A465 Blaenau'r Cymoedd

Adrannau 5 + 6: Dowlais Top – Hirwaun

A465 Heads of the Valleys

Sections 5 + 6: Dowlais Top – Hirwaun

Llywodraeth Cymru
Welsh Government

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A465 Heads of the Valleys Sections 5 and 6: Dowlais Top to Hirwaun

Environmental Statement Volume 4: Environmental Masterplan — July 2017

Contents

1. Introduction

1.1 Objectives of the Environmental Masterplan

The Environmental Statement (ES) for the proposed dualling of the A465 Sections 5 & 6 Dowlais Top to Hirwaun has been compiled in line with the guidance contained in the Design Manual for Roads and Bridges (DMRB) Volume 10 and Volume 11 and includes several separately bound documents. These are:

- Volume 1 of the Environmental Statement (main text);
- Volume 2 of the Environmental Statement (Appendices to main text);
- Volume 3 of the Environmental Statement (Figures for main text); and
- Volume 4 of the Environmental Statement (Environmental Masterplan).

This document sets out the environmental proposals for the proposed scheme and forms Volume 4 of the ES, published alongside the Draft Orders. These have been summarised on a series of drawings that form the Environmental Masterplan (EMP). The EMP has been prepared using the methodology set out in Section 0 of the Design Manual for Roads and Bridges (DMRB) Volume 10.

The DMRB Volume 10 Section 0 methodology is intended to provide a consistent system for defining and achieving the environmental objectives. The EMP drawings are included in this document at A1 size with a scale of 1:1000 (or equivalent). These plans, as well as being an essential part of the ES, in time will help to inform the development of the Construction Environmental Management Plan (CEMP), the detailed design and associated construction specification, and eventually the Maintenance EMP (MEMP). The MEMP informs the responsible maintaining agent of the future management of the soft estate.

This Environmental Masterplan is based on the proposed scheme design fixed to inform the Draft Orders process at the end of the outline design phase (Key Stage 3). It was developed based on the environmental design themes agreed early in Key Stage 3 and includes the detailed environmental mitigation measures identified during the Environmental Impact Assessment (EIA) process.

1.2 Functions and Elements

The methodology set out in Section 0 of DMRB Volume 10 uses a system of ‘Functions’ and ‘Elements’ to describe environmental features. The use of this system enables environmental data to be recorded and developed in a consistent manner and linked through all stages of scheme evolution from initial design through to construction requirements and management action plans. The codes represent all of the environmental topics.

‘Physical Environmental Features’ are subdivided for convenience into ‘Landscape’ and ‘Environmental’, although these elements all form an integral part of the overarching heading of ‘Environment’. Refer below for a list of the ‘Functions’ and ‘Elements’ used within this document. These are shown in the legend on the EMP drawings.

Each environmental feature on or adjacent to the highway could have one or more ‘Functions’, and an ‘Element’ which describes its physical attributes or designation in statutory terms. The basis of recording and showing these features is that they have an interaction with the highway i.e. if there are features that do not have an environmental function, or form a constraint upon the design or operation of the proposed scheme; they are not recorded in this document. All features (i.e. Elements) may have a multiple purpose and therefore can be ascribed more than one ‘Function’ e.g. a vertical barrier may be designed to achieve visual screening, noise attenuation, or vehicle containment, and planting may be required to achieve landscape integration and biodiversity mitigation.

Within the overall environment of the highway and its surroundings there are many features that influence the environmental design and future maintenance. Of these, the ‘Landscape Elements’ cover the largest area. The landscape and environmental elements help to mitigate the adverse impacts of the highway, and may require

regular maintenance or inspection to achieve their longer-term objectives. The 'Landscape Elements' are divided into types e.g. woodland, shrubs, or hedges. 'Environmental Elements' are those features that are relevant to achieving the non-landscape environmental objectives in respect of water quality, ecology and nature conservation features.

The specific Functions and Elements used in this EMP are set out in the following sections.

1.2.1 Environmental Functions

EFA Visual Screening
EFB Landscape Integration
EFC Enhancing Built Environment
EFD Nature Conservation and Biodiversity
EFE Visual Amenity
EFF Heritage
EFG Auditory Amenity
EFH Water Quality
EFI Public Rights of Way Network

1.2.2 Environmental Elements

Noise
E1.2 Environmental Barrier – built elements

Water
E2.1 Water Pollution Control Measures

Nature Conservation and Biodiversity
E3.1 Protected Species
E3.2 Ecological Protection Measures

1.2.3 Planning and policy elements

Nature Conservation Designations
P1.1 Statutory Nature Conservation Designation
P1.2 Local Nature Conservation Designation

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P3.1 Cultural Heritage Feature
P3.2 Conservation Area

Land Use
P4.4 Public Rights of Way
P4.41 Public Rights of Way – proposed shared use non-motorised user (NMU) facility
P4.42 Public Rights of Way – diverted footpath

1.2.4 Landscape Elements

Grassland
LE1.31 Neutral grassland creation
LE1.32 Acid grassland creation
LE1.33 Ancient woodland ground flora top soil salvage, coppice and shrub translocation
LE1.34 Heathland creation
LE1.4 Rock and scree

Native Planting
LE2.1 Woodland
LE2.2 Woodland edge
LE2.5 Shrubs with intermittent trees
LE2.6 Shrubs
LE2.8 Scrub
LE4.3 Native species hedgerow
LE 5.1 Individual trees
LE6.4 Marsh and wet grassland

Other Landscape Treatments
LE7 Hard landscape features
LE7.1 Manmade rock design feature
LE9 Land acquired for Ecological Mitigation
LE10.1 Retained woodland
LE10.2 Retained scrub
LE10.3 Reinstate and return to landowner

1.2.5 Existing features

The designations that are displayed on the plans are provided by third parties as follows:

- Special Area of Conservation and Site of Special Scientific Interest (SSSI) designations: Natural Resources Wales;
- Scheduled Ancient Monument and Listed Buildings: Cadw;
- Ancient semi-natural woodland and local wildlife site: Biodiversity Information Service; and
- Rights of Way: Rhonda Cynon Taf, Merthyr Tydfil and Powys County Borough Council.

Existing habitat:

- Retained vegetation / boundaries: Jacobs UK Ltd Phase 1 Habitat Survey.

1.3 Environmental Design Principles

Scheme specific environmental design principles were developed early in the outline design phase by relevant technical specialists to guide the design process. These are detailed in Table 1.1 below. The design principles were used in conjunction with the strategic legislation and policies as shown in the ES, Volume 1, Chapter 2: Legislative and Policy Context.

Table 1.1 : Design principles

A465 Sections 5 & 6 design principles
Principle 1 – Minimise impact on existing marshy grassland habitats by minimising risk of drying out, whilst considering whole life cost of the scheme
Principle 2 – Minimise impact on Ancient Woodland in close proximity of the scheme
Principle 3 – Where technically feasible and not entailing excessive cost, consider opportunities to enhance existing ecological connectivity
Principle 4 – Aim to achieve an earthworks balance and make use of exposed geology, where suitable in terms of slope stability and safety, to create drama and reduce land take when compared with typical engineering batters
Principle 5 – Minimise habitat loss from Sites of Importance for Nature Conservation in close proximity to the scheme
Principle 6 – Adopt a "Simple and Elegant" approach for structures
Principle 7 – Minimise lighting on scheme as a whole, particularly viaducts over Taf Fawr and Taf Fechan
Principle 8 – Ensure structures design, facing and finishes provides integration to current vernacular balanced by whole life cost
Principle 9 – Maintain existing underpasses to maintain connectivity for wildlife and minimise habitat severance
Principle 10 – Provide linear landscape strips in areas where they currently exist, if appropriate, to re-integrate proposed scheme as per the existing highway planting
Principle 11 – Where appropriate, minimise tree and shrub planting to create open, outward views from the scheme and integrate with existing upland landscape character
Principle 12 – Minimise flooding and water quality impacts

Design principles specific to the landscape aspects of the proposed scheme are detailed in the ES, Volume 1, Chapter 10: Landscape and Visual Impact.

1.4 Design Commission for Wales (DCfW)

The mission of the Design Commission for Wales (DCfW) is to champion high standards of architecture, landscape and urban design in Wales, promoting wider understanding of the importance of good quality in the built environment, supporting skill building, encouraging social inclusion and sustainable development.

Welsh Government has consulted with the DCfW throughout the design development process, with the aim of obtaining the views, influence and support of the DCfW for the proposed scheme design.

Two design review workshops attended by members of the project team from Welsh Government and Jacobs were held with DCfW, and with the relevant statutory and local authorities, on the 18 February 2016 and 19 May 2016. A summary of topics covered as part of each review is provided below and key DCfW recommendations are summarised.

A Design Statement detailing the current design development was submitted by Jacobs in advance of each of Design Review meeting, and these are included in Appendix A and 0 respectively. The content of each Design Statement provides a more detailed narrative of the design process followed to develop the proposed scheme, its structures and the EMP.

DCfWs full responses to the design review workshops were provided in the form of a Design Review Report which summarised the design review and outlined key issues and geographical areas that should be considered as the design progresses. The DCfW Design Review Reports for the first and second design review workshops are included in Appendix C and Appendix D respectively.

1.4.1 Design Review 1 - 18 February 2016

Topics covered

- Proposed scheme objectives.
- Proposed scheme background.
- Site context.
- Lessons learnt from other schemes.
- Key environmental features influencing the design of the proposed scheme.
- Proposed approach to highway, structural and landscape design, including the identification of feature / gateway junctions along the route.
- A physical scale model of the A470 junction was developed and presented at the Design Review meeting. Although not a fully accurate model, it demonstrated the design options for this junction at that time. The junction was identified as being a key Gateway to the Brecon Beacons National Park (BBNP).

Extracts from DCfW Feedback Report 18 February 2016

- Understanding the landscape – The commission believes that it is important to develop and use a good understanding of the landscape and context to inform the design. It is important to understand the different qualities along the route before getting into landscape design drawings.
- Balancing and Managing Impacts – As with all schemes of this nature and complexity, balances would need to be struck between meeting technical requirements and design standards, and the impacts made on surrounding landscapes and communities.
- Approach to Bridge and Structure Design – In this case, it may not be appropriate to take a uniform or ‘family’ approach to the design of the bridges and other structures because of the significant variation in surroundings along the length of the road. In general, the simple, elegant and raw approach to new construction which the team described seems appropriate. Reflecting, and sometimes exposing, the underlying geology and expressing the construction method of new structures are valid approaches which would echo the regions industrial heritage.

1.4.2 Design Review 2 - 19 May 2016

Topics covered

- Non-Motorised Users.
- Understanding the Landscape.
- Structures, Landscape and Public Realm.
- Street Lighting Strategy.

- A physical scale model of the Baverstock junction was developed and presented at the Design Review meeting. Similar to the model presented at the first design review meeting this was not a fully accurate scale model. It demonstrated the proposals for rock face cuttings and the junction layout of the scheme design at that time.
- A series of artists impressions of key junctions and structures along the route were also developed and presented at the Design Review meeting. The content of the sketches outlined emerging conceptual landscape proposals which have since been translated into the current EMP.

Extracts from DCfW feedback report 19 May 2016

- Approach to redundant roads – Strategies for dealing with stretches of road which would become redundant should be defined, including information on what should be removed, what should be retained, what should be added, and the rationale for doing so.
- Street lighting - Minimising standard street lighting would help reduce light pollution, which is a particularly positive step near to the Brecon Beacons National Park. The Commission also supports the approach to amenity lighting as an integrated design opportunity.
- Positive drainage strategies – The Commission encourages the design of positive drainage strategies. Drainage solutions have the potential to add or take away value from adjacent foot and cycle paths and therefore require careful design.
- Art strategies – Where artwork is being considered, a good brief and the right artist who can demonstrate experience of the scale and type of work would be required.

1.5 Feature / Gateway Junctions

In consultation with DCfW and the local planning authorities, a series of key junctions and locations along the proposed scheme considered as being suitable for an enhanced landscape approach were identified. The locations of these junctions are identified in Plate 1.1 below.

Plate 1.1 : Junction locations (not to scale)

At all identified junctions, the design of the proposed scheme's associated highway structures would play an important role in providing legibility and a sense of place along the length of the proposed scheme and where appropriate, such as at the Hirwaun and A470 junctions, acting as 'gateways' to the BBNP. The latter responds in particular to consultation with the Brecon Beacons National Park Authority (BBNPA) who indicated the aspiration for key access points to the National Park to be emphasised. Combined landscape and structural design concepts have been developed with input from the project's Structures Aesthetic Advisor Ric Russell.

The objectives of the landscape design at the junctions are to:

- build upon the Environmental Design Principles set at the start of outline design development and discussed with key stakeholders;
- create a landscape setting which is unique and relevant to the local context;
- develop recognisable features that provide legibility along the length of the proposed scheme, and where appropriate mark the entrance to the BBNP in the form of 'gateway junctions'; and
- utilise locally sourced materials such as stone, including any suitable stone arising from the earthworks during construction of the proposed scheme, and locally indigenous tree and shrub species to create an environmental design which complements the landscapes adjacent to the A465.

1.5.1 Hirwaun and Dowlais junctions

A distinctive landscape treatment is proposed at both junctions to mark the start and finish of this section of the A465 improvement. The landscape treatment of the two junctions would be complementary, but not exactly matching, responding to the varied landscape character found at either end of the proposed scheme. The Hirwaun junction would also act as a gateway to the BBNP (refer to Plate 1.2 below). Feature landscape design would be contained within the roundabout spaces, with minimal height around the perimeter to accommodate vehicular sightlines. The ground would then rise in height towards the centre of the junctions to enable the proposed tree and shrub planting to more effectively screen the elevated A465 mainline as it passes over the junctions. The raised planting would frame the linear views along the A465 experienced by drivers moving across the junctions.

Bridge abutments would be clad in locally sourced stone. Semi-circular terraced stone retaining walls are proposed within areas of the rising ground within the roundabout at the Hirwaun junction, replicating the stone walling design found at the existing Hirwaun West Junction. A more linear design of stone retaining walls is proposed at Dowlais to reflect the more urban nature of the local environment. The stone used for the retaining walls would match that of the bridge abutments but possibly with rougher cut or split faces and more informal coursing (refer to Plate 1.3 below).

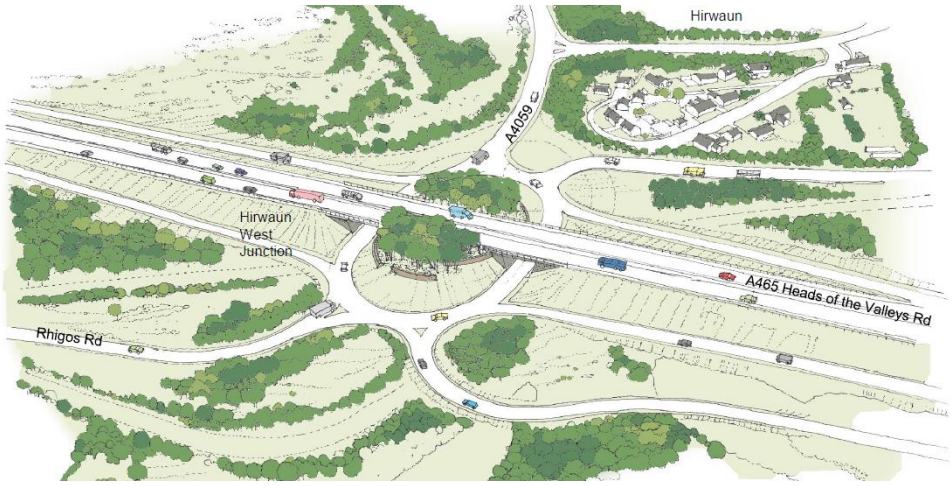


Plate 1.2 : Evolving design for the Hirwaun junction presented to DCfW

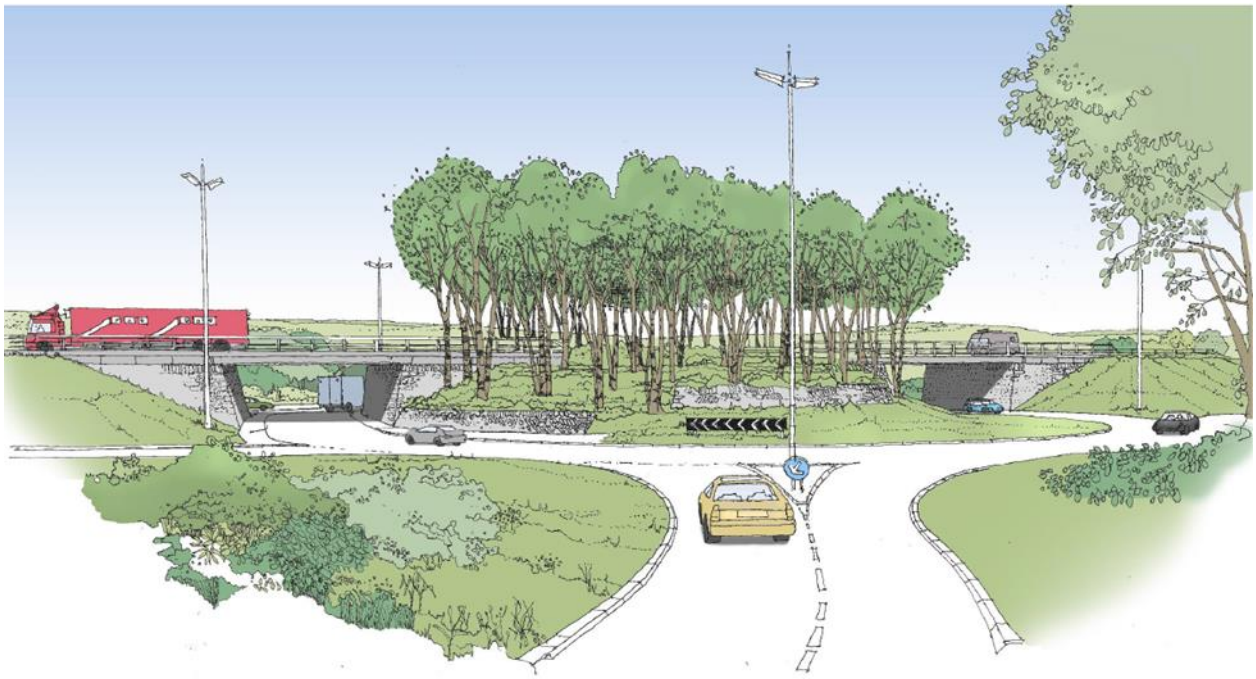


Plate 1.3 : Sketch of the evolving design for the Hirwaun junction presented to DCfW

1.5.2 Croesbychan junction

The vertical engineering alignment would keep the junction as low as possible in the landscape to minimise visual impacts in this location. Mixed native woodland planting on the embankments would integrate the elevated A465 mainline into the landscape as it passes over the junction and partially screen traffic in views, particularly from the south. Rock and scree features would be integrated into embankments where they tie into the junction bridge abutments on either side of the mainline using local stone. This would complement the more formal stone cladding applied to the junction bridge abutments and give the junction a distinct character. Natural regeneration and weathering on the rock and scree slopes would add interest over time.

1.5.3 Baverstock junction

The exposed rock cutting at Baverstock, would create a dramatic experience for drivers, framing views to the east and west and providing an interesting glimpse of the geology that underlies the area (refer to Plate 1.4 below). Natural regeneration and weathering would occur on the rock faces and ledges softening the cutting over time.

Mixed native woodland planting on the embankments would integrate the elevated A465 mainline into the landscape as it passes over the junction and partially screen traffic in views from the north and south. A low key landscape treatment with the bold use of stone arising locally from the cutting is proposed for the junction link road and roundabouts. This would be enhanced by the judicious use of planting including some pines, birch and rowan trees and heathland creation, to reflect the nearby coniferous plantations, deciduous woodland and heathland landscapes. Care would be taken with the planting to ensure that views of the surrounding landscape are retained from the junction.

Stones of varying size, but matching the main exposed Baverstock rock cutting, would reduce the scale of both roundabouts and create a visual link to the cutting. The informal use of varying sized stones would continue at the base of structures and junction approaches and contrast with proposed more formal stone cladding to the junction bridge abutments.

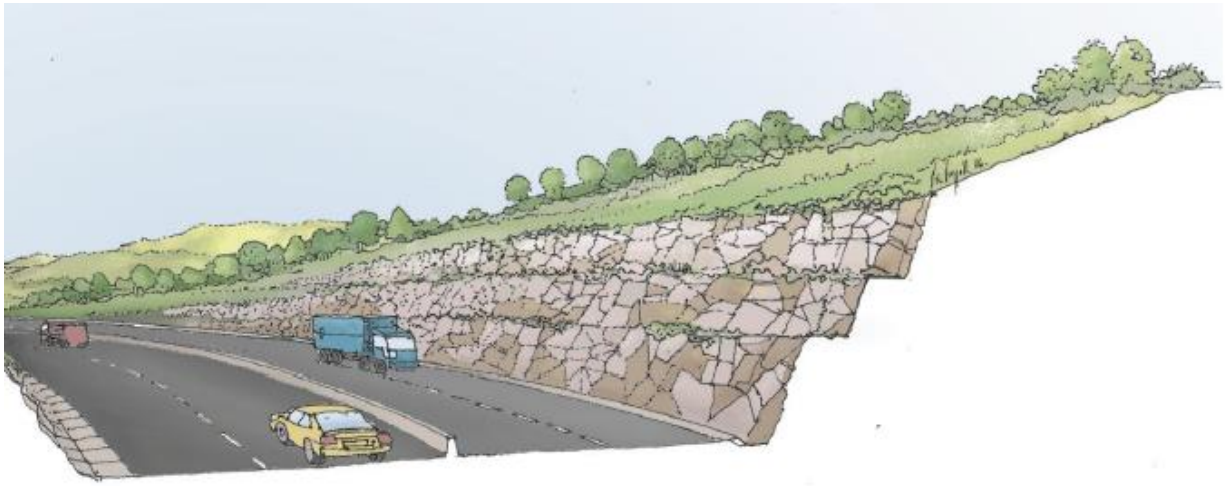


Plate 1.4 : Sketch of the exposed rock cutting at Baverstock

1.5.4 A470 junction

The A470 junction would be the primary gateway to the BBNP. Landscape ground modelling, terracing and rock and stone wall features with carefully considered planting would be employed to highlight the importance of the junction spaces as entry points into the BBNP. This approach would complement the unique local landscape character of the area and its underlying geology (refer to Plate 1.5 below).

In addition to the landscape proposals there would also be an opportunity to integrate art into the setting of the junction and the associated structures to enhance their role in expressing local cultural heritage and the presence of the BBNP. This could take the form of sculptured earthworks, interventions in walls, retaining structures, bridge abutments, signage and lighting and / or as individual or collections of sculpture. The involvement of an artist or artists in the proposed scheme should be considered at the detailed design stage of the project and be guided by input from key stakeholders including the BBNPA, Merthyr Tydfil County Borough Council (MTCBC) and Rhondda Cynon Taf County Borough Council (RCTCBC). Commissioning of the artist(s) should be carried out on the basis of a carefully stated brief prepared in consultation with the key stakeholders. Ultimately the art input should be fully integrated into the detailed design process to ensure that the landscape, engineering and art of the gateways combine as a striking, coherent whole.

Plate 1.5 : Sketch of the evolving design for the A470 junction presented to DCfW in 2016

1.5.5 High Street Bridge

Whilst not a junction, the Cefn-coed-y-cymmer High Street bridge is a form of 'gateway' between the town of Merthyr Tydfil to the south and the surrounding Cefn Coed community. The BBNP is accessed to the north via the A4054 (High Street) and the A470. The proposed design of the bridge has been developed to include simple linear areas of public realm on either side of the bridge in order to continue the urban context between the town in the south and the community to the north.

The internal facing bridge parapets would be clad in local stone to complement existing stone walls to the north and south of the bridge. The pedestrian pavements on the bridge structure would be paved in a high quality natural stone with stone kerbs, characteristic of the materials found within other parts of Merthyr Tydfil. The use of high quality materials would enhance the townscape amenity of the area and provide an appropriate setting to the Tabor Independent Chapel Grade II listed building immediately to the north-west of the bridge, (refer to Plate 1.6 below).

The opportunity to include stone planters with specimen standard tree planting and integrated seating should also be explored at the project's detailed design stage to further enhance the bridge environs in its role as public realm.

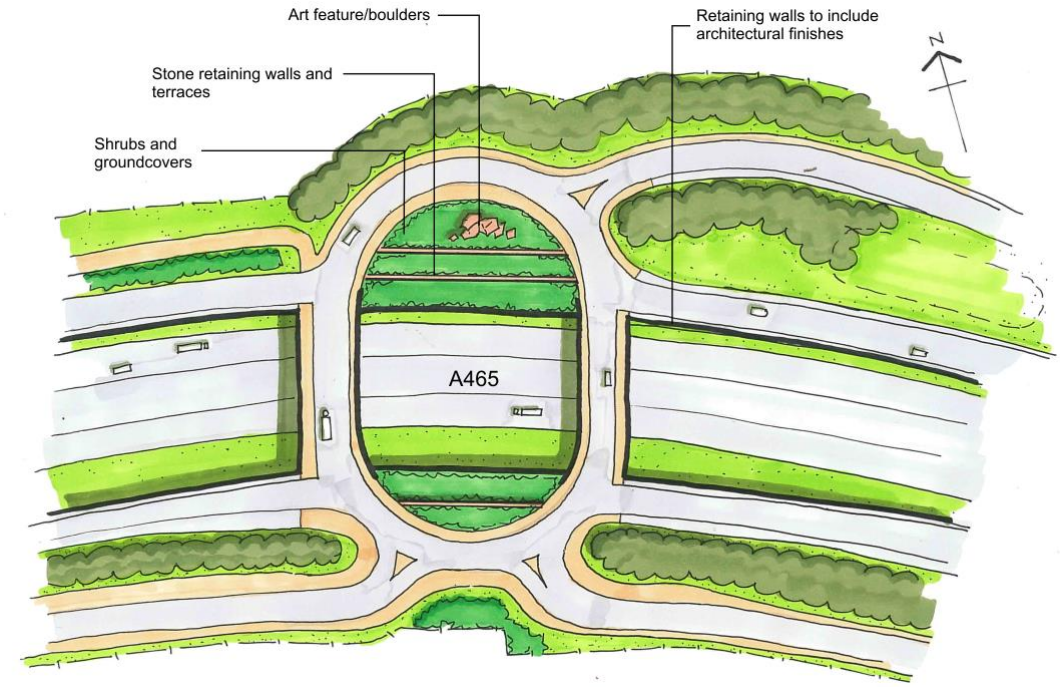
Plate 1.6 : Sketch looking north towards the High Street bridge and Tabor Independent Chapel (Grade II Listed)

1.5.6 Prince Charles Hospital junction

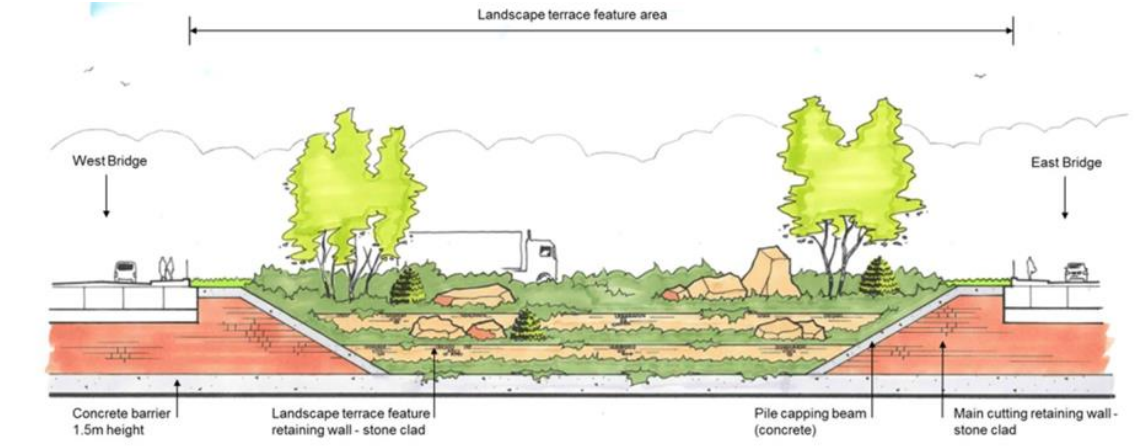
The location of the proposed Prince Charles Hospital junction provides an opportunity to create a landscape feature which would break the long length of the retaining structures on either side of this section of the A465. A planted terraced landscape is proposed within the open spaces on either side of the A465 carriageway within the main junction roundabout on either side of the A465. The terracing would consist of local stone walling which would complement the more formal stone cladding applied to the junction bridge abutments. Planting would be a minimal mix of ornamental and native shrubs and groundcovers with low mature heights around the perimeter to accommodate vehicular sightlines (refer to Plate 1.7 below).

In addition to the landscape proposals there is also an opportunity to integrate art into the design. The Prince Charles Hospital junction is located in an area which has a less distinct character in comparison to other areas along the proposed scheme.

The introduction of a creative element would enhance the identity of the local area and reflect the local area's regeneration. The involvement of an artist or artists in the proposed scheme should be considered at the detailed design stage of the project and be guided by input from key stakeholders, as described above for the A470 junction.



Sketch plan of Prince Charles Hospital junction (not to scale)



Prince Charles Hospital Junction - North Elevation (not to scale)

Images for retaining wall and landscape area

Plate 1.7 : Sketch plan of Prince Charles Hospital junction, north elevation and images

1.6 Ecological Mitigation and Connectivity

As well as providing landscape integration and screening, the environmental design of the proposed soft estate has also been driven by nature conservation objectives. The main aim of the design was to create an improved quality and more connected habitat representative of those habitats of nature conservation value in the local area. Where landscaping would be required it would be enhanced to provide increased biodiversity and connectivity with retained habitats and land acquired for mitigation. The proposed soft estate would support a range of acid, neutral and marshy grassland, heathland and woodland habitats and would be of greater nature conservation value than the existing soft estate. Ecological mitigation objectives for marsh fritillary butterfly *Euphydryas aurinia,* that requires an open grassland landscape with minimal woodland shelter belts, have been combined with landscaping and visual objectives to provide uninterrupted landscape views for all travellers outward, particularly southwards from Section 6 of the proposed scheme. Where screening and integration planting has been proposed in Section 6 efforts have been made to find the best compromise between the two opposing objectives of maximising views out whilst also providing screening and integration planting.

The permeability of the proposed road for mammals has been addressed by design. The proposed scheme would include enhancement of existing culverts or provision of additional new culverts, which would have mammal ledges to allow safe passage of animals under the A465. These culverts would be located on existing north – south mammal commuting corridors which are currently severed by the existing A465. Therefore, these proposals are considered to be enhancement measures rather than mitigation measures given there is negligible safe passage possible across the existing A465.

In addition, key areas of land acquired for ecological mitigation are specifically located at:

- Croesbychan junction to deal with the loss of ancient woodland;
- Llwydcoed Slopes to deal with the loss of marsh fritillary habitat and botanical features of interest at Tir Mawr and Dderi Hir SSSI; and
- Blaencarno for the loss of lapwing breeding habitat at Dowlais Top.

1.7 Environmental Barriers

The requirement for environmental barriers in certain locations along the proposed scheme has been identified in order to mitigate potential adverse impacts arising from traffic noise experienced by various receptors. While improving the noise environment for the receptors the barriers could cause adverse visual effects. Careful attention would, therefore, be paid to the design and siting of these barriers to minimise their visual effects and to ensure that they complement the overarching environmental design aims for the proposed scheme.

Three broad styles of noise barrier design would be adopted as follows:

- Basic. This would apply to most environmental barriers, particularly those set slightly away from A465 mainline. The primary finishing material used for these barriers would be Corten ‘weathering steel’ assembled as vertical panels. The surface patina of the weathering steel would develop matt rust colours that would blend very well with the natural colours of the local landscape and would reflect the renowned iron and steel heritage of the Heads of the Valleys area. It would also complement those structures in the proposed scheme that use structural Corten steel.
- Contemporary. This would apply where barriers are immediately adjacent to the A465 mainline and / or on bridges and viaduct structures associated with the proposed scheme. These environmental barriers would have natural galvanised or a matt light grey painted finish to reflect the colour of the concrete and galvanised steel used for the structures and highway infrastructure respectively. The bridge and viaduct structures would be generally elevated and the matt light grey colour would generally be recessive when seen against the sky. Barrier panels would be horizontal or vertical, subject to detailed design.
- Traditional. This would apply to environmental barriers in urban townscape areas and involves the use of natural local stone and / or brickwork to complement the existing townscape.

Where environmental barriers are 3 m or greater in height, clear (tinted) panels, fabricated from heavy duty acrylic for example, would be used for the top part of the barriers (approximately the top 0.5 m). This would

reduce the apparent scale of the barriers and shadow areas while still achieving the required noise mitigation performance.

An indicative schedule of environmental barriers and their design styles and materials, is included in Table1 in Appendix E together with indicative images in Plate 1.11, Plate 1.12 and Plate 1.13 in Appendix F. The final appearance of the barriers would be subject to detailed design with appropriate adjustments made to achieve the necessary absorptive or reflective properties required from each barrier.

1.8 Structures

As described above, the new highway structures would play an important role in providing legibility and a sense of place along the length the proposed scheme. Where new structures are located in close proximity to distinctive existing structures, care would be taken to ensure the design of the new structures reflects that of the existing. For example the Nant Hir (North) Viaduct would comprise a steel arch to match the existing arched structure, the Taf Fawr Mainline Viaduct would comprise a three span concrete structure similar to the existing Taf Fawr viaduct with broad elegant lightweight arches, and the Taf Fechan Mainline Viaduct would comprise a steel arch to match the existing Taf Fechan viaduct.

Local stone cladding would be applied to the wing walls and internal elevations of bridge abutments at the key junction locations, set above a band of fair faced concrete, as indicated in Plate 1.8 and Plate 1.9 below. Retaining walls would have a combination of finishes incorporating fair faced concrete, stone and weathering steel cladding. Examples suggested for the Prince Charles Hospital junction retaining walls are illustrated in Plate 1.10 below.

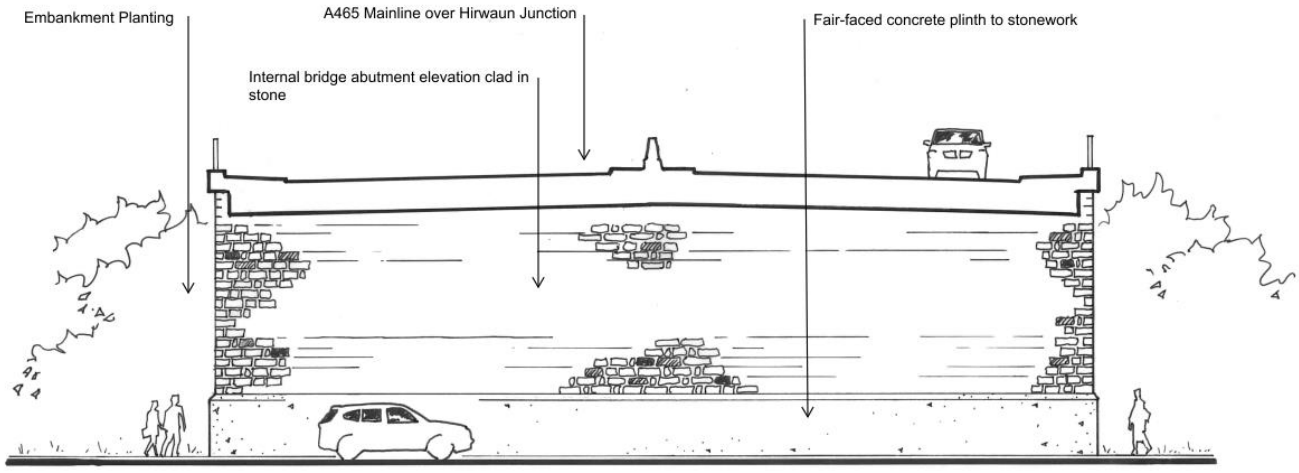


Plate 1.8 : Internal Hirwaun junction bridge elevation (not to scale)

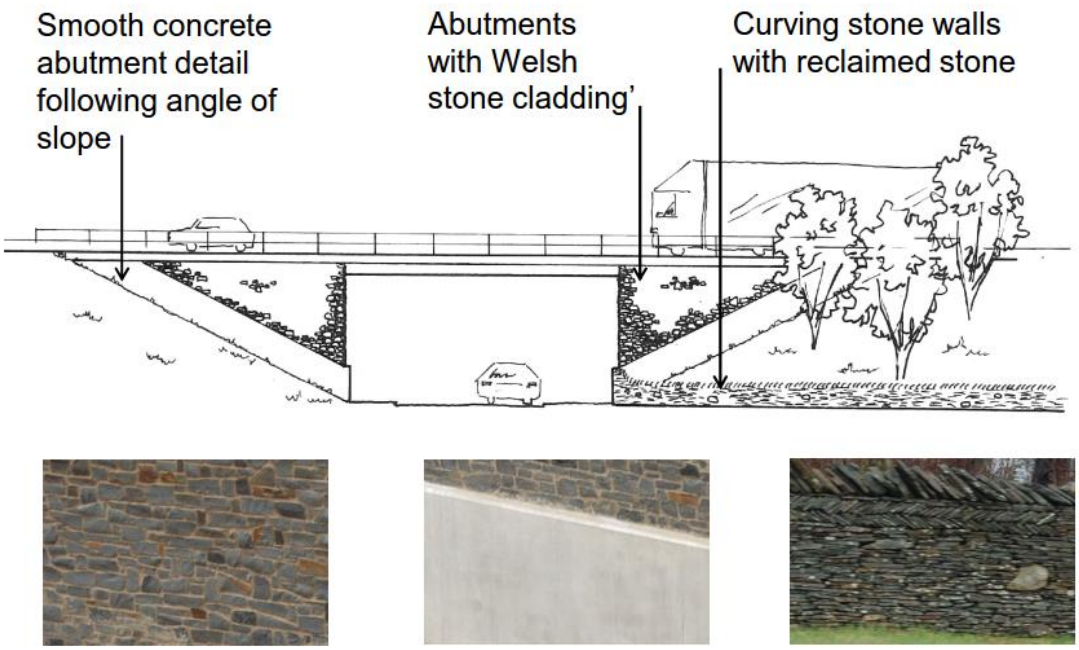


Plate 1.9 : Side elevation of a Hirwaun junction bridge (not to scale) with images of suggested materials

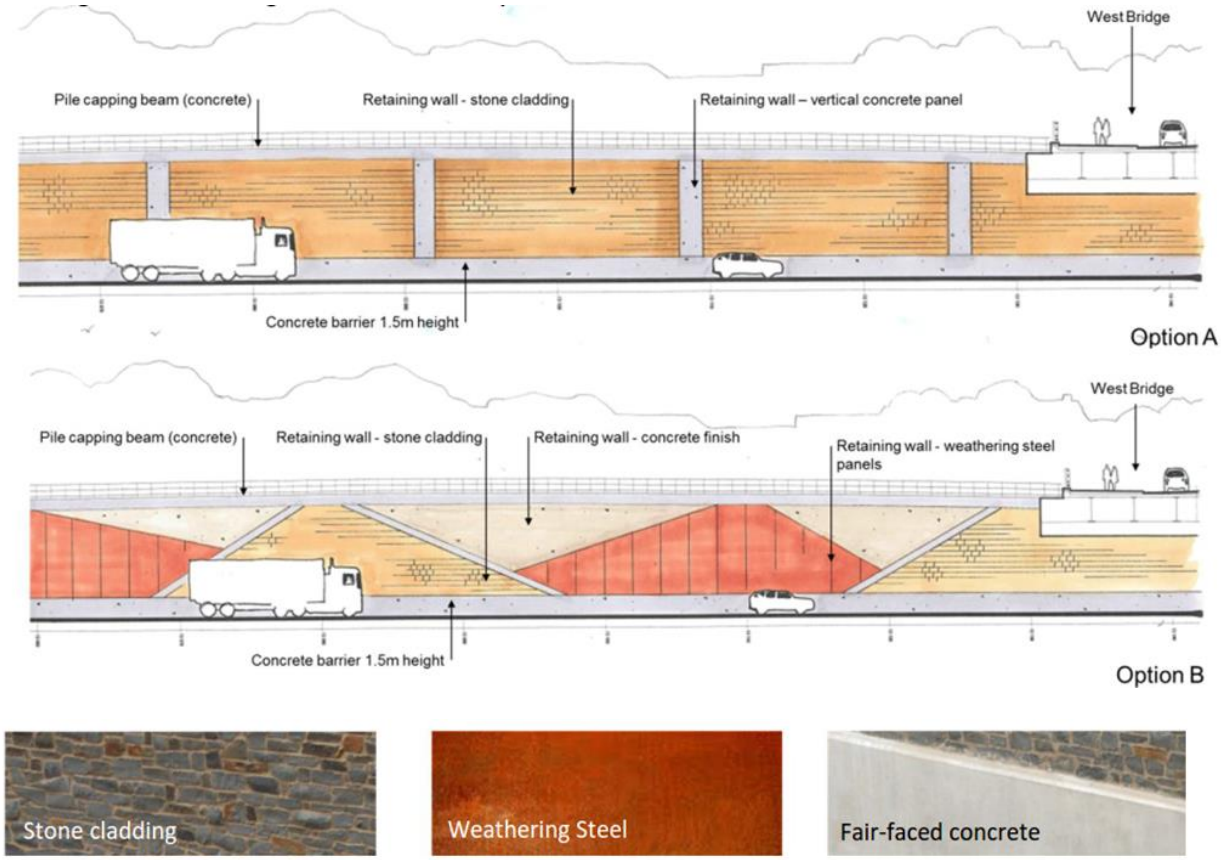
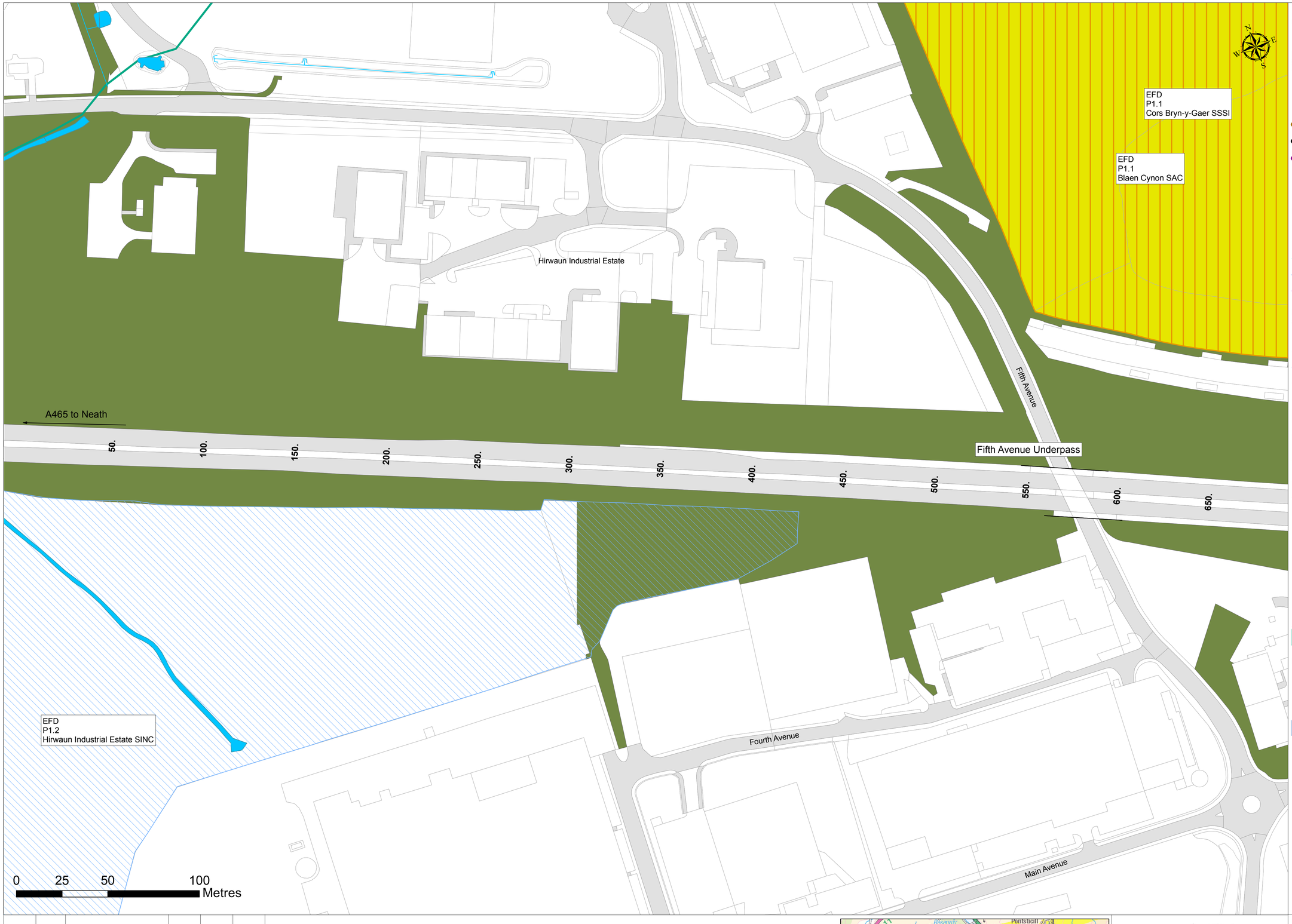


Plate 1.10 : Suggested retaining wall finishes at Prince Charles Hospital junction

Public rights of way underpasses would also include stone cladding finishes and be appropriately lit for personal safety reasons.

1.9 Sensitive Features

A suitable relocation site for an existing memorial tree on Section 6 would be finalised in detailed design in consultation with local stakeholders. The likely location will be as close to the original location as possible and in a safe accessible situation for the families to visit.



Legend

Highway
- Scheme design
- Embankment
- Cutting
- Structures (bridges, viaducts and retaining walls)
- Stock proof fence - highway boundary
- Stock proof fence - non-highway boundary
- Stock proof fence - temporary
- Proposed aluminium road lighting - 10m
- Proposed aluminium road lighting - 12m

Drainage
- Proposed drainage pond
- Proposed drainage ditches
- Culverts - water pollution control measures
- Culverts - ecological protection measures
- Culverts - footbridges

Public rights of way and access
- Bridleway
- Footpath
- National Cycle Network Route
- Proposed 3m shared use NMU facility
- Re-routed public right of way
- Private means of access

Planning and Policy Elements
- Local authority boundary
- Listed features
- Scheduled Ancient Monument (SAM)
- Conservation areas
- Registered park and garden
- Special Area of Conservation (SAC)
- Site of Special Scientific Interest (SSSI)
- Local Nature Reserve (LNR)
- Sites of Importance for Nature Conservation (SINC)
- Wildlife Trust Reserve
- Fforest Fawr Geopark

Existing features
- Ancient Woodland
- Existing woodland to be retained
- Tree Preservation Orders
- Jewish Cemetery
- Approximate location of cave entrances
- Waterbodies and watercourses
- Dry channels
- Existing roads

Proposed features
- Neutral grassland creation
- Acid grassland creation
- Heathland creation
- Rock and scree (extent dependent on ground conditions)
- Woodland
- Woodland edge
- Shrubs with intermittent trees
- Shrubs
- Scrub
- Marsh and wet grassland
- Decorative surface
- Manmade rock design feature
- Ecological management area
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- Land to be returned to landowner
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LE1.4 Rock and scree

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LE6.4 Marsh and wet grassland

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LE7.1 Manmade rock design feature
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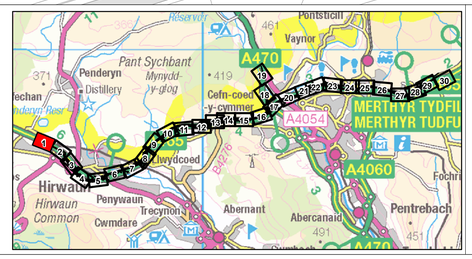

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Title	ENVIRONMENTAL MASTERPLAN HIRWAUN INDUSTRIAL ESTATE	
Scale	1:1,000 @A1	DO NOT SCALE
Drawing No.	FIGURE 1 SHEET 1 OF 30	Rev 0

EFD
P1.1
Cors Bryn-y-Gaer SSSI

EFD
P1.1
Blaen Cynon SAC

Mineral Railway

Hirwaun Ponds

EFD
P1.2
Hirwaun Ponds North SINC

EFD
E3.1
Devil's-bit scabious seeding

EFH
E2.1
Existing Culvert
HD-CP5, no works

EFB EFA EFD
LE2.1
Integrate pond into landscape

EFD
E3.1
Marginal vegetation planting

EFH
E2.1
New culvert HD-CP3 900mm pipe

EFD
E3.1
Location of bat and bird boxes

EFB EFA EFD
LE2.1
Integrate junction

Tower Colliery Sidings
clear span bridge not
impacted by scheme

700. 750. 800. 850. 900. 950. 1000. 1050. 1100. 1150. 1200. 1250. 1300. 1350.

EFB EFA EFD
LE10.2
Retained scrub

Hirwaun Industrial
Estate Viaduct

EFD
P1.2
Hirwaun Ponds SINC

0 25 50 100 Metres

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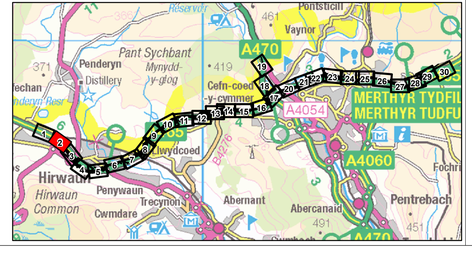

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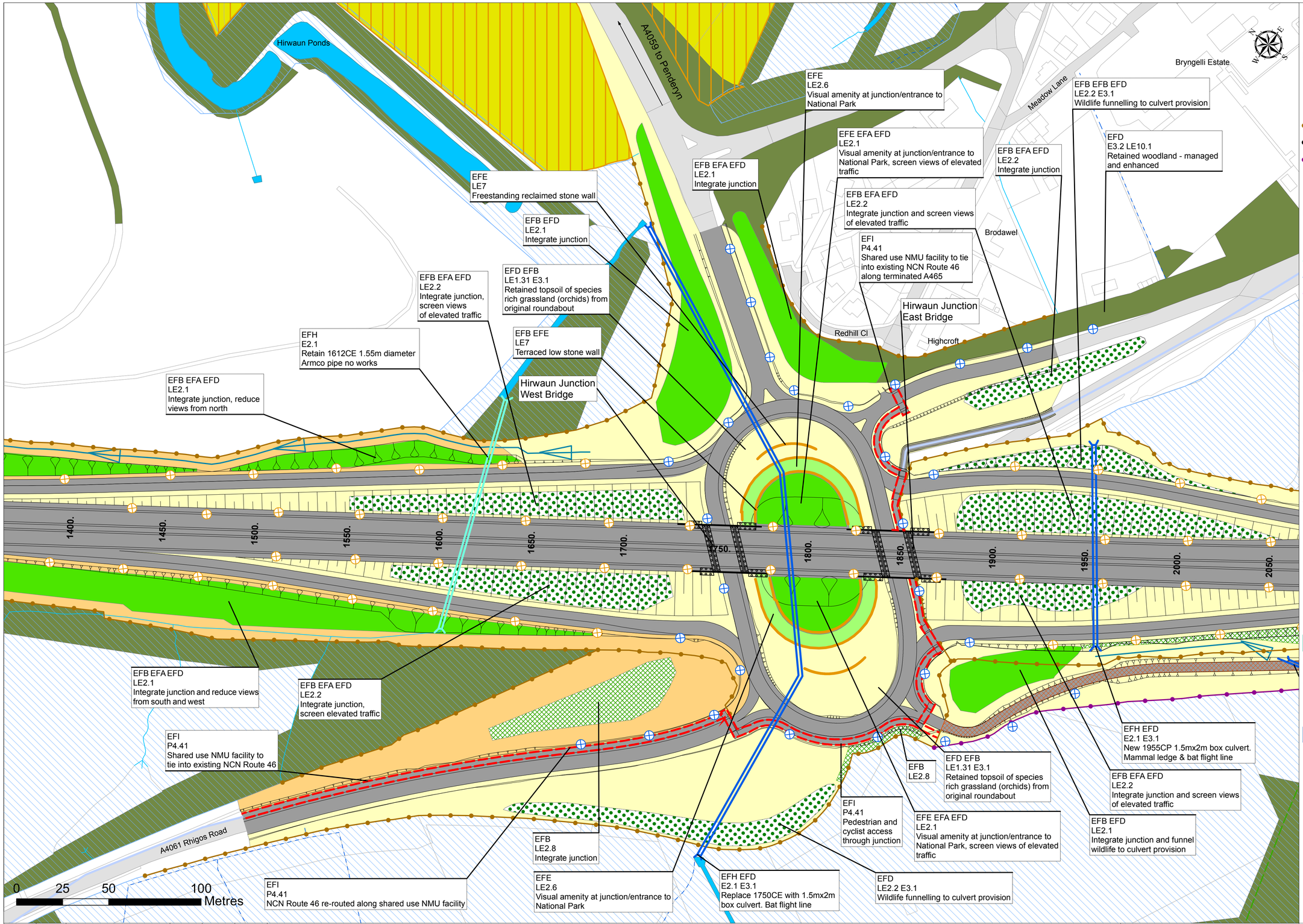

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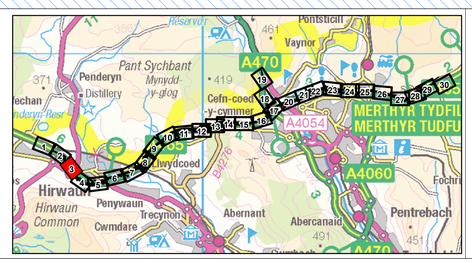

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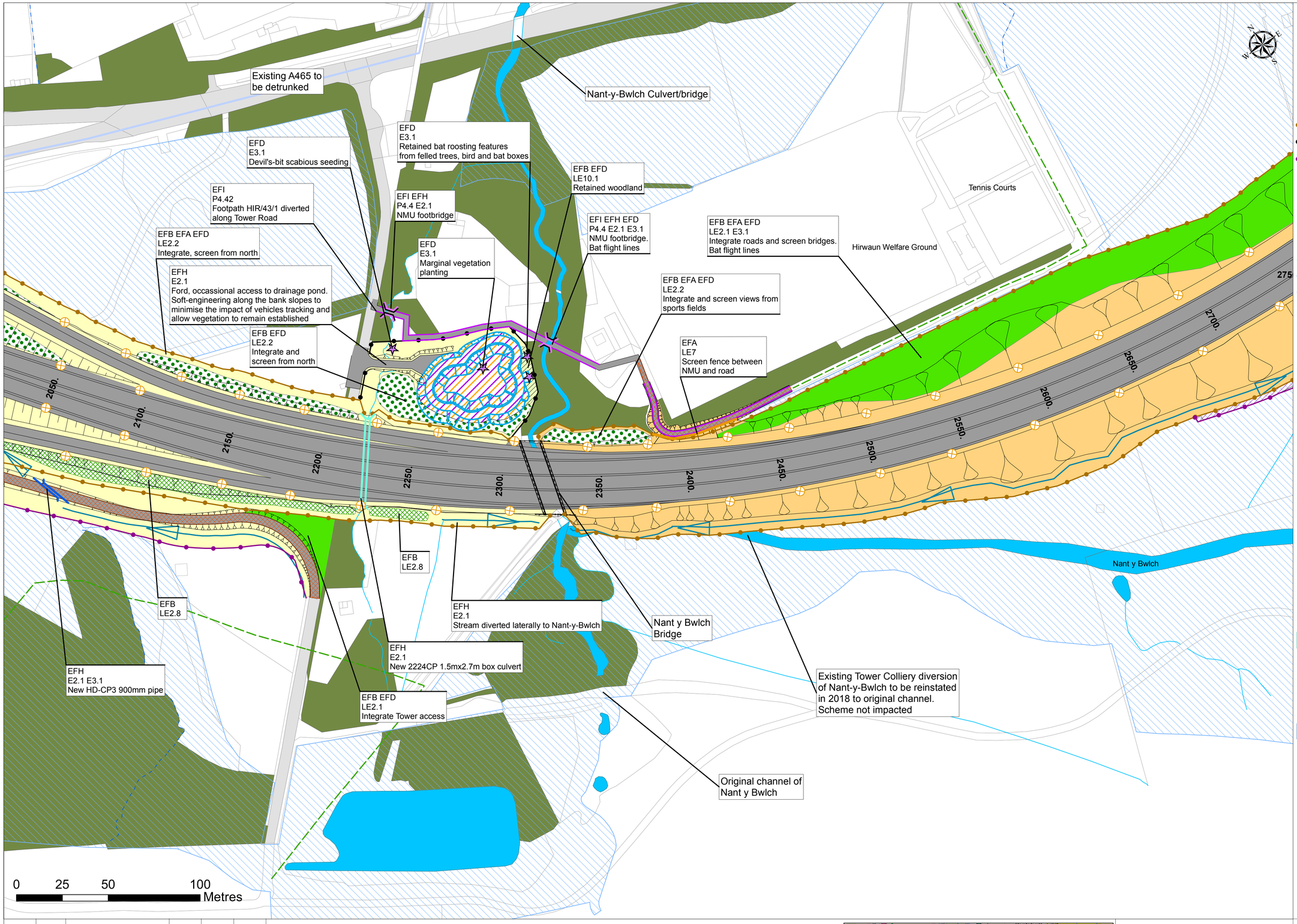
Drawing No.	FIGURE 1 SHEET 3 OF 30 — Rev 0



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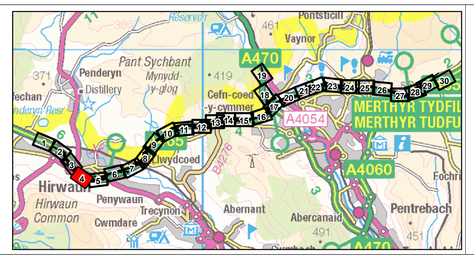

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Scale	1:1,000 @A1	DO NOT SCALE
Drawing No.	FIGURE 1 SHEET 4 OF 30	Rev 0

Existing A465 to be detrunked

Hirwaun Primary School

EFI
P4.41
Shared use NMU facility incorporated into scheme

A4059 Brecon Road

Glanant St

EFE EFD
LE5.1 E3.1
Individual trees, visual amenity and bat flight line

EFB EFA EFD
LE2.1 E3.1
Integrate and screen bridges, bat flight line

EFE EFA EFB
LE2.6

Trewaun East Bridge

EFB EFA EFD
LE2.1 E3.1
Integrate road, bat flight line

EFH EFD
E2.1 E3.1
Existing Glanant St culvert 700mm pipe. No works as part of the scheme, bat flight line

EFB
LE10.3
Reinstate and return to landowner

EFB EFA EFD
LE2.1 E3.1
Integrate and screen road, bat flight line

EFI
P4.41
Shared use NMU facility to tie into existing footways

EFB EFA EFD
LE2.1 E3.1
Integrate and screen bridges, bat flight line

EFB EFA EFD
LE2.1 E3.1
Integrate and screen bridges, bat flight line

EFB
LE10.3
Reinstate and return to landowner

EFH
E2.1
Replace 3288CE with 2.4mx1.2m box culvert with Siphon under the mainline

EFG
E1.2
Environmental barrier 01

EFE EFD
LE5.1 E3.1
Individual trees, visual amenity and bat flight line

EFD EFA EFB
LE2.1 E3.1
Integrate and screen bridges, bat flight line

Johnson Park

Ivy Cottages

EFB
LE10.3
Reinstate and return to landowner

EFB
LE2.6

Mountains View

EFI
P4.41
Shared use NMU facility to tie into wind farm access bridge

EFB EFA EFD
LE2.1 E3.1
Integrate roads and screen bridges. Bat flight lines

Wind Farm Access Bridge

EFA EFB EFD
LE2.2
Screen road and integrate

Trewaun

EFI
P4.41
Pedestrian and cyclist access through junction

2700.
2750.
2800.
2850.
2900.
2950.
3000.
3050.
3100.
3150.
3200.
3250.
3300.
3350.

Waungron

EFB EFE
LE7
Low stone wall

EFE
LE7
Decorative surface to footway on bridges

Trewaun West Bridge

EFB
LE10.3
Reinstate and return to landowner

EFB
LE10.3
Reinstate and return to landowner

EFI
P4.41
Shared use NMU facility to tie into existing footways access bridge

EFE EFA EFD
LE2.1
Visual amenity, integrate and screen junction

EFE EFA EFD
LE5.1
Visual amenity to integrate NMU and junction

EFB EFD EFA
LE2.1 E3.1
Integrate and screen bridges, bat flight line

EFB EFD EFA
LE2.1 E3.1
Integrate and screen bridges, bat flight line

EFB EFD EFA
LE2.2 E3.1
Integrate and screen junction, bat flight line

EFB EFA EFD
LE2.1
Integrate roads and screen bridges

EFH
E2.1
New HD-CP4 900mm pipe. Proposed highway ditch conveyed under wind farm access

EFH
E2.1
Watercourse to be diverted approximately 450m east along drainage ditch into culvert

EFB
LE10.3
Reinstate and return to landowner

EFI
P4.42
Footpath HIR/44/4 diverted

Nant y Bwlch

0 25 50 100 Metres

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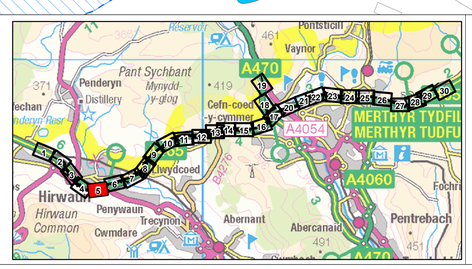

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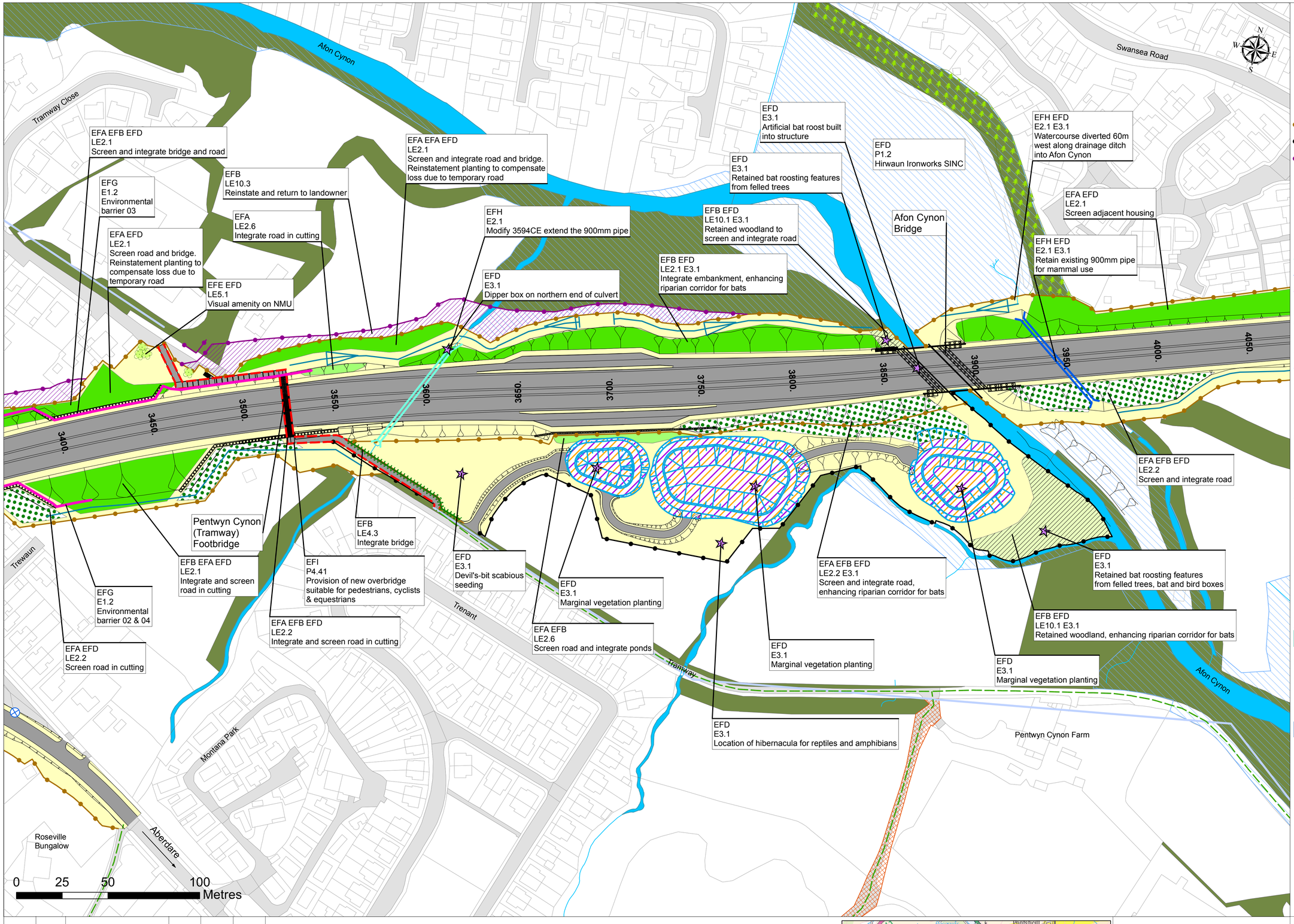

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- Culverts - water pollution control measures
- Culverts - ecological protection measures
- Culverts - footbridges

Public rights of way and access
- Bridleway
- Footpath
- National Cycle Network Route
- Proposed 3m shared use NMU facility
- Re-routed public right of way
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Planning and Policy Elements
- Local authority boundary
- Listed features
- Scheduled Ancient Monument (SAM)
- Conservation areas
- Registered park and garden
- Special Area of Conservation (SAC)
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Existing features
- Ancient Woodland
- Existing woodland to be retained
- Tree Preservation Orders
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- Approximate location of cave entrances
- Waterbodies and watercourses
- Dry channels
- Existing roads

Proposed features
- Neutral grassland creation
- Acid grassland creation
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- Rock and scree (extent dependent on ground conditions)
- Woodland
- Woodland edge
- Shrubs with intermittent trees
- Shrubs
- Scrub
- Marsh and wet grassland
- Decorative surface
- Manmade rock design feature
- Ecological management area
- Retained vegetation within highway boundary
- Land to be returned to landowner
- Hard landscape features
- Built noise barrier
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- Interpretation board
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EFA Visual Screening
EFB Landscape Integration
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EFD Nature Conservation and Biodiversity
EFE Visual Amenity
EFF Heritage
EFG Auditory Amenity
EFH Water Quality
EFI Public Rights of Way Network

Culverts
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Landscape Elements

Grassland
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LE1.32 Acid grassland creation
LE1.33 Ancient woodland ground flora top soil salvage coppice and shrub translocation
LE1.34 Heathland creation
LE1.4 Rock and scree

Native Planting
LE2.1 Woodland
LE2.2 Woodland edge
LE2.5 Shrubs with intermittent trees
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LE2.8 Scrub
LE4.3 Native species hedgerow
LE 5.1 Individual trees
LE6.4 Marsh and wet grassland

Other Landscape Treatments

LE7 Hard landscape features
LE7.1 Manmade rock design feature
LE9 Ecological management area
LE10.1 Retained woodland
LE10.2 Retained scrub
LE10.3 Reinstate and return to landowner

Environmental barriers
E1.2 Environmental barrier - built elements

Nature Conservation and Biodiversity
E2.1 Water pollution control measures
E3.1 Protected Species
E3.2 Ecological Protection Measures

Planning and Policy Elements

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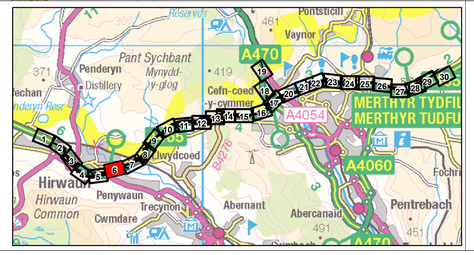

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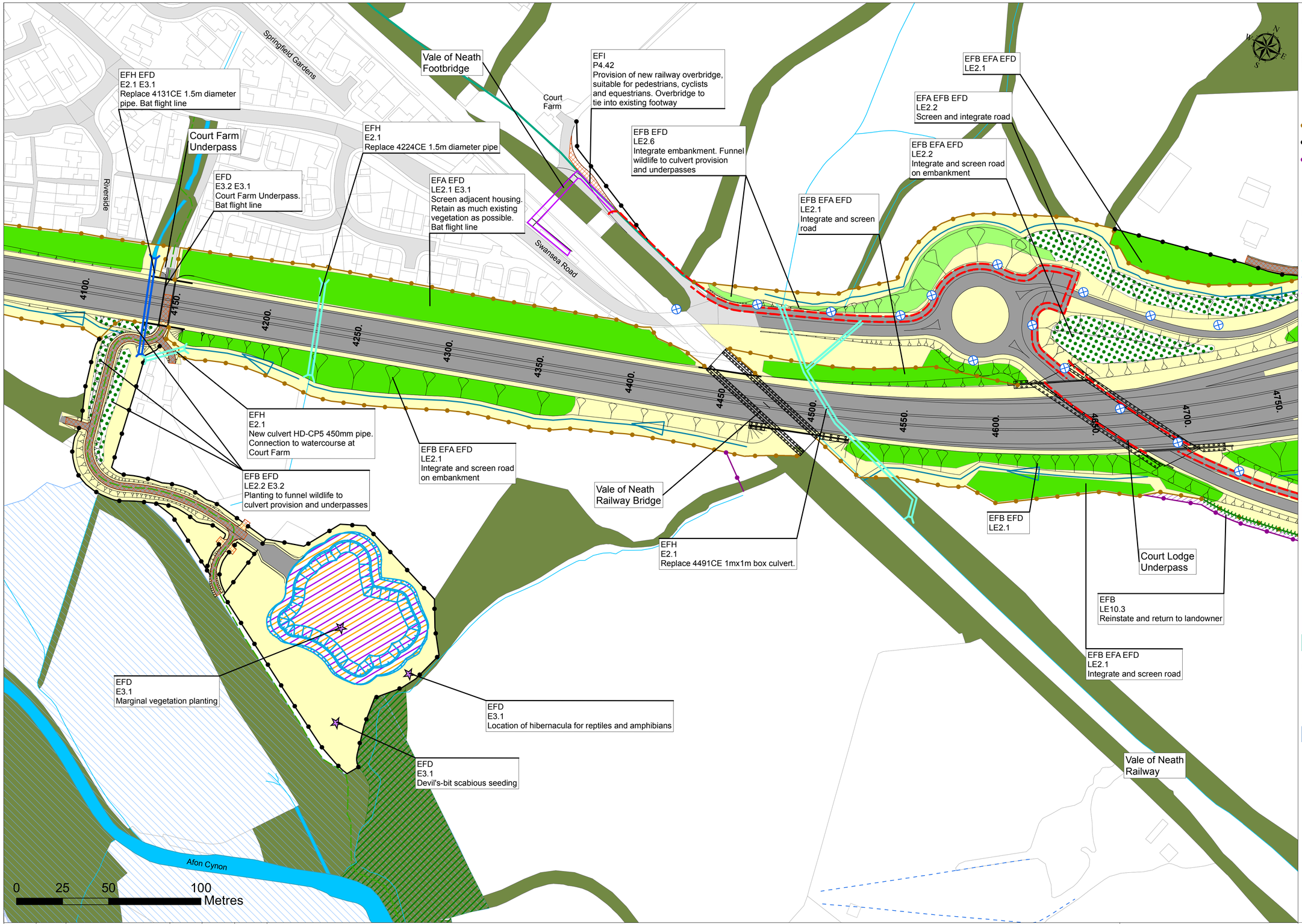
Title	ENVIRONMENTAL MASTERPLAN AFON CYNON
Scale	1:1,000 @A1 — DO NOT SCALE
Drawing No.	FIGURE 1 SHEET 6 OF 30 — Rev 0



EFH EFD
E2.1 E3.1
Replace 4131CE 1.5m diameter pipe. Bat flight line

Court Farm Underpass

EFD
E3.2 E3.1
Court Farm Underpass.
Bat flight line

EFH
E2.1
Replace 4224CE 1.5m diameter pipe

Vale of Neath Footbridge

EFI
P4.42
Provision of new railway overbridge, suitable for pedestrians, cyclists and equestrians. Overbridge to tie into existing footway

EFA EFD
LE2.1 E3.1
Screen adjacent housing. Retain as much existing vegetation as possible.
Bat flight line

EFB EFD
LE2.6
Integrate embankment. Funnel wildlife to culvert provision and underpasses

EFB EFA EFD
LE2.1
Integrate and screen road

EFA EFB EFD
LE2.2
Screen and integrate road

EFB EFA EFD
LE2.2
Integrate and screen road on embankment

EFB EFA EFD
LE2.1

EFH
E2.1
New culvert HD-CP5 450mm pipe.
Connection to watercourse at Court Farm

EFB EFA EFD
LE2.1
Integrate and screen road on embankment

EFB EFD
LE2.2 E3.2
Planting to funnel wildlife to culvert provision and underpasses

Vale of Neath Railway Bridge

EFH
E2.1
Replace 4491CE 1mx1m box culvert.

EFB EFD
LE2.1

EFB
LE10.3
Reinstate and return to landowner

EFB EFA EFD
LE2.1
Integrate and screen road

EFD
E3.1
Marginal vegetation planting

EFD
E3.1
Location of hibernacula for reptiles and amphibians

EFD
E3.1
Devil's-bit scabious seeding

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LE7.1 Manmade rock design feature
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LE10.1 Retained woodland
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LE10.3 Reinstate and return to landowner

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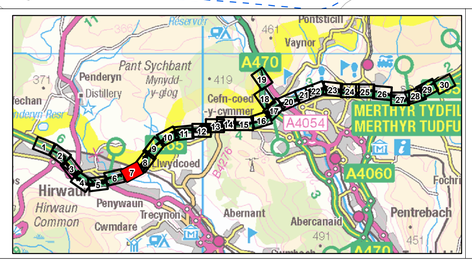

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Scale	1:1,000 @A1 — DO NOT SCALE
Drawing No.	FIGURE 1 SHEET 7 OF 30 — Rev 0

EFH EFD
E2.1 E3.1
Replace 5021CE with 1.8mx1.8m box culvert. Mammal ledge & bat flight line

EFA EFB EFD
LE2.2
Integrate and screen elevated road. Funnel protected species to culvert provision

EFB EFA EFD
LE2.2
Integrate and screen elevated road

EFH EFD
E2.1 E3.1
Replace 4824CE 2.6mx2.1m with box culvert. Mammal ledge & bat flight line

EFA EFB EFD
LE2.1
Integrate and screen road from views from north

EFE
LE2.6
Visual amenity at junction

EFA EFB EFD
LE2.2
Integrate and screen elevated road

EFA EFB EFD
LE2.2
Integrate and screen elevated road

EFA EFB EFD
LE2.2
Integrate and screen elevated road

EFD EFB
LE9 LE1.33
Mitigate ancient woodland. Ground flora top soil salvage, coppice and shrub translocation

EFI EFH
P4.4 E2.1
Footbridge under NMU

EFE
LE7.1
Visual amenity at junction

EFA EFB
LE2.6
Visual amenity and integration of NMU

EFI
P4.41
Shared use NMU facility to tie into attenuation pond access road

EFB EFA EFD
LE2.2
Integrate and screen road from north

EFC
LE7
Nant Melyn Cattle Crossing

EFB
LE4.3
Replacement hedgerow

EFB
LE2.2

EFB EFD
LE2.2
Integrate pond

EFD
E3.1
Location of hibernacula for reptiles and amphibians

EFD
E3.1
Devil's-bit scabious seeding

EFB
LE4.3
Replacement hedgerow

EFD
E3.1
Marginal vegetation planting

EFI
P4.42
Footpath HIR/7/1 diverted along Gellitarw farm access road

EFI
P4.41
Equestrian facilities provided through new Croesbychan Junction

EFB EFD
LE9 LE1.33
Mitigate ancient woodland. Ground flora top soil salvage, coppice and shrub translocation

EFD
LE4.3
Hedgerow for bat flightline culvert provision

EFB
LE2.2

EFH
E2.1
New JCT3-CP3 1.5m pipe

EFD EFB
LE9 LE1.33
Mitigate ancient woodland. Ground flora top soil salvage, coppice and shrub translocation

EFI
P4.41
Shared use NMU facility to tie in with existing NCN Route 46 along Crematorium Road

EFH EFD
E2.1 E3.1
New JCT3-CP1 2.6mx2.1m box culvert. Mammal ledge & bat flight line

EFB
LE4.3
Replacement hedgerow

EFB
LE4.3
Replacement hedgerow

EFH EFD
E2.1 E3.1
New JCT3-CP2 2.6mx2.1m box culvert. Mammal ledge & bat flight line

EFB
LE10.3
Reinstate and return to landowner

EFD EFB
LE9
Mitigate and manage ancient woodland

EFB EFA EFD
LE2.1
Funnel protected species to culvert

EFE
LE2.6
Visual amenity at junction

EFD
E3.1
Location of bat and bird boxes

EFE
LE7.1
Visual amenity at junction

EFD EFB
LE9 LE1.33
Mitigate ancient woodland. Ground flora top soil salvage, coppice and shrub translocation

EFD
E3.1
Artificial bat roost built into structure

EFG
E1.2
Environmental barrier 05

EFB EFA EFD
LE2.1
Integrate and screen elevated road

EFB EFA EFD
LE2.1
Integrate and screen elevated road

Croesbychan Junction Bridge

Min-Y-Coed
Court Lodge
The Oaks
Keepers Lane
Lynwood
Dingle Gardens
Tawel Fan
Nant Melyn
La Paz
Ty Croes-Bychan
Nant Hir
Glyn Villa
The Dell
Swn yr Awel
Llwydcoed
Hirwaun
Hirwaun Common
Penywaun
Trecynon
Cwmdare
Abernant
Abercanaid
Pentrebach
Penderyn Distillery
Pant Sychbant
Mynydd-y-glog
Cefn-coed-y-cymmer
Vaynor
Pontsticill
Fochriw
MERTHYR TYDFIL
MERTHYR TUDFUL
A470
A4054
A4060

4750. 4800. 4850. 4900. 4950. 5000. 5050. 5100. 5150. 5200. 5250. 5300. 5350. 5400.

0 25 50 100 Metres

Legend

Highway scheme
- Scheme design
- Embankment
- Cutting
- Structures (bridges, viaducts and retaining walls)
- Stock proof fence - highway boundary
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LE1.4 Rock and scree

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LE7 Hard landscape features
LE7.1 Manmade rock design feature
LE9 Ecological management area
LE10.1 Retained woodland
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E1.2 Environmental barrier - built elements

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E2.1 Water pollution control measures
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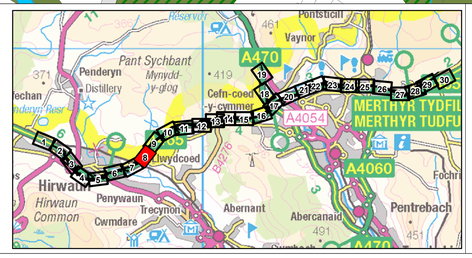

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Title	ENVIRONMENTAL MASTERPLAN CROESBYCHAN JUNCTION
Scale	1:1,000 @A1 — DO NOT SCALE
Drawing No.	FIGURE 1 SHEET 8 OF 30 — Rev 0

EFD
E3.1
Devil's-bit scabious seeding

EFD
E3.1
Retained bat roosting features
from felled trees, bat and bird boxes

EFD
E3.1
Retained bat roosting features
from felled trees, bat and bird boxes

EFB EFD
LE10 E3.1
Retained woodland for
bat box location

EFB EFD
LE10.1
Retained woodland for
bat box location

EFC
LE7
Nant Melyn Cattle Crossing

EFB EFD
LE2.2
Integrate pond

EFD
E3.1
Marginal vegetation planting

EFB EFD
LE2.2
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EFI
P4.41
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EFH EFD
E2.1 E3.1
Replace 5969CE with 2.7mx1.8m box culvert.
Mammal ledge & bat flight line

EFB EFD
LE2.1
Integration

EFD
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Artificial bat roost
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EFB EFD
LE2.1
Integrate road on embankment

EFC EFD
LE7 E3.2
Nant Melyn Mainline
Viaduct

EFB EFA EFD
LE2.1
Integrate and screen road in
views from south

EFD
E3.1
Marginal vegetation
planting

EFD
E3.1
Location of hibernacula for
reptiles and amphibians

Nant Melyn

Unnamed watercourse

5350. 5400. 5450. 5500. 5550. 5600. 5650. 5700. 5750. 5800. 5850. 5900. 5950. 6000. 6050.

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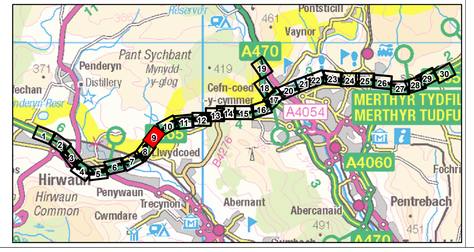

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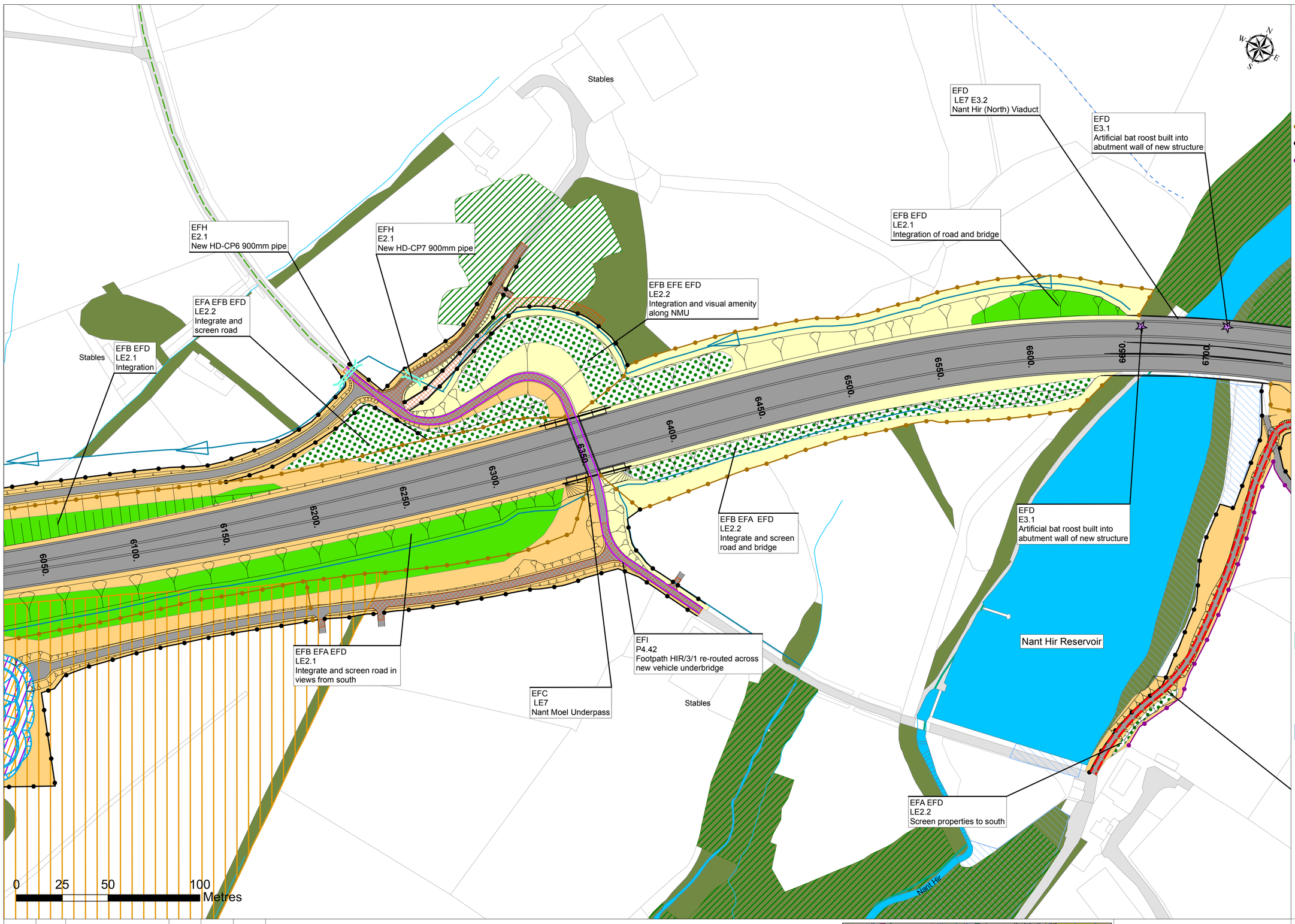
Drawing No.	FIGURE 1 SHEET 9 OF 30 — Rev 0



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- Approximate location of cave entrances
- Waterbodies and watercourses
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Proposed features

- Neutral grassland creation
- Acid grassland creation
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- Rock and scree (extent dependent on ground conditions)
- Woodland
- Woodland edge
- Shrubs with intermittent trees
- Shrubs
- Scrub
- Marsh and wet grassland
- Decorative surface
- Manmade rock design feature
- Ecological management area
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- Hard landscape features
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0	JULY17	FINAL	FL	LE	WB

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LE7.1 Manmade rock design feature
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LE10.1 Retained woodland
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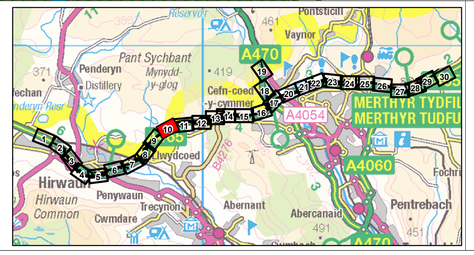

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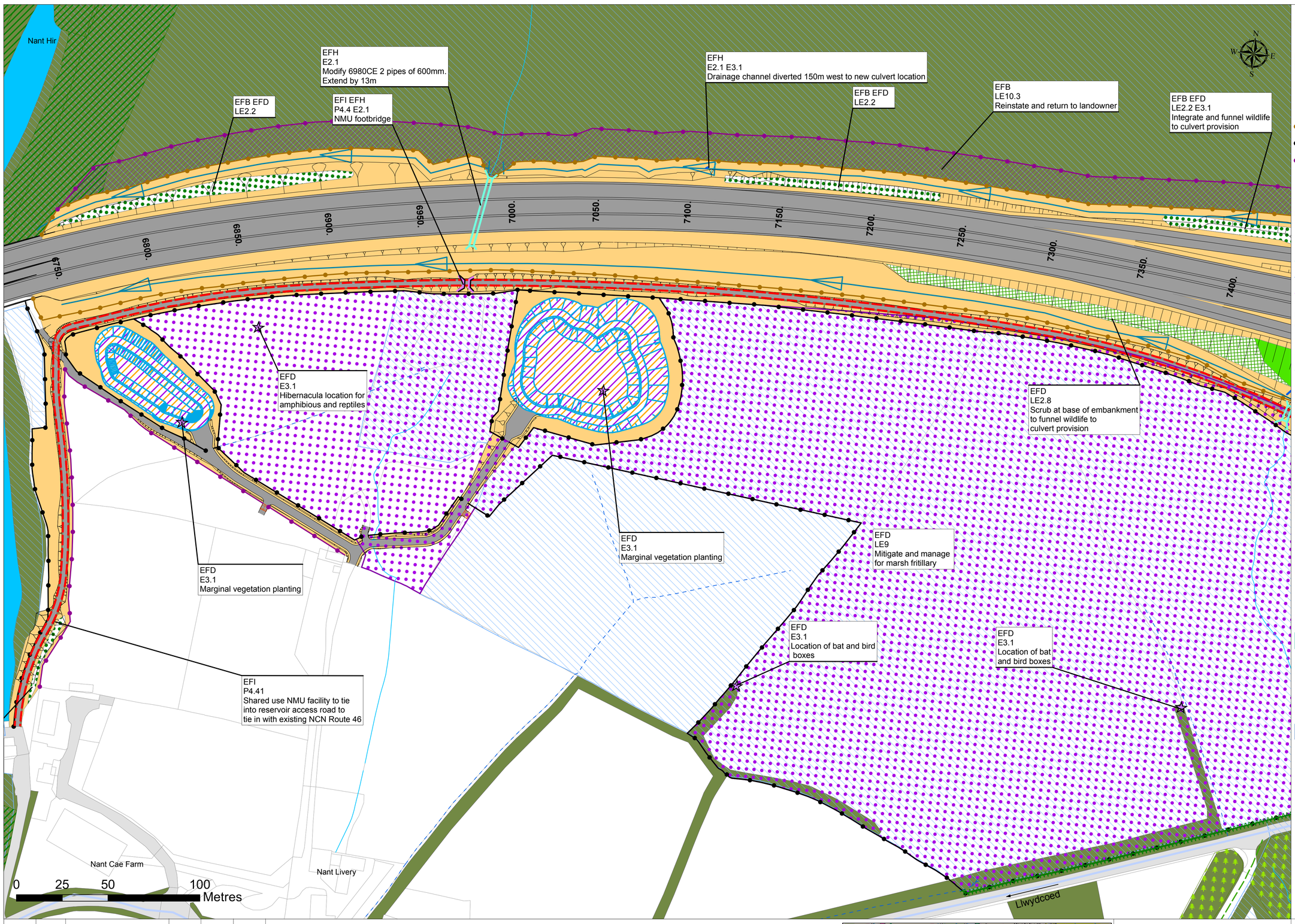
Status	FINAL
Project	A465 HEADS OF THE VALLEYS SECTIONS 5 AND 6 DOWLAIS TOP TO HIRWAUN
Title	ENVIRONMENTAL MASTERPLAN NANT HIR RESERVOIR
Scale	1:1,000 @A1 — DO NOT SCALE
Drawing No.	FIGURE 1 SHEET 10 OF 30 — Rev 0



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LE 5.1 Individual trees
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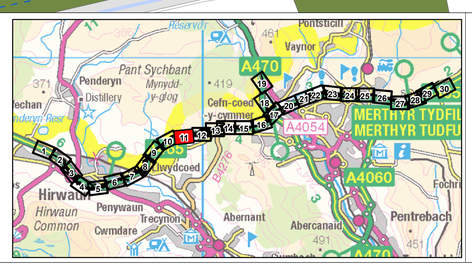

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Status	FINAL
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Title	ENVIRONMENTAL MASTERPLAN LLWYDCOED SLOPES
Scale	1:1,000 @A1 — DO NOT SCALE
Drawing No.	FIGURE 1 SHEET 11 OF 30 — Rev 0

EFD
P1.2
Nant Hir Valley & Reservoir SINC

Dynevor Arms
(Former LNG
storage facility

EFB EFD
LE2.1
Integrate road. Funnel
wildlife to culvert provision

EFH
E2.1
New HD-CP8
900mm pipe

EFI
P4.41
Pavement along road to provide access
to Jah-Jireh care home

EFB EFD
LE2.2
Integrate road

EFE EFB
LE7.1
Visual amenity and integration of junction

EFE EFB
LE7.1
Visual amenity and integration of junction

EFE EFB
LE7.1
Visual amenity and integration of junction

EFI
P4.41
Equestrian facilities to be provided along shared use NMU facility

Baverstock Junction
Bridge

EFH EFD
E2.1 E3.1
Replace 7548CE 1.8mx1.2m.
Mammal ledge

EFB EFD
LE2.2

EFH EFD
E2.1 E3.1
Replace 7448CE 2.1mx1.8m
box culvert. Mammal ledge

7450.
7500.
7550.
7600.
7650.
7700.
7750.
7800.
7850.
7900.
7950.
8000.
8050.
8100.

EFD
E3.1
Interpretation board Llwydcoed marsh
fritillary ecological management area

EFB EFA EFD
LE2.2
Integrate and reduce
views of road

EFH
E2.1
New culvert 28-CP1 1.5m
diameter pipe

EFH
E2.1
New culvert 28-CP1 1.5m
diameter pipe

EFE EFB
LE7.1
Visual amenity and
integration of junction

EFB EFA EFD
LE2.1 E3.1
Integrate and reduce views of road
below ridge from west. Funnel
wildlife to culvert provision

EFD
E3.1
Marginal vegetation
planting

EFD
LE9
Mitigate and manage
for marsh fritillary

EFD
LE1.34 E3.1
Funnel wildlife to
culvert provision

EFD
LE1.32 E3.1
Funnel wildlife to
culvert provision

EFD
P1.2
Llwydcoed Slopes SINC

EFI
P4.41
Shared use NMU facility to
tie in with existing NCN Route 46

EFD
E3.1
Location of hibernacula for
reptiles and amphibians

EFB EFE
LE7.1
Visual amenity and integration
of junction

EFH EFD
E2.1 E3.1
New JCT4 CP2 2.6mx2.1m box
culvert. Mammal ledge

EFB
LE4.3
Species rich hedgerow

EFB
LE4.3
Species rich hedgerow

EFB EFA EFD
LE2.1
Integrate and reduce
views of road

EFE EFB
LE7.1
Visual amenity and integration
of junction

EFB EFA EFD
LE2.2
Integrate and reduce views
of elevated road

EFE EFB
LE7.1
Visual amenity and
integration of junction
below ridge from west

Nant Ty Gwyddel

Llwydcoed

Ty Gwyn Farm

0 25 50 100 Metres

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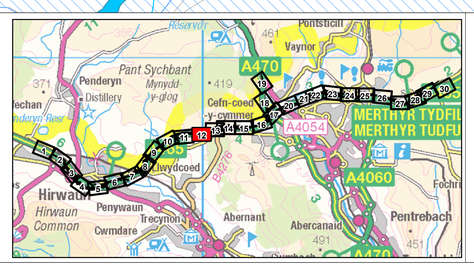

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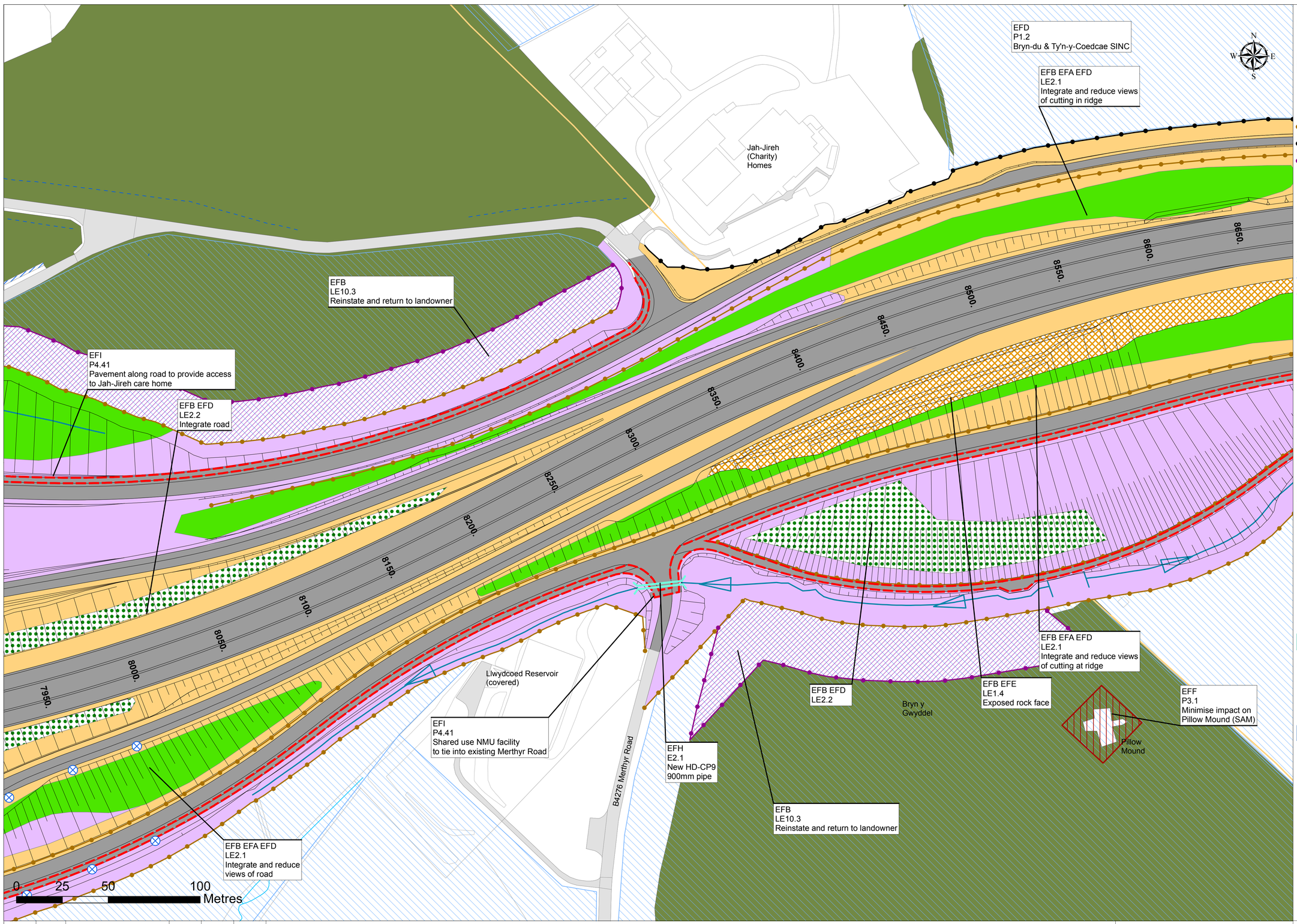
Title	ENVIRONMENTAL MASTERPLAN BAVERSTOCK JUNCTION
Scale	1:1,000 @A1 — DO NOT SCALE
Drawing No.	FIGURE 1 SHEET 12 OF 30 — Rev 0



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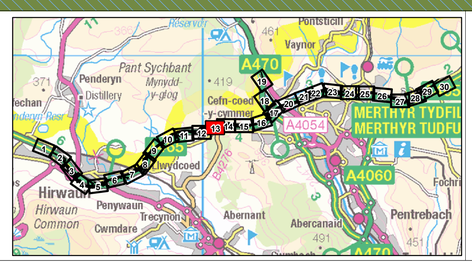

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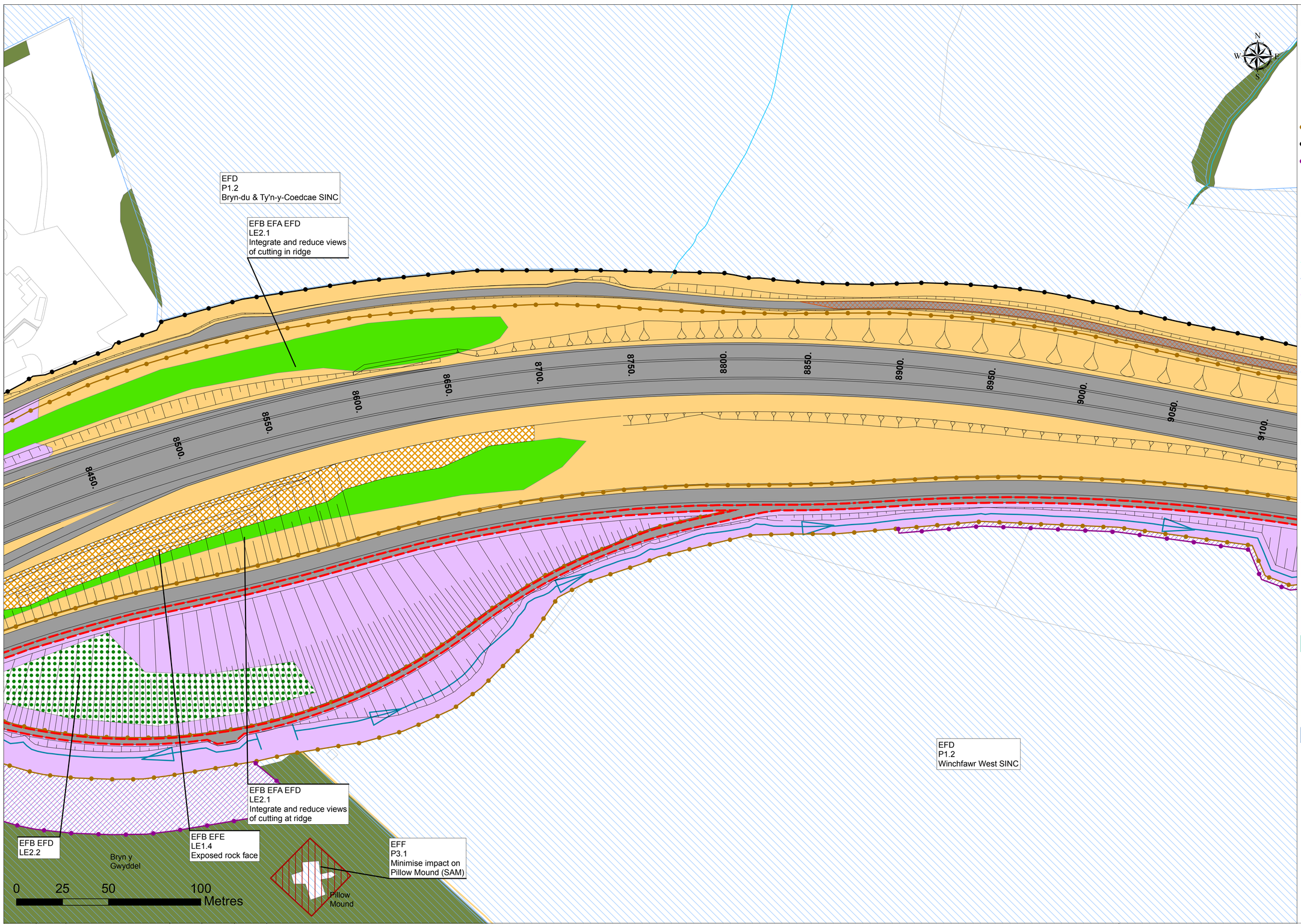
Title	ENVIRONMENTAL MASTERPLAN BRYN Y GWYDDEL	
Scale	1:1,000 @A1	DO NOT SCALE
Drawing No.	FIGURE 1 SHEET 13 OF 30	Rev 0



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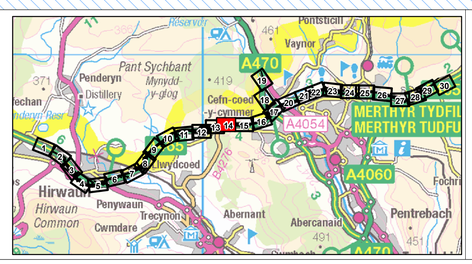

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Scale	1:1,000 @A1 — DO NOT SCALE
Drawing No.	FIGURE 1 SHEET 14 OF 30 — Rev 0

Ty'n-y-coedcae Farm

Nant Ffrwd

EFD
E3.1
Dipper box on northern end of culvert

EFB EFD
LE2.2 E3.1
Funnel wildlife to culvert provision

EFB
LE2.8

EFD
E3.1
Marginal vegetation planting

EFD
E3.1
Location of hibernacula for reptiles and amphibians

EFH
E2.1
Replace 9640CE with 2.1mx1m box culvert. Watercourse realigned to provide depressed invert (300mm below existing bed level) as part of extension of culvert to ensure cover at upstream end

EFB EFA EFD
LE2.1
Integrate road at ridge

9150. 9200. 9250. 9300. 9350. 9400. 9450. 9500. 9550. 9600. 9650. 9700. 9750. 9800.

EFB EFA EFD
LE2.1
Integrate and screen from housing

Swansea Road

Beacon Heights

Clos Cribyn

Heol Corn Du

EFD
E3.2 E3.1
Great Crested Newt habitat, retain existing ponds

EFD
E3.1
Location of hibernacula for reptiles and amphibians

EFD
LE10.3 LE3.1
Temporary newt receptor area. Manage and return to landowner

EFH EFD
E2.1 E3.1
Replace 9640CE with 2.1mx1.8m box culvert. Mammal ledge & GCN connectivity

EFB EFD
LE2.8 E3.1
Funnel wildlife to culvert provision

EFI
P4.41
Pedestrian, cyclist and equestrian access

EFD
E3.1
Retained bat roosting features from felled trees

EFB EFD
LE2.1
Integrate and screen from housing

EFB
LE10.1
Retained vegetation

EFI
P4.41
Shared use NMU facility to tie into existing NCN Route 46

EFH
E2.1
New 35-CP1 1x2.1m box culvert. Known issue upstream of existing culvert at existing access track, further review of potential additional upstream treatment to be undertaken at detailed design

0 25 50 100 Metres

Legend

Highway scheme
- Scheme design
- Embankment
- Cutting
- Structures (bridges, viaducts and retaining walls)
- Stock proof fence - highway boundary
- Stock proof fence - non-highway boundary
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- Proposed aluminium road lighting - 12m

Drainage
- Proposed drainage pond
- Proposed drainage ditches
- Culverts - water pollution control measures
- Culverts - ecological protection measures
- Culverts - footbridges

Public rights of way and access
- Bridleway
- Footpath
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Planning and Policy Elements
- Local authority boundary
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Existing features
- Ancient Woodland
- Existing woodland to be retained
- Tree Preservation Orders
- Jewish Cemetery
- Approximate location of cave entrances
- Waterbodies and watercourses
- Dry channels
- Existing roads

Proposed features
- Neutral grassland creation
- Acid grassland creation
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- Rock and scree (extent dependent on ground conditions)
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- Woodland edge
- Shrubs with intermittent trees
- Shrubs
- Scrub
- Marsh and wet grassland
- Decorative surface
- Manmade rock design feature
- Ecological management area
- Retained vegetation within highway boundary
- Land to be returned to landowner
- Hard landscape features
- Built noise barrier
- Hedgerows
- Ecology mitigation
- Individual tree
- Interpretation board
- Landscape gateway features

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0	JULY17	FINAL	FL	LE	WB

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LE1.34 Heathland creation
LE1.4 Rock and scree

Native Planting
LE2.1 Woodland
LE2.2 Woodland edge
LE2.5 Shrubs with intermittent trees
LE2.6 Shrubs
LE2.8 Scrub
LE4.3 Native species hedgerow
LE 5.1 Individual trees
LE6.4 Marsh and wet grassland

Other Landscape Treatments
LE7 Hard landscape features
LE7.1 Manmade rock design feature
LE9 Ecological management area
LE10.1 Retained woodland
LE10.2 Retained scrub
LE10.3 Reinstate and return to landowner

Environmental barriers
E1.2 Environmental barrier - built elements

Nature Conservation and Biodiversity
E2.1 Water pollution control measures
E3.1 Protected Species
E3.2 Ecological Protection Measures

Planning and Policy Elements

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P1.2 Local Nature Conservation Designation

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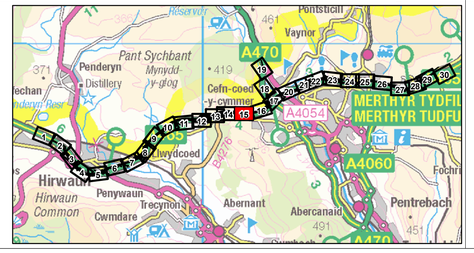
P3.1 Cultural Heritage Feature
P3.2 Conservation Area

Land Use
P4.4 Public Rights of Way
P4.41 Public Rights of Way - proposed shared use NMU facility
P4.42 Public Rights of Way - diverted footpath



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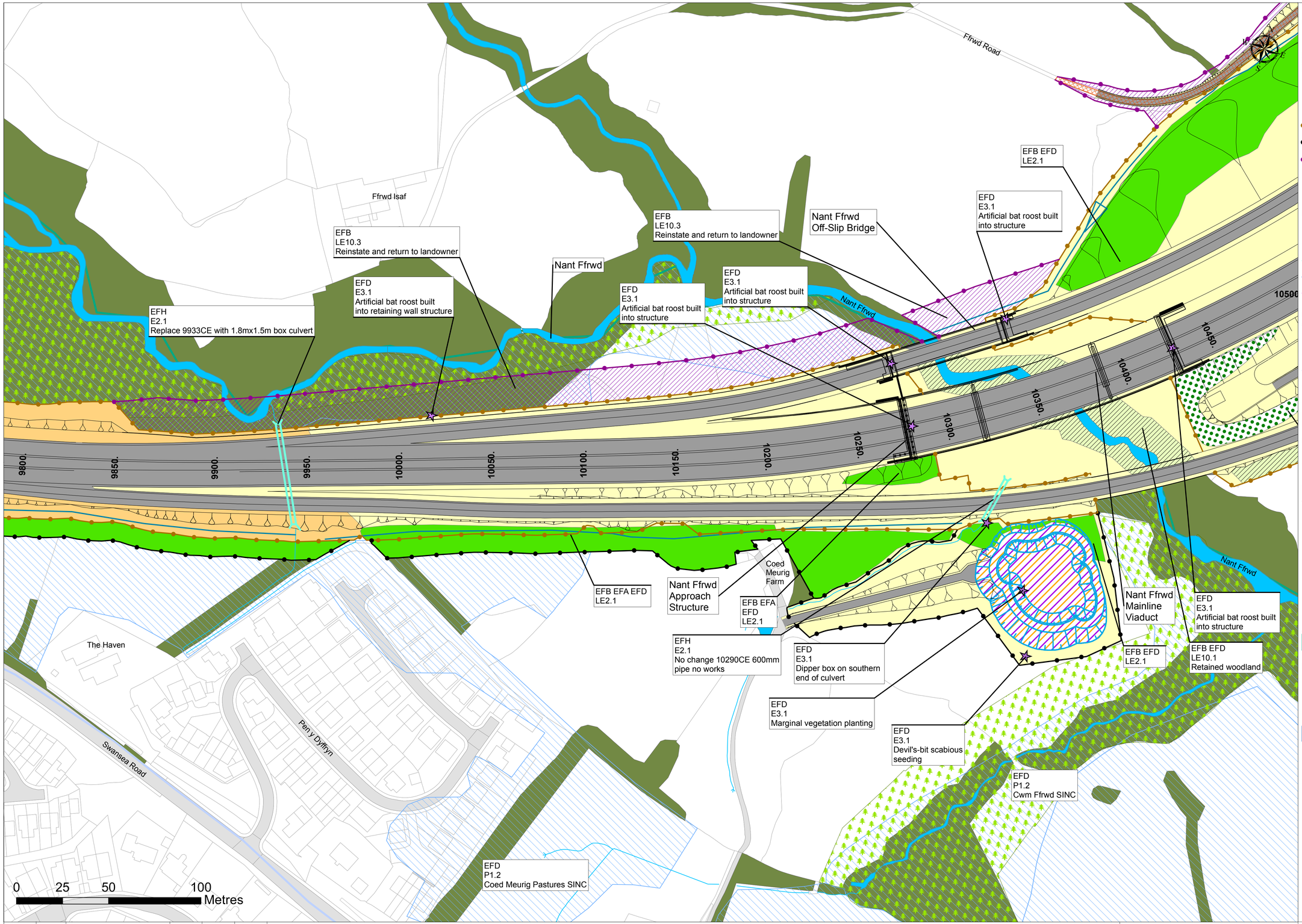
Status	FINAL
Project	A465 HEADS OF THE VALLEYS SECTIONS 5 AND 6 DOWLAIS TOP TO HIRWAUN
Title	ENVIRONMENTAL MASTERPLAN SWANSEA ROAD
Scale	1:1,000 @A1 — DO NOT SCALE
Drawing No.	FIGURE 1 SHEET 15 OF 30 — Rev 0



Legend

Highway scheme

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Drainage

- Proposed drainage pond
- Proposed drainage ditches
- Culverts - water pollution control measures
- Culverts - ecological protection measures
- Culverts - footbridges

Public rights of way and access

- Bridleway
- Footpath
- National Cycle Network Route
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Planning and Policy Elements

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- Wildlife Trust Reserve
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Existing features

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- Tree Preservation Orders
- Jewish Cemetery
- Approximate location of cave entrances
- Waterbodies and watercourses
- Dry channels
- Existing roads

Proposed features

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- Manmade rock design feature
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- Land to be returned to landowner
- Hard landscape features
- Built noise barrier
- Hedgerows
- Ecology mitigation
- Individual tree
- Interpretation board
- Landscape gateway features

0	JULY17	FINAL	FL	LE	WB
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Native Planting
LE2.1 Woodland
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LE2.6 Shrubs
LE2.8 Scrub
LE4.3 Native species hedgerow
LE 5.1 Individual trees
LE6.4 Marsh and wet grassland

Other Landscape Treatments
LE7 Hard landscape features
LE7.1 Manmade rock design feature
LE9 Ecological management area
LE10.1 Retained woodland
LE10.2 Retained scrub
LE10.3 Reinstate and return to landowner

Environmental barriers
E1.2 Environmental barrier - built elements

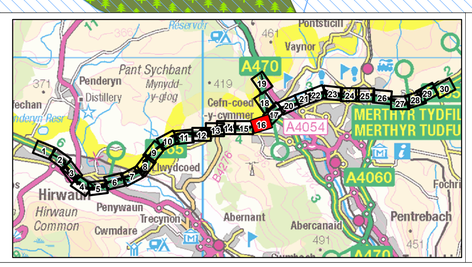
Nature Conservation and Biodiversity
E2.1 Water pollution control measures
E3.1 Protected Species
E3.2 Ecological Protection Measures

Planning and Policy Elements

Nature Conservation Designations
P1.1 Statutory Nature Conservation Designation
P1.2 Local Nature Conservation Designation

Cultural Heritage
P3.1 Cultural Heritage Feature
P3.2 Conservation Area

Land Use
P4.4 Public Rights of Way
P4.41 Public Rights of Way - proposed shared use NMU facility
P4.42 Public Rights of Way - diverted footpath



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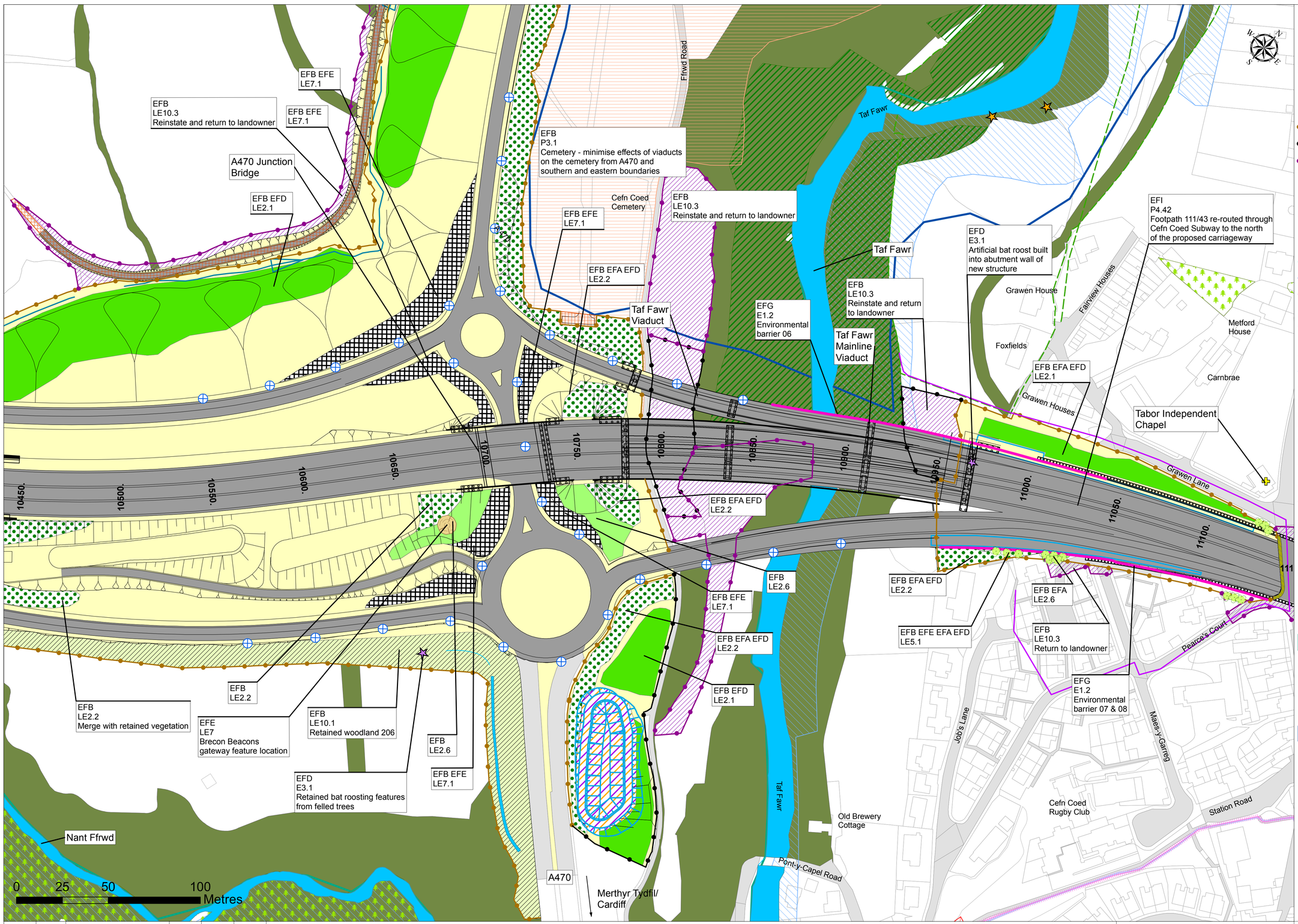
Status	FINAL
Project	A465 HEADS OF THE VALLEYS SECTIONS 5 AND 6 DOWLAIS TOP TO HIRWAUN
Title	ENVIRONMENTAL MASTERPLAN NANT FFRWD
Scale	1:1,000 @A1 — DO NOT SCALE
Drawing No.	FIGURE 1 SHEET 16 OF 30 — Rev 0



Legend

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- Culverts - footbridges

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Existing features
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- Hard landscape features
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- Ecology mitigation
- Individual tree
- Interpretation board
- Landscape gateway features

Rev.	Rev. Date	Purpose of revision	Drawn	Checked	Approved
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Environmental Functions

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Native Planting
LE2.1 Woodland
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Other Landscape Treatments
LE7 Hard landscape features
LE7.1 Manmade rock design feature
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LE10.1 Retained woodland
LE10.2 Retained scrub
LE10.3 Reinstate and return to landowner

Environmental barriers
E1.2 Environmental barrier - built elements

Nature Conservation and Biodiversity
E2.1 Water pollution control measures
E3.1 Protected Species
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Planning and Policy Elements

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P3.1 Cultural Heritage Feature
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Land Use
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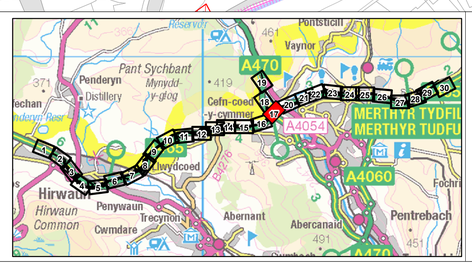

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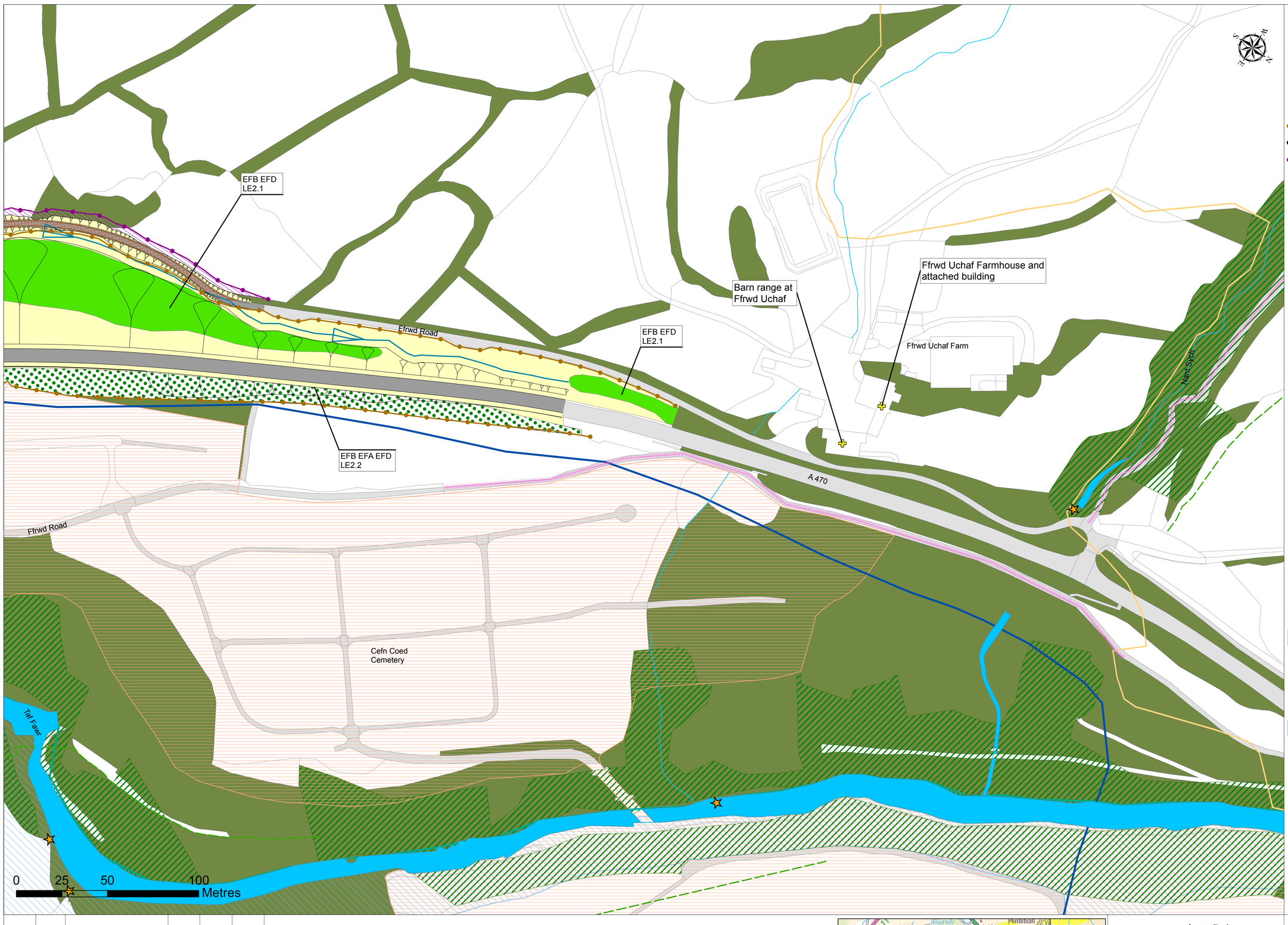
Status	FINAL
Project	A465 HEADS OF THE VALLEYS SECTIONS 5 AND 6 DOWLAIS TOP TO HIRWAUN
Title	ENVIRONMENTAL MASTERPLAN A470 JUNCTION
Scale	1:1,000 @A1 — DO NOT SCALE
Drawing No.	FIGURE 1 SHEET 17 OF 30 — Rev 0



Legend

Highway scheme

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Drainage

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- Proposed drainage ditches
- Culverts - water pollution control measures
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- Culverts - footbridges

Public rights of way and access

- Bridleway
- Footpath
- National Cycle Network Route
- Proposed 3m shared use NMU facility
- Re-routed public right of way
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Planning and Policy Elements

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Existing features

- Ancient Woodland
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- Approximate location of cave entrances
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Proposed features

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- Hedgerows
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Other Landscape Treatments
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LE7.1 Manmade rock design feature
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LE10.3 Reinstate and return to landowner

Environmental barriers
E1.2 Environmental barrier - built elements

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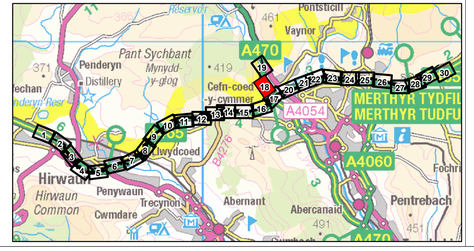

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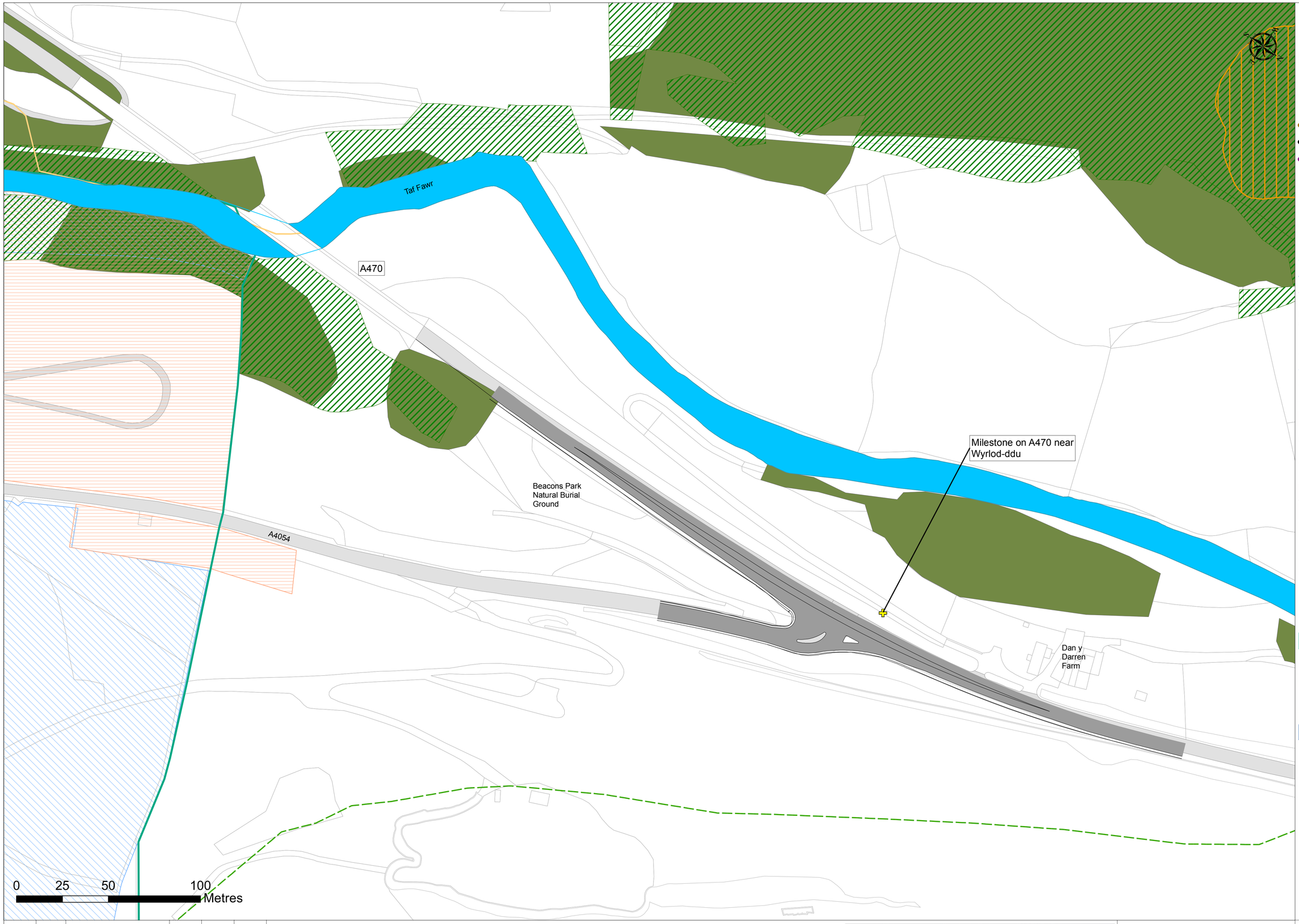
Status	FINAL
Project	A465 HEADS OF THE VALLEYS SECTIONS 5 AND 6 DOWLAIS TOP TO HIRWAUN
Title	ENVIRONMENTAL MASTERPLAN CEFN COED CEMETERY
Scale	1:1,000 @A1 — DO NOT SCALE
Drawing No.	FIGURE 1 SHEET 18 OF 30 — Rev 0



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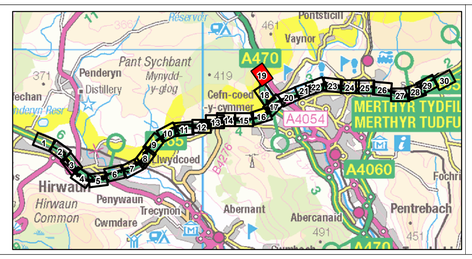

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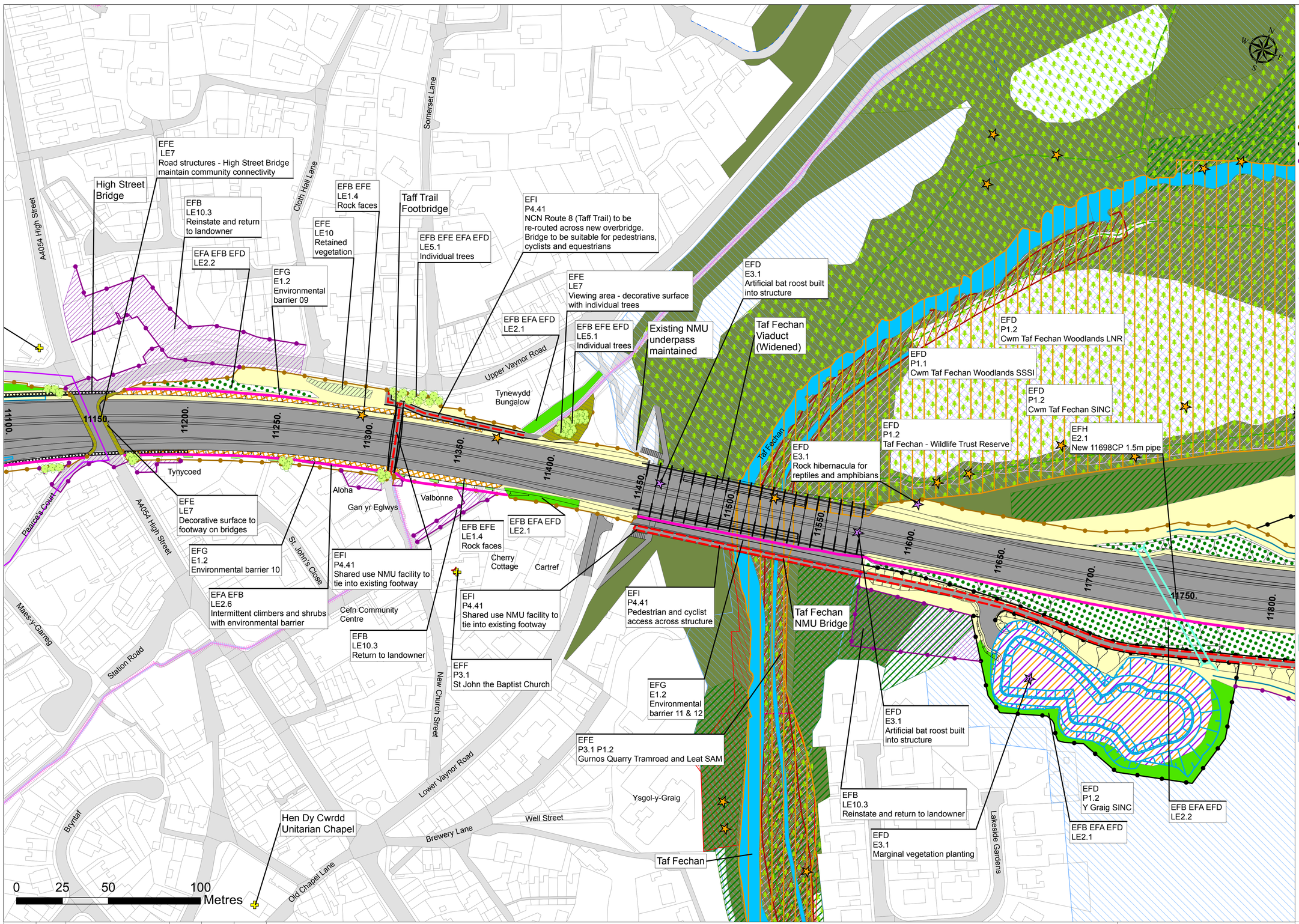
Status	FINAL
Project	A465 HEADS OF THE VALLEYS SECTIONS 5 AND 6 DOWLAIS TOP TO HIRWAUN
Title	ENVIRONMENTAL MASTERPLAN A470 JUNCTION IMPROVEMENT
Scale	1:1,000 @A1 — DO NOT SCALE
Drawing No.	FIGURE 1 SHEET 19 OF 30 — Rev 0



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- Interpretation board
- Landscape gateway features

Rev.	Rev. Date	Purpose of revision	Drawn	Checked	Approved
0	JULY17	FINAL	FL	LE	WB

Environmental Functions

EFA Visual Screening
EFB Landscape Integration
EFC Enhancing Built Environment
EFD Nature Conservation and Biodiversity
EFE Visual Amenity
EFF Heritage
EFG Auditory Amenity
EFH Water Quality
EFI Public Rights of Way Network

Culverts
CE - Culvert existing
CP - Culvert proposed
HD-CP - Highway drainage culvert
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No.-CP - NMU route no. culvert

Landscape Elements

Grassland
LE1.31 Neutral grassland creation
LE1.32 Acid grassland creation
LE1.33 Ancient woodland ground flora top soil salvage coppice and shrub translocation
LE1.34 Heathland creation
LE1.4 Rock and scree

Native Planting
LE2.1 Woodland
LE2.2 Woodland edge
LE2.5 Shrubs with intermittent trees
LE2.6 Shrubs
LE2.8 Scrub
LE4.3 Native species hedgerow
LE 5.1 Individual trees
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LE7 Hard landscape features
LE7.1 Manmade rock design feature
LE9 Ecological management area
LE10.1 Retained woodland
LE10.2 Retained scrub
LE10.3 Reinstate and return to landowner

Environmental barriers
E1.2 Environmental barrier - built elements

Nature Conservation and Biodiversity
E2.1 Water pollution control measures
E3.1 Protected Species
E3.2 Ecological Protection Measures

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P1.2 Local Nature Conservation Designation

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P3.1 Cultural Heritage Feature
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P4.4 Public Rights of Way
P4.41 Public Rights of Way - proposed shared use NMU facility
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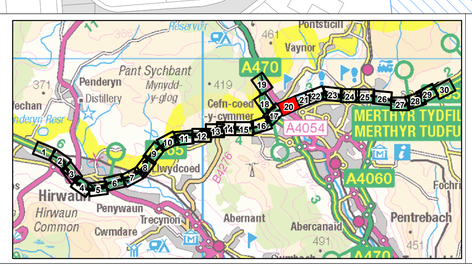

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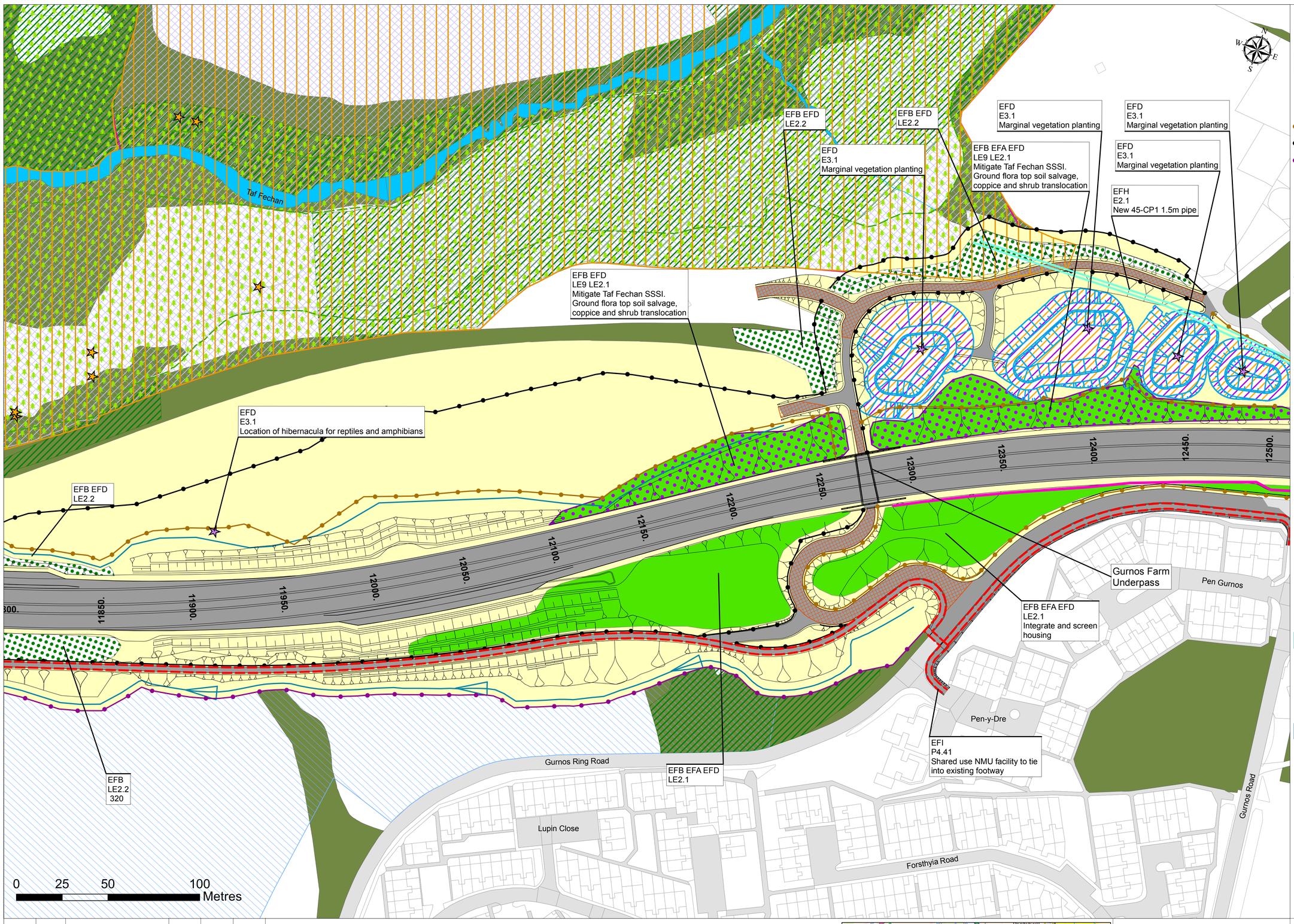
Status	FINAL
Project	A465 HEADS OF THE VALLEYS SECTIONS 5 AND 6 DOWLAIS TOP TO HIRWAUN
Title	ENVIRONMENTAL MASTERPLAN CEFN COED & TAF FECHAN
Scale	1:1,000 @A1 — DO NOT SCALE
Drawing No.	FIGURE 1 SHEET 20 OF 30 — Rev 0



Legend

Highway scheme

- Scheme design
- Embankment
- Cutting
- Structures (bridges, viaducts and retaining walls)
- Stock proof fence - highway boundary
- Stock proof fence - non-highway boundary
- Stock proof fence - temporary
- Proposed aluminium road lighting - 10m
- Proposed aluminium road lighting - 12m

Drainage

- Proposed drainage pond
- Proposed drainage ditches
- Culverts - water pollution control measures
- Culverts - ecological protection measures
- Culverts - footbridges

Public rights of way and access

- Bridleway
- Footpath
- National Cycle Network Route
- Proposed 3m shared use NMU facility
- Re-routed public right of way
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- Local authority boundary
- Listed features
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- Conservation areas
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- Sites of Importance for Nature Conservation (SINC)
- Wildlife Trust Reserve
- Fforest Fawr Geopark

Existing features

- Ancient Woodland
- Existing woodland to be retained
- Tree Preservation Orders
- Jewish Cemetery
- Approximate location of cave entrances
- Waterbodies and watercourses
- Dry channels
- Existing roads

Proposed features

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- Scrub
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- Decorative surface
- Manmade rock design feature
- Ecological management area
- Retained vegetation within highway boundary
- Land to be returned to landowner
- Hard landscape features
- Built noise barrier
- Hedgerows
- Ecology mitigation
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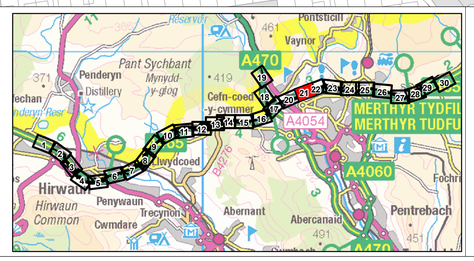

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Status	FINAL	
Project	A465 HEADS OF THE VALLEYS SECTIONS 5 AND 6 DOWLAIS TOP TO HIRWAUN	
Title	ENVIRONMENTAL MASTERPLAN TAF FECHAN & GURNOS	
Scale	1:1,000 @A1	DO NOT SCALE
Drawing No.	FIGURE 1 SHEET 21 OF 30	Rev 0

EFB EFD
LE2.2

EFB EFD
LE2.2

EFD
E3.1
Marginal vegetation planting

EFD
E3.1
Marginal vegetation planting

EFB EFA EFD
LE9 LE2.1
Mitigate Taf Fechan SSSI.
Ground flora top soil salvage,
coppice and shrub translocation

EFD
E3.1
Marginal vegetation planting

EFH
E2.1
New 45-CP1 1.5m pipe

Gurnos Farm

EFB
LE10.3
Reinstate and return
to landowner

EFB EFA EFD
LE2.1

EFH
E2.1 E3.1
Existing ditch diverted 200m west into drainage ditch

EFH
E2.1
New 45-CP2 1.5m pipe

Gurnos
Farm
Cottages

EFD
E3.1
Marginal vegetation planting

12250.
12300.
12350.
12400.
12450.
12500.
12550.
12600.
12650.
12700.
12750.
12800.
12850.
12900.

Gurnos Ring Road

Gurnos Farm
Underpass

Pen Gurnos

EFI
P4.41
Shared use NMU facility to tie
into existing footway

EFB EFA EFD
LE2.1
Integrate cutting and
reduce views

EFB EFA EFD
LE2.1
Integrate and screen
housing

Penyfan View

Fernhill Close

EFG
E1.2
Environmental barrier
13, 14 & 15

Whitebeam

Wellingtonia Close

Pen-y-Dre

EFI
P4.41
Shared use NMU facility to tie
into existing footway

Pen-y-garn Wood

EFI
P4.41
Shared use NMU facility to tie into existing
footway. Access suitable for pedestrians
and cyclists along Gurnos Ring Road

Gurnos Road

Forsthyia Road

0 25 50 100 Metres

Legend

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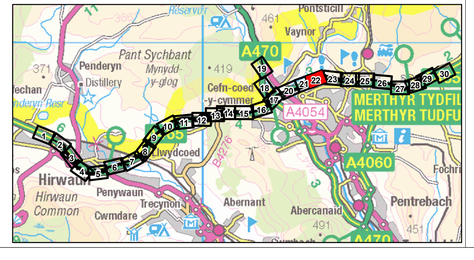

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Project	A465 HEADS OF THE VALLEYS SECTIONS 5 AND 6 DOWLAIS TOP TO HIRWAUN
Title	ENVIRONMENTAL MASTERPLAN GURNOS
Scale	1:1,000 @A1 — DO NOT SCALE
Drawing No.	FIGURE 1 SHEET 22 OF 30 — Rev 0

EFD
P1.2
Gyrnos Wood SINC

Prince Charles
Hospital Overbridge
(West)

EFD
P1.2
Bryniau SINC

Dan-Y-Castell
Farm

EFD
E3.1
Marginal vegetation planting

EFD
E3.1
Dipper box on northern end of culvert

EFH
E2.1
New JCT6 CP1 1.5m pipe

EFD
E3.1
Marginal vegetation planting

EFI
P4.42
Bridleway/byway 103/2 rerouted over
new Prince Charles Hospital junction

EFI
P4.41
Shared use NMU facility incorporated into scheme

EFH
E2.1
Modify 13240CE. Diameter to be
confirmed. 35m extension

EFB EFA EFD
LE2.1

EFD
E3.1
Dipper box on northern end of culvert

EFB EFA
LE2.6

EFE
LE7
Artwork

EFE
LE2.6

EFB EFA EFD
LE2.2

EFD
E3.1
Location of hibernacula for reptiles and amphibians

EFD
E3.1
Marginal vegetation planting

EFB EFA EFD
LE2.1

EFB EFA EFD
LE2.1

12900.
12950.
13000.
13050.
13100.
13150.
13200.
13250.
13300.
13350.
13400.
13450.
13500.
13550.
13600.

EFE
LE7
Decorative surface to
footway on bridge

EFE
LE2.6

EFE
LE2.6

EFB EFA EFD
LE2.2

EFE
LE7
Low stone wall/terrace

EFI
P4.41
Equestrian facilities provided
through junction

Prince Charles
Hospital Overbridge
(East)

EFI
P4.41
Shared use NMU facility to tie
into existing footway

Pen-Y-Dre
High School

Wellingtonia Close

Golfre Lane

Gurnos Ring Road

EFB EFA EFD
LE2.2

0 25 50 100 Metres

N E S W

Legend

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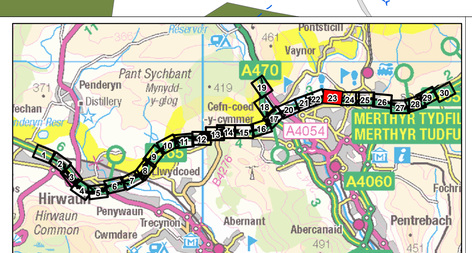

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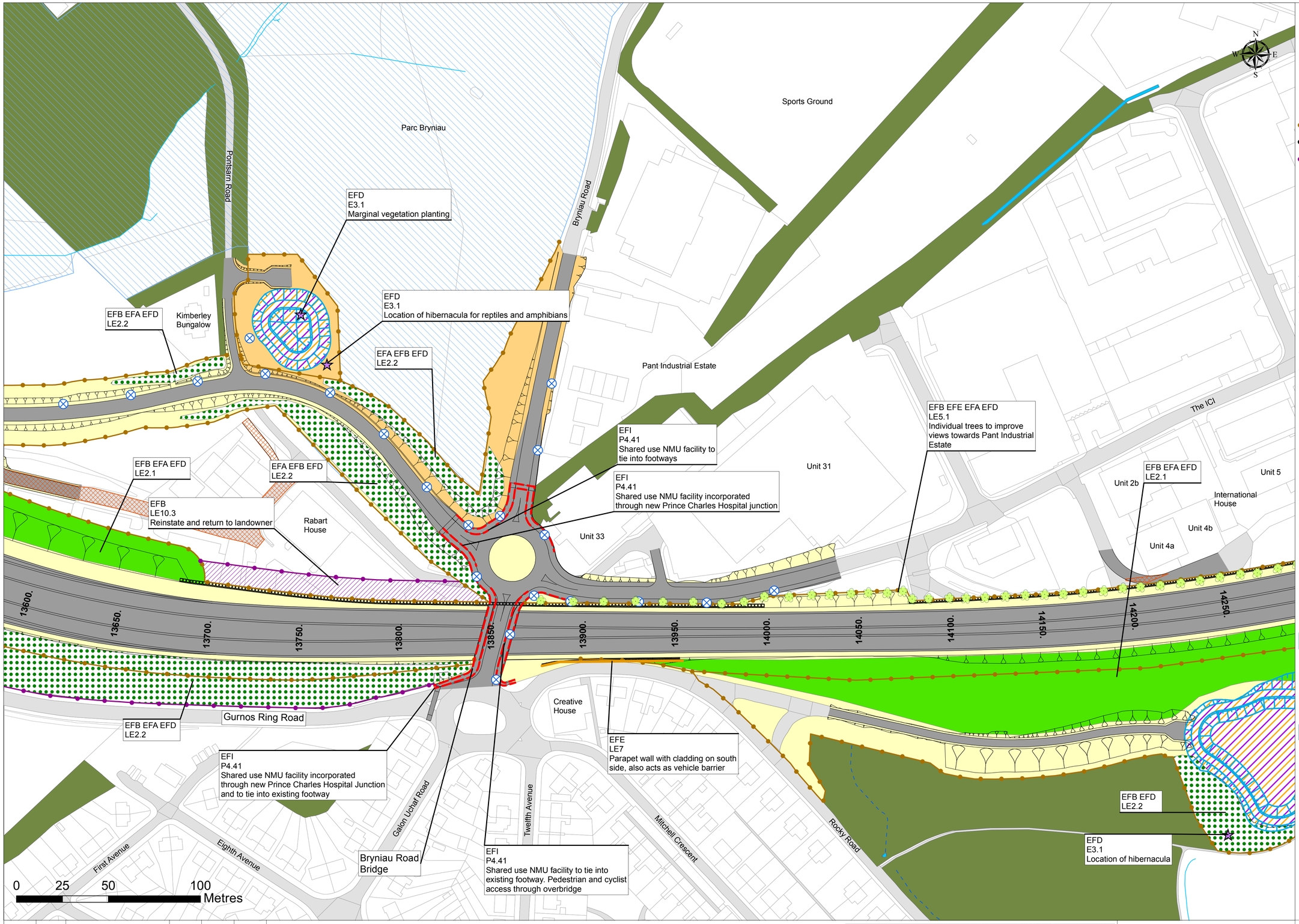
Status	FINAL
Project	A465 HEADS OF THE VALLEYS SECTIONS 5 AND 6 DOWLAIS TOP TO HIRWAUN
Title	ENVIRONMENTAL MASTERPLAN PRINCE CHARLES HOSPITAL JUNCTION
Scale	1:1,000 @A1 — DO NOT SCALE
Drawing No.	FIGURE 1 SHEET 23 OF 30 — Rev 0



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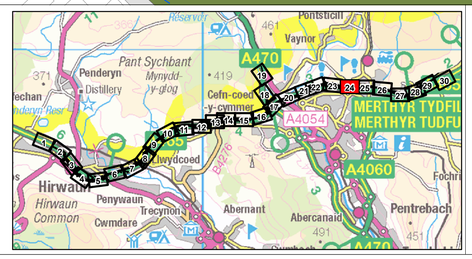

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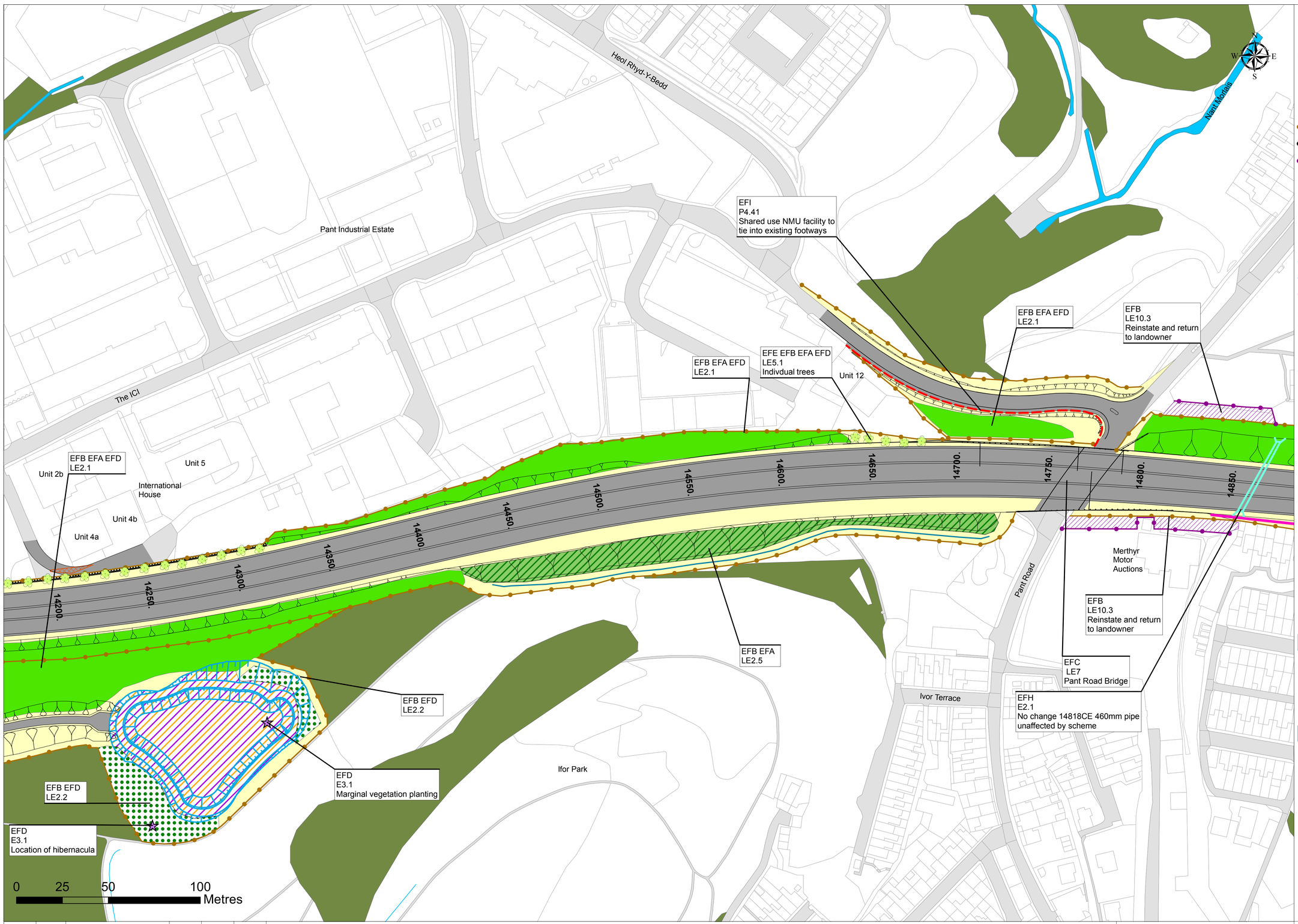
Title	ENVIRONMENTAL MASTERPLAN BRYNIAU	
Scale	1:1,000 @A1	DO NOT SCALE
Drawing No.	FIGURE 1 SHEET 24 OF 30	Rev 0



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- Dry channels
- Existing roads

Proposed features

- Neutral grassland creation
- Acid grassland creation
- Heathland creation
- Rock and scree (extent dependent on ground conditions)
- Woodland
- Woodland edge
- Shrubs with intermittent trees
- Shrubs
- Scrub
- Marsh and wet grassland
- Decorative surface
- Manmade rock design feature
- Ecological management area
- Retained vegetation within highway boundary
- Land to be returned to landowner
- Hard landscape features
- Built noise barrier
- Hedgerows
- Ecology mitigation
- Individual tree
- Interpretation board
- Landscape gateway features

Rev.	Rev. Date	Purpose of revision	Drawn	Checked	Approved
0	JULY17	FINAL	FL	LE	WB

Environmental Functions

EFA Visual Screening
EFB Landscape Integration
EFC Enhancing Built Environment
EFD Nature Conservation and Biodiversity
EFE Visual Amenity
EFF Heritage
EFG Auditory Amenity
EFH Water Quality
EFI Public Rights of Way Network

Culverts
CE - Culvert existing
CP - Culvert proposed
HD-CP - Highway drainage culvert
JCT-CP - Junction culvert
No.-CP - NMU route no. culvert

Landscape Elements

Grassland
LE1.31 Neutral grassland creation
LE1.32 Acid grassland creation
LE1.33 Ancient woodland ground flora top soil salvage coppice and shrub translocation
LE1.34 Heathland creation
LE1.4 Rock and scree

Native Planting
LE2.1 Woodland
LE2.2 Woodland edge
LE2.5 Shrubs with intermittent trees
LE2.6 Shrubs
LE2.8 Scrub
LE4.3 Native species hedgerow
LE 5.1 Individual trees
LE6.4 Marsh and wet grassland

Other Landscape Treatments
LE7 Hard landscape features
LE7.1 Manmade rock design feature
LE9 Ecological management area
LE10.1 Retained woodland
LE10.2 Retained scrub
LE10.3 Reinstate and return to landowner

Environmental barriers
E1.2 Environmental barrier - built elements

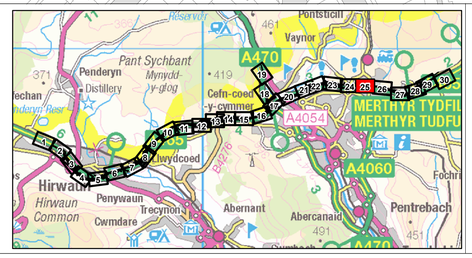
Nature Conservation and Biodiversity
E2.1 Water pollution control measures
E3.1 Protected Species
E3.2 Ecological Protection Measures

Planning and Policy Elements

Nature Conservation Designations
P1.1 Statutory Nature Conservation Designation
P1.2 Local Nature Conservation Designation

Cultural Heritage
P3.1 Cultural Heritage Feature
P3.2 Conservation Area

Land Use
P4.4 Public Rights of Way
P4.41 Public Rights of Way - proposed shared use NMU facility
P4.42 Public Rights of Way - diverted footpath



Llywodraeth Cymru
Welsh Government

JACOBS

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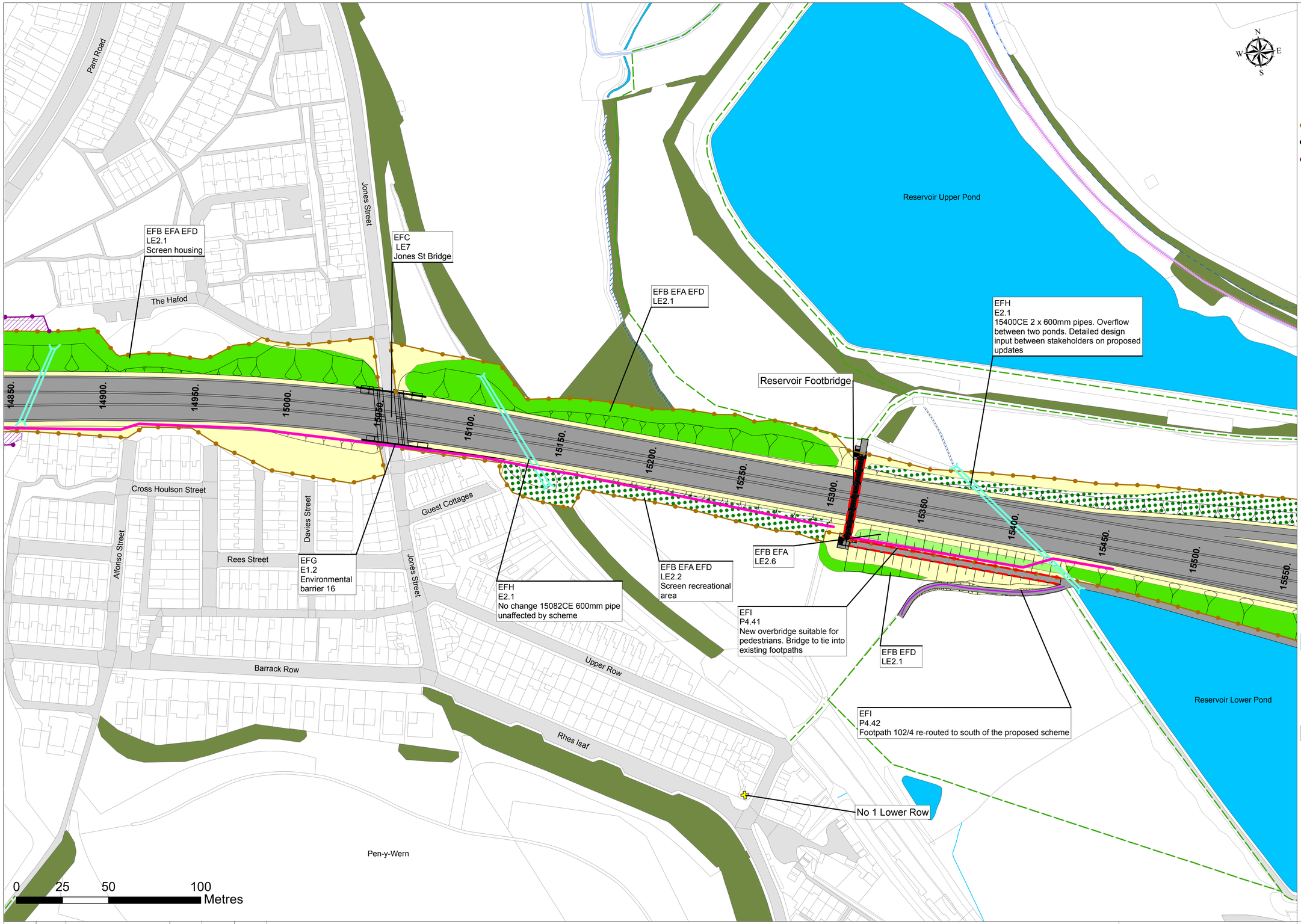
Status	FINAL
Project	A465 HEADS OF THE VALLEYS SECTIONS 5 AND 6 DOWLAIS TOP TO HIRWAUN
Title	ENVIRONMENTAL MASTERPLAN PANT INDUSTRIAL ESTATE
Scale	1:1,000 @A1 — DO NOT SCALE
Drawing No.	FIGURE 1 SHEET 25 OF 30 — Rev 0



Legend

Highway scheme

- Scheme design
- Embankment
- Cutting
- Structures (bridges, viaducts and retaining walls)
- Stock proof fence - highway boundary
- Stock proof fence - non-highway boundary
- Stock proof fence - temporary
- Proposed aluminium road lighting - 10m
- Proposed aluminium road lighting - 12m

Drainage

- Proposed drainage pond
- Proposed drainage ditches
- Culverts - water pollution control measures
- Culverts - ecological protection measures
- Culverts - footbridges

Public rights of way and access

- Bridleway
- Footpath
- National Cycle Network Route
- Proposed 3m shared use NMU facility
- Re-routed public right of way
- Private means of access

Planning and Policy Elements

- Local authority boundary
- Listed features
- Scheduled Ancient Monument (SAM)
- Conservation areas
- Registered park and garden
- Special Area of Conservation (SAC)
- Site of Special Scientific Interest (SSSI)
- Local Nature Reserve (LNR)
- Sites of Importance for Nature Conservation (SINC)
- Wildlife Trust Reserve
- Fforest Fawr Geopark

Existing features

- Ancient Woodland
- Existing woodland to be retained
- Tree Preservation Orders
- Jewish Cemetery
- Approximate location of cave entrances
- Waterbodies and watercourses
- Dry channels
- Existing roads

Proposed features

- Neutral grassland creation
- Acid grassland creation
- Heathland creation
- Rock and scree (extent dependent on ground conditions)
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- Woodland edge
- Shrubs with intermittent trees
- Shrubs
- Scrub
- Marsh and wet grassland
- Decorative surface
- Manmade rock design feature
- Ecological management area
- Retained vegetation within highway boundary
- Land to be returned to landowner
- Hard landscape features
- Built noise barrier
- Hedgerows
- Ecology mitigation
- Individual tree
- Interpretation board
- Landscape gateway features

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0	JULY17	FINAL	FL	LE	WB

Environmental Functions

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No.-CP - NMU route no. culvert

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LE1.34 Heathland creation
LE1.4 Rock and scree

Native Planting
LE2.1 Woodland
LE2.2 Woodland edge
LE2.5 Shrubs with intermittent trees
LE2.6 Shrubs
LE2.8 Scrub
LE4.3 Native species hedgerow
LE 5.1 Individual trees
LE6.4 Marsh and wet grassland

Other Landscape Treatments
LE7 Hard landscape features
LE7.1 Manmade rock design feature
LE9 Ecological management area
LE10.1 Retained woodland
LE10.2 Retained scrub
LE10.3 Reinstate and return to landowner

Environmental barriers
E1.2 Environmental barrier - built elements

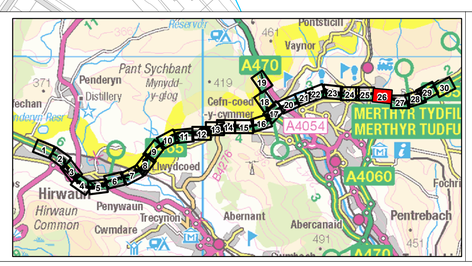
Nature Conservation and Biodiversity
E2.1 Water pollution control measures
E3.1 Protected Species
E3.2 Ecological Protection Measures

Planning and Policy Elements

Nature Conservation Designations
P1.1 Statutory Nature Conservation Designation
P1.2 Local Nature Conservation Designation

Cultural Heritage
P3.1 Cultural Heritage Feature
P3.2 Conservation Area

Land Use
P4.4 Public Rights of Way
P4.41 Public Rights of Way - proposed shared use NMU facility
P4.42 Public Rights of Way - diverted footpath



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Welsh Government

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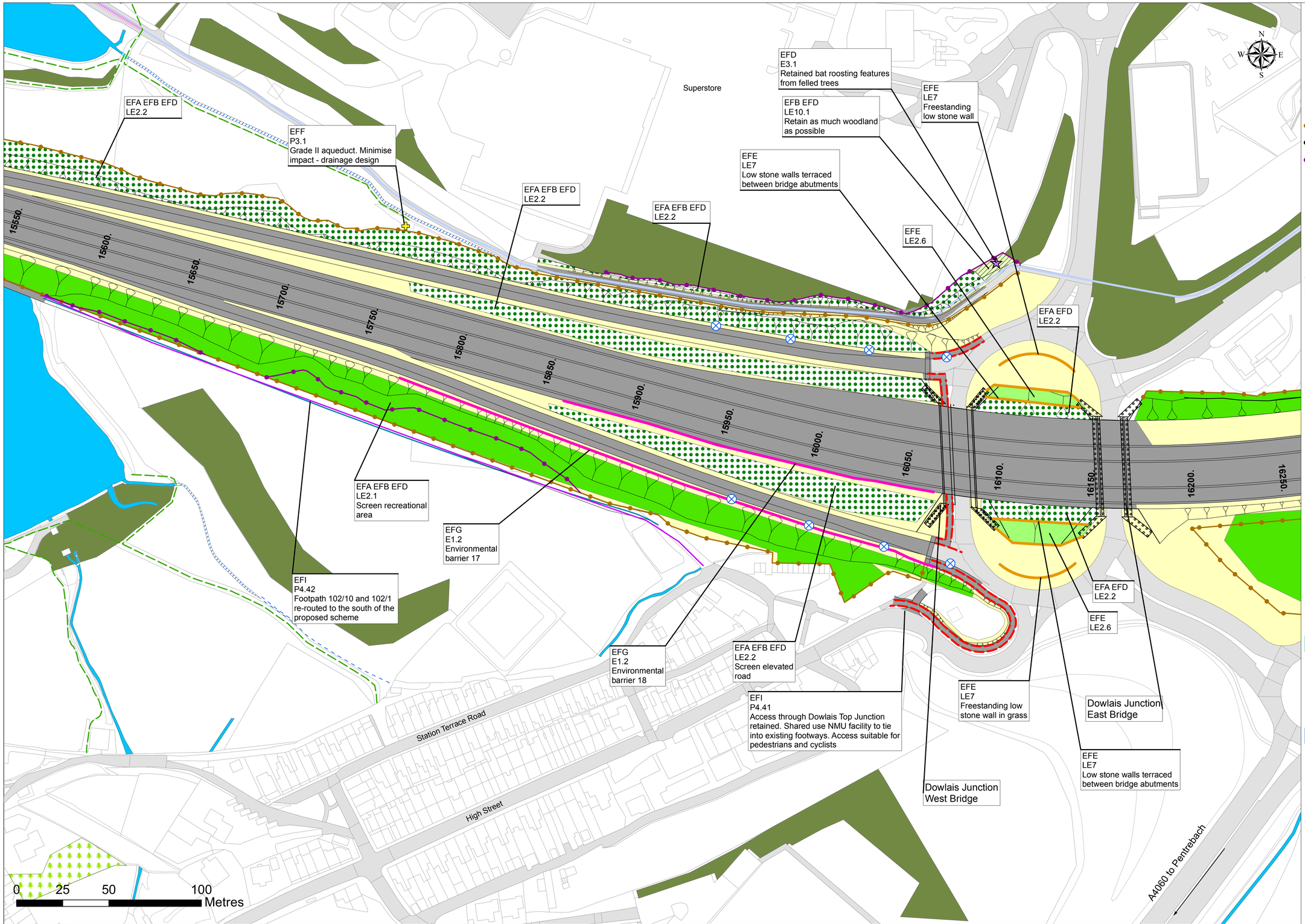
Status	FINAL	
Project	A465 HEADS OF THE VALLEYS SECTIONS 5 AND 6 DOWLAIS TOP TO HIRWAUN	
Title	ENVIRONMENTAL MASTERPLAN PENYWERN PONDS	
Scale	1:1,000 @A1	DO NOT SCALE
Drawing No.	FIGURE 1 SHEET 26 OF 30	Rev 0



Legend

Highway scheme
- Scheme design
- Embankment
- Cutting
- Structures (bridges, viaducts and retaining walls)
- Stock proof fence - highway boundary
- Stock proof fence - non-highway boundary
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- Proposed aluminium road lighting - 10m
- Proposed aluminium road lighting - 12m

Drainage
- Proposed drainage pond
- Proposed drainage ditches
- Culverts - water pollution control measures
- Culverts - ecological protection measures
- Culverts - footbridges

Public rights of way and access
- Bridleway
- Footpath
- National Cycle Network Route
- Proposed 3m shared use NMU facility
- Re-routed public right of way
- Private means of access

Planning and Policy Elements
- Local authority boundary
- Listed features
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- Site of Special Scientific Interest (SSSI)
- Local Nature Reserve (LNR)
- Sites of Importance for Nature Conservation (SINC)
- Wildlife Trust Reserve
- Fforest Fawr Geopark

Existing features
- Ancient Woodland
- Existing woodland to be retained
- Tree Preservation Orders
- Jewish Cemetery
- Approximate location of cave entrances
- Waterbodies and watercourses
- Dry channels
- Existing roads

Proposed features
- Neutral grassland creation
- Acid grassland creation
- Heathland creation
- Rock and scree (extent dependent on ground conditions)
- Woodland
- Woodland edge
- Shrubs with intermittent trees
- Shrubs
- Scrub
- Marsh and wet grassland
- Decorative surface
- Manmade rock design feature
- Ecological management area
- Retained vegetation within highway boundary
- Land to be returned to landowner
- Hard landscape features
- Built noise barrier
- Hedgerows
- Ecology mitigation
- Individual tree
- Interpretation board
- Landscape gateway features

Rev.	Rev. Date	Purpose of revision	Drawn	Checked	Approved
0	JULY17	FINAL	FL	LE	WB

Environmental Functions

EFA Visual Screening
EFB Landscape Integration
EFC Enhancing Built Environment
EFD Nature Conservation and Biodiversity
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EFH Water Quality
EFI Public Rights of Way Network

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No.-CP - NMU route no. culvert

Landscape Elements

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LE2.2 Woodland edge
LE2.5 Shrubs with intermittent trees
LE2.6 Shrubs
LE2.8 Scrub
LE4.3 Native species hedgerow
LE 5.1 Individual trees
LE6.4 Marsh and wet grassland

Other Landscape Treatments
LE7 Hard landscape features
LE7.1 Manmade rock design feature
LE9 Ecological management area
LE10.1 Retained woodland
LE10.2 Retained scrub
LE10.3 Reinstate and return to landowner

Environmental barriers
E1.2 Environmental barrier - built elements

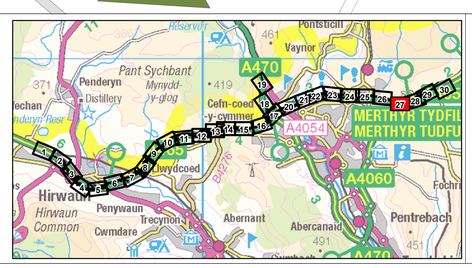
Nature Conservation and Biodiversity
E2.1 Water pollution control measures
E3.1 Protected Species
E3.2 Ecological Protection Measures

Planning and Policy Elements

Nature Conservation Designations
P1.1 Statutory Nature Conservation Designation
P1.2 Local Nature Conservation Designation

Cultural Heritage
P3.1 Cultural Heritage Feature
P3.2 Conservation Area

Land Use
P4.4 Public Rights of Way
P4.41 Public Rights of Way - proposed shared use NMU facility
P4.42 Public Rights of Way - diverted footpath



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JACOBS

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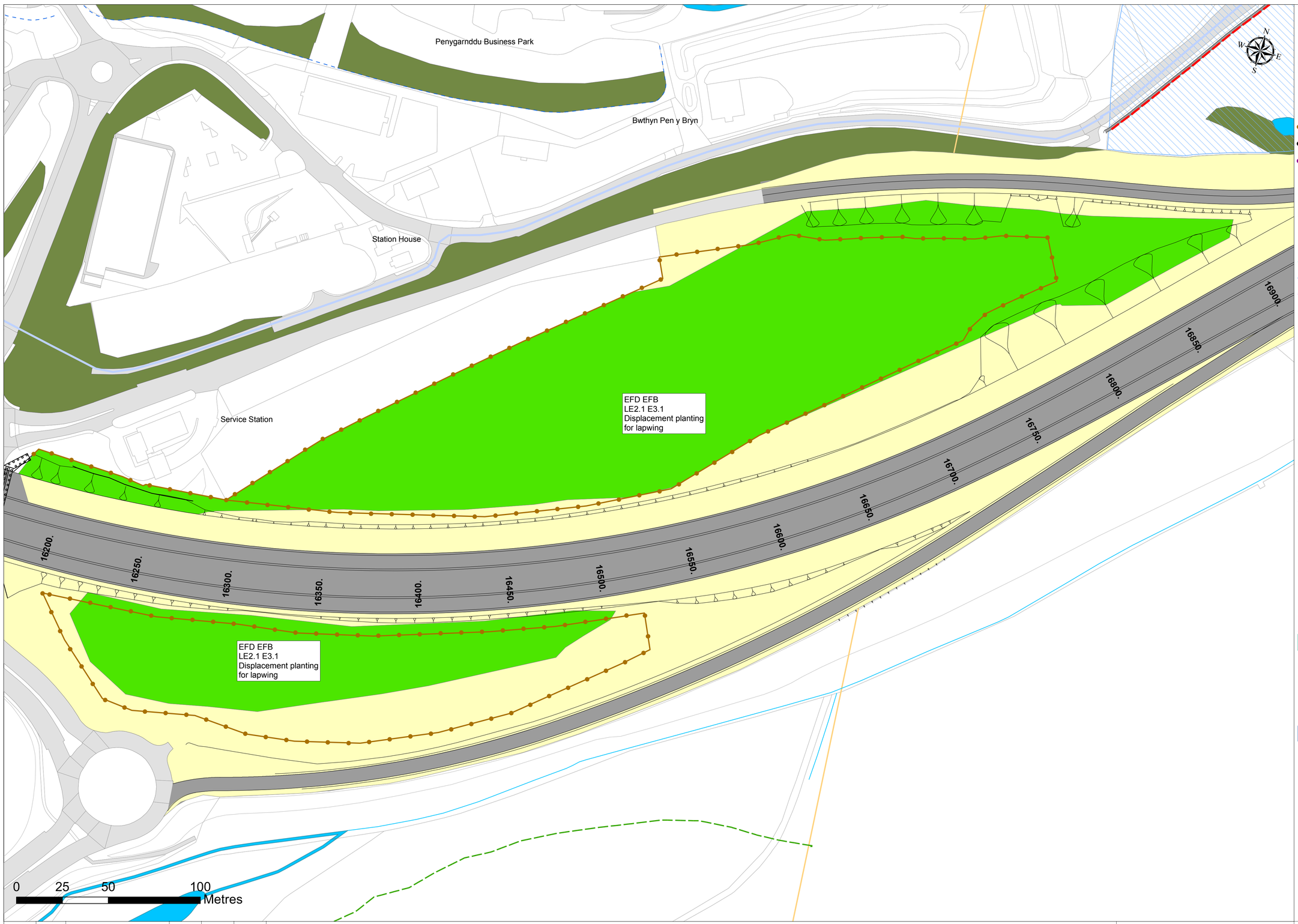
Status	FINAL
Project	A465 HEADS OF THE VALLEYS SECTIONS 5 AND 6 DOWLAIS TOP TO HIRWAUN
Title	ENVIRONMENTAL MASTERPLAN DOWLAIS JUNCTION
Scale	1:1,000 @A1 — DO NOT SCALE
Drawing No.	FIGURE 1 SHEET 27 OF 30 — Rev 0



Legend

Highway scheme

- Scheme design
- Embankment
- Cutting
- Structures (bridges, viaducts and retaining walls)
- Stock proof fence - highway boundary
- Stock proof fence - non-highway boundary
- Stock proof fence - temporary
- Proposed aluminium road lighting - 10m
- Proposed aluminium road lighting - 12m

Drainage

- Proposed drainage pond
- Proposed drainage ditches
- Culverts - water pollution control measures
- Culverts - ecological protection measures
- Culverts - footbridges

Public rights of way and access

- Bridleway
- Footpath
- National Cycle Network Route
- Proposed 3m shared use NMU facility
- Re-routed public right of way
- Private means of access

Planning and Policy Elements

- Local authority boundary
- Listed features
- Scheduled Ancient Monument (SAM)
- Conservation areas
- Registered park and garden
- Special Area of Conservation (SAC)
- Site of Special Scientific Interest (SSSI)
- Local Nature Reserve (LNR)
- Sites of Importance for Nature Conservation (SINC)
- Wildlife Trust Reserve
- Fforest Fawr Geopark

Existing features

- Ancient Woodland
- Existing woodland to be retained
- Tree Preservation Orders
- Jewish Cemetery
- Approximate location of cave entrances
- Waterbodies and watercourses
- Dry channels
- Existing roads

Proposed features

- Neutral grassland creation
- Acid grassland creation
- Heathland creation
- Rock and scree (extent dependent on ground conditions)
- Woodland
- Woodland edge
- Shrubs with intermittent trees
- Shrubs
- Scrub
- Marsh and wet grassland
- Decorative surface
- Manmade rock design feature
- Ecological management area
- Retained vegetation within highway boundary
- Land to be returned to landowner
- Hard landscape features
- Built noise barrier
- Hedgerows
- Ecology mitigation
- Individual tree
- Interpretation board
- Landscape gateway features

Rev.	Rev. Date	Purpose of revision	Drawn	Checked	Approved
0	JULY17	FINAL	FL	LE	WB

Environmental Functions

EFA Visual Screening
EFB Landscape Integration
EFC Enhancing Built Environment
EFD Nature Conservation and Biodiversity
EFE Visual Amenity
EFF Heritage
EFG Auditory Amenity
EFH Water Quality
EFI Public Rights of Way Network

Culverts
CE - Culvert existing
CP - Culvert proposed
HD-CP - Highway drainage culvert
JCT-CP - Junction culvert
No.-CP - NMU route no. culvert

Landscape Elements

Grassland
LE1.31 Neutral grassland creation
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LE1.34 Heathland creation
LE1.4 Rock and scree

Native Planting
LE2.1 Woodland
LE2.2 Woodland edge
LE2.5 Shrubs with intermittent trees
LE2.6 Shrubs
LE2.8 Scrub
LE4.3 Native species hedgerow
LE 5.1 Individual trees
LE6.4 Marsh and wet grassland

Other Landscape Treatments
LE7 Hard landscape features
LE7.1 Manmade rock design feature
LE9 Ecological management area
LE10.1 Retained woodland
LE10.2 Retained scrub
LE10.3 Reinstate and return to landowner

Environmental barriers
E1.2 Environmental barrier - built elements

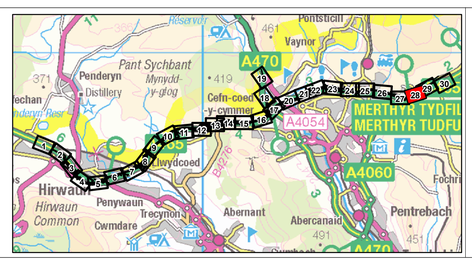
Nature Conservation and Biodiversity
E2.1 Water pollution control measures
E3.1 Protected Species
E3.2 Ecological Protection Measures

Planning and Policy Elements

Nature Conservation Designations
P1.1 Statutory Nature Conservation Designation
P1.2 Local Nature Conservation Designation

Cultural Heritage
P3.1 Cultural Heritage Feature
P3.2 Conservation Area

Land Use
P4.4 Public Rights of Way
P4.41 Public Rights of Way - proposed shared use NMU facility
P4.42 Public Rights of Way - diverted footpath



Llywodraeth Cymru
Welsh Government
JACOBS
Churchill House, Churchill Way, Cardiff, CF10 2HH
Tel: +44(0)29 2035 3200 Fax: +44(0)29 2035 3222

Status	FINAL
Project	A465 HEADS OF THE VALLEYS SECTIONS 5 AND 6 DOWLAIS TOP TO HIRWAUN
Title	ENVIRONMENTAL MASTERPLAN PENYGARNDDU BUSINESS PARK
Scale	1:1,000 @A1 — DO NOT SCALE
Drawing No.	FIGURE 1 SHEET 28 OF 30 — Rev 0

EFD
P1.2
Pan March and Traed y Milwyr, Llechryd SINC

EFI
P4.41
Shared use NMU facility to tie into existing NCN Route 46 along Common Road. Missing link in existing NCN Route 46 completed. Access suitable for pedestrians and cyclists.

Fochriw Road Bridge

Fochriw Road

16750. 16800. 16850. 16900. 16950. 17000. 17050. 17100. 17150. 17200. 17250. 17300. 17350. 17400.

0 25 50 100 Metres

Legend

Highway scheme
- Scheme design
- Embankment
- Cutting
- Structures (bridges, viaducts and retaining walls)
- Stock proof fence - highway boundary
- Stock proof fence - non-highway boundary
- Stock proof fence - temporary
- Proposed aluminium road lighting - 10m
- Proposed aluminium road lighting - 12m

Drainage
- Proposed drainage pond
- Proposed drainage ditches
- Culverts - water pollution control measures
- Culverts - ecological protection measures
- Culverts - footbridges

Public rights of way and access
- Bridleway
- Footpath
- National Cycle Network Route
- Proposed 3m shared use NMU facility
- Re-routed public right of way
- Private means of access

Planning and Policy Elements
- Local authority boundary
- Listed features
- Scheduled Ancient Monument (SAM)
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- Waterbodies and watercourses
- Dry channels
- Existing roads

Proposed features
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- Shrubs
- Scrub
- Marsh and wet grassland
- Decorative surface
- Manmade rock design feature
- Ecological management area
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- Land to be returned to landowner
- Hard landscape features
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- Hedgerows
- Ecology mitigation
- Individual tree
- Interpretation board
- Landscape gateway features

Rev.	Rev. Date	Purpose of revision	Drawn	Checked	Approved
0	JULY17	FINAL	FL	LE	WB

Environmental Functions

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Native Planting
LE2.1 Woodland
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Other Landscape Treatments
LE7 Hard landscape features
LE7.1 Manmade rock design feature
LE9 Ecological management area
LE10.1 Retained woodland
LE10.2 Retained scrub
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Environmental barriers
E1.2 Environmental barrier - built elements

Nature Conservation and Biodiversity
E2.1 Water pollution control measures
E3.1 Protected Species
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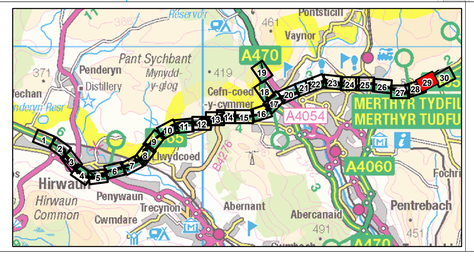

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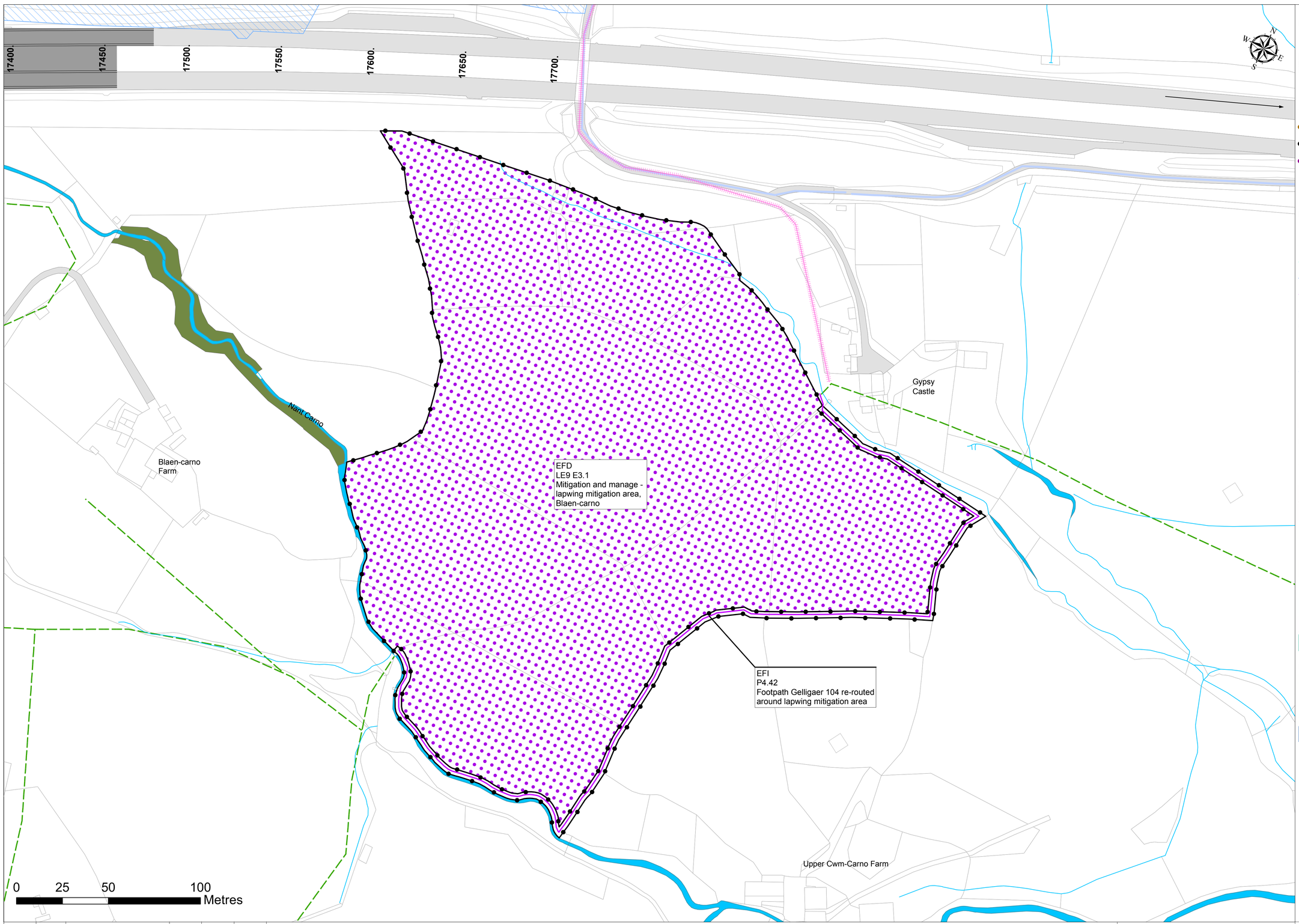
Status	FINAL	
Project	A465 HEADS OF THE VALLEYS SECTIONS 5 AND 6 DOWLAIS TOP TO HIRWAUN	
Title	ENVIRONMENTAL MASTERPLAN PEN MARCH	
Scale	1:1,000 @A1	DO NOT SCALE
Drawing No.	FIGURE 1 SHEET 29 OF 30	Rev 0



Legend

Highway scheme

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E1.2 Environmental barrier - built elements

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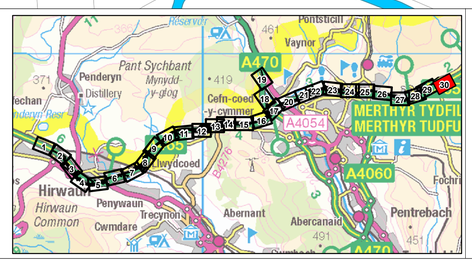
P4.41 Public Rights of Way - proposed shared use NMU facility
P4.42 Public Rights of Way - diverted footpath



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Status	FINAL	
Project	A465 HEADS OF THE VALLEYS SECTIONS 5 AND 6 DOWLAIS TOP TO HIRWAUN	
Title	ENVIRONMENTAL MASTERPLAN BLAENCARNO	
Scale	1:1,000 @A1	DO NOT SCALE
Drawing No.	FIGURE 1 SHEET 30 OF 30	Rev 0

Appendix A – February 2016 DCfW Jacobs Submission Document

See following page.

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A465 Heads of the Valleys Dualling – Sections 5 and 6 Dowlais Top to Hirwaun
Design Commission for Wales Submission Document

Llywodraeth Cymru
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Contents

1. Introduction

1.1 Overview

The Welsh Government proposes to dual the A465 Heads of the Valleys road ('the A465') between Dowlais Top and Hirwaun ('the scheme').

The scheme is part of a broader dualling of the entire 40km of the A465 between Abergavenny and Hirwaun (referred to as Sections 1 to 6). Sections 1 to 4 have been through the planning phases and most sections have already been constructed, with the exception of Section 2 (Gilwern to Brynmawr) which is currently being constructed. This scheme refers to Sections 5 and 6 and comprises approximately 16km of proposed dualling, mainly on line of the existing A465.

The A465 forms part of the Trans-European Road Network and provides a principal road link between the Midlands and west Wales. It also connects local communities and provides access to main cities such as Newport, Cardiff and Swansea.

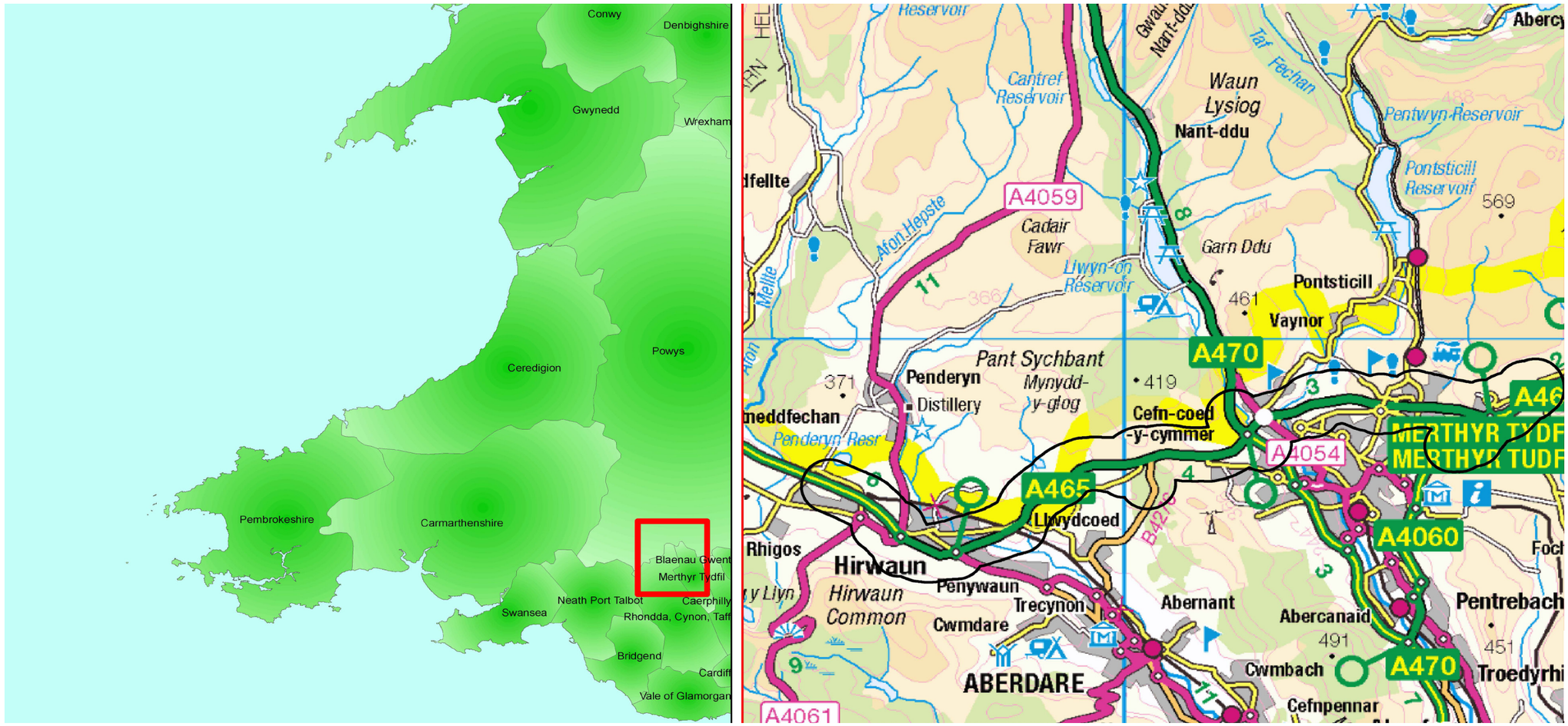
A design was prepared in 1997 by Jacobs (formerly Babtie), followed by a Public Enquiry in 1998. In 1999 the Secretary of State for Wales announced the decision to proceed and confirmed the Line Order for the scheme.

The Welsh Government Minister's statement on Transport Priorities in July 2013 confirmed that the Welsh Government is committed to completing Sections 5 and 6 by 2020 in accordance with the commitment made in the National Transport Plan 2011. Sections 5 and 6 will be subject to further statutory processes which are likely to require a Public Local Inquiry.

Jacobs has been commissioned to deliver Key Stage 3 (preliminary design, Environmental Statement, Stage 2 SAR and draft orders) and Key Stage 4 (publication of draft Orders, Public Local Inquiry procedures (if required) and contract documentation preparation). Jacobs is supported by Nicoll Russell Associates who are providing Aesthetic Advisory services.

The location of the scheme is shown in Figure 1.1

Figure 1.1: Location of the scheme



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Legend

A465 Section 5 & 6 development area

Welsh principal areas

1.2 Purpose of this statement

The mission of the Design Commission for Wales (DCfW) is to champion high standards of architecture, landscape and urban design in Wales, promoting wider understanding of the importance of good quality in the built environment, supporting skill building, encouraging social inclusion and sustainable development.

An initial design review will be held for the A465by DCfW with the project team on 18 February 2016. The purpose of this written statement is to provide a snapshot of the design process followed to date. It is intended that emerging ideas, design principles and concepts are discussed with the DCfW early in the design process.

Through the design review process, the Welsh Assembly wishes to obtain the views, influence and support of the DCfW on the principles and thought process around the design of the scheme to date.

It must be noted that the design of the scheme is continuously evolving and as such the intention of this document is to demonstrate a snapshot of design development up to the date of submission of this document (4 February 2016). It is likely that the information provided regarding design development will have developed further prior to the DCfW design review date.

1.3 Description of the scheme

Section 5 would primarily comprise on-line widening of approximately 5.9km of road between Dowlais Top and the A470 Junction, with short lengths of slightly off-line widening.

Key changes to the existing built form in Section 5 include:

- Replacement of Pant Viaduct, Cefn Coed-y-Cymmer High Street overbridge, disused railway overbridge carrying the Taff Trail
- Two new viaducts at Taf Fawr
- Two new underbridges (50m length) at Dowlais Top

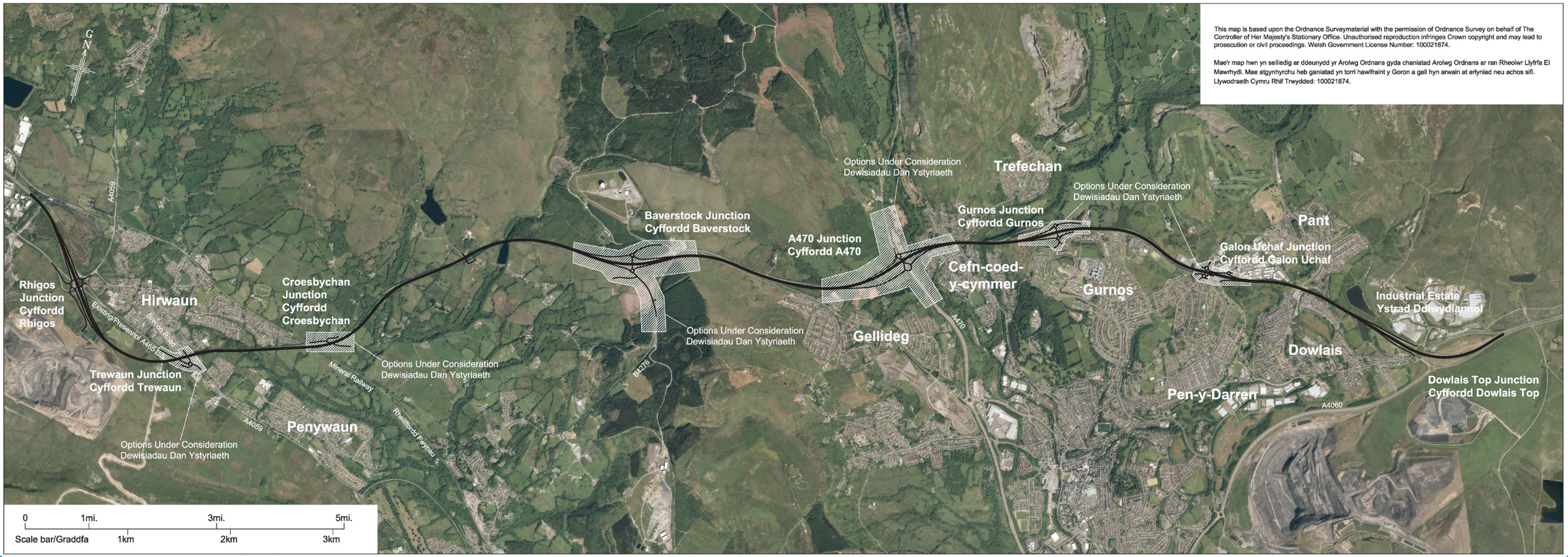
Section 6 runs between the A470 Junction and Hirwaun, partly as an off-line widening to the south of Hirwaun with the majority of the section between Hirwaun and A470 junction on-line widening. The vertical alignment would largely be similar to that of the existing A465.

Key changes to the existing built form in Section 6 include:

- New major cuttings at Baverstock, west of Nant Hir and either side of Hirwaun Roundabout
- New Nant Ffrwd viaduct from main carriageway
- Local road at-grade roundabout at Hirwaun changed to grade-separated from main carriageway

The scheme is shown in Figure 1.2.

Figure 1.2: The scheme



1.4 Programme

The Written Statement – Transport (July 2013) released by the Minister for Economy, Science and Transport confirmed that the Welsh Government are committed to complete Sections 5 and 6 by 2020 in accordance with the commitment made in the National Transport Plan 2011. To achieve this, the Welsh Government is working towards the following broad programme.

- October 2016 – publish design development, Environmental Statement and Draft Line (Amendment), Side and Compulsory Purchase Orders.
- Mid-2017 – Public Inquiry (if required) with a decision from the Minister for Economy and Transport late 2017 / early 2018.
- 2017/18 – procurement phase, 'Key Stage 5'. Following this, the 'Special Purpose Vehicle' (SPV) will be appointed to design, build, finance and operate the scheme.
- December 2018 – commence construction, with completion programmed for the end of 2020.

The Jacobs project team are currently working to a constrained timeframe.

Key deliverable dates for the Jacobs project team that the DCfW should be aware of include:

- **22 April 2016** ('Week 28') – draft 1:2500 Preliminary Design and Draft Environmental Management Plan to be fixed and presented to the Welsh Government.
- **6 May 2016** ('Week 30') – final 1:2500 Preliminary Design and Draft Environmental Management Plan to be fixed. Final design freeze.
- **15 August 2016** ('Week 45') – final Environmental Statement (ES) and EMP.
- **9 September 2016** ('Week 51') – notice of the ES.

These dates are fixed and flexibility on these dates is not possible.

It is suggested that the second meeting with DCfW occurs prior to Week 28 in early April 2016 to enable DCfW to influence the design.

2. Scheme objectives

2.1 Scheme objectives

The following are the overarching scheme and transport planning specific objectives. The intention is that the project team continuously revisits these objectives through the design.

Overarching objectives

- To facilitate economic regeneration of the Heads of the Valleys Area by improving accessibility, reducing journey time and improving journey time reliability
- To strengthen resilience on the A465 by improving standards and enhancing road safety

Transport planning objectives

The transport planning objectives for the scheme were developed with the Welsh Government and include:

- 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 and a reduction in short vehicle journeys
- To deliver a scheme which minimises future maintenance requirements 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

3. Background

3.1 History of the scheme

The following provides a timeline of key activities and decisions that have led to the current status of the scheme.

- 1990 – a regional traffic study identified the need for improvement to dual carriageway standards along the A465 between Abergavenny and Hirwaun.
- 1994 – proposals for improvements to the A465 went to public consultation.
- 1995 – the preferred route was announced by the Secretary of State for Wales. The preferred route consisted of predominantly on-line dualling, with off-line construction proposed at Hirwaun and Rassau.
- 1997 – design development was carried out by Babtie. Draft Line Order proposals and an Environmental Statement were published.
- 1998 – Public Inquiry held. The Public Inquiry prioritised the construction of Sections 1 and 4 (Abergavenny to Gilwern and Tredegar to Dowlais respectively) and, for these sections draft Side Road Orders dealing with changes to local roads, footpaths, accesses and draft Compulsory Purchase Orders for the acquisition of land were also published.
- 1999 – the Secretary of State for Wales announced the decision to proceed.

Between 1999 and 2015, the focus has been on the development and construction of Sections 1-4 of the A465 upgrade. However some activities have been carried out specific to Sections 1-5, including:

- 2008-2015 – Jacobs completed baseline marsh fritillary butterfly monitoring.
- 2015 – in March 2015 an Environmental Scoping Report was issued for consultation with Statutory Environmental Bodies. In October 2015 Jacobs was appointed to develop the design and environmental assessment components of the scheme.

At the time of this submission, two key activities are currently being undertaken to progress the design of the A465, including:

- The review and correction of the 1997 centreline road alignment in accordance with standards relating to horizontal curvature, transition lengths and vertical curvature.
- As a separate exercise, running in parallel with the design development is optioneering of selected areas in response to changes in physical and natural environment and surrounding communities since 1997 as well as responding to community consultation. Sections 5 and 6 of the scheme will be subject to further statutory processes which are likely to require a Public Local Inquiry.

3.2 Consultation

3.2.1 Recent consultation

Consultation forms an important source of information and influence on the design of the scheme. As such, consultation with the community and stakeholders is ongoing.

The most recent public consultation was held with communities along the scheme in December 2015. The aim of public consultation in December 2015 was to:

- Provide information about the route that was developed in the 1990s.
- Identify aspects of the design that are currently being reviewed by the project team.
- Allow for comments and questions about the design.
- Introduce the project team and inform participants on how they can engage with the development process going forward.

A summary of the dates, locations and visitor numbers at each location is provided in Table 3.1.

Table 3.1: Summary of consultation in December 2015

Venue	Date	Time	Address	Approximate number of attendees
St Lleurwg's Church Hall	Monday 7 December 2015	12.00-21.00	St Lleurwg's Church Hall, Hirwaun, Station Road, Aberdare, CF44 9TA	300
Cefn coed Community Centre	Tuesday 8 December 2015	12.00-21.00	Cefn coed Community Centre, New Church St, Cefn-coed-y-cymmer, Merthyr Tydfil CF48 2NA	250
Dowlais Community Centre	Friday 11 December 2015	12.00-21.00	Dowlais Community Centre, Station Rd, Merthyr Tydfil, Mid Glamorgan, CF48 2NB	200
Cefn coed Community Centre	Saturday 12 December 2015	09.00-13.00	Cefn coed Community Centre, New Church St, Cefn-coed-y-cymmer, Merthyr Tydfil, CF48 2NA	100

During public consultation, key issues raised included:

- **Croesbychan Junction** - Provide a vehicle link to the A465 due to the significant development that has taken place in the area and the congestion issues being experienced in Hirwaun.
- **Baverstock Junction** - Link to the crematorium road raised concerns with regard to vehicles backing up onto the slips, particularly funeral cortèges.

- **Swansea Road** - The loss of the Swansea Road was a concern to residents of Gellideg as they consider the retail park junction on the A470 to have congestion issues so they use the A465 access point.

- **Pant Viaduct** - Impact during construction. Meetings to be arranged with Merthyr Car Auctions and Harp Funeral Services.

An initial response to these key issues is provided in Table 3.2. Response to community consultation is still evolving.

Table 3.2: Initial response to key issues raised during consultation in December 2015

Location	Option description	Additional comments
Croesbychan Junction	Access to A465	• Could be full movement or east facing only. • Overwhelming majority of Hirwaun residents in newer housing estates to the east of the village centre use existing Croesbychan junction for direct access to A465 or access to Aberdare via existing unclassified road, so need to maintain this provision as much as possible. • Existing Hirwaun village centre very congested so prospect of re-routing east side residents through village to join A465 at Rhigos junction will exacerbate existing congestion problems and was particularly unwelcome. • Hirwaun residents requested a review of traffic calming or other measure to ease congestion in Hirwaun village.
Croesbychan Junction	Aberdare Bypass	• Relocation of junction to accord with aspirations of Rhondda Cynon Taf County Borough Council for an Aberdare bypass.
Baverstock	Link to Swansea Road	• Issue raised by consultation attendees that a rat run to the A470 could be created.
Baverstock	Relocate eastwards	
Swansea Road	Proposed Stopping up	• Some residents of new housing estates on Swansea Road not satisfied with stopping up but majority appeared to accept it as they had major concerns about Swansea Road becoming a rat run in the event that the proposed Trago Mills major development (department store), located near the junction of Swansea Road with Cyfarthfa Retail park is approved. Suggestion to ensure traffic model accounts for scenario with or without Trago Mills major development in place. Need to ensure connectivity of existing cycle path is maintained as many Cefn Coed and Swansea Road residents use this currently.
A470	Western shift	• Use of compact junction techniques to remove slip roads from eastern side creating a single bridge option. • Views onto A470 junction a major concern for most attendees from Cefn Coed, whether or not they had existing direct views from their property onto the junction. Request to consider design quality and minimisation of impacts on views at this location.
Cefn Coed	Access to Cefn Coed	• Link from eastbound on slip road to High Street in the vicinity of the existing access, probably off only. Request to query wider structure carrying the slip.
Gurnos Junction	Full movements	• Limited surrounding consultation attendees indicated that they regularly use the existing Pant junction to get on/off the existing A465. As such, it was requested that an 'on/off' junction is maintained or provided in all directions in that particular part of the scheme. • Indication from some consultation attendees that the existing Pant Junction is where a lot of Forestry HGVs from the Brecon Beacons National Park join onto the trunk road network.

3.2.2 Ongoing consultation

Consultation for the scheme is ongoing and includes consultation with communities and major stakeholders. Consultation activities specific to the design include:

- Technical Working Groups (TWGs) convened on an as-needed basis to allow for a collaborative design approach.

  To date (February 2016) five TWGs have been completed regarding the following topics:

  - Land Quality and Ground Investigation Scope (invitees RCTCBC, MTCBC, NRW)
  - Landscape and Visual Impact (invitees BBNP, RCTCBC, MTCBC, NRW);
  - Flooding/Drainage design (invitees RCTCBC, MTCBC, NRW)
  - Marsh fritillary butterfly and botanical SSSI mitigation (invitees RCTCBC, MTCBC, NRW)

- Environmental Liaison Group (ELG) meetings, which are convened to promote early identification of issues, review progress and key issues, record agreed actions and decisions. ELG Meeting #1 was held in December 2015. Attendees included environmental discipline leads who presented on the following topics:

  - Air quality
  - Cultural heritage
  - Landscape and visual impact
  - Nature conservation
  - Geology and soils
  - Noise and vibration
  - Effects on all travellers
  - Community and private assets
  - Road drainage and the water environment

Minutes from the ELG on 1 December 2015 are included in Appendix A.

The next ELG meeting will be held in March 2016.

3.3 Approach to inclusive design and sustainability

3.3.1 Inclusive design

Inclusive design is about making places everyone can use. Our understanding of an inclusive approach is derived from the following:

'An 'inclusive' approach to the design and management of any environment will ensure potential barriers are removed, allow people to maximise their own individual abilities, and enable them to have full, equal, confident, independent and safe participation in everyday activities'. (DCfW, 2011)

Applying this approach to the design of a highway includes ensuring multiple users of the facility are considered. This includes pedestrians, cyclists, equestrians, bus travellers and vehicle travellers (private and commercial). For this scheme, these multiple users will be considered in the 'All Travellers' section of the Environmental Statement (ES). Existing infrastructure and facilities for multiple users will be highlighted in the draft Environmental Management Plan, which is currently being developed.

The All Travellers chapter of the ES is currently being developed. The Scoping Report (Jacobs, December 2014) identifies that in the first instance impact to known, existing infrastructure for pedestrians, cyclists and equestrians should be avoided through design where practicable. Mitigation or alternative arrangement would also be provided where possible in instances where there would be a direct impact on existing facilities.

3.3.2 Sustainability

In addition to the scheme specific objective to 'deliver a scheme that is sustainable', the Welsh Government are committed to sustainable development. The overarching aim is to *'become a one planet nation, putting sustainable development at the heart of government'*. Commitments are to:

- Live within environmental limits and acting on climate change
- Protecting healthy eco-systems
- Creating sustainable places for people

Actions that the scheme is delivering to meet the scheme specific and overarching Welsh Government sustainability objectives include:

- The scheme will be assessed under the Civil Engineering Environmental Quality Assessment and Award Scheme (CEEQUAL), which strives to encourage the attainment of environmental excellence in civil engineering, and to deliver improved environmental and social performance in project specification, design and construction. An application for CEEQUAL will be made at a later stage of the scheme delivery to allow sufficient information to inform the application.
- Actions within the design to ensure legacy opportunities including:
  - Improve pedestrian connections across the route
  - Enhance and improve existing connections, such as Public Rights of Way (PRoW)
  - Walking and cycling facilities around key junctions, considering the experience of the pedestrian or cyclist using that junction
  - Use of landscape to enhance environmental features, such as using Sustainable Drainage System (SUDS) techniques in the design
- Environmental Design Principles have been developed by the team (see Section 5.4.1 of this report), which relate to sustainability such as aiming to achieve an earthworks balance.

Actions within the project delivery that focus on social sustainability/legacy include:

- Establishment of a Public Liaison Officer (PLO) office within the scheme area. Initial investigations have identified the Forsythia Project as an appropriate venue, which will provide financial support to a valuable community facility supported by donation.
- Recruitment of an apprentice, from the local NEET/LTU community, to support the PLO and Community Liaison Officer (CLO) providing employment and development opportunities.
- CLO organising a charity community event to support local community causes.
- CLO developing a community initiative register to identify local good causes that could benefit from the scheme.
- Support the Merthyr Global Village event and other local initiatives focussed on the integration of immigrants into the community.
- CLO developing links with local educational establishments to investigate opportunities to increase STEM awareness through activities like ICE Bridge to Schools events.
- Sponsorship of a PhD student at South Wales University. This is currently being investigated.
- Targeted local recruitment requirements to be bound into the PPP contract supported by relevant KPIs.
- Targeted supply chain activities focussing on the use of local SMEs where possible, recent activities include the printing and distribution of brochures by two companies located in the scheme area.
- Targeted venue selection. When identifying venues for staging public events we look to find those that provide the necessary facilities, but are in the greatest need of funding support, rather than the easiest.
- "Transforming Spaces Design Factor" supported by Pinkspiration which involves the upskilling of young people through the refurbishment of empty spaces into usable facilities. Recent activity included sponsorship of the fit out of an empty retail unit in Cardiff that was used by students from across South Wales as a pop-up shop to sell goods. Students had to undergo a Dragons Den style pitch of their business plan to secure a spot. The result was over £1000 raised on the day, 36 young people upskilled in the refit of the unit and the unit has been let directly as a result. We are investigating opportunities to utilise the "Transforming Spaces Design Factor" to refurbish derelict social housing stock for use by the contractor during the construction phase, this stock will then be returned to the Housing Association for inclusion in their own portfolio.

4. Site context

A number of sources are being used to inform the development of the design. This includes existing and emerging environmental, landscape and land use information, site visits and site photography.

The scheme will involve online widening of an existing 3-lane trunk road between Dowlais Top roundabout in the east and Hirwaun Industrial Estate in the west, which is approximately 16km. The A465 Heads of the Valleys trunk road links south and west Wales to the English Midlands and was constructed in the 1960s. Currently, the majority of the trunk road consists of a three lane carriageway between Dowlais Top and Hirwaun, with 2 lanes forming the uphill and 1 lane the downhill, which is a total 3 lanes. Surrounding land uses are varied and include residential towns and villages including Hirwaun, Cefn Coed, Gurnos, Pant, and Dowlais Top; Brecon Beacon National Park; agricultural uses; and industrial estates.

The following describes the landscape and visual and environmental elements which form the site context.

4.1 Landscape and visual

The A465 landscape is formed of:

- A dramatic hilly landscape comprising fast flowing watercourses tumbling down steep sided valley bottoms
- Open moorland
- Ancient woodlands
- Striking exposed geology

The surrounding area has a rich cultural heritage, particularly relating to the industries of the Industrial Revolution which led to the growth of settlements and a wealth of features still visible today. The decline of the historic industries in the latter part of the 20th Century has led to changing land uses and the development of alternative economic activities together with a growing emphasis on recreation and the conservation and management of the natural resources.

4.1.1 Key viewpoints

Key viewpoints are shown on the annotated photomontages on the following pages. The photographs were taken in July, November and December 2015. The date of each photomontage is indicated on each figure.

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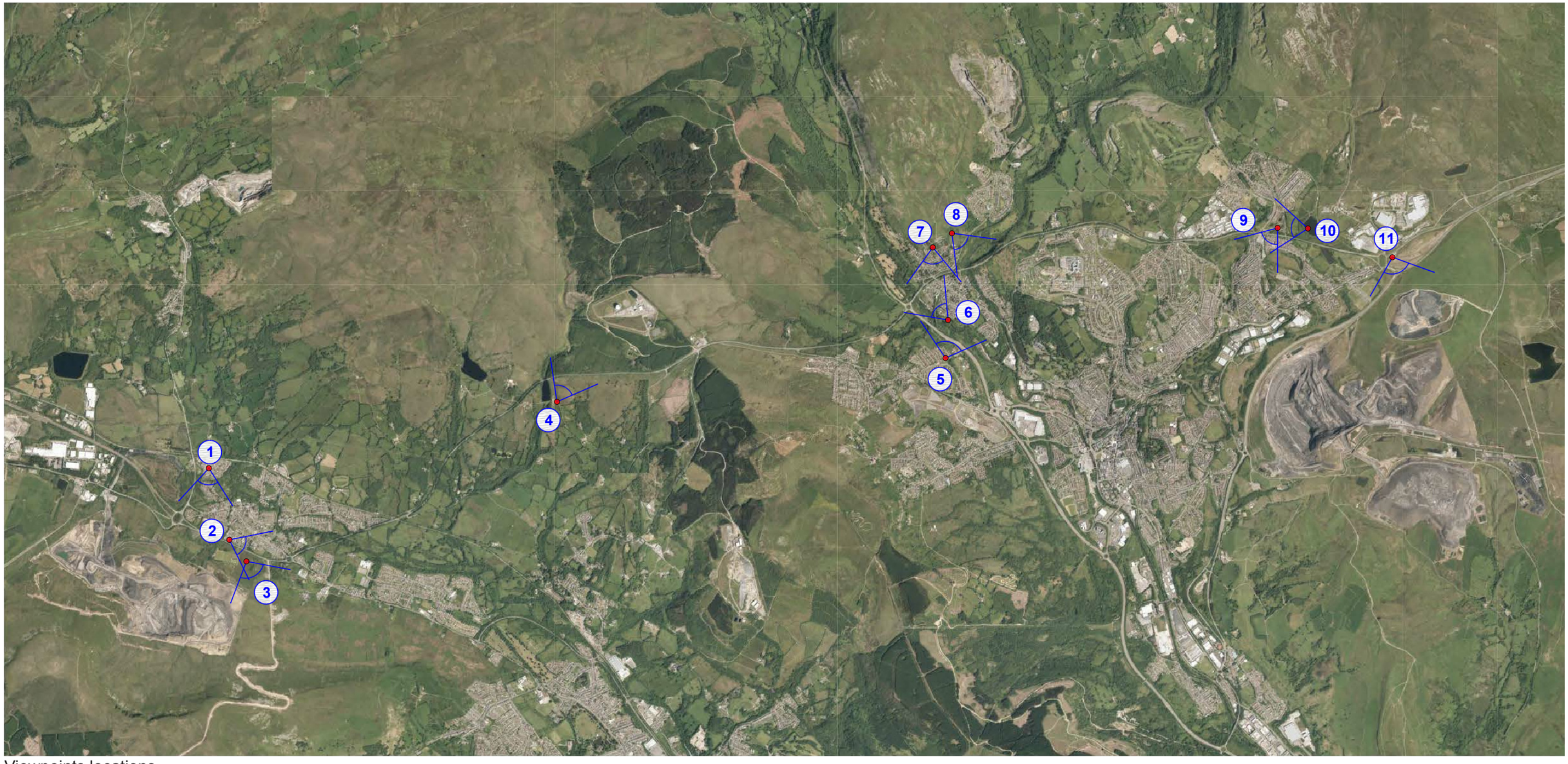
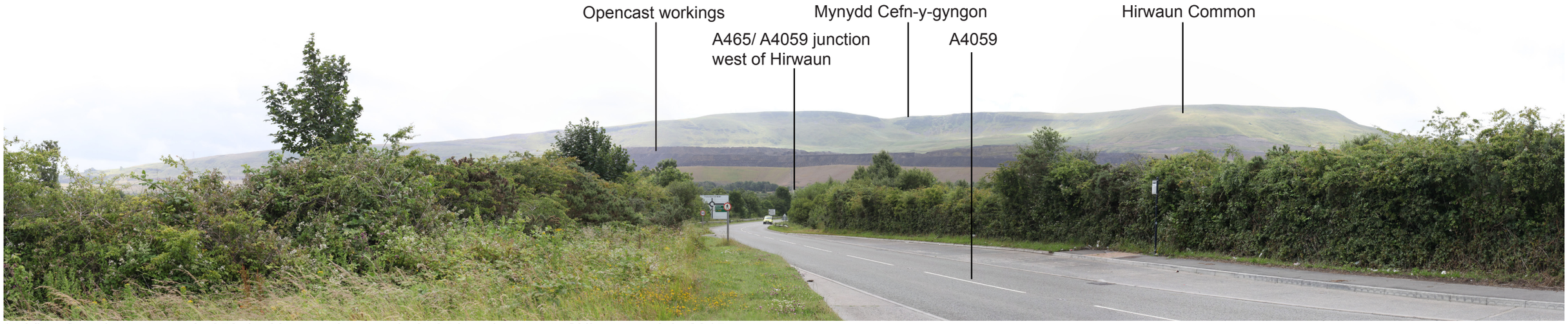
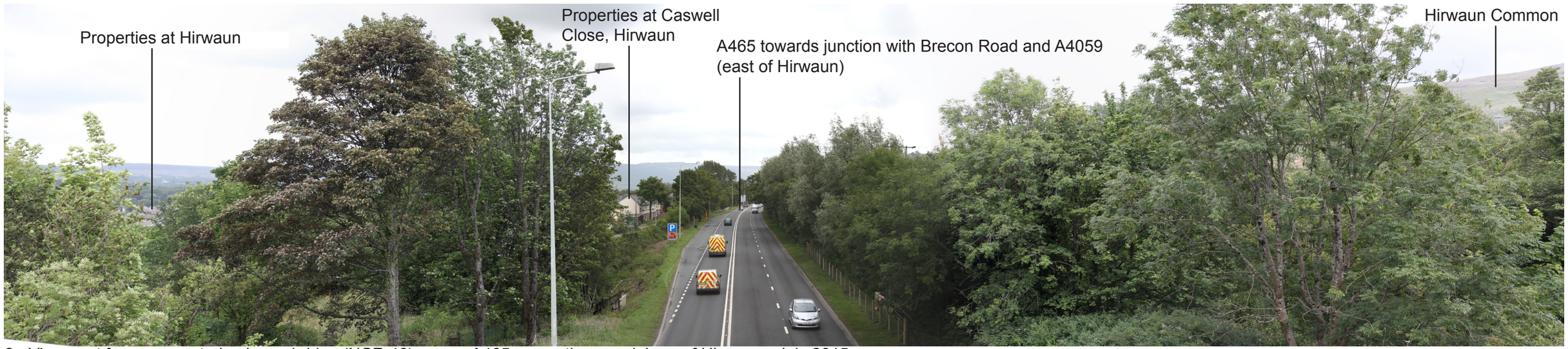


Viewpoints locations



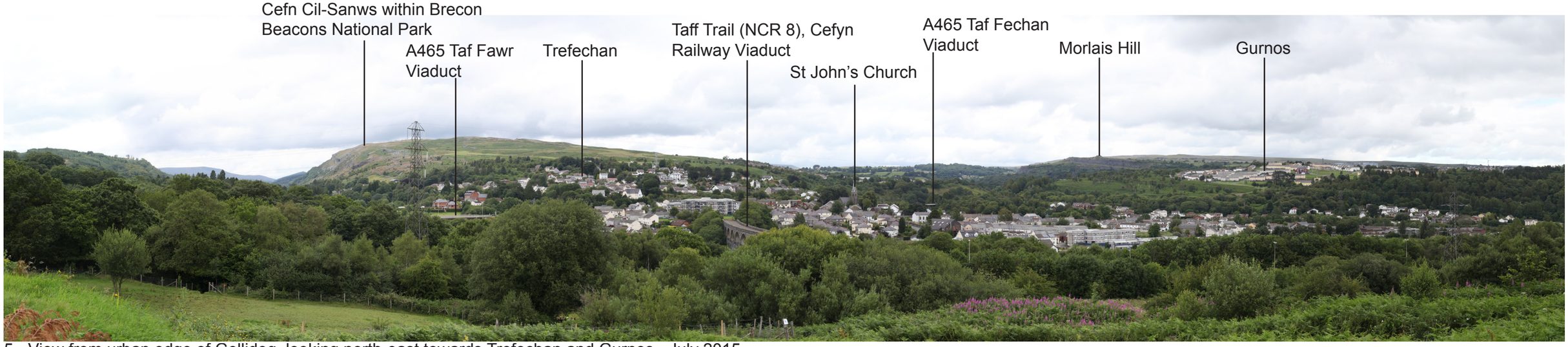
1 - View from bus stop at A4059, looking south towards A465 junction west of Hirwaun - July 2015



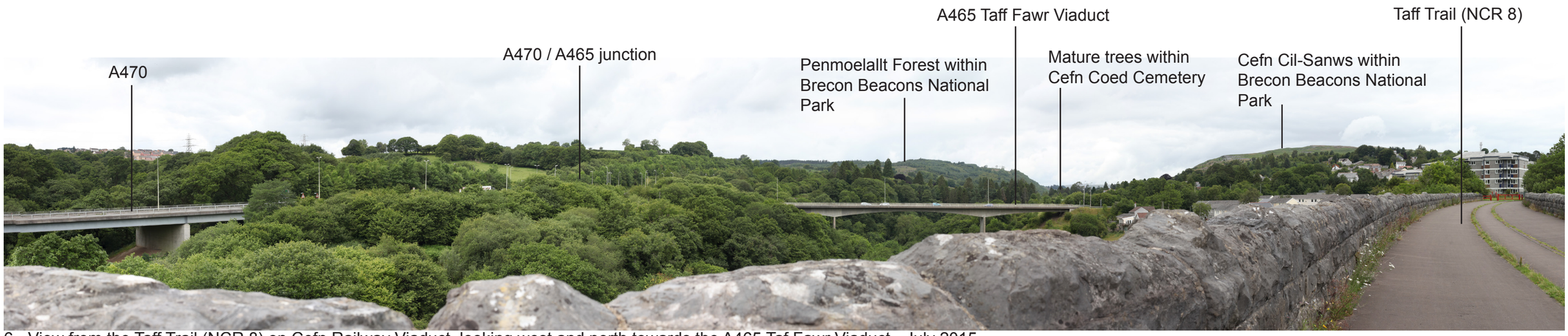
2 - View east from non motorised user bridge (NCR 46) across A465 on southern periphery of Hirwaun - July 2015

3 - View from recreation ground in Hirwaun, looking south-east to Hirwaun Common - July 2015

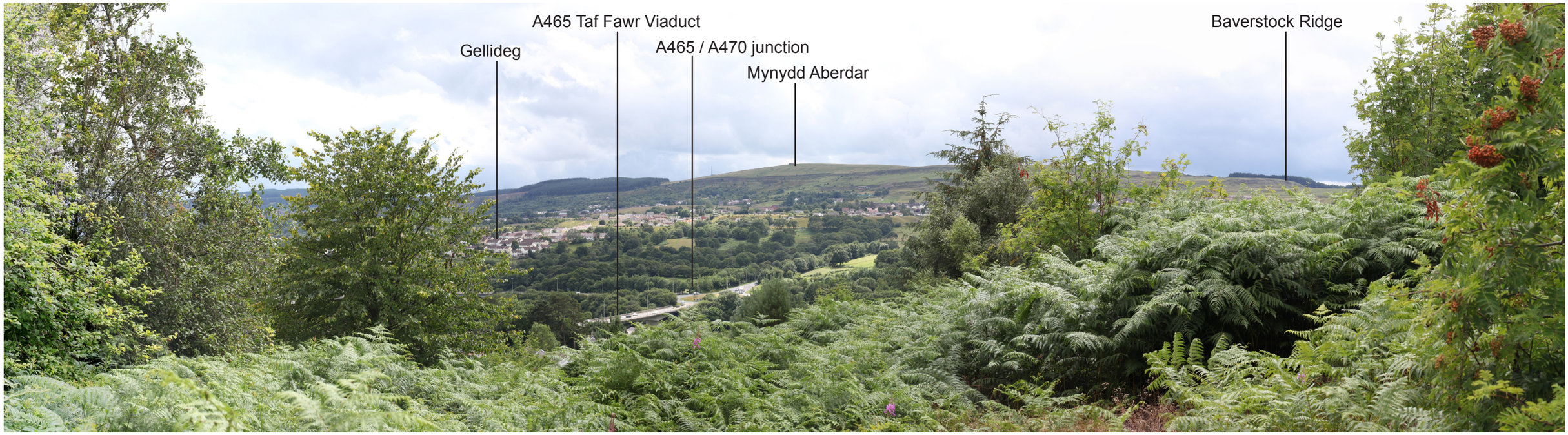
4 - View from Hirwaun Footpath 3, link 1 (HIR / 3 / 1), looking north-east across Nant-Hir Reservoir - July 2015



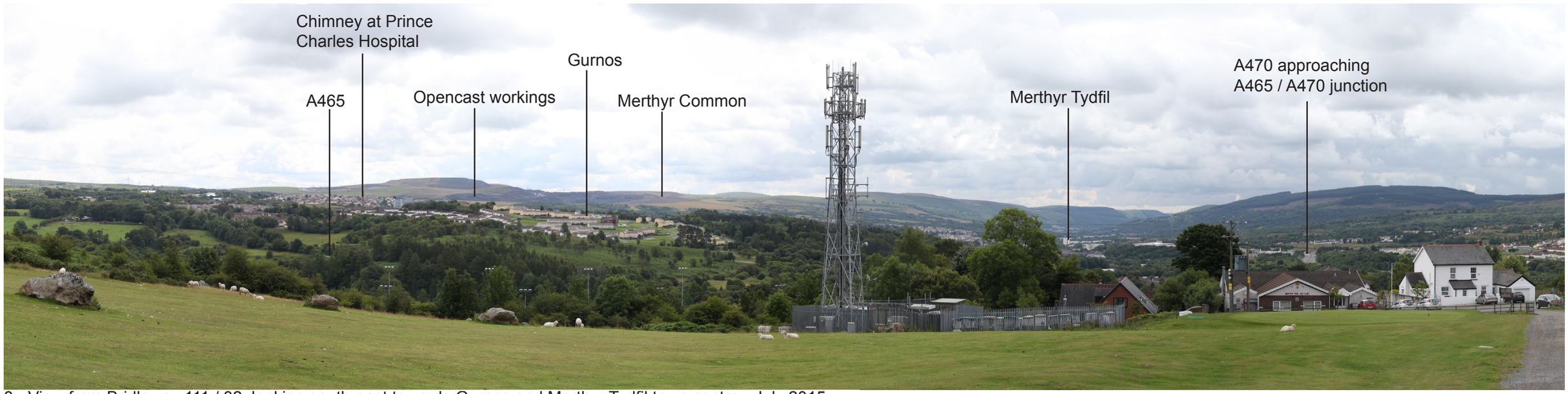
5 - View from urban edge of Gellideg, looking north-east towards Trefechan and Gurnos - July 2015



6 - View from the Taff Trail (NCR 8) on Cefn Railway Viaduct, looking west and north towards the A465 Taf Fawr Viaduct - July 2015



7 - View from Cilsanws Lane, looking south-west towards Gellideg - July 2015



8 - View from Bridleway 111 / 32, looking south-east towards Gurnos and Merthyr Tydfil town centre - July 2015

9 - View from Pant Road, looking south towards A465 viaduct - July 2015

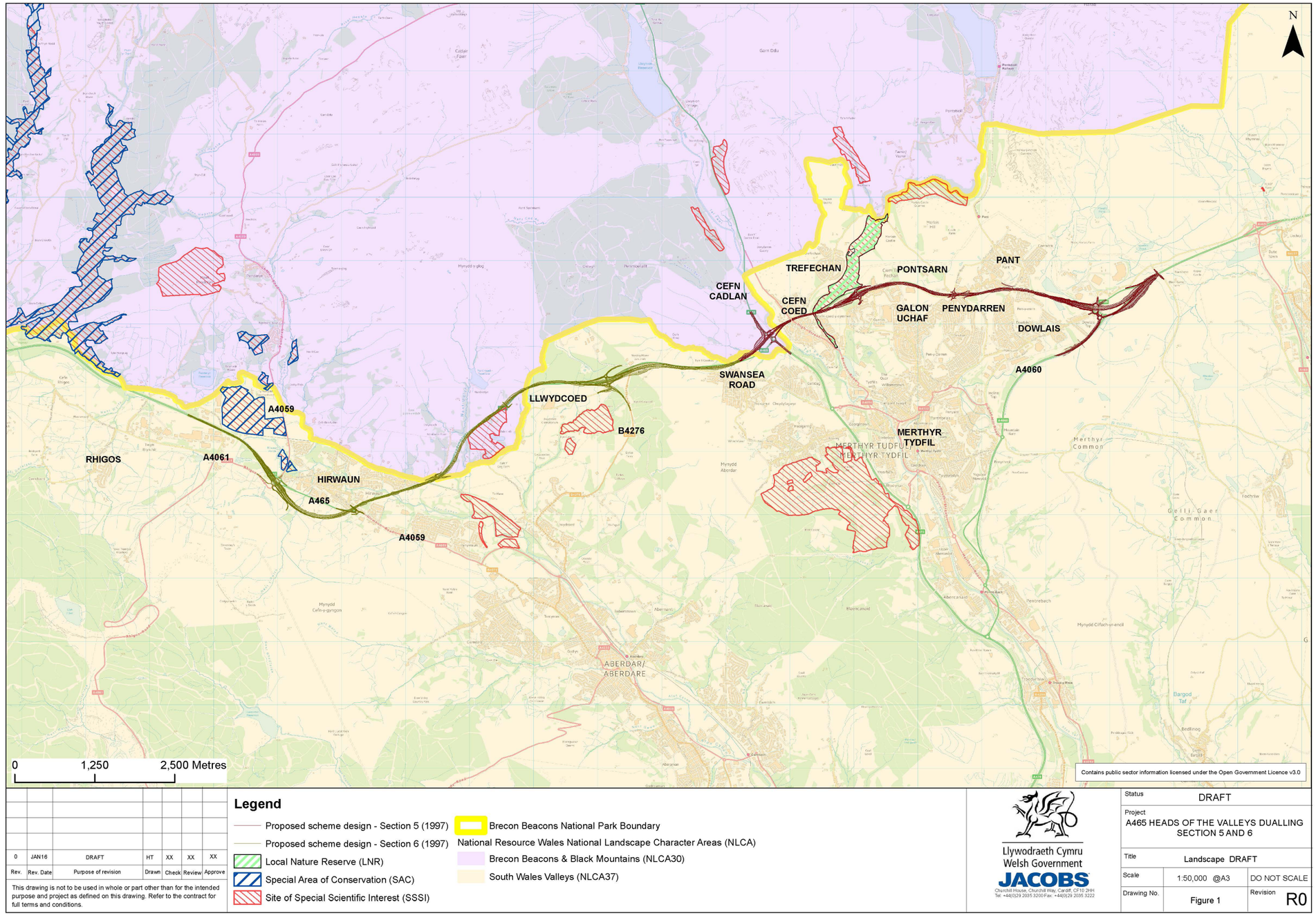
10 - View from Footpath 105 / 8, looking south-west towards Pant - July 2015

11 - View from NCR 46, looking across roundabout at A465 / A4060 junction at Dowlais Top - December 2015

4.1.2 Landscape context plan

Figure 4.1 provides an overview of the National Resource Wales National Landscape Character Areas as well as Sites of Special Scientific Interest (SSSI), Special Areas of Conservation (SAC) and Local Nature Reserves (LNR).

Figure 4.1 Landscape context plan



Rev.	Rev. Date	Purpose of revision	Drawn	Check	Review	Approve
0	JAN16	DRAFT	HT	XX	XX	XX

This drawing is not to be used in whole or part other than for the intended purpose and project as defined on this drawing. Refer to the contract for full terms and conditions.

Legend

- Proposed scheme design - Section 5 (1997)
- Proposed scheme design - Section 6 (1997)
- Local Nature Reserve (LNR)
- Special Area of Conservation (SAC)
- Site of Special Scientific Interest (SSSI)
- Brecon Beacons National Park Boundary

National Resource Wales National Landscape Character Areas (NLCA)

- Brecon Beacons & Black Mountains (NLCA30)
- South Wales Valleys (NLCA37)

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Status	DRAFT
Project	A465 HEADS OF THE VALLEYS DUALLING SECTION 5 AND 6
Title	Landscape DRAFT
Scale	1:50,000 @A3 DO NOT SCALE
Drawing No.	Figure 1
Revision	R0

4.1.3 Landscape character

The scheme traverses two National Landscape Character Areas (NLCAs) including Brecon Beacons and Black Mountains (NLCA30) and the South Wales Valleys (NLCA37). These NLCAs are wild, remote and thinly populated. The following provides the key characteristics of each NLCA.

Brecon Beacons and Black Mountains (NLCA30)

Key characteristics of the Brecon Beacons and Black Mountains (NLCA30) (NRW, December 2014) include:

- The highest mountains in South Wales - distinctive flat-topped mountains.
- The source of a number of rivers - four major rivers, the Usk, Neath, Tawe and Aman, flow generally south through the landscape, fed by fast flowing streams and waterfalls from the surrounding uplands.
- Numerous reservoirs - have been created forming notable landscape features.
- Rough moorland habitats - open, exposed, mainly sheep grazed, some commons.
- Classic limestone scenery – lower parts to the south. There are also a number of old limestone quarries and associated remnant infrastructure.
- Strong field pattern with many small fields - pasture enclosed by stone walls at higher altitudes and in limestone areas but thick hedgerows elsewhere and in the valley bottoms, with improved pasture fields found on the lower valley slopes.
- Large conifer blocks - cover some valley side slopes in certain areas.
- Biodiversity and geodiversity - large parts are designated.
- Tourism - the Brecon Beacons National Park symbolises the iconic beauty of South Wales and attracts thousands of visitors each year.
- Scattered, small settlements – confined to valleys, overall the area is sparsely settled.
- Highly tranquil - the windswept uplands display little intrusion of modern forms. High points afford panoramic views across the area and far beyond. The area is recognised for its dark skies.

South Wales Valleys (NLCA37)

Key characteristics of the South Wales Valleys (NLCA37) (NRW, March 2014) include:

- Extensive Upland plateaux – typically wild and windswept, often with unenclosed tracts, running roughly north-south as ‘fingers’ parallel between intervening deep valleys.
- Numerous steep-sided valleys - typically aligned in parallel, flowing in southerly directions, shaped by southward flowing glaciers, leaving behind distinctive corrie (‘cwm’) and crag features. Major rivers include the Tawe, Taff and Rhymney.
- Ribbon urban and industrial areas in valleys – in places extending up valley sides and to valley heads. The area is sometimes regarded as being part of a ‘city region’. Middle and eastern valleys tend to be the most heavily and continuously developed, e.g. Rhondda Valley. The uplands by comparison have little or no settlement.
- Extensive remains of heavy industry – with a mix of derelict, preserved and largely redeveloped areas, notably for coal mining. This typically includes old railway alignments, buildings and former tips.
- Contrast of urban valley activity next to quiet uplands – e.g. busy roads, new developments, traffic noise, night lighting, versus the adjacent wilder, remoter, quieter uplands.
- Large blocks of coniferous plantation and deciduous woodland fringes – covering many steep hillsides and hilltops, most notably in the middle to western portion of the area, providing a softer contemporary landscape where there was once industry.
- Heather, rough grassland and steep bracken slopes – dominate many plateaux and are grazed mainly by sheep. Much is common land.
- Improved pastures on some lower valley sides - grazed by sheep and some dairy cattle.
- Field boundaries - dry stone walls mark the boundary of common land while fields on lower slopes are bounded by dense hawthorn hedges, interspersed with swathes of broadleaved woodland.
- Transport routes restricted to valleys – the intervening topography makes valley to valley travel difficult, except at heads and bottoms of valleys. Occasionally there are roads that climb steeply over passes with dramatic views and ‘hair pin’ bends.
- Iconic cultural identify – many popular images of a tough, rugby-playing, religious, radically-minded society still remain associated with the South Wales Valleys, however today’s post-industrial, internet-connected reality is somewhat different.

Brecon Beacons National Park

The Brecon Beacons National Park also forms an important part of the landscape.

The Brecon Beacons National Park Landscape Character Assessment (Brecon Beacons National Park Authority, 2012) identifies 15 Landscape Character Areas. The scheme would traverse or be close to four of these LCAs including:

- LCA 3 – Fforest Fawr
- LCA 4 – Waterfall Country and Southern Valleys
- LCA 8 – Talybont and Taff Reservoir Valleys
- LCA 9 – Mynyddoedd Llangatwg and Llangynidr

Excerts from the Brecon Beacons National Park Landscape Character Assessment for LCA 3, 4, 8 and 9 are provided below.

LCA 3. Fforest Fawr

“A bleak, upland moorland landscape, the character of which is locally influenced by its past use as a royal hunting ground and more recent estate ownership, apparent through the dry stone boundary walls, estate cottages, shelterbelts and former rabbit farms. Remains of prehistoric and medieval occupation, and later industrial archaeological sites, are visible in the landscape. Away from the occasional roads which run across the area, it feels tranquil, and with a sense of remoteness and relative wildness. Its distinctive flat-topped summits and steep northern escarpment are prominent in views from the north.”

LCA 4. Waterfall Country and Southern Valleys

"The predominantly limestone geology of this LCA creates its characteristic rough texture and grey colour, appearing in the crags, walls and buildings of this enclosed and relatively settled pastoral landscape. Ancient woodlands surround the streams and spectacular waterfalls which are found in the south of the LCA, flowing in deep, fern-filled gorges. Between the valleys are ridges of higher land with a more open quality and long views. The dark green of the extensive blocks of conifers in the south of the area contrasts with the surrounding grasslands."

LCA 8. Talybont and Taff Reservoir Valleys

"This LCA is characterised by its reservoirs, surrounded by steep sided, dark green forested valleys. Between the reservoir valleys are more open ridges of upland moorland which have long views across the reservoirs and their surrounding forests. This LCA is easily accessed from Merthyr Tydfil and the A470, and is a popular recreation destination."

LCA 9. Mynyddoedd Llangatwg and Llangynidr

"This LCA comprises an elevated plateau of moorland, characterised by its openness, smooth profile, lack of settlement, prehistoric archaeology and quarrying legacy. It contains many features of a karst (limestone) landscape, and a mosaic of high-quality moorland habitats. Despite its proximity to settlements, much of the area retains an open, undeveloped quality and is not heavily used for recreation although it has been used recently as a set for various films and TV programmes, Its crags and moorland also provide a dramatic and seasonally-changing backdrop to surrounding lower land including the Usk Valley."

4.2 Environment

The scheme is located within an area characterised by a range of environmental features. Refer to Figure 4.2 and 4.3 for an overview of key environmental features.

The route passes through a mixture of urban and rural areas and runs in close proximity to residential and industrial developments to the north of Merthyr and Hirwaun. Large parts of the geographical scheme area are designated at international, national and local level for their wildlife, habitats, landscape and heritage sites.

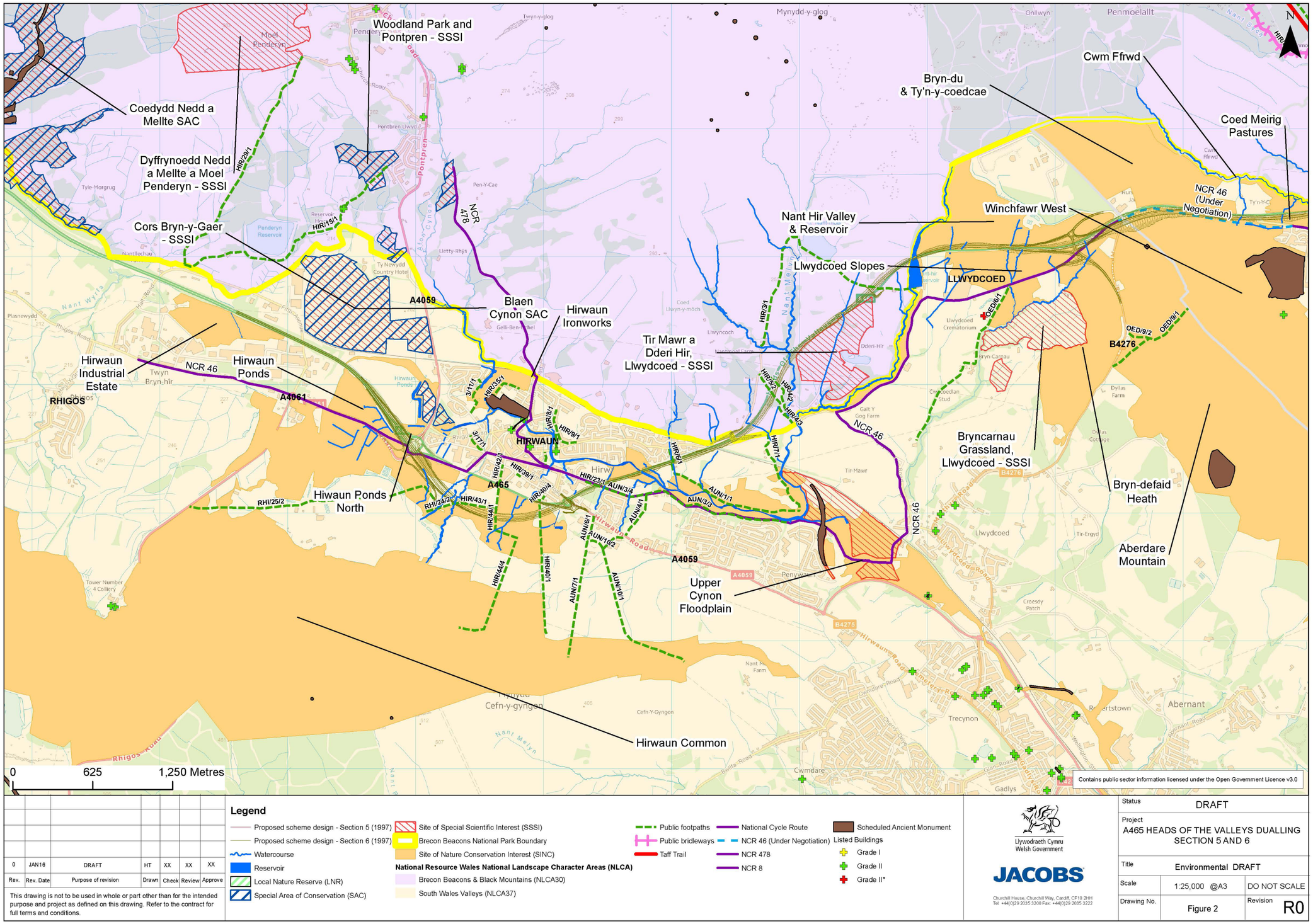
The designated sites potentially affected by the scheme include:

- Blaen Cynon Special Area of Conservation (SAC);
- Cors Bryn-Y-Gaer Site of Special Scientific Interest (SSSI);
- Brecon Beacons National Park;
- Tir Mawr A Dderi Hir SSSI;
- Bryn Y Gwyddel Scheduled Ancient Monument (SAM);
- Gurnos Quarry Tramroad SAC;
- Several SINCs;
- Areas of confirmed bat roosts;
- Several Marsh Fritillary Monitoring sites; and,
- Several areas of ancient woodland.

Several major water courses between Hirwaun and Dowlais top will be impacted to some degree by the construction of the mainline carriageway and structures. These include the River Taff, Cwm Taff Fechan, Afon Taff Fawr, Nan Ffrwd, Afon Cynon, Nant Hir, Nant Moel and Nant Bwlch.

Figures 4.2 and 4.3 show key environmental features along the scheme.

Figure 4.2 Key environmental features



Legend

- Proposed scheme design - Section 5 (1997)
- Proposed scheme design - Section 6 (1997)
- Watercourse
- Reservoir
- Local Nature Reserve (LNR)
- Special Area of Conservation (SAC)
- Site of Special Scientific Interest (SSSI)
- Brecon Beacons National Park Boundary
- Site of Nature Conservation Interest (SINC)

National Resource Wales National Landscape Character Areas (NLCA)

- Brecon Beacons & Black Mountains (NLCA30)
- South Wales Valleys (NLCA37)

- Public footpaths
- Public bridleways
- Taff Trail
- National Cycle Route
- NCR 46 (Under Negotiation)
- NCR 478
- NCR 8
- Scheduled Ancient Monument

Listed Buildings

- Grade I
- Grade II
- Grade II*

Rev.	Rev. Date	Purpose of revision	Drawn	Check	Review	Approve
0	JAN16	DRAFT	HT	XX	XX	XX

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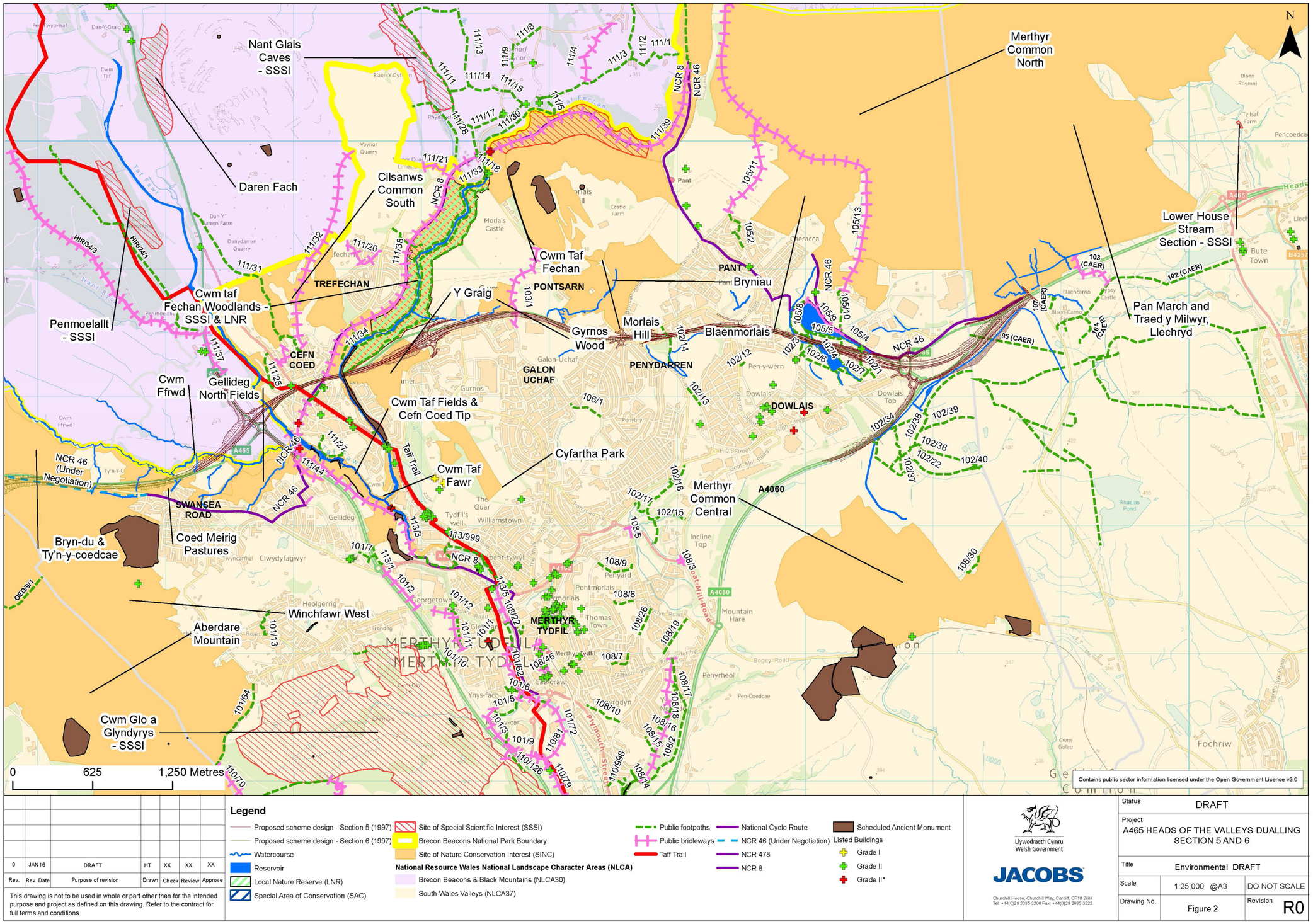
Status	DRAFT
Project	A465 HEADS OF THE VALLEYS DUALLING SECTION 5 AND 6
Title	Environmental DRAFT
Scale	1:25,000 @A3 / DO NOT SCALE
Drawing No.	Figure 2
Revision	R0

Figure 4.3 Key environmental features



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Status	DRAFT
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Drawing No.	Figure 2
Revision	R0

Key environmental factors have been selected to discuss in further detail due to their potential to influence or be influenced by the design. These key features include landscape and visual, nature conservation, all travellers, and cultural heritage. These environmental factors are outlined in Table 4.1.

Table 4.1: Key environmental factors influencing the design of the scheme

Topic	Summary of environmental topic	Key concerns / potential impacts which could be addressed through design
Landscape and visual	Brecon Beacons National Park is crossed by the scheme and there are other cultural heritage, nature conservation and geological designations within the study area. The study area is a mix of upland moorland, settlement and commercial retail development areas, woodland blocks, open upland field systems with hedgerows and trees, marshy grassland and open waste ground with scrub. Receptors include: • People - residents, road users, walkers , e.g. people using residential properties and public open spaces / PRoWs etc. along the route. • Landscape elements (e.g. bridges, trees etc). • Landscape / townscape character Landscape character and key viewpoints are described further in Section 4.1 of this report.	• Earth movements and general construction related disturbance • Loss of / damage to trees and other vegetation during construction • Construction / removal of structures altering / introducing or removing landscape features during construction (e.g. cuttings, embankments, bridges etc). • Landscape and visual impact of construction compounds • Reduction of vegetation cover in operation • Widening, and raising of road levels, incorporation of new junctions and new offline sections potentially increasing the visual prominence of the road • Lighting and headlights
Nature conservation	The area supports a wide range of habitats and species many of which are designated or otherwise protected. Statutory designations within 2km of the scheme include two Special Areas of Conservation (SAC) and 12 Sites of Special Scientific Interest (SSSI). Within 250m of the scheme there are 23 locally designated Sites of Importance for Nature Conservation (SINC). Protected species recorded within 5km include various bats, reptiles, amphibians (including Great Crested Newt), otter, water vole, pine marten, hazel dormouse, badger, freshwater crayfish, marsh fritillary butterfly, white letter hairstreak butterfly and various breeding and wintering birds. Invasive plant species present include Japanese knotweed, New Zealand pygmy weed and curly water weed.	• Land take / habitat loss or damage during construction • Severance / fragmentation of habitats and populations during construction and operation • Impacts associated with air and water quality / hydrology changes during construction and operation • Direct mortality of animals during construction and operation • Noise / vibration / light disturbance during construction and operation.
All travellers	The main settlements along Sections 5 and 6 of the A465 are Merthyr Tydfil and Hirwaun and various small villages. There are 11 footpaths crossing Sections 5 and 6 of the A465 and a further eight in close proximity. Two bridleways, three National Cycle Routes and the Taff Trail also occur close by and fourteen bus routes either use or cross these sections of the road. Receptors include: • Vehicle travellers • Pedestrians, cyclists and equestrians • Bus users	• Diversion / severance of rights of way during construction and operation. • Demolition and provision of new bridges / crossings • Changes in amenity value during construction and operation • Driver and journey delay (increasing in construction and decrease in operation) • Changes in vehicle user views during construction and operation • Changes to bus stop access during construction
Cultural heritage	A total of 130 heritage assets are recorded within the study area of which 14 have statutory or non-statutory designation. The statutorily protected designations within the study area consist of: • one Grade II* Listed Building; • five Grade II Listed Buildings; • four Scheduled Monuments; and • one Conservation Area. The non-statutorily protected designations within the study area consist of: • two Registered Historic Landscapes; and • one Registered Historic Park and Garden. A total of 116 undesignated heritage assets are recorded within the study area, including archaeological remains, historic buildings and historic landscapes.	• Disturbance damage to assets during construction • Intrusion on the setting of assets during both construction and operation • Severance of related assets during construction

5. Design development – a snapshot

The design of the scheme is continuously evolving and as such the intention of this section is to demonstrate a snapshot of design development up to the date of submission of this document (4 February 2016). It is likely that the information provided regarding design development will have developed further prior to the DCfW design review date.

The following describes lessons learnt from other schemes and the principles and status of design development for highways, structures, landscape, environment and lighting.

With regard to landscape and environmental features, the project team has adopted the following overall approach:

- Through design development and lessons learnt on other projects, avoid impacts all together. To facilitate this, communication between the various environmental and design disciplines has been essential. Major design issues continue to be raised through the TWGs.
- If this is not possible, reduce the impact through design where possible.
- As a last resort, compensate for an effect where mitigation or management is not possible.

5.1 Lessons learnt from other schemes

The design team are considering lessons learnt from the design of Sections 1-4 of the A465 whilst the design is being developed.

A workshop was held on 18 November 2015 regarding the development of environmental design principles. At this workshop, lessons learnt from other schemes was also discussed and recorded.

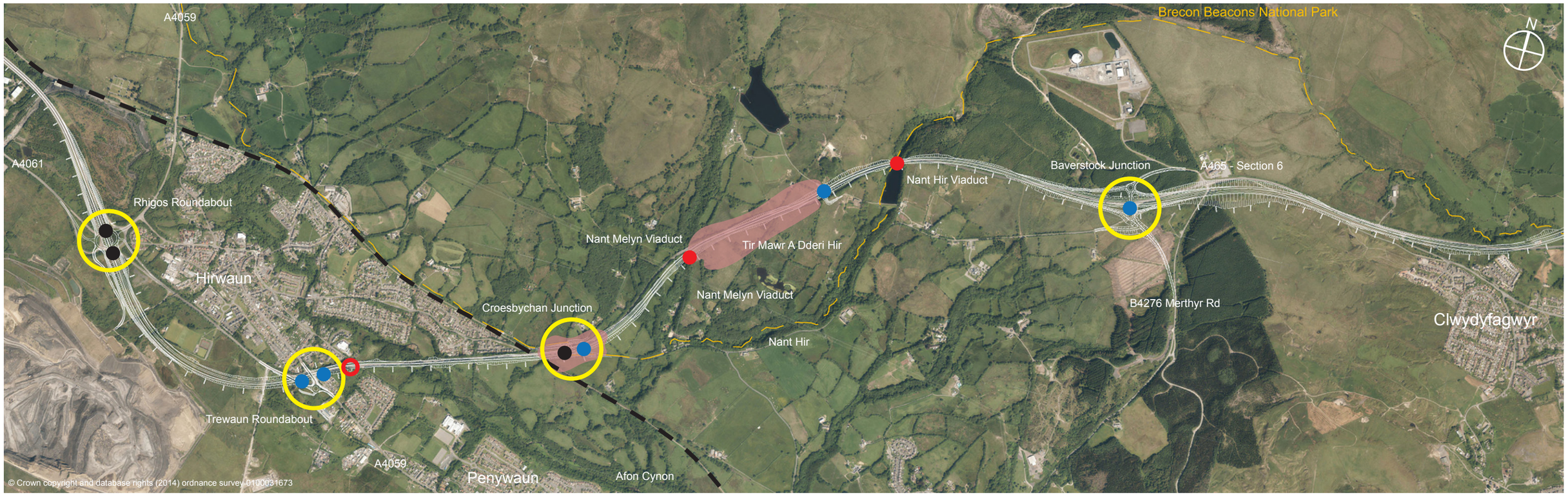
Lessons learnt from Sections 1-4 of the A465 include:

- Allow sufficient space to grade slopes or provide natural rock faces. Avoid use of soil nailing. This is a lesson learnt from Section 2 Gilwern to Brynmawr.
- Use natural materials with local characteristics in the design of retaining features, and unify with structural elements. Good practice examples were supplied by the Welsh Government, based on Section 2 (Gilwern to Brynmawr) and Section 3.
- Ensure sufficient land to accommodate incompetent rock or unexpected construction issues, by inclusion of a risk element for land take, to deliver environmental requirements. This is a lesson learnt from Section 3.
- CPO sufficient land so attenuation ponds can have shallow slopes for increased biodiversity and avoid the need to fence. This is a lesson learnt from the A470 Dolwyddelan to Pont-yr-Afanc.
- Include landscape interventions at sensitive locations to help integrate the road into the landscape, particularly where the scheme has a close relationship with the Brecon Beacon National Park. This is a lesson learnt from Section 2 (Gilwern to Brynmawr) and Section 3.
- Enable drivers to experience dramatic views from the road to upland landscapes. This is a lesson learnt from Section 3.

5.2 Structures design

The projects engineers and architects are developing the 1997 design and focussing on key areas where the site constraints and opportunities have changed since the original design. Currently, high priority is the A470/A465 junction and the Merthyr Tydfill High Street, both of which will feature as part of the design review discussion with DCfW on 18 February 2016.

The strategic approach to aesthetics and design of structures is provided in the following pages.



5.2.1 Route Structures and Interventions – Sections 6 & 5

The 1997 design for Sections 6 and 5 of the A465 dualling has been adopted as a basis point for the scheme design development. Due to localised contextual changes, revisions to environmental and design standards, the Highway Design is being reviewed within the overall framework of the earlier scheme.

The assessment of alternative junction and alignment option which ensure compliance is currently ongoing.

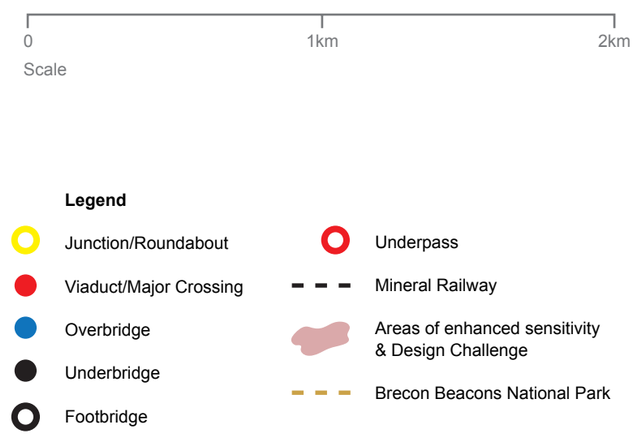
Similarly, the designs of related bridges and associated structures are being developed and tested in unison.

Range of Structures
Due to the complexity and variables of topography, landscape, context, junction type and alignments it is most unlikely that a standardised ‘family of structures’ approach will prove appropriate.

A more likely outcome is an ‘aesthetic unity’ of approach to individual solutions, which respond appropriately to the localised context.

The adjacent ariel overlays locate and identify the locations of structures and pertinent aspects.

For simplicity of presentation, the complexity of the environmental and landscape constraints are not indicated although clearly of major influence.



There is a requirement over the length of the scheme, for a significant number of structures ranging from large viaducts over valleys, overbridges and underbridges of variable types, footbridges, underpasses, culverts and retaining structures. Refer to Appendix Table A.1.

Constraints
Due to several considerably contained sections of the route corridor, alongside all the complex environmental, landscaping and contextual constraints, the engineering will be much influenced by traffic management, buildability, and economics.

DCFW Review
In acknowledgement of the scale and variance of the route contexts it is considered for practical purposes that a limited number of locations, where significant design challenges and potentially high impact have been identified, are presented as examples of the design methodology and approach intended throughout the project.

1. A470 junction and associated valley crossing at Taf Fawr, which have potentially significant environmental, community and visual impacts.
2. 2 new bridges over the urban cutting through Cefn-Coed-Y-Cymmer at Merthyr Tydfil which impact on a local community context.
3. The parallel widening of the existing Taf Fechan arched viaduct which examples an approach to widening a typology of structural form which also exists in several other locations.

The following section outlines the principles of a holistic design approach which is to be pursued in the development of the project.

5.2.2 Strategic Approach to Aesthetics and Design of Structures

A Route of Unique Quality
Given the unique scenic value of the A645 Heads of the Valleys Route, it is imperative that not only the route alignment of Sections 5 and 6, but the location and form of all structures are considered with great care so as to avoid intruding and marring the natural settings by insensitive engineering.

That said, the advantages of the improvements must be acknowledged and a certain level of intervention within the context is inevitable.

It therefore follows that the approach to resolving the engineering challenges created by the dualling requirements should follow a disciplined holistic and sensitive design analysis methodology from the outset.

Whilst the exact route alignments are yet to be finalised in detail, this document seeks to identify the general placements of structures, interventions and connectivities required of the dualling project. Each localised context will be considered further during future design development.

Design of Structures within the Broad Range of Landscape Experiences
The extreme variety of character, topography, landscape settings, connectivities and route constraints clearly rules out a simple 'family of structures approach' across the entire route. It is unlikely that a single set of rules will fit all locations.

Indeed, it is recommended that a careful assessment of each location and engineering requirement should be undertaken with a view to 'De-engineering' the intervention within the contextual constraints. As far as possible solutions should be sought that 'go with' the natural topography and landscape rather than being engineered despite it. It also must be accepted that the most economic solution may be inappropriate in highly sensitive areas.

In locations where many complex constraints preclude such a solution, the design of structures will require very careful consideration to ensure that they contribute positively to their local settings and wider landscape context. In these circumstances the design quality is of paramount importance and should have lasting elegance.

However, it is considered that a strategic aesthetic and engineering design approach which seeks to limit landscape and visual impacts along the entire route should be generally adopted. Such a design approach should promote appropriate minimisation of intervention complementary to the landscape setting, rather than engineered structures that rely on inappropriate landscape screening to 'disappear' poorly conceived compositions and forms.

In this important setting such an approach would be regarded as intelligent best practice and should be adopted consistently and comprehensively for both the initial selection of route alignments, design of structures, (major and minor), comprehensively through to the treatment of road signs, lighting, safety barriers and all other associated carriageway requirements.

Connecting Structures
Due to the requirement to maintain existing connectivities wherever necessary, it is clear that apart from the impact of the road widening itself, there will be a need to construct engineering overbridges, underbridges, river and railway crossings, footbridges, watercourse crossings and culverts etc.

In addition, the widening, modification or replacement of existing structures at many locations will also be required.

In extremely complex topographical locations the route alignment is likely to require the complex engineering of cuttings, side supports, retaining walls etc. All such structural measures would bring about localised visual impact which will require careful mitigation and sensitive design.

Although not determined at this stage, there may be at specific locations requirements for acoustic containment barriers which would by nature, unless well considered, have a serious negative visual impact, potentially restrict landscape views and create unnatural scars within the terrain. Where the landform is suitable, the preference would be to employ the use of berms and false cuttings. Where such is not possible, acoustic screen or fencing should be designed to be as visually unobtrusive as possible utilising materials which are in harmony with the local landscape setting. Where appropriate screen planting should be considered to avoid any lengthy corridor effect.

The employment of landscape and planting measures must also be carefully considered to avoid incongruous impacts and unnatural features. Appropriate landscape selection for each location is essential.

Route User Experience
Due to the obvious qualities of the A465 landscape, the relationship of the route to the scenery itself,heritage sites, particular aspects of interest and views of scenic beauty must at all times be respected as a priority. In addition, wherever opportunities exist, to 'heighten', re-establish, or create visual experience and engagement, they should be embraced and maximised. It is therefore essential that these 'key' scenic views be identified and their importance considered in the development of the route design and the promotion of the highest quality of the user experience.

The Bigger Picture
Whilst a considerable focus inevitably will be on the road user's experience and the impact on the immediate vicinity of the route, the greater visual impact of the road improvements and structures as seen from afar cannot be left unconsidered. For this reason, the impact on the views from outwith the route corridor must be assessed as part of the holistic approach.

Impact on Communities
Albeit beneficial overall, the dualling project will in places impact both visually and physically on adjacent communities. It will be important to consider the design of structures and their relationship to the localised urban fabric and context, endeavouring where opportunities arise to contribute positively to the local settings and environment.

5.2.3 Particular Approach to Structures

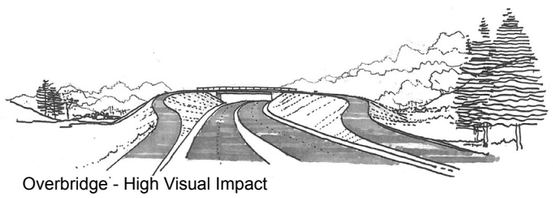
Alignment Selection
Fundamental to the aesthetic quality of the journey and structures required is the route alignment selection. The general principles for the route were set out in 1998. The development of this alignment requires an extremely 'careful and holistic' approach to achieve the best fit with the local topography, balancing the pragmatic engineering challenges, costs and nature of associated potentially intrusive structures. In addition, the impacts of contextual change and reviewed Design Standards over the past 18 years have influences on the detailed approach.

Given the variety of landscape characters, where significant interventions are required, landscape design should be employed to aid integration and screening. Conversely opportunities should be maximised, where considered appropriate, to enhance the road users experience revealing and framing scenic views.
Similarly, a 'holistic' approach, to retaining the subsidiary road infrastructure, access points and general connectivity will be essential to reduce the number and impact of junctions, overbridges and intrusive structures. Wherever possible the alignments should seek the employment of underbridges to provide cross connectivity in a less intrusive manner.

Grade Separated Junctions
The creation of junctions and assessment of form and location will be of key importance, especially where the topography and constraints are complex. Full consideration should be given to adopting junction arrangements that, as far as possible, merge into the landscape and localised character, rather than simply utilising standard formats. Locations that best serve subsidiary infrastructure yet minimise the physical impact should be sought. Junctions that can utilise underbridge arrangements would be the preferred approach in most locations wherever practicable.

Overbridges
Generally, overbridges create the greatest impact on the user experience and landscape settings. In particularly sensitive settings such structures should be 'engineered out' if possible by selection of locations where connectivity could be provided by underbridges.

Where unavoidable, overbridges should be 'open spanned' and designed to employ wherever possible the natural topography to avoid the impact of built up approach ramps. Materials employed should be well considered and empathetic with the localised context. The use of significant extents of 'brute' concrete wing walls, abutments and retaining structures should be avoided. The use of natural stone facings, complementary to the location, should be considered at appropriate locations.


Overbridge - High Visual Impact


Underbridge - Less Visual Impact

The requirement for lighting across structures in open landscape should be carefully assessed and wherever possible avoided to address the impact of isolated light pollution.

Underbridges
Underbridges are more likely to have a visual impact on the immediately adjacent landscape or close by communities and buildings. Generally, the scale of these can be more simply mitigated than that of overbridges.

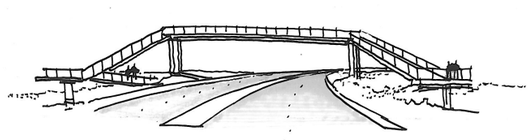
Where connectivity is required on a community level it is important to consider the environmental quality of the user experience through the underbridge structures, especially where pedestrian use is expected. The consideration of appropriate scale and avoidance of intimidating character is essential. Careful consideration of lighting is also essential to provide safe use yet avoid the impact of isolated light output within the landscape.

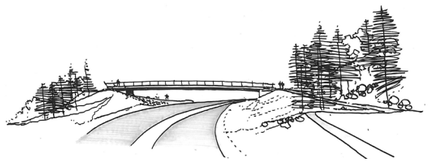
Unification of the localised urban grain and local character should be considered in the scale and arrangement of abutments, wing walls, finishes and appropriate landscape.

Major Structures
Due to the complex topography prevailing in many key locations there will be a requirement to construct some reasonably significant mainline structures. These will be required to cross rivers, railways and in places deep valleys. Where the route alignment is widened "online", such structures as exist will require modification, widening, replication or even replacement. In general, it would seem rational to recommend that existing structures should, wherever possible, be altered in a "seamless" manner, extending or replicating the existing form and material. Where new structures are required "offline", the design, form and use of material should be considered in an elegant, well engineered manner, appropriately related to the contextual setting and existing structures, taking full account of the overall appearance within the bigger landscape setting.

Footbridges
Generally, footbridges promote more desirable and safer access routes than underpasses due to their open aspect. Visually, however, they have a greater visual impact within the context, especially when obtrusive ramp structures are required. It is preferable to seek locations where the existing topography allows a more natural arrangement of access and obviating the need for clumsy ramp structures. The design of the structure and choice of form and material should be elegant and complementary to the specific location and its character.

Pedestrian Underpasses
Should underpasses be adopted as a connection link it is essential that due consideration is given to the scale and generosity of the structure and approaches. The siting should promote natural community linkage.


Footbridge - Approach ramps with high visual impact


Footbridge - Approach ramps merged into landscape

5.2.4 A470 Junction and Taf Fawr Crossing Context and Points of Special Note

As the north western suburban fringe of Merthyr Tydfil the A470 connects to the A465 at a roundabout.

The existing A465 emerges westwards from a narrow urban cutting passing through Cefn-Co-Ed-Y-Cymmer and crosses over the deeply wooded Taf Fawr valley on the existing 33 metre long viaduct.

This large 3 span haunched concrete box structure sits some 33 metres above the valley floor.

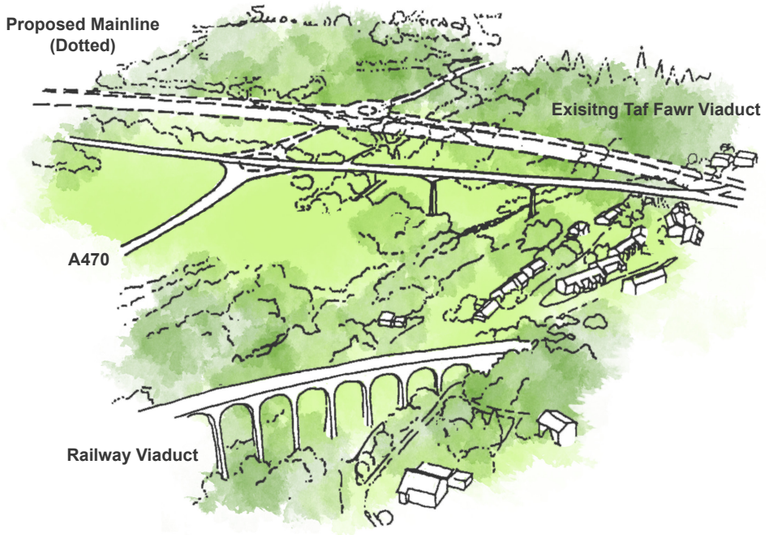
This elevated structure has a high visual impact on the valley and surroundings, being visible from many viewing points.

In close proximity is the impressive historic railway viaduct which now forms part of the Taf Trail.

The natural beauty of the protected woodland, which lies within the Brecon Beacons National Park provides nature walks. A section of the Taf Trail also follows the valley's course.

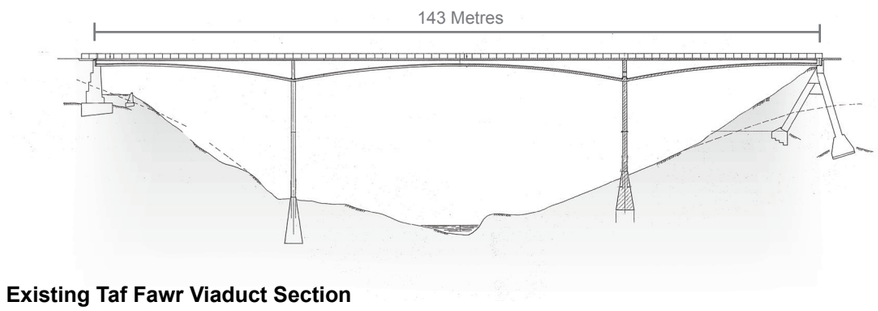
Contextual Impact of the Project Proposals

The proposed new dualling alignments and upgrading of the A470 junction present a significant design challenge, due to the complexity of the local topography, quality of landscape and close proximity of the suburban settlement.



Existing Contextual Overview

Existing Aerial Overview



Existing Taf Fawr Viaduct Section

0 300m

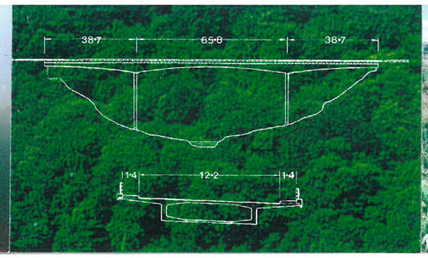
Scale

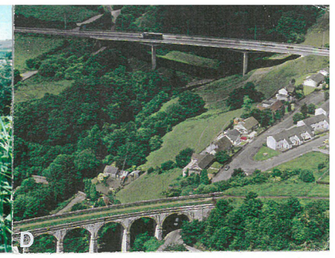
Legend

- Junction/Roundabout
- Viaduct/Major Crossing
- Overbridge
- Underbridge
- Footbridge
- Underpass
- Brecon Beacons National Park

A470 Junction and Taf Fawr Viaduct

Previous Design 1997 Broadsheet





LOCATION PLAN: Chainage approx. 10850 Scale 1:5000

Existing Structures	Type	WO No	Assessment Results
No.SE022A	UB	29.70	Not Tested
No.SE023A	CV	29.90	Unknown

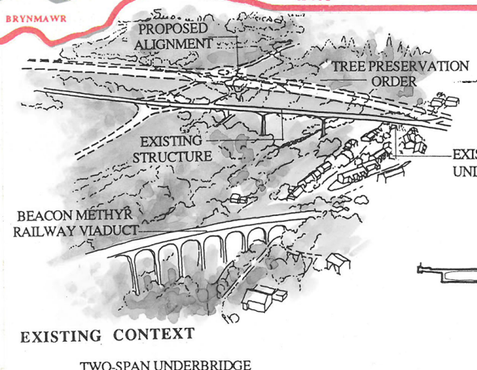
CONTEXT AND POINTS OF SPECIAL NOTE

The existing road alignment cuts across the deeply wooded Taf Fawr Valley which separates the Western fringes of the urban area of Cefn-Coed-Y-Cymmer from the open countryside. The bridge is a post tensioned concrete box structure, supported by two 33 metre high reinforced concrete piers, spanning 143 metres across the valley and affording fine views of the old railway viaduct to the south.

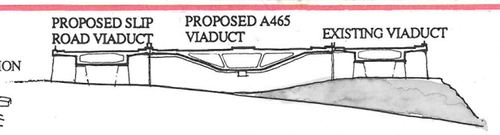
The natural beauty of the protected woodland, which lies within Brecon Beacons National Park, provides nature walks and a section of the Taf Trail follows the valley's course. The elevated structure has a high impact on the valley and its surroundings, being visible from North, South and the urban fringes to the East.

The existing pedestrian underpass at the Eastern approach, albeit decorated with murals, is 'tunnel like' and this would be exacerbated by the widening.

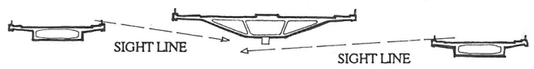
TAF FAWR VIADUCT CONTEXTUAL CATEGORY A1 No 03



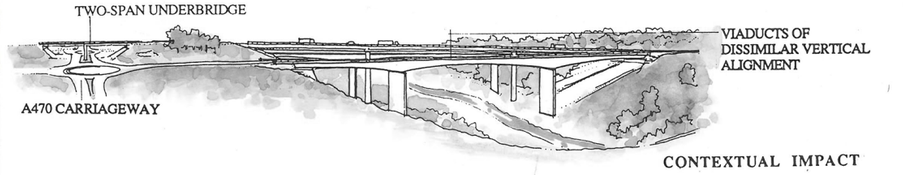
EXISTING CONTEXT



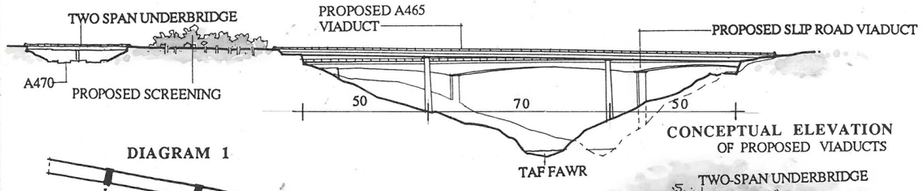
CONTEXTUAL SECTION AT ABUTMENT



CONTEXTUAL SECTION AT MID-SPAN



CONTEXTUAL IMPACT



CONCEPTUAL ELEVATION OF PROPOSED VIADUCTS

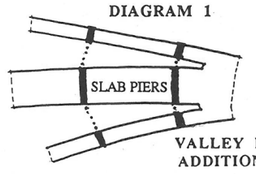


DIAGRAM 1

VALLEY IMPACT OF ADDITIONAL PIERS

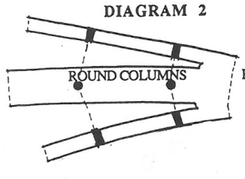
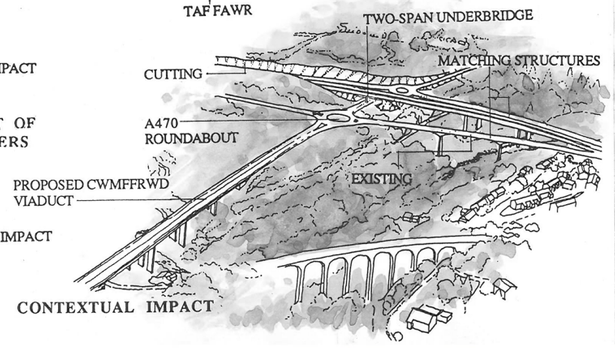


DIAGRAM 2



CONTEXTUAL IMPACT

No.	Proposed Structures	Type
SP022	Taf Fawr Viaduct	UB
SP022B	Taf Fawr Slip Road Viaduct	UB
SP022C	A465/A470 Bridge	UB

ANALYSIS

The proposed road alignment and the requirement to provide slip roads to the J7 junction to the West of the Taf Fawr necessitates the introduction of 2 further structures across the valley. Alternative junction arrangements for J7 were assessed in the search for a valley crossing configuration with less impact, however no other solution was found to be satisfactory.

The design of 3 bridges in close proximity across the valley requires careful consideration to ensure a harmonious relationship with one another and minimise as far as possible the visual and environmental impact. Due to the differing vertical alignments at the West abutment, the design of the central structure requires particular attention since the underside of the rising deck will be very apparent from the adjacent slip roads and a deep structure would block the open views of the valley. Most importantly the arrangement of support columns in the valley must be carefully considered to maintain as open a structure as possible.

CONSTRUCTION ISSUES

Geotechnical information not yet available. Tree Preservation Order may constrain construction.

TRAFFIC MANAGEMENT

No impact.

INITIAL PROPOSALS

To provide a balanced composition, the three bridges have been arrayed in a symmetrical fan form, the new central A465 structure flanked by two matched slip road structures. (One being the existing Taf Fawr bridge).

Structuring the main bridge to match the existing Taf Fawr was considered. However it was felt inappropriate since the slab piers would visually establish a very strong louvring and directional wall effect in the valley, and the solidity of the haunching would block the openness under the structure at the West end. To avoid these problems, a structure with slim circular columns supporting an elegant tapered aerofoil profiled deck has been proposed. It is considered that this form will be complementary to the adjacent haunched structures and provide a successful composition.

It is proposed to re-route the underpass tunnel at the East end and provide an open walkway elsewhere.

RECOMMENDED APPROACH

* Develop proposals.
* Consult with authorities with regard to design of an appropriate National Park 'gateway' marker.

A470 Junction and Taf Fawr Viaduct

Previous Taf Fawr Viaduct Visualistation

A470 Junction – Option 1

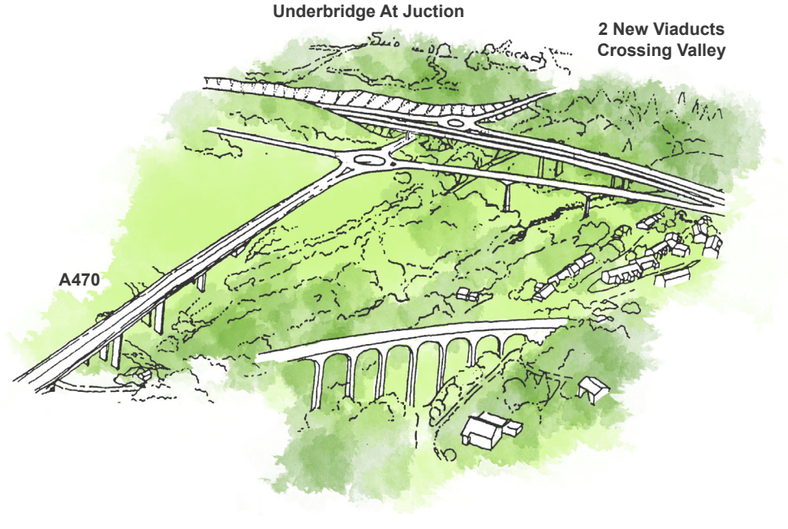
To resolve the challenges of this complex location, many options of junction layout have been considered and it has proven difficult to achieve a solution which is compliant with standards within the contextual constraints.

Option 1 draws on the principles of the 1997 design which purposes a twin roundabout junction with the A470 with the implication of constructing two further large viaducts across the Taf Fawr valley which present a significant intervention to the setting. The junction and slip arrangement require deep cuttings and will have a high impact on the landscape which sits, partially within the Brecon Beacons National Park.

Aesthetically and environmentally the configuration of 3 bridges across the valley is challenging. Should this be developed it is envisaged that all bridges would require to be of a related design form to avoid incongruity.

The new structures would cross over the preservation order tree belt running through the valley which will make construction and foundation location difficult.

Given that this junction is the entrance to the National Park there is an opportunity to create a sense of ‘Gateway’ in the junction and structures design.



Contextual Overview of Option 1

Aerial Overview Option 1

A470 Junction – Option 4

In realisation that the 1997 Option 1 design had a significant impact, several other junction forms have been considered with a view to reducing the impact of building more bridges across Taf Fawr Valley. Ideally one structure carrying the main line would minimise the intervention, however no compliant configuration has been identified which accommodates this.

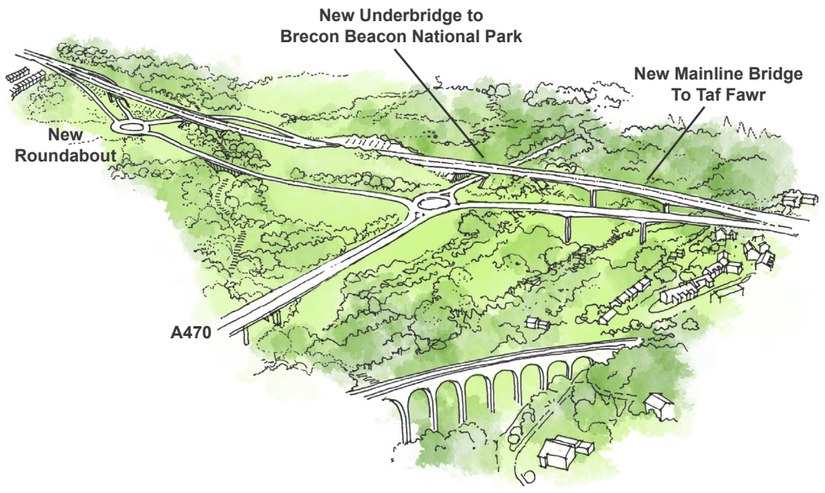
Consequently, Option 4, which introduces a second roundabout to the west, reconfigures the on and off slips and proposes only 1 additional bridge across the valley, is currently being developed.

This junction layout significantly reduces the cuttings at the entrance area of the National Park, and achieves an improved landscape fit.

Whilst the detail of the several structures required has at this point not been developed, it is envisaged that the design of the large viaduct would be approached with a view to being aesthetically sympathetic to the existing Taf Fawr haunched 3 span bridge.

The configuration at the existing roundabout locates a bridge under the mainline which would naturally form a ‘Gateway’ to the park. It is envisaged that the design of this structure would be developed to reinforce its significance.

This option also requires the resolution of the necessary structural arrangement across the Nant Ffrwed.



Contextual Overview of Option 4

Aerial Overview Option 4

0 300m

Scale

Legend

- Junction/Roundabout
- Viaduct/Major Crossing
- Overbridge
- Underbridge
- Footbridge
- Underpass
- Brecon Beacons National Park

5.2.5 High Street Overbridge and Taf Trail Footbridge Context and Points of a Special Note

This section of the A465 runs in a deep cutting which physically and psychologically bisects Merthyr Tydfil outlying suburb of Cefn-Coed-Y-Cymmer.

Community linkages are provided by the existing High Street overbridge and the old railway bridge (now dismantled Brecon and Merthyr railways line) which is now used as a cycle and footpath and forms part of the Taf Trail.

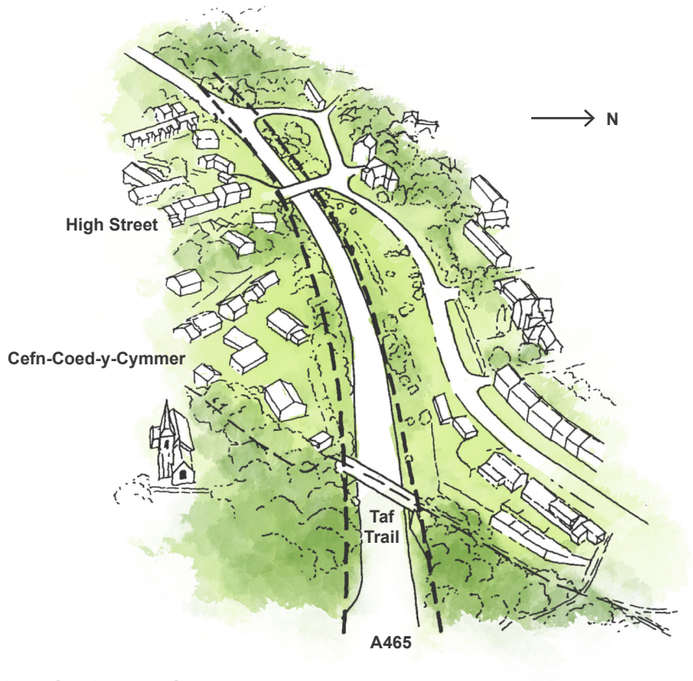
Both bridges are extremely skewed in their alignments which creates an awkward visual dynamic for mainline road users.

The existing cutting is through rock and there are exposed outcrops with vegetation and landscape which presently offers reasonable screening.

Contextual Impact of Project Proposals
Due to the prevailing narrowness of the cutting and close proximity of buildings and infrastructure the engineering of section is challenging.

The widening will further reinforce the bisection of the community and it is therefore important that the design of the new bridge linkages respond to this community issue.

The loss of existing landscape will impact significantly on the appearance of the area and relationship of the A465 to the community.



Existing Contextual Overview

Existing Aerial Overview

0 50m
Scale

Legend

- Junction/Roundabout
- Viaduct/Major Crossing
- Overbridge
- Underbridge
- Footbridge
- Underpass
- Brecon Beacons National Park

Existing High St Bridge

Existing Taf Trail Footbridge

BRECON ROAD, MERTHYR TYDFIL

CONTEXTUAL CATEGORY A2 No 02

LOCATION PLAN: Chainage approx. 11100 Scale 1:5000

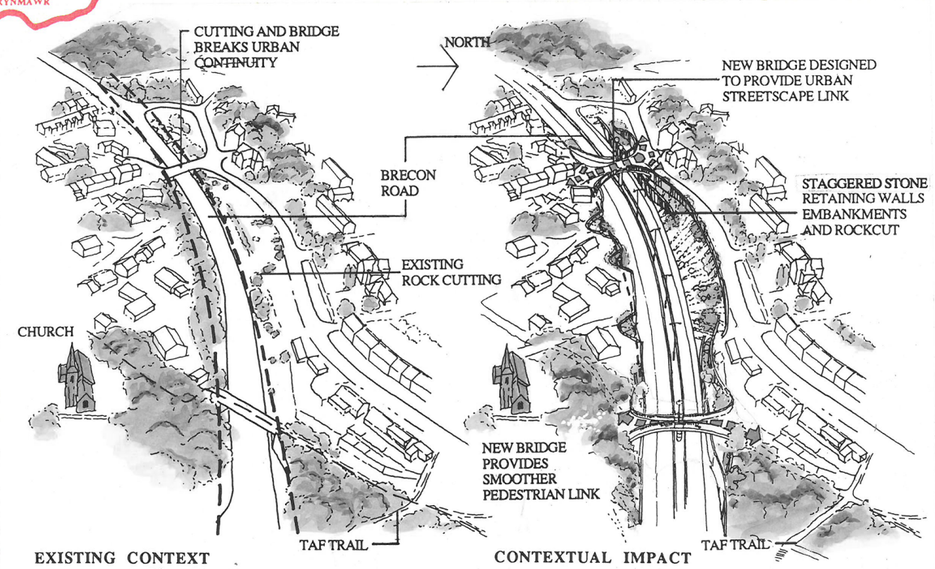
Existing Structures	Type	WO No	Assessment Results
No.RE024A	RW	Unknown	Unknown
No.SE026	OB	30.20	40 tonne
No.SE027A	FB	Unknown	Unknown

CONTEXT AND POINTS OF SPECIAL NOTE

This section of the A465 runs in a deep cutting and bisects the Merthyr Tydfil outlying suburb of Cefn-Coed-Y-Cymmer.

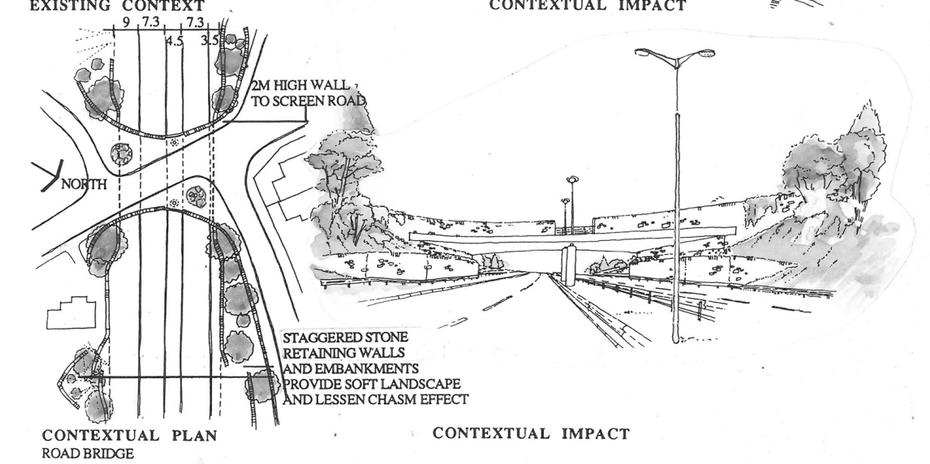
The cutting comprises outcrops of rock and vegetation which screens the road from the town at higher level. The two parts of the suburb are presently linked by a single span simply supported bridge. To the East of the town the line of the dismantled Brecon and Merthyr Railway crosses the A465 by means of a single span steel structure. The route of the former railway is now used as a cycle and footpath and forms part of the Taff Trail.

Any road widening proposals will require retaining measures and environmental barriers. Due to the deep nature of the cutting, environmental impact should be low.



EXISTING CONTEXT

CONTEXTUAL IMPACT



CONTEXTUAL PLAN
ROAD BRIDGE

CONTEXTUAL IMPACT

No.	Proposed Structures	Type
RP024	Vaynor Rd Ret.Wall	RW
RP025	Cefn-Coed-Y-Cwmmer	RW
SP026A	Brecon Road	OB
SP027	Merthyr Footbridge	FB

ANALYSIS

The existing cutting already creates a severe urban discontinuity between the Northern and Southern areas of Cefn-Coed-Y-Cymmer. At present this rift is somewhat mitigated by the landscaped nature of the existing rock cuts. The widening proposals will exacerbate this lack of urban cohesion since the residual embankment area will be substantially reduced and therefore limit the scope for vegetation. The surfaces of the proposed retaining walls/rock cuts will require very careful design consideration, especially in landscape terms.

The two replacement structures bridging the route will form vital community links. In the replacement of the existing Brecon Road overbridge a "once only" opportunity exists to reinforce the urban linkage across the A465. A skilfully handled design could help regenerate this area and provide more urban continuity. Similarly the proposed footbridge, which will replace the old railway bridge, can be redesigned to enhance this urban linkage and provide a suitable link in the Taf Trail.

CONSTRUCTION ISSUES

Detailed geotechnical data is required to establish the nature and integrity of the existing rock cutting.

TRAFFIC MANAGEMENT

Temporary closures of a carriageway may be necessary and management measures required.

INITIAL PROPOSALS

Providing an individual design at Merthyr Tydfil, the proposal addresses the contextual issues identified. At Brecon Road a form of structure widened at the abutments to address the junction constraints creates a flowing plan arrangement which is reinforced by high parapet walls giving continuity to the High Street, and 'squaring' the structure alignment up with the A465. The concrete two-span structure integrates central reserve columns and feature lamp posts to create an individual image. At the abutments the parapets sweep out to merge with walls creating a series of landscaped terraces formed along the cuttings.

On the South cutting every opportunity is taken to mitigate the retaining wall by capturing left-over land pockets and introducing planting.

The Merthyr footbridge structure is conceived with a similar aesthetic to that at Brecon Road with high parapet walls providing enclosure and continuity to the Taf Trail. Ground area adjacent to the abutments would be landscaped.

RECOMMENDED APPROACH

* Establish geotechnical information.
* Develop the strategy.

High Street Overbridge and Taf Trail Footbridge

The design and engineering challenges are significant in this section. New bridges and widening of the A465 are proposed.

The widening of the cutting will exacerbate the community severance from a visual and psychological view point.

The construction of retaining walls and rock cutting in close proximity of infrastructure and buildings requires complex and considered engineering.

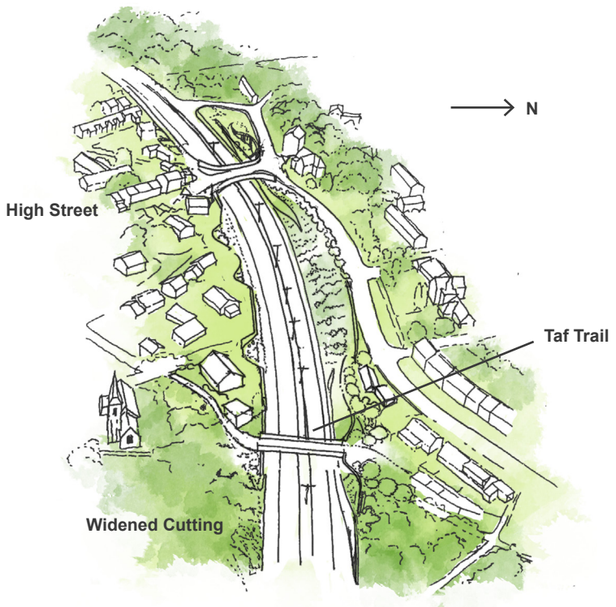
In addition, the existing bridges will require to be replaced without significant disturbance to the community linkage whilst the engineering us undertaken. It is likely that a temporary bridge solution will be employed.

The 1997 proposals considered the benefits of more appropriate, less skewed bridge alignments and the potential for the High Street Bridge to reinforce the sense of community linage and extend the urban grain of the street through the use of parapet design, ‘place making’ and landscape.

It is considered that these are still valid although the nature of the bridge designs will have to respond to more recent standards and constraints.

The Taff Trail Bridge is currently extremely skewed and it is proposed to realign the new structure to better relate to the trail context.

Landscape and Streetscape improvements will be an important aspect of the design.



Contextual Overview of New Bridge Structures and Cutting

Proposed Alignment

0 50m

Scale

Legend

- Junction/Roundabout
- Viaduct/Major Crossing
- Overbridge
- Underbridge
- Footbridge
- Underpass
- Brecon Beacons National Park

5.2.6 Taf Fechan Viaduct - Context and Points of Special Note

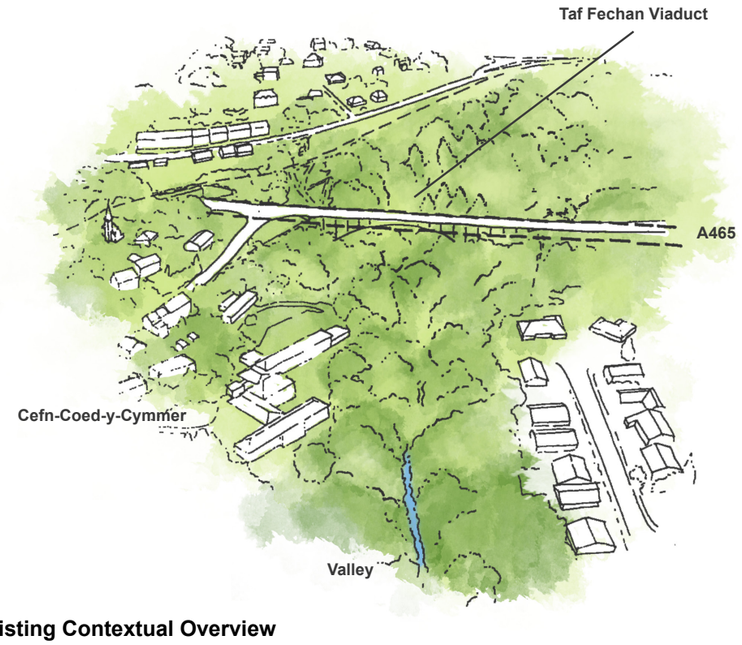
From the Northeast the Taf Fechan River descends into a heavily wooded gorge on the outskirts of Cefn-coed-y-cymmer before flowing south-westwards around the Gurnos estate and eventually joining with the Taf Fawr River to form the River Taff.

The existing A465 crosses the steeply sloping and wooded Taf Fechan river valley on the existing Taf Fechan Viaduct, immediately to the east of Cefn-coed-y-cymmer. The Taf Fechan area is designated as a Site of Special Scientific Interest (SSSI) and a Local Nature Reserve (LNR) for its woodland, grassland and heath habitats. An existing footway passes under the Western end of the bridge connecting the Taf Trail with Lower Vaynor Road.

The existing Taf Fechan Viaduct, designed by Rendel, Palmer and Tritton Consulting Engineers is an elegant reinforced concrete open spandrel fixed arch structure with an arch span of some 69 metres and overall length of 119 metres. A number of other bridges with similar structural forms, exist within Sections 5 and 6 of the A465.

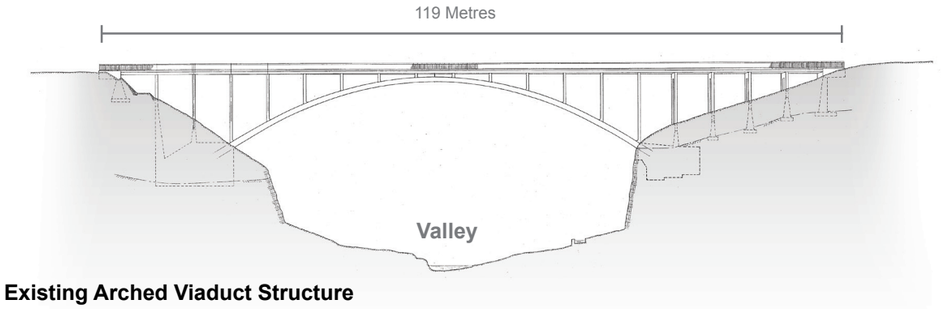
The existing structure is clearly visible from the urban areas of Cefn-Coed-Y-Cymmer to North and South.

Contextual Impact of the Project Proposals
The A465 dualling will require the symmetrical widening of the existing Taf Fechan Viaduct. The structural alterations and increased scale will have a high visual impact on the existing environment. The detailing of the structural solution will therefore require careful consideration to ensure that the purity of the existing form is maintained.



Existing Contextual Overview

Existing Aerial Overview



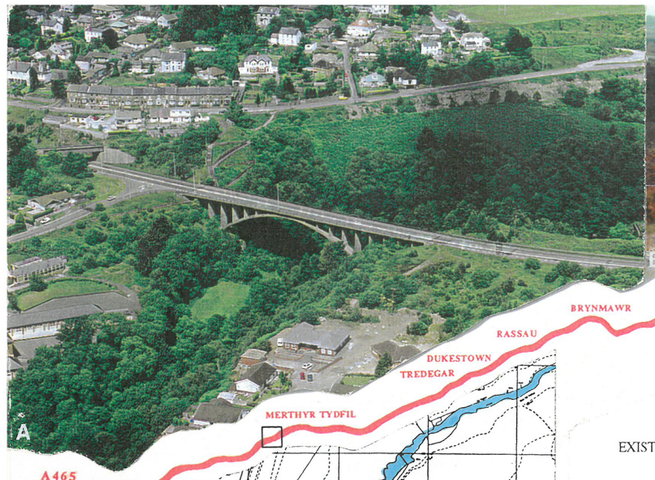
Existing Arched Viaduct Structure

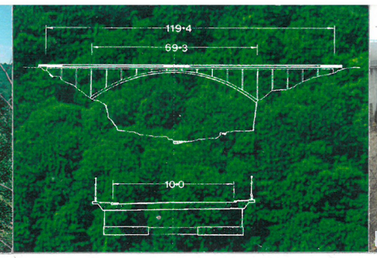
0 50m
Scale

Legend

- Junction/Roundabout
- Viaduct/Major Crossing
- Overbridge
- Underbridge
- Footbridge
- Underpass
- Brecon Beacons National Park

Taf Fechan Viaduct
Previous Design 1997 Broadsheet





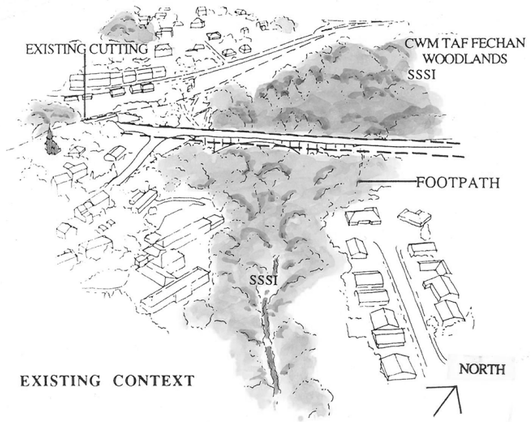
LOCATION PLAN: Chainage approx. 11500 Scale 1:5000

Existing Structures	Type	WO No	Assessment Results
No.SE028	UB	30.60	Unknown

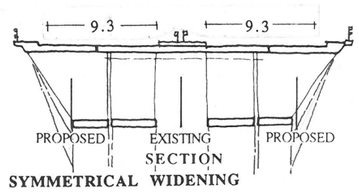
CONTEXT AND POINTS OF SPECIAL NOTE

The Taf Fechan Bridge is a reinforced concrete open spandrel fixed arch structure with an arch span of some 69 metres and overall length of 119 metres. It spans the deep wooded valley of the Taf Fechan. Cwm Taf Fechan is designated a Site of Special Scientific Interest (SSSI) and Local Nature Reserve (LNR) for its woodland, grassland and heath habitats. Footpaths follow the valley route, including the Taf Trail which utilises the dismantled railway line.

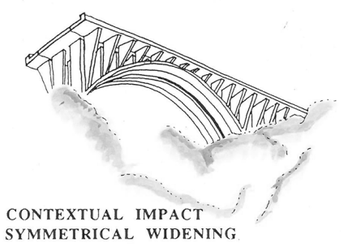
The existing structure is clearly visible from the urban areas of Cefn-Coed-Y-Cymmer to North and South. Any new structure will have a high impact on the existing environment.



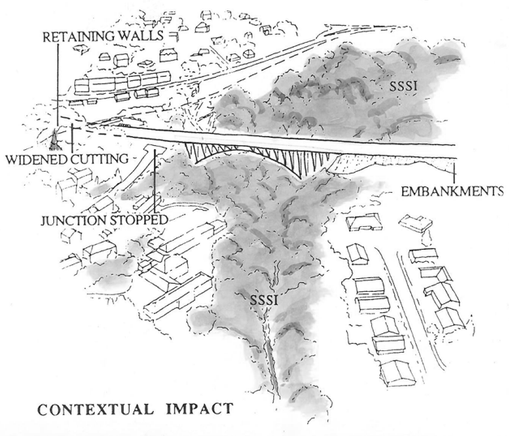
EXISTING CONTEXT



SYMMETRICAL WIDENING
SECTION



CONTEXTUAL IMPACT
SYMMETRICAL WIDENING



CONTEXTUAL IMPACT

TAF FECHAN VIADUCT CONTEXTUAL CATEGORY A1 No 04

No.	Proposed Structures	Type
SP028A	Taf Fechan Viaduct	UB

ANALYSIS
The route alignment at this crossing is largely dictated by the restrictions imposed by the existing urban fabric and the practicalities of constructing a widening of the existing bridge structure.
Extensive widening of the existing cutting through the townscape at the Western side is unavoidable.
Considerable embankment extension to the East approach will be necessary.
Improvements could be made to the environmental quality of the pedestrian routes currently piercing through the spandrel panel voids.

CONSTRUCTION ISSUES
Care will require to be taken to minimise intrusion into the SSSI valley landscape during widening procedures by adoption of an appropriate construction method.

TRAFFIC MANAGEMENT
Symmetrical widening will affect both existing carriageways and therefore will require suitably phased construction programming to minimise disruption.

INITIAL PROPOSALS
Aesthetically the only acceptable solution to the provision of a wider carriageway is a "look alike" design approach.
Whilst parallel widening to the South was the Stage 1 preference, symmetrical widening is now considered as the preferred option since this would bring about a less bulky underbelly arch, and minimise the scale of abutment extensions below the approaches. The form would allow more light penetration to the valley below

RECOMMENDED APPROACH
* Assess further and refine the road alignment to suit symmetrical widening strategy.
* Should the above prove non-viable, the fall-back position would be to parallel widen the bridge to the South.

5.3 Highway design

The focus of the highway design is to develop the existing design (i.e. the approved 1997 Line Order design) according to existing highway design standards and 'scale back' the standards where there are potential issues of changes at selected locations.

Based on the current programme, the highway design team are developing the highway design, including junction layouts with the view to fix the design by February 2016. Options for the A470/A465 junction layout are still being discussed and it is likely that optioneering for this junction will be ongoing at the date of the DCfW design review.

5.3.1 Highway design development – current status

The current status of the highway design is described as follows.Historic centreline alignment reviewed and corrected for compliance with respect to horizontal curvature, transition lengths and vertical curvature.

- Fully compliant cross section applied to achieve desirable minimum stopping sight distance throughout.
- Where permissible, cross sectional reduction applied to minimise land take whilst achieving stopping sight distance of 215m, a relaxation of 1 design speed step.
- Constrained areas reviewed and further cross sectional reductions applied to minimise impact, some of which are at proposed junction locations which impact proposed relaxations and departures.
- Historic junctions designed in accordance with current standards.As a separate exercise, running parallel with the design development, is optioneering which is being prepared by a completely separate team. It has comprised the sifting of 40 alternative options to the following options:
- A470/ A465 junction – reducing the structure at Taff Fawr to a single structure to reduce the visual impact.
- A470/A465 junction – at grade solution.
- Trewaun – mainline over / side road under, as opposed to the currently proposed mainline under, side road retained at EGL.
- Croesbychan - additional junction between Court Lodge and Nant Hir reservoir, providing all movements and proposed to replace the historic proposal at Court Lodge.
- Bavistocks – compact grade separated junction, due to the small volume of traffic using the junction the size can be reduced and therefore the land take and impact.
- Gurnos – the addition of east facing slips to make the junction all movements.
- New Gurnos / Galon Uchaf Junction – a single, central junction location proposed to replace the two historic junctions at Gurnos and Galon Uchaf.

Once the design drawings are complete the options will be issued to each discipline for scoring and the results will be collated and detailed within an Optioneering Report.

The options that are taken forward will be incorporated into the design. Currently, the optioneering exercise is behind schedule and as such is impacting the completion of the final design and the alignment and junction strategy report.

Other selected items are yet to be addressed, such as the layby strategy. Design standards regarding layby locations have changed since 1997. Our strategy will need to be in compliance with current standards and also consider stakeholder engagement, such as Network Management and the National Park.

5.3.2 Key constraints to highway design development

The key constraints to the development of highway design include:

- **Adjoining development** (sensitive receptors), which may have changed since the 1997 design, including Trewaun, Cefyn Coed, Gurnos, Galon Uchaf and Pant industrial estate.
- **Environmental constraints** – Brecon Beacons National Park and environmentally designated sites such as SSSI and SINCs abut the existing A465 with alignment improvements skirting these areas, rather than dissecting the designations. With the use of relaxed horizontal curvature as opposed to realigning through the area with desirable minimum horizontal curvature, thus having minimal impact.
- **Existing structures**
- **Cost** – suitability of alternative alignments to retain a further four existing viaducts for use for either carriageway with adjacent structures for the opposing carriageway at:
  - Nant Melyn
  - Nant Hir
  - Taff Fechan
  - Pant
- **Buildability** – suitability of structure proposals, replace or widen, with rationalisation of the cross section to make widening of existing structures viable.
- **Sustainability and inclusive design objectives** – consideration being given to earthworks balance, with a focus on the Baverstocks area which generates a large portion of the surplus material in the historic design via the extensive cut to the east of Baverstocks. A minimal modification to the eastbound approach gradient creates a fill area to the west, which not only helps in creating a balanced earthwork but also retains suitable site won material for re-use within this section of the scheme.
- **Responding to ongoing community and stakeholder consultation feedback**, such as the Public Information Exhibitions (PIEs) held in December 2015. Design responses to community suggestions are provided in Section 3 of this report.
- **Specific areas**, including:
  - Existing narrow corridor through the built environment at Trewaun.
  - Existing narrow corridor through the built environment at Cefy Coed, not only the constraint of maintaining the existing highway and residential development, but the fact that this section is in existing rock cut and how widening in the cut could be undertaken with minimal disruption to the properties that abut the existing corridor.
  - The existing highway network and residential development at Gurnos.

- The existing highway network and residential development at Galon Uchaf.

- The industrial units at Pant Industrial Estate.

5.3.3 Key features of the highway design at January 2016

The alignment strategy adopted for Sections 5 and 6 follows the corridor and connectivity principles of the original design which is largely defined by the Made Line Order, Scheme Assessment Stage 1 Reports and the Technical Appraisal Report, all of which proposed alignment options and the Preferred Route were taken to public consultation in 1994.

The main features of the design of the highways component include:

- Two-lane dual carriageway along the mainline route.
- A sign posted speed limit of 70mph for the duration of the mainline route, with a 120kph design speed.
- A wide median in areas where unconstrained to provide appropriate stopping sight distances. Two 3.65 metre through lanes at all proposed intersection upgrades, eastbound and westbound.
- Two metre wide shoulders.
- Connector roads comprising 3.7m wide running lane and 3.3m hard shoulder
- Local road design criteria of:
  - 30mph posted speed and 60kph design speed.
  - Lanes 3.5m wide
- A 1 in 100 flood immunity for all roads, bridges and retaining walls.
- Provision for landscaping.
- Barriers as required along the road for safety purposes.
- Offline cycle / pedestrian considerations including crossings of the A465.

A detailed description of the 1997 design is provided in **Appendix B.**

5.3.4 Changes to the historical design / departures from standards

The emerging alignment largely follows the conceptual design which considered the environmental constraints present in the area at the time of development in 1997. In some areas where the carriageway had to be widened to improve Stopping Sight Distance visibility, every effort was made to reduce further impact to environmentally sensitive areas but, to avoid deviating from the original design or causing further impacts upstream, in some instances this was not possible.

Current key areas of design development include:

- Compliance with current design standards
- Design of intersections. Options for the A470/A465 junction are currently being considered.
- Design of components which impact cross sectional provision, including:
  - Drainage
  - Road restraint (safety barrier)
  - Signage

Departures and relaxations from standards are being considered in areas throughout the scheme to avoid unnecessary widening which would have a further detrimental effect on environmentally sensitive areas.

Currently, departures and relaxations from DMRB standards are considered as follows:

- Approximately 7 departures from standard are proposed over the extent of the scheme and all relate to a reduction in Stopping Sight Distance at or on the approach to major junctions, in accordance with TD 9/93 Highway Link design.
- Approximately 28 relaxations from standard are proposed over the extent of the scheme and all relate to a reduction in Stopping Sight Distance at or existing structure, developments, environmental constraints associated with minimising the cross sections and consequentially the footprint, in accordance with TD 9/93 Highway Link design.

5.4 Environmental design

Environmental constraints and opportunities for the scheme are well documented. The environmental constraints influence the highways and structures design through the adoption of environmental principles and specific constraints at certain locations. These specific issues are mainly communicated through the Technical Working Groups, as described in Section 2 of this statement.

An Environmental Management Plan (EMP) is also being prepared in parallel which details specific areas where mitigation needs to be designed into the scheme. The EMP is being developed at the time of writing this statement.

5.4.1 Environmental design principles

An Environmental Design Workshop was held with the project team on 18 November 2015, consisting of environmental discipline leads as well as representatives from the highways and structures design teams. Participants went through the design with known environmental constraints overlaid to determine a set of environmental design principles. The design principles and supporting additional information are outlined in Table 5.1.

Table 5.1: Environmental design principles and supporting notes

Environmental design principle	Supporting notes
Principle 1 – Minimise impact on existing marshy grassland habitats by minimising risk of drying out, whilst considering whole life cost of scheme.	
Principle 2 – Minimise impact on Ancient Woodland in close proximity of scheme	May involve minor change scheme alignment. -Possible use of retaining walls instead of sloped banks/embankments to be considered to reduce encroachment into Ancient Woodland. -Where Ancient Woodland removal is inevitable, soil to be re-used in appropriate locations adjoining retained Ancient Woodland. - Post Meeting Note: This may also apply to TPO vegetation.
Principle 3 – Where technically feasible and not entailing excessive cost, consider opportunities to enhance existing ecological connectivity	Woodland, hedgerow – increase dispersal of ancient woodland plants.
Principle 4 - Aim to achieve an earthworks balance	A – Buildability B – Movement C - Sustainability of material out e.g. If rock then reuse for construction. Possibility of gradual grading for screening then return to agriculture + get rid of spoil
Principle 5 – Minimise habitat loss from SINC's in close proximity to the scheme	
Principle 6 - "Simple and Elegant" for structures	
Principle 7 – Minimise lighting on scheme as a whole, particularly viaducts over Taf Fawr and Taf Fechan	Minimise lighting, avoid light spill General avoidance of lighting effects for the scheme as a whole, eg. on National Park.
Principle 8 – Ensure structures design, facing and finishes provides integration to current vernacular balanced by whole life cost	E.g. Dry stone/masonry walls. Look at natural stone cladding e.g. section 4 concrete quite ugly. Whole life cost analysis on section 4. Depending on localised geology, exposed rock faces may be appropriate.
Principle 9 – Maintain existing underpasses to maintain connectivity for wildlife and minimise habitat severance	
Principle 10 – Provide linear landscape strips in areas where they currently exist, if appropriate, to re-integrate proposed scheme as per the existing highway planting	
Principle 11 – Drainage avoid impacts regarding flooding and water quality. Where appropriate, minimise tree and shrub planting to create open, outward views from the scheme and integrate with existing upland landscape character	
Principle 12 – Minimise flooding and water quality impacts	Off line planting may be appropriate to provide screening, possibly combined with off line landtake for ecology mitigation. If essential mitigation may have to be part of scheme landtake. Otherwise consider as 'off-site' planting. Break out redundant carriageways and establish soft landscape or other treatment. Examine possibility of moving/relocating aqueduct feature if practical (precise nature of the feature currently unknown).

5.4.2 Environmental Management Plan

Based on the environmental principles a draft Environmental Management Plan (EMP) is currently being prepared. The draft EMP is likely to be complete prior to the design review with DCfW.

5.5 Landscape and visual

In addition to the environmental design principles, guiding principles for the development of landscape and visual elements were developed during the Landscape and Visual Impact TWG and are as follows.

- Expose existing geology where suitable to create drama and provide retaining edges and slope finishes.
- Keep boundary treatments simple using fences and walls typical of adjacent upland areas.
- Use a palette of local materials to face and unify structures along the scheme.
- Keep planting low key in open upland locations using native species and promoting local grassland types.
- Accommodate views from remote upland areas to and from the scheme in the planting design to enhance the visual experience from the road while retaining remoteness from upland locations.
- Respond to stakeholder aspirations for the gateway to the Brecon Beacons National Park to be accentuated.
- Lead in the creation of a coherent environmental design that responds effectively to all the environmental constraints including ecology, cultural heritage, water quality and community uses.

5.6 Lighting

The approach to lighting along the scheme is currently in progress. A Series 1300 Lighting Proposal Report as per DMRB Volume 8 Section 3 will be produced. The report intends on identifying sections of the road that will be lit and provide an outline design proposal. In addition, lighting will be considered in the Landscape and Visual assessment in the ES.

It is acknowledged that the scheme is partially located within the Brecon Beacons National Park which forms part of a Dark Sky Reserve. A Dark Sky Reserve is an area which reduces artificial light pollution, allowing for the appreciation of the natural night time environment.

The Lighting Proposal Report will consider the Brecon Beacons Nation Park International Dark Sky Reserve Lighting Management Plan (International Dark-Sky Association, undated).

In addition to impact on the Dark Sky Reserve, lighting is also considered with reference to road user safety including that of pedestrians, cyclists and equestrians.

6. Next steps

The Welsh Government proposes to dual the A465 Heads of the Valleys road between Dowlais Top and Hirwaun.

Jacobs and Nicoll Russell Associates are working together with the community and stakeholders to deliver a design that meets overarching and transport related objectives whilst adhering to a demanding programme.

Jacobs and Russell Associates, on behalf of the Welsh Assembly, wish to obtain the views, influence and support of the DCfW on the principles and thought process around the design of the scheme to date.

The design of the scheme is continuously evolving. As such, it is likely that the session with the DCfW on 18 February 2016 will focus on two areas, including the overarching principles and approach as well as key areas of concern for structural, highway and environmental design.

The next steps relating to the design of the scheme and DCfW input are anticipated to be:

- Design review session with DCfW on 18 February 2016.
- DCfW to provide design review report on 4 March 2016 (two weeks following design review).
- Jacobs and Russell Associates consider content and recommendations of DCfW design review report.
- A second meeting with the DCfW to be held early April 2016 to enable DCfW to influence the design. By the second meeting, the intention is to have developed the highways, structural and environmental design further having considered DCfW comment and advice, community and stakeholder consultation feedback, and general design requirements.

7. References

Brecon Beacons National Park Authority (2012). Brecon Beacons National Park Landscape Character Assessment

International Dark-Sky Association (undated).Brecon Beacons Nation Park International Dark Sky Reserve Lighting Management Plan

DCfW (2011). Design and Access Statements in Wales: Why, What and How

Appendix A. Minutes from ELG held on 1 December 2015

Appendix B not included to avoid duplication of text in submission document

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Meeting Minutes

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Purpose	**A465 Section 5 and 6 - Environmental Liaison Group Meeting (ELG) 1**		
Prepared by	Amy Davies		
Location	Cardiff Office	**Date/Time**	1 December 2015 10:00
Participants	See Appendix A	**Apologies**	None Received

1 **Welcome and Introduction**

WB welcomed and thanked everyone for attending first Environmental Liaison Group (ELG) for the A465 Sections 5 and 6. The aim of the meeting was for everyone to gain a better understanding of the scheme. Everyone around the table introduced themselves. Wendy Bateman is the Environmental Coordinator for the scheme, Gareth Protheroe is the Project Manager and Sarah Simons is the Principal Ecologist.

2 **Health and Safety Moment**

Two health and safety issues were highlighted:

(i) When preparing the meeting it was noticed that the staples used to staple the handouts together were a potential hand injury risk by as they were too big for the paper. It was subsequently ensured the handouts were re stapled to reduce the risk.

(ii) A weather related incident was described whereby a colleague was waiting for a train and saw a person rushing for their train who slipped almost into the train path. The lesson learned is not to rush especially in bad weather and to be careful as the saying goes it is better late than never.

3.0 **Presentation by the Project Team**

3.1 A copy of the slides used for the presentation is included in Appendix B

It was explained that the scheme is a not for profit distribution (NPD) design build finance and operate (DBFO). It was clarified that with an ECI scheme, which has been the procurement model adopted to deliver previous sections of the A465 Heads of the Valleys Dualling, it is the designer and contractor that would commit to the scheme construction and delivering what is outlined in the Environmental Statement (ES). In the case of the NPD PPP model, the ES mitigation and environmental commitments will be included in the contract set up with the 'special purpose vehicle' company appointed to construct, operate and maintain the new road.

3.2 The Key Stage 3 programme was discussed and key milestone dates highlighted.

3.3 This is would be the third major Welsh Highway scheme in 10 years delivered by the Jacobs Cardiff team. The scheme will be taken to the Design Commission for Wales in early 2016 and the draft Environmental Statement is due to be published for consultee comment in May 2016.

The forthcoming December 2015 Public Information Exhibitions were mentioned. These would be held as per below:

Venue	Date	Time	Address
St Leurwg's Church Hall	Monday 7 December 2015	Open 12.00-21.00	St Lleurwg's Church Hall, Hirwaun, Aberdare, CF44 9TA
Cefn coed Community Centre	Tuesday 8 December 2015	Open 12.00-21.00	Cefn coed Community Centre, New y-cymmer, Merthyr Tydfil CF48 2NA
Dowlais Community Centre	Friday 11 December 2015	Open 12.00-21.00	Dowlais Community Centre, Station Glamorgan CF48 2NB
Cefn coed Community Centre	Saturday 12 December 2015	Open 09.00-13.00	Cefn coed Community Centre, New y-cymmer, Merthyr Tydfil CF48 2NA

Post Meeting Note:

3.4 ELG attendees that receive general enquiries from members of the public should direct them to the following contacts:

Information about the project is available on the Welsh Government website:
http://gov.wales/a465section5and6
You can let us know your views or questions by contacting the project team by:
Email *A465PLO@Jacobs.com*
Phone *07497 894081*
Post *: A465 Public Liaison Officer, Chris Meredith, Jacobs UK Limited, Churchill House, Churchill Way,*
Cardiff, CF10 2HH

3.5 JA advised that Jacobs may need to factor in extra meetings for Design Commission for Wales.

3.6 Minutes of this meeting will be included in the ES. Any concerns about the scheme are to be raised as early as possible. Where necessary, issues will be taken forward to be discussed in more detail at technical working groups (TWGs). The current proposed list of TWGs is as follows. All will be held at the Jacobs Office in Cardiff and Outlook Calendar invitations will be issued in due course.

3.7 Proposed TWGs and Invitees

1. *Landscape*
Invitees – Merthyr LA, RCT LA, BBNP, Olwen Maidment (NRW), Jacobs - Highways, Wendy Bateman, Cath Walker, Kathy Ronald, Lucy Emery, Sarah Simons, Lindis Danson, Rupert Lovell,
Timing – January 2016

2. *Flood risk, structures and highways design*
Invitees – Jacobs Highways, Jackie Walters (NRW) TBC (NRW), Jacobs - Dan Watson, Wendy Bateman, Cath Walker, Jon Barnes,
Timing – January 2016

3. *Land Quality/GI*
Invitees – Merthyr LA, RCT LA, Kay Roberts (NRW), Jacobs - Hugh Masters-Williams, Alan Dishington, Wendy Bateman, Cath Walker, Highways, Tony Kernon,
Timing – TBC

4. *Marsh Fritillary Butterfly*
Invitees – Richard Wistow (RCT), Rolf Brown (Merthyr), Scott Hand (NRW), Khalid Aazem (NRW) Jacobs - Wendy Bateman, Cath Walker, Sarah Simons, Lucy Emery , Laura Gore, Highways

Further TWGs will be arranged throughout KS3 as required.

3.8 The Highways Act (1980) process was summarised, highlighting that enhancement is not an easy thing to justify

3.9 The public liaison officer will deal with complaints

3.10 JA stated that monthly meetings with stakeholders are beneficial. The Orders Exhibition will be in late 2016 and will take place in similar locations to the public information exhibitions. LC stated the ES is a legal document. By the Public Inquiry (PI), ideally all issues raised by statutory consultees will have already been addressed through the ELGS and TWGs in KS3, and captured in the ES and Register of Environmental Commitments.

4.0 **Presentation of Draft Environmental Mitigation Measures 1**

4.1 WB presented the draft Environmental Masterplan (EMP) based on the 1997 proposed scheme design.

4.2 Air quality: WB stated that Jacobs are building a traffic model of the proposed scheme.

4.3 Landscape and visual: the scheme weaves along the edge of the Brecon Beacons National Park. Lighting will be mainly restricted to junctions and wherever possible, where safety in design standards permit, the intention is that the main sections of the scheme will be unlit.

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4.4 Nature conservation: sites potentially affected include Blaen Cynon SAC, SSSIs and SINCs. Protected species may also be impacted. No bat tree roosts have been identified to date, however building roosts have been confirmed. Jacobs

4.5 RB stated that if the Swansea road junction was stopped up it would be an issue for local road users. MD stated the junction strategy is under review. Best access to Prince Charles Hospital is to be considered. There are issues at Dowlais Top with PROW conflicts, and many recent road accidents involved pedestrians crossing the existing A465 in that area.

4.6 The overall preferred route corridor of the proposed scheme is fixed but there will be minor alterations as the scheme design is not compliant with current standards.

4.7 CE queried how the visual and landscape impacts will be presented. WB said that the structures will be in the form of artists impression. Jacobs will produce a 3D model during KS3. GP will determine how far we can take the viewpoint on model. Jacobs

4.8 CL stated that good practice could be taken from the A465 Sections 2 and 3. JA stated that this will be relevant to the Merthyr Junction as this is the gateway to the Brecon Beacons National Park (BBNP). RB raised point that golf courses and Morlais Castle provide good views. A landscape TWG will be arranged for January 2016. The proposed scheme has to be buildable within existing constraints. CL queried the use of soil nailing. JA stated that there is a lesson learned in relation to Section 2 and ideally would not like soil nailing to be used.

4.9 LC had attended a lessons learned meeting for Section 3. One of the outcomes was consideration of including a risk element into land take parameters in order to ensure sufficient land to deliver environmental requirements in the event there is incompetent rock or other unexpected issues encountered at construction stage.

4.10 Road Drainage and the water environment: Drainage and attenuation ponds - on the A470 scheme some ponds were not fenced. Have enough CPO land so attenuation ponds have shallow slopes for increased biodiversity.

5.0 **Marsh Fritillary Butterfly draft mitigation strategy presentation –SS**

5.1 See slide presentation in Appendix B.

5.2 The Blaen Cynon SAC is to be taken forward to Stage 2 Appropriate Assessment. Other European sites have been screened out at Stage 1 of the Assessment of Implications on European Sites (AIES) process due distance from the proposed scheme. RW stated that habitat is important to butterfly conservation. There are options to obtain land for essential mitigation. WB stated that in the AIES process it is essential to show how we do this. GP stated that Welsh Government could take land so environmental mitigation is functional. WB stated that the habitat has to be up to standard but not proven to be in use. RW stated that need to consider the

existing work with marsh fritillary mitigation in the area and integrate with this. LC raised the possibility of combining the proposed mitigation area with the RCT area. Jacobs is proposing a corridor north of the proposed scheme road and RCT are delivering a corridor south of the road. RW explained that south of the road, there are a number of developments at differing stages of completion.

5.3 Marsh Fritillary Butterfly Mitigation TWG to be arranged for January 2016.

5.4 GP queried how long it takes to make an area of land suitable for marsh fritillary. SS stated that it depends on what the land is like to start with. RW stated the structure of the vegetation needs to be correct with loci of devils bit scabious. It may take 1 to 2 years for overgrazed areas to become suitable. LC queried whether we are looking to improve dispersal ability of meta populations. SS confirmed that we are.

5.5 There will be loss of SSSI and SINC habitats with the proposed scheme therefore proposed essential mitigation areas will serve a dual purpose. RW queried possibility as of growing devil's bit scabious from local nurseries. Further details will be discussed at the TWG in January 2016.

5.6 CL stated that there is an area of species rich grassland of interest at Hirwaun west of the roundabout and whether there was the capacity to translocate. CL also asked whether it would be possible to relocate or translocate dry stone walls within the proposed scheme. SS confirmed that we will consider this and that these types of grasslands are being looked at.

6.0 **Presentation of Draft Environmental Mitigation Measures 2**

6.1 JM queried the status of great crested newts (GCN) and what the impacts may be. The proposed scheme will not involve the loss of any GCN breeding ponds. eDNA surveys were undertaken in 2015 within the study area of the proposed scheme which confirmed absence of GCN in all ponds surveyed. The proposed scheme will result in a small amount of direct GCN terrestrial habitat loss.

6.2 JM queried why the Usk bat SAC sites was screened out based on distance alone as he does not think this would be robust. WB stated that WG are currently reviewing the AIES Stage 1 Screening report and Jacobs are awaiting comments. There will be an opportunity for NRW to review and comment on the AIES Stage 1 screening document once this process has been completed.

6.3 Community and private assets - LC stated it is important to get public liaison officer involved as soon as possible. CL said that on the eastbound approach to Baverstocks there is a memorial tree where there have been fatalities in 2008. This may be mentioned at public inquiry and the public may want more lighting in this area. CL asked whether the tree could be transplanted. Tree is not mature and therefore could be transplanted. SUSTRANS sent a letter of congratulation to section 3 for improving cycle strategy. RB stated that the Merthyr Tydfil cycle path has scope for improvement.

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6.4 Road drainage and water environment: mitigation is based on construction phase controls. LC asked how the WFD requirements will be included in the process. WB confirmed that the WFD will be included in compliance report as appendix to the Road Drainage and Water Environment chapter of the ES.

6.5 CEEQUAL. MD stated that there may be new guidelines in 2017.

7.0 Next Meeting

ELG 2 will take place at the Jacobs office on 29th March 2016.

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Appendix A – Attendee List

Wendy Bateman (WB) – chair,
Khalid Aazem - Natural Resources Wales (KA)
Julian Atkins - Brecon Beacons National Park Authority (JA)
Rolf Brown - Merthyr Tydfil County Borough Council (RB)
Luci Collinwood - Welsh Government (LA)
Amy Davies – Jacobs (AD)
Petra Davies - South Wales Trunk Road Agent (PD)
Mark Dixon - Welsh Government (MD)
Chris Engel – Blaenau Gwent County Borough Council (CE)
Laura Gore – Jacobs (LG)
Scott Hand - Natural Resources Wales (SH)
Cameron Lewis - South Wales Trunk Road Agent (CL)
Fran Lynn - Jacobs (FL)
Olwen Maidment - Natural Resources Wales (OM)
John Messenger - Natural Resources Wales (JM)
Chris Nutt - Natural Resources Wales (CN)
Gareth Protheroe – Jacobs (GP)
Huw Roberts - Merthyr Tydfil County Borough Council (HR)
Kay Roberts - Natural Resources Wales (KR)
Sarah Simons - Jacobs (SS)
Tim Stephens - Caerphilly County Borough Council (TS)
Cath Walker – Jacobs (CW)
Jackie Walters - Natural Resources Wales (JW)
Richard Wistow - Rhondda Cynon Taff County Borough Council (RW)

Appendix B. Detailed description of highways design

The existing highway design and 'historic design' features are described below.

Section 5 – Dowlais Top to Junction with the A470

Section 5 would primarily comprise on-line widening of 5.9km of road between Dowlais Top and the A470 Junction, with short lengths of off-line widening. This would include:

- parallel widening to the north from Dowlais Top to Ch.14700 and then south as far as Ch.14200;
- symmetrical widening from Ch.14200 to Ch.13700;
- parallel widening to the north, then south, as far as Ch.12400;
- from Ch.12400, off-line to the south as far as Taf Fechan Ch.11600;
- parallel widening through Cefn Coed-y-Cymmer; and
- off-line widening as far as Ch.10100.

Three new junctions would be provided at Galon Uchaf, Gurnos, and the A470. Details of Section 5 are provided in Table A.1.

Table A.1: Section 5 – Dowlais Top to A470 Junction between Chainage 10,100 – 16,000 (taken from Table 5.9 of the 1997 Environmental Statement)

Highway design feature	Existing highway	Historic design features (1997 design)
Carriageway	Three-lane wide single carriageway, apart from 700m at Cefn Coed-y-Cymmer which is two-lane wide single carriageway	Two-lane dual carriageway
Major cuttings	Galon Uchaf (Ch.14000-13500)	Extended with additional retaining walls
	Cefn Coed-y-Cymmer (Ch.11400-11000)	• Extended with additional retaining walls • Gurnos cutting (10m) (Ch.12100-11800) • At A470 Junction into northwest hillside (Ch.10700-10400)
Major embankments	None	Gurnos Embankment (7m)
Junctions	Galon Uchaf: grade-separated	Grade-separated partial access junction
	Cefn Coed-y-Cymmer left-in, left-out in both directions	Stopped up
	A470 Roundabout: at-grade	A470: grade-separated junction
		Gurnos Junction: grade-separated partial access junction
Accesses	None on A465	Gurnos Farm access provided from Gurnos Junction
Road crossings	Jones Street underbridge (Ch.15000)	Underbridge replaced
	Pant Road viaduct (Ch.14700)	Replaced
	School Road underbridge (Ch.13000)	Replaced
	Gurnos Farm access track (Ch.12400)	Access from Gurnos Junction
	Disused railway overbridge carrying the Taff Trail (Ch.11300)	Replaced
	Cefn Coed-y-Cymmer High Street overbridge (Ch.11100)	Replaced
	Pedestrian subway at Cefn Coed-y-Cymmer	Re-routed
River crossings	Taf Fechan (Ch.11500)	Widened, 130m long
	Taf Fawr (Ch.10800)	Maintained
		New Taf Fawr crossings for main carriageway and slip road, 190m, 170m long
Major Structures	Pant Viaduct,130m	Replaced
	Taf Fechan Viaduct, 130m	Symmetrical widening
	Taf Fawr viaduct, 140m	Maintained
		Two underbridges (50m length) at Dowlais Top to be constructed (Ch.16100 and 16000)
		Two new viaducts at Taf Fawr for main line and slip road, 190m, 170m
Surface water outfalls	Gurnos Quarry (Ch.12400)	Unnamed watercourse (Ch.12800)
	Taf Fechan (Ch.11500)	Taf Fechan
		Taf Fawr (Ch.10800)
Overhead electric line crossings	33kV crossing at Lower Reservoir (Ch.15400)	Unaffected
	33kV and 132kV crossing at Gurnos (Ch.11900)	Both lines altered
Speed limit	60mph	70mph (120kph design speed)
Lighting	Lit along entire length	Unlit lengths would be considered for lighting; remainder lit.*
Lay-bys	6	4
Bus stops	None	None

*Note, it is now considered likely that only junctions would be lit.

Section 6 – Junction with A470 to Hirwaun

Section 6 runs between the A470 Junction and Hirwaun, partly as an off-line widening to the south and on-line widening. The vertical alignment would be similar to that of the existing A465 as far as Ch.9000, where it would drop into a deep cutting as far as Baverstock. The widening will include:

- on-line widening to the south as far as Ch.7500;
- off-line widening to the north as far as Nant Hir Ch.6900;
- crossing of Nant Hir with symmetrical widening;
- off-line to north as far as Ch.6100;
- parallel widening to south as far as Ch.5600;

- off-line to south as far as Ch.4800;
- parallel widening to south to old Trewaun Roundabout Ch.3300;
- off-line as far as Rhigos Roundabout at Ch.1500, before tying in to dual carriageway to the west at Ch.800.

Three new junctions would be provided at Baverstock, Hirwaun and Rhigos. In addition, a climbing lane is proposed westbound from the A470 Junction westbound merge slip road towards Baverstock. Details of Section 6 are provided in Table A.2.

Table A.2: Section 6 –A470 Junction to Hirwaun between Chainage 0 - 10,100 (taken from Tables 5.10 and 5.11 of the 1997 ES)

Highway design feature	Existing highway	Historic design features (1997 design)
Carriageway	Three-lane wide single carriage-way until Rhigos Roundabout; West of Rhigos Roundabout two lane dual carriageway	Two-lane dual carriageway
Major cuttings	None	Baverstock cutting to east of junction (25m) (Ch.9000-Ch.7800)
		West of Nant Hir (15m on northwest side) (Ch.6600-6100)
		Either side of Hirwaun Roundabout 800m long (Ch.3500-2500)
Major embankments	None	Carrying main line over Rhigos Junction (10m) (Ch.2000-1400)
Junctions	Baverstock: at-grade junction (Ch.8400)	Grade-separated junction
	Swansea Road A4102 T-junction (Ch.9400)	To be stopped up
	At-grade junction with B4018 (Ch.4600)	Replaced by overbridge
	Hirwaun: at-grade roundabout	Local road at-grade roundabout: grade-separated from main carriageway
	Rhigos: at-grade roundabout	Grade-separated junction
	Tower Road T-junction (Ch.2200)	Access to be linked to Rhigos Junction
Accesses	Tyn-y-Coedcae Farm access T-junction (Ch.9300)	Access to be provided from Baverstock Junction
	Residential accesses close to Hirwaun Roundabout	Accesses provided by new local road layout
	Agricultural access (Ch.2900)	Severed by off-line lengths of proposed scheme
Road crossings	Coed Meurig underpass (Ch.10100)	To be stopped up
	Access track to Nant Moel Res-ervoir (Ch.6300)	Relocated (Ch.6200)
	Nant Moel Farm underpass (Ch.5200)	Re-routed under Nant Melyn Viaduct
	Mineral railway (Ch.4400)	Extended
	Pen-y-Waun underpass (Ch.3500)	Extended
	Agricultural underpass at Afon Cynon (Ch.4100)	Demolished, access diverted
	Tower Road footbridge (Ch.2300)	Brecon Road and old A465 overbridge at Hirwaun Roundabout
River crossings	Nant Ffrwd viaduct (Ch.10300	New Nant Ffrwd viaduct from main carriageway
	Nant Hir Reservoir (Ch.6700)	Widened
	Nant Melyn (Ch.5400)	New structure
	River Cynon (Ch.3800)	Widened
Major Structures	Nant Ffrwd viaduct	New Nant Ffrwd viaduct from main carriageway
	Nant Hir Reservoir viaduct (Ch.6700)	Widened
	Nant Melyn viaduct (Ch.5400)	Replaced - different location
	River Cynon bridge (Ch.3800)	Widened Retaining walls at Hirwaun Roundabout on either side of main line (Ch.3300-3100)
Speed limit	60mph	70mph (120kph design speed)
Lighting	Lit in east, unlit in west	Unlit lengths would be considered for lighting; re-mainder lit. *
Lay-bys	7	6
Bus stops	None	None

*Note, it is now considered likely that only junctions would be lit.

Appendix B. May 2016 DCfW Second Review Jacobs Submission Document

See following page.

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Welsh Government

A465 Heads of the Valleys Dualling - Sections 5 and 6 - Dowlais Top to Hirwaun

Design Commission for Wales
Second Review Submission Document

4th May 2016

Contents

1. Introduction

1.2 Background

Poor transport links are a longstanding issue for the A465 'Heads of the Valleys' road. Issues relate not only to links with other parts of Wales and the UK, but also the quality of access within the Heads of the Valleys area itself.

The Welsh Government has been undertaking work to upgrade the A465 between Abergavenny and Hirwaun since the proposals were first presented in the early 1990s. The overall objectives of the project were to upgrade the 3-land single carriageway road into a dual carriageway with a requirement for all junctions to be grade separated. The purpose of this work is to facilitate the economic regeneration of the Heads of the Valleys Area by improving accessibility, reducing journey times and improving journey time reliability. The design standards of the road will be improved, and this will enhance road safety.

In order the progress the scheme in a number of phases the scheme was split into six sections, these are:

- Section 1 - Abergavenny to Gilwern;
- Section 2 - Gilwern to Brynmawr;
- Section 3 - Brynmawr to Tredegar;
- Section 4 - Tredegar to Dowlais Top;
- Section 5 - Dowlais Top to A470 Junction; and
- Section 6 - A470 Junction to Hirwaun.

Section 4 was completed first and opened in 2004 with Section 1 opening in 2008 and Section 3 opening in 2015. Section 2 is currently under construction. The scheme now being presented includes the final two sections and runs between Dowlais Top and Hirwaun.

1.3 Section 5 and 6 Objectives

The unimproved length of the A465 between Dowlais and Hirwaun was constructed in the 1960s. It does not deliver the quality of service required of this important strategic trunk route and is below current design standards in place. It is primarily a three lane carriageway generally with two lanes in the uphill direction and one in the downhill direction.

Traffic flows are restricted by the roads width and layout together with the at-grade junctions and limited opportunities for safe overtaking. Problems associated with the current road include:

- Higher than average accident numbers
- Higher than average severity of accidents
- Traffic congestion in particular at peak times
- Poor journey reliability
- Difficult access from side-road junctions
- Difficulties in undertaking road maintenance
- Poor links for pedestrians, equestrians and cyclists resulting in restricted connectivity and severance of a number of local communities

All of the problems are expected to worsen over time as traffic volumes increase leading to:

- Higher journey times
- Reduced speeds

- Reduced journey time reliability; and
- And increased rate of traffic

The scheme-specific objectives for Sections 5 and 6 are a combination of the overall objectives for the A465 Dualling project from Abergavenny and Hirwaun, on which the 1999 Line Order was based, and additional objectives reflecting subsequent changes in policy since the original objectives were developed

- Reduce journey times for private and commercial road users;
- Facilitate economic regeneration;
- Bypass congested towns and villages;
- Enhance road safety and reduce casualties;
- Deliver a scheme that is sustainable;
- Promote cycling and walking and provide opportunities for healthy lifestyles;
- Deliver a scheme which minimises future maintenance requirements and disruption to the network;
- Reduce journey time variability and improve resilience on the A465;
- Use the A465 to manage traffic effectively and improve resilience on the strategic road network in South East Wales;
- Ensure all of these objectives are met with due consideration given to the impact on the environment.

1.4 Jacobs commission

Jacobs have been commissioned by Welsh Government to:

- Undertake a period of optioneering to review the historic (1997) design with a view to identifying improvements to be made to the scheme to be developed.
- Complete the outline design and Environmental Impact Assessment for the project to enable publication of the draft Orders.
- Prepare all documentation required for the publication of draft Orders.
- Prepare the Outline Business Case for the project including any liaison required with stakeholders to understand the construction, operation and maintenance implications of project options.
- Progress the project through the Statutory Process.
- Provide technical support to the Employer in all stages of the procurement and appointment of the SPV.
- Take on the role of Employer's Lead Advisor and liaise with other advisors appointed by the Employer.

The project program which Jacobs are currently working towards remains unchanged to that presented in the original DCFW Submission Document submitted in February 2016.

Jacobs continues to be supported by Nicoll Russell Associates who are providing Aesthetic Advisory services for design of scheme structures.

2. Consultation

2.1 Design Commission for Wales

The Design Commission for Wales are a key consultee in respect of development in Wales. An initial design review was held by DCFW with the project team on 18 February 2016. DCFW issued a report to the project team on 3 March 2016, which summarised the design review and outlined key issues and geographical areas that should be considered as the design progresses. The Design Review Report lists a number issues that should be considered at a future Design Review workshop.

- Explanation and examples of how design is being informed by understanding of landscapes and the interfaces with routes across the A465;
- How lessons learnt from previous sections of the A465 have been used;
- Work in progress on design of structures;
- Baverstock Junction options modelled;
- Drainage / attenuation pond strategies; and
- Community connections identified and mapped.

Further to a constructive and informative initial review the project team are happy to accept an invitation from DCFW to participate in a second design review on the 19 May 2016. It is envisaged that this will take the form of an interactive workshop with the project team.

The purpose of this document is to provide the DCFW panel with a short update on project progress ahead of the second design review as well as outlining the material which will be presented on the day. The content of this report and the presentation to be given on the 19 May will build upon the original Design Commission for Wales Submission Document submitted in February 2016.

Amongst other documents a copy of draft scheme General Arrangement Drawings are provided in Appendix A. These scheme proposals were presented to the Welsh Government client in April 2016. It is anticipated that a further revision to these General Arrangement Drawings will be available by the date of the second design review and paper copies of these will be provided at the workshop.

2.2 Wider Project Consultation

As required under the commission and in accordance with good practice, consultations have been held with the public as well as statutory and non-statutory bodies throughout design development. This consultation has covered a broad range of topic areas and has resulted in changes to the scheme through the design evolution. Table 1 (below) provides details of meetings held with various consultees and advisors since Jacobs became involved in the scheme development in October 2015.

Table 1: Record of Public Consultation Meetings

Meeting	Date	Attendees
Public Information Exhibition 1 (St Lleurg Church Hall)	07/12/2015	WG, Jacobs, Public
Public Information Exhibition 2 (Cefn Coed Community Centre)	08/12/2015	WG, Jacobs, Public
Public Information Exhibition 3 (Dowlais Community Centre)	11/12/2015	WG, Jacobs, Public
Public Information Exhibition 4 (Cefn Coed Community Centre)	12/12/2015	WG, Jacobs, Public

Table 2: Record of Statutory Body Consultation Meetings

Meeting	Date	Attendees
Environmental Liaison Group 1	01/12/2015	WG, Jacobs, NRW, BBNP Authority, MTCBC, SWTRA, Blaenau Gwent CBC, CCBC, RCTCBC
Merthyr Tydfil County Borough Council Engagement Technical Working Group	01/12/2015	WG, Jacobs, MTCBC
Rhondda Cynon Taff County Borough Council Engagement Technical Working Group	03/12/2015	WG, Jacobs, RCTCBC
Caerphilly County Borough Council Engagement Technical Working Group	04/12/2015	WG, Jacobs, CCBC
Landscape Technical Working Group	19/01/2016	WG, Jacobs, NRW, BBNP Authority, RCTCBC
Flood risk, structures and highway design Technical Working Group	27/01/2016	WG, Jacobs, NRW, MTCBC, RCTCBC
Marsh Fritillary Butterfly Mitigation Technical Working Group	03/02/2016	WG, Jacobs, NRW, RCTCBC, MTCBC
Marsh Fritillary Butterfly Technical Working Group	09/03/2016	WG, Jacobs, Butterfly Conservation
Environmental Liaison Group 2	29/03/2016	WG, Jacobs, NRW, BBNP Authority, CADW, MTCBC, SWTRA, CCBC

Table 3: Record of Non-Government Organisation Consultation Meetings

Meeting	Date	Attendees
Design Commission for Wales Scoping Technical Working Group	15/12/2015	Jacobs
RCTCBC Local Access Forum	26/02/2016	Jacobs, RCT Local Access Group
MTCBC Local Access Forum	26/02/2016	Jacobs, MTCBC Local Access Group
Sustrans	22/02/16	Sustrans, Jacobs
Briars Bridleway	22/02/16	Briars Bridleway, Jacobs
Marsh Fritillary Butterfly Technical Working Group	09/03/2016	WG, Jacobs, Butterfly Conservation

Table 4: Record of Statutory Undertaker Meetings

Meeting	Date	Attendees
Western Power low voltage	02/02/16	Jacobs, WG, Western Power Distribution
Dwr Cymru Welsh Water	03/02/16	Jacobs, WG, Welsh Water
BT Openreach	09/02/16	Jacobs, WG, BT
Wales and West Utilities (Gas)	12/02/16	Jacobs, WG, Wales and West
Western Power high voltage	16/02/16	Jacobs, WG, Western Power Distribution
National Grid High Pressure Gas and High Voltage Meeting	25/02/16	Jacobs, WG, National Grid

Table 5: Record of Internal/Client Consultation Meetings

Meeting	Date	Attendees
Optioneering Workshop	22/10/2015	WG, Jacobs, Roadbridge
Environmental Technical Working Group	28/10/2015	WG, Jacobs
Stakeholder Engagement Technical Working Group	04/11/2015	WG, Jacobs
Interactive Planning/Risk/Partnering Workshop	05/11/2015	WG, Jacobs, Roadbridge
Traffic Technical Working Group	11/11/2015	WG, Jacobs
Lands and Orders Technical Working Group	13/11/2015	WG, Jacobs
Environmental Design Technical Working Group	18/11/2015	Jacobs
Structures Technical Working Group	19/11/2015	WG, Jacobs
Buildability Technical Working Group	02/12/2015	WG, Jacobs
Design Commission for Wales Scoping TWG	15/12/2015	Jacobs
Programming Workshop	06/01/2016	Jacobs
Risk Workshop	06/01/2016	Jacobs
Structures/Landscape Workshop	07/01/2016	Jacobs
Land Quality/Ground Investigation Technical Working Group	13/01/2016	WG, Jacobs, NRW
A465/A470 Junction Meeting with WG	29/01/2016	WG, Jacobs
Traffic Technical Working Group	03/02/2016	WG, Jacobs
SWTRA and Network Management - O&M	03/02/2016	WG, Jacobs, SWTRA, Network

Meeting	Date	Attendees
		Management
Design Coordination Meeting	08/02/2016	WG, Jacobs
Buildability Workshop	08/02/2016	WG, Jacobs, Roadbridge
Topographical Survey Meeting	15/02/2016	Jacobs
Drainage Design Technical Working Group	02/03/2016	Jacobs
Hazard Elimination and Risk Reduction Meeting	07/03/2016	Jacobs
Design Coordination Meeting	08/03/2016	Jacobs
Buildability Session	15/03/2016	WG, Jacobs, Roadbridge
Design Hazard Log Meeting	21/03/2016	Jacobs
Construction Risk Workshop	22/03/2016	WG, Jacobs
Traffic Technical Working Group	06/04/2016	WG, Jacobs

3. Highway Design Philosophy

3.1 Review of the Proposed Design

The scheme is part of the Trans European Road Network and is a Rural All-Purpose Dual 2-Lane Carriageway (D2AP) with a grade separated junction strategy as illustrated and defined by the Made Line Order. The 1997 Design is nearly twenty years old, as a result, objectives, legislation, standards, and challenges are different now to what they were then.

3.2 Review of 1997 Design Compliance with Current Design Standards

The A465 Section 5 & 6 1997 Design was developed in accordance with the design standards current at the time prior to the 1998 Public Local Inquiry.

A review of the 1997 Design's compliance with the DMRB standards current at Invitation to Tender has identified departures and further relaxations that have arisen, largely as a result of changes to design standards since 1998.

3.3 Key findings of the review of the 1997 Design are:

- **Mainline:** Review of the 1997 Design geometrical alignment presented very little difference in terms of the compliance with current standards as the Highway Link Design standard TD 9, has not changed in the intervening period. Notwithstanding this there were a number of Departures that were incorporated into the 1997 design, that are still applicable in the current design proposals.
- **Junction Layout (junction type):** Current design standards base the selection of junction type on predicted traffic flows. The Conceptual Design junction layouts satisfied the standards applicable at the time of development. These comprised standard Type A layouts with single lane merge and diverge connections. The current predicted traffic flows have identified additional demand at the A470 / A465 intersection resulting in two- lane diverge configuration both east and westbound.
- **Junction Weaving Length:** Review of the 1997 Design junction separations in the context of current standards, indicates that the separation is less than the required 1km mandatory Desirable Minimum between Dowlais and Galon Uchaf. In this context, the 1997 Design lay-bys are now treated as junctions, hence all layby locations currently being proposed are likely to be affected. In 1998 the required minimum junction separation was 450m and the design complied with the current standards at the time.
- **Lay-bys – position and layout:** The 1997 Design layby locations no longer comply with standards in respect of sighting distance relative to other highway features. Lay-bys are now treated a junctions and therefore must be sited a minimum of 1km from other [grade separated] junctions. In addition, current standards state that for a dual carriageway road with a speed limit greater than 40mph, laybys should be provided with merge tapers to assist traffic re-joining the main carriageway. The 1997 Design (Type A) lay-bys omit the merge taper. As stated above laybys are now defined as 'Junctions', this introduces other restrictions in terms of siting namely weaving. Provision of laybys will ultimately require Departures wherever they are positioned within the current proposals.

3.4 Development of the Proposed Design

The proposed Alignment and Junction Strategy Report for the scheme is currently in draft format. The route and the junction strategy have been modified and changes implemented compared to the Made Line Order. These changes are presented at Section 8 of this document. The current proposals for the A465 Section 5 & 6 Dualling are based upon subsequent development of the original 1997 Design to add value in respect of the scheme objectives. They also reflect the feedback received during engagement with the Local Highway Authorities and comments received as part of the Public Information Exhibition (PIE) process.

3.5 Design Approach for Mainline and Junctions

The design methodology adopted was to follow the corridor and connectivity as published in the Made Line Order. There is very little scope to be able to realign the mainline alignment, hence the design almost replicates the 1997 Design.

The engagement with the Local Highway Authorities and feedback from the PIE has resulted in the introduction of a new junction at Croesbychan and the combination of the 1997 Galon Uchaf and Gurnos junctions into a full movement junction in the vicinity of Galon Uchaf.

All junctions are grade separated in keeping with the objectives to develop this route as part of the Trans European Road network and secure its future as a strategic long distance highway corridor rather than a local / regional distributor / connector road.

In minimising the number of direct accesses along the route, it improves journey time reliability and increases resilience on the network.

3.6 Design Standards

The following Design Manual for Roads and Bridges (DMRB) design standards that have been applied in the design development and preparation of the geometrical alignment and junction strategy. These are the major standards applicable, but should not be regarded as an exhaustive listing;

- TD 9/93 Highway Link Design
- TD 27/05 Cross Sections and Headrooms
- TD 22/06 Layout of Grade Separated Junctions
- TD 16/07 Geometric Design of Roundabouts
- TD 69/07 The Location and Layout of Lay-bys and Rest Areas
- TA 57/87 Roadside Features
- TA 90/05 The Geometric Design of Pedestrians, Cycle and Equestrian Routes

3.7 Design Speed

The A465 Sections 5 & 6 Dualling have been designed with a 120kph design speed (Band B) based upon the implementation of a 70mph signed speed limit for the entire length of the scheme from Dowlais Top to Hirwaun.

3.8 Highway Cross Section

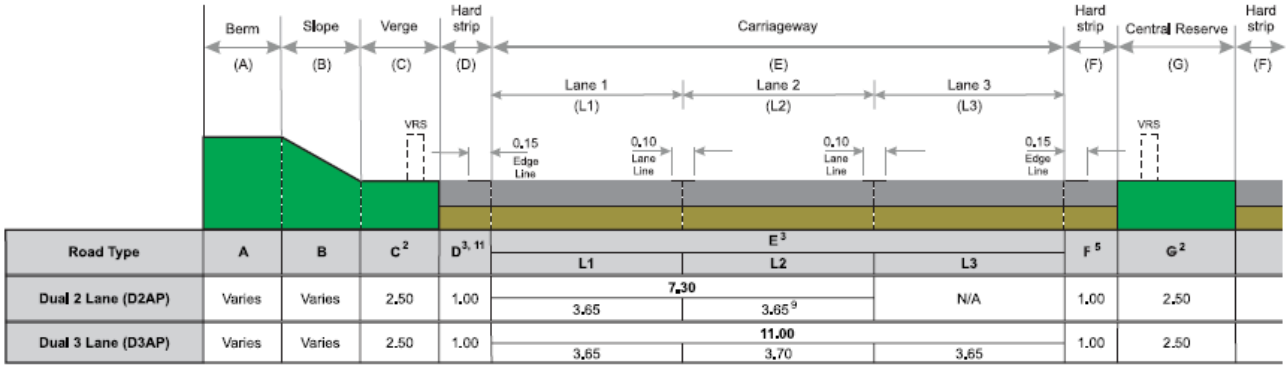
Sections 5 and 6 have contrasting characteristics with differing constraints. Section 5 from Dowlais to the A470 is significantly constrained by established communities and the built environment immediately north and south of the A465. Section 6 from the A470 to Hirwaun has a more open and rural characteristic, with challenging topography.

These constraints have had a fundamental influence on choice of the original line of the scheme and the current junction configuration presented in these proposals. The resultant scheme is effectively an online improvement, which follows the line of the existing A465 highway corridor with the exception of a few minor offline / parallel sections.

The route does not lend itself to minimising cross sectional widths, due to the bendiness of the horizontal alignment and need to achieve and provide a high level of visibility. Whilst the majority of the cross sectional components of the highway cross section meet with the minimum standards required for a D2AP, the constraints imposed do not allow sufficient widening to accommodate other key highway design aspects.

The central will comprise a high containment Vertical Concrete Barrier (VCB) as part of the Road Restraint System. This will provide long term benefits in terms of whole life cost, with regard to maintenance and end of life replacement costs. In reduces the risk of cross over accidents and total breach of the central reserve barrier and it reduces the exposure of risk to the maintaining workforce.

The proposed Rural All- Purpose Dual 2-Lane (D2AP) highway cross section is as shown in the following extract from TD 27;



Road Type	A	B	C [2]	D [3, 11]	E [3]			F [5]	G [2]
					L1	L2	L3		
Dual 2 Lane (D2AP)	Varies	Varies	2.50	1.00	7.30		N/A	1.00	2.50
					3.65	3.65 [9]			
Dual 3 Lane (D3AP)	Varies	Varies	2.50	1.00	11.00			1.00	2.50
					3.65	3.70	3.65		

Dual Carriageway

3.9 Relaxations and Departures from Standard

The existing A465 corridor alignment is geometrically tortuous due to the constraints mentioned previously, including unavoidable pinch points.

The approach with regard to compliance that has been applied to the proposed design and resultant scheme footprint, adopts the following hierarchy;

i). Fully Compliant
ii). Introduction of Permissible Relaxations
iii). Incorporation of Departures from Standard

With each reduction in hierarchy comes a step reduction in standards and ultimately a reduction in the scheme impact.

Due to the number and proximity of junctions on Sections 5 & 6 of the A465 there is a significant length of the geometrical alignment that would prohibit the use of permissible relaxations.

As a result, most of the permissible relaxations on the immediate approach to or in the vicinity of a junction, relate to a 1 Step Reduction below Desirable Minimum SSD or a combination of a 1 Step Reduction below Desirable Minimum SSD with a 1 Step Reduction below Desirable Minimum Horizontal Radius. Due to the proximity of the junctions these constitute Departures from Standard.

The majority of the Departures are attributable to;

a) A reduction in Desirable Minimum SSD on the immediate approach or in the vicinity of a junction (Usually not less than 1 Design Speed Step i.e. 215m)
b) Location of Layby
c) Weaving Length

4. Optioneering

In accordance with the Scope of the commission a period of optioneering was undertaken to review the historic scheme design (1997) with a view to identifying improvements to the scheme to be carried forward into design development.

All options examined during optioneering were appraised using the principles of WelTAG, and the focus of the optioneering was around improvements to junctions.

The optioneering phase fully considered current design standards, legislation, environmental constraints, the scheme Transport Planning Objectives (TPOs) and changes in land use since publication of the draft Line Orders.

The optioneering was undertaken in 5 phases, namely:

- Phase 1: Option Management – To review existing options and to identify, appraise and sift additional potential options.
- Phase 2: Option Assessment – To review, assess, and prioritise options prior to further development.
- Phase 3: WelTAG Stage 1 Appraisal – To qualitatively appraise options in accordance with a Stage 1 WelTAG Appraisal.
- Phase 4: Recommended Mainline Design – To present the dominant link and junction options alongside the Preferred Route to form the Mainline Design.
- Phase 5: Approval – To seek Welsh Government approval on the recommended options for inclusion into the Mainline Design.

A total of 68 different options were assessed at the various phases of optioneering. The results of the optioneering, in the context of the 1997 design, are summarised in table 6 on the following page.

Table 6: Optioneering Recommendations

Junction	Chainage	Optioneering Recommendation
Rhigos/Hirwaun	1800	To proceed with the 1997 design.
Trewaun	3200	To proceed with the 1997 design including a minor shift in roundabout location (circa 40m to the south west).
Croesbychan	5100	To include dumbbell type junction arrangement (not shown on 1997 design).
Llwydcoed	6300 - 7800	To proceed with the 1997 design (crematorium road to tie in to Baverstock junction).
Baverstock	7800	To proceed with the 1997 design, with the additional provision of a connection to Swansea Road.
Swansea Road	7800 - 9600	To proceed with the 1997 design - with the extension of Swansea Road to run parallel to the Mainline for tie into the Baverstock Junction.
A470 / A465 Interchange	10600	To proceed with the 1997 design.
Gurnos	1300	To omit this half junction and provide a full movement junction at

		Galon Uchaf.
Galon Uchaf	13800	Full movement junction recommended for inclusion to replace the 1997 Scheme split (Gurnos/Galon Uchaf) junction provision. It is advised that the northern link into Pant Industrial Estate be revised to retain access into industrial units and playing fields.
Dowlais Top	16100	To proceed with the 1997 design.

It is important to note that following the optioneering review, the proposed junction layouts have been examined in more detail (in conjunction with the client) in order to arrive at the preliminary design shown on the drawings in Appendix A.

In April 2016 a further billability review workshop was carried out to ensure that the preferred options were still the most appropriate option.

5. Non-Motorised Users

Provisions for non-motorised users (NMU's) are being identified, assessed and recorded in an NMU Context Report. The purpose of the NMU Context Report will be to provide the Design Team and Project Sponsor with the necessary information to take appropriate decisions on design elements that may affect NMUs and to assist them in meeting the needs of NMUs within the scheme design, where NMUs are considered to be:

- Pedestrians
- Cyclists
- Equestrians

The report will set out the opportunities and objectives to improve conditions for NMUs.

The report is being written in accordance with the requirements of DMRB HD42/05 'Non-Motorised User Audits'. The report is being written based on meetings with and information provided by relevant authorities and organisations together with a desktop study of OS and web based maps, relevant government policies and action plans.

To identify issues affecting NMUs, consultation has been conducted with the Local Access Forums and also directly with the following statutory bodies:

- Merthyr Tydfil County Borough Council;
- Rhondda Cynon Taf County Borough Council; and
- Caerphilly County Borough Council.

Additionally, the following non-governmental organisations were consulted:

- Sustrans;
- Briars Bridleways (affiliates of the British Horse Riding Society); and
- Merthyr Valley Ramblers.

The tables on the following pages summarise some of the issues raised at each of the above consultations.

Issues raised by Merthyr Tydfil County Borough Council
• MTCBC are keen for the design development to consider Public Rights of Way (PRoW) which were stopped up as a result of constructing the existing A465, back in the 1960s. • To improve road safety the design should incorporate alternative routes and safe crossing points on the A465 between Pant and Dowlais. • MTCBC have provided drawings showing Walking and Cycling /Active travel / Safe Routes In Communities schemes which are either ongoing or proposed or desired in the vicinity of the A465 to improve NMU connectivity and provision between Pant and Dowlais. • Gaps exist in the cycle route between Swansea Road and Baverstock and every effort should be made to re-establish the link between the cycle routes to provide a safe zone for cyclists alongside the A465 connecting to RCTCBC's networks. • MTCBC have land agreements in place at Cefn Cemetery which may be affected by initial design. • School children are climbing over the safety barrier and using the A465 Taf Fechen Viaduct as a route to access Pen Y Dre High School school. This issue that needs to be addressed in the scheme development. • PRoWs located at Galon Uchaf Junction should be reviewed to ensure safe passage for pupils attending Pen Y Dre High School.

Issues raised by Rhondda Cynon Taff County Borough Council
• There are issues with connectivity of industrial areas and several housing estates. • NMU routes will be required to access the Tower Colliery Development. • RCTCBC would like current cycle routes to be improved at Trewaun and Hirwaun.

Issues raised by Caerphilly County Borough Council
• There is a gap in the cycle link between Dowlais and Caerphilly. Users are forced to merge on to the existing Common Road until Rumney junction. CCBC would welcome a provision for cyclists to avoid using the road, which is in poor condition and is used by local businesses for access to properties and HGVs travelling to Biffa Waste Services. • CCBC expressed concern over the number of pedestrians crossing the existing A465 at Dowlais Reservoirs.

Issues raised by Sustrans
• The construction of this road represents a once in a lifetime chance of building good walking and cycling infrastructure in an area with difficult topography and it should not be missed. This approach will of course take more land and this has been raised as an issue in the past with the inspector at a public enquiry. However any inspector will now have to take into account the Active Travel Act (ATA). • Design of routes should be in accordance with the Welsh Government Active Travel Design Guidance. In particular they should consider directness, coherence, safety, comfort and attractiveness. • A new route from the Rhigos junction into Hirwaun could be created, mainly following the alignment of the existing NCN46 but also using the section of the existing A465 at Hirwaun which will be bypassed as part of the scheme. The existing footbridge over the A465 is a maintenance liability and is not up to active travel standards so it could be removed and replaced with an at-grade crossing when the route is detrunked. • The main NCN46 route could be diverted to follow alongside the new A465 alignment around Hirwaun and on to Baverstocks with local links into Hirwaun at the Rhigos roundabout, the PRoW along the access to the wind farm, the A4059 underpass, the NCN478 Cynon Trail, the B4018, Nant Hir reservoir and Llwydcoed crematorium. • A shared use path should be constructed alongside the A465 to provide the missing link in the NCN46 between Baverstocks and Swansea Road. • The works to the A465 in Cefn-coed-y-cymmer present an opportunity to provide a diverted Taff Trail route avoiding the existing poor infrastructure of the Taff Trail route immediately south of the A465. • An ATA Safe Route in the Community (SRIC) link could be provided from the Taff Trail to Gurnos Ring Road, Prince Charles Hospital, Peny-y-Dre High School and to the Morlais Heritage Trail. • Walking and cycling measures need to be implemented across the junction leading to Pant Industrial Estate. • A route from Pen-y-wern should be constructed alongside the A465 to connect to the proposed NMU bridge at Dowlais. This would overcome the steep gradients on the existing NCN46 which do not meet ATA standards. • A shared use path should be constructed alongside the north side of A465 to provide the missing link in the NCN46 between Dowlais Top and Gypsy Castle.

The findings of the NMU context report and the issues raised at each of the consultations (above) are currently being further assessed and were the subject of a technical working group on the 20 April 2016. The aim of the technical working group was to determine the specific NMU provisions to be carried forward into the design.

An initial indication of the routes proposed for inclusion has been superseded by Chapter 15: Effects on All Travellers in Volume 1 of the Environmental Statement issued in July 2017 and so have not been provided in Appendix B.

A summary of the NMU Context Report and its proposed will be given at the second design review on the 19 May 2016.

6. Preliminary Design Proposals and Changes from the 1997 Design

Following completion of optioneering and in conjunction with the client, further design development was carried out at which point proposals were further assessed in terms of impact to the existing natural and built environment, compliance with design standards and the viability of junctions in accordance with anticipated traffic flows.

Further design development also considered the results of various consultations held including the public information exhibitions.

This activity resulted in a number of design changes being incorporated "post optioneering". Table 7 provides an indication of any changes in design that have occurred since optioneering was carried out and briefly describes the junction provisions included in the preliminary design proposals.

Table 7: Summary of Design Development

Junction	Chainage	Optioneering Recommendation	Preliminary Design Proposal
Rhigos / Hirwaun	1800	To proceed with the 1997 design.	As optioneering. Fully grade separated gyratory type arrangement with links to Rhigos Road, A4059, the de-trunked existing A465 and Tower Road.
Trewaun	3200	To proceed with the 1997 design including a minor shift in roundabout location (circa 40m to the south west).	As optioneering. East – West link between Hirwaun Road and Brecon Road maintained. No direct access on to the A465 provided. Existing windfarm access from the de-trunked A465 has been maintained.
Croesbychan	5100	To include dumbbell type junction arrangement (not shown on 1997 design).	As optioneering. East – West link between Court Farm and Cwmynysminton Road provided. Grade separated, dumbbell arrangement included to provide direct access onto the A465.
Llwydcoed	6300 - 7800	To proceed with the 1997 design (crematorium road to tie in to Baverstock junction).	As optioneering. No direct access to the A465 provided. Crematorium Road to tie in to the A465 at Baverstock.
Baverstock	7800	To proceed with the 1997 design, with the additional provision of a connection to Swansea Road.	As optioneering. Fully grade separated dumbbell type arrangement to provide direct access on to the A465 as well as links to Crematorium Road, Swansea Road and Merthyr Road. Geometry of roundabouts and links improved from the 1997 design to provide more favourable gradients.
Swansea Road	7800 - 9600	To proceed with the 1997 design - with the extension of Swansea Road	As optioneering. Link to Baverstock provided.

		to run parallel to the Mainline for tie into the Baverstock Junction.	
A470 / A465 Interchange	10600	To proceed with the 1997 design.	As optioneering. Fully grade separated dumbbell type arrangement.
Cefn Coed	11200	To proceed with the 1997 design.	Direct access to the A465 omitted for safety reasons (proximity to the A470 interchange).
Gurnos	1300	To omit this half junction and provide a full movement junction at Galon Uchaf.	As optioneering. Gurnos junction omitted based on WelTAG assessment. Full movement junction provided at Galon Uchaf (below).
Galon Uchaf	13800	Full movement junction recommended for inclusion to replace the 1997 Scheme split junction provision. It is advised that the northern link into Pant Industrial Estate be revised to retain access into industrial units and playing fields.	As optioneering. Fully grade separated dumbbell type arrangement with links to the Gurnos Ring Road, Pant Industrial Estate (Bryniau Road) and Rocky Road. Additional roundabouts provided where on/off slip-roads tie in to the existing road network.
Dowlais Top	16100	To proceed with the 1997 design.	As optioneering. Fully grade separated tying in to the existing gyratory arrangement.

Since the Design Review in February 2016 further work on the design has been undertaken. This work includes:

- Design development and iteration;
- Refinement of all preferred junction options;
- Development of Baverstock cutting horizontal and vertical alignment to achieve earthworks balance for entire scheme;
- Buildability review of all structures options to inform design; and
- Environmental team and SEB inputs to design

Jacobs intends to present further information regarding these design changes at the Design Review workshop on the 19th May 2016. This presentation will include a 3D physical model of the Baverstock junction.

7. Lessons Learnt from other sections of the A465 Improvements

Due to the A465 highways improvements having been undertaken in separate sections it has been possible to incorporate lessons learnt from earlier sections into the design of Sections 5&6.

Key lessons learnt are:

- Public Information Exhibitions early in the preliminary design stage were invaluable in identifying key issues. These were brought forward by a month for Sections 5&6 so that issues could be taken into account at the optioneering stage of design;
- Community benefits of maximising opportunities for integration and improvement of non-motorised users provision
- The experience of the road user in particular views from the road are very important in creating a positive impression of the area along the heads of the valleys with views to Blaenau Gwent having been enhanced in Section 3; and
- The success of creation of a rest facility with view point in enhancing user experience, something that was considered as part of this scheme but is not considered feasible.

8. Understanding the Landscape

The baseline landscape character of the area has been identified through site visits, reference to LANDMAP Geographic Information System and review of the relevant existing landscape character assessments. LANDMAP is the formally adopted approach to landscape assessments in Wales and is a landscape information resource where characteristics, qualities and influences on the landscape are recorded as five themed spatial layers. Geographically discrete areas are identified and mapped by their landscape qualities and characteristics. The five spatial layers are:

- Geological Landscape;
- Landscape Habitats;
- Historic Landscape;
- Visual and Sensory; and
- Cultural Landscape.

Reference has been had to the published Landscape Character Areas which have been identified by Natural Resources Wales. The scheme lies within two different LCAs: the Brecon Beacons and Black Mountains (NLCA30) and the South Wales Valleys (NCLA37).

The Brecon Beacons National Park Authority published a landscape character assessment covering the National Park in August 2012. Of the 15 Landscape Character Areas that were identified, four are either directly crossed by the scheme or are in its vicinity. These are Fforest Fawr, Waterfall Country and Southern Valleys, Talybont and Taff Reservoir Valleys, and Mynyddoedd Llangatwg and Llangynidr.

In addition, following consultation with both Merthyr Tydfil and Rhondda Cynon Taf County Borough Councils viewpoint locations have been agreed for the environmental assessment. These viewpoints take into account a wider landscape catchment and are in addition to the assessment of impacts on individual visual receptors, which is a long list of sites along the entire length of the scheme.

Key viewpoints recommended by landscape officer from Rhondda Cynon Taf County Borough Council at Landscape Technical Working Group meeting 19 Jan 2016:

- View from Mynydd-y-glog;
- View from Moel Penderyn and
- View from Hirwaun Common.

Key views received by e-mail from landscape officer at Merthyr Tydfil County Borough Council:

- View from A4060 to approaches to Dowlais
- Views looking to the Pant Industrial Estate, looking north
- Views towards Gurnos looking east (the Graig is visible here)

A number of site visits have been undertaken within the Study Area, which has informed the development of the mitigation design and is informing the landscape and visual assessment of the scheme.

Further information regarding this work will be provided at the workshop on the 19th May 2016.

9. Environmental Impact Assessment and Environmental Masterplan

It has been determined by the Welsh Government that the A465 Section 5 & 6 scheme is a relevant project within Annex II to Council Directive 85/337/EEC ("the Directive") as amended by Council Directive 97/11/EC and that it should be subject to an Environmental Impact Assessment (EIA) in accordance with the Directive. The Proposed Scheme is being taken forward under the Highways Act 1980.

At the time of writing this report the project team are currently undertaking EIA of the developing scheme. The ongoing assessment process is being used to inform scheme design and environmental mitigation. The results of the EIA are currently being used to inform the production of an Environmental Statement (ES).

Assessment of scheme landscape and visual impact will be included in the EIA. The ongoing assessment of landscape and visual impact is being used to inform ongoing highway, structural and environmental design. At the initial design review the DCFW panel expressed a specific interest in the identification of scheme visual receptors and the project teams approach to assess and mitigate impact. A detailed presentation of the findings of the landscape and visual assessment process to date will be given at the second design review on the 19 May 2016. An initial indication of key visual receptors is provided in Appendix F.

The ES is being produced in line with the guidance contained in the Design Manual for Roads and Bridges (DMRB) Volume 10 and Volume 11 and includes an emerging scheme Environmental Masterplan setting out the environmental proposals for the scheme. The Environmental Masterplan is being prepared using the methodology set out in Section 0 of DMRB Volume 10.

Informed by a thorough review of known environmental constraints a series of Environmental Design Principles have been jointly developed by the multi-discipline Environmental work stream and used to inform the environmental proposals set out within the Environmental Masterplan.

A465 Sections 5 & 6 Environmental Design Principles
Principle 1 – Minimise impact on existing marshy grassland habitats by minimising risk of drying out, whilst considering whole life cost of scheme
Principle 2 – Minimise impact on Ancient Woodland in close proximity of scheme - May involve minor change scheme alignment. -Possible use of retaining walls instead of sloped banks/embankments to be considered to reduce encroachment into Ancient Woodland. -Where Ancient Woodland removal is inevitable, soil to be re-used in appropriate locations adjoining retained Ancient Woodland. - Post Meeting Note: This may also apply to TPO vegetation.
Principle 3 – Where technically feasible and not entailing excessive cost, consider opportunities to enhance existing ecological connectivity Woodland, hedgerow – increase dispersal of ancient woodland plants.
Principle 4 – Aim to achieve an earthworks balance A – Buildability B – Movement C - Sustainability of material out e.g. If rock then reuse for construction. Possibility of gradual grading for screening then return to agriculture + get rid of spoil
Principle 5 – Minimise Habitat Loss from SINC's in close proximity to the scheme
Principle 6 – "Simple and Elegant" for structures

A465 Sections 5 & 6 Environmental Design Principles
Principle 7 – Minimise lighting on scheme as a whole, particularly viaducts over Taf Fawr and Taf Fechan Minimise lighting, avoid light spill General avoidance of lighting effects for the scheme as a whole, e.g. on National Park.
Principle 8 – Ensure structures design, facing and finishes provides integration to current vernacular balanced by whole life cost E.g. Dry stone/masonry walls. Look at natural stone cladding e.g. section 4 concrete quite ugly. Whole life cost analysis on section 4. Depending on localised geology, exposed rock faces may be appropriate.
Principle 9 – Maintain existing underpasses to maintain connectivity for wildlife and minimise habitat severance
Principle 10 – Provide linear landscape strips in areas where they currently exist, if appropriate, to re-integrate proposed scheme as per the existing highway planting
Principle 11 – Drainage avoid impacts regarding flooding and water quality. Where appropriate, minimise tree and shrub planting to create open, outward views from the scheme and integrate with existing upland landscape character
Principle 12 – Minimise flooding and water quality impacts Offline planting may be appropriate to provide screening, possibly combined with off line land take for ecology mitigation. If essential mitigation may have to be part of scheme land take. Otherwise consider as 'off-site' planting. Break out redundant carriageways and establish soft landscape or other treatment. Examine possibility of moving/relocating aqueduct feature if practical (precise nature of the feature currently unknown).

A working draft of the Environmental Masterplan based on the developing scheme have been superseded by the July 2017 version included within Volume 4 of the Environmental Statement and have not been included as Appendix C. It includes the landscape design themes and environmental mitigation measures. Jacobs will present further information regarding this Environmental Masterplan at the workshop on the 19th May 2016.

Once complete the Environmental Masterplan will form an essential part of the Environmental Statement and in time will help to inform the development of the Construction Environmental Management Plan (CEMP) and the Maintenance EMP when the constructed scheme is passed to the Trunk Road Agents for future maintenance and management.

10. Baverstock Junction

At the Design Review in February 2016 the Design Commission for Wales requested further information regarding the Baverstock Junction tbe presented at the second review. Since February further work has been undertaken on this junction, including further design engineering of the horizontal and vertical alignments needed to achieve the design principals for the road as well as achieving an earthworks balance for the entire scheme.

A 3D physical model of the proposed junction will be provided at the design review workshop on the 19th May 2016.

11. Drainage and Attenuation Ponds Strategy

The need for, and broad locational requirements for the drainage and attenuation ponds have been identified through the hard engineering and these locations are identified on the General Arrangement Drawings.

These ponds are now subject to further design input from both the landscape and ecological specialists. This design evolution will consider the following:

- Whether then ponds are typically dry or wet;
- The extent to which they can provide additional ecological habitats;
- The gradients of the ponds and their banks in order to place them in the landscape;
- Localised siting in the landscape;
- Safety concerns regarding falls into water (danger of drowning); and
- The need for, and types of fencing provided.

12. Structures, Landscape and Public Realm

At the initial design review 18 February 2016 the project team presented their emerging proposals for the design of structures and associated public realm along the scheme. Whilst the project teams focus since the initial design review has been to resolve the highway alignment a multi-discipline team consisting of Structural Designer, Architect and Landscape Architect has continued to develop proposals for the design of scheme structures and associated public realm along the scheme.

The project team continues to build upon the proposals made within the 'Strategic Approach to Aesthetics and Design of Structures' section of the presented in the original DCFW Submission Document submitted in February 2016.

This design process is very much ongoing and detailed presentation of design proposals for key scheme junction and structures will be provided will be given at the second design review on the 19 May 2016.

In the short term a Structures, Landscape and Public Realm Concept Diagram is presented at Appendix D and provides a summary of the project teams current intended design direction.

13. Street Lighting Strategy

The street lighting strategy has been formulated with two key considerations: cost and maintenance; and impacts on the night time landscape.

The existing A465 trunk road is partially lit with conventional High Intensity Discharge (HID) street lighting.

13.1 Economic Assessment

Through the comparison of the monetised benefits against the cost associated with the road lighting, it was found that it would not be economically worthwhile to provide any lighting on the upgraded A465 Heads of the Valleys Dualling (S5 & S6) scheme.

The proportion average of darkness Personal Injury Accident's between Hirwaun Junction to Dowlais Junction are greater than the national average. It is likely that the new alignment will contribute to the reduction of the existing PIA's without the need for providing lighting on the entire length of the scheme.

13.2 Compliance with TD34/07

Although the result of the TA49/07 economic assessment show that it is not economically worthwhile to provide lighting on the upgraded A465 Heads of the Valleys Dualling Section 5 & 6 scheme; in order to achieve compliance with TD34/07 'Design of Road Lighting for the Strategic Motorway and All Purpose Trunk Road Networks', CIE 115/2010 'Lighting of roads for motor and pedestrian traffic', and TD 22/06 'Layout of Grade Separated Junctions', the following recommendations are made:

(a) **Hirwaun and Dowlais Top grade separated Junctions shall be fully lit** with lighting to be provided on the mainline through the junctions and on the slip roads in accordance with the requirements of TD34/07 C.3.14 (iii) and TD22/06 C.5.35.

Lighting on slip roads, should extend to the end of the taper and the mainline lighting should continue for a further distance no less than 1.5 times the Desirable Minimum Stopping Sight Distance as defined in TD 9, i.e. at a speed of 70mph this equates to 442.5m.

The full length of the junctions' on/off-line elements connecting to existing lit roads shall be fully lit and lighting extended to tie-in with the lit sections.

(b) Lighting extents between Hirwaun and Dowlais Junctions shall be kept to a minimum due to environmental constraints.

Therefore, **Croesbychan, Baverstock, A470 and Galon Uchaf grade separated junctions shall be partially lit** with only the on/off-line conflict points lit in accordance with the requirements of TD34/07 C.3.14 (ii) and CIE 115/2010.

Lighting should not terminate closer to the conflict point than indicated as follows:

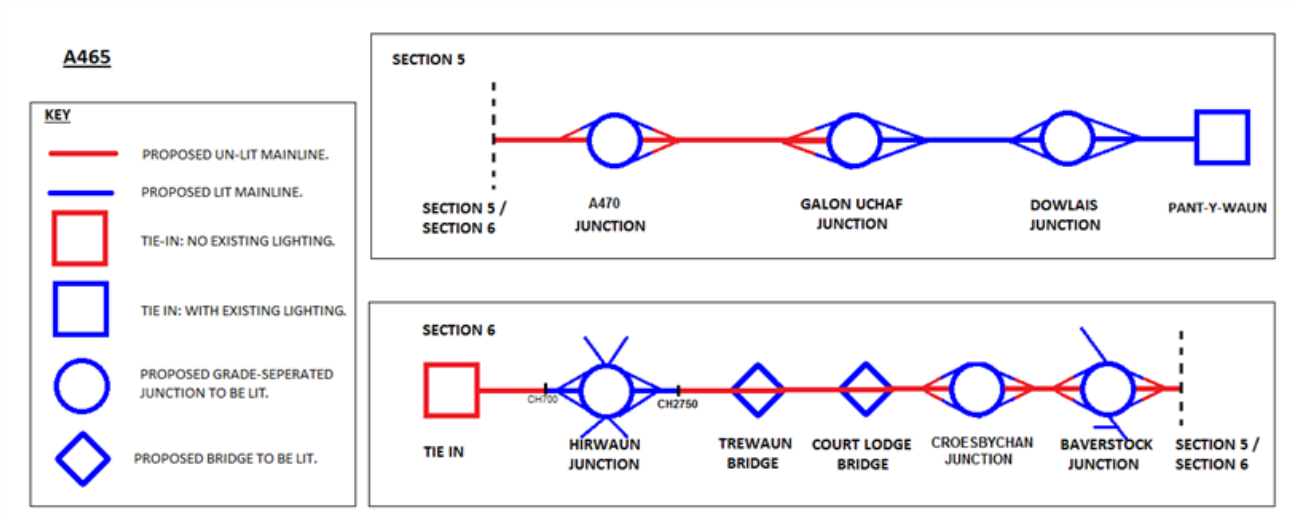
- lighting on the on/off-line elements shall extend for a distance long enough to provide the 5 seconds of driving at the expected traffic speed, i.e. 156m (for 70MPH speed).
- the peak traffic queuing distance on the approach to a give way or stop line;
- the distance required to illuminate any bend at the end of an exit slip road or the beginning of an entry slip road.

The junctions' on/off-line elements connecting to existing lit roads shall be fully lit and lighting extended to tie-in with the lit sections.

(c) Gaps of less than four times the stopping sight distance between lit sections are to be lit in accordance with the requirements of TD34/07 C.3.19.

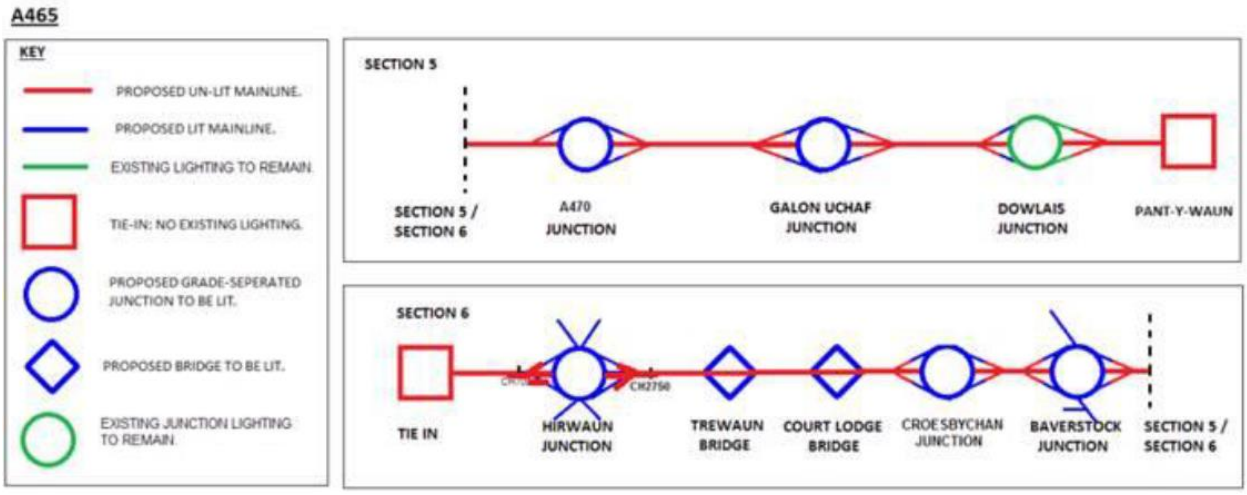
Figure…. below is a schematic indicating the proposed extents of lighting on this scheme.

Figure ……..: Recommended lighting extents on the new A465 Heads of the Valleys Dualling Sections 5 & 6 scheme.



At the time of writing this report the project team are in the process of assessing the feasibility of removing all street lighting from the mainline scheme. This approach would assist in reducing the schemes carbon footprint and landscape and visual impact. The project team's aspiration is to achieve a proposal such as that shown in Fig……

Figure….: Lighting extents without mainline scheme lighting.



This report was prepared in the absence of the Road Safety Engineer's assessment and safety impact assessment of the proposed geometric departures. Therefore the extents of lighting proposed in Figure 2 above are subject to change.

13.3 Landscape Impact and Sustainability

13.3.1 Background

The scheme is within, and within the vicinity of the Brecon Beacons National Park and therefore impacts on the night sky through light pollution are more important than they might be in other more urban environmental. The type of lighting proposed as part of the scheme has taken into account the Brecon Beacons Dark Sky Reserve Initiative as well as the

'Welsh Assembly Government Motorway And Trunk Road Lighting Policy' and in line with the Brecon Beacons National Park Dark Sky Reserve Initiative:

13.3.2 Proposed Lighting Technology

(i) Light Emitting Diodes (LED):

- LEDs consume less power than conventional street lighting hence achieving at least 30% in energy cost savings;
- LEDs are more reliable compared to conventional street lighting;
- LEDs have a life span of up to 25 years;
- LEDs require minimal maintenance over 25 years;
- LED, do not emit potentially harmful ultra-violet emissions to the environment, and hence will have a lower impact on flora and fauna;
- LEDs have high colour rendering, providing bright, true colour at night. Hence, will contribute in reducing crime levels and enhance safety; and,
- Installation of LEDs will reduce the electrical infrastructure due to reduced power consumption.

(ii) Central Management System (CMS):

This is a system used to monitor, control and dim the street lighting remotely based on historically gathered traffic flow information. This will result in the following benefits for the Welsh Government:

(a) Reduced energy consumption by a further 15%;

(b) Monitor and report on WG's actual energy usage for the road lighting to evidence WG carbon reduction commitments, and give complete control of energy spend against the backdrop of continued increases in energy costs and direct reporting of actual energy usage to the energy suppliers;

(c) Integration with the WG's asset management system to monitor the performance of the road lighting assets, to allow for repair and maintenance of the road lighting before failures occur, by providing early indication of the incorrect operation prior to complete failure to facilitate faster response to defects; and,

(d) Remove the need for unnecessary costly maintenance visits.

(iii) Traffic Demand Responsive Lighting:

A cloud based system used to integrate real-time traffic data into the CMS system to enable dynamic control of the lighting according to real-time traffic conditions. This will ensure the provision of the right amount of light, in the right place, and at the right time. The following benefits may be realised:

(a) Such real time control of lighting may reduce energy by 30% from pre-dimmed value and increase the scope for safely dimming the motorway lights when traffic is light;

(b) Utilising existing technologies such as traffic counters and CMS to benefit from further reduction of energy consumption and environmental implications; and,

(c) Future proof WG as Lighting Standards and Institute of Lighting Professionals guidance are updated to reflect technological advancements and societal change. Any change to standards and / or guidance can be easily implemented in a single system in one operation.

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Annex A – General Arrangement Drawings

See following page.

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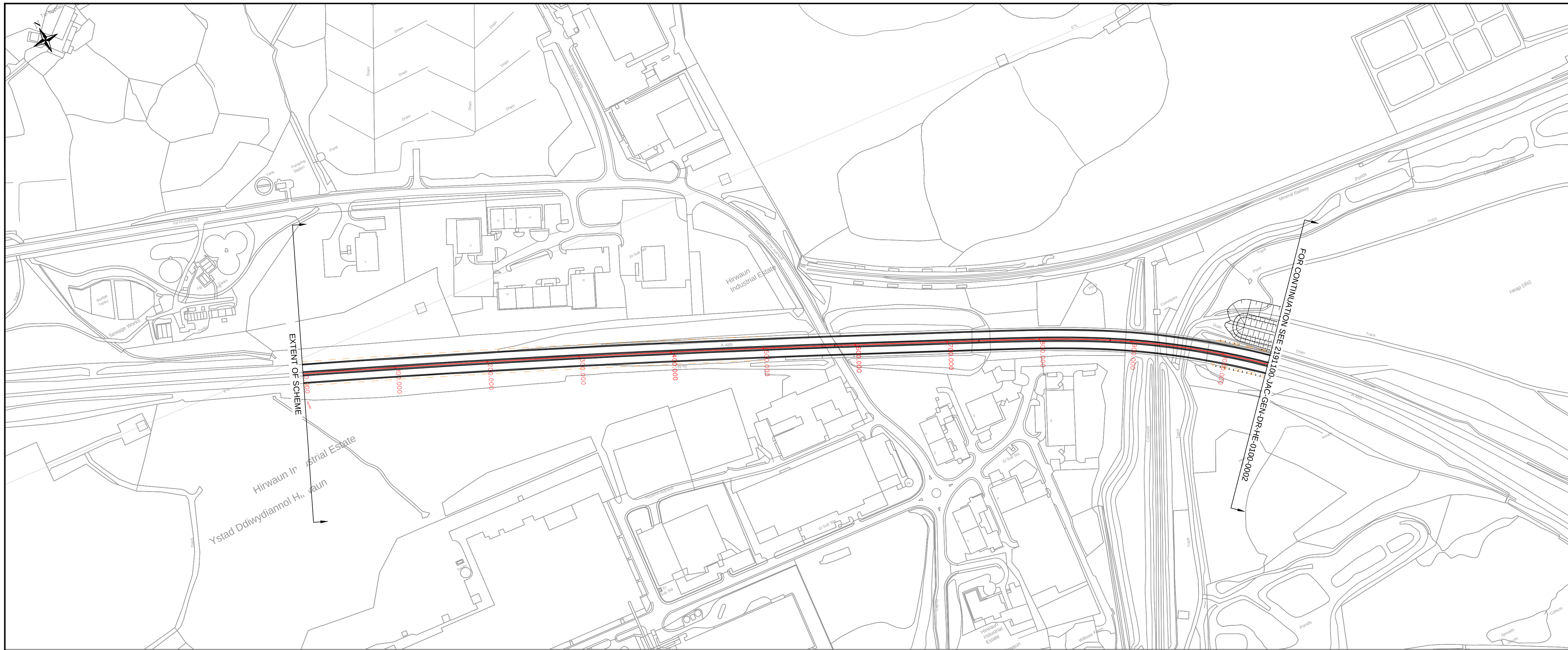

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40.000	210.000	-999.000	-0.000
60.000	210.000	-999.000	-0.000
80.000	210.000	-999.000	-0.000
100.000	210.000	-999.000	-0.000
120.000	209.999	-999.000	-0.000
140.000	209.999	-999.000	-0.000
160.000	210.006	-999.000	0.031
180.000	210.049	-999.000	0.215
200.000	210.132	-999.000	0.419
220.000	210.257	-999.000	0.622
240.000	210.422	-999.000	0.826
260.000	210.628	-999.000	1.030
280.000	210.850	-999.000	1.110
300.000	211.053	-999.000	1.013
320.000	211.236	-999.000	0.916
340.000	211.399	-999.000	0.818
360.000	211.544	-999.000	0.721
380.000	211.668	-999.000	0.623
400.000	211.773	-999.000	0.525
420.000	211.859	-999.000	0.428
440.000	211.925	-999.000	0.330
460.000	211.971	-999.000	0.233
480.000	211.998	-999.000	0.135
500.000	212.008	-999.000	0.047
520.000	212.014	-999.000	0.031
540.000	212.020	-999.000	0.031
560.000	212.026	-999.000	0.031
580.000	212.032	-999.000	0.031
600.000	212.038	-999.000	0.031
620.000	212.045	-999.000	0.031
640.000	212.051	-999.000	0.031
660.000	212.057	-999.000	0.031
680.000	212.063	-999.000	0.031
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720.000	212.075	-999.000	0.031
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980.000	212.155	213.366	0.031
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P01	18.04.16	FOR INFORMATION	MP	DM	JT	GP

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Project: A465 SECTIONS 5 & 6

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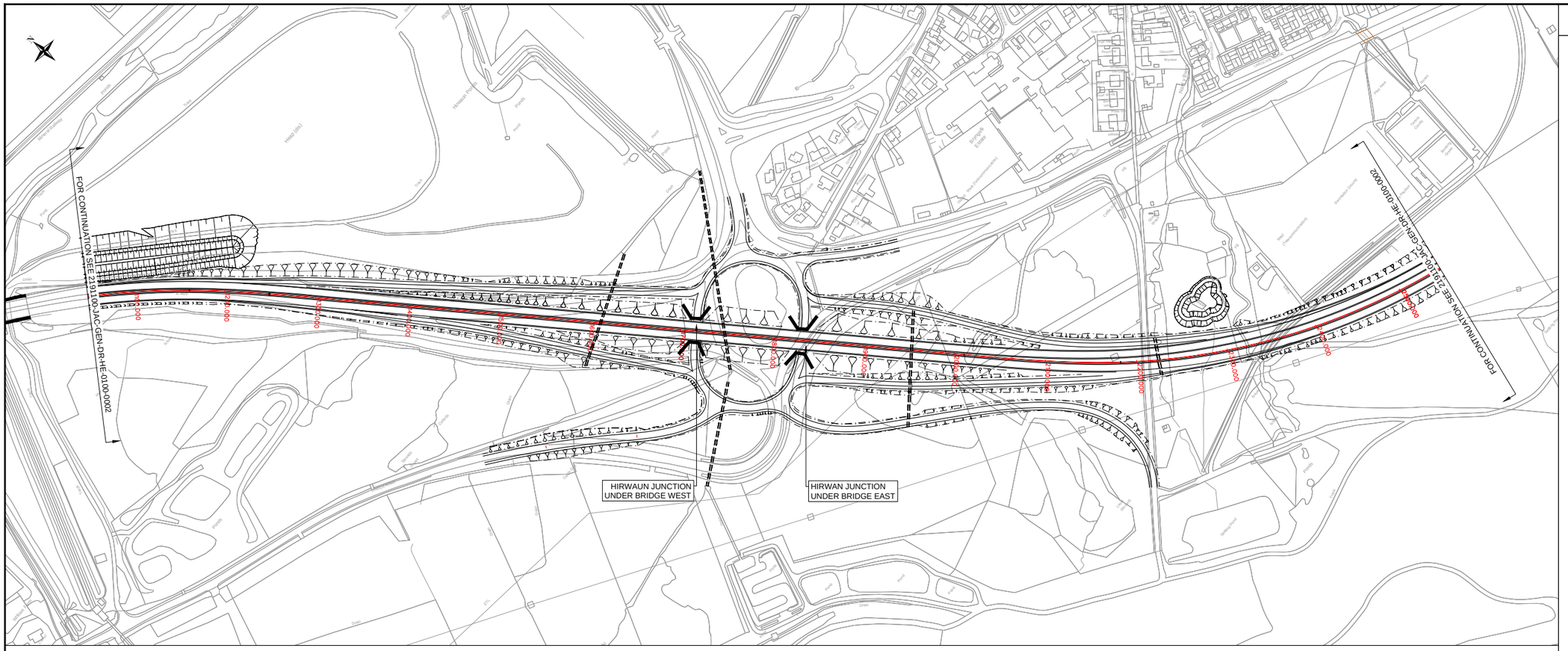
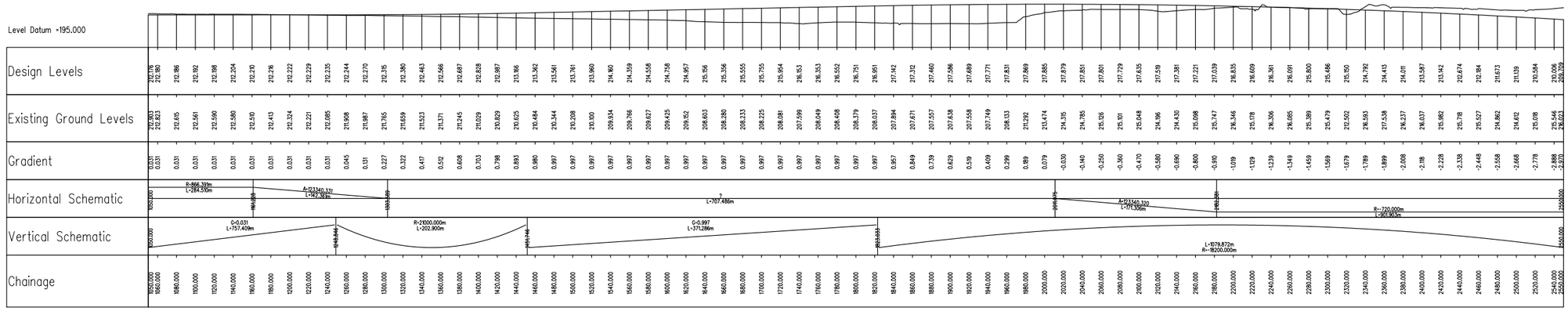
Rev: P01





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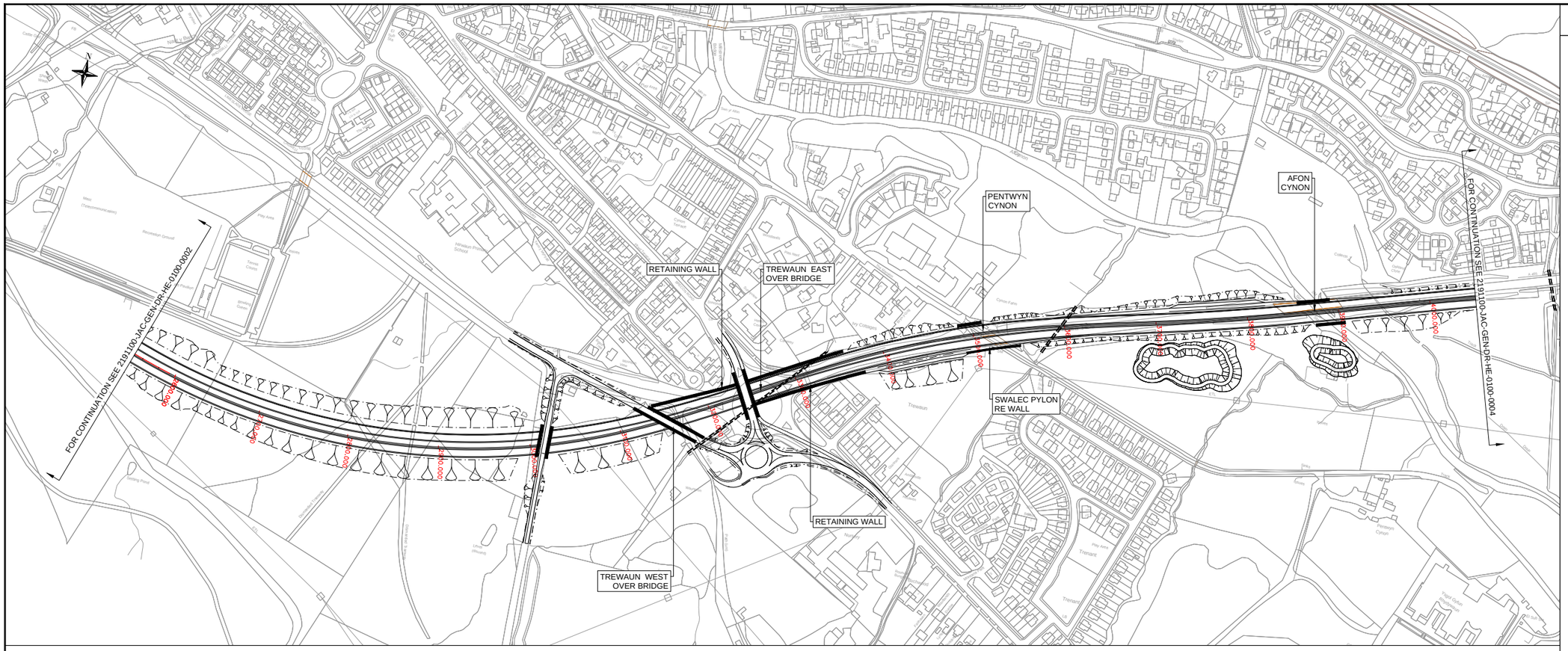

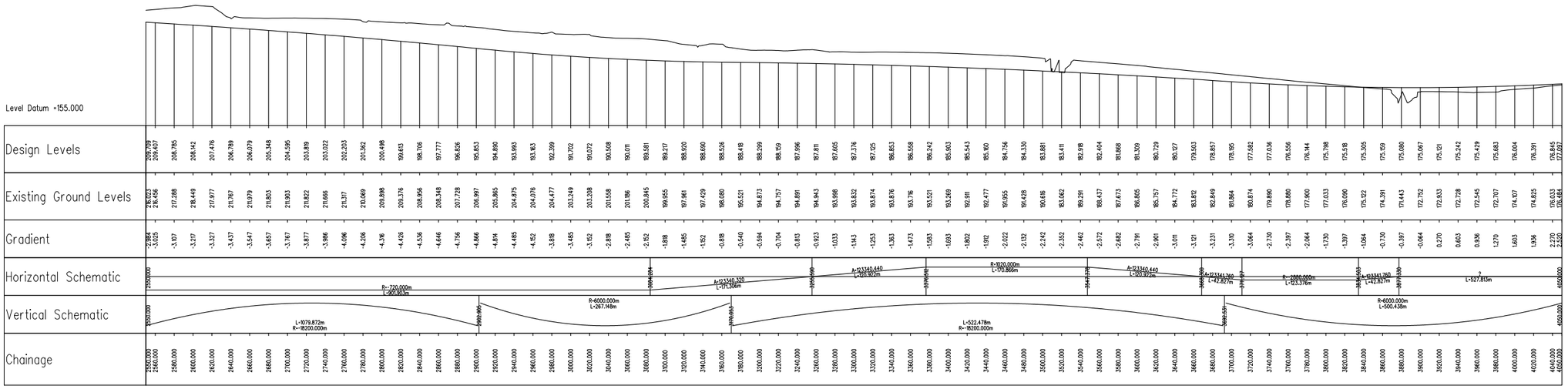

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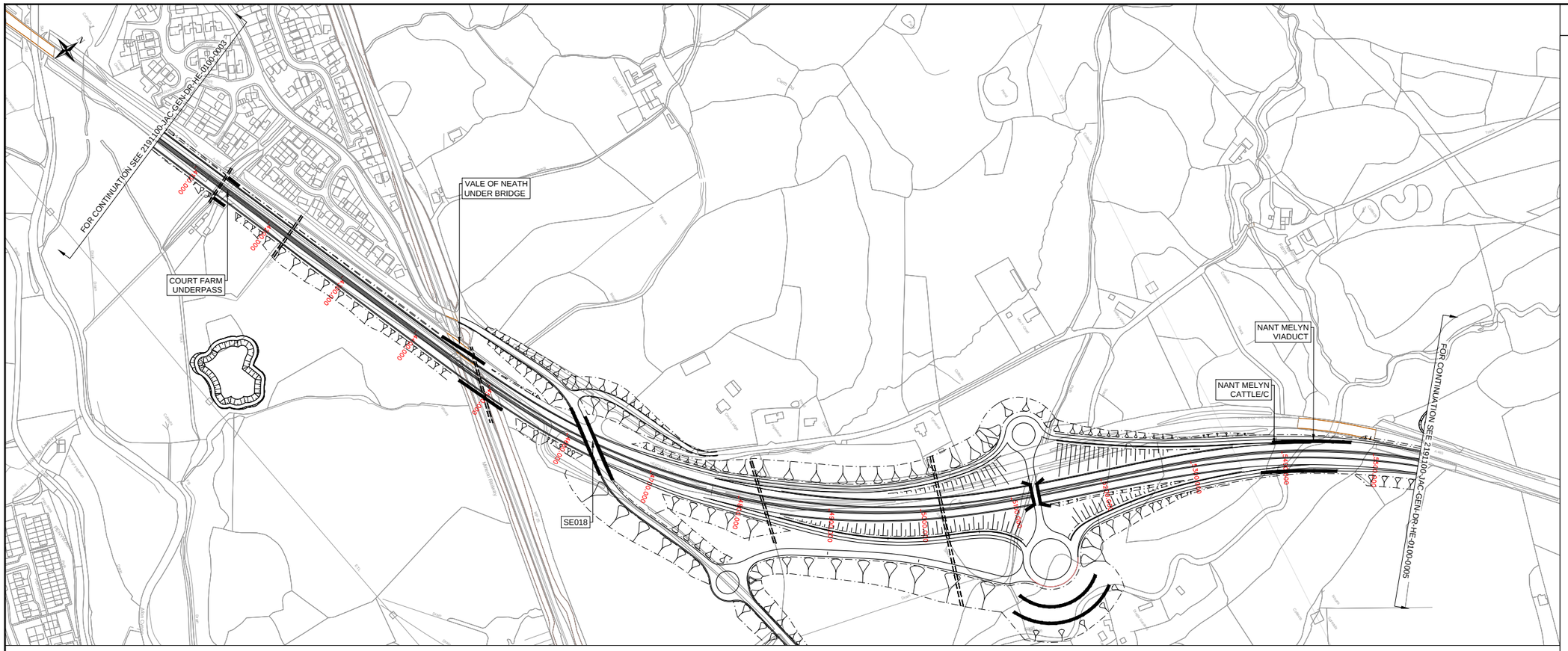

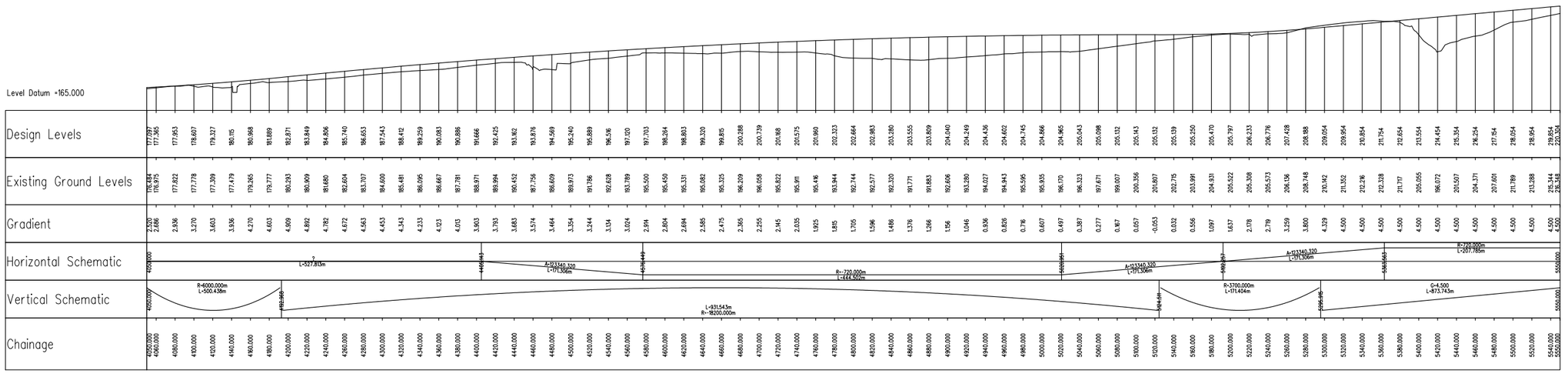

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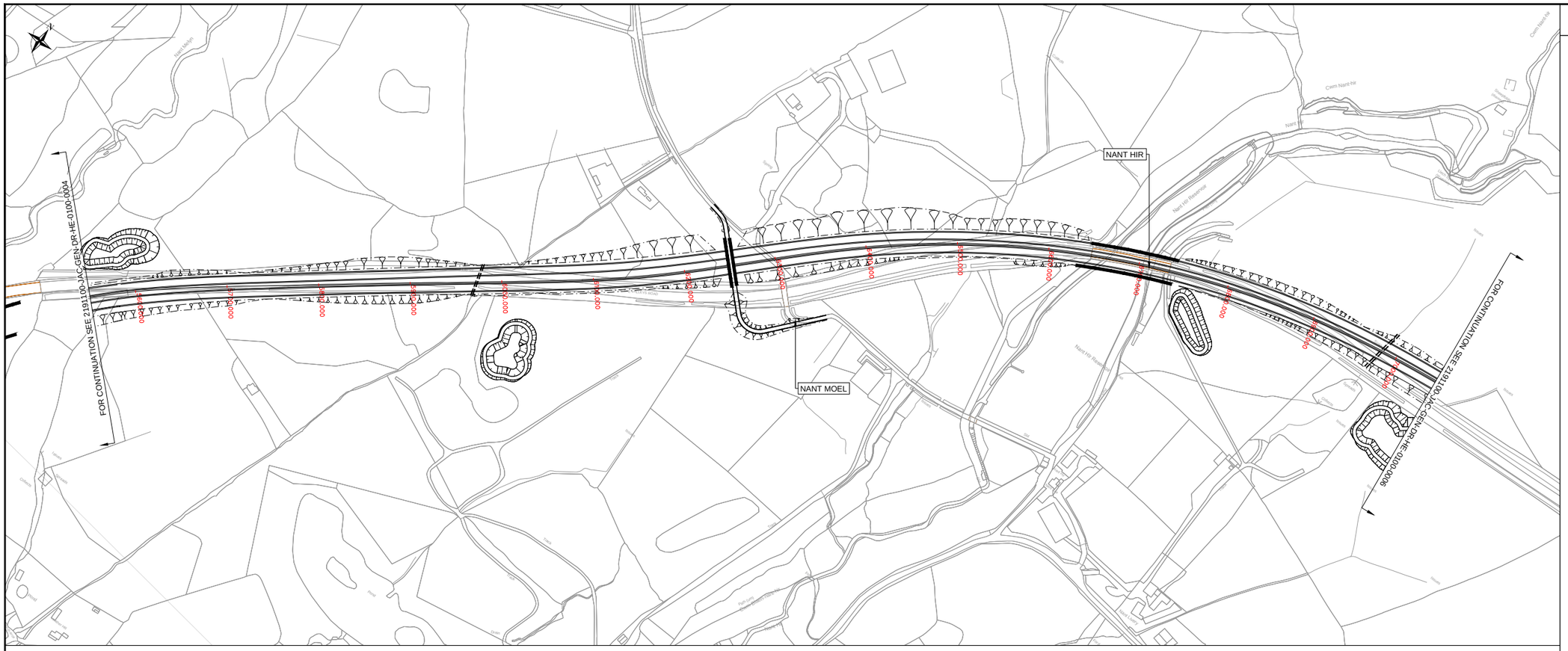

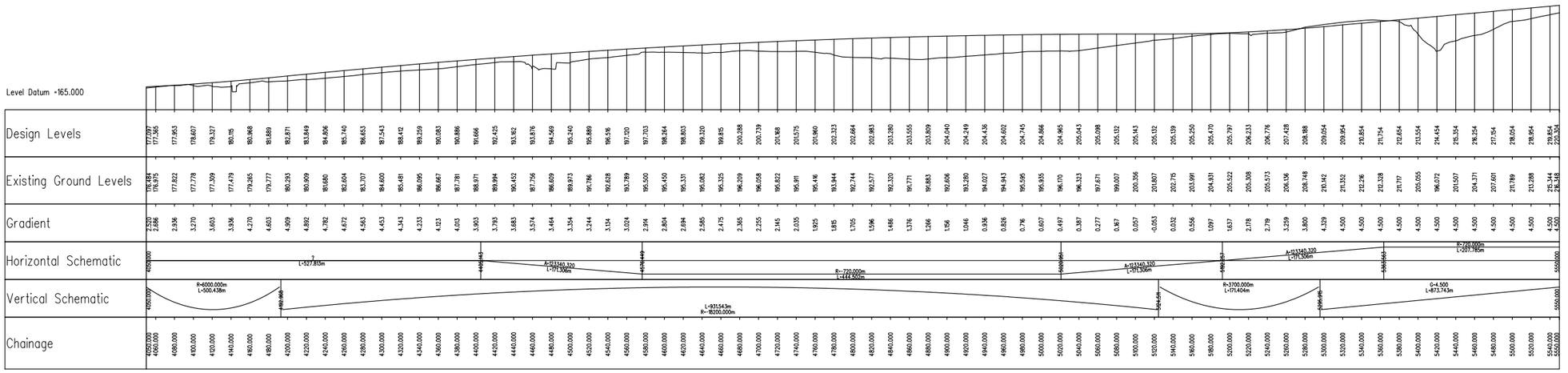

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LEGEND:

PROPOSED CULVERT

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PROPOSED DRAINAGE ATTENUATION POND

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5OF 13

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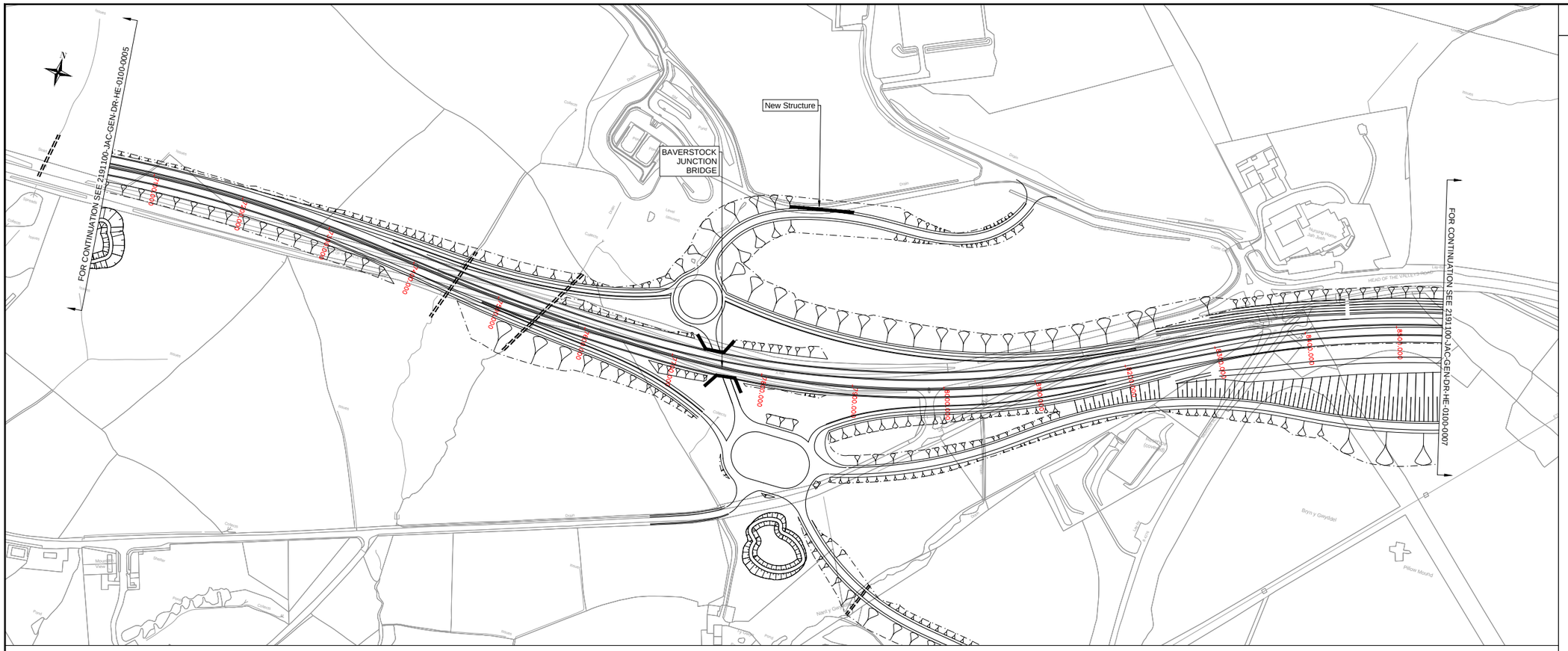

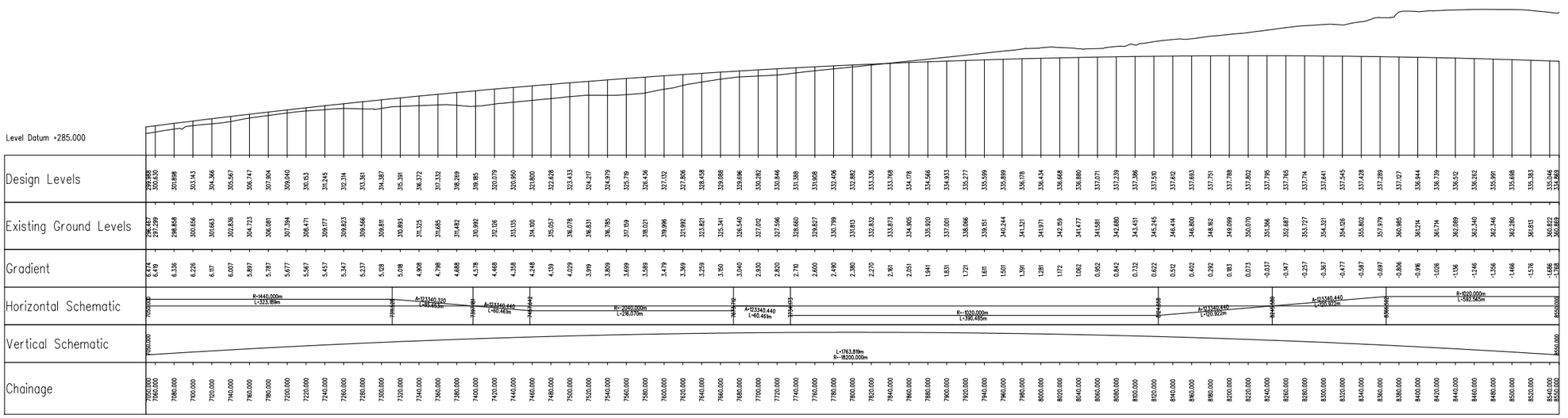

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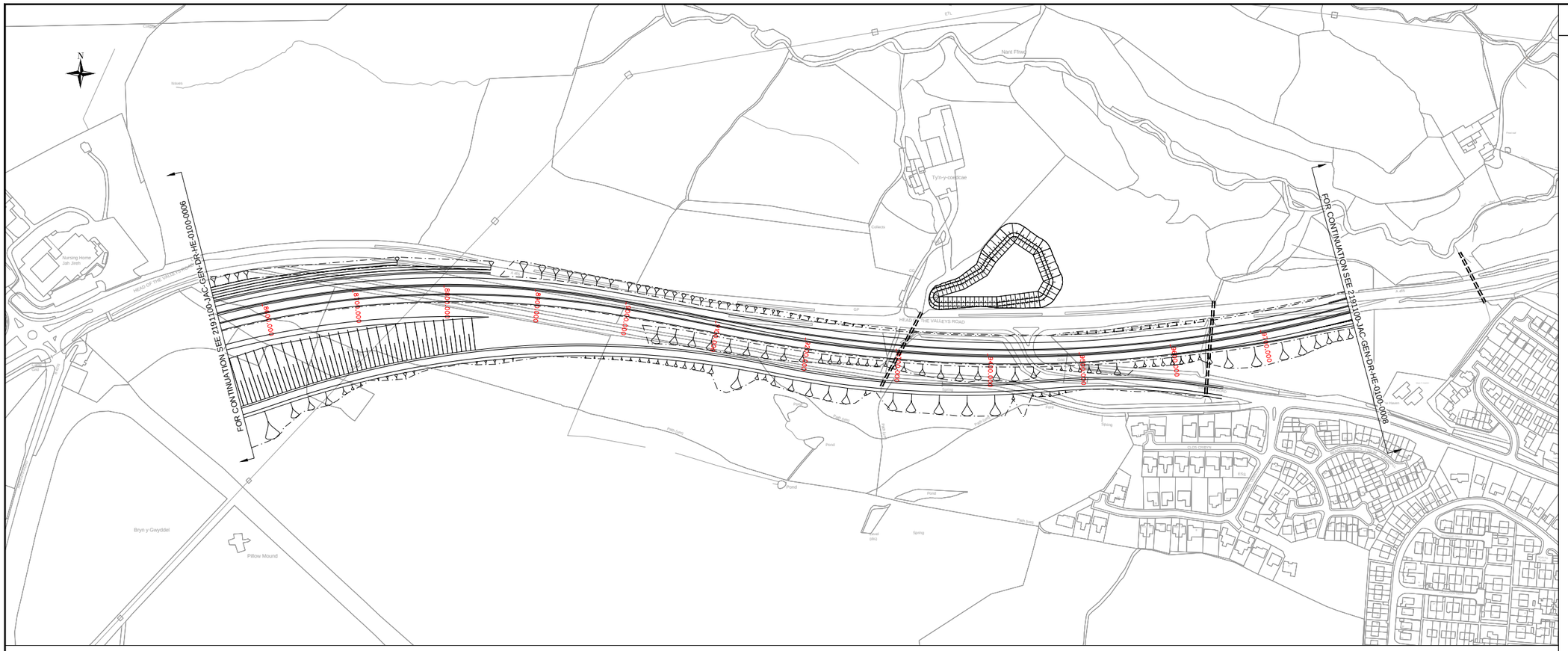

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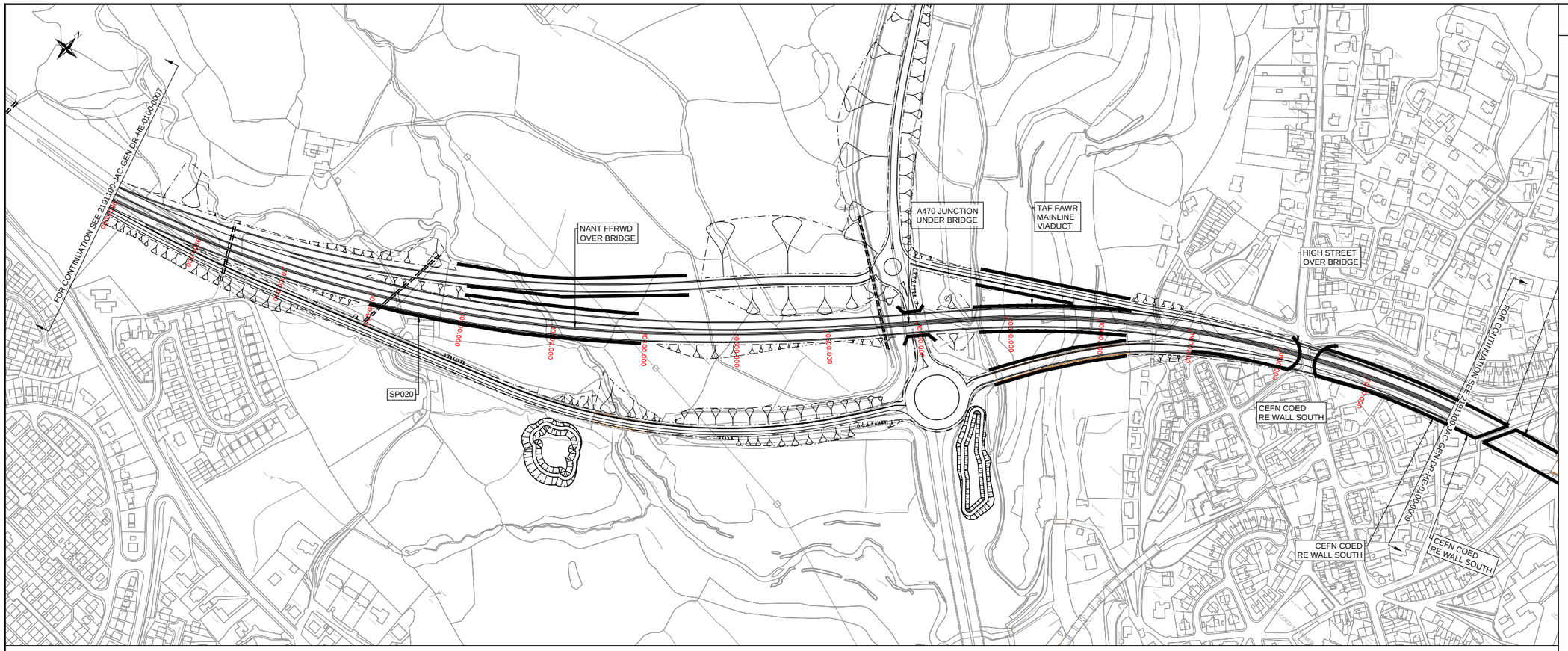

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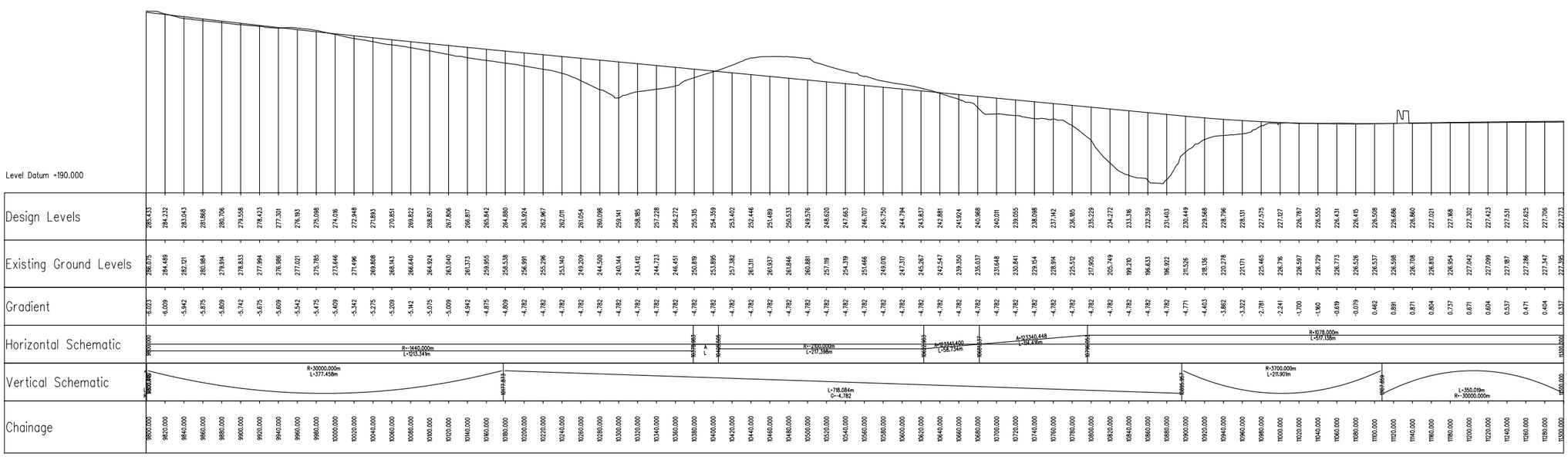

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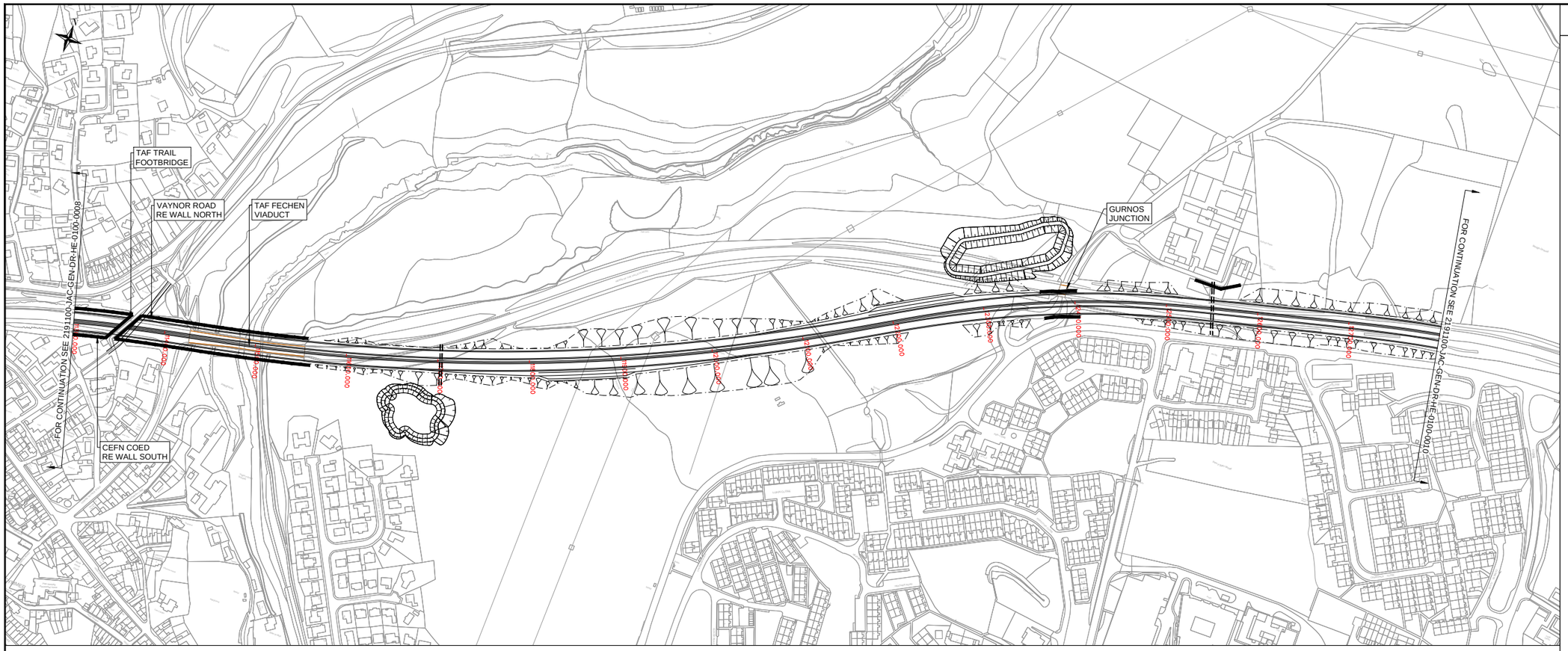

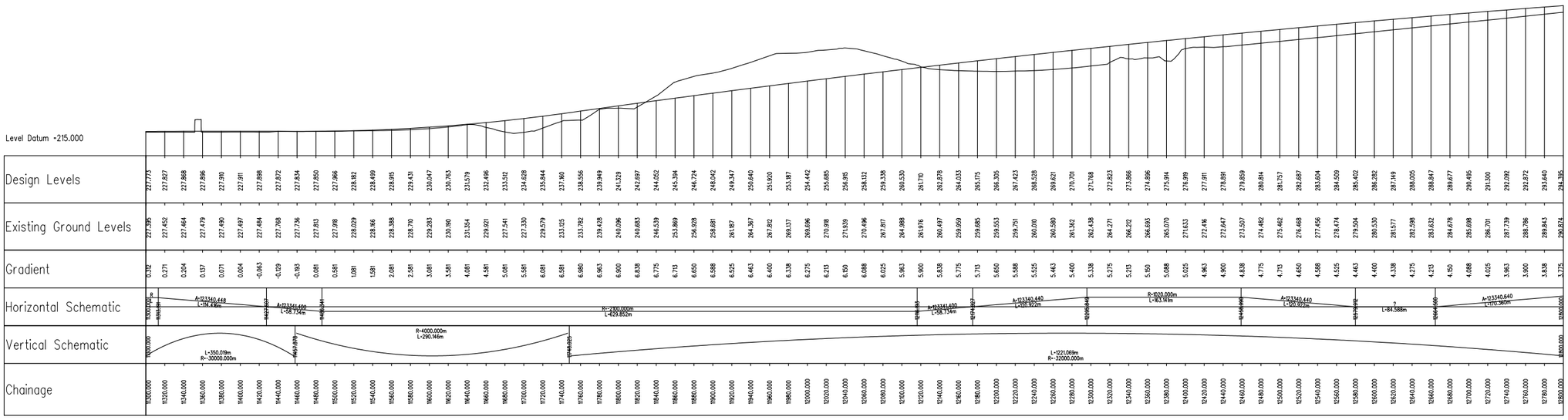

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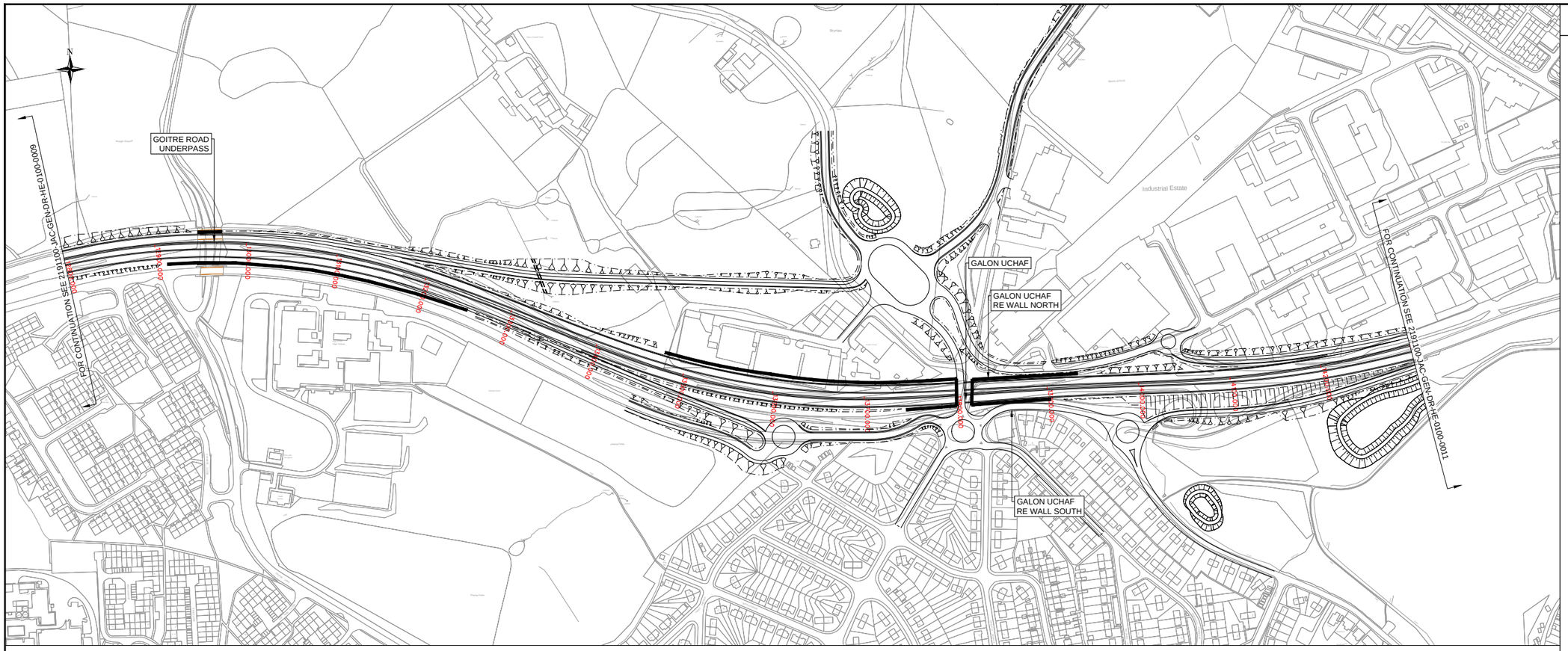

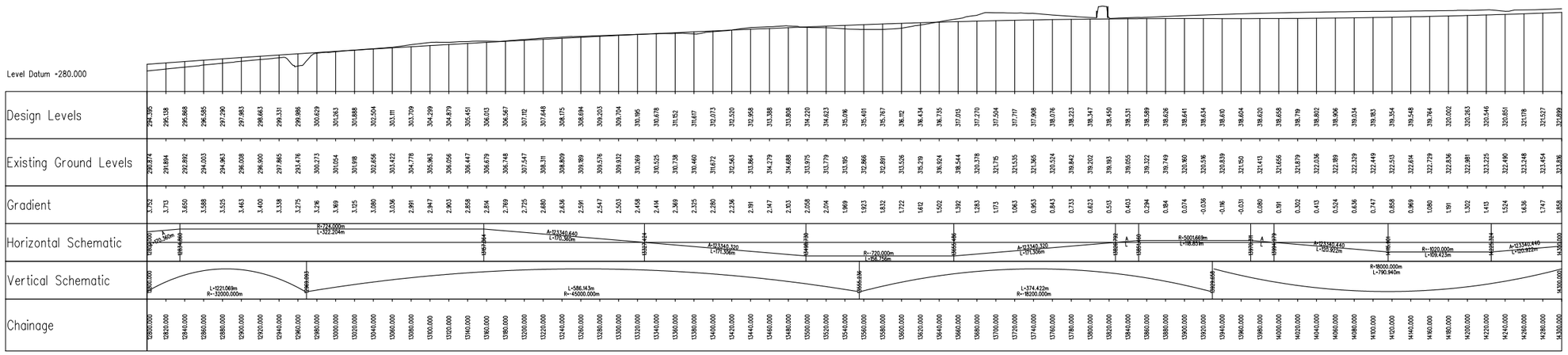

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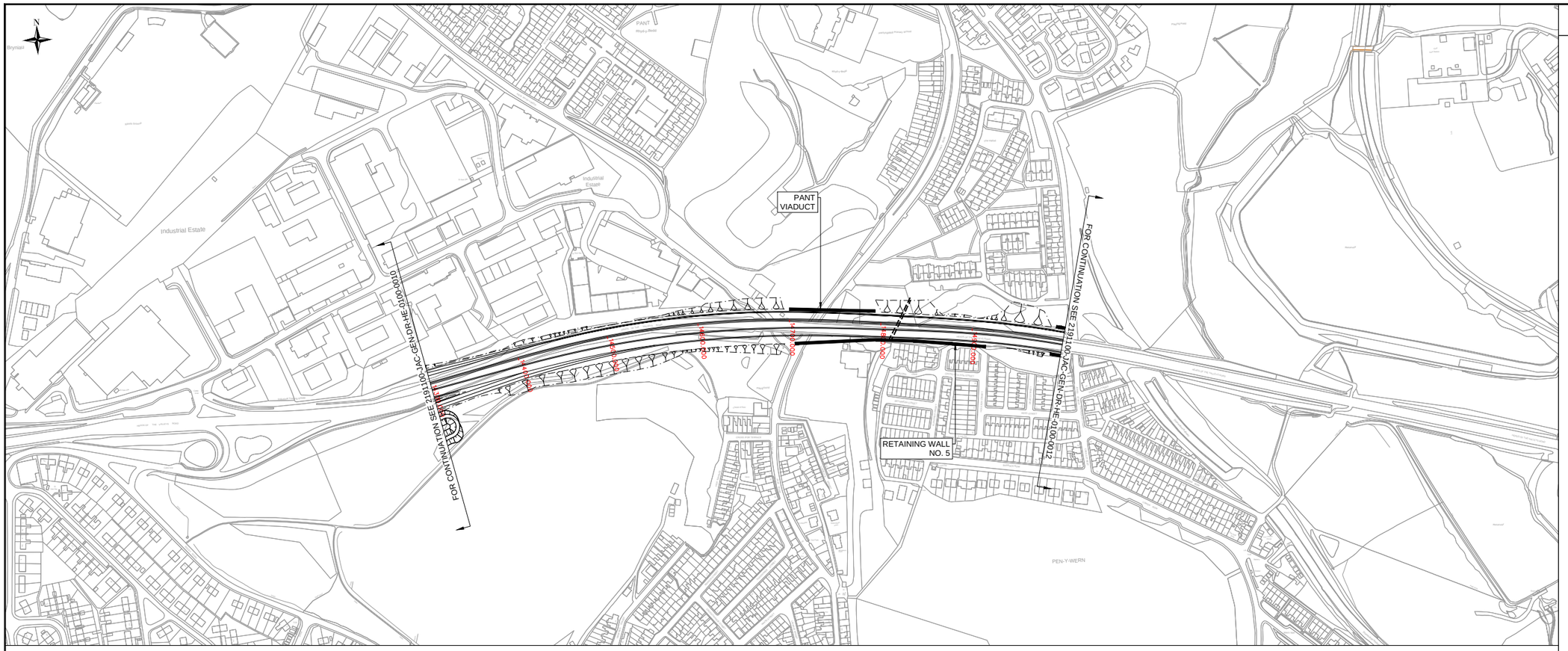

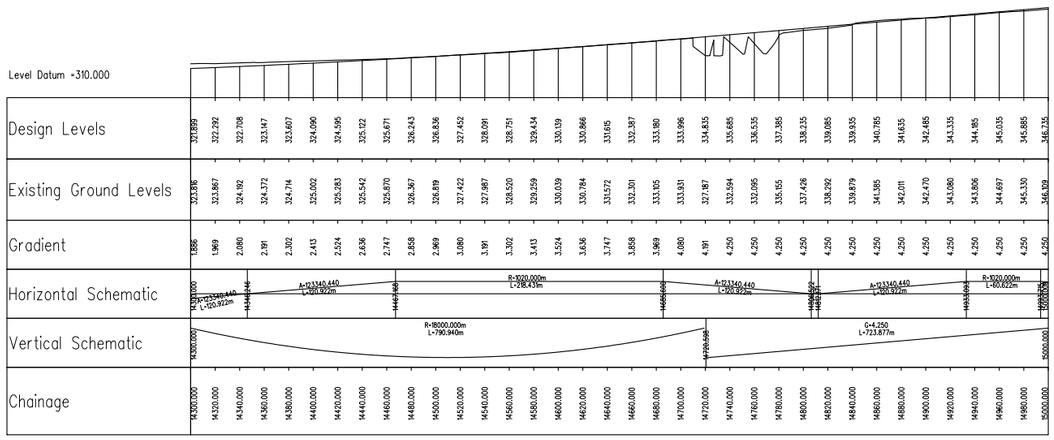

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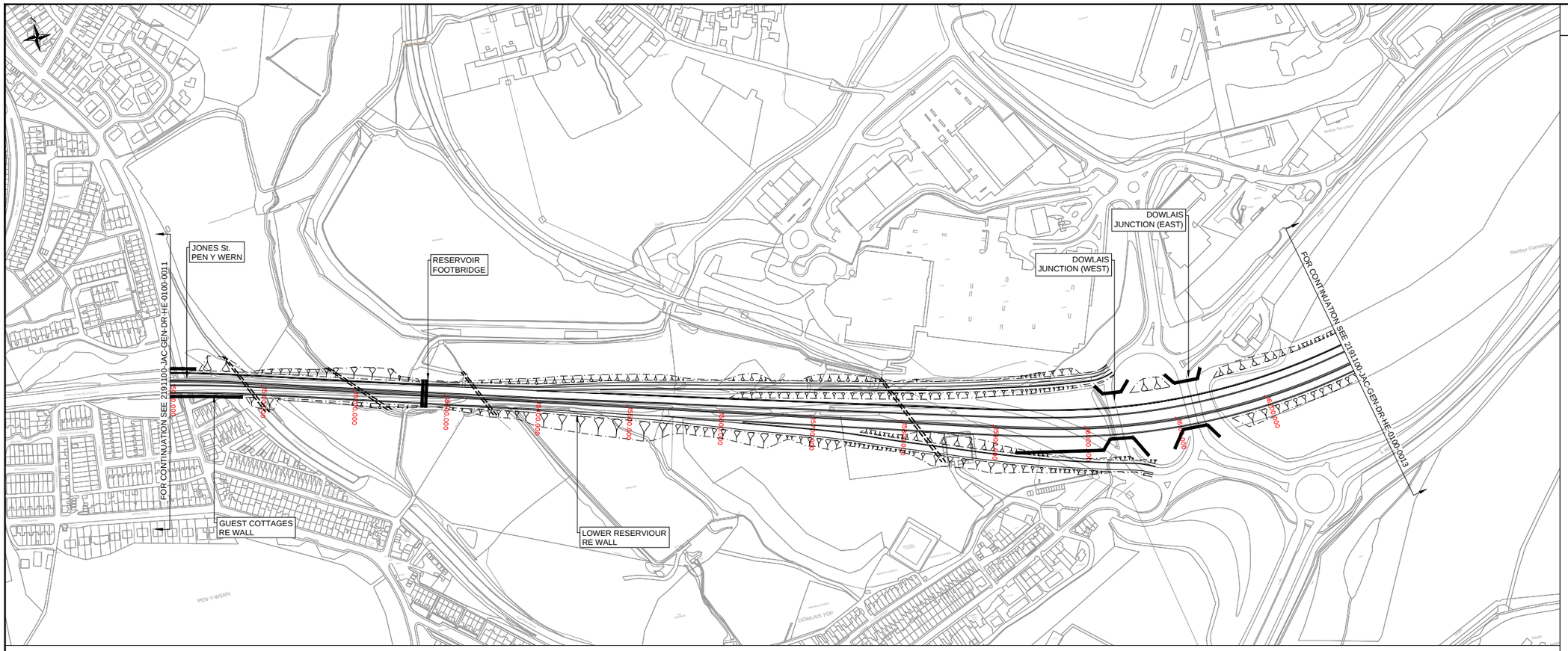

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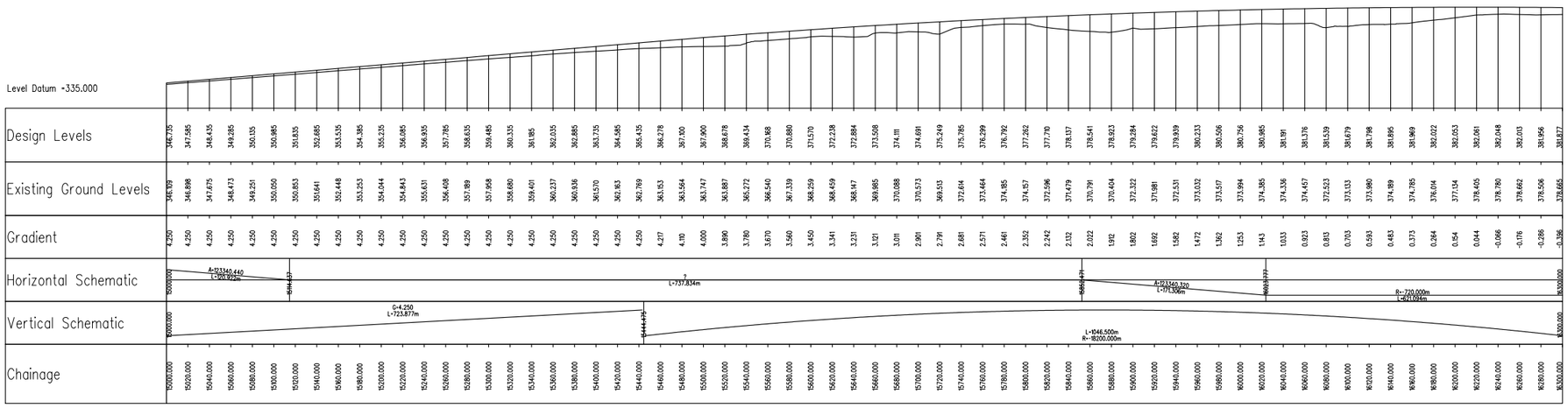

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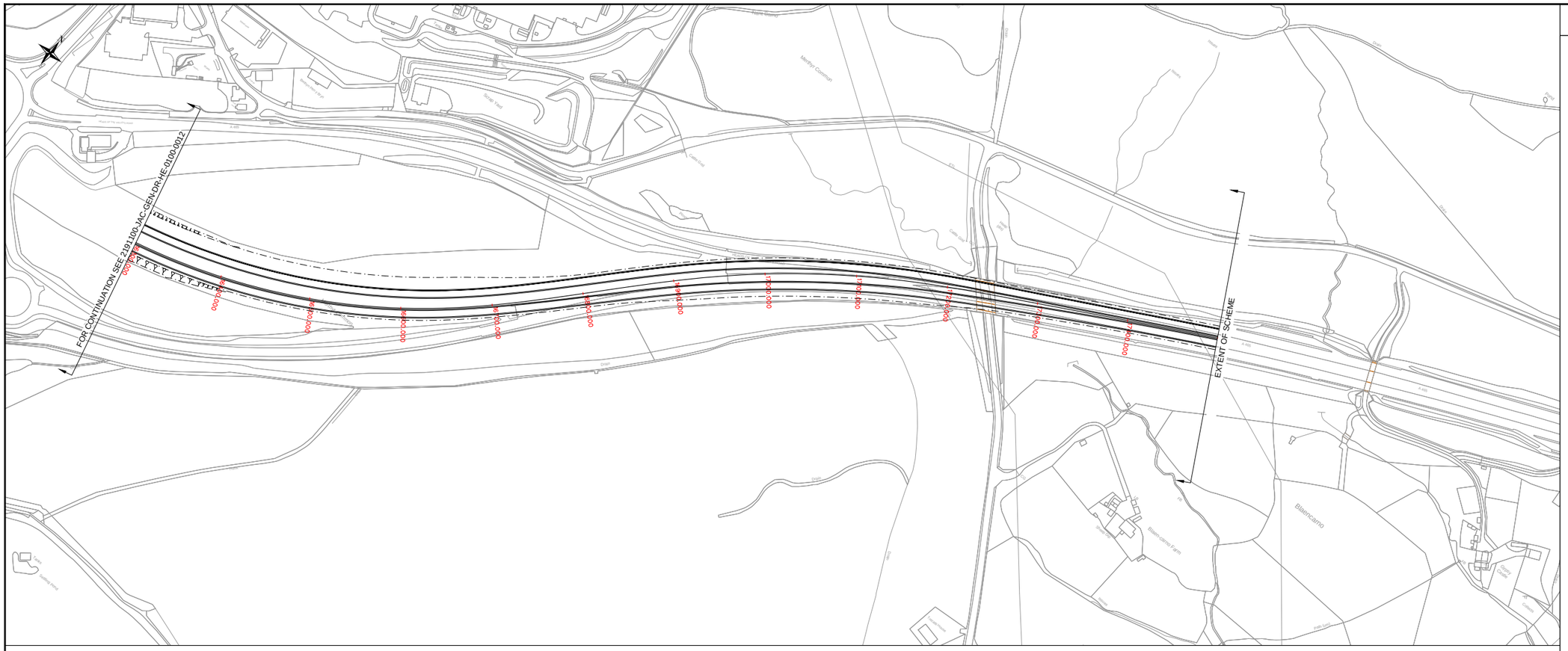

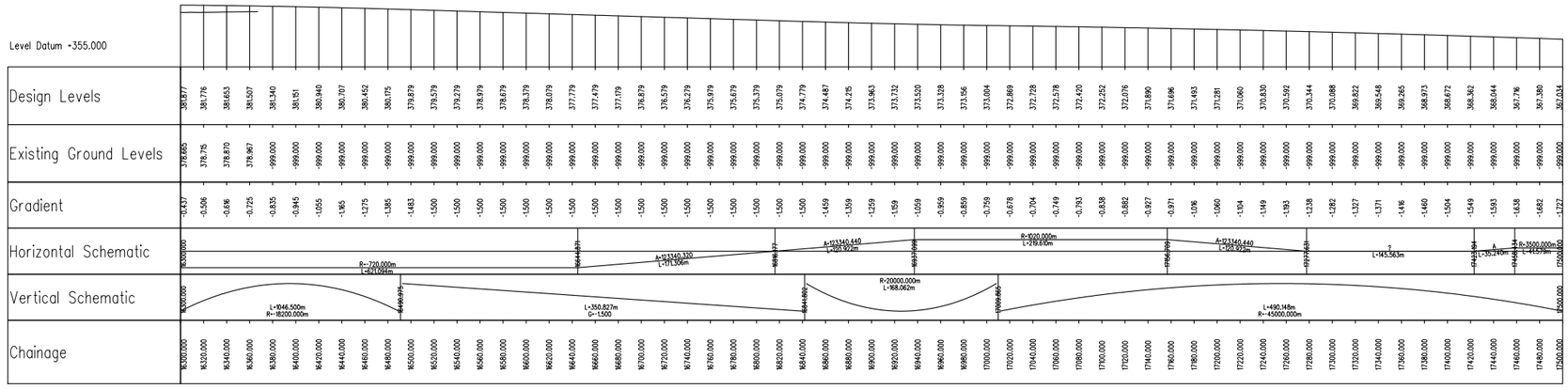

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Annex B – Non-motorised User Routes

This annex has been superseded by the Environmental Statement Effects on All Travellers chapter in the July 2017 Environmental Statement and therefore has not been included.

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Annex C – Draft Environmental Masterplan

This annex has been superseded by the July 2017 Environmental Masterplan included within Volume 4 of the Environmental Statement and has therefore not been included.

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Annex D – Structures, Landscape and Public Realm Concept Diagram

See following page.

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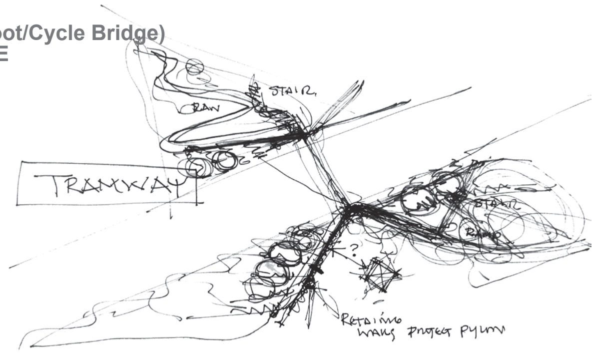
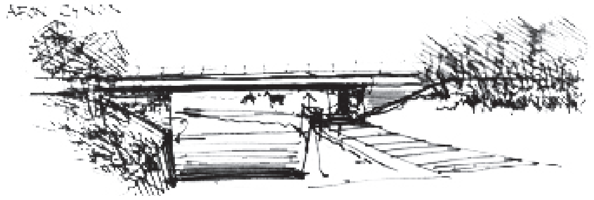
4. TRAMWAY OVER-BRIDGE (Pentwyn Cynon Foot/Cycle Bridge) & ELECTRICITY PYLON RETAINING STRUCTURE

- Retaining walls at 45 degrees to road as illustrated; design in progress.
- Move away from straight retaining edge along highway to create something more varied, visually interesting from the road and with capacity to be integrated more successfully into the landscape through planting, land-form and materials.



5. AFON CYNON - RIVER UNDERPASS

- An arrangement which allows for pedestrian and animal passage along the river and under the A465 in Cynon Valley River Park as sketched below.
- Planting to frame views across park and soften bridge structure at ends.



6. COURT FARM UNDERPASS

- Designed to standard and appearance of current structure.

7. MINERAL RAILWAY BRIDGE

- Widened to the south with wing walls retained in railway cutting.
- Concrete finish.
- Similar to existing

10. NANT MOEL ACCESS OVER-BRIDGE

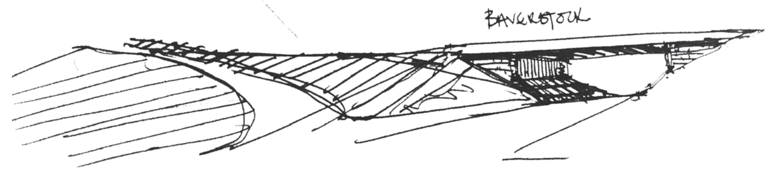
- Awaiting flood risk before determining width of bridge.
- Design to match existing

11. NANT HIR

- Three spans with columns.
- Symmetrical widening of existing structure.

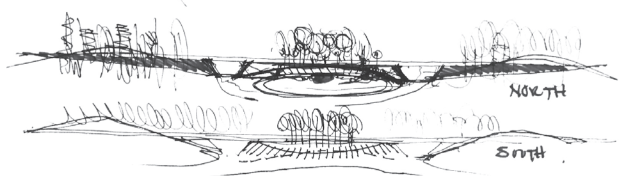
12. BRAVESTOCK JUNCTION

- Create underpass with open flowing views beyond thereby reducing tunnel effects.
- Sloping abutments under the bridged to create lighter more open space as illustrated in sketch below.
- Stone clad abutments and use of concrete finish to define edges and recessed, contrasting shapes.
- Abutments angled out at base to aid flow of spaces beneath structure.
- Piers stepped back at top to give impression of bridge floating over road.



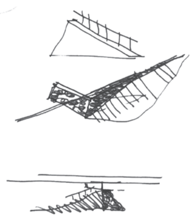
1. HIRWAUN WEST JUNCTION

- Existing roundabout has simple feature of birch and pine trees enclosed by traditionally constructed stone walls.
- Proposal to integrate stone wall features into design of abutments is being explored and is illustrated Opposite;
- Abutments angled out at top to give impression of lighter structure with more open connecting views from the road.
- Mounding to southern side to help integrate road into wider landscape from elevated views.



2. WIND-FARM ACCESS OVER-BRIDGE

- 6 -7m wide skew bridge across the road.
- Lightweight fencing along top of sloping embankment walls to minimise visual impact.



3. TREWAUN JUNCTION WITH A4059

- The bridges designed as a single slab over the A465 forming a large open area between Hirwaun and Pennywaun.
- Single slab to cover mainline between roads suitable for planting.
- Pocket park open space for public use.
- Tree and shrub planting to link and form spaces and provide screening.

0 1km 2km
Scale

8. CROESBYCHAN JUNCTION

- Design in progress.
- Very large terraced retaining structure adjacent to river with loss of ancient woodland
- Clad with pockets/edges for plants/climbers to break up scale.

9. NANT MELYN VIADUCT

- Widening with steel replica of existing concrete bridge.

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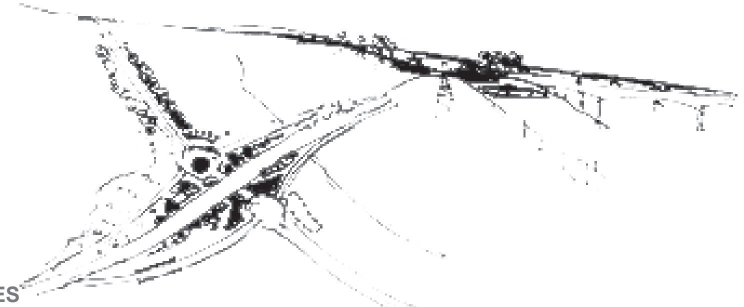
14a. A470 JUNCTION MAIN LINE OVERBRIDGE AND GATEWAY FEATURE

- The development of a double roundabout at the A470 junction combined with three bridges over the Taf Fawr; create a strong sense of place at the entrance to the Brecon Beacons National Park.
- Important to create open flowing space between roundabouts.
- Bridge walls battered back, stone and concrete finishes to improve views.
- Embankment slopes stackened or terraced.
- Close association with embankments and land-form in wider area.
- Use of water or other feature to create strong identity at entrance to park.
- Land-form, views, rocks and planting to give character to spaces.



13. NANT FFRWD

- Water course close to road and crossing at an angle, keep any culvert or crossing as short as possible, use retaining edges to shorten rather than have long mouse holes through embankments.
- Use of Beebow pre-cast concrete arch being considered

14b. TAF FAWR BRIDGES

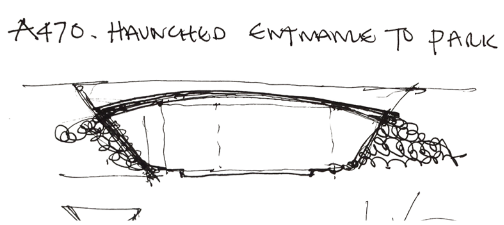
- On east end of bridges three large abutments line up on the side of the valley and form a huge wall of concrete, 50 – 60m high. Terracing the lower levels and use of rock slopes would break up expanse of concrete, reduce the visual impact and enable to abutments to sit more sympathetically within valley. Would still be large dominating feature in views from ground level. The footpath could be taken under the bridge along top of one of the terraces.
- New bridges to match style of existing.

15a. HIGH STREET BRIDGE

- Better links to existing roads.
- Bridge to read as continuation of High Street for pedestrians.
- Use of natural stone cladding to parapets.
- Street features including planting to add interest and character to street-scape.

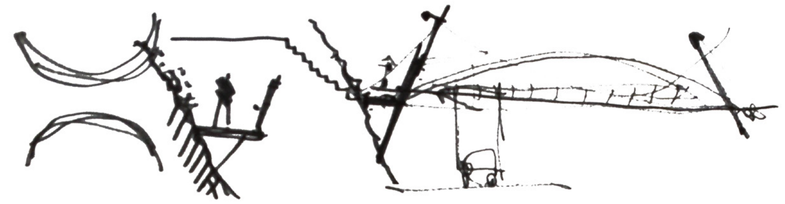
15b. CUTTING THROUGH MERTHYR

- Likely to be a mix of retaining walls and roads terraced to reflect the new and existing levels and following the housing boundaries with pockets of landscape.



16. TAFF TRAIL

- New and better location to link into public rights of way and road network.
- Cantilevered walkway off north cutting face to reconnect to existing Taff Trail.
- Improved access for residents with provision of steps to new bridge.
- Railings bowed to prevent climbing.
- Viewing area at junction of walkway and existing



17. GOITRE ROAD UNDERPASS

- Pedestrian underpasses in less pleasant surroundings, such as Goitre at Gurnos, important to employ strategies which create less intimidating and more open aspect.
- Link-up into existing Gurnos road bridge would create very long tunnel. Not a pleasant or safe environment.
- Look for alternative crossing and garner local stakeholder opinion on importance of crossing.

19. PANT VIADUCT

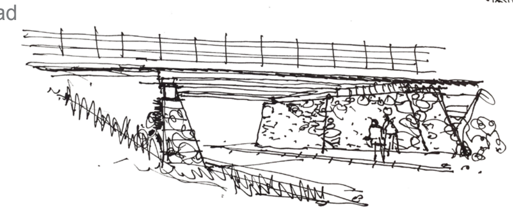
- Reduced width opening a smaller structure and access road to industry realigned. Loss of inter-visibility between communities to north and south.
- Opportunity for usable community space under road linking existing play area to south and open space to north.

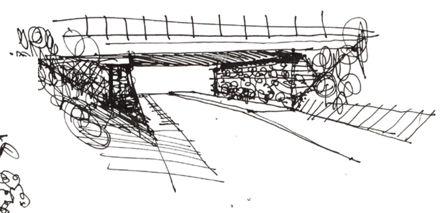
18. GALON UCHAF

- New retaining wall along Trade Centre of Wales site and buildings and retaining wall on south side of A465 along Gurnos Ring Road. Breakup expanse of wall with planting pockets for climbers and surface finishes.
- Retaining wall up to 8m high on north side.
- Retain existing where possible, onsouth side.

20. JONES STREET

- 11.5m clear span precast concrete beam insitu wing walls.
- On slope to south.





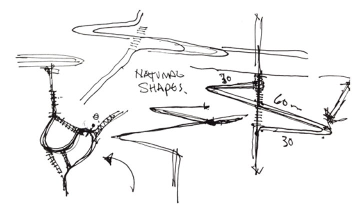
- Stone faced battered from base, concrete edge and recessed areas to articulate shapes and spaces.to increase intervisibility

0 1km 2km

Scale

21. RESERVOIR FOOTBRIDGE

- Level access north side and descending south side to link into footpaths.
- Level Warren Truss equestrian bridge 1.8m high parapets.



Appendix D. Structures, Landscape and Public Realm Concept Diagram

A465 Heads of the Valleys Duelling – Sections 5 and 6 Dowlais Top to Hirwaun
Design Commission for Wales Submission Document

Annex E – Visual Receptors Summary Diagram

See following page.

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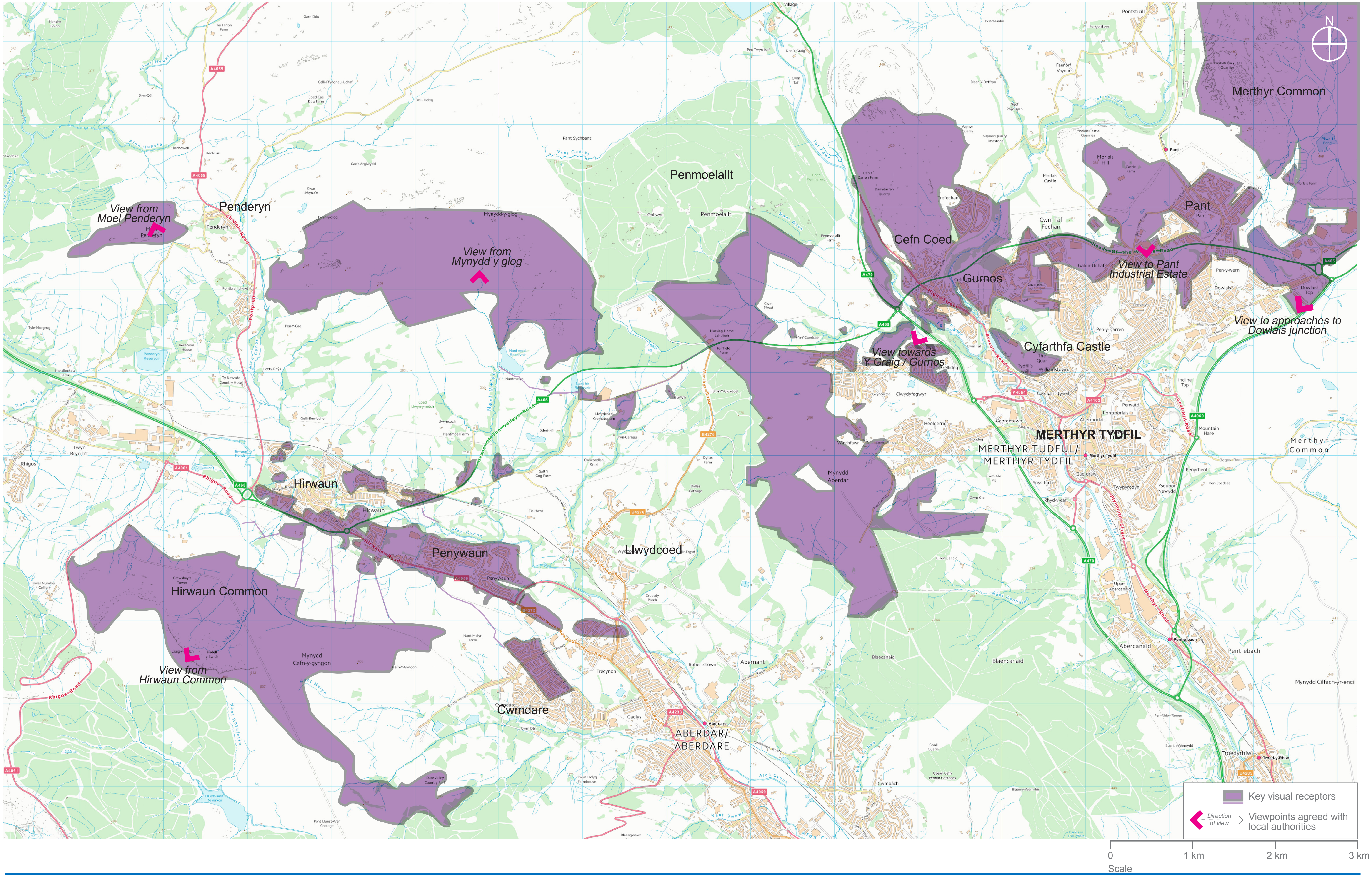

Appendix E. Visual Receptors Summary Diagram

A465 Heads of the Valleys Duelling – Sections 5 and 6 Dowlais Top to Hirwaun
Design Commission for Wales Submission Document

View from Moel Penderyn

View from Mynydd y glog

View from Hirwaun Common

View towards Y Graig / Gurnos

View to Pant Industrial Estate

View to approaches to Dowlais junction

Appendix C. DCfW Design Review Report February 2016

See following page.

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DESIGN
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Design Review Report

DCFW Reference: N99

A456 Sections 5 and 6,

Dowlais Top to Hirwaun

18th February 2016

Declarations of Interest

Panel members, observers and other relevant parties are required to declare ***in advance*** any interests they may have in relation to the Design Review Agenda items. Any such declarations are recorded here and in DCFW's central records.

Review Status	**PUBLIC**
Meeting date	18th February 2016
Issue date	2nd March 2016
Scheme location	Dowlais Top to Hirwaun
Scheme description	Highways/road infrastructure
Scheme reference number	N99
Planning status	N/A

Declarations of Interest

None declared

Consultations to Date

Public consultation on the 1997 scheme was completed in December 2015. There is ongoing consultation with Natural Resources Wales (NRW).

The Proposals

The proposed scheme involves online widening of an existing 2-3-lane trunk road between Dowlais Top roundabout in the east and Hirwaun Industrial Estate in the west, approximately 16km. The A465 Heads of the Valleys trunk road links south and west Wales to the English Midlands and was constructed in the 1960s. Currently, the majority of the trunk road consists of a two - three lane carriageway between Dowlais Top and Hirwaun. Surrounding land uses are varied and include residential towns and villages including Hirwaun, Cefn Coed, Gurnos, Pant, and Dowlais Top; the Brecon Beacons National Park; agricultural uses; and industrial estates. Works would include some small off-line sections, grade separated junctions, replacement and new structures, and major earthworks. The scheme is part of a broader dualling of the entire 40km of A465 between Abergavenny and Hirwaun. Previous sections are now completed or under construction. It may be useful to read DCFW's reports on the earlier phases to learn lessons for this section.

Main Points in Detail

The following points summarise key issues from the review, and should inform work ahead of further review of the scheme:

Presentation and Communication
The Design Commission commends the team for their clear presentation which provided an excellent overview of the complex issues involved and the design approach being taken to this scheme. The visual and verbal presentations helped to engender confidence that the design process is considering the right things in the right level of detail at this stage, even though it was not possible to cover all the issues in detail at this review. The design narrative was made especially clear, which is encouraging.

The use of physical working models to demonstrate design options for the A470 junction was helpful. It would be useful to model some of the other particularly sensitive parts of the scheme in this way as the project progresses.

The clear language used in the presentation and discussion is appropriate for communicating the complex issues and in explaining and justifying the design approach to a wide variety of stakeholders.

Design Team Approach
The Design Commission supports the general design approach being taken, which is moving in the right direction, at this stage. Protecting the design narrative, ethos and ultimate quality will be key challenges.

It is good to see members of the design team working together at this early stage to understand and integrate different issues and responses.

Understanding the Landscape
This stretch of road passes through a variety of landscape character types, adding complexity. The Commission believes that it is important to develop and use a good understanding of the landscape and context to inform the design. It is important to understand the different qualities along the route before getting into landscape design drawings.

The presenting team demonstrated that they are investing time in understanding the landscapes and contexts through a variety of studies, including spending time on site, drawing and modelling. The 'narrative of observations' along the route is useful.

The places along the stretch where there is transition, from townscape to landscape for example, will be especially important and much harder to get right. Extending the analysis and design response along the crossing and intersecting routes away from the immediate confines of the A465 alignment will also be crucial, and the evidence of locations where this has already been considered was encouraging.

Balancing & Managing Impacts
As with all schemes of this nature and complexity, balances will need to be struck between meeting technical requirements and design standards, and the impacts made on surrounding landscapes and communities. There are numerous issues to weigh up in making decisions, and it is important that design philosophies and project visions are in place to guide this process, and so that value judgements can be made when there are conflicting demands. Iterative testing processes will be required to balance impacts in different situations. It will also be useful for the team to look at precedent schemes, especially the previous sections of the A465, to learn lessons for this project.

It will be useful to identify key viewpoints and receptors to focus design attention and decision making. Views to and from, and impacts on sensitive landscapes and communities will be important.

Where drainage and attenuation ponds are necessary, these should be integrated through design to maximise benefits.

At the Baverstock and Croes Bychan junctions it will be particularly challenging to get the right balance between managing traffic flows on and off the main road and minimising the scale of the junction in this open area of high ground. It would be useful to model this junction to achieve a better understanding of potential impacts.

It is good that an ecologist will be working closely with the other designers to avoid any potentially negative knock-on effects from compliance with or responses to environmental legislation.

Approach to Bridge and Structure Design

In this case, it may not be appropriate to take a uniform or 'family' approach to the design of the bridges and other structures because of the significant variation in surroundings along the length of the road.

There are a number of existing structures with significant design and heritage value which have been recognised by the team. The best way to approach these structures will need to be carefully debated so that a philosophy can be developed. It will be important that the right level of detail and information relating to working with the existing structures is included in the tender documents.

In general, the simple, elegant and raw approach to new construction which the team described seems appropriate. Reflecting, and sometimes exposing, the underlying geology and expressing the construction method of new structures are valid approaches which would echo the region's industrial heritage.

Community Connections

The scale of this scheme will mean significant impacts on surrounding communities. Wherever possible, opportunities for making those impacts positive rather than negative should be pursued.

It would be useful to map existing community connections which could be improved, as well as opportunities for new connections. All routes and connections should be designed to feel safe to use and encourage active travel.

Through good, integrated design, there are many aspects of the scheme which could improve the amenity for local residents and visitors, and these should be identified and built into the scheme at an early stage.

Some of the opportunities for improvement may sit partly outside the scope of this scheme, so engagement with the local authorities would be beneficial. For example, a public realm strategy for High Street would have many benefits for the community, but

would need to stretch beyond the boundaries of this project. Opportunities for future projects such as these should be identified and mapped with local authorities.

Approach to Detail Design & Procurement
Due to the complexity and variety of conditions to which this scheme will need to respond, the design process will require a significant investment of time and resources in order to get all parts of the project working well as an integrated whole. The value of design investment at these early stages of the scheme should not be underestimated. The same will apply at the detail design stage: this will be important, but it is good that strategic design issues are being well considered first.

The content of the specifications and drawings for tender will need to reflect the project priorities and philosophies so that money is spent in the right places and to benefit from innovation in the right places. The Commission strongly supports an approach that makes essential design requirements mandatory in the construction contract documents. Where there is something that the client and design teams feel is important it should be prescribed in detail and not left to later interpretation by the contractor team.

Further Review
The Design Commission welcomes the opportunity to review this scheme again as design work progresses. At the next review we would expect to see:

- Explanation and examples of how design is being informed by understanding of landscapes and the interfaces with routes across the A465
- How lessons learnt from previous sections of the A465 have been used
- Work in progress on design of structures
- Baverstock Junction options modelled
- Drainage/attenuation pond strategies
- Community connections identified and mapped

Attendees

Agent/Client/Developer:	Mark Dixon, Welsh Government
Designers/Contractors:	Gareth Protheroe, Jacobs (PM) Frank Klaptocz, Jacobs (Structures) Thomas Darcy, Jacobs (Landscape) Whitney Adam, Jacobs (Planner) Ric Russell, Nicholl Russell Studios (Architect/Bridges)
Statutory & Local Authorities:	Jackie Walters, NRW Olwen Maidment, NRW Tom Bramley, Merthyr Tydfil CBC Ray Edwards, RCTCBC
Design Review Panel:	
Chair	Ewan Jones
Lead Panellist	Andrew Linfoot Steve Smith Steven Smith Toby Adam Amanda Spence, Design Advisor, DCFW Carole-Anne Davies, Chief Executive, DCFW Jen Heal, Design Advisor, DCFW

Appendix D. DCfW Design Review Report May 2016

See following page.

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DESIGN
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Design Review Report

A456 Sections 5 and 6,

Dowlais Top to Hirwain

DCFW Reference: N99

Meeting of 19th May 2016

Declarations of Interest

Panel members, observers and other relevant parties are required to declare ***in advance*** any interests they may have in relation to the Design Review Agenda items. Any such declarations are recorded here and in DCFW's central records.

Review Status	**PUBLIC**
Meeting date	19th May 2016
Issue date	2nd June 2016
Scheme location	A465 Dowlais Top to Hirwain
Scheme description	Highways/infrastructure
Scheme reference number	N99
Planning status	N/A

Declarations of Interest

None declared

Consultations to Date

Public consultation on the 1997 scheme was completed in December 2015. There is ongoing consultation with NRW.

This scheme was previously reviewed by Design Commission for Wales on 18th February 2016. This report should be read in conjuction with the report from that review.

The Proposals

The proposed scheme involves online widening of an existing 2-3-lane trunk road between Dowlais Top roundabout in the east and Hirwaun Industrial Estate in the west, approximately 16km. The A465 Heads of the Valleys trunk road links south and west Wales to the English Midlands and was constructed in the 1960s. Currently, the majority of the trunk road consists of a two to three lane carriageway between Dowlais Top and Hirwaun. Surrounding land uses are varied and include residential towns and villages including Hirwaun, Cefn Coed, Gurnos, Pant, and Dowlais Top; the Brecon Beacons National Park; agricultural uses; and industrial estates. Works would include some small off-line sections, grade separated junctions, replacement and new structures and major earthworks. The scheme is part of a broader dualling of the entire 40km of A465 between Abergavenny and Hirwaun. Previous sections are now completed or under construction. The team is aiming to publish Draft Orders in October 2016. It may be useful to read DCFW's reports on the earlier phases to learn lessons for this section.

Main Points in Detail

The following points summarise key issues from the review and should inform work and procurement discussions ahead of publication of Draft Orders or further review of the scheme:

Design Approach & Communication
The Design Commission continues to support the general design approach being taken, in which members of the design team are working collaboratively to understand and integrate different issues. Work since the previous review was presented clearly; the additional physical modelling was particularly useful.

It is important that this good work is not eroded through the procurement process but that important precise design ideas and qualities become essential requirements in the construction contract documents.

Approach to redundant roads
Strategies for dealing with stretches of road which will become redundant should be defined, including information on what should be removed, what should be retained, what should be added and the rationale for doing so. For example, there are important grasslands around the Hirwain junctions which could be visually emphasised and biologically enhanced.

There are many issues to consider in setting out these strategies, including ecological value, drainage, views and appreciation of landscape character and land use. It will be important to consider ownership and management responsibilities in relation to control of ideas.

Lighting strategy
The presenting team stated that they have been instructed to challenge the lighting standards to minimise lighting along the route and at junctions where safe to do so. The Design Commission supports this approach and agrees with the team that carefully designed lighting provides the opportunity to improve the quality of the experience of those using the road and the surrounding environment. Minimising standard street lighting will also help reduce light pollution, which is a particularly positive step near to the National Park. The Commission also supports the approach to amenity lighting as an integrated design opportunity.

Positive drainage strategies
The Commission encourages the design of positive drainage strategies. Drainage solutions have the potential to add or take away value from adjacent foot and cycle paths and therefore require careful design. As far as possible attenuation ponds or ditches should be designed so that safety fencing is not required. This could be done through careful positioning of areas of water in relation to publically accessible routes, shaping of topography and landscape design, such as ha-ha's. The design of each drainage solution should take account of the landscape in which it will sit.

Art strategies
Where artwork is being considered a good brief and the right artist - who can demonstrate experience of the scale and type of work – will be required. There should be an intimate relationship between the artwork and its locality and it should be integrated with the design of surrounding landscape and/or structures, which will require the early involvement and collaboration of the artist(s).

Hirwain Junction
This junction and its landscape and structures are being carefully designed and a successful solution is emerging.

Nant Hir Bridge
It is important that enjoyment of the existing bridge structure is maintained. This may require detailed specification of requirements to be included in contract documents.

Baverstock Junction
The physical model of this junction usefully demonstrates the potential for road users to experience a new rock-face cutting, although now this proposal needs to be considered in more detail, including provision of guard rails at the edge of the cutting.

The proposal would benefit from further simplification of the landscape design and planting strategy, taking into account the scale and character of the landscape and views from the road and avoiding planting only for mitigation. Proposals could be usefully checked through site visits.

A470 Junction & National Park Link
The option which was being considered at the previous review is no longer deemed feasible due to negative environmental impact and cost. This will be an important junction as it will be one of the busiest and act as a link to the National Park.

The team presented a good landscape design concept to mark this junction as the route to the National Park. Thought needs to be given to how the subtleties of the concept can be accurately carried through to the delivery stages, including whether on-site control will be required.

Sculpture installations seem appropriate at this location but a good brief and the right artist will be required to ensure they are of good quality.

Taf Fawr bridges
The proposal here requires retention of an existing bridge and two additional bridges, which must all work as a composition in the landscape. Modelling the forms of the bridges and surrounding landscape in a computer package would be a useful way to check views from different points and refine the composition. A simple design tool model, rather than a highly rendered model, would be appropriate at this stage.

The existing bridge is seen against a substantial background of trees which provide a very simple background for the bridge structure. There is a risk that this background will become disrupted and cluttered by the earthworks needed for the remodelled junction, making it much more difficult for the new bridges to be successfully integrated into this composition.

The impacts during and after construction now need to be considered in more detail. These will include, but are not limited to, earthworks, retention or felling of trees, new planting, how structures meet the ground or rock face, the composition of safety barriers and street lighting, access to structures for maintenance and the composition of bridge supports from different angles. This should all be part of the LVIA design process.

It would be useful to explore the different safety barrier manufacturers available as they will be an important visual element of this part of the scheme.

High Street Bridge & Taff Trail
Designs for the High Street bridge are in progress but appear to have the right ambition to provide a better experience for those using the environment above the bridge on the High Street.

Realignment of the Taff Trail, to remove the existing pinch point and provide new connections to the existing settlement, would be a positive move. It is good that the team are considering ways to improve the experience of this stretch of the trail as part of a longer journey. The 'cliff-hanging' path and 'corner outlook' proposals would add new highlights to the journey and maximise the benefits resulting from the works.

Management responsibilities for the new elements of the Taff Trail should be clearly defined.

The composition of the three proposed elements in this section (High Street bridge, Taff Trail bridge and cliff-hanging walkway) appear to work well with each structure appropriate to its function and responding to its location.

Ty Fechan
A pedestrian desire line following the route of the existing bridge has been identified at Ty Fechan. The idea of threading a suspended pedestrian bridge under the deck of the existing bridge is being explored and has the potential to provide an exciting and appropriate solution. Care will need to be taken to provide a pleasant, safe environment along the pedestrian route whilst building in restrictions to vandalism.

Goitre Road & James Street underpasses
The ambition to improve the environment of underpasses to provide safer, more pleasant routes is good.

Exaggerating the width of the Goitre Road underpass, taking the stone walling through, providing subtle lighting and using a contrast textured stone surface either side of the path are positive steps to achieving this ambition. Care should be taken to minimise opportunities for vandalism.

There is a change in the underlying geology in this location compared to other parts of the scheme, which could be reflected in the stonework. This may be an appropriate location to involve an artist (to work with stone and light) to add interest along the length of the underpass.

Pant Viaduct
The impact of proposals is currently being studied and was not presented at this meeting.

Five roundabouts junction
This is a challenging junction to resolve as it will have a significant impact on the communities and businesses which are very close to the roads. The current proposed solution, which would require a series of five roundabouts, could cause confusion for road users and introduce considerable highway signage. It is understood that a simpler road layout would have a greater impact on the businesses. However, more detailed studies are required to assess and balance the impacts of different solutions, using professional judgement to find the best layout, as the current proposal is far from ideal.

Retaining design strategies & quality through procurement
It is good to see that time, effort and skills are being properly invested in from the early design stages to address the complexity and variety of conditions to which this scheme will need to respond. The design team are working well together to deal with each element of this complex scheme at a strategic level, before moving into the detail design. Both the strategic concepts and detail design quality must be retained through procurement to the delivery of the scheme to maximise the value and benefits of this early investment in design.

It will be important to identify which elements of the proposal need to be firmly fixed in the tender documents so that they cannot be undermined by the contractor. Getting the right level of detail and specification will be crucial. The large bridge structures and landscape design at key junctions are visually important and are areas where specific details should be fixed. There may be other areas where flexibility for the contractor will be beneficial.

It will be important that contractor-proposed changes which would reduce the design quality and value of the scheme are rejected. Although DCFW involvement in schemes usually ends at the planning permission stage, in this case, we believe there will be value in reviewing the contractor's detailed proposals so that the good design work that is taking place now is not eroded through delivery of the scheme.

Further Review
The Design Commission welcomes the opportunity to review large schemes a number of times as designs progress. It is suggested that the next meeting takes place at a stage where contractual details and commitments are being decided.

should not be considered 'advice' and no third party is bound or required to act upon it. The Design Review Service is delivered in line with DCFW's published protocols, code of conduct and complaints procedure, which should be read and considered by users of the service.

A Welsh language copy of this report is available upon request.

Attendees

Agent/Client/Developer:	Fil Pamment, Welsh Government (Project Engineer)
Designers/Contractors:	Gareth Protheroe, Jacobs (PM) Voirrey Costain, Jacobs (Environmental Consultant) Frank Klaptocz, Jacobs (Structures) Thomas Darcy, Jacobs (Landscape) Adam Priestley, Jacobs (Environmental Consultant) Ric Russell, Nicholl Russell Studio(Architect/Bridges)
Statutory & Local Authorities:	Jackie Walters, NRW Olwen Maidment, NRW Scott Hand, NRW Tom Bramley, Merthyr Tydfil CBC Ray Edwards, RCTCBC Rob Chiat, RCTCBC
Design Review Panel:	
Chair	Ewan Jones
Lead Panellist	Andrew Linfoot Cora Kwiatkowski Alister Kratt Kedrick Davies Amanda Spence, Design Advisor, DCFW Jen Heal, Design Advisor, DCFW

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Appendix E. Indicative A465 Sections 5 and 6 Environmental Barrier Finishes and Materials

Table E1.1: Indicative A465 Sections 5 & 6 environmental barrier finishes & materials

Barrier ID	Location	Structure information	Length (m)	Height	Style	Material	Colour / finishes	Notes
1	Between Trewaun East Bridge and West Bridge (N)	On Structure (Part)	83	2	Basic	Vertical Corten 'weathering steel' panels.	Corten weathering steel. Untreated recessive rust colours with a matt patina.	N/A
2	Trewaun South East Retaining Wall 1 (S)	On Structure (Part)	92	2	Basic	Vertical Corten 'weathering steel' panels.	Corten weathering steel. Untreated recessive rust colours with a matt patina.	N/A
3	Trewaun North East Retaining Wall (N)	On Structure (Part)	288	2	Basic	Vertical Corten 'weathering steel' panels.	Corten weathering steel. Untreated recessive rust colours with a matt patina.	N/A
4	Trewaun South East Retaining Wall 2 (S)	On Structure (Part)	66	2	Basic modified	Vertical Corten 'weathering steel' panels with heavy duty clear acrylic top panels.	Corten weathering steel. Untreated recessive rust colours with a matt patina. Clear (tinted) acrylic.	Clear top panels to reduce scale.
5	Croesbychan junction (E)	On Structure (Part)	485	1	Contemporary	Metal / steel panels, horizontal or vertical.	Visually recessive, light greys, matt. Painted and / or 'natural' galvanised steel.	Colours need to be recessive on raised structure. Materials to complement structure finishes (mainly grey concrete) and highway infrastructure (mainly galvanised steel).
6	Taf Fawr Mainline Viaduct (N)	On Structure (Whole)	187	2	Contemporary	Metal / steel panels, horizontal or vertical.	Visually recessive, light greys, matt. Painted and / or 'natural' galvanised steel.	Colours need to be recessive on raised structure. Materials to complement structure finishes (mainly grey

Barrier ID	Location	Structure information	Length (m)	Height	Style	Material	Colour / finishes	Notes
								concrete) and highway infrastructure (mainly galvanised steel).
7	Taf Fawr Slip Road 1 (S)	N/A	94	3	Basic modified	Vertical Corten 'weathering steel' panels with heavy duty clear acrylic top panels.	Corten weathering steel. Untreated recessive rust colours with a matt patina. Clear (tinted) acrylic.	Clear top panels to reduce scale.
8	Taf Fawr Slip Road 2 (S)	N/A	87	2	Basic and traditional	Vertical Corten 'weathering steel' panels. Section nearest High Street to include natural stone masonry.	Corten weathering steel. Untreated recessive rust colours with a matt patina. Natural grey local sandstone for traditional section.	Use of natural stone masonry to tie in with existing public realm at High Street.
9	Cefn Coed High Street Overbridge to Taff Trail Footbridge (N)	N/A	100	2	Traditional	Natural stone masonry.	Natural grey local sandstone.	Use of natural stone masonry to complement setting to Listed Building and to tie in with existing public realm at High Street and in adjacent residential area.
10	Cefn Coed High Street Overbridge to Taf Fechan Viaduct (Widened) (S)	On Structure (Part)	207	2	Traditional	Natural stone masonry.	Natural grey local sandstone.	Use of natural stone masonry to complement setting to Listed Building and to tie in with existing public realm at High Street and in adjacent residential area.
11	Taf Fechan Viaduct (Widened) (S)	On Structure (Whole)	131	1	Contemporary	Metal / steel panels, horizontal or vertical.	Visually recessive, light greys, matt. Painted and/or 'natural' galvanised steel.	Colours need to be recessive on raised structure. Materials to complement structure finishes (mainly grey

Barrier ID	Location	Structure information	Length (m)	Height	Style	Material	Colour / finishes	Notes
								concrete) and highway infrastructure (mainly galvanised steel).
12	Taf Fechan (S)	N/A	219	1	Contemporary	Metal / steel panels, horizontal or vertical.	Visually recessive, light greys, matt. Painted and / or 'natural' galvanised steel.	Colours need to be recessive on raised structure. Materials to complement structure finishes (mainly grey concrete) and highway infrastructure (mainly galvanised steel).
13	Gurnos Farm Underpass to Prince Charles Hospital Junction 1 (S)	N/A	405	3	Basic modified	Vertical Corten 'weathering steel' panels with heavy duty clear acrylic top panels.	Corten weathering steel. Untreated recessive rust colours with a matt patina. Clear (tinted) acrylic.	Clear top panels to reduce scale.
14	Gurnos Farm Underpass to Prince Charles Hospital Junction 2 (S)	N/A	80	4	Basic modified	Brick faced masonry wall at base. Vertical Corten 'weathering steel' panels with heavy duty clear acrylic top panels.	Corten weathering steel. Untreated recessive rust colours with a matt patina. Clear (tinted) acrylic.	Brickwork base, weathering steel mid-section and clear top panels to reduce scale.
15	Gurnos Farm Underpass to Prince Charles Hospital Junction 3 (S)	On Structure (Part)	177	1	Basic	Vertical Corten 'weathering steel' panels.	Corten weathering steel. Untreated. Recessive rust colours with a matt patina.	
16	Pant Road Bridge to Jones St. Bridge (N)	On Structure (Part)	220	3	Contemporary	Metal / steel panels, horizontal or vertical with heavy duty clear acrylic top panels to reduce scale.	Visually recessive, light greys, matt. Painted and / or 'natural' galvanised steel. Clear (tinted) acrylic.	Colours need to be recessive on raised structure. Materials to complement structure finishes (mainly grey concrete) and highway

Barrier ID	Location	Structure information	Length (m)	Height	Style	Material	Colour / finishes	Notes
								infrastructure (mainly galvanised steel).
17	Beacons View (Dowlais) (S)	N/A	44	2	Basic	Vertical Corten 'weathering steel' panels.	Corten weathering steel. Untreated recessive rust colours with a matt patina.	
18	Cross Houlson Street (Dowlais) (S)	N/A	81	2	Contemporary	Metal / steel panels, horizontal or vertical with heavy duty clear acrylic top panels to reduce scale.	Visually recessive, light greys, matt. Painted and / or 'natural' galvanised steel. Clear (tinted) acrylic.	Colours need to be recessive. Materials to complement structure finishes (mainly grey concrete) and highway infrastructure (mainly galvanised steel).
19	Jones St. (Dowlais) (S)	On Structure (Part)	478	3	Contemporary	Metal / steel panels, horizontal or vertical with heavy duty clear acrylic top panels to reduce scale.	Visually recessive, light greys, matt. Painted and / or 'natural' galvanised steel. Clear (tinted) acrylic.	Colours need to be recessive. Materials to complement structure finishes (mainly grey concrete) and highway infrastructure (mainly galvanised steel).
20	Dowlais Top Slip Road (S)	N/A	431	1	Basic	Vertical Corten 'weathering steel' panels.	Corten weathering steel. Untreated recessive rust colours with a matt patina.	
21	Dowlais Top Mainline (S)	N/A	206	1	Contemporary	Metal / steel panels, horizontal or vertical.	Visually recessive, light greys, matt. Painted and / or 'natural' galvanised steel.	Colours need to be recessive on raised structure. Materials to

Barrier ID	Location	Structure information	Length (m)	Height	Style	Material	Colour / finishes	Notes
								complement structure finishes (mainly grey concrete) and highway infrastructure (mainly galvanised steel).

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Appendix F. Example Environmental Barrier Finishes

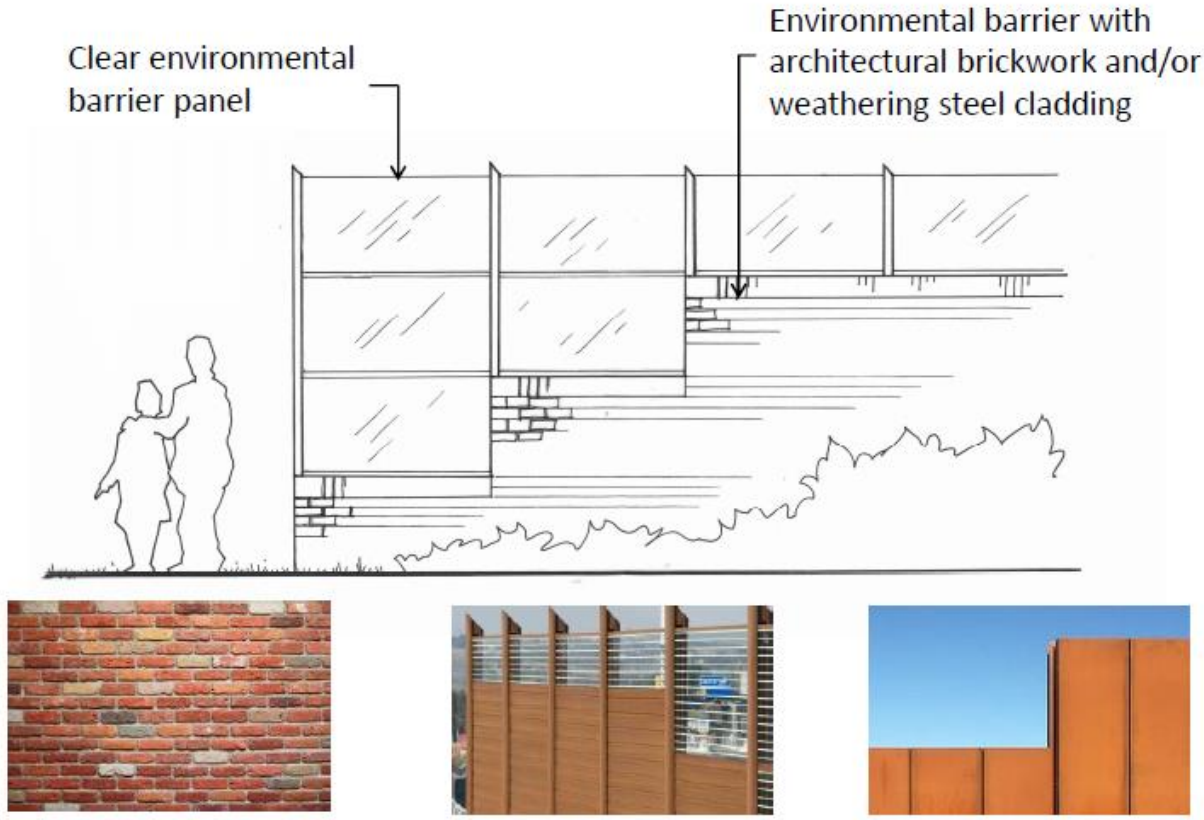

Plate 1.11 : 'Basic' environmental barrier (Corten weathering steel) and 'traditional' environmental barrier with brickwork. Modifications using clear panels are also illustrated.

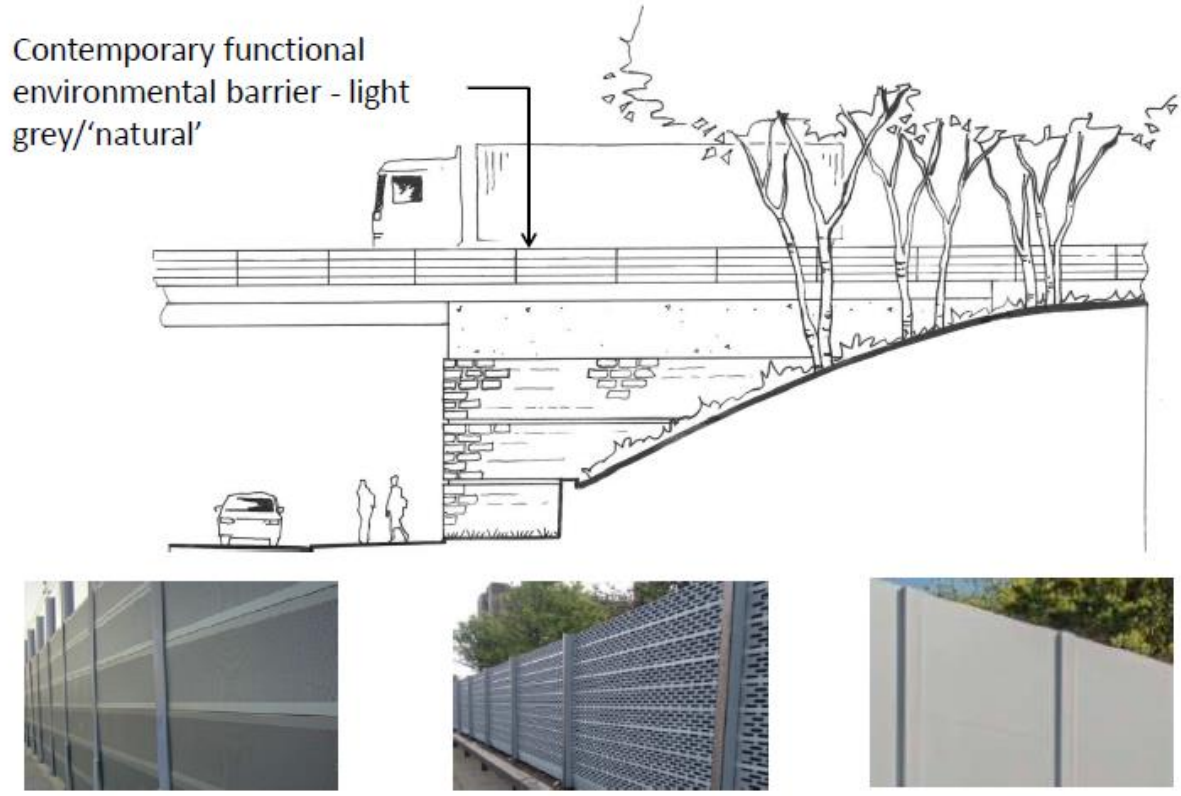

Plate 1.12 : 'Contemporary' environmental barrier.

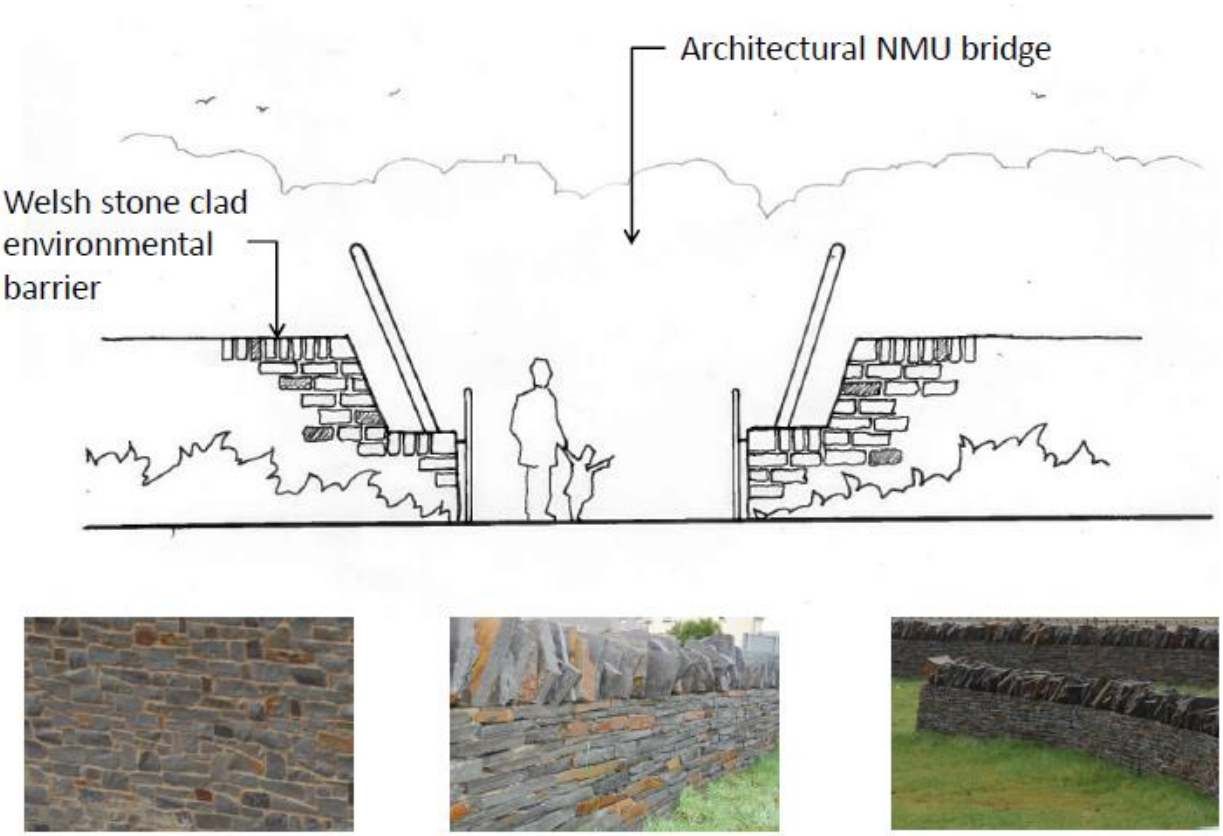

Plate 1.13 : 'Traditional' environmental barrier at access point to Taff Trail NMU Bridge.

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