Llywodraeth Cymru / Welsh Government

A487 New Dyfi Bridge

Environmental Statement - Volume 3: Appendix 1.4

Scoping Report

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Contents

Appendices

Glossary of Abbreviations and Acronyms

AADT	Annual Average Daily Traffic
ALC	Agricultural Land Classification
ARM	Affected Road Network
AQAP	Air Quality Action Plans
AQMA	Air Quality Management Areas
ASIDOHL	Assessment of the Significance of Impacts of Development on Historic Landscapes
BMV	Best and Most Versatile
BTO	British Trust for Ornithology
CEMP	Construction Environmental Management Plan
CIRIA	Construction Industry Research and Information Association
CPAT	Clwyd Powys Archaeological Trust
CPRW	Campaign for the Protection of Rural Wales
CRTN	Calculation of Road Traffic Noise
CCW	Countryside Council for Wales
CO	Carbon monoxide
CO_2	Carbon dioxide
CSM	Conceptual Site Model
CPAT	Clwyd-Powys Archaeological Trust
DMRB	Design Manual for Roads and Bridges
DTM	Digital terrain modelling
EA	Environment Agency (now part of Natural Resources Wales)
ECI	Early Contractor Involvement
EIA	Environmental Impact Assessment
ELG	Environmental Liaison Group
ES	Environmental Statement
EU	European Union
FCA	Flood Consequences Assessment
GAT	Gwynedd Archaeological Trust
GES	Good Ecological Status
GEP	Good Ecological Potential
GCR	Geological Conservation Review
GI	Ground Investigation
HAWRAT	Highways Agency Water Risk Assessment Tool
HGV	Heavy Goods Vehicle
IAN	Interim Advice Note
IAQM	Institute of Air Quality Management
JNCC	Joint Nature Conservation Committee
LAQM	Local Air Quality Management
LDP	Local Development Plan
LNR	Local Nature Reserve
LVIA	Landscape and Visual Impact Assessment
NAQS	National Air Quality Strategy
NCN	National Cycle Network
NNR	National Nature Reserve
NoD	Notice of Determination
NPPF	National Planning Policy Framework
NRW	Natural Resources Wales
NOx	Oxides of Nitrogen
NMU	Non-Motorised User

NTP	National Transport Plan
MMP	Materials Management Plan
MPA	Minerals Planning Authority
MPPW	Minerals Planning Policy Wales
PM	Particulate matter
PLI	Public Local Inquiry
PPV	Peak Particle Velocity
PPW	Planning Policy Wales
PRoW	Public Rights of Way
PSSR	Preliminary Sources Study Report
RCAHMW	Royal Commission on the Ancient and Historical Monuments of Wales
RDB	Red Data Book
RIGS	Regionally Important Geological and Geomorphological Sites
RoD	Record of Determination
SAC	Special Area of Conservation
SAM	Scheduled Ancient Monument
SINC	Site of Importance for Nature Conservation
SLA	Special Landscape Area
SNP	Snowdonia National Park
SNPA	Snowdonia National Park Authority
SPA	Special Protected Area
SSSI	Site of Special Scientific Interest
SUDS	Sustainable Drainage Systems
SWMP	Site Waste Management Plan
TPO	Transport Planning Objectives
TRA	Trunk Road Agent
UDP	Unitary Development Plan
UNECE	United Nations Economic Commission for Europe
WelTAG	Welsh Transport Planning and Appraisal Guidance
WFD	Water Framework Directive
WG	Welsh Government
WHO	World Health Organisation
ZTV	Zone of Theoretical Visibility

1 Introduction

1.1 Context

1.1.1 The Welsh Government proposes to provide a new section of the A487 trunk road which incorporates the provision of a new crossing of the River Dyfi upstream of the existing road bridge, Pont-ar-Ddyfi.

1.1.2 The existing A487 trunk road leading northwards from Machynlleth has been subject to increased traffic and repeated flooding. The Pont-ar-Ddyfi is a pinch point on the network due to its narrow nature and the safety issues associated with the junction at the northern end. The structure was not designed to carry the current volume and type of traffic.

1.1.3 The continued deterioration of the existing masonry road bridge (Pont-ar-Ddyfi) which leads to the junction of the A487 and the A493, has resulted in required structural strengthening works and repairs to keep the bridge in operation. The Pont-ar-Ddyfi is Grade II* listed and a Scheduled Ancient Monument, so there are restrictions on altering the bridge. The Afon Dyfi is subject to frequent flooding leaving the approach road from Machynlleth inundated, causing the A487 trunk road to be closed and severing the local communities either side of the river. Further closures result from accidents on the Pont-ar-Ddyfi and associated bridge repairs. During closures, traffic is required to take a diversion of up to 30 miles.

1.2 Background

1.2.1 There have been several studies into the area to look at operation, suitability, online and off-line improvements and traffic management. In November 2000, a Powys TRA Stage II Technical Appraisal Report supported by an Environmental Statement concluded that for the trunk road to remain accessible to traffic at all times the recommended option was to construct an offline multi-span viaduct across the floodplain.

1.3 The Scheme

1.3.1 The A487 New Dyfi Bridge is located on the A487 Fishguard to Bangor Trunk Road, to the north of Machynlleth. The proposed Scheme is a 1100m new section of single carriageway road. The proposed route is to the south east of the existing route and Pont-ar-Ddyfi Bridge. The Scheme includes a viaduct and river bridge across the Afon Dyfi and associated floodplain, some 550m in length. For most of its route, the Scheme will be elevated across a generally flat floodplain and at its highest point (on the river bridge) it will be some 10-11m above ground level. The existing A487 will be de-trunked between the two ends of the scheme. Pont-ar-Ddyfi will be restricted to Non-Motorised Users (NMUs) only.

1.4 Location of the A487 New Dyfi Bridge

1.4.1 The location of the New Dyfi Bridge is shown in Figure 1, which illustrates how the Scheme will tie into the existing A487, crossing the Afon Dyfi upstream of the Pont-ar-Ddyfi and adjacent to the Millennium Bridge. The bridge is located on the A487 Fishguard to Bangor Trunk Road which is the principal strategic north south route along the west coast of Wales. The Scheme is located immediately north of Machynlleth in North Powys and Gwynedd. Pont-ar-Ddyfi is the first upstream crossing of the Afon Dyfi, approximately 8km west of the next road crossing at Jubilee Bridge, Grofft. The Scheme passes through the predominantly rural landscape of the Dyfi valley and lies partly within the Snowdonia National Park, the boundary of which extends south of the river encompassing part of the valley floor (as shown in Figure 2a and 2b).

1.5 Planning Context

1.5.1 The scheme falls within both Gwynedd Council and Powys County Council and is partly within the Snowdonia National Park (see Figure 3). The Snowdonia National Park Authority is the local planning authority within the national park. Gwynedd Council and Powys County Council are statutory consultees for planning applications in the National Park within their areas.

1.5.2 The Eryri Local Development Plan (LDP) 2007-2022 is the adopted plan in the Snowdonia National Park. It was adopted by Snowdonia National Park Authority on the 13th of July, 2011.

1.5.3 In Gwynedd Council the Gwynedd Unitary Development Plan (UDP) 2001-2016 is the adopted plan. Further to this, Gwynedd Council and the Isle of Anglesey County Council have prepared a draft Joint Local Development Plan for Anglesey and the Gwynedd Local Planning Authority Area - Joint Local Development Plan Anglesey & Gwynedd (2011 - 2026). The Eryri LDP takes precedence within the Snowdonia National Park.

1.5.4 In Powys County Council the Powys Unitary Development Plan (UDP) 2001 - 2016 is the adopted plan. It was adopted in March 2010. As part of the process of preparing the Powys Local Development Plan (LDP) (2011-2026), the Council recently consulted on the revised Deposit LDP (8th June to 20th July 2015). Upon adoption, the LDP will replace the current UPD. The Eryri LDP takes precedence within the Snowdonia National Park.

1.6 Overseeing Organisation

1.6.1 The Overseeing Organisation[1] as defined is responsible for ensuring that environmental issues are fully integrated into the project and agree on the proposed levels of assessment to be applied at each stage of project. The Welsh Government

[1] Highways Agency, Scottish Government, Welsh Assembly Government, Department for Regional Development Northern Ireland (2008) Design Manual for Roads and Bridges HA 218/08 Volume 11, Section 2, Part 7. Glossary of Terms used in DMRB Volume 11, Sections 1 and 2

(WG) is the Overseeing Organisation, for A487 New Dyfi Bridge and has appointed CH2M and Corderoy as their Employers Agent.

1.7 The Team

1.7.1 The Welsh Government has awarded an Early Contractor Involvement (ECI) contract for the next stage of Scheme development and environmental surveys for A487 New Dyfi Bridge up to publication of draft Statutory Orders and an Environmental Statement. The contract has been awarded to Alun Griffiths with support from design consultant Arup and Wallingford HydroSolutions Ltd.

1.8 Screening

1.8.1 The A487 New Dyfi Bridge falls under Annex II of the EIA Directive, which includes:

> 10. INFRASTRUCTURE PROJECTS
>
> (e) Construction of roads, harbours and port installations, including fishing harbours (projects not included in Annex I);

1.8.2 To determine whether or not Annex II projects are relevant, thresholds of project size and environmental sensitivity exist in the EIA Regulations for Annex II projects. In Wales, the thresholds for project size and environmental sensitivity are defined in the Highways (Assessment of Environmental Effects) Regulations 1999 (as amended).

1.8.3 Within the Highways (Assessment of Environmental Effects) Regulations 1999 (as amended) 'sensitive area' are identified. The following 'sensitive areas' have been identified that are relevant to the Scheme:

> (a) land notified under section 28(1) (areas of special scientific interest) of the Wildlife and Countryside Act 1981(a)
>
> (d) a National Park within the meaning of the National Parks and Access to the Countryside Act 1949(c);
>
> (g) a property appearing on the World Heritage List kept under article 11(2) of the 1972 UNESCO Convention for the Protection of the World Cultural and Natural Heritage(b);
>
> (h) a scheduled monument within the meaning of the Ancient Monuments and Archaeological Areas Act 1979(c);
>
> (i) a European site within the meaning of regulation 10 of the Conservation (Natural Habitats etc.) Regulations 1994(d).

1.8.4 The Scheme is determined to be a 'relevant project'[2] due to the size of the Scheme exceeding 1 hectare and the following sensitive areas having the potential to be affected by the development:

[2] Highways Agency, Scottish Government, Welsh Assembly Government, Department for Regional Development Northern Ireland (2008) Design Manual for Roads and Bridges HA 204/08 Volume 11, Section 2, Part 4 Scoping of Environmental Impact Assessments.

- The northern part of the route is within the Snowdonia National Park; and
- the Scheme is within the Dyfi Biosphere Reserve boundary;
- the existing Pont-ar-Ddyfi is a Scheduled Ancient Monument – MG002;
- the route of the proposed scheme crosses the floodplain of the Afon Dyfi. Further downstream the Afon Dyfi is designated as part of the Dyfi SSSI, the Pen Llyn a'r Sarnau / Lleyn Peninsula and the Sarnau Special Area of Conservation (SAC), the Dyfi Estuary / Aber Dyfi Special Protection Area (SPA), the Cors Fochno and Dyfi Ramsar site and the Dyfi National Nature Reserve (NNR);
- the Fridd round barrows lie directly east of the northern part of the route and are a Scheduled Ancient Monument (ME231) (see Figure 2b).

1.8.5 A determination process must therefore be followed that meets the requirements of the EIA Regulations. As part of determination process, a Record of Determination (Rod) will be produced for the Scheme to record the considerations undertaken and the knowledge or judgement used, including the views of statutory environmental bodies. The approval of the RoD gives authorisation for project teams to produce and publish the Determination decision as required by Section 105B of the Highways Act 1980, (as amended). This is referred to as the Notice of Determination (NoD)[3].

1.9 Policy Context

Wales Transport Strategy – One Wales: Connecting the Nation (April 2008)

1.9.1 The Wales Transport Strategy was published in 2010 and is a statutory strategy required by the Transport (Wales) Act 2006. The Strategy establishes a national framework for transport planning in Wales. The goal of One Wales: Connecting the Nation is to promote sustainable transport networks that safeguard the environment while strengthening the country's economic and social life. The outcomes of the strategy, through the strategic priorities, will be achieved by Welsh Government at national level, Regional Consortia at regional level and Local Authorities at local level. TraCC (Trafnidiaeth Canolbarth Cymru) is the regional consortium for Central Wales responsible for achieving the outcomes of the strategy through their Regional Transport Plan

National Transport Plan (March 2010)

1.9.2 The current National Transport Plan was published in 2010 and prioritised in 2011. The Plan details the Welsh Government's approach to putting Transport onto a carbon reduction pathway, whilst at the same time ensuring that it can continue to support sustainable economic development and social inclusion. The current Plan was focused on the period from 2010 to 2015, hence a new plan is required to set out plans for the period beyond that.

[3] Welsh Assembly Government (2009) Interim Advice Note 126/09(W) Supplementary Guidance for Users of DMRB Volume 11 'Environmental Impact Assessment' Reporting of Determination and Publication of Notices Wales Only

National Transport Finance Plan for Wales (August 2015)

1.9.3 On the 16 July 2015, the Welsh Government's National Transport Finance Plan 2015 was published. The plan sets out a timetable of delivery, estimated expenditures and sources of funding for the Welsh Government's key transport projects to support their economic and social priorities.

1.9.4 The purpose of this plan is to:

- provide the timescale for financing the schemes undertaken by the Welsh Government
- provide the timescale for delivering these schemes
- detail the estimated expenditure required to deliver the schemes
- identify the likely source of financing to allow delivery to take place.

1.9.5 The plan lists A487 Dyfi Bridge as scheme reference R23 under "New Road Infrastructure – Schemes to be Constructed" with a delivery period of 2015 – 2020.

1.10 Purpose of this Scoping Report

1.10.1 Environmental Impact Assessment (EIA) is the process of identifying and assessing the significant effects likely to arise from a proposed development.

1.10.2 EIA requires consideration of the likely changes to the environment, where these arise as a consequence of the proposed development, through comparison with the existing and likely future baseline conditions in the absence of the proposed development.

1.10.3 The scoping process seeks to confirm which environmental topics should be assessed during the EIA process and the level of detail this assessment should comprise.

1.10.4 The purpose of this Scoping Report is to identify the scope of the EIA process that will be undertaken and to set out the proposed assessment methodologies (the requirement for an EIA to be undertaken for this Scheme is discussed in Section 6.1). DMRB Volume 11, Section 2, Part 4[4] notes that a formal Scoping Opinion is not a legal requirement but that statutory environmental bodies, local authorities and other public authorities with environmental responsibilities, as well as key stakeholders, are likely to have views on the scope of an EIA. EIA is expected by DMRB for road projects and the scoping process is recognised as good practice.

1.10.5 This document is the Scoping Report for the A487 New Dyfi Bridge. It relates only to the EIA process as defined by Section 105A of the Highways Act 1980, as amended. Other assessment procedures under different legislation and guidance (such as the Assessment of Implications on European Sites process) will be subject to separate screening and assessment processes, following separate prescribed

[4] Highways Agency, Scottish Government, Welsh Assembly Government, Department for Regional Development Northern Ireland (2008) Design Manual for Roads and Bridges HA 204/08 Volume 11, Section 2, Part 4. Scoping of Environmental Impact Assessments

methodologies, and will be reported separately. The purpose of this Scoping Report is to communicate with SEB's, to identify which environmental topics are to be examined and to confirm the level of assessment for each – either Simple or Detailed.

1.11 Structure of the Scoping Report

1.11.1 This report has been structured taking into account the guidance provided in Design Manual for Roads and Bridges (DMRB), Volume 11, Section 2, Part 6 HD 48/08[5].

1.11.2 The following chapters in this Scoping Report describe the Scheme (Chapter 2), alternatives considered (Chapter 3) and consultation (Chapter 4).

1.11.3 Subsequent chapters set out the scope and topic specific methodologies proposed for each environmental assessment topic to be addressed during the EIA process and to be reported upon in the final ES. Each topic chapter provides the following information:

- introduction;
- policy and guidance;
- work undertaken to date;
- baseline conditions, based on current knowledge;
- proposed scope of further baseline studies; and
- approach to assessment of effects.

1.12 Next Steps

1.12.1 Responses provided to this Scoping Report will be taken into account, in the environmental assessment process.

1.12.2 The findings of the EIA process will be set out in an ES, which will be prepared in accordance with Section 105A of the Highways Act 1980, as amended. The draft Orders and supporting documentation including an ES will be published in summer 2016.

1.12.3 The ES and draft Orders will be subject to consultation. Depending on the nature and number of any objections received to the published draft Orders, a Public Local Inquiry (PLI) may be held before an independent Inspector appointed for the purpose by the Welsh Government on nomination by the Planning Inspectorate.

1.12.4 The Welsh Ministers will take into consideration any representations on the ES and draft Orders, before deciding whether or not to proceed with the A487 New Dyfi Bridge, with or without modifications.

[5] Highways Agency, Scottish Government, Welsh Assembly Government, Department for Regional Development Northern Ireland (2008) Design Manual for Roads and Bridges HD 48/08 Volume 11, Section 2, Part 6. Reporting of Environmental Impact Assessments

2 The Scheme

2.1 Scheme Objectives

Welsh Government Objectives and Mission Statement

2.1.1 The Welsh Government's objectives associated with the National Transport Plan 2010 (NTP) and the A487 Route Management Strategy (Fishguard to Machynlleth) are covered in the proposed works for the A487 New Dyfi Bridge by improving the highway standards, reducing the susceptibility of flooding and the removal of the trunk road status at the existing Pont-ar-Ddyfi. These proposals would lead to a reduction in incidences when the A487 trunk road is fully or partially closed due to flooding, accidents and repairs and substantially reduce accident or collision damage to the Pont-ar-Ddyfi which results in long diversionary routes.

2.1.2 The Welsh Government's mission statement is to:

"Promote the vision and transport strategy described in the Welsh Assembly Government's, One Wales: Connecting the Nation, the Wales Transport Strategy and the National and Regional Transport Plans."

2.1.3 The Wales Transport Strategy 'One Wales: Connecting the Nation'[6] sets out the following goal:

'…to promote sustainable transport networks that safeguard the environment while strengthening our country's economic and social life'

2.1.4 The strategy includes a number of long-term social, economic and environmental outcomes to which the transport system contributes. Indicators are provided to track progress against the outcomes.

2.1.5 The Wales Transport Strategy includes the following relevant environmental outcomes:

- Outcome 11: The sustainability of the transport infrastructure - Increase the use of more sustainable materials in our country's transport assets and infrastructure;
- Outcome 12: Greenhouse gas emissions - Reduce the impact of transport on greenhouse gas emissions;
- Outcome 13: Adapting to climate change - Adapt to the impacts of climate change;
- Outcome 14: Air pollution and other harmful emissions - Reduce the contribution of transport to air pollution and other harmful emissions;
- Outcome 15: The local environment - Improve the positive impact of transport on the local environment;

[6] Welsh Assembly Government (2008) One Wales: Connecting the Nation. The Wales Transport Strategy

- Outcome 16: Our heritage - Improve the effect of transport on our heritage;
- Outcome 17: Biodiversity - Improve the impact of transport on biodiversity.

Scheme Specific Objectives

2.1.6 Eight Transport Planning Objectives (TPOs) were identified to be addressed by the Scheme and reported in the WelTAG Planning Stage Report[7]. These include:

TP01	To improve reliability of crossing the Afon Dyfi for people, freight and emergency vehicles on the A487 strategic corridor.
TP02	To improve efficient and reliable accessibility to key services including employment opportunities, healthcare and education.
TP03	To maintain the role of Machynlleth as a vibrant and sustainable local centre.
TP04	To preserve the long-term integrity of Pont-ar-Ddyfi
TP05	To reduce the number of severity of collisions and causalities on the A487 in the study area.
TP06	To ensure that flood risk to third parties is not increased.
TP07	To minimise the impact of transport improvements on the landscape, biodiversity, water resources and heritage.
TP08	To increase the opportunity for efficient, safe and reliable travel by walking and cycling on the A487 corridor within the study area.

2.1.7 In the Welsh Government's Programme for Government, the aim of the Environment and Sustainability Programme is '*To become a 'one planet nation', putting sustainable development at the heart of government*', with the following commitments made:

- living within environmental limits and acting on climate change;
- protecting healthy eco-systems; and
- creating sustainable places for people.

2.2 Background to the Scheme

2.2.1 The A487 trunk road is the principal south to north route along the west coast of Wales passing through a number of major towns between Fishguard and Bangor (Cardigan, Aberystwyth, Machynlleth, Dolgellau, Porthmadog and Caernarfon). The existing river crossing at Machynlleth (Pont-ar-Ddyfi) is the first upstream crossing of the Afon Dyfi and is located over 14km from the estuary. The Afon Dyfi is subject to frequent flooding leaving the approach road from Machynlleth inundated and the trunk route severed several times each year. Further closures result from accidents on

[7] Welsh Government (2012) A487 Dyfi Bridge Welsh Transport Planning and Appraisal Guidance (WelTAG), Planning Stage Final Report, April 2012.

the Pont-ar-Ddyfi and associated bridge repairs. In these conditions traffic must use the next upstream Afon Dyfi crossing on the B4404 requiring a long diversion.

2.2.2 Details of the history of the A487 New Dyfi Bridge, including recent alternatives considered, are set out in Chapter 3 of this Scoping Report.

2.3 A487 New Dyfi Bridge: Scheme Description

2.3.1 A new section of A487 single carriageway trunk road north of Machynlleth is to be provided, incorporating a new crossing of the River Dyfi upstream of the existing road bridge at Pont-ar-Ddyfi. The new road would tie into the existing A487 south and east of Pont-ar-Ddyfi and would be to rural all-purpose road standard S2[8]. The crossing point of the River Dyfi would be approximately 480m upstream of Pont-ar-Ddyfi. Figure 10 shows the Scheme General Arrangement.

2.3.2 The existing A487 would be de-trunked between the connection with the Scheme at the southern end and a point approximately 40m south of the existing Pont-ar-Ddyfi. A short section of the existing A487 would be stopped up approximately 40m south of the River Dyfi. The Pont-ar-Ddyfi and the approximate 40m section of the existing A487 to the south of the river would be restricted to Non-Motorised Users (NMUs) and authorised vehicles only. Authorised vehicles would be access for farmers and for statutory undertakers. Fixed and demountable bollards (sensitively designed) would be provided on the bridge to restrict access.

2.3.3 The proposed scheme consists of a new viaduct structure to cross the River Dyfi approximately 480m upstream of the existing bridge. At the northern end of the scheme the alignment ties into the existing A487 in the area of the completed Ffridd Gate Improvement and the existing A487 will be renumbered as the A493, joining the new A487 alignment via a ghost island 'tee' junction. The scheme crosses the River Dyfi and floodplain on a structure, connecting via a short embankment to the existing A487 north of the Cambrian Line Railway Bridge over the A487 on the edge of Machynlleth. The length of the proposed scheme is approximately 1100m with approximately 570m being on viaduct.

2.3.4 The existing A487 between the tie in points with the new scheme will be de-trunked. Preliminary design indicates the viaduct spans being typically 1 x 60m over the River Dyfi with 2No. x 35m, 14No. x 30m and 1No. x 20m spans crossing the floodplain. The viaduct structure is assumed to be carried by single circular columns on piled foundations with the deck structure being continuous steel/concrete construction.

2.3.5 The proposed scheme includes measures to address the flooding issues at the railway bridge in the form of a pumped drainage scheme.

[8] Single carriageways are described with an S prefix, followed by a number representing to the total number of lanes on the road. S2 is defined by Highways Agency, Scottish Government, Welsh Assembly Government and the Department for Regional Development Northern Ireland (2005) Design Manual for Roads and Bridges TD 27/05 Volume Volume 6, Section 1, Part 2. Cross Sections and Headrooms.

3 Alternatives Considered

3.1.1 One of the mandatory requirements of Section 105A of the Highways Act 1980 is to provide:

3.1.2 'An outline of the main alternatives studied by the Secretary of State" (the Welsh Government) "and an indication of the main reasons for this choice, taking into account the environmental effects' (Highways Act, 1980 Section 105A 5(d) (as amended).

3.1.3 The text below provides an outline of the history of the A487 New Dyfi Bridge.

3.1.4 The A487 trunk Road at Pont-ar-Ddyfi has been the subject of a number of studies into the operation and serviceability of the existing route and alternative crossing points that may be suitable to cross the Afon Dyfi floodplain. In the last thirty years increased traffic and the continuing deterioration of the masonry structure has necessitated structural strengthening works and repairs to keep the bridge operational.

3.1.5 Powys County Council, acting as Trunk Road Agents (TRA), commissioned a Feasibility Study and a Technical Assessment Report from RUST Consultants in 1996. In the study a number of on-line improvement options to Pont-ar-Ddyfi were evaluated, strengthening and alternate signalised one way operation emerged as the only viable solution. A preferred offline improvement was also identified crossing the river 200m upstream of the existing bridge on a skew bridge and re-connecting to the A487.

3.1.6 In November 2000 Powys TRA were directed to review the earlier work and produce a Stage II Technical Appraisal Report[9] with an accompanying Environmental Assessment in 2002 /2003[10]. This report concluded that for the trunk road to remain accessible to traffic at all times the recommended option was to construct an offline multi span viaduct across the floodplain. However, should regular flooding and resulting severance of the route be considered acceptable then strengthening of the bridge or a variant was the optimum solution.

3.1.7 CH2MHill, formerly Halcrow, were commissioned by the Welsh Government (WG) in August 2011 to carry out WelTAG planning stage appraisal for the Dyfi Bridge and surrounding area. The purpose of the study being to identify, develop and sift transport options to resolve problems in the study area. Following stakeholder consultation, the WelTAG planning stage report[11] recommended four options (below) to be taken forward for further detailed appraisal. Following an internal review, only upstream options were to be progressed for further development.

- New crossing 200-500m upstream

[9] Powys County Council Trunk Road Agency (2000) Stage 2 Technical Appraisal Report.
[10] Powys County Council (2002) A487 Fishguard to Bangor Trunk Road, Pont ar Dyfi Improvement. Stage II Environmental Assessment. Volume I, December 2002
[11] The A487 Dyfi Bridge Welsh Transport Planning and Appraisal Guidance (WelTAG), Planning Stage Final Report, Welsh Government, April 2012

- New crossing 200-500m downstream
- Widening and strengthening + flood mitigation + raise A487
- Widening and strengthening + flood mitigation

4 Consultation

4.1 Consultation Undertaken to Date

4.1.1 An Environmental Liaison Group (ELG) meeting was held with key consultees on 11th November 2014 to introduce the A487 New Dyfi Bridge scheme to the ELG and to confirm the key environmental issues of the scheme.

4.1.2 Key statutory environmental stakeholders include:

- Natural Resources Wales
- Cadw
- Powys County Council
- Gwynedd Council
- Snowdonia National Park Authority.

4.1.3 Other environmental stakeholders include:

- Dyfi Biosphere Partnership
- New Dovey Fishery Association
- North Wales Wildlife Trust
- Montgomeryshire Wildlife Trust
- Sustrans
- Clwyd-Powys Archaeological Trust
- Gwynedd Archaeological Trust
- Biodiversity Information Service for Powys and Brecon Beacons National Park
- Cofnod – North Wales Environmental Information Service
- Gwynedd Bat Group
- Snowdonia Mammal Group
- NMWTRA (Trunk Road Agent)
- EcoDyfi
- Dyfi Valley Steering Group
- Campaign for the Protection of Rural Wales (CPRW)

4.2 Proposed Consultation

4.2.1 This Scoping Report provides the basis for consultation regarding the scope of the EIA and the proposed assessment methodologies. However, specialist topic advice will also be sought from the relevant statutory consultees throughout the EIA process. In addition non-statutory organisations and stakeholders will be contacted to provide any relevant information they may hold relating to the scheme.

Environmental Liaison Group Meetings

4.2.2 Environmental Liaison Group (ELG) meetings will be held to provide:

- Active stakeholder engagement
- An opportunity to ask questions and raise concerns
- An organisational view not personal view
- An opportunity for timely discussion and improvement to influence through provision of good advice

4.2.3 The ELG meetings will recommence during the EIA process. The first ELG meeting following the award of the ECI contract was held on the 16th September 2015 at Y Plas, Machynlleth, Powys SY20 8ER.

Technical Working Group Meetings

4.2.4 Technical Working Groups (TWGs) will be held to focus on more detailed, topic-specific discussions. This will enable active stakeholder engagement and provide the opportunity for specialists to have more detailed discussions on relevant topics with specialists within the Environment team. This mechanism of engagement will enable stakeholders to be better involved in their specific area of interest.

4.3 Public Information Exhibition

4.3.1 The overall consultation and engagement process will include a public information exhibition. This was held at Y Plas, Machynlleth, Powys, SY20 8ER on the 7th October 2015.

4.3.2 The objectives of the exhibition were:

- to inform the public of the proposed programme for the works and the statutory processes;
- to introduce the Project Team, particularly the Public Liaison Officer; and
- to establish communications and process for public to raise issues and concerns.

4.3.3 A report will be prepared which summarises the exhibition process and presents the key findings and feedback resulting from the comments received at the exhibition. The results of the exhibition feedback will be used to refine the design and mitigation measures for the A487 New Dyfi Bridge and to ensure full and robust environmental assessments have been carried out.

4.4 Consents and Licences

4.4.1 A summary of potential consents and licences required for the Scheme is provided in **Table 1**. The likelihood of these being require is subject to the presence of species, the design of the Scheme and how the Scheme is constructed. Consultation with the consenting authority will be undertaken prior to any applications being made.

Table 1 Summary of Potential Consents and Licences

Consent / Licence	Regulatory Regime	Consenting Authority	Status / Comment
European Protected Species Licences – Bats, Otters, Badger, Dormouse	Conservation of Habitats and Species Regulations 2010	NRW	The presence of European Protected Species will be confirmed by species surveys. In the event that an European Protected Species is found, the relevant applications will be made.
Scheduled Monument Consent (Listed Building Consent)	Ancient Monuments and Archaeological Areas Act 1979	Cadw	Should the Pont-ar-Ddyfi be directly affected by the Scheme, a Notice of Application for Scheduled Monument Consent will be applied for. As the Pont-ar-Ddyfi is both listed and scheduled, a scheduled monument consent would take precedence over listed building consent.
Flood Defence Consent	Water Resources Act 1991	NRW	Applications will be made as required prior to construction commencing for both temporary (works that do not form part of the permanent works) and permanent works.
Licence to abstract water and/or consent to discharge	Water Resources Act 1991	NRW	Applications will be made as required prior to construction commencing.
Section 61 Consent - Control of noise on construction site	Control of Pollution Act 1974	Gwynedd Council and/or Powys County Council	Applications will be made as required prior to construction commencing.

5 Air Quality

5.1 Introduction

5.1.1 This chapter of the Scoping Report details the proposed scope of the assessment for local air quality and regional pollutant emissions, during both the construction and operational phases of the Scheme.

5.1.2 There is the potential for local air quality to be affected during the construction of the Scheme from exhaust emissions from vehicles and fugitive dust emissions from site activities.

5.1.3 Emissions from vehicle exhausts contain a number of pollutants, including oxides of nitrogen (NO_x), carbon monoxide (CO), hydrocarbons, carbon dioxide (CO_2) and particulate matter (PM). The quantities of each pollutant emitted depend on the type of vehicle, quantity and type of fuel used, engine size, speed of the vehicle and abatement equipment fitted. Once emitted, the pollutants are diluted and dispersed into the ambient air. Pollutant concentrations of nitrogen dioxide (NO_2) and PM in the air can be measured or modelled, and then compared with air quality standards. Local air quality will be affected as a result of the Scheme redistributing vehicles across the network.

5.2 Air Quality Objectives/Limit Values and Relevant Guidance

EU Limit Values

5.2.1 In May 2008, the Council Directive[12] (2008/50/EC) on Ambient Air Quality and Cleaner Air for Europe came into force. The Directive sets 'limit values' and 'target values' for ambient concentrations of pollutants. The limit values defined in the Directive are legal requirements and compliance with these is reported on an annual basis by Welsh Ministers. The Directive also covers the division of the UK into zones for the purpose of compliance reporting. The Directive was transposed into national legislation in Wales by the Air Quality Standards (Wales) Regulations 2010 (WSI 2010 No. 1433).

5.2.2 The Scheme is located in the North Wales Zone (UK0042), which is covered by an Air Quality Plan[13] . Consideration will be given to the EU limit values to determine the air quality effects of the Scheme in the North Wales Zone.

5.2.3 In addition to limit values to protect human health, the EU has set NO_x limit values for the protection of vegetation. The annual mean limit value for NO_x for the protection of vegetation is 30 µg/m^3. The limit values for the protection of vegetation apply to locations more than 20 km from towns with more than 250,000 inhabitants or more than 5 km from other built-up areas, industrial installations or

[12] Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe
[13] Defra, Welsh Government, Department of Environment, The Scottish Government (2015) Air Quality Plan for the achievement of EU air quality limit value for nitrogen dioxide (NO_2) in North Wales (UK0042)

motorways. As stated in the EU Directive, monitoring sites need to be representative of an area of 1,000 square kilometres, the limit does not have a statutory basis in micro-scale environments such as those close to a road or other pollution source.

5.2.4 The United Nations Economic Commission for Europe (UNECE) and the World Health Organisation (WHO) have set a critical level for NO_x (30µg/m^3), for the protection of vegetation. Therefore, the statutory nature conservation agency's (Natural Resources Wales) policy is to apply the 30 µg/m^3 criterion as a benchmark, on a precautionary basis, in internationally designated conservation sites and in Sites of Special Scientific Interest (SSSIs).

5.2.5 In addition, critical loads for nitrogen deposition have been set that represent (according to current knowledge) the exposure below which there should be no significant harmful effects on sensitive elements of the ecosystem.

UK Objectives

5.2.6 The National Air Quality Strategy (NAQS) was first published in 1997 and subsequently reviewed and revised in 2000, as the Air Quality Strategy for England, Scotland, Wales and Northern Ireland. The current strategy was published by DEFRA in 2007 [14]. This sets national objectives for human health and the protection of vegetation for specified pollutants, including those of concern to the assessment of the Scheme.

5.2.7 Part IV of The Environment Act (1995) requires local authorities to undergo a process of Local Air Quality Management (LAQM), requiring review and assessment of air quality in each administrative area. The LAQM system assesses where the UK objectives are exceeded and requires local authorities to declare Air Quality Management Areas (AQMAs) and derive Air Quality Action Plans (AQAPs) to outline measures to improve air quality.

Air Quality Objectives and Limit Values

5.2.8 The air quality EU limit values and UK air quality objectives applicable to the Scheme are shown in **Table 2: Air Quality Standards**. Some pollutants have standards expressed as annual mean concentrations due to the chronic way in which they affect health or the natural environment (i.e. effects occur after a prolonged period of exposure to elevated concentrations). Others have standards expressed as 24-hour, 1-hour or 15-minute mean concentrations due to the acute way in which they affect health or the natural environment (i.e. after a relatively short period of exposure). Some pollutants have standards expressed in terms of both long-term and short-term concentrations.

[14] Department for Environment Food and Rural Affairs (Defra), Welsh Assembly Government, Scottish Executive and Department of the Environment, Northern Ireland (2007) The Air Quality Strategy for England, Scotland, Wales and Northern Ireland.

Table 2: Air Quality Standards

Pollutant	Averaging Period	EU Limit Value/ UK Objective	Date for Compliance
Human Health			
Nitrogen Dioxide (NO_2)	Annual mean	40µg/m3	Wales(a) 11 June 2010
			EU(b) 01 Jan 2010
	1-hour mean	200µg/m3	Wales(a) 11 June 2010
		not to be exceeded more than 18 times a year (99. 8th percentile)	EU(b) 01 Jan 2010
Fine Particulate Matter (PM_{10})	Annual mean	40µg/m3	Wales(a) 11 June 2010
			EU(b) 01 Jan 2005
	24-hour mean	50µg/m3	Wales(a) 11 June 2010
		not to be exceeded more than 35 times a year (90. 4th percentile)	EU(b) 01 Jan 2005
Designated Sites			
Nitrogen Oxide (NOx)(c)	Annual mean	30 µg/m3	31 Dec 2000 Wales(a)
			19 July 2001 EU(b)

(a) The Air Quality Standards (Wales) Regulations 2010, WSI 2010 No. 1433

(b) Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe

(c) For the protection of vegetation only

Relevant Guidance

5.2.9 The method for assessing the likely operational air quality effects of the Scheme will follow the guidance described in DMRB Volume 11, Section 3, Part 1: HA 207/07[15]. In addition, the associated Interim Advice Notes will be considered:

- IAN 170/12v3[16] Updated Air Quality Advice on the Assessment of Future NOx and NO2 Projections for Users of DMRB Volume 11, Section 3, Part 1 'Air Quality'; and

[15] Highways Agency, Transport Scotland, Welsh Assembly Government, the Department for Regional Development Northern Ireland (2007) Design Manual for Roads and Bridges, Volume 11, Section 3, Part 1: HA 207/07. Air Quality

[16] Highways Agency (2013) IAN 170/12v3 Updated Air Quality Advice on the Assessment of Future NOx and NO2 Projections for Users of DMRB Volume 11, Section 3, Part 1 'Air Quality'

- IAN 174/13[17] Updated Advice for Evaluating Significant Local Air Quality Effects for DMRB Volume 11, Section 3, Part 1 'Air Quality' (HA 207/07).

5.2.10 The IANs listed above have not yet been adopted in Wales, however it is considered that these IANs reflect current best practice guidance and, as there is no suitable Welsh equivalent guidance, these have been used to inform the proposed method of assessment. It has been acknowledged that references to the National Planning Policy Framework (NPPF) set out in the above IANs are not relevant in the Welsh context.

5.2.11 It should be noted that DMRB HA207/07 provides limited guidance regarding assessing air quality during construction. Therefore industry standard guidance18 published by the Institute of Air Quality Management (IAQM) will be used to provide a more robust technical assessment.

Dust Guidance

5.2.12 Dust is the generic term used in the British Standard document BS 6069 (Part Two)[19] to describe particulate matter in the size range 1–75 μm in diameter. Dust nuisance is the result of the perception of the soiling of surfaces by excessive rates of dust deposition. Under provisions of the Environmental Protection Act 1990, dust nuisance is defined as a statutory nuisance.

5.2.13 There are currently no formal standards or guidelines for what constitutes dust nuisance in the UK, nor are formal dust deposition standards specified. This reflects the uncertainties in dust monitoring technology and the highly subjective relationship between deposition events, surface soiling and the perception of such events as a nuisance. In law, complaints about excessive dust deposition would have to be investigated by the local planning authority and any complaint upheld for a statutory nuisance to occur. However, dust deposition is generally managed by suitable on-site practices and mitigation rather than by the determination of statutory nuisance and/or prosecution or enforcement notice(s).

5.2.14 The IAQM has published guidance on the assessment of dust from demolition and construction. This provides a risk-based qualitative approach for determining the potential for dust impacts during the construction phase of the Scheme.

5.3 Study Area

5.3.1 The study area of the air quality assessment is defined by the guidance used to assess potential air quality effects. Air quality effects during the construction phase will be assessed within 350m of construction works where receptors are present. The study area for the assessment of operational effects consists of the area within 200 metres of road sections which are likely to be affected by the Scheme, as required by the

[17] Highways Agency (2013) IAN 174/13 () Updated Advice for Evaluating Significant Local Air Quality Effects for DMRB Volume 11, Section 3, Part 1 'Air Quality' (HA 207/07).
[18] Institute of Air Quality Management, Guidance on the Assessment of Dust from Demolition and Construction, 2014
[19] British Standards Institution (1994) British Standard document BS6069 (Part Two)

DMRB. Based on current information, it is likely that the only DMRB criteria that will be met to determine the ARN is a change in road alignment by 5 metres or more.

5.3.2 The criteria used to define the study area for the assessment of regional air quality effects are also set out in the DMRB. However, these differ from those set out for the local air quality assessment. The criteria for determining the regional road network considered are presented below:

- a change of more than 10% in AADT; or
- a change of more than 10% to the number of heavy duty vehicle; or
- a change in daily average speed of more than 20 km/hr.

5.3.3 The study area of the air quality assessment is shown in Figure 11.

5.4 Work Undertaken to Date

5.4.1 A review of the Stage 2 Environmental Assessment[20] for the Scheme was undertaken in 2003. This indicated that air quality at very few properties is likely to be affected by the Scheme and that changes in local air quality are likely to result from the redistribution of traffic onto the new Dyfi Bridge rather than a significance increase/decrease in traffic using the route as a result of the Scheme. The Stage 2 assessment indicated that air quality effects would not be significant from the options assessed.

5.5 Baseline Conditions

5.5.1 All local planning authorities are required by the Environment Act 1995 Part IV to carry out a review and assessment of air quality. This involves examining current pollutant concentrations, estimating future concentrations and comparing the future concentrations with the objectives in the National Air Quality Strategy.

5.5.2 Where the objectives are not likely to be achieved in all relevant locations, the local planning authority must designate these areas as Air Quality Management Areas (AQMA).

5.5.3 The scheme has the potential to affect air quality within the following local authority areas:

- Powys County Council;
- Gwynedd Council; and
- Snowdonia National Park Authority.

5.5.4 A review of local air quality progress reports produced by Gwynedd Council shows that no air quality monitoring is undertaken by the Council in the vicinity of the Scheme. Local air quality progress reports produced by Powys County Council have been requested to determine if any air quality monitoring is undertaken in Machynlleth and the surrounding areas to determine baseline air quality conditions

[20] Mid Wales Trunk Road Agency (September 2003) A487 Fishguard to Bangor Trunk Road Pont ar Dyfi Improvement Machynlleth. Stage II Environmental Assessment

for the area. It is noted that neither Powys of Gwynedd Council have declared AQMAs within the vicinity of the Scheme.

5.5.5 Background pollutant mapping available from Defra[21] for each 1km x 1km grid square across the UK has been used to determine the baseline air quality conditions in the area. Background pollutant concentrations are well below the relevant air quality standards.

Identification of Sensitive Receptors

5.5.6 The roads to be considered for the purposes of the local air quality assessment are defined as those which meet any of the following criteria as set out in DMRB Volume 11, Section 3, Part 1[22]. These roads will be known as the Affected Road Network (ARN):

- road alignment will change by 5 metres or more;
- daily traffic flows will change by 1000 annual average daily traffic (AADT) or more;
- Heavy duty vehicle (HDV) flows will change by 200 AADT or more;
- peak hour speed will change by 20km/hr or more; and
- daily average speed will change by 10km/hr or more.

5.5.7 Within the study area, two types of receptors will be considered, as follows:

- residential properties and areas where members of the public would be present for a time period comparable with the objectives; and
- ecological sites designated at international, European or national level.

5.5.8 Both human and ecological receptors will be considered within 200 metres of the ARN, as required by the DMRB. Beyond 200 metres changes to pollutant concentrations as a result of the scheme would be negligible. Those receptors identified for inclusion in the air quality assessment are shown on Figure 11.

5.6 Proposed Scope of Baseline Studies

5.6.1 Existing or baseline ambient air quality refers to the concentration of relevant substances that are already present in the environment – these are present from various sources, such as industrial processes, commercial and domestic activities, traffic and natural sources.

[21] Defra, Background Pollutant Mapping Data, http://uk-air.defra.gov.uk/data/laqm-background-maps?year=2011 [Accessed August 2015]

[22] Highways Agency, Transport Scotland, Welsh Assembly Government, the Department for Regional Development Northern Ireland (2007) Design Manual for Roads and Bridges, Volume 11, Section 3, Part 1: HA 207/07. Air Quality

5.6.2 A desk-based review of the following data sources will be undertaken to determine baseline air quality conditions in this assessment for both human and ecological receptors:

- Powys County Council and Gwynedd Council review and assessment reports and local air quality monitoring data;
- The Welsh Air Quality Forum website;
- APIS (Air Pollution Information System) website
- The Defra website; and
- NRW website.

5.6.3 Based on current data at the time of writing, it is anticipated that receptors to be included in the assessment of air quality effects are those residential properties adjacent to the existing A487 and A493 at Pont-ar-Ddyfi and also commercial receptors at Dyfi Eco Park. It is not anticipated that any ecological receptors will experience a change in air quality as a result of the scheme.

Future Baseline Conditions

5.6.4 Air quality is predicted to improve in the future with the introduction of cleaner fuel technologies into the UK vehicle fleet. However, given that construction is proposed to begin in 2017, baseline air quality at the start of construction is predicted to be similar to the existing scenario.

5.6.5 An assessment of air quality concentrations will be undertaken for the opening and design year without the Scheme in place. This will enable future baseline air quality conditions to be considered. In accordance with guidance, this will take into account likely future changes in background concentrations and emissions.

5.7 Assessment of Effects

Scope of Proposed Assessment

5.7.1 The proposed scope of assessment will include two main assessments:

- an assessment of potential effects during construction which can be broadly classified into exhaust emissions from vehicles and fugitive dust emissions from site activities; and
- local air quality assessment (operational phase) for the affected road network.

Issues Proposed to be Scoped Out

5.7.2 The operation of site equipment, vehicles and machinery during the construction of the Scheme will result in emissions to atmosphere of exhaust gases. However, such emissions are unlikely to be significant, particularly in comparison to levels of similar emissions from vehicle movements on the local road network. Any impacts

can be mitigated by use of equipment meeting recent emission control standards, operating well-maintained vehicles and planning to reduce trip generation. As such, the impacts of site equipment are proposed to be scoped out of this assessment. Furthermore, additional traffic generated as a result of the construction of the Scheme is not anticipated to meet any of the criteria outlined in DMRB as having potential to have an impact on air quality, therefore an assessment of air quality effects from construction traffic is proposed to be scoped out.

5.7.3 It is highly unlikely that the Scheme will result in changes to traffic that meet the criteria outlined in DMRB for undertaking an assessment of regional air quality. It is therefore proposed that an assessment of regional air quality effects are scoped out of this assessment, however this would be confirmed once traffic data for the Scheme is made available.

5.7.4 Interim Advice Notes produced by Highways England in relation to air quality and the assessment of effects from highways schemes have been reviewed. IAN 185/15[23] 'updated traffic, air quality and noise advice on the assessment of link speeds and generation of traffic data into speed-bands' provides an assessment methodology for assessing the impact of congestion on local air quality. The study area does not suffer from congestion therefore an assessment using IAN 185/15 has been scoped out.

5.8 Assessment of Potential Effects

5.8.1 Fugitive dust emissions arising from construction activities are likely to be variable in nature and will depend upon the type and extent of activity, soil type and moisture content, road surface conditions, and weather conditions. Periods of dry weather combined with higher wind speeds have the potential to generate more dust.

5.8.2 Fugitive dust arising from construction and demolition activities generally has a particle size greater than the PM10 fraction (which can potentially affect human health). It is noted that construction activities may contribute to an increase in local PM10 concentrations. Unmitigated dust impacts can harm human and ecological health and cause nuisance. Appropriate dust control measures can be highly effective for controlling emissions from potentially dust generating activities identified above, and adverse effects can be greatly reduced or eliminated.

5.8.3 An assessment of effects during construction will be undertaken using the risk based approach published by the IAQM where sensitive receptors are identified within 350m of construction activities. Mitigation measures will be recommended where sites are assessed to be at risk of generating dust effects and incorporated in the Construction Environmental Management Plan for the scheme. The IAQM guidance notes that the significance of dust effects should be determined using professional judgement however also notes that with the implementation of effective site-specific mitigation measures, the impact of dust effects can generally be determined not significant. It is not anticipated that increases in vehicles as a result of the

[23] Highways Agency (2015) IAN 185/15 Updated Traffic, Air Quality and Noise Advice on the Assessment of Link Speeds and Generation of Vehicle Data into 'Speed-bands' for Users of DMRB Volume 11, Section 3, Part 1 'Air Quality' and Volume 11, Section 3, Part 7 Noise

construction phase will be significant and therefore an assessment of the emissions associated with construction traffic will be scoped out.

5.8.4 Concentrations of NO_2 and PM_{10}, the key pollutants of concern in the UK in relation to road traffic, will be assessed at all receptors within the study area using the DMRB spreadsheet method for a baseline scenario (2014), opening year (2019) both with and without Scheme scenarios, and the future year (2034) both with and without Scheme scenarios. This will follow the simple level assessment methodology outlined in DMRB HA207/07.

5.8.5 In addition, the assessment will be undertaken in accordance with IAN170/12[24]. IAN 170/12 provides a methodology to account for the uncertainty surrounding future projections of NO_x and NO_2 concentrations, and this would allow the assessment to robustly assess likely changes in pollutant concentrations in the opening and future year of the Scheme. Although not adopted in Wales, it is considered that IAN 170/12 reflects current best practice guidance, and as there is no suitable Welsh equivalent guidance, this will be used to inform the proposed method of assessment.

5.8.6 Evaluation of the significance of the local air quality findings will be undertaken in accordance with IAN 174/13[25]. This requires evaluation of significance for NO_2 and PM_{10}.

5.8.7 The estimated levels of pollution in the existing, construction, opening and design year of assessment, and the change due to the Scheme, will be compared with the air quality standards described in **Table 2**. For the local air quality assessment, the evaluation of significance of effects will take into account the guidance in IAN 174/13, which determines whether the Scheme is significant or not significant with regard to air quality. Although the guidance in IAN 174/13 has not yet been adopted in Wales, in the absence of available equivalent Welsh guidance it is proposed that this guidance will be used for this assessment. Therefore, it is acknowledged that references to the National Planning Policy Framework (NPPF) set out in the IAN 174/13 are not relevant in the Welsh context.

The approach for evaluation of significant local air quality effects is described in Section 3 of IAN 174/13. The guidance in Section 3 and Table 3.1 of IAN 174/13 will be taken into account within the assessment (see Table 3).

[24] Highways Agency (2013) IAN 170/12v3 Updated Air Quality Advice on the Assessment of Future NOx and NO2 Projections for Users of DMRB Volume 11, Section 3, Part 1 'Air Quality'

[25] Highways Agency (2013) IAN 174/13 Updated advice for evaluating significant local air quality effects for users of DMRB Volume 11, Section 3, Part 1 'Air Quality (HA207/07)

Table 3: Overall Evaluation of Local Air Quality Significance

Key Criteria Questions	Yes/No
Is there a risk that environmental standards will be breached?	
Will there be a large change in environmental conditions?	
Will the effect continue for a long time?	
Will many people be affected	
Is there a risk that designated sites, areas, or features will be affected?	
Will it be difficult to avoid, or reduce or repair or compensate for the effect?	
On balance is the overall effect significant?	
Evidence in support of the professional judgement:	

5.9 Mitigation Measures

5.9.1 Where the assessment identifies significant air quality effects from either the construction or operational phase of the Scheme, where practicable mitigation measures will be recommended for inclusion in the Scheme design. Mitigation measures recommended during the construction phase as well as general best practice for dust suppression will be included in the Construction Environmental Management Plan for the Scheme.

5.10 Summary

5.10.1 The assessment of construction effects on local air quality will be undertaken following guidance published by the IAQM as this provides a more robust assessment methodology than that provided in DRMB. The IAQM guidance also provides criteria for the assessment of significance.

5.10.2 The assessment of operational effects on local and regional air quality will follow the simple assessment methodology provided in DMRB HA207/07 as well as include subsequent Interim Advice Notes where relevant. The assessment of significance will be undertaken following guidance contained within IAN 174/13.

6 Cultural Heritage

6.1 Introduction

6.1.1 This section outlines the approach that will be adopted for the assessment of the effects on archaeology and cultural heritage, which may arise as a result of the construction and operation of the Scheme.

6.2 Relevant Guidance

6.2.1 The method for assessing the likely cultural heritage effects of the Scheme will follow the guidance described in DMRB Volume 11, Section 3, Part 2: HA 208/07[26].

6.2.2 Currently more detailed guidance on the application of the policies outlined in Planning Policy Wales is presented in three planning circulars:

- Circular 60/96 – Planning and the Historic Environment: Archaeology[27];
- Circular 61/96 – Planning and the Historic Environment: Historic Buildings and Conservation Areas[28]; and
- Circular 1/98 – Planning and the Historic Environment: Directions by the Secretary of State for Wales[29].

6.2.3 The overall aim of these guidance documents (as with the policies described above) is to protect the historic environment from significant harm, rather than to prevent change.

6.2.4 Additional guidance on how to identify and appraise the values associated with heritage assets is presented in the document Conservation Principles for the Sustainable Management of the Historic Environment in Wales[30].

6.2.5 As described above with regard to Planning Policy Wales, Welsh Government has established a Register of Landscapes, Parks and Gardens of Special Historic Interest in Wales. A specific methodology has been established by Cadw and the former Countryside Commission for Wales (now Natural Resources Wales) for the examination of the impacts of proposed developments on registered historic landscapes. Guidance on the use of this methodology (Assessment of the Significance of Impacts of Development on Historic Landscapes - ASIDOHL) has

[26] Highways Agency, Transport Scotland, Welsh Assembly Government, the Department for Regional Development Northern Ireland (2007) Design Manual for Roads and Bridges, Volume 11, Section 3, Part 2: HA 208/07. Cultural Heritage.
[27] Welsh Office (1996) Welsh Office Circular 60/96 Planning and the Historic Environment: Archaeology
[28] Welsh Office (1996) Welsh Office Circular 61/96 Planning and the Historic Environment: Historic Buildings and Conservation Areas.
[29] Welsh Office (1998) Welsh Office Circular 1/98 Planning and the Historic Environment: Directions by the Secretary of State for Wales
[30] Welsh Assembly Government (2011) Conservation Principles for the Sustainable Management of the Historic Environment in Wales.

been most recently published in the Guide to Good Practice on using the Register of Landscape of Historic Interest in Wales in the Planning and Development Process[31].

6.2.6 Additionally the Standard and Guidance for Historic Environment Desk-Based Assessment[32] will be used to inform the desk-based aspects of the assessment. Guidance for archaeological fieldwork includes the Standard and Guidance for Archaeological Field Evaluation[33] and the Standard and Guidance for Archaeological Geophysical Survey[34].

6.3 Study Area

6.3.1 The study area for the assessment would extend 300m from the footprint of the proposed scheme.

6.4 Work Undertaken to Date

6.4.1 A desk-based study of readily available information has been undertaken. The initial review has been undertaken utilising Cadw GIS data sets to identify heritage assets within 300m of the proposed scheme. This included identifying the following:

- Designated Heritage Assets - Scheduled Monuments
- Designated Heritage Assets - Listed Buildings
- Non-designated heritage assets – including archaeological remains, historic buildings
- World Heritage Sites
- Historic Landscapes - Landscapes of Outstanding Historic Interest in Wales

6.5 Baseline Conditions

6.5.1 The desk-based study undertaken as part of the Scoping used readily available information to identify cultural heritage assets. To put these into context of the Scheme, these have been categorised as either:

- Directly affected by the Scheme i.e. within the Scheme footprint, or;
- Indirectly affected by the scheme i.e. within 300m of the proposed scheme.

[31] Cadw, CCW and Welsh Assembly Government (2007) Guide to Good Practice on using the Register of Landscape of Historic Interest in Wales in the Planning and Development Process (revised 2nd edition)
[32] Chartered Institute for Archaeologists (2014) Standard and Guidance for Historic Environment Desk-Based Assessment. December 2014.
[33] Chartered Institute for Archaeologists (2014) Standard and Guidance for Archaeological Field Evaluation. December 2014.
[34] Chartered Institute for Archaeologists (2014) Standard and Guidance for Archaeological Geophysical Survey. December 2014.

Designated Heritage Assets - Scheduled Monuments

6.5.2 The initial data review has identified the following Scheduled Monuments within 300m of the proposed scheme.

Table 4 Initial data review of scheduled monuments within 500m of the proposed scheme.

Scheduled Monument No.	Name	Type	Period	Affected by the Scheme?
MG002	Pont-ar-Ddyfi	Bridge	Post-Medieval/ Modern	Directly
ME231	Fridd round barrows	Round barrow	Prehistoric	Indirectly

Designated Heritage Assets - Listed Buildings

6.5.3 The initial data review has identified the following Listed Buildings within 300m of the proposed scheme:

Table 5 Initial data review of Listed Buildings within 500m of the proposed scheme.

Listed Building No.	Name	Grade	Affected by the Scheme?
22720	Turnpike Cottage	II	Indirectly
22722	Pont Felin-y-ffridd	II	Indirectly
22723	Pont ar Ddyfi (partly in Machynlleth Community)	II*	Directly
22891	2 Dovey Cottage, Pen-y-bont Cottages	II	Indirectly
22892	3 Pen-y-bont Cottages	II	Indirectly
22893	4 Pen-y-bont Cottages	II	Indirectly
22894	5 Pen-y-bont Cottages	II	Indirectly
22895	6 Pen-y-bont Cottages	II	Indirectly
5233	1 Pen-y-bont Cottages	II	Indirectly
83040	Pont Felin y ffridd	II	Indirectly
8396	No.15 Morris Cottages,Heol-Y-Doll	II	Indirectly
8397	No.17 Morris Cottages,Heol-Y-Doll	II	Indirectly
8398	No.19 Morris Cottages,Heol-Y-Doll	II	Indirectly
8399	No.21 Morris Cottages,Heol-Y-Doll	II	Indirectly
8400	No.23 Morris Cottages,Heol-Y-Doll	II	Indirectly
8401	No.25 Morris Cottages,Heol-Y-Doll	II	Indirectly
8402	No.27 Morris Cottages,Heol-Y-Doll	II	Indirectly
8403	No.29 Morris Cottages,Heol-Y-Doll	II	Indirectly
8404	No.31 Morris Cottages,Heol-Y-Doll	II	Indirectly

Listed Building No.	Name	Grade	Affected by the Scheme?
8405	No.33 Morris Cottages,Heol-Y-Doll	II	Indirectly
8406	No.1 Cottage To Rear Of Morris Cottages, Heol-Y-Doll	II	Indirectly
8407	No.2 Cottage To Rear Of Morris Cottages, Heol-Y-Doll	II	Indirectly
8408	No.3 Cottage To Rear Of Morris Cottages, Heol-Y-Doll	II	Indirectly
8409	No.4 Cottage To Rear Of Morris Cottages, Heol-Y-Doll	II	Indirectly
8410	No.5 Cottage To Rear Of Morris Cottages, Heol-Y-Doll	II	Indirectly
8411	No.6 Cottage To Rear Of Morris Cottages, Heol-Y-Doll	II	Indirectly
8412	Glyndwr Hotel,Heol-Y-Doll	II	Indirectly
8413	No.14 Heol-Y-Doll	II	Indirectly
8506	Pont-Ar-Ddyfi (Partly In Corris Community)	II*	Directly

Non-designated heritage assets

6.5.4 The initial data review has identified the following non- designated heritage assets within 300m of the proposed scheme.

6.5.5 **Table 6 Initial data review of non-designated heritage assets within 500m of the proposed scheme**

HER No.	Period	Name	Type
711	Iron Age	Gallt y Gog Hillfort	Hillfort
37441	Post medieval	Felin Fridd mill	Mill
87285	Modern	Pont ar Ddyfi, Dyfi revetment	Revetment
87279	Post Medieval	Machynlleth, Pont ar Ddyfi (1681)	Bridge
11804	Romano-British	Pennal-Ffestiniog	Road
36899	Post medieval	Machynlleth, Pont ar Ddyfi (1533)	Bridge
130953	Modern	Machynlleth bus garage	Bus Station
4323	Post medieval	Pont-ar-Ddyfi (Machynlleth) battle	Battle site
87281	Modern	Dyfi Millennium Bridge	Suspension Bridge
36886	Post medieval	Corris Railway (Powys section)	Railway
36898	Post medieval	Pont–ar-Ddyfi 'mere stones'	Boundary Stones
36888	Post medieval	Corris Railway, culvert	Culvert
36893	Post medieval	Pont-ar-Ddyfi platform	Platform Building
36894	Post medieval	Corris Railway, Dyfi Bridge I	Railway viaduct
5163	Medieval, Post medieval	Bryn Coch Field System	Field system
36895	Modern	Pont-ar-Ddyfi embankment	Flood defence

HER No.	Period	Name	Type
87280	Modern	Corris Railway, Dyfi Bridge II	Railway bridge
36897	Medieval	Machynlleth ridge and furrow	Ridge and Furrow
87284	Post medieval	Corris Railway, embankment	Railway Embankment

World Heritage Sites

6.5.6 No World Heritage Sites are present within the study areaLandscapes of Outstanding Historic Interest in Wales

6.5.7 The Register of Landscapes of Outstanding Historic Interest In Wales and Register of Landscapes of Special Historic Interest in Wales[35] was consulted to identify the presence or absence of Cadw Historic Landscape Areas. No such areas are present within the study area.

6.5.8 Hedgerows are present within the study area and Important Hedgerows will be considered as part of the assessment under the Hedgerow Regulations ian1997.

Identification of Sensitive Receptors

6.5.9 The identification of sensitive cultural heritage receptors that could be affected by the Scheme will be undertaken in accordance with the methodology described in the DMRB, Volume 11, Section 3, Part 2, HA208/07[26], specifically the procedures identified in Annexes 5, 6 and 7 of that document.

6.6 Proposed Scope of Baseline Studies

6.6.1 The baseline study will include a combination of desk-based assessment and field-based survey. The initial part of the desk-based assessment will be the further acquisition and examination of all appropriate data held by the Clwyd-Powys Archaeological Trust (CPAT) and Gwynedd Archaeological Trust (GAT), including the regional Historic Environment Record, and by the RCAHMW, including the National Monuments Record. This will address areas of additional land required for the Scheme that have not previously been considered as part of the earlier studies (including borrow pits, compensation areas, etc.), as well as updating the data previously acquired to take account of recent entries onto these databases.

6.6.2 The desk-based work will be backed up by a phased programme of field survey, including a detailed walk-through of the study area along with visits where appropriate to locations outside the study area. The proposed non-intrusive and intrusive fieldwork programmes are described below in more detail. It should be noted that intrusive fieldwork such as trial trenching will only be possible where suitable access can be agreed.

[35] https://data.gov.uk/dataset/the-registered-landscapes-of-oustanding-historic-interest-in-wales-registered-landscapes-of-spe

6.6.3 The desk-based assessment will be undertaken in line with current guidance and best practice. Guidance includes the Standard and Guidance for Historic Environment Desk-Based Assessment[36].

6.6.4 Photomontages will be produced for the scheduled ancient monuments MG002 and ME231 to assess impacts upon their settings, deriving from the construction and operation of the proposed scheme, including site compounds.

6.6.5 Geophysical survey will be undertaken within areas that may be affected by construction activities. The extent of this survey and methodology to be employed will be agreed with the CPAT Development Control Archaeologist.

6.6.6 Intrusive investigation by trial trenching may be undertaken to clarify the results of the geophysical survey. The extent of the trial trenching will be agreed with the CPAT, GAT, Cadw and SNPA Development Control Archaeologists, and would be undertaken only in areas where impacts on other constraints, such as ecological receptors, would be avoided.

6.7 Assessment of Effects

Scope of Proposed Assessment

6.7.1 The assessment will consider impacts upon all heritage assets within the study area. Following the Scoping exercise, further work is required. It is proposed that a Detailed Assessment will be undertaken due to the presence of nationally important heritage assets within the study area that may experience impacts as a result of the scheme.

6.7.2 The Detailed Assessment will involve:

- Evaluation of heritage assets to establish the value of each assets on a 5 point scale ranging from ‘negligible’ to ‘very high’;
- Determination of the magnitude of impact on each asset, using five point scale, ranging from ‘no change’ to major’; and
- Assessment of the significance of effect on each asset, using a five point scale ranging from ‘neutral’ to ‘very large’.

Issues Proposed to be Scoped Out

6.7.3 No protected landscapes are present within the study area and therefore ASIDOHL will not be undertaken as part of the assessment.

6.8 Assessment of Potential Effects

6.8.1 The EIA will be undertaken in accordance with the methodology set out in DMRB Volume11, Section 3, Part 2 Cultural Heritage HA 208/07. The significance of

[36] Chartered Institute for Archaeologists (2014) Standard and Guidance for Historic Environment Desk-Based Assessment. December 2014

impacts, whether for construction or operational phases, will be based on consideration of the magnitude of the impact and the importance, condition and reliability of the individual interests to be affected, both on and off site. Potential effects of the Scheme include direct impact upon buried non-designated heritage assets and indirect impacts on non-designated and designated heritage assets as a result of changes to their settings.

6.9 Mitigation Measures

6.9.1 Mitigation will consider the predicted impacts of the proposed scheme and aim to avoid adverse effects on archaeology and heritage assets within the study area. Wherever possible, mitigation will be designed to deliver benefits, such as enhancing the visual setting of historic assets. In the case of the archaeological remains the mitigation will aim to avoid undisturbed archaeological remains and preserve them in situ. Where this is not possible, preservation by record will be proposed as mitigation.

7 Landscape and Visual Impact

7.1 Introduction

7.1.1 The Landscape and Visual Impact Assessment (LVIA) assesses the significance of the impact on visual changes arising from the Scheme, together with the changes to the character and quality of the landscape. The DMRB guidance (IAN135/10 (W) (2014) describes two levels of Landscape and visual assessment which can be chosen to proportionately suit the nature and scale of the proposed development and the potential for adverse effects. As this is a large scale development proposed in a sensitive landscape and visual environment, this will be a detailed Assessment.

7.1.2 The existing landscape character and the visual environment will be surveyed and assessed separately. The landscape assessment, comprising field work and desk study informed by the LANDMAP identifies characteristics, features and elements which constitute this particular landscape and its character. The visual baseline identifies existing views to, across, or from the site, and identifies the visual receptors, such as nearby residents, users of Public Rights of Way (PRoWs), roads and the railway line who might be affected by the Scheme.

7.1.3 Figure 4 shows a Zone of Theoretical Visibility (ZTV) and the locations of proposed viewpoints. These viewpoints have been chosen to represent visual receptors for the LVIA. The selection will be agreed with the Welsh Government prior to further consultation with Local Planning Authorities (Snowdonia National Park Authority, Gwynedd Council, Powys County Council and Natural Resources Wales) will occur in order to agree the final scope, number and location of viewpoints.

7.2 Relevant Guidance

7.2.1 This assessment will follow guidance set out in the following documents:

- Interim Advice Note 135/10 (W) Landscape and Visual Effects Assessment Wales Only, Highways Agency, April 2014
- 'Guidelines for Landscape and Visual Impact Assessment', Third Edition37.
- Photography and Photomontage in Landscape and Visual Impact Assessment, Landscape Institute Advice Note 01/11
- Visual representation of wind farms: good practice guidance, Scottish Natural Heritage, Version 2 (2014)

7.2.2 Existing background information on the study area has been sourced from:

- Ordnance Survey – 1:50,000 and 1:25,000 scale maps.
- Google Earth and Street View
- Bing maps

[37] Landscape Institute & Institute of Environmental Management and Assessment (2013) Guidelines for Landscape and Visual Impact Assessment, 3rd Edition.

- GIS designation data sets
- LANDMAP - http://test.landmap.ccw.gov.uk/

7.3 Study Area

7.3.1 The desktop study and field work identified viewpoints to be within a 5km radius of the site, as beyond this distance views are limited due to topography and intervening vegetation. The ZTV will analyse the visibility within the surrounding landscape and highlight any potential viewpoint locations further afield.

7.4 Work Undertaken to Date

7.4.1 Prior to visiting the site, an initial desktop study of the site and its surroundings has been conducted using GIS data sets, Google Earth, Street View and Ordnance Survey maps.

7.4.2 An initial 'worst case' ZTV showing the approximate extent of visibility of the proposed development was produced to inform the extent of field work. This was based on an early version of the proposed scheme and using free, Open Source low resolution bare earth terrain data. This ZTV informed the first round of field work. Once the scheme design was more defined a further ZTV was run using higher resolution (2m) digital surface model data with built form and vegetation included in the model.

7.4.3 The photographic survey work was undertaken on 11th August 2015 when deciduous trees were in leaf. Thus the screening effect of this vegetation is most effective at this time of the year. Visibility across the landscape is greater in winter. Therefore further field work was undertaken on 18th January 2016 when trees were out of leaf. In the assessments, allowance will be made for the worst case visibility. This latter field work included assessors experiencing and photographing the night time visual baseline environment

7.4.4 Preparation of figures including:

- Viewpoint Location and Visibility Plan, which will include a refined Zone of Theoretical Visibility (see Figure 4);
- Visual receptor map;
- Night-time visual environment map;
- Landscape Character Areas (LANDMAP) Refer to Figures 5a to 5.c; and
- Viewpoint photographs and a selection of rendered photomontage visualisations.

7.4.5 The landscape character and views have been assessed from public vantage points. Although there is no right in planning law to a view from a private property, visual impact assessment protocol normally requires such views to be considered. In this case, however, it was impractical to seek access to all private property. Potentially significant private receptors have, nonetheless, been represented from a relevant similar public viewpoint for which access was possible. An assessment of the extent

and direction of views from properties will be recorded in a schedule of properties and marked on a plan. All assessment work will be undertaken at ground level and on foot.

7.4.6 A night-time visual environment map was produced showing existing landscape character: darkness and lighting. Depending on the nature of any lighting proposed as part of the development it may be necessary to prepare an additional night time ZTV.

Baseline Conditions

7.4.7 The site is located on the relatively flat, expansive floodplain of the River Dyfi, Machynlleth.

7.4.8 The landscape has a rural character and is surrounded by development and infrastructure to the south, and the Snowdonia National Park to the north. The River Dyfi, the railway line, existing Grade II* listed Pont-ar-Ddyfi and the Millennium footbridge are all prominent features in the landscape.

7.4.9 Field boundaries comprise overgrown hedgerows with occasional gaps, barbed wire fencing and ditches. Some of these hedgerows are designated as Important Hedgerows under the Hedgerow Regulations 1997 These will be identified and assessed in the Nature conservation assessment as stated at Section 8.5.7, below.

7.4.10 Areas of marshland occur in lowland areas, under trees and along the river bank. The route of a disused railway line forms a barely noticeable and fragmented embankment, bisecting the floodplain in a north-east to south-westerly direction.

7.4.11 The northern half of the flat rural landscape of the valley floor and partially wooded side slopes to the north are with the nationally designated and highly value landscape of Snowdonia National Park, The southern half of the valley floor and slopes forms part of the setting of the National Park. The receiving landscape is highly sensitive to the type of development proposed.

7.4.12 We have carried out field work at night and evaluated the night time environment across the study area. We have classified areas according to the Institute of Lighting Engineers' Environmental Zones. The study area is largely within Zone E1 (Intrinsically dark), with the exception of the following settlements:

- Machynlleth, which has lighting levels of E3 (Small town, medium distinct brightness) and E4 (Town Centre, high distinct brightness)
- and four small settlements at: Plas Dolguog, Glan-fechan, Pen-y-bont and Derwenlas, which all have E2 (Rural, low distinct brightness),

7.4.13 A plan will be produced to accompany the Landscape and Visual Impact Assessment to shows this.

7.4.14 On 4th December 2015, Snowdonia National Park was designated an International Dark Sky Reserve by the International Dark-Sky Association (IDA). This is a public or private land possessing an exceptional or distinguished quality of starry nights and nocturnal environment that is specifically protected for its scientific, natural, educational, cultural, heritage and/or public enjoyment. Reserves consist of a core

area meeting minimum criteria for sky quality and natural darkness, and a peripheral area that supports dark sky preservation in the core.

Identification of Sensitive Receptors

7.4.15 The following highly valued receptors within the local landscape were identified from a desktop study and field work:

- People enjoying the setting of the Grade II* listed Pont-ar Ddyfi
- Users of the Millennium footbridge
- Recreational users of Snowdonia National Park (SNP)
- Character of the Highly sensitive landscape within the SNP and Dyfi Biosphere
- Users of the Long Distant Recreational Routes – Glyndwr's Way National Trail and Wales Coast Path
- User of the National Cycle Routes 8 and 82 ;
- Users of PRoW adjacent to River Dyfi;
- Passengers on the Cambrian Line Railway; and
- Residents in nearby dwelling with views of the site.

Future Baseline Conditions

7.4.16 The landscape in this part of the Dyfi Valley is a working agricultural landscape comprising largely pasture with some hay and silage cropping. Fields are small to medium in size and irregular in shape. Under the current regime of management and occasional inundation from flooding, the condition of the landscape is varied and the slightly higher ground to the south has more intact and overgrown boundaries. To the north, hedgerows are more fragmented becoming broken scrubby fence lines nearer the river.

7.4.17 With or without the Scheme, there is no reason to suggest that the land use nor its prevalent management regimes are likely to change significantly. Thus the approach for mitigation will be to work with the existing land uses, devising a Scheme that enhances the character of the landscape whilst managing and mitigating views of the Scheme.

7.5 Assessment of Effects

Methodology

7.5.1 The method for carrying out and reporting on the landscape and visual assessment will follow the guidance set out in Interim Advice Note 135/10 (W) as referenced at 8.2.7 above. It will be further informed by guidance set out in GLVIA3 and based on the professional judgement and experience of the assessors.

7.5.2 The field and desk based work undertaken to date has identified the receptors within the landscape which may be affected by the Scheme. A description of the receptors identified will be described in the following sub-sections.

Landscape Character Assessment

7.5.3 The LVIA will assess individual elements of the landscape fabric and the area's landscape character that may be affected by the Scheme. Effects on the landscape may arise where the landscape character of the area is modified by the Scheme. It is important to place the Scheme in its landscape context.

7.5.4 The landscape character assessment will use LANDMAP, a system developed specifically for the assessment of character in the Welsh landscape. The system was promoted by CCW (now NRW) and implemented in partnership with Local Planning Authorities throughout Wales.

7.5.5 The LANDMAP methodology for landscape characterisation notes that landscape character areas are to be defined using the Visual & Sensory Aspect Area and the Cultural Aspect Areas as a starting point. Landscape Characterisation is then refined by examining the data from all other Aspects. To date, the following have been mapped: LANDMAP Aspect Areas, Visual and Sensory, Cultural and Historic (Refer to Figure 5a to 5.c). The assessment will include an assessment of direct changes to the fabric of the receiving landscape area as a result of the Scheme, but also indirect changes to the visual settings of the surrounding Aspect Areas. The Geological Landscape, Historical Landscape and Landscape Habitat Aspect Areas in which the site is situated will also be mapped and considered in the assessment of the landscape baseline.

7.5.6 The special qualities of the local landscape will be identified through field work and through desk based research into the details of designations including the Snowdonia National Park, Dyfi Biosphere Reserve and other local environmental designations (Refer to Figures 2a and 2b).

Visual Assessment

7.5.7 The desktop study and field work identified the following viewpoints (Table 7) representing receptors with the potential to be significantly affected by the Scheme. Visibility in the area is limited due to the undulating nature of the topography either side of the valley and existing vegetation on the valley floor.

7.5.8 The sensitivity of visual receptors to change is assessed by combining judgements on the value of the views in question and of their susceptibility to the type of change or development proposed.

7.5.9 In line with the recommendations at Sections 3.2 to 3.6 in IAN 135/10(W), all receptors expected to receive visual effects will be depicted on a Visual Effects Drawing (VED) and listed and described in a Visual Effects Schedule (VES).

Table 7 A visual assessment from representative viewpoints

Viewpoint Location (Refer to Figure 4)	Description	Reason for selection and receptors represented
Viewpoint 1	View looking east from the foot and cycle path on the southern bank of the River Dyfi 20m from the proposed development. Grid Ref: SH 74749 01923	This view is representative of those available from highly sensitive receptors including pedestrians and cyclists using the footpath and NCR 8.
Viewpoint 2	View looking northwest from the middle of millennium bridge 50m from the proposed development. Grid Ref: SH 74920 01985	This view is representative of those available from highly sensitive receptors including pedestrians and cyclists using the footpath and NCR 8.
Viewpoint 3	View looking west from the footpath and NCR 8, adjacent to the A487, just north of the proposed development. Grid Ref: SH 74533 01993	This view is representative of those available to highly sensitive receptors including pedestrians and cyclists using the NCR 8 and to users of the A487 within the SNP.
Viewpoint 4	View looking southwest from the B4404 adjacent to Glan-fechan, 500m northeast of the proposed development. Grid Ref: SH 75465 02249	This view represents that available to residents and workers at the farm and to users of a short length of the B4404
Viewpoint 5	View looking west from the footpath 300m from the proposed development. Grid Ref: SH 75057 01846	This view is representative of those available from the highly sensitive footpath on the southern bank of the River Dyfi.
Viewpoint 6	View from the Cambrian Line Railway 600m southeast of the proposed development Grid Ref: tbc	Represents views available to rail passengers

Viewpoint Location (Refer to Figure 4)	Description	Reason for selection and receptors represented
Viewpoint 7	View looking northwest from Plas Dolguog Hotel 1.3km from the proposed development. Grid Ref: SH 76107 01775	This view is representative of those available to hotel residents
Viewpoint 8	View looking north-northeast from Cae-Gybi Road 1.8km from the proposed development. Grid Ref: SH 73998 00033	This view is representative of those available from the highly sensitive (LDR) – Glyndwr's Way National Trail, the road and Cae-Gybi Cottages.
Viewpoint 9	View north from the Platform of Machynlleth train station on the bridge above the A487, 200m south of the proposed development. Grid Ref: SH 74419 01284	Represents views available to rail passengers
Viewpoint 10	Looking northwest from the entrance to the Dyfi Eco Park off the existing A487 Grid Ref: SH 7444 0141	Representative of road users on the A487, workers and visitors to the Dyfi Eco Park and residents in the single private dwelling on the west edge of the Eco Park.
Viewpoint 11	View northeast from the point along the A487 at which the proposed new route ties into the existing road. Grid Ref: SH 74435 01526	Road users and recreational users of NCNR 8 and the LDR Wales Coast Path
Viewpoint 12	View east from the A487 (section to be de-trunked), 100m west of the proposed development. Grid Ref: tbc	Road users and recreational users of NCNR 8 and the LDR Wales Coast Path

Viewpoint Location (Refer to Figure 4)	Description	Reason for selection and receptors represented
Viewpoint 13	View looking east from Pont-ar-Ddyfi, 50m from the proposed development. Grid Ref: SH 74414 01907	This view is representative of those available from the highly sensitive receptors including pedestrians and cyclists using the long distance recreational route and NCR 8. As well as residential properties on the northern side of the bridge.
Viewpoint 14	View looking south from property 1km north of the site on the A487. Grid Ref: SH 74533 01993	This view is representative of those available to residents.
Viewpoint 15	View east from the PRoW adjacent to the River Dyfi, 500m west of the proposed development Grid Ref: SH 73945 01713	Walkers and on the PRoW outside the SNP on the east side of the river.
Viewpoint 16	View east from the A493 adjacent to the River Dyfi, 500m west of the proposed development Grid Ref: SH 73945 01713	Eastbound road users on the A487 within the SNP on the west side of the river.
Viewpoint 17	View looking southeast from the unnamed track north of the A487, 150m northeast of Penrhyn Dyfi. 0.5km from the proposed development. Grid Ref: SH 74038 01893	This view is representative of those available from the highly sensitive Long distance recreational route
Viewpoint 18	View northeast from a PRoW in Open Access Land at the top of Mynydd Cynffyrch, 3.6 km southwest of the proposed development. Grid Ref: SN 71850 98925	Distant view representing walkers enjoying views from this elevated viewpoint.

7.5.10 In order to support the reporting of the assessment work and to facilitate legibility of the Scheme, by the planning authorities, statutory consultees and the public, a selection of the baseline photographs will be used to accurately visualise the Scheme in the landscape. This selection of viewpoints to be visualised as photomontages is shown on Figure 4, but is subject to agreement with the Welsh Government and consultees.

7.5.11 For further detail on the scope of the proposed assessment with reference to the assessment methodology, refer to Appendix A.

Issues Proposed to be Scoped Out

7.5.12 Following two field studies with vegetation in and out of leaf and interpretation of the detailed ZTV map, the receptors below have been scoped out of the assessment as they will not have any visual connection with the proposed development.

- Longer distance views from higher ground within the Snowdonia National Park to the north and northwest of the site were excluded due to intervening topography and tree cover. Refer to Figure 4, which shows the ZTV.
- Views from PRoW to the southwest of the site, on lower lying areas below Mynydd Cynffyrch and around Derwenlas have been excluded due to distance and intervening vegetation.
- Views from the PRoW on the northern bank of the River Dyfi, on the track leading to Dolgelynen, west of the site, are excluded as there is only one very limited distant and partial view from a very short length of the route.
- Field work established that there would be no views of the proposed development from the elevated Open Access land at Pen yr Allt due to intervening topography.

7.6 Mitigation Measures

7.6.1 The proposed development is early on in the iterative design and assessment process. The following mitigation measures will be subject to further rounds of design and consultation.

7.6.2 The detailed design of the viaduct and other engineered structures themselves will be critical in mitigating against adverse visual effects, and offers the opportunity to create a positive feature in the landscape. To help avoid or reduce adverse effects, the landscape consultants will input into the detailed design process to optimise the appearance of the structure through the careful selection of materials, colours and finishes to complement the existing listed bridge and to avoid visual conflict with the surrounding landscape. These measures will be described in the Assessment as integral to the Scheme.

7.6.3 Further landscape mitigation will be designed and described as part of the assessment process and will be shown on a set of detailed Environmental Masterplans at a scale of 1:1000. The effects of the scheme will be assessed and described before and after landscape mitigation is established.

7.6.4 Where appropriate field boundary hedgerows and tree planting will be used to help break up the line through the landscape.

7.6.5 Essential[38] mitigation measures comprising sensitive treatment of embankment slopes, planting and landscaping on them and under the viaduct, will naturally be concentrated along the Scheme corridor. However in order to avoid a 'scar' of new planting alongside the route, it may be necessary to include some additional landscape measures in the design. Where these are determined to be essential to mitigate the effects of the Scheme, the Scheme boundary will be extended to incorporate them.

7.6.6 Plants will be of local provenance, planted in locally occurring species associations and will be managed appropriately in line with existing regimes. This will help to assimilate the Scheme and the new landscape into its setting.

7.6.7 Opportunities will be sought to implement mitigation in advance of completion of the Scheme where possible. Depending on the availability of local service provision and the programme of construction it may be possible to undertake contract growing. If possible, this would involve seed being locally sourced and plant stock grown locally to improve the provenance, success and wildlife value of the proposed planting. This would be in line with sustainability aspirations and support local business.

7.6.8 At either end of the bridge and around the tie-in junctions to the north and south, there will be a concentration of prominent, moving or tall elements such as signage, and road vehicles. Careful use of small areas of woodland, individual trees, hedgerows and other boundary features, in keeping with those already present, will be used to filter views towards the Scheme and also protect particularly sensitive receptors such as the existing bridges or the National Park.

7.6.9 Sustainable Drainage Systems (SUDS) associated with the Scheme are likely to offer a great opportunity to implement multi-functional solutions. For example, diverse wet grasslands succeeding to native willow scrub would enhance the local landscape, benefit wildlife and improve water outflow quality. Further design work is required to establish the viability of such desirable measures.

[38] DMRB Volume 11 Section 2 Part 5 HA 205/08, Chapter 1 Information Assembly, X Mitigation enhancement and monitoring, Page 1/9

8 Nature Conservation (Ecology)

8.1 Introduction

8.1.1 This chapter of the Scoping Report sets out the proposed approach to the assessment of effects on ecology and nature conservation in terms of sites designated for their nature conservation importance (international, national and local), the habitats present, and the protected or otherwise notable species which they support. It identifies the nature conservation constraints to enable an informed decision on the level and approach to the assessment to be established. During the EIA process, the potential effects of both the construction and operational phases of the Scheme will be considered and these effects avoided and mitigated so far as practicable. The significance of the likely ecological and nature conservation effects will also be assessed.

8.2 Relevant Guidance

8.2.1 The following guidance, initiatives and plans are also relevant and will be considered during the assessment:

- Guidelines for Ecological Impact Assessment in the UK Chartered Institute of Ecology and Environmental Management**Error! Bookmark not defined.** (currently under review);
- Guidelines for Baseline Ecological Assessment (Institute of Environmental Assessment)[39];
- Design Manual for Roads and Bridges (DMRB) Volume 11, Section 3, Part 4: Ecology and Nature Conservation[40];
- Interim Advice Note 116/08 (W) Nature Conservation in Relation to Bats[41];
- Interim Advice Note 130/10 Ecology and Nature Conservation: Criteria for Impact Assessment[42];
- DMRB Volume 11, Section 4, Part 1: Assessment of Implications (of Highways and/or Roads Projects) on European Sites (Including Appropriate Assessment)[43];

[39] Institute of Environmental Assessment (1995) Guidelines for Baseline Ecological Assessment.
[40] Highways Agency (1993) Design Manual for Roads and Bridges (DMRB) Volume 11, Section 3, Part 4: Ecology and Nature Conservation.
[41] Welsh Assembly Government (2009) Interim Advice Note 116/08 (W) Nature Conservation Advice in Relation to Bats. Wales Only.
[42] Highways Agency (2010) Interim Advice Note 130/10 Ecology and Nature Conservation: Criteria for Impact Assessment.
[43] Highways Agency, Scottish Government, Welsh Assembly Government and the Department for Regional Development Northern Ireland (2009) Design Manual for Roads and Bridges Volume 11, Section 4, Part 1: HD 44/09. Assessment of Implications (of Highways and/or Roads Projects) on European Sites (Including Appropriate Assessment).

- Technical Advice Note (TAN) 5: Nature Conservation and Planning[44];
- The UK Post-2010 Biodiversity Framework[45];
- Welsh Transport Planning and Appraisal Guidance: WelTAG[46];
- Trunk Road Estate Biodiversity Action Plan 2004-2014[47];
- The State of Birds in Wales (RSPB Cymru, BTO Cymru, the Wildfowl and Wetlands Trust, the Welsh Ornithological Society and Countryside Council for Wales)[48];
- Otter Road Casualties in South Wales: Recommendations for Mitigation: A report by the Cardiff University Otter Project[49];
- Birds of Conservation Concern 3: The Population Status of Birds in the United Kingdom, Channel Islands and the Isle of Man[50];
- Powys Local Biodiversity Action Plan (Powys Biodiversity Partnership)[51];
- Natur Gwynedd Biodiversity Action Plan (Gwynedd Council)[52];
- Snowdonia Biodiversity Action Plan (Snowdonia National Park Authority)[53].

8.3 Study Area

8.3.1 In accordance with the relevant guidance, the ecology desk study area for the Scheme extends to 30 km for SACs designated for bats, 10 km for other internationally designated sites, 2 km for nationally designated SSSIs and 1 km for locally designated Sites of Importance for Nature Conservation (SINCs).

8.3.2 For protected species the desk study area extends for 2 km (other than for bats for which it is 5 km) and for other species of conservation concern, 1 km.

8.3.3 The proposed study area for ecological field surveys will include all land within 500m of the centre line of the proposed scheme and any compound or laydown areas that will be used.

[44] Welsh Assembly Government (2009) Planning Policy Wales Technical Advice Note 16: Sport, Recreation and Open Space. January 2009.
[45] JNCC/DEFRA (2012) The UK Post-2010 Biodiversity Framework, July 2012;
[46] Welsh Assembly Government (2008) Welsh Transport Planning and Appraisal Guidance: WelTAG.
[47] Welsh Assembly Government (2004) Trunk Road Estate Biodiversity Action Plan 2004-2014.
[48] RSPB Cymru, BTO Cymru, the Wildfowl and Wetlands Trust, the Welsh Ornithological Society and Countryside Council for Wales (2012) The State of Birds in Wales.
[49] Wikinson, C. and Chadwick, E. (2012) Otter Road Casualties in South Wales: Recommendations for Mitigation. A report by the Cardiff University Otter Project.
[50] Eaton et al. (2009)Birds of Conservation Concern 3: The Population Status of Birds in the United Kingdom, Channel Islands and the Isle of Man
[51] http://www.powys.gov.uk/en/countryside-outdoors/biodiversity-in-powys/local-biodiversity-action-plan/
[52] https://www.gwynedd.gov.uk/en/Council/Strategies-and-policies/Environment-and-planning/Natur-Gwynedd-Biodiversity-Acion-Plan.aspx
[53] http://www.eryri-npa.gov.uk/the-environment/biodiversity/local-action-plan

8.4 Work Undertaken to Date

8.4.1 A high level desk study and Phase 1 habitat survey were undertaken during the route appraisal stage (DMRB stage 2 assessment) by Conservation Consultancy in 2001. This was used to identify the scope of the baseline surveys.

8.5 Proposed Scope of Baseline Studies

8.5.1 The following section sets out the methodologies for the surveys, which follow the best practice guidelines. Advice will be sought from NRW with regard to species and habitat included within the survey, as well as survey methodology.

Extended Phase 1 Habitat Survey

8.5.2 A detailed Extended Phase 1 Habitat Survey will be undertaken in accordance with the guidance set out in Guidelines for Baseline Ecological Assessment (Institute of Environmental Assessment 1995[54]) and (JNCC, 2010[55]) during July and August 2015. This maps existing habitats and provides an assessment of the potential for those habitats present to support legally protected and otherwise notable species (such as Red Data Book, BAP species and species of principal importance for the conservation of biological diversity).

8.5.3 This survey is supported by a detailed desk study of records supplied by Cofnod (North Wales Environmental Records Centre), the West Wales Biological Records Centre and the Biodiversity Information Service for Powys and the Brecon Beacons National Park.

National Vegetation Classification (NVC)

8.5.4 An NVC survey will be undertaken to include a 100m buffer around the proposed scheme, giving a corridor 200m wide and approximately 900m long. The objective of the survey will be to map and describe the plant communities within the Study Area using NVC methodology, and plant communities will be described in terms of the NVC communities published by the Joint Nature Conservation Committee (JNCC).

8.5.5 This survey will be undertaken by an experienced botanist, who will carry out a study using a walk-through method, supplemented by the use of quadrat sampling. A plant species list will be compiled for each vegetation type, and the broad characteristics of the habitat would be described. Each stand of vegetation will then be examined in greater detail to describe it in terms of the NVC. It is intended that this survey was completed in August 2015.

[54] Guidelines for Ecological Impact Assessment in the UK Chartered Institute of Ecology and Environmental Management (CIEEM 2006) (currently under review)
[55] Handbook for Phase 1 Habitat Survey - a technique for environmental audit. Peterborough: Joint Nature Conservancy Council.

Arboricultural survey

8.5.6 A pre-development tree survey in accordance with British Standard BS5837:2012 Trees In Relation to Design, Demolition and Construction will be undertaken to provide a tree constraints plan. This will be used to inform mitigation requirements in terms of tree protection.

Hedgerows

8.5.7 All hedgerows that may be affected by the proposal will be assessed to determine if they are ecologically 'important' in respect of Paragraph 7 of Schedule 1 of the Hedgerow Regulations 1997. Hedgerow surveys are currently being undertaken, having commenced in July 2015.

Bryophytes

8.5.8 A survey for bryophytes (mosses and liverworts) will be undertaken of the study area by an experienced and suitably qualified Bryologist. The survey will aim to:

- Compile an inventory of the bryophyte species present within the areas to be affected by the scheme; and
- Accurately document the locations of any species of conservation concern, including Fissidens polyphyllus, by GPS, mapping and photography.

Lichens

8.5.9 A survey for lichens will be undertaken of the study area by an experienced and suitably qualified Lichenologist. The survey will aim to record the diversity of lichen species present taking particular note of any species of conservation importance.

Invasive species

8.5.10 A survey for invasive plant species including Rhododendron (Rhododendron ponticum), Japanese knotweed (Fallopia japonica), Giant hogweed (Heracleum mantegazzianum) and Himalayan balsam (Impatiens glandulifera) will be undertaken as part of the Extended Phase 1 Habitat Survey.

Amphibians

8.5.11 Waterbodies within 500m of the Study Area will be subjected to a Habitat Suitability Index appraisal (HSI)[56] to assess their potential to support great crested newt. The standard methodology written by ARG UK[57] has been designed to evaluate habitat quality and quantity in order to assess which ponds provide suitable habitat for great crested newt breeding. The HSI was undertaken in July 2015.

[56] Oldham, Keeble, Swan & Jeffcote (2000) Evaluating the suitability of habitat for the great crested newt (Triturus cristatus). Herpetological Journal, 10, 143 - 155

[57] ARG UK (2010) Advice Note 5 Great Crested Newt Habitat Suitability Index, May 2010

8.5.12 Those waterbodies identified as having below average or greater suitability for great crested newts will then be subject to further presence / absence surveys in spring 2016. The presence/absence surveys for great crested newt will be in accordance with the methodology prescribed within the Great Crested Newt Mitigation Guidelines[58].

8.5.13 It is considered highly likely that other species of amphibians such as frogs and toad will be present within the Study Area, and therefore assumption will be made in terms of their presence and potential impacts. Specific surveys for these species will be undertaken.

Bats

8.5.14 Bat surveys will be undertaken in accordance with the guidelines set out in Bat Surveys: Good Practice Guidelines[59].

8.5.15 Buildings and trees within and adjacent to the site boundary will be assessed to determine their potential to support bat roosts. These will be categorised in accordance with the Bat Surveys: Good Practice Guidelines and emergence surveys undertaken in accordance with those guidelines (i.e. three emergence surveys for high potential buildings/trees, two for medium potential and one for low potential). Where required tree climbing surveys will be undertaken to refine the initial ground based assessment. All surveys and any inspections would be undertaken by experienced bat workers, with relevant NRW survey licences where required.

8.5.16 Surveys will also consist of transects within the Study Area combined with the use of static bat detectors in accordance with the Good Practice Guidelines. Transect survey work commenced in July 2015 and is intended to be undertaken once per month between July and September 2015 and April to June 2016, in-line with BCT guidance. Proposed transect and remote detector locations are shown on the attached Figure 6.

8.5.17 The transects are walked in suitable weather conditions by two surveyors using an EM3+ or Batlogger M detector. Each transect survey commences from dusk and continue for at least two hours targeting areas of potential foraging and commuting habitat. Listening points are built into the survey design at pre-determined locations. The duration spent at each listening point is ten minutes, in accordance with the Guidelines, to increase the chance of detecting horseshoe bats.

8.5.18 Bat passes will be recorded on a detailed plan noting time, location and wherever possible, direction of flight, species and behaviour (i.e. whether bats were commuting, foraging or social calling). Three Song Meter 2+ static bat detectors will be placed at suitable locations targeting linear features that would be bisected by the proposed alignment. Data are being collected over five consecutive nights each month between July and September 2015 and between April and June 2016.

8.5.19 Automated recorders may also be used in areas where health and safety concerns limit the scope of transects (e.g. cattle grazed pasture with young calves). Bat calls

[58] English Nature (2001) Great Crested Newt Mitigation Guidelines
[59] BCT (2012) Bat Surveys: Good Practice Guidelines

recorded on remote detectors and on transect routes will be analysed using computer software by an experienced bat specialist.

Dormice

8.5.20 Dormice have previously been recorded in the woodland to the north of the scheme. Therefore, a habitat suitability assessment will be undertaken to assess the need for a full dormouse survey. The assessment will entail the consideration of habitats present in terms of species composition and connectivity by an experienced ecologists and dormouse survey licence holder aloneg with searches for characteristically chewed hazel nuts where fruiting hazel is found to be present.

Otter

8.5.21 The Afon Dyfi and its' tributaries within 500m of the proposed alignment will be searched by experienced ecologists for signs of activity and potential resting places which could be used by otter. The survey will be undertaken in accordance with authoritative sources (Chanin, 2003[60]; Crawford, 2003[61]; Strachan & Jefferies, 1996[62]). Details of the water bodies will be recorded using standard forms to record their characteristics and any signs of otters which may be found. Where signs are found, the GPS co-ordinates of the location will be recorded.

Water Vole

8.5.22 The Afon Dyfi and its tributaries within 500m of the proposed alignment will be searched by experienced ecologists for field signs of water voles. The survey method for water voles will be undertaken in accordance with best practice survey guidelines in the Water Vole Conservation Handbook[63]. Details of the water bodies will be recorded using standard forms to record their characteristics and any signs of water voles which may be found. Where signs are found the GPS co-ordinates of the location will be recorded.

Badger

8.5.23 Badger surveys are currently being undertaken, having commenced in July 2015. Surveys will include searches for characteristic field signs (faeces, setts, paths, scratching posts, snuffle holes, day nests, hair traces, footprints and latrines) within the Study Area. Surveys will be undertaken by an appropriately qualified and experienced surveyor.

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[60] Chanin, P. (2003). *Ecology of the European Otter. Conserving Nature 2000 Rivers, Ecology Series No 10.* EN, CCW, EA, SEPA, SNH & SNIFFER

[61] Crawford. (2003). Fourth Otter Survey of England 2000 - 2002. Environment Agency.

[62] Strachan, R, & Jefferies, D.J. (1993) The Water Vole Arvicola terrestris in Britain 1989-1990: its distribution and changing status. London: The Vincent Wildlife Trust

[63] Strachan, R, Moorhouse, T & Gelling, M (2011) Water Vole Conservation Handbook (3rd Edition) Dec 2011

Wintering Birds

8.5.24 The wintering bird surveys will involve monthly field counts within the Study Area, taking account of the tidal conditions within the estuary to the west, and targeting times around sunset and sunrise. It is intended that these surveys will be carried out once a month between September 2015 and March 2016.

Breeding Birds

8.5.25 The breeding bird survey will follow the generic Breeding Bird Survey methodology set out in Bird Monitoring Methods[64].The survey will aim to sample the habitats present within the site boundary to assess the species present and relative abundance within different habitat types.

8.5.26 Experienced ornithologists will walk transects within the Study Area. The route will be walked at a slow pace, pausing briefly at intervals to listen for song and to scan for birds flying overhead or taking flight from the surrounding area. All birds seen and heard will be mapped in accordance with the British Trust for Ornithology (BTO) standard activity recording codes.

8.5.27 The survey will be carried out over three visits between March and June 2016, each at least two weeks apart. The transect routes will be walked in the morning, between 7am and 11am, when levels of avian activity (particularly singing) are likely to be at their highest. On one of the three visits the routes will be walked in the opposite direction to the previous visit, to balance any temporal variation in behaviour levels.

Aquatic and Terrestrial Invertebrates

8.5.28 Invertebrate surveys will be undertaken by an experienced entomologist from David Clements Ecology in September 2015, May and June 2016. Invertebrates will be sampled using several different techniques including pitfall trapping, pan/water trapping, light sampling and various active sampling methods. The survey methodology will follow the published guidelines, (including published guidance by English Nature[65] and Natural England[66]) as well as more specific published literature for particular invertebrate groups. The surveys will follow the Code of Conduct for Collecting Insects and other invertebrates[67] and involve subsequent laboratory analysis of collected samples.

8.5.29 Terrestrial surveys will be achieved using several different techniques including sweep netting, aerial netting, beating trays, bark-picking, grubbing and direct

[64]Gilbert, G, Gibbons DW & Evans J (1998) Bird Monitoring Methods: A Manual of Techniques for Key UK Species

[65] English Nature (2005) Organising Surveys to Determine Site Quality for Invertebrates. English Nature, Peterborough.

[66] Natural England (2007) Surveying Terrestrial and Freshwater Invertebrates for Conservation Evaluation. Natural England, Peterborough.

[67] Invertebrate Link (Joint Committee for the Conservation of British Invertebrates) (2002) A Code of Conduct for Collecting Insects and other Invertebrates. British Journal of Entomology and Natural History: 15, 2002.

searching. Pitfall traps, pan-traps and light traps will also be deployed. Aquatic surveys will include kick-sampling, netting and direct searching.

8.5.30 The rarity of invertebrate species will be assessed by reference to published and unpublished sources including the relevant national Red Data Books (RDBs), National Reviews and distribution atlases etc. The priority lists of the UK Biodiversity Action Plan will also be consulted, as will the lists set out in the published guidelines for the designation of Local Wildlife Sites.

Other Surveys

8.5.31 It is currently proposed not to undertake surveys for reptiles. Reptiles are assumed to be present within the Study Area and it is proposed to assume that they will be affected by the scheme and to include construction mitigation appropriately to avoid killing or injuring any reptiles.

8.5.32 A search of desk study records will be undertaken and the results reviewed along with the extended Phase 1 habitat survey results to determine the need for dormouse surveys, and we would welcome NRWs views with regard to the potential to scope out this species.

8.5.33 Signs of species listed on the List of Species of Principal Importance in Wales such as hedgehog, polecat and brown hare, will be noted during the course of the other surveys although apart from invertebrates and bird species, specific surveys for such species are not currently proposed.

8.5.34 It is noted that there are anecdotal reports of a beaver on the Afon Dyfi. However as this species is not currently native in the UK and its presence is limited to a trial release study and escaped animals, it is not proposed to survey for them. Furthermore as a non-native species it is not afforded any legal protection through the existing legislation.

8.6 Baseline Conditions

8.6.1 The route of the proposed scheme crosses the floodplain of the Afon Dyfi. Further downstream the Afon Dyfi is designated as part of the Dyfi SSSI, the Pen Llyn a'r Sarnau / Lleyn Peninsula and the Sarnau Special Area of Conservation (SAC), the Dyfi Estuary / Aber Dyfi Special Protection Area (SPA) and the Cors Fochno and Dyfi Ramsar site (illustrated in Figure 2a).. The closest of these sites is located approximately 5km from the proposed river crossing. A description of the relevant designated sites identified in the desk study and their features are given in Table 8.

Table 8 Description of designated sites and their features

Designation	Features
Dyfi SSSI	The estuary of the River Dyfi includes a range of habitats, with river channels and creeks, and extensive areas of sandbanks, mudflats and saltmarsh. The dunes support a rich orchid populations and an unusual fungus population. Estuarine peat bog system of Cors Fochno has a gently undulating mosaic of hummocks and hollows, with flowering plants and shrubs such as bog-myrtle

	Myrica gale dominating the hummocks, and lawns of bog-mosses *Sphagnum* species in the hollows. The Ynyslas dunes and Cors Fochno support an important assemblage of mosses and liverworts, including 6 Red Data Book species. The higher plant flora on the Dyfi complex is rich, with 2 Red Data Book species – long-stalked orache *Atriplex longipes* and fragrant evening-primrose *Oenothera stricta*, 11 nationally scarce species, and 35 species which are scarce in Mid Wales. The habitats of the Dyfi are of considerable entomological interest, supporting many nationally scarce species, and 16 Red Data Book species, including the major British stronghold for the rosy marsh moth *Eugraphe subrosea*. The pools and ditches of Cors Fochno and Ynyshir also support a rich assemblage of damselfly and dragonfly species. The intertidal sand flats support communities of burrowing invertebrates, crustaceans and molluscs. The site is of considerable ornithological importance, and particularly notable for its variety of breeding and wintering species. Resident dormouse, otter, polecat and good populations of amphibians and reptiles provide additional interest on this site. This estuary is important as a spawning ground for marine fish, especially bass.
Pen Llyn a'r Sarnau / Lleyn Peninsula and the Sarnau SAC	Sandbanks which are slightly covered by sea water at all times Estuaries Coastal lagoons Large shallow inlets and bays Reefs Mudflats and sandflats not covered by seawater at low tide Salicornia and other annuals colonizing mud and sand Atlantic salt meadows (*glauco-puccinellietalia maritimae*) Submerged or partially submerged sea caves Bottlenose dolphin (*Tursiops truncatus*) Otter (*Lutra lutra*) Grey seal (*Halichoerus grypus*)
Dyfi Estuary / Aber Dyfi SPA	Greenland white-fronted goose (*Anser albifrons flavirostris*)
Cors Fochno and Dyfi Ramsar site	Active raised bogs Degraded raised bogs still capable of natural regeneration Depressions on peat substrates of the *Rhynchosporion*

8.6.2 The river at the crossing point is bordered to the north by a woodland strip separating the river from the A487. To the south is an area of grazed pasture and farmland used for silage production. The river is an important fishery and is known to be used by otter. It is also likely to be an important commuting and foraging corridor for bats.

Identification of Sensitive Receptors

8.6.3 Receptors will be identified through a combination of a detailed desk study, botanical and faunal species specific surveys, and consultation with key stakeholders including

Natural Resources Wales (NRW). The proposed surveys and methodology to be followed are described in section 8.5.

8.7 Future Baseline Conditions

8.7.1 Consideration would be given to the potential for changes in the baseline conditions in the medium to long-term as a result of climate change. The Climate Change Risk Assessment for Wales[68] identified the following main potential threats and opportunities for the natural environment as a result of climate change:

- reduction in soil moisture and lower river flows, and an increase in the frequency and magnitude of droughts;
- changes in soil organic carbon, although the ways in which it might be affected are not adequately understood at present;
- changes in climate space and species migration patterns, which could result in significant changes to biodiversity;
- increases in pests and diseases;
- changes to coastal and estuarine habitats and species, including a reduction in intertidal area; and
- changes to the marine environment, including an increase in disease hosts and pathogens, harmful algal blooms and invasive species. The effects of ocean acidification include adverse impacts on shellfish.

8.7.2 The potential effects of these main potential effects of climate change on the future ecological baseline will be considered recognising that ecosystems are complex and are affected by a wide range of factors, and that there are limited data and modelling capability. The extent to which the management of land and water in the area of the Scheme is likely to moderate the effects of climate change on biodiversity will also be considered.

8.8 Assessment of Effects

Scope of Proposed Assessment

8.8.1 In addition to the guidance described in Section 8.2, the assessment of effects will follow a methodology primarily taking account of the following guidance:

- DMRB Volume 11, Section 2, Part 5: HA205/08 Assessment and Management of Environmental Effects; and
- Guidelines for Ecological Impact Assessment in the UK Chartered Institute of Ecology and Environmental Management (CIEEM)[69].

[68] Welsh Government and Defra (2012) The Climate Change Risk Assessment for Wales

8.8.2 As referred to above, the Guidelines for Ecological Impact Assessment in the UK[69] are currently under review. Until such time as a revised version is published, the 2006 version remains current. If a revised version is published prior to preparation of the ES, this will be taken into account.

8.8.3 The scope of the assessment will consider the potential effects outlined below.

Issues Proposed to be Scoped Out

8.8.4 It is not currently proposed to undertake specific surveys for dormouse, reptiles, amphibians or other Species of Principal Importance for the Conservation of Biodiversity. Assumptions will be made in respect of the likely presence of such species and mitigation proposed within the ES accordingly. This decision will be reviewed in light of any comments that may be received in response to the scoping consultation.

Assessment of Potential Effects

8.8.5 The assessment of the effects of the Scheme will include those arising from:

- the permanent land take required for the Scheme;
- construction; and
- operation.

8.8.6 The potential effects of the permanent land take for the Scheme would primarily arise from habitat loss which, as well as resulting in the loss of habitat of intrinsic value in its own right, would reduce the area available for foraging and nesting animals. Reducing the area can reduce viability of the habitat and lead to a reduction in the diversity of plant and animal communities present. The integrity of the habitat could therefore be altered, and the conservation status of species affected.

8.8.7 In addition to land take, the new road, highway fencing, drainage and bridge/culvert alterations have the potential to create a barrier to movement of species between areas of habitat ('habitat fragmentation'). Mitigation to any barrier identified will be incorporated into the design.

8.8.8 The design of the scheme, its drainage and construction should take into account amphibians and also ensure the potential for these species becoming trapped in the drainage system is minimised

8.8.9 Where invasive plant species are present mitigation measures will be adopted to manage the presence of such species including the control of the species in accordance with existing guidelines such as the relevant Environmental Agency guidance[70].

8.8.10 The potential effects of the Scheme during construction would include:

[69] Chartered Institute for Ecology and Environmental Management CIEEM (2006) Guidelines for Ecological Impact Assessment in the UK

[70] Environment Agency (2010) Managing invasive non-native plants

- additional habitat loss as a result of the construction of the Scheme resulting from use of land for soil storage areas or construction compounds etc;
- potential hydrological effects of the earthworks resulting in changes in water levels in watercourses and wetland areas;
- temporary severance/fragmentation of habitats or corridors used by species (in addition to that caused by the completed Scheme);
- disturbance to sensitive species in adjacent areas from noise, light, unaccustomed human activity;
- effects of air pollution from construction vehicle exhaust gases and dust from haul roads;
- potential effects of pollution from inappropriate storage of chemicals or spillages on nearby or more distant receptors; and
- potential effects of run-off from the construction area resulting in particulate pollution of watercourses.

8.8.11 The effects to be assessed relating to operation of the Scheme would include:

- severance/fragmentation of habitats or corridors used by species;
- animal road casualties as normal commuting routes are disrupted;
- disturbance to sensitive species from noise, light, traffic and air pollution;
- effects of highway drainage on existing watercourses and the hydrological regime;
- salt accumulation from de-icing operations may affect plant communities on the roadside verges and the ecology of the receiving watercourses;
- potential for pollution events resulting from collisions/other traffic incidents on the new road;
- effects of air pollution resulting from vehicle exhaust gases and particulates on sensitive habitats and species; and
- potential ecological benefits of new landscape provision and management.

8.9 Mitigation Measures

8.9.1 The wider landscape through which the Scheme would be constructed includes sites which have been designated at the highest level for their nature conservation value. It is essential that the Scheme avoids effects on these sites so far as practicable, and, where the effects cannot be avoided, that appropriate and effective mitigation is provided. The avoidance and mitigation measures will be developed as part of the Scheme design and in the light of the results of the ecological surveys.

8.9.2 As referred to above, the Welsh Government has particular responsibilities with respect to the conservation and enhancement of SSSIs under Section 28 of the Wildlife and Countryside Act 1981, and more generally must have regard to the purpose of conserving biodiversity under Section 40 of the Natural Environment and

Rural Communities Act 2006. Both duties would be strengthened by the Environment (Wales) Bill once enacted.

9 Geology and Soils

9.1 Introduction

9.1.1 This chapter of the Scoping Report covers ground conditions, geology and soils with particular emphasis on land contamination. It should be noted that effects on the agricultural use of soils are considered within Chapter 14 (Community and Private Assets), and effects on groundwater are considered within Chapter 15 (Road Drainage and the Water Environment) of this Scoping Report.

9.2 Relevant Guidance

9.2.1 The assessment will be undertaken with due consideration of the following guidance:

- DMRB Volume 11, Section 3, Part 11 Geology and Soils[79];
- Model Procedures for the Management of Land Contamination (CLR11)[71];
- Construction Industry Research and Information Association R132: A Guide for Safe Working on Contaminated Sites[72];
- CIRIA SP73: Roles and Responsibility in Site Investigations[73];
- BS5930: 2015 – Code of Practice for Site Investigations including Amendment 2, issued[74];
- BS10175: Code of Practice for Investigation of Potentially Contaminated Sites[75];
- Eurocode 7 (BS EN 1997-1[76] & EN 1997-2[77]) and all relevant Normatives;
- National Resources Wales (formerly Environment Agency Wales) Pollution Prevention Guidelines.

9.3 Study Area

9.3.1 The study area for the contaminated land assessment will cover the construction land take and permanent land take. The baseline study area will include all potential contaminated land sites that intersect the Scheme and those site that have plausible pollutant linkages that may intercepted by proposed alignment, typically within

[71] Environment Agency and Defra (2004) Model Procedures for the Management of Land Contamination (CLR11).
[72] Construction Industry Research and Information Association (CIRIA) (1996) R132: A Guide for Safe Working on Contaminated Sites.
[73] Construction Industry Research and Information Association (CIRIA) (1991) CIRIA SP73: Roles and Responsibility in Site Investigations.
[74] British Standards Institution (2015) BS5930: Code of Practice for Site Investigations including Amendment 2, issued.
[75] British Standards Institution (2013) BS10175: Code of Practice for Investigation of Potentially Contaminated Sites.
[76] British Standards Institution (2013) BS EN 1997-1: 2004 and Amendment 1: 2013: Eurocode 7 Geotechnical Design. General Rules.
[77] British Standards Institution (2007) BS EN 1997-2: 2007 UK National Annex to Eurocode 7 Geotechnical Design. Ground Investigation and Testing.

approximately 250 metres of the route corridor, although potential pollutant linkages will be considered on a case by case basis.

9.3.2 The geology study area will be determined on the basis of the regional geology for the area and the site-specific data gathered during investigations along the Scheme. The detailed study area for geology is therefore based along a corridor following the route. Consideration will also be given to the other sites associated with ancillary activities that may be situated outside the route alignment.

9.4 Work Undertaken to Date

9.4.1 A ground investigation and interpretative report were completed by CJ Associates in 2001. This work was carried out for a range of possible highway alignments that were under consideration for the scheme at the time.

9.4.2 A Preliminary Sources Study Report (PSSR) is currently being prepared for the proposed scheme, to document the findings of the ongoing geotechnical desk study investigation.

9.5 Baseline Conditions

9.5.1 The 2001 interpretative report summarises the geology and encountered ground conditions as follows:

"According to the British Geological Survey geological map of the area, and other available information, the site under investigation is underlain by Silurian rocks of the Llandovery Series. These are generally blue, black and grey graptolitic shales and mudstones with only occasional interbedded sandy bands."

"The strata revealed by this investigation across the flood plain to the south of the river can be generally summarised as soft to firm silty clay to between approximately 1.00m to 3.00m over medium dense becoming very dense river-deposited gravel with occasional sand or silt/clay horizons to between 15.60m to 22.10m over moderately strong to strong siltstone or shale bedrock. To the north of the river bedrock was found at much shallower depths, varying between .030m and 8.60m, although the overlying deposits were the same as those to the south.

Groundwater was generally encountered upon reaching the granular sand and/or gravel deposits."

"Testing of four samples revealed no contaminants exceeding the ICRCL trigger concentration thresholds for metals. On the basis of this limited evidence it is possible to recommend that, with regard to metals contamination, no works are necessary on site.

It is emphasised that only a small number of tests have been carried out and that the possibility of contamination elsewhere on the site cannot be entirely ruled out."

9.5.2 It is noted that as interpretative report quoted above was prepared in 2001, the contamination test results were compared against ICRCL contamination threshold

values that were current at that time. The 2016 environmental assessment shall adopt the use of current guideline values instead of ICRCL threshold values.

9.5.3 Further details on the assessment of hydrogeological aspects of the scheme are presented in Chapter 15.

9.5.4 The Environment Agency identified during the Stage 2 Environmental Assessment[78] that the deposited silts in the bank could contain toxic metals (including lead) from former mining activity in the region. These soils are to be sampled and tested for a range of contaminants as part of the 2015 ground investigation, to establish whether the material can be reused or will need disposal. The test results shall be assessed as part of the Environmental Statement.

9.5.5 Further ground investigation is proposed for late October - December 2015, the results of which will inform the baseline conditions for the Environmental Statement. Contamination assessment will be reassessed using the latest guidance and recommendations:

- The risk management framework provided in CLR11, Model Procedures for the Management of Land Contamination
- Planning Policy Wales**Error! Bookmark not defined.**
- Guiding Principles for Land Contamination
- Groundwater Protection: Principles and Practice (GP3)[102]

Identification of Sensitive Receptors

9.5.6 Sensitive receptors will be identified based on the review of existing information and the work undertaken to inform the EIA process. Receptors relevant to this topic area may include:

- Areas of geological or geomorphological interest;
- Soils;
- Sensitive human receptors;
- Controlled waters that may be affected by release and migration of contaminants; and
- Ecological receptors that may be affected by release of contaminants.

9.5.7 Identification of receptors and consideration of their sensitivity will be undertaken in accordance with the DMRB Volume 11, Section 3, Part 11[79] and Volume 11, Section 2, Part 5**Error! Bookmark not defined.**. The assessment applied will be in accordance with the risk management framework provided in CLR11, Model Procedures for the Management of Land Contamination.

[78] Powys County Council (2002) A487 Fishguard to Bangor Trunk Road Pont ar Ddyfi Improvement Stage II Environmental Assessment

[79] Highways Agency (1993) Design Manual for Roads and Bridges (DMRB) Volume 11, Section 3, Part 11: Geology and Soils

9.5.8 Approaches adopted for the identification of sensitive ecological and hydrological receptors are considered within Chapters 9 and 15 of this Scoping Report respectively.

9.6 Proposed Scope of Baseline Studies

9.6.1 A gap analysis of the information contained within PSSR (2014) will be undertaken and the existing information validated and updated where appropriate using the following sources of information:

- Topographical maps
- Ordnance survey maps at scales of 1:50,000 and 1:25,000.
- Geological maps and memoirs
- A GroundSure/Envirocheck report will be obtained for the site containing both Geological and Historical plans. In addition the BGS 1:50,000 scale, and if available, the 1:10,000 geological plans will be used. The geological memoir for the local area will be consulted.
- Hydrology and hydrogeology
- OS plans of the area surround the site will be reviewed. The groundwater vulnerability will be considered from the Environment Agency's online viewer.
- Records of mines and mineral deposits
- The Review of Mining Instability in Great Britain, Volume 1/iii – Wales Regional report, prepared by Arup for the Department of the Environment (1991) will be consulted. Historic OS plans will be used to identify the potential presence of historic quarries.
- Natural cavities
- The potential for natural cavities will be assessed from geological maps and memoirs.
- Land use and soil survey information
- A site walkover and the GroundSure/Envirocheck report will be used to assess current land use. Aerial photographs will be used to assess recent historical land use.
- A review of the soil survey plans is not proposed as part of this chapter.
- Existing and proposed ground investigations
- The British Geological Survey borehole records database will be reviewed and available borehole records obtained for the local area.
- Factual reports on previous ground investigations are available for the scheme.
- The Welsh Assembly Geotechnical Data Management System will also be consulted.
- A ground investigation is to be completed for the proposed scheme.

- Consultation with statutory bodies and agencies
- Consultation will take place with NRW and the Local Authority Pollution Control department regarding potential geo-environmental issues, in addition to the Overseeing Organisation.
- Recorded contaminated land, pollution incidents and areas of landfill will be reviewed NRW data contained within the GroundSure/Envirocheck report.

Future Baseline Conditions

9.6.2 Consideration would be given to the potential for changes in the baseline conditions in the medium to long-term as a result of climate change. The Climate Change Risk Assessment for Wales[68] would be reviewed, together with other climate change prediction tools. However, it is not considered likely that there would be significant changes in geological conditions. With respect to soils, the Change Risk Assessment for Wales identifies the following:

- reduction in soil moisture and lower river flows, and an increase in the frequency and magnitude of droughts;
- changes in soil organic carbon, although the ways in which it might be affected are not adequately understood at present;
- increase in soil erosion in drier summers;
- wetter soils and increased waterlogging in wetter winters.

9.6.3 It is anticipated that the key areas of existing contaminated land would remain in the future as there are no other plans for their remediation.

9.7 Assessment of Effects

Scope of Proposed Assessment

9.7.1 A detailed assessment will be undertaken. The assessment will include consideration of possible effects on statutory and non-statutory geological sites along the route of the Scheme. The assessment will also consider general effects on potential contaminated land exposure along the proposed route.

9.7.2 From review of the data described in Section 9.5 the extent of potentially contaminated land will be identified. A conceptual site model (CSM) shall be prepared as part of the contamination assessment, which shall be carried out in accordance with the risk management framework provided in CLR11, Model Procedures for the Management of Land Contamination. The need for further focused assessment will be considered where existing or suspected contaminated land may have an effect as a result of construction of the scheme, i.e. by creating or altering pollutant linkages between sources of potential contaminants and sensitive receptors like humans, ecology, surface water and groundwater bodies.

9.7.3 Using the information contained within the updated baseline studies, including the results of the 2015 ground investigation, conceptual site models shall be prepared for

those locations identified as potentially contaminated. These conceptual site models will be used to establish the risks posed by each location and the need or otherwise for further assessment.

9.7.4 Interrelationships are identified between the ES chapters concerned with land contamination, materials, drainage and water environment, air quality (dust), ecology, landscape and cultural heritage. The assessment of effects will take into account these interrelationships. However, the principal effects on soils from these topic areas will be assessed primarily within the relevant chapters.

Issues Proposed to be Scoped Out

9.7.5 It is proposed that those contaminated land sites identified as being fully outside the zone of influence of the study area (including adjacent earthworks), will be scoped out of requiring further assessment.

Assessment of Potential Effects

9.7.6 The overall assessment of the environmental effects on the geology and soils of the Scheme will be carried out in accordance with the guidance set out in DMRB Volume 11, Section 3, Part 11[80], whilst the detailed assessment on the magnitude of impacts and significance criteria for effects will be undertaken using the methodology outlined in DMRB Volume 11, Section 2, Part 5**Error! Bookmark not defined.**.

9.7.7 Assessment of effects in relation to contamination will be undertaken in accordance with industry best practice, including CLR11[71]. The process comprises a tiered approach which starts with a simple and conservative Tier 1 assessment of potential risks from possible Pollutant Linkages (Source-Pathway-Receptor). Any potential risks identified at Tier 1 are then studied in more detail through a Tier 2: Generic Quantitative Risk Assessment (GQRA) and, if necessary, a Tier 3: Detailed Quantitative Risk Assessment (DQRA). Consideration shall be given to whether risks may be presented to human health and/or the water environment. This shall be determined on a location specific basis as part of the environmental impact assessment.

9.7.8 The risk assessment process is underpinned throughout by the development of the Conceptual Site Model (CSM) which provides a schematic representation of the identified Contaminated Linkages.

9.7.9 Where pollutant linkages dictate, additional assessments will be prepared as necessary including remedial options appraisals and piling risk assessments.

9.8 Mitigation Measures

9.8.1 At this stage, the design is being progressed on the basis that all soils will be retained on site for use. For sites that are not scoped out of the assessment, measures will be taken to establish acceptable reuse criteria and procedures defined for ensuring suitability of material can be demonstrated and verified. A discovery strategy will be

[80] Highways Agency (1993) Design Manual for Roads and Bridges (DMRB) Volume 11, Geology and Soils.

developed to enable unforeseen ground conditions to be addressed if or when encountered. Inter-relationships with the Materials chapter of the ES will be captured relating to soil re-use.

10 Material Resources

10.1 Introduction

10.1.1 The purpose of this chapter of the Scoping Report is to set out the proposed approach to the assessment of potential impacts of the proposed Scheme associated with the use of material resources and the management of waste. It considers the effects of the use of materials and the generation and management of wastes, and presents details of material resources and waste movements.

10.2 Relevant Guidance

10.2.1 The overarching policy in relation to the handling of material resources along the Scheme is the EU Waste Framework Directive 2008/98/EC. This provides the framework legislation for the collection, transport, recovery and disposal of waste. It includes a common definition of 'waste', which is 'any substance or object which the holder discards or intends to discard', with the term 'discard' including the disposal, recovery or recycling of a substance. The overall purpose of the Waste Framework Directive is to set out measures to protect the environment and human health by preventing or reducing the adverse effects of waste generation and its management, and by improving the efficiency of resource use. Member States are required by the Directive to take all the necessary measures to ensure that waste is recovered or disposed of without endangering human health or causing harm to the environment. The Directive sets a number of high- level objectives, which have influenced national waste management policy and legislation. In particular, Article 11 of the Waste Framework Directive (amended in 2008) requires that Member States take the necessary measures to achieve 70% recycling of non-hazardous construction and demolition waste by 2020.

10.2.2 In addition to the above Directive, reference will be made to the following guidance and legislation relating to material resources and wastes:

- Interim Advice Note (IAN) 125/09(W) Supplementary Guidance for Users of DMRB Volume 11 'Environmental Assessment'**Error! Bookmark not defined.**.
- Interim Advice Note (IAN) 153/11 Guidance on the Environmental Assessment of Material Resources[81].
- Design Manual for Road and Bridges (DMRB) Volume 11, Section 3 Part 3, Disruption Due to Construction[82]. This covers the effect on people and on the natural environment which can occur, mainly during construction works.
- DEFRA Environmental Permitting (England and Wales) Regulations 2010.

[81] Highways Agency (2011) Interim Advice Note 153/11 Guidance on the Environmental Assessment of Material Resources.
[82] Highways Agency (1993) Design Manual for Roads and Bridges (DMRB) Volume 11, Section 3 Part 3, Disruption Due to Construction

- DEFRA Environmental Permitting Guidance 'The Waste Framework Directive' for the Environmental Permitting (England and Wales) Regulations 2010.
- The Waste (England and Wales) Regulations 2011. This implements revisions to the Waste Framework Directive in England and Wales.
- The Hazardous Waste (England and Wales) Regulations 2005.
- Definition of Waste: Development Industry Code of Practice, Version 2 (Contaminated Land: Applications in Real Environments (CL:AIRE) 2011)[83].

10.3 Study Area

10.3.1 The study area will encompass the spatial area over which the Scheme would be expected to have an effect. For material resources, this would typically relate only to the areas that would be disturbed by the Scheme. Consideration of the potential effects outside of the study area will also be included, specifically in regards to the supply and movement (import/export) of materials outside of the Scheme boundaries. This will include primary aggregate and other materials such as steelwork for the structures. This secondary area will extend to include the waste management infrastructure identified for use by the scheme.

10.4 Work Undertaken to Date

10.4.1 Much of the information needed for this chapter of the ES will be derived from geotechnical and contaminated land surveys (reference is made to sections 11.3 and 11.6). The output from these surveys is not yet available. The Scheme is still in the design stage and therefore, the earthworks strategy has not been finalised.

10.4.2 Preliminary estimates of likely quantities of earthworks fill required are of the order of 20,000m^3. Due to the alignment of the proposed scheme, the quantity of earthworks fill will exceed the volume that will be excavated. There is therefore the opportunity to maximise the reuse of site won fill across the scheme, so long as it is suitable or can be rendered suitable for reuse. A net import of fill will however be required.

10.4.3 The Stage 2 Environmental Assessment Report (Powys County Council 2002) identified the material resources considered to be present in the areas affected by the Scheme across specified sections.

10.4.4 Mineral resources along the Scheme are managed by two mineral planning authorities (MPA) - Powys County Council and Gwynedd Council.

[83] Contaminated Land: Applications in Real Environments (CL:AIRE) (2011) Definition of Waste Development Industry Code of Practice

10.5 Baseline Conditions

10.5.1 A description of the superficial deposits and the solid geology beneath the Scheme are described in Chapter 9 of this Scoping Report.

10.5.2 Further ground investigation is proposed for late October to December 2015, the results of which will inform the baseline conditions for the ES.

10.5.3 A description of the nature of the materials that would be excavated during the construction of the Scheme will be provided in the ES chapter. The description of baseline conditions will include details of:

- availability of key materials resources required for the Scheme (aggregates / soils/ concrete, steel);
- waste arisings with the study area (segregated by waste type);
- capacities of waste management infrastructure (facilities and landfills) that can receive the waste types and quantities likely to arise from the Scheme; and
- volume of traffic movements on the road infrastructure to be utilised by the vehicles associated with the Scheme's material resources and waste.

Identification of Sensitive Receptors

10.5.4 Sensitive receptors will be identified based on the review of existing information and the work undertaken to inform the EIA process. Receptors relevant to this topic area may include:

- areas of geological or geomorphological interest;
- soils;
- sensitive human receptors;
- controlled waters and ecological receptors that may be affected by release of contaminants;
- the extended highways network in relation to the transportation of the Scheme's material resources and waste;
- the primary aggregate workings within the study area, which are likely to be the primary source of the aggregates used in the proposed works;
- off site material resource sources;
- the waste management infrastructure within the study areas which are likely to be used to manage the majority of waste generated through the proposed works;
- the global climate system as the ultimate receptor of any new greenhouse gas (embodied carbon) emissions generated from the proposed works.

10.6 Proposed Scope of Baseline Studies

10.6.1 Baseline information on the material resources and waste management infrastructure for the Scheme will be collated through a desk study and the following further sources of information:

- Stage 2 Assessment (Powys County Council 2002);
- British Geological Survey Maps;
- Natural Resources Wales Public Register - list of operational waste management facilities;
- Consultation with NRW, SNPA, Powys County Council and Gwynedd Council will be undertaken to reveal any concerns regarding material resources and waste management. NRW will be specifically consulted with respect to the Site Waste Management Plan which will be produced as part of the CEMP.

10.6.2 The above information will be supplemented by the findings of the recent ground investigations along the Scheme, together with details of the receptors set out in Section 10.5.

Future Baseline Conditions

10.6.3 Consideration will be given to enable future site conditions to be assessed against pre construction conditions.

10.6.4 Consideration will also be given to any potential for changes in baseline conditions, such as climate change, to affect the identified receptors.

10.7 Assessment of Effects

Scope of Proposed Assessment

10.7.1 Materials is a new topic chapter in the DMRB Volume 11, Section 3 (Environmental Assessment Techniques) and is introduced under IAN 125/09(W). Section 2.2 of the IAN states "*Guidance on the assessment and reporting requirements of materials (part 6) has not yet been issued in Section 3. Pending the publication of the new advice, direction can be sought from Welsh Assembly Government*."

10.7.2 The assessment of effects of the Scheme on material resources will be undertaken in line with the requirements of IAN 153/11[83]. It will consider the construction, demolition and operational phases, although it is anticipated that most of the effects on materials would be likely to arise during construction. In the longer term, some more limited effects could occur during the operational phase, such as the disposal of wastes arising from routine maintenance operations.

10.7.3 The assessment of the effects on material resources for constructing the Scheme will consider the extent, method and programme of the proposed earthworks and construction activities required to complete the Scheme. It will be undertaken on a reasonable worst case scenario basis.

10.7.4 The following factors would be assessed:

- works area;
- contamination;
- suitability for re-use of site won materials;
- construction materials balance;
- waste disposal (considering the impact of scheme requirements on the local infrastructure and capacities available);
- movement of materials during construction (both to and from the Scheme);
- material sources (both on and off site material resources required by the Scheme);
- storage of materials during construction;
- processing of materials; and
- management of waste.

10.7.5 The cost for the proposed Scheme is estimated to be over £20million, which is greater than the £300,000 threshold. Therefore, it is assumed that the potential exists for environmental impacts and effects from the use of materials and generation of waste. Given the extent of the scheme and the identified intent to maximise re-use of site won materials, it is recommended that a simple level of assessment will be undertaken, in line with IAN 153/11[81] requirements. It is intended that the re-use of materials within the Scheme will not increase the risk from existing contamination and existing pollutant linkages nor create new contamination or pollution linkages.

Issues Proposed to be Scoped Out

10.7.6 No issues have been identified that will be scoped out of the assessment.

Assessment of Potential Effects

10.7.7 The consumption of significant quantities of material resources is likely to result in permanent indirect and direct impacts on the environment. The generation of waste may lead to both permanent and temporary impacts on available waste management infrastructure.

10.7.8 There is currently no specific defined methodology for the assessment of the impacts and effects associated with the use and consumption of materials resources and the generation and management of waste. The assessment will follow the guidance in the Interim Advice Note 125/09 and in Interim Advice Note 153/11[81]. Professional judgement will be used to determine the magnitude of impact and the significance of the effect, taking into account the guidance given in DMRB.

10.7.9 The assessment of the effects of constructing the Scheme on material resources and waste management infrastructure will consider the extent, method and programme of the proposed earthworks, demolition and construction activities required to complete the Scheme.

10.7.10 Assessment of significance in relation to contamination will be set out in the Geology and Soils chapter of the ES.

10.8 Mitigation Measures

10.8.1 A Site Waste Management Plan (SWMP) will be prepared for the Scheme and would be implemented by the contractor during construction. The SWMP would set out how building materials and resulting waste will be managed during the Scheme construction. As SWMPs are not a legal requirement in Wales this will be undertaken to provide supporting information on the basis of best practice. A consultation was held across Wales which ended in April 2013. Subject to the outcome of the consultation, SWMP regulations could come into force in 2016.

10.8.2 Related guidance for the SWMP includes the following by Construction industry research and information association (CIRIA):

- CIRIA C536 Demonstrating Waste Minimisation Benefits During Construction[84];
- CIRIA SP133 Waste Minimisation in Construction – Site Guide[85];
- CIRIA SP134 Waste Minimisation and Recycling in Construction – Design Manual[86];
- Designing out Waste: a design team guide for Civil Engineering[87]
- Designing out Waste process[88]: Guidance Note - Implementing Designing out Waste in construction projects
- WRAP Site Waste Management Plan template[89]

10.8.3 Measures would be incorporated to avoid impacts and will likely include:

- Re-use of materials excavated from the site as fill as part of the overall earthwork movements, where practicable.
- Re-use of site won soils will be planned in accordance with the Definition of Waste Development Industry Code of Practice (CL:AIRE 2011) and will be controlled via a site specific Materials Management Plan (MMP).
- Responsibly sourcing construction materials and products where possible;
- Employing carbon footprinting techniques to identify opportunities to avoid, reduce, or substitute project related carbon emissions;
- Facilitating the prevention, reuse, recycling and recovery of waste through the implementation of a Site Waste Management Plan;

[84] CIRIA (2001) C536: Demonstrating Waste Minimisation Benefits During Construction.
[85] CIRIA (1997) SP133: Waste Minimisation in Construction – Site Guide.
[86] CIRIA (1999) SP134: Waste Minimisation and Recycling in Construction – Design Manual.
[87] WRAP http://www.wrap.org.uk/content/designing-out-waste-design-team-guide-civil-engineering
[88] WRAP http://www.wrap.org.uk/sites/files/wrap/DoW%20Process%20summary%20guide.pdf
[89] WRAP http://www.wrap.org.uk/content/site-waste-management-plan-template-lite

- Ensuring that all waste is stored, transported, treated, reprocessed and disposed of safely without harming the environment.

10.8.4 A design for resource efficiency / designing out waste workshop will be held to agree the above mitigation measures.

11 Noise and Vibration

11.1 Introduction

11.1.1 This section presents a scoping assessment of the noise and vibration aspects of the Scheme, which has been undertaken in accordance with the guidance given in DMRB Volume 11, Section 3, Part 7 HD 213/11 (hereafter referred to HD 213/11). This is the relevant guidance on the assessment of noise and vibration impacts associated with highway projects in the UK. It also describes the scope of the assessment within the context of the EIA by providing a description of the approach to gathering baseline noise data, the assessment methodology and presentation of results and assessment conclusions.

11.1.2 The purpose of this section is to:

- Use the available information to provide a preliminary assessment of whether the noise and vibration impacts associated with the Scheme are expected to exceed the threshold criteria given in paragraph 3.5 of HD 213/11.
- Describe the scope of the assessment to be presented within the EIA.

11.1.3 The de-trunking of the section of the A487 on the north side of the River Dyfi will result in reductions in road traffic passing adjacent to dwellings on this section of road. The re-alignment of the route to the north of Machynlleth on the new carriageway, viaduct and river bridge will bring road traffic closer to the nearest residential receptors 200m to the south, although it should be noted that the Dyfi Eco Park and the railway line are between the proposed Scheme and these receptors. The Scheme will also result in changes in flow on the existing local road network. The changes are expected to result in both increases and decreases in road traffic noise affecting dwellings and other sensitive receptors. Furthermore, the use of plant and equipment in constructing the new carriageway, viaduct and river bridge is expected to generate temporary noise and vibration impacts. This may also result short-term effects especially if stages of the works are undertaken during the night-time. However, requirement for night works have not been established. These factors should be considered when determining the appropriate level of noise assessment (HD 213/11 paragraph A1.8).

11.1.4 It is considered that there is potential for the levels of impact to exceed the threshold levels specified in HD 213/11 (paragraph 3.5). Paragraph 3.6 states that a 'Detailed' level assessment should be carried out where such changes in noise are expected. Therefore, the assessment to be presented within the EIA will be in accordance with this.

11.1.5 The key noise and vibration impacts due to the Scheme with the potential to affect dwellings and other sensitive receptors are identified as follows:

- Temporary noise and vibration impacts due to the use of plant and equipment in the construction of the new carriageway, viaduct and river bridge.

- Temporary changes in road traffic noise due to application of traffic management and diversion routes.
- Permanent noise and vibration impacts due to road traffic using the new carriageway and changes in traffic using the existing road network.

11.1.6 For a glossary of Acoustic Terminology refer to Appendix B.

11.2 Relevant Guidance

Relevant Guidance

11.2.1 Design Manual for Roads and Bridges – Environmental Assessment, Volume 11, Section 3, Part 7 - DMRB is the regulatory standard for the design of a new road or improvements to an existing road. In particular, Volume 11 Section 3 Part 7 (HD 213/11 Revision 1)90 sets out the method for assessing noise and vibration associated with road traffic. HD 213/11 provides guidance on defining the assessment study area and the relevant assessment years. This procedure has been adopted for the purpose of this assessment. Calculation of Road Traffic Noise

11.2.2 HD 213/11 requires that road traffic noise is calculated under the method described in Calculation of Road Traffic Noise (CRTN)[91] CRTN describes a procedure for determining the level of noise from the highway based upon the traffic flow parameters (flow, speed and percentage heavy vehicles), road surface type, propagation distance, screening, intervening ground cover and topographical features between the highway and receptor.

11.2.3 A noise action plan for Wales 2013–2018, December 2013 explains how noise is managed in Wales and by whom. Although the plan is for built-up areas with over 100,000 people living in them, the general principles of managing environmental noise are relevant to this Scheme.

BS 5228 Code of Practice for noise and vibration on construction and open sites

11.2.4 The British Standard BS 5228 Code of Practice for noise and vibration on construction and open sites –Part 1:2009+A1:2014 Noise Part 2:2009 +A1:2014 Vibration92 provides guidance on the assessment and control of noise and vibration from construction activities. The Standard contains detailed information on noise reduction measures and promotes the 'best practicable means' approach to control noise and vibration to minimise the impact on local residents and construction workers. The Standard also provides criteria for vibration with regard to perception

[90] THE HIGHWAYS AGENCY, TRANSPORT SCOTLAND, WELSH ASSEMBLY, DRD (2011), Design Manual for Roads and Bridges Volume 11, Section 3, Part 7,HD 213/11 – Revision 1, TSO
[91] DEPARTMENT OF TRANSPORT WELSH OFFICE (1988), Calculation of Road Traffic Noise, HMSO
[92] BRITISH STANDARDS INSTITUTION (2014); BS 5228-1:2009+A1:2014 and BS 5228 Part 2 Code of Practice for Noise and Vibration Control on Open Construction Sites

and disturbance to residents and the onset of potential cosmetic or structural damage to buildings.

BS 6472 Guide to evaluation of human exposure to vibration in buildings

11.2.4.1 BS 6472-1:2008[93] Guide to evaluation of human exposure to vibration in buildings provides guidance on the assessment of vibration from a variety of sources (including general construction) and its potential to cause disturbance to people.

BS ISO 4866 Mechanical Vibration and Shock

11.2.5 BS ISO 4866: 2010, Mechanical vibration and shock – Vibration of fixed structures – Guidelines for the measurement of vibrations and evaluation of their effects on structures - BS ISO 4866[94] provide guidance and methodologies for the measurement and effects of vibration upon buildings.

Other Relevant Guidance

11.2.5.1

- The National Waste Strategy Towards Zero Waste – One Wales: One Planet 2010
- WRAP Cymru Delivery Plan: 2011–15 For a World Without Waste
- Climate Change Strategy for Wales 2010
- Environment (Wales) Bill: Part 1: "Sustainable management of natural resources" May 2015

11.3 Study Area

11.3.1 The determination of study area will be taken from the guidance given in HD 213/11. For the Detailed level of assessment used for this study, a quantitative noise impact study is made for all noise sensitive properties within 600m of all scheme roads and those existing roads subject to large traffic flow changes (i.e. equal to or more than +25% or -20%) as a result of the scheme. Figure 12 shows the HD 213/11 study area based on the physical extents of the Scheme. This shall be refined to take into account affected routes once the traffic data has been finalised.

11.4 Work Undertaken to Date

11.4.1 The work carried out at this stage comprises a desk-based exercise based on the details of the Scheme alignment, mapping and preliminary forecasts of traffic parameters. Baseline traffic parameters within the area of the Scheme were obtained

[93] BRITISH STANDARDS INSTITUTION (2008), BS 6472-1 Guide to evaluation of human exposure to vibration in buildings Part 1: Vibration sources other than blasting, British Standards Institution
[94] BRITISH STANDARDS INSTITUTION (2010) BS ISO 4866 : 2010, Mechanical vibration and shock – Vibration of fixed structures – Guidelines for the measurement of vibrations and evaluation of their effects on structures, British Standards Institution

by Arup by way of a survey using automatic counters. Parameters to convert the ATC (Automatic Traffic Count) data to AAWT were derived from traffic data provided by the Welsh Government for various roads in the study area.

Consultation

11.4.2 Consultation with Powys County Council was undertaken for the purpose of selecting positions for baseline noise monitoring. Further consultation will be undertaken in the preparation of the EIA. The discussion with consultees will be based on the initial findings presented here and on the approach as set out below. The main consultees are Powys County Council, Gwynedd Council and the Snowdonia National Park Authority.

Limitations

11.4.3 Comprehensive traffic data including average speeds and percentage of heavy vehicles was not available at the time of the assessment in all the scenarios to be considered within the assessment according to HD 213/11. However, an indication of overall flows has been used to estimate the noise changes based on the increases or decreases in flow as a percentage.

11.4.4 The working methods to be used in constructing the Scheme are not sufficiently developed to carry out a meaningful quantitative assessment of the potential noise and vibration impacts.

11.5 Baseline Conditions

11.5.1 Traffic travelling over the Afon Dyfi from the north of Machynlleth currently passes over the road bridge passing adjacent to dwellings on the north bank of the Afon Dyfi. Most of these properties are close to the east side of the road bridge, although there are some residences approximately 130m further east (Ffridd Farm). Approximately 500m east of the road bridge, where the proposed Scheme would connect to the existing A487, the Millennium Bridge crosses the river just south of the existing road as part of National Cycle Route 8. From the Millennium Bridge, this route continues west along the south river bank to join with the main road bridge. Other than the dwellings, the river is used by anglers, and the riverside paths used by walkers and cyclists. Open space used for recreational purposes is considered as a sensitive receptor in accordance with HD 213/11.

11.5.2 Road traffic noise, combined with the noise of the river, are likely to be the dominant sources of environmental noise affecting these dwellings and the public paths near to the river.

11.5.3 At the southern end of the proposed Scheme is the Dyfi Eco Park which accommodates a range of commercial and amenity buildings. Further south, over the railway, the closest residential properties in Machynlleth are approximately 200m from the proposed Scheme at its closest point. Baseline ambient noise at these locations would most likely be dominated by local traffic noise and noise from the railway.

Identification of Sensitive Receptors

11.5.4 Paragraph 2.26 of DMRB guidance HD 213/11 Revision 1 notes that:

'One of the issues to consider during an assessment of noise and vibration is the impacts upon people. This relates to people in their homes, their gardens and also outside in recreation areas. The impact upon other sensitive receptors and the enjoyment of these receptors is also important.'

11.5.5 Other than dwellings, non-residential receptors may also be noise sensitive. These would include, hospitals, schools, community facilities, public rights of way, and officially designated areas, such as national parkland (e.g. Snowdonia National Park on north side of the proposed scheme) or sensitive ecological receptors.

11.5.6 The presence of noise sensitive receptors will be surveyed in order to identify all relevant buildings, open areas or other amenities which could be potentially subject to noise effects associated with the construction or operation of the Scheme.

11.6 Proposed Scope of Baseline Studies

11.6.1 Further reviews of the area affected by the proposed scheme will be carried out to identify noise or vibration sensitive buildings and amenity areas which should be identified in the assessment. Baseline noise surveys will be carried out at sufficient locations to represent all identified noise sensitive areas. These locations, and the survey methodology, will be agreed with Powys County Council, Gwynedd Council and the Snowdonia National Park Authority as part of the assessment consultation process. The survey methodology will follow procedures defined in the established guidance for traffic noise prediction and assessment, i.e. CRTN and DMRB (refer to Section 0).

Future Baseline Conditions

11.6.2 The measured baseline noise survey data will be used for the construction noise assessment to represent baseline ambient noise levels at representative receptor locations. It is assumed that local noise would change substantively between the survey period and the commencement of proposed works.

11.6.3 The future baseline noise conditions for the operational traffic assessment will be determined by the CRTN noise prediction model for a forecast traffic scenario prior to construction of the Scheme. This will provide detailed coverage across the entire study area. HD 213/11 makes clear that this is the preferred approach for establishing baseline noise conditions, which are then directly comparable with the prediction model noise levels with the proposed scheme in operation for future assessment years. However, the future baseline noise level predictions will be supplemented by the data obtained during the baseline noise measurement survey.

11.7 Assessment of Effects

Scope of Proposed Assessment

11.7.1 The assessment will consider all noise and vibration associated with the operation of the proposed scheme and the effects associated with the construction of the Scheme.

Issues Proposed to be Scoped Out

11.7.2 The study area and the effects to be considered are defined with the HD 213/11 methodology. All of the assessment areas defined above in Section 0 will be included, as required by the assessment guidance. None of these standard assessment considerations will be scoped out.

Permanent Impacts due to Road Traffic Noise

11.7.3 The HD 213/11 approach to assessing operational noise impacts is to consider the predicted road traffic noise levels under the Do Something scenario (with proposed Scheme) and the Do Minimum scenario (without Scheme) in the Scheme opening year and the future year (generally the 15th year after opening). The method requires that the following comparisons are made for:

- Short term change with the Scheme: Do Minimum in the opening year versus Do Something in the opening year
- Long-term change with the Scheme: Do Minimum in the opening year versus Do Something in the future year
- Long-term change without the Scheme: Do Minimum in the opening year versus Do Minimum in the future year

11.7.4 Based on an opening year of 2019, the future assessment year is taken as 2034 (the 15th year after opening). Traffic noise will be assessed for 2019 and 2034, these apply to the Do Something and Do Minimum scenarios.

11.7.5 Noise predictions will be carried out according to the CRTN methodology using proprietary software. Noise levels from road traffic will be calculated across a grid of receiver positions over the study area, and contours of noise level exposure established. The study area extends to 600m either side of all scheme roads. For the purpose of this assessment the study area will also include any other roads connecting to the scheme, or on the wider network, where it was considered that there was the potential for traffic flow changes that could give rise to 1dB changes or more (i.e. flow changes of at least +25% or -20%).

11.7.6 The assessment of operational noise will be based upon the ‘Detailed level’ of assessment described in HD 213/11. This is on the basis that dwellings adjacent to the section to be de-trunked are expected to experience a reduction in road traffic noise greater than 1dB as a result of the route of the A487 being relocated to the south along the proposed new carriageway. Preliminary forecasted traffic flows indicate a reduction of 27% on Scheme opening. Therefore, the dwellings adjacent to this section of road are expected to experience a reduction in road traffic noise

greater than 1dB. In the long-term, the reduction is 13% - it is offset by the long-term growth in traffic on the existing roads.

11.7.7 Within the EIA, noise levels will be calculated in terms of the LA10,18h index as specified in CRTN. This represents the A-weighted noise level exceeded for 10% of the time between the hours of 06:00 and 00:00 on an average weekday. The basis, of which CRTN derives its source to receiver distance, is to assume a 'notional' line source position 3.5m in from the edge of the nearside operational lane. The traffic flow predictions on which the noise calculations are made will be taken from the traffic impact assessment data for the different scenarios.

11.7.8 In addition to traffic flow information, the traffic noise calculations will be determined from digital mapping data derived from both topographical surveys and landscaping details. Man-made features such as building infrastructure and man-made ground areas will also be modelled, as well as existing noise mitigation barriers and bunds. Positions of noise sensitive receivers will be identified. Details of earthworks, road surfaces, and other relevant information, will also be modelled.

11.7.9 The changes in traffic flow on existing roads and the re-alignment of the highway are factors that should be considered when determining the appropriate level of noise assessment (HD 213/11 paragraph A1.8). In this case it is considered that these changes could result in noise changes greater than the noise impact threshold values specified in HD 213/11 (paragraph 3.5). Paragraph 3.6 states that a 'Detailed' level assessment should be carried out where such changes in noise are expected.

11.7.10 There is no established UK guidance that clearly defines criteria for the assessment of significant effects arising from road traffic noise. The response of people to noise is subjective, and sensitivity to changes in traffic noise varies across the population. Given the variability of response and the potential for non-acoustic factors to influence perceptions of noise, any assessment of significance can only represent the general community response to traffic noise.

11.7.11 DMRB HD 213/11 provides categories for assessing the magnitude of impact due to changes in road traffic noise. These magnitude of impact descriptors are shown below in Table 9 (short term) and Table 10 (long term). The different scales reflect the different threshold criteria referred to in HD 213/11 (paragraph 3.5) for short term changes in traffic noise as opposed to the response to long term, steady state differences in traffic noise.

Noise Change [dB(A)]	Magnitude of Impact in the Short-term
0	No change
0.1 – 0.9	Negligible
1.0 – 2.9	Minor
3.0 – 4.9	Moderate
5.0 +	Major

Table 9: Classification of magnitude of noise impact in the short term under DMRB

Noise Change [dB(A)]	Magnitude of Impact in the Long-term
0	No change
0.1 – 2.9	Negligible
3.0 – 4.9	Minor
5.0 – 9.9	Moderate
10.0 +	Major

Table 10: Classification of magnitude of noise impact in the long term under DMRB

11.7.12 HD 213/11 notes that, following a change in traffic flow, perceptible changes have been reported in the short-term for traffic noise changes as small as 1dB(A). This is based on research of community response to noise indicating that people can be more sensitive to the abrupt noise change soon after opening of a new or altered scheme. The guidance notes that this heightened sensitivity to noise change is a temporary effect and the longer-term noise nuisance level after a number of years reverts to the 'steady state' level.

11.7.13 Other research suggests that the reported sensitivity to small changes in noise levels (less than 3dB) may be coloured by factors other than noise (Baughan & Huddart, 1993).

11.7.14 As required by HD 213/11, an assessment of the short term change in noise levels comparing the Do-Minimum condition in the baseline year against the Do-Something condition, will be undertaken.

11.7.15 Whilst HD 213/11 does not advocate use of absolute noise levels as a means of assessing noise impact or effects on receptors, the IEMA Guidelines for Environmental Noise Impact Assessment[95] note that relying solely on noise change may not be always appropriate. There are two sets of circumstance that in particular warrant some further consideration:

11.7.16 Already very noisy locations: Receptors may already be exposed to very high levels of noise from other sources and hence any increase in noise may be considered unsatisfactory and hence additional effort may need to be made to reduce the projected noise increase; and

11.7.17 Tranquil areas: In areas formally recognised for their tranquillity because of low noise levels, small increases in noise may again be considered significant.

11.7.18 Arup has developed significance criteria for changes in road traffic noise at sensitive receptors. These are given below in Table 11.

Change in Noise Level in the Long Term (dB(A))	Initial Indicator of Significance
+5 or greater	

[95] Institute of Environmental Management and Assessment (IEMA) (2014), Guidelines for Environmental Noise Impact Assessment

+3 to +4.9	Potentially significant increase
+1 to +2.9	Unlikely to be significant
+0.9 to -0.9	Not significant
-1 to -2.9	Unlikely to be significant
-3 to -4.9	Potentially significant decrease
-5 or less	

Table 11: Assessment of magnitude and potential significance of impact

11.7.19 For residential receptors, the overall significance of the effect is assessed using professional judgement by considering the DMRB noise impact criteria and other factors.

Temporary Impacts due to Construction Noise

11.7.20 Detailed construction information such as the type and number of plant machinery and the specific processes may not be fully determined at the assessment stage. However in order to predict typical construction noise levels, assumptions will be made that are suitable with respect to the project type and size. Construction noise and vibration effects will be assessed by considering the likely range of construction processes associated with specific works and their typical durations.

11.7.21 Based on the assessed effects, any relevant mitigation measures will be considered and the residual effects described to understand the scope to minimise them.

11.7.22 The 'ABC' assessment method described in BS 5228–1:2009+A1:2014 will be used to establish the threshold of potential significant effect for construction noise at residential receptors.

11.7.23 Under this approach, the adverse impact threshold is determined at a dwelling using the existing ambient noise level, rounded to the nearest 5dB. This is then used to determine the assessment category: A, B or C, which then defines the adverse noise impact threshold, as described in Table 12. The predicted construction noise level is then compared to the appropriate noise impact threshold level.

11.7.24 If the LAeq construction noise level exceeds the appropriate noise impact threshold level shown in Table 12, then an adverse impact with the potential to cause a significant effect is identified.

Assessment category and threshold value period	**Threshold value, dB**		
	Category A	Category B	Category C
Daytime (07:00 – 19:00) and Saturdays (07:00 – 13:00)	65	70	75
Category A: threshold value to use when ambient noise levels (rounded to the nearest 5dB) are less than these values			

Category B: threshold value to use when ambient noise levels (rounded to the nearest 5dB) are the same as Category A values Category C: threshold value to use when ambient noise levels (rounded to the nearest 5dB) are higher than Category A values.

Table 12: Threshold of significant effect at dwellings according to ABC method in BS 5228-1:2009+A1:2014

11.7.25 For example, for a site exposed to an existing ambient noise level of 68dB(A), this would be rounded to 70dB(A). An ambient level of 70dB(A) is higher than the Category A value of 65dB(A), therefore the Category C value of 75dB(A) would apply in this case as a threshold for potential significant effect.

11.7.26 Having established if there is a potentially significant effect using the ABC method, the final assessment of significance is made using professional judgement. This is evaluated by considering various other factors described later in this section such as the expected duration of the activity.

Temporary Impacts due to Ground-Borne Vibration during Construction

11.7.27 BS 5228–2:2009+A1:2014 indicates that the threshold of perception in residential environments corresponds with a Peak Particle Velocity (PPV) of 0.3mm/s. It also states that complaint is likely where levels occur above 1.0mm/s PPV but can be tolerated if prior warning and explanation has been given to residents. Levels of vibration of 10mm/s PPV and above are likely to be intolerable for any more than a very brief exposure to this level.

11.7.28 BS 5228-2:2009+A1:2014 also provides criteria for the potential onset of cosmetic and structural damage in light-framed and industrial buildings.

11.7.29 The overall significance of the effect is assessed using professional judgement by considering the criteria above and other factors described later in this section.

11.7.30 Ground-borne vibration during the construction of the proposed carriageway may arise due to breaking out surfaces and foundations, excavation, the use of compactors or rollers and particularly due to piling if required for the construction of the viaduct supports and abutments. The magnitude of the vibration generated by piling will be dependent on the method employed. Impacts at sensitive receptors will be dependent on their proximity to the works and the intervening ground conditions.

11.7.31 The effects in terms of community response are expected to be governed mainly by the time of day that the works are undertaken and whether prior notice has been given. Effects in terms of cosmetic or structural damage to buildings may also be of concern where they are exposed to levels of vibration much higher than the lowest perceptible levels.

11.7.32 BS 5228-2:2009+A1:2014 provides a methodology for predicting typical levels of vibration from certain types of construction activities based on case study data and empirical models. This will be used assess the likelihood that vibration from the works may exceed the thresholds for perception and disturbance.

Permanent Impacts due to Ground-Borne Vibration from Road Traffic

11.7.33 The movement of road traffic can generate ground-borne vibration due to the passage of vehicles over discontinuities or imperfections in the longitudinal profile of the carriageway surface. Generally, the level of vibration is related to the physical dimensions of the discontinuities and weight of the vehicles.

11.7.34 The route of the existing A487 passes close to dwellings at the north end of the Pont-ar-Ddyfi bridge. The façades of these buildings are within two metres of the edge of the carriageway. It is likely that these dwellings currently experience perceptible vibration from the movement of heavy vehicles over discontinuities or undulations in the existing carriageway.

11.7.35 The proposed Scheme will reduce the frequency of heavy vehicle movements on the carriageway adjacent to the dwellings. Furthermore, the new carriageway is more remote from sensitive receptors and the surface will be constructed to be free of significant discontinuities. Consequently, the Scheme is expected to result in a reduction in the exposure of dwellings to traffic-induced ground-borne vibration.

11.7.36 However, the assessment shall assess changes in ground-borne vibration from road traffic.

Determining significance of effects

11.7.37 All of the identified sources of noise and vibration would be evaluated to determine if there would be adverse impacts and the potential to cause significant effects according to the criteria described above.

11.7.38 If potentially significant effects are identified, the overall assessment of significance is evaluated using professional judgement based on the following factors.

11.7.39 Residential:

- the magnitude of the impact and effect identified (based on overall noise level and noise change);
- the number and grouping of adversely affected dwellings and shared open areas;
- the level and character of the existing noise environment;
- any unique features of the source or receiving environment in the local area;
- combined exposure to noise and vibration;
- duration of impact and effect (for construction); and
- the effectiveness of mitigation measures that could avoid or reduce the adverse effects.

11.7.40 Non-residential

- the generic use (e.g. educational, healthcare, religious buildings or community uses) and hence relevant guidance on noise;

- the times of use;
- design of the receptor (especially windows, doors and ventilation systems) and hence ability of receptor to experience changes in external noise environment without significant change in internal noise conditions;
- the layout - whether the most sensitive parts of the building are closest to and face the proposed scheme or are located further from the scheme and are on the opposite side of a building;
- the duration of impact and effect (for construction); and
- the effectiveness of mitigation measures that could avoid or reduce the adverse effects.

11.8 Mitigation Measures

11.8.1 As part of the construction method statement 'Best Practicable Means' to control noise and vibration would be applied as a matter of course, as described in BS 5228. The need for mitigation measures during the operation of the scheme will also be considered in the assessment and appropriate recommendations will be made where necessary.

12 Effects on all Travellers

12.1 Introduction

12.1.1 This chapter considers whether there is a potential for significant effects on vehicle travellers, such as pedestrians, cyclists, equestrians and bus users as a result of the scheme. It also considers whether vehicle drivers could be significantly affected in relation to driver stress and their views of the road. Views from the road are assessed in relation to general driving conditions rather than visual amenity. Driver stress is defined as the adverse mental and physiological effects experienced by a driver travelling the road network.

12.1.2 The assessment includes the likely effects on all vehicle travellers likely to use the existing Pont-ar-Ddyfi when it is de-trunked, and the new section of A487 single carriageway trunk road north of Machynlleth which incorporates a new crossing of the River Dyfi upstream of the existing road bridge Pont-ar-Ddyfi.

12.1.3 The assessment topic of 'Effects on All Travellers' was introduced into standard highway environmental assessment guidance in Wales through IAN 125/09(W)**Error! Bookmark not defined.**. The new topic combines some guidance from DMRB Volume 11, Section 3, Part 8, Pedestrians, Cyclists, Equestrians and Community Effects with guidance in DMRB Volume 11, Section 3, Part 9, Vehicle Travellers.

12.2 Relevant Guidance

12.2.1 The Effects on Travellers Assessment is based on the following guidance:

- Interim Advice Note 125/09 Supplementary guidance for users of DMRB Volume 11 'Environmental Assessment';
- DMRB Volume 11, Section 3, Part 8 – Pedestrians, Cyclists, Equestrians and Community Effects[96]; and
- DMRB Volume 11, Section 3, Part 9 - Vehicle Travellers[97].

12.2.2 The assessment topic of 'Effects on All Travellers' was introduced into standard highway environmental assessment guidance in Wales through IAN 125/09(W). The new topic combines some guidance from DMRB Volume 11, Section 3, Part 8, Pedestrians, Cyclists, Equestrians, and Community Effects with guidance in DMRB Volume 11, Section 3, Part 9, Vehicle Travellers. Due to guidance changes resulting from IAN 125/09(W) the recreational facilities assessment now form part of the 'Community and Private Assets' (Chapter 14) assessment.

12.3 Study Area

12.3.1 DMRB guidance does not specify a standard study area for the assessment of effects on all travellers. However, the guidance references the requirement to identify

[96] Highways Agency (1993) Design Manual for Roads and Bridges Volume 11, Section 3, Part 8: Pedestrians, Cyclists, Equestrians and Community Effects

[97] Highways Agency (1993) Design Manual for Roads and Bridges Volume 11, Section 3, Part 9: Vehicle Travellers

existing and proposed Public Rights of Way which may be affected by the proposed scheme, particularly those associated with access to key community facilities.

12.3.2 The study area will therefore include all PRoW and local roads which meet or cross the scheme, including the existing Pont-ar-Ddyfi. In addition, any other key routes, such as cycleways and bridleways, to trip generators will be included in the study area if there is potential for such routes to be affected. It would be beneficial to position at least one survey location to the south of Pont-ar-Ddyfi in order to note travellers who do not use the riverside path and continue along the A487 or turn onto the A493.

12.4 Work Undertaken to Date

12.4.1 A Pedestrian, Cyclist, Equestrian and Community Effects assessment was undertaken in 2002 during the Stage II Environmental Assessment. The scope of works covered the impact on journeys made in the scheme's locality by traffic other than road users. Changes in journey length, travel patterns or amenity experienced by pedestrians and others was also assessed.

12.4.2 A plan showing the locations of the National Cycling Routes in the vicinity of the scheme is provided in Figure 7. The Public Right of Ways information has been requested.

12.5 Baseline Conditions

12.5.1 A National Cycle Network (NCN), Route 8, falls within the study area. This route crosses the Afon Dyfi via the Millennium Bridge and continues adjacent to the Afon Dyfi to the A487 and follows the A487 south to A489. NCN Route 8 and Millennium Bridge form part of the Sustrans network. Building work was started in 2000 and completed in the early part of 2001. An additional link of NCN Route 8, which shares the footway on the western side of the A487 between Pont-ar-Ddyfi and the railway bridge, has also been upgraded recently. NCN 82 also falls within the study area and follows the route of NCN 8 from Machynlleth but continues north over the Pont-ar-Ddyfi and turns left onto the A493.

12.5.2 Within the study area, there are two PRoW which form a continuous public right of way along the southern bank of the Afon Dyfi. One PRoW joins the site from the east after crossing the railway line. It follows the bank of the river, links with the cycle route and continues as far as the eastern side of the A487 trunk road, just south of Pont-ar-Ddyfi. The other PRoW continues westward from the A487 and follows a route along the southern bank of the river.

12.5.3 It should be noted that there is presently no pedestrian facility over the bridge and pedestrians crossing the bridge share the carriageway with all other road users, notably vehicular traffic.

12.5.4 The Wales Coast Path crosses over Pont-ar-Ddyfi and continues south along the A487.

12.5.5 NMU surveys will be undertaken in the autumn of 2015 to inform the Scheme design.

12.5.6 Machynlleth railway station is situated to the south of the study area and provides a link to Aberystwyth and the Cambrian coast to the west and Newtown and Shrewsbury to the east.

12.5.7 Table 13 below summarises the bus services and their routes that serve the bus stops in the immediate vicinity of Pont-ar-Ddyfi. The frequency of most services is approximately 1-2 per hour during the weekday daytime.

Route No.	Frequency (buses per day)			Route
	Monday – Friday	Saturday	Sunday	
34	9	9	-	Machynlleth - Corris - Aberllefenni
34A (extension to 34)	8	-	-	Machynlleth - Cae Crwn
T2	6	6	3	Bangor - Dolgellau - Machynlleth - Aberystwyth
X27	4	6	-	Machynlleth – Corris – Dolgellau
X28/29	6	5	-	Llanegryn - Tywyn - Machynlleth - Aberystwyth
X26/X85	6	5	-	Machynlleth - Newtown

Table 13 Bus Service Summary

12.5.8 Bus stops in the vicinity of Pont-ar-Ddyfi operate as request stops, with no signage or carriageway demarcations. Consultation with Lloyds Coaches revealed that outside of town centres, many of the buses operate on a hail and ride type service, with few bus stops demarcated with timetables or shelter provision. However, there are some locations that are recognised as bus stops, due to frequency of use and/or layby formation.

12.5.9 The nearest bus stops with timetable information are located at Lloyds Coaches Bus Depot, at both the northbound and southbound stops, approximately 700m south of Pont-ar-Ddyfi

12.6 Identification of Sensitive Receptors

12.6.1 The following broad types of receptor will be considered in the assessment:

Non-Motorised Users

12.6.2 Pedestrians, cyclists and equestrians are sometimes referred to collectively as non-motorised users (NMUs). These travellers may make their journeys for utility (e.g. commuting to work) or recreational purposes. NMUs also include people with mobility problems who may have needs that differ from those of other pedestrians.

Vehicle travellers

12.6.3 The assessment of impacts on vehicle travellers considers both the quality of views of the road and the levels of stress experienced by drivers. Stress varies by individual but can be caused by frustration, route uncertainty and fear of accidents. It can be linked to congestion, slow-moving traffic, poor signage, busy traffic and complex junctions.

Bus travellers

12.6.4 Bus travellers, as receptors, are not covered in detail in the DMRB guidance. However, it is proposed to consider these receptors in terms of their physical access to bus services and how the Scheme may affect access to these services. It is recognised that people who travel by bus usually undertake part of their journeys by other modes such as by foot, bicycle or car.

12.6.5 There is no standard guidance of applying a value to the receptors for this topic. The general DMRB Volume 11 approach will be applied in this assessment.

12.7 Proposed Scope of Baseline Studies

Future Baseline Conditions

12.7.1 The following baseline scenarios would be taken into consideration during the assessment of the proposed scheme, if appropriate:

- construction stage;
- operational stage: when the new bridge is open to traffic and the existing bridge is closed to vehicles except NMU's; and
- A design year, 15 years after completion of construction.

12.8 Assessment of Effects

12.8.1 The assessment of potential effects during both construction and operational stages on all travellers will be drawn from the methodologies provided in DMRB Volume 11, Section 3, Part 8 relating to pedestrians, cyclists and equestrians and DMRB Volume 11, Section 3, Part 9 in relation to vehicle travellers, driver stress and views from the road.

12.8.2 A NMU Context Report will be prepared in relation to the design of the scheme and will be referenced in the impact assessment.

Scope of Proposed Assessment

12.8.3 The assessment will consider the below effects during the operation and construction phase on NMUs, bus travellers and vehicle travellers.

Construction

Non-Motorised Users

12.8.4 During construction there may be temporary closures and diversions of Public Rights of Way and other routes used by these travellers for up to 18 months. Closure of PROWs should be minimised to avoid closures for the duration of the works, which could inconvenience travellers and/or lengthen their journey times. Construction activities may generate noise and dust, and the visual impact of moving construction vehicles could reduce the amenity value of the PRoW, thus reducing the acceptability of previous desire lines. These effects could potentially be significant during construction for a temporary period of up to 18 months, for example where a well-used commuter route or popular recreational route is disrupted for an extended period.

Bus travellers

12.8.5 Access to bus stops will be disrupted during construction and journey times for bus services may become temporarily unreliable as a result of road works and associated traffic delays. These impacts could potentially be significant if people are unable to get to important destinations on time, for example for hospital appointments, school, college or work.

Vehicle travellers

12.8.6 Driver stress may be temporarily increased to Minor Adverse during construction as a result of road works and associated traffic delays. Views from the road are likely to be temporarily affected by construction activities as well as the potential loss of mature trees, which would alter the character of the local area and open up some views into the medium term (up to approximately 15 years). However, this is unlikely to be significant as the effects would be restricted to specific sections of the route at any one time and views would be transient for vehicle travellers.

Operation

Non-Motorised Users

12.8.7 Diversion of existing PRoWs may increase journey times or introduce other obstacles, such as bridges, which may reduce the amenity value of the route. The amenity of existing PRoWs may also be affected by changes in traffic flows with the associated noise and visual impact, thus reducing the amenity value of the journey.

12.8.8 There is potential for some positive benefits for pedestrians and cyclists with the potential for the incorporation of a new overbridge crossings to relieve any existing severance. The Scheme aims to increase the opportunity for efficient, safe and reliable travel by walking and cycling on the A487 corridor within the study area. In addition, the existing Pont-ar-Ddyfi will be restricted to NMUs only.

Bus travellers

12.8.9 There may be some beneficial effects on bus travellers with improved bus journey times, in particular with the removal of lengthy diversions during periods of heavy rainfall.

Vehicle travellers

12.8.10 The proposed scheme would result in a Moderate Beneficial effect on driver stress due to alleviation of driver stress and frustration by improving the reliability of crossing the Afon Dyfi for people, freight and emergency vehicles. The scheme will reduce traveller's risk of being affected by flooding and thus having to undertake a lengthy diversion.

Issues Proposed to be Scoped Out

12.8.11 There are no known issues to be scoped out at this stage.

Methodology for Establishing Baseline Conditions

12.8.12 The following data sources will be used to collate the baseline conditions at the ES stage:

- A487 Fishguard to Bangor Trunk Road Pont-ar-Ddyfi Stage II Environmental Assessment (2002) Volumes I, II and III;
- Ordnance Survey mapping;
- Definitive Maps of Public Rights of Way (PRoW);
- Ordnance Survey (OS) MasterMap Address Layer data;
- OS Points of Interest data;
- Sustrans web based data at www.sustrans.org.uk;
- Powys Unitary Development Plan 2001 – 2016;
- Consultation with the local authorities on cycleways, public rights of way and footpaths within the scheme area; and
- Data from the Non-Motorised Users (NMU) Context and Audit Reports.

Methodology for Assessing Effects on all Travellers

12.8.13 The assessment will principally involve identification of the potential impacts likely to result from the proposed route on NMUs in terms of lengthening or reducing journeys, amenity value, severance and exposure to travel risks.

12.8.14 DMRB Vol. 11 Part 3 Section 9 (Vehicular Travellers), states that the assessment should be "sufficient assessment to identify the factors and effects concerning vehicle travellers". Guidance for the assessment of effects on vehicle travellers is taken from DMRB Volume 11 (Section 3, Part 9) and is based on views from the road, driver stress and driver care for which a qualitative assessment will be

undertaken. Traveller's view is concerned with what travellers can see in the surrounding landscape and the attractiveness of the general travelling environment. Traveller stress consists of three components – frustration, fear of potential accidents and uncertainty relating to the route being followed. Driver care considers road safety records compared with national statistics.

12.8.15 The significance of effects during the construction and operation stage is in accordance with the general DMRB Volume 11 approach to determining significance.

12.8.16 The significance of effects within the Stage 2 Environmental Assessment has been assessed against a generic scale. DMRB Volume 11 Section 2 Part 5 sets out a general approach to determining significance.

12.9 Construction Mitigation Measures

12.9.1 The following measures could be put in place during the construction period:

- Temporary closures and diversions of public rights of way and other routes could be partially mitigated through the provision of information in advance of closures and diversions. Closures of any routes could be minimised to specific operations only such as deck beam lifts etc.;
- Nuisance due to noise, dust and visual impacts due to movement of construction vehicles could be partially mitigated through considerate construction management including the use of screening (temporary or permanent) and appropriate routing of haul routes;
- To mitigate the impact on bus services, early consultation with bus operators, provision of advance travel information for passengers and effective traffic management may be effective; and
- Effective traffic management would help reduce delays and clear signage would assist in mitigating driver stress.

Operation Mitigation Measures

12.9.2 The following measures could be put in place during the operation period:

- Provision of diversions and new crossings (including underpasses and overbridges); and
- In terms of drivers' views, there is a potential for introducing landscaping measures to improve driver experience. This would need to be balanced with other considerations such as reducing visual intrusion through use of screening binds or planting, and the need for noise barriers; and
- The need for noise barriers.

13 Community and Private Assets

13.1 Introduction

13.1.1 This chapter sets out the proposed approach to the assessment of Community and Private Assets in respect of the proposed Scheme and in relation to the following aspects:

- Agricultural land and farming businesses;
- Access to community facilities and effects on land used by the community;
- Effects on private property including residential and commercial;
- Effects on local businesses;
- Effects on development land; and
- Effects on the local economy including employment.

13.1.2 The approach set out in this chapter takes account of guidance for 'Community and Private Assets' introduced into standard highway environmental assessment guidance in Wales through IAN 125/09(W). The new assessment topic combines some guidance from DMRB Volume 11, Section 3, Part 6, 'Land Use' with the 'Community Effects' element in DMRB Volume 11, Section 3, Part 8 'Pedestrians, Equestrians, Cyclists and Community Effects'. The references to be employed in this section are set out in the 'Relevant Guidance' section below.

13.2 Relevant Guidance

13.2.1 The Community and Private Assets assessment is based on the following guidance:

- Interim Advice Note 125/09 Supplementary guidance for users of DMRB Volume 11 'Environmental Assessment';
- DMRB Volume 11, Section 3, Part 6, 'Land Use'[98] with the 'Community Effects'; and
- DMRB Volume 11, Section 3, Part 8 'Pedestrians, Equestrians, Cyclists and Community Effects'[99].

13.3 Study Area

13.3.1 DMRB guidance does not specify a standard study area for assessment of the effects on communities and community facilities. However, the guidance references the requirement to establish local travel patterns and identification of key community facilities and their catchment areas. This Scoping Report highlights some of these

[98] Highways Agency, Scottish Executive Development Department, The National Assembly for Wales and the Department for Regional development Northern Ireland (2001) Design Manual for Roads and Bridges Volume 11, Section 3, Part 6: Land Use.
[99] Highways Agency (1993a) Design Manual for Roads and Bridges Volume 11, Section 3, Part 8: Pedestrians, Cyclists, Equestrians and Community Effects

important community resources and future desk study will be employed to comprehensively identify the facilities within the study area.

13.3.2 The local study area will include all residences and businesses along the existing A487 and the proposed route and also communities in the immediate surrounding area that contain facilities which are assumed to be used by local residents.

13.3.3 The study area varies depending on the topic of assessment. The agricultural land and farms assessment has considered the footprint of the scheme and adjacent land which may be severed. Community facilities and private property have been considered within approximately 1km of the scheme. Development land is considered within 500m of the scheme, through major planning applications up to 2km from the scheme have been considered where the likelihood for impact exists. For community effects, the assessment has focused on communities which would be directly affected by the scheme.

13.4 Work Undertaken to Date

13.4.1 A Pedestrian, Cyclist, Equestrian and Community Effects assessment was undertaken in 2002 during the Stage II Environmental Assessment. The scope of works addressed at that time covered the impact on journeys made in the Scheme's locality by traffic other than road users. Changes in journey length, travel patterns or amenity experienced by pedestrians and others were assessed.

13.5 Baseline Conditions

Community

13.5.1 For the purposes of baseline data gathering to inform this Scoping Report, key community facilities have been identified within the study area established for the proposed Scheme outlined in Figure 13:

- GP surgeries;
- Hospitals;
- Museum;
- Aged Persons Homes;
- Schools;
- Shops;
- Post Offices;
- Churches; and
- Parks, Play Areas and Sports Centres.

13.5.2 The town of Machynlleth provides most of these facilities. The proposed Scheme route corridor under study includes the main footway connecting Pont-ar-Ddyfi to the town.

13.5.3 Within this assessment, land used by the community includes land which is designated for Open Space (amenity, public and private) in the PCC Deposit LDP. It also includes land on which the public have the 'right to roam' under the Countryside Rights of Way Act, known as 'Open Access Land' within the vicinity of the Scheme, please refer to Figure 13.

Socio-economics

13.5.4 Machynlleth, a market town, is situated to the south of the proposed Scheme and within the Dyfi Valley at the intersection of the A487 and the A489 roads. At the 2011 Census, the town recorded a population of 2,235 with approximately 1,114 economically active residents aged 16 to 74.

13.5.5 Tourism is one of the principal forms of employment in Machynlleth with a wide range of activity-based attractions such as mountain biking, as well as the Visitor Centre at the Centre for Alternative Technology which is approximately 2km north of the proposed scheme. In addition, agriculture continues to play a significant part in the make-up of the town and the surrounding area.

13.5.6 The northern part of the proposed Scheme lies within the Snowdonia National Park.

Settlements and Community Facilities

13.5.7 More widely beyond Machynlleth, settlements are highly reflective of Powys more generally including a predominance of agriculture with a particular emphasis on sheep and livestock farming. Whilst Machynlleth provides for a wide range of community services and facilities, as does the wider network of market towns, smaller villages are less well served. Locally, to the proposed Scheme, Derwenlas is a hamlet located immediately west of Machynlleth along the A487 trunk road and Abergwydol is a village located immediately east of Machynlleth on the A489 road between Cemmaes Road and Penegoes. The lower provision of facilities for smaller villages creates additional emphasis on mobility and access between villages and market towns from which services can be accessed. There is a high degree of dependency between villages and the surrounding larger market towns. Poor access to community facilities in smaller dispersed settlements is also generally reflected in lower levels of employment, skills attainment, lower incomes and poorer housing provision, higher crime indices and issues around health.

Private Assets

13.5.8 The key land use types and private assets within the study area considered for this Community and Private Assets Chapter are:

- Agricultural land;
- Existing road and infrastructure (addressed in respect of the Scheme Objectives and Background to the Scheme within this Scoping Report);
- Commerce and industry; and
- Residential.

Agricultural Land

13.5.9 The Agricultural Land Classification (ALC) system provides a framework for classifying agricultural land according to how well physical or chemical characteristics support agricultural use in the long term. Land which is classified as Grades 1 to 3a is considered to be the best and most versatile agricultural land. Figure 14 outlines the ALC system within the study area. At the Environmental Statement stage, a plan outlining landownership will be included within the ES.

13.5.10 Agricultural land in Wales generally tends to be classified in the lower quality grades due to the predominance of upland areas. The land along the proposed Scheme reflects this wider National picture. There is no land classified as Grades 1-3 in the study area. A high proportion, in the order of 80% of the land along the Scheme is classified as Grade 5 (Very Poor), the poorest quality, with the remainder classified as Grade 4 (Poor). The soils are predominantly heavy textured clay loams and are seasonally waterlogged. Agriculture is based principally around extensive livestock production from grassland. The area is characterised by poorer quality mountain grazing with occasional areas of improved grassland on individual farm holdings and Common Land. Despite the Scheme being in a predominantly upland area, the pasture/meadows are of a 'lowland' nature.

13.5.11 The principal livestock enterprise is sheep, with some small beef herds. There are also several small agricultural enterprises, such as farm shops and hay and silage making, present

13.5.12 There are no Nitrate Sensitive Areas or Nitrate Vulnerable Zones in the vicinity of the proposed scheme.

13.5.13 Whilst it is noted that ALC Grades for the area potentially affected by the proposed Scheme are predominantly poor, wider effects upon the use of agricultural land within the study area will be assessed as part of the assessment. The value of agricultural land and farming businesses will be assessed based on the quality and quantity of agricultural land lost to the scheme and consequences for maintaining farm viability.

Commerce / Industrial land

13.5.14 There is an area of industrial land to the north of Machynlleth. Dyfi EcoPark is located to the south of the study area, adjacent to A487 and north of Machynlleth Train Station.

Land Ownership (Residential Housing)

13.5.15 Residential housing is situated to the south of the study area within the town of Machynlleth. For residential and commercial property, the level of severance and land take will determine the impact. Community facilities and attractions will largely be assessed on the level of continued accessibility for the community and visitors. This will take due account of land which is allocated for future potential development (where such information can be reasonably sourced through engagement and examination of the Local Development Plan).

13.6 Identification of Sensitive Receptors

13.6.1 As part of the EIA, an exercise will be undertaken to identify all community facilities (informed by the baseline information collated to date) which have the potential to be affected by the proposed Scheme. The assessment will identify those facilities which will be subject to direct land take or where impacts to vehicular access during construction and/or operation are likely.

13.6.2 The following types of potentially sensitive receptors will be considered in the assessment:

- Agricultural land and farming businesses;
- Residential properties;
- Commercial properties and individual businesses;
- Community facilities; and
- Recreational and tourist attractions.

13.7 Proposed Scope of Baseline Studies

Future Baseline Conditions

13.7.1 The following baselines would be taken into consideration during the assessment of the Scheme, if appropriate:

- baseline at 2015;
- 2019 as a future year when the proposed Scheme would be open to traffic; and
- 2034 as the design year, 15 years after completion of construction.

13.7.2 Consideration would be given to potential changes in baseline conditions associated with future climate change, where practicable and where this might affect resources or features of relevance to the scope of this assessment, based on the information available at the time of writing.

13.8 Assessment of Effects

Scope of Proposed Assessment

13.8.1 The approach for the assessment of the potential effects on Community and Private Assets has been drawn from the methodology described under DMRB Volume 11, Section 3, Part 8, relating to 'Pedestrians, Cyclists, Equestrians and Community Effects', and guidance provided in Volume 11, Section 3, Part 6 relating to 'Land Use' for the determination of the effects on Private Assets. In addition, guidance for 'Community and Private Assets' introduced into standard highway environmental assessment guidance in Wales through IAN 125/09(W) has been considered.

13.8.2 The types of effects to be considered as part of the Community and Private Assets assessment include:

- Permanent land take required for the proposed Scheme resulting in loss of land for community, agriculture or wider private uses;
- Severance (including reduced, positive effects and adverse increased effects);
- Operational effects; and
- Constructional effects.

13.8.3 Within this assessment, land used by the community includes land which is designated for Open Space (amenity, public and private) in the PCC Deposit LDP. It also includes land on which the public have the 'right to roam' under the Countryside Rights of Way Act, known as 'Open Access Land' within the vicinity of the Scheme. There will be no loss or severance on community land resulting from the Scheme.

13.8.4 No properties will be demolished during the construction and operational stages for the Scheme.

13.8.5 Several farm units will be impacted directly due to severance of the scheme during the construction and operational stage.

13.8.6 There will be relatively small amount of permanent land take of agricultural land due to the Scheme's piers.

13.8.7 The assessment will also address the following factors:

- Whether the impact would be permanent or temporary, and the duration of any impacts; and
- How essential the affected features are to the functioning of the receptor or the affected community.

Issues Proposed to be Scoped Out

13.8.8 There are no issues proposed for scoping out at this stage.

Assessment of Potential Effects

13.8.9 In the absence of published guidance for the determination of impacts and their significance on communities and private assets, the impacts would be assessed using professional judgement drawing on DMRB guidance methodologies.

13.8.10 The value/sensitivity of each receptor will be based on a three point scale:

- High sensitivity - will relate to residential or commercial buildings and land used regularly by the community (e.g. schools, community halls, playing fields) and community land that attracts users nationally (e.g. a National Park). In terms of agricultural land, high sensitivity only relates to areas which have relatively high quality land (no land crossed by the scheme is high quality) or an important function in the local context;

- Medium sensitivity - will be applied to residential and commercial land (e.g. gardens) and land used intermittently on a regional scale. In terms of agricultural land medium sensitivity will apply to areas which have average quality land or significant function in the local context; and
- Low sensitivity - will be applied to derelict or unoccupied buildings and land only occasionally used for community purposes. In terms of agricultural land low sensitivity will apply to areas which have relatively low quality land or negligible function in the local context.

13.8.11 The magnitude of impacts on community facilities and private assets (mainly related to severance or direct land take) would be classified according to the following broad levels shown in Table 14.

Magnitude of impact	Typical criteria descriptors
High magnitude	refers to a property or business (including agricultural) which is completely demolished/destroyed, all access is blocked, or where the business will no longer be viable as a result of the scheme
Medium magnitude	refers to a property or business where some direct land take is required, access is partially blocked, or where that residence or business is directly affected but can continue viably into the future
Low magnitude	refers to a property or business where there is no significant direct land take but there is some loss of amenity, or where access is somewhat reduced
Negligible magnitude	refers to effects which have no significant bearing on the property or business

Table 14 Description of the Magnitude of Impact

13.8.12 The significance of the effect is a function of both the magnitude of the impact and the sensitivity of the receptor.

13.9 Mitigation Measures

13.9.1 Mitigation measures will be informed during the EIA process. These will consider both construction and operational periods.

Construction

13.9.2 For the construction period, the following measures are anticipated:

- Ensuring essential access is maintained for businesses, farms and community facilities throughout the construction period, or at least during the normal operating hours of the businesses and facilities;
- Nuisance due to noise, dust and movement of construction vehicles could be partially mitigated through considerate construction management including the use of screening and appropriate routing of haul routes; and

- Clear signage would assist in ensuring customers are aware businesses and facilities are still ‘open for business’.

Operation

13.9.3 The following measures are anticipated during the operational period:

- Relocation/ compensation for any businesses which are subject to direct land take impacts and where the businesses cannot viably continue. This will be determined during EIA.

14 Road Drainage and the Water Environment

14.1 Introduction

14.1.1 This chapter outlines the proposed scope of the environmental impact assessment of the potential impact to the water environment, including both surface water and groundwater. Road scheme development has the potential to impact on the water environment through pollution from surface water run-off or spillages, and also physical changes to the water bodies which might affect the ecology and natural hydrological systems. In addition, road schemes may contribute to changes in flood plains which may result in changes to water flows or levels and to the risk of flooding.

14.2 Relevant Guidance

14.2.1 The assessment will be undertaken with due consideration of the following guidance:

- DMRB Volume 11, Section 3, Part 10 HD45/09 Road Drainage and the Water Environment100;
- Construction Industry Research and Information Association (CIRIA) Technical Guidance C648: Control of Water Pollution from Linear Construction Projects101.
- Environment Agency, Groundwater Protection: Policy and Practice (GP3)102; and
- Environment Agency et al Pollution Prevention Guidelines (PPG) Series (including PPG1103, PPG5104 and PPG6105.

14.3 Study Area

14.3.1 The geographical extent for the assessment includes the site and surrounding water bodies within 500m of the proposed Scheme and the receptors or water bodies downstream, up to the point of potential effect from the proposed Scheme. See Figure 9 showing the surface water features in the proximity of the proposed Scheme.

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[100] Highways Agency, Transport Scotland, Welsh Assembly Government, the Department for Regional Development Northern Ireland (2009) Design Manual for Roads and Bridges Volume 11, Section 3, Part 10: HD 45/09. Road Drainage and the Water Environment.
[101] CIRIA (2006) Technical Guidance C648: Control of Water Pollution from Linear Construction Projects.
[102] Environment Agency (2013) Groundwater Protection: Policy and Practice (GP3).
[103] Environment Agency, Northern Ireland Environment Agency and Scottish Environmental Protection Agency (2013) Pollution Prevention Guidelines: Understanding Your Environmental Responsibilities – Good Environmental Practices. PPG1.
[104] Environment Agency, Environment and Heritage Service (Northern Ireland) and Scottish Environmental Protection Agency (2007) Pollution Prevention Guidelines: Works and Maintenance In or Near Water. PPG5.
[105] Environment Agency, Northern Ireland Environment Agency and Scottish Environmental Protection Agency (2012) Pollution Prevention Guidelines: Working at Construction and Demolition Sites. PPG6, Second Edition.

14.4 Work Undertaken to Date

14.4.1 A water quality and drainage assessment was undertaken in 2002 during the Stage 2 Environmental Assessment. The scope of works included a review of route options and covered the potential impacts of the development.

14.4.2 The data sources used at Stage 2 included:

- General walkover surveys to identify surface water features;
- Envirowise report (including historical Ordnance Survey mapping);
- Information obtained from Natural Resources Wales (formerly Environment Agency Wales);
- Aerial photography held at the aerial photography unit at the Welsh Government; and
- Local Planning Authority records.

14.5 Baseline Conditions

14.5.1 The baseline conditions described are based on the work undertaken at Stage 2 and updated during a desk study to inform this Scoping Report.

Hydrology and hydrogeomorphology

14.5.2 A number of surface water features have been identified within the study area, as shown in the Surface Water Features Map (Figure 9), including:

1. Afon Dyfi (River Dyfi);
2. Afon Dulas, 500m upstream of the proposed bridge crossing;
3. Tributary from the north, approximately 150m upstream of Pont-ar-Ddyfi;
4. Tributary from the north, approximately 70m downstream of the Pont-ar-Ddyfi;
5. Tributary from the north, approximately 500m upstream of the Pont-ar-Ddyfi;
6. A number of surface water ponds reported at Stage 2, to the south of the River;
7. Three surface water ditches or drainage channels to the south of the River.

14.5.3 The Afon Dyfi is included within the Western Wales River Basin Management Plan[106]. The stretch adjacent to the proposed development is the Dyfi - tidal limit to Afon Twymyn. The River runs in a westerly direction into the Dovey Estuary. Above Machynlleth, the Afon Dyfi exceeds 35km in length and has a catchment area of approximately 470 km^2. Over this distance the river runs in a valley usually less than a kilometre wide with steep sides rising several hundreds of metres in less than a kilometre. The Afon Dyfi tributaries are fast flowing and run in steep sided valleys from the adjacent mountainous areas.

14.5.4 Along the stretch adjacent to the proposed Scheme the hydromorphology of the river is characterised by a natural river channel, including pools and riffles, with shingle beaches deposited on the inner meander bends. The northern bank of the Afon Dyfi is locally strengthened with stone, either loose or as gabions, whilst the southern

[106] Environment Agency (2009) River Basin Management Plan, Western Wales River Basin District

bank is earthen. Also on the southern bank is a shingle beach deposited on the inner bend where the bridge would pass over the bank.

Water Framework Directive (WFD) Classification

14.5.5 According to the Environment Agency's WFD Surface Water Status Objectives, the Afon Dyfi - tidal limit to Afon Twymyn, is currently classified as being of a Moderate Ecological Quality and a Good Chemical Quality[106].

14.5.6 The current quantity and dynamics of flow in the River Dyfi, in addition to the morphology, are all considered of good status.

14.5.7 The 2015 Predicted Quality, as set out in River Basin Management Plan[106], was for the River to achieve Moderate Ecological Quality Status and Good Chemical Quality, both of which have been achieved. The Ecological status is depressed, below a Good status, due to the levels of copper and zinc.

14.5.8 The future status objectives are for the river to achieve Good Ecological Status by 2027. The objective for the waterbody to reach a Good Ecological Status by 2015 is described in the River Basin Management Plan as being technically infeasible due to the level of zinc in the water body.

14.5.9 The Environment Agency identified during the Stage 2 Environmental Assessment[107] that the deposited silts in the bank, which could be disturbed during construction work, could contain toxic metals (including lead) from former mining activity in the region.

Fisheries

14.5.10 New Dyfi Fishery (1929) Ltd control much of the fishing on the Afon Dyfi. The fishing season runs from April to October. During years when there is low flow, fish may spawn in the River in the reach where the proposed bridge would cross the River.

Afon Dyfi Flow Rates

14.5.11 The Afon Dyfi flow data is recorded at a monitoring station adjacent to the Pont-ar-Ddyfi. Flow rates have been recorded by NRW, and previously Environment Agency Wales and National Rivers Authority, since 1962. Flow data from gauging station "64001 - Dyfi at Dyfi Bridge" is presented in Table 155[108].

[107] Powys County Council (2002) A487 Fishguard to Bangor Trunk Road Pont ar Ddyfi Improvement Stage II Environmental Assessment

[108] Natural Resources Wales, National River Flow Archive http://nrfa.ceh.ac.uk/data/station/meanflow/64001

Parameter	Data
Period of Record:	1962 – 2013
Percent Complete:	91 %
Base Flow Index:	0.39
Mean Flow:	23.432 m^3/s
95% Exceedance (Q95):	2.339 m^3/s
70% Exceedance (Q70):	7.431 m^3/s
50% Exceedance (Q50):	13.05 m^3/s
10% Exceedance (Q10):	54.4 m^3/s

Table 15 Afon Dyfi flow rate data[108]

Flooding

14.5.12 The proposed Scheme is located in Zone C2 of the floodplain of the Dyfi River, as described in the TAN15, as shown in the Flood Map (Figure 8). Zone C2 is the area within the extreme flood zone and without significant flood defence infrastructure.

14.5.13 The average river level at Pont-ar-Ddyfi is 10.961 mAOD[109]. The typical river level range for this location is between 10.781 mAOD and 12.041 mAOD. The Afon Dyfi is prone to flooding on a regular basis with flood levels exceeding 11.961 mAOD. The highest recent river level recorded at this location is 13.991 mAOD on 18th November 2009. Highway records indicate that the A487 is closed by flood events up to four times each year.

Hydrogeology

14.5.14 The proposed Scheme is located in the Meirionydd Groundwater area, within the Western Wales River Basin District. It is a protected area and a drinking water protected area classified but is classified as being of poor quality.

14.5.15 The proposed Scheme is located over superficial deposits, classified as a Secondary A aquifer and bedrock classified as Secondary B aquifer. Secondary A aquifers are described as permeable layers supporting water suppliers at a local, rather than strategic, scale, and in some cased forming an important source of base flows for rivers. Secondary B aquifers are predominantly lower permeability layers which may store and yield a limited amount of groundwater due to localised fissure, thin permeable horizontal horizons and weathering.

14.5.16 The groundwater is classified as having a high leaching potential (H1) – soils which reality transmit liquid discharges because they are either shallow or susceptible to rapid by-pass flow directly to rock gravel or groundwater.

[109] Data downloaded from the Environment Agency website on 19/08/2015. http://apps.environment-agency.gov.uk/river-and-sea-levels/120766.aspx?stationId=4146

14.5.17 Within a 1000m search area of the proposed development no abstraction from groundwater were identified.

14.6 Identification of Sensitive Receptors

14.6.1 All surface water features that might be impacted by the Scheme will be identified and their baseline condition assessed from a variety of sources including:

- Work previously undertake at Stage 2;
- Western Wales River Basin Management Plan;
- Consultation with stakeholders, including NRW and the relevant local authorities;
- NRW website[110];
- Ordnance Survey open data (Bing Maps[111]);
- Site visit and necessary survey work; and
- Cross reference with wider survey work undertaken during the EIA, for example ecology surveys.

14.6.2 The attributes of the water resources identified will inform classification of their level of importance or sensitivity, in line with the methodology set out in HD 45/09[112]. The attributes to be considered will include:

- Local, national and European environmental designations and distribution of protected features, including the Dovey Estuary SSSI;
- Water quality and flow data collected by NRW and/or baseline studies;
- The Water Framework Directive status of Afon Dyfi, including chemical, biological, ecological and geomorphological status;
- Water resources including abstractions, discharges, flood risk etc. identified by NRW and the local authorities;
- General water quality screening assessment using relevant water quality threshold criteria (e.g. Environmental Quality Standards, threshold values administered through NRW, drinking water standards); and
- Evaluation of site-specific ecological data pertaining to aquatic flora and fauna.

14.7 Proposed Scope of Baseline Studies

14.7.1 The baseline study will consist of a more detailed desk based review of available data and will include:

[110] https://naturalresources.wales/our-evidence-and-reports/maps/?lang=en
[111] http://www.bing.com/maps/
[112] Design Manual for Roads and Bridges: Volume 11 Environmental Assessment Part 10 HD 45/09 Road Drainage and the Water Environment.

- Consultation with NRW to update the WFD classification of the River Dyfi, the Dovey Estuary, groundwater under the site and all other relevant waterbodies;
- Identification of all abstractions and discharges to surface and groundwater both through consultation with NRW and reference to an Envirocheck report;
- A Traffic Assignment Model will be built to forecast the future traffic flows with and without the Scheme in place. The traffic data (AADT and % HGV) will be used to inform the assessment of the risk from spillages on surface water and the assessment of routine runoff; and
- The existing Isis Tuflow 1D 2D flood risk model of the River Dyfi will be extended to a point just upstream of the confluence with the Afon Dulas, using topographic data of the River obtained from surveys and Lidar data of the floodplain. In line with comments received from NRW, the hydrology will be reassessed to conform with current best practice methods for flood peak flow estimation.

14.7.2 A site visit will be carried out to confirm the presence of all surface waters identified though the desk study and to undertake a river channel survey to collect the physical channel data required for the Highways Agency Water Risk Assessment Tool (HAWRAT) water quality modelling, if required. A geomorphology survey will also be undertaken where the proposed river crossing is located on the meander to inform the Water Framework Directive compliance assessment.

14.8 Future Baseline Conditions

14.8.1 Consideration will be given to the potential for changes in the baseline conditions over the lifetime of the proposed Scheme as a result of climate change or other trends in baseline conditions. The Climate Change Risk Assessment for Wales[113] identifies the following main potential threats and opportunities for the natural environment as a result of climate change:

- Reductions in river flows and water availability during the summer, affecting the natural environment; and
- Increases in flooding affecting people, property and infrastructure.

14.8.2 Climate change will be taken into account in the modelling of predicted run-off rates. The extent to which the management of land and water in the area of the Scheme is likely to moderate the effects of climate change on the water environment, will also be considered.

[113] Welsh Government and Defra (2012) A Climate Change Risk Assessment for Wales, January 2012.

14.9 Assessment of Effects

Scope of Proposed Assessment

14.9.1 An initial assessment undertaken in line with Section 6.8 HD45/09 confirms the need for an assessment of the potential impacts to the water environment due to the proposed Scheme.

14.9.2 The assessment of effects due to the proposed development will consider possible effects on surface, groundwaters and on flood risk to both the proposed Scheme and to downstream receptors.

14.9.3 The assessment will cover potential effects during both the construction and operational phases.

Issues Proposed to be Scoped Out

Water quality monitoring

14.9.4 Surface water and groundwater quality monitoring are not considered to be required at this stage.

14.9.5 Baseline surface and ground water quality data, to inform the sensitivity of these receptors, will be obtained from consultation with NRW. Where current data is not available recent classification and monitoring data will also be procured as an Envirocheck report, or similar.

Assessment of Potential Effects

14.9.6 Potential effects during the construction phase will be assessed qualitatively and addressed through the development of suitable mitigation measures. The effects considered during construction will include:

- The effect on surface water from run-off during highway construction;
- The effect on groundwater and surface water from material reuse and detailed highway design during the construction; and
- Effects on groundwater, particularly if band drains are required for achieving settlement of the embankment.

14.9.7 The assessment of effects during operation will be undertaken in line with HD 45/09[114].

14.9.8 Pollution effects due to surface water run-off from the road surface will be assessed using:

[114] Design Manual for Roads and Bridges: Volume 11 Environmental Assessment Part 10 HD 45/09 Road Drainage and the Water Environment.

- Method A[114] of the HAWRAT assessment for effects to surface water quality, and
- Method C[114] for effect to groundwater quality, where discharges are planned to dry or low flow ditches.

14.9.9 An assessment of the risk from spillages on surface water will be carried out in line with Method D[114].

14.9.10 **Water Framework Directive (WFD) compliance assessments** are required where there is a potential for developments to affect the hydromorphology of a waterbody, cause deterioration, or prevent achievement of Good Ecological Status (GES) or Good Ecological Potential (GEP) for heavily modified waterbodies. In line with this requirement a WFD screening assessment will be undertaken to assess the potential for impacts on the current and potential geomorphological and ecological status of the affected waterbody, due to the proposed changes. The level of WFD assessment required for the scheme will need to be agreed with Natural Resources Wales.

14.9.11 A **Flood Consequences Assessment** (FCA) will be produced for the development, in line with the requirements of Technical Advice Note 15. It will consider all sources of flood risk, but will primarily focus on fluvial flood risk associated with the main River Dyfi and the management of surface water run-off and any related surface water flooding. The methodology and outcomes for the FCA will consist of the following stages:

- The updated Isis Tuflow 1D 2D flood risk model of the River Dyfi will be used to assess the flood risk impacts of the proposed bridge alignment, during both the construction and operational phases.
- The assessment of the construction phase will consider the impacts due to the works compounds and excavation and stockpiling of materials.
- The assessment of the operational phase will consider all permanent structures and embankments.

14.9.12 The extent of any potential impacts on flood risk will be assessed for a range of return period events in terms of flood level and flood extents and consider the effects on 3rd party receptors, including businesses, development and land that could be affected.

14.9.13 The model will also be used to confirm whether the current flooding problem under the railway bridge is likely to be influenced by river flood levels. However, detailed assessment of the flooding under the railway bridge is not included in the scope of this assessment.

14.9.14 The assessment of the significance of the potential impacts to the water environment will take into account the sensitivity of the receptor and the predicted magnitude of any impacts. The criteria for determining the sensitivity of the receptor and the magnitude of impacts will take into account the guidance set out in HD 45/09[114].

14.10 Mitigation Measures

14.10.1 The proposed Scheme could potentially lead to a short term increase in pollution during and immediately after construction. The earth moving process associated with construction could increase sediment load in run-off affecting watercourses. Furthermore, there is the potential of pollution from vehicles and construction chemicals during the construction period which could impact on both surface water and groundwater.

14.10.2 Well-established construction practices will be used, and the requirements of NRW and other key stakeholders will be incorporated into the project Construction Environmental Management Plan (CEMP). Where specific pollution risks or impacts on the water environment are identified, the mitigation approach will be developed based on past experience and consultation with the Scheme designers.

14.10.3 Potential mitigation measures to protect the hydrological environment and to prevent degradation of surface water and groundwater, based on current proposals, could include:

- Design the road so that flood flows are not restricted in the floodplain;
- Piling to be undertaken in accordance with Environment Agency guidance to prevent contamination of the aquifer[102];
- Bridge construction to be undertaken at a time of the year such that production of silt and clouding of the River has minimum effects on fish;
- Sediment traps placed downstream to mitigate the effects of short-term sediment delivery; and
- Ensure bank sediments which may contain toxic metals are not disturbed during construction work.

14.10.4 To mitigate for potential increases in surface water flows from the carriageway, the highway drainage will be designed to capture and attenuate the 1:100 flood return period, and also to meet agreed green field run-off rates.

14.10.5 A long list of flood mitigation options will be drawn up and assessed qualitatively by the project team, to determine a short list of mitigation options. A short list of options will be modelled to confirm the preferred option. Consultation with NRW will be ongoing during the development of flood mitigation options.

15 Cumulative Effects and inter-relationships

15.1 Cumulative Effects

15.1.1 The EIA Directive requires the EIA to consider cumulative effects. Cumulative effects result from multiple actions on receptors and resources and over time and are generally additive or interactive (synergistic) in nature. Cumulative impacts can also be considered as:

- '…impacts resulting from incremental changes caused by other past, present or reasonably foreseeable actions together with the project.' (European Commission 1999)

Cumulative effects relevant to the scheme

15.1.2 The cumulative effects of the Scheme in conjunction with other proposed developments will be assessed and presented as a separate chapter within the ES. Discipline specific cumulative effects will also be set out within each of the ES topic chapters. Major developments that will be considered for the cumulative effects assessment will be identified within the following categories:

- development under construction;
- application(s) permitted but which are not yet implemented;
- submitted applications not yet determined, and which, if permitted, would affect the proposed development in the scoping request; and
- development identified in the adopted and emerging development plan (with appropriate weight being given as they move closer to adoption) recognising that much information on any relevant proposals will be limited.

Initial review of available information

15.1.3 An initial review of the following sources will be undertaken:

- Local planning authority websites, with particular emphasis on proposed developments (including transport or minerals related developments) in closest proximity to the site located within the administrative boundaries of Gwynedd Council and Powys County Council; and
- The Planning Inspectorate website, in order to identify any Nationally Significant Infrastructure Projects in the vicinity of the Scheme.

Guidance for Assessment of Cumulative Effects

15.1.4 Advice and guidance on the assessment of cumulative effects is given in DMRB HA 205/08 and HD 48/08[115]. Additionally, IAN 125/09(W) acknowledges that 'as yet there is no industry standardised approach' to the assessment of cumulative effects. However, the cumulative assessment should nevertheless 'differentiate between permanent, temporary, direct, indirect and secondary effects, positive and negative'.

15.1.5 Where there is an absence of topic specific guidance for the assessment of cumulative effects, the standardised criteria outlined in DMRB will be taken into account as a framework for determining significance of cumulative effects, as shown in Table 16.

Table 16 DMRB Criteria for Determining Significance of Cumulative Effects

Significance	Effect
Severe	Effects that the decision-maker must take into account as the receptor/resource is irretrievably compromised.
Major	Effects that may become key decision-making issues.
Moderate	Effects that are unlikely to become issues on whether the project design should be selected, but where future work may be needed to improve on current performance.
Minor	Effects that are locally significant.
Not Significant	Effects that are beyond the current forecasting ability or are within the ability of the resource to absorb such change.

15.2 Inter-relationships

15.2.1 Consideration of inter-relationships is a requirement of the EIA Directive. Inter-relationships refer to the combined effect on individual (or groups of) receptors or resources from more than one source or type of environmental effect (e.g. noise, flooding, people ecology, loss of amenity, visual impact on a dwelling). Inter-relationships between topics will be presented within the ES.

[115] Highways Agency, Scottish Government, Welsh Assembly Government, Department for Regional Development Northern Ireland (2008) Design Manual for Roads and Bridges HD 48/08 Volume 11, Section 2, Part 6. Reporting of Environmental Impact Assessments

Appendix A

LVIA Assessment Method

A1 Assessing the Sensitivity of Landscape Receptors to Change

A1.1.1 This study assigns a degree of sensitivity to landscape features and to each landscape character area identified

A1.1.2 The sensitivity of Landscape receptors to change is assessed by combining judgements of their susceptibility to the type of change or development proposed and the value of the landscape.

A1.2 Value

A1.2.1 Landscape value is concerned with the relative Importance and quality/condition that is attached to different landscapes.

A1.2.2 In a policy context the usual basis for recognising certain important landscapes is via application of local or national landscape designations. A landscape can nonetheless be valued by different communities for many different reasons without any formal designation.

A1.2.3 The assessment of landscape quality (condition) is based on judgements about the physical state of the landscape and about its intactness from visual, functional and ecological perspectives. It also reflects the state of repair of individual features and elements that make up the character in any one place.

A1.3 Susceptibility to Change

A1.3.1 Susceptibility to change refers to the degree to which a particular landscape feature or character area is able to accommodate change without significant effects on its components or overall character.

A1.3.2 It usually follows that highly valued landscapes have higher susceptibility to change, but this must also be assessed in conjunction with landscape value to give an overall assessment of sensitivity.

A1.3.3 The Criteria used to define each sensitivity rating are given in Table A1.

Table A.1: Landscape Sensitivity

Landscape Sensitivity	Definition
Very high	Landscapes or townscapes covered by a national or international designation for landscape value such as World Heritage Site or National Park. Key characteristics of landscape are very vulnerable to change and are unable to accommodate development without significant character change; thresholds for significant change are very low. Development conflicts directly with and would dominate landscape character
High	Landscapes covered by a national designation such as AONB or Heritage Coast or a highly valued local landscape designation such as AGLV or Special Landscape Area. Key characteristics of landscape are vulnerable to change and development can be absorbed, but only in limited situations without significant character change; thresholds for significant change are low.
Medium	Landscapes covered by a local designation for landscape value or with many locally valued landscape features. Key characteristics of landscape are susceptible to change but with some ability to absorb development in some situations without significant character change; thresholds for significant change are intermediate.
Low	An undesignated and relatively robust landscape, possibly with some locally valued features. Key characteristics of landscape are resilient to change and are able to absorb development in many situations without significant character change; thresholds for significant change are high.
Negligible	Significantly eroded landscapes with no discernible landscape pattern or landscape characteristics that would be affected by change;

A2 Assessing the Magnitude of Change to Landscape Features

A2.1.1 The landscape assessment compares the constituent parts and overall character of the existing landscape with that which would result from the construction of the scheme. It verbally quantifies the degree of change in terms of size or scale, geographical extent of the change and its duration and reversibility.

A2.1.2 The magnitude of change to the current (baseline) environment depends on a combination of factors:

- The extent to which the constituent characteristics of the landscape will be lost, gained or changed and the importance of each characteristic to the overall character of the landscape.
- The degree of contrast or integration of proposed elements with the existing or remaining features or characteristics of the receiving landscape that may detract from or add to its character;
- The geographical area over which the changes will take place; site specific, immediate site setting, landscape character area wide, or spanning several distinct character areas.
- The duration and reversibility of effect.

A2.1.3 The magnitude of the change to existing landscape character and features is assessed in accordance with the criteria set out in Table A.2. These criteria can be applied to both positive and negative impacts.

Table A.2: Magnitude of Change to the Landscape

Landscape Impact Magnitude	**Definition**
Very high	The proposed development will either cause a large improvement or complete loss of or major alteration to key elements/characteristics over a large area, possibly spanning several character areas. Introducing elements considered entirely uncharacteristic. Effects are likely to be long term and irreversible
High (dominant)	The proposed development will cause either a significant improvement or deterioration of one or more key elements/features/characteristics of the landscape, typically over much of a character area. Introducing elements that may be considered to be substantially uncharacteristic or which substantially strengthen the landscape character. Effects are likely to be long or medium term and irreversible or only partly reversible.
Medium (prominent)	A noticeable deterioration or improvement to the characteristic elements of a landscape, with the development causing a partial change to the perception landscape character. Change would typically be to the site and its immediate setting, or may influence a small part of the Character area. Change will normally be short to medium term and at least partly reversible.
Low (present)	The proposed development will cause a minor improvement or deterioration to one or more characteristics of the landscape causing a minor change to the character of the landscape. Change will be localised and often reversible.
Negligible (No discernible Change)	The development fits with the existing landscape character or does not change the character or perception of an area. Any slight effects are short term very localised and often reversible.

A3 Assessing the Sensitivity of Visual Receptors to Change

A3.1.1 The purpose of describing the baseline visual environment is to identify the most important sensitive visual receptors around the site which have views to or across the proposed development. A visual receptor is essentially any person whose visual amenity may be affected as a result of the proposed development.

A3.1.2 The sensitivity of visual receptors to change is assessed by combining judgements of their susceptibility to the type of change or development proposed and the value of the views in question.

A3.2 Value

A3.2.1 Value is derived from evaluation of a receptor's location and context; the relationship of a receptor to planning designations; the existence of documentation and interpretation relating to particular views; and of the receptors popularity or frequency of use.

A3.3 Susceptibility to Change

A3.3.1 The susceptibility of the receptor to changes in views is derived from evaluation of the expectations and occupation or activity of the viewer and the extent to which their attention may be focused on visual amenity.

A3.3.2 The sensitivity of visual receptors is assessed using the following criteria:

Table A3: Visual Receptor Sensitivity

Visual Receptor Sensitivity	Indicative Definition
Very high	Views from within internationally and nationally designated high quality landscapes (National Parks, AONB), scheduled monuments or Grade 1 listed buildings and their setting, and from, or near to public rights of way, where the attractive nature of the environment is a major factor in the enjoyment of the experience, such as National Trails or Long distance Routes through designated landscapes. Views from large numbers of residential properties in the same location (typically 100+) Viewers have a high susceptibility to changes in views
High	Views from within high or medium high quality regionally designated landscapes (Areas of Great Landscape Value), parks or gardens listed in the National Gardens Register, Grade II* and Grade II listed buildings and their settings. Views from well used public rights of way often known to and used by people from beyond the local area where the attractive nature of the countryside is a significant factor in the enjoyment of the experience, such as Long Distance Routes or National Cycle Routes.). Views from a large number of residential properties within a similar location (typically between 10-100 dwellings) Viewers have a medium to high susceptibility to changes in views
Medium	Views from within medium quality non-designated but locally important landscapes, outdoor sports or recreation (where the landscape is not a significant factor in the enjoyment of the sport). Views from locally valued public rights of way often passing through rural landscapes. Views from passenger trains, or people within cars on local roads. Views from single or small groups of up to 10 residential properties Viewers have a low to moderate susceptibility to changes in views
Low	Views from within medium-low quality non-designated but potentially locally valued landscapes. Views from less well used public rights of way which pass through less attractive landscapes or townscapes and are not used specifically for enjoyment of the scenery. Views from or near to motorways, main roads, or business premises. Viewers have a low susceptibility to changes in their views
Negligible	Views from within unattractive non-designated landscapes of local importance.

A4 Assessing the Magnitude of Visual Change

A4.1.1 The visual assessment compares the quality of the existing view with that which would result from the construction of the scheme and then verbally quantifies the degree of change.

A4.1.2 The magnitude of change to the current (baseline) visual environment depends on a combination of factors:

- The size and scale of change in the view;
- The proximity of the viewpoint to visible elements of the development;
- The extent and composition of the view (eg degree of existing screening, partial, glimpsed or unobstructed views, fleeting or constant nature of view);
- The degree of contrast or integration of proposed elements with the existing or remaining features or characteristics of the receiving landscape that may detract from or add to its amenity;
- The relative direct or oblique angle of the view in relation to the receptor; and
- The duration and reversibility of effect.

A4.1.3 The magnitude of change to visual amenity is assessed using the criteria defined in Table A.4:

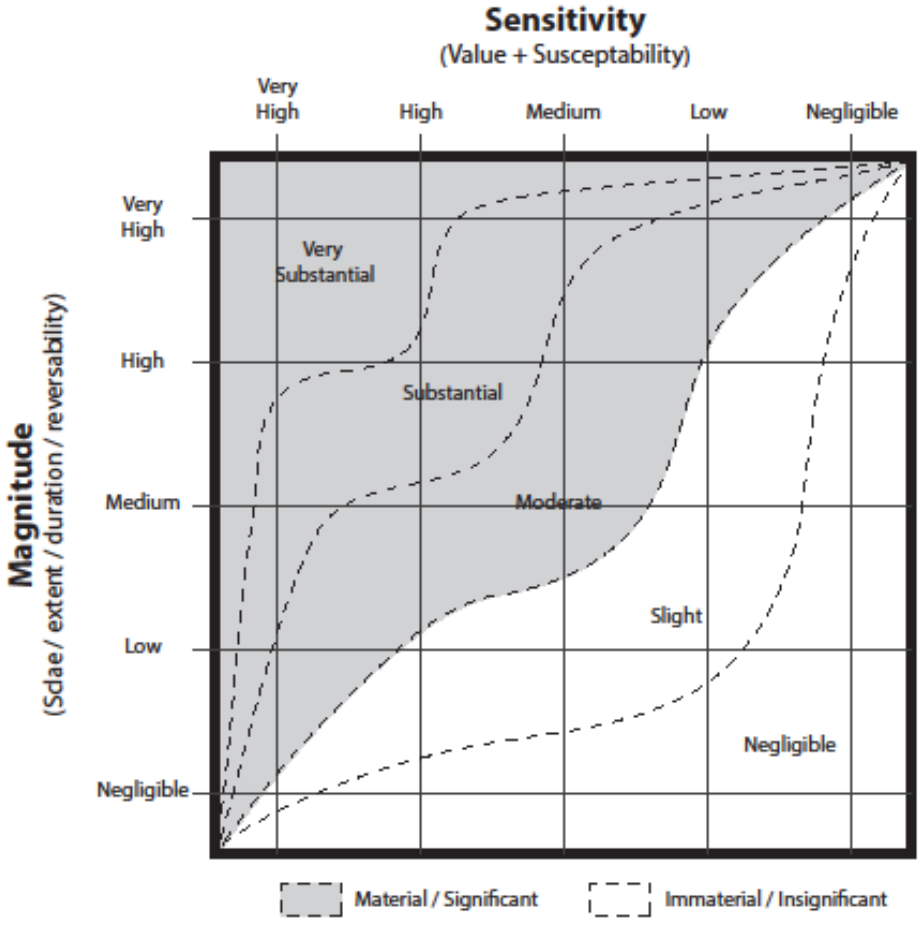
Table A.4: Magnitude of Visual Change

Visual Impact Magnitude	**Definition**
Very high	Total alteration to key features or characteristics of the existing views such that post development, an open and direct existing view will be permanently, irreversibly and completely or almost completely changed by starkly contrasting elements that will occupy a large or very large proportion of the view
High (dominant)	The proposed development will contrast with and visually dominate or intrude upon the view resulting in a considerable improvement or deterioration of the view These changes may be medium or long term and are likely to be irreversible or only partly reversible. New elements will occupy a large proportion of the view
Medium (prominent)	The proposed development will be visually prominent within the view and will result in either a noticeable improvement or deterioration of the view. The change will be moderate in scale, contrast with the view and be medium term permanent and sometimes irreversible or often partly reversible
Low (present)	Minor, often temporary and reversible alterations to the view that are small in scale or do not overtly contrast with the key features or characteristics of the view such that post development the existing view will be largely unchanged despite discernible differences
Negligible (No discernible Change)	Minimal alteration to the key features or characteristics of the existing view such that post development there will be barely discernible changes or no change to the view

A5 Assessment of Significance

A5.1.1 The significance of impacts is assessed using the appropriate national and international quality standards and professional judgement. For clarity and transparency, criteria have been used to attribute levels of significance. Broadly, the significance is a function of the magnitude of the impact and the sensitivity of receptors. The reversibility and duration of the effect are also important considerations.

A5.1.2 For each assessment factor the sensitivity of the effect is combined with magnitude to give an overall score for the significance of the impact as set out in Figure A.1 and defined in Table A.5. The area Highlighted in Grey defines effects assessed as having a level of moderate or greater which are considered to be significant. The White area defining effects assessed to have a level of moderate/minor or less which are not considered to be significant.



A5.1.3 **Figure A.1** Matrix used as guidance in combining judgements on Sensitivity and magnitude of change to determine the significance of Landscape and Visual Effects. This is adapted from the version provided in IEMA's special Report entitled; The State of Environmental Impact Assessment Practice in The UK. 2011.

Table A.5: Significance criteria

Impact Significance Rating	Definition
Very Substantial	These effects are generally, but not exclusively, associated with sites or features of international, international or national importance that are likely to experience very damaging or very beneficial changes of high or very high magnitude leading to permanent, irreversible loss or enhancement of resource integrity. The proposed development will cause complete degradation of or a very substantial improvement to the landscape character/landscape features/existing views. These effects are key factors in the decision-making process.
Substantial	These effects are generally, but not exclusively, associated with sites or features of national or regional importance that are likely to experience damaging or beneficial changes of medium to very high magnitude leading to long term irreversible loss or enhancement of resource integrity. However, a major change to a site or feature of local importance may also enter this category. The proposed development will cause substantial degradation or enhancement of the landscape character/landscape features/existing views. These effects are material factors in the decision-making process.
Moderate	These effects are generally, but not exclusively, associated with sites or features of regional or local importance that are likely to experience damaging or beneficial changes of low to high magnitude, often leading to reversible long or medium term loss or enhancement of resource integrity. The proposed development will cause noticeable degradation or enhancement of the landscape character/elements/existing views. These adverse effects may be important, but individually are not likely to be key decision-making factors. These effects are important in enhancing the subsequent design of the project. The cumulative effects of such factors may influence decision-making if they lead to an increase in the overall effects on a particular resource or receptor.
Slight	The proposed development will cause degradation or enhancements of low to medium magnitude to landscape character elements/existing views of local importance. These adverse effects may be raised as local factors. They are unlikely to be critical in the decision-making process, but are used in enhancing the subsequent design of the project.
Neutral	The proposed development will cause barely perceptible degradation or enhancement of the landscape character/elements/ existing views. Or Beneficial effects balance out adverse effects such that there is no overall beneficial or adverse effect

Appendix B

Glossary of Acoustic Terminology

B1 Glossary of Acoustic Terminology

B1.1 Decibel

B1.1.1 The ratio of sound pressures, which we can hear, is a ratio of 106 (one million: one). For convenience, therefore, a logarithmic measurement scale is used. The resulting parameter is called the 'sound pressure level' (Lp) and the associated measurement unit is the decibel (dB). As the decibel is a logarithmic ratio, the laws of logarithmic addition and subtraction apply.

B1.2 dB(A)

B1.2.1 The unit used to define a weighted sound pressure level, which correlates well with the subjective response to sound. The 'A' weighting follows the frequency response of the human ear, which is less sensitive to low and very high frequencies than it is to those in the range 500Hz to 4kHz.

B1.2.2 In some statistical descriptors the 'A' weighting forms part of a subscript, such as LA10, LA90, and LAeq for the 'A' weighted equivalent continuous noise level.

B1.3 Equivalent Continuous Sound Level

B1.3.1 Another index for assessment for overall noise exposure is the equivalent continuous sound level, Leq. This is a notional steady level which would, over a given period of time, deliver the same sound energy as the actual time-varying sound over the same period. Hence fluctuating levels can be described in terms of a single figure level.

B1.4 Statistical Noise Levels

B1.4.1 For levels of noise that vary widely with time, for example road traffic noise, it is necessary to employ an index which allows for this variation. The L10, the level exceeded for ten per cent of the time period under consideration, has been adopted in this country for the assessment of road traffic noise. The L90, the level exceeded for ninety per cent of the time, has been adopted to represent the background noise level. The L1, the level exceeded for one per cent of the time, is representative of the maximum levels recorded during the sample period. A weighted statistical noise levels are denoted LA10, dBLA90 etc. The reference time period (T), is normally included, e.g. dBLA10, 5min or dBLA90, 8hr.

B1.5 Maximum Noise Level

B1.5.1 This is generally expressed as the maximum A-weighted noise level (LAmax) and represents the maximum instantaneous noise level that occurred with the monitoring period. Certain assessment criteria

recommend maximum noise levels to avoid disturbance as well as limits for longer-term averaged noise exposures.

B1.6 Minimum Noise Level

B1.6.1 This is generally expressed as the minimum A-weighted noise level (LAmin) and represents the minimum instantaneous noise level that occurred within the monitoring period. This might be presented together with LAmax to indicate the full range of noise exposure over the period.

B1.7 Frequency

B1.7.1 The rate of repetition of a sound wave. The subjective equivalent in music is pitch. The unit of frequency is the Hertz (Hz), which is identical to cycles per second. A thousand hertz is often denoted kHz, e.g. 2kHz = 2000Hz. Human hearing ranges approximately from 20Hz to 20kHz. For design purposes, the octave bands between 63Hz to 8kHz are generally used. The most commonly used frequency bands are octave bands, in which the mid frequency of each band is twice that of the band below it. For more detailed analysis, each octave band may be split into three one-third octave bands or in some cases, narrow frequency bands.

B1.8 Sound Pressure Level

B1.8.1 The sound power emitted by a source results in pressure fluctuations in the air, which are heard as sound. The sound pressure level (Lp) is 10 times the logarithm of the ratio of the measured sound pressure (detected by a microphone) to the reference level of 2 x 10-5Pa (the threshold of hearing). Thus Lp (dB) = 10 log (P1/Pref)2 where Pref, the lowest pressure detectable by the ear, is 0.00002 pascals (i.e. 2x10-5 Pa). The threshold of hearing is 0dB, while the threshold of pain is approximately 120dB. Normal speech is approximately 60dB(A) or more and a change of 3dB is only just detectable. A change of 10dB is subjectively twice, or half, as loud.

B1.9 Vibration

B1.9.1 Vibration may be expressed in terms of displacement, velocity and acceleration. Velocity and acceleration are most commonly used when assessing structureborne noise or human comfort issues respectively. Vibration amplitude may be quantified as a peak value, or as a root mean squared (rms) value.

B1.9.2 Vibration amplitude can be expressed as an engineering unit value e.g. 1 mms-1 or as a ratio on a logarithmic scale in decibels: Vibration velocity level, dB = 20 log (V/Vref). (where the preferred reference level, Vref, for vibration velocity = 10-9 ms-1.). The decibel approach has advantages for manipulation and comparison of data.

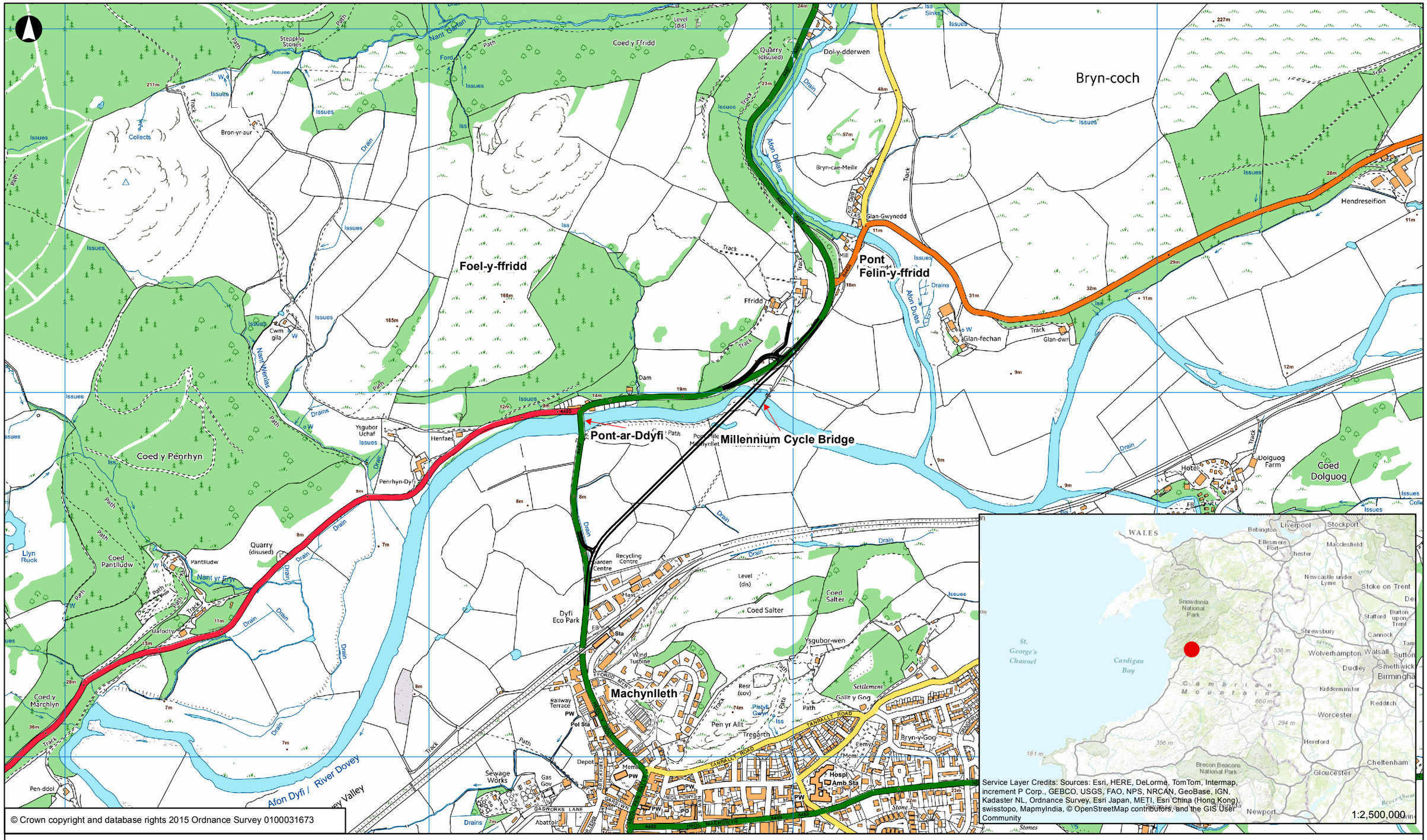
B1.10 Typical Noise Levels

B1.10.1 Examples of relevant typical noise levels are given in Table B.1:

Table B.1 Examples of typical Noise Levels (dB(A) relevant to the scheme

Noise Level, dB(A)	Example
130	Threshold of pain
120	Jet aircraft take-off at 100m
110	Chain saw at 1m
100	Inside disco
90	Heavy lorries at 5m
80	Kerbside of busy street
70	Loud radio (in typical domestic room)
60	Office or restaurant
50	Domestic fan heater at 1m
40	Living room
30	Theatre
20	Remote countryside on still night
10	Sound insulated test chamber
0	Threshold of hearing

A3



Legend

Proposed Scheme

Metres

0 135 270 540

Rev	Date	By	Chkd	Appd
P01.4	05/11/15	EB	JP	CF

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Project Title
A487 New Dyfi Bridge

Client
Llywodraeth Cymru
Welsh Government

Drawing Title
Figure 1
Location Plan

Scale at A3 **1:10,000**

Role Specialist Designer - Environmental

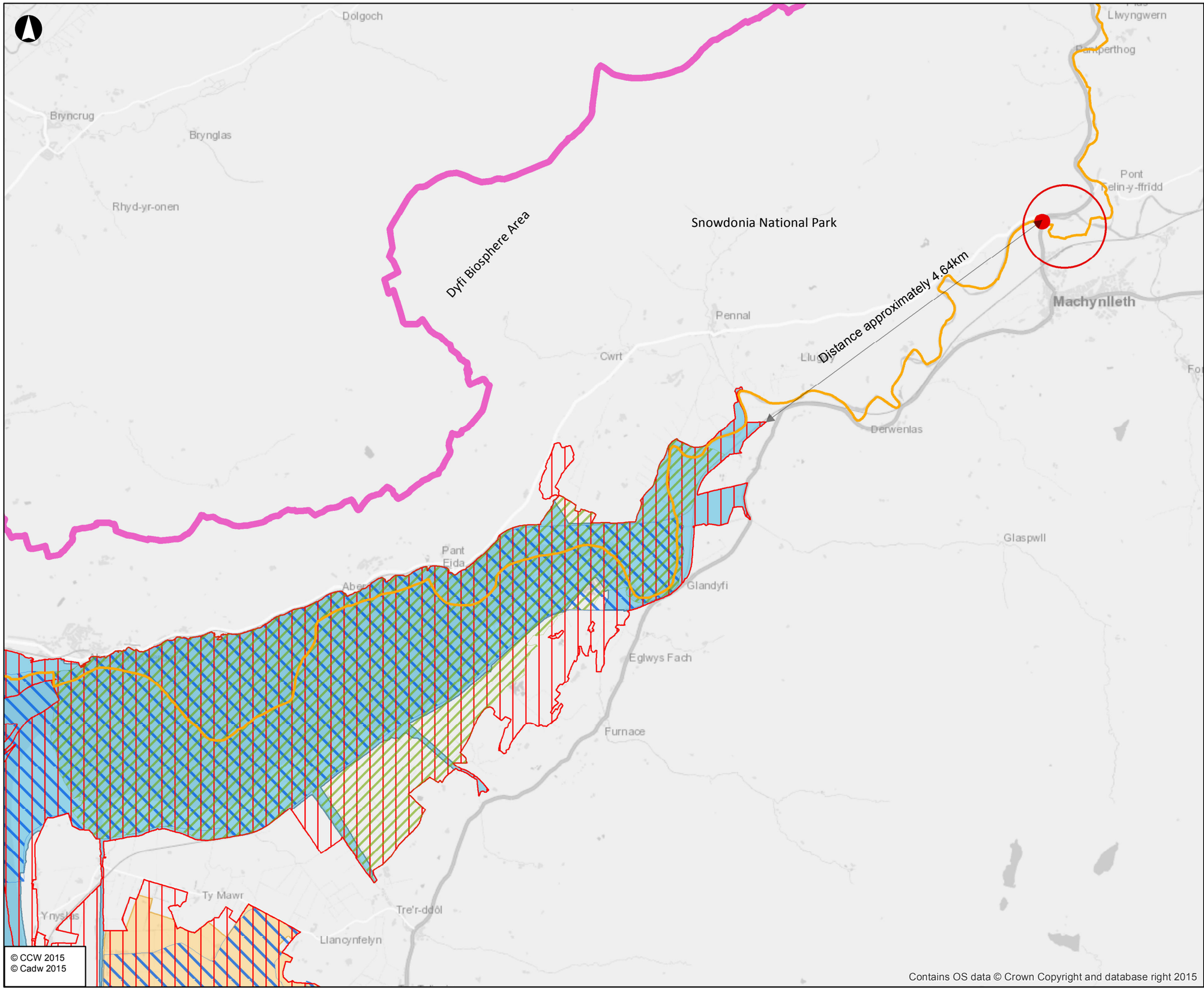
Suitability S0 - Initial non-contractual

Job No **244562-00**

Rev **P01.4**

Name **900237-ARP-ZZ-ZZ-DR-YE-00003**

A3



Legend

- Pont-ar-Ddyfi (Listed/Scheduled Monument)
- Site Location
- Snowdonia National Park Boundary
- Pen Llŷn a'r Sarnau / Lleyn Peninsula and the Sarnau Special Area of Conservation (SAC)
- Cors Fochno SAC
- Cors Fochno and Dyfi Ramsar site
- Dyfi Estuary / Aber Dyfi Special Protection Area (SPA)
- Dyfi Site of Special Scientific Interest (SSSI)
- Dyfi Biosphere Reserve

Metres
0 650 1,300 2,600

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P01.5	07/01/16	EB	JP	CF

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Drawing Title
Figure 2a
General Environmental Context

Scale at A3 **1:50,000**

Role Specialist Designer - Environmental

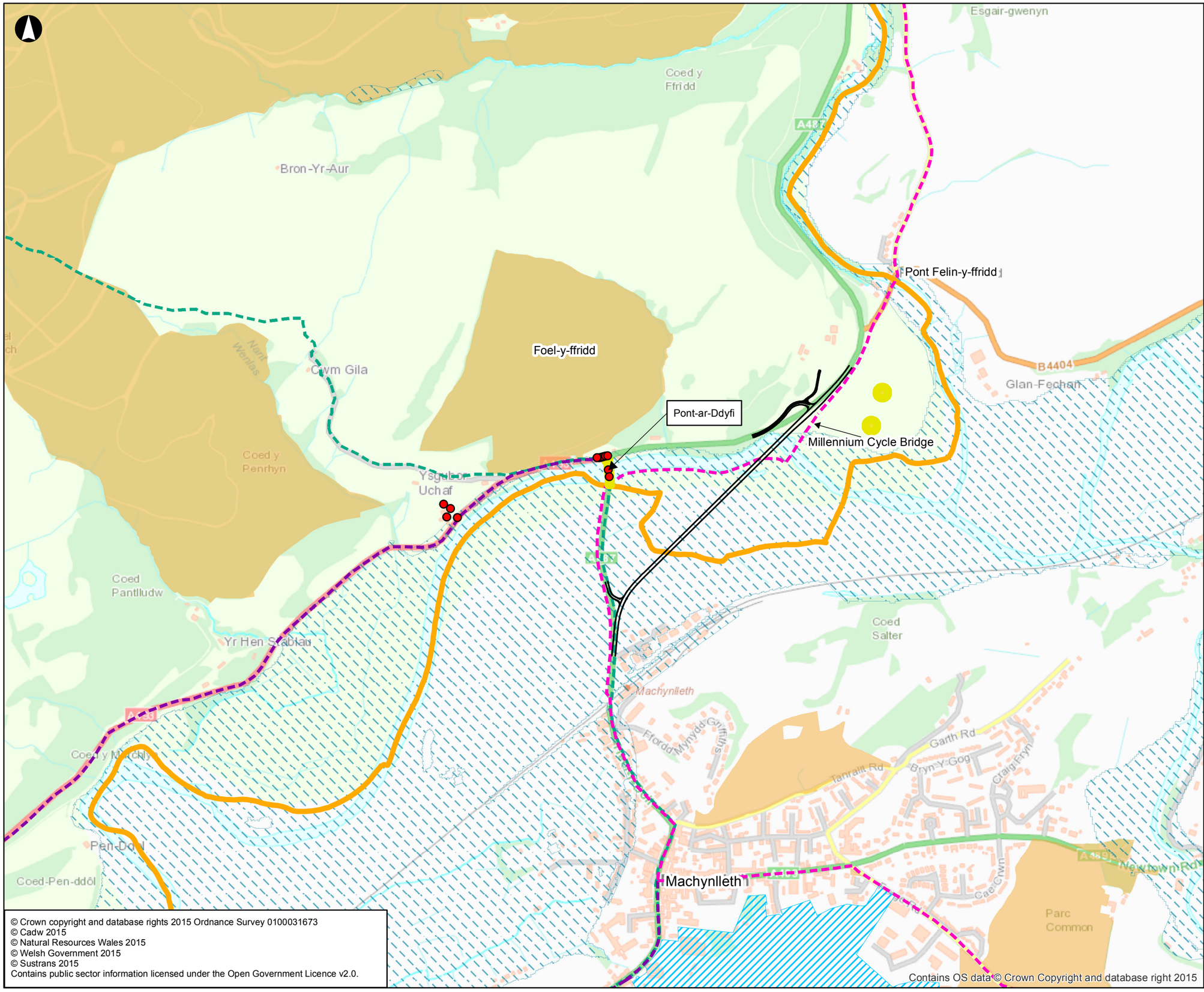
Suitability S0 - Initial non-contractual

Arup Job No **244562-00**

Rev **P01.5**

Name **900237-ARP-ZZ-ZZ-DR-YE-00008**

A3



Legend

- Proposed Scheme
- Listed Buildings (Within 500m of Proposed Scheme)
- National Cycle Network Route No 8
- National Cycle Network Route No 82
- Wales Coastal Path
- TAN15 Flood Zones B and C2
- Plas Machynlleth Parkland (Cadw)
- Access Land
- Scheduled Ancient Monument (SAM)
- Snowdonia National Park Boundary

Metres
0 135 270 540

Rev	Date	By	Chkd	Appd
P01.5	05/11/15	EB	JP	CF

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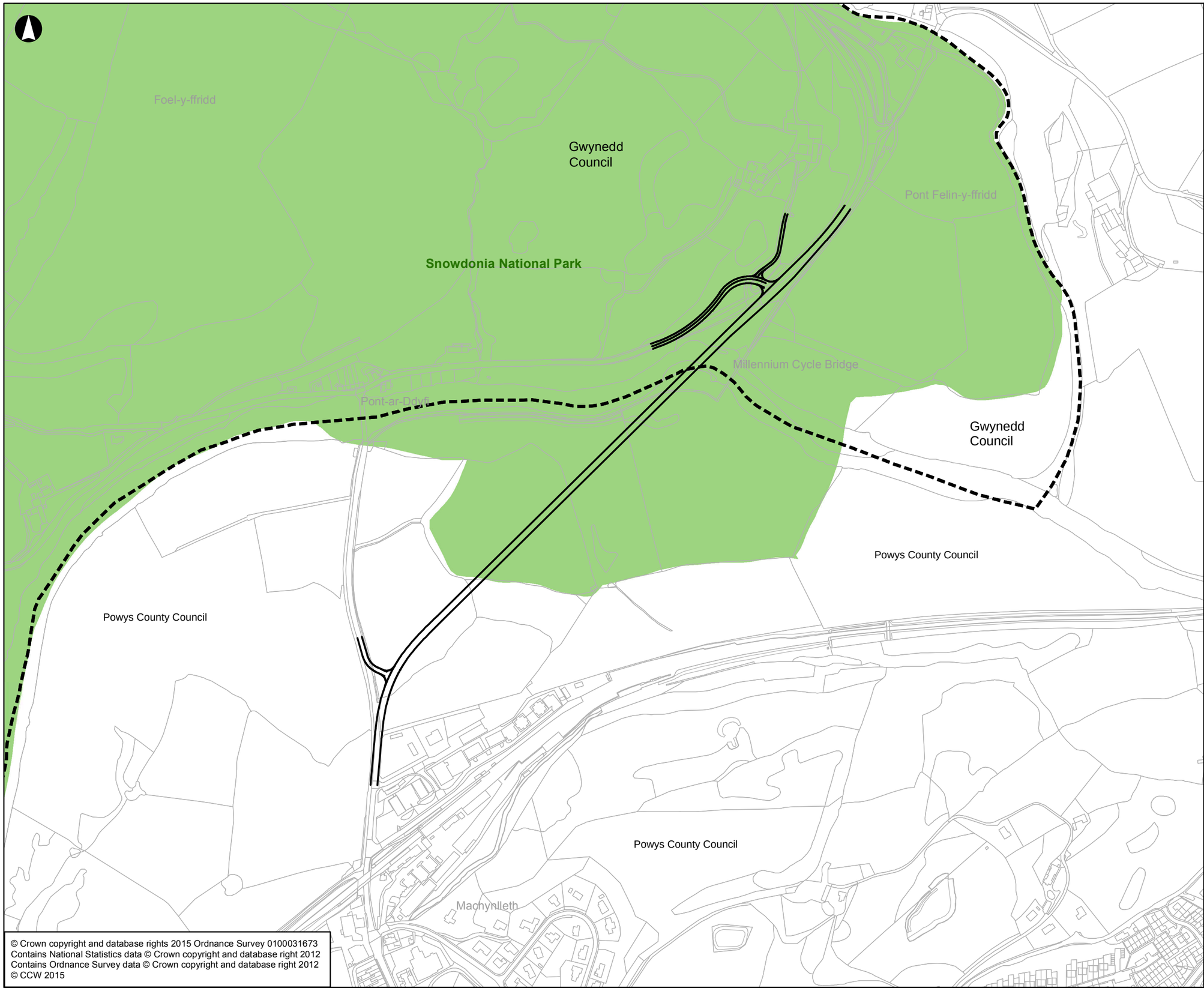
Drawing Title
Figure 2b
Local Environmental Context

Scale at A3 **1:10,000**
Role Specialist Designer - Environmental
Suitability S0 - Initial non-contractual
Arup Job No **244562-00**
Rev **P01.5**
Name **900237-ARP-ZZ-ZZ-DR-YE-00009**

A3



Legend

- Proposed Scheme
- Snowdonia National Park
- Unitary Authority Boundary

Metres

0 65 130 260

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P01.1	21/01/16	EB	JP	CF

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Project Title

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Drawing Title

Figure 3 Authority Boundaries

Scale at A3 **1:5,000**

Role Specialist Designer - Environmental

Suitability S0 - Initial non-contractual

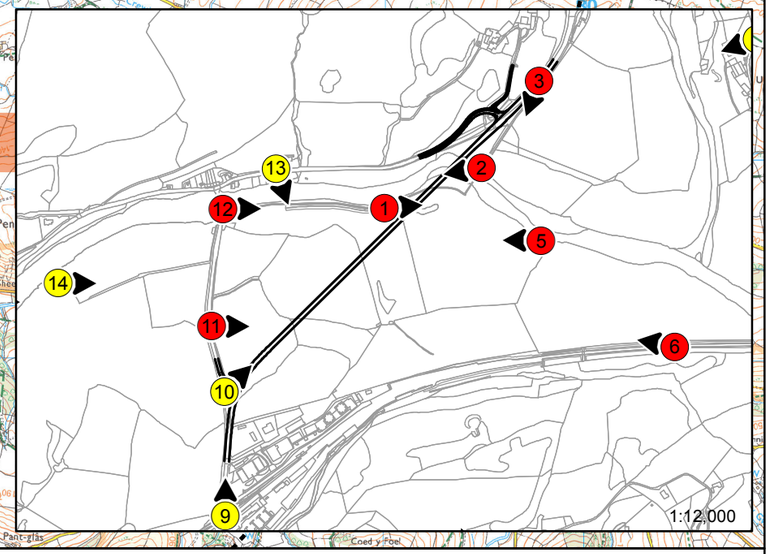
Arup Job No **244562-00**

Rev **P01.1**

Name **900237-ARP-ZZ-ZZ-DR-ZX-00002**

A3

See Inset Below



Legend

- Proposed Scheme
- Viewpoint to be photomontaged
- Appraisal Viewpoint – no Photomontage
- Viewpoint with no view
- 5km Study area for LVIA
- Zone of Theoretical Visibility (ZTV) - Visible

Metres

0 400 800 1,600

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Drawing Title
Figure 4
Site Location, Viewpoint Locations and Zone of Theoretical Visibility (ZTV)

Scale at A3 **1:30,000**

Role Specialist Designer - Environmental

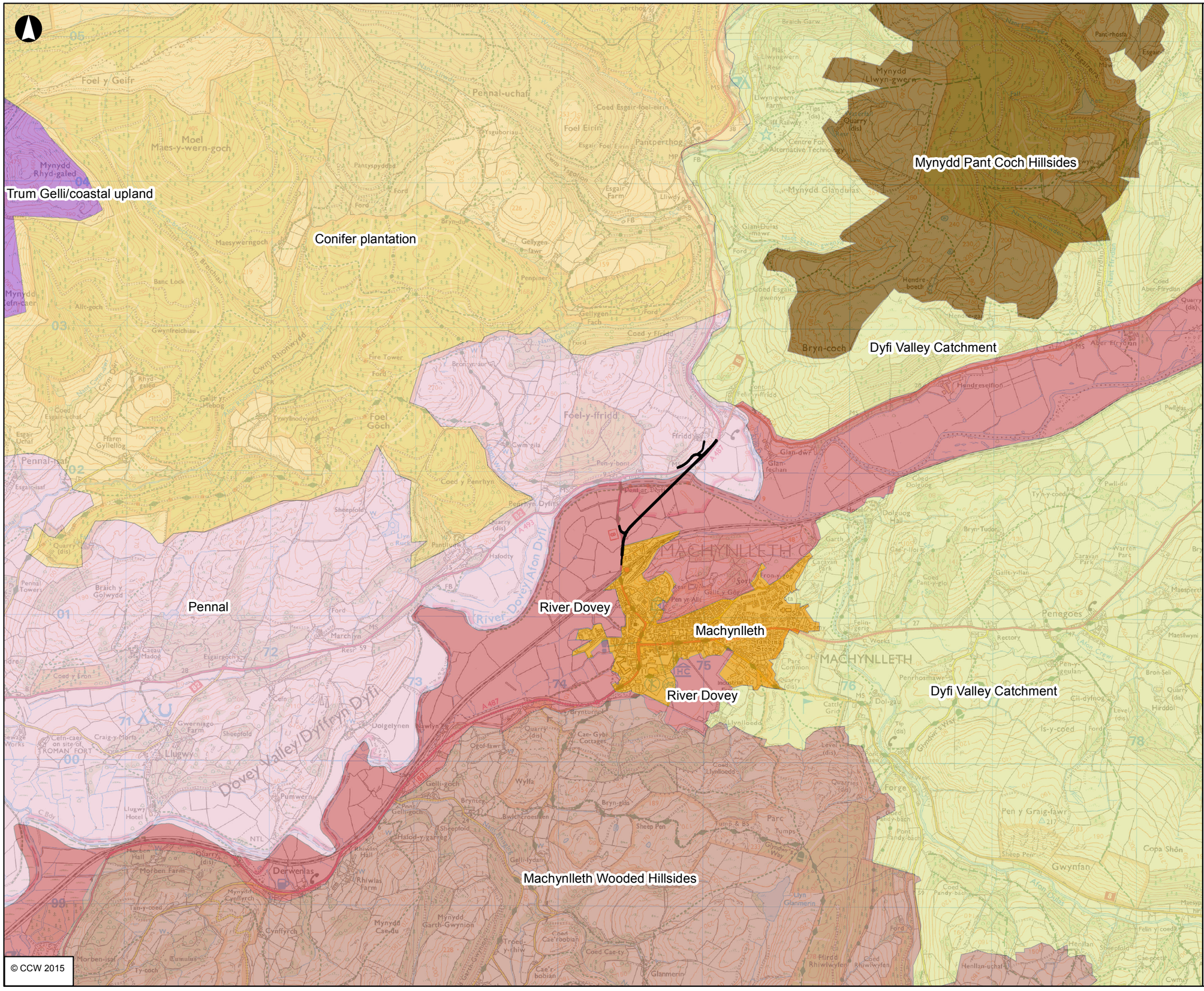
Suitability S0 - Initial non-contractual

Job No **244562-00**

Rev **P01.4**

Name **900237-ARP-ZZ-ZZ-DR-LX-00001**

A3



Legend

- Proposed Scheme
- Conifer plantation
- Dyfi Valley Catchment
- Dyfi Valley Rolling Grazing
- Machynlleth
- Machynlleth Wooded Hillsides
- Mynydd Pant Coch Hillsides
- Pennal
- River Dovey
- Trum Gelli/coastal upland

For other LANDMAP Aspect Areas please refer to the following drawings:
Figure 5b – 900237-ARP-ZZ-ZZ-DR-LX-00004 Cultural Aspect Areas
Figure 5c – 900237-ARP-ZZ-ZZ-DR-LX-00005 Historic Aspect Areas

Metres
0 335 670 1,340

Rev	Date	By	Chkd	Appd
P01.3	06/11/15	EB	JP	CF

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Project Title
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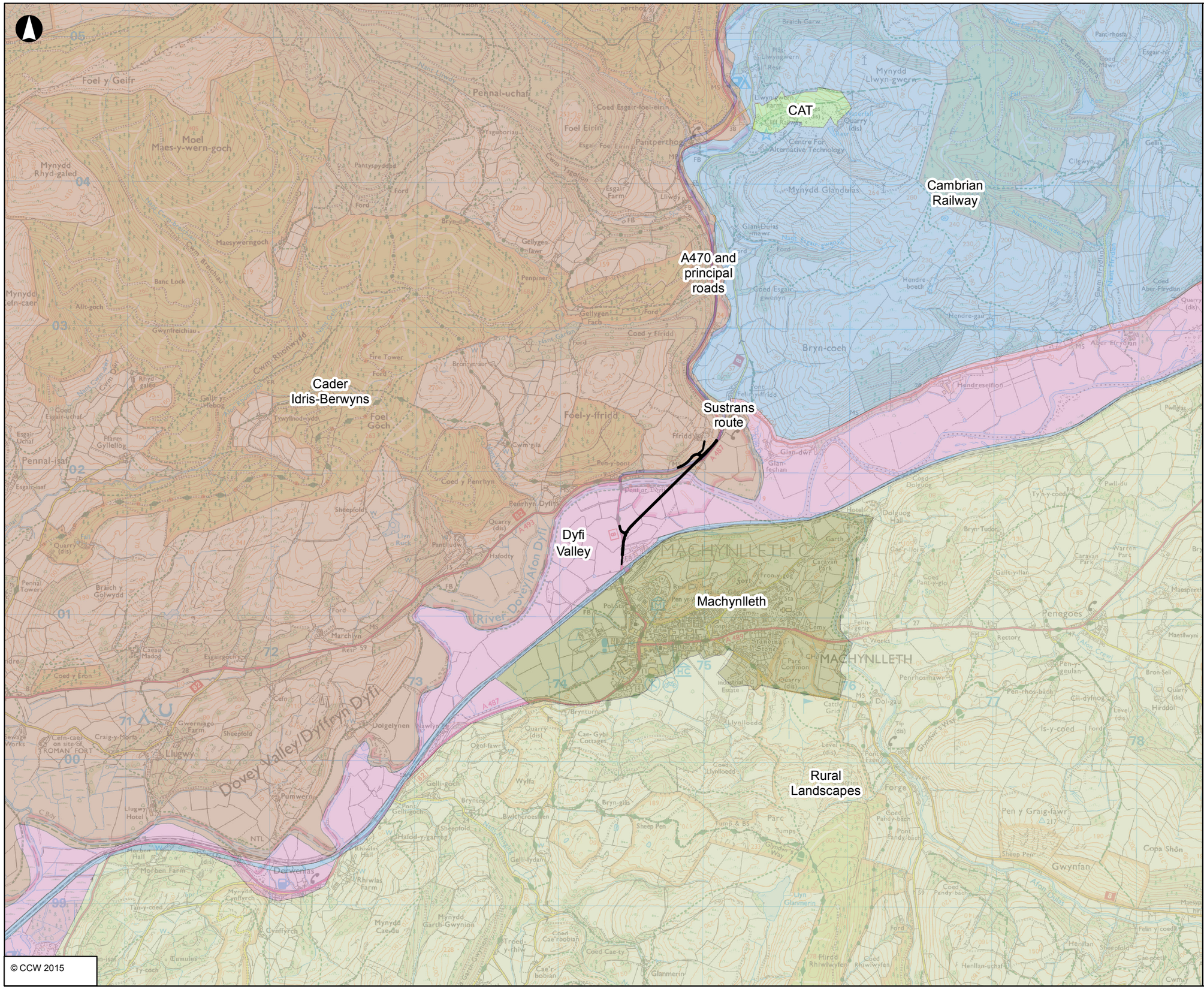
Drawing Title
Figure 5a
LANDMAP - Visual and Sensory

Scale at A3 **1:25,000**
Role Specialist Designer - Environmental
Suitability S0 - Initial non-contractual
Arup Job No **244562-00**
Rev **P01.3**
Name **900237-ARP-ZZ-ZZ-DR-LX-00002**

A3



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Legend

Proposed Scheme

AreaName

- A470 and principal roads
- CAT
- Cader Idris-Berwyns
- Cambrian Railway
- Dyfi Valley
- Machynlleth
- Rural Landscapes
- Sustrans route

For other LANDMAP Aspect Areas please refer to the following drawings:
Figure 5a – 900237-ARP-ZZ-ZZ-DR-LX-00002 LANDMAP - Visual and Sensory Aspect Areas
Figure 5c – 900237-ARP-ZZ-ZZ-DR-LX-00005 Historic Aspect Areas

Metres
0 335 670 1,340

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Drawing Title

Fig 5b
LANDMAP - Cultural Aspect areas

Scale at A3 **1:25,000**

Role Specialist Designer - Environmental

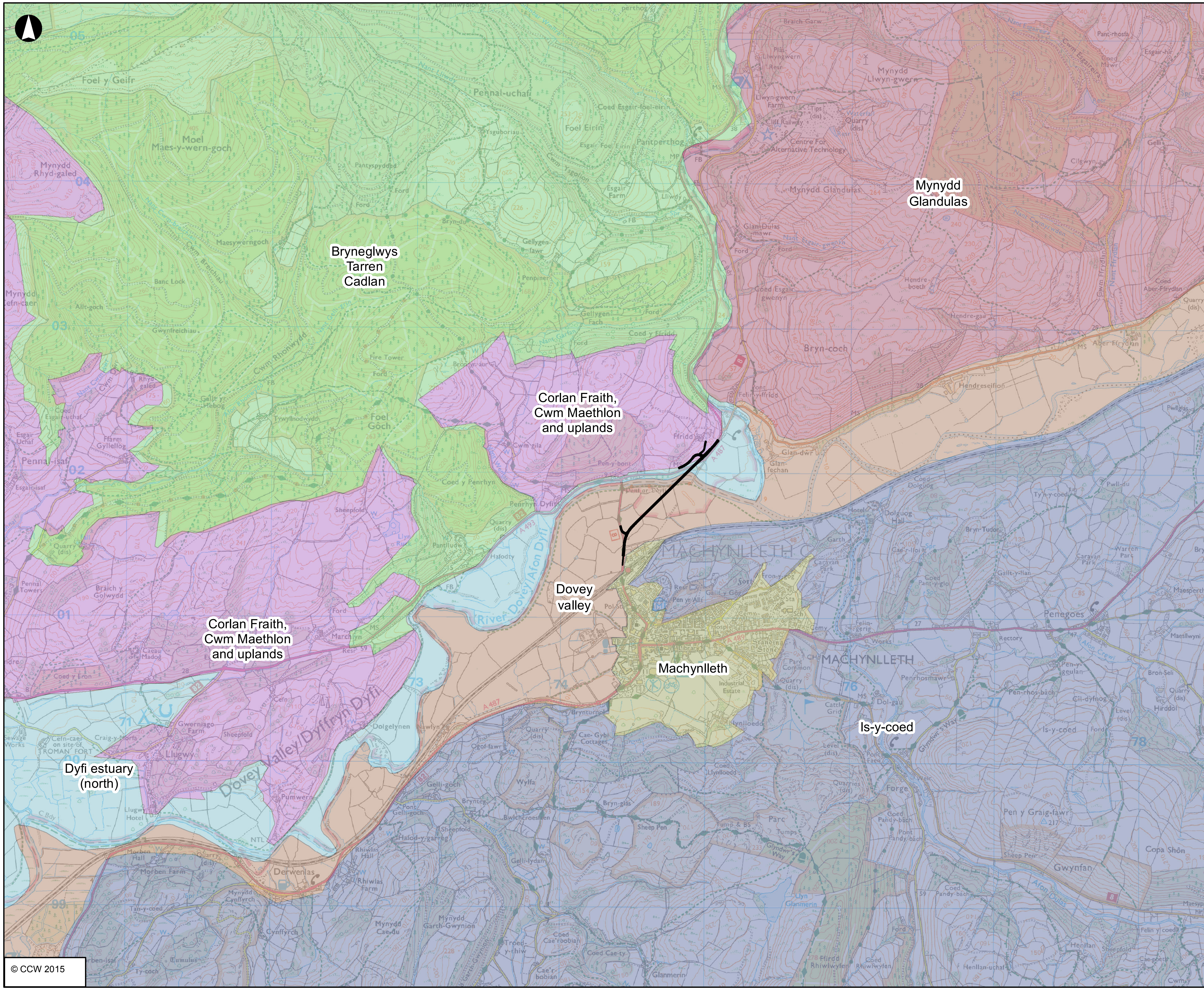
Suitability S0 - Initial non-contractual

Arup Job No **244562-00**

Rev **P01.2**

Name **900237-ARP-ZZ-ZZ-DR-LX-00004**

A3



Legend

- Proposed Scheme
- Bryneglwys Tarren Cadlan
- Corlan Fraith, Cwm Maethlon and uplands
- Dovey valley
- Dyfi estuary (north)
- Is-y-coed
- Machynlleth
- Mynydd Glandulas

For other LANDMAP Aspect Areas please refer to the following drawings:
Figure 5a – 900237-ARP-ZZ-ZZ-DR-LX-00002 LANDMAP - Visual and Sensory Asoect Areas
Figure 5b – 900237-ARP-ZZ-ZZ-DR-LX-00004 Cultural and Landscape Aspect Areas

Metres
0 335 670 1,340

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Drawing Title
Figure 5c
LANDMAP - Historic Aspect areas

Scale at A3 **1:25,000**

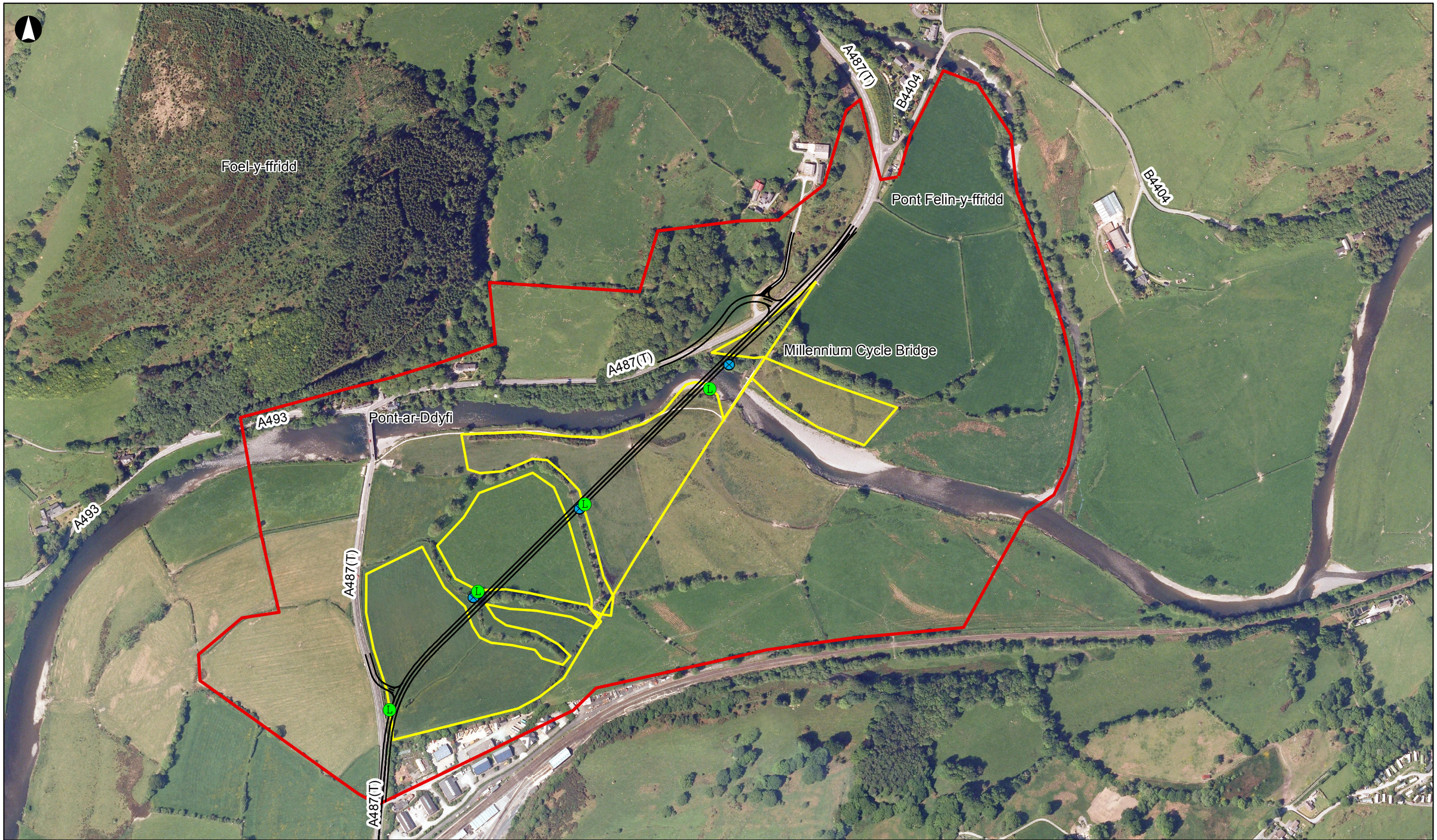
Role Specialist Designer - Environmental

Suitability S0 - Initial non-contractual

Arup Job No **244562-00** Rev **P01.2**

Name **900237-ARP-ZZ-ZZ-DR-LX-00005**

A3



Legend

- Listening Point
- Static
- Proposed Scheme
- Bat Transect
- Study area for the Ecological Surveys

Metres

0 65 130 260

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Drawing Title
Figure 6
Bat Survey Extent

Scale at A3 **1:5,000**

Role Specialist Designer - Environmental

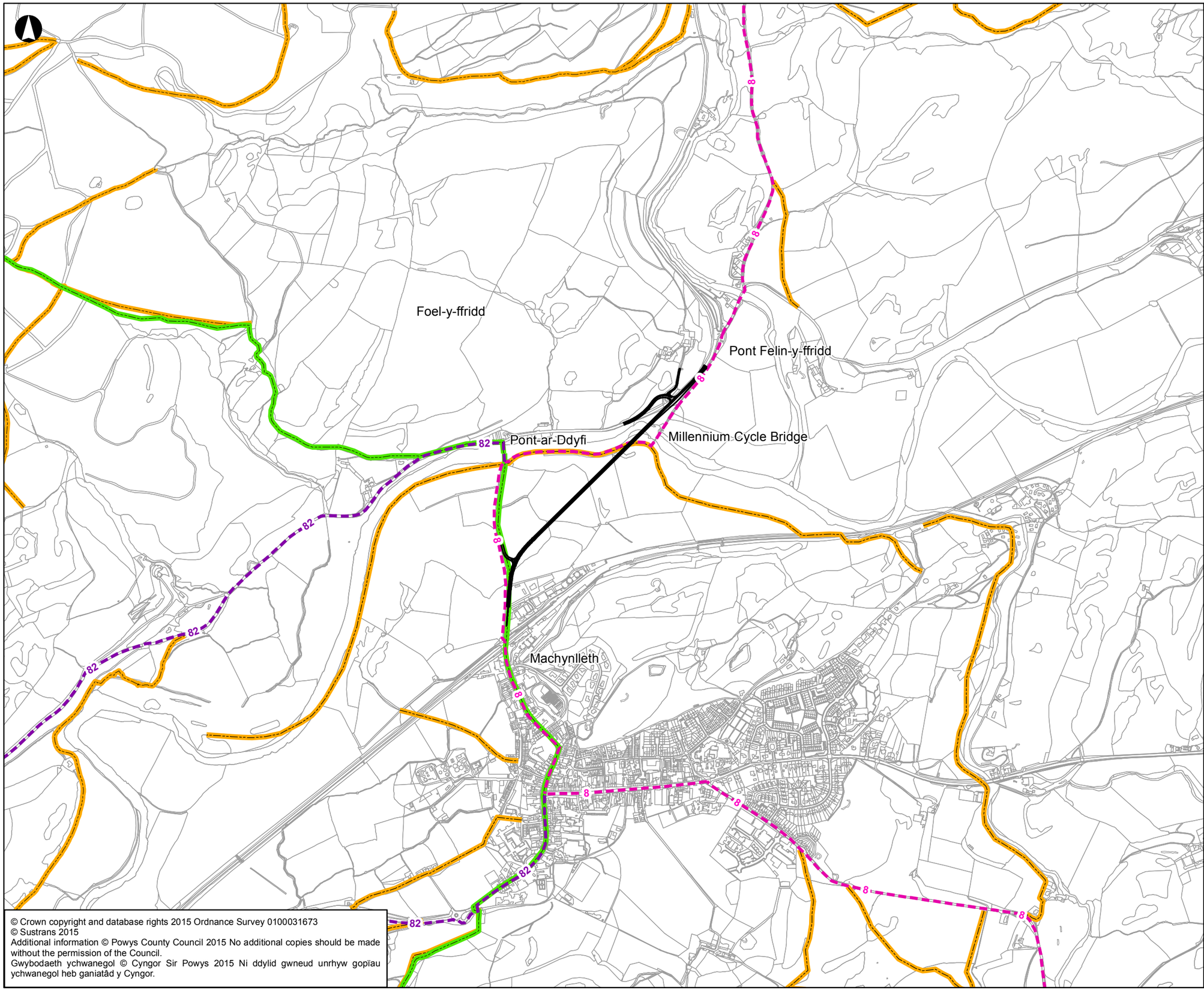
Suitability S0 - Initial non-contractual

Job No **244562-00**

Rev **P01.5**

Name **900237-ARP-ZZ-ZZ-DR-YE-00005**

A3



Legend

- Proposed Scheme
- National Cycle Network Route No 8
- National Cycle Network Route No 82
- Public Rights of Way
- Wales Coastal Path

Metres

0 — 162.5 — 325 — 650

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Project Title

A487 New Dyfi Bridge

Drawing Title

Figure 7
Non Motorised User Routes

Scale at A3 **1:12,000**

Role Specialist Designer - Environmental

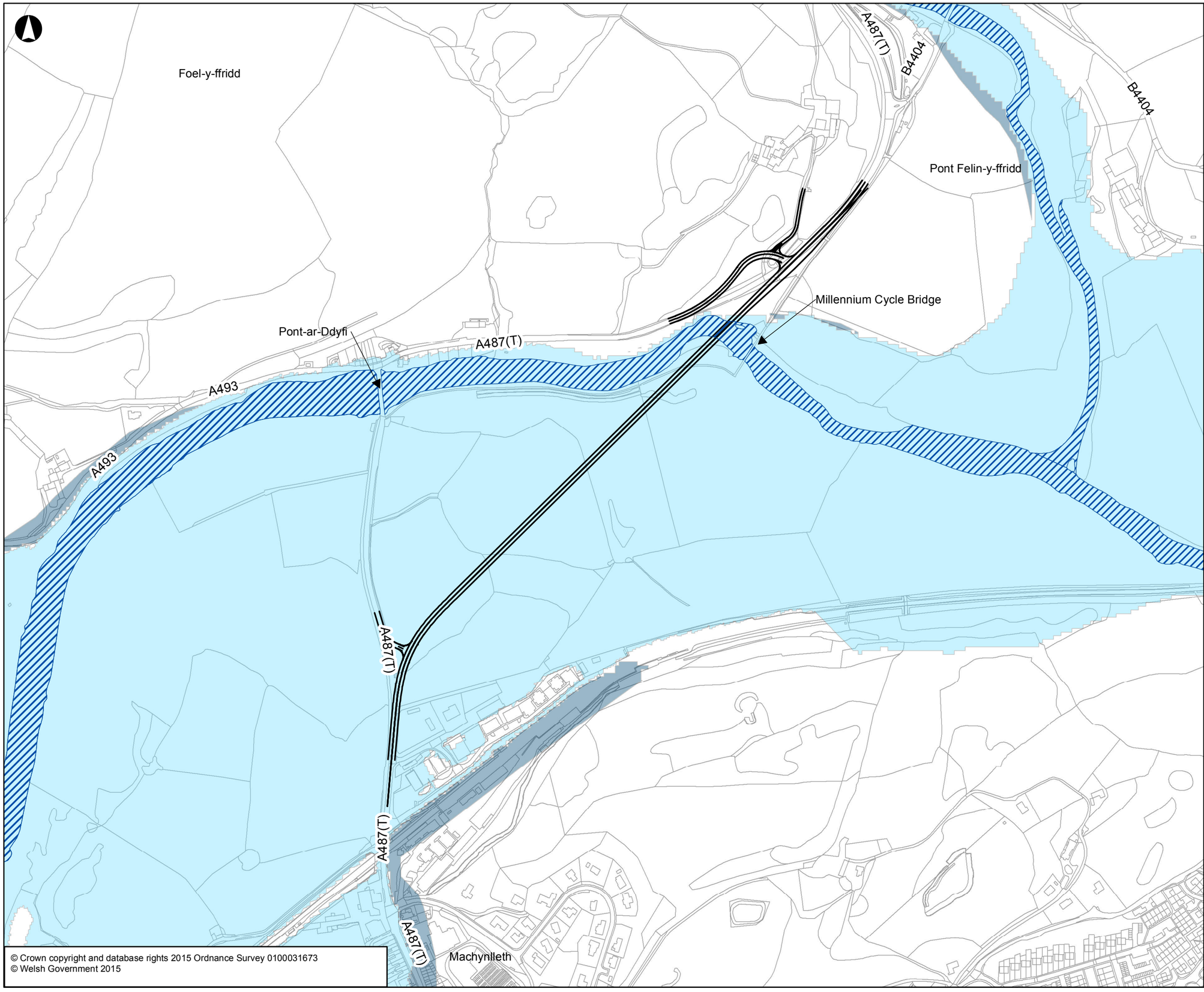
Suitability S0 - Initial non-contractual

Arup Job No **244562-00**

Rev **P01.6**

Name **900237-ARP-ZZ-ZZ-DR-YE-00004**

A3



Legend

- Proposed Scheme
- TAN15 Zone C2
- TAN15 Zone B
- Key Streams / Rivers

Metres

0 65 130 260

Rev	Date	By	Chkd	Appd
P01.5	10/11/15	EB	JP	CF

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Project Title

A487 New Dyfi Bridge

Drawing Title

Figure 8
Flood Map

Scale at A3 **1:5,000**

Role Specialist Designer - Environmental

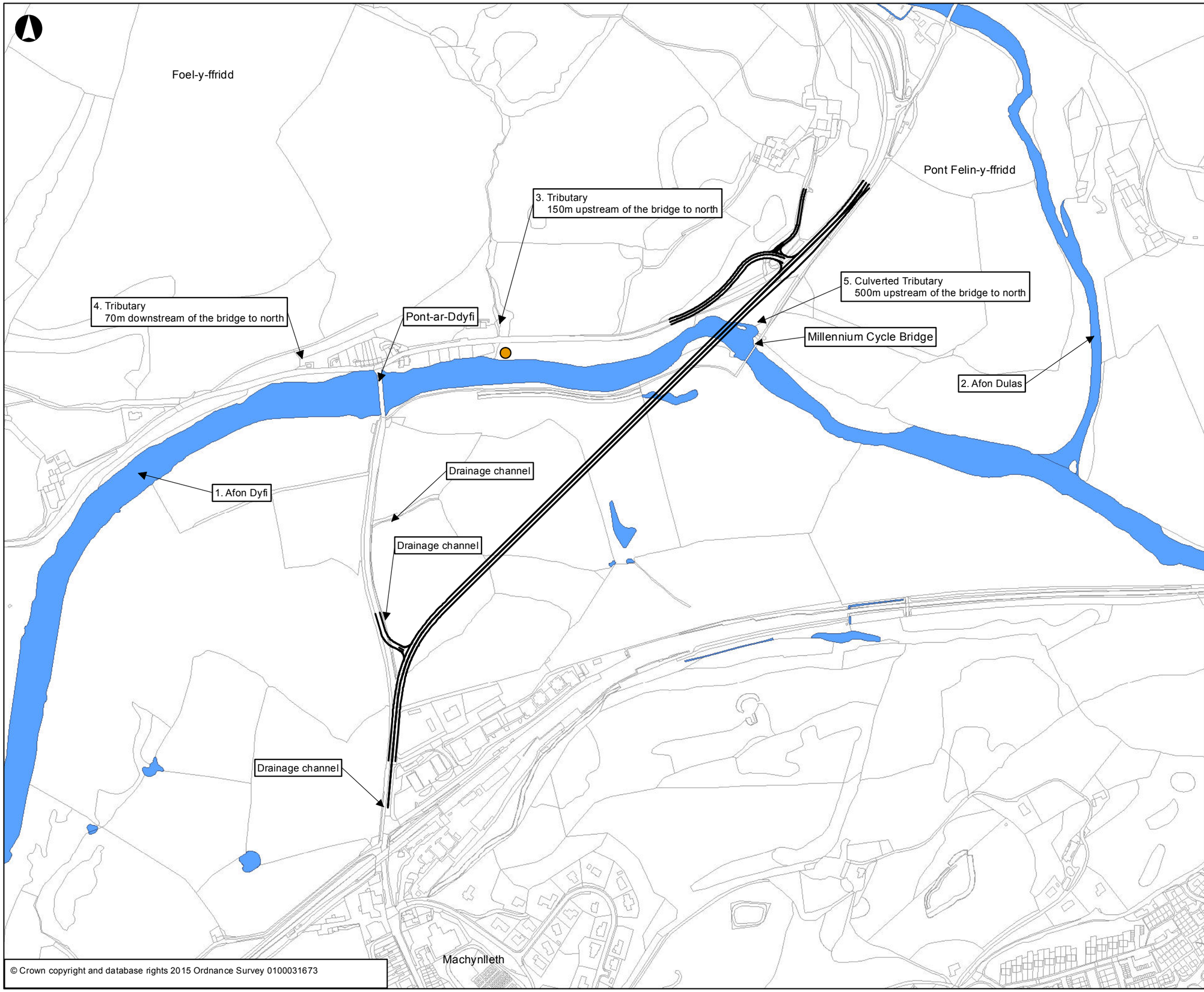
Suitability S0 - Initial non-contractual

Arup Job No **244562-00**

Rev **P01.5**

Name **900237-ARP-ZZ-ZZ-DR-YE-00006**

A3



Legend

- NRW Flood Gauging Station
- Proposed Scheme
- Surface Water

Metres

0 65 130 260

Rev	Date	By	Chkd	Appd
P01.6	11/12/15	EB	JP	CF

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Client

Llywodraeth Cymru
Welsh Government

Project Title

A487 New Dyfi Bridge

Drawing Title

Figure 9
Surface Water Features

Scale at A3 **1:5,000**

Role Specialist Designer - Environmental

Suitability S0 - Initial non-contractual

Arup Job No **244562-00**

Rev **P01.6**

Name **900237-ARP-ZZ-ZZ-DR-YE-00007**

A1

A493 to Aberdyfi

A487 to Dolgellau

Dyfi Bridge

River Dyfi

A493

ADS

0+000.000

0+100.000

0+200.000

0+235.212

0+038.524

0+025.239

0+200.000

0+300.000

0+400.000

0+500.000

0+600.000

0+700.000

0+800.000

0+900.000

1+000.000

1+100.000

0+202.607

1+238.093

1+200.000

Millenium Footbridge

Flood Bund

Railway Bridge

Machynlleth

0 10 20 30 40 50 100 Metres

Scale 1:2500

FOR INFORMATION ONLY

Legend

- Existing Vegetation
- Proposed Planting
- Proposed Seeding
- Wild Flower Seeding
- Highway Fenceline
- Site Extents
- ADS — Advanced Directional Signs
- Existing NMU Routes
- Proposed NMU Routes
- Proposed Culvert & Headwalls
- Proposed Cut-off Ditch
- Proposed Ditch
- Existing Culvert & Headwalls

Notes:

Issue	Date	By	Chkd	Appd
P01.3	—	—	—	—

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Project Title: A487 New Dyfi Bridge

Drawing Title: Figure 10 Scheme General Arrangement

Scale at A1: 1:2500

Role: Civil - Highways

Suitability: S0 - Initial non-contractual

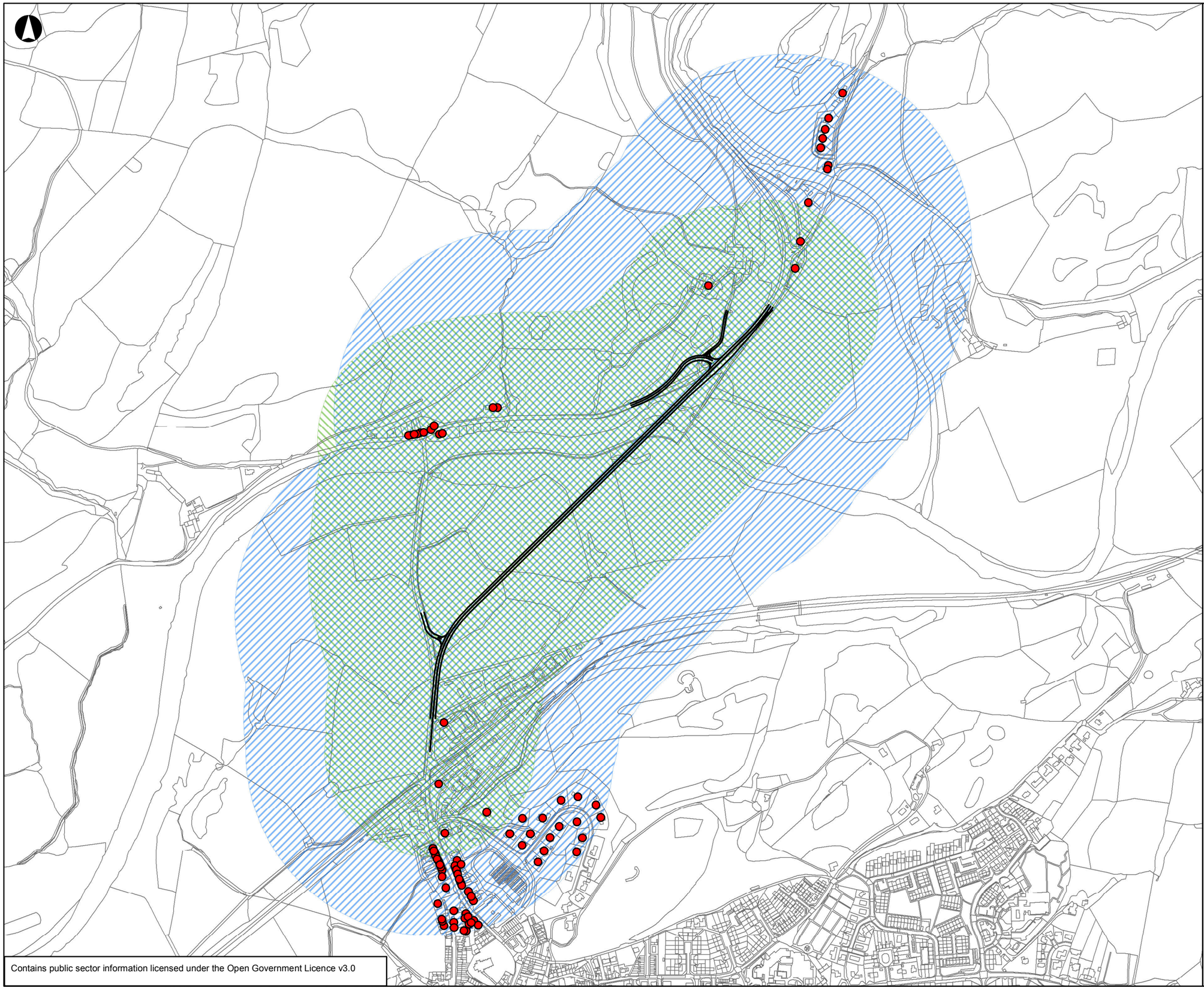
Arup Job No: 244562-00

Rev: P01.3

Name: 900237-ARP-ML-ZZ-DR-CH-00101

Do not scale

A3



Legend

- Residential Properties within Assessment Areas
- Proposed Scheme
- Study Area for Operational Assessment
- Study Area for Construction Assessment

Metres

0 95 190 380

Rev	Date	By	Chkd	Appd
P01.1	11/01/16	EB	TR	SW

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Project Title

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Drawing Title

Figure 11 Study Area for Air Quality Assessment

Scale at A3 **1:7,000**

Role Specialist Designer - Environmental

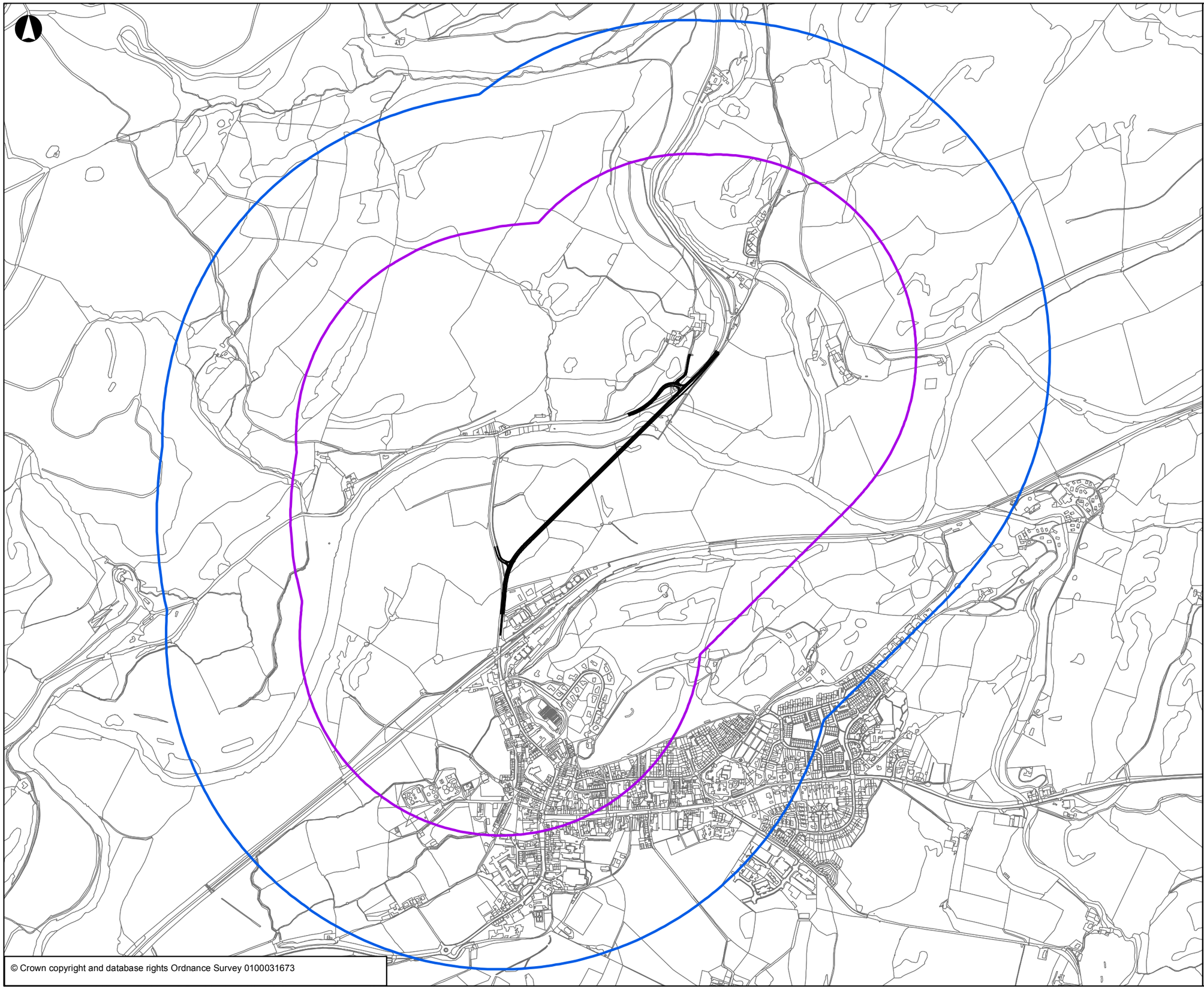
Suitability S0 - Initial non-contractual

Arup Job No **244562-00**

Rev **P01.1**

Name **900237-ARP-ZZ-ZZ-DR-YE-00022**

A3



Legend

- Proposed Scheme
- 600m Boundary
- 1km Boundary

Metres

0 150 300 600

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P01.1	16/02/16	EB	GH	JP

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Figure 12
Study area defined for the purposes of the DMRB HD 213/11 noise and vibration assessment

Scale at A3 **1:11,000**

Role Specialist Designer - Environmental

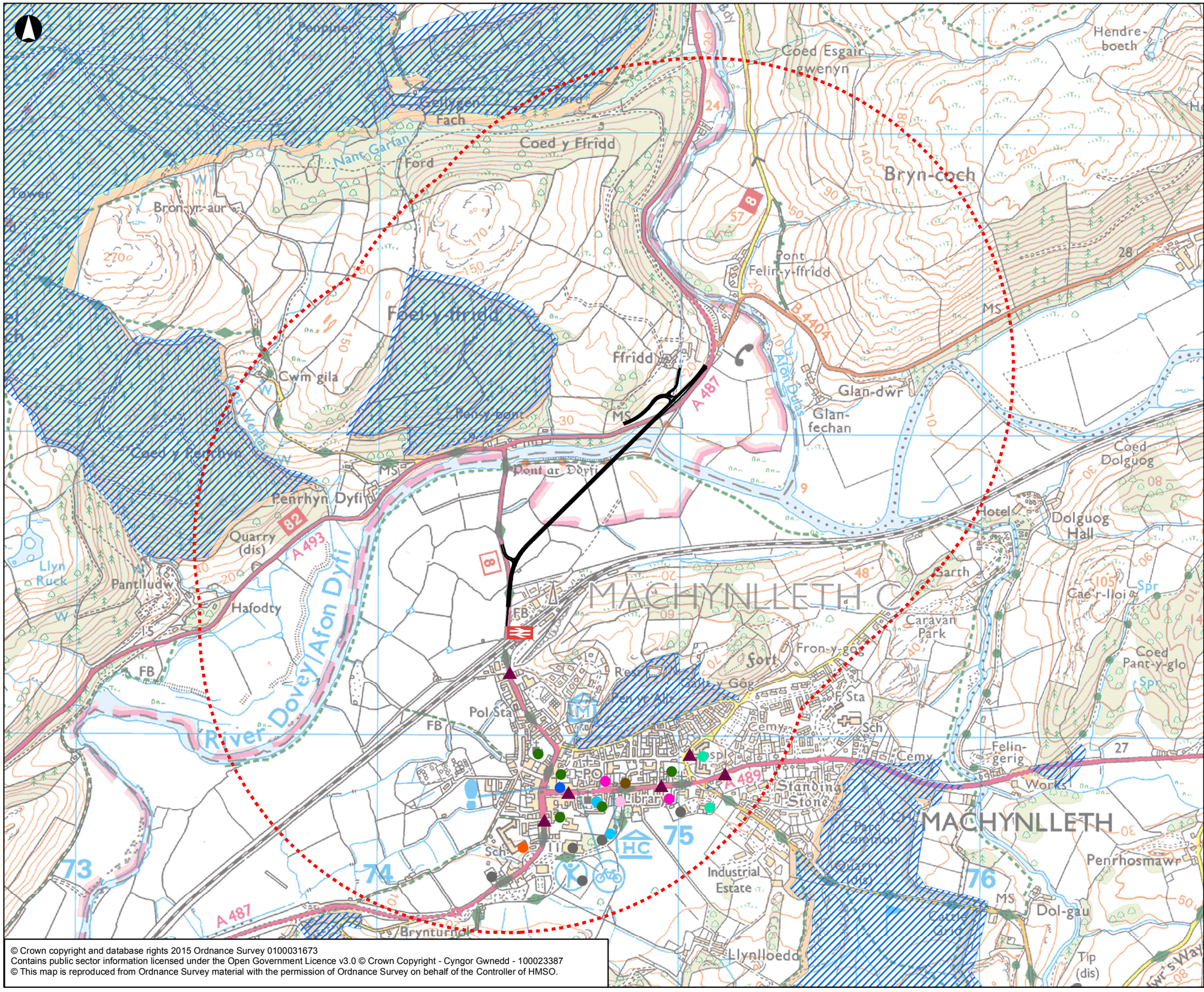
Suitability S0 - Initial non-contractual

Arup Job No **244562-00**

Rev **P01.1**

Name **900237-ARP-ZZ-ZZ-DR-YA-00001**

A3



Legend

- Proposed Scheme
- Proposed Scheme (1km Buffer)
- Bus Stop
- Nursery
- Places of Worship
- Clinic: Health Centres
- Sport and Leisure Centres
- Village Hall / Community Facility
- Public House / Inn
- Library
- Railway Station
- Open Access Land

Metres

0 162.5 325 650

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Figure 13 Community Facilities

Scale at A3 **1:12,000**

Role Specialist Designer - Environmental

Suitability S0 - Initial non-contractual

Arup Job No **244562-00**

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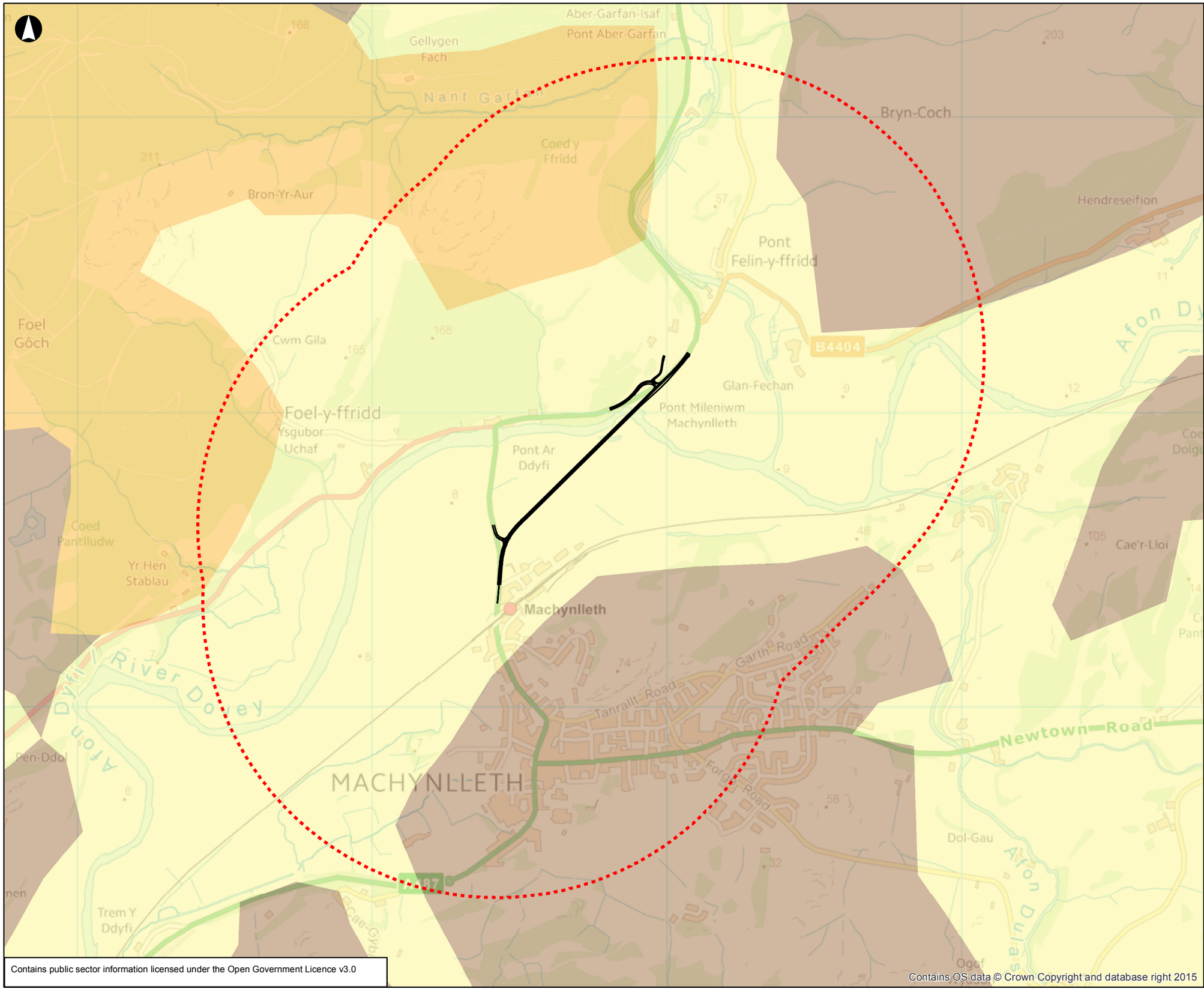
Name **900237-ARP-ZZ-ZZ-DR-YE-00024**

A3



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Legend

- Proposed Scheme
- Proposed Scheme (1km Buffer)

Agricultural Land Classification (ALC)

- Grade 4
- Grade 5
- Non Agricultural

Metres

0 170 340 680

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Project Title

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Drawing Title

Figure 14
Agricultural Land Classification (ALC)

Scale at A3 **1:12,500**

Role Specialist Designer - Environmental

Suitability S0 - Initial non-contractual

Arup Job No **244562-00**

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Name **900237-ARP-ZZ-ZZ-DR-YE-00023**