2006.

3.2.25 Evidence of otter activity from tributaries to the River Clydach was also limited, although this may be explained in some cases due to the nature of the confluences, which are frequently culverted under the existing A465, and may also contain other natural barriers such as substantial waterfalls, which are likely to prove true barriers to otters.

3.2.26 However, given that otters can range over considerable distances from substantial water-courses, the presence of otters cannot be discounted from any sections of the scheme, including all areas of the Clydach and potentially all tributaries. Otter activity was also noted along the Monmouthshire and Brecon Canal, both in 2006 and the recent surveys.

3.2.27 Two hover locations (temporary otter resting-up locations) identified in the River Clydach to the west of Gilwern in 2006 could not be identified with any certainty during the recent survey visits, although the section in which they were previously identified has abundant potential locations for hovers and indeed for true holts. Notwithstanding this potential, no holts were identified during the survey, which may be as a result of the very rocky river bed offering limited opportunity for deeply under-washed tree root systems. Given the normal distribution of resting places (holts, couches and hovers) along an individual's territory, it would be expected that a number of hovers may be present along the section of the River Clydach affected by the scheme.

3.3 Potential effects on the Usk Bat Sites SAC

Lesser Horseshoe Bat

Construction phase

Habitat loss - loss of roosts

3.3.1 No Lesser Horseshoe Bat maternity roosts would be lost due to construction, although construction of the new carriageway above the Clydach Viaduct maternity roost would change conditions to the north of the existing road/roost, which could affect how bats use the viaduct roost (refer to paragraph 3.3.39).

3.3.2 Lesser Horseshoe Bat roosts that would be lost to the scheme include:

- A Lesser Horseshoe Bat summer day roost (8 or 9 bats recorded in August 2012) in the Chapel building at ch. 34970 would be lost due to construction. This roost is outside the SAC boundary.
- A Lesser Horseshoe Bat summer roost in the toilet block at the caravan site on Station Road, ch. 33720 would be lost due to construction. The number of bats using this roost is undetermined but may be in the region of 15 individuals (based on droppings present). This roost is outside the SAC boundary.
- A Lesser Horseshoe Bat summer day roost in a recess in the cliff would be lost at ch. 30860. A radio-tagged bat was tracked to this location in August and September 2005. It may also be used by other individual bats. This roost is inside the SAC boundary.

- A Lesser Horseshoe Bat hibernation site, Coal Tar Adit at ch. 29900 would be lost. This roost is outside the SAC boundary and is occasionally used by Lesser Horseshoe Bat (maximum count during surveys prior to 2009 of three bats).

3.3.3 It is possible that unknown roosts may exist and be affected by the Scheme, although extensive survey has been undertaken to determine any roosts that would be affected. The most likely examples of unknown roosts are any undiscovered caves under the Scheme that may be used by bats, road drains/chambers or small night roosts, such as cavities under tree roots or recesses in the cliff.

3.3.4 The conservation objectives for Lesser Horseshoe Bat include that *"buildings, structures and habitats on the site will be in optimal condition to support the populations", and that "management of the surrounding habitats is of the appropriate type and sufficiently secure to ensure that there is likely to be no reduction in population size or range, nor any decline in the extent or quality of breeding, foraging or hibernating habitat."*

3.3.5 The loss of Coal Tar Adit hibernation site, whilst outside the SAC boundary, is contrary to the conservation objectives, as it would constitute a loss of hibernating habitat that contributes towards maintaining the SAC population of Lesser Horseshoe Bats. However, given its low-use and availability of hibernation sites along the gorge it is likely that the small number of bats that currently use Coal Tar Adit would use another hibernation site instead. As bats have not been observed on all survey occasions, it is considered likely that the bats recorded in the adit also use other sites. It should be noted that out of 23 survey visits made between 1994 and 2012 bats were only observed on five occasions, the last being in 1998. Whilst this does not mean that bats were not present and hidden somewhere unable to be observed, it does point to the fact that Coal Tar Adit is used relatively little by bats compared with other underground sites in the area and therefore is likely to be of low functional value. Coal Tar Adit could also be used during the summer as a night roost and possibly for other functions, such as a 'stepping-stone' roost, allowing easier access to a wider foraging resource. However, its entrance is currently obstructed by bramble scrub, and for this reason its use is considered likely be very limited.

3.3.6 Performance indicators for hibernating bats give minimum target numbers of 270 Lesser Horseshoe Bat at Agen Allwedd Cave, 280 at Buckland Ice House and 60 at Foxwood Cave, as well as the 18 for Clydach Gorge Caves and 47 to be recorded at least once in the Clydach Gorge Caves during the six year monitoring cycle. These figures were constructed using the lowest and highest counts in the previous SAC reporting cycle. This was to allow for natural fluctuation & prescribes that numbers can go up to a natural carrying capacity but there should be no downward trend. The loss of roosting opportunity for a minimum of 3-5 bats would represent c0.8% of the total or c22% of the Clydach Gorge Caves minimum target wintering Lesser Horseshoe Bat population. However, with the availability of alternative roosts nearby and by incorporating mitigation measures to avoid bat mortality, it is not expected that these bats would be lost but would simply move to other suitable roost sites.

3.3.7 In the absence of suitable mitigation, this effect would be certain, negative, limited in extent to the loss of one low-use hibernation roost, which is currently possibly obstructed to bats by bramble scrub around the adit entrance. The effect would be permanent and irreversible.

3.3.8 The loss of the summer and winter roost sites is contrary to the conservation objectives for Lesser Horseshoe Bat in that it would result in a reduction in available roosting habitat. However, as Tables 3.1 to 3.3 show, there are numerous roost sites along Section 2.

3.3.9 In the absence of suitable mitigation, this effect would be certain, negative, limited in extent to the three known roosts lost, permanent and irreversible. Mitigation is therefore proposed in Chapter 4.

Habitat loss - loss of foraging habitat

3.3.10 Lesser Horseshoe Bats primarily forage in mature broadleaved woodland and along tree belts and mature hedgerows (Schofield, 1996 and Bontadina et al., 2002).

3.3.11 Total losses of woodland habitat, including the Scheme footprint, construction buffer and temporary landtake, potentially used by foraging Lesser Horseshoe Bat would be approximately 11.64 ha of semi-natural broadleaved woodland, 2.54 ha of broadleaved plantation woodland, 2.53 ha of mixed plantation woodland, 1.36 ha of coniferous plantation woodland and 0.35 ha of various hedgerow types (Table 1.2), which gives a total figure of 18.42 ha.

3.3.12 The approximate footprint of the Scheme, construction buffer and temporary landtake within the Usk Bat Sites SAC is 11.08 ha. This figure includes approximately 2.39 ha of semi-natural broadleaved woodland, minimal losses of plantation woodland and no losses of hedgerow (Table 1.2).

3.3.13 Radio-tracking studies have shown that pregnant bats reduce their home range from maternity roosts during the third trimester of pregnancy (Schofield et al 2002). Heavily pregnant bats may confine foraging to within 1km of the roost, and some may forage over a smaller distance of 600m. Maintenance of foraging habitat within 1km of key maternity roosts is therefore of importance in ensuring that the roosts remain viable. Radio-tracking studies have also shown that Lesser Horseshoe Bats select woodland in which to forage, and that this is predominantly broadleaf woodland (Bontadina et al 2002 and Motte & Libois 2002). Figure 9 shows currently available woodland habitat within 1km of the four known maternity roosts close to the Scheme. Woodland habitat losses within a 1km radius of these roosts due to the Scheme are shown below in Table 3.6.

Table 3.6: Losses of foraging habitat within 1 km of maternity roosts.

Roost	Existing foraging habitat within 1km (ha)	Max LHB count (all months, from Table 3.1)	Bats / ha of foraging habitat	Loss of foraging habitat within 1km (ha)				Percentage loss (%)	Potential adverse effect in absence of mitigation?
				Scheme	5m buffer	Temporary landtake	Total		
Clydach Viaduct (M1)	39.33	43	1.09	2.29	0.90	0.52	3.71	9.43	Yes
Clydach House (M2)	45.36	86	1.90	4.10	1.08	0.87	6.05	13.34	Yes
Auckland House (M3)	41.70	164	3.93	1.95	0.71	0.09	2.75	6.59	Yes
Llanwenarth House (M4)	22.72	232	10.21	0.12	0.15	0.84	1.11	4.89	Yes

3.3.14 Percentage habitat loss within 1km of the maternity roosts ranges from 4.89% (Llanwenarth House) to 13.34% (Clydach House).

3.3.15 Bat foraging habitat would be lost along the whole of the Scheme route. There is a large amount of good-quality foraging habitat in the surrounding area which would be unaffected by the Scheme, but it is not clear to what extent competitive pressure on bats already using this habitat would adversely affect the Lesser Horseshoe Bat population when foraging activity is displaced from cleared areas into surrounding areas. It is likely that much of the affected habitat in the vicinity of the scheme would not be as valuable as mature broadleaved woodland situated away from the road because much of it is secondary growth woodland that has developed since the road was built in the 1960s and is subject to light spillage from existing street lights. Table 3.6 shows that there is variability in the number of bats per hectare of available foraging habitat between different roosts, which potentially suggests that not all foraging habitat is currently fully utilised by bats.

3.3.16 The conservation objectives state that there should be “no loss of foraging habitat used by the bats”, and the performance indictor for ‘foraging areas and links to roosts’ states that “there should be no net loss of suitable woodland, scrub and hedgerows within the SAC or adjoining areas used by the bats”.

3.3.17 In the absence of suitable mitigation, effects on foraging habitat within 1 km of Llanwenarth House, Clydach Viaduct, Clydach House and Auckland House maternity roosts would be certain, negative, permanent in duration and irreversible and contrary to the conservation objectives for Lesser Horseshoe Bat. Mitigation is therefore proposed in Chapter 4.

3.3.18 Although there are a number of known bat hibernation sites within the Clydach valley, many of these have low and infrequent usage. There are two notable sites. In order of importance, these are Ogof Craig y Ffynnon and Pylon Cave. Ogof Craig y Ffynnon (OCF) is an extensive cave system that provides a range of roosting conditions that the bats require during the winter. Other winter sites are comparatively small and so may be less suitable in terms of temperature stability throughout the winter (CCW, 2012). In addition to the intrinsic qualities of OCF, it is situated in close proximity to large areas of good quality foraging habitat with good connectivity, making it an ideal winter roosting site. OCF and Pylon Cave account for 55-75% of the total winter count (Jan/Feb) (CCW pers. comm.). Ogof Rhaeadr Ddu (SO21271254), Ogof Pant Gam (SO20901260), Waterfall Cave (SO21271249), Ogof capel (SO21661259), Ogof Gelynnen (SO21681260) and others in the central part of valley are arguably 2nd order sites with frequent use but low numbers. There is also an indication of a trend from the run of cave counts of both an increase in numbers and a shift of proportion using Pylon Cave and the central area.

3.3.19 A study of Lesser Horseshoe Bats in Cheddar Gorge, Somerset found that the mean distance that Lesser Horseshoe Bats travelled from hibernation sites during bouts of winter feeding was 1.2 km (Williams, 2001). It should be noted that only one study of winter foraging range is currently available and availability of different habitats in the Clydach Gorge may differ from that in Cheddar Gorge. However, this is the best indicator of hibernation roost range size available. Figure 9 shows currently available woodland habitat within 1.2 km of the two notable hibernation roosts close to the Scheme. Whilst all hibernation sites are important, these two locations are used to consider winter foraging impact via habitat loss, as the areas within the 1.2km radius zones also encompass the majority of woodland habitat around other hibernation roosts along the scheme. Woodland habitat losses within 1.2km of these roosts due to the Scheme are shown below in Table 3.7.

Table 3.7: Losses of foraging habitat within 1.2 km of hibernation roosts.

Roost	Existing foraging habitat within 1km (ha)	Max LHB count (all months, from Table 3.1)	Bats / ha of foraging habitat	Loss of foraging habitat within 1km (ha)				Percentage loss (%)	Potential adverse effect in absence of mitigation?
				Scheme	5m buffer	Temporary landtake	Total		
Pylon Cave	60.13	33	0.55	1.92	1.23	0.60	3.76	6.24	Yes
Ogof Craig y Ffynnon	78.47	25	0.32	2.27	1.40	0.46	4.12	5.24	Yes

3.3.20 Woodland habitat losses for the two hibernation sites are 5.24% for Ogof Craig y Ffynnon and 6.24% for Pylon Cave.

3.3.21 The conservation objectives state that there should be “no loss of foraging habitat used by the bats”, and the performance indictor for ‘foraging areas and links to roosts’ states that “there should be no net loss of suitable woodland, scrub and hedgerows within the SAC or adjoining areas used by the bats".

3.3.22 In the absence of suitable mitigation, effects on the foraging habitat within 1.2 km of the two notable hibernation roosts would be certain, negative, permanent in duration and irreversible, and contrary to the conservation objectives for Lesser Horseshoe Bat. Mitigation is therefore proposed in Chapter 4.

Disturbance to species – mortality during construction

3.3.23 The destruction of the four bat roosts as outlined in 3.3.2 could result in mortality of bats if they are present when the roosts are lost, however, bats would be excluded from these roosts prior to destruction and/or the roosts would be dismantled carefully under the supervision of a licensed bat ecologist, meaning that it is extremely unlikely that any bats would be killed. Whilst this sensitive destruction could be considered as mitigation, it is included within the scheme design without mitigation as it is plainly established and uncontroversial mitigation and it would not be possible to destroy these roosts under licence from NRW without undertaking such methods to avoid killing any bats. More detail on the methods to be used is included in Chapter 4.

3.3.24 This effect would be extremely unlikely, negative, limited in extent to a very small number of bats (less than 5), short/medium-term in duration and reversible (in that the reduction in population size would not be significant when considering the total population of Lesser Horseshoe Bats in the SAC, would be within likely natural fluctuations and the population should be able to recover[3]), and would be a one-off event.

3.3.25 Another cause of mortality during construction could be disruption to flight-lines causing bats to fly over the road at risk of being killed by collision with traffic. It is considered that bats mainly use existing road crossing structures, e.g. culverts and subways to cross under the road, although there have been occasional sightings of bats crossing over the road that could have been Lesser Horseshoe Bats and this species was also recorded by Anabats (automated bat detectors) during over-road crossing surveys. However, the previous survey reports are inconclusive as to whether Lesser Horseshoe Bats actually crossed over the road. Research by Stone et al. (2009) showed that Lesser Horseshoe Bats actively avoid lit areas, such as the existing road.

3.3.26 If bats do occasionally cross over the road they are already at risk of mortality from collision with vehicles. Of the existing road crossing structures, there are five crossing points that are used significantly more than others by Lesser Horseshoe Bats (refer to Table 3.3), namely:

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[3] Bats have a low reproductive rate, typically less than 1 progeny per year, but have a longer lifespan than other mammals of similar size. The maximum age of Lesser Horseshoe Bat recorded in Europe is 21 years but the average age of animals in nursery roosts is substantially lower at 4-5 years (Dietz *et. al*., 2009).

- BC4/M20 [4](ch. 31100, max. bat activity index (BAI) 525);
- BC5/M22 (ch. 31170, max. BAI 79);
- BC10 /C18 (ch. 33700, max. BAI 75);
- RC5 (Saleyard Bridge)/E35 (ch. 33800, max. BAI 2044); and
- Hopyard underpass (ch. 36900, max BAI 3292).

3.3.27 As well as these five crossings, river culverts RC3/M12 and RC4/M15 are also considered likely to be well used by Lesser Horseshoe Bat, particularly based on radio-tracking survey results.

3.3.28 The remaining structures have had less than 5 Lesser Horseshoe Bat passes recorded (as a maximum count), although it is possible that bats may use these culverts at different times of year, i.e., on nights when they were not surveyed, including during the winter. The number of bat passes recorded does not necessarily equate to the number of bats crossing, as bats will often fly up and down within a culvert or around the culvert entrance. Nevertheless, given the changes to the landscape around the structures it is possible that bats may cross the road and that a small number of Lesser Horseshoe Bats could be killed by collisions with traffic during construction. Refer also to section 3.3.50 for assessment of habitat fragmentation and severance.

3.3.29 During construction, the Scheme would be lit such that it mimics operational lighting levels as far as is practicable (see paragraph 3.3.49), and therefore bats would be deterred from crossing. With the provision of lighting, the effect of mortality due to bats attempting to cross the road during construction would be extremely unlikely, negative, short-term in duration and reversible (given that even if bats are temporarily deterred from using crossing points, it is highly likely that bats will start to use the extended under-road crossings once vegetation has re-established around the culvert entrances). No additional mitigation measures to reduce mortality are therefore required.

Disturbance to species – damage or obstruction of access to roosts

3.3.30 There are several roost sites close to or within the Scheme (see Table 3.8 below and Figure 4).

3.3.31 Roost sites that would definitely be lost are described in 3.3.2. There are other roost sites where potential damage could occur to the roost entrances or where the roosts are in structures associated with the existing road which would be retained but where access could be temporarily restricted (including by disturbance) by construction activities.

[4] Culverts / crossing points generally have two codes; the first is the code used in previous bat surveys, and the second is the code used by the contractor. Both have been included to ensure that structures can be identified on older documents and on engineering drawings produced for the Scheme.

Table 3.8: Potential damage / obstruction of access to Lesser Horseshoe Bat roosts.

Roost (see Figure 4)	Potential effect	Potential adverse effect in absence of mitigation?
Clydach Viaduct East Span maternity roost	Temporary disturbance during construction of road on north side and repair works. The construction of the new eastbound carriageway would change conditions to the north of the existing road/roost, which could affect how bats use the viaduct roost.	Yes
Clydach Viaduct Span 8 summer roost	Temporary disturbance during construction of road on north side and repair works. The construction of the new eastbound carriageway would change conditions to the north of the existing road/roost, which could affect how bats use the viaduct roost.	Yes
Clydach Viaduct Pump House Span summer roost	Temporary disturbance during construction of road on north side and repair works. The construction of the new eastbound carriageway would change conditions to the north of the existing road/roost, which could affect how bats use the viaduct roost.	Yes
Waterfall Cave	No direct impact Possible severance of cave connection to cave entrances south of road.	Yes
LHB road drain roost 1 Ch. 33970 LHB road drain roost 2 Ch. 34000 LHB road drain roost 3 Ch. 34700 LHB road drain roost 4 Ch. 34510 LHB road drain roost 5 Ch. 34780	Temporary disturbance during construction	Yes
Ogof Gelynnen and Ogof Gelynnen second entrance	No direct impact likely	No

3.3.32 A detailed cave survey, including use of ground-penetrating radar, has been carried out to assess potential for damage to occur to Ogof Gelynnen and Ogof Gelynnen second entrance (an occasional winter roost for Lesser Horseshoe Bat), which lies close to and potentially under the scheme at ch. 31750. The survey confirmed that the cave system is 6-8m below the A465 (Table 3.5) and no direct impact is likely.

3.3.33 There are also five Lesser Horseshoe Bat roosts in road drains under the existing carriageway (See Figure 4 for locations). These structures would be retained but the entrances could be affected by construction works.

3.3.34 Radio-tracking studies have determined use of these roosts by low numbers of bats, but precise numbers are unknown and the results represent the minimum number of bats and such structures being used, with no information on frequency of use. Further survey of these structures is planned for summer 2013.

3.3.35 The worst case scenario caused by damage to these roosts is that they become permanently unsuitable for Lesser Horseshoe Bats due to obstruction of the roost entrances. In this case, impacts would be assessed as for the loss of roost sites above, and would represent an adverse effect for the same reason. This effect is assessed as extremely unlikely as the retention of these roosts has been taken fully into account during scheme design.

3.3.36 A possible effect of construction would be to render the roost sites temporarily unavailable to bats.

3.3.37 In the absence of suitable mitigation, this effect would be uncertain, negative, limited in extent to the number of bats using the affected roosts, short-term in duration (construction period from 2014-2017) and reversible.

3.3.38 It is therefore considered that the temporary loss of non-breeding Lesser Horseshoe Bat roosts could have an adverse effect on Lesser Horseshoe Bats. Suitable mitigation is therefore proposed in Chapter 4.

3.3.39 Construction of the northern carriageway at Clydach Gorge Viaduct (Ch. 30720-30800) could potentially affect the Lesser Horseshoe Bat maternity roost present underneath this structure. Access to this roost would not be wholly obstructed since the southern edge of the viaduct is open to the gorge and would remain so during construction. However, there is also a small access available for bats under the carriageway that emerges onto the northern side of the road. Construction of the northern carriageway could therefore make this access unattractive to Lesser Horseshoe Bats, which would cause bats to travel further to areas of foraging habitat and increase competitive pressure on foraging habitat south of the viaduct.

3.3.40 In the absence of suitable mitigation, this effect would be probable, negative, limited in extent to around 40 bats in the affected roost at any one time, short -term in duration (construction period from 2014-2017) and irreversible.

3.3.41 It is therefore considered that disturbance to a Lesser Horseshoe Bat maternity roost could have an adverse effect on Lesser Horseshoe Bats. Mitigation is therefore proposed in Chapter 4.

Disturbance to species – noise and vibration during construction

3.3.42 Noise and vibration generated during the construction of the Scheme has the potential to cause disturbance to Lesser Horseshoe Bats in two ways. Firstly, noise and vibration may disturb bats in roosts close to the Scheme. Secondly, construction noise during hours of darkness may disturb bats foraging in adjacent habitat, rendering the habitat less suitable for bats.

3.3.43 Bats, including Lesser Horseshoe Bats, can be quite tolerant of noise whilst roosting, particularly if the noise is ‘regular’ or not unexpected and the bats become accustomed to it. The bats using the Clydach Viaduct roost are obviously tolerant of the road noise and vibration over the viaduct and another Lesser Horseshoe Bat maternity roost, with up to 220 bats recorded in July 2004, in the much busier M5 Wynhol Viaduct also shows Lesser Horseshoe Bat tolerance to regular noise (Highways Agency unpublished data). Lesser Horseshoe Bats are also known to become accustomed to other forms of disturbance, including roosting adjacent to haul routes within working mines (Robert Stebbings pers. comm.) and roosting within the living areas of houses and tolerating the activities of humans living there (Richard Green pers. experience).

3.3.44 However, there is some potential in the absence of mitigation for noise events to disturb bats in roosts during construction, particularly from loud construction activities such as piling. This effect is considered unlikely, but appropriate mitigation is identified in Chapter 4.

3.3.45 Bats foraging in habitat adjacent to the scheme throughout its length could be deterred from foraging and displaced into adjacent habitat, therefore increasing competitive pressure for resources and increasing flight times between roosts and foraging areas. However, given the presence of the existing road, and the fact that working at night would be very limited in extent, it is considered extremely unlikely that foraging bats would be significantly affected by construction noise.

Disturbance to species – lighting during construction

3.3.46 Lighting is known to have a deterrent effect on Lesser Horseshoe Bats (Stone *et a*l. 2009), and therefore any increases in light levels in foraging areas or flightlines adjacent to the Scheme is likely to render the habitat less suitable for Lesser Horseshoe Bats and displace foraging activity and commuting into adjacent areas, thereby increasing competitive pressure for resources.

3.3.47 The existing carriageway is already lit with streetlamps, and vehicular traffic also contributes to an existing baseline level of light pollution in adjacent habitats.

3.3.48 Night-time construction will be required at many locations, which would require additional lighting, and security lighting would be required for construction compounds. This could result in light spillage into areas of foraging habitat not currently affected by the existing lighting. Sensitive lighting design to minimise light spillage would be employed, and night working would be avoided close to occupied roosts where possible. No temporary construction compounds would be located inside the SAC.

3.3.49 Furthermore, there is commitment from the ECI Contractor (Costain) to light the Scheme during construction to mimic current operational lighting levels so far as practicable. Therefore, any significant additional adverse effects on bat foraging behaviour are considered extremely unlikely.

Habitat fragmentation – severance of flightlines

3.3.50 The severance of flightlines used by Lesser Horseshoe Bat can restrict access to roosts and foraging habitat. Bats are known to cross under the A465 in several places along the Scheme (Table 3.9) and have also been observed flying along vegetation at the road edge. Loss of woodland areas, scrub and hedgerows alongside the Scheme could also result in severance of flightlines.

Table 3.9: Potential effects on Lesser Horseshoe Bat crossing points.

Crossing point No. (see Figure 4)	Potential effect	Potential adverse effect in absence of mitigation?
RC1 / E4	No significant change	No
SW1 / E7	No significant change	No
RC2 / E10	No significant change	No
RC3 / M12	To be extended by 2m. No significant change or vegetation loss. No change in angle	No
BC1 / C3	Extension of 20.5m culvert 3.5m to the south and removal of vegetation around southern entrance may reduce use by bats or cause bats not to use it in the short-term. No change in angle. Proposed vertical manhole 1.5m high, 1.5m wide, 2.15m long with 250mm bar spacing trash screen replaces 1.1m diameter, 2m high manhole with 100mm bar spacing grating	In combination with other modified culverts
RC4 / M14	No significant change	No
SW2 / E15	Extension of culvert and insertion of 1.8m diam. pipe for dedicated bat crossing. Low bat use recorded. In the short-term bats may not use the culvert due to the initial change in the landscape but in the long-term, bats are likely to use the culvert more, as there will be no lighting (currently it is lit) and vegetation will be planted up to the entrance. 12.7m high, 2.4m diameter vertical manhole added for route extension up cliff face. No other change in angle.	In combination with other modified culverts

Crossing point No. (see Figure 4)	Potential effect	Potential adverse effect in absence of mitigation?
BC2 / C10	Extension of culvert to the north and removal of vegetation around northern entrance may reduce use by bats or cause bats not to use it in the short-term. 12 degree slope from horizontal of existing 700mm diameter pipe increases to 39 degree slope to horizontal for 900mm diameter pipe extension	In combination with other modified culverts
BC3 / C11	Extension of culvert to the north and removal of vegetation around northern entrance may reduce use by bats or cause bats not to use it in the short-term. New 10m high, 3m diameter vertical manhole added and 1.8m diameter pipe to viaduct at 13 degree slope from horizontal replaces gap under north end of viaduct (gap more likely to be used by bats than existing 700mm pipe with significant water flow)	In combination with other modified culverts
BC4 / M20	Extension of culvert to the north and removal of vegetation around northern entrance may reduce use by bats or cause bats not to use it in the short-term. Additional new 1.2mx1.2m box culvert dedicated for bat use at 2 degrees from horizontal compared to existing retained but extended 1.2m diameter culvert at 1 degree slope from horizontal.	In combination with other modified culverts
BC5 / M22	Extension of culvert to the north and removal of vegetation around northern entrance may reduce use by bats or cause bats not to use it in the short-term. Existing 1.2m / 0.9m diameter pipe at 3 degree slope from horizontal compared to 1.8m diameter extension pipe at 15 degrees to horizontal.	In combination with other modified culverts
SD1 / C12	No significant change	No

Crossing point No. (see Figure 4)	Potential effect	Potential adverse effect in absence of mitigation?
SW3 / M26	Extension of culvert and insertion of 1.8m diam. pipe for dedicated bat crossing. Low bat use recorded. In the short-term bats may not use the culvert due to the initial change in the landscape but in the long-term, bats are likely to use the culvert more, as there will be no lighting (currently it is lit) and vegetation will be planted up to the entrance. No change in slope although additional 5.7m high, 2.4m diameter vertical manhole at north end.	In combination with other modified culverts
BC6 / M28	Retention of existing 39.5m long 1200mm diameter pipe. Existing headwall to be demolished and replaced with a new headwall with a trash screen with 140mm clear space between vertical fins. Minor habitat loss around culvert entrances to enable construction work. Both of these issues could deter bats from entering culvert. No change in slope.	In combination with other modified culverts
BC7 / C17	Existing 27m long 300mm diameter pipe to be filled in. Lesser horseshoe bats have been observed emerging from this pipe but it is not possible for them to fly right through it as there is a mesh covering the north opening. Therefore it is assumed that bats roost in the pipe. Filling in the pipe will therefore result in the loss of a roost.	No. The culvert is not a crossing point and therefore there would be no change
BC8 / M29	Extension of culvert to the north and removal of vegetation around northern entrance may reduce use by bats or cause bats not to use it in the short-term	In combination with other modified culverts
BC9 / C15	No significant change	No
SW4 / M33	Extension of culvert and insertion of 1.8m diam. pipe for dedicated bat crossing. Low bat use recorded. In the short-term bats may not use the culvert due to the initial change in the landscape but in the long-term, bats are likely to use the culvert more, as there will be no lighting (currently it is lit) and vegetation will be planted up to the entrance. Part of the 1.8m diameter extension at 29 degrees to horizontal compared to rest of pipe at 1 degree to horizontal that matches existing slope.	In combination with other modified culverts

Crossing point No. (see Figure 4)	Potential effect	Potential adverse effect in absence of mitigation?
BC10 / C18	No significant change	No
RC5 / E35	No significant change	No
Hopyard Underpass	Loss of planting above northern entrance and construction of retaining wall. Planting to be retained each side of underpass entrance.	No

3.3.51 If crossing points become unusable by bats, this could either increase flight times between roosts and foraging areas as the bats find alternative routes, thereby increasing energy expenditure and reducing fitness, or could force bats to attempt to cross the road above ground, thereby increasing risk of mortality, with a potentially adverse effect on fitness and survival. However, given that lighting has been shown to deter Lesser Horseshoe Bats, it is considered unlikely that they would attempt to cross the lit road (refer to 3.3.25 & 3.3.70).

3.3.52 This would be contrary to the SAC performance indicator F.13 (connectivity) for 'foraging areas and links to roosts' which notes that links between foraging areas, maternity roosts and hibernacula are provided by hedgerows, woodland, scrub and lines of trees and requires that major gaps in the continuity of these habitats should not be created.

3.3.53 In the absence of suitable mitigation, this effect would be probable, negative, limited in extent to populations of bats which currently use flightlines that could be severed by the Scheme, long-term in duration and irreversible.

3.3.54 Details of proposed mitigation together with an assessment of residual effects are provided in Chapter 4.

Habitat deterioration – dust generation during construction

3.3.55 DMRB Vol 11 Section 3 Part 1 HA207/07 (Air Quality) suggests that dust emissions are most likely to require active mitigation for sources within 200m of a sensitive ecological area.

3.3.56 As the Scheme passes through areas of Lesser Horseshoe Bat foraging habitat , the deposition of dust onto vegetation has the potential to adversely affect bat foraging by either making vegetation less suitable for invertebrate prey (the dust itself deterring invertebrates), or by affecting vegetation growth such that invertebrates are less attracted to the vegetation. If adjacent areas of habitat adjacent to the Scheme become less suitable for foraging bats, they would be displaced into habitat further away, increasing competitive pressure for resources.

3.3.57 In practice, the potential zone of vegetation that could be significantly affected by dust generation is likely to be less than 200m wide. Met office data for the Usk weather station gives an average annual rainfall of 1077mm and an average number of days of rainfall (precipitation > 1mm) per year of 134.7. This is likely to reduce the effects of dust generation by washing dust off vegetation, when compared to parts of the UK with lower rainfall.

3.3.58 In addition, the bats should be capable of finding alternative foraging habitat given the large amount of foraging habitat available adjacent to the scheme and the likelihood that the habitat most affected by dust generation during construction is currently underutilised due to effects of light spillage from the existing carriageway.

3.3.59 In the absence of suitable mitigation, this effect would be probable, negative, limited in extent to a slight decline in suitability of a small quantity of foraging habitat for bats, short-term in duration, and reversible.

3.3.60 As part of construction best practice, measures to minimise the effects of dust generation will be put in place via the Construction Environment Management Plan. These measures are outlined in Chapter 4.

Habitat deterioration – discharge of pollutants to watercourses during construction

3.3.61 The Scheme is adjacent to the River Clydach along its length. Construction activities giving rise to discharge of pollutants into the watercourse could have adverse effects on foraging bats if invertebrate populations in the river are affected.

3.3.62 Key construction activities that could adversely affect water quality are:

- In-channel or river bank works
- Earthworks near to the river
- Use of vehicles and machines near watercourses
- Spoil / storage heaps near watercourses
- Storage and use of chemicals, oil, concrete and cement in or near watercourses
- Disposal of water from construction activities
- Accidental spillages or leakages, including contamination from old mine workings

3.3.63 In the absence of suitable mitigation, this effect would be probable, negative, limited in extent to the length of affected watercourse, short-term in duration and reversible. Given the large amount of suitable bat foraging habitat in the area, there is a large resource of invertebrate prey that is not dependent on the watercourse. It is therefore considered that there is unlikely to be an adverse effect on Lesser Horseshoe Bats. Best practice construction measures would be put in place to minimise effects during construction, and these are summarised in Chapter 4.

Operational effects

Disturbance to species – mortality during operation

3.3.64 Lesser Horseshoe Bats are known to cross the road using existing culverts and underpasses. The design of the road has therefore included the retention of all potential under-road crossings and their extension where necessary. Lesser Horseshoe Bat are known to be deterred from crossing open spaces by lighting and given that the existing carriageway is lit, there is extremely likely to be an existing deterrent effect in operation. A very small amount of mortality of bats crossing the road above ground may occur, so the need for mitigation has been assessed further on a precautionary basis.

3.3.65 The alterations to existing crossing points (culverts) may lead bats to attempt to cross the Scheme aboveground, thereby increasing potential mortality, although given that lighting has been shown to deter Lesser Horseshoe Bats, it is considered unlikely that they would attempt to cross the lit road (refer to 3.3.51).

3.3.66 The Scheme could therefore lead to a slight increase in bat mortality, although this is difficult to quantify.

Disturbance to species – noise during operation

3.3.67 Noise generated during the operation of the Scheme has potential to cause disturbance to bats foraging adjacent to the Scheme.

3.3.68 Limited studies have been undertaken on the impacts of noise on bats. A study of Greater Mouse-eared Bat *Myotis myotis*, a species that gleans its prey from the ground or vegetation, relying more on the rustling sounds of its prey rather than echolocation, found that traffic noise impaired the foraging success of greater mouse-eared bats (Siemers & Schaub, 2010). Traffic noise is broadband, up to 50 kHz, with energy declining from low to high frequencies. It is therefore considered extremely unlikely that traffic noise would interfere with Lesser Horseshoe Bats, as they tend to catch prey using echolocation rather than listening for their prey and their echolocation calls are at around 110-115 kHz.

3.3.69 Whilst a noise assessment has been undertaken, this is based on human receptors rather than bats and is therefore not directly relevant. However, based on the predicted noise change for both the Do-Minimum scenario in the baseline year against Do-Something scenario in the baseline year (short-term) and in the future assessment year (long-term), the level of significance is considered to range between major beneficial to major adverse, although more receptors are likely to experience a noise decrease rather than a noise increase. It is therefore likely that foraging bats would also experience a net decrease in noise levels along the scheme. It is therefore considered that there would be no adverse effect on Lesser Horseshoe Bats.

Disturbance to species – lighting during operation

3.3.70 Lighting is known to have a deterrent effect on Lesser Horseshoe Bats (Stone *et al*. 2009), and therefore any increases in light levels in foraging areas or flightlines adjacent to the Scheme is likely to render the habitat less suitable for Lesser Horseshoe Bats and displace foraging activity and commuting into adjacent areas, thereby increasing competitive pressure for resources. The use of directional lighting for the Scheme is likely to cause less light spillage into adjoining areas than currently exists.

3.3.71 The existing carriageway is already lit with streetlamps, and vehicular traffic also contributes to an existing baseline level of light pollution in adjacent habitats.

3.3.72 The road would be lit, and directional ‘warm’ or ‘neutral’ white LED lighting would be used such that light spillage into adjacent foraging habitat would be avoided.

3.3.73 Warm, and to a lesser extent neutral, white LED lighting, having less blue spectral component than ‘cool’ white lighting, is considered to have a lesser potentiality of impact on a wide spectrum of animal behaviours, biological functions and rythms, including attractiveness to insects (Patriarca & Debernadi, 2010, Emma Stone pers. comm.).

3.3.74 It is therefore considered extremely unlikely that there would be any significant increase in disturbance to foraging bats or that more insects would be attracted to the road from adjacent woodland habitat during operation compared to the existing baseline.

3.3.75 It is not therefore considered that there would be a significant adverse effect on foraging behaviour due to operational lighting.

Habitat deterioration – discharge of pollutants into watercourses during operation

3.3.76 The discharge of pollutants into the River Clydach or its tributaries during operation of the Scheme could have adverse effects on foraging bats if invertebrate populations in the river are affected.

3.3.77 Road runoff is currently not attenuated and is discharged untreated into the river. Accidental spillages could therefore lead to a significant pollution incident. In the absence of suitable mitigation, this effect would be unlikely, negative, limited in extent to the length of affected watercourse, short-term in duration and reversible. Given the large amount of suitable bat foraging habitat in the area, there is a large resource of invertebrate prey that is not dependent on the watercourse. It is therefore considered that there is unlikely to be an adverse effect on Lesser Horseshoe Bats.

3.3.78 However, the highways drainage design for the Scheme includes mechanisms to reduce the potential severity of effects from accidental spillages. Details are provided in Sections 4.2.115 - 4.2.124.

Habitat deterioration – aerial emissions during operation

3.3.79 DMRB Vol. 11 Section 3 Part 1 HA207/07 ‘Air Quality’ requires an assessment of effects on SACs within 200m of the Scheme that have habitats potentially sensitive to changes in air quality.

3.3.80 Bat foraging habitat (woodland, scrub, trees) is not necessarily inherently sensitive to changes in air quality, although an assessment has been undertaken for potential effects on woodland habitat SAC features (Appendix D).

3.3.81 This assessment concluded that there is no potential for adverse effects on woodland beyond 50m from the Scheme, and that there would be no adverse effect on the integrity of *Tilio-acerion* woodland within 50m of the scheme as a result of the operation of the proposed scheme due to changes in air quality. It is therefore considered that there would be no adverse effect on Lesser Horseshoe Bat foraging habitat, and no further mitigation is therefore required.

Tilio-acerion woodland

Construction phase

Habitat loss – direct land take

3.3.82 The distribution of the *Tilo-acerion* woodland feature in the vicinity of the scheme has been determined by reference to previous NVC surveys, through additional surveys carried out as part of the Scheme assessment process, and through consultations carried out with CCW. Woodland within the W8e, W8f and W9a NVC communities was assessed in terms of strongly, moderately or weakly conforming to the definition of *Tilio-acerion* woodland. The distribution of these woodland types is shown on Figure 6.

3.3.83 The scheme avoids direct land take in all areas of woodland which strongly, moderately or weakly conforms to *Tilio-Acerion* woodland.

3.3.84 There would not therefore be an adverse effect on the SAC feature, and no further consideration of mitigation is required.

Habitat loss – changes in hydrology during construction

3.3.85 A tufa flush supporting rare lower plant communities was identified on a block of partially dried out tufa near to the bottom of the Clydach Gorge at approximately Ch 31390 opposite Blackrock Quarry, approximately 35 metres below the level of the existing A465.

3.3.86 The potential for the construction of the Scheme to have an adverse effect on this flush by altering local hydrology during rock cutting was assessed,.

3.3.87 Existing highway drainage in the area is by gulleys and carrier pipes which discharge via a series of outfalls directly to the side of the gorge. The nearest upstream outfall is at Ch 31360 which drains an area of approximately $364m^2$. The drainage proposed for the Scheme would remove this outfall and redirect the highway drainage to a new outfall further downstream. Whether the existing outfall contributes some or all of the flow to enable the tufa to form is not proven, but is thought unlikely for the following reasons.

3.3.88 Firstly, the existing road has been operational for 51 years (it was opened in 1962). Tufa precipitation rates in the UK range from 0.2 mm/yr to 8 mm/yr (Pentecost, 1978, 1981, 1987) which after 50 years could result in a formation up to 40cm in height or length. 40cm however should be considered a maximum dimension. Bosanquet and Motley (2013) in their bryophyte survey report refer to a 'massive' block of tufa, which is substantially larger than 40cm in size, strongly suggesting that its formation predated the construction of the road. Furthermore, its 'partially dried out' state would suggest that it is no longer actively growing and that the hydrological conditions that led to its formation have subsequently changed significantly.

3.3.89 Secondly, the distance between the existing highway outfall and the tufa formation is some 35m. This is a very short distance in which the highway runoff could dissolve the limestone bedrock to a point of becoming supersaturated such that on discharge, it degasses to precipitate calcite, the form of calcium carbonate of which tufa is composed. In addition, not only is the distance short but the gradient is steep therefore lessening further the time the runoff would be in contact with the limestone bedrock sufficient to enable it to dissolve it sufficiently.

3.3.90 Given the above it is considered much more likely that the tufa-forming waters originated from further afield to the north of the road. The regional hydrological gradient of the karst system of the Clydach Gorge as demonstrated by the orientation of known caves is NNW-SSE. In that direction from the tufa deposit lies Blackrock Quarry. Further removal of limestone bedrock as a result of the Scheme would be confined to the volume beneath the existing Main Road which would be lowered by up to a couple of metres to accommodate the eastbound carriageway of the Scheme. Such a limited removal of limestone bedrock immediately below an existing road surface and significantly above the existing cave stream levels would have no effect on the karst hydrology and hence on the existing tufa formation.

3.3.91 There would not therefore be an adverse effect on the SAC feature, and no further consideration of mitigation is required.

Habitat deterioration – generation of dust during construction

3.3.92 DMRB Vol 11 Section 3 Part 1 HA207/07 (Air Quality) suggests that dust emissions are most likely to require active mitigation for sources within 200m of a sensitive ecological area.

3.3.93 As the Scheme is adjacent to areas of *Tilio-acerion* woodland, the deposition of dust onto vegetation has the potential to negatively affect habitat quality by affecting vegetation growth.

3.3.94 In practice, the potential zone of vegetation that could be significantly affected by dust generation is likely to be less than 200m wide. Met office data for the Usk weather station gives an average annual rainfall of 1077mm and an average number of days of rainfall (precipitation > 1mm) per year of 134.7. This is likely to reduce effects of dust generation by washing dust off vegetation, when compared to parts of the UK with lower rainfall.

3.3.95 Furthermore, there is already a road present which is likely to generate some dust in areas closest to the existing carriageway, and the Tilio-acerion woodland present in the gorge is not considered to be particularly high quality. It is considered likely that the vegetation would be capable of recovering from the effects of dust when construction ceases.

3.3.96 In the absence of suitable mitigation, this effect would be probable, negative, limited in extent to the areas of woodland close to the road, short-term in duration, and reversible.

3.3.97 As part of construction best practice, measures to minimise the effects of dust generation will be put in place via the Construction Environment Management Plan. These measures are outlined in Chapter 4.

Operational phase

Habitat deterioration – aerial emissions during operation

3.3.98 The assessment of operational air quality impacts on woodland is provided in Appendix D.

3.3.99 This assessment concluded that there is no potential for adverse effects on Tilio-acerion woodland as a result of the operation of the proposed scheme due to changes in air quality, and no further mitigation is therefore required.

Caves not open to the public

Construction phase

Habitat loss – direct land take

3.3.100 The known locations of caves are shown on Figure 7 and summarised in Table 3.5.

3.3.101 The widening of the existing A465 through the Blackrock area does not cut through known cave systems. However, it is possible (albeit very unlikely) that unknown cave systems and related features occur in areas of cut.

3.3.102 Should any unknown cave systems be present in areas of cut, any reduction in the extent of the cave system used by hibernating bats would be contrary to the conservation objectives for the feature: performance indicator A1 (extent and distribution) specifies that there should be no loss of suitable bat hibernating areas in unit 5, which encompasses the gorge slopes.

3.3.103 In the absence of suitable mitigation, the loss of cave habitat would represent a significant effect on the SAC feature, and would be very unlikely, long-term and irreversible. Suitable mitigation is therefore proposed in Chapter 4.

Habitat loss – indirect construction effects

3.3.104 Widening of the existing A465 through the Blackrock area has the potential to bury/disturb some of the lesser known/smaller cave entrances and lead potentially to collapse/disturbance of the caves/karst features that cross underneath the existing road at shallow depth.

3.3.105 Any reduction in the extent of the cave system used by hibernating bats would be contrary to the conservation objectives for the feature: performance indicator A1 (extent and distribution) specifies that there should be no loss of suitable bat hibernating areas in unit 5, which encompasses the gorge slopes.

3.3.106 In the absence of suitable mitigation, this would represent a significant effect on the SAC feature, and would be unlikely, long-term and irreversible. Suitable mitigation is therefore proposed in Chapter 4.

Habitat deterioration – changes in hydrology during construction

3.3.107 Construction activities in the vicinity of the cave system have the potential to cause damage beyond the extent of the scheme boundary itself, by altering hydrological characteristics (e.g. changes in flow of water through caves thereby affecting humidity), which could adversely affect the suitability of the cave systems to support hibernating bats.

3.3.108 Any reduction in the extent of the cave system used by hibernating bats would be contrary to the conservation objectives for the feature: performance indicator A1 (extent and distribution) specifies that there should be no loss of suitable bat hibernating areas in unit 5, which encompasses the gorge slopes.

3.3.109 In the absence of suitable mitigation, this would represent a significant effect on the SAC feature and would be probable, negative, limited in extent, long-term in duration, and irreversible. Suitable mitigation is therefore proposed in Chapter 4.

Habitat loss / deterioration – changes in air-flow during construction

3.3.110 Construction activities in the vicinity of the cave system have the potential to cause damage beyond the extent of the scheme boundary itself. Should any caves be broken into or existing entrances modified, including landform around entrances, this could affect caves adjacent to the scheme boundary by air-flow characteristics (e.g. changes in flow of air through caves thereby affecting temperature and humidity), which could adversely affect the suitability of the cave systems to support hibernating bats.

3.3.111 Any reduction in the extent of the cave system used by hibernating bats would be contrary to the conservation objectives for the feature: performance indicator A1 (extent and distribution) specifies that there should be no loss of suitable bat hibernating areas in unit 5, which encompasses the gorge slopes.

3.3.112 In the absence of suitable mitigation, this would represent a significant effect on the SAC feature. Suitable mitigation is therefore proposed in Chapter 4.

Construction / operation phase

Effects on bats

3.3.113 Impacts on Lesser Horseshoe Bats are summarised in Sections 3.3.1 - 3.3.69.

3.3.114 Whilst Lesser Horseshoe Bat is the only bat species that is a qualifying feature of the SAC, conservation objectives for the caves, include the use of the caves by other bat species, including greater horseshoe, Brandt's, Whiskered, Natterer's, Daubentons and Brown Long-eared Bats. It is considered that in the majority of cases, the assessment for other bat species would be adequately covered under that for Lesser Horseshoe and for others there would be no effect. A consideration of the effects on non-Lesser Horseshoe Bat species is considered in Table 3.10 below.

Table 3.10: Consideration of effects for other bat species.

Hazard	Clutter adapted[5] species (Greater Horseshoe, Natterer's, Daubenton's, Brown Long-eared)	Less clutter adapted species (Whiskered, Brandt's)	Comments
Construction phase			
Habitat loss - loss of roosts	No known roosts lost	No known roosts lost	No
Habitat loss - loss of bat foraging habitat	No different to LHB assessment and mitigation	No different to LHB assessment and mitigation	Whilst there are some differences in feeding ecology between species, woodland is considered an important foraging habitat for all species of bats. Refer to assessment for LHB
Disturbance to species – mortality during construction	No different to LHB assessment and mitigation	No different to LHB assessment and mitigation	Refer to assessment for LHB
Disturbance to species – damage or obstruction of access to roost sites	No known roosts affected	No known roosts affected	No effect
Disturbance to species – noise and vibration during construction	No different to LHB assessment and mitigation	No different to LHB assessment and mitigation	Refer to assessment for LHB
Disturbance to species – lighting during construction	No different to LHB assessment and mitigation	No different to LHB assessment and mitigation	Refer to assessment for LHB
Habitat fragmentation – loss of habitat Habitat fragmentation – severance of flightlines	No different to LHB assessment and mitigation	No different to LHB assessment and mitigation	It is expected that clutter adapted bats would fly through culverts. These bats are manoeuvrable and able to negotiate narrow spaces. Abbott *et al*. (2012) demonstrated that such species flew through narrow drainage pipes more readily than edge and open-space adapted species. Less clutter adapted species may also use culverts and are more likely to cross over the road above the lit carriageway and hence out of range of traffic, as they are considered more likely to fly in open-space. Refer to assessment for LHB

[5] Certain bat species are adapted for flight and foraging in cluttered airspace, in terms of having a broad wing morphology and echolocation signal design. Other species are adapted for woodland edge or open-space foraging and have a narrower wing morphology and echolocation calls that tend to have a constant frequency component. Whiskered and Brandt's bats are not open-space foragers and are adapted to foraging in woodland and are therefore clutter-adapted but not so much as the other species considered as clutter-adapted species.

Hazard	Clutter adapted[5] species (Greater Horseshoe, Natterer's, Daubenton's, Brown Long-eared)	Less clutter adapted species (Whiskered, Brandt's)	Comments
Operational phase			
Habitat deterioration – aerial emissions during operation	No different to LHB assessment and mitigation	No different to LHB assessment and mitigation	Refer to assessment for LHB
Disturbance to species – mortality during operation	No different to LHB assessment and mitigation	No different to LHB assessment and mitigation	It is expected that clutter adapted bats would fly through culverts. These bats are manoeuvrable and able to negotiate narrow spaces. Abbott *et al*. (2012) demonstrated that such species flew through narrow drainage pipes more readily than edge and open-space adapted species. Less clutter adapted species may also use culverts and are more likely to cross over the road above the lit carriageway and hence out of range of traffic, as they are considered more likely to fly in open-space. Refer to assessment for LHB
Disturbance to species – lighting during operation	No different to LHB assessment and mitigation	No different to LHB assessment and mitigation	Refer to assessment for LHB
Disturbance to species – noise during operation	No different to LHB assessment and mitigation	No different to LHB assessment and mitigation	Refer to assessment for LHB

3.4 Potential effects on Cwm Clydach Woodlands SAC

Asperulo-Fagetum beech forests and Atlantic acidophilous beech forests with *Ilex* and sometimes also *Taxus* in the shrub layer

Construction phase

Habitat deterioration – dust generation during construction

3.4.1 DMRB Vol 11 Section 3 Part 1 HA207/07 (Air Quality) suggests that dust emissions are most likely to require active mitigation for sources within 200m of a sensitive ecological area.

3.4.2 As the Scheme is close to areas of Beech woodland, the deposition of dust onto vegetation has the potential to negatively affect habitat quality by affecting vegetation growth.

3.4.3 In practice, the potential zone of vegetation that could be significantly affected by dust generation is likely to be less than 200m wide. Met office data for the Usk weather station gives an average annual rainfall of 1077mm and an average number of days of rainfall (precipitation > 1mm) per year of 134.7. This is likely to effects of dust generation by washing dust off vegetation, when compared to parts of the UK with lower rainfall.

3.4.4 There is already a road present which is likely to generate some dust in areas closest to the existing carriageway. The vegetation would be likely to be capable of recovering from the effects of dust when construction ceases.

3.4.5 In the absence of suitable mitigation, this effect would be probable, negative, limited in extent to the areas of woodland close to the road, short-term in duration, and reversible. It is not therefore considered to be an adverse effect on integrity.

3.4.6 As part of construction best practice, measures to minimise the effects of dust generation will be put in place via the Construction Environment Management Plan. These measures are outlined in Chapter 4.

Operational phase

Habitat deterioration – aerial emissions during operation

3.4.7 The assessment of operational air quality impacts on woodland is provided in Appendix D.

3.4.8 This assessment concluded that there is no potential for adverse effects on woodland as a result of the operation of the proposed scheme due to changes in air quality, and no further mitigation is therefore required.

3.5 Potential effects on River Usk SAC

Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation

Construction phase

Habitat deterioration – discharge of sediment and chemical pollutants to watercourses during construction

3.5.1 The Scheme is adjacent to the River Clydach along its length, and crosses over in more than one location (Figure 4). As well as the River Clydach there are 16 watercourses which would be receptors of surface water discharge from the A465. All flow into the Clydach and hence into the River Usk north of Gilwern, approximately 0.53km to the north of the scheme.

3.5.2 Construction activities giving rise to discharge of pollutants into Clydach and tributaries could therefore have adverse effects on the River Usk habitat feature if pollutant concentrations would rise significantly in areas of this habitat type.

3.5.3 Performance indicators for the distribution of this habitat within the SAC include limits for distribution in site units 2, 3 and 10. Unit 10 is upstream of the confluence of the River Clydach with the River Usk, and therefore would not be affected by any water quality effects due to the Scheme.

3.5.4 Units 2 and 3 are downstream of the confluence (the confluence occurs in Unit 4), and could therefore potentially be affected. Unit 3 starts approximately 7.4km downstream from the confluence, and unit 2 is a further c22.2km downstream, approximately 29.6km from the confluence.

3.5.5 It is considered that the dilution effect between the potential discharge points of pollutants to the Clydach through the c7.4km stretch of the River Usk before the start of Management Unit 3 would be such that a significant effect from normal construction activities would be unlikely, with the potential exception of large accidental spillages or leakages of toxic pollutants. A large-scale pollution incident of this nature could result in the deterioration of habitat quality through suppression of vegetation growth or through vegetation dieback.

3.5.6 In the event of a large-scale pollution incident occurring in the absence of suitable mitigation, this effect would be unlikely, negative, potentially extensive (i.e. could affect the a long stretch of the

River Usk, short -term in duration and reversible (i.e. it is likely that the habitats would recover in the medium-long term).

3.5.7 As part of construction best practice, measures to minimise the effects of dust generation will be put in place via the Construction Environment Management Plan. These measures are outlined in Chapter 4.

Operational phase

Habitat deterioration – discharge of pollutants into watercourses during operation

3.5.8 The River Clydach discharges into the River Usk north of Gilwern. Discharge of pollutants into the Clydach during operation could therefore have adverse effects on the River Usk habitat feature if pollutant concentrations would rise significantly in areas of this habitat type.

3.5.9 It is considered that the dilution effect between the potential discharge points of pollutants to the Clydach through the c7.4km stretch of the River Usk Management Unit 3 would be such that a significant effect from operation of the scheme would be unlikely, with the potential exception of large accidental spillages or leakages.

3.5.10 A large-scale pollution incident of this nature could result in the deterioration of habitat quality through suppression of vegetation growth or through vegetation dieback.

3.5.11 In the event of a large-scale pollution incident occurring in the absence of suitable mitigation, this effect would be unlikely, negative, potentially extensive (i.e. could affect a long stretch of the River Usk, short-term in duration and reversible (i.e. it is likely that the habitats would recover in the medium-long term).

3.5.12 The drainage design for the Scheme includes measures to reduce the risk of adverse effects from accidental spillages. These measures are summarised in Chapter 4.

Fish

3.5.13 For the purposes of this assessment, impacts on all fish species in the SAC assemblage are considered together.

Construction phase

Mortality and habitat deterioration – discharge of pollutants to watercourses during construction

3.5.14 The Scheme is adjacent to the River Clydach along its length, and crosses over in more than one location (Figure 4). The River Clydach discharges into the River Usk north of Gilwern, approximately 0.5km from the Scheme.

3.5.15 Construction activities giving rise to discharge of sediment and pollutants into the Clydach could therefore have adverse effects on fish in the River Usk habitat feature if pollutant concentrations would rise significantly such that populations are affected.

3.5.16 It is considered that the magnitude of any effect from normal construction activities would be low, with the potential exception of large accidental spillages or leakages. However, the discharge of large volumes of sediment and / or toxic pollutants into the river would clearly have the potential to result in a decline in habitat quality and mortality of fish over potentially quite a long stretch of the Usk downstream of the confluence.

3.5.17 In the absence of suitable mitigation, this effect would be unlikely, negative, potentially extensive along the River Usk, and while short-term in duration in terms of the pollution event itself, could be of medium-long term in duration in terms of the length of time fish populations might take to recover, and reversible.

3.5.18 This would represent an an adverse effect on the SAC fish features. Suitable mitigation is therefore proposed in Chapter 4).

Operational phase

Mortality and habitat deterioration – discharge of pollutants into watercourses during operation

3.5.19 The River Clydach discharges into the River Usk north of Gilwern. Discharge of pollutants into the Clydach during operation could therefore have adverse effects on the River Usk if pollutant concentrations would rise significantly in areas of this habitat type.

3.5.20 It is considered that the magnitude of any likely significant effect from normal operation would be low, with the potential exception of large accidental spillages or leakages. However, the discharge of large volumes of toxic pollutant into the river would clearly have the potential to result in a decline in habitat quality and mortality of fish over potentially quite a long stretch of the Usk downstream of the confluence.

3.5.21 In the absence of suitable mitigation, this effect would be unlikely, negative, potentially extensive along the River Usk, and while short-term in duration in terms of the pollution event itself, could be of medium-long term in duration in terms of the length of time fish populations might take to recover, and reversible.

3.5.22 This would represent an an adverse effect on the SAC fish features. Suitable mitigation is therefore proposed in Chapter 4)

Otter

Construction effects

Disturbance to species – noise and vibration during construction

3.5.23 Noise and vibration generated during the construction of the Scheme has potential to cause disturbance to Otters foraging along the River Clydach.

3.5.24 Construction of the scheme will result in the creation of two new major road bridges over the River Clydach, the Brynmawr Gateway bridge and the Saleyard River Crossing. In addition the current Intermediate Road Bridge will be removed and replaced by a new Intermediate footbridge and cycleway. Considerable lengths of the new construction run alongside the river Clydach, although the sections where the scheme lies closest to the river is between the Coal Adits SAM and the Pont Harri river crossing, where works will occur right on the banks of the river, which is already running through a concrete channel for most of this section; Evidence that otters currently regularly reach this section of the river is very weak, and therefore disturbance from construction works to otters is therefore unlikely to be significant.

3.5.25 Furthermore, given the presence of the existing carriageway, Otters are likely to be habituated to noise and vibration effects at least to some extent, and the restriction of normal working hours will further reduce the likelihood of otter behaviour being significantly affected. It is considered unlikely that general construction activities would have an effect on otter behaviour along the Clydach.

3.5.26 Construction activities such as rock cutting have potential to cause more additional disturbance events, but again the locations where these activities are proposed do not overlap with known otter foraging areas. With the exception of the new Saleyard Bridge, all major construction activities (including rock cutting) will occur on the opposite side of the road from the River Clydach. In addition the most substantial areas of rock cutting will occur to the west of Blackrock, where Otter activity is occasional at most.

3.5.27 It is therefore considered that there would not be a significant adverse effect on Otters as a result of construction noise and vibration, and no additional mitigation measures beyond the best practice measures adopted in the CEMP to minimise construction noise and vibration are therefore required.

Disturbance to species – lighting during construction

3.5.28 An increase in light levels in foraging areas adjacent to the Scheme could render the habitat less suitable for Otters and displace foraging activity.

3.5.29 The existing carriageway is already lit with streetlamps, and vehicular traffic also contributes to an existing baseline level of light pollution in adjacent habitats.

3.5.30 Construction of the scheme will result in the creation of two new major road bridges over the River Clydach, the Brynmawr Gateway bridge and the Saleyard River Crossing. In addition the current Intermediate Road Bridge will be removed and replaced by a new Intermediate footbridge and cycleway. Considerable lengths of the new construction run alongside the river Clydach, although the sections where the scheme lies closest to the river is between the Coal Adits SAM and the Pont Harri river crossing, where works will occur right on the banks of the river which is already running through a concrete channel for most of this section. Surveys suggest that Otters currently rarely reach this section of the river, and therefore disturbance from construction works on otters is therefore unlikely to be significant.

3.5.31 It is therefore considered that there would not be an adverse effect on Otters as a result of construction lighting, and no additional mitigation measures beyond the best practice measures adopted in the CEMP to minimise light spillage from construction areas are therefore required.

Mortality and habitat deterioration – discharge of pollutants to watercourses during construction

3.5.32 The Scheme is adjacent to the River Clydach along its length, and crosses over in more than one location (Figure 4). The River Clydach discharges into the River Usk north of Gilwern, approximately 0.5km from the Scheme. Otters are known to occur along the Clydach as well as on the Usk.

3.5.33 Construction activities giving rise to discharge of pollutants into the watercourse could have adverse effects on foraging otters, either by affecting prey populations or by affecting Otters themselves through direct acute exposure to toxins or through accumulative exposure through bioconcentration of toxins up through the food chain.

3.5.34 It is considered that the magnitude of any likely significant effect from normal construction activities would be low, with the potential exception of large accidental spillages or leakages. However, the discharge of large volumes of toxic pollutant into the river would clearly have the potential to result in a decline in habitat quality through mortality of fish and potentially mortality of otters along the Clydach and potentially quite a long stretch of the Usk downstream of the confluence.

3.5.35 In the absence of suitable mitigation, this effect would be unlikely, negative, potentially extensive, and while short-term in duration in terms of the pollution event itself, could be of medium-long term in duration in terms of the length of time fish and hence populations might take to recover, and reversible.

3.5.36 It is therefore considered that the Scheme could have an adverse effect on Otter populations caused by mortality and / or deterioration in habitat quality, and suitable mitigation is therefore proposed in Chapter 4).

Operational effects

Disturbance to species – noise during operation

3.5.37 Noise and vibration generated during operation is considered unlikely to significantly differ from the baseline to the extent that the behaviour of Otters foraging or dispersing along the River Clydach would be affected.

3.5.38 Given the presence of the existing carriageway, Otters are likely to be habituated to noise and vibration effects at least to some extent

3.5.39 It is therefore considered that there would not be a significant adverse effect on Otters as a result of operational noise and vibration, and no additional mitigation measures are therefore required.

Disturbance to species – lighting during operation

3.5.40 An increase in light levels in foraging areas adjacent to the Scheme could render the habitat less suitable for Otters and displace foraging activity.

3.5.41 The existing carriageway is already lit with streetlamps, and vehicular traffic also contributes to an existing baseline level of light pollution in adjacent habitats.

3.5.42 The scheme will employ directional lighting and it is not therefore considered that a significant increase in light levels would occur along the river corridor where Otters might be expected to forage. No significant adverse effect on Otters is therefore identified.

Disturbance to species – mortality during operation

3.5.43 There is currently no protective fencing for Otters along the Scheme with the exception of the extreme eastern end.

3.5.44 Currently there is little sign that Otters forage along the entire length of the Clydach adjacent to Section 2. This is likely to be at least in part due to a series of natural and man-made barriers, two of which are directly associated with the existing road. Access to the more westerly sections of the river for otters is encumbered by the presence of a particularly deep natural chute with very steep rock walls at Devil's Bridge, a concrete weir associated with River Clydach culvert RC3, which has a vertical section of around 2.5m and no steps or other means for otters to pass through it. There is a further vertical drop of some 2.5-3m in the culvert under the existing Brynmawr Roundabout. The presence of these barriers may result in an increased chance of Otters attempting to disperse upstream via the carriageway. In the absence of mitigation it is not considered likely that the operation of the scheme would result in a significant increase in mortality of otters.

3.5.45 Nonetheless, as a best practice and precautionary basis, mitigation to improve connectivity of otter habitat and to reduce risk of mortality on the carriageway is being provided as part of the Scheme (see Chapter 4).

Mortality and habitat deterioration – discharge of pollutants into watercourses during operation

3.5.46 The River Clydach discharges into the River Usk north of Gilwern. Discharge of pollutants into the Clydach during operation could therefore have adverse effects on the River Usk if pollutant concentrations would rise significantly in areas of this habitat type.

3.5.47 It is considered that the magnitude of any likely significant effect from normal operation would be low, with the potential exception of large accidental spillages or leakages. However, the discharge of large volumes of sediment or toxic pollutant into the river would clearly have the potential to result in a decline in habitat quality and mortality of fish and potentially otters over potentially quite a long stretch of the Usk downstream of the confluence.

3.5.48 In the absence of suitable mitigation, this effect would be unlikely, negative, potentially extensive along the River Usk, and while short-term in duration in terms of the pollution event itself, could be of medium-long term in duration in terms of the length of time populations might take to recover, and reversible.

3.5.49 It is therefore considered that the Scheme could have an adverse effect on the integrity of Otter populations caused by mortality and / or a deterioration in habitat quality during operation.

3.5.50 Suitable mitigation is therefore proposed in Chapter 4.

3.6 Assessment of in-combination effects

3.6.1 Other trunk road projects considered in addition to the Scheme include Sections 5 and 6 of the A465 Heads of the Valleys road for which information from the Strategic Environmental Assessment (SEA) completed for the Wales Transport Strategy and the SEA and Habitats Regulations Assessment (HRA) completed for the National Transport Plan have informed the assessment, together with the 1997 EIA of the A465 Dualling Scheme.

3.6.2 In terms of traffic, and hence air quality assessment, Sections 1 and 4 are already constructed. These, together with Section 3 which is under construction, are therefore considered within the baseline traffic data and all other scenarios. A future baseline year of 2020 when Sections 5 and 6 will also be open has been included in the assessment.

3.6.3 In the Design Year (2032) all six sections of the A465 will be open, and the traffic assessment (and hence noise and air quality assessments) therefore take into account the combined effects of the upgrade of all sections of the A465. The effect on Section 2 from the opening of Sections 5 and 6 (i.e. the completion of the whole A465 upgrade) is a predicted rise in traffic of up to 7%. This was assessed as having a negligible effect on air quality.

3.6.4 Therefore, there is no requirement to carry out additional in-combination assessment of air quality effects for the other A465 sections.

3.6.5 A description of other developments considered for potential in-combination effects is provided below.

Table 3.11: Other plans or projects considered for in-combination assessment

Scheme	Potential Impact	Mitigation
A465 Section 3 (commenced 2013)	Potential impacts on Usk Bat Sites SAC and River Usk SAC	This scheme has been subject to detailed assessment and includes a rigorous mitigation package to minimise these effects. A full SIAA was not required for Section 3, as it the potential for significant effects on the Usk Bat Sites SAC were ruled out at the screening stage. No further in-combination effects with Section 2 are therefore considered to occur.
A465 Sections 5 & 6	Potential impacts on Usk Bat Sites SAC	Assessment of air quality has identified a negligible effect from the traffic increase predicted to occur upon the opening of all 6 A465 sections. No potential for other in-combination effects.
Proposed Circuit of Wales, Rassau	A proposed 335ha motor sport complex which would have some impacts on bats in the absence of mitigation. The site is some 750m from the Usk Bat Sites SAC.	A detailed environmental assessment has been prepared for the proposed scheme, which includes details of a package of mitigation and compensation measures. These are intended to minimise impacts on ecological receptors and provide areas with enhanced management to compensate for loss of habitats. An SIAA was not required for this development. Given that the ES did not consider that effects on the bat interest of the SAC would occur, the proposed mitigation for bats and the distance of the site from the SAC, it is not considered that significant in-combination effects with the Scheme would occur.
Major developments in Blaenau Gwent (primarily Ebbw Vale Enterprise Zone)	Potential in-combination effects with the Scheme could occur from large developments if they would cause further habitat loss or habitat fragmentation (particularly for bats (Usk Bat Sites SAC) and Otters (River Usk SAC)	A review of development proposals for the area did not identify any developments with potential for in-combination effects with the Scheme. No additional impacts beyond those identified in Sections 3.3-3.5 would therefore occur, and further mitigation is therefore not required.

3.7 Summary of effects without mitigation

3.7.1 Table 3.12 lists the Likely Significant Effects that were identified in Table 1.1, and summarises which, following the assessment carried out in Sections 3.3 to 3.6, were considered to comprise an adverse effect in the absence of mitigation other than the PEU mitigation incorporated into the Scheme design and identified in Section 2.5. Where an adverse effect has been identified mitigation is provided in Section 4.

Usk Bat Sites SAC

3.7.2 Significant adverse effects on Lesser Horseshoe Bat were identified from a number of factors including loss of roost sites, loss of foraging habitat, severance of flightlines, disturbance of and obstruction of access to roost sites and deterioration of foraging habitat quality. These would be counter to the conservation objectives for Lesser Horseshoe Bat, which state that:

- *"buildings, structures and habitats on the site will be in optimal condition to support the populations";*
- *"management of the surrounding habitats is of the appropriate type and sufficiently secure to ensure that there is likely to be no reduction in population size or range, nor any decline in the extent or quality of breeding, foraging or hibernating habitat."* and
- there should be "*no net loss of suitable woodland, scrub and hedgerows within the SAC or adjoining areas used by the bats*".

3.7.3 Significant adverse effects on Caves not open to the public were identified from potential damage or loss of cave systems during construction, and from impacts on bats using the caves (as per the assessment of Lesser Horseshoe Bats). This would be contrary to the conservation objective requiring no loss of suitable bat hibernating habitat.

3.7.4 A significant effect on Tilio-acerion woodland was identified from habitat deterioration from dust generation, which could be contrary to the conservation objective for maintaining woodland ground flora.

3.7.5 It is therefore considered that in the absence of mitigation, there would be an adverse effect on integrity of the Usk Bat Sites SAC, as the ability of the site to maintain the population of Lesser Horseshoe Bats at its current level could be affected. There would be losses of roost sites and foraging habitat, and the ability of the bats to move across the landscape could also be adversely affected. The extent of the cave system and quality of Tilio-acerion woodland could also be adversely affected.

3.7.6 Appropriate mitigation is therefore proposed in Section 4.

Cwm Clydach Woodlands SAC

3.7.7 A significant effect on the two Beech woodland habitat features was identified from habitat deterioration from dust generation. This would be contrary to the conservation objectives for maintaining typical woodland ground flora and avoiding nutrient enrichment.

3.7.8 Appropriate mitigation is therefore proposed in Section 4.

River Usk SAC

3.7.9 Adverse effects on habitat and species features of the River Usk SAC were identified from potential discharges of pollutants to watercourses during both construction and operation, which would discharge into the River Usk. In the absence of mitigation, pollution events capable of affecting the SAC are unlikely but their potential severity is such that were an event to occur, it would be contrary to the conservation objectives for the SAC and would therefore represent an adverse effect on the integrity of the SAC. Suitable mitigation is therefore proposed in Section 4.

Table 3.12: Summary of likely significant effects before mitigation.

Site	Feature	Likely Significant Effect identified at screening stage	Adverse effect identified in absence of mitigation?
Usk Bat Sites SAC	Lesser Horseshoe Bat	Habitat loss – loss of roosts	Yes – loss of summer roost sites and one hibernation site
		Habitat loss – loss of foraging habitat	Yes – losses of >5% foraging habitat within 1km of maternity roosts and 1.2km of notable hibernation roosts
		Disturbance to species – mortality during construction	Yes – potential mortality within roosts being destroyed
		Disturbance to species – damage or obstruction of access to roost sites during construction	Yes
		Disturbance to species – noise and vibration during construction	Yes
		Disturbance to species – lighting during construction	No
		Habitat fragmentation –severance of flightlines	Yes
		Habitat deterioration – dust generation during construction	Yes.
		Habitat deterioration – discharge of pollutants to watercourses during construction	Yes
		Disturbance to species – mortality during operation	Yes - potential for increased mortality due to flightline disruption
		Disturbance to species – noise and vibration during operation	No
		Disturbance to species – lighting during operation	No
		Habitat deterioration – discharge of pollutants into watercourses during	Yes

Site	Feature	Likely Significant Effect identified at screening stage	Adverse effect identified in absence of mitigation?
		operation	
		Habitat deterioration – aerial emissions during operation	No
	Tilio-acerion Woodland	Habitat loss – direct land take	No
		Habitat loss: Indirect - changes in hydrology during construction	No
		Habitat deterioration – dust generation during construction	Yes
		Habitat deterioration – aerial emissions during operation	No
	Caves not open to the public	Habitat loss – direct land take	Yes
		Habitat loss – indirect construction effects	Yes
		Habitat loss / deterioration – changes in hydrology and airflow during construction	Yes
		Impacts on bats	Yes (assessment covered under relevant LHB sections)
Cwm Clydach Woodlands SAC	Asperulo-Fagetum beech forests and Atlantic acidophilous beech forests with Ilex and sometimes also Taxus in the shrub layer	Habitat deterioration – dust generation during construction	Yes
		Habitat deterioration – aerial emissions during operation	No
River Usk SAC	Water courses of plain to montane levels	Habitat deterioration – discharge of silt and chemical pollutants to watercourses during construction	Yes
		Habitat deterioration – discharge of chemical pollutants to watercourses during operation	Yes
	Fish	Habitat deterioration – discharge of silt and chemical pollutants to watercourses during construction	Yes
		Habitat deterioration – discharge of chemical pollutants to watercourses during operation	Yes
	Otter	Disturbance to species – noise and vibration during construction	No
		Disturbance to species – lighting during construction	No
		Mortality and habitat deterioration – discharge of silt and chemical pollutants to watercourses during construction	Yes
		Disturbance to species – noise and vibration during operation	No

Site	Feature	Likely Significant Effect identified at screening stage	Adverse effect identified in absence of mitigation?
		Disturbance to species – lighting during operation	No
		Disturbance to species – mortality during operation	No
		Habitat deterioration and mortality – discharge of chemical pollutants to watercourses during operation	Yes

4. Mitigation and assessment of residual effects

4.1 Introduction

4.1.1 This section sets out the proposed mitigation for the adverse effects that were identified as occurring in the absence of mitigation during the assessment detailed in Section 3 and summarised in Table 3.8. Where possible information is given on the timetabling of the application of mitigation.

4.1.2 The mitigation proposed is in addition to the PEU mitigation incorporated into the Scheme design, or is a more detailed consideration of mitigation principles that were established during the scheme design but which required additional detail to assess their effectiveness.

4.1.3 Following an assessment of the effectiveness of the mitigation measures proposed, an assessment of whether there would be a residual adverse effect on the integrity of any of the European Sites is then carried out.

4.1.4 Monitoring and remediation of mitigation measures during construction and aftercare period will be undertaken, in consultation with NRW, to ensure that measures are functioning as well as possible. This is outlined in Section 5.

4.2 Usk Bat Sites SAC

Lesser Horseshoe Bat

Construction phase

Habitat loss - loss of roosts

4.2.1 To mitigate for the loss of summer and winter Lesser Horseshoe Bat roost sites, artificial roosts will be provided and maintained in perpetuity.

4.2.2 The location(s) of the proposed maternity roosts are shown on Figure 10, and their designs are shown in Figure 11. Proposed maternity roosts include an above-ground maternity roost at Hafod, a heated underground roost in an embankment at Saleyard and a partially buried roost in the open south-facing embankment at chainage 31850, designed to absorb heat from the sun and provide warm conditions for bats, although this design is less conventional that the above-ground roost design. This roost would also provide a separate cool potential hibernation chamber.

4.2.3 The warm underground roost at Saleyard is proposed to replace a summer roost in the toilet block at the caravan site near Saleyard. This replacement roost would be artificially heated to provide a suitable summer and maternity roost; it would however not be available until toward the end of the construction period due to engineering constraints. The proposed maternity roosts are spread along the valley to give Lesser Horseshoe Bats easy access to different local high quality foraging areas.

4.2.4 The replacement roost sites will provide a greater number of potential roost sites for bats and be designed using the best available knowledge of the requirements of roosting Lesser Horseshoe Bat, from sources such as the Lesser Horseshoe Conservation Handbook (Schofield 2008), Bat Mitigation Guidelines (Mitchell-Jones 2004), the Bat Conservation Trust Bat Roost Replacement and Enhancement Resource (http://roost.bats.org.uk) and personal experience of other successful roost replacement examples, including a successful replacement maternity roost at Beacon Technology Park, Bodmin, Cornwall, designed, in part, by Richard Green and that includes an artificially heated chamber. The roosts have been designed and located to ensure that the in-combination replacement and additional maternity roost resource provides a functional value to Lesser Horseshoe Bats greater than currently exists. NRW will also be fully consulted on the detailed design of the roosts, which will also form part of the EPS licence required for loss of/disturbance to existing roosts.

4.2.5 Given that Lesser Horseshoe Bat are known to be roosting in many man-made structures along the existing road (e.g. road drains), the provision of artificial roosts consisting of culvert pipes and manhole chambers in the road embankment, well connected to foraging habitat following landscaping, is considered to be an adequate replacement for the loss of summer and night roost sites to the Scheme (See Figure 12 for locations).

4.2.6 Replacement roosts would be located in close proximity to those being lost, to ensure adequate spatial coverage, providing ‘stepping-stone’ roosts as the existing roosts may be functioning, allowing bats easy access to different areas of foraging habitat.

4.2.7 The potential effect on bat use of the Clydach Viaduct maternity roost, as well as the loss of foraging habitat along the Scheme, will be mitigated by provision of a purpose built Lesser Horseshoe Bat maternity roost building at grid reference SO 20859 12610, ch. 30900. This would be well connected to Lesser Horseshoe Bat foraging and commuting habitat, being immediately adjacent to the Nant Hafod dingle. It would also receive full sunlight for the majority of the day, providing warm conditions for breeding bats. Cool areas will also be included on the ground floor for spring, autumn and winter roosting. The design will consist of a single-storey block building with a slate roof (lined with type 1f bituminous felt) over an uncluttered loft, 3m high to the ridge, i.e., a ‘cut and pitch’ roof with a traditional ridge board. The building will be in an ‘L’-shaped configuration, with the elbow/corner/junction pointing south, to maximise solar gain throughout summer days. The overall volume of the building will be approximately 250m^3. Two sheltered access points, suitable for Lesser Horseshoe Bat light sampling activity will be provided with good connectivity to Nant Hafod Dingle.

4.2.8 Suitable winter roost sites are more difficult to create, as bats require temperature and humidity conditions, within a certain range, to be stable throughout the winter. Natural large, extensive and complex underground systems are more likely to provide favourable conditions than small, simple sites constructed of concrete or plastic pipes. In order to maximise the success of providing a suitable range of conditions, man-made underground structures will be designed to be as extensive and complex as possible, providing roosts at different levels and with branching passages and side chambers, within the area available for construction, insulated by covering with earth to a suitable depth, and humidity levels maintained by incorporating areas of bare earth within chambers and feeding rainwater into the system.

4.2.9 The artificial roosts will be constructed in advance of the destruction of the roost sites where possible (see Section 1.6). Where this is not possible, temporary roosts suitable as night roosts would be provided using simple shed-like structures constructed of timber frames and metal sheets or wooden boxes, open at the bottom, suspended in trees. Therefore ensuring that roosting opportunities for bats will be maintained. The new maternity roost at Nant Hafod dingle will be constructed at the very beginning of construction and in advance of any work to the viaduct.

4.2.10 The provision of replacement roosts would ensure that bats have alternative roosts within the same spatial area as those lost. Successful design of summer day and night roosts is plainly established and uncontroversial, although there may be some uncertainty as to the success of creating hibernation roosts. However, given that the hibernation roost lost at Coal Tar Adit only supports a small number of bats and that there are several other existing hibernation sites within close proximity, it is not expected that the loss of a single low-use hibernation roost would have any significant effect on population size and range or be contrary to the conservation objectives for Lesser Horseshoe Bat in relation to hibernation counts in the Gorge.

4.2.11 Work to the Clydach Viaduct, where there is a maternity roost, is planned for winter 2016, avoiding the maternity period. Therefore there would be no direct disturbance but there would be a change in the landscape to the north. There would be no change to vegetation and access to the roost to the south. Whilst it cannot be predicted with certainty how the bats will react to the changes, it is possible that the change could result in a reduced airflow under the viaduct, which could improve the temperature and conditions for bats. There would also be increased roosting opportunity in manhole chambers, which could be warmer than the area currently used by bats, by absorbing heat from the surface of the road and trapping it in a smaller chamber. Whilst bat access would be provided via culverts and a manhole chamber, there would be a short-term (1-5 years) loss of woody vegetation providing connectivity between the north culvert entrance and vegetation to the north. However, connectivity would be provided using a trench with hydro-seeded faggots at the top of banks to provide bats with a semi-covered fly-way to the culvert entrance, until vegetation matures on the new rock slope, which would be hydro-seeded either side of the trench. Given that the majority of foraging habitat is to the south of the road and that other crossing points would be available not far from the viaduct, e.g., twin culverts at Nant Hafod (ch. 31100) and converted subway and river culvert at Pont Harri (ch. 30500), it is considered extremely unlikely that bats would abandon this roost, unless they choose to move to the new maternity roost being provided as mitigation to the north of the water works (ch. 30900) because it provides more favourable conditions, in which case, there would be no adverse effect on the bats.

4.2.12 In summary, the Scheme will result in an increase in the number of summer / night roosts, an increase in the number of suitable maternity roosts and an increase in the number of potential hibernation sites, providing better access for bats from these new roosts to existing foraging habitat within key foraging ranges of Lesser Horseshoe Bats at critical times. In combination, these roosts would provide a functional resource of greater value than those roosts already present along the Gorge.

4.2.13 With this proposed mitigation it is therefore concluded that the Scheme is extremely unlikely to adversely affect Lesser Horseshoe Bats through loss of roost sites and it is likely to have a beneficial effect by providing more potential maternity roosts, which in turn could increase Lesser Horseshoe Bat productivity in the Gorge in the short and long term.

Habitat loss - loss of foraging habitat

4.2.14 Mitigation for loss of bat foraging habitat would be provided by replacement woodland planting in the locations shown on Figure 12.

4.2.15 Areas of proposed replacement foraging habitat have been selected on the basis of a number of criteria which have been agreed with NRW as follows:

- within 1.0 km of a maternity roost;
- within 1.2 km of a main hibernation roost;
- connected to suitable existing bat foraging/commuting habitat;
- ratio of woodland habitat replacement to loss within the radii for each roost to be no less than 1:1;
- ratio of woodland habitat replacement to loss within the Usk Bat Sites SAC to be no less than 1:1;
- ratio of woodland habitat replacement to loss within range of all maternity and main hibernation roosts to be no less than 1.3:1;

- sites chosen should be open with no significant tree cover, and preferably improved/semi-improved grassland; and

- where woodland planting was included in the scheme design, this should be counted where it was within the appropriate radii of roosts and connected to existing bat foraging/commuting habitat.

4.2.16 Table 4.1 below shows the extent of existing and proposed replacement foraging habitat within the core foraging zones for the key roosts identified as being potentially affected in Chapter 3. For all roosts, the target of ratio of 1:1 is achieved (range from 1.14:1 to 1.89:1). The ratio for replacement planting within the Usk Bat Sites SAC is 1.15:1. The overall woodland replacement ratio for all roosts is 1.36: 1. All of the agreed criteria have thus been achieved. The planting provided above the target ratio provides some safeguard against the chance that the replacement planting does not provide as good quality replacement habitat as existing. However, given that the majority of woodland habitat lost is immediately adjacent to the existing road and subject to light spill, it is extremely likely that the areas of new woodland planting would develop into better quality foraging habitat. Planting outside of the highway engineering footprint would commence at the start of the construction period.

4.2.17 New woodland planting would comprise native species of local provenance and species composition would follow that of the native woodland in each part of the scheme (Figure 12). Trees would be planted at 3m centres, following soil inversion and sowing with wildflower seed mix, comprising a mix of native woodland annuals and perennials, providing an immediate nectar source to increase invertebrate abundance in the areas during the first stage of woodland establishment, i.e., until canopy establishment and closure. Refer to the Landscape and Ecological Management Plan for the Scheme and Luscombe *et al*. 2008 for further information. Dead wood habitats of benefit to saproxylic invertebrates will also be created in planting areas by utilising the trunks and major limbs of trees removed during site clearance. In order to maximise the benefits of these habitats, they will be placed at regular intervals along the scheme, with spacing as close to every 25m as practicable. Individual locations for dead wood habitats will be varied and will encompass shaded and well-lit locations, and in addition locations ranging from permanently wet to permanently dry.

4.2.18 The extent of existing and proposed replacement woodland habitat within the core foraging zones for the key roosts identified as being potentially affected in Chapter 3 is shown in Table 4.1.

4.2.19 The areas identified provide a ratio of new planting to losses from c1:1.19 for Clydach House to up to 2.07 for Clydach Viaduct.

Table 4.1: Provision of replacement woodland habitat within 1km of maternity roosts and 1.2 km of notable hibernation roosts.

Roost	Existing foraging habitat within foraging zone (ha)	Loss of foraging habitat within foraging zone (ha)	Percentage loss without mitigation (%)	Proposed new planting (ha)	Ratio
Clydach Viaduct (M1)	39.33	3.71	9.43	7.67	2.07
Clydach House (M2)	45.36	6.05	13.34	7.19	1.19
Auckland House – (M3)	41.7	2.75	6.59	3.17	1.15
Llanwenarth House (M4)	22.72	1.11	4.89	1.78	1.60
Pylon Cave (H1)	60.13	3.76	6.25	6.29	1.67
Ogof Craig y Ffynnon (H3)	78.47	4.12	5.25	5.25	1.27

4.2.20 Once mature, the proposed woodland planting would provide greater foraging habitat opportunities for bats from the key roost sites than the current baseline.

4.2.21 In the long-term therefore, there would be an increase in the area and quality of suitable foraging habitat within the key foraging zones of the roosts summarised in Table 4.1, and there would be an improvement in landscape connectivity.

4.2.22 The majority of foraging habitat lost is likely to be underutilised for foraging due to the effect of light spillage from the existing carriageway, whereas much of the proposed replacement planting is located at a greater distance from the scheme, and the use of directional lighting would reduce light spillage into retained woodland closer to the scheme.

4.2.23 There would be a period between clearance of habitat for Scheme construction and the maturation of new woodland planting where woodland habitat in the roost foraging zones would be reduced by between 4.89-13.34%. The value of replacement woodland planting as a foraging habitat is expected to reach full potential as mature woodland between 50-100 years after planting. However, it is highly likely that Lesser Horseshoe Bats will begin to utilise areas of new planting within a year or two following planting. Monitoring surveys of an area of habitat creation on Section 1 of the A465 comprising ponds, a scrape and woodland planting found that Lesser Horseshoe Bats used it after one year following planting and use continued and steadily increased over the following years. It can therefore be stated with confidence that areas of new planting would be of value for foraging bats well in advance of development into full canopy mature woodland. Bats could therefore be expected to make use of planted areas in the second year of the construction period, with use increasing steadily each following year. Planting is planned for autumn/winter 2014, when construction starts.

4.2.24 This temporary loss of foraging habitat could adversely affect the capacity of the roosts to support the current numbers of bats, and numbers in the roosts could decline, although bats could move to other maternity roosts, including those provided in mitigation as part of the Scheme, rather than not breeding at all. Whilst this could increase competition between bats elsewhere, it is currently hypothesized by NRW (CCW, 2012) that foraging habitat in the Gorge is under-utilised by pregnant bats in their third trimester.

4.2.25 Although in the long-term there would be greater foraging opportunity, and the Lesser Horseshoe Bat population would therefore be expected to be maintained or increased in the long-term, assuming no change to other factors affecting breeding success, a residual short to medium-term effect could still have an adverse effect on the conservation objectives for Lesser Horseshoe Bats.

4.2.26 However, the provision of a new maternity roost at Nant Hafod Dingle is considered to provide a better maternity roost than that at the Clydach Viaduct, which is considered to be used by a relatively small number of Lesser Horseshoe Bats because conditions in the roost are not considered to be ideal, despite there being abundant woodland foraging habitat close by. The temperature and security (from disturbance) are lower than would be expected in the loft of a building with a slate roof, such as the new maternity roost. The new roost would have the potential to both support a larger colony than currently uses the viaduct, and would be available before work on the viaduct began, and thus would provide a likely beneficial impact on the integrity of the SAC.

4.2.27 With the provision of a new maternity roost, as well as other roosts along the scheme, bats would have access to habitat within a new maternity roost critical foraging zone, i.e., within 1 km, that they would not previously have had close access to from other maternity roosts. Given that the new maternity roost would be constructed at the beginning of the construction period, that it would be constructed immediately adjacent to an existing well-used Lesser Horseshoe Bat flightpath and that it has been designed to offer the best available conditions for breeding Lesser Horseshoe Bats and immediate connectivity to high quality and abundant foraging habitat, it is expected that bats would soon find and start using it. Whilst the rate of uptake of such roosts is dependant on a range of factors, if the new roost offers a better overall resource for the bats than they would have by continuing to use existing roosts, it is expected that they would readily start using it. Lesser Horseshoe Bats are known to be opportunistic and to readily adopt favourable roosts given the chance. To give an example, a maternity roost is known just outside Exeter where lesser horseshoe bats moved into a closet under the stairs of the house, where there are warm hot water pipes, within the same season of a covering board being removed for inspection and not replaced immediately (Richard Green pers. comm.). If the amount of temporary loss of habitat is not actually significant (in the absence of additional roost provision), i.e., bats still have sufficient foraging resource available to them without having to find alternative foraging areas at additional energy expenditure costs, bats may choose to continue using the existing roosts, as there would be no significant disadvantage to them by doing so. The temporary loss of foraging habitat whilst the new planting is maturing is therefore considered extremely unlikely to have an adverse effect on integrity.

Disturbance to species – mortality during construction

4.2.28 Mitigation includes methods and timing of works, maintenance of crossing points and enforced speed limits on the new road both during and after construction.

4.2.29 The risk of mortality of bats in roosts will be minimised by carrying out the destruction of known roosts when bats are least likely to be present. Additional measures, including exclusion of bats and inspecting for bats prior to demolition, along with capture and translocation of bats or methods to encourage bats to leave the roosts, such as lighting, will avoid any mortality of bats. As an added precaution, such measures will also be undertaken on potential roosts that have not been confirmed to be used by bats. Destruction of roosts would be undertaken under licence from NRW and, as such, the detailed method would be agreed by them.

4.2.30 In the case of Coal Tar Adit, it would be closed in the summer prior to destruction. In advance of this work, automated bat detectors would be used for several nights to monitor bat activity within the entrance of the adit. If no activity is monitored for five successive nights the entrance will be sealed to prevent further bat access. If bats are recorded using the adit, lights will be installed in the entrance and turned on 2 hours after sunset and left on until dawn. This will allow bats to emerge but deter them from re-entering. Automated bat detectors will be used to monitor bat activity during the period when lighting is employed and the adit only sealed when there has been no bat activity in the adit for five successive nights.

4.2.31 In the case of the other roosts to be lost, it should be possible to see any Lesser Horseshoe Bats in them prior to demolition. The roost in the cliff recess would be accessed using rope access. Any bats present in the roosts would be discouraged from returning to roosts by using lighting, as above, and the structures only destroyed when it is certain that no Lesser Horseshoe Bats are present. Buildings would then be dismantled carefully under supervision of the bat ecologist, in case any crevice dwelling bats are present. These would be carefully taken and moved to replacement bat roosts.

4.2.32 During construction the Scheme, including sensitive areas, would be lit continuously at night to deter bats from crossing over the carriageway. In addition, a 40 mph speed limit will be enforced using average speed cameras, to reduce the risk of bats being hit by traffic, should they choose to cross the carriageway. The risk of this occurring is further reduced by the fact that vegetation either side of the carriageway, in the construction area (5m either side of proposed alignment), will be cleared as advance works with guidance structures erected to lead bats to culvert entrances. NRW will be consulted on the detail of construction lighting.

4.2.33 Timing of construction in different areas along the scheme would also reduce the risk of mortality and disturbance to bats in roosts. Work to the Clydach Viaduct would be undertaken during the winter and work over the caves (ch. 30900-31900) undertaken in summer to avoid any direct impact on roosting bats.

4.2.34 In addition, existing crossing points would be kept open during construction for bats to be able to use them. Temporary fencing or netting would be erected at the end of each working day to 'guide' bats to the culverts from retained vegetation outside of the construction area. Works to culverts will also be phased so that not all culverts used by bats in each area are worked on simultaneously, therefore providing bats with undisturbed alternative crossing points within relatively close proximity (see Table 4.4). It is therefore considered extremely unlikely that any bats would be killed during construction.

Disturbance to species – damage or obstruction of access to roosts

4.2.35 Proposed mitigation for the adverse effects of construction on retained roost sites is summarised in Table 4.2 below.

4.2.36 The assessment concludes that with the proposed mitigation an adverse effect on Lesser Horseshoe Bats from damage or obstruction of access to roost sites would be extremely unlikely.

Table 4.2: Mitigation measures for damage / obstruction of access to Lesser Horseshoe Bat roosts.

Roost (see Figure 4 for locations)	Potential effect	Proposed mitigation	Adverse effect on Lesser Horseshoe Bats with mitigation?
Clydach Viaduct East Span maternity roost	Temporary disturbance during construction of road on north side and repair works. The construction of the new eastbound carriageway would change conditions to the north of the existing road/roost, which could affect how bats use the viaduct roost.	Undertake work during winter (November to March). Inspect structure for bats prior to work. Ensure access beneath structure is maintained with temporary and permanent connectivity measures. No lighting or night-working. Provide new maternity roost at Nant Hafod.	No
Clydach Viaduct Span 8 summer roost	Temporary disturbance during construction of road on north side and repair works. The construction of the new eastbound carriageway would change conditions to the north of the existing road/roost, which could affect how bats use the viaduct roost.	Undertake work during winter (November to March). Inspect structure for bats prior to work. Ensure access beneath structure is maintained with temporary and permanent connectivity measures. No lighting or night-working.	No

Roost (see Figure 4 for locations)	Potential effect	Proposed mitigation	Adverse effect on Lesser Horseshoe Bats with mitigation?
Clydach Viaduct Pump House Span summer roost	Temporary disturbance during construction of road on north side and repair works. The construction of the new eastbound carriageway would change conditions to the north of the existing road/roost, which could affect how bats use the viaduct roost.	Undertake work during winter (November to March). Inspect structure for bats prior to work. Ensure access beneath structure is maintained with temporary and permanent connectivity measures. No lighting or night-working.	No
Waterfall Cave	No direct impact	Refer to Sections 4.2.127 - 4.2.142 for construction mitigation measures	No
LHB road drain roost 1 Ch. 33970 LHB road drain roost 2 Ch. 34000 LHB road drain roost 3 Ch. 34700 LHB road drain roost 4 Ch. 34510 LHB road drain roost 5 Ch. 34780	Temporary disturbance during construction	Road drain roosts and access, along with woodland habitat around access will be retained and undisturbed. The new road will simply be built over the existing roosts. Whilst the roosts will therefore be deeper below finished ground level, because of existing shading from the steep wooded embankment on the south side of the existing road, it is not considered that these road drains get particularly warm or are used as maternity roosts. The additional cover may increase the stability of temperatures in the drains and make them more suitable as winter roosts.	No
Ogof Gelynnen and Ogof Gelynnen second entrance	No direct impact	Refer to Sections 4.2.127 - 4.2.142 for construction mitigation measures	No

Disturbance to species – noise and vibration during construction

4.2.37 Proposed mitigation for the adverse effects of construction noise on retained roost sites is summarised in Table 4.3 below.

4.2.38 The assessment concludes that with the proposed mitigation there would not be an adverse effect on Lesser Horseshoe Bats from construction noise or vibration.

Table 4.3: Mitigation measures for construction noise / vibration effects on Lesser Horseshoe Bat roosts.

Roost (see Figure 4)	Potential effect	Proposed mitigation	Adverse effect on Lesser Horseshoe Bats with mitigation?
Elled Coal Adits	Disturbance to hibernating bats.	Timing of blasting etc. to avoid winter period.	No
Clydach Viaduct Span 8 summer roost	No direct impact Temporary disturbance during construction of road on north side and repair works	Timing of works to avoid summer period.	No
Clydach Viaduct Pump House Span summer roost	No direct impact Temporary disturbance during construction of road on north side and repair works	Timing of works to avoid summer period.	No
Ogof Nant Rhin LHB hibernaculum	Disturbance to hibernating bats.	Timing of blasting etc. to avoid winter period.	No
Waterfall Cave	No direct impact	Refer to Sections 4.2.127 - 4.2.142 for construction mitigation measures	No
LHB road drain roost 1 Ch. 33970 LHB road drain roost 2 Ch. 34000 LHB road drain roost 3 Ch. 34700 LHB road drain roost 4 Ch. 34510 LHB road drain roost 5 Ch. 34780	Temporary disturbance during construction	Road drains and manhole chambers will be retained and covered over with negligible disturbance.	No
Ogof Gelynnen and Ogof Gelynnen second entrance	No direct impact	Refer to Sections Sections 4.2.127 - 4.2.142 for construction mitigation measures	No
Old Bridge (LHB night roosts)	Disturbance of bats using night roost	No night-working in proximity of bridge	No

Habitat fragmentation – severance of flightlines

4.2.39 Mitigation for potential severance of flightlines used by Lesser Horseshoe Bats is summarised in

Table 4.4 and Figure 13. It should be noted that all confirmed and potential under-road crossing points should be retained on their existing alignment. There would be no reduction in cross-sectional area but culverts are, in several cases, to be extended and angles steepened.

4.2.40 Each culvert is assessed individually in Table 4.4. Whilst the design of crossings for bat use has been carefully considered, factors remain that do not allow a definitive conclusion on how quickly they will be adopted to a similar degree as the existing crossings they replace. There will be a need at many of the culverts for bats to find /be guided to a new entrance location. Experience on other schemes, including the Talgarth Bypass and A487 Porthmadog Bypass, has shown that if new culverts are placed on the line of existing crossing points and temporary guide measures are installed to guide bats to them, Lesser Horseshoe Bats will readily adopt the new culverts.

4.2.41 The activity data/counts for under-road crossings are not sufficient to assess relative importance of the under-road crossings points, although the survey work undertaken suggests that the majority of crossing points are used at a low level at random times and are therefore not necessarily on a well-used commuting route by lots of bats. The summer radio-tracking data suggests most foraging activity is focused on areas of mature woodland and that some under-road crossing points are less important than others. There is no survey information to consider winter foraging ranges and crossing points.

4.2.42 In conclusion it is considered that it is certain that there will be changes to the pattern of usage of under-road crossings and highly probable that there will be a reduction in usage for an initial period. The degree of change in usage at any location, the change in cumulative net use of the crossings and the effect on population size are not possible to determine with certainty. However, with careful design and placement of temporary guide measures, even though usage of crossing points may change, they are likely to be adopted relatively quickly (within days or even immediately). Should it take longer for bats to adopt the new crossings, there would be many alternative potential crossing points to choose from if a bat is deterred from one in the short-term. Lighting would deter them from crossing over the road during construction and operation, therefore avoiding mortality of bats due to collisions with traffic.

4.2.43 The river crossings, which are considered to be the most important crossing locations, will remain largely unaltered and will allow unimpeded access for bats along the Gorge and from one side of the road to the other. It is therefore considered extremely unlikely that the changed under-road crossings would cause a reduction in the Lesser Horseshoe Bat population.

Table 4.4: Mitigation for effects on Lesser Horseshoe Bat crossing points.

Crossing point No. (see Figures 4 and 13)	Potential effect	Proposed mitigation	Likely significant effect with mitigation?
RC1 / E4	No significant change. Not affected by proposed works.	Entrances of culvert to remain clear at night and minimum continuous cross- sectional area of 1.5m2 retained through culvert.	No
SW1 / E7	No significant change. Minor repairs only.	Entrances of culvert to remain clear at night and minimum continuous cross- sectional area of 1.5m2 retained through culvert.	No
RC2 / E10	No significant change. Minor repairs only.	Entrances of culvert to remain clear at night and minimum continuous cross- sectional area of 1.5m2 retained through culvert.	No
RC3 / M12	Not including lighting, noise and vibration which are discussed above, the minimal extension of RC1 and incorporation of central pier is unlikely to discourage bats from flying through RC1, although plant and scaffolding erected inside culvert could cause an obstruction.	Entrances of culvert to remain clear at night and minimum continuous cross- sectional area of 1.5m2 retained through culvert.	No
C1 / C3	Extension of culvert to the south and removal of vegetation around southern entrance may reduce use by bats or cause bats not to use it in the short-term	Culvert to remain clear at night during construction. No reduction in internal culvert dimensions (0.865m diam.). Provide replacement planting around cascade, as soon as possible. 250mm gap provided between trash screen bars and trash screen angled at 45o to encourage bats to fly through it (current trask screen is horizontal).	No
RC4 / M14	Strengthening of existing culvert is unlikely to discourage bats from flying through RC1, although plant and scaffolding erected inside culvert could cause an obstruction.	Entrances of culvert to remain clear at night and minimum continuous cross- sectional area of 1.5m2 retained through culvert.	No

Crossing point No. (see Figures 4 and 13)	Potential effect	Proposed mitigation	Likely significant effect with mitigation?
SW2 / E15	Extension of culvert and insertion of 1.8m diam. pipe for dedicated bat crossing. Low bat use recorded. In the short-term bats may not use the culvert due to the initial change in the landscape but in the long-term, bats are likely to use the culvert more, as there will be no lighting (currently it is lit) and vegetation will be planted up to the entrance.	Culvert to remain clear at night during construction. 1.8m diam. pipe is considered adequate for LHB to fly through. Provide landscaping and replacement planting around new culvert entrance as soon as possible. Use temporary guide 'fencing' until vegetation becomes established. 250mm gap provided between grille bars, set into entrance of culvert to encourage bats to fly through it. Chamber and baffles provided inside culvert to provide roosting opportunities.	No. Chamber could potentially be used as a maternity roost.
BC2 / C10	Extension of culvert to the north and removal of vegetation around northern entrance may reduce use by bats or cause bats not to use it in the short-term.	Culvert to remain clear at night during construction. No reduction in internal culvert dimensions (existing 700mm pipe increased to 900mm diam.). Provide landscaping, including guide channel in rock and replacement planting close to entrance and hydro-seeding of rock-face, as soon as possible. Use temporary guide measures, such as willow faggots until vegetation becomes established. Chamber provided inside culvert to provide roosting opportunities.	No
BC3 / C11	Extension of culvert to the north and removal of vegetation around northern entrance may reduce use by bats or cause bats not to use it in the short-term	Culvert to remain clear at night during construction. 1.8m diam. pipe is considered adequate for LHBs to fly through. Provide landscaping, including guide channel in rock and replacement planting close to entrance and hydro-seeding of rock-face, as soon as possible. Use temporary guide measures, such as willow faggots until vegetation becomes established. 250mm gap provided between grille bars, at entrance of culvert to encourage bats to fly through it. Chamber provided inside culvert to provide roosting opportunities.	No. Chamber could potentially be used as a maternity roost.

Crossing point No. (see Figures 4 and 13)	Potential effect	Proposed mitigation	Likely significant effect with mitigation?
BC4 / M20	Extension of culvert to the north and removal of vegetation around northern entrance may reduce use by bats or cause bats not to use it in the short-term	Existing culvert to remain clear at night during construction. No reduction of existing 1.2m diam. pipe. Provision of additional dry culvert of 1.2m square-section. Retain existing channel and provide replacement planting close to entrance, as soon as possible. Use temporary guide measures until vegetation becomes established. 250mm gap provided between grille bars, at entrance of culvert to encourage bats to fly through it.	No
BC5 / M22	Extension of culvert to the north and removal of vegetation around northern entrance may reduce use by bats or cause bats not to use it in the short-term	Culvert to remain clear at night during construction. No reduction of existing 1.2m diam. pipe. Create new guide channel and provide replacement planting close to entrance, as soon as possible. Use temporary guide measures, such as willow faggots until vegetation becomes established. Trash screen set away from culvert entrance to encourage bats to fly through culvert.	No
SD1 / C12	Not affected by proposed works	Entrances of culvert to remain clear at night and minimum continuous cross- sectional area of 1.5m2 retained through culvert.	No
SW3 / M26	Extension of culvert and insertion of 1.8m diam. pipe for dedicated bat crossing. Low bat use recorded. In the short-term bats may not use the culvert due to the initial change in the landscape but in the long-term, bats are likely to use the culvert more, as there will be no lighting (currently it is lit) and vegetation will be planted up to the entrance	Culvert to remain clear at night during construction. 1.8m diam. pipe is considered adequate for LHBs to fly through. Provide landscaping and replacement planting around new culvert entrance, as soon as possible. Use temporary guide ‘fencing’ until vegetation becomes established. 250mm gap provided between grille bars, set into entrance of culvert to encourage bats to fly through it. Chamber and baffles provided inside culvert to provide roosting opportunities.	No

Crossing point No. (see Figures 4 and 13)	Potential effect	Proposed mitigation	Likely significant effect with mitigation?
BC6 / M28	Change to culvert access - existing headwall to be demolished and replaced with a new headwall with a trash screen with 140mm clear space between vertical fins. Minor habitat loss around culvert entrances to enable construction work. Both of these issues could deter bats from entering culvert.	Additional horizontally-grilled bat access provided with 140mm space between bars via adjacent block house. Minimise habitat loss around culvert entrance during construction and use temporary guide ‘fencing’ until vegetation becomes established.	No
BC7 / C17	Existing 27m long 300mm diameter pipe to be filled in. Lesser horseshoe bats have been observed emerging from this pipe but it is not possible for them to fly right through it as there is a mesh covering the north opening. Therefore it is assumed that bats roost in the pipe. Filling in the pipe will therefore result in the loss of a roost.	The pipe would be inspected prior to filling in and bats excluded if necessary. A replacement roost would be provided in the form of a 1m cubed chamber set in the south embankment, with a 600mm diameter pipe for access. Use temporary guide ‘fencing’ until vegetation becomes established.	No
BC8 / M29	6m extension of 1m diam culvert to the north and removal of vegetation around northern entrance may reduce use by bats or cause bats not to use it in the short-term	Culvert to remain clear at night during construction. New channel constructed to guide bats to culvert. Provide landscaping and replacement planting around channel and new culvert entrance, as soon as possible. Use temporary guide ‘fencing’ until vegetation becomes established. Trash screen set away from culvert entrance to encourage bats to fly through culvert.	No
BC9 / C15	No work planned. No change to culvert.	Culvert to remain open and undisturbed during construction.	No

Crossing point No. (see Figures 4 and 13)	Potential effect	Proposed mitigation	Likely significant effect with mitigation?
SW4 / M33	Extension of culvert and insertion of 1.8m diam. pipe for dedicated bat crossing. Low bat use recorded. In the short-term bats may not use the culvert due to the initial change in the landscape but in the long-term, bats are likely to use the culvert more, as there will be no lighting (currently it is lit) and vegetation will be planted up to the entrance	Culvert to remain clear at night during construction. 1.8m diam. pipe is considered adequate for LHBs to fly through. Provide landscaping and replacement planting around new culvert entrances, as soon as possible. Use temporary guide 'fencing' until vegetation becomes established. 250mm gap provided between grille bars, set into entrance of culvert to encourage bats to fly through it. Chamber and baffles provided inside culvert to provide roosting opportunities.	No
CC / C18	No work planned. No change to culvert.	Culvert to remain open and undisturbed during construction.	No
RC5	Minor repair work only possibly required.	Entrances of culvert to remain clear at night and minimum continuous cross- sectional area of 1.5m2 retained through culvert.	No
Hopyard Underpass	Widening of slip road over the top of the underpass requires a retaining wall to be constructed over the northern entrance. This would result in the removal of trees	A 2 metre high close-boarded fence would be erected alongside the road to reduce light-spill from car headlights and any road lighting, as well as encourage bats to go through the underpass rather than over the road. This would be similar to a fence on the south side of the road over the underpass.	No

Habitat deterioration – dust generation during construction

4.2.44 Potential effects from dust generation during construction will be controlled by the following measures, as set out in the Construction Environmental Management Plan (CEMP) for the Scheme.

4.2.45 Appropriate mitigation measures to address the issue of dust that may be generated by site operations will be established in accordance with 'The control of dust and emissions from construction and demolition: Best Practice Guidance (Mayor of London 2006)'

4.2.46 The measures described in the CEMP and summarised below will be applied for the duration of the construction works to minimise the impacts from dust.

4.2.47 Where possible the activities that are likely to generate dust will be replaced by alternative methods which are less likely to create a dust nuisance. Where this is not possible, the following methods of mitigation will be considered for inclusion into works method statements.

Site Planning

4.2.48 Activities likely to generate dust nuisance will be located away from sensitive receptors where possible.

4.2.49 The storage and use of materials will be managed to avoid unnecessary handling, and designated secure areas will be used for the storage of materials and waste.

4.2.50 Regular site inspections will be carried out by appropriately trained staff and records will be maintained on site.

Haulage Routes, Vehicles and Plant

4.2.51 Where possible, the haul route will be aligned to avoid passing close to sensitive receptors, and the alignment will be agreed with relevant stakeholders prior to construction. Haul routes will be regularly inspected and repairs carried out promptly.

4.2.52 Areas of hard standing will be provided at site access and egress points. These areas will be inspected regularly and kept clean. Wheel wash facilities including jet wash areas for vans and cars will be provided at the site entrance, to control dust on the haul routes. Where possible, dust suppression equipment will be located away from watercourses.

4.2.53 Unpaved surfaces and roads will be damped down during dry periods and as necessary.

4.2.54 Good practice measures to minimise nuisance emissions from plant and vehicles will include the operation of plant and equipment away from sensitive receptors where possible. Vehicles and plant will be regularly serviced and maintained and in accordance with manufacturers' recommendations. Records of inspections will be maintained on site. Engines will be switched off when not in use and vehicles with low exhaust emissions and emission controls such as catalysts or diesel particulate filters will be used where possible.

Demolition, Blasting and Piling

4.2.55 The works will be designed and executed by specialist sub-contractors. Fine water sprays will be used to damp down prior to, and during, works. A detailed method statement, including dust suppression measures, will be prepared by sub-contractors for any blasting and demolition works.

4.2.56 The use of mobile plant for crushing and screening materials from demolition activities will be regulated by an Environmental Permit that includes requirements for the control of dust and odours.

4.2.57 Crushing plant will be located away from sensitive areas and operated in accordance with the appropriate Environmental Permit.

Fabrication processes, concrete cutting, hole formation, surface preparations

4.2.58 Fencing may need to be erected around potentially dust generating activities, using suitable debris screens. The requirement for screens will be included in the work method statements.

4.2.59 Cutting operations will be located away from sensitive areas where feasible and either water will be used as a dust suppressant or techniques such as vacuum extraction will be used. Tools such as angle grinders and disc cutters will be fitted with particle control equipment such as dust extractors.

Materials handling, storage and disposal

4.2.60 Material storage areas will be kept clean and free from dust.

4.2.61 Stockpiles will be kept to a minimum practical height and be gently sloped. Small or short-term stockpiles will be stored in a sheltered area or covered with sheeting to protect from wind erosion. The surfaces of long-term storage mounds will be sealed by re-vegetating or secured with tarpaulins.

4.2.62 Dusty materials will be damped down with suitable water sprays. Controlled spraying of the surface of long-term stockpiles with chemical bonding agents may be used with approval from NRW.

4.2.63 Methods and equipment will be in place for the immediate clear up of accidental spillages of dusty or potentially dusty materials. Wet handling methods will be used for cleaning up spillages of cement powder and similar materials.

4.2.64 The number of materials handling operations will be kept to a minimum and the delivery of potentially dust producing materials such as aggregates will be planned to minimise the storage of dusty materials on site by employing a just-in-time policy for deliveries. Enclosed or sheeted vehicles will be used for transporting dusty materials and aggregates.

4.2.65 Enclosed skips will be used to store waste wherever possible and no burning will be allowed on site.

4.2.66 Given these measures, it is considered extremely unlikely that there would be any residual effect from dust generation on Lesser Horseshoe Bats.

Habitat deterioration – discharge of pollutants to watercourses during construction

4.2.67 Potential effects from discharge of silt and chemical pollutants to watercourses during construction will be controlled by the following measures, as set out in the Construction Report for the Scheme.

4.2.68 Measures will be in accordance with the Environment Agency's Pollution Prevention Guidelines (PPGs) and relevant construction industry guidance best practice measures to protect the water environment.

Water Management Plan

4.2.69 A detailed Water Management Plan will be developed for the protection of controlled waters throughout the construction works. Control measures at specific locations to mitigate the risk from the earthworks and other construction activities that are likely to be used during the construction phase will be incorporated into sub-contractor method statements.

4.2.70 The plan will specify control measures at specific locations. Proposals are summarised in Table 4.5 below.

Table 4.5. Water management proposals during construction

Area	Construction Activities	Proposed mitigation
Brynmawr Ch29000-30000	Extensive cutting of existing ground to accommodate Brynmawr junction to accommodate new east and westbound carriageway. New over-bridge spanning the A465. Mine working treatment. Construction of retaining walls adjacent to the River Clydach.	Establish diversion drains around the top and bottom of slopes where earthworks cuttings are to be carried out. This will be carried out before the slope is cut to ensure that runoff is captured and treated before entering the River Clydach. In areas of limited footprint, settlement tanks and oil separators will be used to treat contaminated water from the work areas. Flocculants may be used in association with settlement facilities as a last resort. This would be discussed with Natural Resources Wales (NRW). Works in mine treatment areas will be segregated by physical barriers and housekeeping of the working area maintained throughout the work. Physical barriers to stop large diameter material spilling into the River Clydach and its tributaries will be used as and when required. Suitable systems will be developed to deal with such instances of overspill. To minimize the possibility of the River Clydach and its tributaries becoming polluted with dissolved solids, physical barriers will be erected adjacent to water courses where possibility of watercourse contamination exists. This will be done prior to work in the area commencing.
Split level carriageway through the Clydach Gorge Ch 30000-31150, Ch 31150 - 32100	Earthworks Rock removal using various techniques Specifically rock removal within limestone (Karst) zones where karst features such as water horizons and conduits lead to more prominent features like sink holes and caves. Construction of retaining walls Extension of River Clydach culverts.	Establish pre-earthworks drainage such as diversion ditches and slope drains. Settlement tanks with use of flocculants (in agreement with NRW). Physical barriers to stop large diameter material spillage and also silt netting or similar to protect watercourses. Protocol of remedial action in the event of exposure of karst features, such as conduits and voids, with the excavation teams fully informed of action to be taken where exposures are encountered. Geotextile and filter materials will be available at the point of excavation for use where inclement weather could carry suspended solids/excavated fines into the pre cave systems. General awareness of encountering perched water.
Clydach-Cheltenham Ch32100 - 33350	Construct culvert and footbridge Construct retaining walls and highway construction in a southerly direction as part of mainline dualling work	V-ditches leading to settlement areas silt netting and physical barriers to stop material overspill. Suitable water management such as overpumping required during culvert work. General awareness of encountering perched water.

Area	Construction Activities	Proposed mitigation
Saleyard Junction Ch33350 - 34100	Extensive filling operation to Sale Yard embankment. Construction of foundations to structures as well as a structure over the River Clydach. Concrete repairs to existing bridges, cut to the South side of the Saleyard area.	Pre-earthworks drainage such as diversion channels leading to settlement ponds/tanks. Use of bunds adjacent to the watercourse to act as a barrier for large material overspill during filling works. Silt netting used to manage runoff. For works to the undersides of the bridges, appropriate screening between the work and the watercourse below will be implemented. Pumping of concrete contaminated water to designated washout area, which will be located away from the watercourse.
Brunant Cutting Ch33900-34750	Earthworks culminating in cutting to the southern side of the existing A465. False cutting on the northern side of the existing A465.	Pre-earthworks drainage such as diversion channels leading to settlement ponds/tanks. Erect physical barriers to eliminate the possibility of materials entering the River Clydach where false cutting filling occurs. Use of debris screens, silt netting and ditches to direct flows to settlement and filtration area through the use of straw/hay bales.
Gilwern Junction Ch34750 - 35750	Retaining wall construction along the Monmouthshire and Brecon Canal and the south bank of the River Clydach. Earthworks filling operation adjacent to the Navigation Inn.	Physical barriers to stop large diameter materials and silt entering the watercourse. Diversion ditches cut along access tracks to the retaining walls and work areas, which lead to filtration areas and settlement ponds/tanks.
Gilwern Cutting & Glanbaiden Ch35750-36800	Earthworks cutting. Construction of Navigation Inn overbridge. New approach towards bebo arches at Glanbaiden.	Use of pre-earthworks drainage such as v-ditches leading to settlement ponds and settlement tanks. Physical barriers to eliminate the possibility of material contaminating the watercourse.

4.2.71 Works over and within watercourses, or any works that may affect the watercourses, will require a Flood Defence Consent from NRW. Early consultation with NRW will be undertaken to agree appropriate pollution control measures and consent requirements. Methods of disposal/discharge of water from the site will also be developed in consultation with NRW.

4.2.72 Discharge consents are not required for the discharge of highway run-off to surface waters, but NRW will be consulted on the treatment and discharge measures to be used on the Scheme. NRW consents will be required for the construction of outfalls to surface waters.

4.2.73 Due to the topography of the site, the drainage system will need to take into account the surrounding catchment. Pre-earthworks drainage will be provided at the top of embankments and bottom of earthworks embankments to intercept adjacent land surface-water run-off falling towards the proposed Scheme footprint.

4.2.74 Temporary drainage systems will be installed and carefully managed to prevent localised flooding or pollution of surface and groundwater from silt and other contaminants.

4.2.75 In areas where old potentially contaminated land and mine workings have been identified, specific mitigation measures will be designed to manage and contain potentially contaminated soils and/or mine waters. Detailed method statements will be prepared for works in these areas.

4.2.76 NRW would be consulted and licenses obtained if any dewatering is required during construction.

4.2.77 Where concrete works are required for superstructures (e.g. bridges), if watercourses are present beneath the structures, deck sections will be sealed and inspected.

General Control Measures

4.2.78 An emergency response plan will be developed in accordance with EA Guidance PPG21 – Pollution Incidence Response Planning. The plan will be communicated to all personnel. Emergency spill control equipment such as spill kits, oil booms and absorbent materials, will be held at appropriate locations on site and within site compounds.

4.2.79 Site compounds will, where possible, be located away from all surface water features and watercourses.

4.2.80 A site drainage plan will be prepared in advance of construction works, showing the location of all watercourses and drains/drainage paths.

4.2.81 All drainage on site will be identified and colour coding will be used to distinguish between surface water, foul sewer and combined drainage. This will ensure that all those working on site are aware of the type of drain in the event of a pollution incident. Pollution control measures such as the use of oil interceptors or the placement of bunds or silt traps will be used to prevent silt run-off entering drains.

4.2.82 Work involving concrete and cement will be carried out in accordance with PPG 5 Works in, near or liable to affect a watercourse.

4.2.83 No fuels, oils or other chemicals will be stored in high-risk locations such as:

- within 50 metres of a spring, well or borehole;
- within 10 metres of a watercourse; and
- places where spills could enter open drains or soak into groundwater.

4.2.84 Storage tanks will be sited on an impermeable base, surrounded by an impermeable bund, and inspected regularly for leaks. Any valve, filter, sight gauge, vent pipe or other ancillary equipment must be kept within the bund when not in use.

4.2.85 At filling points, vent pipes and gauges will be sealed to prevent discharge to any watercourse, land or underground strata.

4.2.86 Associated pipework should be situated above ground and protected from accidental damage.

4.2.87 All bulk fuels storage must be contained within a double skinned bowser/container or have a bund. Double skinned tanks or bowsers must also be bunded unless the outer skin would provide secondary containment. The bund must have sufficient volume to contain 110% of the contents of the largest fuel/pipe container or 25% of the total storage capacity of all the containers, whichever is the greater.

4.2.88 All fuel containers, including those containing waste fuels, must be stored on a drip tray/bunded area away from vehicle traffic within a designated storage area, where possible, to avoid damage.

4.2.89 Mobile bowser and bulk fuel tanks will be locked when not in use. Any pumps associated with fuel and oil will be securely locked

4.2.90 All storage containers must be strong enough to hold the substance without leaking or bursting and must be labelled with their content and capacity. Regular inspections will be carried out for signs of leaks or corrosion.

4.2.91 Oil/fuel etc from drip trays will be removed using oil absorbent pads. If the oil/water cannot be separated fully the tray water should be disposed of as contaminated water.

4.2.92 Haul routes will be regularly inspected and maintained to minimise silty run-off.

4.2.93 Areas of hard standing will be provided at site access and egress points. The areas will be regular inspected and cleaned and road sweepers/cleaners will be employed on existing highways near the construction area.

4.2.94 All vehicles, plant and equipment will be regularly inspected and maintained in accordance with manufacturers' recommendations. Records of inspections will be maintained on site.

4.2.95 Site wheel washing facilities will be established at designated locations, away from watercourses. Cleaning will be carried out in a bunded area and wastewater will either be recycled or discharged to foul sewer (with consent from the sewerage undertaker).

4.2.96 Any contaminated waste will be removed from site by a licensed waste carrier for disposal to an appropriately licensed facility.

Works in, near or liable to affect a watercourse

4.2.97 The timing of works will be restricted, if required. Works on culverts and diversion channels will be carried out in accordance with NRW consent requirements, and NRW will be consulted on the works programme associated with the River Clydach.

4.2.98 Discharge flow rates from over-pumping operations will be controlled to prevent flooding and to prevent localised damage to receiving waters by erosion or the deposition of sediments.

4.2.99 Pollution control measures will include cut-off ditches or bunds to prevent run-off entering drains and watercourses and buffer zones may be used as a secondary measure along the site boundary and river bank to act as sediment filters during activities such as vegetation clearance.

4.2.100 Seeding/mulches/geotextile/mats/soil binders may be used for temporary erosion control to stabilise exposed soils.

4.2.101 Surface water run-off will be managed using cut-off drains or ditches to channel water around the site and/or to prevent silty water entering excavations and watercourses.

4.2.102 In areas of the works in close proximity to the watercourses, cut-off trenches combined with geo-textiles may be used to assist in preventing sediment from entering the river.

4.2.103 Silty water will be treated to allow suspended solids to settle out before disposal. Treatment is likely to include a combination of settlement tanks (e.g. Siltbuster), filtration systems such as coarse aggregates, silt bags, silt fencing and straw bales, or infiltration to grassed areas supplemented with silt fencing. As a last resort, flocculants may be used in association with settlement facilities subject to consultation with the NRW.

4.2.104 Temporary settlement lagoons for the control of run-off and the treatment of sediment will be established at designated locations. Where required, settlement and filtration ponds will have the base sealed to prevent water entering adjacent ground and to contain potentially contaminated water.

4.2.105 Stockpiles will be located away from drains and watercourses.

4.2.106 Exposed stockpiles will be seeded or stabilised and silt fencing or other barriers placed at the toe of stockpile slopes to prevent the transport of run-off.

4.2.107 The works programme associated with the River Clydach will be agreed with the NRW.

4.2.108 Measures, such as temporary bunds, may be used to prevent water from entering excavations. Discharge flow rates from pumping operations will be controlled to prevent flooding and to prevent localised damage to receiving waters by erosion or the deposition of sediments.

4.2.109 De-watered groundwater will not be discharged to surface waters, sewers and/or ground/groundwater without NRW consent.

4.2.110 Where required, a sediment settlement facility would be used to treat water pumped from excavations. This may either be in the form of tanks or a temporary settlement lagoon.

Summary and conclusion

4.2.111 Given the mitigation measures outlined above to control discharge of pollutants to watercourses, it is considered that construction would have no significant adverse effects on water quality.

Operational effects

Disturbance to species – mortality during operation

4.2.112 Existing culverts and underpasses that are used by bats would be retained and modified (Table 4.4). Post construction monitoring of culvert use by Lesser Horseshoe Bats would be undertaken to determine their usage and the efficacy of the modifications undertaken (see Section 5).

4.2.113 The road would be lit, therefore discouraging bats from crossing over the road. All existing potential and confirmed under-road crossing points would be retained and have been designed in consultation with NRW so that Lesser Horseshoe Bat are able to fly through them. Existing culverts would not be reduced in cross-sectional area and in many cases the cross-sectional dimensions would be increased. In some cases, culverts would be extended and steepened; however, dimensions are considered adequate not to deter bats from flying through them. Underpasses would be reduced to 1.8m diameter but this is considered adequate for Lesser Horseshoe Bat passage. In addition, existing lighting within the underpasses would be removed and grilles installed at either end to prevent human entry. The conductivity of subways in relation to Lesser Horseshoe Bat passage is therefore likely to be improved in the long-term. In the short-term, vegetation would be removed from around the entrances of extended culverts, potentially deterring bats from using them until vegetation sufficiently matures, likely to be between 5 & 10 years. To mitigate this, temporary and permanent landscaping measures and planting would be provided to ensure that Lesser Horseshoe Bats are able to fly to the culverts from retained vegetation outside of the construction area. The success of such measures for Lesser Horseshoe Bat has been demonstrated on other schemes, although there has often been an initial period of adaptation to new structures and bats may choose to use unaltered crossings instead, particularly along the River Clydach, or not cross the road initially. The Scheme would be lit along its length, and this would at least maintain existing levels of deterrence for bats.

4.2.114 It is therefore considered extremely unlikely that there would be any mortality of bats caused by the Scheme during operation and any residual risk would be no greater than the existing road presents.

Habitat deterioration – discharge of pollutants into watercourses during operation

4.2.115 As noted in Section 3.3.77, there is not considered to be a potential adverse effect on Lesser Horseshoe Bats arising from discharges to watercourses during operation.

4.2.116 The drainage design includes measures to minimise the severity of effects of accidental spillages.

4.2.117 The drainage design for the Scheme proposes a system that would include five main stages that link in a treatment process:

- catchpits and gulley collection;
- piped drainage;
- bypass interceptors;
- offline storage; and
- penstock valves.

4.2.118 Catchpits and gulleys would provide a primary method of collecting water from the road surface. Catchpits have a grill that would prevent larger particles from being washed into the drainage system. Piped drainage would provide an effective form of transferring road drainage without any risk of discharge to sensitive groundwater. Incorporating bypass interceptors into the treatment sequence would provide mitigation by allowing improved retention of hydrocarbons from daily run-off and from lay-bys. Offline storage would allow the increased discharges of flow from increased impermeable areas of the scheme to be stored and slowly released ensuring no increased flood risk. Penstock valves would provide the facility to prevent road drainage entering a watercourse should there be a spillage of pollutant on the highway.

4.2.119 The proposed scheme has 16 proposed discharges, all of which would be provided with the minimum proposed mitigation of class 1 bypass separators. This would provide some measure of removal of oils in the event of a serious spillage. Their locations are summarised in Table 4.6.

4.2.120 The drainage design incorporates the capacity to cope with a 1 in 100 flood event plus an additional 20% capacity to account for the potential effects of climate change.

Table 4.6. Summary of proposed discharges and proposed mitigation

Outfall Reference	Outfall Chainage	Receiving water attribute	Proposed mitigation
1	29700	R.Clydach	Class 1 Bypass Interceptor
8	31000 or 31450	R.Clydach	Class 1 Bypass Interceptor
3	32900	R.Clydach	First Flush Pond
4	33600	R.Clydach	Class 1 Bypass Interceptor
5	35050	R.Clydach	Class 1 Bypass Interceptor
6	35400	Brec & Mon Canal	Class 1 Bypass Interceptor
9	36150	Brec & Mon Canal	Class 1 Bypass Interceptor
7a	36680	Llanbaidan Brook	Class 1 Bypass Interceptor
10a	366800	Llanbaidan Brook	Class 1 Bypass Interceptor
7b	37400	Cwmshenkin Brook	Swale/Pond + Class 1 Bypass Interceptor (possibly use existing)
10b	37350	Cwmshenkin Brook	Swale/Pond + Class 1 Bypass Interceptor (possibly use existing)
SR1	30130 (Main Road)	Trib to R.Clydach	Class 1 Bypass Interceptor
SR6	33850 (Saleyard)	R.Clydach	Class 1 Bypass Interceptor
SR7	33650 (Saleyard)	R.Clydach	Class 1 Bypass Interceptor
SR8	35270 (Gilwern)	Brec & Mon Canal	Class 1 Bypass Interceptor
SR9	35250 (Gilwern)	Brec & Mon Canal	Class 1 Bypass Interceptor

4.2.121 In order to restrict potential pathways for pollution to the groundwater environment, no direct discharges to groundwater or soakaways would be used and all attenuation features would be self-contained. This is to ensure that there would be no risk of contamination of groundwater and that no new pathways for contamination would be opened in areas of cut.

4.2.122 By using piped discharge from the highway to the river, the probability of any discharge to groundwater is low compared to other sustainable drainage system techniques, such as grass lined channels, filter drains and infiltration trenches.

4.2.123 Road run-off for all new impermeable areas would be attenuated to ensure that it would not cause or increase flooding elsewhere. Mitigation for all new impermeable areas would typically be in the form of a combination of catchpits with sediment traps, bypass separators, penstock valves and in one instance a pond that would be of a size sufficient to attenuate outfall flow for a 1 in 100 year event.

4.2.124 The addition of the mitigation measures outlined above would slightly improve the quality of road drainage to the water environment and would reduce the risk of serious pollution incidents from spillages. There is therefore a slight beneficial effect of the Scheme compared to the baseline situation.

Tilio-acerion woodland

Construction phase

Habitat deterioration – generation of dust during construction

4.2.125 Measures to limit the effects of dust generation during construction are summarised in Sections 4.2.44-4.2.65.

4.2.126 Given the measures outlined to control dust generation, it is not considered that dust generation would result in significant effects on the quality of Tilio-acerion woodland within the Usk Bat Sites SAC adjacent to the Scheme, and no residual effects on this habitat feature are therefore identified.

Caves not open to the public

Construction phase

Habitat loss – direct land take

4.2.127 The design of the proposed scheme has been developed to avoid loss of the caves and minimise disruption to entrances. Mitigation to minimise the impact of construction activities include:

- Internal surveys of those caves in closest proximity to the proposed works will be undertaken, together with internal inspection and condition recording, prior to construction works and monitoring during the works.

- Suitable methods for the excavation of rock will be assessed to determine the potential impacts of the works on the cave system. It is proposed to use low impact rock planing/ rotary head grinders attached to excavation plant where possible.

- Any blasting works required near the caves will be designed to minimise damage and/or loss using appropriate blasting methods with reduced charges. Works would be designed and carried out by specialist blasting contractors.

- If necessary, either a bridging element (e.g.foundation slab) and / or lightweight fill would be used to reduce loading above some features.

4.2.128 All practical measures have been taken to identify caves and related features, and all available sources have been researched such as those records described above. The construction team has carried out a thorough review of available relevant information on known caves and associated limestone (karst) features in advance of any construction work.

4.2.129 The ground penetrating radar survey undertaken in 2013 will be complemented by internal surveys of those caves in closest proximity to the proposed works together with internal inspection and condition recording prior to construction works.

4.2.130 A number of the caves within the limestone areas of the Clydach Gorge are in close proximity to the proposed construction works, including Waterfall Cave and the Ogof Capel and Ogof Gelynnen system (see Figures 4a-g and 7 for locations).

4.2.131 Between ch. 31200-31330 the cave most likely to be affected is Waterfall Cave. Waterfall Cave currently extends from Blackrock Quarry and runs beneath Main Road and the existing A465, exiting in the north bank of the River Clydach, to the south of the existing A465. Immediately to the south of Blackrock Quarry, Main Road is to be realigned towards the north thereby providing construction footprint to accommodate the new eastbound carriageway of the A465 in its split level arrangement.

4.2.132 To construct the new eastbound carriageway of the new A465 in split level it is necessary to provide a central retaining wall where this crosses over the stream passage of Waterfall Cave. If necessary, either a bridge and/or lightweight fill would be used to reduce loading.

4.2.133 Where appropriate, measures may be taken to provide better distribution of future vehicular loading above the existing chamber by introducing a reinforced concrete slab within the new highway construction or another similar form of load transfer measure.

4.2.134 Between Chainages 31700m to 31750m, the entrances to both Ogof Capel and Ogof Gelynnen are in the south facing limestone cliff faces to the immediate south of the Drum and Monkey public house on the south of the existing A465. Ogof Capel is an 835m long resurgence cave discharging water from Ogof Craig a Ffynnon. The cave entrance leads to a sump (flooded passage) after a few metres and this is followed by a second sump.

4.2.135 Ogof Gelynnen was initially explored to a boulder choke (an area of roof collapse). This, and subsequent boulder chokes, were excavated by cavers and in late 2005 a connection was made with Ogof Capel beyond the two entrance sumps.

4.2.136 The new A465 in dual carriageway necessitates a widening of the existing highway footprint, to accommodate the new westbound carriageway to the south of the existing road. There is a requirement to reduce the existing cover to the cave system and provide strengthening and improved vehicular load distribution over and above it to mitigate for future trafficking. At this location the new A465 in dual carriageway will be constructed at grade.

4.2.137 In order to construct the new westbound carriageway of the new A465 at this location the unavoidable excavation of rock will be performed using low impact rock planing / rotary head grinders attached to excavation plant. Once the exact plan location of the cave is established, this equipment can be operated with the excavation machine sitting outside the planned positions of the chambers. It is likely that load transfer could be achieved with geo-grids and reinforced concrete slabs spanning the cave chambers at high level and any such requirement will be included in the highway design.

Potential for discovery of further cave features during construction work

4.2.138 It is a reasonable assumption that there may be cave passages in the vicinity of the Scheme that are as yet undiscovered but might be intersected during the construction works. It is also possible that conduits tributary to caves will be intersected.

4.2.139 Although works will be carefully supervised and controlled there remains a risk of encountering unknown caves/conduits during excavation and other works. A protocol has therefore been developed to establish appropriate hold points to control work activities in these areas (see Appendix E).

4.2.140 Procedures would include the requirement to stop works immediately and secure the area and to consult with the appropriate specialists to agree revised working methods if necessary.

4.2.141 All practicable measures (many of which are stated above) would therefore be taken to avoid physical damage to the cave system underlying the Scheme by using appropriate design and construction methods.

4.2.142 It is therefore considered that given the construction methods and mitigation outlined above, that the construction of the scheme would be extremely unlikely to result in an adverse effect on the cave system.

Habitat loss – indirect construction effects

4.2.143 Measures to prevent loss of cave habitat via indirect construction effects are outlined above in Sections 4.2.127 to 4.2.142.

4.2.144 Given these mitigation measures, it is considered that the construction of the scheme would be extremely unlikely to result in an adverse effect on the cave system.

Habitat deterioration – changes in hydrology and airflow during construction

4.2.145 Measures to prevent losses of cave habitat via indirect construction effects are outlined above in Sections 4.2.127 - 4.2.142. All practicable measures will be taken to avoid physical damage to the cave system underlying the Scheme by using appropriate design and construction methods, and avoiding damage to the system would also prevent a deterioration in habitat quality via changes to hydrology and airflow. Should any unknown cave systems be broken into, mitigation works would include surface water management to prevent surface water from draining into any exposed cavities, and advice would be sought from the specialist on the most appropriate way of closing up entrances to exposed caves. Therefore, whilst there might be some short term changes to airflow and / or hydrology whilst remedial measures are identified, a significant long-term effect is considered extremely unlikely to occur.

4.2.146 Given these mitigation measures, it is considered that the construction of the scheme would be extremely unlikely to result in an adverse effect on the cave system.

Construction / operation phase

Effects on bats

4.2.147 The assessment of potential effects on bat species other than Lesser Horseshoe concluded that an adverse effect on these species was considered likely (Sections 3.3.1 - 3.3.69).

4.2.148 Mitigation for effects on Lesser Horseshoe Bats is presented and assessed in the section below. The assessment concludes that it is extremely unlikely that there would be an adverse effect on Lesser Horseshoe Bats. Given that the issues are similar for other bat species (refer to Sections 3.3.113 - 3.3.114 and Table 3.10, it is also concluded that it is extremely unlikely that there would be an adverse effect on other bat species associated with Caves Not Open to the Public.

4.3 Cwm Clydach Woodlands SAC

Asperulo-Fagetum beech forests and Atlantic acidophilous beech forests with *Ilex* and sometimes also *Taxus* in the shrub layer

Construction phase

Habitat deterioration – generation of dust during construction

4.3.1 Measures to limit the effects of dust generation during construction are summarised in Sections 4.2.125 - 4.2.126.

4.3.2 Given the measures outlined to control dust generation, it is not considered that dust generation would result in significant effects on the quality of beech woodland within the Cwm Clydach Woodlands SAC where is close the Scheme, and no residual effects on these habitat features are therefore identified.

4.4 River Usk SAC

Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation

Construction phase

Habitat deterioration – discharge of silt and pollutants to watercourses during construction

4.4.1 Mitigation measures to prevent significant effects on watercourses during construction are outlined in Sections 4.2.67 - 4.2.111.

4.4.2 Given the mitigation measures outlined above to control discharge of pollutants to watercourses, it is not considered that construction would result in an adverse effect on this habitat feature, and the residual effect is assessed to be neutral.

Operational phase

Habitat deterioration – discharge of pollutants to watercourses during operation

4.4.3 The mitigation measures proposed as part of the operational drainage design for the Scheme are summarised in Sections 4.2.116 - 4.2.124.

4.4.4 The mitigation measures will slightly improve the quality of road drainage to the water environment and will reduce the risk of serious pollution incidents from spillages. There is therefore a slight beneficial effect of the Scheme compared to the baseline situation.

4.4.5 It is therefore considered that an adverse effect on the habitat as a result of surface water drainage during operation is extremely unlikely, and no residual effect is identified.

Fish

Construction phase

Mortality and habitat deterioration – discharge of silt and pollutants to watercourses during construction

4.4.6 Mitigation measures to prevent significant effects on watercourses during construction are outlined in Sections 4.2.67 - 4.2.111.

4.4.7 Given the mitigation measures outlined above to control discharge of pollutants to watercourses, it is not considered that construction would result in significant adverse effects on water quality; no adverse effect is therefore expected.

Operational phase

Mortality and habitat deterioration – discharge of pollutants into watercourses during operation

4.4.8 The mitigation measures proposed as part of the operational drainage design for the Scheme are summarised in Sections 4.2.116 - 4.2.124.

4.4.9 The mitigation measures will slightly improve the quality of road drainage to the water environment and will reduce the risk of serious pollution incidents from spillages. There is therefore a slight beneficial effect of the Scheme compared to the baseline situation.

4.4.10 It is therefore considered that an adverse effect on fish species would occur as a result of surface water drainage during operation is extremely unlikely, and no residual effect is identified.

Otter

Construction effects

Habitat deterioration – discharge of silt and pollutants into watercourses during construction

4.4.11 Mitigation measures to prevent significant effects on watercourses during construction are outlined in Sections 4.2.67 - 4.2.111.

4.4.12 Given the mitigation measures outlined above to control discharge of pollutants to watercourses, it is not considered that construction would result in significant adverse effects on water quality; no effect on integrity is predicted and the residual effect is assessed to be neutral.

Operational phase

Mortality during operation

4.4.13 Otters would be able to utilise river and major tributary crossings to cross under the Scheme without being at risk from traffic, in locations as shown on the Environmental Master Plan (Figure 12).

4.4.14 Fencing would be provided to “funnel” otters into the crossing points, and to prevent them from attempting to cross the new road at those locations. Details of the proposed Otter exclusion fencing are provided on Figure 14.

4.4.15 The inclusion of measures to allow otters to pass through water crossings at all levels of flow should reduce the need for otters to venture onto the road scheme.

4.4.16 Given this mitigation, it is considered that the Scheme will provide an improvement on the baseline in terms of Otter mortality, and there will therefore be a slight positive effect.

Habitat deterioration – discharge of pollutants into watercourses during operation

4.4.17 The mitigation measures proposed as part of the operational drainage design for the Scheme are summarised in Sections 4.2.116 - 4.2.124.

4.4.18 The mitigation measures will slightly improve the quality of road drainage to the water environment and will reduce the risk of serious pollution incidents from spillages. There is therefore a slight beneficial effect of the Scheme compared to the baseline situation.

4.4.19 It is therefore considered that no adverse effect on integrity of otter would occur as a result of surface water drainage during operation, and the residual effect is assessed as neutral.

4.5 Summary of assessment of residual effects

4.5.1 Table 4.7 below summarises the adverse effects identified in Table 3.12 and provides an overall summary of whether any residual effects were identified following the assessment of mitigation in Section 4

Table 4.7: Summary of mitigation measures and residual effects

Site	Feature	Likely Significant Effect identified at screening stage	Adverse effect identified in absence of mitigation?	Summary of proposed mitigation	Adverse effect with mitigation?
Usk Bat Sites	Lesser Horseshoe Bat	Habitat loss – loss of roosts	Yes – loss of summer roost sites and one hibernation site	Provision of replacement roosts	**No**
		Habitat loss – loss of foraging habitat	Yes – losses of >5% foraging habitat within 1km of maternity roosts and 1.2km of notable hibernation roosts	Provision of replacement foraging habitat at >1:1 ratio	**No**
		Disturbance to species – mortality during construction	Yes – potential mortality within roosts being destroyed, and potential for increased mortality due to flightline disruption	Roost destruction when bats not present Maintenance of crossing points Lighting to deter bats at carriageway	**No**
		Disturbance to species – damage or obstruction of access to roost sites during construction	Yes	Timing of works to avoid most sensitive periods	**No**
		Disturbance to species – noise and vibration during construction	Yes – potential for impacts from loud construction events e.g. piling	Timing of works to avoid most sensitive periods	**No**
		Habitat fragmentation – by habitat loss / severance of flightlines	Yes	Retention of crossing points and design of amendment culverts to ensure bats can still use them	**No**

Site	Feature	Likely Significant Effect identified at screening stage	Adverse effect identified in absence of mitigation?	Summary of proposed mitigation	Adverse effect with mitigation?
		Habitat deterioration – dust generation during construction	Yes	Measures to control dust generation	**No**
		Habitat deterioration – discharge of silt and chemical pollutants to watercourses during construction	Yes	Water Management Plan	**No**
		Disturbance to species – mortality during operation	Yes - potential for increased mortality due to flightline disruption	Maintenance of all existing crossing points, retention of lighting to deter crossing at carriageway level	**No**
		Habitat deterioration – discharge of chemical pollutants to watercourses during operation	Yes	Drainage design results in slight improvement in water quality and better interception of pollutants	**No**
	Tilio-acerion Woodland	Habitat deterioration – dust generation during construction	Yes	Measures to control dust generation	**No**
	Caves not open to the public	Habitat loss – direct land take	Yes	No known caves affected. Protocols to minimise risk if unknown cave systems discovered during construction	**No**
		Habitat loss: indirect construction effects	Yes	No known caves affected. Protocols to minimise risk if unknown cave systems discovered during construction	**No**

Site	Feature	Likely Significant Effect identified at screening stage	Adverse effect identified in absence of mitigation?	Summary of proposed mitigation	Adverse effect with mitigation?
		Habitat loss / deterioration – changes in hydrology and airflow during construction	Yes	No known caves affected. Protocols to minimise risk if unknown cave systems discovered during construction	**No**
		Impacts on Bats	Yes (assessment covered under relevant LHB sections)	Mitigation as for LHB	**No**
Cwm Clydach Woodlands SAC	Fagetum beech forests and Atlantic acidophilous beech forests with Ilex and sometimes also Taxus in the shrub layer	Habitat deterioration – dust generation during construction	Yes	Measures to control dust generation	**No**
River Usk SAC	Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation	Habitat deterioration – discharge of silt and chemical pollutants to watercourses during construction	Yes	Water Management Plan	**No**
		Habitat deterioration – discharge of pollutants to watercourses during operation	Yes	Drainage design results in slight improvement in water quality and better interception of pollutants	**No**
	Fish species	Mortality and habitat deterioration – discharge of silt and pollutants to watercourses during construction	Yes	Water Management Plan	**No**

Site	Feature	Likely Significant Effect identified at screening stage	Adverse effect identified in absence of mitigation?	Summary of proposed mitigation	Adverse effect with mitigation?
		Mortality and habitat deterioration – discharge of pollutants to watercourses during operation	Yes	Drainage design results in slight improvement in water quality and better interception of pollutants	**No**
	Otter	Mortality and habitat deterioration – discharge of silt and pollutants to watercourses during construction	Yes	Water Management Plan	**No**
		Mortality during operation	No but measures included as best practice.	Fencing to exclude Otters from carriageway Provision for safe passage of Otters for river and tributary crossing points	**No**
		Mortality and habitat deterioration and mortality – discharge of pollutants to watercourses during operation	Yes	Drainage design results in slight improvement in water quality and better interception of pollutants	**No**

5. Proposals for monitoring and reporting

5.1 Pre-construction monitoring

Lesser Horseshoe Bat

5.1.1 In order to ensure up to date information on Lesser Horseshoe Bat activity within the study area against which to assess effects, a programme of pre-construction monitoring would be drawn up in consultation with NRW and carried out in 2013 and 2014 prior to the commencement of construction. It would reflect the frequency and effort from the baseline surveys, amended to suit how construction impacts may occur. The aims of this pre-construction monitoring would be to continue to monitor the size of known Lesser Horseshoe Bat maternity, summer and hibernation roosts (which ones) and continue to monitor Lesser Horseshoe Bat activity at crossing points. Data for winter use of crossing points close to notable hibernation sites would also be gathered.

5.2 Monitoring during construction

Lesser Horseshoe Bat

5.2.1 Monitoring of bat roosts, would be undertaken as frequently as that undertaken pre-construction to allow comparison with pre-construction and baseline data.

5.2.2 New bat roosts created would be monitored to assess success and the need for modification if necessary.

5.2.3 Bat crossing points would be monitored throughout the construction phase to inform remediation/iterative modifications should there be concerns that bats are not using the crossing points. Monitoring would be on a monthly basis between April and October inclusive. Bat behaviour in relation to the road would be investigated to determine the effectiveness of guide fencing and crossing structures and inform modifications if required.

Otter

5.2.4 An annual monitoring survey once per season of all new and existing otter crossing points along the scheme would be carried out during construction.

5.3 Post-construction monitoring

Lesser Horseshoe Bat

5.3.1 Monitoring would be carried out in relation to Lesser Horseshoe Bats following the construction of the Proposed Scheme. This would consist of four elements:

- Monitoring to determine the effectiveness of bat crossings and associated landscape measures aimed at providing Lesser Horseshoe Bats with safe crossing points. These would be carried out on a monthly basis between April and October inclusive, during years 1 and 2, of the operational phase. Each crossing point will be monitored at least once each month during the survey period, along with the open road within the vicinity of the crossing point to determine numbers using the crossings and those flying over the road. Further monitoring would be arranged for following years depending on the results of the initial monitoring and in consultation with NRW.

- Once juvenile bats start to fly (usually from mid July onwards depending on seasonal factors), walkover surveys of the road in areas to be determined following discussion with NRW will be undertaken at dawn to look for Lesser Horseshoe Bat corpses killed by passing traffic. These surveys will be undertaken on mornings following the bat crossing surveys, detailed above, until October of each year.

- Surveys to monitor the structure and function of the newly created areas of bat foraging habitat for Lesser Horseshoe Bats

- Monitoring of Lesser Horseshoe Bat maternity and hibernation roosts for a period of five years with a review at year 5 to determine if further monitoring is necessary to determine effects on Lesser Horseshoe Bats.

Otter

5.3.2 An annual monitoring survey once per season of all new and existing otter crossing points along the scheme would be carried for 5 years after completion of the Scheme and then reviewed. All reports of otter casualties would be noted and provided for further assessment by the Cardiff University Otter project, which has been reviewing data on otter road casualties in Wales.

Tilio-acerion woodland

5.3.3 A condition assessment (to a methodology drawn up in consultation with NRW) would be carried out within two years after completion, and again at five years after completion. A review will then be undertaken to consider whether further surveys are necessary. The survey would review condition of areas identified in the 2013 report.

5.4 Criteria for success

Lesser Horseshoe Bat

5.4.1 The mitigation measures would be considered successful if the monitoring programme demonstrates the following:

- Bats cross the Proposed Scheme utilising the under-road crossing structures in similar numbers (as assessed by the Bat Activity Index) to those recorded as part of the baseline/pre-construction monitoring.

- Numbers of Lesser Horseshoe Bats recorded at Clydach House, Auckland House, Llanwenarth House and Clydach Viaduct maternity roosts show no significant decline over a five-year period, also considering the regional or national trend (Welsh) in Lesser Horseshoe roost numbers over this period. Numbers should be considered in combination with those at the new Nant Hafod roost and other structures along the scheme, e.g., pipe and chamber roosts and manhole chambers, as bats may choose to relocate to these roosts if they provide more favourable conditions. This assumes that the roosts do not experience disturbance from non-road related sources. Disturbance from other sources will be factored into the consideration of results

- In line with current Conservation Objectives for the Usk Bat Sites SAC, a total of 18 or more Lesser Horseshoe Bats are recorded at the Clydach Gorge cave sites, and 47 to be recorded at least once during the six year monitoring cycle.

Otter

5.4.2 The mitigation measures for Otter would be considered a success if:

- Evidence of continued presence of Otters in areas where they are currently known to occur is obtained.

- No Otter casualties on the carriageway are observed or reported.

Tilio-acerion woodland

5.4.3 Mitigation measures would be considered a success if the condition of the woodland does not deteriorate for reasons associated with the road scheme, with particular attention paid to ground flora species.

5.5 Reporting

5.5.1 The results of the Lesser Horseshoe Bat monitoring programme would be formally reported to the Welsh Government and NRW initially on a quarterly basis, with brief monthly reports sent by email. Six-monthly review meetings with NRW in attendance would be held to discuss the results (in spring/autumn), any remediation measures required and the need for future monitoring.

5.5.2 In addition, *ad hoc* meetings with NRW would be held as required to respond to specific events if monitoring results suggest that this is necessary to consider adaptive measures which may be required.

5.5.3 Other monitoring programmes would be formally reported on an annual basis.

6. Consultations

6.1.1 Regulation 61(3) of the Habitats Regulations requires the competent authority, before deciding to undertake, or give any consent, permission or other authorisation for, a plan or project which requires appropriate assessment to:

6.1.2 "…for the purposes of the assessment consult the appropriate nature conservation body and have regard to any representations made by that body within such reasonable time as the authority specify."

6.1.3 As noted in Sections 1.1.25 - 1.1.28, the scheme has been subject to much assessment prior to the appointment of the Contractor, going back to the original ES and line order in 1997, which has involved extensive consultation with the Countryside Council for Wales (CCW).

6.1.4 Since the appointment of the contractor and in accordance with the requirements of Regulation 61(3), regular meetings have been held, initially with CCW and, since 1st April 2013, Natural Resources Wales (NRW), to discuss the development of the project design and the progress of the assessment of effects, including the AIES.

6.1.5 These meetings commenced on 19th July 2011 and were initially held quarterly. From February 2012 meetings have been held at approximately monthly intervals. The AIES has been on the agenda of these meetings from the early stages of the consultation with CCW.

6.1.6 Initial discussions related to the Screening stage of the AIES and the requirements for survey to provide the necessary baseline information to inform the assessment of likely significant effects and where relevant subsequent appropriate assessment.

6.1.7 The draft Screening Report was issued to statutory consultees for comment on 13th June 2012. The report was sent to CCW, Environment Agency Wales (EAW, now part of NRW), Monmouthshire County Council and the Brecon Beacons National Park Authority.

6.1.8 Comments were received from all these organisations in July and August 2013, and these were taken into account in revising the Screening Assessment included in this SIAA report.

6.1.9 As the scheme design progressed detailed discussions took place with CCW (and subsequently NRW) on relevant matters including the design of under-road crossings for bats, requirements for woodland planting to mitigate for loss of bat foraging habitat, the need for lighting of the scheme, requirements for replacement bat roosts and their location and design, the definition of *Tilio-acerion* woodland and its mapping in the Clydach Gorge, effects of air quality on the woodland habitats in the gorge, and the protection of caves from damage during the construction of the road.

6.1.10 CCW/NRW have been consulted on a draft screening report and on a draft version of this SIAA report, and their comments have been taken into account when finalising this report.

6.1.11 This document is part of the formal consultation with NRW, Monmouthshire County Council and the Brecon Beacons National Park Authority.

The Bat Technical Advisory Group (BATTAG)

6.1.12 In 2005 the Bat Technical Advisory Group (BATTAG) was formed to advise the Welsh Government, Transport Wales on risks to the integrity of the Usk Bat Sites SAC from the proposed dualling of the A465. Its members include relevant specialists from NRW and recognised national experts in bat ecology. It was set up because it was considered that, because of the complexity of the situation in relation to Lesser Horseshoe Bats, taking the views of experts would be a good way forward to inform the preparation of the SIAA, and their views have informed the assessment of Sections 1 (completed) and 3 (under construction) as well as Section 2.

6.1.13 The Terms of Reference of the Group are to:

- advise Transport Wales on the methodology of survey and assessment, interpretation of data and development of mitigation/ compensatory measures;
- facilitate the collation of maximum available information and data relating to the scheme;
- facilitate open discussion amongst key stakeholders of issues arising through consideration of the impact assessment;
- attempt to gain consensus on scientific validity of the conclusions of the assessment, and to clearly identify where differences of opinion exist;
- maintain focus on the requirements of the Appropriate Assessment of the proposed development to avoid “mission creep” into consideration of interesting but non-essential “research” that cannot be sustained through the remit of Transport Wales; and
- identify potential for linking the current study and assessment of impacts on the proposed development with other projects (e.g. other development impact studies or research projects) in order to add value to both.

6.1.14 In order to record the views of the TAG members in a way that would both provide a formal record of these views and allow them to directly contribute to the assessment process, a questionnaire based approach was developed (loosely based on the Delphi Process) which allows for qualitative expert opinion to be gathered in a manner that can be quantitatively coded. The quantitative coding allows for a greater level of analysis than a purely qualitative approach allowing for a more explicit ranking of views and measures of uncertainty to be derived.

6.1.15 The purpose of the TAG meetings has been to record and quantify the professional opinions of the group members, after they have reviewed the evidence from surveys and other sources of relevant information. This data has been used to inform and support the decisions made during the design of the scheme. The TAG is independent of the scheme and has not made decisions on behalf of the Contractor. The TAG provided quantitative and auditable insights into potential impacts, appropriate survey effort and mitigation design that can be used to robustly support decisions made by the Contractor.

6.1.16 Meetings of the TAG have been held on 9th March 2012, 22nd August 2012 and 3rd July 2013. At all these meetings key aspects of the developing design were described to the TAG members and their opinions sought on specific points. Detailed reports of each of the TAG members' responses were produced and have informed evidence gathering and design decisions.

7. Conclusions

7.1.1 HD44/09 recommends that clear answers to the following four questions (a to d) should be provided (based on the information presented) when concluding a SIAA. These are addressed in turn here.

a) Is the proposal directly connected with or necessary to site management for nature conservation?

7.1.2 The proposals relate to a road improvement scheme and are neither connected with nor necessary to the management of the Usk Bat Sites SAC, the Cwm Clydach Woodlands SAC or the River Usk SAC.

b) Is the proposal likely to have a significant effect on the features of the site of European Importance, alone or in combination with other plans and projects?

7.1.3 The screening exercise identified that the proposal was likely to have a significant effect on features of the Usk Bat Sites SAC, the Cwm Clydach Woodlands SAC or the River Usk SAC. The likely significant effects identified during the screening stage are summarised in Sections 1.1.35-1.1.52 and Table 1.1.

c) What are the implications of the effects of the proposal on the sites' conservation objectives and will it delay or interrupt progress towards achieving the objectives?

7.1.4 It has been concluded that, assuming the implementation of the various mitigation measures outlined in Section 4 of this document, the proposals would not affect progress towards the achievement of any of the objectives for qualifying features of the Usk Bat Sites SAC, the Cwm Clydach Woodlands SAC or the River Usk SAC.

d) Can it be ascertained that the proposal will not adversely affect the integrity of the sites beyond reasonable scientific doubt?

7.1.5 Whether the Scheme would have an adverse effect on the integrity of the sites has been determined by assessing whether, following the implementation of the mitigation measures identified in this document, it would affect the achievement of one or more conservation objectives set for the three European Sites considered. As stated above, the Scheme would not affect the achievement of any of the conservation objectives set for the Usk Bat Sites SAC, the Cwm Clydach Woodlands SAC or the River Usk SAC.

7.1.6 There is an extremely small risk of a short term effect on integrity of the Usk Bat Sites SAC due to the inherent uncertainties associated with ecological systems and assessments, in relation to effects on Lesser Horseshoe Bats during the period when replacement planting is maturing. However, on the balance of probability using professional judgement, and taking into consideration the precautionary principle, the risk is considered *de minimis* and extremely unlikely to occur. Therefore it is considered beyond reasonable scientific doubt that there would be no impact on integrity.

7.1.7 Therefore, for the purposes of Regulation 61 of the Conservation of Habitats and Species Regulations 2010, it is concluded that there would not be an adverse effect on the integrity of the European Sites considered in this Habitats Regulations Assessment.

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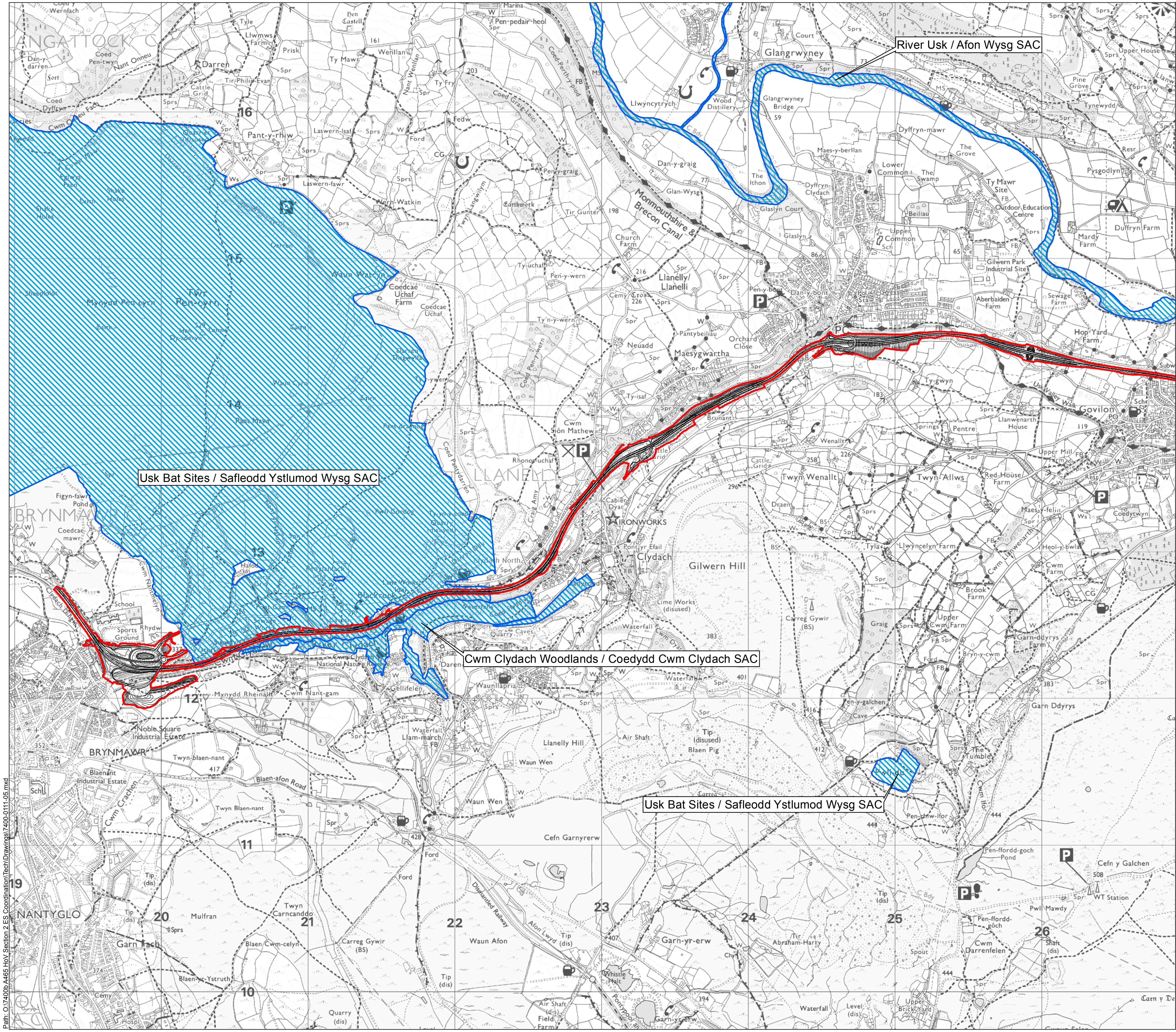
Figure 1: Scheme location and SAC boundaries



Legend

- Scheme Footprint
- SAC

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COSTAIN

A465 Heads of the Valleys
Section 2: Gilwern - Brynmawr

Scheme Location and Nearby SACs

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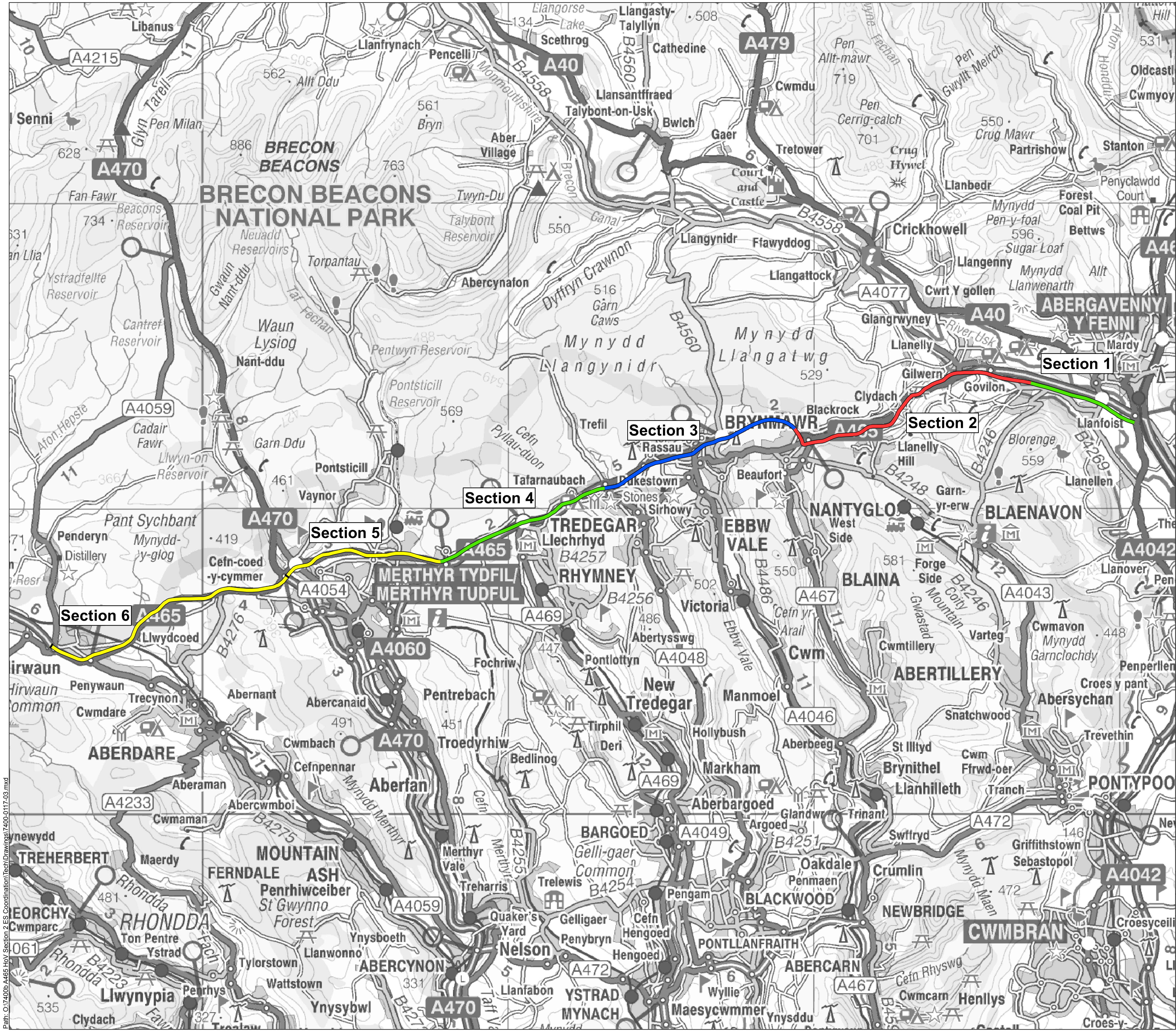
Figure 2: Plan showing locations of all sections of the A465 upgrade



Legend

- Open to Traffic
- Under Construction
- Subject of this Report
- Yet to be Designed and Built

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A465 Heads of the Valleys
Section 2: Gilwern - Brynmawr

Plan Showing Locations of All Sections of the A465 Upgrade

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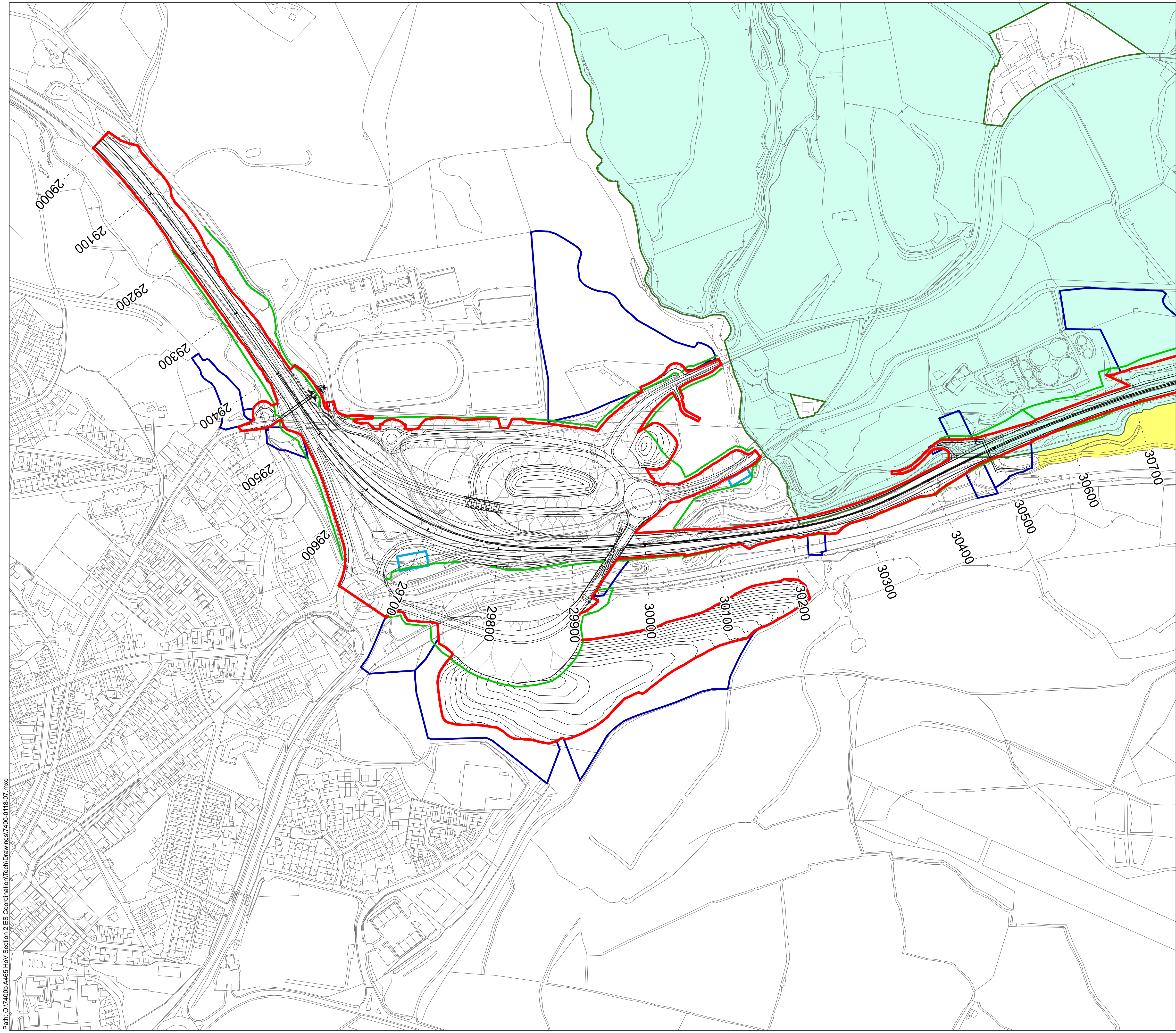
Figure 3: Current scheme design



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Legend

- Scheme Footprint
- Drainage Feature / Attenuation Pond
- Scheme Fenceline
- Temporary landtake during construction
- Cwm Clydach Woodlands / Coedydd Cwm Clydach SAC
- Usk Bat Sites / Safleodd Ystlumod Wysg SAC
- River Usk / Afon Wysg

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A465 Heads of the Valleys
Section 2: Gilwern - Brynmawr

Current Scheme Design
KS3 rev7
Sheet 1 of 6

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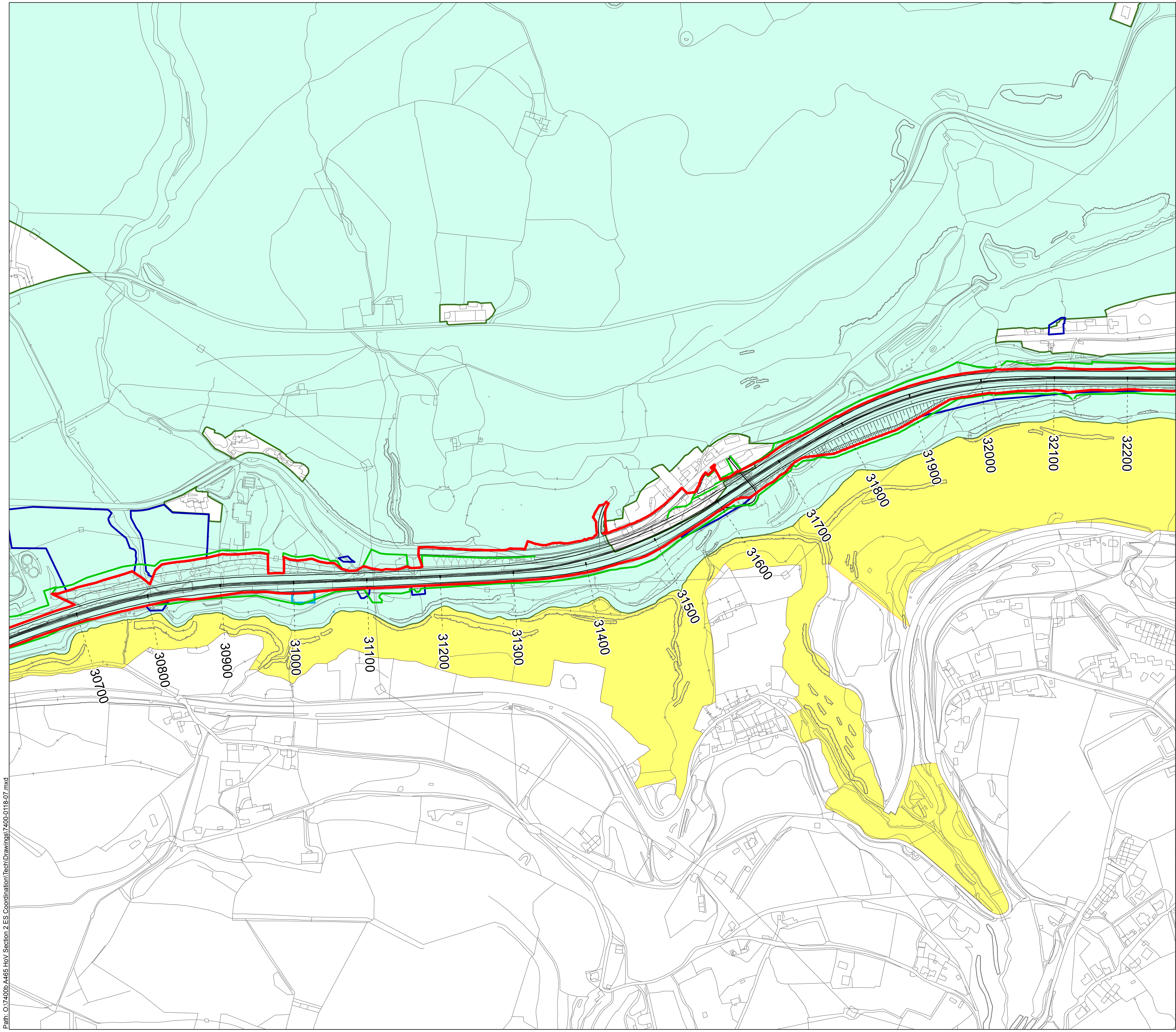

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A465 Heads of the Valleys
Section 2: Gilwern - Brynmawr

Current Scheme Design
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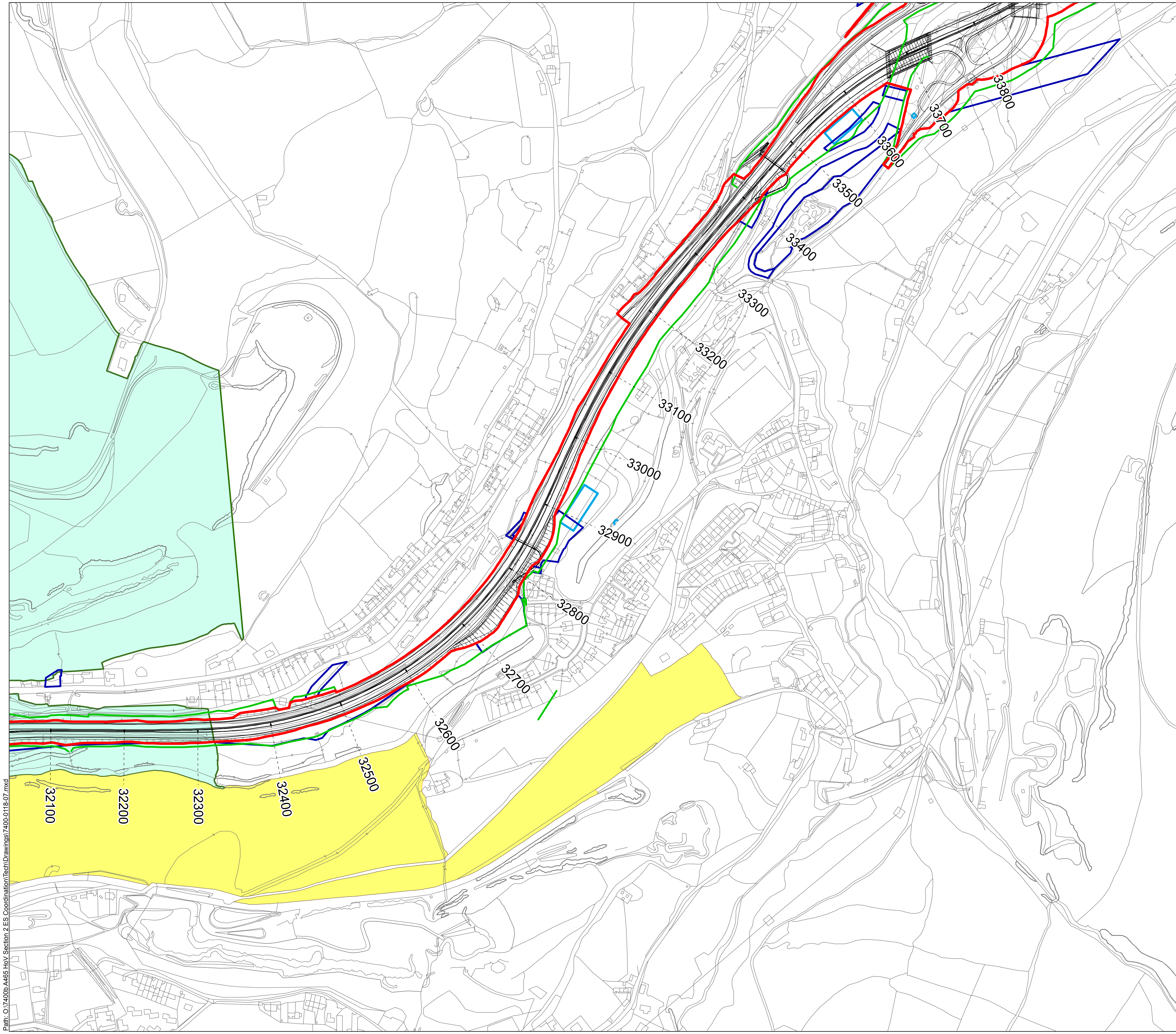

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A465 Heads of the Valleys
Section 2: Gilwern - Brynmawr

Current Scheme Design
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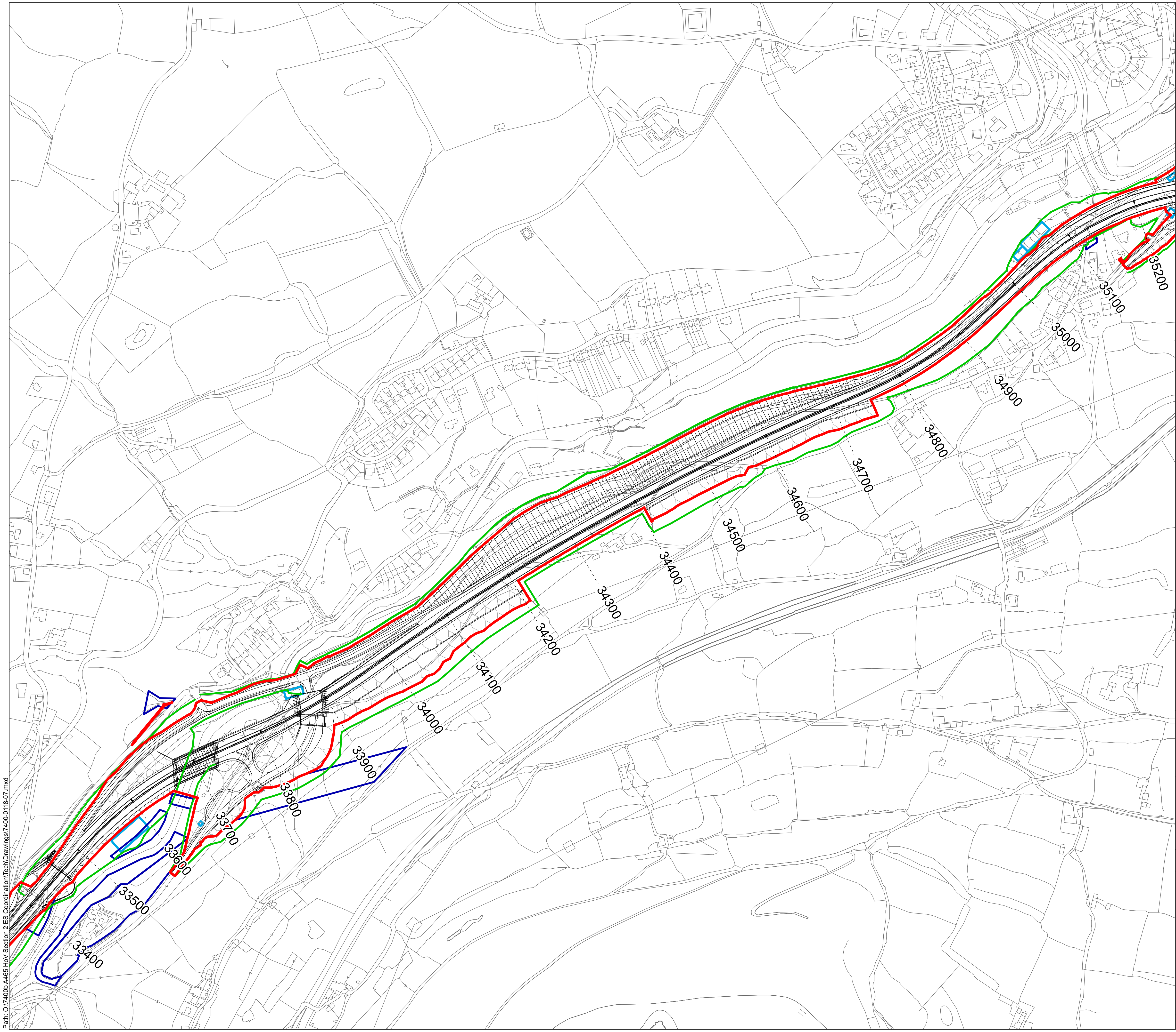

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A465 Heads of the Valleys
Section 2: Gilwern - Brynmawr

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Sheet 4 of 6

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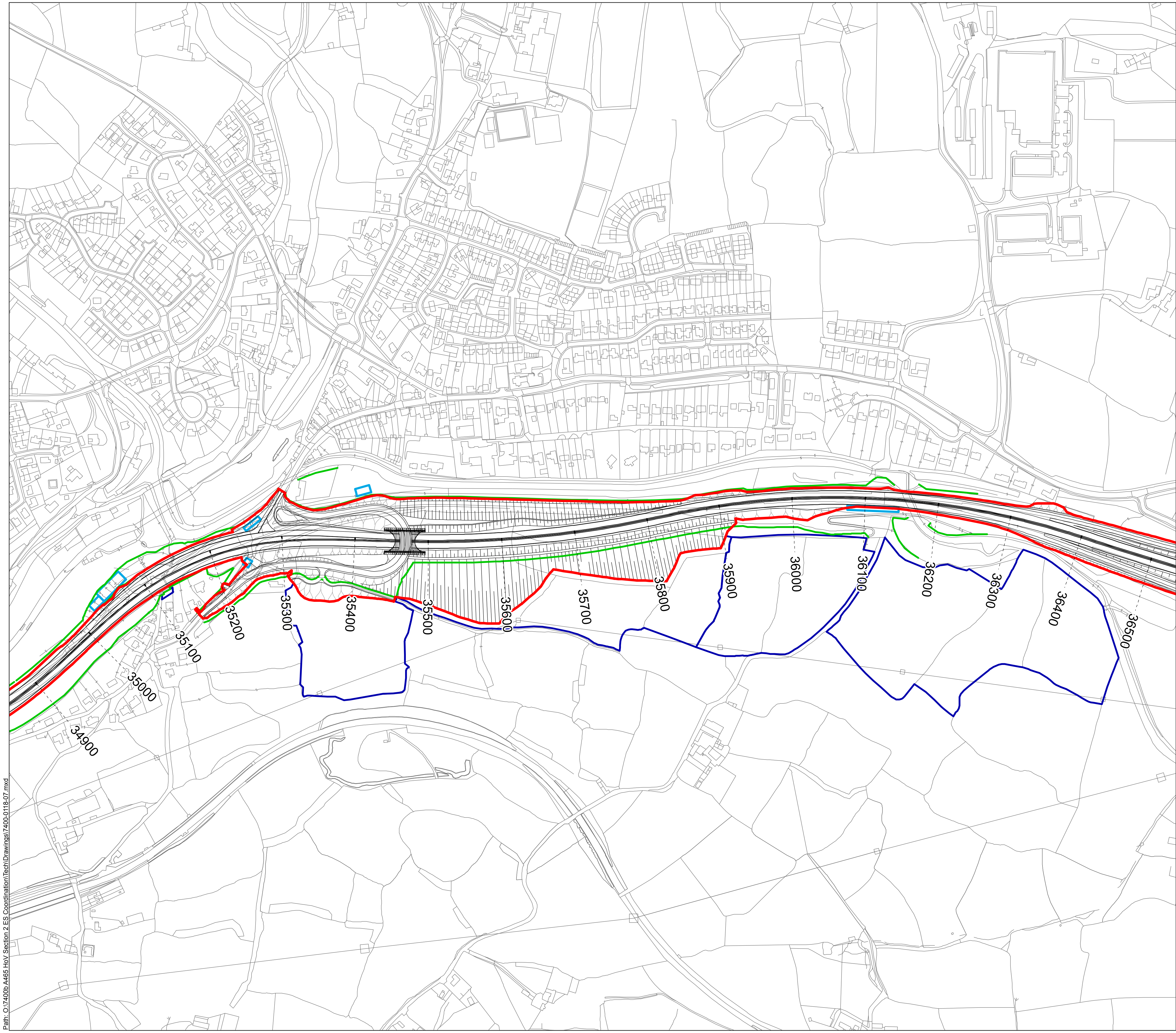

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Current Scheme Design
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Sheet 5 of 6

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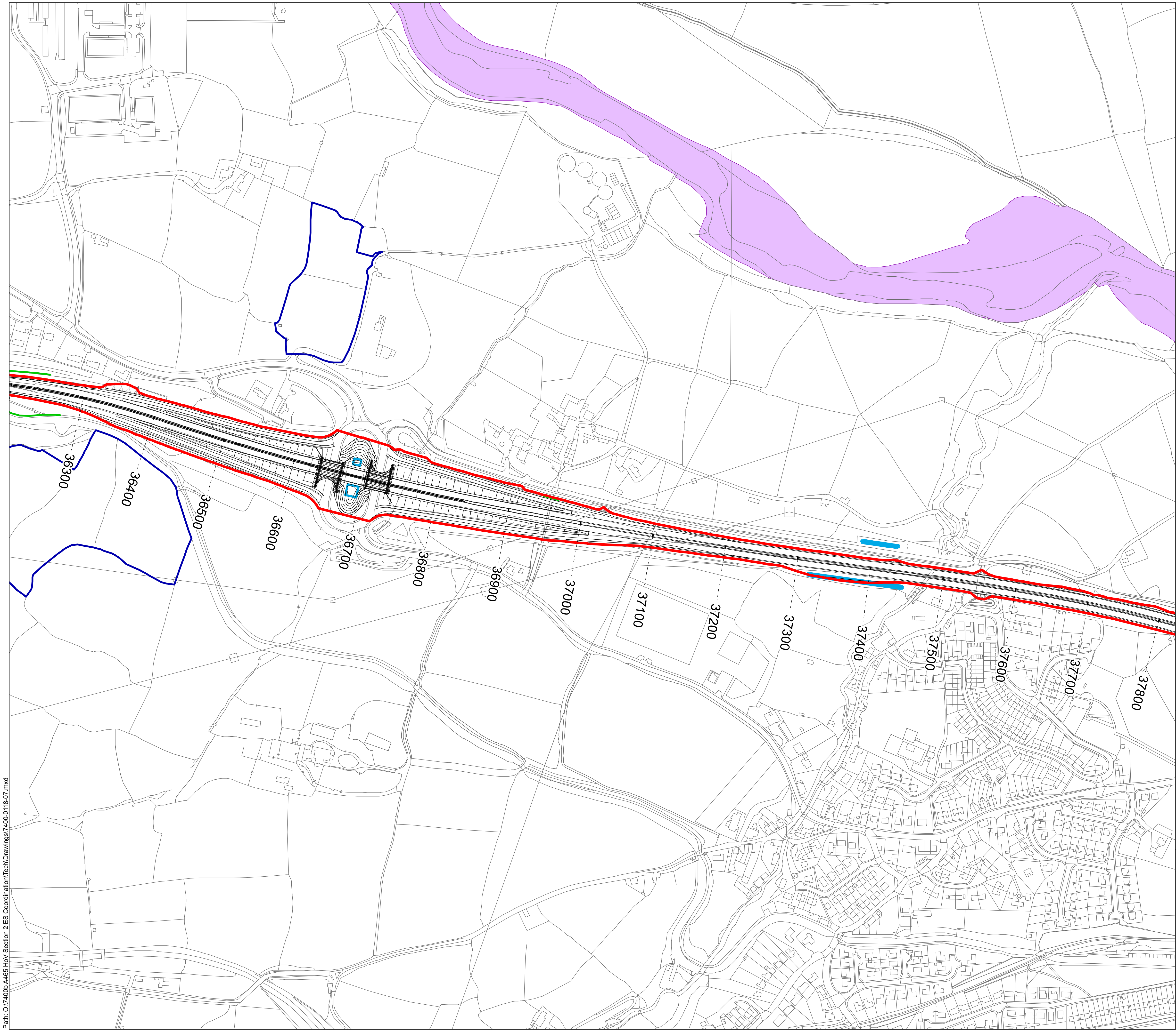

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Current Scheme Design
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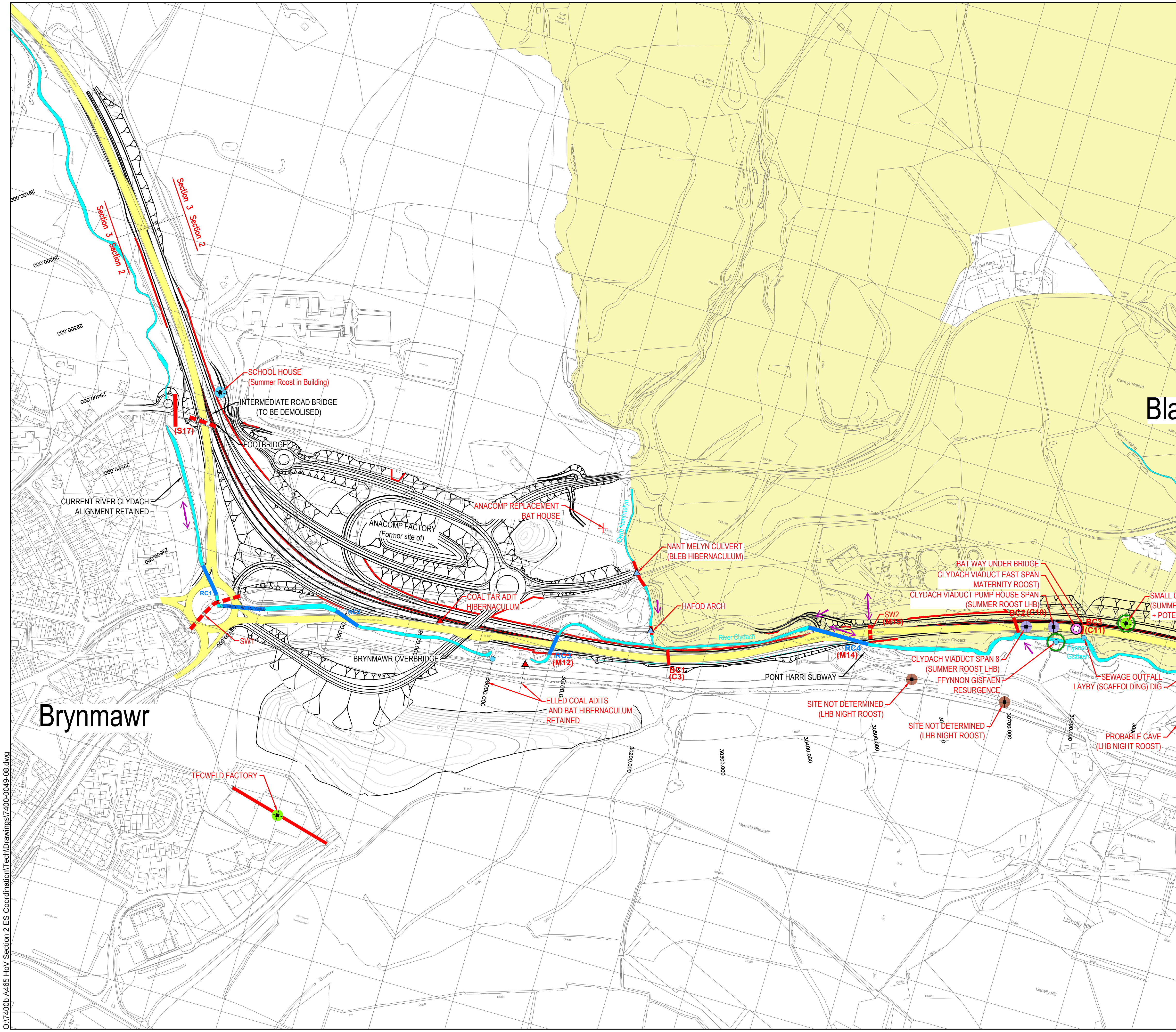
Figure 4: Existing Lesser Horseshoe Bat features map



KEY

- CAVES
- MATERNITY ROOST (LHB)
- MATERNITY ROOST (NON LHB)
- ROOST (LHB) Summer and possibly winter
- ROOST NIGHT (LHB)
- ROOST SUMMER (LHB)
- ROOST SUMMER (UNKNOWN SPECIES)
- ROOST SUMMER (NON LHB) IN BUILDINGS
- LOCALLY SIGNIFICANT HIBERNACULUM (LHB) regular winter use by 10 or more LHB
- HIBERNACULUM (LHB)
- HIBERNACULUM (NON-LHB)
- BAT ACTIVITY
- BC BAT CULVERT (USED BY BATS)
- RC RIVER CULVERT (USED BY BATS)
- UNDERGROUND SITE (No bats recorded)
- POTENTIAL BAT FLYWAY (UNDER ROAD VIA CAVE)
- ROAD STRUCTURES (ABOVE & BELOW) WITH VALUE TO BATS
- ROAD DRAIN
- SAC

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A465 Heads of the Valleys
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Bat Survey Information
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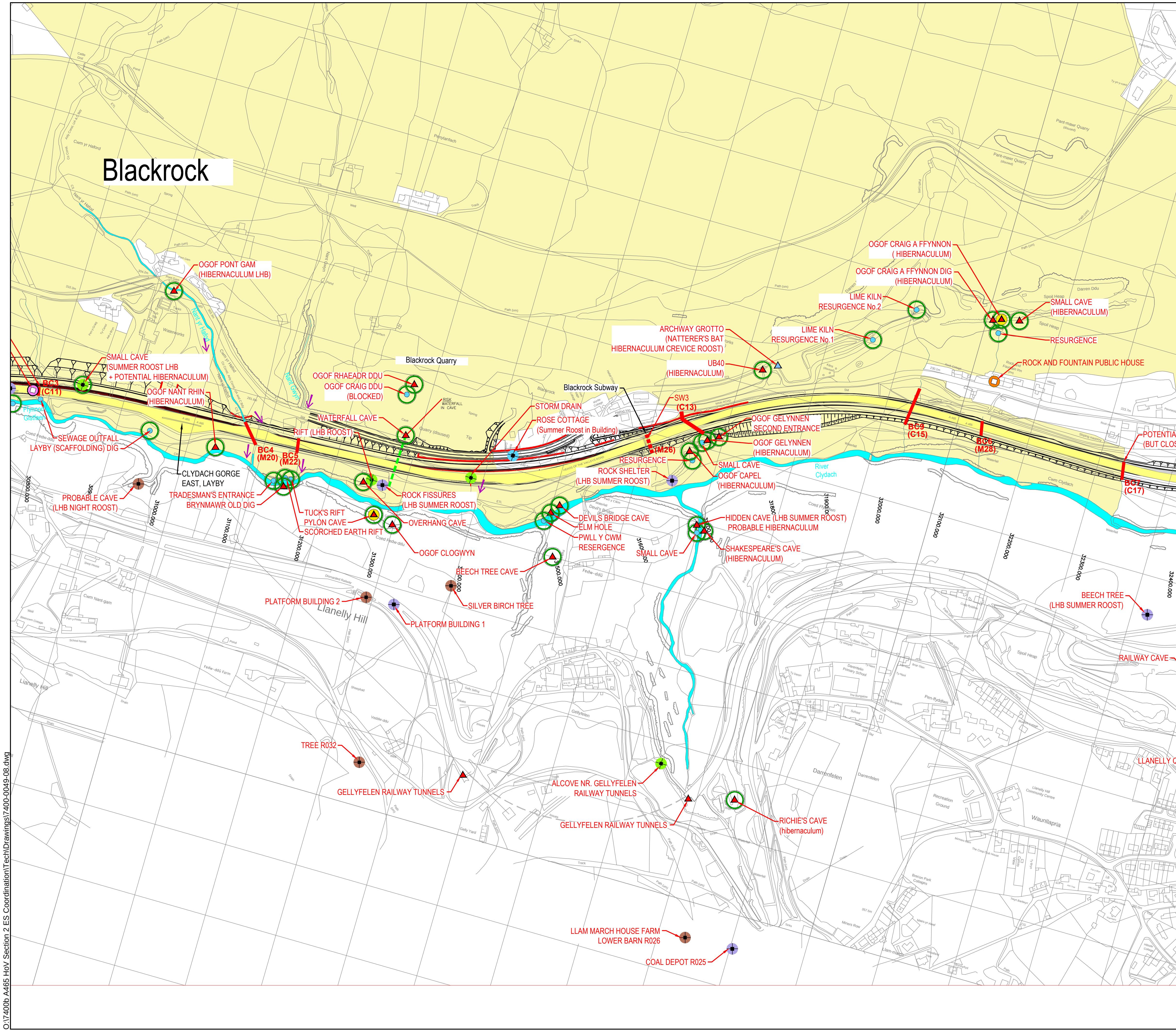

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A465 Heads of the Valleys
Section 2: Gilwern - Brynmawr

Bat Survey Information
Sheet 2 of 7

Figure:	4b	Revision:	-
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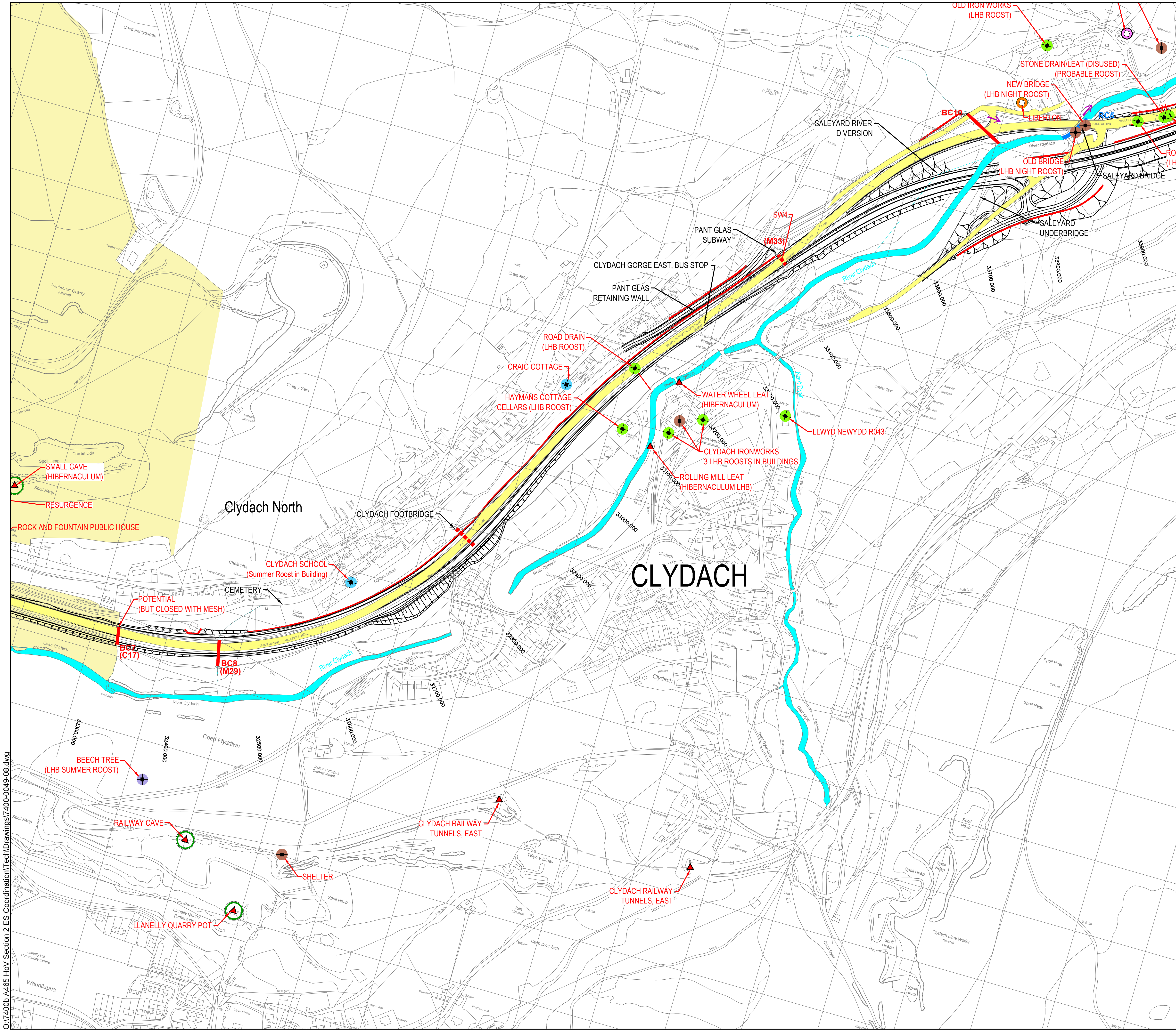

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A465 Heads of the Valleys
Section 2: Gilwern - Brynmawr

Bat Survey Information
Sheet 3 of 7

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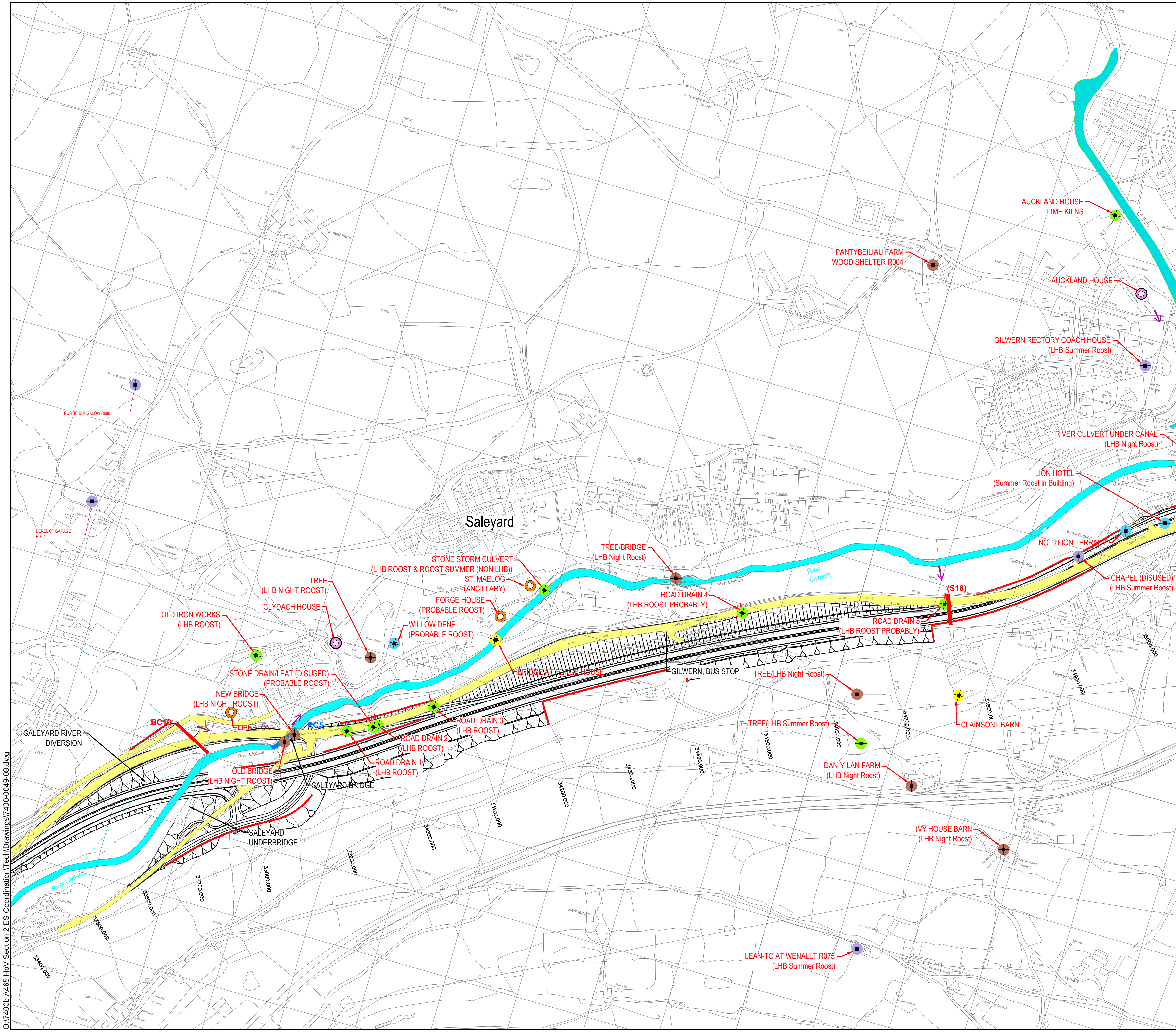

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COSTAIN

A465 Heads of the Valleys
Section 2: Gilwern - Brynmawr

Bat Survey Information
Sheet 4 of 7

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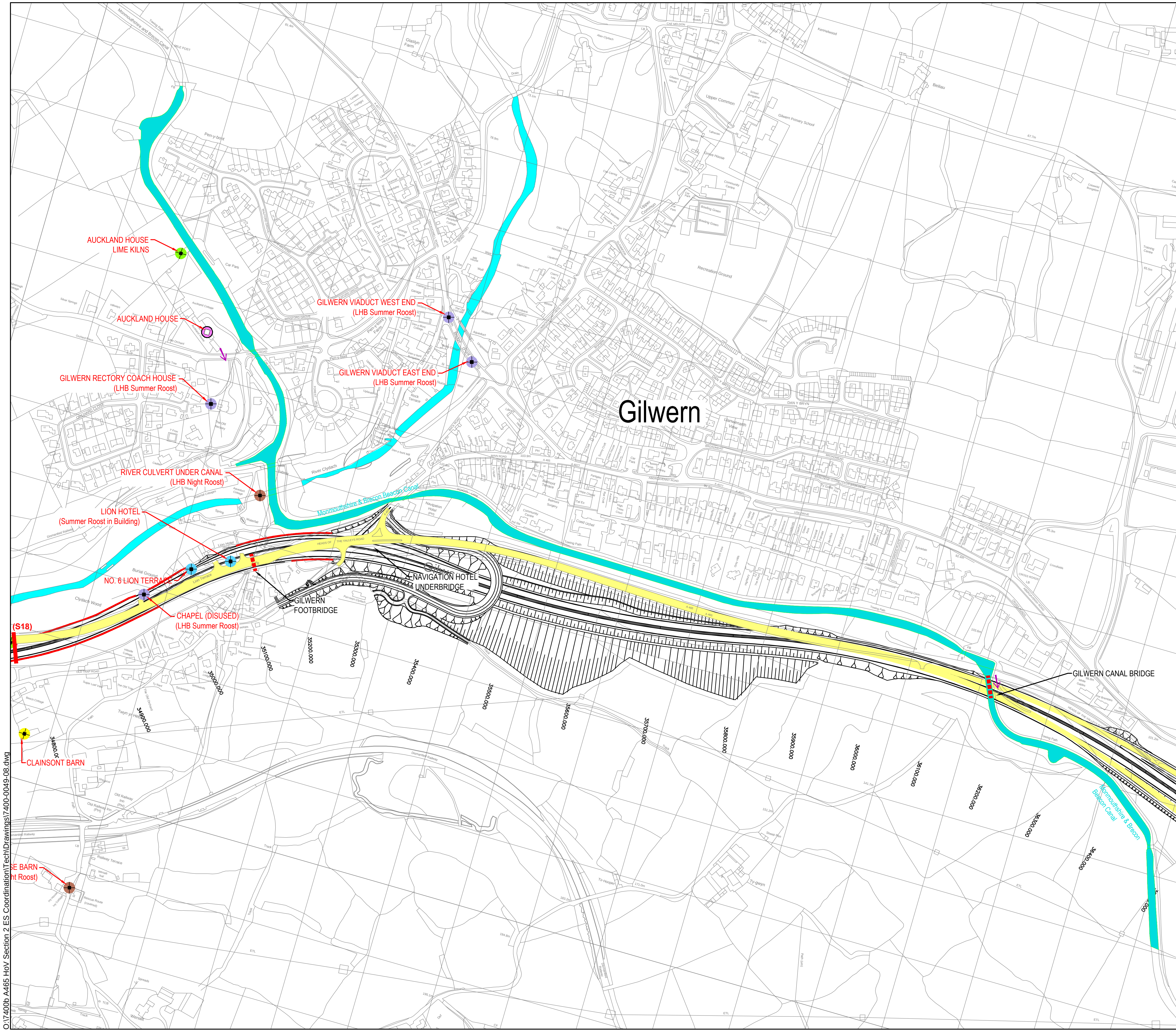

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A465 Heads of the Valleys
Section 2: Gilwern - Brynmawr

Bat Survey Information
Sheet 5 of 7

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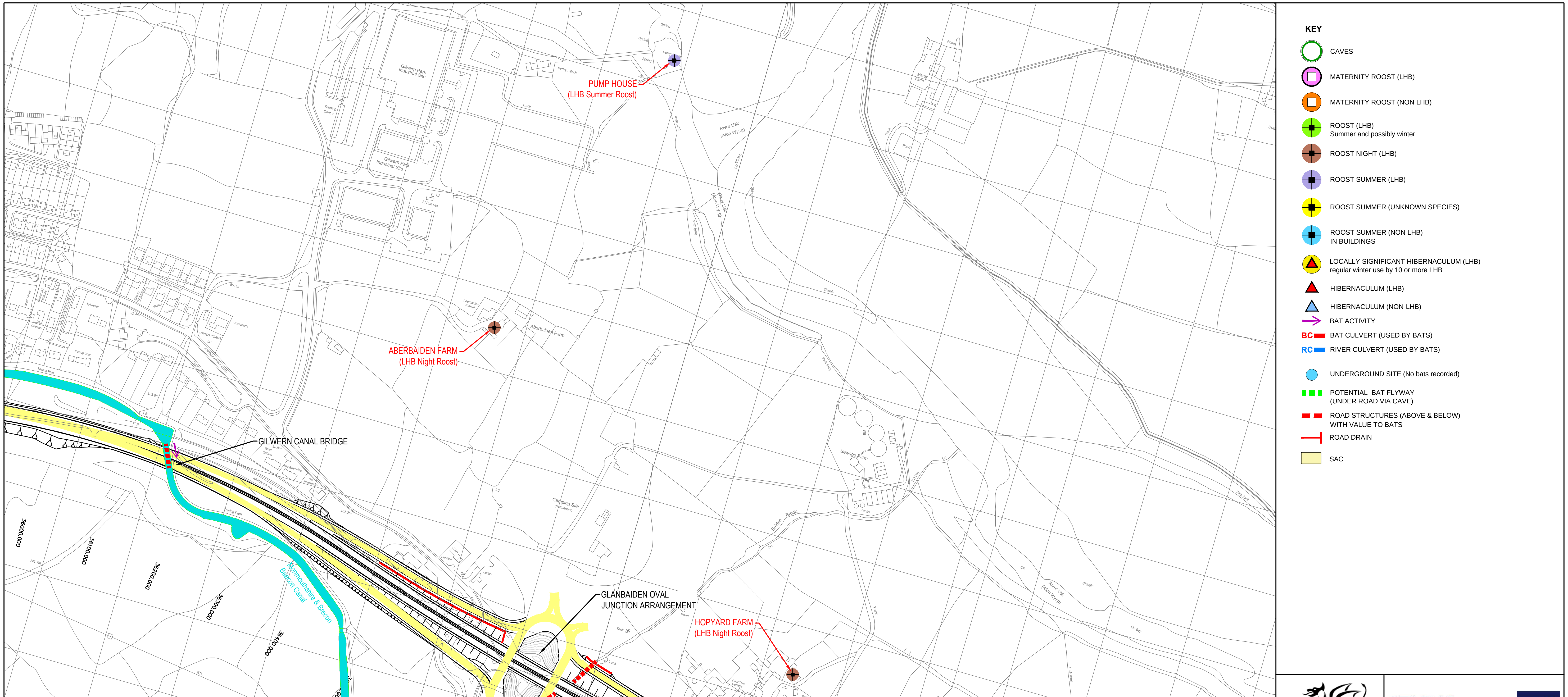

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A465 Heads of the Valleys
Section 2: Gilwern - Brynmawr

Bat Survey Information
Sheet 6 of 7

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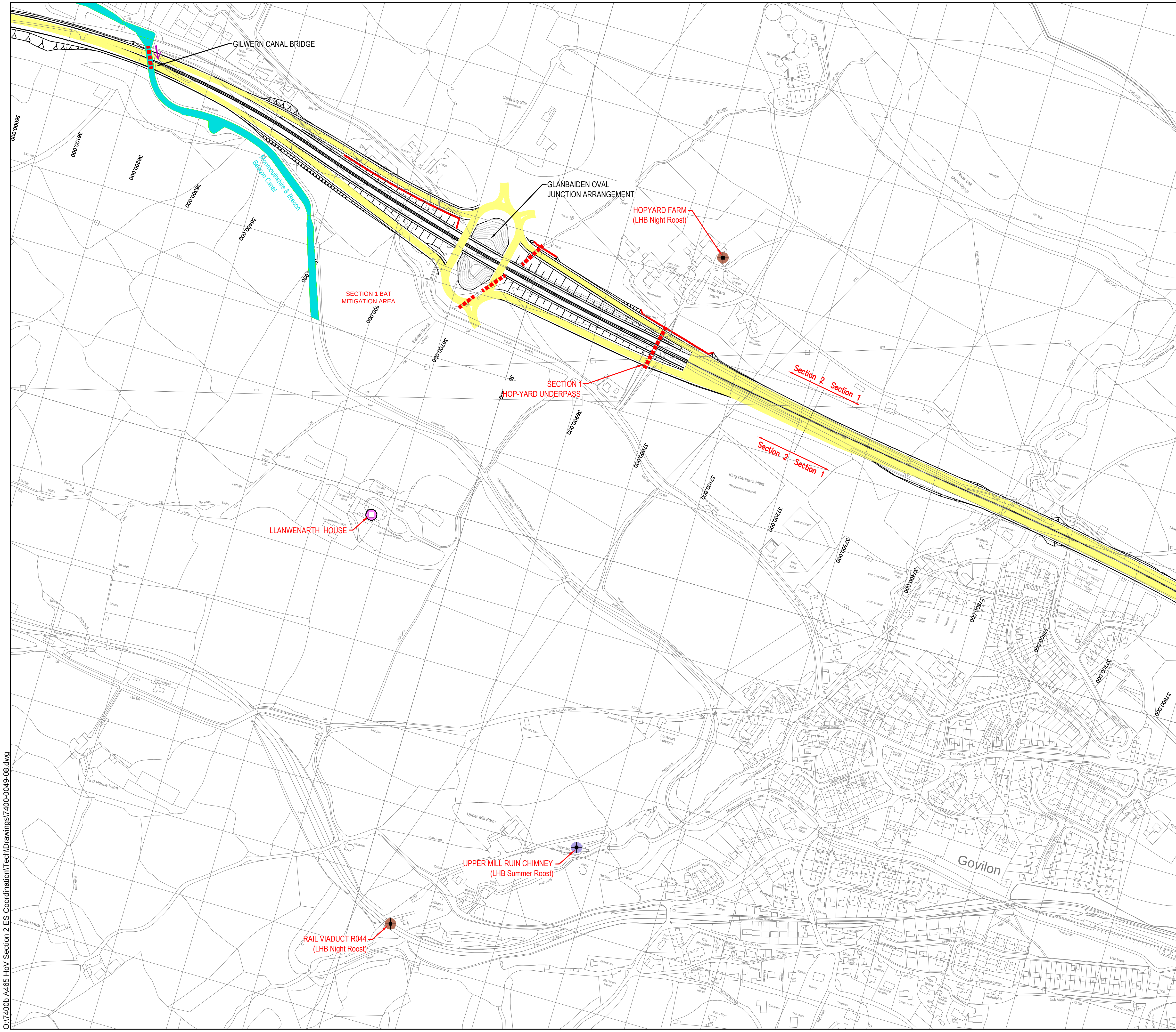

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COSTAIN

A465 Heads of the Valleys
Section 2: Gilwern - Brynmawr

Bat Survey Information
Sheet 7 of 7

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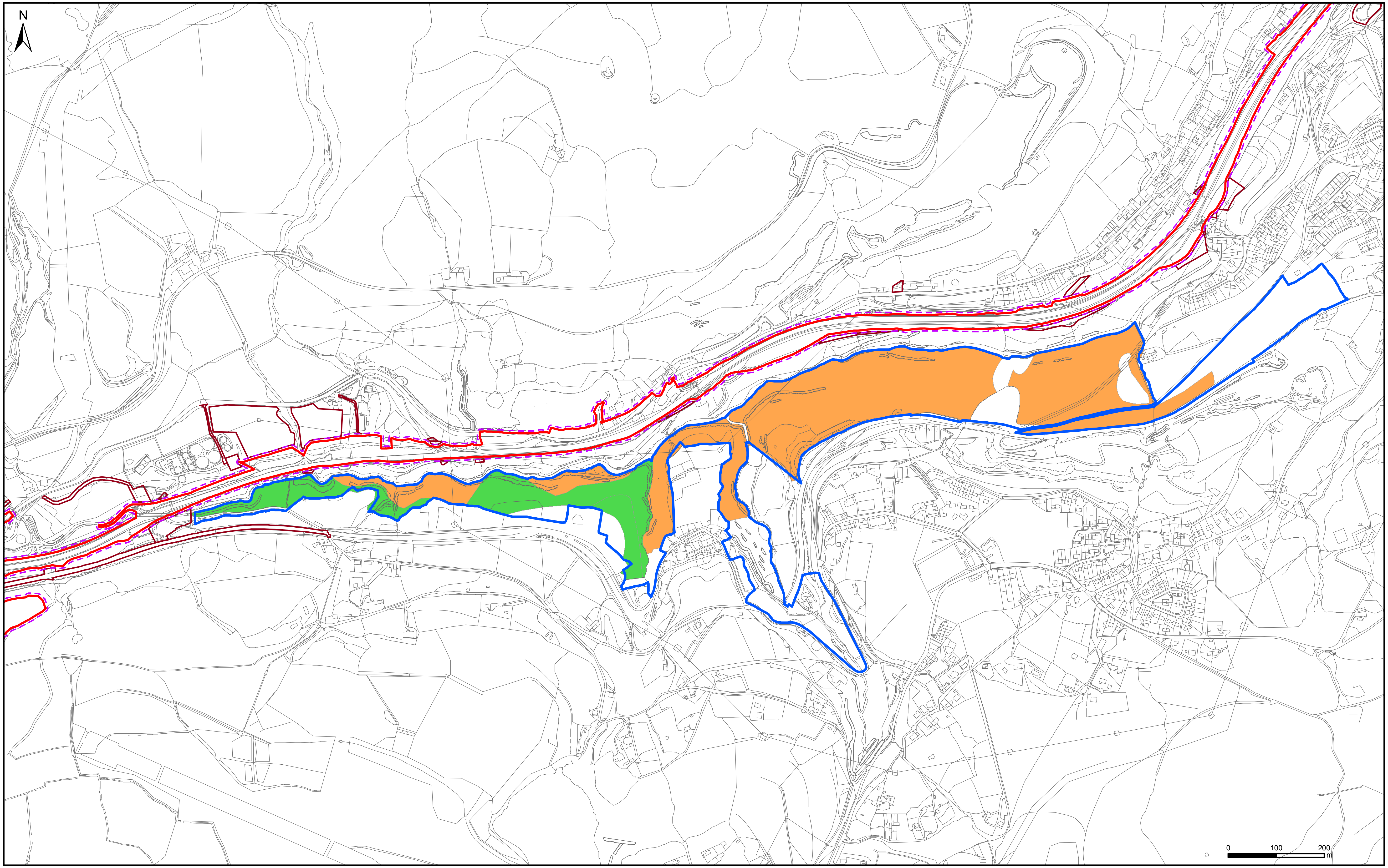
Figure 5: Distribution of the two woodland features in Cwm Clydach Woodlands SAC



Legend

- Scheme Footprint
- 5m Construction Buffer
- Temporary Landtake Requirements
- Cwm Clydach Woodlands SAC

Beech Woodland

- Asperulo-Fagetum beech forests
- Atlantic acidophilous beech forests with Ilex and sometimes also Taxus in the shrub layer (Quercion robori-petraeae or Ilici-Fagenion)

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A465 Heads of the Valleys
Section 2: Gilwern - Brynmawr

Title
Distribution of the two woodland features in Cwm Clydach Woodlands SAC
(Pryce Consultants Ecology 2012)

Purpose Of Issue
FINAL

Original Scale	Designed/drawn	Checked	Authorised
1:7,500@ A3	MP Date Aug 2013	KJ Date Aug 2013	- Date -

Status	Drawing Number	Rev
S0	Figure 5	P1

Rev P1
Drawing Number A465HOV2-RPS-XXXX-XX-DR-000
Suitability S0

DO NOT SCALE

A3

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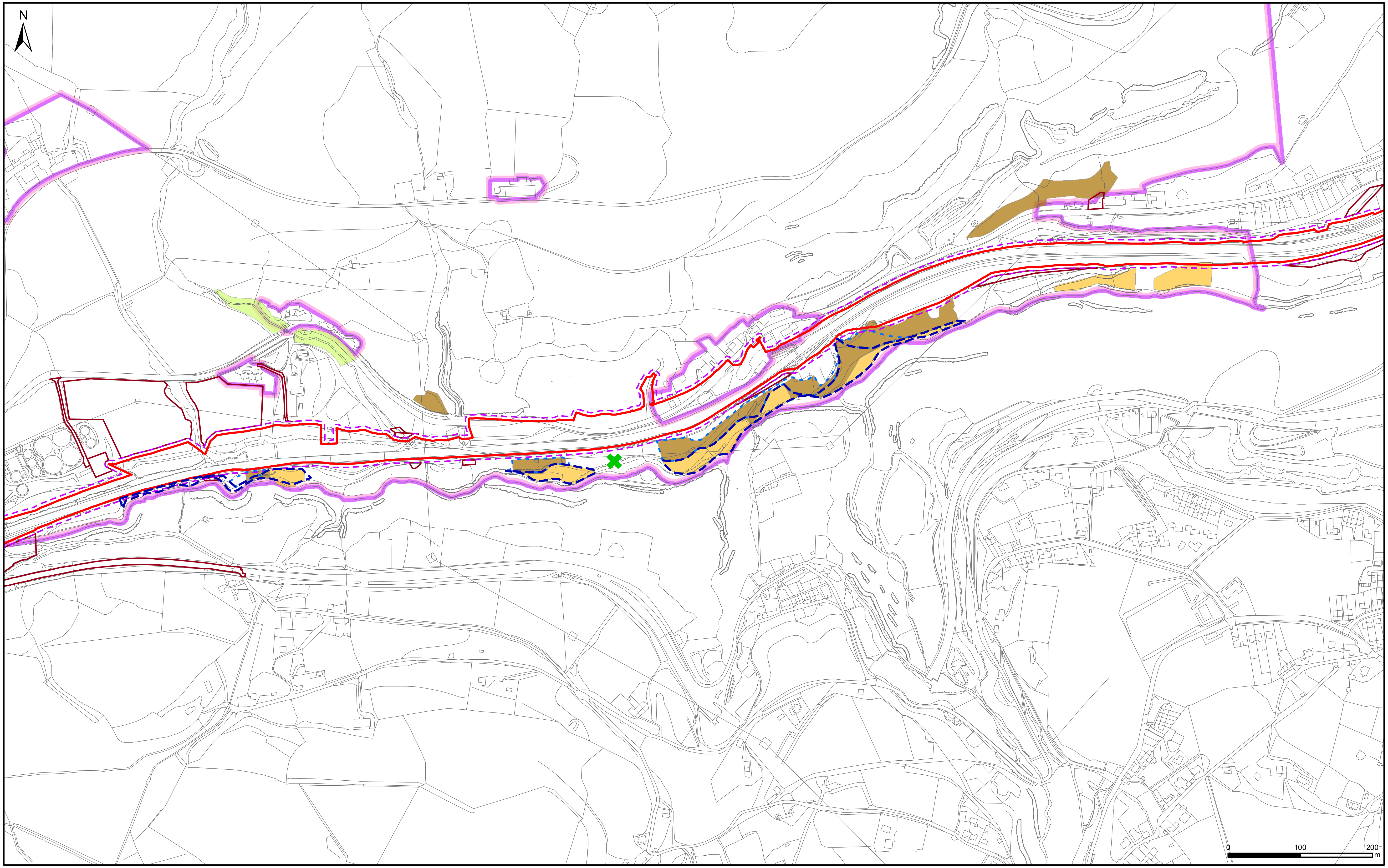
Date: 19/09/2013 Plotted by: pearsonm

Path: O:\7400b A465 HoV Section 2 ES Coordination\Tech\Drawings\7400-0199-04.mxd

Figure 6: Distribution map of Tilio woodland



Legend

- Scheme Footprint
- 5m Construction Buffer
- Temporary Landtake Requirements
- Usk Bat Sites SAC

Tilio-Acerion Categories

- Strongly conforms to Tilio-Acerion (none recorded)
- Moderately conforms to Tilio-Acerion
- Weakly conforms to Tilio-Acerion

CCW NVC mapping

- W8e
- W8f
- W9a

- Tufa Deposit

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A465 Heads of the Valleys Section 2: Gilwern - Brynmawr

Purpose Of Issue

FINAL

Title
Distribution of Tilio-acerion woodland in Clydach Gorge (Pryce Consultants Ecology 2012)

Original Scale	Designed/drawn	Checked	Authorised
1:5,000 @ A3	MP	KJ	-
	Date Aug 2013	Date Aug 2013	Date -

Status	Drawing Number	Rev
S0	Figure 6	P4

Suitability S0 Drawing Number A465HOV2-RPS-0801-XX-DR-006 Rev P4

DO NOT SCALE

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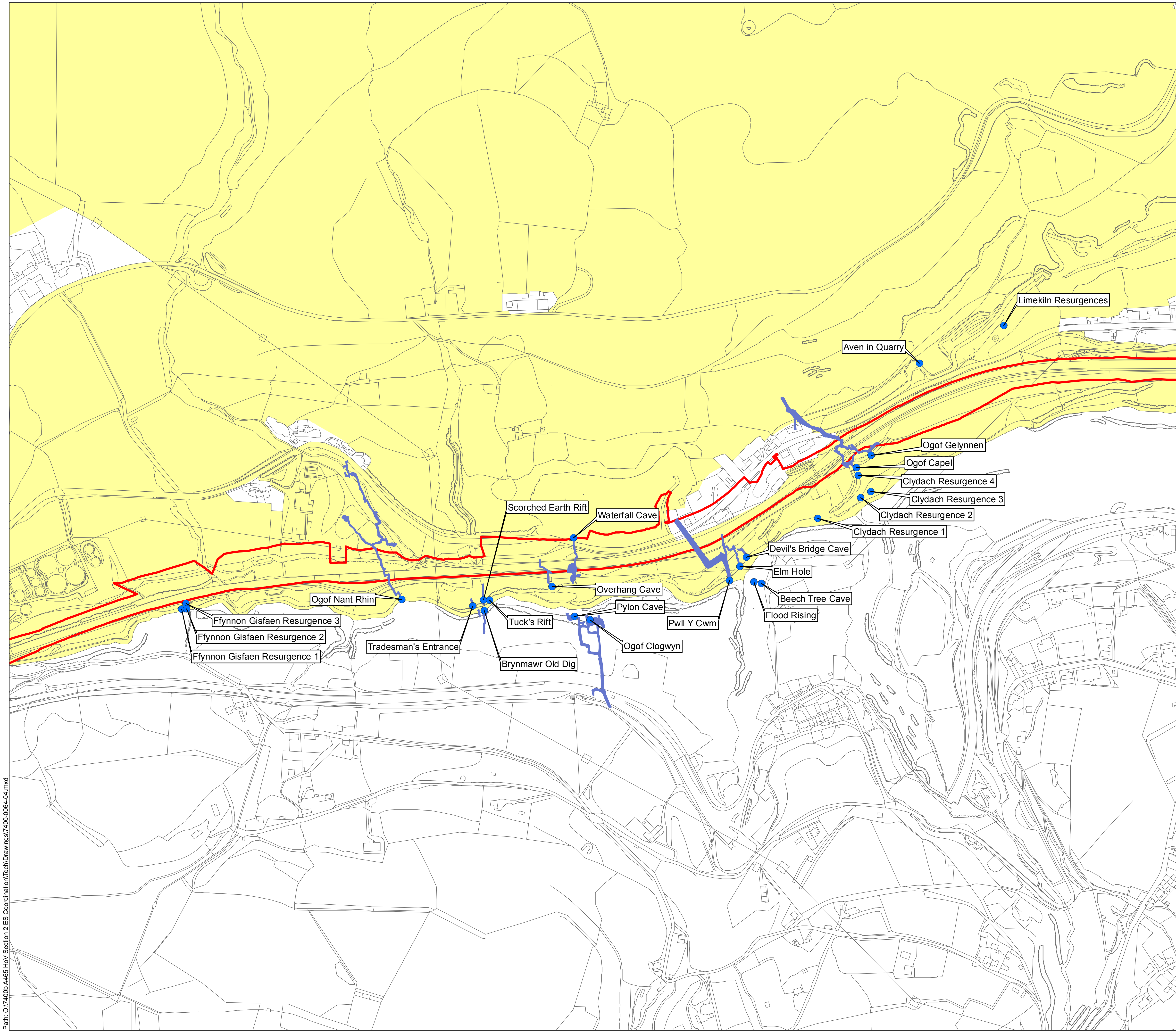
Date: 17/09/2013 Plotted by: pearsonm

Path: O:\7400b A465 HoV Section 2 ES Coordination\Tech\Drawings\7400-0148-11.mxd

Figure 7: Location and extent of known cave systems



Legend

- Scheme Footprint
- Usk Bat Sites SAC
- Cave Entrance
- Cave Extents (where known/mapped)

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A465 Heads of the Valleys
Section 2: Gilwern - Brynmawr

Location and Extent of Known Cave Systems

Figure: 7	Revision: -
Date: Aug 2013	Status: FINAL
Drawn: MP	Checked: KJ

Scale: A3 @ 1:5,000
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N

dwg ref: 7400-0064-04

Path: O:\7400b A465 HoV Section 2 ES Coordination\Tech\Drawings\7400-0064-04.mxd

Figure 8: Otter survey results

Legend

- 500m Survey Area
- River Usk SAC
- Spraint
- Spraint (Jacobs 2006 survey)
- Fresh spraint
- Fresh spraint (Jacobs 2006 survey)
- Old spraint
- Old spraint (Jacobs 2006 survey)
- Potential otter barrier
- Slide
- Hover (Jacobs 2006 survey)
- Sign heap (Jacobs 2006 survey)
- Water course

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A465 Heads of the Valleys
Section 2: Gilwern - Brynmawr

Otters
Survey Area and Results

Figure: 8a	Revision: --
Date: Aug 2013	Status: FINAL
Drawn: LM	Checked: -

Scale: A3 @ 1:7,500

0 100 200 m

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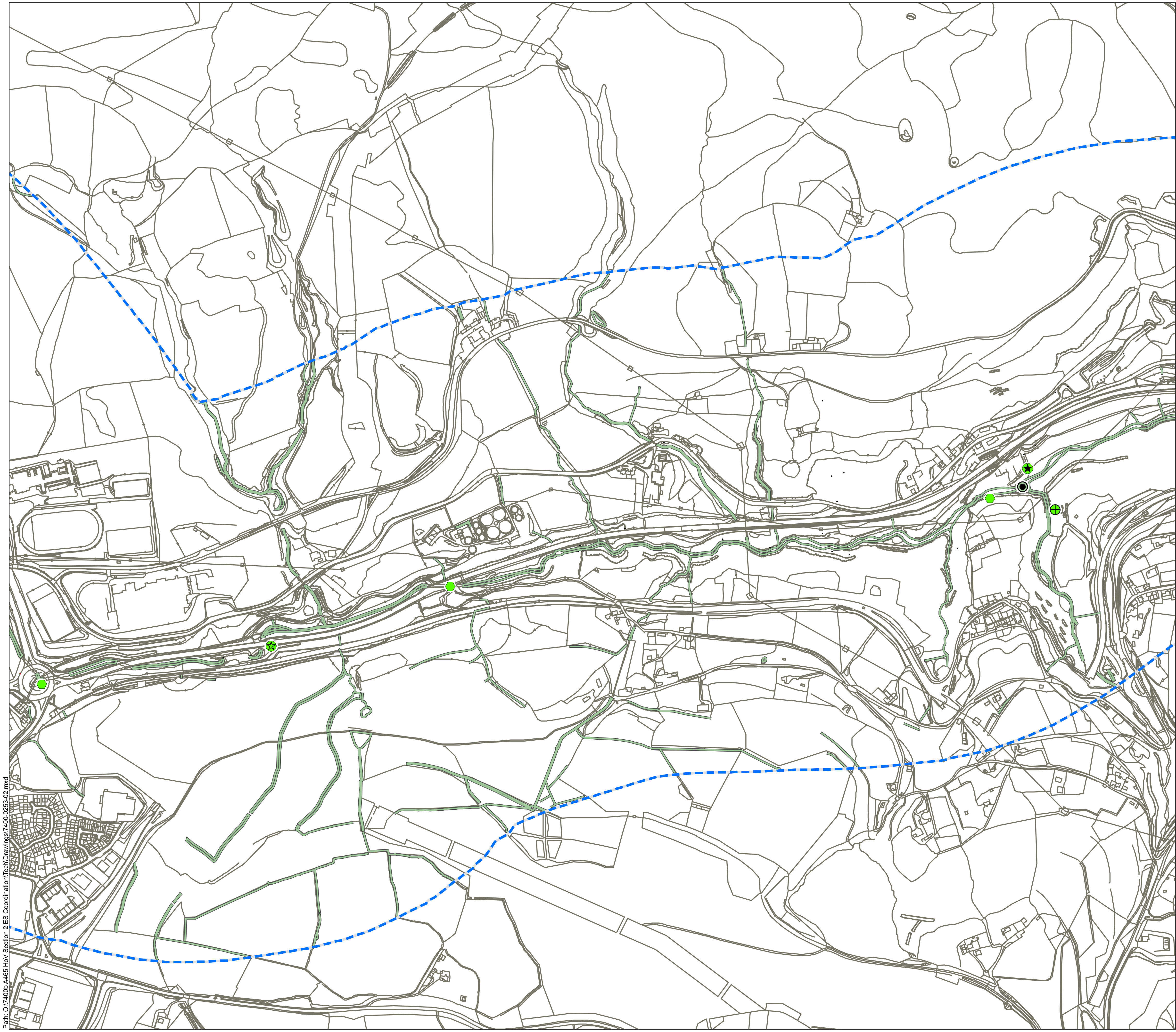
dwg ref: 7400-0253-02

Path: O:\7400b A465 HoV Section 2 ES Coordination\Tech\Drawings\7400-0253-02.mxd



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Legend

- 500m Survey Area
- River Usk SAC
- Spraint
- Spraint (Jacobs 2006 survey)
- Fresh spraint
- Fresh spraint (Jacobs 2006 survey)
- Old spraint
- Old spraint (Jacobs 2006 survey)
- Potential otter barrier
- Slide
- Hover (Jacobs 2006 survey)
- Sign heap (Jacobs 2006 survey)
- Water course

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A465 Heads of the Valleys
Section 2: Gilwern - Brynmawr

Otters
Survey Area and Results

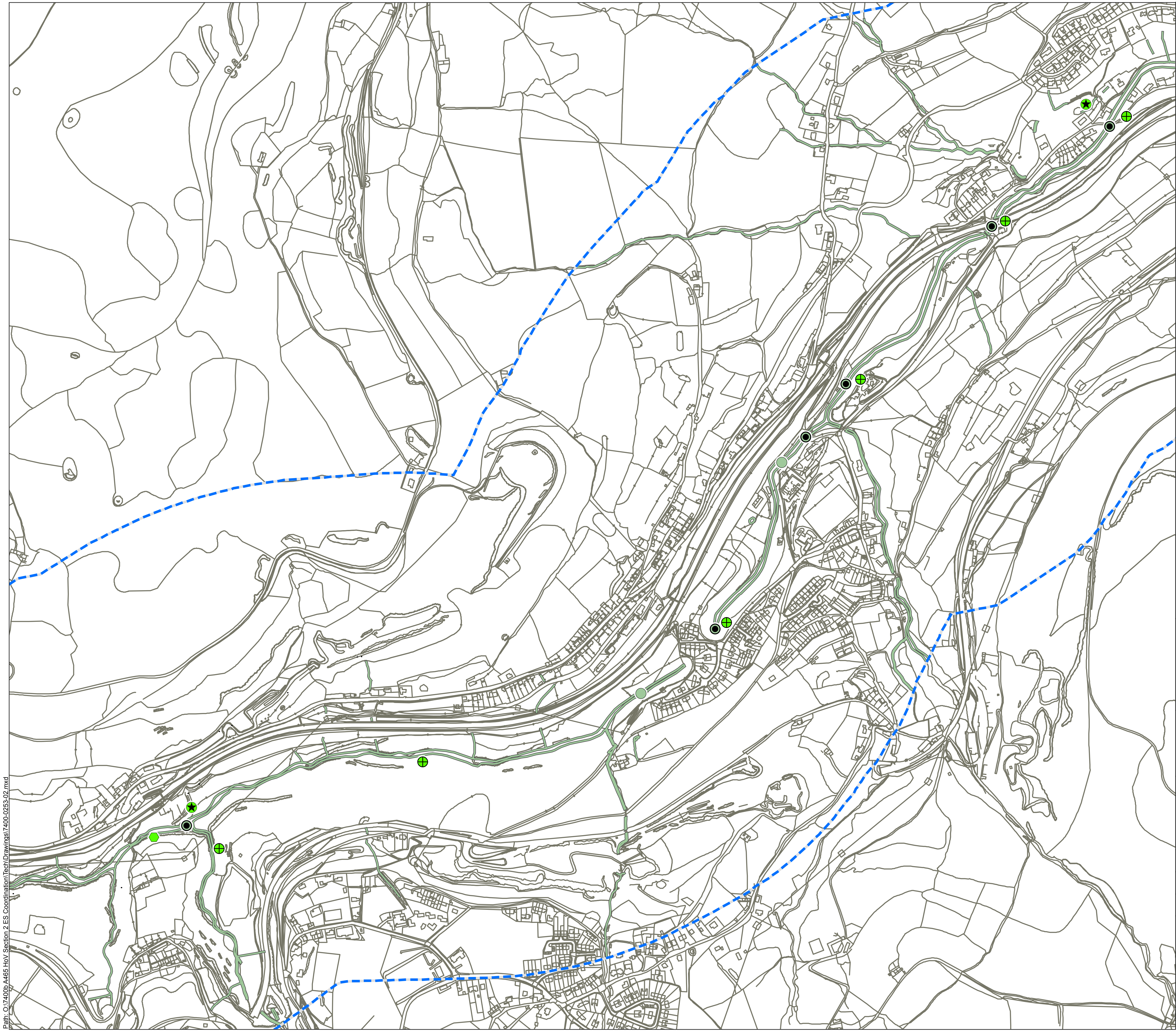
Figure: 8b	Revision: --
Date: Aug 2013	Status: FINAL
Drawn: LM	Checked: -

Scale: A3 @ 1:7,500

0 100 200 m

N

dwg ref: 7400-0253-02



Legend

- 500m Survey Area
- River Usk SAC
- Spraint
- Spraint (Jacobs 2006 survey)
- Fresh spraint
- Fresh spraint (Jacobs 2006 survey)
- Old spraint
- Old spraint (Jacobs 2006 survey)
- Potential otter barrier
- Slide
- Hover (Jacobs 2006 survey)
- Sign heap (Jacobs 2006 survey)
- Water course

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A465 Heads of the Valleys
Section 2: Gilwern - Brynmawr

Otters
Survey Area and Results

Figure: 8c	Revision: --
Date: Aug 2013	Status: FINAL
Drawn: LM	Checked: -

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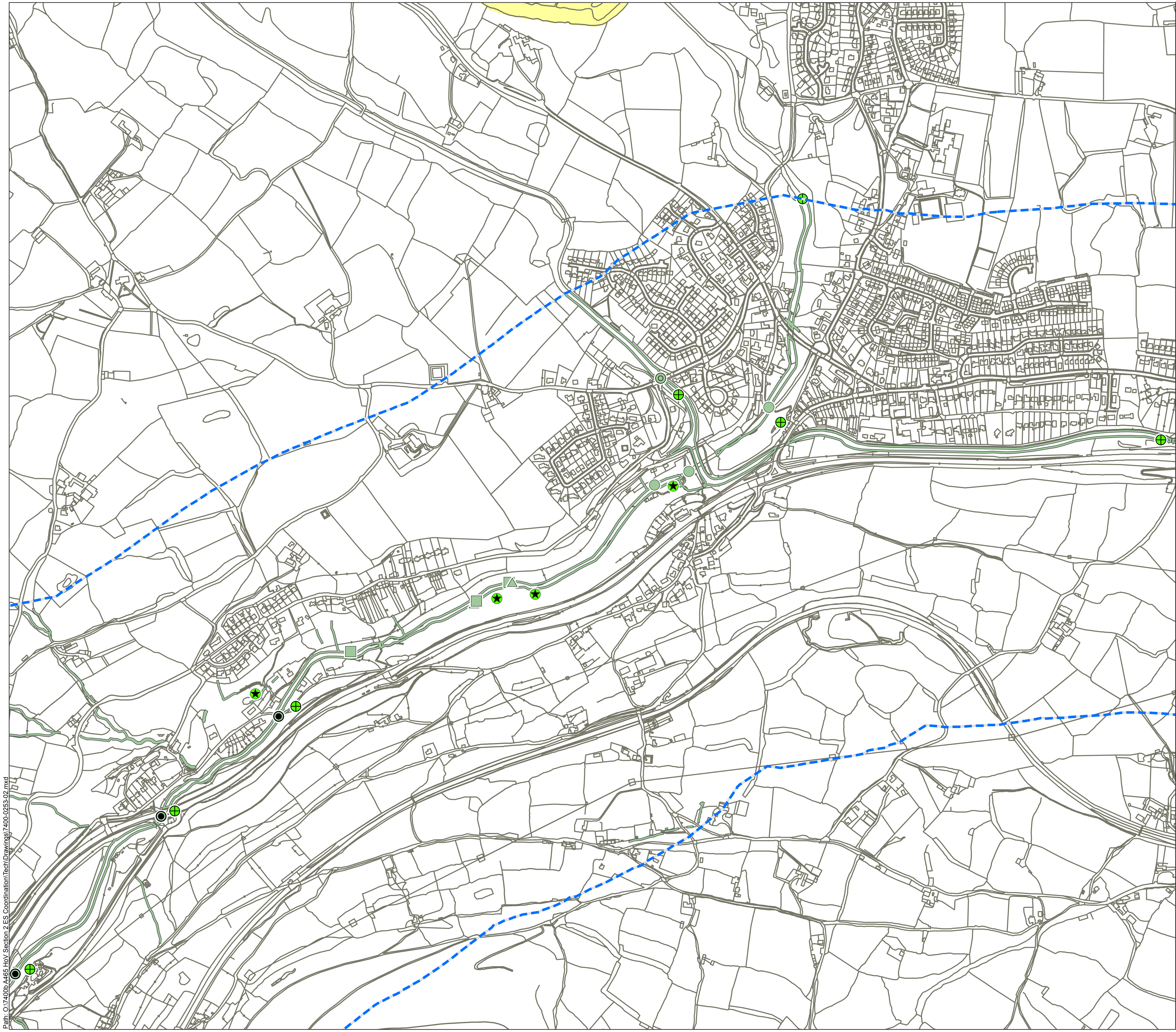

Legend

- 500m Survey Area
- River Usk SAC
- Spraint
- Spraint (Jacobs 2006 survey)
- Fresh spraint
- Fresh spraint (Jacobs 2006 survey)
- Old spraint
- Old spraint (Jacobs 2006 survey)
- Potential otter barrier
- Slide
- Hover (Jacobs 2006 survey)
- Sign heap (Jacobs 2006 survey)
- Water course

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A465 Heads of the Valleys
Section 2: Gilwern - Brynmawr

Otters
Survey Area and Results

Figure: 8d	Revision: --
Date: Aug 2013	Status: FINAL
Drawn: LM	Checked: -

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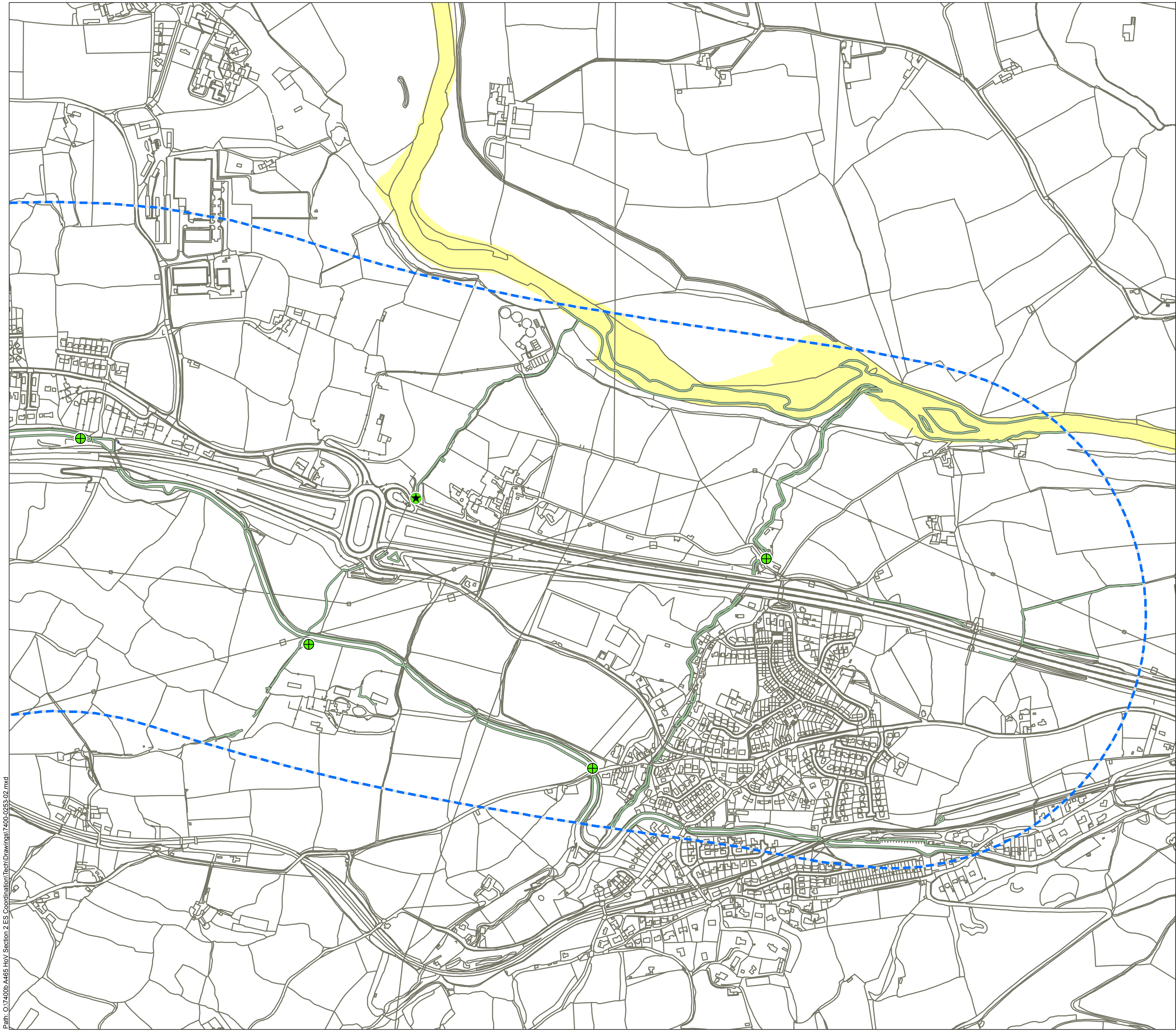

Legend

- 500m Survey Area
- River Usk SAC
- Spraint
- Spraint (Jacobs 2006 survey)
- Fresh spraint
- Fresh spraint (Jacobs 2006 survey)
- Old spraint
- Old spraint (Jacobs 2006 survey)
- Potential otter barrier
- Slide
- Hover (Jacobs 2006 survey)
- Sign heap (Jacobs 2006 survey)
- Water course

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A465 Heads of the Valleys
Section 2: Gilwern - Brynmawr

Otters
Survey Area and Results

Figure: 8e	Revision: --
Date: Aug 2013	Status: FINAL
Drawn: LM	Checked: -

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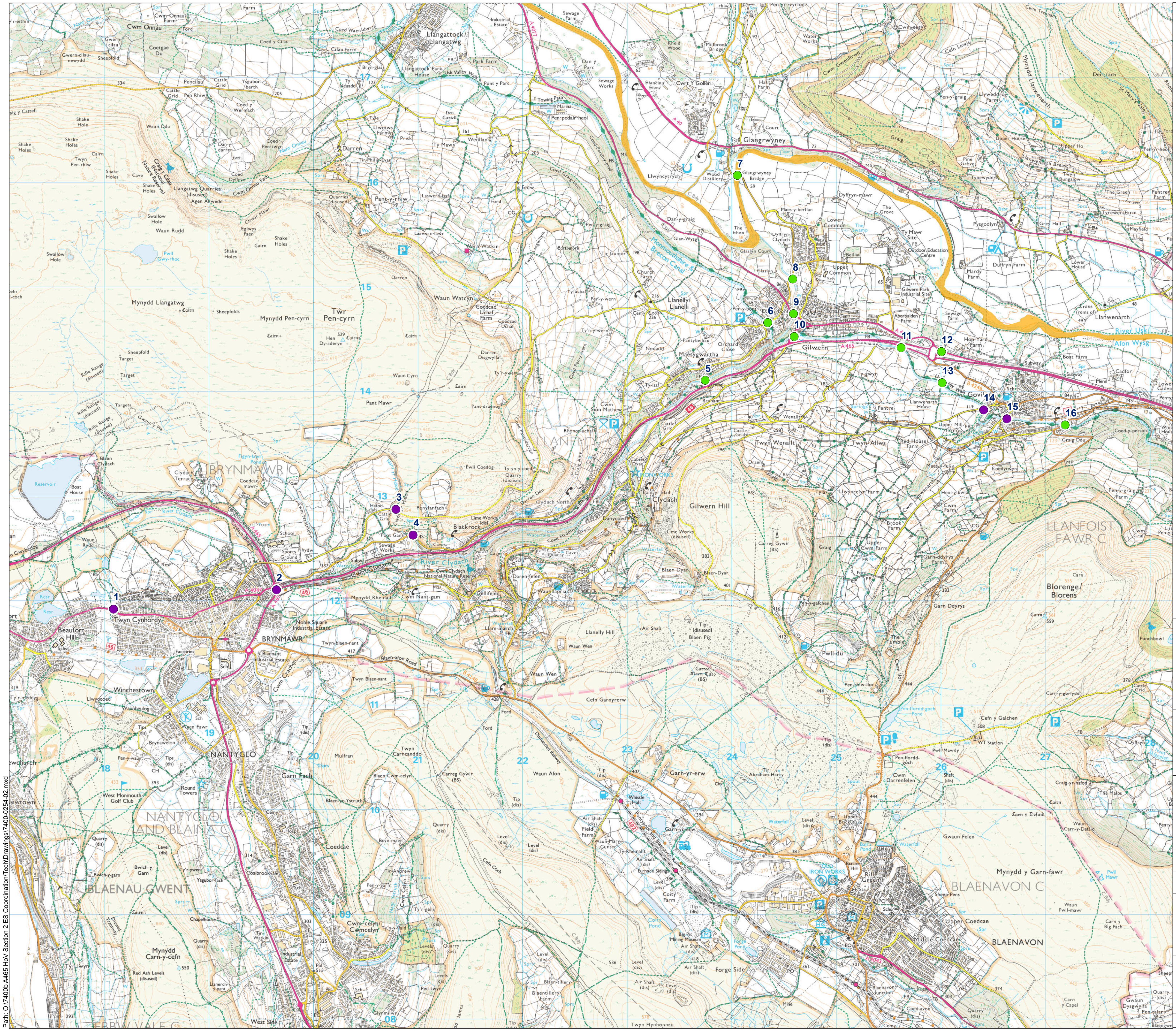

Legend

- River Usk SAC
- Bridge Locations with Evidence of Otters
- Bridge Locations with No Evidence of Otters

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A465 Heads of the Valleys
Section 2: Gilwern - Brynmawr

Otters
Bridge Survey Locations

Figure: 8f	Revision: --
Date: Aug 2013	Status: FINAL
Drawn: LM	Checked: -

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0 0.5 1km
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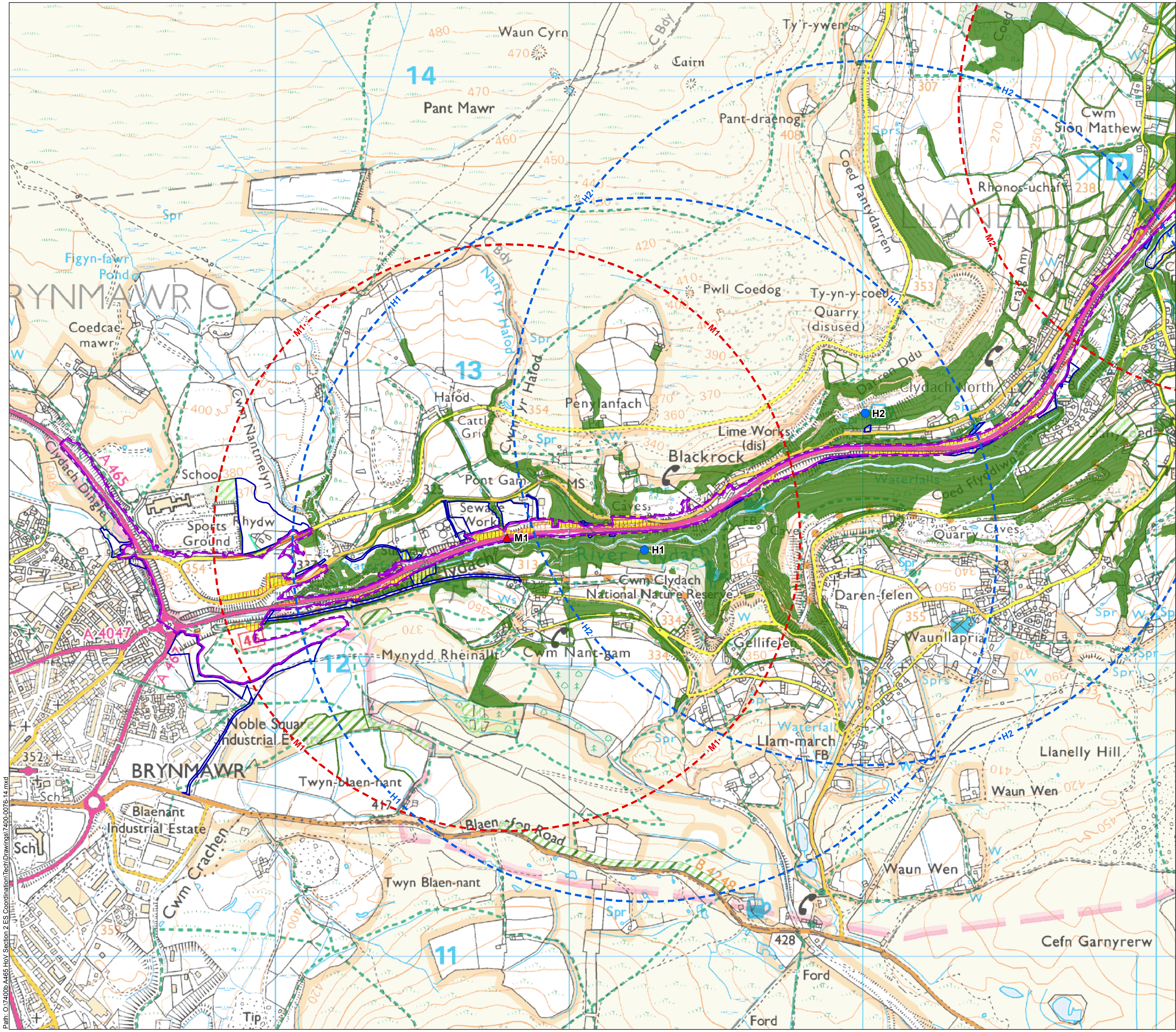
dwg ref: 7400-0254-02

Path: O:\7400b A465 HoV Section 2 ES Coordination\Tech\Drawings\7400-0254-02.mxd

Figure 9: Lesser Horseshoe Bat habitat within roost foraging zones

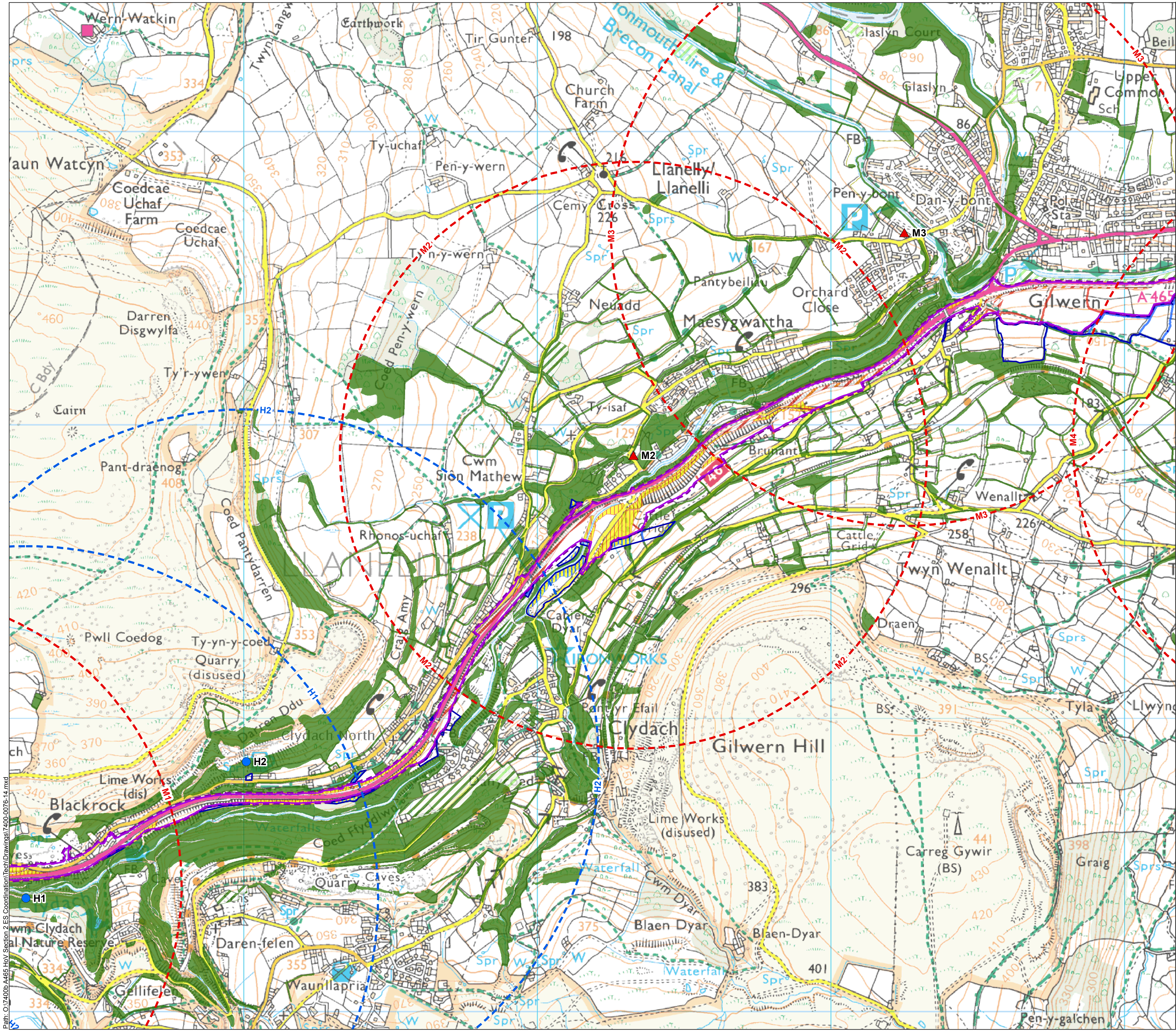


Lesser Horseshoe Bat Foraging Habitats within Roost Foraging Zones
Sheet 1 of 3

Figure: 9a	Revision: -
Date: Aug 2013	Status: FINAL
Drawn: MP	Checked: KJ

Scale: A3 @ 1:12,500

dwg ref: 7400-0076-14



Legend

- Maternity roost
- Hibernation roost
- Maternity roost 1km buffer
- Hibernation roost 1.2km buffer
- Scheme Footprint
- 5m Construction Buffer
- Temporary Landtake Requirements

Unaffected Habitat

- Semi-natural broadleaved woodland
- Broadleaved plantation
- Coniferous plantation
- Mixed plantation
- Hedgerow/treebelt
- Defunct hedge/defunct hedge with trees

Habitat Lost to Scheme

- Semi-natural broadleaved woodland
- Broadleaved plantation
- Coniferous plantation
- Mixed plantation
- Hedgerow/treebelt

Habitat Affected by Temporary Landtake

- Semi-natural broadleaved woodland
- Broadleaved plantation
- Mixed plantation
- Hedgerow/treebelt
- Defunct hedge/defunct hedge with trees

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A465 Heads of the Valleys
Section 2: Gilwern - Brynmawr

Lesser Horseshoe Bat Foraging Habitats within Roost Foraging Zones Sheet 2 of 3

Figure: 9b	Revision: -
Date: Aug 2013	Status: FINAL
Drawn: MP	Checked: KJ

Scale: A3 @ 1:12,500
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dwg ref: 7400-0076-14

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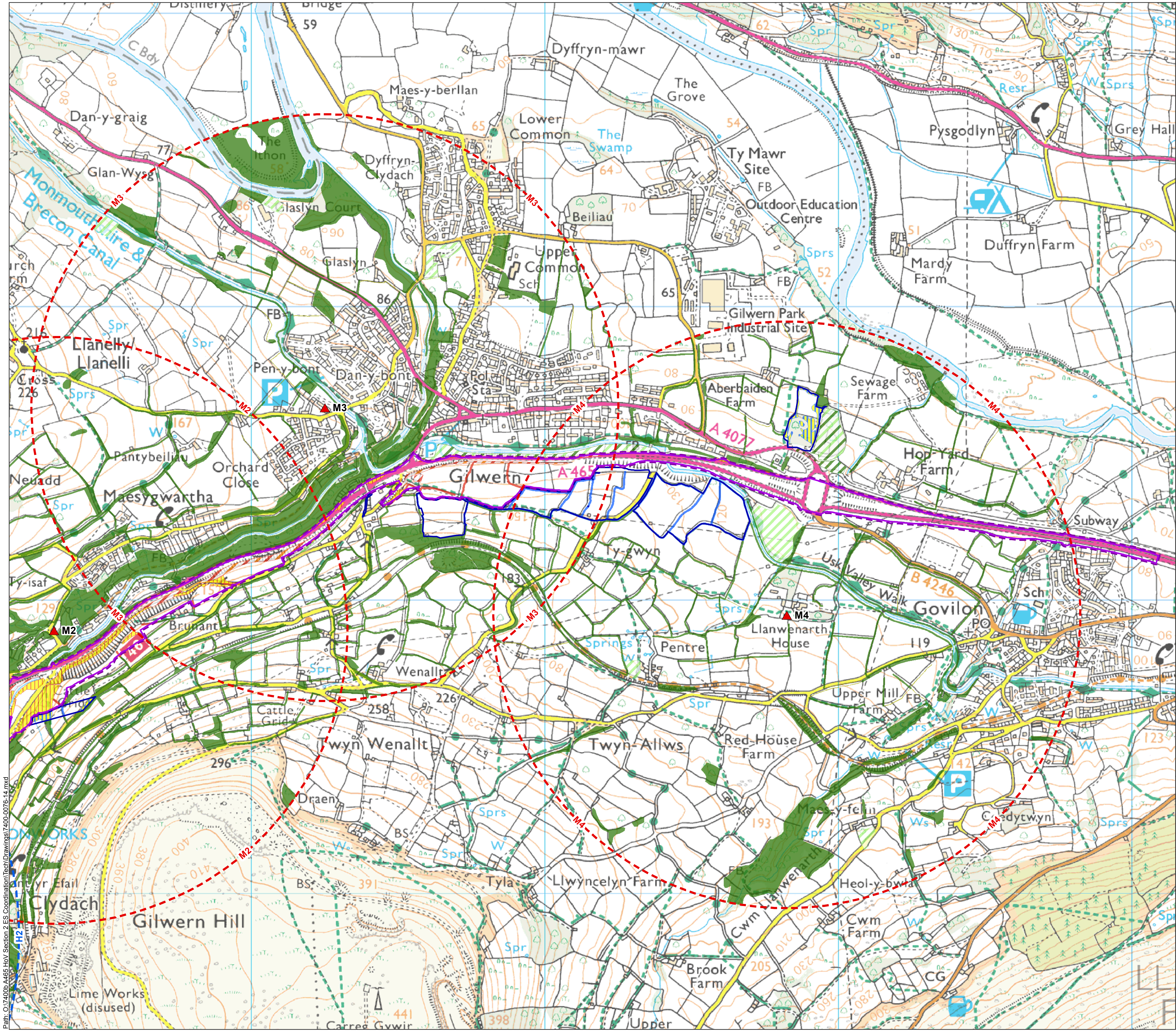

Legend

- Maternity roost
- Hibernation roost
- Maternity roost 1km buffer
- Hibernation roost 1.2km buffer
- Scheme Footprint
- 5m Construction Buffer
- Temporary Landtake Requirements

Unaffected Habitat

- Semi-natural broadleaved woodland
- Broadleaved plantation
- Coniferous plantation
- Mixed plantation
- Hedgerow/treebelt
- Defunct hedge/defunct hedge with trees

Habitat Lost to Scheme

- Semi-natural broadleaved woodland
- Broadleaved plantation
- Coniferous plantation
- Mixed plantation
- Hedgerow/treebelt

Habitat Affected by Temporary Landtake

- Semi-natural broadleaved woodland
- Broadleaved plantation
- Mixed plantation
- Hedgerow/treebelt
- Defunct hedge/defunct hedge with trees

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A465 Heads of the Valleys
Section 2: Gilwern - Brynmawr

Lesser Horseshoe Bat Foraging Habitats within Roost Foraging Zones Sheet 3 of 3

Figure: 9c	Revision: -
Date: Aug 2013	Status: FINAL
Drawn: MP	Checked: KJ

Scale: A3 @ 1:12,500
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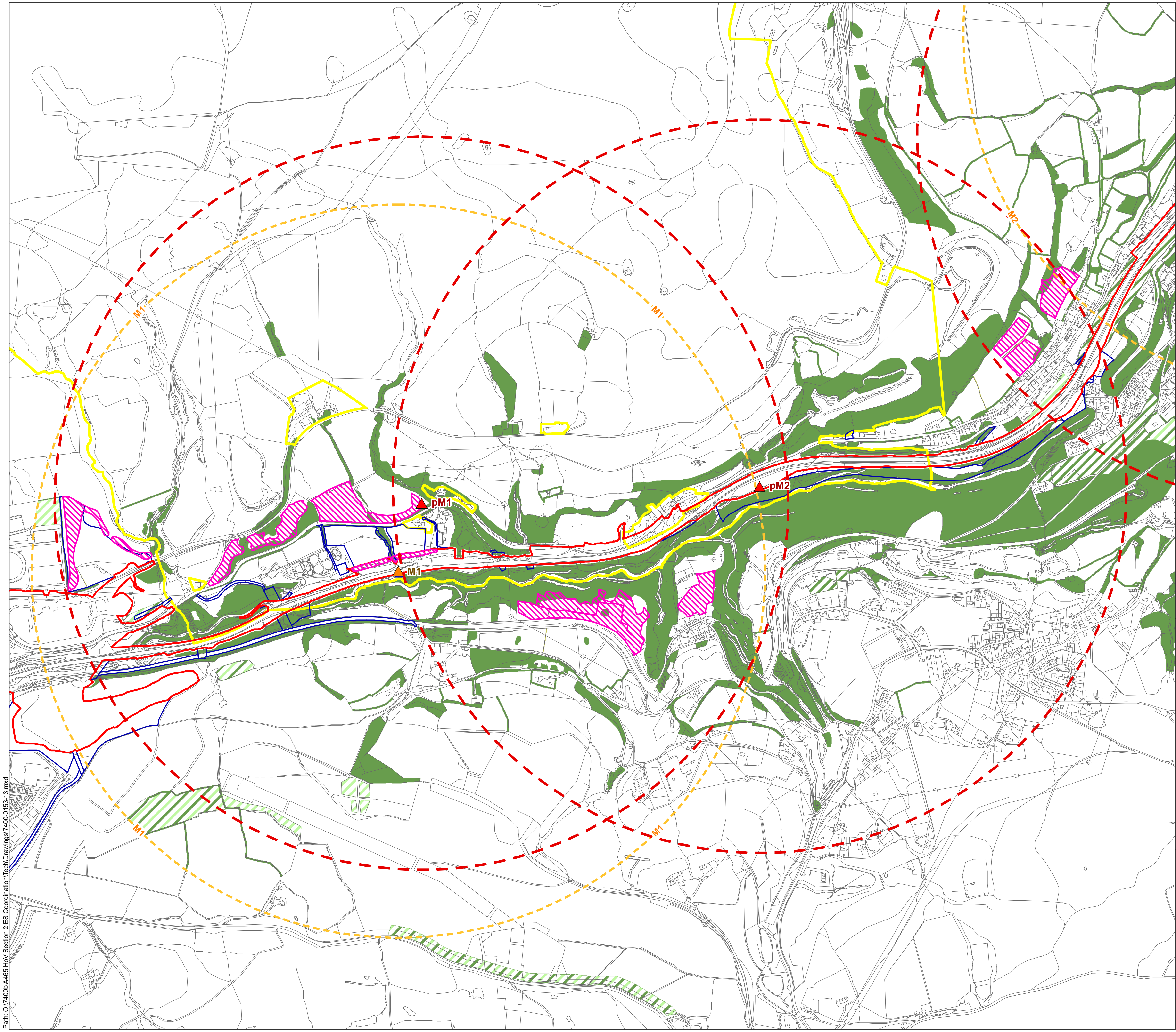
N

dwg ref: 7400-0076-14

Path: O:\7400b A465 HoV Section 2 ES Coordination\Tech\Drawings\7400-0076-14.mxd

Figure 10: Lesser Horseshoe Bat habitat within foraging zones of new roosts



Legend

- Scheme Footprint
- Temporary Landtake Requirements
- Bat Mitigation Areas
- Usk Bat Sites SAC

Existing Maternity Roosts

- Maternity roost
- Roost 1km foraging zone

Proposed Maternity Roosts

- Proposed Location for Additional Maternity Roost
- Proposed Roost 1km foraging zone
- Semi-natural broadleaved woodland
- Broadleaved plantation
- Coniferous plantation
- Mixed plantation
- Hedgerow/treebelt
- Defunct hedge/defunct hedge with trees

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A465 Heads of the Valleys
Section 2: Gilwern - Brynmawr

Location of proposed new maternity roosts and post-development retained and replacement foraging habitat

Figure: 10a	Revision: -
Date: Aug 2013	Status: FINAL
Drawn: MP	Checked: KJ

Scale: A3 @ 1:10,000
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dwg ref: 7400-0153-13

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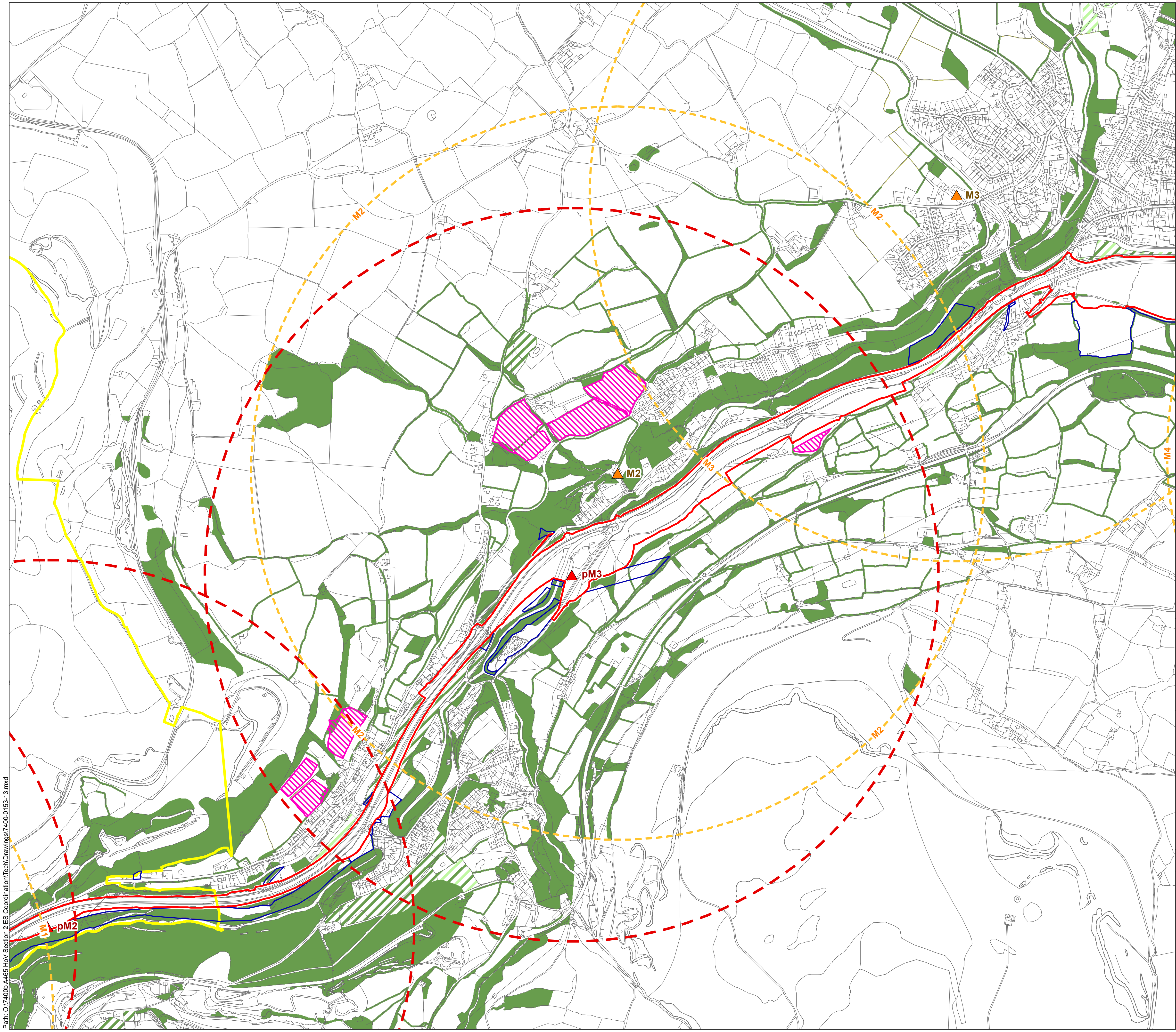

Legend

- Scheme Footprint
- Temporary Landtake Requirements
- Bat Mitigation Areas
- Usk Bat Sites SAC

Existing Maternity Roosts

- Maternity roost
- Roost 1km foraging zone

Proposed Maternity Roosts

- Proposed Location for Additional Maternity Roost
- Proposed Roost 1km foraging zone
- Semi-natural broadleaved woodland
- Broadleaved plantation
- Coniferous plantation
- Mixed plantation
- Hedgerow/treebelt
- Defunct hedge/defunct hedge with trees

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COSTAIN

A465 Heads of the Valleys
Section 2: Gilwern - Brynmawr

Location of proposed new maternity roosts and post-development retained and replacement foraging habitat

Figure: 10b	Revision: -
Date: Aug 2013	Status: FINAL
Drawn: MP	Checked: KJ

Scale: A3 @ 1:10,000
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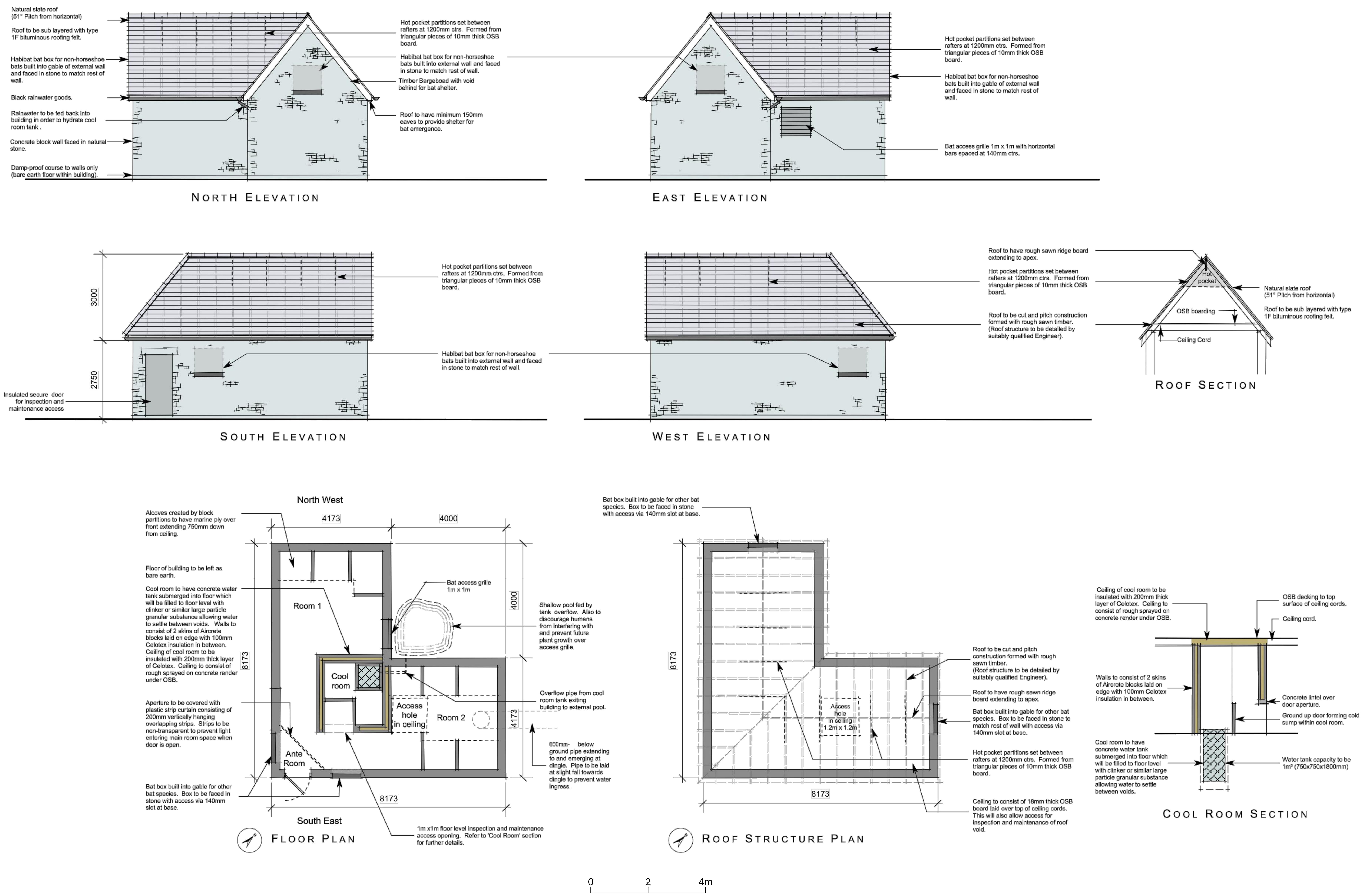
dwg ref: 7400-0153-13

Figure 11: Design of replacement roosts



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A465 Heads of the Valleys
Section 2: Gilwern - Brynmawr

Designs of Proposed Bat Maternity Roosts - Hafod Maternity Roost

Figure: 11a	Revision: -
Date: Aug 2013	Status: FINAL
Drawn: -	Checked: -

Scale: NTS

Data Sources

dwg ref: 7400-0228-03.dwg

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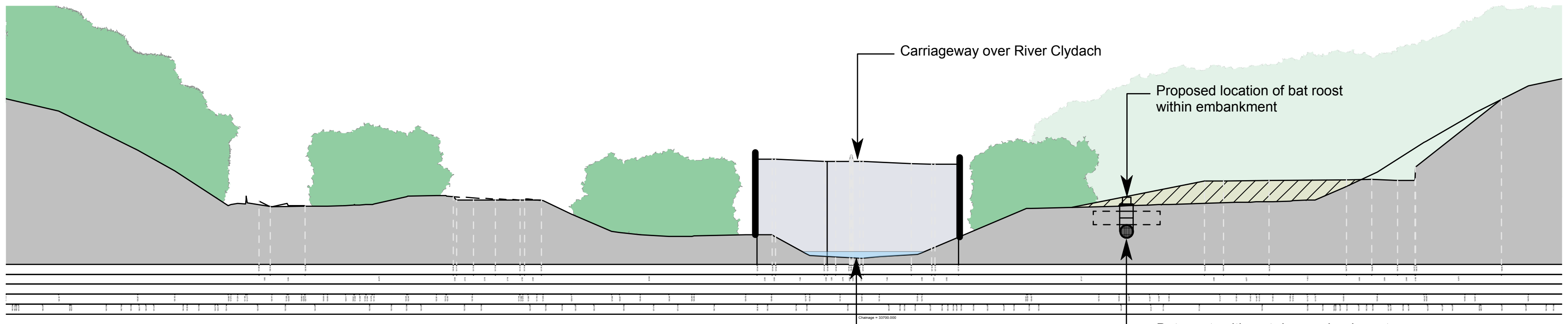
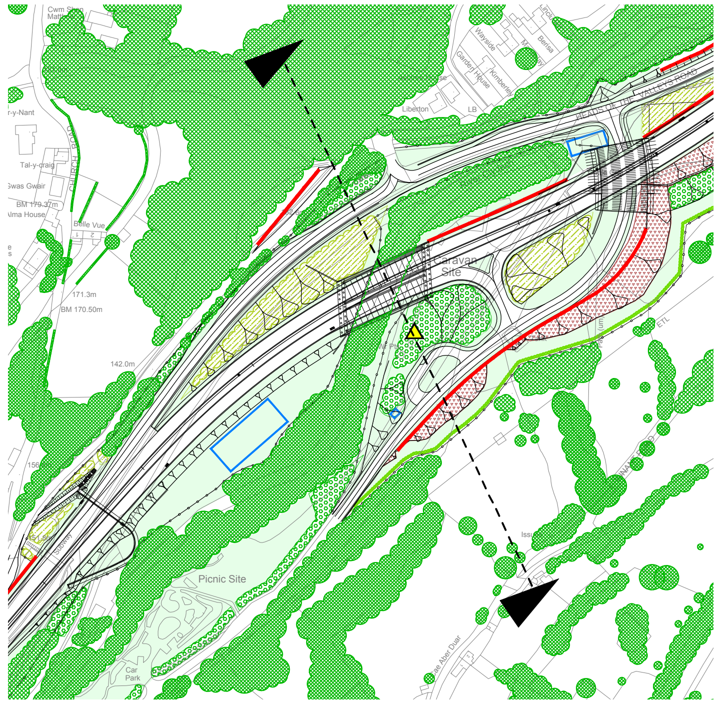
Rev P1
Drawing Number A465HOV2-RPS-xxxx-XX-xx-000
Suitability S4

DO NOT SCALE

A3



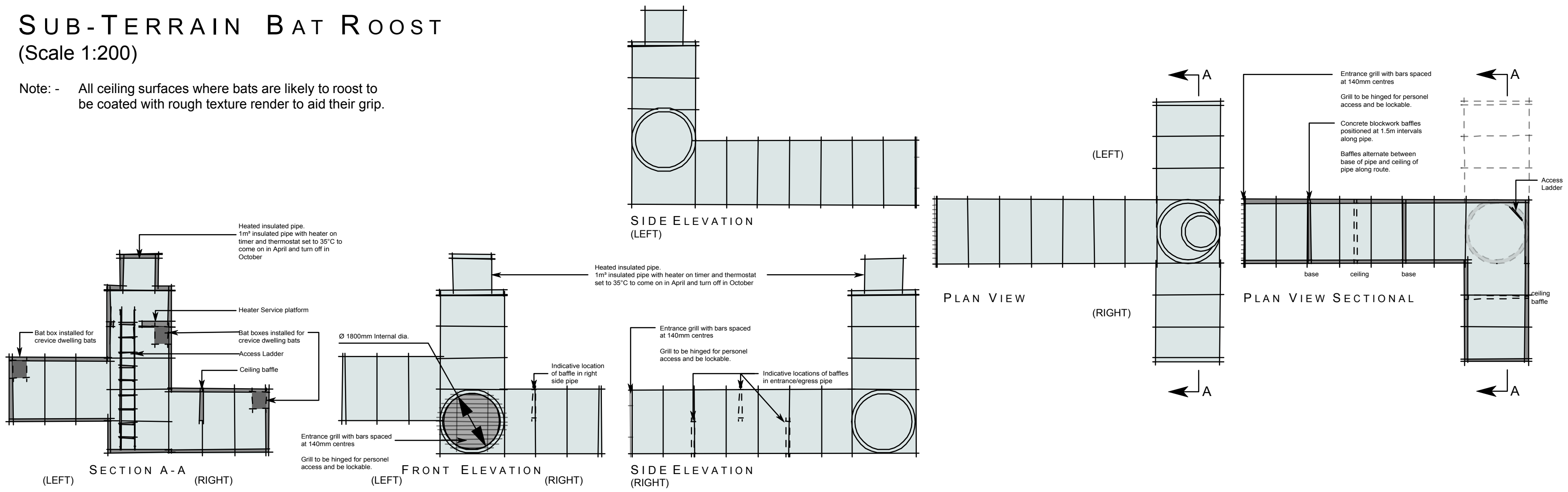
SECTION AT SALEYARD RIVER CROSSING
(Scale 1:1000)



SECTION LOCATION - SALEYARD
(Scale NTS)

SUB-TERRAIN BAT ROOST
(Scale 1:200)

Note: - All ceiling surfaces where bats are likely to roost to be coated with rough texture render to aid their grip.



SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made to the design hazard log).

Construction
(Enter 'None' if applicable)
Maintenance/Cleaning
(Enter 'None' if applicable)
Use
(Enter 'None' if applicable)
Decommissioning/Demolition
(Enter 'None' if applicable)

Rev	Description	By	Date	Chk'd	Auth

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COSTAIN

A465 Heads of the Valleys
Section 2: Gilwern - Brynmawr

Purpose of Issue
FINAL

Title
Figure 11b
Designs of Proposed Bat Maternity Roosts

Original Scale	Designed/Drawn	Checked	Authorised
As Shown @ A3	AJC	-	-
	Date AUG 2013	Date -	Date -

Status	Drawing Number	Rev
S4	A465HOV2-RPS-xxxx-XX-xx-000	P1

File: 7397-0003-01.vwx
Date: Aug 18, 2013 - 14:45pm Plotted by: corfea

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Figure 12: Environmental Masterplan showing proposed planting, potential areas for CPO offsite planting and location of new roosts

Rev P20
Drawing Number A465HOV2-RPS-xxxx-XX-xx-000
Suitability S4

DO NOT SCALE

A1

KEY

EXISTING

- Scheduled Ancient Monument (SAM)
- Special Area of Conservation (SAC)
- Site of Special Scientific Interest (SSSI)
- Geological SSSI

Existing Features

- Woody vegetation (retained)
- Watercourses
- Culverts (used by Bats)
- River Culverts (used by Bats)
- Subways (used by Bats)
- Pedestrian bridges
- Rock faces
- HOV Section 1 completed planting
- Bat Roost
- Bat Roost (to be demolished)
- Bat Hibernacula
- Bat Maternity Roost (LHB)
- Overhead pylons
- 20m Standoff either side of OHL
- Public Right of Way
- Sustrans NCN 492
- Weakly or moderately Tilio-Acerion Woodland

PROPOSED LANDSCAPE ELEMENTS & ENVIROMENTAL ELEMENTS

- Grassland (LE 1.1 or 1.6)

Native planting

- Woodland (LE 2.1, 2.3, 2.4, 2.5)
- Woodland (LE 2.1 advanced planting)
- Native Shrubs (LE 2.6)
- Scrub (LE 2.8)
- Hedgerow (LE 4.3)
- Landscape contours
- Retaining wall
- Rock and Scree (LE 1.4)
- Potential Environmental barrier (E 1.2)
- Reinforced earth wall (LE 7.7)

Other features

- Proposed Public Right of Way
- Agricultural reinstatement
- Potential Bat Mitigation Areas
- Mitigation Hibernation Roosts
- Mitigation Maternity Roosts
- Potential ecological fencing (E3.2)
- Existing river culverts extended for bat underpass
- Existing culverts extended for bat underpass
- Existing subways extended for bat underpass
- New Crossing point for bats
- Area of common land required for scheme
- Potential area of exchange land
- Planting Areas within Scheme

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

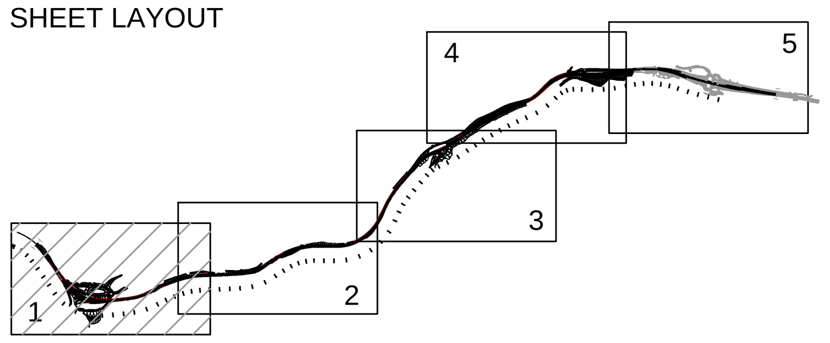
In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made to the design hazard log).

Construction
(Enter 'None' if applicable)
Maintenance/Cleaning
(Enter 'None' if applicable)
Use
(Enter 'None' if applicable)
Decommissioning/Demolition
(Enter 'None' if applicable)

NOTES

Environmental Functions as follows unless otherwise noted on the drawings:-
All native planting (LE 2.1, 2.3, 2.4, 2.5) to be EFA/ EFB/ EFD.
All rock and scree (LE 1.4) to be EFE.
All potential Environmental Barriers (E 1.2) to be EFG.
All Reinforced Earth Walls (LE 7.7) to be EFB.
All Marsh and Wet Grassland (LE 6.4) to be EFD.
All potential bat mitigation areas (E 3.2) to be EFD
Potential environmental barrier locations subject to further modelling and review. Locations shown are indicative only.
All potential ecological fencing is draft only and subject to review following further survey.
For sections refer to Drawing Nos: A465/HOV2/RPS/0811/XX/DR/006 - 009

SHEET LAYOUT



Rev	Description	By	Date	Chk'd	Auth
P19	add planted areas	MP	08-08-13	KJ	
P18	revised BMAs	MP	01-08-13	KJ	
P15	revised BMAs	MP	12-07-13	KJ	
P14	update EMP data	MP	25-06-13	KJ	
P13	revised mitigation areas	MP	13-06-13	KJ	
P12	revised mitigation areas	MP	09-05-13	KJ	
P11	update to EMP rev P5 & amended BMA's	MP	02-05-13	KJ	

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A465 Heads of the Valleys
Section 2: Gilwern - Brynmawr

Purpose of Issue

Title
Figure 12a
Bat Mitigation Areas
Sheet 1 of 5

Original Scale	Designed/Drawn	Checked	Authorised
1:2500 @ A1	MP	KJ	-
	Date Aug 2013	Date Aug 2013	Date -

Status	Drawing Number	Rev
S4	A465HOV2-RPS-xxxx-XX-xx-000	P20

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Date: Aug 16, 2013 - 1:02pm Plotted by: pearsonm

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Rev P19

Drawing Number A465HOV2-RPS-xxxx-XX-xx-000

Suitability S4

DO NOT SCALE

A1

KEY

EXISTING

- Scheduled Ancient Monument (SAM)
- Special Area of Conservation (SAC)
- Site of Special Scientific Interest (SSSI)
- Geological SSSI

Existing Features

- Woody vegetation (retained)
- Watercourses
- Culverts (used by Bats)
- River Culverts (used by Bats)
- Subways (used by Bats)
- Pedestrian bridges
- Rock faces
- HOV Section 1 completed planting
- Bat Roost
- Bat Roost (to be demolished)
- Bat Hibernacula
- Bat Maternity Roost (LHB)
- Overhead pylons
- 20m Standoff either side of OHL
- Public Right of Way
- Sustrans NCN 492
- Weakly or moderately Tilio-Acerion Woodland

PROPOSED LANDSCAPE ELEMENTS & ENVIROMENTAL ELEMENTS

- Grassland (LE 1.1 or 1.6)

Native planting

- Woodland (LE 2.1, 2.3, 2.4, 2.5)
- Woodland (LE 2.1 advanced planting)
- Native Shrubs (LE 2.6)
- Scrub (LE 2.8)
- Hedgerow (LE 4.3)
- Landscape contours
- Retaining wall
- Rock and Scree (LE 1.4)
- Potential Environmental barrier (E 1.2)
- Reinforced earth wall (LE 7.7)

Other features

- Proposed Public Right of Way
- Agricultural reinstatement
- Potential Bat Mitigation Areas
- Mitigation Hibernation Roosts
- Mitigation Maternity Roosts
- Potential ecological fencing (E3.2)
- Existing river culverts extended for bat underpass
- Existing culverts extended for bat underpass
- Existing subways extended for bat underpass
- New Crossing point for bats
- Area of common land required for scheme
- Potential area of exchange land
- Planting Areas within Scheme

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made to the design hazard log).

Construction

(Enter 'None' if applicable)

Maintenance/Cleaning

(Enter 'None' if applicable)

Use

(Enter 'None' if applicable)

Decommissioning/Demolition

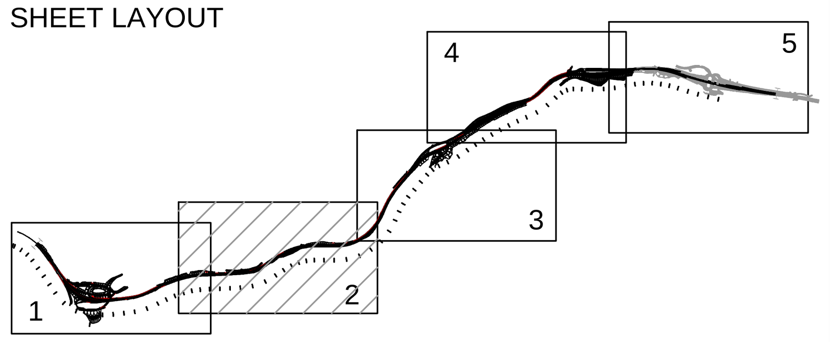
(Enter 'None' if applicable)

NOTES

Environmental Functions as follows unless otherwise noted on the drawings:-
All native planting (LE 2.1, 2.3, 2.4, 2.5) to be EFA/ EFB/ EFD.
All rock and scree (LE 1.4) to be EFE.
All potential Environmental Barriers (E 1.2) to be EFG.
All Reinforced Earth Walls (LE 7.7) to be EFB.
All Marsh and Wet Grassland (LE 6.4) to be EFD.
All potential bat mitigation areas (E 3.2) to be EFD
Potential environmental barrier locations subject to further modelling and review. Locations shown are indicative only.
All potential ecological fencing is draft only and subject to review following further survey.

For sections refer to Drawing Nos: A465/HOV2/RPS/0811/XX/DR/006 - 009

SHEET LAYOUT



Rev	Description	By	Date	Chk'd	Auth
P19	add planted areas	MP	08-08-13	KJ	
P18	revised BMAs	MP	01-08-13	KJ	
P15	revised BMAs	MP	12-07-13	KJ	
P14	update EMP data	MP	25-06-13	KJ	
P13	revised mitigation areas	MP	13-06-13	KJ	
P12	revised mitigation areas	MP	09-05-13	KJ	
P11	update to EMP rev P5 & amended BMA's	MP	02-05-13	KJ	

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Welsh Government

ATKINS | Halcrow A CH2M HILL COMPANY | RPS

COSTAIN

A465 Heads of the Valleys
Section 2: Gilwern - Brynmawr

Purpose of Issue

FIA

Title

Figure 12b
Bat Mitigation Areas
Sheet 2 of 5

Original Scale	Designed/Drawn	Checked	Authorised
1:2500 @ A1	MP	KJ	-
	Date Aug 2013	Date Aug 2013	Date -

Status	Drawing Number	Rev
S4	A465HOV2-RPS-xxxx-XX-xx-000	P19

File: 7400-0152-20.dwg

Date: Aug 16, 2013 - 1:02pm Plotted by: pearsonm

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Rev P19

Drawing Number A465HOV2-RPS-xxxx-XX-xx-000

Suitability S4

DO NOT SCALE

0 10 100 200

A1

KEY

EXISTING

- Scheduled Ancient Monument (SAM)
- Special Area of Conservation (SAC)
- Site of Special Scientific Interest (SSSI)
- Geological SSSI

Existing Features

- Woody vegetation (retained)
- Watercourses
- Culverts (used by Bats)
- River Culverts (used by Bats)
- Subways (used by Bats)
- Pedestrian bridges
- Rock faces
- HOV Section 1 completed planting
- Bat Roost
- Bat Roost (to be demolished)
- Bat Hibernacula
- Bat Maternity Roost (LHB)
- Overhead pylons
- 20m Standoff either side of OHL
- Public Right of Way
- Sustrans NCN 492
- Weakly or moderately Tilio-Acerion Woodland

PROPOSED LANDSCAPE ELEMENTS & ENVIROMENTAL ELEMENTS

- Grassland (LE 1.1 or 1.6)

Native planting

- Woodland (LE 2.1, 2.3, 2.4, 2.5)
- Woodland (LE 2.1 advanced planting)
- Native Shrubs (LE 2.6)
- Scrub (LE 2.8)
- Hedgerow (LE 4.3)
- Landscape contours
- Retaining wall
- Rock and Scree (LE 1.4)
- Potential Environmental barrier (E 1.2)
- Reinforced earth wall (LE 7.7)

Other features

- Proposed Public Right of Way
- Agricultural reinstatement
- Potential Bat Mitigation Areas
- Mitigation Hibernation Roosts
- Mitigation Maternity Roosts
- Potential ecological fencing (E3.2)
- Existing river culverts extended for bat underpass
- Existing culverts extended for bat underpass
- Existing subways extended for bat underpass
- New Crossing point for bats
- Area of common land required for scheme
- Potential area of exchange land
- Planting Areas within Scheme

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made to the design hazard log).

Construction

(Enter 'None' if applicable)

Maintenance/Cleaning

(Enter 'None' if applicable)

Use

(Enter 'None' if applicable)

Decommissioning/Demolition

(Enter 'None' if applicable)

NOTES

Environmental Functions as follows unless otherwise noted on the drawings:-
All native planting (LE 2.1, 2.3, 2.4, 2.5) to be EFA/ EFB/ EFD.
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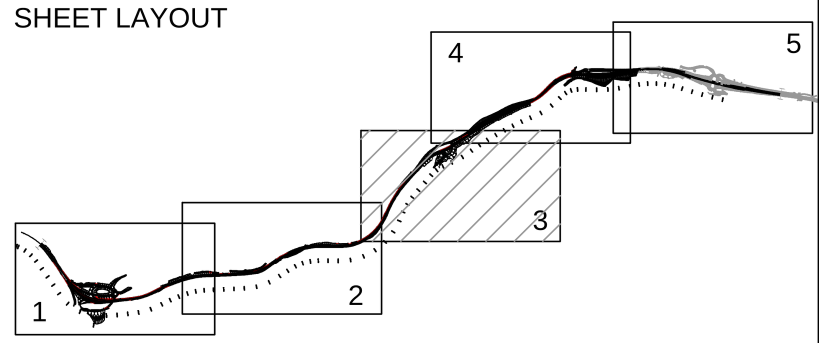
All potential ecological fencing is draft only and subject to review following further survey.

For sections refer to Drawing Nos: A465/HOV2/RPS/0811/XX/DR/006 - 009

SHEET LAYOUT



Rev	Description	By	Date	Chk'd	Auth
P19	add planted areas	MP	08-08-13	KJ	
P18	revised BMAs	MP	01-08-13	KJ	
P15	revised BMAs	MP	12-07-13	KJ	
P14	update EMP data	MP	25-06-13	KJ	
P13	revised mitigation areas	MP	13-06-13	KJ	
P12	revised mitigation areas	MP	09-05-13	KJ	
P11	update to EMP rev P5 & amended BMA's	MP	02-05-13	KJ	

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Welsh Government

ATKINS Halcrow A CH2M HILL COMPANY RPS

COSTAIN

A465 Heads of the Valleys
Section 2: Gilwern - Brynmawr

Purpose of Issue

Title

Figure 12c
Bat Mitigation Areas
Sheet 3 of 5

Original Scale	Designed/Drawn	Checked	Authorised
1:2500 @ A1	MP	KJ	-
	Date Aug 2013	Date Aug 2013	Date -

Status	Drawing Number	Rev
S4	A465HOV2-RPS-xxxx-XX-xx-000	P19

File: 7400-0152-20.dwg
Date: Aug 16, 2013 - 1:03pm Plotted by: pearsonm

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Rev P19

Drawing Number A465HOV2-RPS-xxxx-XX-xx-000

Suitability S4

DO NOT SCALE

0 10 100 200

A1

File: 7400-0152-20.dwg Date: Aug 16, 2013 - 1:03pm Plotted by: pearsonm

KEY

EXISTING

- Scheduled Ancient Monument (SAM)
- Special Area of Conservation (SAC)
- Site of Special Scientific Interest (SSSI)
- Geological SSSI

Existing Features

- Woody vegetation (retained)
- Watercourses
- Culverts (used by Bats)
- River Culverts (used by Bats)
- Subways (used by Bats)
- Pedestrian bridges
- Rock faces
- HOV Section 1 completed planting
- Bat Roost
- Bat Roost (to be demolished)
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- Bat Maternity Roost (LHB)
- Overhead pylons
- 20m Standoff either side of OHL
- Public Right of Way
- Sustrans NCN 492
- Weakly or moderately Tilio-Acerion Woodland

PROPOSED LANDSCAPE ELEMENTS & ENVIROMENTAL ELEMENTS

- Grassland (LE 1.1 or 1.6)

Native planting

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- Scrub (LE 2.8)
- Hedgerow (LE 4.3)
- Landscape contours
- Retaining wall
- Rock and Scree (LE 1.4)
- Potential Environmental barrier (E 1.2)
- Reinforced earth wall (LE 7.7)

Other features

- Proposed Public Right of Way
- Agricultural reinstatement
- Potential Bat Mitigation Areas
- Mitigation Hibernation Roosts
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SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made to the design hazard log).

Construction

(Enter 'None' if applicable)

Maintenance/Cleaning

(Enter 'None' if applicable)

Use

(Enter 'None' if applicable)

Decommissioning/Demolition

(Enter 'None' if applicable)

NOTES

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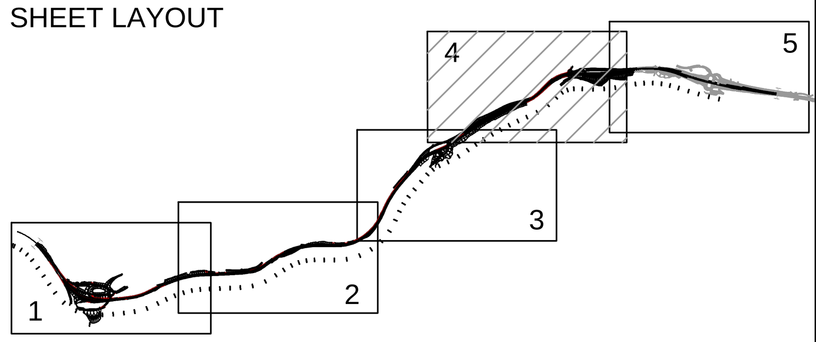
SHEET LAYOUT



Rev	Description	By	Date	Chk'd	Auth
P19	add planted areas	MP	08-08-13	KJ	
P18	revised BMAs	MP	01-08-13	KJ	
P15	revised BMAs	MP	12-07-13	KJ	
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P11	update to EMP rev P5 & amended BMA's	MP	02-05-13	KJ	

Llywodraeth Cymru
Welsh Government

ATKINS Halcrow A CH2M HILL COMPANY RPS

COSTAIN

A465 Heads of the Valleys
Section 2: Gilwern - Brynmawr

Purpose of Issue

Title

Figure 12d
Bat Mitigation Areas
Sheet 4 of 5

Original Scale	Designed/Drawn	Checked	Authorised
1:2500 @ A1	MP	KJ	-
	Date Aug 2013	Date Aug 2013	Date -

Status	Drawing Number	Rev
S4	A465HOV2-RPS-xxxx-XX-xx-000	P19

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Rev P19

Drawing Number A465HOV2-RPS-xxxx-XX-xx-000

Suitability S4

DO NOT SCALE

A1

File: 7400-0152-20.dwg Date: Aug 16, 2013 - 1:03pm Plotted by: pearsonm

KEY

EXISTING

- Scheduled Ancient Monument (SAM)
- Special Area of Conservation (SAC)
- Site of Special Scientific Interest (SSSI)
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Existing Features

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- Retaining wall
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SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made to the design hazard log).

Construction

(Enter 'None' if applicable)

Maintenance/Cleaning

(Enter 'None' if applicable)

Use

(Enter 'None' if applicable)

Decommissioning/Demolition

(Enter 'None' if applicable)

NOTES

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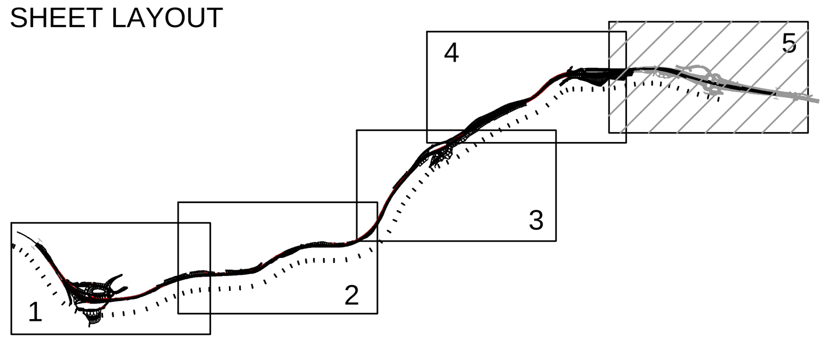
All potential ecological fencing is draft only and subject to review following further survey.
For sections refer to Drawing Nos: A465/HOV2/RPS/0811/XX/DR/006 - 009

SHEET LAYOUT



Rev	Description	By	Date	Chk'd	Auth
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P18	revised BMAs	MP	01-08-13	KJ	
P15	revised BMAs	MP	12-07-13	KJ	
P14	update EMP data	MP	25-06-13	KJ	
P13	revised mitigation areas	MP	13-06-13	KJ	
P12	revised mitigation areas	MP	09-05-13	KJ	
P11	update to EMP rev P5 & amended BMA's	MP	02-05-13	KJ	

Llywodraeth Cymru
Welsh Government

ATKINS Halcrow A CH2M HILL COMPANY RPS

COSTAIN

A465 Heads of the Valleys
Section 2: Gilwern - Brynmawr

Purpose of Issue

Title
Figure 12e
Bat Mitigation Areas
Sheet 5 of 5

Original Scale	Designed/Drawn	Checked	Authorised
1:2500 @ A1	MP	KJ	-
	Date Aug 2013	Date Aug 2013	Date -

Status	Drawing Number	Rev
S4	A465HOV2-RPS-xxxx-XX-xx-000	P19

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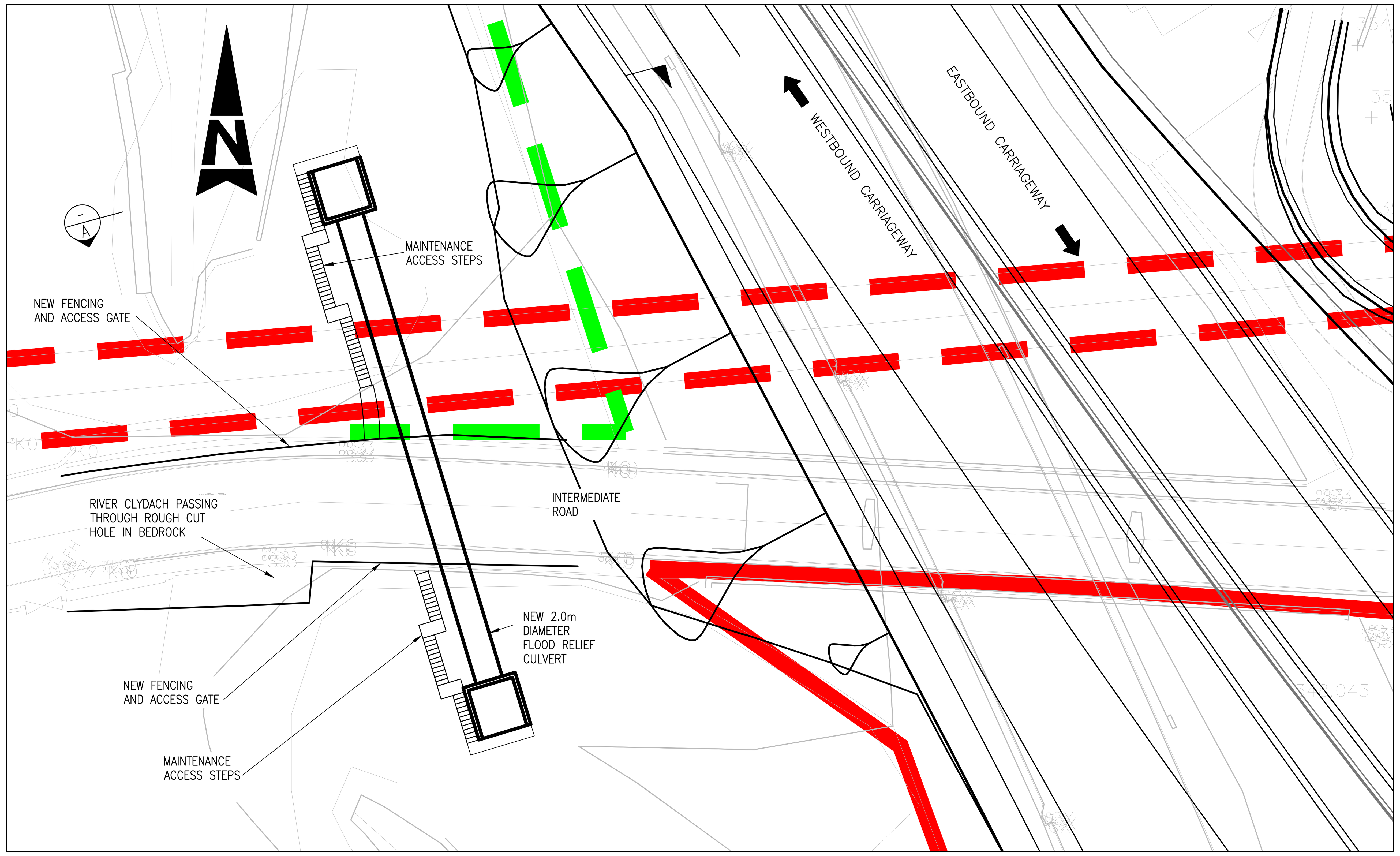
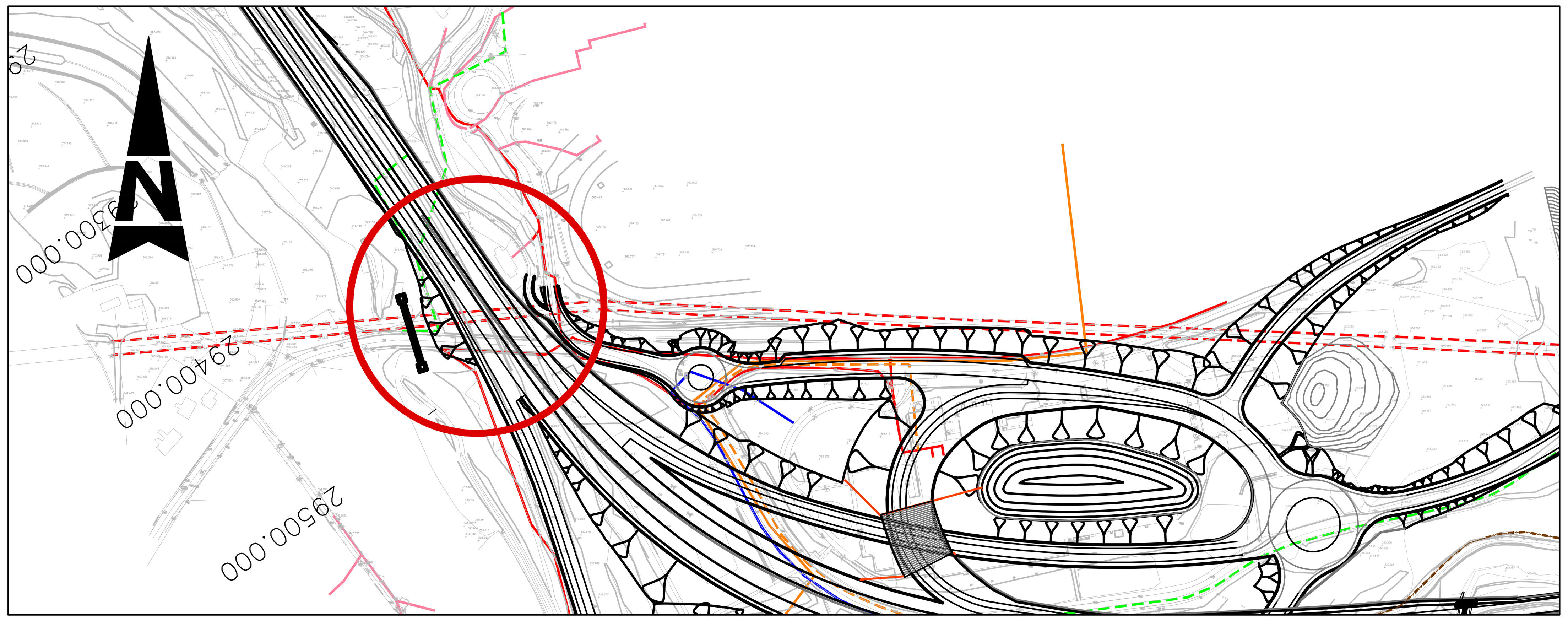
Figure 13: Culvert modifications



PLAN

SCALE 1:250

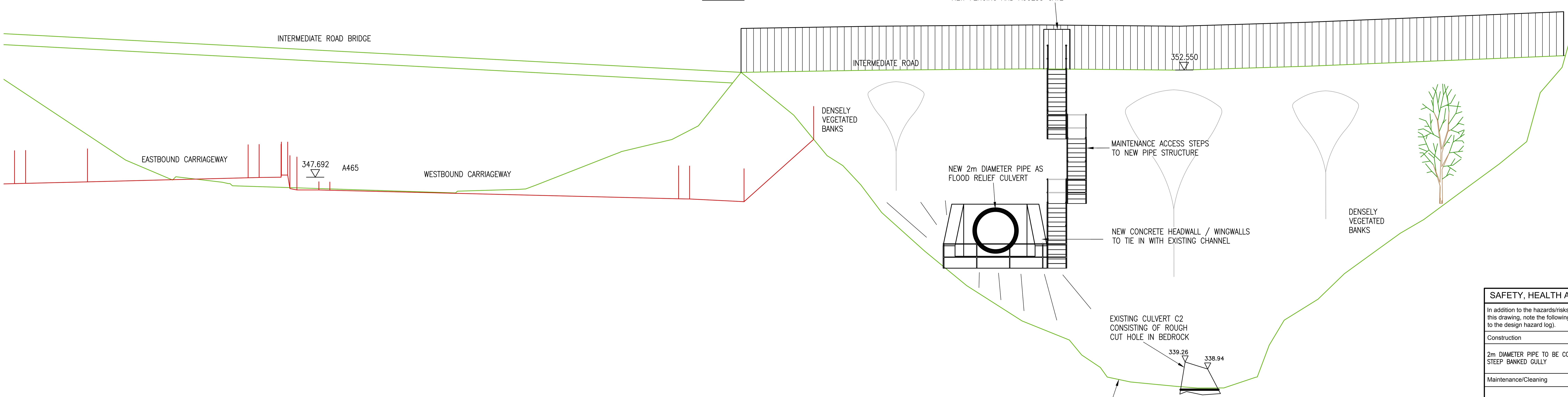


LOCATION PLAN

SCALE 1:2500

SERVICES - KEY

- ELEC - LV
- BRITISH TELECOMS
- 132 KV DUAL
- ELEC - 11KV
- GAS - HP
- GAS - MP
- POTABLE WATER
- FOUL
- GAS - LP



SECTION A

SCALE 1:100

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made to the design hazard log).

Construction

2m DIAMETER PIPE TO BE CONSTRUCTED THROUGH ROCK FACE AND AT BOTTOM OF STEEP BANKED GULLY

Maintenance/Cleaning

ACCESS FOR MAINTENANCE REQUIRED

Use

TBC

Decommissioning/Demolition

TBC

Notes:

1. This drawing represents a preliminary design only for the purpose of illustrating the structural form and design intent. Confirmation of design including the key member sizes and foundation type is subject to detailed design and the results of the final geotechnical investigation.
2. All dimensions are in millimetres unless noted otherwise.
3. All levels are in metres relative to ordinance datum.
4. The positions of services shown are approximate.
5. Maintenance access routes and details will be agreed with SWTRA in the detailed design stage.

Rev	Description	By	Date	Chk'd	Auth
P2	ISSUE FOR ENVIRONMENTAL STATEMENT	RO	MAY '13	JN	DO
P1	FOR INFORMATION	RO	MAR '13	JN	DO

Llywodraeth Cymru
Welsh Government

ATKINS Halcrow RPS

COSTAIN

A465 Heads of the Valleys
Section 2: Gilwern - Brynmawr

Purpose of Issue: ISSUE FOR ENVIRONMENTAL STATEMENT

Title: **Figure 13 a**
Design of Culvert Modifications

S17: INTERMEDIATE ROAD CULVERT
GENERAL ARRANGEMENT

Original Scale	Designed/Drawn	Checked	Authorised
As Shown	RO, Date MAR '13	JN, Date MAR '13	DO, Date MAR '13

Status	Drawing Number	Rev
S4	A465HOV2-DJV-0717-S17-DR-001	P2

Rev P2
Drawing Number A465HOV2-DJV-0717-S17-DR-001
Suitability

DO NOT SCALE

A1

File: Bridge Master - bat culverts - all.dwg
Date: May 15, 2013 - 7:09pm Plotted by: oate1424

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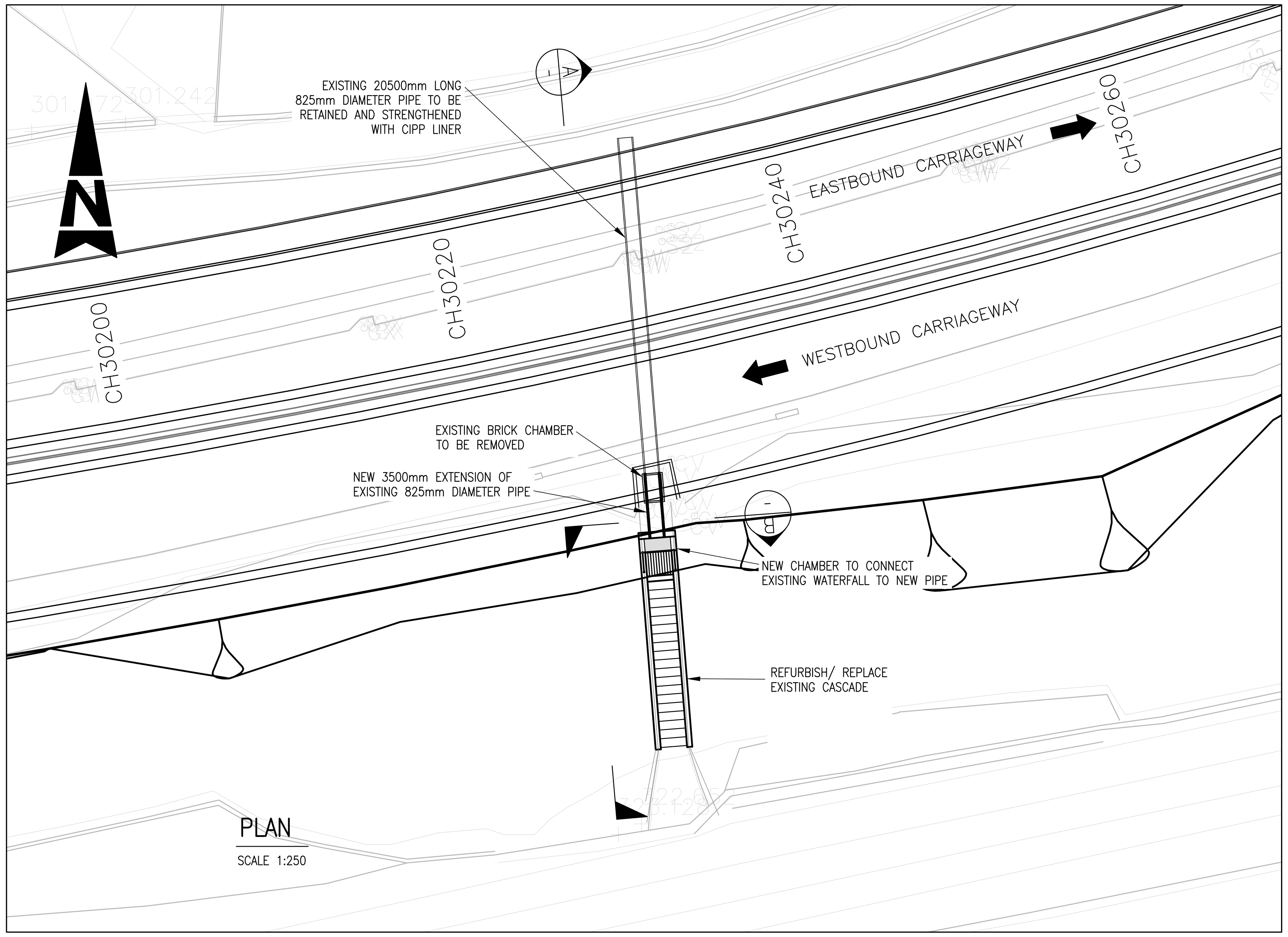
Rev P8

Suitability | Drawing Number A465HOV2-DJV-0717-C3-DR-001

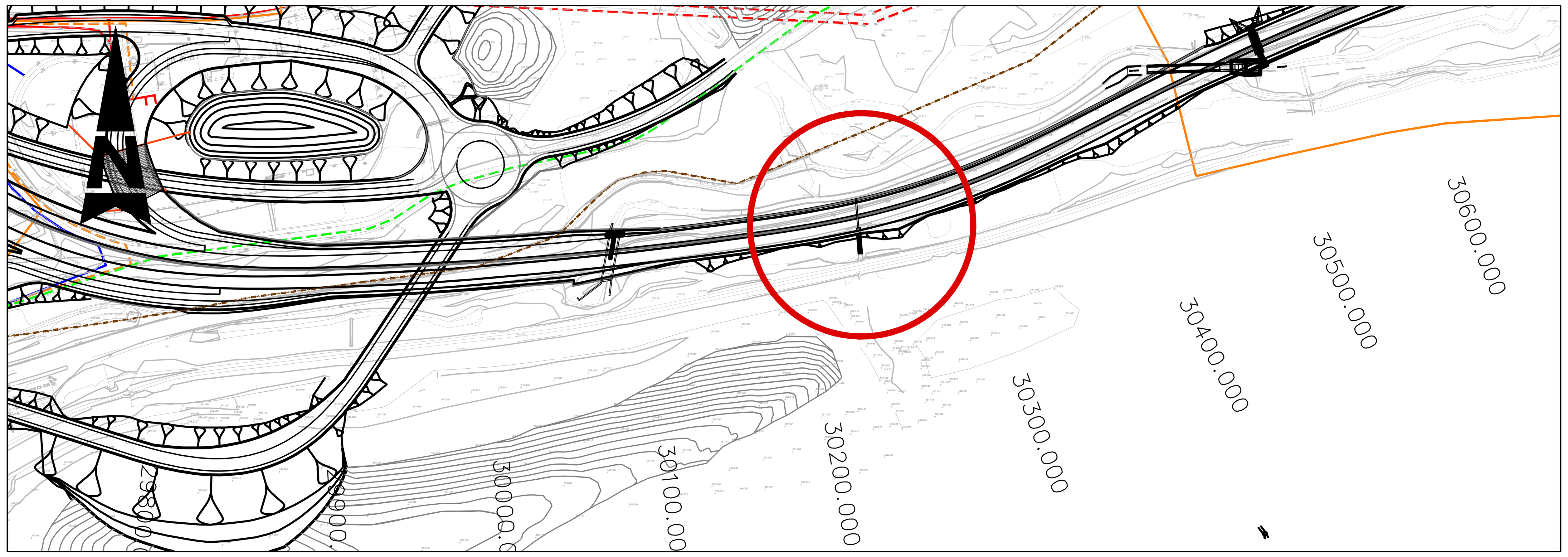
DO NOT SCALE

A1



PLAN

SCALE 1:250

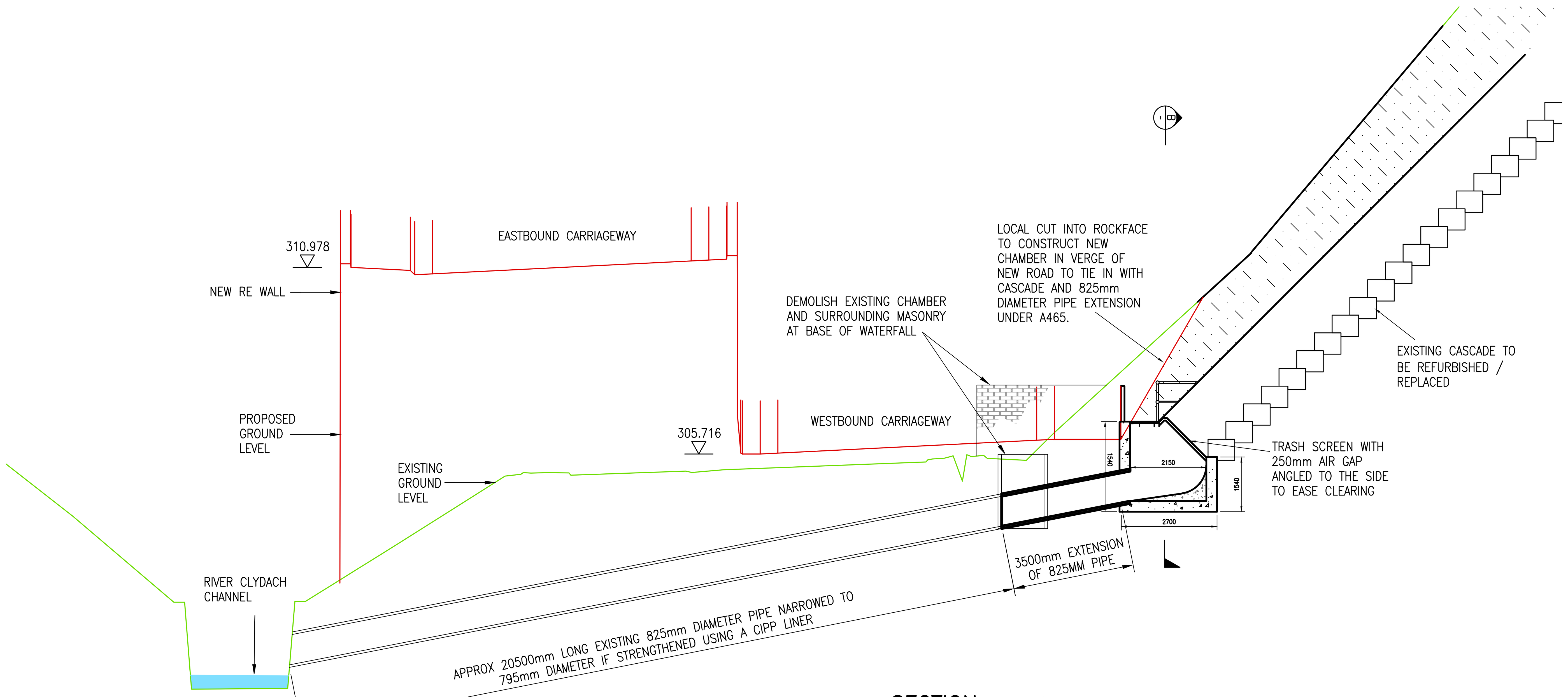


LOCATION PLAN

SCALE 1:2500

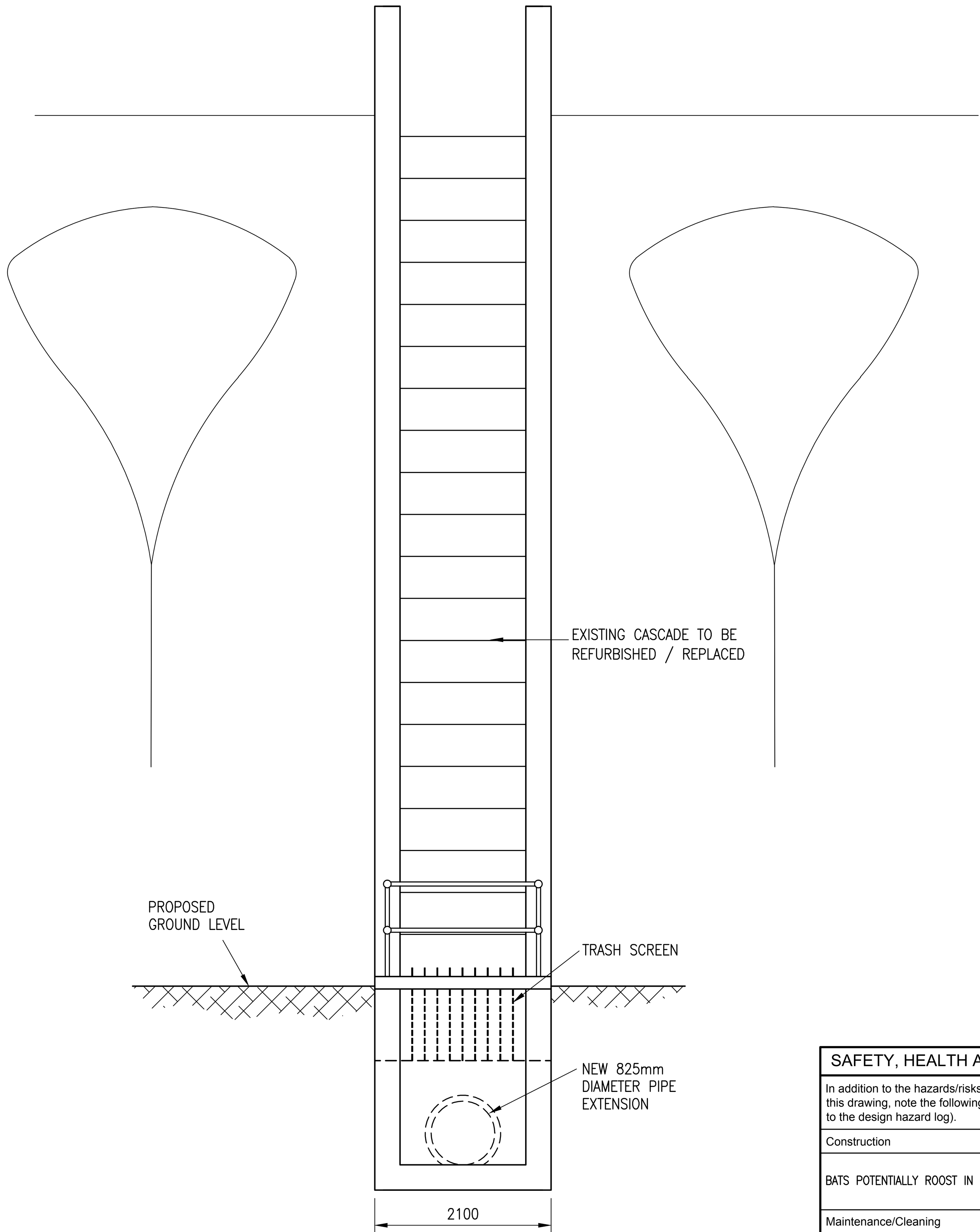
SERVICES - KEY

- ELEC - LV
- BRITISH TELECOMS
- 132 KV DUAL
- ELEC - 11KV
- GAS - HP
- GAS - MP
- POTABLE WATER
- FOUL
- GAS - LP



SECTION A

SCALE 1:100



SECTION B

SCALE 1:50

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION
In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made to the design hazard log).
Construction
BATS POTENTIALLY ROOST IN CULVERT
Maintenance/Cleaning
PIPE CLASSED AS ENCLOSED SPACE WITH DROP AT END. LANYARD ATTACHMENTS INSIDE PIPE TO PREVENT FALLS. DROP AT END OF PIPE INTO RIVER CLYDACH. BATS POTENTIALLY ROOST IN CULVERT
Use
PUBLIC DETERRED FROM ACCESSING PIPE BY WALLED CHAMBER WITH LOCKABLE GATE AND TRASH SCREEN. BATS POTENTIALLY ROOST IN CULVERT
Decommissioning/Demolition
BATS POTENTIALLY ROOST IN CULVERT

Notes:

1. This drawing represents a preliminary design only for the purpose of illustrating the structural form and design intent. Confirmation of design including the key member sizes and foundation type is subject to detailed design and the results of the final geotechnical investigation.
2. All dimensions are in millimetres unless noted otherwise
3. All levels are in metres relative to ordinance datum .
4. The positions of services shown are approximate.
5. Maintenance access routes and details will be agreed with SWTRA in the detailed design stage.

Rev	Description	By	Date	Chk'd	Auth
P8	ISSUE FOR ENVIRONMENTAL STATEMENT	RO	MAY '13	JN	DO
P7	ALIGNMENT AMENDED	RO	MAR '13	JN	DO
P6	TRASH SCREEN AMENDED	JN	JAN '13	RW	DO
P5	WORK IN PROGRESS	JN	AUG '12	RW	DO
P4	WORK IN PROGRESS	JN	AUG '12	RW	DO
P3	WORK IN PROGRESS	JN	AUG '12	DO	DO
P2	FOR REVIEW AND COMMENT	JN	JUN '12	JS	DO
P1	FOR INFORMATION	JN	JUN '12	JS	DO

Llywodraeth Cymru Welsh Government

ATKINS Halcrow RPS

COSTAIN

A465 Heads of the Valleys
Section 2: Gilwern - Brynmawr

Purpose of Issue: ISSUE FOR ENVIRONMENTAL STATEMENT

Title: **Figure 13 b**
Design of Culvert Modifications

C3: BEN WARDS FIELDS EAST DRAIN
GENERAL ARRANGEMENT

Original Scale	Designed/Drawn	Checked	Authorised
As Shown	JN	JS	DO
	Date JUNE '12	Date JUNE '12	Date JUNE '12

Status	Drawing Number	Rev
S4	A465HOV2-DJV-0717-C3-DR-001	P8

File: Bridge Master - bat culverts - all.dwg
Date: May 15, 2013 - 7:15pm Plotted by: oate1424

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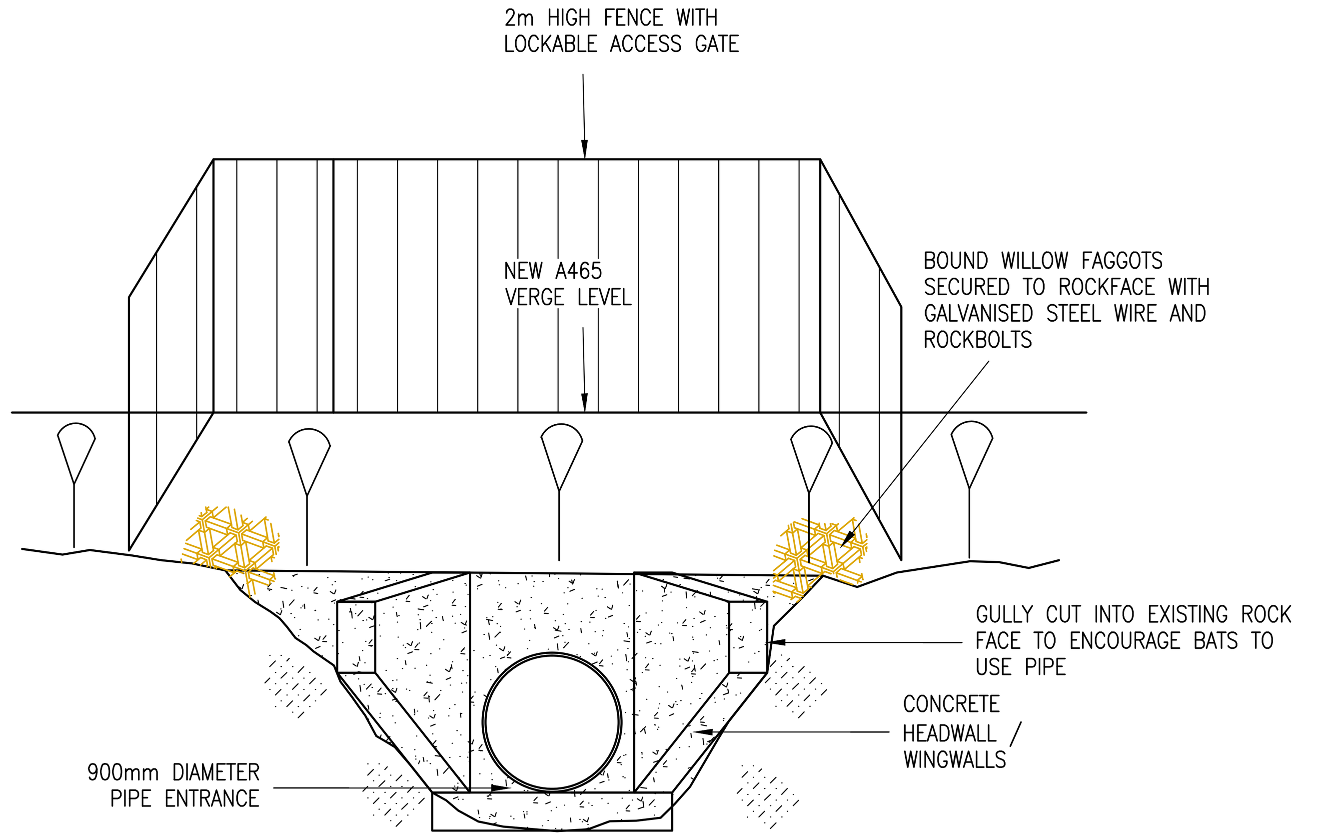
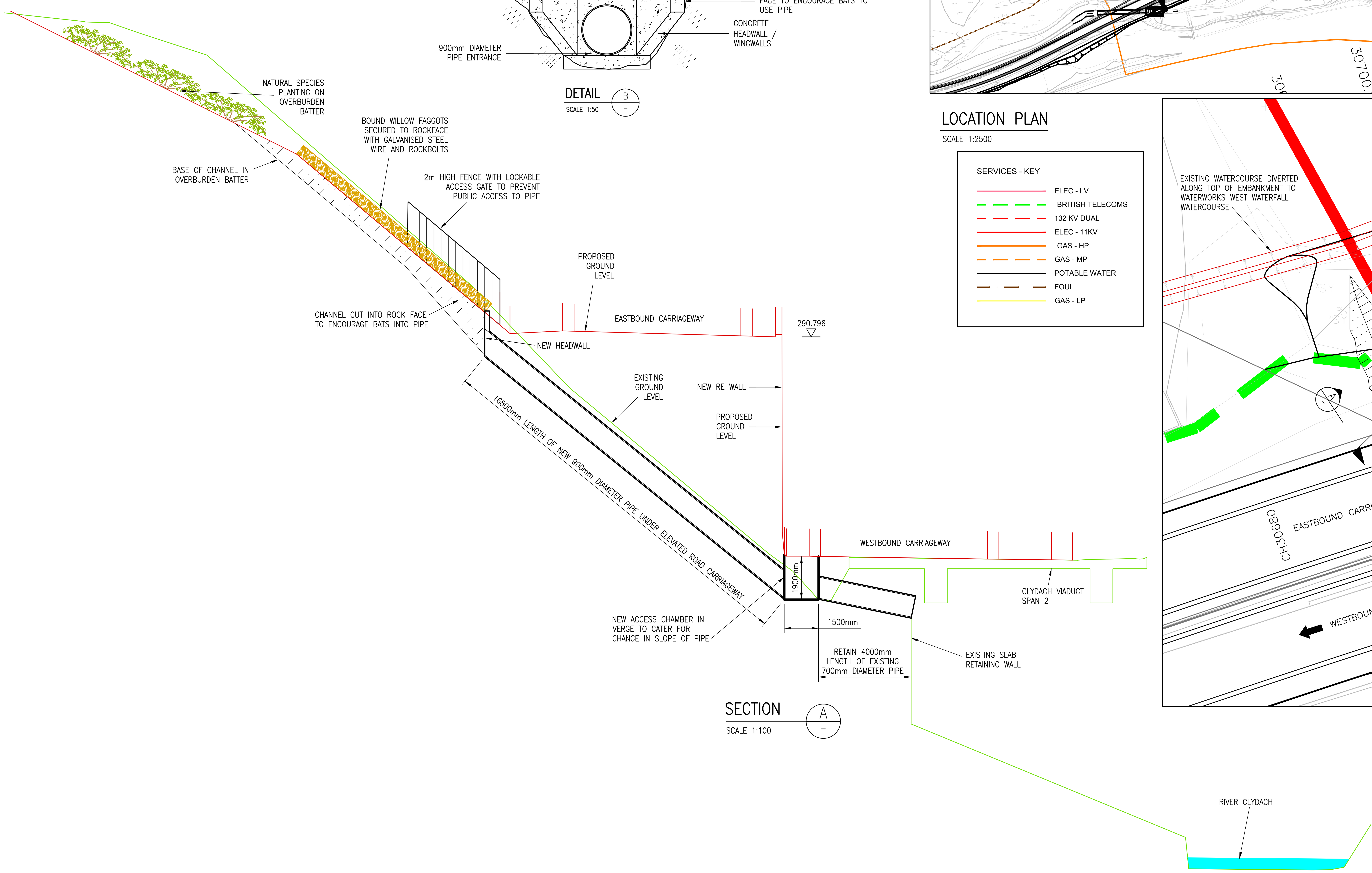


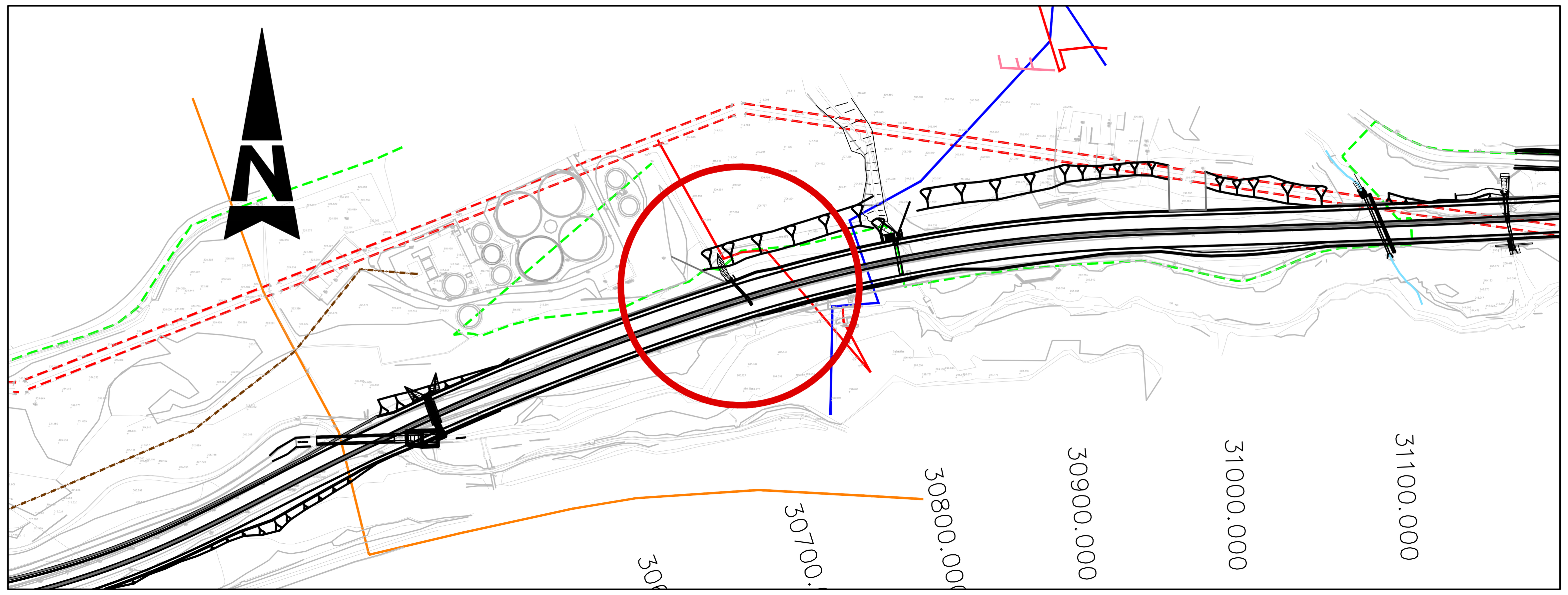
DETAIL B

SCALE 1:50



SECTION A

SCALE 1:100

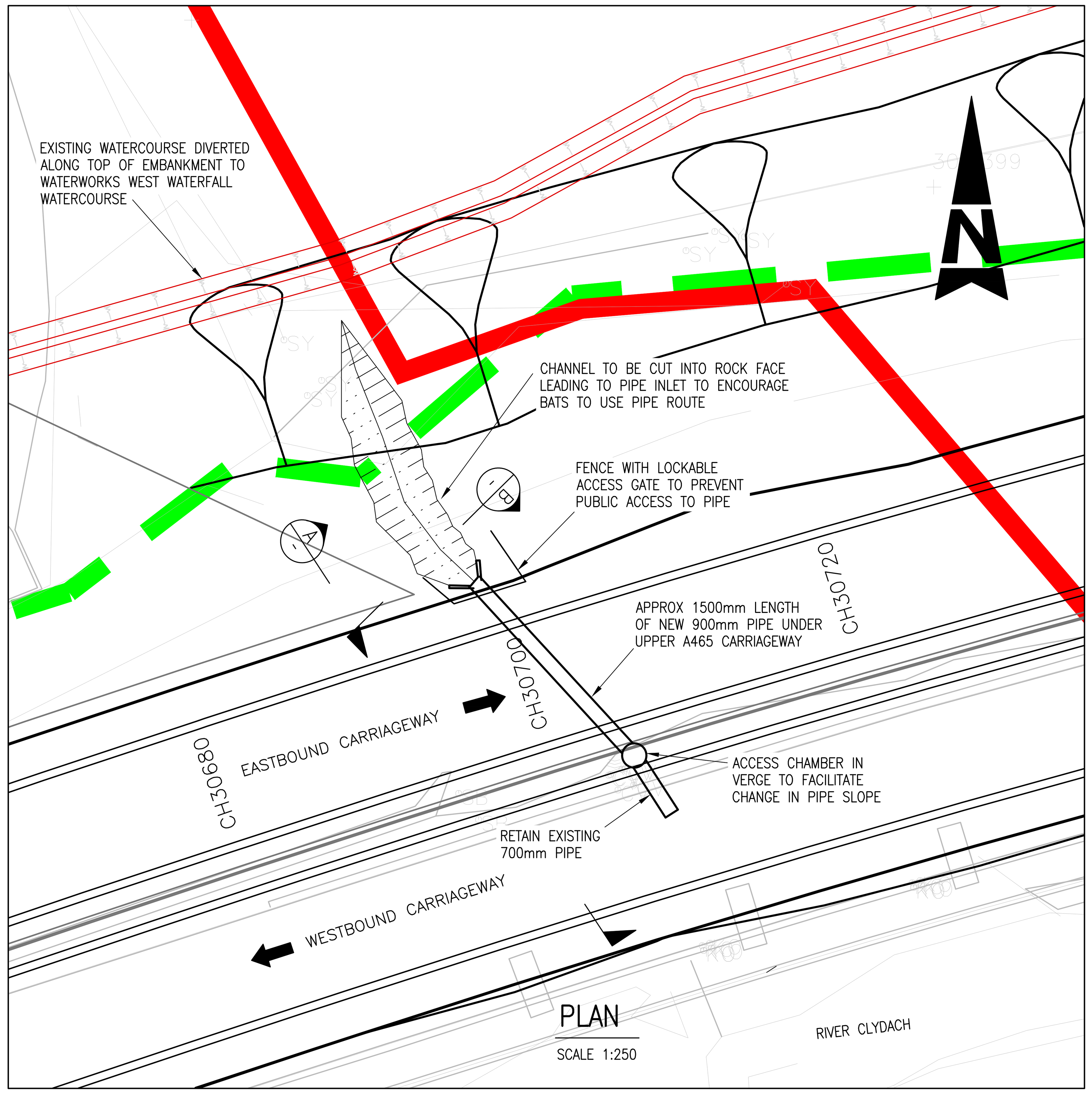


LOCATION PLAN

SCALE 1:2500

SERVICES - KEY

- ELEC - LV
- BRITISH TELECOMS
- 132 KV DUAL
- ELEC - 11KV
- GAS - HP
- GAS - MP
- POTABLE WATER
- FOUL
- GAS - LP



PLAN

SCALE 1:250

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made to the design hazard log).

Construction

BATS POTENTIALLY ROOST IN CULVERT

Maintenance/Cleaning

BATS POTENTIALLY ROOST IN CULVERT

Use

BATS POTENTIALLY ROOST IN CULVERT

Decommissioning/Demolition

BATS POTENTIALLY ROOST IN CULVERT

Notes:

1. This drawing represents a preliminary design only for the purpose of illustrating the structural form and design intent. Confirmation of design including the key member sizes and foundation type is subject to detailed design and the results of the final geotechnical investigation.
2. All dimensions are in millimetres unless noted otherwise
3. All levels are in metres relative to ordinance datum.
4. The positions of services shown are approximate.
5. Maintenance access routes and details will be agreed with SWTRA in the detailed design stage

Rev	Description	By	Date	Chk'd	Auth
P7	ISSUE FOR ENVIRONMENTAL STATEMENT	RO	MAY '13	JN	DO
P6	ALIGNMENT AMENDED	RO	MAR '13	JN	DO
P5	FOR REVIEW AND COMMENT	JN	OCT '12	RW	DO
P4	WORK IN PROGRESS	JN	AUG '12	RW	DO
P3	WORK IN PROGRESS	JN	AUG '12	DO	DO
P2	FOR REVIEW AND COMMENT	JN	JUN '12	JS	DO
P1	FOR INFORMATION	JN	JUN '12	JS	DO

Llywodraeth Cymru
Welsh Government

ATKINS Halcrow RPS

COSTAIN

A465 Heads of the Valleys
Section 2: Gilwern - Brynmawr

Purpose of Issue
ISSUE FOR ENVIRONMENTAL STATEMENT

Title
Figure 13 c
Design of Culvert Modifications
C10 - SEWAGE WORKS BAT CULVERT GENERAL ARRANGEMENT

Original Scale	Designed/Drawn	Checked	Authorised
As Shown	JN	JS	DO
	Date JUNE '12	Date JUNE '12	Date JUNE '12

Status	Drawing Number	Rev
S4	A465HOV2-DJV-0717-C10-DR-001	P7

Rev P7

Drawing Number A465HOV2-DJV-0717-C10-DR-001

Suitability

DO NOT SCALE

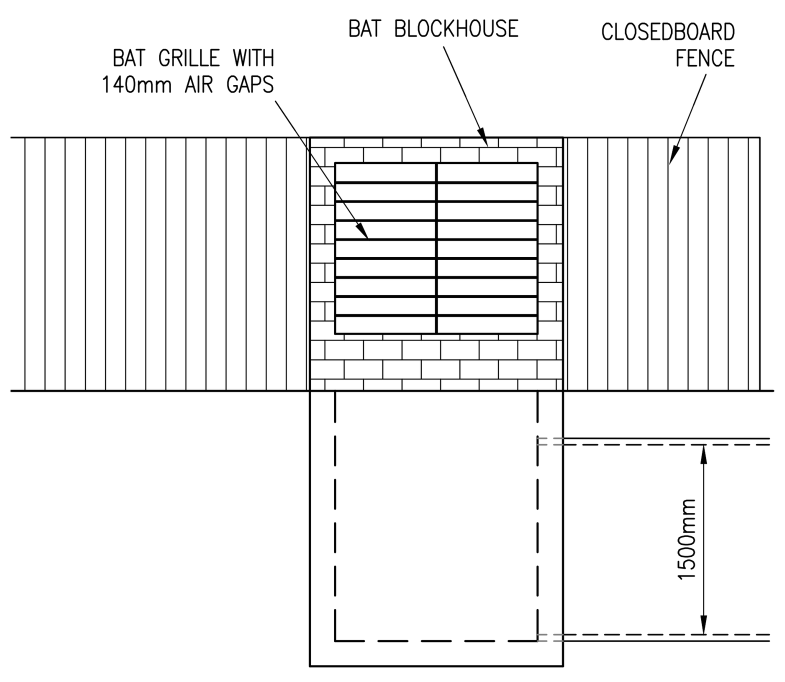
100 10 0

A1

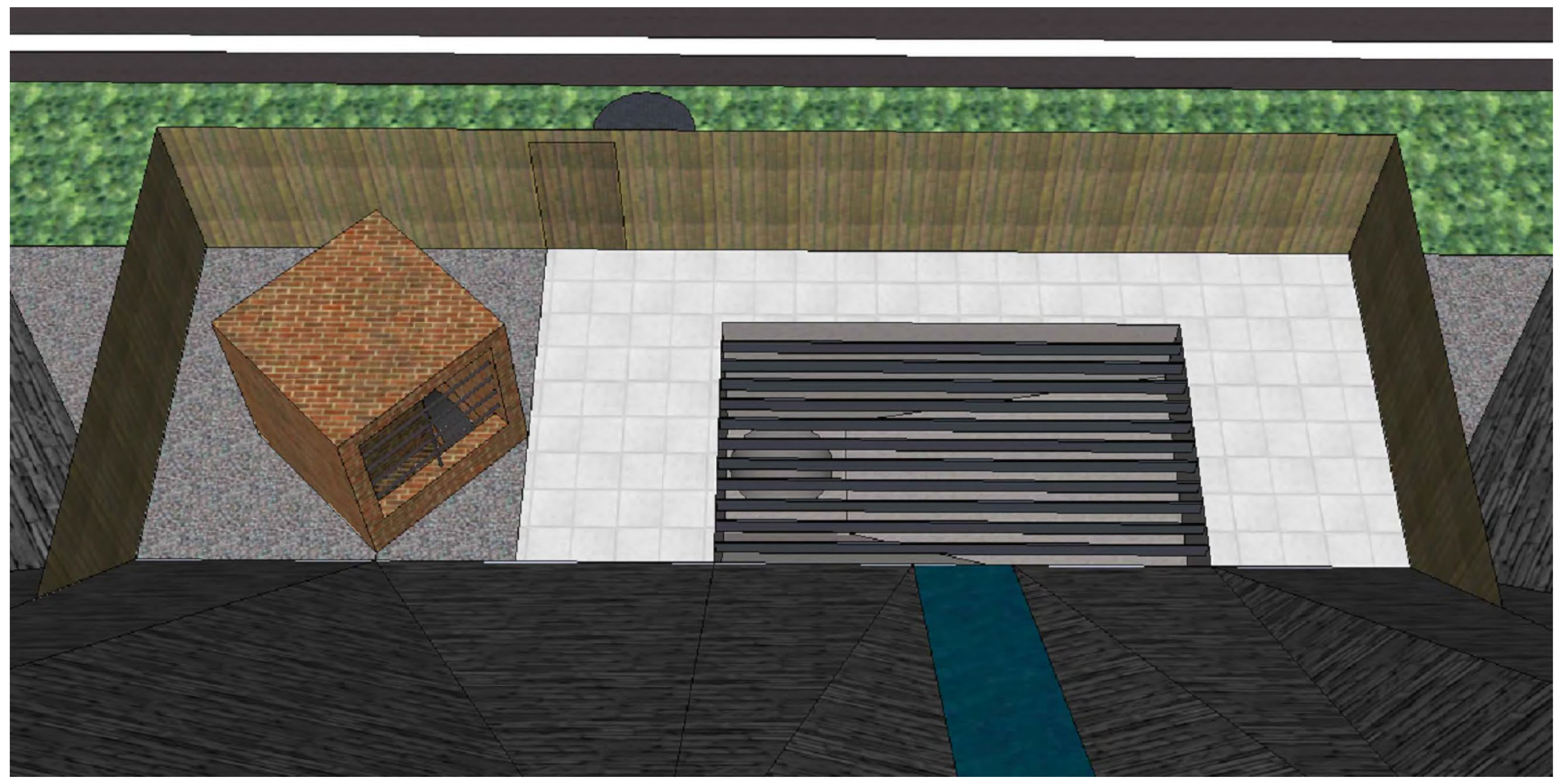
File: Bridge Master - bat culverts - all.dwg

Date: May 15, 2013 - 7:43pm Plotted by: oate1424

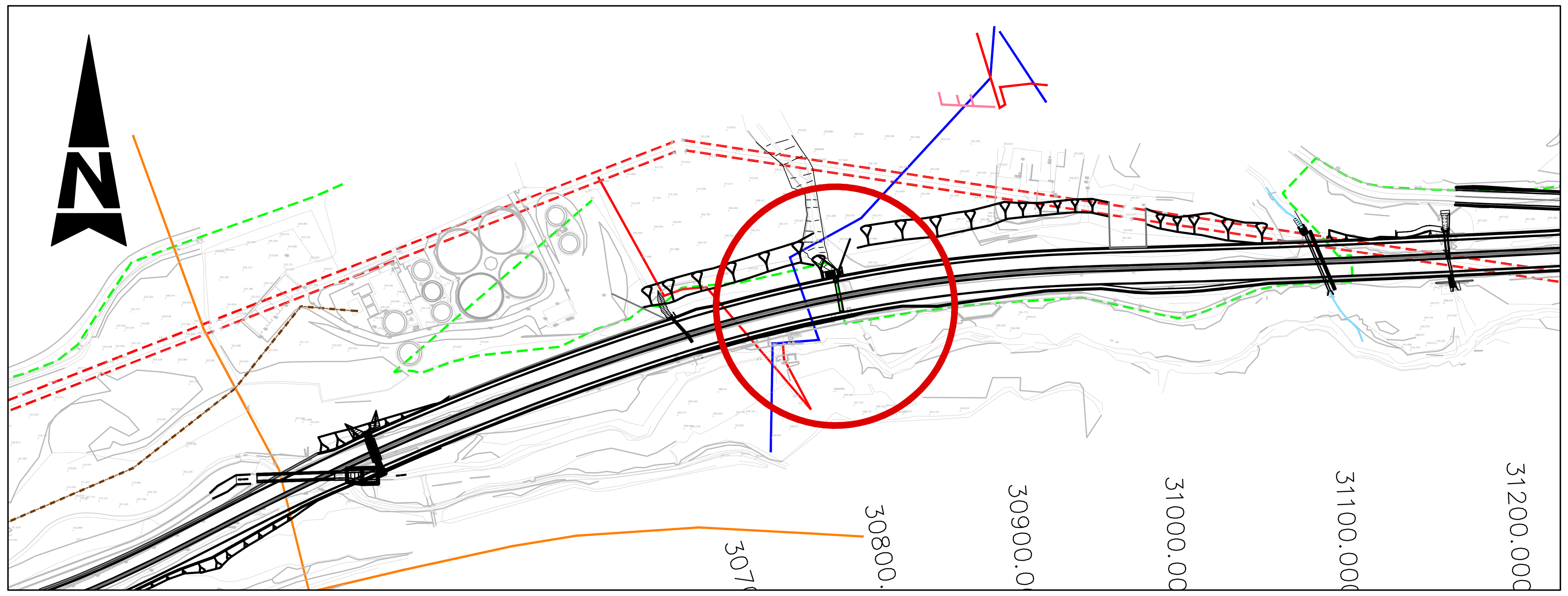
P:\GBEMB\HandT\Tsol\AR JV-Projects\5104461_A465 Section 2 ECI_GILB3264\07 Technical (Eng)\17 Structures\11 Bridges\Bat Crossings\CABridge Master - bat culverts - all.dwg



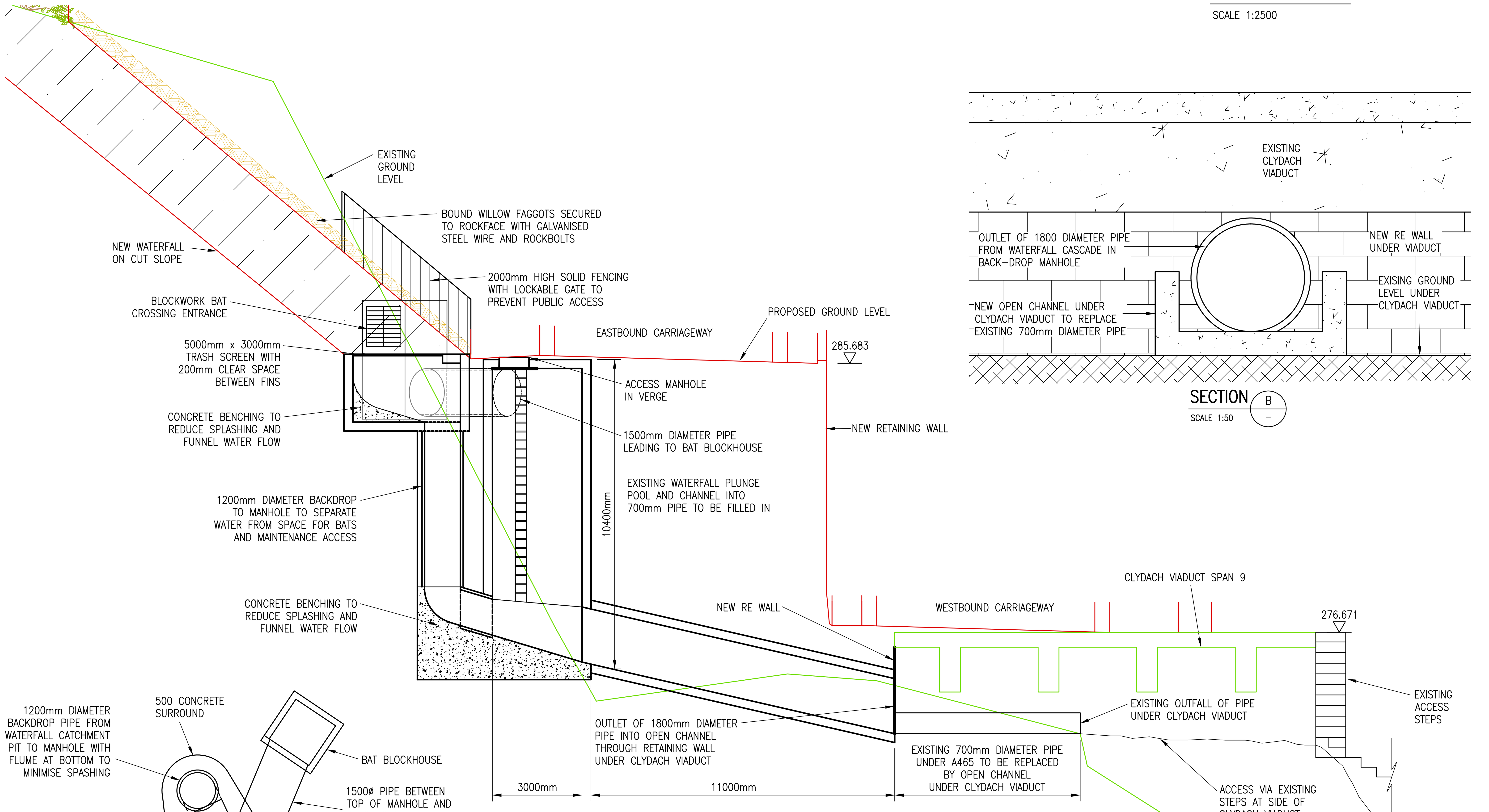
SECTION C
SCALE 1:50



VIEW FROM WATERFALL TO TRASHSCREEN AND BAT ENTRANCE BLOCKHOUSE

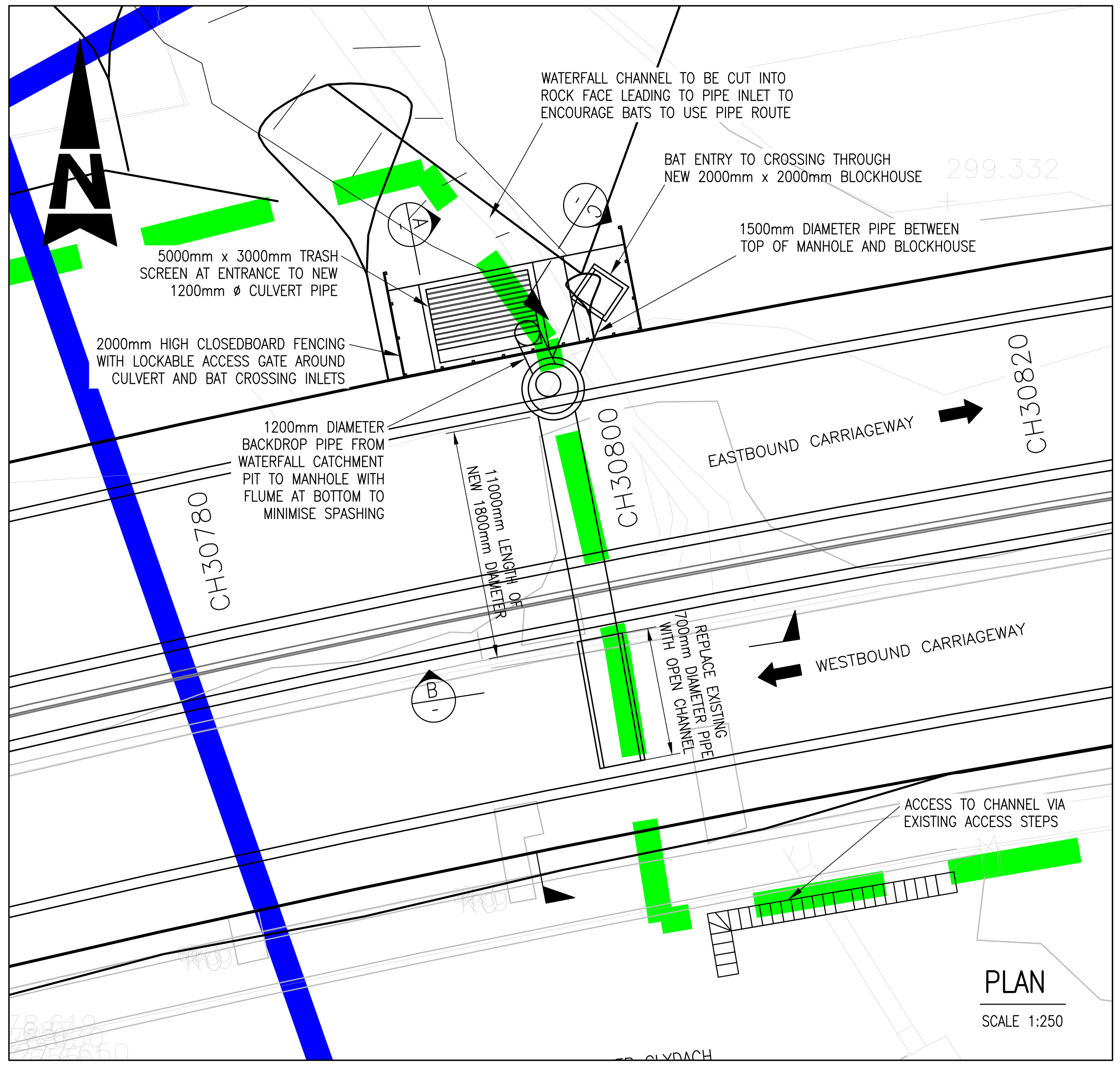


LOCATION PLAN
SCALE 1:2500

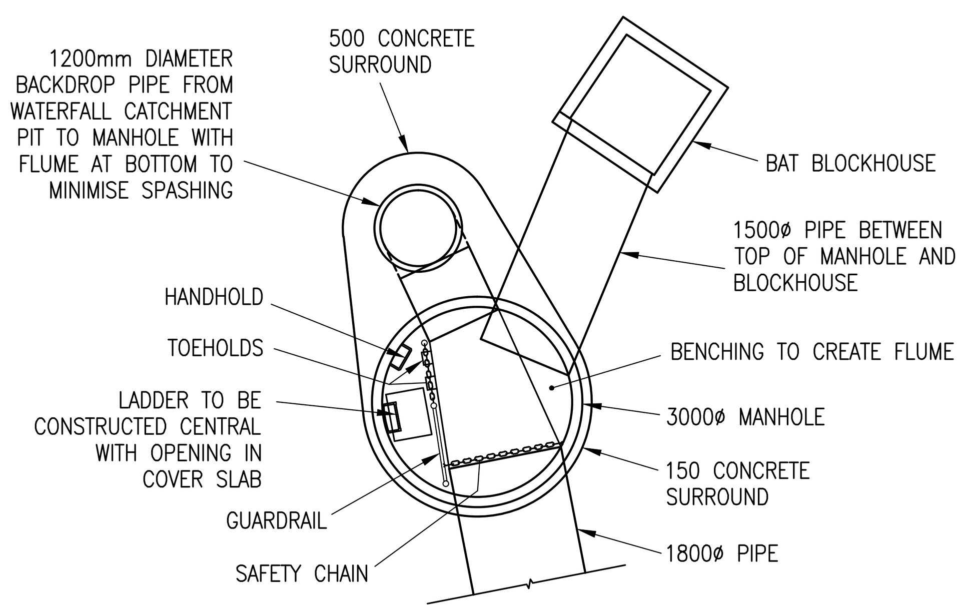


SECTION A
SCALE 1:100

SECTION B
SCALE 1:50



PLAN
SCALE 1:250



PLAN ON MANHOLE AND BAT ENTRANCE IN NORTH VERGE
SCALE 1:100

SERVICES - KEY
ELEC - LV
BRITISH TELECOMS
132 KV DUAL
ELEC - 11KV
GAS - HP
GAS - MP
POTABLE WATER
FOUL
GAS - LP

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made to the design hazard log).

Construction
BATS POTENTIALLY ROOST IN PIPE

Maintenance/Cleaning
MAINTENANCE ACCESS THROUGH MANHOLE IN VERGE OF WESTBOUND A465.
BATS POTENTIALLY ROOST IN PIPE

Use
MEMBERS OF THE PUBLIC RESTRICTED FROM ACCESSING THE PIPE BY SOLID FENCING WITH LOCKABLE ACCESS GATE. BATS POTENTIALLY ROOST IN PIPE

Decommissioning/Demolition
BATS POTENTIALLY ROOST IN PIPE

Notes:

1. This drawing represents a preliminary design only for the purpose of illustrating the structural form and design intent. Confirmation of design including the key member sizes and foundation type is subject to detailed design and the results of the final geotechnical investigation.
2. All dimensions are in millimetres unless noted otherwise
3. All levels are in metres relative to ordinance datum .
4. The positions of services shown are approximate.
5. Maintenance access routes and details will be agreed with SWTRA in the detailed design stage

Rev	Description	By	Date	Chk'd	Auth	Rev	Description	By	Date	Chk'd	Auth
P7	SEPARATE PIPE OPTION	JN	JAN '13	DO	DO						
P6	FOR REVIEW AND COMMENT	JN	OCT '12	DO	DO						
P5	WORK IN PROGRESS	JN	AUG '12	DO	DO						
P4	WORK IN PROGRESS	JN	AUG '12	DO	DO	P11	ISSUE FOR ENVIRONMENTAL STATEMENT	RO	MAY '13	JN	DO
P3	WORK IN PROGRESS	JN	AUG '12	DO	DO	P10	CHAINAGE ADDED	RO	MAR '13	JN	DO
P2	FOR REVIEW AND COMMENT	JN	JUN '12	JS	DO	P9	ALIGNMENT AMENDED	RO	MAR '13	JN	DO
P1	FOR INFORMATION	JN	JUN '12	JS	DO	P8	BLOCKHOUSE OPTION	JN	FEB '13	JS	DO

Llywodraeth Cymru
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ATKINS Halcrow
RPS
COSTAIN

A465 Heads of the Valleys
Section 2: Gilwern - Brynmawr

Purpose of Issue
ISSUE FOR ENVIRONMENTAL STATEMENT

Title
Figure 13 d
Design of Culvert Modifications

C11 - WATERWORKS WEST WATERFALL
BAT CULVERT - GENERAL ARRANGEMENT

Original Scale	Designed/Drawn	Checked	Authorised
As Shown	JN, Date JUNE '12	JS, Date JUNE '12	DO, Date JUNE '12

Status	Drawing Number	Rev
S4	A465HOV2-DJV-0717-C11-DR-001	P11

Rev P11
Drawing Number A465HOV2-DJV-0717-C11-DR-001
Suitability

DO NOT SCALE

100
10
0

A1

File: Bridge Master - bat culverts - all.dwg
Date: May 15, 2013 - 8:20pm Plotted by: oate1424

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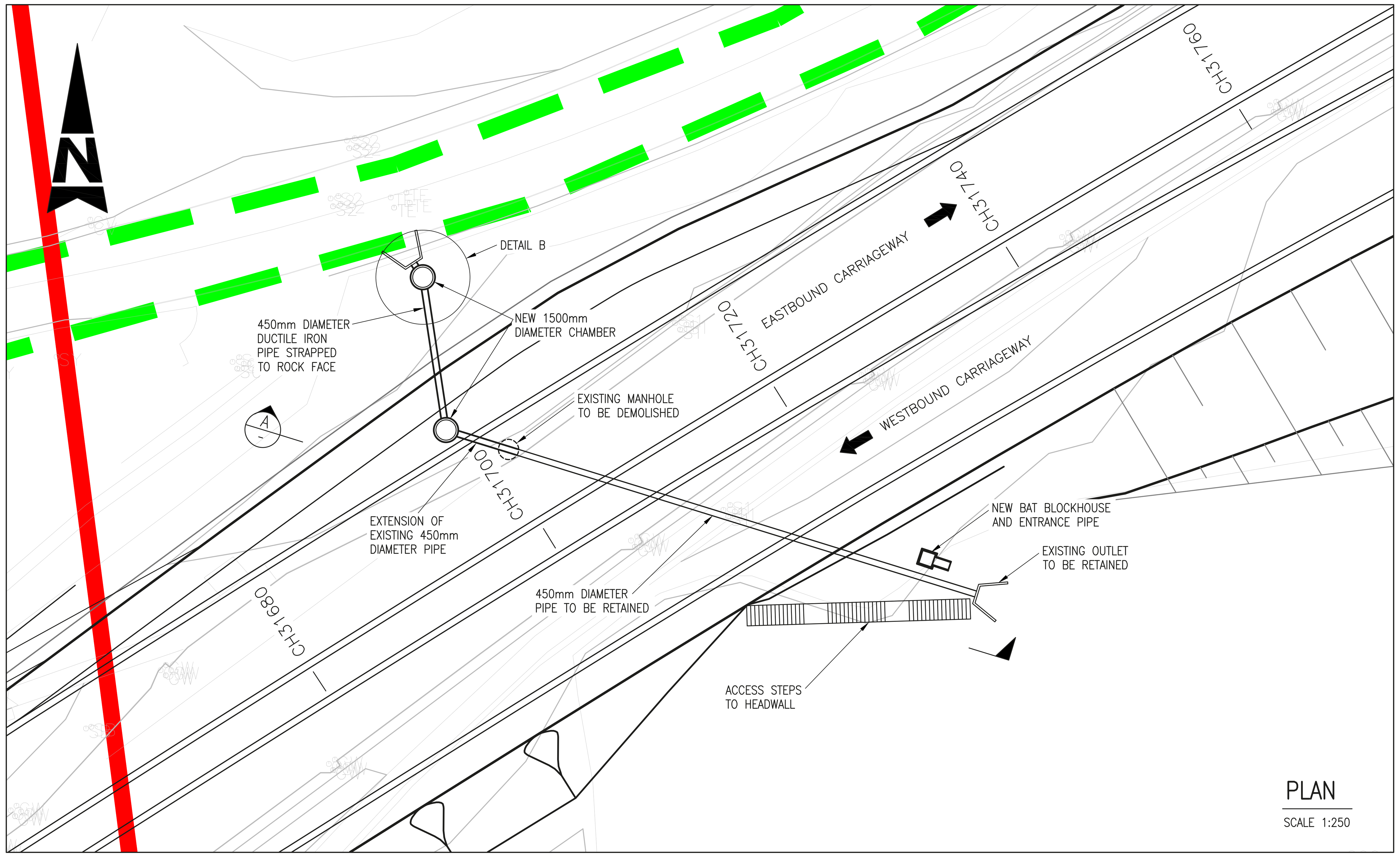
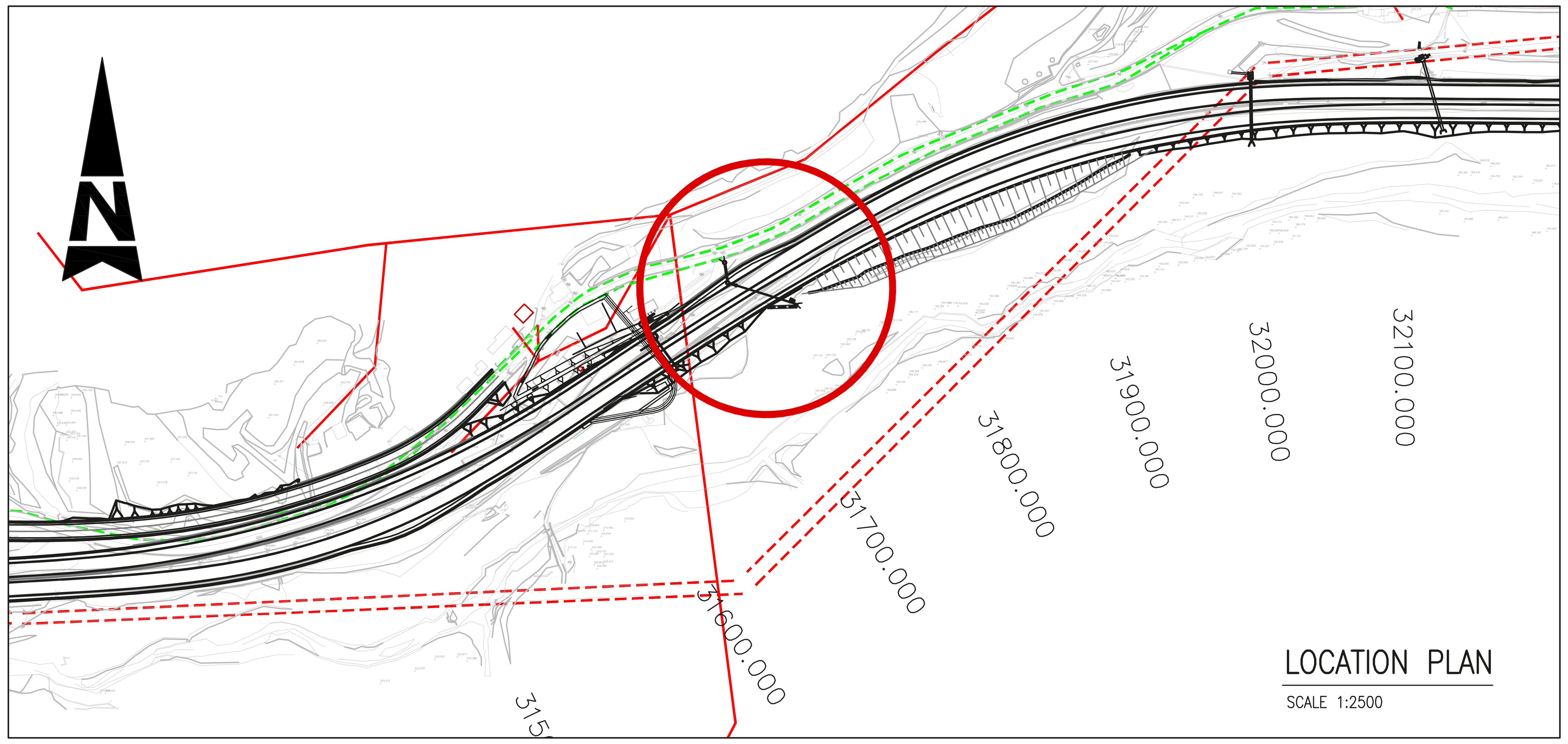


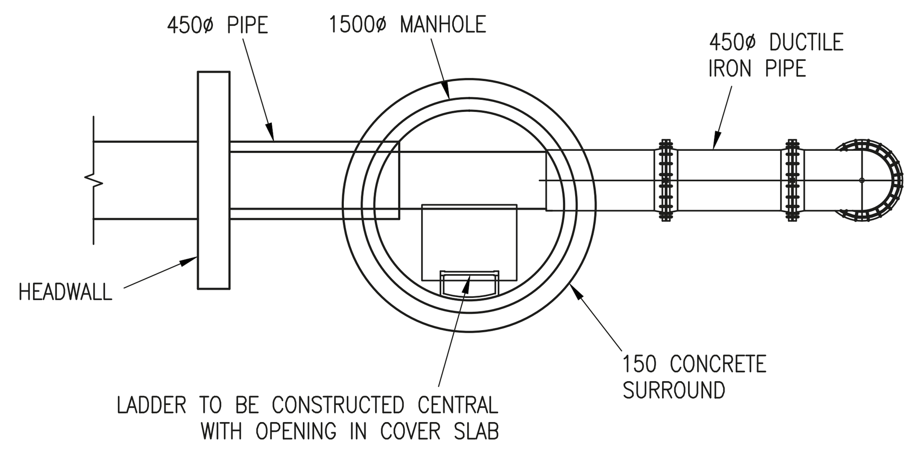
PLAN
SCALE 1:250



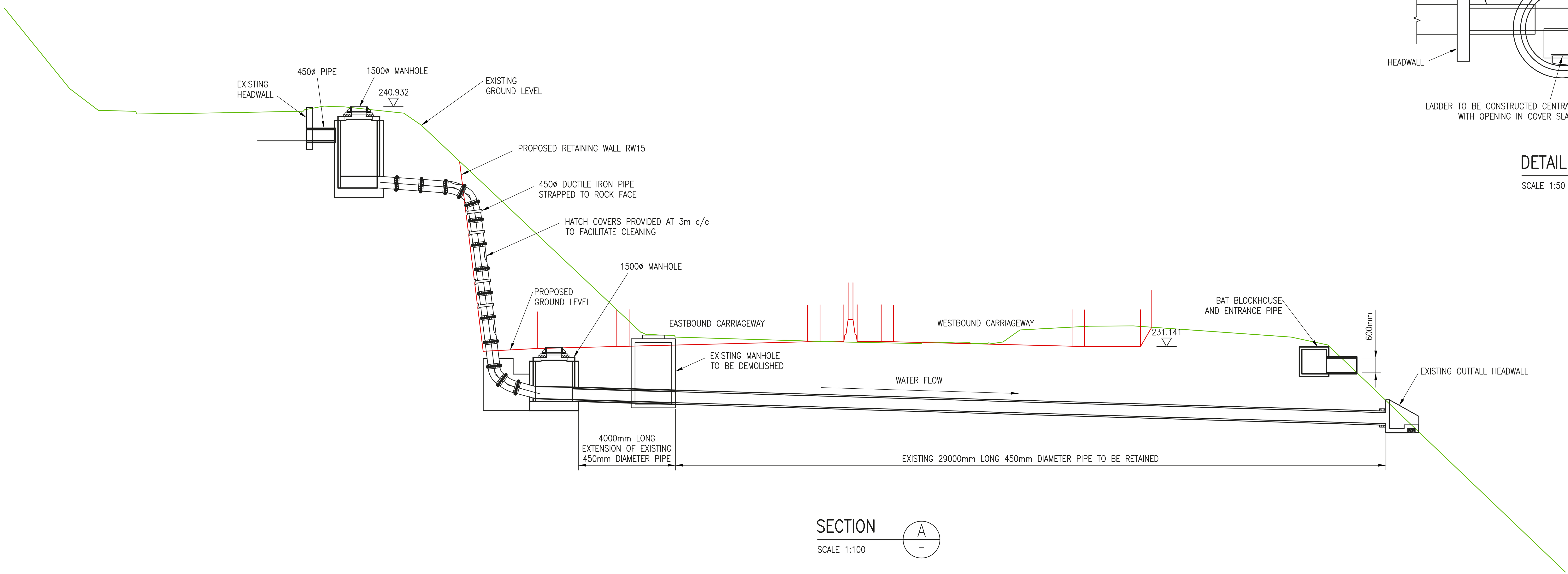
LOCATION PLAN
SCALE 1:2500

SERVICES - KEY

- ELEC - LV
- BRITISH TELECOMS
- 132 KV DUAL
- ELEC - 11KV
- GAS - HP
- GAS - MP
- POTABLE WATER
- FOUL
- GAS - LP



DETAIL B
SCALE 1:50



SECTION A
SCALE 1:100

DO NOT SCALE

A1

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION
In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made to the design hazard log).
Construction
BATS POTENTIALLY ROOST IN CULVERT
Maintenance/Cleaning
BATS POTENTIALLY ROOST IN CULVERT
Use
BATS POTENTIALLY ROOST IN CULVERT
Decommissioning/Demolition
BATS POTENTIALLY ROOST IN CULVERT

Notes:

1. This drawing represents a preliminary design only for the purpose of illustrating the structural form and design intent. Confirmation of design including the key member sizes and foundation type is subject to detailed design and the results of the final geotechnical investigation.
2. All dimensions are in millimetres unless noted otherwise.
3. All levels are in metres relative to ordinance datum.
4. The positions of services shown are approximate.
5. Maintenance access routes and details will be agreed with SWTRA in the detailed design stage.

Rev	Description	By	Date	Chk'd	Auth
P1	ISSUE FOR ENVIRONMENTAL STATEMENT	RO	MAY '13	JN	DO

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Welsh Government

ATKINS Halcrow RPS

COSTAIN

A465 Heads of the Valleys
Section 2: Gilwern - Brynmawr

Purpose of Issue
ISSUE FOR ENVIRONMENTAL STATEMENT

Title
Figure 13 e
Design of Culvert Modifications

C13: BLACKROCK CULVERT
GENERAL ARRANGEMENT

Original Scale	Designed/Drawn	Checked	Authorised
As Shown	RO, Date MAY '13	JN, Date MAY '13	DO, Date MAY '13

Status	Drawing Number	Rev
S4	A465HOV2-DJV-0717-C13-DR-001	P1

Rev P1
Drawing Number A465HOV2-DJV-0717-C13-DR-001
Suitability

File: Bridge Master - bat culverts - all.dwg
Date: May 15, 2013 - 8:34pm Plotted by: oate1424

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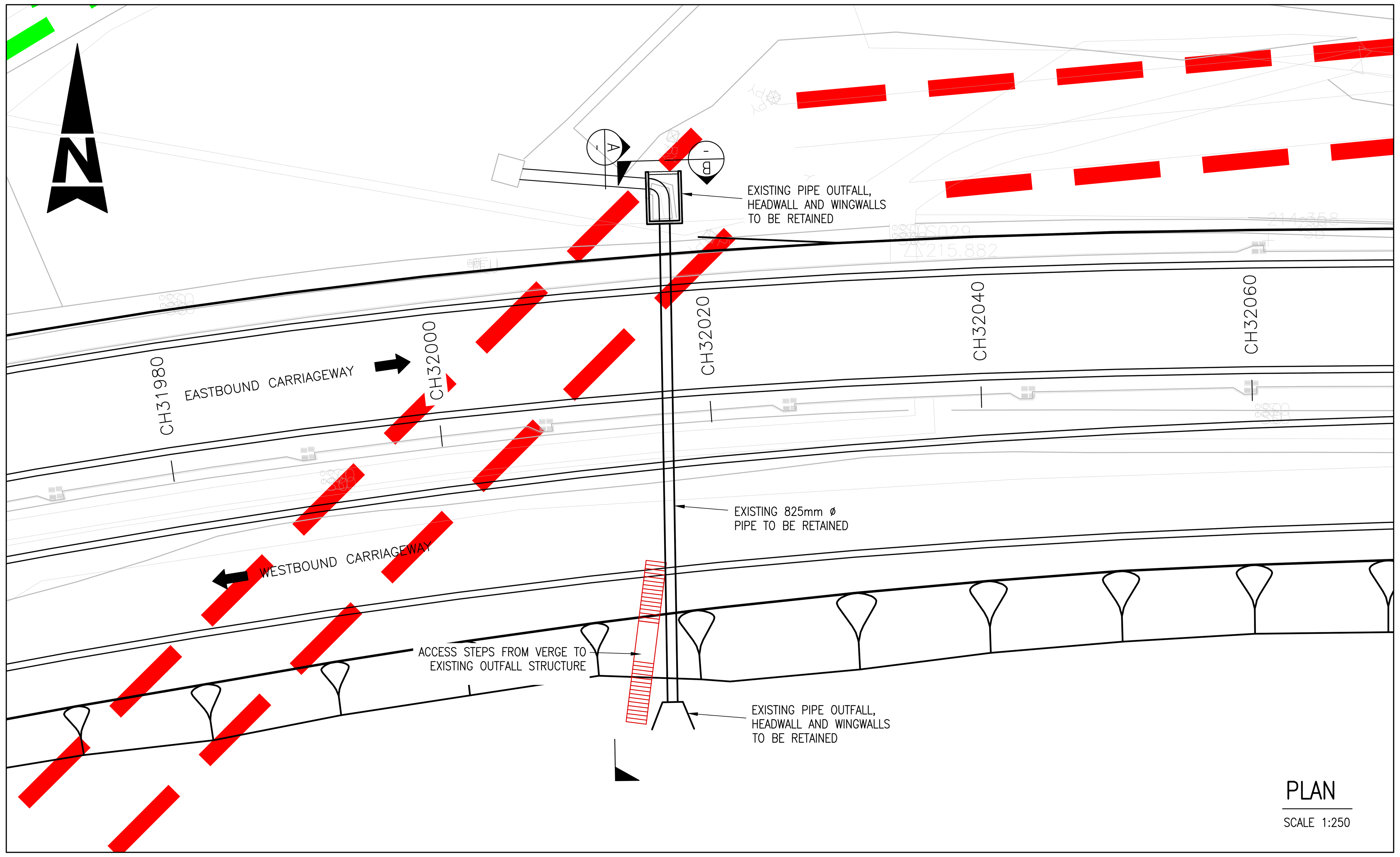
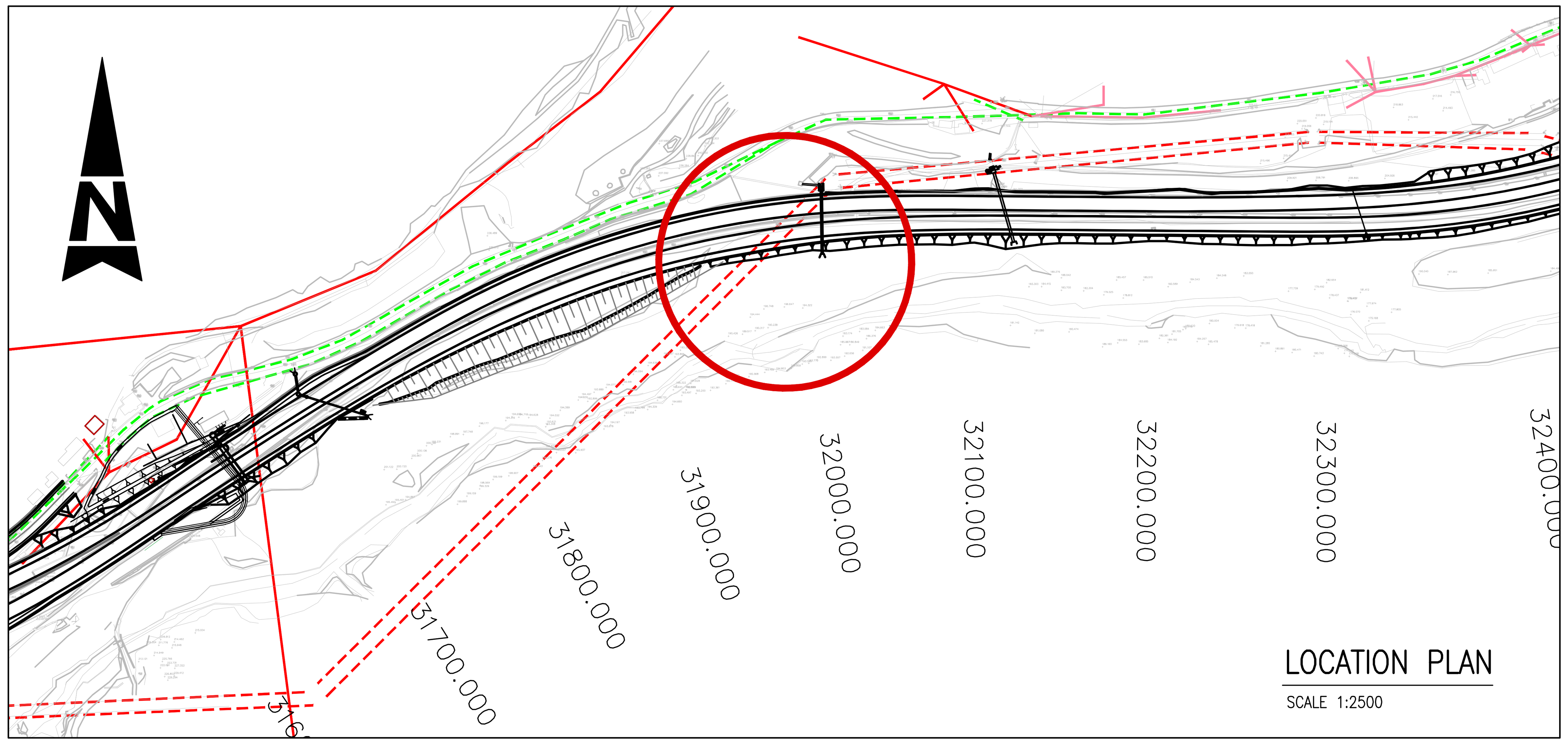
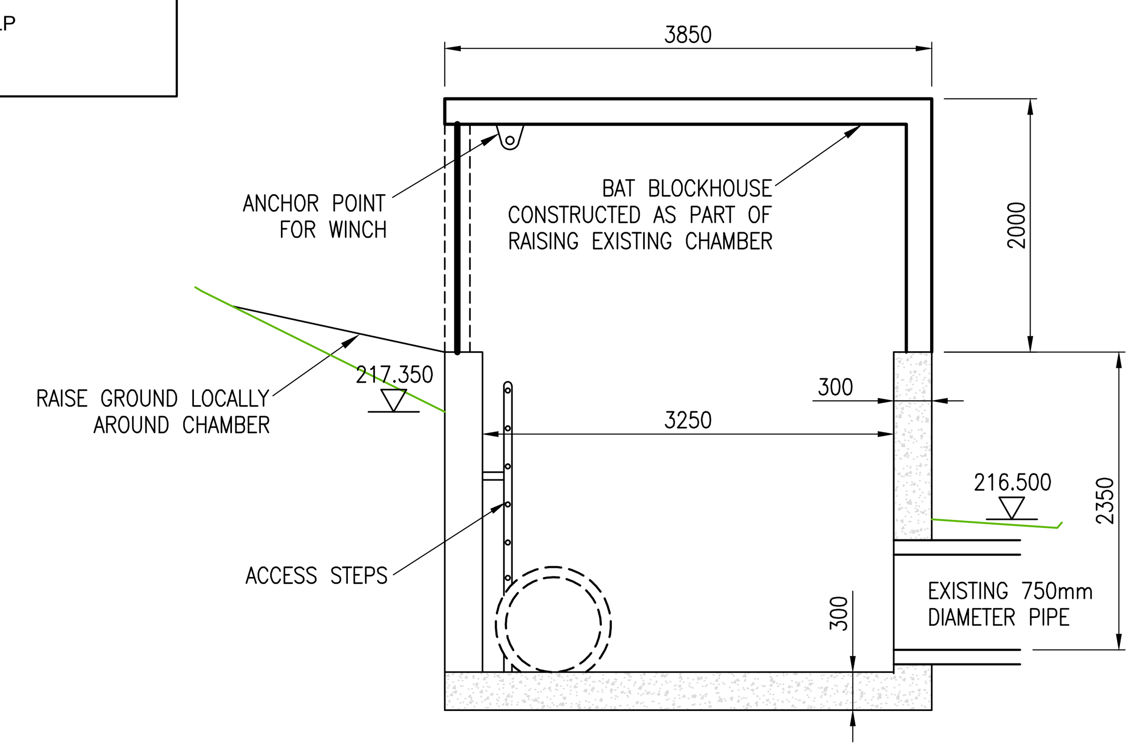


PLAN
SCALE 1:250

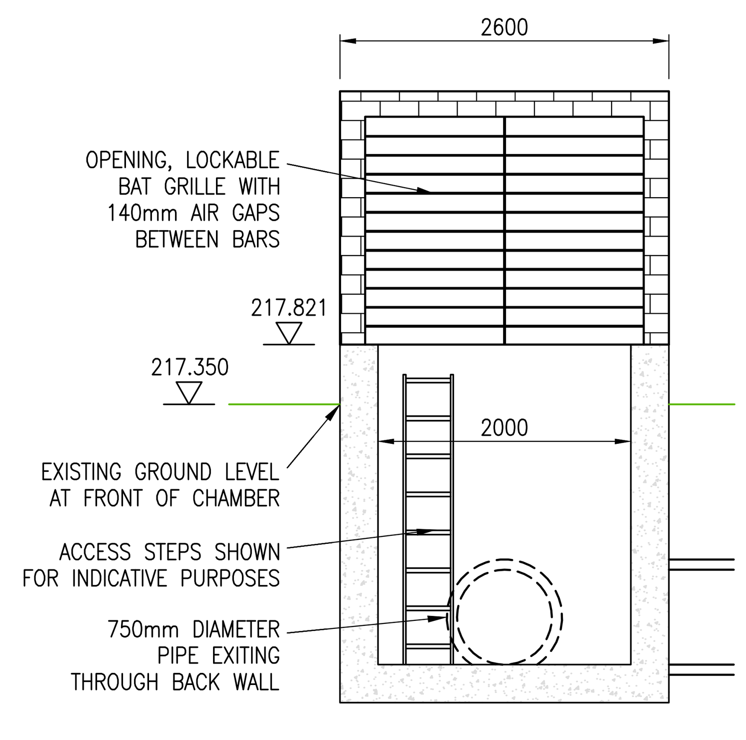


LOCATION PLAN
SCALE 1:2500

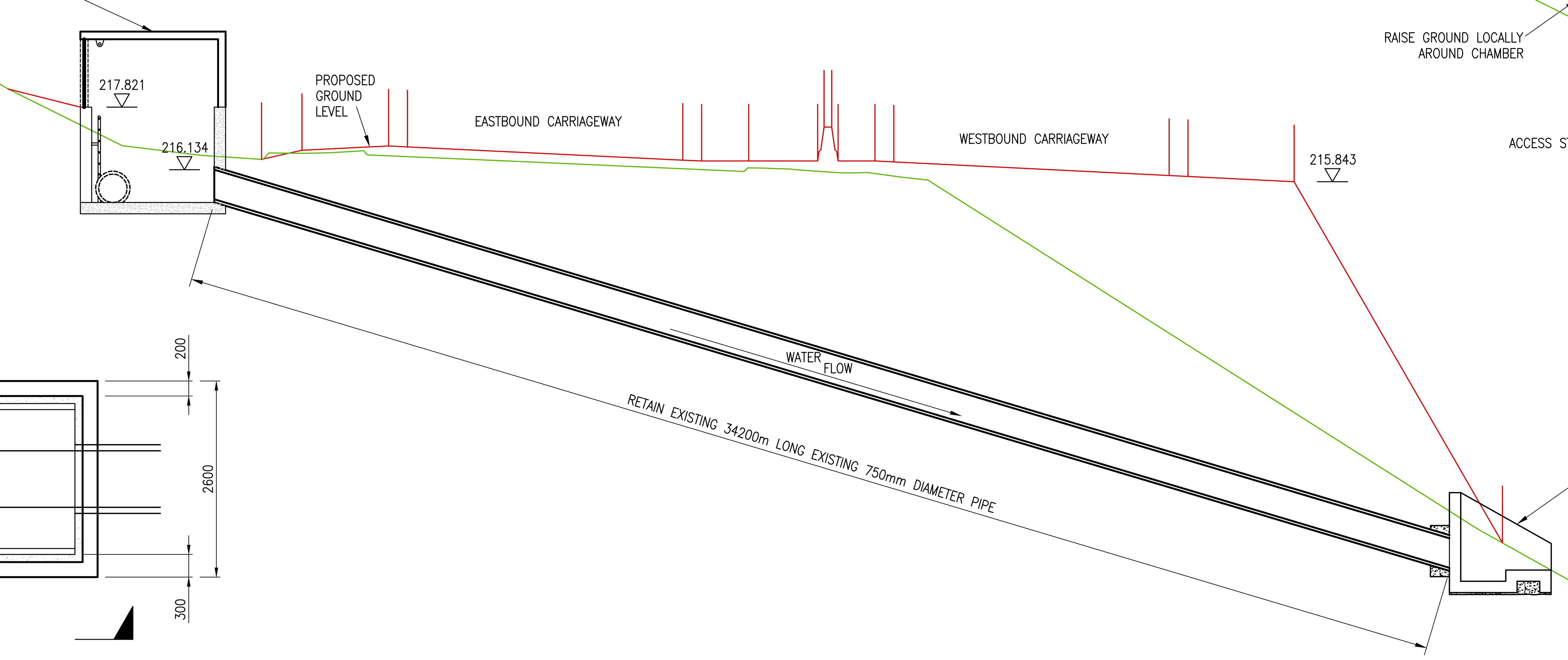
SERVICES - KEY
- ELEC - LV
- BRITISH TELECOMS
- 132 KV DUAL
- ELEC - 11KV
- GAS - HP
- GAS - MP
- POTABLE WATER
- FOUL
- GAS - LP



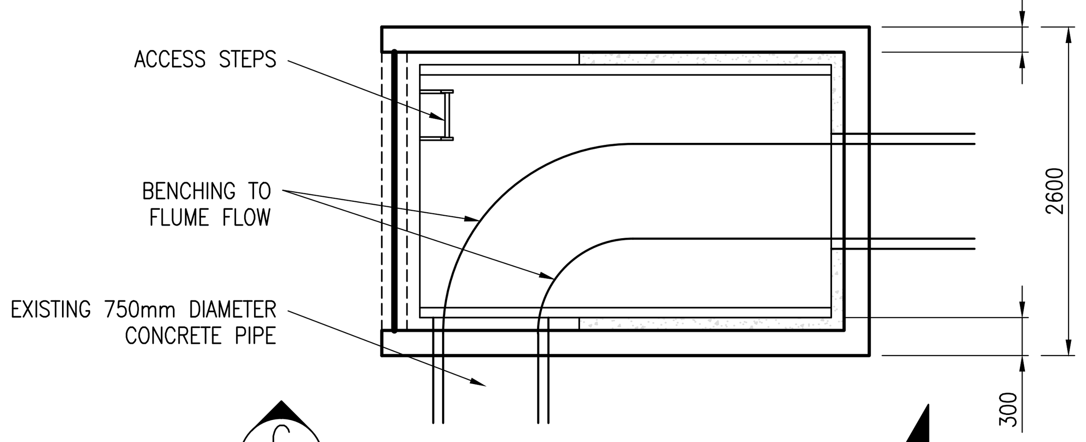
DETAIL C
SCALE 1:50



SECTION B
SCALE 1:50



SECTION A
SCALE 1:100



DETAIL D
SCALE 1:50

Notes:

1. This drawing represents a preliminary design only for the purpose of illustrating the structural form and design intent. Confirmation of design including the key member sizes and foundation type is subject to detailed design and the results of the final geotechnical investigation.
2. All dimensions are in millimetres unless noted otherwise.
3. All levels are in metres relative to ordinance datum.
4. The positions of services shown are approximate.
5. Maintenance access routes and details will be agreed with SWTRA in the detailed design stage.

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION
In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made to the design hazard log).
Construction
BATS POTENTIALLY ROOST IN CULVERT
Maintenance/Cleaning
BATS POTENTIALLY ROOST IN CULVERT
Use
BATS POTENTIALLY ROOST IN CULVERT
Decommissioning/Demolition
BATS POTENTIALLY ROOST IN CULVERT

Rev	Description	By	Date	Chk'd	Auth
P1	ISSUE FOR ENVIRONMENTAL STATEMENT	RO	MAY '13	JN	DO

Llywodraeth Cymru
Welsh Government

ATKINS Halcrow RPS

COSTAIN

A465 Heads of the Valleys
Section 2: Gilwern - Brynmawr

Purpose of Issue
ISSUE FOR ENVIRONMENTAL STATEMENT

Title
Figure 13 f
Design of Culvert Modifications

C15: ROCK COTTAGE CULVERT
GENERAL ARRANGEMENT

Original Scale	Designed/Drawn	Checked	Authorised
As Shown	RO, Date MAY '13	JN, Date MAY '13	DO, Date MAY '13

Status	Drawing Number	Rev
S4	A465HOV2-DJV-0717-C15-DR-001	P1

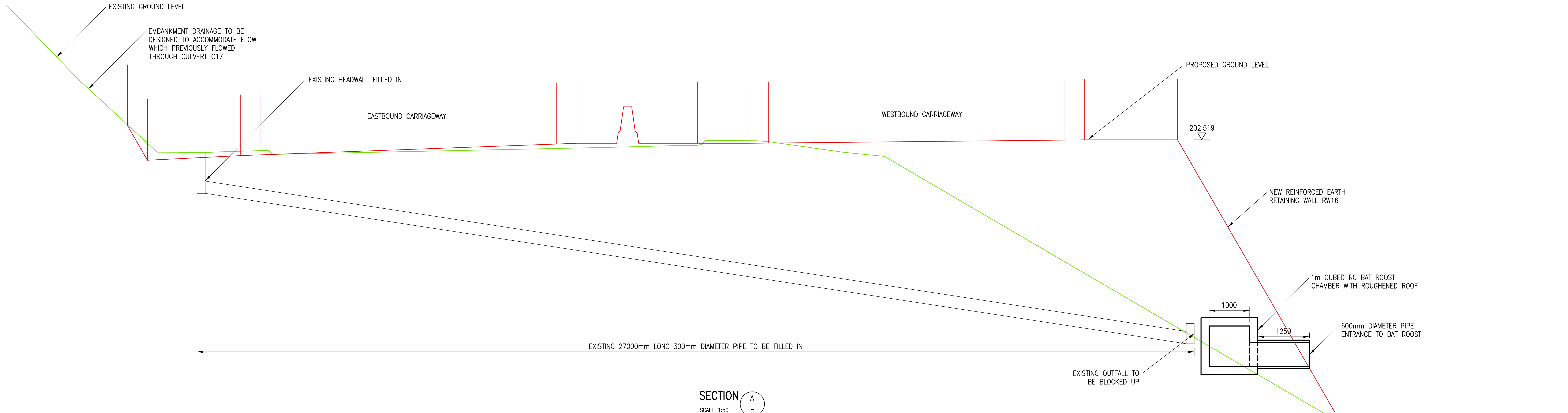
Rev P1
Drawing Number A465HOV2-DJV-0717-C15-DR-001
Suitability

DO NOT SCALE

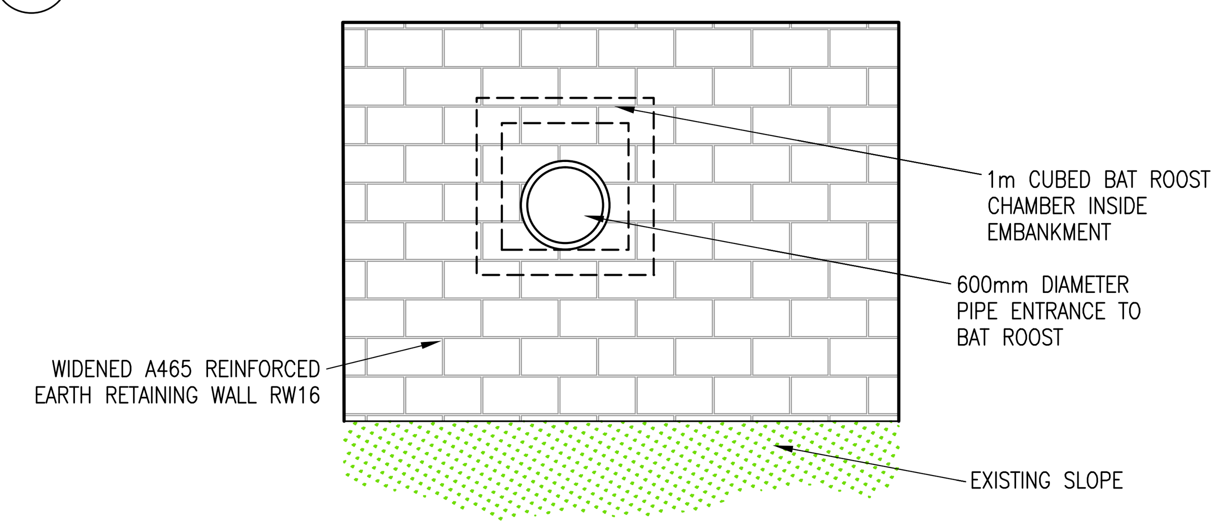
A1

File: Bridge Master - bat culverts - all.dwg
Date: May 15, 2013 - 8:32pm Plotted by: oate1424

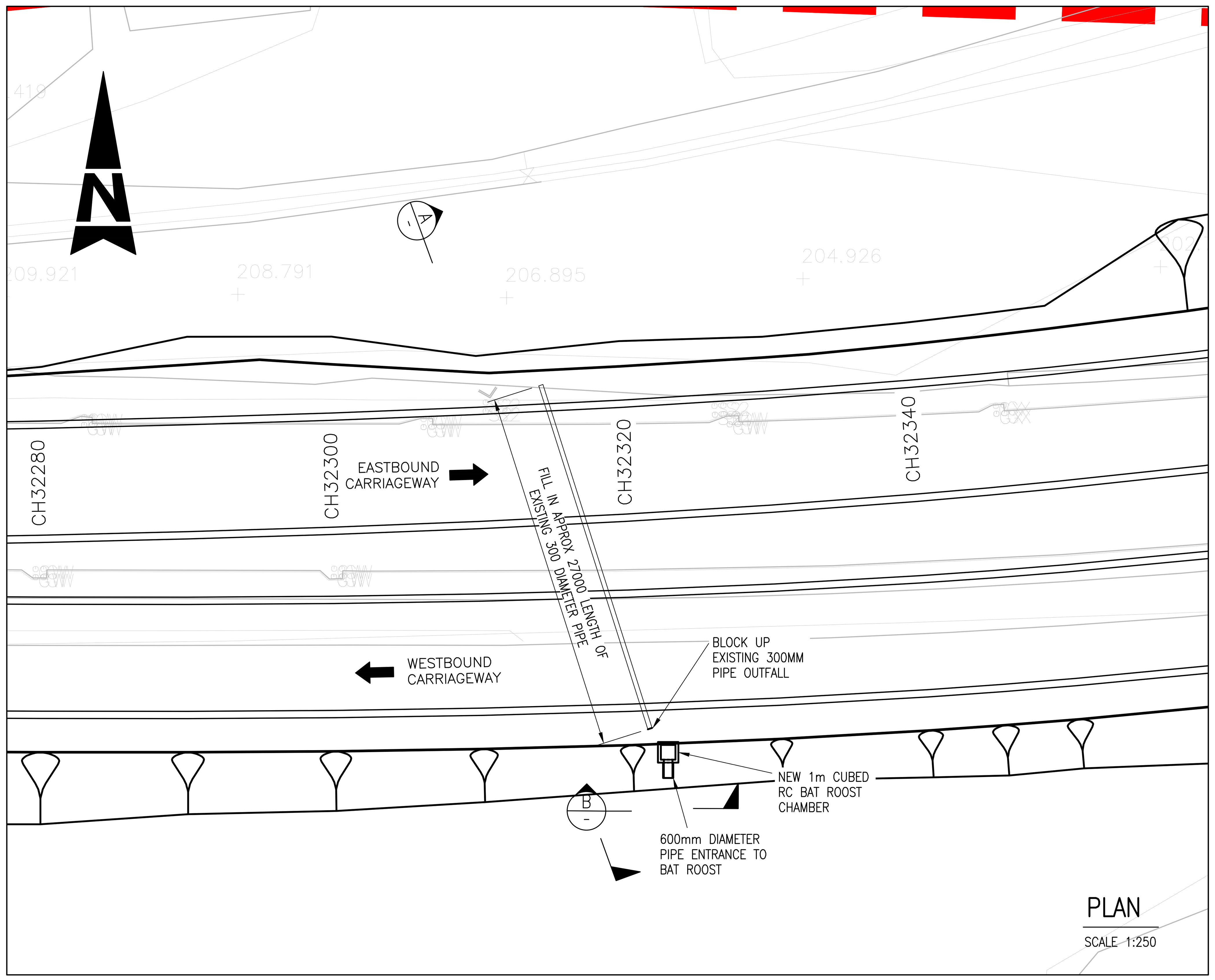
P:\GBEMB\HandT\Tsol\AR JV-Projects\5104461_A465 Section 2 ECI_GILB3264\07 Technical (Eng)\17 Structures\11 Bridges\Bat Crossings\CABridge Master - bat culverts - all.dwg



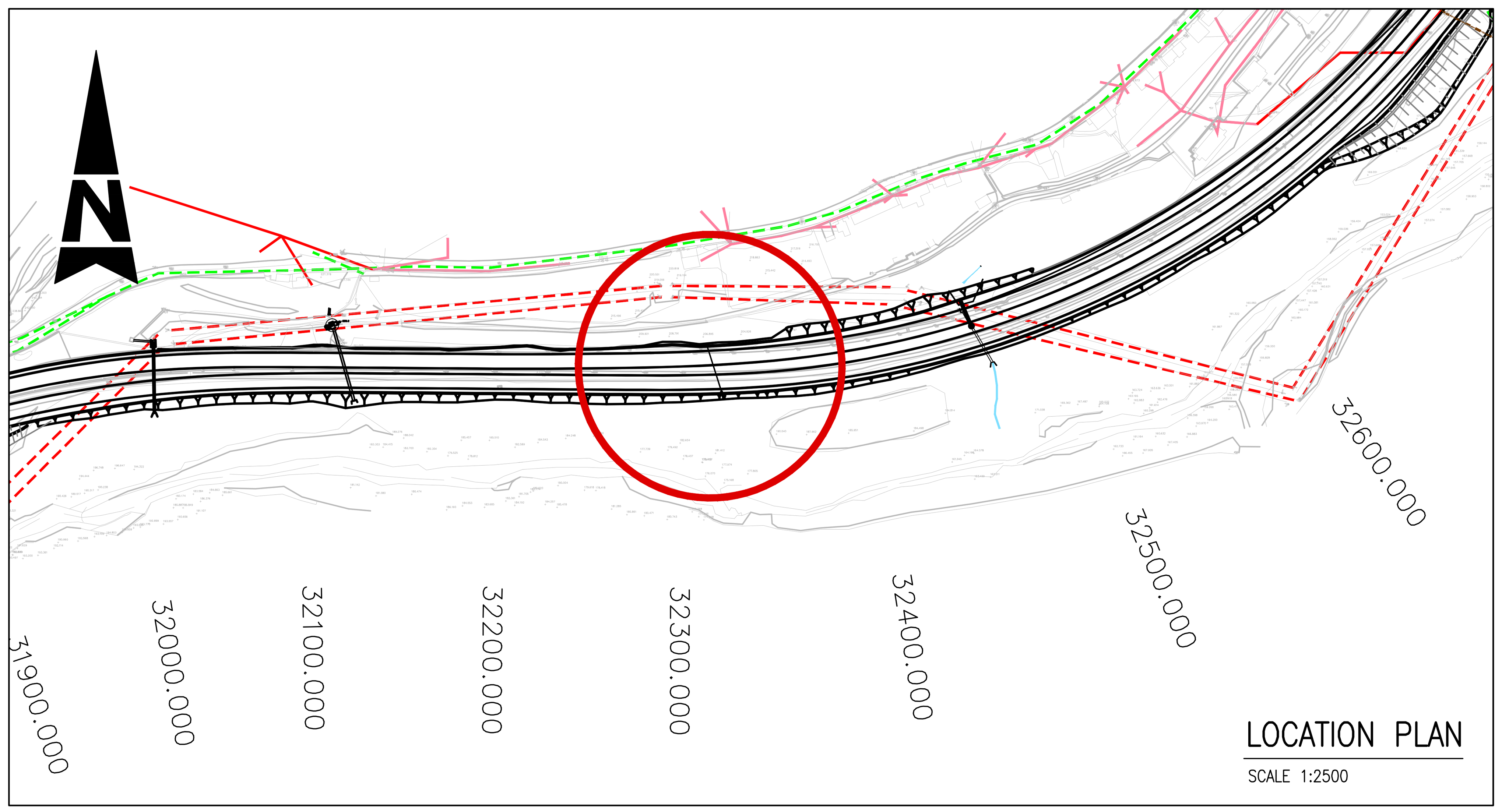
SECTION A
SCALE 1:50



SECTION B
SCALE 1:50



PLAN
SCALE 1:250



LOCATION PLAN
SCALE 1:2500

SERVICES - KEY

- ELEC - LV
- BRITISH TELECOMS
- 132 KV DUAL
- ELEC - 11KV
- GAS - HP
- GAS - MP
- POTABLE WATER
- FOUL
- GAS - LP

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made to the design hazard log).

Construction

BATS POTENTIALLY ROOST IN PIPE

Maintenance/Cleaning

BATS POTENTIALLY ROOST IN PIPE

Use

BATS POTENTIALLY ROOST IN PIPE

Decommissioning/Demolition

PIPE IN REINFORCED EARTH, BATS POTENTIALLY ROOST IN PIPE

Notes:

1. This drawing represents a preliminary design only for the purpose of illustrating the structural form and design intent. Confirmation of design including the key member sizes and foundation type is subject to detailed design and the results of the final geotechnical investigation.
2. All dimensions are in millimetres unless noted otherwise
3. All levels are in metres relative to ordinance datum .
4. The positions of services shown are approximate.
5. Maintenance access routes and details will be agreed with SWTRA in the detailed design stage

Rev	Description	By	Date	Chk'd	Auth
P8	ISSUE FOR ENVIRONMENTAL STATEMENT	RO	MAY '13	JN	DO
P7	CULVERT DETAILS AMENDED	RO	MAR '13	JN	DO
P6	ALIGNMENT AMENDED	RO	MAR '13	JN	DO
P5	300MM DIAMETER PIPE SHOWN	JN	JAN '13	RW	DO
P4	WORK IN PROGRESS	JN	AUG '12	RW	DO
P3	WORK IN PROGRESS	JN	AUG '12	DO	DO
P2	WORK IN PROGRESS	JN	AUG '12	DO	DO
P1	FOR REVIEW AND COMMENT	JN	JUN '12	JS	DO

Llywodraeth Cymru
Welsh Government

ATKINS Halcrow RPS

COSTAIN

A465 Heads of the Valleys
Section 2: Gilwern - Brynmawr

Purpose of Issue
ISSUE FOR ENVIRONMENTAL STATEMENT

Title
Figure 13 g
Design of Culvert Modifications

C17 - ROCK HOUSE BAT CULVERT
GENERAL ARRANGEMENT

Original Scale	Designed/Drawn	Checked	Authorised
As Shown	JN	JS	DO
	Date JUNE '12	Date JUNE '12	Date JUNE '12

Status	Drawing Number	Rev
S4	A465HOV2-DJV-0717-C17-DR-001	P8

Rev P8
Drawing Number A465HOV2-DJV-0717-C17-DR-001
Suitability
DO NOT SCALE
100 10 0
A1

File: Bridge Master - bat culverts - all.dwg
Date: May 15, 2013 - 8:27pm Plotted by: oate1424

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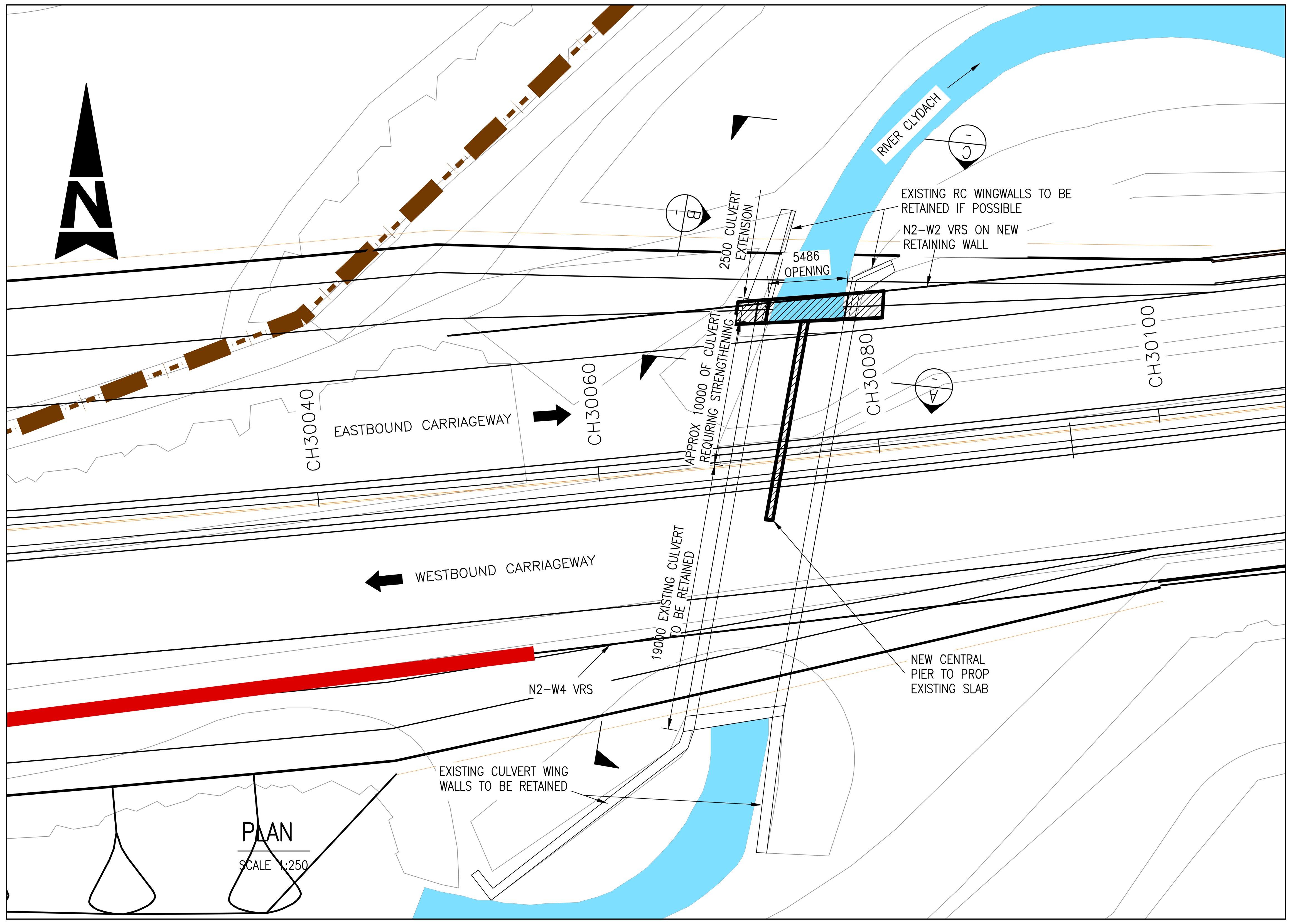
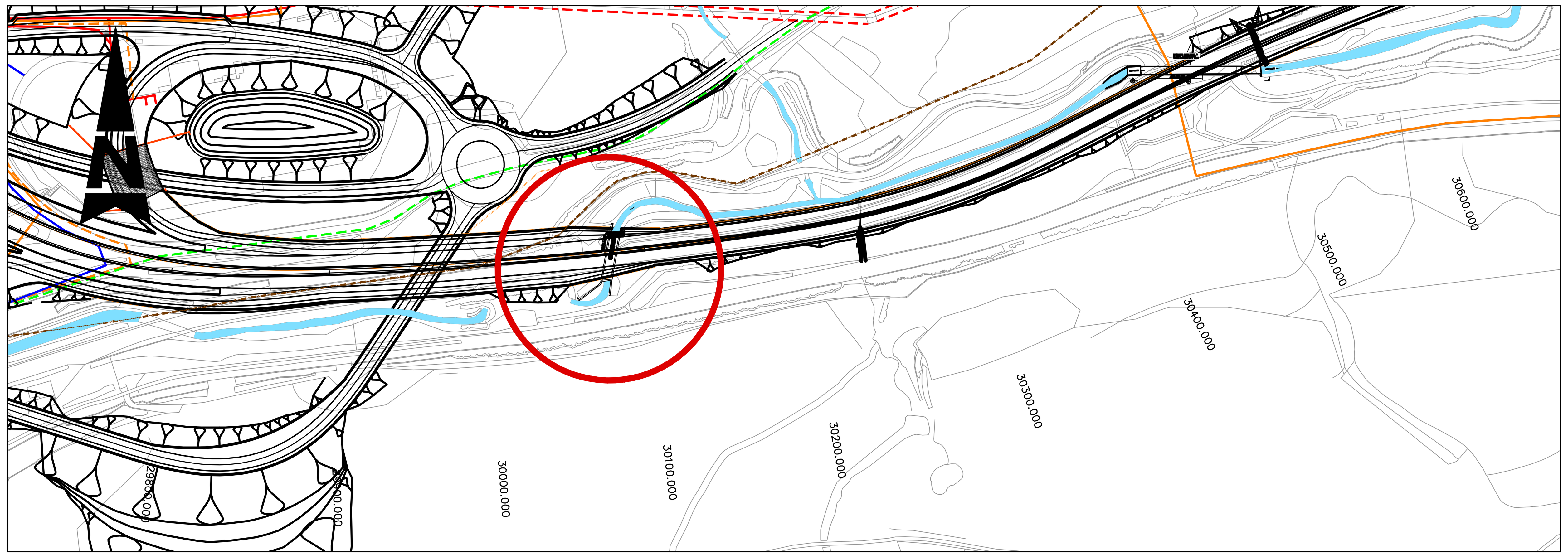


PLAN

SCALE 1:250

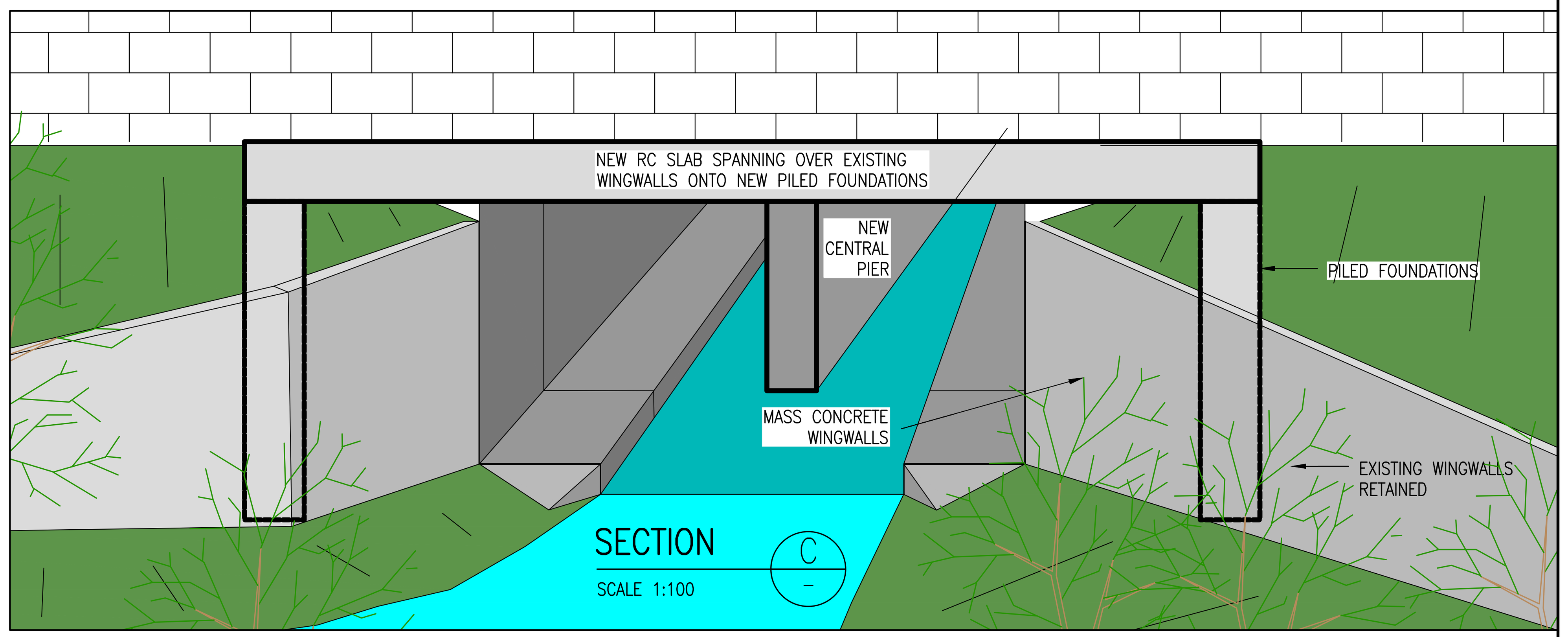


LOCATION PLAN

SCALE 1:2500

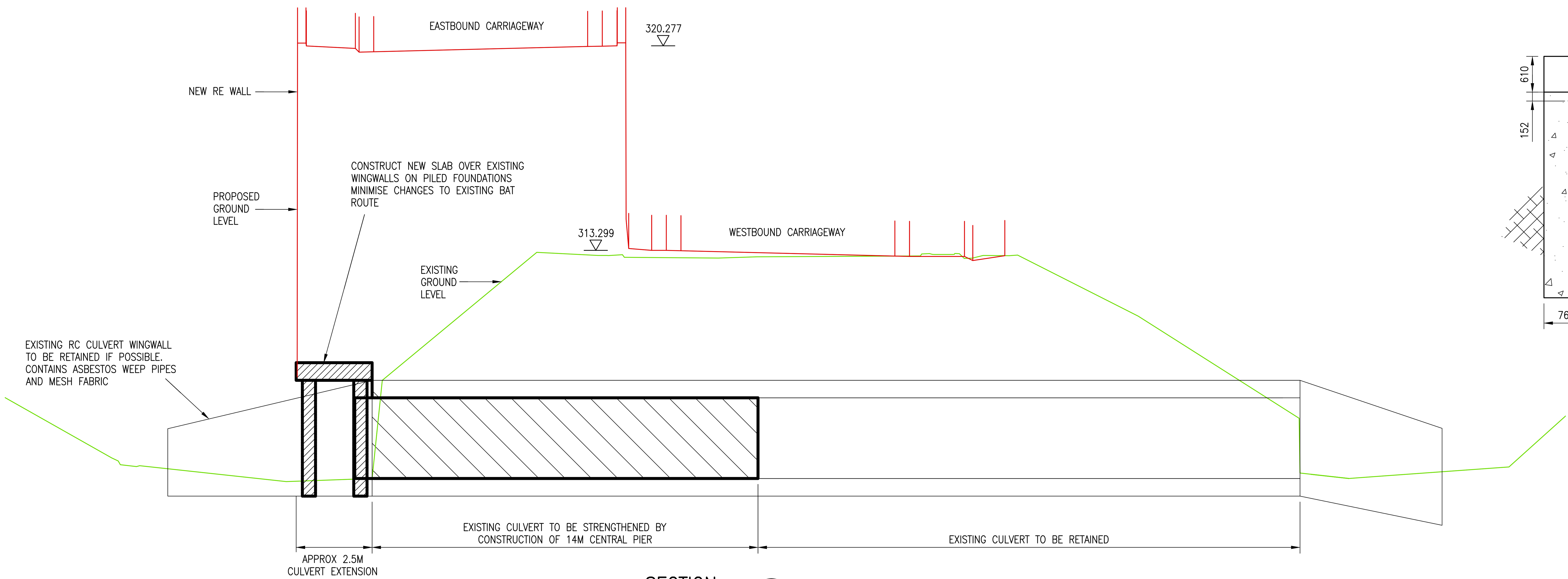
SERVICES - KEY

- ELEC - LV
- BRITISH TELECOMS
- 132 KV DUAL
- ELEC - 11KV
- GAS - HP
- GAS - MP
- POTABLE WATER
- FOUL
- GAS - LP



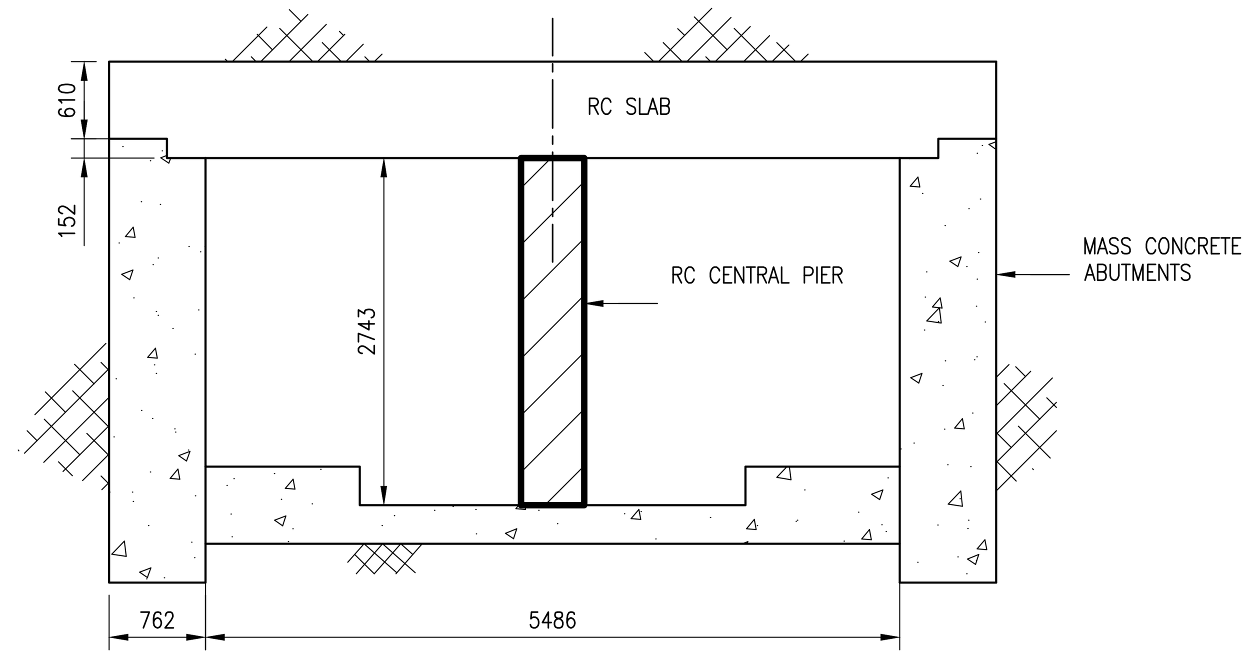
SECTION C

SCALE 1:100



SECTION B

SCALE 1:100



SECTION A

SCALE 1:50

Notes:

1. This drawing represents a preliminary design only for the purpose of illustrating the structural form and design intent. Confirmation of design including the key member sizes and foundation type is subject to detailed design and the results of the final geotechnical investigation.
2. All dimensions are in millimetres unless noted otherwise.
3. All levels are in metres relative to ordinance datum.
4. The positions of services shown are approximate.
5. Maintenance access routes and details will be agreed with SWTRA in the detailed design stage.

Rev	Description	By	Date	Chk'd	Auth
A	AIP SUBMISSION	RO	MAR '13	JN	DO

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made to the design hazard log).

Construction	BATS POTENTIALLY ROOST IN CULVERT
Maintenance/Cleaning	BATS POTENTIALLY ROOST IN CULVERT
Use	BATS POTENTIALLY ROOST IN CULVERT
Decommissioning/Demolition	BATS POTENTIALLY ROOST IN CULVERT

Llywodraeth Cymru
Welsh Government

ATKINS Halcrow RPS

COSTAIN

A465 Heads of the Valleys
Section 2: Gilwern - Brynmawr

Purpose of Issue: AIP SUBMISSION

Title
Figure 13 h
Design of Culvert Modifications

M12: RIVER CLYDACH CULVERT NO4
GENERAL ARRANGEMENT

Original Scale	Designed/Drawn	Checked	Authorised
As Shown	JN	JS	DO
	Date JUNE '12	Date JUNE '12	Date JUNE '12

Status	Drawing Number	Rev
S5	A465HOV2-DJV-0717-M12-DR-001	A

Rev A | Drawing Number A465HOV2-DJV-0717-M12-DR-001 | Suitability

DO NOT SCALE

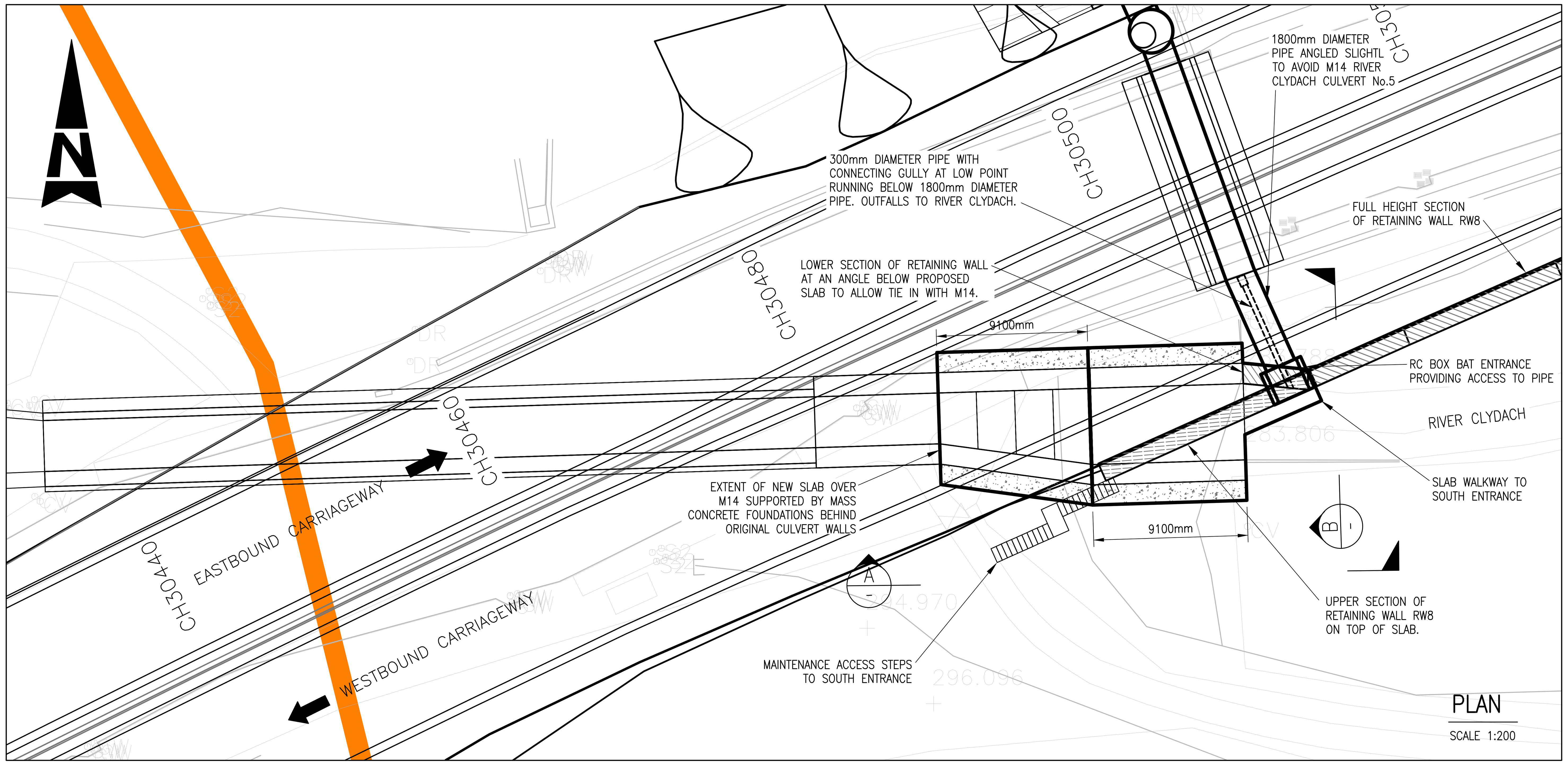
A1

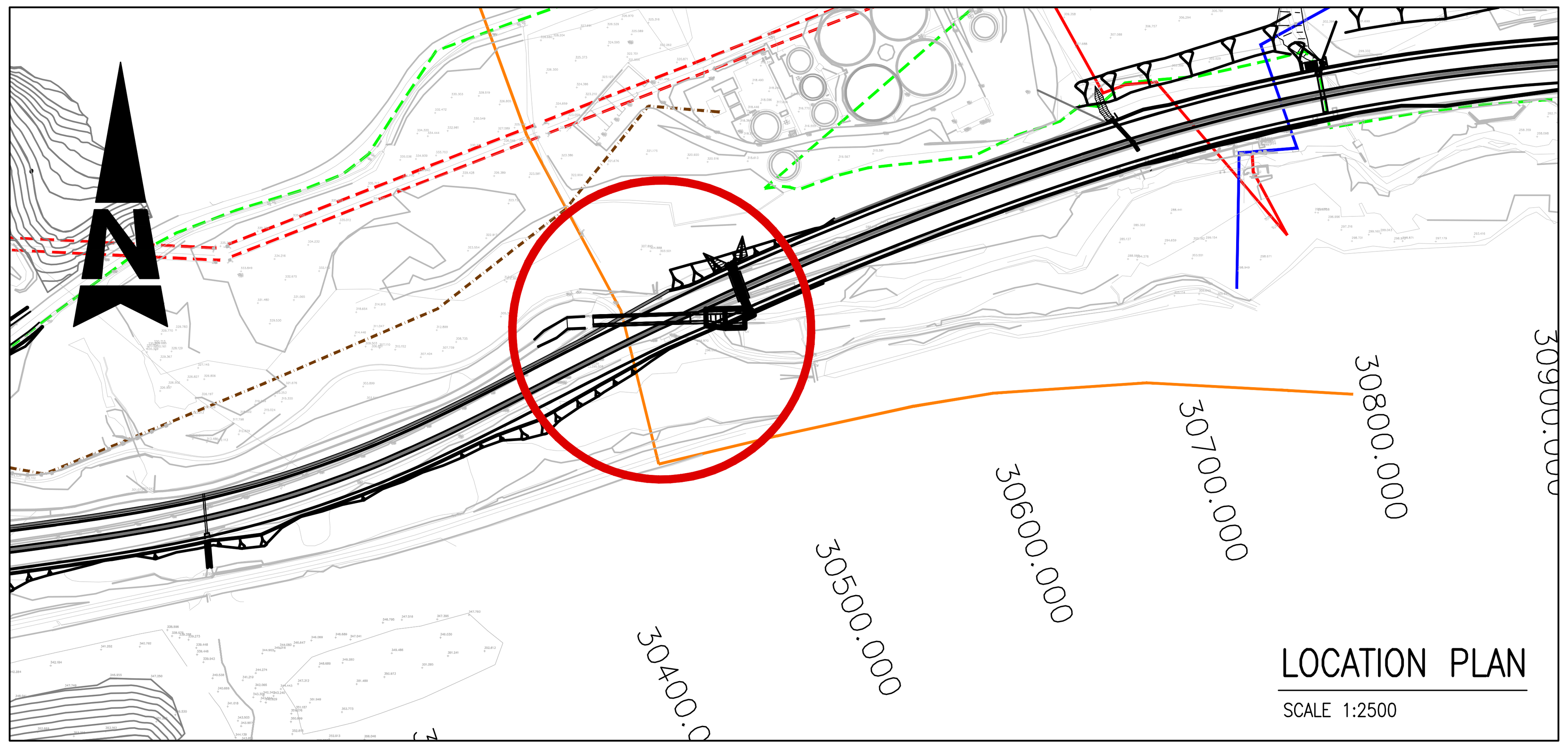
File: Bridge Master - bat culverts - all.dwg
Date: Mar 18, 2013 - 12:02pm Plotted by: oate1424

P:\GBEMB\HandT\Tsol\AR JV-Projects\5104461_A465 Section 2 ECI_GILB3264\07 Technical (Eng)\17 Structures\11 Bridges\Bat Crossings\CABridge Master - bat culverts - all.dwg

DO NOT SCALE

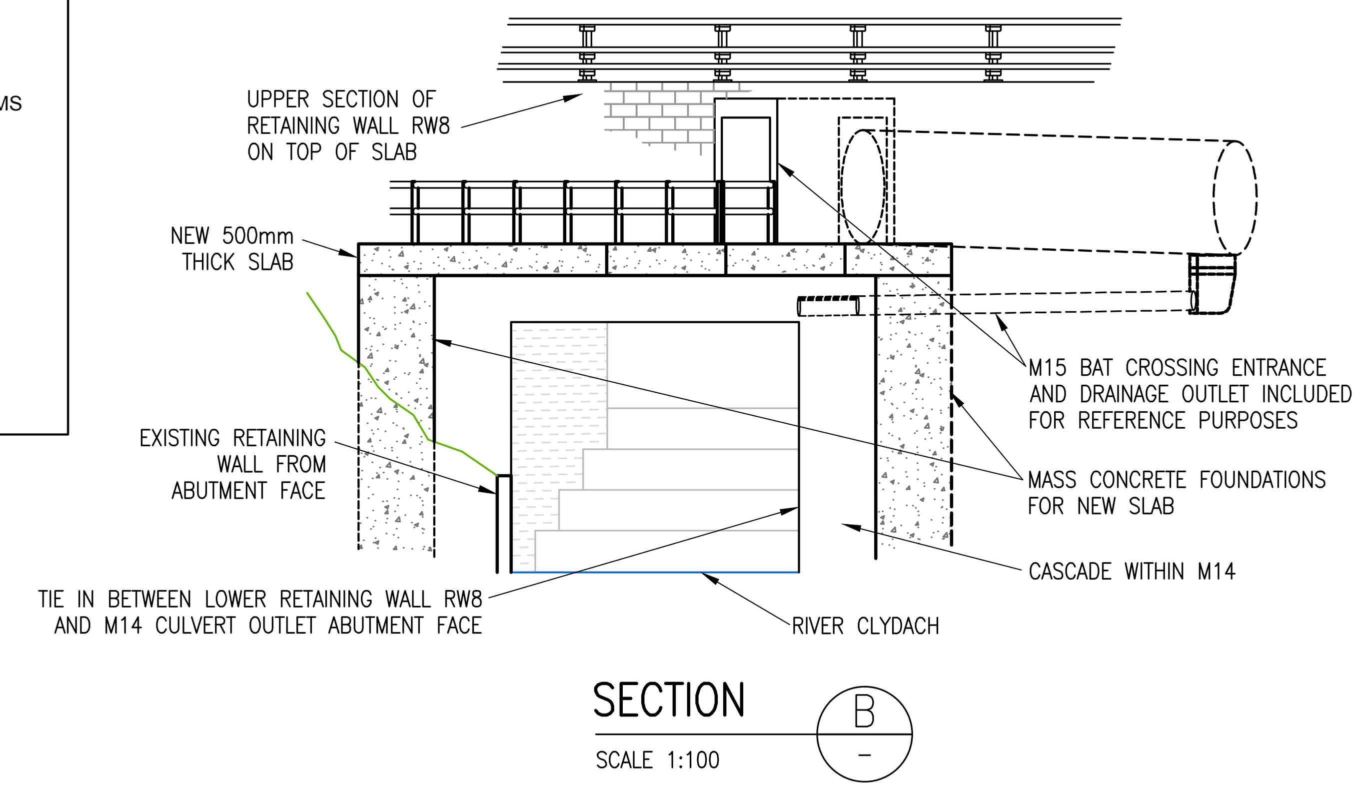
A1

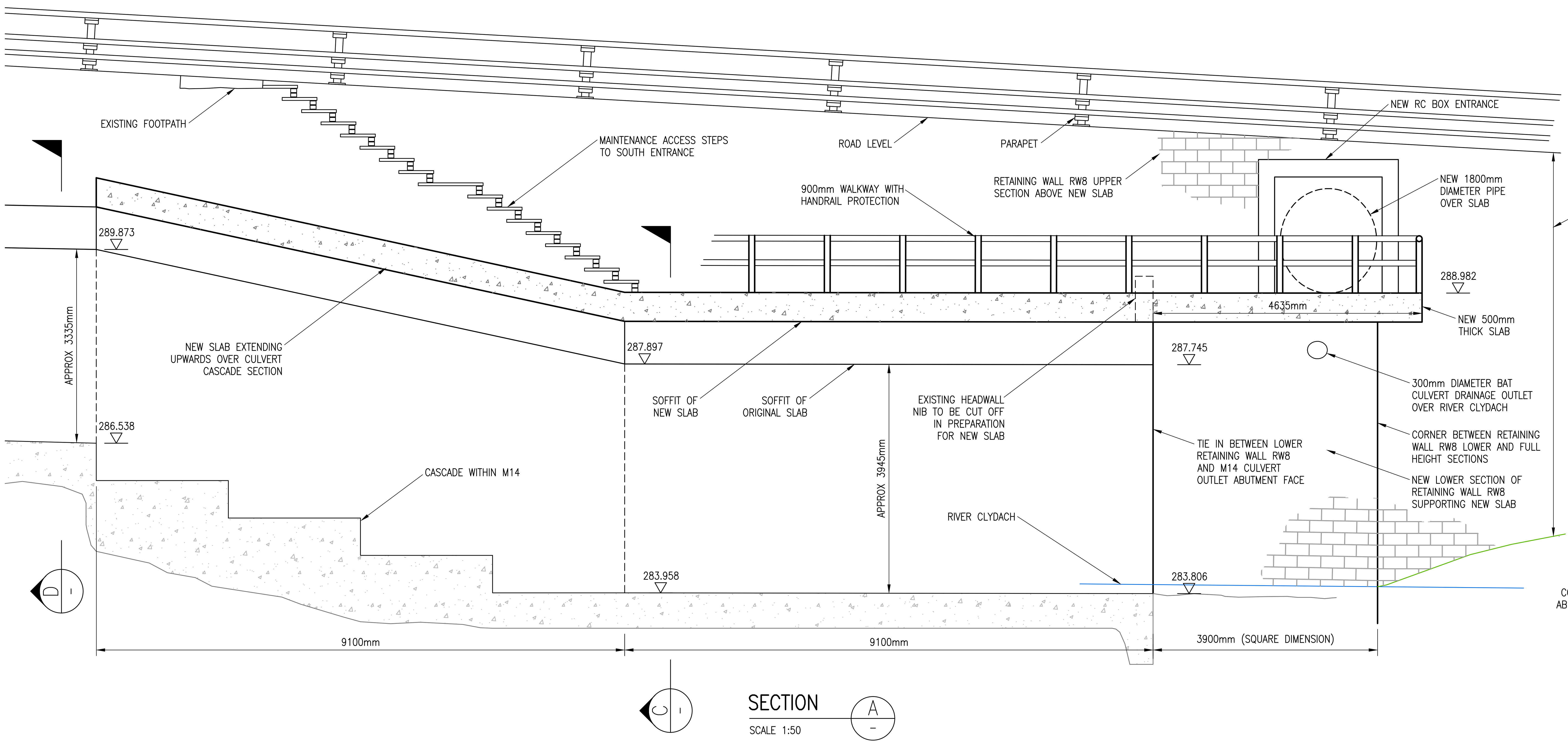


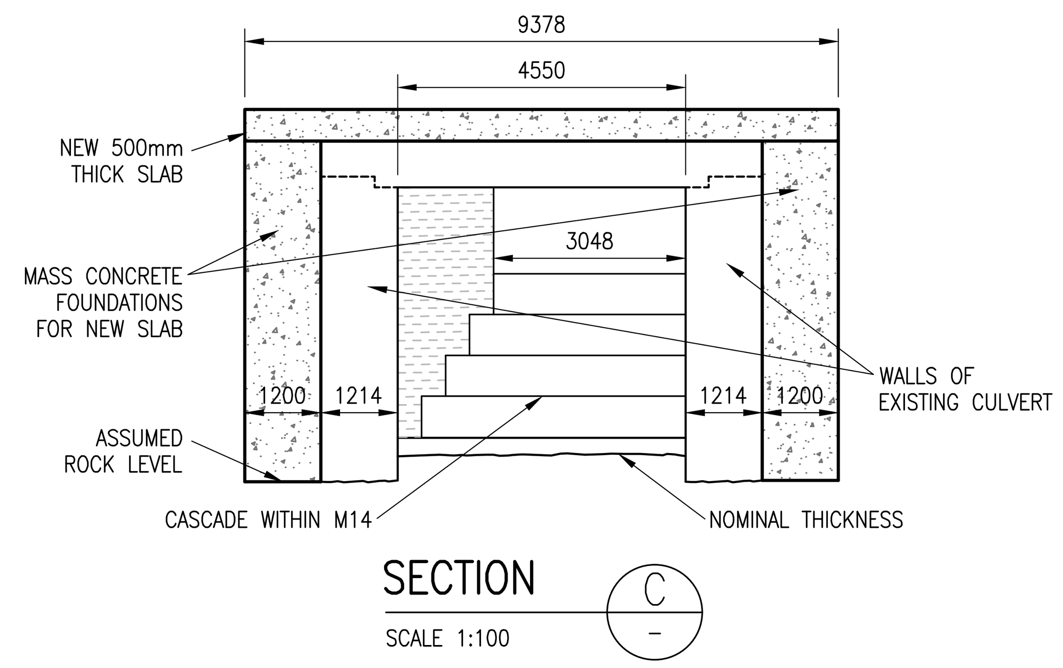


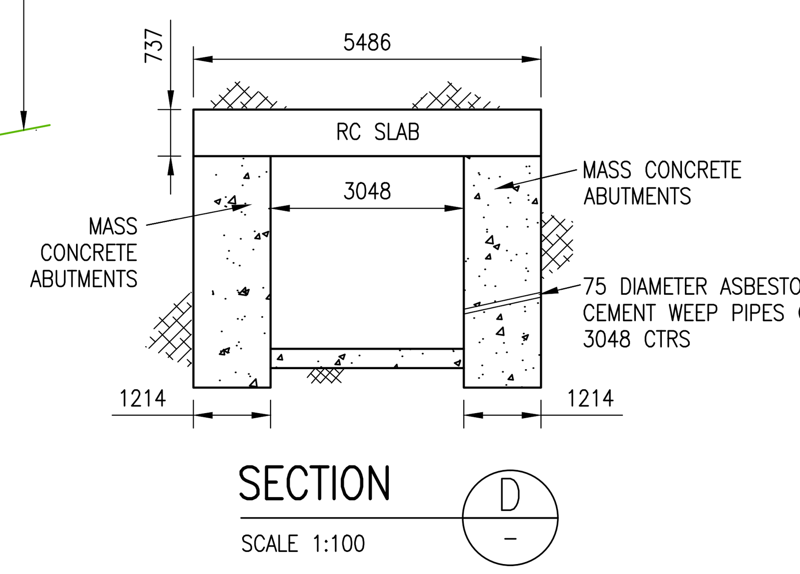
SERVICES - KEY

- ELEC - LV
- BRITISH TELECOMS
- 132 KV DUAL
- ELEC - 11KV
- GAS - HP
- GAS - MP
- POTABLE WATER
- FOUL
- GAS - LP









SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made to the design hazard log).

Construction

BATS POTENTIALLY ROOST IN CULVERT.

Maintenance/Cleaning

ACCESS DURING BAT FREE PERIODS IN AGREEMENT WITH AN ECOLOGIST. BATS POTENTIALLY ROOST IN CULVERT.

Use

BATS POTENTIALLY ROOST IN CULVERT.

Decommissioning/Demolition

BATS POTENTIALLY ROOST IN CULVERT.

Notes:

1. This drawing represents a preliminary design only for the purpose of illustrating the structural form and design intent. Confirmation of design including the key member sizes and foundation type is subject to detailed design and the results of the final geotechnical investigation.
2. All dimensions are in millimetres unless noted otherwise
3. All levels are in metres relative to ordnance datum.
4. The positions of services shown are approximate.
5. Maintenance access routes and details will be agreed with SWTRA in the detailed design stage.

Rev	Description	By	Date	Chk'd	Auth
P1	ISSUE FOR ENVIRONMENTAL STATEMENT	RO	MAY '13	JN	DO

Llywodraeth Cymru Welsh Government

ATKINS Halcrow RPS

COSTAIN

A465 Heads of the Valleys
Section 2: Gilwern - Brynmawr

Purpose of Issue: ISSUE FOR ENVIRONMENTAL STATEMENT

Title: Figure 13 i
Design of Culvert Modifications

M14: RIVER CLYDACH CULVERT No. 5
GENERAL ARRANGEMENT

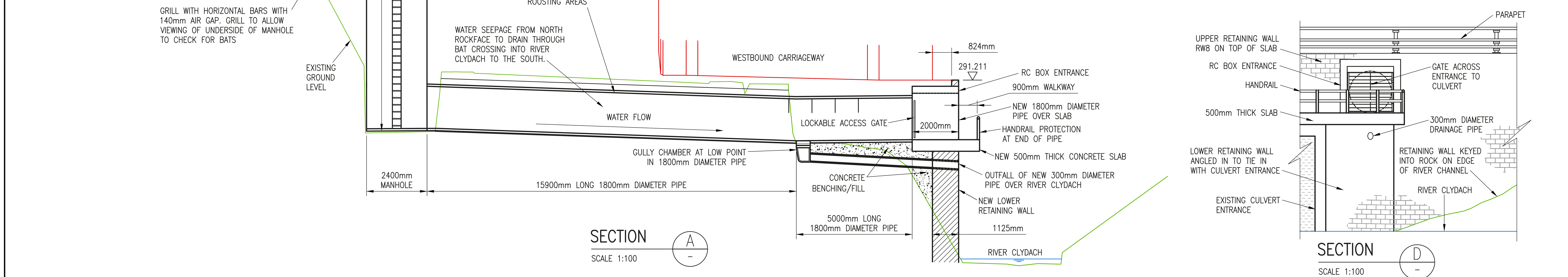
Original Scale	Designed/Drawn	Checked	Authorised
As Shown	RO, Date MAY '13	JN, Date MAY '13	DO, Date MAY '13

Status	Drawing Number	Rev
S4	A465HOV2-DJV-0717-M14-DR-002	P1

Suitability | Drawing Number: A465HOV2-DJV-0717-M14-DR-002 | Rev: P1

File: Bridge Master - bat culverts - all.dwg
Date: May 15, 2013 - 7:50pm Plotted by: oate1424

P:\GBEMB\HandT\Tsol\AR JV-Projects\5104461_A465 Section 2 ECI_GILB3264\07 Technical (Eng)\17 Structures\11 Bridges\Bat Crossings\CABridge Master - bat culverts - all.dwg



DO NOT SCALE

A1

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made to the design hazard log).

Construction

GRATING BARS TO BE INSTALLED GRADUALLY DURING CONSTRUCTION PROCESS SO BATS CAN GET USED TO CONTINUING TO USE ROUTE WITH GRATING PRESENT. BATS POTENTIALLY ROOST IN PIPES.

Maintenance/Cleaning

MAINTENANCE AND INSPECTIONS TO BE UNDERTAKEN FROM NORTHEN END THROUGH MANHOLE CHAMBER IN VERGE. PIPE DESIGNATED CONFINED SPACE AND WILL REQUIRE WINCHED ACCESS. ACCESS DURING BAT FREE PERIODS IN AGREEMENT WITH AN ECOLOGIST. BATS POTENTIALLY ROOST IN PIPES.

Use

FENCING PROVIDED AROUND SITE TO TO PREVENT PUBLIC ACCESS TO PIPE
BATS POTENTIALLY UNDER MANHOLE COVER WHEN OPENED.
BATS POTENTIALLY ROOST IN PIPES.

Decommissioning/Demolition

BATS POTENTIALLY ROOST IN PIPES.

Notes:

1. This drawing represents a preliminary design only for the purpose of illustrating the structural form and design intent. Confirmation of design including the key member sizes and foundation type is subject to detailed design and the results of the final geotechnical investigation.
2. All dimensions are in millimetres unless noted otherwise
3. All levels are in metres relative to ordinance datum.
4. The positions of services shown are approximate.
5. Maintenance access routes and details will be agreed with SWTRA in the detailed design stage.

Rev	Description	By	Date	Chk'd	Auth
P10	ISSUE FOR ENVIRONMENTAL STATEMENT	RO	MAY '13	JN	DO
P9	MANHOLE DETAILS AMENDED	RO	MAR '13	JN	DO
P8	ALIGNMENT UPDATED	RO	MAR '13	JN	DO
P7	SOUTH MANHOLE ADDED	JN	FEB '13	RW	DO
P6	FOR REVIEW AND COMMENT	JN	JAN '13	RW	DO
P5	FOR REVIEW AND COMMENT	JN	OCT '12	RW	DO
P4	WORK IN PROGRESS	JN	AUG '12	RW	DO
P3	WORK IN PROGRESS	JN	AUG '12	DO	DO
P2	FOR REVIEW AND COMMENT	JN	JUN '12	JS	DO
P1	FOR INFORMATION	JN	JUN '12	JS	DO

Llywodraeth Cymru Welsh Government

ATKINS Halcrow RPS

COSTAIN

A465 Heads of the Valleys
Section 2: Gilwern - Brynmawr

Purpose of Issue: ISSUE FOR ENVIRONMENTAL STATEMENT

Title: **Figure 13 j**
Design of Culvert Modifications

M15: PONT HARRI ISAAC SUBWAY
BAT ROUTE - GENERAL ARRANGEMENT

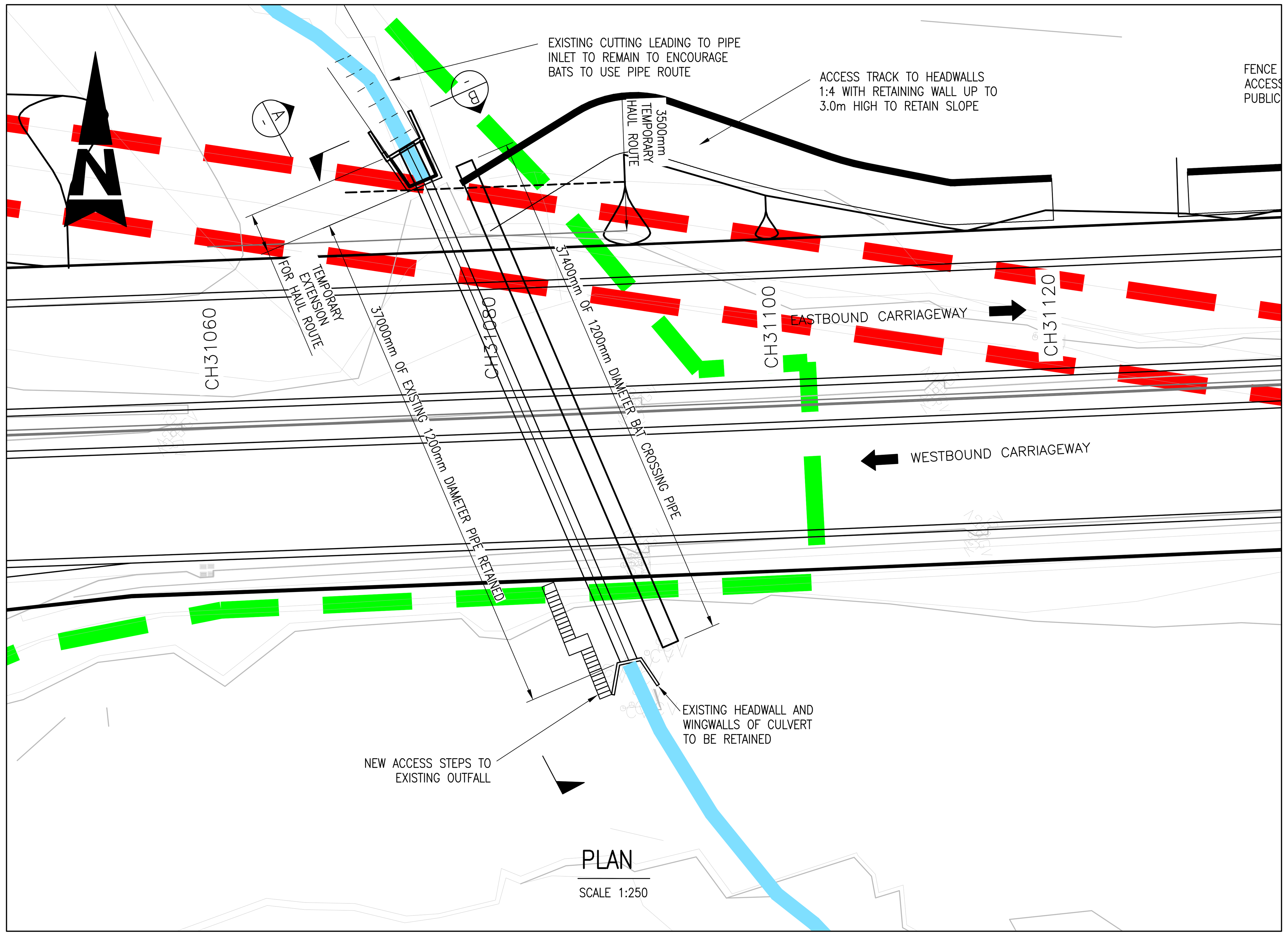
Original Scale	Designed/Drawn	Checked	Authorised
As Shown	JN	JS	DO
	Date JUNE '12	Date JUNE '12	Date JUNE '12

Status	Drawing Number	Rev
S4	A465HOV2-DJV-0717-M15-DR-001	P10

Suitability | Drawing Number A465HOV2-DJV-0717-M15-DR-001 | Rev P10

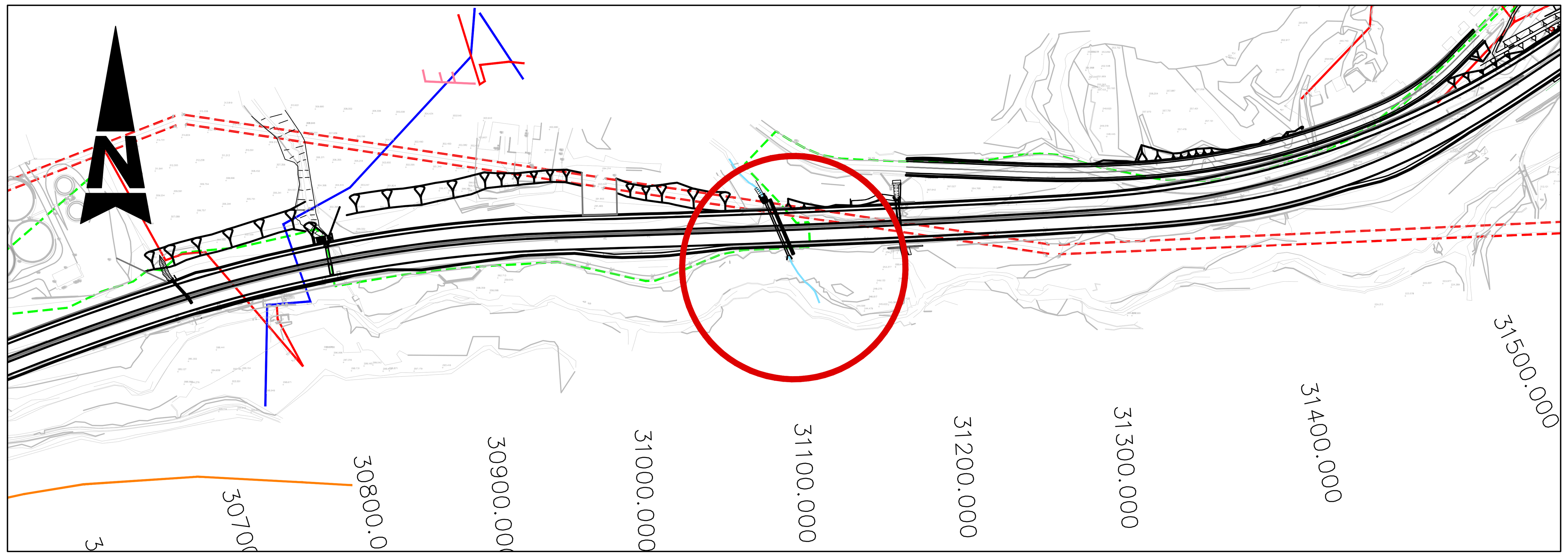
File: Bridge Master - bat culverts - all.dwg
Date: May 15, 2013 - 7:53pm Plotted by: oate1424

P:\GBEMB\HandT\Tsol\AR JV-Projects\5104461_A465 Section 2 ECI_GILB3264\07 Technical (Eng)\17 Structures\11 Bridges\Bat Crossings\CABridge Master - bat culverts - all.dwg



PLAN

SCALE 1:250

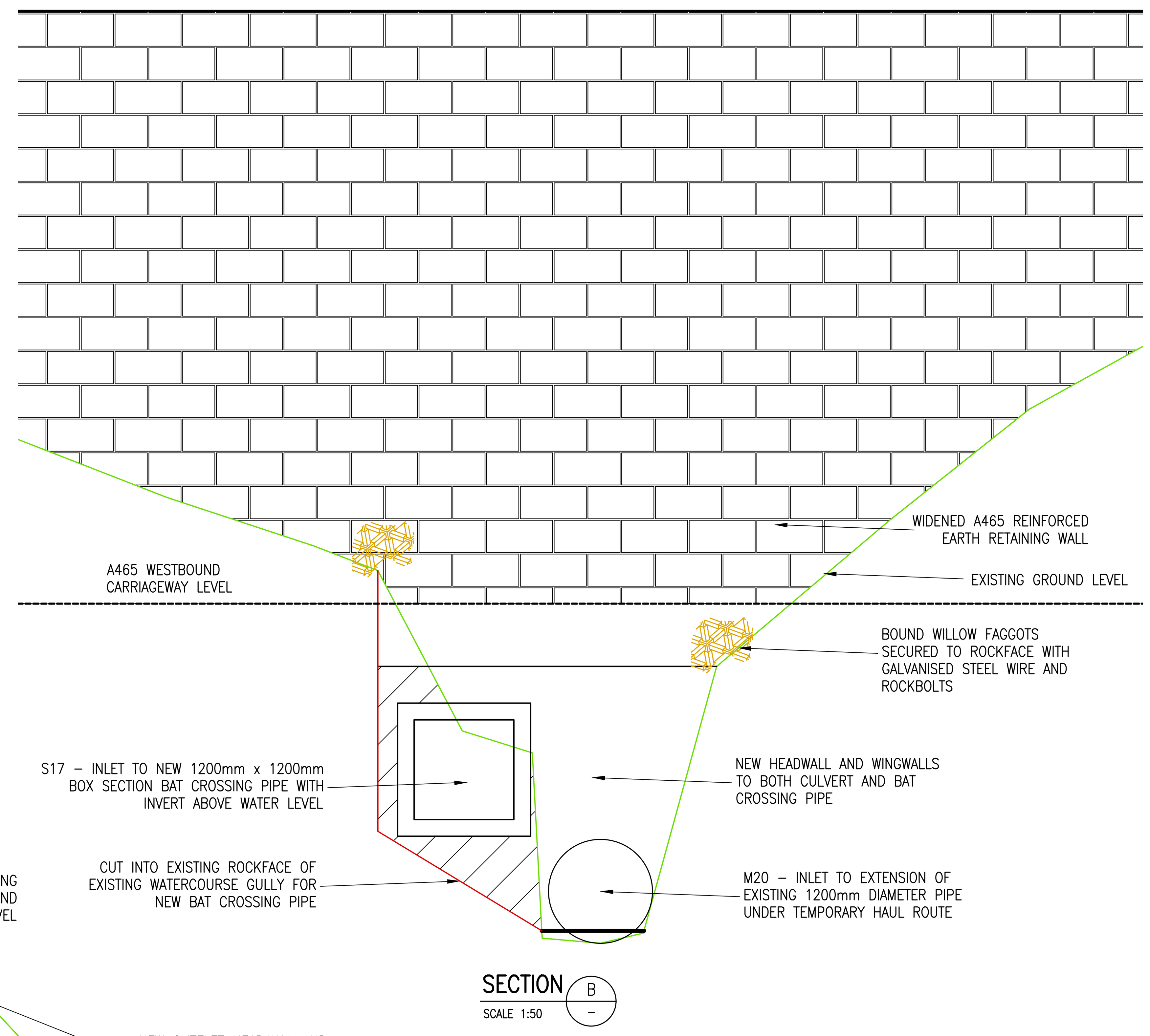


LOCATION PLAN

SCALE 1:2500

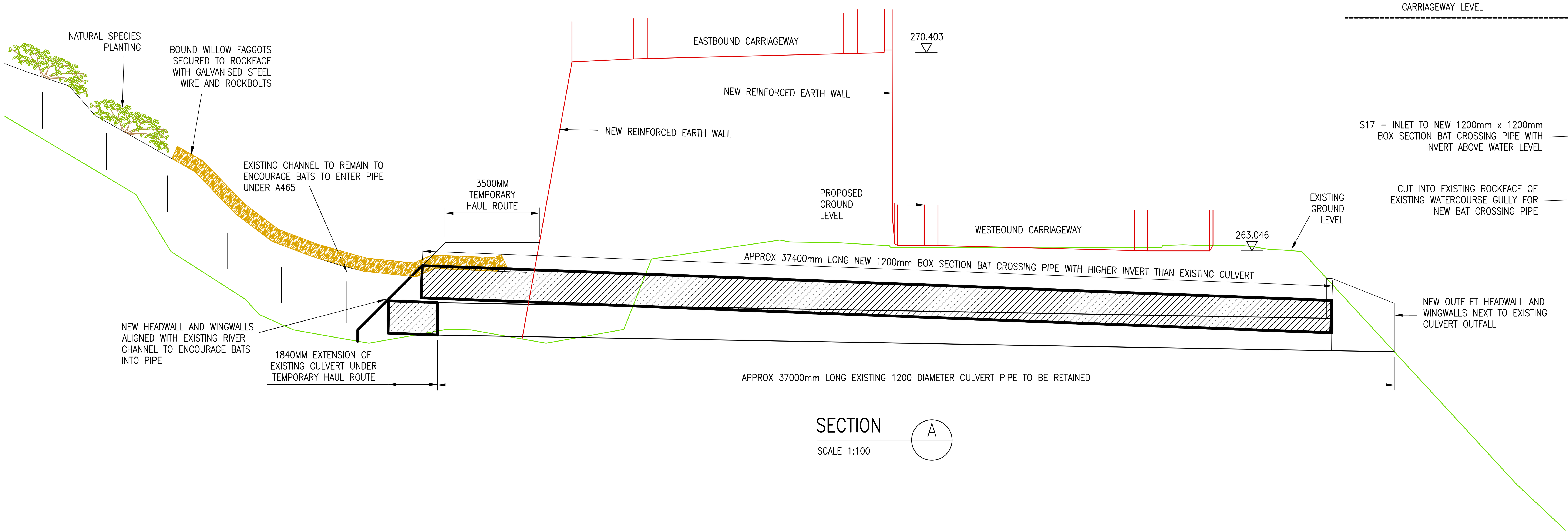
SERVICES - KEY

- ELEC - LV
- BRITISH TELECOMS
- 132 KV DUAL
- ELEC - 11KV
- GAS - HP
- GAS - MP
- POTABLE WATER
- FOUL
- GAS - LP



SECTION B

SCALE 1:50



SECTION A

SCALE 1:100

DO NOT SCALE

A1

Suitability | Drawing Number A465HOV2-DJV-0717-M20-DR-001 | Rev P7

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION
In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made to the design hazard log).
Construction
BATS POTENTIALLY ROOST IN PIPE
Maintenance/Cleaning
NEW ACCESS STEPS REQUIRED TO INLET AND OUTLET, BATS POTENTIALLY ROOST IN PIPE
Use
CONSIDERATION GIVEN TO REQUIREMENT FOR TRASH SCREEN OR MEASURES TO PREVENT PUBLIC ACCESS TO PIPE, BATS POTENTIALLY ROOST IN PIPE
Decommissioning/Demolition
BATS POTENTIALLY ROOST IN PIPE

Notes:

1. This drawing represents a preliminary design only for the purpose of illustrating the structural form and design intent. Confirmation of design including the key member sizes and foundation type is subject to detailed design and the results of the final geotechnical investigation.
2. All dimensions are in millimetres unless noted otherwise
3. All levels are in metres relative to ordinance datum .
4. The positions of services shown are approximate.
5. Maintenance access routes and details will be agreed with SWTRA in the detailed design stage.

Rev	Description	By	Date	Chk'd	Auth
P7	ISSUE FOR ENVIRONMENTAL STATEMENT	RO	MAY '13	JN	DO
P6	CHAINAGES ADDED	RO	MAR '13	JN	DO
P5	ALIGNMENT AND CULVERT AMENDED	RO	MAR '13	JN	DO
P4	ALIGNMENT AMENDED	JN	MAR '13	JN	DO
P3	SECOND PIPE ADDED	JN	JAN '13	RW	DO
P2	FOR REVIEW AND COMMENT	JN	OCT '12	RW	DO
P1	FOR INFORMATION	JN	JUN '12	JS	DO

Llywodraeth Cymru
Welsh Government

ATKINS Halcrow RPS

COSTAIN

A465 Heads of the Valleys
Section 2: Gilwern - Brynmawr

Purpose of Issue
ISSUE FOR ENVIRONMENTAL STATEMENT

Title
Figure 13 k
Design of Culvert Modifications

M20 - WATERFALL (NANT HAFOD)
BAT CULVERT - GENERAL ARRANGEMENT

Original Scale	Designed/Drawn	Checked	Authorised
As Shown	JN Date JUNE '12	JS Date JUNE '12	DO Date JUNE '12

Status	Drawing Number	Rev
S4	A465HOV2-DJV-0717-M20-DR-001	P7

File: Bridge Master - bat culverts - all.dwg
Date: May 15, 2013 - 7:22pm Plotted by: oate1424

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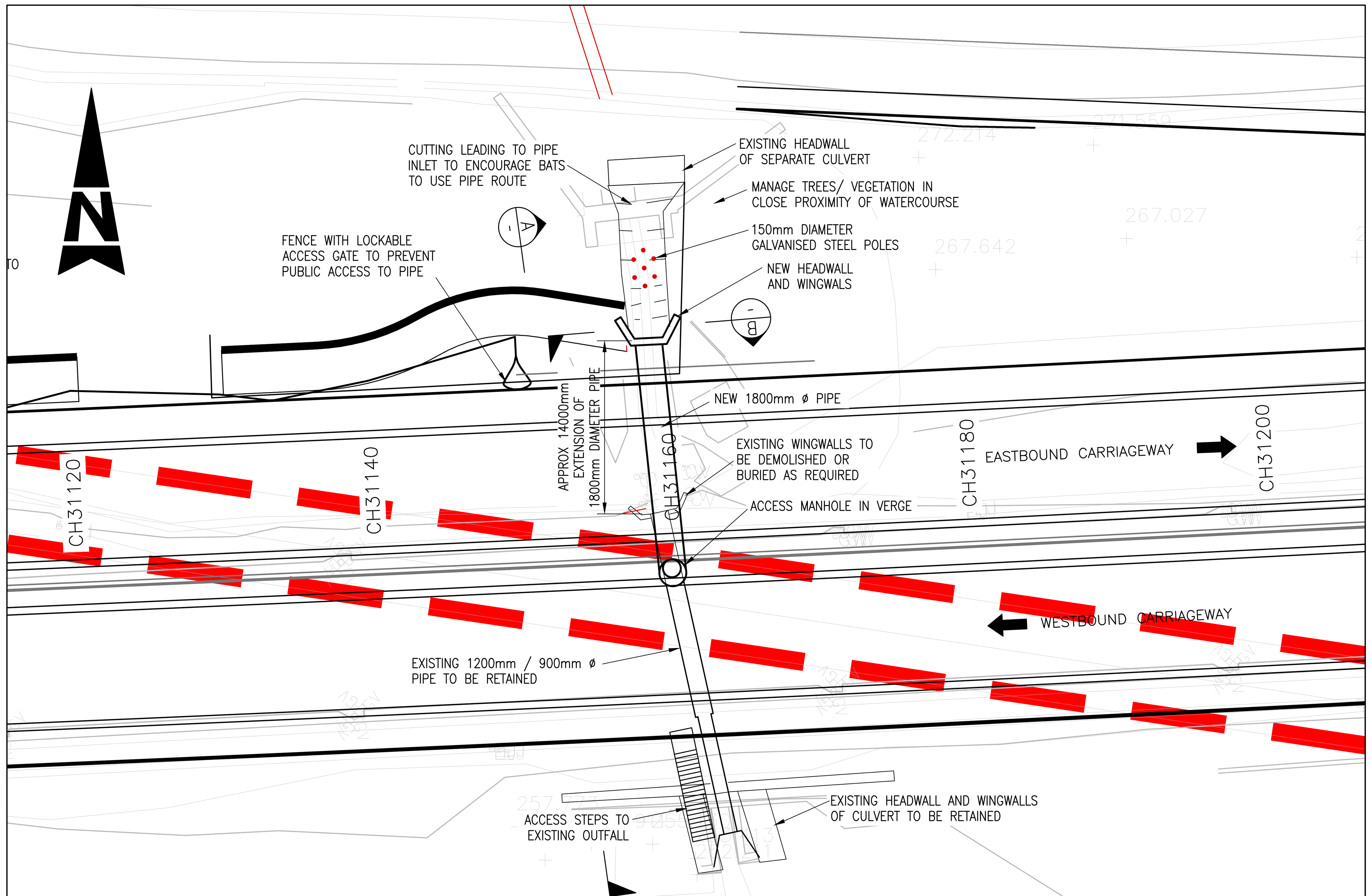
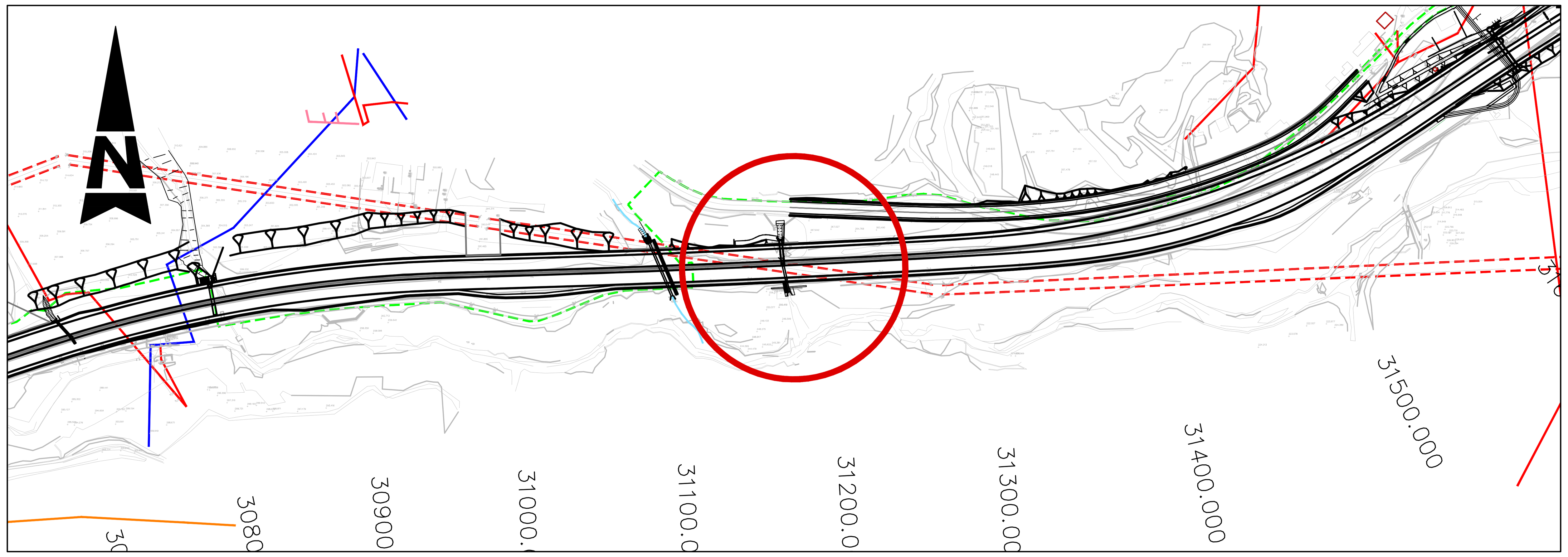


PLAN

SCALE 1:250

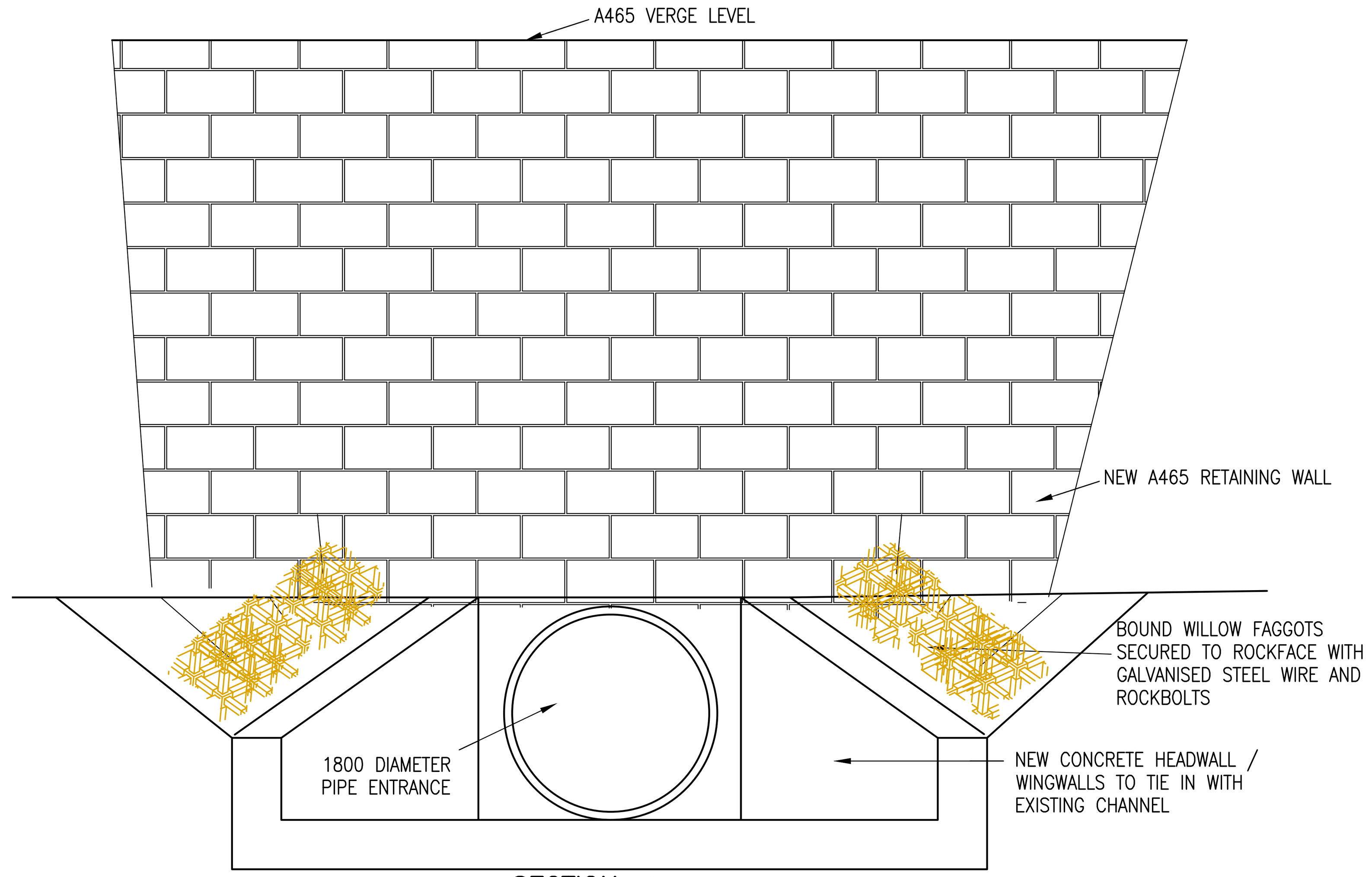


LOCATION PLAN

SCALE 1:2500

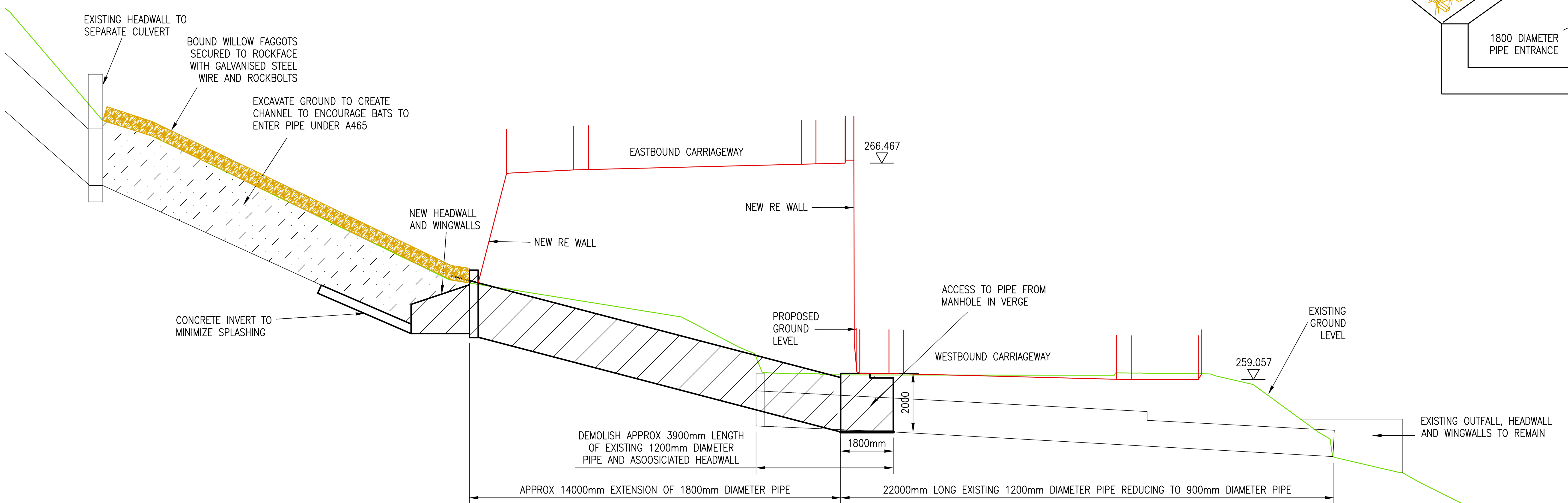
SERVICES - KEY

- ELEC - LV
- BRITISH TELECOMS
- 132 KV DUAL
- ELEC - 11KV
- GAS - HP
- GAS - MP
- POTABLE WATER
- FOUL
- GAS - LP



SECTION B

SCALE 1:50



SECTION A

SCALE 1:100

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made to the design hazard log).

Construction

BATS POTENTIALLY ROOST IN PIPES.

Maintenance/Cleaning

MAINTENANCE ACCESS TO PIPE USING MANHOLE IN WESTBOUND CARRIAGEWAY OUTER VERGE. BATS POTENTIALLY ROOST IN PIPES.

Use

FENCE PROVIDED AROUND NORTHER VERGE AND ACCESS PATH TO PREVENT PUBLIC ACCESS TO PIPE AND TRASH SCREEN. BATS POTENTIALLY ROOST IN PIPES.

Decommissioning/Demolition

BATS POTENTIALLY ROOST IN PIPES.

Notes:

1. This drawing represents a preliminary design only for the purpose of illustrating the structural form and design intent. Confirmation of design including the key member sizes and foundation type is subject to detailed design and the results of the final geotechnical investigation.
2. All dimensions are in millimetres unless noted otherwise
3. All levels are in metres relative to ordinance datum.
4. The positions of services shown are approximate.
5. Maintenance access routes and details will be agreed with SWTRA in the detailed design stage.

Rev	Description	By	Date	Chk'd	Auth
P8	ISSUE FOR ENVIRONMENTAL STATEMENT	RO	MAY '13	JN	DO
P7	ALIGNMENT AMENDED	RO	MAR '13	JN	DO
P6	INCREASED PIPE SIZE	JN	JAN '13	RW	DO
P5	FOR REVIEW AND COMMENT	JN	OCT '12	RW	DO
P4	WORK IN PROGRESS	JN	AUG '12	DO	DO
P3	WORK IN PROGRESS	JN	AUG '12	DO	DO
P2	FOR REVIEW AND COMMENT	JN	JUN '12	JS	DO
P1	FOR INFORMATION	JN	JUN '12	JS	DO

Llywodraeth Cymru
Welsh Government

ATKINS Halcrow RPS

COSTAIN

A465 Heads of the Valleys
Section 2: Gilwern - Brynmawr

Purpose of Issue: ISSUE FOR ENVIRONMENTAL STATEMENT

Title: **Figure 13 I**
Design of Culvert Modifications

M22 - BLACKROCK BAT CULVERT
GENERAL ARRANGEMENT

Original Scale	Designed/Drawn	Checked	Authorised
As Shown	JN, Date JUNE '12	JS, Date JUNE '12	DO, Date JUNE '12

Status	Drawing Number	Rev
S4	A465HOV2-DJV-0717-M22-DR-001	P8

Rev P8
Drawing Number A465HOV2-DJV-0717-M22-DR-001
Suitability

DO NOT SCALE

100 10 0

A1

File: Bridge Master - bat culverts - all.dwg
Date: May 15, 2013 - 8:02pm Plotted by: oate1424

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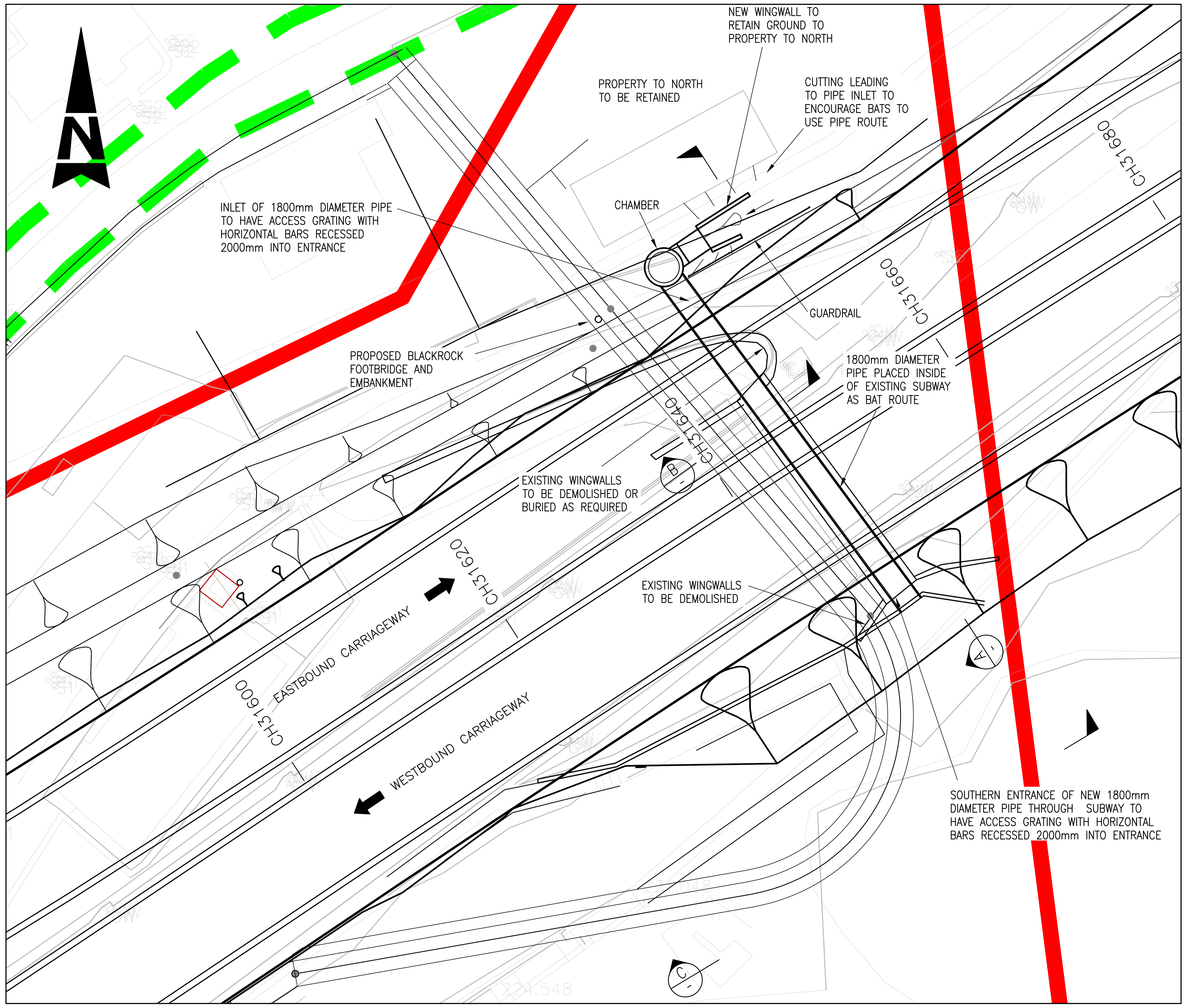
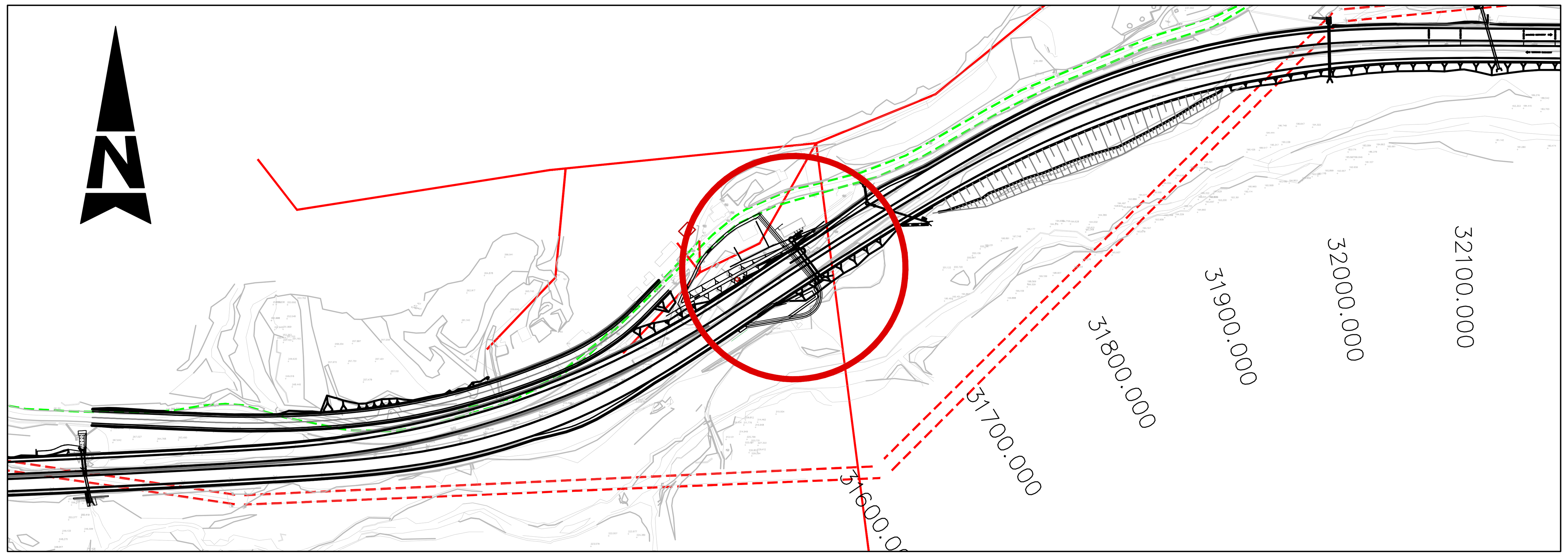


PLAN

SCALE 1:250

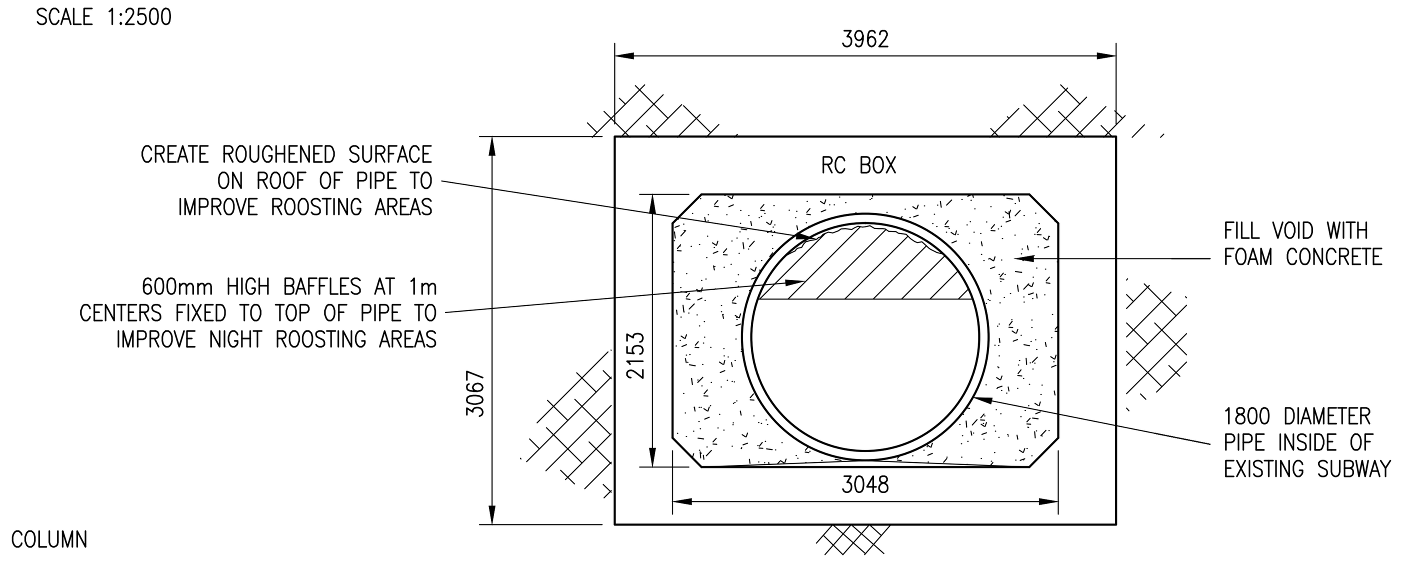


LOCATION PLAN

SCALE 1:2500

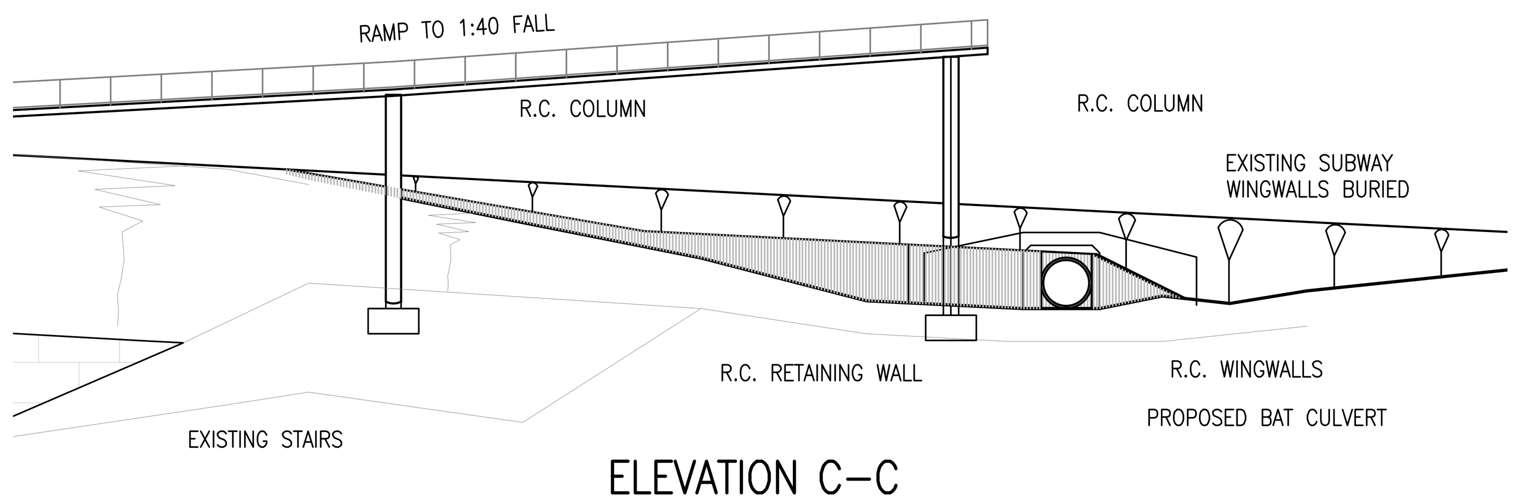
SERVICES - KEY

- ELEC - LV
- BRITISH TELECOMS
- 132 KV DUAL
- ELEC - 11KV
- GAS - HP
- GAS - MP
- POTABLE WATER
- FOUL
- GAS - LP



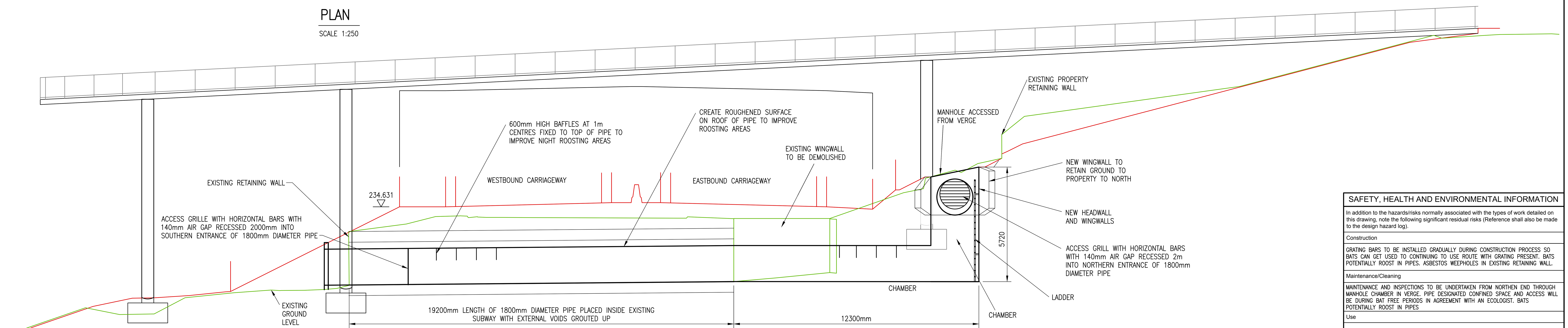
SECTION B

SCALE 1:50



ELEVATION C–C

SCALE 1:250



ELEVATION

SCALE 1:100

Notes:

1. This drawing represents a preliminary design only for the purpose of illustrating the structural form and design intent. Confirmation of design including the key member sizes and foundation type is subject to detailed design and the results of the final geotechnical investigation.
2. All dimensions are in millimetres unless noted otherwise
3. All levels are in metres relative to ordinance datum.
4. The positions of services shown are approximate.
5. Maintenance access routes and details will be agreed with SWTRA in the detailed design stage
6. For details of footbridge, refer to drawing: A465HOV2-DJV0717-S6-DR-001

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made to the design hazard log).

Construction

GRATING BARS TO BE INSTALLED GRADUALLY DURING CONSTRUCTION PROCESS SO BATS CAN GET USED TO CONTINUING TO USE ROUTE WITH GRATING PRESENT. BATS POTENTIALLY ROOST IN PIPES. ASBESTOS WEEPHOLES IN EXISTING RETAINING WALL.

Maintenance/Cleaning

MAINTENANCE AND INSPECTIONS TO BE UNDERTAKEN FROM NORTHEN END THROUGH MANHOLE CHAMBER IN VERGE. PIPE DESIGNATED CONFINED SPACE AND ACCESS WILL BE DURING BAT FREE PERIODS IN AGREEMENT WITH AN ECOLOGIST. BATS POTENTIALLY ROOST IN PIPES

Use

GRATINGS TO PREVENT PUBLIC ACCESS TO PIPE. BATS POTENTIALLY ROOST IN PIPES

Decommissioning/Demolition

BATS POTENTIALLY ROOST IN PIPES

Rev	Description	By	Date	Chk'd	Auth	Rev	Description	By	Date	Chk'd	Auth
						P7	FOOTBRIDGE MOVED EAST	JN	FEB '13	RW	DO
						P6	GRILL AIR GAP 140MM	JN	JAN '13	RW	DO
						P5	FOR REVIEW AND COMMENT	JN	OCT '12	RW	DO
						P4	WORK IN PROGRESS	JN	AUG '12	RW	DO
P10	ISSUE FOR ENVIRONMENTAL STATEMENT	RO	MAY '13	JN	DO	P3	WORK IN PROGRESS	JN	AUG '12	DO	DO
P9	CHAINAGE ADDED	RO	MAR '13	JN	DO	P2	FOR REVIEW AND COMMENT	JN	JUN '12	JS	DO
P8	ALIGNMENT UPDATED	RO	MAR '13	JN	DO	P1	FOR INFORMATION	JN	JUN '12	JS	DO

Llywodraeth Cymru
Welsh Government

ATKINS Halcrow RPS

COSTAIN

A465 Heads of the Valleys
Section 2: Gilwern - Brynmawr

Purpose of Issue: ISSUE FOR ENVIRONMENTAL STATEMENT

Title: **Figure 13 m**
Design of Culvert Modifications

M26: BLACKROCK SUBWAY BAT ROUTE GENERAL ARRANGEMENT

Original Scale	Designed/Drawn	Checked	Authorised
As Shown	JN Date JUNE '12	JS Date JUNE '12	DO Date JUNE '12

Status	Drawing Number	Rev
S4	A465HOV2-DJV-0717-M26-DR-001	P10

Rev P10
Drawing Number A465HOV2-DJV-0717-M26-DR-001
Suitability

DO NOT SCALE

A1

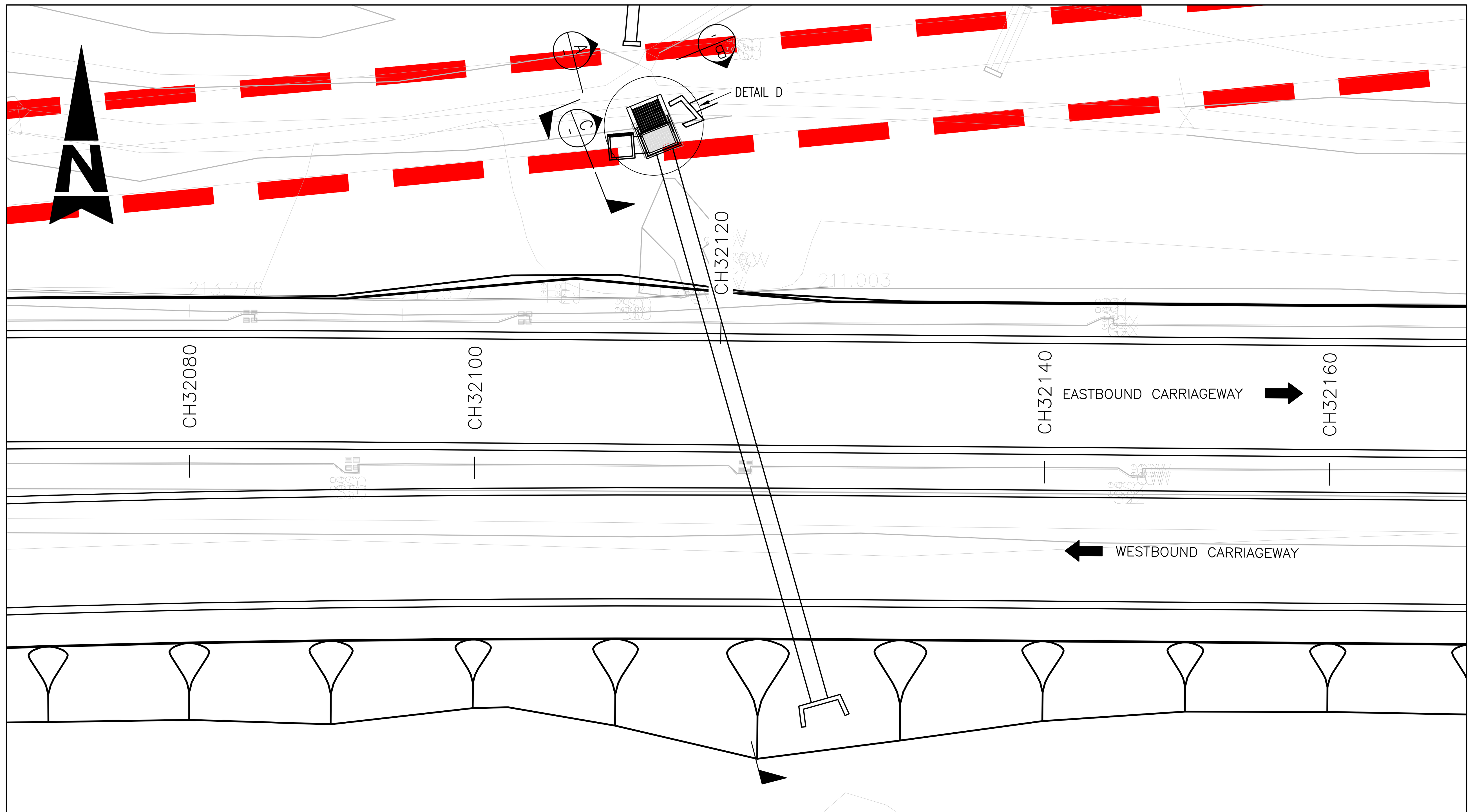
0 10 100

File: Bridge Master - bat culverts - all.dwg
Date: May 15, 2013 - 8:11pm Plotted by: oate1424

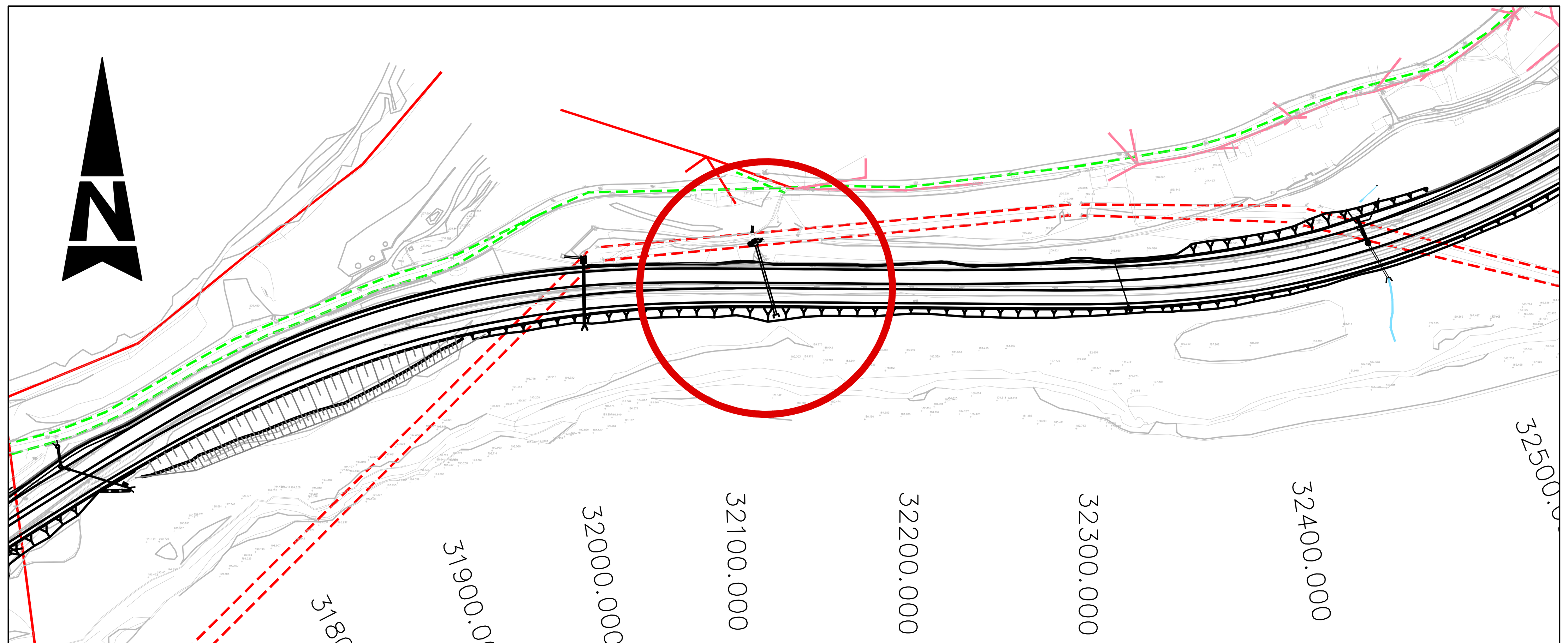
P:\GBEMB\HandT\Tsol\AR JV-Projects\5104461_A465 Section 2 ECI_GILB3264\07 Technical (Eng)\17 Structures\11 Bridges\Bat Crossings\CABridge Master - bat culverts - all.dwg

DO NOT SCALE

A1



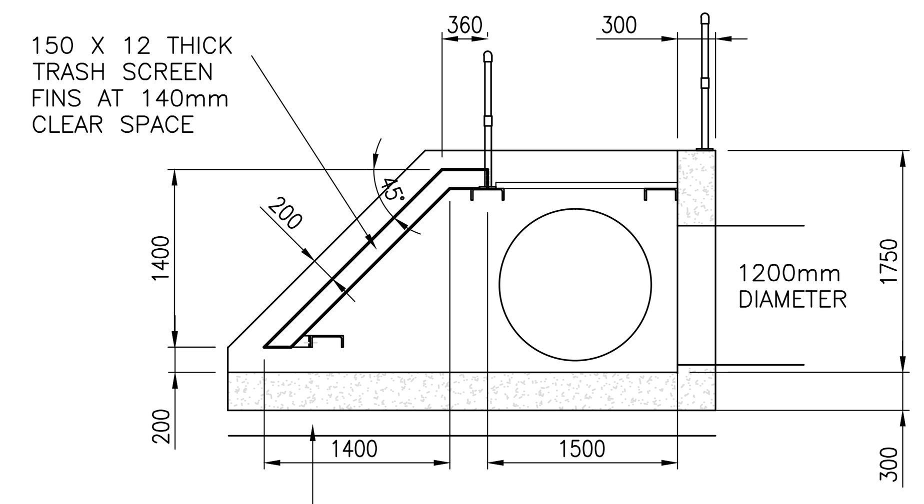
PLAN
SCALE 1:250



LOCATION PLAN
SCALE 1:2500

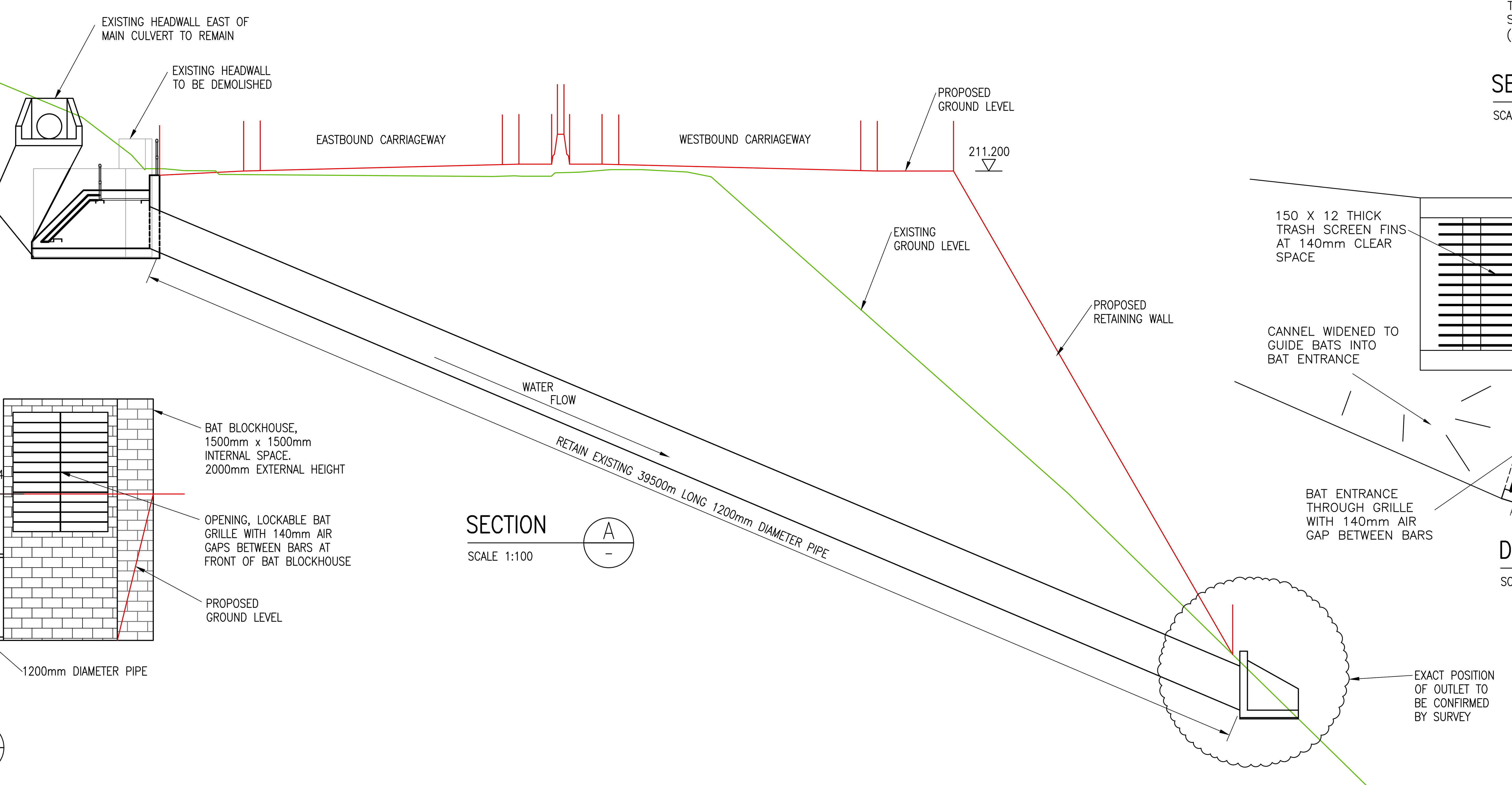
SERVICES - KEY

- ELEC - LV
- BRITISH TELECOMS
- 132 KV DUAL
- ELEC - 11KV
- GAS - HP
- GAS - MP
- POTABLE WATER
- FOUL
- GAS - LP

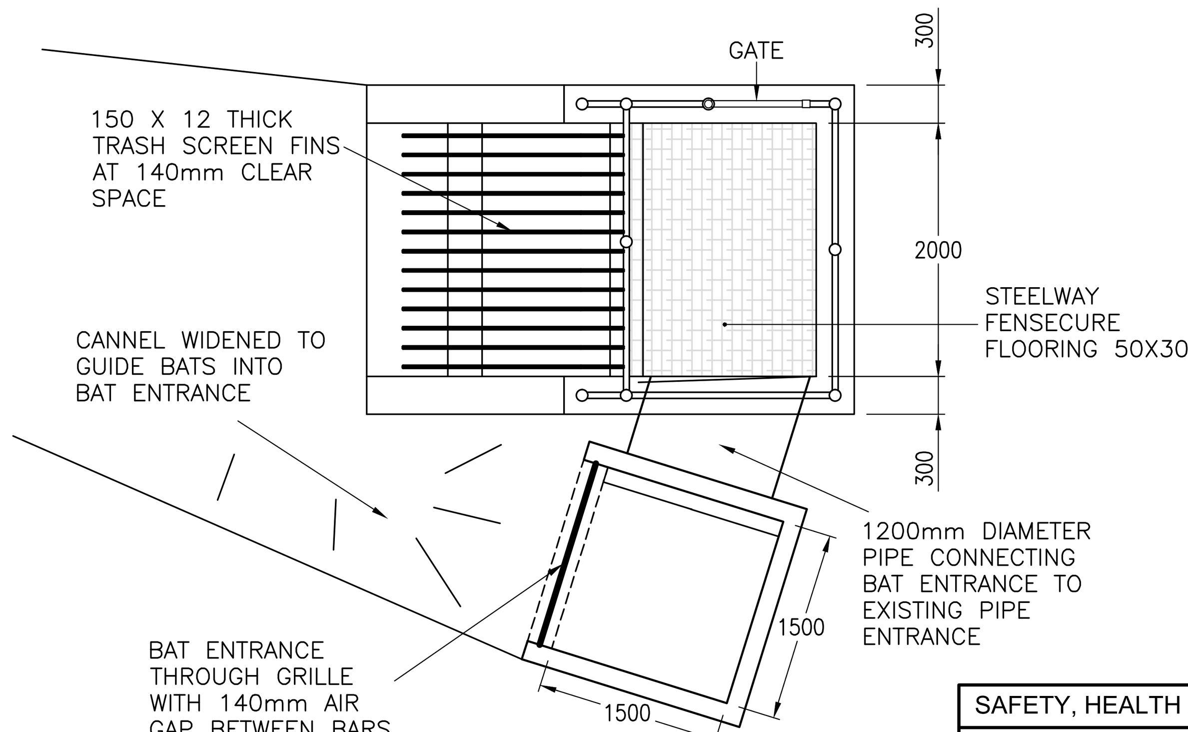


ALL SOFT GROUND TO BE REMOVED AND REPLACED WITH MASS CONCRETE OR CLASS 6N FILL MATERIAL TO SUITABLE FOUNDATION LEVEL TO THE SATISFACTION OF THE SUPERVISING ENGINEER. (ALLOW MIN 200mm FOR PRICING)

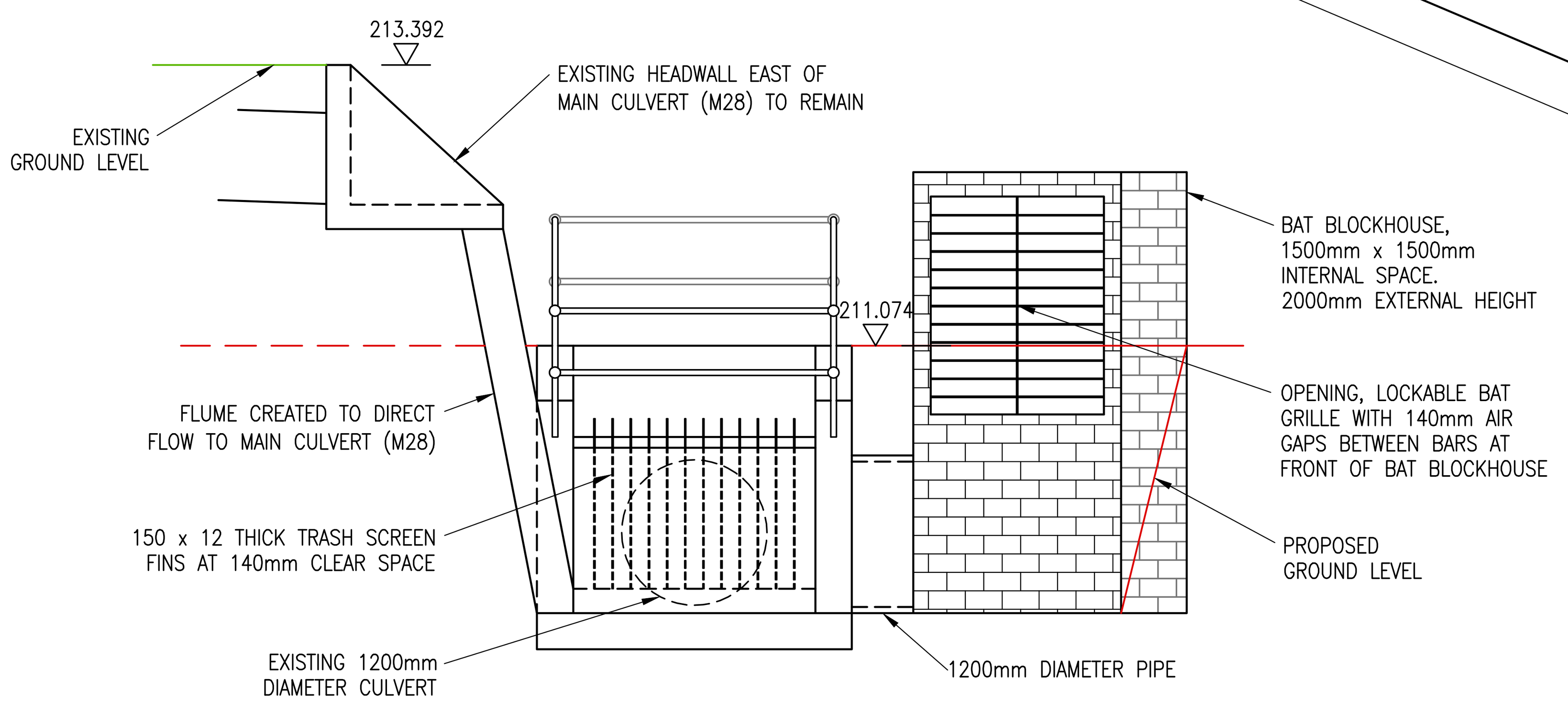
SECTION C
SCALE 1:50



SECTION A
SCALE 1:100



DETAIL D
SCALE 1:50



SECTION B
SCALE 1:50

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made to the design hazard log).

Construction	BATS POTENTIALLY ROOST IN CULVERT
Maintenance/Cleaning	BATS POTENTIALLY ROOST IN CULVERT
Use	BATS POTENTIALLY ROOST IN CULVERT
Decommissioning/Demolition	BATS POTENTIALLY ROOST IN CULVERT

Notes:

1. This drawing represents a preliminary design only for the purpose of illustrating the structural form and design intent. Confirmation of design including the key member sizes and foundation type is subject to detailed design and the results of the final geotechnical investigation.
2. All dimensions are in millimetres unless noted otherwise.
3. All levels are in metres relative to ordinance datum.
4. The positions of services shown are approximate.
5. Maintenance access routes and details will be agreed with SWTRA in the detailed design stage.

Rev	Description	By	Date	Chk'd	Auth
P1	ISSUE FOR ENVIRONMENTAL STATEMENT	RO	MAY '13	JN	DO

Llywodraeth Cymru
Welsh Government

ATKINS Halcrow RPS

COSTAIN

A465 Heads of the Valleys
Section 2: Gilwern - Brynmawr

Purpose of Issue
ISSUE FOR ENVIRONMENTAL STATEMENT

Title
Figure 13 n
Design of Culvert Modifications
M28: ROCK & FOUNTAIN (CLYDACH) CULVERT
GENERAL ARRANGEMENT

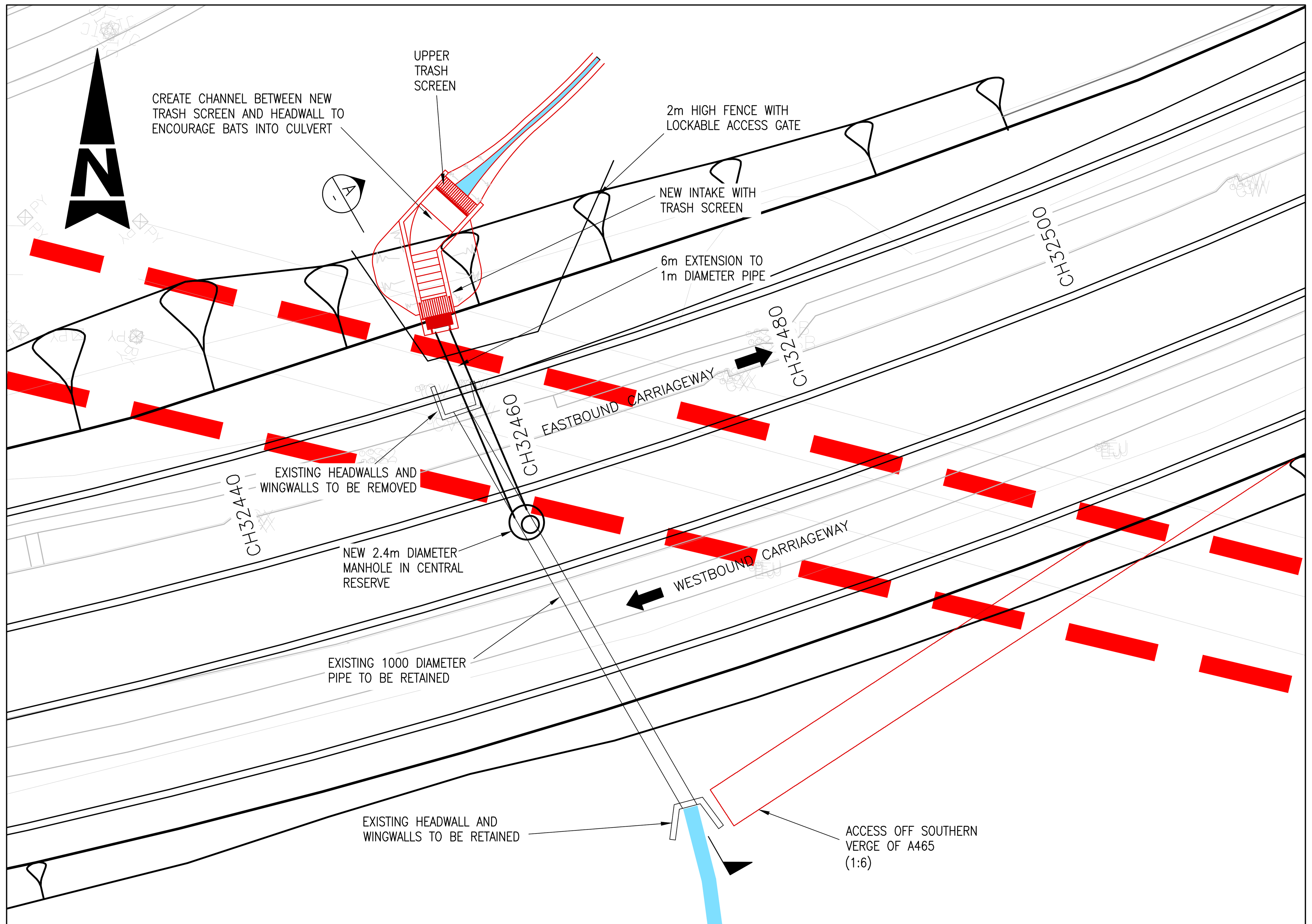
Original Scale	Designed/Drawn	Checked	Authorised
As Shown	RO, Date MAY '13	JN, Date MAY '13	DO, Date MAY '13

Status	Drawing Number	Rev
S4	A465HOV2-DJV-0717-M28-DR-001	P1

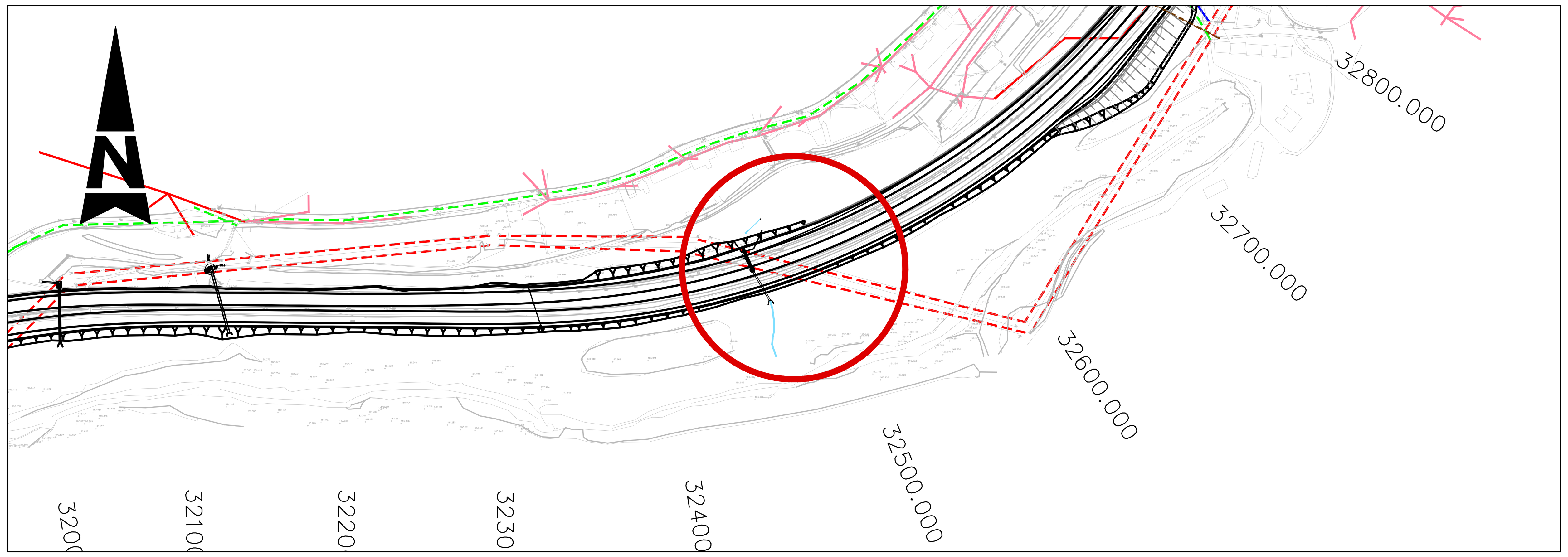
Rev P7
Drawing Number A465HOV2-DJV-0717-M29-DR-001
Suitability

DO NOT SCALE

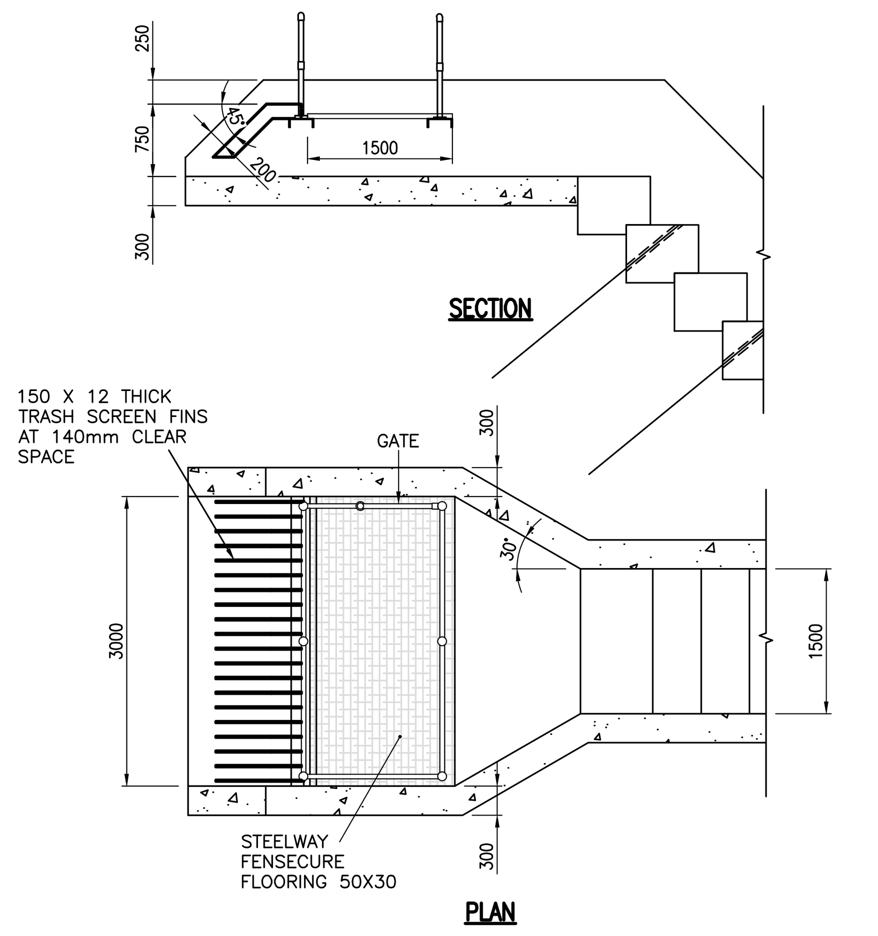
A1



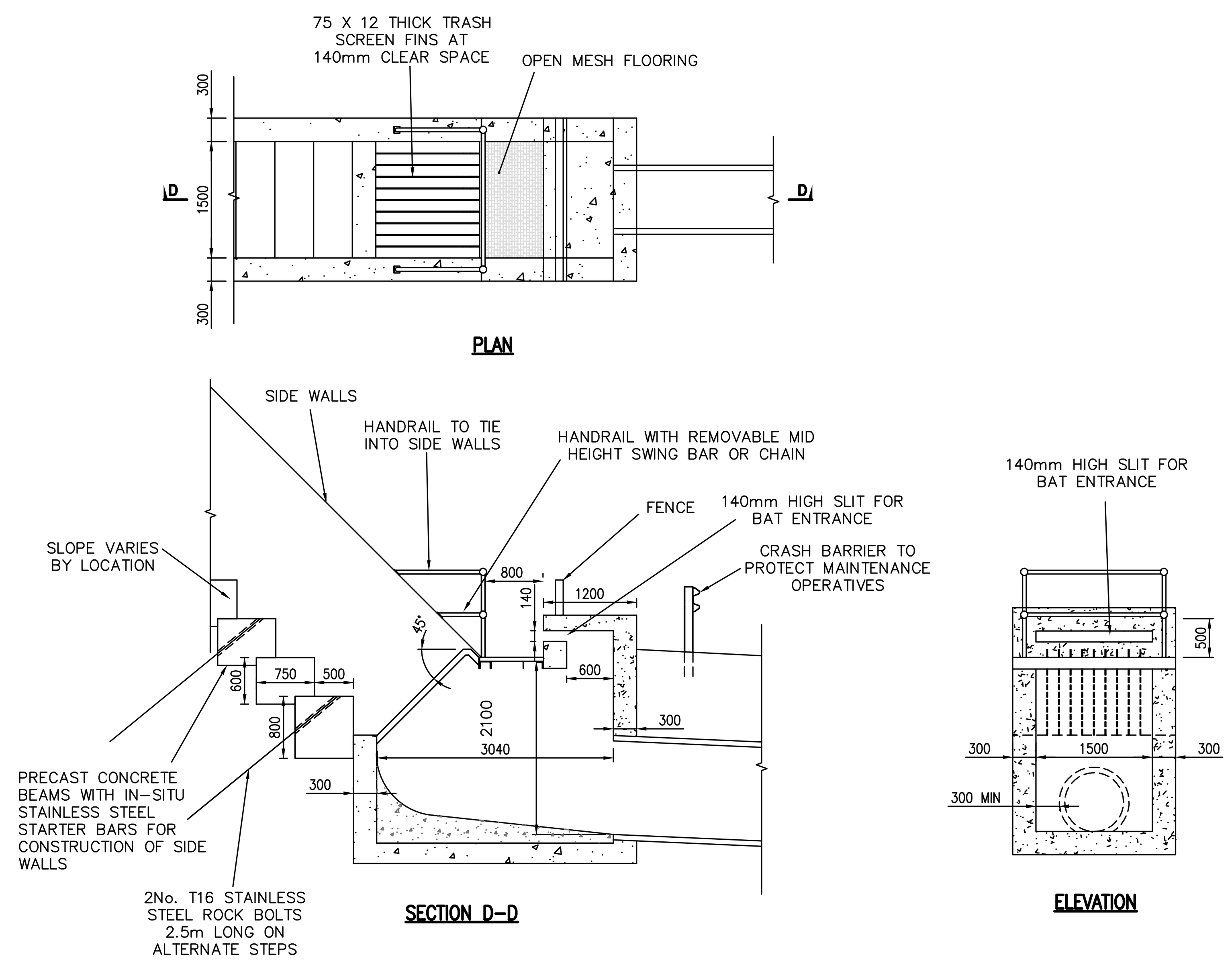
PLAN
SCALE 1:250



LOCATION PLAN
SCALE 1:2500



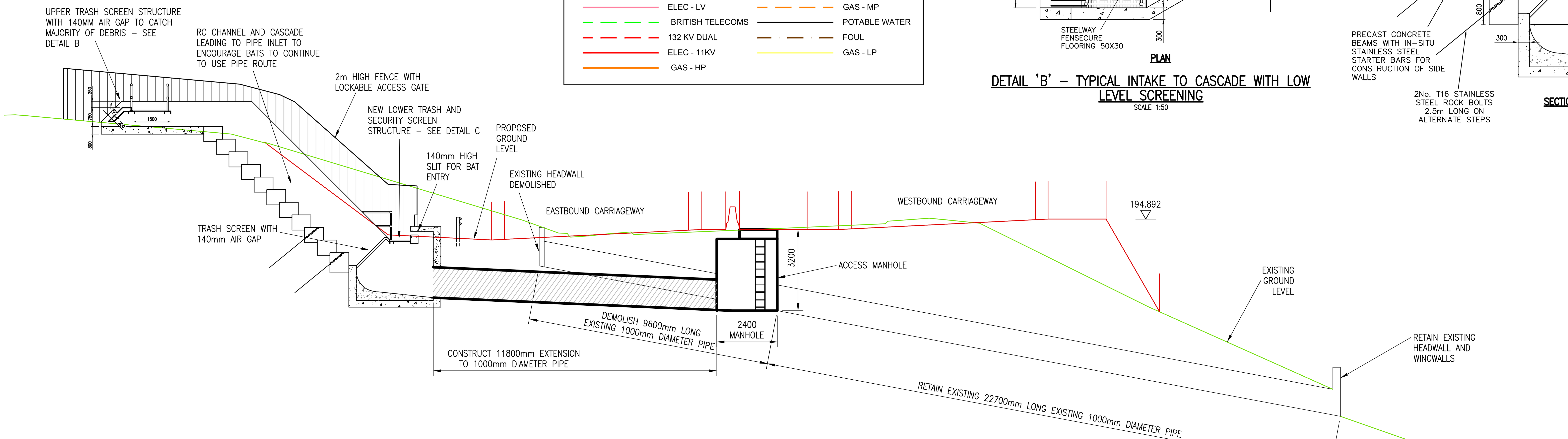
DETAIL 'B' – TYPICAL INTAKE TO CASCADE WITH LOW LEVEL SCREENING
SCALE 1:50



DETAIL 'C' CASCADE SUMP AND TRASH/SECURITY SCREEN
SCALE 1:50

SERVICES - KEY

ELEC - LV	GAS - MP
BRITISH TELECOMS	POTABLE WATER
132 KV DUAL	FOUL
ELEC - 11KV	GAS - LP
GAS - HP	



SECTION A
SCALE 1:100

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made to the design hazard log).

Construction

BATS POTENTIALLY ROOST IN CULVERT

Maintenance/Cleaning

BATS POTENTIALLY ROOST IN CULVERT

Use

PUBLIC ACCESS PREVENTED BY USE OF 2m HIGH FENCE WITH LOCKABLE ACCESS GATE, BATS POTENTIALLY ROOST IN CULVERT

Decommissioning/Demolition

BATS POTENTIALLY ROOST IN CULVERT

Notes:

1. This drawing represents a preliminary design only for the purpose of illustrating the structural form and design intent. Confirmation of design including the key member sizes and foundation type is subject to detailed design and the results of the final geotechnical investigation.
2. All dimensions are in millimetres unless noted otherwise
3. All levels are in metres relative to ordinance datum .
4. The positions of services shown are approximate.
5. Maintenance access routes and details will be agreed with SWTRA in the detailed design stage

Rev	Description	By	Date	Chk'd	Auth
P7	ISSUE FOR ENVIRONMENTAL STATEMENT	RO	MAY '13	JN	DO
P6	CULVERT AMENDED TO SURVEY POINTS	RO	MAR '13	JN	DO
P5	FOR REVIEW AND COMMENT	JN	OCT '12	RW	DO
P4	WORK IN PROGRESS	JN	AUG '12	RW	DO
P3	WORK IN PROGRESS	JN	AUG '12	DO	DO
P2	FOR REVIEW AND COMMENT	JN	JUN '12	JS	DO
P1	FOR INFORMATION	JN	JUN '12	JS	DO

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Welsh Government

ATKINS Halcrow RPS

COSTAIN

A465 Heads of the Valleys
Section 2: Gilwern - Brynmawr

Purpose of Issue
ISSUE FOR ENVIRONMENTAL STATEMENT

Title
Figure 13 o
Design of Culvert Modifications

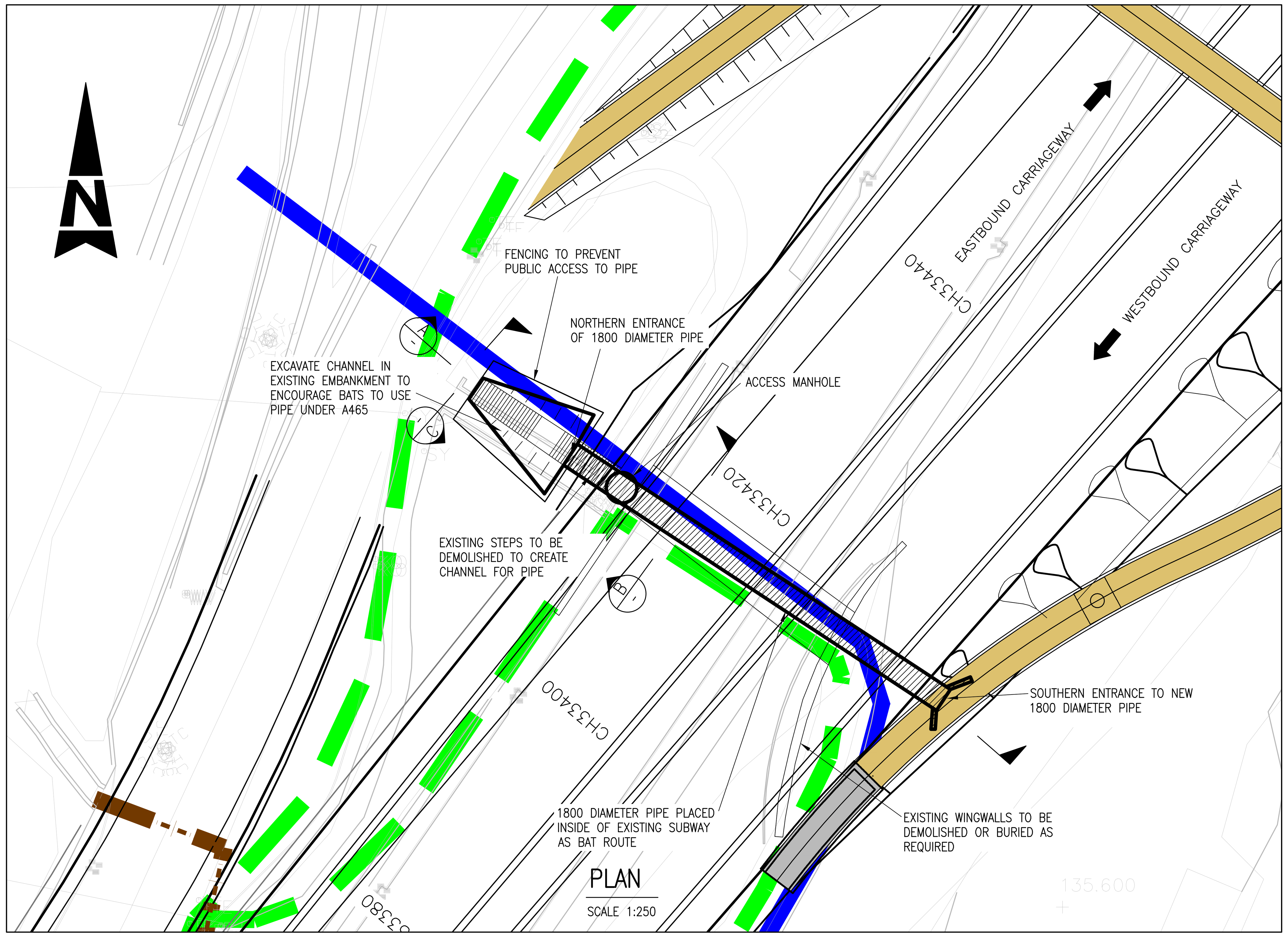
M29 - CHELTENHAM BAT CULVERT
GENERAL ARRANGEMENT

Original Scale	Designed/Drawn	Checked	Authorised
As Shown	JN	JS	DO
	Date JUNE '12	Date JUNE '12	Date JUNE '12

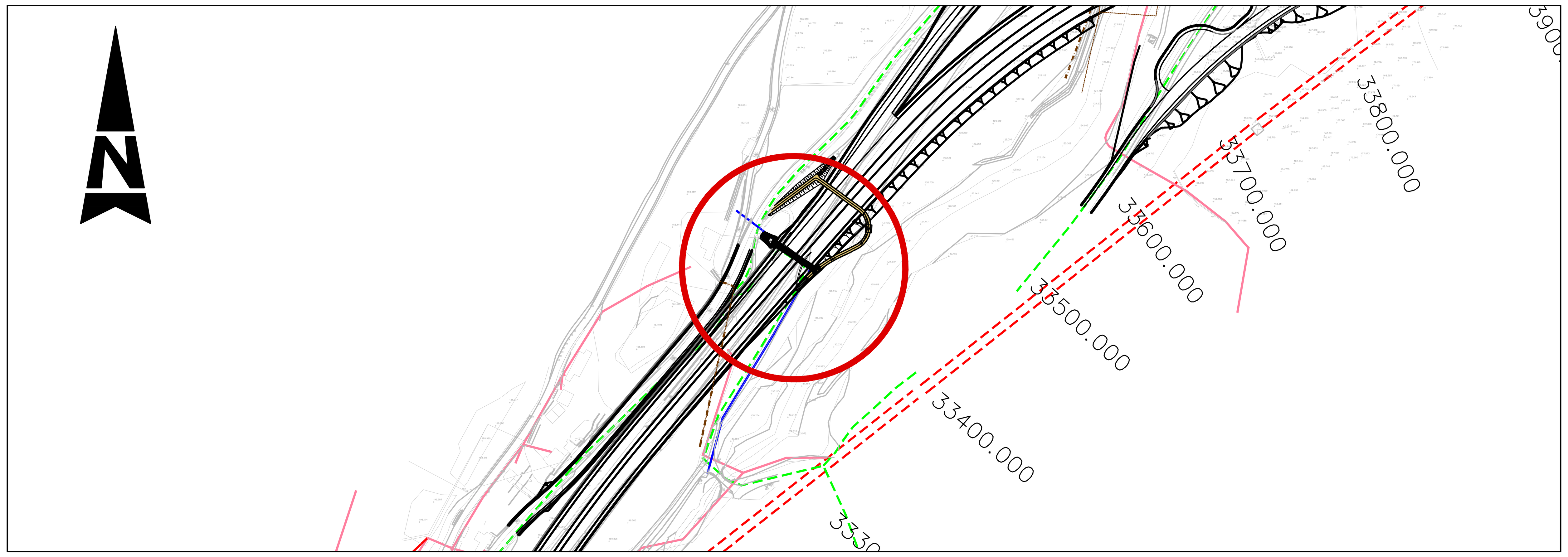
Status	Drawing Number	Rev
S4	A465HOV2-DJV-0717-M29-DR-001	P7

File: Bridge Master - bat culverts - all.dwg
Date: May 15, 2013 - 8:17pm Plotted by: oate1424

P:\GBEMB\HandT\Tsol\AR JV-Projects\5104461_A465 Section 2 ECI_GILB3264\07 Technical (Eng)\17 Structures\11 Bridges\Bat Crossings\CABridge Master - bat culverts - all.dwg



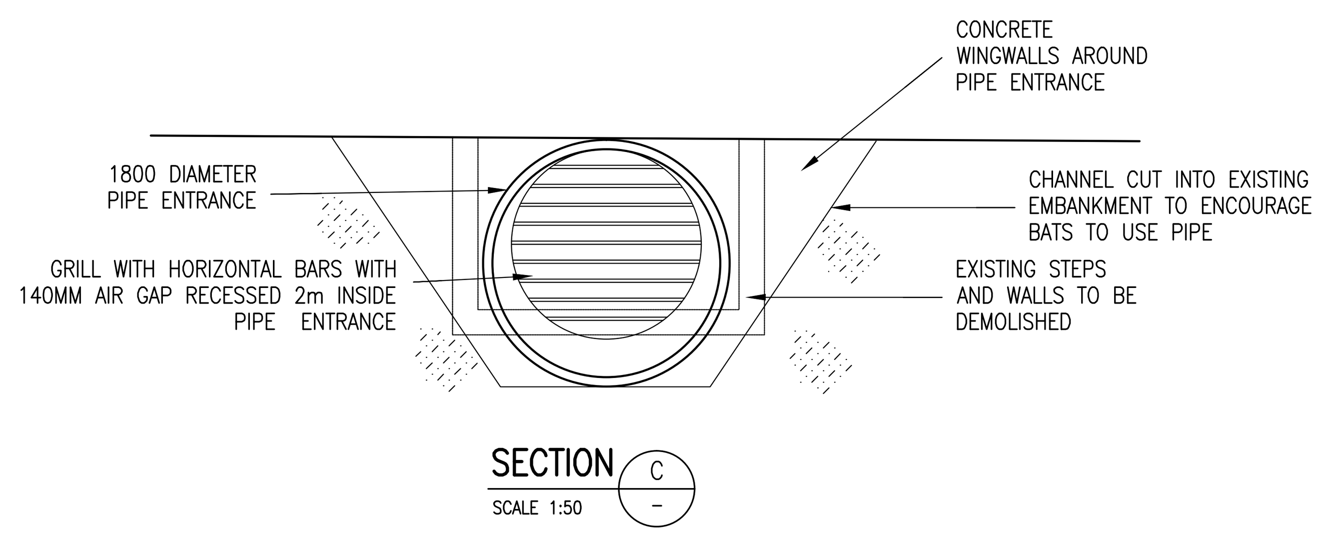
PLAN
SCALE 1:250



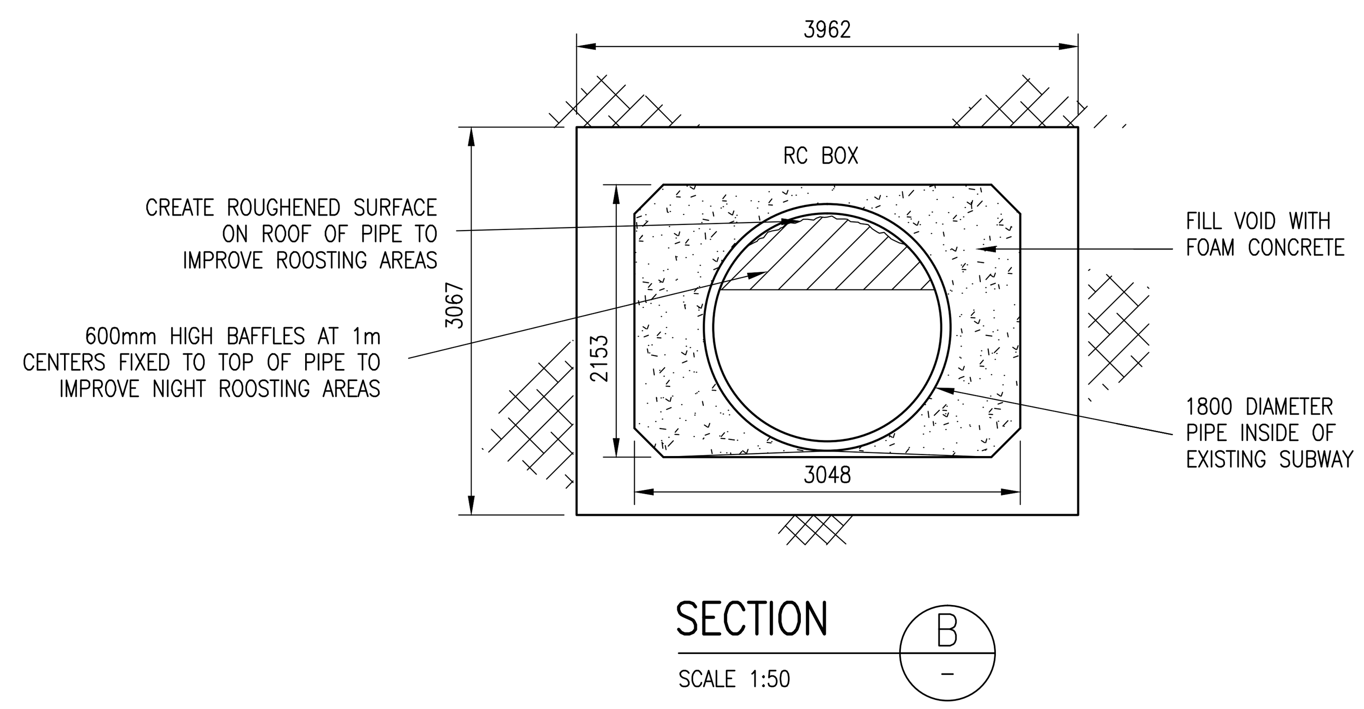
LOCATION PLAN
SCALE 1:2500

SERVICES - KEY

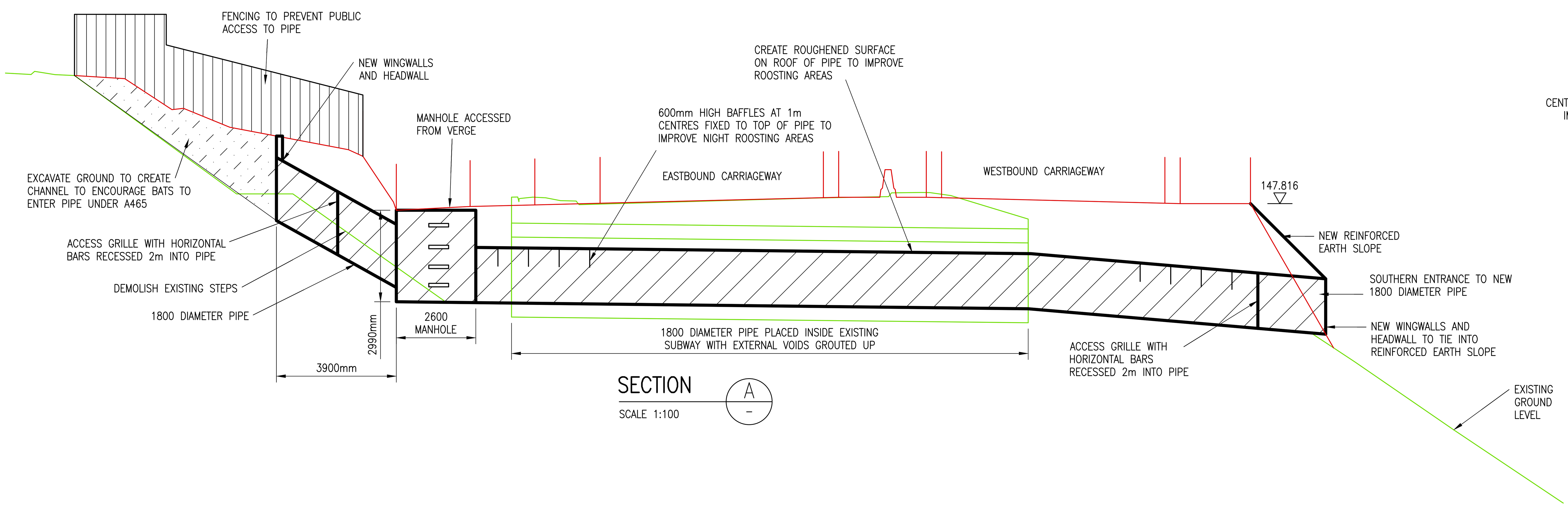
- ELEC - LV
- BRITISH TELECOMS
- 132 KV DUAL
- ELEC - 11KV
- GAS - HP
- GAS - MP
- POTABLE WATER
- FOUL
- GAS - LP



SECTION C
SCALE 1:50



SECTION B
SCALE 1:50



SECTION A
SCALE 1:100

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made to the design hazard log).

Construction

GRATING BARS TO BE INSTALLED GRADUALLY DURING CONSTRUCTION PROCESS SO BATS CAN GET USED TO CONTINUING TO USE ROUTE WITH GRATING PRESENT.
BATS POTENTIALLY ROOST IN PIPE

Maintenance/Cleaning

MAINTENANCE AND INSPECTIONS TO BE UNDERTAKEN FROM NORTHEN END THROUGH MANHOLE CHAMBER IN VERGE. PIPE DESIGNATED CONFINED SPACE AND ACCESS WILL BE DURING BAT FREE PERIODS IN AGREEMENT WITH AN ECOLOGIST.
BATS POTENTIALLY ROOST IN PIPE

Use

GRATINGS TO PREVENT PUBLIC ACCESS TO PIPE. BATS POTENTIALLY ROOST IN PIPE

Decommissioning/Demolition

BATS POTENTIALLY ROOST IN PIPE

Notes:

1. This drawing represents a preliminary design only for the purpose of illustrating the structural form and design intent. Confirmation of design including the key member sizes and foundation type is subject to detailed design and the results of the final geotechnical investigation.
2. All dimensions are in millimetres unless noted otherwise
3. All levels are in metres relative to ordinance datum.
4. The positions of services shown are approximate.
5. Maintenance access routes and details will be agreed with SWTRA in the detailed design stage

Rev	Description	By	Date	Chk'd	Auth
P8	ISSUE FOR ENVIRONMENTAL STATEMENT	RO	MAY '13	JN	DO
P7	ALIGNMENT AMENDED	RO	MAR '13	JN	DO
P6	"GRATING2 CHANGED TO "GRILLE"	JN	JAN '13	RW	DO
P5	FOR REVIEW AND COMMENT	JN	OCT '12	RW	DO
P4	WORK IN PROGRESS	JN	AUG '12	RW	DO
P3	WORK IN PROGRESS	JN	AUG '12	DO	DO
P2	FOR REVIEW AND COMMENT	JN	JUN '12	JS	DO
P1	FOR INFORMATION	JN	JUN '12	JS	DO

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Welsh Government

ATKINS Halcrow RPS

COSTAIN

A465 Heads of the Valleys
Section 2: Gilwern - Brynmawr

Purpose of Issue: ISSUE FOR ENVIRONMENTAL STATEMENT

Title: **Figure 13 p**
Design of Culvert Modifications

M33: PANT GLASS SUBWAY BAT ROUTE
GENERAL ARRANGEMENT

Original Scale	Designed/Drawn	Checked	Authorised
As Shown	JN, Date JUNE '12	JS, Date JUNE '12	DO, Date JUNE '12

Status	Drawing Number	Rev
S4	A465HOV2-DJV-0717-M33-DR-001	P8

Rev P8
Drawing Number A465HOV2-DJV-0717-M33-DR-001
Suitability

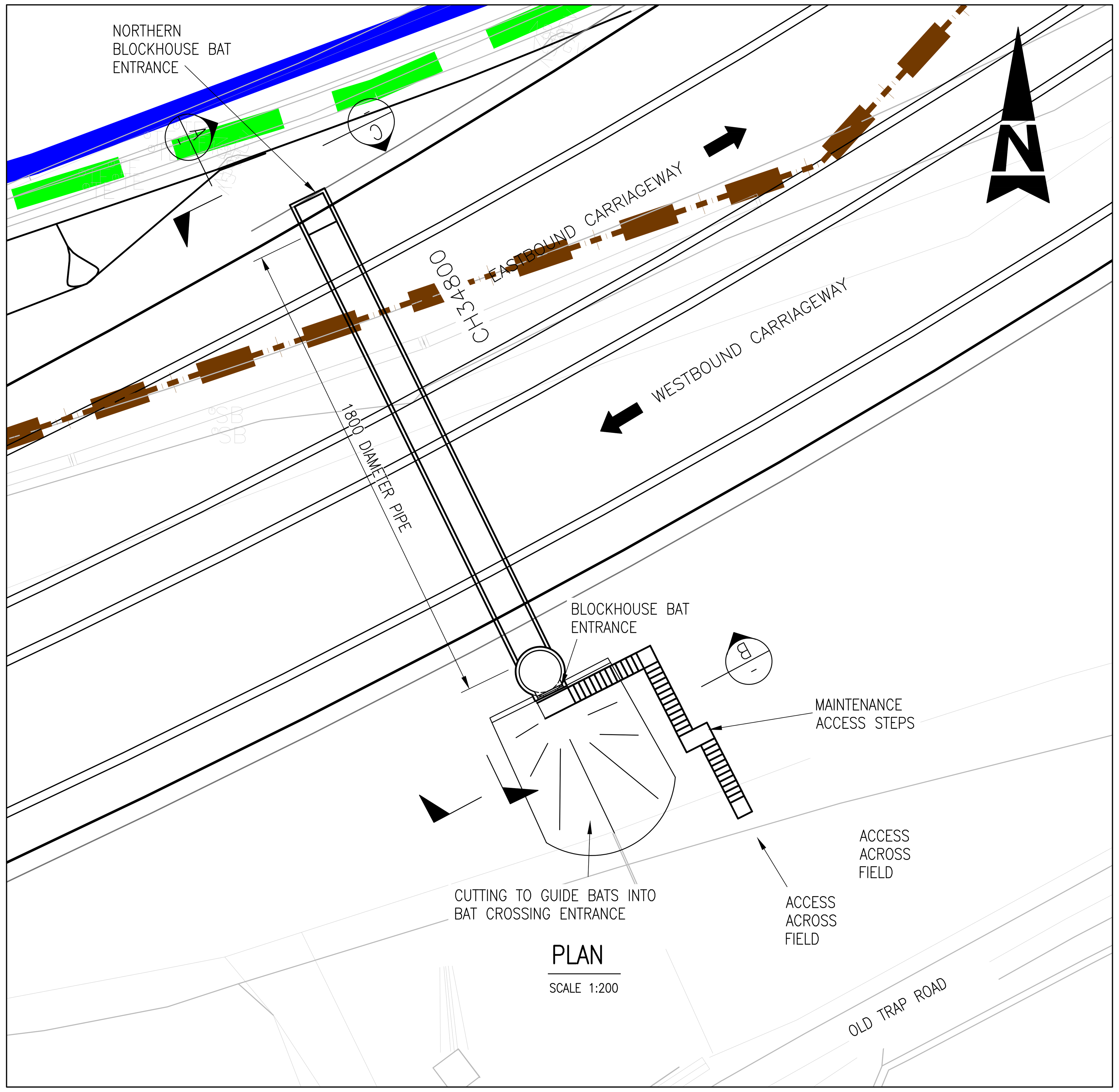
DO NOT SCALE

100 10 0

A1

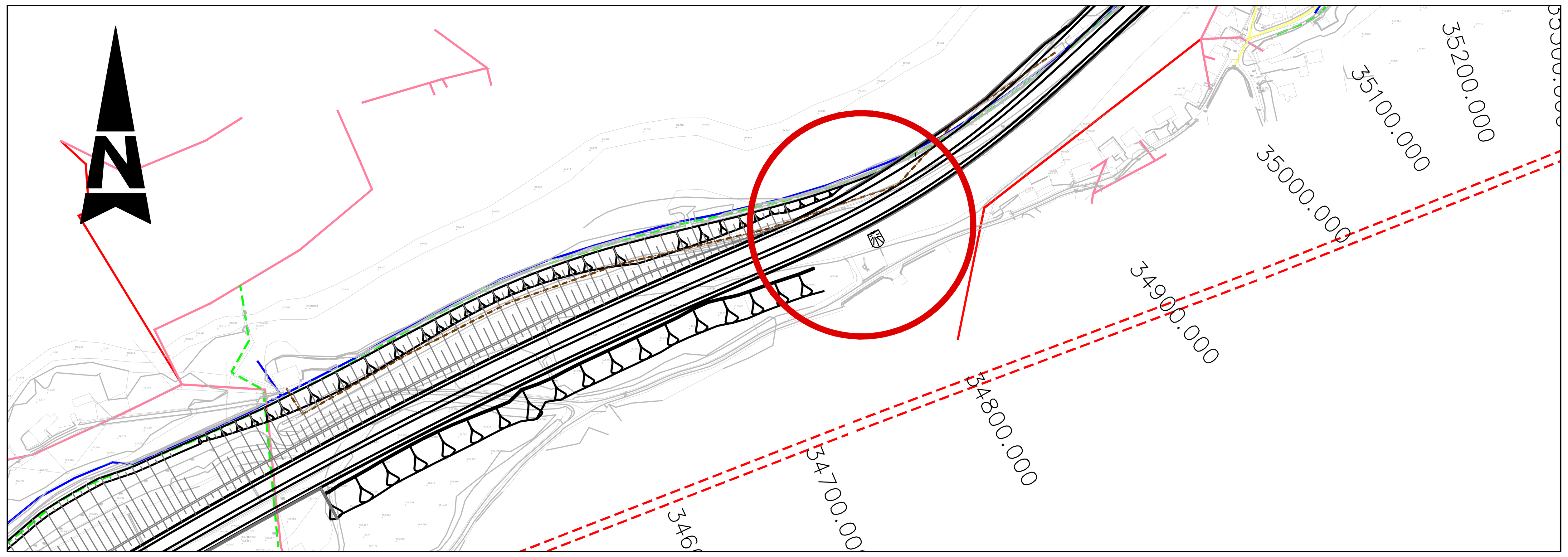
File: Bridge Master - bat culverts - all.dwg
Date: May 15, 2013 - 8:22pm Plotted by: oate1424

P:\GBEMB\HandT\Tsol\AR JV-Projects\5104461_A465 Section 2 ECI_GILB3264\07 Technical (Eng)\17 Structures\11 Bridges\Bat Crossings\CABridge Master - bat culverts - all.dwg



PLAN

SCALE 1:200

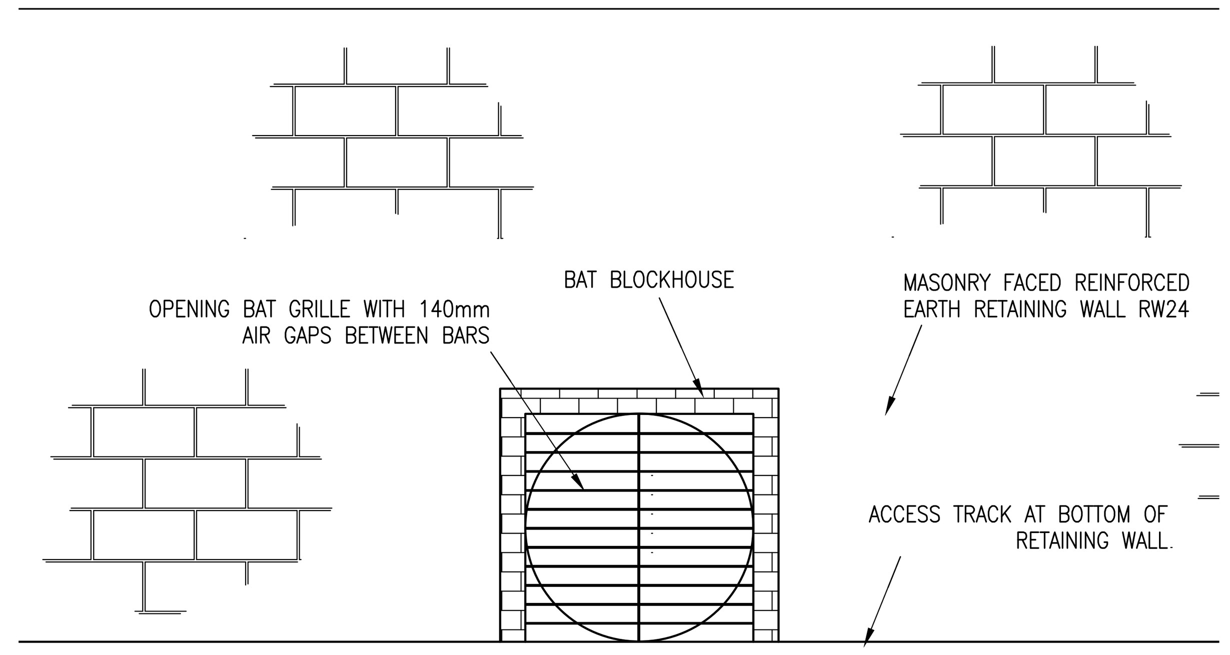


LOCATION PLAN

SCALE 1:2500

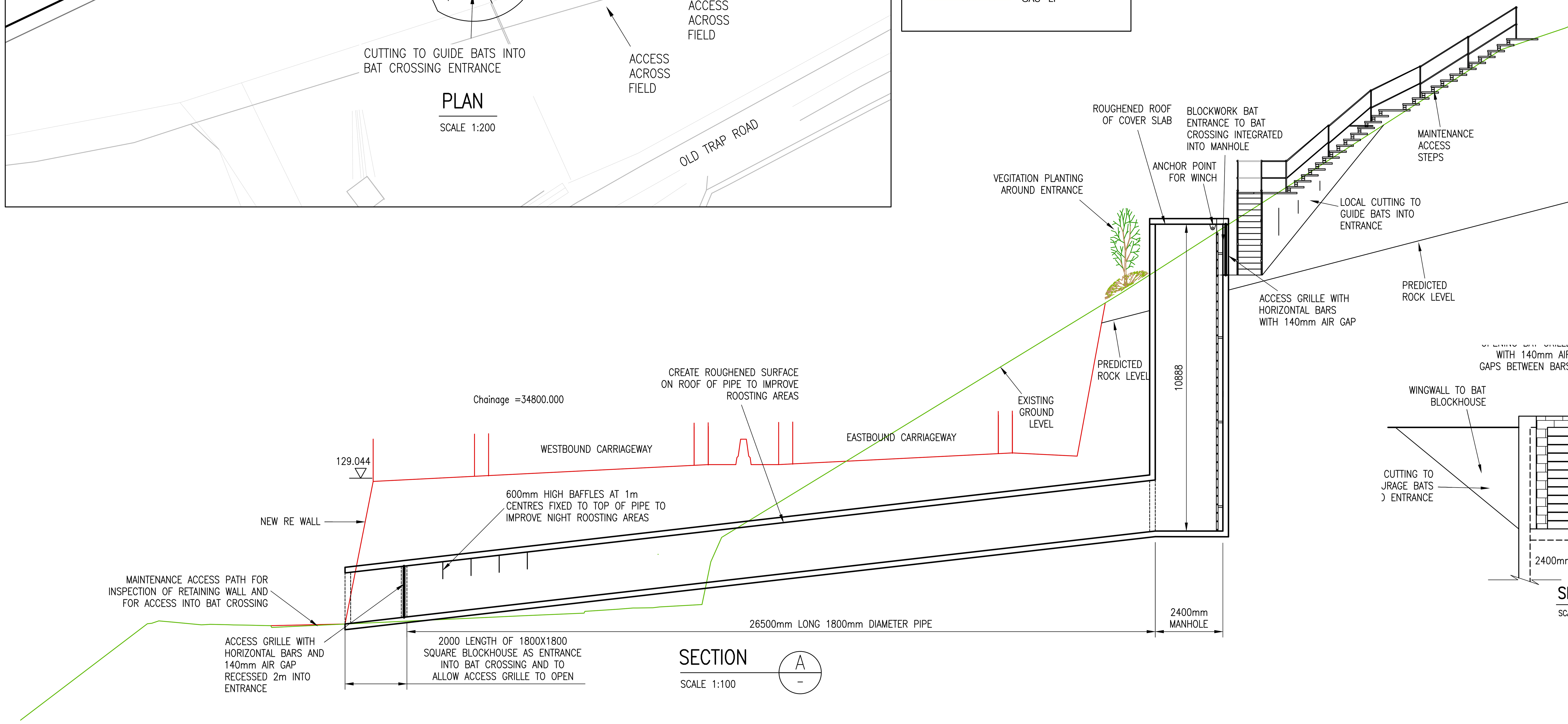
SERVICES - KEY

- ELEC - LV
- BRITISH TELECOMS
- 132 KV DUAL
- ELEC - 11KV
- GAS - HP
- GAS - MP
- POTABLE WATER
- FOUL
- GAS - LP



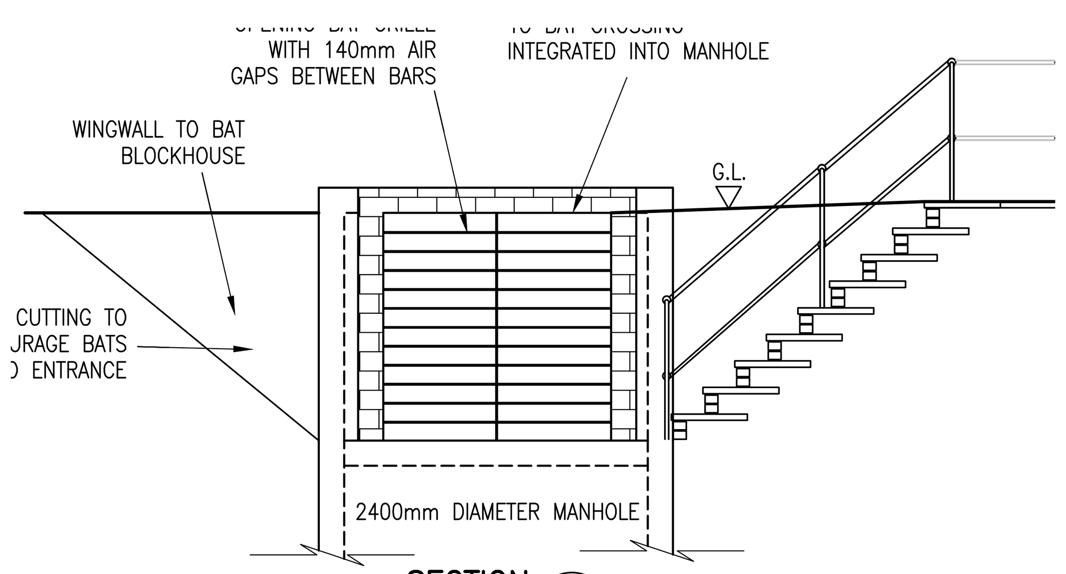
SECTION C

SCALE 1:50



SECTION A

SCALE 1:100



SECTION B

SCALE 1:50

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made to the design hazard log).

Construction

GRATING BARS TO BE INSTALLED GRADUALLY DURING CONSTRUCTION PROCESS SO BATS CAN GET USED TO CONTINUING TO USE ROUTE WITH GRATING PRESENT. BATS POTENTIALLY ROOST IN PIPES.

Maintenance/Cleaning

ANY MAINTENANCE AND INSPECTIONS UNDERTAKEN FROM SOUTHERN END THROUGH MANHOLE CHAMBER IN VERGE WILL REQUIRE WINCHED ACCESS. PIPE DESIGNATED CONFINED SPACE. ACCESS DURING BAT FREE PERIODS IN AGREEMENT WITH AN ECOLOGIST. BATS POTENTIALLY ROOST IN PIPES.

Use

LOCKABLE ACCESS GRILLES TO PREVENT PUBLIC ACCESS TO PIPE.
BATS POTENTIALLY ROOST IN PIPES.

Decommissioning/Demolition

BATS POTENTIALLY ROOST IN PIPES.

Notes:

1. This drawing represents a preliminary design only for the purpose of illustrating the structural form and design intent. Confirmation of design including the key member sizes and foundation type is subject to detailed design and the results of the final geotechnical investigation.
2. All dimensions are in millimetres unless noted otherwise
3. All levels are in metres relative to ordinance datum.
4. The positions of services shown are approximate.
5. Maintenance access routes and details will be agreed with SWTRA in the detailed design stage.

Rev	Description	By	Date	Chk'd	Auth
P3	ISSUE FOR ENVIRONMENTAL STATEMENT	RO	MAY '13	JN	DO
P2	SOUTHERN BAT ENTRANCE AMENDED	RO	MAY '13	JN	DO
P1	FOR INFORMATION	RO	APR '13	JN	DO

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COSTAIN

A465 Heads of the Valleys
Section 2: Gilwern - Brynmawr

Purpose of Issue

ISSUE FOR
ENVIRONMENTAL STATEMENT

Title

Figure 13 q
Design of Culvert Modifications

S18: BRUNANT BAT CROSSING
GENERAL ARRANGEMENT

Original Scale	Designed/Drawn	Checked	Authorised
As Shown	RO, Date APR '13	JN, Date APR '13	DO, Date APR '13

Status	Drawing Number	Rev
S4	A465HOV2-DJV-0717-S18-DR-001	P3

Rev P3
Drawing Number A465HOV2-DJV-0717-S18-DR-001
Suitability

DO NOT SCALE

100 10 0

A1

File: Bridge Master - bat culverts - all.dwg
Date: May 15, 2013 - 8:29pm Plotted by: oate1424

P:\GBEMB\HandT\Tsol\AR JV-Projects\5104461_A465 Section 2 ECI_GILB3264\07 Technical (Eng)\17 Structures\11 Bridges\Bat Crossings\CABridge Master - bat culverts - all.dwg

Figure 14: Otter mitigation measures

Rev P2
Drawing Number A465HOV2-RPS-xxxx-XX-xx-000
Suitability S4

DO NOT SCALE

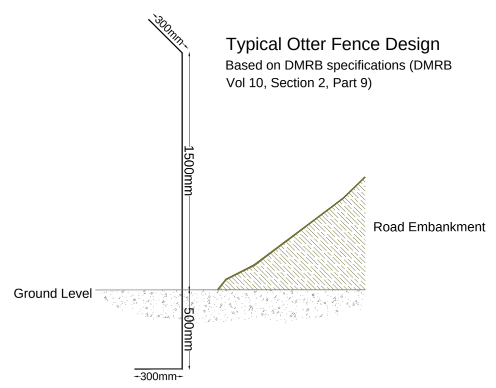
A1

Retaining Wall

Otter Fencing
ties into retaining walls where these will prevent otter access

Safe Otter Crossing
incorporated into Scheme water crossing

Other Ecological Fencing



Typical Otter Fence Design
Based on DMRB specifications (DMRB Vol 10, Section 2, Part 9)

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made to the design hazard log).

Construction
(Enter 'None' if applicable)
Maintenance/Cleaning
(Enter 'None' if applicable)
Use
(Enter 'None' if applicable)
Decommissioning/Demolition
(Enter 'None' if applicable)

NOTES
Environmental Functions as follows unless otherwise noted on the drawings:-
All native planting (LE 2.1, 2.3, 2.4, 2.5) to be EFA/ EFB/ EFD.
All rock and scree (LE 1.4) to be EFE.
All potential Environmental Barriers (E 1.2) to be EFG.
All Reinforced Earth Walls (LE 7.7) to be EFB.
All Marsh and Wet Grassland (LE 6.4) to be EFD.
All potential bat mitigation areas (E 3.2) to be EFD
Potential environmental barrier locations subject to further modelling and review. Locations shown are indicative only.
All potential ecological fencing is draft only and subject to review following further survey.
For sections refer to Drawing Nos: A465/HOV2/RPS/0811/XX/DR/006 - 009

SHEET LAYOUT
1 2 3 4 5

Rev	Description	By	Date	Chk'd	Auth
P2	update fence alignments	MP	25/06/13		
P1	update fence alignments	MP	14/06/13		

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Welsh Government

ATKINS Halcrow A CH2M HILL COMPANY RPS
COSTAIN

A465 Heads of the Valleys
Section 2: Gilwern - Brynmawr

Purpose of Issue

Title
Figure 14a
Location of Otter fencing and design of improvements to Otter crossings
Sheet 1 of 5

Original Scale	Designed/Drawn	Checked	Authorised
1:2500 @ A1	MP	-	-
	Date Aug 2013	Date -	Date -

Status	Drawing Number	Rev
S4	A465HOV2-RPS-xxxx-XX-xx-000	P2

File: 7400-0201-07.dwg
Date: Sep 19, 2013 - 3:57pm Plotted by: pearsonm

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Rev P2

Drawing Number A465HOV2-RPS-xxxx-XX-xx-000

Suitability S4

DO NOT SCALE

A1

Date: Sep 19, 2013 - 3:57pm Plotted by: pearsonm

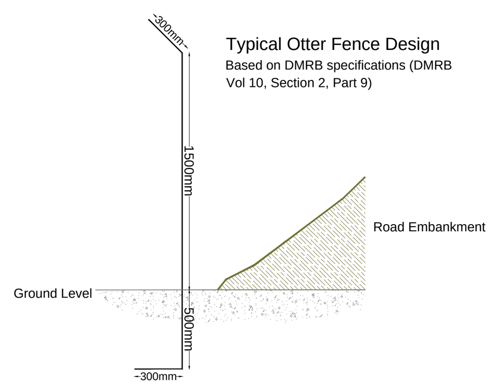
File: 7400-0201-07.dwg

Retaining Wall

Otter Fencing
ties into retaining walls where these will prevent otter access

Safe Otter Crossing
incorporated into Scheme water crossing

Other Ecological Fencing



Typical Otter Fence Design
Based on DMRB specifications (DMRB Vol 10, Section 2, Part 9)

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made to the design hazard log).

Construction
(Enter 'None' if applicable)

Maintenance/Cleaning
(Enter 'None' if applicable)

Use
(Enter 'None' if applicable)

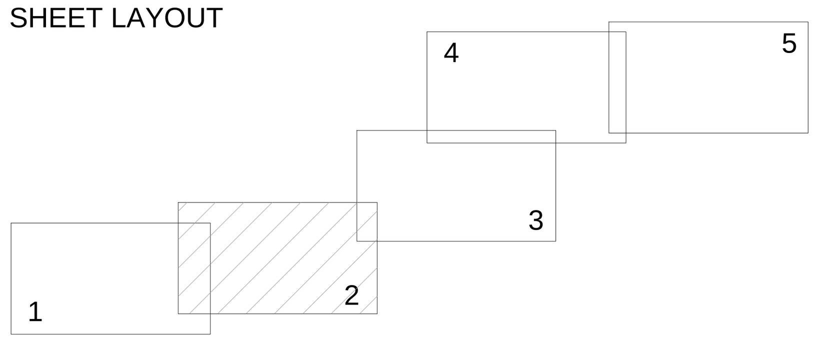
Decommissioning/Demolition
(Enter 'None' if applicable)

NOTES

Environmental Functions as follows unless otherwise noted on the drawings:-
All native planting (LE 2.1, 2.3, 2.4, 2.5) to be EFA/ EFB/ EFD.
All rock and scree (LE 1.4) to be EFE.
All potential Environmental Barriers (E 1.2) to be EFG.
All Reinforced Earth Walls (LE 7.7) to be EFB.
All Marsh and Wet Grassland (LE 6.4) to be EFD.
All potential bat mitigation areas (E 3.2) to be EFD
Potential environmental barrier locations subject to further modelling and review. Locations shown are indicative only.
All potential ecological fencing is draft only and subject to review following further survey.

For sections refer to Drawing Nos: A465/HOV2/RPS/0811/XX/DR/006 - 009

SHEET LAYOUT



Rev	Description	By	Date	Chk'd	Auth
P2	update fence alignments	MP	25/06/13		
P1	update fence alignments	MP	14/06/13		

Llywodraeth Cymru
Welsh Government

ATKINS Halcrow A CH2M HILL COMPANY RPS

COSTAIN

A465 Heads of the Valleys
Section 2: Gilwern - Brynmawr

Purpose of Issue

Title
Figure 14b
Location of Otter fencing and design of improvements to Otter crossings
Sheet 2 of 5

Original Scale	Designed/Drawn	Checked	Authorised
1:2500 @ A1	MP	-	-
	Date Aug 2013	Date -	Date -

Status	Drawing Number	Rev
S4	A465HOV2-RPS-xxxx-XX-xx-000	P2

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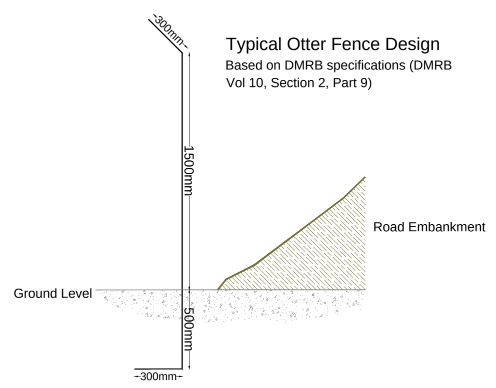
Retaining Wall

Otter Fencing
ties into retaining walls where these will prevent otter access

Safe Otter Crossing
incorporated into Scheme water crossing

Other Ecological Fencing



SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made to the design hazard log).

Construction
(Enter 'None' if applicable)
Maintenance/Cleaning
(Enter 'None' if applicable)
Use
(Enter 'None' if applicable)
Decommissioning/Demolition
(Enter 'None' if applicable)

NOTES

Environmental Functions as follows unless otherwise noted on the drawings:-
All native planting (LE 2.1, 2.3, 2.4, 2.5) to be EFA/ EFB/ EFD.
All rock and scree (LE 1.4) to be EFE.
All potential Environmental Barriers (E 1.2) to be EFG.
All Reinforced Earth Walls (LE 7.7) to be EFB.
All Marsh and Wet Grassland (LE 6.4) to be EFD.
All potential bat mitigation areas (E 3.2) to be EFD
Potential environmental barrier locations subject to further modelling and review. Locations shown are indicative only.
All potential ecological fencing is draft only and subject to review following further survey.

For sections refer to Drawing Nos: A465/HOV2/RPS/0811/XX/DR/006 - 009

SHEET LAYOUT

1 2 3 4 5

Rev	Description	By	Date	Chk'd	Auth
P2	update fence alignments	MP	25/06/13		
P1	update fence alignments	MP	14/06/13		

Llywodraeth Cymru
Welsh Government

ATKINS Halcrow A CH2M HILL COMPANY RPS

COSTAIN

A465 Heads of the Valleys
Section 2: Gilwern - Brynmawr

Purpose of Issue

Title
Figure 14c
Location of Otter fencing and design of improvements to Otter crossings
Sheet 3 of 5

Original Scale	Designed/Drawn	Checked	Authorised
1:2500 @ A1	MP	-	-
	Date Aug 2013	Date -	Date -

Status	Drawing Number	Rev
S4	A465HOV2-RPS-xxxx-XX-xx-000	P2

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Rev P2
Drawing Number A465HOV2-RPS-xxxx-XX-xx-000
Suitability S4
DO NOT SCALE
0 10 100 200
A1
File: 7400-0201-07.dwg
Date: Sep 19, 2013 - 3:57pm Plotted by: pearsonm

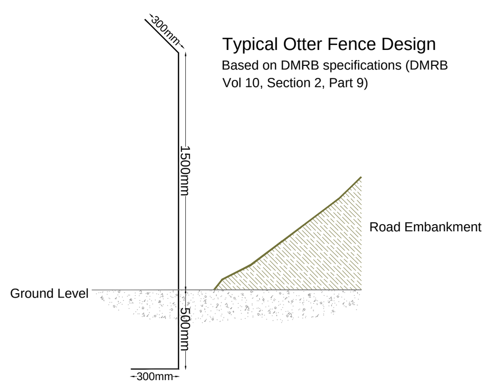
Retaining Wall

Otter Fencing
ties into retaining walls where these will prevent otter access

Safe Otter Crossing
incorporated into Scheme water crossing

Other Ecological Fencing

Typical Otter Fence Design
Based on DMRB specifications (DMRB Vol 10, Section 2, Part 9)



SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made to the design hazard log).

Construction
(Enter 'None' if applicable)
Maintenance/Cleaning
(Enter 'None' if applicable)
Use
(Enter 'None' if applicable)
Decommissioning/Demolition
(Enter 'None' if applicable)

NOTES
Environmental Functions as follows unless otherwise noted on the drawings:-
All native planting (LE 2.1, 2.3, 2.4, 2.5) to be EFA/ EFB/ EFD.
All rock and scree (LE 1.4) to be EFE.
All potential Environmental Barriers (E 1.2) to be EFG.
All Reinforced Earth Walls (LE 7.7) to be EFB.
All Marsh and Wet Grassland (LE 6.4) to be EFD.
All potential bat mitigation areas (E 3.2) to be EFD
Potential environmental barrier locations subject to further modelling and review. Locations shown are indicative only.
All potential ecological fencing is draft only and subject to review following further survey.

For sections refer to Drawing Nos: A465/HOV2/RPS/0811/XX/DR/006 - 009

SHEET LAYOUT

1 2 3 4 5

Rev	Description	By	Date	Chk'd	Auth
P2	update fence alignments	MP	25/06/13		
P1	update fence alignments	MP	14/06/13		

Llywodraeth Cymru
Welsh Government

ATKINS Halcrow A CH2M HILL COMPANY RPS

COSTAIN

A465 Heads of the Valleys
Section 2: Gilwern - Brynmawr

Purpose of Issue

Title
Figure 14d
Location of Otter fencing and design of improvements to Otter crossings
Sheet 4 of 5

Original Scale	Designed/Drawn	Checked	Authorised
1:2500 @ A1	MP	-	-
	Date Aug 2013	Date -	Date -

Status	Drawing Number	Rev
S4	A465HOV2-RPS-xxxx-XX-xx-000	P2

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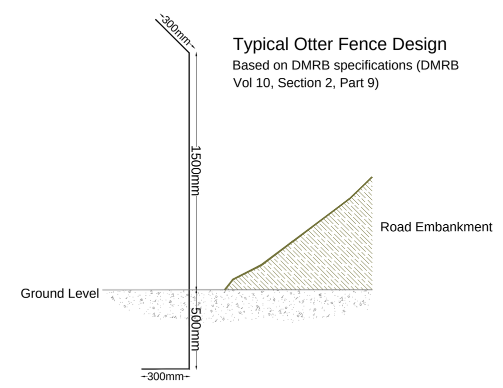
Rev P2
Drawing Number A465HOV2-RPS-xxxx-XX-xx-000
Suitability S4
DO NOT SCALE
0 10 100 200
A1
File: 7400-0201-07.dwg
Date: Sep 19, 2013 - 3:57pm Plotted by: pearsonm

- Retaining Wall
- Otter Fencing ties into retaining walls where these will prevent otter access
- Safe Otter Crossing incorporated into Scheme water crossing
- Other Ecological Fencing



SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

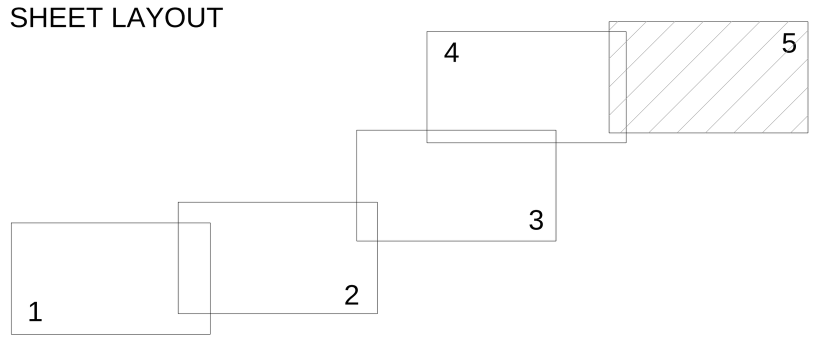
In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made to the design hazard log).

Construction
(Enter 'None' if applicable)
Maintenance/Cleaning
(Enter 'None' if applicable)
Use
(Enter 'None' if applicable)
Decommissioning/Demolition
(Enter 'None' if applicable)

NOTES

Environmental Functions as follows unless otherwise noted on the drawings:-
All native planting (LE 2.1, 2.3, 2.4, 2.5) to be EFA/ EFB/ EFD.
All rock and scree (LE 1.4) to be EFE.
All potential Environmental Barriers (E 1.2) to be EFG.
All Reinforced Earth Walls (LE 7.7) to be EFB.
All Marsh and Wet Grassland (LE 6.4) to be EFD.
All potential bat mitigation areas (E 3.2) to be EFD
Potential environmental barrier locations subject to further modelling and review. Locations shown are indicative only.
All potential ecological fencing is draft only and subject to review following further survey.
For sections refer to Drawing Nos: A465/HOV2/RPS/0811/XX/DR/006 - 009

SHEET LAYOUT



Rev	Description	By	Date	Chk'd	Auth
P2	update fence alignments	MP	25/06/13		
P1	update fence alignments	MP	14/06/13		

Llywodraeth Cymru
Welsh Government

ATKINS Halcrow A CH2M HILL COMPANY RPS COSTAIN

A465 Heads of the Valleys
Section 2: Gilwern - Brynmawr

Purpose of Issue

Title
Figure 14e
Location of Otter fencing and design of improvements to Otter crossings
Sheet 5 of 5

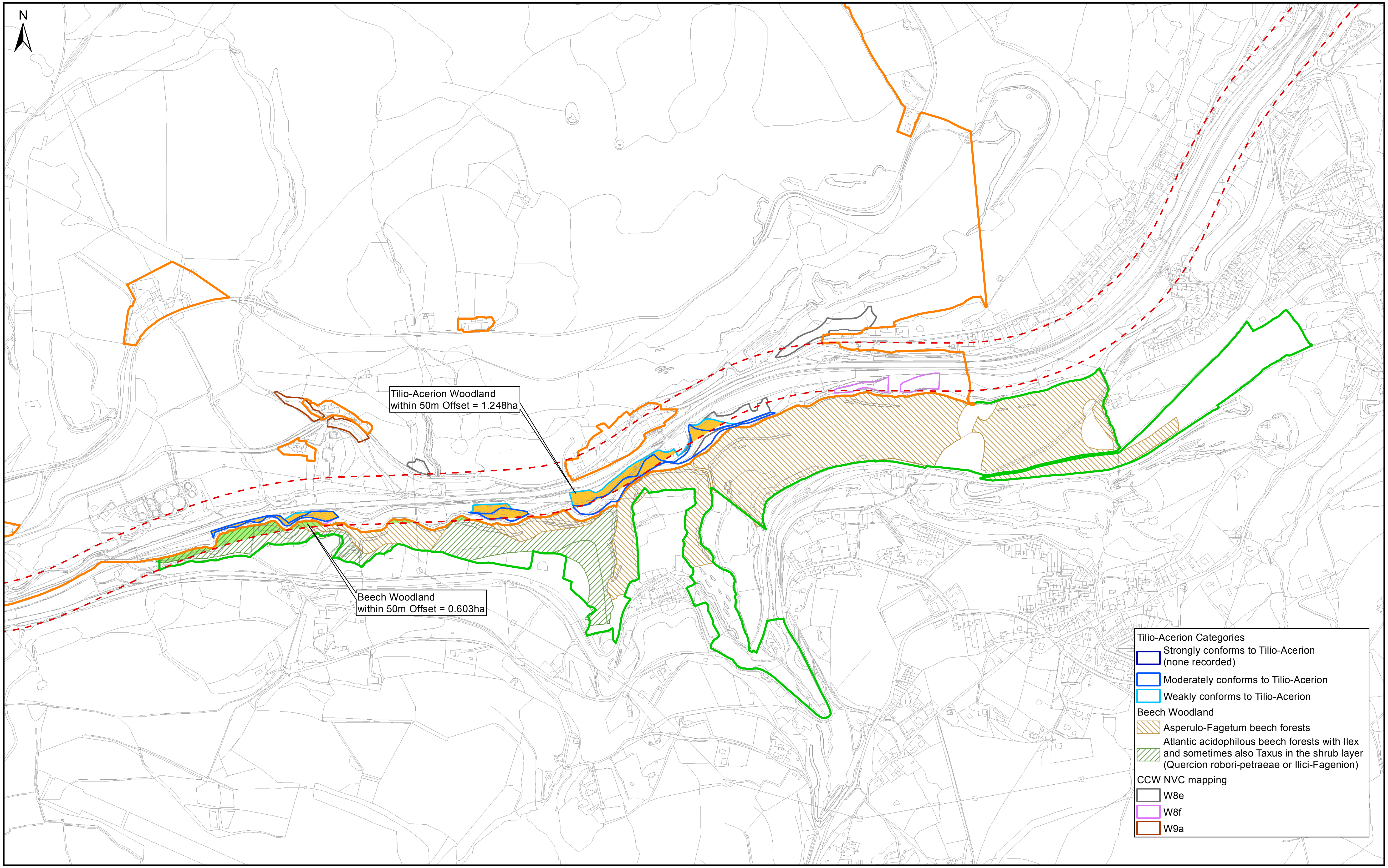
Original Scale	Designed/Drawn	Checked	Authorised
1:2500 @ A1	MP	-	-
	Date Aug 2013	Date -	Date -

Status	Drawing Number	Rev
S4	A465HOV2-RPS-xxxx-XX-xx-000	P2

O:\7400b A465 HoV Section 2 ES Coordination\Tech\Drawings\7400-0201-07.dwg

Rev P2
Drawing Number A465HOV2-RPS-xxxx-XX-xx-000
Suitability S4
DO NOT SCALE
A1
File: 7400-0201-07.dwg
Date: Sep 19, 2013 - 3:58pm Plotted by: pearsonm

Figure 15: Operational air quality effects on woodland



Rev P1

Suitability S0 | Drawing Number

DO NOT SCALE

A3

File: O:\7400b A465 HoV Section 2 ES Coordination\Tech\Drawings\7400-0265-02.mxd

Date: 05/09/2013 Plotted by: pearsonm

50m Offset
SACs
Cwm Clydach Woodlands
Usk Bat Sites
Tilio-Acerion Woodland within 50m Offset
Beech Woodland within 50m Offset

Llywodraeth Cymru
Welsh Government

ATKINS Halcrow A CH2M HILL COMPANY RPS

COSTAIN

A465 Heads of the Valleys
Section 2: Gilwern - Brynmawr

Purpose Of Issue

FINAL

Title
Zone of potential influence of changes to air quality within Usk Bat Sites SAC and Cwm Clydach Woodlands SAC

Original Scale	Designed/drawn	Checked	Authorised
1:7,500@ A3	MP	KJ	-
	Date Aug 2013	Date Aug 2013	Date -

Status	Drawing Number	Rev
S0	Figure 15	P1

Path: O:\7400b A465 HoV Section 2 ES Coordination\Tech\Drawings\7400-0265-02.mxd

8.1 Appendix A: Performance Indicators for Relevant SAC Interest Features

Usk Bat Sites SAC

Lesser Horseshoe Bat

Performance indicators for feature condition		
Attribute	**Attribute rationale and other comments**	**Specified limits**
A.1 Pre- parturition population in the maternity roost	The is the target for the number of adult bats required each year during early summer, when females gather to give birth and numbers are likely to be at their highest. The figure of 320 bats is based on the lowest number of bats at Buckland between 2000 and 2006.	On at least one occasion between 29th May and 17 th June of every year, there will be: • 320 or more bats at Buckland Coach House and 600 bats to be recorded at Buckland Coach House in at least one year during the six year monitoring cycle
A.2 Population in hibernation roost	There are a large number of hibernation sites within the SAC, and also a number outside the SAC, which all contribute towards maintaining the SAC population of Lesser Horseshoe Bats. For the performance indicators for the SAC, counts will therefore be undertaken at five key sites. Buckland Ice House, closely associated with the maternity roost, is the easiest site to count. The numbers in the performance indicators are based on maximum counts between 2000 and 2006, and have been devised using the same rationale as for the maternity site. However, there are some difficulties in timing of counts at Buckland Ice House. The site is used by large numbers of bats during relatively mild winters. In cold weather the ice house becomes unsuitable, and the bats relocate to another site not within the SAC, (Ogof Cynnes). For this reason counts for this hibernaculum will be accepted between 1st November and 28th February.	During at least one surveillance visist thbetween 1 January and 28 February of every year, there will be: • 270 or more Lesser Horseshoe Bats at Agen Allwedd cave, and 500 (this figure may need revising as 500 is close to the maximum recorded, although current trends show an increasing population) or more present at least once during the six year monitoring cycle OR 220 or more Lesser Horseshoe Bats at Agen Allwedd Cave excluding the Angel's roost section (see rationale below), AND • A total of 18 or more Lesser Horseshoe Bats at the Clydach Gorge cave sites, and 47 to be recorded at least once during the six year monitoring cycle, AND During at least one surveillance visit between 1st November and 28th February of each year, • 280 or more Lesser Horseshoe Bats at Buckland Ice House and 470 to be recorded at least once during the six year monitoring cycle AND

Performance indicators for feature condition		
Attribute	**Attribute rationale and other comments**	**Specified limits**
	Counts at cave sites are technically very difficult. Bats are often difficult to see and also frequently move hibernation site, within the cave and between caves. They may use parts of the cave inaccessible to humans. There are also specific problems at the Usk Bat Sites hibernation sites. Agen Allwedd is a large cave system with a number of passages. One section particularly favoured by bats is knownas Angel's Roost. However, it is occasionally impossible to survey this section, because bats are hibernating in the passage to it, and it cannot be reached without disturbing these bats. The Clydach Gorge sites consist of more than 10 caves, not all of which are continually used, but which collectively support a significant part of the wintering bat population. Foxwood is a drift cave with holes in the cave roof. This allows warm air in the cave to escape during the winter. As a result, bats frequently leave this site when it becomes too cold. The internal temperature when the site is surveyed is therefore critical to gaining an accurate picture of the importance of this site for Lesser Horseshoe Bats. The numbers of bats expected at each site have been calculated using the same rationale as that used for the maternity site. An alternative lower number is provided for situations in which the Angel's Roost section of Agen Allwedd cannot be accessed. This count should not be used in years when Angel's Roost is accessible. Siambre Ddu is another large roost. Data recently collected from this site requires further examination in order to devise population limits. It is expected that the lower limit would be in the region of several 10s of bats. The performance indicator for this site	During at least one surveillance visit between 1st November and 28th February of each year, when the internal temperature of the cave is 6o or above there will be: • 60 Lesser Horseshoe Bats at Foxwood cave AND There is continued use by Lesser Horseshoe Bats at Siambre Ddu (data collected from this site requires further examination in order to devise population limits).

Performance indicators for feature condition		
Attribute	**Attribute rationale and other comments**	**Specified limits**
	at present requires only that bats be present. Droppings will not be used to make assumptions about bats using the site. Once more data is collected, it is possible that a moving (6yearly) average could be calculated, such that a fall in numbers of say 10% could flag up a potential decline in health of the population.	
Performance indicators for factors affecting the feature		
Buckland House Maternity Roost (may also apply to other non-SAC maternity roosts)		
Factor	Factor rationale and other comments	Operational Limits
F.1 Site security	Derived from Common standards Monitoring advice.	Access to the site under the control of the owner/occupier or site secured against unauthorised access. Doors, gates or security fences in sound condition and able to resist unauthorised access attempts
F.2 External condition of building	As above	Fabric of building sufficient to maintain roost conditions internally with: • Weatherproof roof. The roof covering materials (slates, tiles etc.) in weatherproof condition with no significant gaps, slippage or damage. • No holes large enough to allow soaking of roof timbers, excessive heat loss or high light levels in the roost area • Walls sound, rainwater goods in adequate condition. The building is structurally stable. No significant deterioration in overall condition of the building
F.3 Roost entrance – buildings and underground sites	As above	• Unobstructed roost entrance large enough for bats to fly through unimpeded. Normal minima: 300 x 200 mm
F.4 External Disturbance	As above	Disturbance levels acceptable to bats with: • No increase since previous visit Human access to roost controlled and limited
F.5 Internal condition of building/	As above	• Low light levels with no through

Performance indicators for feature condition		
Attribute	**Attribute rationale and other comments**	**Specified limits**
underground site in roost area		draught. No toxic substances present, which would adversely affect the health of the bats (e.g. chemical timber treatment within inappropriate substances).
F.6 Temperature of roost area	As above	• Range of temperatures available to bats with mean temperature in July greater than 20°C
F.7 Internal disturbance	As above	• Human access to roost area controlled and limited Disturbance is kept to a minimum
Hibernation sites		
F.8 Site entrance	As above	• Existing entrances unobstructed. • No human-influenced new entrances causing a change to ventilation. No change in size sufficient to affect airflow and internal temperature.
F.9 External conditions of site	As above	• Vegetation present close to entrance (s) but not obstructing it (them). No artificial lights shinning on entrance(s).
F.10 Internal conditions	As above	• The temperature should remain constantly cool (8-12°C) and dark, once beyond the entrance zone • No significant man-induced changes to ventilation or temperature regime. No toxic substances present (dumping of oil or other substances).
F.11 Internal disturbance	As above	• Human access to roost area controlled and limited (at Agen Allwedd the number of visitors is already controlled) Disturbance is kept to a minimum.
Foraging areas and links to roosts		
F.12 Habitat Quality	The bats mainly feed along the edges of woodland, large hedges and tree-lined rivers within and around the SAC areas and land situated between the SSSIs in the Usk valley area between Llangorse and Abergavenny.	There should be no nett loss of suitable woodland, scrub and hedgerows within the SAC or adjoining areas used by the bats.

Performance indicators for feature condition		
Attribute	**Attribute rationale and other comments**	**Specified limits**
F.13 Connectivity	The bats appear to prefer not to like crossing large areas of open ground and therefore retaining or providing new cover would be beneficial. Links between foraging areas, maternity roosts and hibernacula, are provided by hedgerows, woodland, scrub and lines of trees. There are quite a few maternity roosts in buildings in the Usk valley area that are not within in the SAC, so connectivity is important here too.	Major gaps in the continuity of these habitats should not be created. See also F12 above.
The extent of these habitats shown on aerial photographs taken in 2006 forms a baseline to measure habitat cover.		

Tilio-Acerion forests of slopes, screes and ravines

Performance indicators for feature condition		
Attribute	**Attribute rationale and other comments**	**Specified limits**
A1. Extent of and distribution	To be assessed using aerial photography and ground checking. The total area of broadleaved semi-natural woodland, screes and ravines has been mapped as a baseline but extent of ash dominated types has been estimated as they can be intermixed with other types. Tilio-Acerion forests of slopes, screes and ravines is defined as: any area where there is a more-or-less continuous cover of shrubs over 3 metres tall, with or without woodland canopy trees such as ash. In the long- term, when a better woodland community has developed, then these objectives will need to be revisited.	Lower limit: 13.5 ha, of which units 1 & 2 support at least 10 ha and unit 5 supports at least 3.5 ha. Small areas are also present in units 12 & 13. Upper limit: N/A
A2. Canopy cover	The woodland is scattered over the lower slopes of Craig y Cilau and extends onto the cliff areas. The latter is secure from the effects of grazing and is probably	Upper limits: 90% canopy cover OR: 60% on the south-west facing slopes of unit 1

Performance indicators for feature condition		
Attribute	**Attribute rationale and other comments**	**Specified limits**
	more or less self-sustaining. The remaining woodland on the grazed slopes has been developing for sometime, and at present it is assumed that this development will continue, provided that the grazing is at a level to permit gradual regeneration. In the long-term (at least 50 years hence), when a better woodland community has developed, then these objectives will need to be revisited.	Lower limits: 75% canopy cover OR: 30% on the south-west facing slopes of unit 1
Attributes A3 –A7 below apply to the main woodland stands in units 1, 2 & 5 (see maps in Annex 1)		
A3. Regeneration	In the Clydach gorge on the southern slopes of Mynydd Llangatwg there are stands of ungrazed woodland, which are unlikely to ever be grazed. Therefore the same performance indicators can be applied to all areas. Regeneration to be met in at least 50% of significant gaps in canopy. Such gaps should be recorded at each monitoring visit.	Upper limit: N/A Lower limit: Canopy forming shrubs, trees or coppice re-growth at least 1.5m high present (should be evident in at least one location within each woodland block).
A4. Woodland structure	A functioning woodland system will have trees of all ages present. Veteran trees provide particularly important habitat for birds and invertebrates. 75% of the woodland should meet the criteria for an understorey.	Upper limit: N/A Lower limits: An understorey at a height of 2–5m over at least 20% of the stand, composed of locally native species, such as yew, wych elm, whitebeams, hawthorn, limes, rowan, hazel and ash. AND: In grazed areas there should be evidence of an understorey developing.
A5. Canopy composition	In some areas non-native trees, such as sycamore, will be tolerated, as long as they are not freely re-generating to form large saplings in the understorey, which would likely change the canopy composition over time. Consequently, only 70% of the woodland need comply with the limits set.	Upper limit: None Lower limit: 95% of tree cover is composed of locally native species, such as ash, whitebeams, wych elm, rowan, field maple, hazel, or beech.
A6. Ground flora	The ground flora is naturally quite sparse in the rocky areas of units 1 and 2, but a few typical ash	Upper limit: The cover of nettles should not exceed 10%.

Performance indicators for feature condition		
Attribute	**Attribute rationale and other comments**	**Specified limits**
	woodland plants should be evident in all areas. Brambles and ivy can be locally abundant in ungrazed ash woodland but other indicators of disturbance and nutrient enrichment should not be. Limits should be met for 80% of the woodland.	Lower limit: Typical ground flora species (see list below) should be evident throughout the woodland.
A7. Deadwood	Deadwood will be retained. The limits given here should be met in at east 50% of existing woodland.	Upper limit: None Lower limit: Presence of standing and/or fallen deadwood.
Typical ash woodland plants: Dog's-mercury; Bramble; Violets; Lesser celandine; Barren strawberry; Ivy; Herb-Robert; Hart's-tongue fern; Chalk comb-moss *Ctenidium molluscum*; Wild garlic; Wood false-brome; Wood sage; Wood Melick; Shield ferns; Enchanter's-nightshade; Wood avens; Lords-and-ladies and Male fern.		
Performance indicators for factors affecting the feature		
Factor	Factor rationale and other comments	Operational Limits
F1. Grazing	The present structure and species composition of the northern escarpment woodland, excluding the cliff ledges, is a result of natural regeneration. The cliff ledges are inaccessible to stock, have developed naturally and are not actively managed. The greatest influence on the woodland, and its continued regeneration, is grazing. In units 1 & 2, the woodland has developed on common land and parts are subject to high grazing levels by sheep. The woodland in units 5, 12 & 13 is now largely un-grazed and the ground flora is noticeably more luxuriant in these areas.	Upper limit: Sufficient to allow regeneration in the long term, as defined by the regeneration attribute above. Lower limit: None required.
F2. Non-native species	Beech is at the edge of its range in this part of Wales. In units 5, 12 and 13 the beech wood appears to be natural, but the spread of beech over much of Units 1 & 2 may not be desirable, as it would replace the ash woodland. Limits should be met in 70% of the woodland.	Upper limits: 5% cover of non-native trees in the canopy. AND: No cotoneaster (or other invasive non-native shrubs) in the understorey or shrub layer. Lower limit: None.

Performance indicators for feature condition		
Attribute	**Attribute rationale and other comments**	**Specified limits**
F3. Woodland management	Natural ecological processes should be allowed to operate as far as possible. In many areas, these are gradually creating greater structural diversity. Most of the woodland on the site is not actively managed (indeed much occurs on cliffs and will never have been managed).	There should be no evidence of tree felling or coppicing within the past five years. (Tree surgery for safety reasons excluded).

Caves not open to the public

Performance indicators for feature condition		
Attribute	**Attribute rationale and other comments**	**Specified limits**
A1. Extent and Distribution of the habitat	Within Mynydd Llangatwg SSSI, many of the same cave passages used by Lesser Horseshoe Bats are also used by other hibernating bat species.	No loss of suitable bat hibernating areas in units 1, 2, 5, 12, 13 and 19.
A2. Species of bat using the caves	Records of other bats using the caves in total at least seven species. These have included Lesser Horseshoe, Greater Horseshoe, Brandt's, Whiskered, Natterer's, Daubentons and Brown Long-eared.	Upper limit: N/A Lower limit: At least 6 of the species listed are recorded as using the caves as hibernation site in Unit 1. AND: At least 3 of the species listed are recorded as using the caves as hibernation site in Unit 2.
Performance indicators for factors affecting the feature		
Factor	Factor rationale and other comments	Operational Limits
F1. Condition of the habitat	It is assumed that the condition of the hibernating areas should be much the same for all bat species, although most of the myotid species require less open space as the hibernate in small crevices.	See factors F1-F13 for Lesser Horseshoe Bats in 4.1 above.

Cwm Clydach Woodlands SAC

Asperulo – Fagetum beech forests

Performance indicators for feature condition		
Attribute	**Attribute rationale and other comments**	**Specified limits**
A1. Extent and distribution	Extent is based on ground surveys and 2006 aerial photographs. Upper limit set to maintain areas of non- wooded habitat.	Upper limit: 25 ha Lower limit: 21 ha Located in units 1 & 5.
A2. Canopy cover	75% of the woodland should meet the criteria for canopy cover.	Upper limit: 90% Lower limit: 80%
Attributes A3–A6 below are based on the Standard Common Standards Monitoring guidance, modified according to site-specific requirements. They apply to the main calcareous beech woodland stands in units 1 & 5.		
A3. Canopy composition	In some areas non-native trees, such as sycamore, will be tolerated, so long as they are not freely re-generating in the understorey. 75% of the woodland needs to comply with the limits set.	Upper limit: N/A Lower limit: 50% of the canopy forming trees are beech (except in those areas where whitebeam dominates) AND: 95% of tree cover is composed of locally native trees (see definition below).
A4. Regeneration	To be met in at least 50% of significant gaps in canopy. Such gaps should be recorded at each monitoring visit. A gap is defined as an open area with a diameter of at least one average tree height. Beech will also regenerate under the canopy and some recording should also occur here.	Upper limit: N/A Lower limit: Canopy forming trees, shrubs or coppice re-growth at least 1.5m high present (there should be enough present to maintain the canopy in the long term).
A5. Ground flora	The ground flora can be naturally quite sparse under the beech canopy, but a few typical calcareous beech woodland plants should be evident in all areas. Brambles and ivy can be locally quite abundant but other indicators of disturbance and nutrient enrichment should not be. Limits should be met for 75% of the woodland.	Upper limit: The cover of nettles should not exceed 10%. Lower limit: Typical ground flora species (see list below) should be evident throughout the woodland.
A5. Dead wood	It is difficult to set meaningful	Upper limit: None

Performance indicators for feature condition		
Attribute	**Attribute rationale and other comments**	**Specified limits**
	limits for dead wood but, in the short term. Much of the woodland is on steep ground and so removal of deadwood is unlikely. However, any fallen timber will tend to accumulate at the foot of the slopes. The limits given here should be met in at least 75% of existing woodland.	Lower limit: Presence of standing and/or fallen deadwood greater than 20 cm diameter.
Locally native Trees and shrubs: Beech; Ash; Oak; Birch; Rowan; Field maple; Yew; Hawthorn; Hazel; Elder and Holly.		
Typical plants of calcareous beech woodland: Dog's mercury; Bramble; Enchanter's-nightshade; Lords-and-Ladies; Woodruff; Male fern; Sanicle; Wood melick; Ivy; False brome; Violets; Rough-stalked feather moss Brachythecium rutabulum; Common feather-moss Eurhynchium praelongum and Herb Robert. List likely to be refined following further survey and monitoring.		
Performance indicators for factors affecting the feature		
Factor	Factor rationale and other comments	Operational Limits
F1. Livestock grazing	There is a long-history of the woodland being open to casual grazing by sheep. This has probably skewed the species make up of the wood towards beech because sheep preferentially graze other species. This is not thought to be a major issue, but needs to be kept under review	Upper limit: Sufficiently low to allow regeneration in the long term, as defined by the regeneration attribute above. Lower limit: None required.
F3. Non-native and invasive species	Along the river corridor there is Japanese knotweed, which may pose a threat to the woodland habitat.	Upper limit: No spread of Japanese knotweed into woodland. Lower limit: None required.

Atlantic acidophilous beech forests with Ilex and sometimes also Taxus in the shrublayer (Quercion robori-petraeae or Ilici-Fagenion)

Performance indicators for factors affecting the feature		
Factor	**Factor rationale and other comments**	**Operational Limits**
A1. Extent and distribution	Extent is based on ground surveys and 2006 aerial photographs. Upper limit set to maintain areas of non- wooded habitat.	Upper limit: 3.5 ha Lower limit: 4.3 ha Located mainly on the upper slopes at the western end of unit 1.
A2. Canopy cover	75% of the woodland should meet the criteria for canopy cover.	Upper limit: 90% Lower limit: 80%
Attributes A3–A6 below are based on the Standard Common Standards Monitoring guidance, modified according to site-specific requirements. They apply to the main acid beech woodland stands in unit 1 (see maps in Annex 1).		
A3. Canopy composition	In some areas non-native trees, such as sycamore, will be tolerated, so long as they are not freely re-generating in the understorey. 75% of the woodland needs to comply with the limits set.	Upper limit: N/A Lower limit: 10% of the canopy forming trees are beech AND: 95% of tree cover is composed of locally native trees (see definition below).
A4. Regeneration	To be met in at least 50% of significant gaps in canopy. Such gaps should be recorded at each monitoring visit. A gap is defined as an open area with a diameter of at least one average tree height.	Upper limit: N/A Lower limit: Canopy forming trees, shrubs or coppice re-growth at least 1.5m high present (should be enough present to maintain the canopy in the long term).
A5. Ground flora	The ground flora can be naturally quite sparse under the beech canopy, but a few typical acid beech woodland plants should be evident. Bracken can be locally quite abundant but should not dominate large areas of the woodland floor. Limits should be met for 75% of the woodland.	Upper limit: N/A Lower limit: Typical ground flora species (see list below) should be evident throughout the woodland.
A5. Dead wood	It is difficult to set meaningful limits for dead wood but, in the short term. Much of the woodland is on steep ground and so removal of deadwood is unlikely. However, any fallen timber will tend to accumulate at the foot of the slopes. The limits given here should be met in at least 75% of existing woodland.	Upper limit: None Lower limit: Presence of standing and/or fallen deadwood greater than 20 cm diameter.

Performance indicators for factors affecting the feature		
Factor	**Factor rationale and other comments**	**Operational Limits**
Locally native Trees and shrubs: Beech; Ash; Oak; Birch; Rowan; Field maple; Yew; Hawthorn; Hazel; Elder and Holly.		
Typical plants of acid beech woodland: Bilberry; Heather; Wavy hair-grass; Common bent; Wood sorrel and moss carpets, of species such as swan's-neck thyme-moss Mnium hornum, bank hair-cap Polytricum formosum, large white-moss Leucobryum glaucum and common tamarisk-moss Thuidium tamariscinum.		
Performance indicators for factors affecting the feature		
Factor	Factor rationale and other comments	Operational Limits
F1. Livestock grazing	There is a long-history of the woodland being open to casual grazing by sheep. This has probably skewed the species make up of the wood towards beech because sheep preferentially graze other species. This is not thought to be a major issue, but needs to be kept under review.	Upper limit: Sufficiently low to allow regeneration in the long term, as defined by the regeneration attribute above. Lower limit: None required.
F2. Non-native and invasive species	There are localised problems with bracken on the upper slopes in the western part of the site, but this is mainly confined to more open areas at the edges of the woodland. Once a canopy has established, shading usually limits the growth of bracken.	Upper limit: No increase in the aof woodland floor that is dominaby invasive species. Lower limit: None required.

River Usk SAC

Sea lamprey *Petromyzon marinus*

Performance indicators for feature condition		
Attribute	**Specified limits**	**Comments**
a) Distribution within catchment	Suitable habitat adjacent to or downstream of known spawning sites should contain *Petromyzon* ammocoetes.	This attribute provides evidence of successful spawning and distribution trends. Spawning sites known to have been used within the previous 10 years and historical sites considered still to have suitable habitat, are shown in Annex 4. Spawning locations may move within and between sites due to natural processes or new sites may be discovered over time. Silt beds downstream of all sites identified in Annex 4 will be sampled for presence or absence of ammocoetes. Where apparently suitable habitat at any site is unoccupied feature condition will be considered unfavourable.
b) Amnocoete density	Ammocoetes should be present in at least four sampling sites each not less than 5km apart.	This standard CSM attribute establishes a minimum occupied spawning range, within any sampling period, of 15km. In the Usk, spawning sites within units 2 to 5 will be assessed against this attribute.
	Overall catchment mean >0.1m^{-2} (Harvey & Cowx 2003)[1]	Although this attribute is not used in CSM for sea lamprey, baseline monitoring in the Usk gave an overall catchment mean of 2.27 -2 2 ammocoetes m^{-2} in suitable habitat , therefore 0.1 m^{-2} is a conservative threshold value for unfavourable condition.

Brook lamprey *Lampetra planeri* and River lamprey *Lampetra fluviatilis*

Performance indicators for feature condition		
Attribute	**Specified limits**	**Comments**
a) Age/size structure of ammocoete population	Samples < 50 ammocoetes ~ 2 size classes Samples > 50 ammocoetes ~ at least 3 size classes	This gives an indication of recruitment to the population over the several years preceding the survey. Failure of one or more years recruitmen may be due to either short or long term impactsor natural factors such as natural flow variability, therefore would trigger further investigation of the cause rather than leading automatically to an unfavourable condition assessment.
b) Distribution of ammocoetes within catchment	Present at not less that 2/3 of sites surveyed within natural range	The combined natural range of these two species in terms of ammocoete distribution includes all units above the tidal limit ie. all except unit 1 Presence at less than 2/3 of sample sites will lead to an unfavourable condition assessment.
	No reduction in distribution of ammocoetes	Reduction in distribution will be defined as absence of ammocoetes from all samples within a single unit or sub-unit/tributary, and will lead to an unfavourable condition assessment.
c) Ammocoete density	Optimal habitat: $>10m^{-2}$ Overall catchment mean: $>5m^{-2}$	Optimal habitat comprises beds of stable fine sediment or sand $\geq$15cm deep, low water velocity and the presence of organic detritus, as well as, in the Usk, shallower sediment, often patchy and interspersed among coarser substrate.

Twaite shad *Alosa fallax* and Allis shad *Alosa alosa*

Performance indicators for feature condition		
Attribute	**Specified limits**	**Comments**
a) Spawning distribution	No decline in spawning distribution	Spawning distribution is assessed by kick sampling for eggs and/or observations of spawning adults. A representative sample of sites within units 2 to 5 will be monitored at 3 yearly intervals. Absence from any site in 2 consecutive surveys will result in an unfavourable condition assessment.
Performance indicators for factors affecting the feature		
a) Flow	Targets are set in relation to river/reach type(s)	Targets equate to those levels agreed and used in the Review of Consents (see Annex 1). Shad are particularly sensitive to flow. The ideal regime is one of relatively high flows in March-May, to stimulate migration and allow maximum penetration of adults upstream, followed by rather low flows in June-September, which ensures that the juveniles are not washed prematurely into saline waters and grow rapidly under warmer conditions. The release of freshets to encourage salmonid migration should therefore be discouraged on shad rivers during this period.

Atlantic salmon *Salmo salar*

Performance indicators for feature condition		
Attribute	**Specified limits**	**Comments**
a) Adult run size	Conservation Limit complied with at least four years in five	CSM guidance states: Total run size at least matching an agreed reference level, including a seasonal pattern of migration characteristic of the river and maintenance of the multi-sea-winter component. As there is no fish counter in the Usk, adult run size is calculated using rod catch data. Further details can be found in the EA Usk Salmon Action Plan.
b) Juvenile densities	Expected densities for each sample site using HABSCORE	CSM guidance states: These should not differ significantly from those expected for the river type/reach under conditions of high physical and chemical quality. Assessed using electrofishing data.
Performance indicators for factors affecting the feature		
Water quality		
a) Biological quality	Biological GQA class A	This is the class required in the CSM guidance or Atlantic salmon, the most sensitive feature.
b) Chemical quality	RE1	It has been agreed through the Review of Consents process that RE1 will be used throughout the SAC.
Hydromorphology		
a) Flow	Targets are set in relation to river/reach type(s)	Targets equate to those levels agreed and used in the Review of Consents

Bullhead *Cottus gobio*

Performance indicators for feature condition		
Attribute	**Specified limits**	**Comments**
a) Adult densities	No less than 0.2 m^{-2} in sampled reaches	CSM guidance states that densities should be no less than 0.2 m^{-2} in upland rivers (source altitude >100m) and 0.5 m^{-2} in lowland rivers (source altitude ≤100m). A significant reduction in densities may also lead to an unfavourable condition assessment.
b) Distribution	Bullheads should be present in all suitable reaches. As a minimum, no decline in distribution from current	Suitable reaches will be mapped using fluvial audit information validated using the results of population monitoring. Absence of bullheads from any of these reaches, or from any previously occupied reach, revealed by on-going monitoring will result in an unfavourable condition assessment.
c) Reproduction / age structure	Young-of- year fish should occur at densities at least equal to adults	This gives an indication of successful recruitment and a healthy population structure. Failure of this attribute on its own would not lead to an unfavourable condition assessment.

Otter *Lutra lutra*

Performance indicators for feature condition		
Attribute	**Specified limits**	**Comments**
a) Distribution	Otter signs present at 90% of Otter Survey of Wales sites	Ref: CCW Environmental Monitoring Report 3 No 19 (2005)
b) Breeding activity	2 reports of cub/family sightings at least 1 year in 6	Ref: CCW Environmental Monitoring Report 3 No 19 (2005)
c) Actual and potential breeding sites	No decline in number and quality of mapped breeding sites in sub-catchments (see Ref)	Ref: CCW Environmental Monitoring Report 3 No 19 (2005) In the Usk catchment, 77 actual or potential breeding sites have been identified, distributed throughout the catchment on the main river and tributaries.

Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation

Performance indicators for feature condition		
Attribute	**Specified Limits**	**Comments**
a) Distribution within catchment	Distribution within site units 2,3 & 10	*Ranunculus* spp. will be present with an MTR species cover score of at least 5 in: Any three representative sample 100m stretches of suitable habitat between Usk Town bridge and the bridge at Newbridge-on-Usk: AND In one representative sample 100m stretch of suitable habitat along the Senni
b) Typical species	Species list for reference vegetation type	Should conform to appropriate JNCC type or other list for site unit as appropriate. Details to be confirmed
Performance indicators for factors affecting the feature		
Negative indicators		
a) Native species	Cover of indicators of eutrophication maintained below threshold over the medium to long term	CSM guidance states: Care should be taken with the setting of these targets as thresholds may vary considerably by site and conservation goals. For the Usk SAC: Algae indicative of eutrophication (*Enteromorpha* spp., *Cladophora* spp. and *Vaucheria* spp.) should not have an MTR cover value of greater than 5 (ie.10%) in 3 consecutive years in: Any three representative sample 100m stretches of suitable habitat between Usk Townbridge and the bridge at Newbridge-on-Usk: AND In one representative sample 100m stretch of suitable habitat along the Senni
b) Alien / introduced species	No impact on native biota from alien or introduced species	In the CSM guidance, the SERCON scoring system for naturalness of aquatic and marginal macrophytes and naturalness of banks and riparian zone, are used to assess this attribute. SERCON protocols have not been applied in the Usk SAC, therefore assessment of this attribute relies on locally defined thresholds and expert judgement. Details to be confirmed

8.2 Appendix B: Initial Screening Matrices

Usk Bat Sites SAC

Project name	A465T Heads of the Valleys Road Section 2	
Natura 2000 site under consideration	**Usk Bat Sites SAC**	
Date	Author	Verified
April 2012	Matt Fasham / Richard Green	Keith Jones
Description of Project Describe any likely direct, indirect or secondary impacts of the project (either alone or in combination with any other plans or projects) on the European Site by virtue of:		
Size and scale (road type and probable traffic volume)	Dualling a 7km section of the existing A465 trunk road with associated infrastructure. Predicted traffic volumes not currently known (data awaited). The outline scheme design covers an area of approximately 50ha. However, as much of the widening is online the additional landtake required is approximately 30ha.	
Land-take within SAC	The Scheme involves some land-take within the SAC (precise extent not yet determined).	
Distance from the European Site or key interests of the site (from edge of the project assessment corridor)	The Scheme runs through the SAC.	
Resource requirements (from the European Site or from areas in proximity to the site, where of relevance to consideration of impacts)	Not known	
Emissions (e.g. polluted surface water runoff – both soluble and insoluable pollutants, atmospheric pollution)	The proposed Scheme has potential to cause pollution of the SAC via: water run-off during construction and operation. Construction impacts would be controlled by a Construction Environment Management Plan. Operation of the proposed Scheme would improve quality of water discharge compared to the baseline and would reduce risk of impacts through specific pollution events. The proposed Scheme has potential to result in air quality impacts during operation.	
Excavation requirements (e.g. impacts of local hydrogeology)	Areas of cut within the SAC have some potential to cause hydrological impacts.	
Transportation requirements	Not known	
Duration of construction, operation etc.	Construction period 2014-2018	
Other	None	
Description of avoidance and / or mitigation measures		
Nature of proposals	Full details not yet available	
Location	Full details not yet available	
Evidence for effectiveness	Full details not yet available	

Project name	A465T Heads of the Valleys Road Section 2
Natura 2000 site under consideration	**Usk Bat Sites SAC**
Mechanism for delivery	Full details not yet available
Characteristics of European Site	
Name of European Site and its EU code	Usk Bat Sites SAC UK0014784
Location and distance of the European Site from the proposed works	SAC comprises four component sites (SSSIs) and encompasses a series of Lesser Horseshoe Bat roosts, upland habitats, woodlands and cave systems located around the valley of the River Usk near to Abergavenny. The proposed Scheme passes through the southern tip of the SAC
European Site size	1686.4 ha
Key features of the European Site including the primary reasons for selection and any other qualifying interests	Lesser Horseshoe Bat European dry heaths Degraded raised bogs still capable of natural regeneration Blanket bogs (Priority feature) Calcareous rocky slopes with chasmophytic vegetation Caves not open to the public Tilio-Acerion forests of slopes, screes and ravines (Priority feature)
Vulnerability of the European Site – any information available from the standard data forms on potential effect pathways	Lesser Horseshoe Bats are most vulnerable in winter and maternity roosts. Also affected by reduction in availability of invertebrate prey due to changes in agricultural practices, and by fragmentation (disruption to flightlines between roosts and foraging areas). APIS data shows that background levels of some air pollutants (acid deposition and nitrogen deposition) currently exceed set critical loads within the SAC.
European Site conservation objectives	See Section 2.2 and Appendix A.
Assessment Criteria Describe the individual elements of the project (either alone or in combination with other plans or projects) likely to give rise to impacts on the European Site	
Direct or indirect loss of bat roosts for construction Direct or indirect loss of bat foraging habitat for construction Disruption to bat flightlines for construction Mortality of bats during construction or operation Disturbance of bats during construction and operation (lighting, noise, vibration) Direct loss of habitats for construction, particularly woodland and potentially caves Habitat deterioration from aerial emissions	
Initial Assessment The key characteristics of the European Site should be considered in identifying potential impacts. Describe any likely changes to the site arising as a result of:	
Reduction of habitat area	Land-take within the SAC will comprise c9.07ha, of which 2.93ha comprises the existing carriageway and other hard standing; total loss of habitats estimated at 6.15ha, including semi-natural broadleaved woodland (4.12 ha), dense and scattered scrub (1.07 ha), grassland (0.27 ha) and bare cliff (0.26 ha). Some of this land-take may comprise Tilio-Acerion woodland – extent of interest feature still being determined, although scheme design has attempted to avoid all potential areas wherever possible. Also potential for land-take to affect caves. No impact on other SAC habitats. Land-take would also result in loss of bat foraging habitat

Project name	A465T Heads of the Valleys Road Section 2
Natura 2000 site under consideration	**Usk Bat Sites SAC**
Disturbance to key species	Construction: Potential for loss of bat roosts and mortality to bats in roosts Indirect temporary disturbance to roosts from construction noise / vibration Disturbance to foraging bats from noise and lighting Disruption to flightlines Operation: Mortality due to traffic collisions Disturbance to foraging bats from noise and lighting Disruption to flightlines
Habitat or species fragmentation	Landtake could increase fragmentation of woodland habitat and bat foraging habitat
Reduction in species density	Impacts on bats as outlined above could potentially reduce numbers of bats and hence density
Changes in key indicators of conservation value (water quality etc)	Potential for emission to air to affect habitats. Air quality effects on habitat features other than Tilio-Acerion woodland not considered likely. Water quality improvement would occur via installation of highways drainage system to treat surface run-off prior to discharge – current situation discharges untreated runoff.
Climate change	It is predicted that range and abundance of Lesser Horseshoe Bats will increase as a result of climate change via a northern expansion of range.
Describe any likely impacts on the European Site as a whole in terms of:	
Interference with the key relationships that define the structure of the site	Potential for effects on some habitats via air quality impacts
Interference with the key relationships that define the function of the site	Potential for effects on bats as outlined above
Indicate the significance as a result of the identification of impacts set out above in terms of:	
Reduction of habitat area	Permanent loss of Tilio-acerion woodland within SAC and bat foraging habitat inside and outside the SAC would result in a significant effect. Permanent loss of bat roost sites would result in a significant effect.
Disturbance to key species	Temporary loss of bat roost sites would result in a short-term significant effect. Loss of foraging habitat is potentially significant although total habitat losses likely to be small in context of overall extent of bat foraging habitat in vicinity of the Scheme.
Habitat or species fragmentation	Potentially significant effect from disruption to bat flightlines
Loss	No likelihood of effects beyond those identified above
Fragmentation	No additional effects beyond those identified above
Disruption	Potentially significant disturbance and mortality impacts on bats as above
Disturbance	No effects other than those outlined for bats above
Change to key elements of the site (e.g. water quality, hydrological regime etc)	Some potential for significant air quality impacts on adjacent habitats. Potentially significant improvement to quality of surface water discharge.
Describe from the above those elements of the project, or combination of elements, where the above impacts are likely to be significant, or where the scale or magnitude of impacts is not known.	

Project name	A465T Heads of the Valleys Road Section 2
Natura 2000 site under consideration	**Usk Bat Sites SAC**
	Potential adverse impacts associated with the scheme are: Habitat loss: Direct - land take (Tilio-acerion woodland, calcareous slopes, caves, bat foraging habitat); Habitat loss: Indirect - changes in hydrology; Habitat deterioration: aerial emissions Habitat fragmentation: by habitat loss; Habitat fragmentation: by interference with flightlines; Disturbance to species: mortality; Disturbance to species: noise and vibration; and Disturbance to species: lighting
Outcome of screening stage	Significant effects are likely
Are the appropriate statutory environmental bodies in agreement with this conclusion?	YES

Cwm Clydach Woodlands SAC

Project name	**A465T Heads of the Valleys Road Section 2**	
Natura 2000 site under consideration	**Cwm Clydach Woodlands SAC**	
Date	Author	Verified
April 2012	Matt Fasham / Richard Green	Keith Jones
Description of Project Describe any likely direct, indirect or secondary impacts of the project (either alone or in combination with any other plans or projects) on the European Site by virtue of:		
Size and scale (road type and probable traffic volume)	Dualling a 7km section of the existing A465 trunk road with associated infrastructure. Predicted traffic volumes not currently known (data awaited). The outline scheme design covers an area of approximately 50ha. However, as much of the widening is online the additional landtake required is approximately 30ha.	
Land-take within SAC	The Scheme does not involve land-take within the SAC	
Distance from the European Site or key interests of the site (from edge of the project assessment corridor)	The Scheme is close to the northern boundary of the SAC (closest distance approximately 30m.	
Resource requirements (from the European Site or from areas in proximity to the site, where of relevance to consideration of impacts)	No resource requirements within the European Site.	
Emissions (e.g. polluted surface water runoff – both soluble and insoluable pollutants, atmospheric pollution)	The proposed Scheme has potential to result in air quality impacts during operation.	
Excavation requirements (e.g. impacts of local hydrogeology)	The proposed Scheme would not cause hydrological impacts on the SAC due to excavation.	
Transportation requirements	Not known	
Duration of construction, operation etc.	Construction period 2014-2018	
Other	None	
Description of avoidance and / or mitigation measures		
Nature of proposals	Full details not yet available	
Location	Full details not yet available	
Evidence for effectiveness	Full details not yet available	
Mechanism for delivery	Full details not yet available	
Characteristics of European Site		
Name of European Site and its EU code	Cwm Clydach Woodlands SAC UK0030127	

Project name	A465T Heads of the Valleys Road Section 2
Natura 2000 site under consideration	**Cwm Clydach Woodlands SAC**
Location and distance of the European Site from the proposed works	SAC predominantly comprises Beech woodlands, with mature sessile and hybrid oaks common in the canopy in the west of the site, located on the south side of the Cwm Clydach gorge. The proposed Scheme runs close to the northern edge of the SAC, at closest approach of 30m.
European Site size	28.81 ha
Key features of the European Site including the primary reasons for selection and any other qualifying interests	Asperulo-Fagetum beech forests Atlantic acidophilous beech forests with Ilex and sometimes also Taxus in the shrublayer (Quercion robori-petraeae or Ilici-Fagenion)
Vulnerability of the European Site – any information available from the standard data forms on potential effect pathways	APIS data shows that background levels of some air pollutants (acid deposition and nitrogen deposition) currently exceed set critical loads within the SAC.
European Site conservation objectives	See Section 2.2 and Appendix A.
Assessment Criteria Describe the individual elements of the project (either alone or in combination with other plans or projects) likely to give rise to impacts on the European Site	
Habitat deterioration from aerial emissions	
Initial Assessment The key characteristics of the European Site should be considered in identifying potential impacts. Describe any likely changes to the site arising as a result of:	
Reduction of habitat area	No land-take within the SAC
Disturbance to key species	Not applicable
Habitat or species fragmentation	Scheme would not cause fragmentation of SAC habitats.
Reduction in species density	Not applicable
Changes in key indicators of conservation value (water quality etc)	Potential for aerial emissions affect habitats.
Climate change	Climate change models for Wales predict warmer wetter winters with much less snow and frost, while summers will be hotter and drier. Impact of this on Beech woodland is uncertain.
Describe any likely impacts on the European Site as a whole in terms of:	
Interference with the key relationships that define the structure of the site	Potential for effects on habitats via air quality impacts
Interference with the key relationships that define the function of the site	None
Indicate the significance as a result of the identification of impacts set out above in terms of:	

Project name	A465T Heads of the Valleys Road Section 2
Natura 2000 site under consideration	**Cwm Clydach Woodlands SAC**
Reduction of habitat area	Not applicable
Disturbance to key species	Not applicable
Habitat or species fragmentation	Not applicable
Loss	Not applicable
Fragmentation	Not applicable
Disruption	Not applicable
Disturbance	Not applicable
Change to key elements of the site (e.g. water quality, hydrological regime etc)	Some potential for significant air quality impacts on habitats.
Describe from the above those elements of the project, or combination of elements, where the above impacts are likely to be significant, or where the scale or magnitude of impacts is not known.	
	Potential adverse impacts associated with the scheme are: Habitat deterioration: aerial emissions
Outcome of screening stage	Significant effects are likely
Are the appropriate statutory environmental bodies in agreement with this conclusion?	YES

River Usk SAC

Project name	A465T Heads of the Valleys Road Section 2	
Natura 2000 site under consideration	River Usk SAC	
Date	**Author**	**Verified**
April 2012	Matt Fasham / Richard Green	Keith Jones
Description of Project Describe any likely direct, indirect or secondary impacts of the project (either alone or in combination with any other plans or projects) on the European Site by virtue of:		
Size and scale *(road type and probable traffic volume)*	Dualling a 7km section of the existing A465 trunk road with associated infrastructure. Predicted traffic volumes not currently known (data awaited). The outline scheme design covers an area of approximately 50ha. However, as much of the widening is online the additional landtake required is approximately 30ha.	
Land-take within SAC	No land-take within the SAC.	
Distance from the European Site or key interests of the site *(from edge of the project assessment corridor)*	The Scheme is 530 m from the SAC at its closest approach.	
Resource requirements *(from the European Site or from areas in proximity to the site, where of relevance to consideration of impacts)*	No resource requirements from SAC	
Emissions *(e.g. polluted surface water runoff – both soluble and insoluable pollutants, atmospheric pollution)*	Potential pollution events during constructionand operation could have significant effects.	
Excavation requirements *(e.g. impacts of local hydrogeology)*	None.	
Transportation requirements	Not known	
Duration of construction, operation etc.	Construction period 2014-2018	
Other	None	
Description of avoidance and / or mitigation measures		
Nature of proposals	Full details not yet available	
Location	Full details not yet available	
Evidence for effectiveness	Full details not yet available	
Mechanism for delivery	Full details not yet available	
Characteristics of European Site		
Name of European Site and its EU code	River Usk SAC UK0014784	

Project name	A465T Heads of the Valleys Road Section 2
Natura 2000 site under consideration	River Usk SAC
Location and distance of the European Site from the proposed works	The River Usk SAC rises in the Black Mountain range in the west of the Brecon Beacons National Park and flows east and then south, to enter the Severn Estuary at Newport. The Scheme is c530m from the SAC at its closest approach (Gilwern).
European Site size	1007.71 ha
Key features of the European Site including the primary reasons for selection and any other qualifying interests	Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation Sea Lamprey Brook Lamprey River Lamprey Twaite Shad Atlantic Salmon Bullhead Otter
Vulnerability of the European Site – any information available from the standard data forms on potential effect pathways	Otters potentially vulnerable to road mortality. Otter distribution and numbers generally increasing. Hydrological processes, in particular river flow (level and variability) and water chemistry, determine a range of habitat factors of critical importance to the SAC features, including current velocity, water depth, wetted area, substrate quality, dissolved oxygen levels and water temperature. Maintenance of both high 'spate' flows and base-flows is essential.
European Site conservation objectives	See Section 2.2 and Appendix A.
Assessment Criteria Describe the individual elements of the project (either alone or in combination with other plans or projects) likely to give rise to impacts on the European Site	
Barriers to fish movement prevent fish from River Usk SAC from migrating upstream to the River Clydach. Otters from the SAC may forage or disperse upstream to the vicinity of the Scheme. However, the scheme will not result in loss of river channel habitat and will not disrupt potential dispersal routes. Potential pollution events during construction and operation could result in significant effects Potential for disturbance effects on otters during construction / operation Operation of the proposed Scheme would improve quality of water discharge compared to the baseline. Significant effects on SAC habitat, Otters and fish are therefore considered likely.	
Initial Assessment The key characteristics of the European Site should be considered in identifying potential impacts. Describe any likely changes to the site arising as a result of:	
Reduction of habitat area	No land-take within the SAC
Disturbance to key species	No effects on key species considered likely.
Habitat or species fragmentation	No fragmentation within the SAC. No disruption to Otter dispersal routes would occur as Scheme does not cause loss of river channel habitat.
Reduction in species density	Might occur in event of significant pollution incident during construction / operation
Changes in key indicators of conservation value (water quality etc)	Potential pollution events during construction would be addressed via a Construction Environment Management Plan. Operation of the proposed Scheme would slightly improve quality of water discharge compared to the baseline.
Climate change	Climate change impacts on otter distribution uncertain

Project name	A465T Heads of the Valleys Road Section 2
Natura 2000 site under consideration	River Usk SAC
Describe any likely impacts on the European Site as a whole in terms of:	
Interference with the key relationships that define the structure of the site	None
Interference with the key relationships that define the function of the site	None
Indicate the significance as a result of the identification of impacts set out above in terms of:	
Reduction of habitat area	Not applicable
Disturbance to key species	Otters
Habitat or species fragmentation	None
Loss	Potential otter / fish mortality from pollution events
Fragmentation	None
Disruption	None
Disturbance	Lighting disturbance to otters
Change to key elements of the site (e.g. water quality, hydrological regime etc)	Scheme would result in improvement of quality of surface water discharge during operation.
Describe from the above those elements of the project, or combination of elements, where the above impacts are likely to be significant, or where the scale or magnitude of impacts is not known.	
	• Pollution during construction / operation • Lighting disturbance (otters).
Outcome of screening stage	Significant effects are likely
Are the appropriate statutory environmental bodies in agreement with this conclusion?	YES

8.3 Appendix C. Tilio-acerion woodland survey

A465 Heads of the Valleys

Section 2

Surveys of:

Tilio-Acerion Woodland

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Appendices

Figures

1. Introduction

1.1 Pryce Consultant Ecologists was commissioned by RPS Group plc in August 2012 to carry out ecological surveys along the Heads of the Valleys Road, between Brynmawr and Gilwern, where dualling works are scheduled.

1.2 The study area was centred on that part of the 6.4km road section that runs through the Carboniferous Limestone of the Clydach Gorge near Blackrock, as shown on figure 1. The survey was focussed on key features with potential to be affected by the road scheme. The survey sought to identify the presence of *Tilio-Acerion* woodland habitats, and if present, to provide guidance on the quality of this habitat.Mapping of *Tilio-Acerion* woodland

2. Tilio-Acerion Survey

2.1 Background

Within the UK, stands of *Tilio-Acerion* forests are widespread (see figure 2) but typically restricted in extent, often occurring as fragments within more extensive woodland units. Consequently many Special Area of Conservation (SAC) sites with *Tilio-Acerion* include it as a qualifying feature, but not a primary reason for site selection, as is the case with the Usk Bat Sites SAC which supports grade C *Tilio-Acerion*. Grade C indicates examples of the habitat which are of at least national importance (i.e. usually above the threshold for SSSI/ASSI notification on terrestrial sites) but not significantly above this. These features are not the primary reason for SACs being selected. To add context to this, the following grades are applied to habitats and features associated with SACs:

A Outstanding examples of the feature in a European context.

B Excellent examples of the feature, significantly above the threshold for SSSI/ASSI notification but of somewhat lower value than grade A sites.

C Examples of the feature which are of at least national importance (i.e. usually above the threshold for SSSI/ASSI notification on terrestrial sites) but not significantly above this. These features are not the primary reason for SACs being selected.

D Features of below SSSI quality occurring on SACs These are non-qualifying features (“non-significant presence”), indicated by a letter D, but this is not a formal global grade.

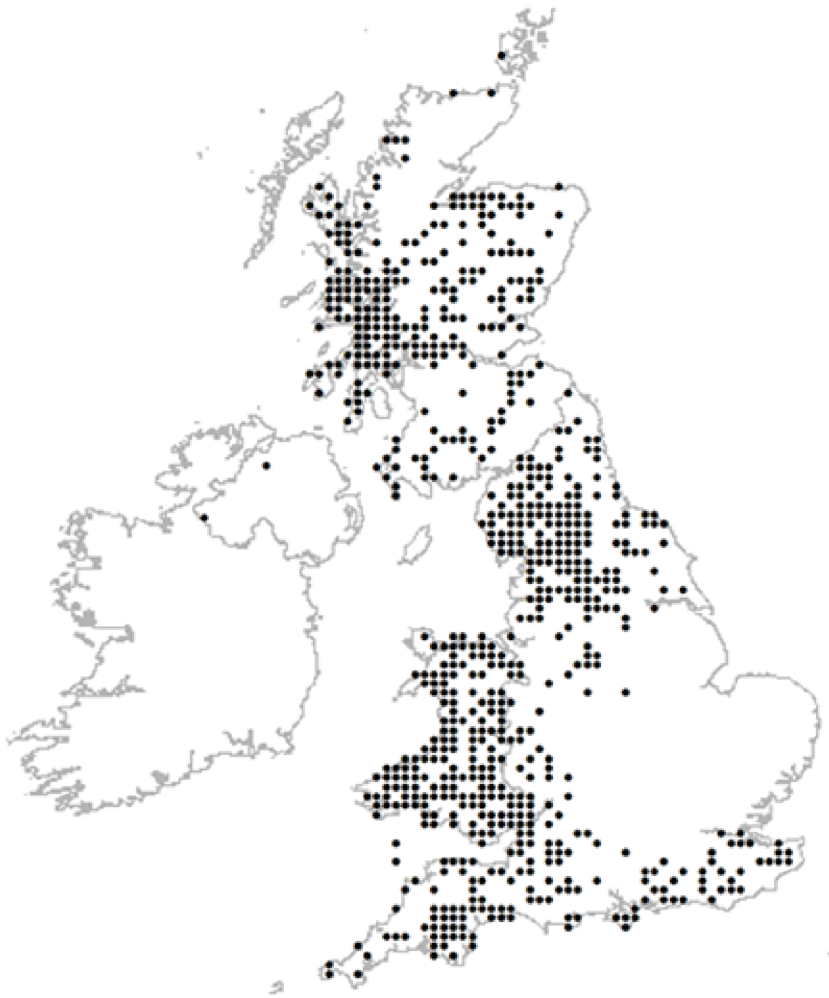


Figure 2: The JNCC distribution map for *Tilio-Acerion* woodland

2.1.1 The JNCC description for *Tilio-Acerion* woodland states:

'Tilio-Acerion *ravine forests are woods of ash* Fraxinus excelsior*, wych elm* Ulmus glabra *and lime (mainly small-leaved lime* Tilia cordata *but more rarely large-leaved lime* T. platyphyllos*). Introduced sycamore* Acer pseudoplatanus *is often present and is a common part of the community in mainland Europe, where it is native. The habitat type typically occurs on nutrient-rich soils that often accumulate in the shady micro-climates towards the bases of slopes and ravines. Therefore it is found on calcareous substrates associated with coarse scree, cliffs, steep rocky slopes and ravines, where inaccessibility has reduced human impact. It often occurs as a series of scattered patches grading into other types of woodland on level valley floors and on slopes above, or as narrow strips along stream-sides. More extensive stands occur on limestone and other base-rich rocks.*

This habitat type is ecologically variable, particularly with respect to the dominant tree species. To the north and west, ash and wych elm assume increasing importance in the canopy, and lime may be completely absent. Floristic differences due to variations in slope, aspect and nature of the substrate add to the diversity of the habitat. The ground flora can be very varied, but the following elements are usually present: fern banks (particularly hart's-tongue Phyllitis scolopendrium*, soft shield-fern* Polystichum setiferum *and buckler-ferns* Dryopteris *spp.); stands of* ramsons Allium ursinum *in the moister zones; dog's mercury* Mercurialis perennis *and enchanter's-nightshade* Circaea *spp. on drier but still base-rich soils; wood avens* Geum urbanum*, and natural 'disturbance communities' comprising common nettle* Urtica dioica*, herb-Robert* Geranium robertianum *and cleavers* Galium aparine *associated with scree and cliff-bases. A wide range of other basiphilous herbs and grasses may occur within these stands.*

The main NVC types conforming to Tilio-Acerion *forests are the 'western' forms (sub-communities d-g) of W8* Fraxinus excelsior – Acer campestre - Mercurialis perennis *woodland, and the equivalent north-western community W9* Fraxinus excelsior – Sorbus aucuparia – Mercurialis perennis *woodland.*

North of the central belt in Scotland, and in upland areas generally, base-rich conditions tend to become more restricted in extent; birch Betula *spp. and oak* Quercus *spp. assume greater abundance in the canopy, and species typical of more acidic communities are often found in a close mosaic with more basiphilous indicators. However, the type is still recognisable in, for example, the hazel* Corylus avellana *stands of the north-west coast of Scotland rich in lichens and higher plants.*

Tilio-Acerion *forests provide a habitat for a number of uncommon vascular plants, including, dark-red helleborine* Epipactis atrorubens*, violet helleborine* Epipactis purpurata*, wood fescue* Festuca altissima*, purple gromwell* Lithospermum purpureocaeruleum *and herb-Paris* Paris quadrifolia*. Many sites support notable bryophytes, in particular calcicoles associated with base-rich rock outcrops and (in western stands) Atlantic species. Some localities have important assemblages of epiphytic lichens.'*

2.2 Woodland Surveys

2.2.1 National Vegetation Classification (NVC) mapping has previously been undertaken by CCW (unpublished CCW files, 2008) and the distribution of the communities conforming to Tilio-Acerion woodland are reproduced on figure 1. It should be noted, however, that whilst these communities can be indicative of *Tilio-Acerion* woodland, there is no direct relationship between the two classification systems and the broader description of *Tilio-Acerion* embraces a wider range of woodland communities. Ongoing discussions with CCW have failed to yield clear objective criteria as to what constitutes *Tilio-Acerion* and published guidance is rather subjective, probably a consequence shoe-horning significant ecological variation within this broad category. Given the limitations in determining if units of woodland qualify as *Tilio-Acerion* woodland, each of the areas surveyed have been placed into one of the following categories:

- <u>Strongly conforms</u> to *Tilio-Acerion*
- <u>Moderately conforms</u> to *Tilio-Acerion*
- <u>Weakly conforms</u> to *Tilio-Acerion*
- <u>Does not conform</u> to *Tilio-Acerion*

2.2.2 The following criteria were used to assign each woodland unit to one of the listed categories. Those features shown in bold are characteristic of *Tilio-Acerion* woodland and the best examples included a higher proportion of these. Assessment was based on judgment rather than attempting to quantify each attribute, which in itself was likely to be subjective.

Topography:

Deep ravine
Open ravine
Base of slope
Level ground
Top of slope
Ridge.

Micro-climate:
Humid & shady
Closed canopy but not especially humid or shady
Open canopy
Exposed field layer

Substrate structure:
Coarse scree
Cliff
Steep rocky slopes
Gentler slopes with deeper soils
Generally level ground with deep humic soils

Substrate chemistry:
Calcareous
Neutral
Acid

Soil nutrient status:
Poor
Moderate
Rich
Eutrophic

Canopy:
Ash (dominant/abundant - frequent - occasional/rare - absent)
Wych Elm (abundant - frequent – occasional/rare - absent**)**
Small-leaved Lime (abundant - frequent - occasional/rare - absent)

Ground flora:
Fern banks with an abundance of the following indicator species:
Hart's-tongue *Phyllitis scolopendrium*
Soft shield-fern *Polystichum setiferum*
Buckler-ferns *Dryopteris* spp.
Ramsons *Allium ursinum*
Dog's Mercury *Mercurialis perennis*
Enchanter's-nightshade *Circaea lutetiana*
Wood Avens *Geum urbanum*
Natural disturbance communities associated with scree supporting:
Common Nettle *Urtica dioica*
Herb-Robert *Geranium robertianum*
Cleavers *Galium aparine*

NVC type:
W8d-g *Fraxinus excelsior– Acer campestre- Mercurialis perennis* woodland
W9 *Fraxinus excelsior – Sorbus aucuparia – Mercurialis perennis* woodland.

Uncommon vascular plants:

Dark-red helleborine *Epipactis atrorubens*
Violet Helleborine *Epipactis purpurata*
Wood Fescue *Festuca altissima*
Purple Gromwell *Lithospermum purpureocaeruleum*
Herb-Paris *Paris quadrifolia*
plus other woodland species of local significance

Notable bryophytes associated with base-rich rock outcrops and Atlantic species (not assessed in detail).

Important assemblages of epiphytic lichens (not assessed).

2.2.3 A key factor influencing woodlands flanking the existing A465 is the impact from previous disturbance during the construction phase of the original road scheme. CCW have indicated that where such woodland has established on areas previously disturbed when the Head of the Valleys Road was first constructed, they would not be particularly concerned if it was affected by the proposed widening. In order to determine the level of disturbance the following categories have been used to indicate the level of modification to woodland habitats, however, it should be noted that *Tilio-Acerion* is a dynamic habitat that includes 'disturbance communities' within its definition, so disturbance may not necessarily be a negative issue:

- <u>Highly modified</u> (major disturbance to substrate evident, or with significant concrete, slag or other artificial material making up part of the substrate)
- <u>Moderately modified</u> (evidence of moderate disturbance to substrate)
- <u>Lightly modified</u> (evidence of limited disturbance to substrate)
- <u>Unmodified</u> (woodland in good condition with diverse range of indicators)

2.2.4 The following descriptions are based on survey work carried out by Pryce Consultant Ecologists during 2012. The main aim of the survey was to assign each woodland unit as conforming or not conforming to *Tilio-Acerion* by means of examining woodland structure, species composition, condition and disturbance of the woodland, in particular those communities with potential to be directly affected by the proposed scheme. The locations of field data collected during the 2012 season are shown by the target notes (TN) on figure 1, which cover all of the potential areas of *Tilio-Acerion*. Full species lists from each sampling area appear at appendix 1. Note that those woodland communities identified during the 2008 CCW woodland survey that do not conform to *Tilio-Acerion* woodland were not extensively surveyed in detail, namely:

- W11a *Quercus petraea – Betula pubescens – Oxalis acetosella* woodland: *Dryopteris dilatata* sub-community
- W12a *Fagus sylvatica – Mercurialis pernnis* woodland: *Mercurialis perennis* sub-community
- W14 *Fagus sylvatica – Rubus fruticosus* woodland
- W16b Quercus spp. – Betula spp. – Deschampsia cespitosa woodland: Vaccinium myrtillus – Dryopteris dilatata sub-community

2.2.5 In general terms the narrow strip of woodland wedged between the A465 and the River Clydach was found to be secondary in nature, comprised mostly of young trees that have presumably re-established since the construction of the Heads of the Valleys Road in 1963. Evidence of disturbance was noted in most of the sections examined and in addition to a poorly developed canopy, the field layer was typically impoverished, with a high frequency of ruderal species and limited abundance and diversity woodland indicators, most notably an absence of ancient woodland indicators.

2.2.6 The woodland at the extreme western end of the Limestone gorge, as shown by **TN01** and **TN02** on figure 1, was deeply incised and very narrow. The road along this section overhangs the woodland, which is only a few metres wide (always <10m)on the north side of the river and the field layer has clearly been disturbed and modified by construction works associated with the road. In addition to loose rocks and rubble there are extensive concrete footings and cliff reinforcements, plus a water works building. Despite these modifications the canopy was found to be moderately diverse with frequent Ash (*Fraxinus excelior*), Beech (*Fagus sylvatica*) and Wych Elm (*Ulmus glabra*). Two Small-leaved Lime (*Tilia cordata*) were noted in this section, both growing from rock under the bridge, presumably regeneration from an established rootstock. Bramble (*Rubus fruticosus*) and Common Ivy (*Hedera helix*) were the most abundant species in the field layer, with locally frequent Common Nettle (Urtica dioica), Enchanter's-nightshade (*Circaea lutetiana*), False-brome (*Brachypodium sylvaticum*), Hart's-tongue (*Phyllitis scolopendrium*), Herb-Robert (*Geranium robertianum*), Indian Balsam (*Impatiens gladulifera*), Tufted Hair-grass (*Deschampsia cespitosa*) and Wood-sedge (*Carex sylvatica*). Fox-tail Feather-moss (*Thamnobryum alopecurum*) was the most widespread and abundant bryophytes, with the bulk of moss and liverwort diversity being concentrated along the immediate river bank where more humid conditions persist.

Woodland at **TN01** and **TN02** best fits the NVC description for W8e *Fraxinus excelsior – Acer campestre – Mercurialis perennis* woodland: *Geranium robertianum* sub-community and despite the section being **highly modified, conforms moderately well to *Tilio-Acerion* woodland**.

2.2.7 The outlet for water originating from Hafod Farm Stream is situated at the base of a ~3m high Limestone cliff, as shown by **TN03** on figure 1. Water quality was poor at the time of the survey and highly pungent indicating a high nutrient status of the splash and spray that was directly affecting much of the cliff. A limited range of common bryophytes was noted on the cliff face. The woodland in the immediate vicinity supported a similar suite of species to that described for TN02 and is best described by the NVC community W8e *Fraxinus excelsior – Acer campestre – Mercurialis perennis* woodland: *Geranium robertianum* sub-community. The woodland in this section has been **moderately modified and conforms moderately well to *Tilio-Acerion* woodland**.

2.2.8 Woodland immediately west of the Coed Fedw-ddu layby, as shown by **TN14** on figure 1, was again deeply incised and very steep, but in comparison with sections to the west had a greater width of level ground (approximately 5m) before the drop-off. It was difficult to assess the degree of modification of the lower slopes due to the steepness of the valley sides, but it is probable that the steepness of the slope will have reduced the amount of disturbance in his section. The canopy was found to be moderately diverse with abundant Beech and locally frequent Ash and Wych Elm. Bramble, Common Ivy and Fox-tail Feather-moss were the most abundant species in the field layer, with locally frequent Common Nettle, False-brome, Hart's-tongue, Herb-Robert, Nipplewort (*Lapsana communis*) and Ramsons (*Allium ursinum*).

Woodland at **TN14** comprises a mosaic of the NVC communities W8e/f *Fraxinus excelsior – Acer campestre – Mercurialis perennis* woodland: *Geranium robertianum/Allium ursinum* sub-communities and W12a *Fagus sylvatica – Mercurialis perennis* woodland: *Mercurialis perennis* sub-community. The section is **moderately modified and the W8e/f elements conform**

moderately well to *Tilio-Acerion* woodland. The W12a element does not conform to *Tilio-Acerion* woodland.

2.2.9 Woodland in the vicinity of Devil's Bridge, as shown by **TN17** on figure 1, was established in a more open section of the gorge with a wider distance and reduced slope between the road and the river. The level of disturbance to the woodland floor and canopy appeared less than that noted further west. Ash was prominent in the canopy and Field Maple (*Acer campestre*) was frequent along with Wych Elm. Common Ivy, Fox-tail Feather-moss and Hart's-tongue were the most abundant species in the field layer, with frequent Bramble, Dog's-Mercury, Enchanter's-nightshade and False-brome. Ramsons was locally frequent lower down along with riparian bryophytes.

Woodland at **TN17** grades from the W8e *Fraxinus excelsior – Acer campestre – Mercurialis perennis* woodland: *Geranium robertianum* sub-community on higher ground to *Allium ursinum* sub-community W8f lower down the slope. The section is **lightly modified and the W8e/f elements conform moderately well to *Tilio-Acerion* woodland.**

2.2.10 Woodland habitats adjacent to the slag tip, as shown by **TN06** and **TN07** on figure 1, were in the most open section of the gorge, with the river being up to 60m from the road. The level of disturbance to the woodland floor was quite significant in these areas, especially so around TN07, with a large amount of slag and loose rock making up the slopes. Much of the main slag tip, shown by TN05 (see below), was without woodland cover. On the upper slopes Goat Willow (*Salix caprea*) was frequent in the canopy along with Ash, Beech, Hazel (*Corylus avellana*) and Wych Elm. A mature suckering Small-leaved Lime was noted at TN06. East of this at **TN04** was a damp rock face with Whorled Tufa-moss (*Eucladium verticillatum*) and Dwarf Feather-moss (*Oxyrrhinchium pumilum*). It is possible that this and other damp Limestone faces support scarcer species and a winter survey carried out by a more experienced bryologist could prove worthwhile. The disturbed field layer of the upper slopes was characterised by low diversity and frequent Bracken (*Pteridium aquilinum*), Bramble, Common Ivy, Fox-tail Feather-moss, Herb-Robert and Wild Strawberry (*Fragaria vesca*). In comparison to these disturbance communities of the higher slopes, the lower part of the slope was less modified and supported a better established woodland community. The lower slopes, shown by **TN07a,** in general supported a higher frequency of woodland indicators including occasional Dog's Mercury, Hart's-tongue and Opposite-leaved Golden-saxifrage (*Chrysosplenium oppositifolium*) and a richer riparian bryophyte assemblage.

Woodland at **TN06** and **TN07** comprises a mosaic of poor W12a *Fagus sylvatica – Mercurialis pernnis* woodland: *Mercurialis perennis* sub-community and poor W8e *Fraxinus excelsior – Acer campestre – Mercurialis perennis* woodland: *Geranium robertianum* sub-community. The section is **highly modified and conforms weakly to *Tilio-Acerion* woodland**.

Woodland on the lower slopes at **TN07a** fit the NVC description for W8e *Fraxinus excelsior – Acer campestre – Mercurialis perennis* woodland: *Geranium robertianum* sub-community. The section is **lightly modified and conforms moderately well to *Tilio-Acerion* woodland**.

2.2.11 The slag tip, shown by **TN05** on figure 1, largely lacked woodland cover, but scattered trees and scrub did include a 2m high Welsh Whitebeam (*Sorbus cambrense*) at SO21811268. Overall diversity was quite high with 92 species noted. This section is **highly modified and does not conform to *Tilio-Acerion* woodland.**

2.2.12 Woodland habitats on the north side of the Heads of the Valleys Road were identified by CCW has having potential remnants of *Tilio-Acerion*, in particular the sections shown by **TN12** and **TN15** on figure 1. These areas support a very narrow woodland corridor that extends along the crest of the original cut through the Limestone section of the A465. Inspections revealed that although the canopy was moderately diverse with abundant Beech and locally frequent Ash, Hawthorn, Hazel and oak hybrids (*Quercus x rosacea*), the field layer was highly modified and lacked many of the species that characterise Tilio-Acerion. Bluebell (*Hyacinthoides non-scripta*), Bracken, Bramble, Common Ivy, Common Nettle, Rough Meadow-grass (*Poa trivialis*) and Swan's-neck Thyme-moss (*Mnium hornum*) were the most frequent species in the rarer well-lit and airy field layer.

Woodland habitats at **TN12** and **TN15** are poor respective examples of W10a *Quercus robur – Pteridium aquilinum – Rubus fruticosus* woodland: Typical sub-community and very poor W8e *Fraxinus excelsior – Acer campestre – Mercurialis perennis* woodland: *Geranium robertianum* sub-community. The section is **highly modified and does not conform to *Tilio-Acerion* woodland**.

2.2.13 Other woodland habitats examined that were not identified by CCW as having potential remnants of *Tilio-Acerion* included the narrow woodland corridor on the north side of the Heads of the Valleys Road between the Brynmawr roundabout and A465 viaduct south-west of the sewage treatment works at SO204123. Data for this section are listed under **TN11** at appendix 1. The underlying geology of this very narrow woodland corridor is Lower Coal Measures Formation comprising Sandstone which being base-poor makes it unsuitable for the formation of Tilio-Acerion woodland. There is some flushing of the cliff face at **TN10**. Whilst the canopy along this section was varied and contained locally frequent Ash and occasional Wych Elm, the field layer lacked the range and abundance of indicator species that characterise *Tilio-Acerion* with Bramble, Common Striated Feather-moss (*Eurhynchium striatum*) and Enchanter's-nightshade being the most abundant species noted. Other species noted as frequent included Cleavers (*Galium aparine*), Common Ivy, Common Nettle, Creeping Buttercup (*Ranunculus repens*) and Male-fern (*Dryopteris felix-mas*).

Woodland habitats at **TN10** and TN11 are poor examples of W10a *Quercus robur – Pteridium aquilinum – Rubus fruticosus* woodland: Typical sub-community. The section is **highly modified and does not conform to *Tilio-Acerion* woodland**.

2.3 Discussion

The survey has shown that *Tilio-Acerion* appears to be a robust habitat and is capable of re-establishing itself where disturbance has not been excessive, and the communities associated with the construction of the original A465 fit in reasonably well with the *Tilio-Acerion* description. Without prior knowledge of the former condition of the habitat on the gorge habitats it is not possible to assess the impact that the previous scheme had on these woodlands, but it appears that by ensuring the environmental conditions within the gorge are maintained, considerable modifications to an already modified substrate may have a limited impact upon the *Tilio-Acerion* element in the longer term.

Appendix 1: 2012 Botanical Field Data

TN01 woodland between road and river

SO20731240 (23/08/2012)

canopy		
Ash	*Fraxinus excelsior*	frequent
Beech	*Fagus sylvatica*	frequent
Goat Willow	*Salix caprea*	occasional
Rowan	*Sorbus aucuparia*	rare
Small-leaved Lime	*Tilia cordata*	rare
Wych Elm	*Ulmus glabra*	frequent
understorey		
Elder	*Sambucus nigra*	occasional
Hawthorn	*Crataegus monogyna*	occasional
Hazel	*Corylus avellana*	frequent
Rusty Willow	*Salix cinerea subsp. oleifolia*	occasional
field layer		
Bramble	*Rubus fruticosus agg.*	abundant
Broad-leaved Willowherb	*Epilobium montanum*	occasional
Cleavers	*Galium aparine*	occasional
Cock's-foot	*Dactylis glomerata*	occasional
Common Feather-moss	*Kindbergia praelonga*	frequent
Common Ivy	*Hedera helix*	locally abundant
Common Nettle	*Urtica dioica*	locally frequent
Common Striated Feather-moss	*Eurhynchium striatum*	frequent
Creeping Thistle	*Cirsium arvense*	occasional
Crescent-cup Liverwort	*Lunularia cruciata*	occasional
Dotted Thyme-moss	*Rhizomnium punctatum*	locally frequent
Enchanter's-nightshade	*Circaea lutetiana*	locally frequent
Endive Pellia	*Pellia endiviifolia*	locally frequent
False-brome	*Brachypodium sylvaticum*	frequent
Fern-leaved Hook-moss	*Cratoneuron filicinum*	locally frequent

Field Horsetail	*Equisetum arvense*	occasional
Fox-tail Feather-moss	*Thamnobryum alopecurum*	frequent
Hart's-tongue	*Phyllitis scolopendrium*	locally frequent
Hart's-tongue Thyme-moss	*Plagiomnium undulatum*	frequent
Hedge Woundwort	*Stachys sylvatica*	occasional
Hemlock Water-dropwort	*Oenanthe crocata*	occasional
Herb-Robert	*Geranium robertianum*	frequent
Indian Balsam	*Impatiens glandulifera*	frequent
Male-fern	*Dryopteris filix-mas*	occasional
Marsh Woundwort	*Stachys palustris*	occasional
Meadowsweet	*Filipendula ulmaria*	occasional
Nipplewort	*Lapsana communis*	locally frequent
Opposite-leaved Golden-saxifrage	*Chrysosplenium oppositifolium*	locally frequent
River Feather-moss	*Brachythecium rivulare*	locally frequent
Rough Meadow-grass	*Poa trivialis*	occasional
Scaly Male-fern	*Dryopteris affinis subsp. affinis*	occasional
Snakewort	*Conocephalum salebrosum*	occasional
Tufted Hair-grass	*Deschampsia cespitosa*	locally frequent
Wavy Bitter-cress	*Cardamine flexuosa*	locally frequent
Wild Strawberry	*Fragaria vesca*	occasional
Wood Avens	*Geum urbanum*	occasional
Wood Dock	*Rumex sanguineus*	occasional
Wood Sage	*Teucrium scorodonia*	occasional
Wood-sedge	*Carex sylvatica*	locally frequent
Yorkshire-fog	*Holcus lanatus*	occasional

TN02 woodland between road and river

SO20781241 (23/08/2012)

canopy

Ash	*Fraxinus excelsior*	occasional
Beech	*Fagus sylvatica*	frequent
Goat Willow	*Salix caprea*	occasional

hybrid oak	*Quercus x rosacea*	rare
Wych Elm	*Ulmus glabra*	frequent
<u>understorey</u>		
Elder	*Sambucus nigra*	occasional
Hawthorn	*Crataegus monogyna*	occasional
Hazel	*Corylus avellana*	frequent
Rusty Willow	*Salix cinerea subsp. oleifolia*	occasional
<u>field layer</u>		
Broad Buckler-fern	*Dryopteris dilatata*	occasional
Chalk Comb-moss	*Ctenidium molluscum*	locally frequent
Common Dog-violet	*Viola riviniana*	occasional
Common Ivy	*Hedera helix*	locally abundant
Common Ragwort	*Senecio jacobaea*	rare
Cylindric Beard-moss	*Didymodon insulanus*	occasional
Dandelion	*Taraxacum agg.*	occasional
Elegant Silk-moss	*Pseudotaxiphyllum elegans*	occasional
Forked Veilwort	*Metzgeria furcata*	occasional
fork-moss	*Dichodontium pellucidum sens. lat.*	locally frequent
Fox-tail Feather-moss	*Thamnobryum alopecurum*	locally abundant
Goldenrod	*Solidago virgaurea*	occasional
hawkweed	*Hieracium agg.*	occasional
Japanese Knotweed	*Fallopia japonica*	occasional
Long-beaked Thyme-moss	*Plagiomnium rostratum*	occasional
Long-beaked Water Feather-moss	*Platyhypnidium riparioides*	frequent
Maidenhair Pocket-moss	*Fissidens adianthoides*	locally frequent
Maidenhair Spleenwort	*Asplenium trichomanes ssp. quad.*	occasional
Pointed Spear-moss	*Calliergonella cuspidata*	locally frequent
River Feather-moss	*Brachythecium rivulare*	locally frequent
Rock Pocket-moss	*Fissidens dubius*	occasional
Rosebay Willowherb	*Chamerion angustifolium*	occasional
Selfheal	*Prunella vulgaris*	occasional
Soft Shield-fern	*Polystichum setiferum*	occasional

St Winifrid's Moss	*Chiloscyphus polyanthos*	locally frequent
Swartz's Feather-moss	*Oxyrrhynchium hians*	occasional
Western Pouncewort	*Lejeunea lamacerina*	locally frequent
Wild Angelica	*Angelica sylvestris*	rare
Wood Melick	*Melica uniflora*	occasional

TN03 woodland between road and river (cliff by sewage outlet into river)

SO20791240 (23/08/2012)

Mougeot's Yoke-moss	*Amphidium mougeotii*	locally frequent
Snakewort	*Conocephalum salebrosum*	occasional
fork-moss	*Dichodontium pellucidum sens. lat.*	frequent
Long-beaked Water Feather-moss	*Platyhypnidium riparioides*	frequent
Maidenhair Pocket-moss	*Fissidens adianthoides*	frequent
Endive Pellia	*Pellia endiviifolia*	frequent
Fox-tail Feather-moss	*Thamnobryum alopecurum*	frequent
Hart's-tongue	*Phyllitis scolopendrium*	frequent
Variable Crisp-moss	*Trichostomum brachydontium*	frequent

TN04 damp Limestone cliff

SO21691260 (23/08/2012)

Whorled Tufa-moss	*Eucladium verticillatum*	locally frequent
Common Ivy	*Hedera helix*	locally frequent
Dwarf Feather-moss	*Oxyrrhynchium pumilum*	occasional
Endive Pellia	*Pellia endiviifolia*	locally frequent

TN05 scrub/grassland mosaic of slag scree

SO217126-SO218126 (23/08/2012)

Agrimony	*Agrimonia eupatoria*	occasional
American Willowherb	*Epilobium ciliatum*	occasional
Ash	*Fraxinus excelsior*	frequent
Beech	*Fagus sylvatica*	occasional
Bittersweet	*Solanum dulcamara*	rare

Black Medick	*Medicago lupulina*	occasional
Blue Fleabane	*Erigeron acer*	occasional
Bracken	*Pteridium aquilinum*	frequent
Bramble	*Rubus fruticosus agg.*	locally frequent
Broad-leaved Dock	*Rumex obtusifolius*	rare
Bulbous Buttercup	*Ranunculus bulbosus*	occasional
Butterfly-bush	*Buddleja davidii*	occasional
Capillary Thread-moss	*Bryum capillare*	locally frequent
Carline Thistle	*Carlina vulgaris*	occasional
Chalk Comb-moss	*Ctenidium molluscum*	locally frequent
Chalk Knapweed	*Centaurea debauxii*	occasional
Common Bird's-foot-trefoil	*Lotus corniculatus*	locally frequent
Common Couch	*Elytrigia repens*	occasional
Common Dog-violet	*Viola riviniana*	occasional
Common Feather-moss	*Kindbergia praelonga*	occasional
Common Field Grasshopper	*Chorthippus brunneus*	present
Common Figwort	*Scrophularia nodosa*	rare
Common Fleabane	*Pulicaria dysenterica*	rare
Common Ragwort	*Senecio jacobaea*	occasional
Creeping Buttercup	*Ranunculus repens*	occasional
Creeping Thistle	*Cirsium arvense*	occasional
Crisped Neckera	*Neckera crispa*	rare
Cuckooflower	*Cardamine pratensis*	rare
Dog-rose	*Rosa canina agg.*	occasional
eyebright	*Euphrasia nemorosa*	occasional
Fairy Flax	*Linum catharticum*	occasional
False Oat-Grass	*Arrhenatherum elatius*	locally frequent
False-brome	*Brachypodium sylvaticum*	locally frequent
Field Horsetail	*Equisetum arvense*	occasional
Field Maple	*Acer campestre*	occasional
Fodder Burnet	*Sanguisorba minor subsp. muricata*	occasional
Frizzled Crisp-moss	*Tortella tortuosa*	occasional

Germander Speedwell	*Veronica chamaedrys*	occasional
Giant Fescue	*Festuca gigantea*	rare
Glaucous Sedge	*Carex flacca*	occasional
Goat Willow	*Salix caprea*	occasional
Goldenrod	*Solidago virgaurea*	locally frequent
Gorse	*Ulex europaeus*	locally abundant
Great Mullein	*Verbascum thapsus*	occasional
Ground-ivy	*Glechoma hederacea*	occasional
Hairy Tare	*Vicia hirsuta*	occasional
Hard Rush	*Juncus inflexus*	rare
Hart's-tongue	*Phyllitis scolopendrium*	occasional
Herb-Robert	*Geranium robertianum*	frequent
Intermediate Screw-moss	*Syntrichia montana*	locally frequent
Ivy-leaved Toadflax	*Cymbalaria muralis*	occasional
Lady-fern	*Athyrium filix-femina*	rare
Lesser Trefoil	*Trifolium dubium*	occasional
Maidenhair Spleenwort	*Asplenium trichomanes ssp. quad.*	occasional
Male-fern	*Dryopteris filix-mas*	occasional
Mouse-ear-hawkweed	*Pilosella officinarum*	frequent
Neat Crisp-moss	*Tortella nitida*	occasional
Neat Feather-moss	*Pseudoscleropodium purum*	frequent
Perforate St John's-wort	*Hypericum perforatum*	occasional
Ploughman's-spikenard	*Inula conyzae*	occasional
Red Fescue	*Festuca rubra*	locally frequent
Red Valerian	*Centranthus ruber*	locally abundant
Ribwort Plantain	*Plantago lanceolata*	occasional
Rosebay Willowherb	*Chamerion angustifolium*	occasional
Rough Hawkbit	*Leontodon hispidus*	occasional
Rough-stalked Feather-moss	*Brachythecium rutabulum*	occasional
Rustyback	*Ceterach officinarum*	rare
Sheep's-fescue	*Festuca ovina*	occasional
Silky Wall Feather-moss	*Homalothecium sericeum*	occasional

Slender Ditrichum	*Ditrichum gracile*	rare
Smooth Hawk's-beard	*Crepis capillaris*	occasional
Spiral Extinguisher-moss	*Encalypta streptocarpa*	occasional
Springy Turf-moss	*Rhytidiadelphus squarrosus*	occasional
Sycamore	*Acer pseudoplatanus*	occasional
Tall Fescue	*Festuca arundinacea*	rare
Thickpoint Grimmia	*Schistidium crassipilum*	occasional
Traveller's-joy	*Clematis vitalba*	frequent
Umbellate Hawkweed	*Hieracium umbellatum*	occasional
Upright Brome	*Bromopsis erecta*	occasional
Upright Hedge-parsley	*Torilis japonica*	occasional
Welsh Whitebeam	*Sorbus cambrensis* (SO21811268)	1
Wild Basil	*Clinopodium vulgare*	occasional
Wild Marjoram	*Origanum vulgare*	frequent
Wild Strawberry	*Fragaria vesca*	frequent
Wild Teasel	*Dipsacus fullonum*	rare
Wild Thyme	*Thymus polytrichus*	frequent
Wood Sage	*Teucrium scorodonia*	locally frequent
Wormwood	*Artemisia absinthium*	rare
Wych Elm	*Ulmus glabra*	occasional
Yarrow	*Achillea millefolium*	occasional
Yellow Feather-moss	*Homalothecium lutescens*	occasional

TN06 woodland between road and river

SO21651259 (23/08/2012)

Ash	*Fraxinus excelsior*	frequent
Beech	*Fagus sylvatica*	frequent
Field Maple	*Acer campestre*	occasional
Hawthorn	*Crataegus monogyna*	occasional
Hazel	*Corylus avellana*	frequent
Small-leaved Lime	*Tilia cordata*	present
Wych Elm	*Ulmus glabra*	frequent

TN07 woodland between base of slag tip and river

SO218126 (23/08/2012)

canopy		
Ash	*Fraxinus excelsior*	frequent
Beech	*Fagus sylvatica*	occasional
Dogwood	*Cornus sanguinea*	occasional
Downy Birch	*Betula pubescens*	occasional
Elder	*Sambucus nigra*	occasional
Field Maple	*Acer campestre*	occasional
Goat Willow	*Salix caprea*	locally frequent
Holly	*Ilex aquifolium*	occasional
Sycamore	*Acer pseudoplatanus*	occasional
Wych Elm	*Ulmus glabra*	occasional
epiphytes		
Forked Veilwort	*Metzgeria furcata*	locally frequent
Polypody	*Polypodium vulgare*	occasional
Slender Mouse-tail Moss	*Isothecium myosuroides*	locally frequent
field layer		
Bracken	*Pteridium aquilinum*	frequent
Bramble	*Rubus fruticosus agg.*	frequent
Broad-leaved Willowherb	*Epilobium montanum*	occasional
Common Feather-moss	*Kindbergia praelonga*	frequent
Common Ivy	*Hedera helix*	locally abundant
Common Nettle	*Urtica dioica*	locally frequent
Common Striated Feather-moss	*Eurhynchium striatum*	frequent
Dog-rose	*Rosa canina agg.*	occasional
Enchanter's-nightshade	*Circaea lutetiana*	locally frequent
False-brome	*Brachypodium sylvaticum*	locally frequent
Fox-tail Feather-moss	*Thamnobryum alopecurum*	locally frequent
Hart's-tongue	*Phyllitis scolopendrium*	occasional
Hart's-tongue Thyme-moss	*Plagiomnium undulatum*	locally frequent

Herb-Robert	*Geranium robertianum*	frequent
Raspberry	*Rubus idaeus*	locally frequent
Rough-stalked Feather-moss	*Brachythecium rutabulum*	occasional
Tufted Hair-grass	*Deschampsia cespitosa*	locally frequent
Wild Strawberry	*Fragaria vesca*	frequent
Wood Sage	*Teucrium scorodonia*	locally frequent

TN07a woodland between base of slag tip and river

SO218126 (23/08/2012)

field layer

Borrer's Scaly Male-fern	*Dryopteris affinis subsp. borreri*	rare
Chalk Comb-moss	*Ctenidium molluscum*	frequent
Common Dog-violet	*Viola riviniana*	occasional
Common Striated Feather-moss	*Eurhynchium striatum*	locally frequent
Common Valerian	*Valeriana officinalis*	occasional
Creeping Buttercup	*Ranunculus repens*	occasional
Dog's Mercury	*Mercurialis perennis*	occasional
Elegant Silk-moss	*Pseudotaxiphyllum elegans*	occasional
Endive Pellia	*Pellia endiviifolia*	occasional
Fork-moss	*Dichodontium pellucidum sens. lat.*	locally frequent
Fox-tail Feather-moss	*Thamnobryum alopecurum*	locally abundant
Goldenrod	*Solidago virgaurea*	occasional
Hart's-tongue	*Phyllitis scolopendrium*	locally frequent
Hart's-tongue Thyme-moss	*Plagiomnium undulatum*	frequent
Hogweed	*Heracleum sphondylium*	rare
Lesser Featherwort	*Plagiochila porelloides*	locally frequent
lichen	*Peltigera membranacea*	occasional
Long-beaked Thyme-moss	*Plagiomnium rostratum*	occasional
Long-beaked Water Feather-moss	*Platyhypnidium riparioides*	frequent
Marsh-bedstraw	*Galium palustre*	occasional
Meadow Buttercup	*Ranunculus acris*	rare
Opposite-leaved Golden-saxifrage	*Chrysosplenium oppositifolium*	frequent

Polypody	*Polypodium vulgare*	rare
River Feather-moss	*Brachythecium rivulare*	locally frequent
St Winifrid's Moss	*Chiloscyphus polyanthos*	locally frequent
Swartz's Feather-moss	*Oxyrrhynchium hians*	occasional
Variable Crisp-moss	*Trichostomum brachydontium*	occasional
Western Pouncewort	*Lejeunea lamacerina*	locally frequent
Wood Avens	*Geum urbanum*	occasional
Wood-sedge	*Carex sylvatica*	locally frequent
Wood-sorrel	*Oxalis acetosella*	occasional

TN08 grassland/scrub mosaic to north of road

SO197121 (05/07/2012)

Agrimony	*Agrimonia eupatoria*	locally frequent
Cat's-ear	*Hypochaeris radicata*	frequent
Cock's-foot	*Dactylis glomerata*	locally abundant
Colt's-foot	*Tussilago farfara*	occasional
Common Knapweed	*Centaurea nigra*	locally frequent
Common Vetch	*Vicia sativa subsp. segetalis*	occasional
Crested Dog's-tail	*Cynosurus cristatus*	locally frequent
Curled Dock	*Rumex crispus*	occasional
False Oat-Grass	*Arrhenatherum elatius*	locally abundant
Garden Lady's-mantle	*Alchemilla mollis*	occasional
Germander Speedwell	*Veronica chamaedrys*	frequent
Goat Willow	*Salix caprea*	occasional
Gorse	*Ulex europaeus*	occasional
Hawthorn	*Crataegus monogyna*	frequent
Hazel	*Corylus avellana*	locally frequent
Himalayan Cotoneaster	*Cotoneaster simonsii*	rare
Juniper Haircap	*Polytrichum juniperinum*	occasional
Lodgepole Pine	*Pinus contorta*	rare
Meadow Crane's-bill	*Geranium pratense*	occasional
Meadow Vetchling	*Lathyrus pratensis*	occasional

Mouse-ear-hawkweed	*Pilosella officinarum*	locally abundant
Mugwort	*Artemisia vulgaris*	occasional
Perennial Cornflower	*Centaurea montana*	rare
Perennial Rye-grass	*Lolium perenne*	occasional
Red Clover	*Trifolium pratense*	occasional
Rough Meadow-grass	*Poa trivialis*	locally frequent
Rusty Willow	*Salix cinerea subsp. oleifolia*	occasional
Silver Birch	*Betula pendula*	frequent
Silver Hair-grass	*Aira caryophyllea*	occasional
Tufted Hair-grass	*Deschampsia cespitosa*	occasional
Upright Hedge-parsley	*Torilis japonica*	occasional
Wood Sage	*Teucrium scorodonia*	locally frequent
Wormwood	*Artemisia absinthium*	rare
Yorkshire-fog	*Holcus lanatus*	locally abundant
<u>section below compound</u>		
Agrimony	*Agrimonia eupatoria*	occasional
Ash	*Fraxinus excelsior*	frequent
Bramble	*Rubus fruticosus agg.*	abundant
Broad-leaved Dock	*Rumex obtusifolius*	occasional
Broad-leaved Willowherb	*Epilobium montanum*	occasional
Broom	*Cytisus scoparius*	occasional
Burnet-saxifrage	*Pimpinella saxifraga*	occasional
Cleavers	*Galium aparine*	occasional
Common Ivy	*Hedera helix*	locally abundant
Common Nettle	*Urtica dioica*	locally frequent
Cow Parsley	*Anthriscus sylvestris*	occasional
Creeping Thistle	*Cirsium arvense*	occasional
Elder	*Sambucus nigra*	rare
Enchanter's-nightshade	*Circaea lutetiana*	frequent
Fern-leaved Hook-moss	*Cratoneuron filicinum*	frequent
Foxglove	*Digitalis purpurea*	occasional
Germander Speedwell	*Veronica chamaedrys*	occasional

Glaucous Sedge	*Carex flacca*	locally frequent
Goat Willow	*Salix caprea*	occasional
Goat's-beard	*Tragopogon pratensis*	occasional
Goldenrod	*Solidago virgaurea*	occasional
Great Willowherb	*Epilobium hirsutum*	occasional
Greater Burdock	*Arctium lappa*	occasional
Hart's-tongue	*Phyllitis scolopendrium*	occasional
Hawthorn	*Crataegus monogyna*	frequent
Hazel	*Corylus avellana*	abundant
Hemp-agrimony	*Eupatorium cannabinum*	occasional
Male-fern	*Dryopteris filix-mas*	frequent
Nipplewort	*Lapsana communis*	occasional
Pedunculate Oak	*Quercus robur*	occasional
Perennial Sow-thistle	*Sonchus arvensis*	occasional
Pineappleweed	*Matricaria discoidea*	rare
Quaking-grass	*Briza media*	occasional
Rosebay Willowherb	*Chamerion angustifolium*	occasional
Rusty Willow	*Salix cinerea subsp. oleifolia*	locally frequent
Salad Burnet	*Sanguisorba minor subsp. minor*	occasional
Sycamore	*Acer pseudoplatanus*	occasional
Wood Avens	*Geum urbanum*	occasional
Yarrow	*Achillea millefolium*	occasional

TN09 Nant Melyn arch

SO20211226 (05/07/2012)

Common Valerian	*Valeriana officinalis*	occasional
Devil's-bit Scabious	*Succisa pratensis*	occasional
Endive Pellia	*Pellia endiviifolia*	frequent
Honeysuckle	*Lonicera periclymenum*	occasional
Marsh Bryum	*Bryum pseudotriquetrum*	frequent
Mougeot's Yoke-moss	*Amphidium mougeotii*	frequent

TN10 flushed cliff faced (coal measures)

SO201112211 (05/07/2012)

Curled Hook-moss	*Palustriella commutata sens. lat.*	abundant
Endive Pellia	*Pellia endiviifolia*	frequent
Fern-leaved Hook-moss	*Cratoneuron filicinum*	abundant
Great Scented Liverwort	*Conocephalum conicum sens. str.*	occasional
Hart's-tongue Thyme-moss	*Plagiomnium undulatum*	occasional
Monkeyflower	*Mimulus agg.*	occasional
Opposite-leaved Golden-saxifrage	*Chrysosplenium oppositifolium*	frequent
River Feather-moss	*Brachythecium rivulare*	frequent
Snakewort	*Conocephalum salebrosum*	locally frequent

TN11 very narrow section between river and A465

SO20261224 to SO20411231 (05/07/2012)

canopy/underscrub

Alder	*Alnus glutinosa*	occasional
Ash	*Fraxinus excelsior*	frequent
Beech	*Fagus sylvatica*	occasional
Blackthorn	*Prunus spinosa*	rare
Gorse	*Ulex europaeus*	occasional
Hawthorn	*Crataegus monogyna*	frequent
Hazel	*Corylus avellana*	frequent
Pedunculate Oak	*Quercus robur*	occasional
Rusty Willow	*Salix cinerea subsp. oleifolia*	occasional
Sessile Oak	*Quercus petraea*	occasional
Silver Birch	*Betula pendula*	occasional
Wych Elm	*Ulmus glabra*	occasional

field layer

Barren Strawberry	*Potentilla sterilis*	occasional
Bramble	*Rubus fruticosus agg.*	locally abundant
Broad-leaved Willowherb	*Epilobium montanum*	occasional
Cleavers	*Galium aparine*	locally frequent

Common Hemp-nettle	*Galeopsis tetrahit agg.*	occasional
Common Ivy	*Hedera helix*	frequent
Common Nettle	*Urtica dioica*	frequent
Common Striated Feather-moss	*Eurhynchium striatum*	locally abundant
Creeping Buttercup	*Ranunculus repens*	frequent
Enchanter's-nightshade	*Circaea lutetiana*	locally abundant
Great Willowherb	*Epilobium hirsutum*	locally frequent
Hart's-tongue	*Phyllitis scolopendrium*	rare
Honeysuckle	*Lonicera periclymenum*	occasional
Lady-fern	*Athyrium filix-femina*	occasional
Male-fern	*Dryopteris filix-mas*	frequent
Nipplewort	*Lapsana communis*	occasional
Soft-rush	*Juncus effusus*	occasional

TN12 woodland remnant at top of cutting

SO20761245 (05/07/2012)

canopy		
Ash	*Fraxinus excelsior*	locally frequent
Beech	*Fagus sylvatica*	locally abundant
Hawthorn	*Crataegus monogyna*	frequent
Hazel	*Corylus avellana*	frequent
oak hybrid	*Quercus x rosacea*	frequent
Rowan	*Sorbus aucuparia*	occasional
field layer		
Bluebell	*Hyacinthoides non-scripta*	locally abundant
Bracken	*Pteridium aquilinum*	locally abundant
Bramble	*Rubus fruticosus agg.*	frequent
Broad Buckler-fern	*Dryopteris dilatata*	occasional
Common Ivy	*Hedera helix*	frequent
Common Nettle	*Urtica dioica*	occasional
Common Striated Feather-moss	*Eurhynchium striatum*	locally abundant
Elegant Silk-moss	*Pseudotaxiphyllum elegans*	occasional

Enchanter's-nightshade	*Circaea lutetiana*	frequent
Forked Veilwort	*Metzgeria furcata*	frequent
Lady-fern	*Athyrium filix-femina*	occasional
Male-fern	*Dryopteris filix-mas*	occasional
Soft Shield-fern	*Polystichum setiferum*	occasional
Wood Anemone	*Anemone nemorosa*	occasional

TN13 pSI grassland

SO20791248 (05/07/2012)

Common Mouse-ear	*Cerastium fontanum*	occasional
Common Sorrel	*Rumex acetosa*	frequent
False Oat-Grass	*Arrhenatherum elatius*	frequent
Germander Speedwell	*Veronica chamaedrys*	occasional
Pignut	*Conopodium majus*	locally frequent
Ribwort Plantain	*Plantago lanceolata*	frequent
Sweet Vernal-grass	*Anthoxanthum odoratum*	abundant
Yorkshire-fog	*Holcus lanatus*	abundant

TN14 woodland between road and river

<u>canopy</u>

Ash	*Fraxinus excelsior*	locally frequent
Beech	*Fagus sylvatica*	locally abundant
Goat Willow	*Salix caprea*	occasional
Rowan	*Sorbus aucuparia*	rare
Sycamore	*Acer pseudoplatanus*	occasional
Wych Elm	*Ulmus glabra*	frequent

<u>understorey</u>

Elder	*Sambucus nigra*	occasional
Hawthorn	*Crataegus monogyna*	occasional
Hazel	*Corylus avellana*	frequent
Rusty Willow	*Salix cinerea subsp. oleifolia*	occasional

<u>field layer</u>

Bramble	*Rubus fruticosus agg.*	abundant
Broad Buckler-fern	*Dryopteris dilatata*	occasional
Broad-leaved Willowherb	*Epilobium montanum*	occasional
Chalk Comb-moss	*Ctenidium molluscum*	locally frequent
Cleavers	*Galium aparine*	occasional
Cock's-foot	*Dactylis glomerata*	occasional
Common Dog-violet	*Viola riviniana*	occasional
Common Feather-moss	*Kindbergia praelonga*	frequent
Common Ivy	*Hedera helix*	locally abundant
Common Nettle	*Urtica dioica*	locally frequent
Common Striated Feather-moss	*Eurhynchium striatum*	frequent
Crescent-cup Liverwort	*Lunularia cruciata*	occasional
Dog's Mercury	*Mercurialis perennis*	occasional
Dotted Thyme-moss	*Rhizomnium punctatum*	locally frequent
Enchanter's-nightshade	*Circaea lutetiana*	locally frequent
Endive Pellia	*Pellia endiviifolia*	locally frequent
False-brome	*Brachypodium sylvaticum*	locally frequent
Fork-moss	*Dichodontium pellucidum sens. lat.*	locally frequent
Fox-tail Feather-moss	*Thamnobryum alopecurum*	locally abundant
Goldenrod	*Solidago virgaurea*	occasional
Hart's-tongue	*Phyllitis scolopendrium*	locally frequent
Hart's-tongue Thyme-moss	*Plagiomnium undulatum*	occasional
Herb-Robert	*Geranium robertianum*	locally frequent
Indian Balsam	*Impatiens glandulifera*	occasional
Japanese Knotweed	*Fallopia japonica*	occasional
Long-beaked Water Feather-moss	*Platyhypnidium riparioides*	frequent
Male-fern	*Dryopteris filix-mas*	occasional
Nipplewort	*Lapsana communis*	locally frequent
Opposite-leaved Golden-saxifrage	*Chrysosplenium oppositifolium*	occasional
Ramsons	*Allium ursinum*	occasional
River Feather-moss	*Brachythecium rivulare*	locally frequent
Rock Pocket-moss	*Fissidens dubius*	occasional

Selfheal	*Prunella vulgaris*	occasional
Soft Shield-fern	*Polystichum setiferum*	occasional
St Winifrid's Moss	*Chiloscyphus polyanthos*	locally frequent
Swartz's Feather-moss	*Oxyrrhynchium hians*	occasional
Tufted Hair-grass	*Deschampsia cespitosa*	occasional
Wavy Bitter-cress	*Cardamine flexuosa*	occasional
Western Pouncewort	*Lejeunea lamacerina*	occasional
Wood Avens	*Geum urbanum*	occasional
Wood Sage	*Teucrium scorodonia*	occasional
Wood-sedge	*Carex sylvatica*	occasional

TN15 woodland remnant by cave shaft

SO20871246 (05/07/2012)

<u>canopy</u>

Ash	*Fraxinus excelsior*	frequent
Beech	*Fagus sylvatica*	frequent
Hawthorn	*Crataegus monogyna*	frequent
Hazel	*Corylus avellana*	frequent

<u>field layer</u>

Annual Meadow-grass	*Poa annua*	occasional
Bluebell	*Hyacinthoides non-scripta*	frequent
Bracken	*Pteridium aquilinum*	locally abundant
Bramble	*Rubus fruticosus agg.*	frequent
Broad-leaved Willowherb	*Epilobium montanum*	occasional
Clustered Feather-moss	*Rhynchostegium confertum*	occasional
Common Dog-violet	*Viola riviniana*	occasional
Common Feather-moss	*Kindbergia praelonga*	locally abundant
Common Ivy	*Hedera helix*	frequent
Common Nettle	*Urtica dioica*	frequent
Forked Veilwort	*Metzgeria furcata*	frequent
Germander Speedwell	*Veronica chamaedrys*	occasional
Hart's-tongue	*Phyllitis scolopendrium*	occasional

Maidenhair Spleenwort	*Asplenium trichomanes subsp. quadrivalens*	occasional
Male-fern	*Dryopteris filix-mas*	occasional
Meadow Buttercup	*Ranunculus acris*	occasional
Opposite-leaved Golden-saxifrage	*Chrysosplenium oppositifolium*	occasional
Rough Meadow-grass	*Poa trivialis*	frequent
Swan's-neck Thyme-moss	*Mnium hornum*	locally frequent
Tufted Hair-grass	*Deschampsia cespitosa*	occasional
Verdigris Tufa-moss	*Gymnostomum aeruginosum*	rare
Wood Avens	*Geum urbanum*	occasional

TN16 section between river and A465

SO20471231 to SO20901242 (05/07/2012)

canopy		
Ash	*Fraxinus excelsior*	occasional
Beech	*Fagus sylvatica*	locally abundant
Blackthorn	*Prunus spinosa*	occasional
Elder	*Sambucus nigra*	occasional
Goat Willow	*Salix caprea*	occasional
Gorse	*Ulex europaeus*	occasional
Hawthorn	*Crataegus monogyna*	occasional
Rusty Willow	*Salix cinerea subsp. oleifolia*	occasional
Silver Birch	*Betula pendula*	occasional
Wild Cherry	*Prunus avium*	occasional
field layer		
Agrimony	*Agrimonia eupatoria*	occasional
Bramble	*Rubus fruticosus agg.*	frequent
Cat's-ear	*Hypochaeris radicata*	occasional
Cleavers	*Galium aparine*	occasional
Cock's-foot	*Dactylis glomerata*	locally frequent
Colt's-foot	*Tussilago farfara*	occasional
Common Ivy	*Hedera helix*	locally abundant
Common Nettle	*Urtica dioica*	locally frequent

Common Ragwort	*Senecio jacobaea*	occasional
Common Valerian	*Valeriana officinalis*	occasional
Creeping Thistle	*Cirsium arvense*	occasional
Enchanter's-nightshade	*Circaea lutetiana*	frequent
False Oat-Grass	*Arrhenatherum elatius*	locally frequent
False-brome	*Brachypodium sylvaticum*	frequent
Foxglove	*Digitalis purpurea*	occasional
Germander Speedwell	*Veronica chamaedrys*	occasional
Hart's-tongue	*Phyllitis scolopendrium*	occasional
Heath Speedwell	*Veronica officinalis*	rare
Japanese Knotweed	*Fallopia japonica*	occasional
Lady-fern	*Athyrium filix-femina*	occasional
Male-fern	*Dryopteris filix-mas*	locally frequent
Pointed Spear-moss	*Calliergonella cuspidata*	locally frequent
Rosebay Willowherb	*Chamerion angustifolium*	occasional
Rough-stalked Feather-moss	*Brachythecium rutabulum*	frequent
Tufted Hair-grass	*Deschampsia cespitosa*	locally frequent
Upright Hedge-parsley	*Torilis japonica*	occasional
Yorkshire-fog	*Holcus lanatus*	locally frequent

TN17 woodland south of road

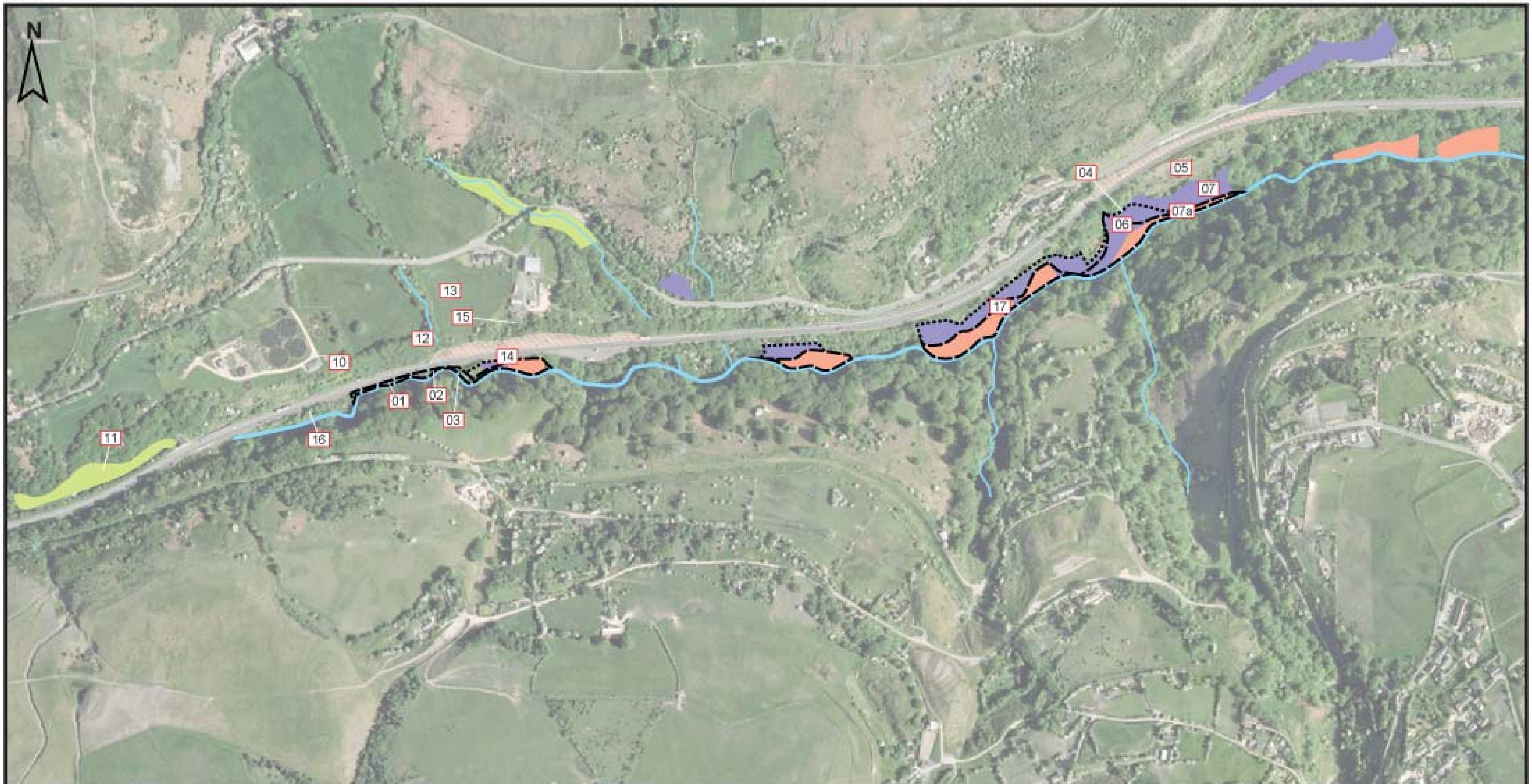
SO215125 (05/07/2012)

<u>canopy</u>		
Ash	*Fraxinus excelsior*	abundant
Beech	*Fagus sylvatica*	occasional
Field Maple	*Acer campestre*	frequent
Goat Willow	*Salix caprea*	occasional
Rowan	*Sorbus aucuparia*	rare
Sycamore	*Acer pseudoplatanus*	occasional
Wych Elm	*Ulmus glabra*	frequent
<u>understorey</u>		
Elder	*Sambucus nigra*	occasional

Hawthorn	*Crataegus monogyna*	occasional
Hazel	*Corylus avellana*	frequent
Rusty Willow	*Salix cinerea subsp. oleifolia*	occasional
field layer		
Bramble	*Rubus fruticosus agg.*	frequent
Broad Buckler-fern	*Dryopteris dilatata*	occasional
Broad-leaved Willowherb	*Epilobium montanum*	occasional
Chalk Comb-moss	*Ctenidium molluscum*	occasional
Cleavers	*Galium aparine*	occasional
Cock's-foot	*Dactylis glomerata*	occasional
Common Dog-violet	*Viola riviniana*	occasional
Common Feather-moss	*Kindbergia praelonga*	frequent
Common Ivy	*Hedera helix*	abundant
Common Nettle	*Urtica dioica*	occasional
Common Striated Feather-moss	*Eurhynchium striatum*	frequent
Dog's Mercury	*Mercurialis perennis*	frequent
Enchanter's-nightshade	*Circaea lutetiana*	frequent
Endive Pellia	*Pellia endiviifolia*	occasional
False-brome	*Brachypodium sylvaticum*	frequent
Fork-moss	*Dichodontium pellucidum sens. lat.*	occasional
Fox-tail Feather-moss	*Thamnobryum alopecurum*	locally abundant
Goldenrod	*Solidago virgaurea*	occasional
Hard Shield-fern	*Polystichum aculeatum*	occasional
Hart's-tongue	*Phyllitis scolopendrium*	locally abundant
Hart's-tongue Thyme-moss	*Plagiomnium undulatum*	occasional
Herb-Robert	*Geranium robertianum*	occasional
Long-beaked Water Feather-moss	*Platyhypnidium riparioides*	locally frequent
Male-fern	*Dryopteris filix-mas*	occasional
Nipplewort	*Lapsana communis*	occasional
Opposite-leaved Golden-saxifrage	*Chrysosplenium oppositifolium*	occasional
Ramsons	*Allium ursinum*	locally frequent
River Feather-moss	*Brachythecium rivulare*	locally frequent

Scaly Male-fern	*Dryopteris affinis subsp. borreri*	rare
Snakewort	*Conocephalum salebrosum*	occasional
Snowberry	*Symphoricarpos albus*	locally frequent
Soft Shield-fern	*Polystichum setiferum*	occasional
Swartz's Feather-moss	*Oxyrrhynchium hians*	occasional
Tufted Hair-grass	*Deschampsia cespitosa*	occasional
Tutsan	*Hypericum androsaemum*	occasional
Wood Avens	*Geum urbanum*	occasional
Wood Sage	*Teucrium scorodonia*	occasional
Wood-sedge	*Carex sylvatica*	occasional
on concrete retainer		
Rambling Tail-moss	*Anomodon viticulosus*	locally frequent
Thickpoint Grimmia	*Schistidium crassipilum*	frequent

Figures



LEGEND

Water courses
Exposed Limestone cliff
Woodland
02 Target Notes

Tilio-Acerion categories

Strongly conforms to *Tilio-Acerion*
Moderately conforms to *Tilio-Acerion*
Weakly conforms to *Tilio-Acerion*
Does not conform to *Tilio-Acerion* (no line)

CCW NVC mapping

W8e *Fraxinus excelsior - Acer campestre - Mercurialis perennis* woodland: *Geranium robertianum* sub-c.
W8f *Fraxinus excelsior - Acer campestre - Mercurialis perennis* woodland: *Allium ursinum* sub-c.
W9a *Fraxinus excelsior - Sorbus aucuparia - Mercurialis perennis* woodland: Typical sub-c

RPS Group plc

Heads of the Valleys dualling Tilio-Acerion surveys

Figure 1

NOT TO SCALE

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8.4 Appendix D. Assessment of changes in air quality (operational phase)

Introduction

The proposed widening of the A465 has the potential to impact terrestrial ecosystems through alterations to air quality as a result of changes in traffic flows from those which occur currently. Although a variety of substances may be involved in such impacts, the DMRB Volume 11, Section 3, Part 1, HA 207/07, Appendix F: Assessment of Designated Sites requires the assessment of potential impacts from annual mean NO_x concentrations and nutrient nitrogen (N) deposition as the principal factors.

Also, in accordance with the DMRB Volume 11, Section 3, Part 1, HA 207/07, sensitive sites have been identified within 200 m of roads likely to be affected by the Scheme (the influence of aerial pollution from roads is not considered to be significant beyond this distance). These comprise the Cwm Clydach Woodlands/Cwm Coedydd Clydach Special Area of Conservation (SAC) and the Usk Bat Sites/ Safleoedd Ystlumod Wysg SAC along with their component Sites of Special Scientific Interest (SSSIs).

Assessment methodology

The assessment methodology follows that described in Chapter 8 of the Environmental Statement. Briefly, background NO_x concentrations have been measured along a defined transect north and south of the existing road out to a distance of 200 m from the centre of the current carriageway. From these data, background rates of nutrient N deposition along this transect have been calculated (see Chapter 8 for details).

Based on predicted traffic flows along the proposed scheme, changes to NO_x concentration have been modelled (see Chapter 8 of the Environmental Statement) from which changes to associated nutrient N deposition have been calculated.

The UK Air Quality Strategy includes an annual-mean NO_x objective of 30 $\mu g.m^{-3}$ to protect vegetation at designated sites (also known as the Critical Level). The DMRB guidance requires that consideration is given to the sensitivity of species where the annual mean predicted NOx concentrations increase by at least 2 $\mu g.m^{-3}$ as a consequence of the operation of the scheme and the predicted concentrations (including background) are very close to or exceed the relevant criterion (i.e. 30 $\mu g.m^{-3}$). For nutrient N deposition, the DMRB method states that the predicted deposition rate should be compared with Critical Loads for nitrogen set by the UNECE in 2003. As some of these have since been refined, the latest Critical Loads from APIS (www.apis.ac.uk) have been used, where different from the 2003 values.

For the habitats present within 200 m of the proposed route within the two SACs considered here, the following critical load ranges are given on the Site-Specific Critical Load Tool on APIS (www.apis.ac.uk):

- Cwm Clydach Woodlands SAC:
  - *Asperulo – Fagetum* beech forests – 10–20 kgN.ha^{-1}.y^{-1}
  - Atlantic acidophilous beech forests with Ilex and sometimes also Taxus in the shrub layer (*Quercion robori– petraeae* or *Ilici – Fagenion*) – 10–20 kgN.ha^{-1}.yr^{-1}
- Usk Bat SitesSAC:
  - *Tilio – Acerion* forests of slopes, screes and ravines – 15–20 kgN.ha^{-1}.yr^{-1}

A range of critical load values is given to represent the heterogeneity associated with natural systems. In this instance, the high rainfall associated with South Wales and steep slopes of much of the woodland within the area will result in significant leaching of nutrient nitrogen from the system thus limiting the potential for eutrophication of soils. It is therefore considered that the upper critical load within these ranges (i.e. 20 kgN.ha^{-1}.yr^{-1}) is appropriate. This approach has been agreed with NRW.

Therefore, for the purposes of this assessment, effects will be considered to be potentially significant if:

- The predicted annual-mean NO_x concentration/nutrient N deposition rate is close to (or above) the Critical Level/Load; and

- The change in NO_x concentration/nutrient N deposition rate (i.e. do something – do nothing scenario) exceeds 1% of the relevant Critical Level/Load.

Results - Oxides of Nitrogen (NO_x)

The results of both the background measurements and modeling are provided in Chapter 8 of the Environmental Statement. For convenience, the tables providing the comparison of the do something – do nothing scenarios are provided in Tables D1 and D2 below.

Table D1. Predicted Annual-Mean NO_X Impacts in 2018

Receptor	Concentration (µg.m^{-3})		With - Without Scheme as % of the Critical Level
	Without Scheme	With Scheme	
Roadside north of A465	20.0	20.4	1.1
50 m north of A465	16.5	16.9	1.2
100 m north of A465	14.0	14.3	0.8
150 m north of A465	13.4	13.5	0.6
200 m north of A465	13.0	13.2	0.5
Roadside south of A465	28.7	39.3	35.2
50 m south of A465	17.9	19.4	5.0
100 m south of A465	15.5	16.2	2.3
150 m south of A465	14.5	14.9	1.3
200 m south of A465	14.0	14.2	0.6

Table D2: Predicted Annual-Mean NO_X Impacts in 2032

Receptor	Concentration (µg.m^{-3})		With - Without Scheme as % of the Critical Level
	Without Scheme	With Scheme	
Roadside north of A465	16.2	17.4	4.0
50 m north of A465	14.4	15.2	2.6
100 m north of A465	13.1	13.5	1.3
150 m north of A465	12.8	13.0	0.9
200 m north of A465	12.6	12.8	0.7
Roadside south of A465	20.8	29.8	29.9
50 m south of A465	15.1	16.8	5.6
100 m south of A465	13.9	14.7	2.8
150 m south of A465	13.4	13.9	1.8
200 m south of A465	13.1	13.5	1.2

Distances measured from the road centre-line of the scheme.
Shaded cells indicate predicted concentrations above the Critical Level for annual-mean NO_X concentrations of 30 µg.m^{-3} and increases above 1% of the Critical Level.

With the scheme in place, the NO_x concentration is predicted to be less than the critical level (30 µg.m^{-3}) at all locations other than the roadside south (i.e. up to 50 m) of the scheme in the opening year (2017). At this location, the change in NO_x concentration (i.e. the difference between do something and do nothing scenarios) is also predicted to be >1%. However, by 2032, all modelled points are predicted to be below the critical level, although the roadside location south of the scheme is very close to 30 µg.m^{-3}.

Results – nutrient nitrogen (N) deposition

As with NO_x, the results tables describing the difference between the do something and do nothing scenarios with respect to nutrient nitrogen deposition (from those within Chapter 8 of the Environmental Statement) are reproduced below (Tables D3 and D4). The tables are based on a critical load of 20 kgN.ha^{-1}.yr^{-1}. As the background nutrient nitrogen deposition rates already exceed the maximum critical load, the analysis focuses on the change in nutrient nitrogen deposition rate in relation to the critical load, rather than consideration of the absolute deposition rates.

Table D3: Predicted Nutrient N Impacts in 2018

Receptor	N Deposition Rates (kg N ha^{-1} yr^{-1})		With - Without Scheme as % of the Critical Load
	Without Scheme	With Scheme	
Roadside north of A465	2.0	2.0	0.2
50 m north of A465	1.7	1.7	0.2
100 m north of A465	1.4	1.4	0.1
150 m north of A465	1.3	1.4	0.1
200 m north of A465	1.3	1.3	0.1
Roadside south of A465	2.9	3.9	5.3
50 m south of A465	1.8	1.9	0.8
100 m south of A465	1.5	1.6	0.2
150 m south of A465	1.5	1.5	0.1
200 m south of A465	1.4	1.4	0.1

Table D4: Predicted Nutrient N Impacts in 2032

Receptor	N Deposition Rates (kg N ha^{-1} yr^{-1})		With - Without Scheme as % of the Critical Load
	Without Scheme	With Scheme	
Roadside north of A465	1.6	1.7	0.6
50 m north of A465	1.4	1.5	0.4
100 m north of A465	1.3	1.3	0.2
150 m north of A465	1.3	1.3	0.1
200 m north of A465	1.3	1.3	0.1
Roadside south of A465	2.1	3.0	4.5
50 m south of A465	1.5	1.7	0.8
100 m south of A465	1.4	1.5	0.4
150 m south of A465	1.3	1.4	0.3
200 m south of A465	1.3	1.3	0.2

Distances measured from the road centre-line of the scheme.

With the scheme operational, modelling suggests that the change in deposition rate is likely to be >1% up to 50 m to the south of the road in 2017 and also within a similar distance to the north by 2032.

Evaluation

Modelling shows that there is the potential for impacts from both changes to NO_x concentrations and nutrient nitrogen deposition as a result of the operation of the scheme to occur up to 50 m from the road centre-line. Therefore, as per Environment Agency guidelines (EA 2012), in situations where background loads/ levels are exceeding the appropriate environmental criterion and the new process contribution will cause an additional small increase then a decision will have to be made on the individual circumstances.

To inform this decision, therefore, an assessment of the proportion of the relevant habitat within each site that is covered by the 50 m potential zone of influence was undertaken (Table D5 and Figure 15).

Table D5: Percentage of woodland resource within 50 m of the proposed scheme located in designated sites

Site name	Cwm Clydach Woodlands SAC	Usk Bat Sites SAC
Total area of site (ha)	28.81	1,686
Area of woodland resource within site (ha)	25.64	57.32
Area of woodland potentially impacted (ha)	0.58	1.84
% of habitat resource potentially impacted as percentage of total resource	2.26	3.21

This analysis assumes that the total area of woodland covered by the 50 m zone of influence would be uniformly impacted. It is therefore extremely conservative when, in reality, impacts would be reduced between the roadside and 50 m as the concentration/deposition rate decreased (albeit not necessarily in a linear manner). Based on the above (conservative) analysis, less than 2.5% of the total woodland resource within the Cwm Clydach Woodlands SAC and less than 3.5% of that within the Usk Bat Sites SAC would potentially be impacted by the proposed scheme.

Further, survey work relating to the quality of the *Tilio-acerion* woodland within the Clydach gorge has been undertaken during the compiling of the baseline data to inform the Environmental Statement. This found that the areas of woodland present within the gorge that either moderately or weakly conformed to this habitat type were of markedly lower quality than that present elsewhere within the SAC (on the Craig-y-Cilau cliffs), several kilometres from the proposed scheme.

Also, while the small increase in nutrient nitrogen deposition expected to occur within the 50 m zone of influence may lead to some localised increase in the dominance of species capable of assimilating that nitrogen (ruderal species, for example), such species already occur frequently close to the existing road (one of the reasons the woodland only weakly conforms to the Tilio-acerion habitat type), where deposition is expected to be highest. Therefore, it is highly unlikely that these changes would result in alterations to the

SAC vegetation community such that habitats characteristic of the SAC would be either lost or see a reduction in quality. Similarly, the bryophyte survey work undertaken to inform the Environmental Statement found that the important bryophyte communities within the Clydach Gorge were generally associated with flushes or similarly humid habitats making it less likely that any nutrient nitrogen deposition would be retained to a sufficient degree to alter species composition. Such ecological niches also make invasion by larger, higher plant species less likely, even given any (slight) increased nutrient nitrogen availability.

Therefore:

- the total area of woodland resource potentially impacted within the two SACs is very small;
- the quality of the Tilio-Acerion woodland potentially impacted is lower than that present elsewhere within the Usk Bat Sites SAC; and
- there is little likelihood of alteration to species present within the zone of influence being sufficient to drive community change away from those characteristic of the SACs (i.e. there would be no loss or reduction in quality of SAC habitat),

On this basis, there is no potential for adverse impacts to the integrity of the sites as a result of the operation of the proposed scheme due to changes in air quality.

References

Environment Agency (2012). *Detailed assessment of the impact of aerial emissions from new or expanding IPPC regulated industry for impacts on nature conservation.* Environment Agency Operational Instruction 67_12, issued 08/05/2012.

8.5 Appendix E: Protocol for treatment of karst (cave) features during construction

Outline description of treatment of Karst features encountered during the construction works.

Karst features will be encountered during the excavation works in limestone throughout the areas of the site known as Clydach Gorge to Blackrock, (approximately Chainage 30800 to 31700).

Ahead of construction a detailed protocol will be fully developed and agreed between the Contractors team, Clients Supervising Engineers and Natural Resources Wales (NRW), this will include action necessary from discovery, inspection, verification, recording, treatment and closure or potential incorporation of features within the works.

General approach - the following provides an outline of how the anticipated conditions will be dealt with and who will be involved in the process. Where a feature is encountered then work will cease until the work has been assessed by an approved person

Type of Feature	Action upon discovery	Verification	Treatment
Conduits - small essentially horizontal features	Assessed by Contractor's geologist who will record, approve treatment and notify NRW.	Deem whether feature is active or inactive in terms of drainage/ habitat value and is to be retained or closed in discussion with Contractors Environmental Co-ordinator and Natural Resources Wales	Where active and above finished ground levels, incorporate to land drainage system Where active and below new finished ground levels, if possible discard from use and close the feature if not ensure continuity of the system Where inactive (above or below) close feature generally. Potentially retain above ground if there is habitat potential in agreement with NRW
Caves – large enough for man entry, essentially horizontal	Contractor's geological supervisors will notify NRW prior to any recording/ treatment. Allow a fully risk assessed inspection and logging by experienced cave surveyors under 'controlled' conditions' where necessary	Deem whether the cave is active in terms of drainage/ habitat value. Agree treatment required with Contractors Environmental Co-ordinator and NRW Design necessary treatment requirements with Contractors Designer.	Protect accordingly and incorporate to the works where possible. Treatment will depend on where exactly the cave presents itself within the work areas, and what form of cave it is for example 1. in road formation– the creation of a spanning slab to support the highway will be necessary ahead of continuing construction 2. in a cut slope a suitable access will have to be formed potentially with a future access point for inspection
Avens (narrow vertical)	Assessed by Contractor's geologist who will record, approve treatment and notify NRW.	Deem whether or not the aven is active in terms of drainage and assess effect in terms of closure with Contractors Environmental Co-ordinator and NRW	1. Minor removal and filling to level of surrounding ground 2. Bridging with geotextile and continue filling above.
Sinkholes (vertical, small) **Sinkholes** (vertical large)	Assessed by Contractor's geologist who will record, approve treatment and notify NRW.	Deem whether active in terms of drainage/habitat value. If within the highway construction 1. Make area safe 2. Remove surrounding overburden 3. Investigate and log sinkhole 4. Agree treatment required with Contractors Environmental Co-ordinator , Designer and NRW	1. Remove infilling material if any, check for cavities/fissures at base 2. Close base by method approved with NRW (rapid cementitious optional if depth exceeds 1M vertical, e.g. concrete filled bags or similar). 3. Fill remaining void with crushed, well graded limestone 4. Lay geotextile over sinkhole onto prepared surfaces (free of protrusions) 5. Continue filling above in accordance with specification 6. Monitor for settlement 7. Include details of hole in Health and Safety file for the works.