



Adran yr Economi a'r Seilwaith  
Department for Economy and Infrastructure

Llywodraeth Cymru  
Welsh Government

**The M4 Motorway (Junction 23 (East of Magor) to West of Junction 29 (Castleton) and Connecting Roads) and The M48 Motorway (Junction 23 (East of Magor) Connecting Road) Scheme 201-**

**The M4 Motorway (Junction 23 (East of Magor) to West of Junction 29 (Castleton) and Connecting Roads) and The M48 Motorway (Junction 23 (East of Magor) Connecting Road) (Amendment) Scheme 201-**

**The London to Fishguard Trunk Road (East of Magor to Castleton) Order 201-**

**The M4 Motorway (West of Magor to East of Castleton) and the A48(M) Motorway (West of Castleton to St Mellons)(Variation of Various Schemes) Scheme 201-**

**The M4 Motorway (Junction 23 (East of Magor) to West of Junction 29 (Castleton) and Connecting Roads) and the M48 Motorway (Junction 23 (East of Magor) Connecting Road) and The London to Fishguard Trunk Road (east of Magor to Castleton) (Side Roads) Order 201-**

**The Welsh Ministers (The M4 Motorway (Junction 23 (East of Magor) to West of Junction 29 (Castleton) and Connecting Roads) and the M48 Motorway (Junction 23 (East of Magor) Connecting Road) and the London to Fishguard Trunk Road (East of Magor to Castleton)) Compulsory Purchase Order 201-**

**The M4 Motorway (Junction 23 (East Of Magor) to West of Junction 29 (Castleton) and Connecting Roads) and The M48 Motorway (Junction 23 (East Of Magor) Connecting Road) (Supplementary) Scheme 201-**

**The Welsh Ministers (The M4 Motorway (Junction 23 (East Of Magor) to West of Junction 29 (Castleton) and Connecting Roads) and The M48 Motorway (Junction 23 (East Of Magor) Connecting Road) and The London to Fishguard Trunk Road (East of Magor to Castleton)) Supplementary Compulsory Purchase Order 201-**

**Proof of Evidence**

**Jon Davies BSc (Hons) MSc CEnv MCIEEM**

**Ecology: Dormice and Water Voles**

**Document Reference: WG 1.19.1**

**CONTENTS**

1	Introduction	2
	1.1 ..... Personal Details	2
	1.2 ..... Scope and Structure of this Evidence	5
	1.3 ..... Species Ecology	6
2	Methodology and Consultation	12
	2.1 ..... Survey Methodologies	12
	2.2 ..... Consultation	16
3	Baseline Conditions	21
	3.1 ..... Water Vole	21
	3.2 ..... Hazel Dormouse	22
4	Potential Impacts of the Scheme <i>Without Mitigation</i>	27
	4.1 ..... Water Vole	27
	4.2 ..... Hazel Dormouse	29
5	Mitigation	31
	5.1 ..... Introduction	31
	5.2 ..... Water Vole	31
	5.3 ..... Hazel Dormouse	44
6	Residual Effects (After Mitigation)	57
	6.1 ..... Water Vole	57
	6.2 ..... Hazel Dormouse	61
7	Consultees' Responses and Objections to the M4CaN Scheme	68
	7.1 ..... Water Vole	68
	7.2 ..... Hazel Dormouse	72
8	Conclusions	76

## **1 Introduction**

### **1.1 Personal Details**

1.1.1 My name is Jonathan George Davies. I am Head of Ecology at Arcadis Consulting (UK) Ltd. I have been an ecological consultant for over 20 years, and manage a team of 65 professional ecologists over five offices. I am the Environmental Advisor to the Welsh Government for the M4 Corridor around Newport (M4CaN), providing technical support to the project team, especially with regard to ecology. In accordance with the new Wellbeing of Future Generations Act (2015), the Arcadis way of working encourages collaboration, rather than a more adversarial approach, so my involvement in the project is very much as a team member rather than simply an advisor. This collaborative approach culminated in my invitation to become an Expert Witness for the Scheme, a role not normally filled by members of the Employer's Agent's team.

1.1.2 I have a BSc Honours Degree in Zoology from Bristol University and an MSc in Conservation from University College London. I am a Full Member of the Chartered Institute of Ecology and Environmental Management (CIEEM) and a Chartered Environmentalist. In addition, I have taught Ecological Impact Assessment (EclA) and Habitats Regulations Assessment (HRA) both to university students and fellow professionals, and have presented papers on 'Appropriate Assessment for Mammals', 'The Importance of Scoping in EclA' and 'Invertebrates and EclA'. I have also written national guidance for National Grid regarding the environmental assessment of major projects.

1.1.3 Since joining Cresswell Associates in 1996 (the company was subsequently acquired by Hyder Consulting in 2006 and then by Arcadis in 2014), I have been responsible for ecological impact assessments of a wide range of public and private sector development

projects, including some of the largest national infrastructure schemes in the UK, including major road projects.

- 1.1.4 From 2005 to 2016, I was the Environmental Co-coordinator for the A40 Penblewin to Slebech Park Improvement in Pembrokeshire. I was responsible for coordinating, editing and compiling the Environmental Statement (ES) for the Published Scheme as well as the Assessment of Implication for European Sites (AIES). The design took into consideration the key environmental constraints associated with two European designated sites, and included a comprehensive sustainable drainage design and a number of features to minimise the impacts on horseshoe bats. I gave evidence on environmental issues at the Public Inquiry in July 2007, and the scheme commenced construction in February 2009. The road opened in March 2011, and won the Constructing Excellence in Wales Project of the Year Award in July 2011, largely because of its high environmental and sustainability credentials. The Aftercare and Maintenance period ended in 2016.
- 1.1.5 I have also provided the ecological inputs to a number of other road schemes in Wales, including the A470 Dolwyddelan to Pont-yr-Afanc Improvement in North Wales, the A470 Maes yr Helmau to Cross Foxes Improvement within Snowdonia National Park, and Sirhowy Enterprise Way near Blackwood. I am currently the Environmental Advisor to the Welsh Government on the A477 Red Roses to St Clears Improvement in Carmarthenshire.
- 1.1.6 Over the last 20 years I have been involved in many projects involving water voles and hazel dormice, a number of which comprised road schemes. I co-authored the detailed mitigation strategy for dormice on the aforementioned Sirhowy Enterprise Way, which included the first bespoke dormouse crossing in the UK, and was also involved in one of the most successful woodland habitat creation schemes for dormice in the UK for the Highways Agency - the A2/M2 Cobham to Junction 4

widening scheme in Kent. This resulted in the creation of an extensive area of broadleaved woodland (comprising approximately 60,000 native trees and shrubs and over a hundred Hazel coppice stools) on former arable land, linking three areas of ancient woodland occupied by dormice. After just ten years of growth, the new woodland was found to support dormice at densities substantially greater than those recorded in the retained ancient woodland (over 50% of nest boxes contained evidence of use by dormice).

1.1.7 I am currently Ecology Project Director for the River Humber Gas Pipeline Replacement Project which has involved mitigating the impacts of several ditch crossings on water voles and providing additional habitat to offset the loss of burrows in certain locations. The project has required significant engagement with Natural England, as the mitigation guidance for water voles changed during the licensing process. I am also Ecology Project Director for the proposed Sizewell C nuclear new build, where we are currently developing a detailed mitigation strategy for water voles. This will involve a large-scale translocation operation as well as extensive habitat creation. Over 6 ha of reedbed and ditch habitat have already been created to offset any impacts on this species (at least three years prior to submission of the DCO application) along with areas of heathland and acid grassland to support biodiversity more widely.

1.1.8 In 2014 I gave evidence as an Expert Witness on behalf of NRW at the conjoined public inquiry into the Llandinam 132KV power line and five associated wind farms, in North Wales. Specifically, I was responsible for the assessment of the applicant's approach to the survey and assessment of dormice for this 35km linear development.

1.1.9 For the M4CaN Scheme, I have been Environmental Advisor since 2014, providing advice during the Contractor tender period, organising over-wintering bird surveys for the 2014/15 winter period, and carrying

out early ecological scoping discussions with NRW to ensure that the extent and methodologies for protected species surveys were agreed in principle prior to the commission of the Contractor in early 2015. I have since been responsible for technically reviewing all of the ecological inputs for both the EIA and HRA, including those aspects relating to water voles and hazel dormice, and am involved in the on-going consultations with statutory and non-statutory nature conservation bodies with regard to the mitigation strategies for both species.

1.1.10 The evidence provided in this Proof of Evidence has been prepared in accordance with CIEEM's Code of Professional Conduct. The opinions expressed are given in a fair and impartial manner and are my true and professional opinions.

## **1.2 Scope and Structure of this Evidence**

1.2.1 Matthew Jones explains in his evidence (WG1.1.1) the process of option selection and scheme design. Dr Keith Jones, in his evidence (WG1.18.1), sets out the ecological and nature conservation considerations that have informed the development of the Scheme subsequent to the award by the Welsh Government of the Professional Services contract for the Scheme development and environmental surveys, including publication of draft Statutory Orders, and up to the Public Local Inquiry.

1.2.2 My Proof of Evidence addresses water voles and hazel dormice. I am considering these species separately to the evidence provided by Dr Keith Jones (WG1.18.1) due to my personal involvement in the consultation process for these species for the M4CaN Scheme and my previous experience with both water voles and dormice.

1.2.3 My evidence is based on surveys carried out by others within the project team, including RPS, Arup and Thomson Ecology. In my role as

Environmental Advisor, I helped develop the scope of this survey work through consultation with NRW, including prior to the appointment of the project team. Having read the survey and assessment reports and been involved in the development of the methodologies for the surveys undertaken, I have confidence in and accept their findings. However, the evidence I will give is also based on my own conclusions regarding the potential effects of the published Scheme on water voles and hazel dormice, and in the context of more recent developments with regard to the draft mitigation strategies for both species.

### **1.3 Species Ecology**

#### **Water Vole Ecology, Threats and Protection**

- 1.3.1 Water voles are the largest species of vole in Britain. They can survive in the wild for 2-3 years, although the majority survive for less than two winters. The breeding season is between March and October, during which time they can have between two and five litters. The young will become independent after 28 days, and those born in July may breed that autumn, although most will breed the following year. Individuals need to continue feeding throughout the winter and so do not hibernate, although they will reduce activity above ground. They are primarily vegetarian.
- 1.3.2 Water voles favour vegetated banks of slow-flowing waterbodies. Favourable sites will have a diversity of tall, dense bankside, marginal and emergent vegetation (Strachan *et al.*, 2011 (Document 11.3.16)). Voles will excavate burrows into the banks (extending up to 5-6 metres into adjacent terrestrial habitat), with entrances at, and above, water-level.
- 1.3.3 A breeding female's home range comprises approximately 50-150 metres of watercourse, which is marked with latrines. The male's home

is between 60 and 300 metres and often overlaps several females' territories (Dean *et al.*, 2016)). Where there is ample favourable habitat, water voles will form colonies; elsewhere they can form a meta-population of scattered populations with frequent activity between.

### **Population Size and Distribution**

1.3.4 Although still widespread throughout Wales, water voles have undergone one of the most serious declines of any mammal in Britain, with a 90% decline in Britain between 1990 and 2008. This decline apparently (according to the Gwent Wildlife Trust (GWT)) resulted in the loss of the species from the Gwent Levels by the early 2000s. However, in 2012 and 2013 GWT introduced over 200 water voles into their nature reserve at Magor Marsh on the Levels, approximately 700m to the east of the Scheme (Figure 1d).

### **Threats**

- 1.3.5 Water vole population declines are believed to be a result of the following factors:
- a) Habitat loss, damage and disturbance, due to development, inappropriate farming practices and habitat management;
  - b) Population fragmentation due to habitat loss, which in turn leads to further genetic decline;
  - c) Flooding and drought - climate change could add to this threat;
  - d) Predation - in particular from American mink, but also from foxes, otters, stoats, weasels, birds of prey (including owls, herons and marsh harriers), pike, brown rats and cats; and
  - e) Pollution – this can adversely affect vegetation and potentially impact upon otter prey, a major competitor of the water vole's main predator, mink.

## Legislation and Policy

- 1.3.6 In Wales, water voles and their places of shelter/protection (i.e. burrows) are protected under Section 9 (Schedule 5) of the Wildlife and Countryside Act 1981 (as amended) (Document 3.1.7). They are also listed as a species of principal importance under Section 42 of the Natural Environment and Rural Communities (NERC) Act 2006 (Document 3.1.13), which requires decision-makers to have regard to the conservation of the species when carrying out their normal functions.
- 1.3.7 Under the UK Post-2010 Biodiversity Framework (Document 11.2.27), which replaces the UK Biodiversity Action Plan (BAP), the water vole is considered to be a species of principal importance in Wales for the conservation of biodiversity. Water vole is also a species of principal importance under the BAPs of Newport (Newport Biodiversity Partnership, 2014) (Document 11.2.30), Monmouthshire (Monmouthshire County Council, 2005) (Document 11.2.8) and the WelshTrunk Road Estate (Document 6.1.1).
- 1.3.8 The requirements of, and what constitutes an offence under, the above legislation are covered in the evidence of Dr Keith Jones (WG1.18.1). In England and Wales, there is no provision under the Wildlife and Countryside Act for licensing development that could affect water voles, so construction activities such as those proposed for this Scheme need to be carried out under a conservation licence. This requires the applicant to demonstrate a conservation benefit for water voles. This has informed the development of the mitigation strategy for this species.

### **Hazel Dormouse Ecology, Threats and Protection**

- 1.3.9 The hazel dormouse is a small nocturnal, largely arboreal rodent. Individuals can live up to six years in the wild, although two or three years is more typical. They are generally active between April and October, depending on local weather conditions. They will hibernate when nights become cooler, and will enter torpor during cool, windy or wet periods during the rest of the year.
- 1.3.10 Dormice can have up to two litters a year, but typically just the one. The average dormouse litter size is four. Typically, dormice will form nests of woven vegetation during the summer, although they may also use hollow tree branches and old bird nests. Hibernation nests are located at ground-level, in cool and moist conditions (e.g. under moss or at the base of coppiced Hazel shrubs).
- 1.3.11 Dormice are generally associated with semi-natural, traditionally-managed woodland. It is considered that a woodland parcel of at least 20 hectares is required to support a sustainable population of dormice in the long term (Bright *et al.*, 1996); however, dormice will also inhabit smaller parcels of woodland (Chanin and Gubert 2012) where other parcels are sufficiently close by to be available. Dormice will also inhabit areas of dense scrub and hedgerows. The presence of connecting hedgerows (ideally species-rich and infrequently-cut) is an important factor in determining presence of dormice in the landscape, and the ability of dormice to disperse (Bright, 1998).

### **Population Size and Distribution**

- 1.3.12 In Wales, hazel dormice occur in a few widely-separated areas in every county except Anglesey (Bright *et al.*, 2006) (Document 11.3.5). The valley of the River Usk is an important area for dormice in Newport. They have also been recorded along the existing M4 and A449

corridors, around Wentwood in the north-east of the county, and in the far west of the county in Park Wood, close to the Caerphilly boundary (Newport Biodiversity Partnership, 2014) (Document 11.2.30).

1.3.13 As reported in The People’s Trust for Endangered Species’ (PTES) publication *The State of Britain’s Dormice 2016* (Wembridge *et al.* 2016), the national population, including that in Wales, has fallen by a third since the end of the 20<sup>th</sup> Century, and its range has shrunk by approximately 50% over the last 100 years, with populations now being reported as absent along the west coast of Wales.

### **Threats**

1.3.14 Population declines are explained by a number of potential causes, including:

- a) Inappropriate habitat management (for example, loss of traditional coppice management, which promotes understorey productivity);
- b) Habitat loss and fragmentation (for example, due to development and inappropriate farming practices);
- c) Population fragmentation due to habitat loss, which in turn leads to genetic decline; and
- d) Climate change - dormice will enter ‘torpor’ when weather conditions are poor, therefore, wetter springs and more extreme weather events are likely to affect dormouse activity, which could in turn affect survival rates and breeding success.

### **Legislation and Policy**

1.3.15 The hazel dormouse and its resting/breeding places are protected in Wales under Annex IV of the Habitats Directive (Document 17.1.1) and Schedule 2 of the Conservation of Habitats and Species Regulations

2010 (Document 2.3.4) as well as under Section 9 (Schedule 5) of the Wildlife and Countryside Act (WCA) 1981 (as amended) (Document 3.1.7). The dormouse is also listed as a species of principal importance under Section 42 of the NERC Act 2006 (Document 3.1.13).

1.3.16 Under the UK Post-2010 Biodiversity Framework (Document 11.2.27), the hazel dormouse is also considered to be a species of principal importance for the conservation of biodiversity in Wales, and is also a species of principal importance under the Newport Local BAP (Newport Biodiversity Partnership, 2014) (Document 11.2.30) and Trunk Road Estate BAP (Document 6.1.1).

1.3.17 The requirements of, and what constitutes an offence under, the above legislation are covered in the evidence of Dr Keith Jones (WG1.18.1). NRW issues licences under Regulation 53 of the Conservation of Habitats and Species Regulations 2010 (Document 2.3.4) to allow construction activities such as those proposed for this Scheme to be carried out within the law. In order to be able to grant such a licence, NRW need to be confident that the action authorised will not be detrimental to the maintenance of the dormouse population concerned at a favourable conservation status (FCS) in their natural range. This has informed the development of the mitigation strategy for this species.

## **2 Methodology and Consultation**

### **2.1 Survey Methodologies**

#### **Ecology Desk Study**

2.1.1 An Ecology Desk Study was undertaken by Arup in 2014 (Appendix 10.2 to the March 2016 ES (Document 2.3.2)), and was updated in 2015 (Appendix 10.17 to the March 2016 ES (Document 2.3.2)).

2.1.2 The study included a request for records of water voles and hazel dormice, within 2 km of the Scheme, from the South-East Wales Biological Records Centre (SEWBRc). Natural Resources Wales (NRW) were also consulted with regard to any records of water voles or hazel dormice that had not been reported to SEWBRc.

2.1.3 In addition, information relating to designated sites for water vole and hazel dormouse conservation were requested from SEWBRc and NRW. Search areas were 10 km from the M4CaN site for European designated sites, 2 km for nationally designated sites and 1 km for locally designated sites.

2.1.4 Results of surveys for the proposed 'New M4 Project' undertaken by Arup in 2007/8, and by Jacobs in 2005/2006 for the M4 Widening between Junctions 29 and 32, were also reviewed.

#### **Field Surveys**

##### **Field Survey – Water Vole**

2.1.5 Water vole field surveys were undertaken in 2014 (Appendix 10.8 to the March 2016 ES (Document 2.3.2)) and 2015 (Appendix 10.24 to the March 2016 ES (Document 2.3.2)).

- 2.1.6 The 2014 survey area covered the same area as the 2007/2008 proposed Scheme, plus a 500m-wide buffer zone. By 2015, the Scheme footprint had become more fixed, and so the survey area covered the footprint of the refined alignment plus a 250m-wide buffer zone (Figure 2 of this evidence), as agreed with NRW.
- 2.1.7 The survey data include the results of a Habitat Suitability Assessment, undertaken in 2014, which considered features including bank profiles, flow rates, vegetation, water quality, cattle poaching and suitability for burrowing. Waterbodies were then surveyed, where practicable, for signs of water vole activity in accordance with Strachan *et al.* (2011) (Document 11.3.16).

### **Field Survey – Hazel Dormouse**

- 2.1.8 Hazel dormouse surveys were undertaken in 2014 (Appendix 10.9 to the March 2016 ES (Document 2.3.2)), 2015 (Appendix 10.25 to the March 2016 ES (Document 2.3.2)) and 2016 (Appendix SS10.1 to the December 2016 ES Supplement (Document 2.4.14)). The studies comprised hazel nut searches and nest tube surveys, in accordance with Bright *et al.* (2006) (Document 11.3.5), and are discussed in the following paragraphs.

### **Hazel Nut Searches**

- 2.1.9 Searches for characteristically-chewed hazelnuts were undertaken in 2014 and 2015 at locations shown on Figures 4 and 5 of this evidence, in order to locate any nuts opened by dormice. Searches were carried out in accordance with the guidelines published in Bright *et al.* (2006) (Document 11.3.5).

### Nest Tube Survey

2.1.10 In 2014, 310 nest tubes were installed in woodland and suitable hedgerows at the locations listed below. Tubes were installed between April and May 2014 (or, with regard to Magor and the Gwent Levels/Pye Corner, in July 2014), and were inspected on a monthly basis for signs of dormouse presence. The score for survey effort provided below is calculated in accordance with Bright *et al.* (2006); in this measure, a different numerical score is allocated for each month of the spring and summer (based on 50 nest tubes), with the total score added up based on which months have been surveyed. Bright *et al.* (2006) considers a sufficient survey score to be 20.

- a) New Park Farm area (Figure 3a of this evidence): 42 nest tubes surveyed for 3 months, 36 nest tubes surveyed for 7 months = a score of 24. (In July, tubes were removed from part of the survey area in order to prevent duplication with surveys for the M4 Motorway Widening Scheme and thus avoid unnecessary additional disturbance of dormice.)
- b) Castleton (Figure 3a): 59 nest tubes surveyed for 7 months, 14 tubes surveyed for 4 months = a score of 33.
- c) Coedkernew (Figure 3b): 106 nest tubes surveyed for 7 months = a score of 51.
- d) Gwent Levels: 19 nest tubes (Pye Corner, Figure 3e) and 10 nest tubes (Tata Steelworks, Figure 3f) surveyed for 4 months = a score of 9.
- e) Magor area (Figure 3h): 67 nest tubes surveyed for 7 months = a score of 32.

2.1.11 In 2015, surveys were continued both where dormice had been recorded in 2014 and where survey scores had been less than 20. Furthermore, new nest tube surveys were undertaken as follows:

- a) Minnett's Lane, Figure 3i\*: 188 nest tubes surveyed for 5 months = a score of 67.
- b) Knollbury, Figure 3h\*: 135 nest tubes surveyed for 5 months = a score of 48.
- c) Gwent Levels (Pye Corner and Tata Steel site, Figures 3e and 3f\*, respectively): 10 nest tubes surveyed for 8 months = a score of 4.8; 90 nest tubes surveyed for 3 months = a score of 19.8. Total score = 24.
- d) North of the M4 and east of Junction 29, Figure 3a: 2 survey areas due to the distance between each and limited connective habitat. 83 nest tubes surveyed for 6 months = a score of 33.2; 42 nest tubes surveyed for up to 7 months. Total score = 32.
- e) North of the M4, west of Junction 29, Figure 3a\*: 65 nest tubes surveyed for 5 months = a score of 23.
- f) South of the M4, west of Junction 29, Figure 3a\*: 95 nest tubes, with 29 surveyed for 6 months (= a score 11.6) and 66 surveyed for 5 months (= a score of 23.76). Total score = 35.

*\* nest tube locations considered as one survey area due to their proximity to each other and the presence of suitable connective habitat.*

2.1.12 In addition, in order to assess the value of the off-site woodland at Coed Mawr as a potential receptor site, in May 2016, 500 nest tubes were installed, as shown on Figure 4 of this evidence, in order to obtain coverage of all habitat types across the site. Nest tubes were surveyed from June until November 2016. Habitat mapping and condition assessments were also undertaken (see Figure 7), and this is due to be updated in more detail in Spring 2017 in order to determine how many translocated dormice the wood may be able to accommodate.

2.1.13 Taking into account the survey effort scores above, it is my professional opinion that the nest tube survey effort has been sufficient to inform a detailed assessment of the potential impacts of the scheme upon dormice. It has also been augmented by the additional nut searches and habitat assessments.

## **2.2 Consultation**

2.2.1 The consultation process is summarised in the evidence provided by Mr Matt Jones (WG1.1.1). Evidence provided by Dr Keith Jones (WG1.18.1) summarises the consultation in relation to ecology and nature conservation, other than that relating specifically to water voles and hazel dormice, which is discussed below.

### **Natural Resources Wales (NRW)**

2.2.2 A meeting, hosted by myself, was held between Hyder and NRW on the 30 January 2015 (Appendix 9.1 of the EIA Scoping Report, which is Appendix 5.1 to the March 2016 ES (Document 2.3.2)).

2.2.3 During the meeting, NRW reported their interest in water vole survey results that had confirmed activity in locations where the species had not previously been known to be present, in particular to the west of the Rivers Usk and Ebbw. NRW agreed that the water vole survey work carried out in 2014 could inform the EIA (by establishing the context of the population across the Levels) and that the 2015 surveys should concentrate on areas along the Scheme footprint not previously surveyed (for example, due to previous access restrictions).

2.2.4 With regard to hazel dormice, it was agreed that the 2014 surveys of the Gwent Levels needed to be completed in 2015, that additional survey was required at the eastern end of the Scheme, and that the rest of the survey effort should focus on those areas where the updated

Phase 1 habitat survey had identified a potential need for more dormouse survey work, although it was considered unlikely there would be much more habitat to survey.

2.2.5 Discussions during this January 2015 meeting, along with the results of a review of the 2014 survey reports, informed the Ecological Scoping Report for the 2015 ecological surveys (Appendix 5.1 to the March 2016 ES (Document 2.3.2)). A draft of the report was discussed with NRW on the 9 April, 12 May and 15 May 2015. NRW's comments were taken into account in the final survey scope.

2.2.6 NRW's formal response to the 2015 Scoping Report was provided in a letter of 18 September 2015. In relation to water voles, NRW highlighted the importance of consulting with GWT and the Water Vole Steering Group. In addition, NRW stated "*We support the proposals with respect to protected species... NRW are of the opinion that the current proposals should identify species presence within the scheme boundary and provide an assessment of the impacts that the scheme by itself would have on these protected species*".

2.2.7 A series of consultation meetings have subsequently been held with NRW since March 2016, a schedule of which is appended to the Proof of Evidence of Mr Peter Ireland (WG1.7.1).

2.2.8 NRW wrote to the Welsh Government on 4 May 2016 in response to the consultation on the Draft Orders and supporting documents. They stated that, with the information provided, they were unable to agree with the conclusions of the ES that adverse effects on water voles and hazel dormice could be avoided. They therefore requested comprehensive strategies for the conservation of both species.

2.2.9 Draft mitigation strategies for water voles and hazel dormice have been developed in consultation with NRW. These draft mitigation strategies

were published as Appendices SS10.7 and SS10.4, respectively, in the December 2016 ES Supplement (Document 2.4.14). With regard to dormice, the final strategy will form the basis of an NRW European Protected Species (EPS) licence application for hazel dormouse.

2.2.10 NRW also requested confirmation that the proposed SSSI mitigation land at Caldicot Moor would be suitable for translocated water voles. This is addressed in the revised *Draft SSSI Mitigation Strategy* which was also published in the December 2016 ES Supplement (Document 2.4.14).

### **Gwent Wildlife Trust (GWT)**

2.2.11 On the 11 October 2016, RPS met with Alice Rees (GWT Water Vole Project Officer) and Gemma Bode (GWT Gwent Levels Living Landscape Manager) in order to discuss the following issues: the content of the M4CaN *Draft Water Vole Mitigation Strategy*; GWT's experience of water vole populations on the Gwent Levels; any concerns they may have with regard to the Scheme and their Water Vole Reintroduction Programme; and any opportunities for the Scheme and GWT to work together for water vole conservation in the area.

2.2.12 GWT reported that the results of their surveys have highlighted a movement of water voles northwards across the Scheme along several watercourses. This has been taken into account in the mitigation measures described below in order to facilitate continued dispersal of individuals in this direction.

2.2.13 It was agreed that the results of on-going surveys, undertaken by both parties, would be exchanged in order to ensure up-to-date baseline conditions are taken into account in both the mitigation strategy (as it develops) and any other conservation measures in the area.

2.2.14 Communications are on-going with GWT, and it is expected that collaboration would continue in order to ensure that the final mitigation strategy effectively takes into account GWT's knowledge of the local water vole population and the area, including habitat enhancement measures planned by GWT for the benefit of water voles.

### **Bristol Zoo**

2.2.15 During a meeting between RPS and Bristol Zoo on the 12 September 2016, Bristol Zoo confirmed their ability to assist with any potential temporary dormouse captivity programme. Consultation is ongoing and a detailed method statement would be included in the final *Hazel Dormouse Mitigation Strategy* (a draft was published as Appendix SS10.4 of the December 2016 ES Supplement (Document 2.4.14)).

2.2.16 The Scheme has also consulted with Bristol Zoo with regard to any temporary captivity of water voles. The Zoo is particularly suited to a temporary captive programme due to the fact they:

- a) Hold a BALAI approval licence;
- b) Have experience of water vole captive breeding and translocations;
- c) Have a team of on-site veterinarians who would be available to monitor the health of the water voles whilst in captivity; and
- d) Are located relatively close to the Scheme, enabling any transfer from site to the zoo to be completed during the day of capture.

2.2.17 Water voles (and also dormice, if necessary) would be located at Bristol Zoo's "Wild Space", an area of farmland owned by the Zoo, with ample space to care for a breeding population of captive water voles. It is located to the north of Bristol and is therefore readily accessible from the M4. Bristol Zoo has confirmed in principle their ability to assist the Scheme, and consultation is on-going with regard to the development of a detailed method statement for the period of captivity. The method statement would be developed in accordance with The Water Vole

Mitigation Guidelines (Dean *et al.* 2016), which includes a section on the care of captive animals. The final Water Vole Method Statement would include the method statement for captivity and captive breeding, and this would be agreed in advance with NRW.

### **Paignton Zoo and PTES**

- 2.2.18 On behalf of the Welsh Government, on the 1 February 2016, RPS contacted Neil Bemment, Co-ordinator of the dormouse captive breeding programme at Paignton Zoo that supports the Natural England Dormouse Reintroduction Programme.
- 2.2.19 A meeting was subsequently held, on 18 January 2017, with Neil Bemment and with Ian White (of the People's Trust for Endangered Species, PTES). A note of this meeting is appended to this Proof. In the meeting, it was agreed that direct translocation to Coed Mawr would be the best option, with any 'excess' dormice (should insufficient receptor habitat be available) being made available to the Common Dormouse Captive Breeders Group (CDCBG). Evidence for the effectiveness of dormouse bridges was also shared by PTES. It was agreed in the meeting that there is the potential for a long-term beneficial effect on the local dormouse population as a result of the M4CaN Scheme, through the creation of a new population at Coed Mawr, increased habitat availability through the Scheme landscape planting, and through increased links across the motorway.
- 2.2.20 Consultation is ongoing with regard to the provision of technical advice and expertise for any temporary captivity or captive breeding programme the Scheme may require, as well as the potential to provide temporary holding sites for captive dormice. However, Bristol Zoo remains the most likely location for holding dormice in captivity, should this be required.

### **3 Baseline Conditions**

#### **3.1 Water Vole**

##### **Desk Study Results – Water Vole**

- 3.1.1 The summary results of the desk study are shown on Figure 1 of this evidence. No sites were reported to have been designated due to the presence of water voles. However, approximately 700 m from the Scheme is GWT's Magor Marsh Nature Reserve, where over 200 captive-bred water voles were released in 2012 and 2013.
- 3.1.2 In addition, several records of water voles were reported by SEWBRc, all of which were located to the east of the River Usk and predominantly from the area of the GWT Magor Marsh Nature Reserve.

##### **Field Survey Results – Water Vole**

- 3.1.3 The results of the 2014 - 2015 field surveys are shown on Figure 2 of this evidence. These results confirmed the presence of water voles both to the east and west of the River Usk. Activity levels were by far the greatest in and around the GWT Magor Marsh Nature Reserve, with water vole burrows (shown in purple on the figures) recorded throughout areas of suitable habitat. This is considered likely to be a direct result of GWT's reintroduction project.
- 3.1.4 As the habitat quality at the eastern end of the survey area is generally optimal, it is likely that territories here are relatively small. Elsewhere across the survey area, water vole signs were relatively scattered, indicating less well-established populations.

### **Evaluation – Water Vole**

- 3.1.5 Recognising that the water vole is a protected species, that the species was previously thought to have disappeared from the Gwent Levels, and that the population here is now robust and increasing as a result of the work of the Gwent Wildlife Trust, the population in the area of the new section of motorway is considered to be of County (Medium) value.

### **3.2 Hazel Dormouse**

#### **Desk Study Results – Hazel Dormouse**

- 3.2.1 The results of the desk study for dormice are shown on Figure 6 of this evidence. The desk study confirmed the presence, to the west of M4 Junction 29 (and just off Figure 6), of one non-statutory designated site selected due to the presence of dormice, the Nant Mwlan Wood Site of Importance for Nature Conservation (SINC). The majority of the desk study records related to areas to the north of the M4 corridor.
- 3.2.2 Information provided by Jacobs reported the presence of dormice within nine of the 11 woodlands surveyed adjacent to the M4 Widening scheme (from Junction 29 to 32). Dormouse surveys undertaken by Arup in 2007/8 confirmed the presence of dormice at four sites around Gwaunshonbrown Farm and Penylan Farm in Castleton. No records were reported from the Gwent Levels.

#### **Field Survey Results – Hazel Dormouse**

#### **Nut Search Results**

- 3.2.3 The results of the nut search are shown on Figure 5 of this evidence. Dormouse-opened hazelnuts were only located in the Castleton area (see area reference O, on Figure 5a).  
Nest Tube Survey
- 3.2.4 The results of the 2014 and 2015 nest tube surveys are shown on Figure 3 of this evidence. These surveys confirmed the presence of an apparently strong meta-population of hazel dormice in the New Park Farm and Castleton areas at the western end of the Scheme (Figure 3a/b). Sub-populations are likely to be small, as suitable habitat is limited by the overall size of the woodlands present. However, the survey results indicate there is a possible meta-population of dormice which is likely to benefit from the habitat connectivity along the existing M4.
- 3.2.5 The results also suggested the presence of a dormouse population on and adjacent to the Tata Steel Llanwern Steelworks site (Figure 3f/g). The population is, however, likely to be small due to the limited amount of good habitat on this site and in the surrounding Levels, the absence of good habitat connectivity, the presence of the A4810 road and deep boundary reens that would present a barrier to movement, and the presence of heavily built-up areas to the north. Further surveys are proposed here in 2017 in order to better understand dormouse distribution and abundance in this area.
- 3.2.6 Dormice were also recorded at the eastern end of the Scheme around Knollbury, to the north of Magor (Figure 3h), and a possible dormouse nest was located at Minnett's Lane, along the proposed haul road to Ifton Quarry (Figure 3i). The subsequent surveys, in 2016, have also recorded the presence of dormice between the M4/M48 at the eastern end of the Scheme (nut search Area H on Figure 3h).

- 3.2.7 Individuals are considered likely to be part of a scattered sub-population due to the limited availability of significant parcels of woodland in the immediate area. The main population, from which the individuals are likely to have originated, is considered likely to inhabit the larger parcels of woodland to the north.
- Coed Mawr Survey Results
- 3.2.8 No characteristically-chewed nuts have been recorded during the hazel nut searches at Coed Mawr woodland, the proposed receptor site for translocated dormice, although one probable dormouse nest was located in an area of naturally-regenerating scrub at the south-eastern tip of the woodland, where conifers had been felled around five years previously. No other signs of dormouse presence have been recorded during the nest tube surveys.
- 3.2.9 Findings of some initial broad habitat mapping and suitability assessment of Coed Mawr are shown on Figure 7 of this evidence. Results show a diversity of age structures and habitat types, including habitats of potential value to dormice. By comparing habitat maps produced by the Forestry Commission (now NRW) (Figure 8 of this evidence) and 2015 habitat maps (Figure 7), it is evident that changes have occurred over recent years as a result of conifer clearance.
- 3.2.10 Recent habitat changes, along with the distance between Coed Mawr and the closest woodland where dormice have been recorded (Figure 6 of this evidence), would explain why only one probable nest has been located in Coed Mawr. The natural spread of populations is a slow process (Chanin, 2014).
- 3.2.11 Detailed habitat mapping is currently being undertaken by the project team, along with a review of NRW's current Forest Plan for the site, and the results will inform the final assessment of Coed Mawr with regard to its likely suitability as a receptor site. It is currently considered

that Coed Mawr is a suitable receptor site, and that the value of the woodland for dormice will continue to increase as conifer plantation gives way to broad-leaved woodland.

### Population Size Estimates

3.2.12 Bright *et al.* (2006) (Document 11.3.5) suggests that a typical dormouse home range could cover approximately 1 to 1.5 hectares of woodland, or 300 m of hedgerow, but that in optimal habitat the mean population density in spring could be up to 10 adults per hectare. In contrast, the National Dormouse Monitoring Programme suggests an average population density of between 1.75 and 2.5 adults per hectare of favourable habitat. The People’s Trust for Endangered Species (PTES) suggest that the home range of a female is up to 1 hectare (with those of males overlapping several female home ranges), and that under optimal conditions, population density could be between 3 and 5 adults per hectare.

3.2.13 Given the above, it would seem reasonable to assume that dormouse densities across the areas to be lost are likely to range from around 1 per hectare to 5 per hectare, given that the habitats to be lost vary in suitability. Taking that into account, estimates of potential dormouse population sizes within the areas to be lost are provided in Table 1 below.

**Table 1:** Dormouse Habitat Area and Population Size Estimates

Location	Vegetation type	Habitat size (ha/m)	Estimate of population size
Castleton and New Park population, Figure 3a	Broadleaved woodland (semi-natural and plantation)	11.52 ha	<b>15 adults</b> (based on 1 adult/ha) – <b>approximately 75 adults</b> (based on 5 adults/ha).
	Mixed plantation	1.72 ha	
	Continuous/dense	0.9 ha	

Location	Vegetation type	Habitat size (ha/m)	Estimate of population size
	scrub		
	Hedgerow	1,894 m	<b>6 adults</b> (based on 1 adult/300 m).
Tata Steel Llanwern Steelworks, south of the A4180, Figure 3f/g	Broadleaved woodland (semi-natural and plantation)	1.21 ha	<b>18 adults</b> (based on 1 adult/ha) – <b>90 adults</b> (based on 5 adults/ha).
	Mixed plantation	0.01 ha	
	Continuous/dense scrub	17.01 ha	
	Hedgerows	1,909 m	<b>6 adults</b> (based on 1 adult/300 m)
Magor/Knollbury/north of Undy, Figure 3h	Broadleaved woodland (semi-natural and plantation)	1.96 ha	<b>2 adults</b> (based on 1 adult/ha) – <b>10 adults</b> (based on 5 adults/ha).
	Hedgerows	1,502 m	<b>5 adults</b> (based on 1 adult/300 m)
Minnett's Lane, Figure 3i	Hedgerow	54 m	<b>1 adult</b> (based on 1 adult/300 m)

### Evaluation – Dormice

3.2.14 There is an apparently strong population of dormice in the area of the Castleton Interchange which is associated with the extensive mature tree planting around the existing junction, and there are additional occurrences of the species to the south of the Tata Steel Llanwern Steelworks and to the north of Magor.

3.2.15 Recognising the protected status of the species, and its inclusion in the Newport Local BAP, the population of dormouse in the area of the M4 is considered to be of County (Medium) value.

## 4 Potential Impacts of the Scheme *Without* Mitigation

### 4.1 Water Vole

4.1.1 Taking into account the results of water vole surveys, without appropriate mitigation the Scheme would result in the following potential impacts:

- a) Loss of habitat (temporary and permanent) of value to water voles;
- b) Impact on the quality of habitat of value to water voles by airborne and run-off pollutants during construction and/or operation;
- c) Temporary and permanent disturbance and disruption to water vole movement due to the physical presence of the construction site and new road, and subsequent population fragmentation; and
- d) Injury and fatality of animals during construction and/or operation.

4.1.2 With regard to habitat loss, the lengths of watercourses where water vole burrows have been recorded (marked in purple on Figure 2) which would be lost to construction (temporarily and permanently) are provided below. Estimates of the number of female home ranges that could be affected are also provided, taking into account the fact that a female water vole's home range is typically between 50 and 150 m of watercourse length.

#### **West of the River Usk**

- a) Percoed Reen WV10/12, Figure 2a/b: 197 m – **between 1 and 4 female home ranges affected.**

**East of the River Usk**

- a) Monk's Drain WV48 (and adjacent ditch), Figure 2d: 239 m – **between 1 and 5 female home ranges affected.**
- b) Middle Road reen WV75, Figure 2d: burrows located outside working area, watercourse 227 m - **possibly only 1 overlapping female home range affected** (only very small overlap into area where burrows were recorded).
- c) Cock Street Reen WV100, Figure 2d/e: 96 m – **between 1 and 3 female home range affected** (the area is relatively densely populated so potential to have smaller home range sizes).
- d) WV110, Figure 2e: 20 m – **part of 1 female home range affected.**
- e) WV126, Figure 2e: 85 m – **approximately 1 female home range affected.**
- f) WV135, Figure 2e: 126 m – **between 1 and 3 female home ranges affected.**

4.1.3 In addition, the lengths of watercourses which would be lost to construction (temporarily and permanently) where signs of water vole activity (but no burrows) have been recorded (marked in yellow on Figure 2) are listed below:

**West of the River Usk**

- a) WV17, Figure 2b: 74 m - **approximately 1 female home range affected.**

**East of the River Usk**

- a) Ellen Reen WV44, Figure 2c: 236 m - **between 1 and 5 female home ranges affected.**
- b) WV50, Figure 2d: 146 m - **between 1 and 3 female home ranges affected.**

- c) Elver Pill Reen WV72, Figure 2d: activity recorded *outside* working area, watercourse 80 m - **1 female home range may be affected.**
- d) Middle Road Reen Diversion WV80, Figure 2d: 312 m – **between 2 and 6 female home ranges affected.**
- e) WV111, Figure 2e: 255 m – **between 1 and 5 female home ranges affected.**
- f) WV119, Figure 2e: 97 m – **between 1 and 2 female home ranges affected.**
- g) WV125, Figure 2e: 125 metres - **between 1 and 3 female home ranges affected.**
- h) WV130, Figure 2e: 38 m - **approximately 1 female home range affected.**
- i) WV131, Figure 2e: 16 m – **approximately 1 female home range affected.**
- j) WV138, Figure 2e: 82 m – **approximately 1 female home range affected.**

3.2.16 Given the above, it would seem reasonable to assume that the number of female home ranges that could potentially be affected by the works could vary between 19 and 49, approximately. A more up-to-date assessment of the number of water voles that might need to be displaced or translocated will be possible following the further water vole surveys planned for 2017. This work will inform development of the final *Water Vole Mitigation Strategy* and will be required for the Method Statement for the water vole conservation licence.

## 4.2 Hazel Dormouse

4.2.1 Taking into account the results of the hazel dormouse surveys, without appropriate mitigation the Scheme could result in:

- a) Loss of habitat of value to dormice due to construction;

- b) Displacement, disturbance and disruption to the movement of dormice due to construction;
- c) Permanent disruption to dormouse movement, and thus population fragmentation, during operation due to the loss of habitat and the physical presence of the new road;
- d) Disturbance of habitats of value to dormice from run-off of pollutants and dust deposition during construction and/or operation; and
- e) Injury or fatality of animals during construction and/or operation.

4.2.2 The amount of habitat that would be lost is set out above in Table 1 (in Section 3.2), along with an estimate of the numbers of dormice that might be affected (based on a range of densities from 1 per hectare to 5 per hectare). In total, I therefore estimate that between 53 and 193 dormice might be affected by habitat loss, and would therefore require displacement or translocation. Ian White of PTES and Neil Bemment of Paignton Zoo have suggested that a figure of around 100 individuals is probably most likely in their experience (see the note of the 18 January 2017 meeting in the Appendices), and this is roughly the number I would expect. However, the dormouse mitigation strategy will need to have sufficient flexibility to cope with more animals than this, if necessary.

4.2.3 Measures to mitigate the above potential effects are discussed in the next section of my Proof of Evidence.

## **5 Mitigation**

### **5.1 Introduction**

- 5.1.1 The Proof of Evidence provided by Mr Matt Jones (WG1.1.1) describes the process of option selection and design, and Chapter 4 of the March 2016 ES (Document 2.3.2) outlines the main alternatives considered and the main reasons for the key elements of the Scheme. The Proof of Evidence provided by Peter Ireland describes the mitigation hierarchy followed by the Scheme (i.e. avoid, reduce and/or remedy or offset).
- 5.1.2 Mitigation specifically relating to water voles and hazel dormice is described below. Additional ecology-related mitigation incorporated into the Scheme is described in the proof of Evidence of Dr Keith Jones (WG1.18.1), Mr Richard Green (with regard to bats) (WG1.20.1) and Dr Simon Zisman (with regard to birds) (WG1.21.1).

### **5.2 Water Vole**

#### **Avoidance**

- 5.2.1 Where practicable, loss of watercourses that are of known and potential value to water voles has been avoided through retention and culverting.

#### **Draft Water Vole Mitigation Strategy**

- 5.2.2 A *Draft Water Vole Mitigation Strategy* has been developed in consultation with NRW and GWT, and was published as Appendix SS10.7 to the December 2016 ES Supplement (Document 2.4.14). The strategy includes: the detailed mitigation measures summarised below; contingency plans; measures to ensure delivery of the strategy;

responsibilities; monitoring; and independent auditing. The strategy is designed to be flexible in order to enable the results of monitoring (below) to be incorporated into ongoing management.

- 5.2.3 The overall aim of the strategy is to ensure:
- a) The availability of sufficient habitat for water voles in the long-term;
  - b) The maintenance and enhancement of the local population in the long-term; and
  - c) No significant adverse effect on the status of the local population.
- 5.2.4 The principles and methodologies set out in the draft strategy, along with the results of pre-construction surveys, will inform the *Final Water Vole Mitigation Strategy* for the Scheme. This document is included in the M4CaN Register of Environmental Commitments Update (Appendix SR18.1 to the December 2016 ES Supplement (Document 2.4.14)).

### **Pollution Control**

- 5.2.5 Water pollution could affect water vole populations as described above. Evidence provided by Richard Graham (Document 1.15.1) identifies measures to minimise the potential for water pollution during construction and operation. This confirms that construction would be undertaken in accordance with the *pre-Construction Environment Management Plan (Pre-CEMP)* (Appendix SR3.2 of the December 2016 ES Supplement (Document 2.4.14)). The final CEMP will include the following:
- a) *Pollution Prevention Plan* (construction)
  - b) *Site Waste Management Plan* (SWMP)
  - c) Soil Handling Methodology
  - d) *Surface Water Management Plan* (SWMP)
  - e) *A Groundwater Management Plan* (GMP)

- f) *Contamination Discovery Strategy*
- g) *Remediation Strategy* (Draft provided at Appendix 11.2 to the March 2016 ES (Document 2.3.2))
- h) *Pollution Incident Emergency Response Plan*

5.2.6 The *CEMP* would be updated prior to construction and agreed with NRW, Monmouthshire County Council (MCC) and Newport City Council (NCC). Operational pollution would be managed in accordance with the operational surface water run-off strategy (Chapter 16 to the March 2016 ES (Document 2.3.2)) and the *Operational Drainage Strategy Report* (Appendix 2.2 to the March 2016 ES (Document 2.3.2)).

5.2.7 Water Treatment Areas (WTAs) would be constructed along the Scheme in order to ensure operational discharge meets both DMRB and regulatory requirements for protection against significant adverse effects on the aquatic ecosystems of the Gwent Levels.

5.2.8 The drainage system would provide comprehensive pollution control measures, and would cater for a 1 in 100-year storm event plus a 30% allowance for climate change. Any storm greater in magnitude than this would be considered to dilute pollutants to insignificant levels, such that any pollution would be negligible.

5.2.9 In addition, proposals for the SSSI Mitigation Areas, as included in the revised *Draft SSSI Mitigation Strategy* (Appendix SR10.35 of the December 2016 ES Supplement (Document 2.4.14)) also include arable reversion to species-diverse grassland, which would reduce pollution from agricultural practices in these areas.

5.2.10 A discussion of the SSSI Mitigation Areas is provided in Dr Keith Jones's Proof of Evidence (WG1.18.1). Management would be in accordance with *Mitigation Area Management Plans*, to be agreed with

NRW in advance of the commencement of construction. The *SSSI Mitigation Strategy* is included in the Register of Environmental Commitments Update (Appendix SR18.1 to the December 2016 ES Supplement (Document 2.4.14)).

### **Flood Management**

5.2.11 Flooding can be a major threat to water vole populations. However, as described above, the drainage system would cater for significant storm events, as well as climate change, so any contribution of the Scheme to flooding is not considered (as set out in the ES) to be a significant risk.

### **Fencing**

5.2.12 As shown on the revised Environmental Master Plan (EMP) (Figure R2.6 to the September 2016 ES Supplement (Document 2.4.4)), permanent mammal fencing would be provided along most of the length of the new section of motorway, other than the elevated section through Newport Docks and the viaduct to the east of the Usk. This operational-phase fencing, along with construction-phase fencing, would help protect retained water vole habitat from damage or disturbance.

### **Pre-Construction Surveys**

5.2.13 Water vole surveys of all watercourses crossed by the Scheme, as well as those within a surrounding 100m-wide buffer zone, will be undertaken in 2017 with regard to guidelines published in Strachan *et al.* (2011) (Document 11.3.16). Results of the surveys would inform the *Final Water Vole Mitigation Strategy*.

5.2.14 In addition, immediately prior to the commencement of any works in an area that would impact upon waterbodies of known or potential value to water voles, appropriately-experienced ecologists would survey the waterbodies in order to confirm the presence/absence of water voles. Results of the survey would inform the final *Water Vole Mitigation Strategy* and the need to displace or translocate water voles prior to the commencement of works in an area (as described below). The survey would be undertaken in accordance with Strachan *et al.* (2011) (Document 11.3.16).

### **Enhancement of Existing Retained Watercourses**

5.2.15 Watercourses that would be required as receptor sites for displaced or translocated water voles would be enhanced as necessary in accordance with the final *Water Vole Mitigation Strategy*. Measures of enhancement would likely include the following:

- a) Re-profiling of banks, with creation of berms at high water-level;
- b) Removal of scrub to prevent over-shading;
- c) Spreading of material from watercourses in the construction site or elsewhere (e.g. by NRW as part of their annual maintenance works) along watercourses to be enhanced, to facilitate early establishment of vegetation;
- d) Potential use of pre-planted coir rolls/pallets for quicker vegetation establishment; and
- e) Mink control, where necessary and in conjunction with GWT.

5.2.16 As described in the revised *Draft SSSI Mitigation Strategy* (Appendix SR10.35 of the December 2016 ES Supplement (Document 2.4.14)), SSSI Mitigation Areas would be considered as potential receptor sites for water voles from working areas (i.e. if displacement to adjacent watercourses is not suitable).

- 5.2.17 Water vole activity was recorded at both Tatton and Maerdy Farm SSSI Mitigation Areas during the 2014 and 2015 surveys (Figure 2 of this evidence). Limited activity was recorded along the footprint of the Scheme in these areas, and the low number of burrows recorded indicated populations were small. Habitat suitability assessments in 2014 (see the March 2016 ES (Document 2.3.2)) reported the presence of low-quality watercourses on the farms that would benefit from enhancement (such as the removal of overhanging bankside scrub to enable light to reach banks and margins, and re-profiling to include berms/ledges of value for feeding and latrine sites).
- 5.2.18 In addition, Caldicot Moor SSSI Mitigation Area, which has been drained for agricultural use, offers the potential to increase the amount of favourable habitat in the area for the benefit of water voles (for example, by removing below-ground drains and re-excavating previously in-filled watercourses, and enhancing existing watercourses, again by removing bankside scrub/hedgerows and re-profiling banks).
- 5.2.19 Arable reversion on both Maerdy Farm and Caldicot Moor, and subsequent management of grassland with very low (or no) inputs, would also reduce the existing pollution impacts of farming practices, and thus help to restore the water quality for the benefit of water voles.
- 5.2.20 No water voles would be displaced or translocated to receptor sites until it has first been confirmed that they are in favourable condition, as detailed in the *Draft Water Vole Mitigation Strategy* (Appendix SS10.7 of the December 2016 ES Supplement (Document 2.4.14)).

## Culverts

- 5.2.21 Given the mobile nature of water voles, the fact that they are utilising waterbodies immediately adjacent to the Scheme, and the reports from GWT that confirm movement of water voles to the north of the Scheme, safe crossing points (in the form of both pipe and box culverts) would be installed throughout the Scheme. This would help water voles access habitat to the north and south of the new road, thereby minimising the potential effects of habitat severance and population fragmentation.
- 5.2.22 Culverts would be installed as described in the *Revised Drainage Strategy* (Appendix 2.2 to the September 2016 ES Supplement (Document 2.4.4)), *Reen Mitigation Strategy* (Appendix 2.3 to the March 2016 ES (Document 2.3.2)) and Chapter 2 of the March 2016 ES (Document 2.3.2), and in the locations shown on Figure 2 of this Proof.
- 5.2.23 Water voles are known to utilise culverts beneath roads (Strachan *et al.* 2011 (Document 11.3.16) and Dean *et al.* (2016)). Dean *et al.* (2016) reported observing water voles utilising circular culverts of 1200 mm diameter with 300 mm headroom above normal water-level. It has been suggested that box culverts under roads could be better for water voles than pipe culverts, which have diminishing headroom when filling with water (Bassett, 2013). Therefore, the use of box culverts, with the dimensions as shown on Figure 2 of this evidence, and minimum freeboards of 200 mm above reen summer penning levels, will help to encourage use.
- 5.2.24 Taking into account the apparent value of some reens with regard to the movement of water voles to the north of the Scheme, as reported by GWT during a consultation meeting on the 11 October 2016, mammal ledges would be installed along the internal length of key box

culverts to encourage use and minimise any potential impact on water vole movement.

5.2.25 In addition to culverts, dry mammal crossings (pipes of 900 mm diameter installed above high-water level) would also be constructed along the Scheme. These potential crossing points would be located adjacent to culverts, as well as at other stand-alone locations, as shown on Figure 2; whilst they are less likely to be used by water voles than culverts, the potential does exist that they could provide safe passage under the Scheme.

5.2.26 Culverts and mammal crossings would be constructed as soon as practicable in order to minimise the potential impact on water vole movement (this is set out in detail in the Buildability Report, Appendix SR3.1 to the December 2016 ES Supplement (Document 2.4.14)).

### **Construction of Waterbodies**

5.2.27 Taking into account results of the 2014 and 2015 water vole surveys (Figure 2 of this evidence; Appendices 10.8 and 10.25 to the March 2016 ES (Document 2.3.2)), the Scheme would result in the loss of 21 sections of watercourses and one reed bed (on Tata Steel Llanwern Steelworks land) where signs of water vole activity have been recorded. In addition, 14 watercourses where signs of water vole activity have been recorded would be at risk of damage or habitat loss during construction due to their proximity to the Scheme.

5.2.28 As explained in the revised *Reen Mitigation Strategy* (Appendix S2.1 to the September 2016 ES Supplement (Document 2.4.4)), the above losses, combined with all other watercourse losses along the Scheme, would amount to 2,755 m of reens and 9,373 m of field ditches to be in-filled or culverted for construction.

- 5.2.29 To mitigate for this loss, a total of 2,826 m of new reens and 10,594 m of new field ditches would be created; this represents a loss:replacement ratio of 1:1.06 for reens and 1:1.08 for ditches (effectively 1:1).
- 5.2.30 As described in the evidence provided by Dr Keith Jones (WG 1.18.1), the ratio of lost:constructed is a result of concerns expressed by NRW that the originally proposed replacement figures (7,610 m new reens and 11,800 m new ditches) could have adverse effects on the hydrology of the Levels.
- 5.2.31 In addition, the revised *Draft SSSI Mitigation Strategy* (Appendix SR10.35 of the December 2016 ES Supplement (Document 2.4.14)) includes for the re-excavation of some 5,865 m of former ditches at Maerdy Farm and Caldicot Moor. Management would take into account requirements of water voles and would be detailed in the *Mitigation Area Management Plans*.
- 5.2.32 Taking into account the ditch construction proposed for the SSSI Mitigation Areas, the updated ratio of ditch loss:construction would be 1:1.76. This therefore represents a net increase in suitable habitat for water voles.
- 5.2.33 New reens associated with the new section of road would be provided along the north of the new road, in order to connect those reens cut off by the new road to sluices for continued management of water-levels. As explained by Mr Ben Sibert in his evidence (WG1.5.1), new reens and ditches would not form part of the direct motorway drainage system, to avoid contamination with pollutants.
- 5.2.34 The detailed methodology for constructing watercourses would be included in the CEMP (based on the *Pre-CEMP*, Appendix SR3.2 of the December 2016 ES Supplement (Document 2.4.14)). It is proposed

that reens would be 2.0 m deep and approximately 5.7 m wide at the surface. The slope of the banks would be approximately 1 in 1 (as recommended in Strachan *et al.* 2016) and would include berms of 0.7 m. New ditches would be 1 m deep and 2.5 m wide, and would also have banks with 1 in 1 slopes. However, continuing advice would be sought from NRW regarding final specifications. Ditches would connect to the nearest main reens.

5.2.35 Watercourses to be used as receptor sites for displaced/translocated water voles (as described below) would be established to favourable condition for water voles in advance of displacement/translocation. Favourable condition would be confirmed by the Environmental Clerk of Works (ECoW) prior to use.

5.2.36 If required, where practicable and with NRW approval, the banks of replacement watercourses that would be constructed during the enabling works phase in 2018 could be 'seeded' with plant material or soils taken from reens and ditches to be removed, and/or watercourses managed by NRW in the surrounding area. Care would be taken to ensure invasive species are not transferred to the new watercourses. As discussed above, pre-construction surveys would be undertaken in order to confirm suitable donor sites.

5.2.37 The provision of berms, and the absence of bankside hedgerows or scrub that could over-shade watercourses, would help to encourage the development of marginal and emergent plants of value to water voles. Berms would also provide potential feeding platforms and latrine sites for water voles to mark their territories.

5.2.38 In addition to watercourses that would be lost, 6.59 hectares of reedbed would also be affected, of which 3.19 hectares would represent permanent loss. New Water Treatment Areas (WTAs) would be constructed along the Scheme, and these would include 9.4

hectares of ponds and 9.9 hectares of reedbeds, as described in the revised *EMP* (Figure R2.6 to the September 2016 ES Supplement (Document 2.4.4)). Whilst the primary purpose of these WTAs is to treat run-off from the new road, and therefore they are not considered as an integral part of the water vole mitigation strategy, the pond and reedbed habitat they support would nevertheless be of potential value to water voles.

### **Water Vole Displacement and Translocation**

- 5.2.39 Displacement and translocation would be undertaken in accordance with the methodology described in Dean *et al.* (2016) and with regard to any advice provided by NRW and GWT during the consultation process. The methodology would be detailed in the *Water Vole Mitigation Strategy* (a draft of which was presented as Appendix SS10.7 in the December 2016 ES Supplement (Document 2.4.14)).
- 5.2.40 The strategy would include: receptor site preparation in advance of use; habitat management for displacement and clearance; and water vole capture, translocation and soft-release into receptor sites. Where necessary, water voles would be transferred to NRW-approved temporary holding sites (potentially including Bristol Zoo's water vole facility) until favourable receptor sites are available.
- 5.2.41 Due to the fact that water voles along the Scheme form part of a larger population that inhabits the Gwent Levels, and that the majority of the watercourses across the Levels are well connected, displacement into adjacent watercourses could be suitable where:
- a) Habitat loss or disturbance would affect no more than 50 m\* of a water vole's home range (on each side of the same watercourse) or 30 m where the density of the water vole

population is large (e.g. more than one latrine per 5m of bank);  
and

- b) Adjoining sections of retained/undisturbed watercourses (within the same home range where possible) contain favourable habitat or favourable habitat could be created prior to displacement.

*\* In a meeting with NRW on 28 November 2016 it was suggested that this figure could be relaxed slightly in order to reduce the number of animals that would need to be taken into captivity (as NRW consider translocation to be a 'last resort').*

5.2.42 However, where habitat in adjoining watercourses is unfavourable to water voles and/or cannot be enhanced to favourable condition ahead of works that would result in the displacement of water voles, a capture and translocation to receptor sites elsewhere within the land take area would be undertaken (or a translocation to an NRW-approved temporary holding site would be undertaken until favourable receptor sites are available).

5.2.43 Any temporary captivity of water voles would be managed in accordance with a detailed method statement to be pre-approved by NRW.

5.2.44 Receptor sites would be located so as to ensure water voles would have open access to the Levels to the south of the new road. The location would be informed by pre-construction surveys and agreed in advance with NRW.

### **Habitat Management Responsibilities**

5.2.45 Management responsibilities are discussed in the evidence provided by Dr Keith Jones (WG1.18.1). In summary, management and maintenance of new watercourses would be the responsibility of the Contractor for the first five years after the completion of construction,

after which the South Wales Trunk Road Agent (SWTRA) would take over the management of planting within the operational boundary of the Scheme as well as the maintenance of culverts and mammal crossings. In addition, the management of replacement watercourses located outside the operational boundary of the new road but within the land take area would also be the responsibility of SWTRA.

5.2.46 Management requirements for water voles would be incorporated into SWTRA's management requirements for watercourses. Water vole management requirements for watercourses in the SSSI Mitigation Areas would be included in the *SSSI Management Plans*, which would form part of each tenancy agreement. NRW would retain the right to obtain access to manage the reed network.

### **Monitoring**

5.2.47 Annual monitoring of water vole populations and new and/or enhanced habitat within the operational boundary of the Scheme would be undertaken in accordance with Strachan *et al.* (2011), as set out in the *Water Vole Mitigation Strategy*. Results would inform on-going management. Should results highlight the need for a significant amendment to the strategy, measures would be agreed in advance with NRW.

### **Reporting and Auditing**

5.2.48 The results of ecology surveys and mitigation measures described in the *Water Vole Mitigation Strategy* would be reported to Welsh Government, the Contractor and NRW, as agreed in the strategy or as requested.

5.2.49 The *Water Vole Mitigation Strategy* and NRW licence application would include the requirement for an independent audit of all ecology works

described in this mitigation strategy. This would be undertaken to help ensure, and confirm, adherence with the requirements of the strategy.

5.2.50 The results of audit visits would be reported to Welsh Government, the Contractor and NRW on an annual basis, or as otherwise agreed or requested (likely to be on a more frequent basis prior to and during construction). Any major failure to adhere to requirements of the strategy would be reported as soon as practicable.

### **5.3 Hazel Dormouse**

#### **Avoidance**

5.3.1 Where practicable, loss and disturbance to habitat of known and potential value to hazel dormice has been avoided through the design of the Scheme. However, this has been especially difficult at the Castleton Interchange, where much of the dormouse habitat exists and where substantial earthworks are required in order to achieve an effective scheme in this area.

#### **Draft Hazel Dormouse Mitigation Strategy**

5.3.2 A *Draft Hazel Dormouse Mitigation Strategy* has been developed in consultation with NRW (Appendix SS10.4 of the December 2016 ES Supplement (Document 2.4.14)). The final version of the strategy will include the method statement that would be submitted in support of an NRW dormouse licence application for disturbance, displacement and/or translocation of dormice, as well as the other measures described below.

5.3.3 Taking into account the results of surveys to date, it is expected that, owing to the amount of habitat that would be lost during construction, a translocation of dormice will be required at the western end of the

Scheme, around Castleton and New Park Farm, and that a displacement methodology would be undertaken at all other areas where dormice would be affected. The strategy and method statement associated with the NRW licence application would be flexible so as to enable the results of monitoring surveys (below) to be incorporated and taken into account.

- 5.3.4 The *Draft Hazel Dormouse Mitigation Strategy* is included in the M4CaN Register of Environmental Commitments Update (Appendix SR18.1 to the December 2016 ES Supplement (Document 2.4.14)).

### **Pre-construction Surveys**

- 5.3.5 Taking into account the potential for baseline conditions to change, pre-construction surveys of hazel dormice would be undertaken using the same techniques described above. Results of the surveys would inform the final mitigation strategy and the Scheme's NRW licence application.

### **Mammal Crossings**

- 5.3.6 Although the existing M4 in the Castleton area is likely to present a significant barrier to the movement of dormice between habitat to the north and south of the road corridor, dry mammal crossings (900 mm diameter dry pipes set above high water-level) would be constructed in locations shown on Figure 3 of this evidence as safe crossing points between existing roadside habitat to the north and south, as well as between this existing habitat and proposed woodland planting on Berryhill Farm. By providing opportunities for movement between populations, mammal crossings could help to minimise the potential for habitat severance and genetic fragmentation.
- 5.3.7 Dry mammal crossings around the Tata Steel Llanwern Steelworks site (Figure 3) would also provide potential safe crossing routes, although I

consider that movement of dormice from favourable habitat on the Tata site to remaining parts of the Gwent Levels to the south, where areas of woodland and scrub are limited in extent and highly fragmented, is likely to be minimal.

- 5.3.8 Given the evidence provided by the PTES at the meeting on 18 January 2017 regarding the use by dormice of dormouse bridges (see the meeting note in the Appendices to this evidence), consideration will be given to using this information to inform the design of the mammal crossings to be incorporated as part of the mitigation for the M4CaN Scheme, where they are intended to mitigate effects on dormice.
- 5.3.9 Chanin and Gubert (2012) cite several examples of dormice travelling considerable distances across open ground, including distances of 250m – 500m across arable fields. Mammal crossings would be considerably shorter than this. They would be constructed as soon as practicable within the construction programme (Appendix SR3.1: Buildability Report to the December 2016 ES Supplement (Document 2.4.14)).

### **Lighting**

- 5.3.10 Work undertaken on a number of highway schemes has shown that dormice can become habituated to high artificial light levels and/or intermittent lighting from vehicle headlights (CIEEM 2008), indeed dormice were recorded along the embankment of the existing M4 during the 2014/2015 surveys.
- 5.3.11 However, as dormice are primarily nocturnal creatures, measures would be set in place in order to reduce the potential effect of construction lighting on activity and predation risk. As explained in Mr Barry Woodman's Proof of Evidence (WG1.6.1), construction lighting would be provided as required during periods of normal working hours in autumn and winter and during night time working. Light fittings would

be directed towards the most frequently used areas of work and away from adjacent retained habitat of value to dormice, and would be positioned at low-level on posts to minimise light spill. Inward-facing security lighting would be provided at construction compounds on a 24-hour basis.

5.3.12 A detailed lighting strategy for the construction period would be developed to identify the type of lighting to be used and measures to be implemented to reduce light spill. Details would be included in the CEMP.

5.3.13 As described in Chapter 2: Scheme Description of the March 2016 ES (Document 2.3.2), operational lighting would be installed at junctions. Due to the fact that dormice are known to utilise habitat in some of the immediately surrounding areas, lighting columns would likely be aluminium with LED luminaires so that they can be directed more precisely, thereby reducing light spill.

### **Fencing**

5.3.14 As explained in Mr Barry Woodman's Proof of Evidence (WG 1.6.1) and in Chapter 3: Scheme Construction of the March 2016 ES (Document 2.3.2), temporary boundary fencing would be installed around the perimeter of the site to prevent unauthorised access outside the construction site. This will help prevent damage or disturbance to habitat or species in surrounding areas. As considered necessary to ensure protection to habitats and species during construction, the ECoW could also instruct the installation of additional fencing to protect ecologically sensitive areas.

## **Displacement and Translocation**

5.3.15 Owing to the presence of dormice along the footprint of the Scheme, the species would need to be displaced or translocated from the site prior to construction. Methods would be detailed in the *Hazel Dormouse Mitigation Strategy* and in the NRW licence application, and are summarised in the following sections.

### **Displacement**

5.3.16 As recommended by Bright *et al.*, 2006 (Document 11.3.5), displacement into adjacent retained habitat would be preferable (compared with translocation) where less than 100 m of hedgerow is to be affected, or where less than a 50 m wide strip of woodland or scrub (or 10% of a parcel of woodland or woodland complex) would be lost. Therefore, taking into account current survey findings (Table 1 above), it is proposed that displacement would be undertaken in the Tata Steel Llanwern Steelworks site (Figure 3f of this evidence), at Knollbury (Figure 3h) and along Minnett's Lane to the north of Undy (Figure 3i).

5.3.17 The mitigation strategy and licence application would include the direction of displacement (which would be selected in order to enable access to favourable habitat in the surrounding areas) as well as measures to enhance habitat for displaced individuals, and methods of habitat manipulation prior to site clearance. Clearly, such enhancement can only be carried out in locations where the Welsh Government has ownership of the retained land (and thus the authority to manage the habitats), and this is why the amount of displacement available to the Scheme is limited.

### **Translocation**

- 5.3.18 Taking into account the estimated size of the local dormouse population (based on survey results to date) and the amount of vegetation that would be lost due to construction (as described below), a translocation to an off-site receptor site (temporary or permanent) would be undertaken, the details of which would be set out in the *Hazel Dormouse Mitigation Strategy* and NRW licence application.
- 5.3.19 Translocation proposals could involve the temporary holding of dormice in captivity, and such an approach is discussed in the *Draft Hazel Dormouse Mitigation Strategy* submitted as Appendix SS10.4 of the December 2016 ES Supplement (Document 2.4.14)). However, it was suggested at the PTES/Paignton Zoo meeting in January 2017 that direct translocation to a receptor site (i.e. Coed Mawr) would be preferable. Nevertheless, because translocated populations would need to be of a suitable size and comprise an appropriate ratio of adult females to males to survive as an independent population without the risk of adversely depleting genetic diversity (ideally, an ‘absolute minimum’ of 30 individuals with a good proportion of females (Chanin 2014)), individuals caught would still need to be held in temporary captivity until the size of the population to be translocated is confirmed. However, this would preferably be within soft-release cages at the proposed receptor site, and for a short period of time, rather than the six weeks of quarantine and screening required under the Natural England reintroduction programme (Chanin, 2014).
- 5.3.20 Nevertheless, in the 2014 review of Natural England’s reintroduction programme (Chanin, 2014) the captive breeding aspect of the programme was reported to be “... *functioning well*”, as was the protocol for release, and no requirements to change the procedures were recommended. Therefore, should extended captivity be required, the methods recommended by Natural England would be followed, in consultation with Neil Bemment of Paignton Zoo, the co-ordinator of the captive breeding programme.

- 5.3.21 An in-principle agreement has been reached with Bristol Zoo (Wild Space) regarding the accommodation of a captive population of dormice, if necessary. The Wild Space is a farm to the north of Bristol with ample “undeveloped” areas, including areas of woodland, in which an expanding population of captive dormice could be housed away from visitors. A detailed method statement is currently being developed with the zoo and would be included in the final *Hazel Dormouse Mitigation Strategy* and any NRW licence application. Whether or not dormice from the Scheme would need to be kept separate from other dormice will need to be agreed in advance with both NRW and Natural England.
- 5.3.22 The 2014 review also reported that the reintroduction side of the reintroduction programme has been successful in the short term (i.e. second generation young have been recorded in all receptor sites), and that in the medium term, two-thirds of the reintroductions were successful (i.e. populations stable over 5-10 years with signs of dispersal). In the long term, 5 of the 9 sites were successful.
- 5.3.23 At the sites where dormice were (probably) no longer present (four of the long-term reintroduction sites), Chanin’s review reported a lack of appropriate management as a common factor. With regard to the M4CaN Scheme, long-term appropriate management would be secured through the use of sites owned and managed by SWTRA and/or NRW, which would remove the risk of relying on a number of private land owners. A detailed management plan for the receptor sites would be included in the final *Hazel Dormouse Mitigation Strategy* and NRW licence application.
- 5.3.24 Coed Mawr, a Welsh Government-owned and NRW-managed woodland to the north of the Scheme (Figure 9), is currently being surveyed as a receptor site for translocated dormice. The selection of the site has taken into account recommendations by Chanin (2014),

who suggests that receptor sites should form part of a cluster of locations that:

- a) comprise 4 to 6 woodlands, each at least 20 hectares and totalling >150 hectares (they can be <20 hectares if well connected to other woods);
- b) are located within a radius of no more than 5 km; and
- c) are connected by parcels of woodland, scrub and/or hedgerows without barriers preventing dispersal (such as roads >12 m wide or open rivers, unless they have connecting tree canopies).

5.3.25 Figure 9 of this evidence illustrates the suitability of Coed Mawr with regard to the above criteria. In addition to the existing M4 corridor, dormice have been recorded in a considerable number of large parcels of woodland within 5 km of Coed Mawr, and there is a good network of interconnecting hedgerows across the area.

5.3.26 Bright *et al* (2006) (Document 11.3.5) and Chanin (2014), suggest suitable receptor sites should contain:

- a) a diverse, unshaded and productive understorey, preferably dominated by hazel;
- b) a high density and diversity of plant species for food throughout the year; and
- c) a commitment to suitable site management in the long-term future.

5.3.27 A habitat assessment of Coed Mawr (see Figure 7) was reported in the *Draft Hazel Dormouse Mitigation Strategy* which indicated the amount of existing suitable habitat (Appendix SS10.4 of the December 2016 ES Supplement (Document 2.4.14)). The *Final Hazel Dormouse Mitigation Strategy* will determine in more detail, on the basis of habitat area and suitability, exactly how many dormice could be accommodated here.

- 5.3.28 During a meeting on the 9 November 2016, NRW provided an in-principle agreement to the use of Coed Mawr as a receptor site for dormice translocated from the Scheme. However, final approval would in part be based on results of detailed habitat surveys to be carried out in 2017. Results of surveys would need to confirm the presence of sufficient favourable habitat and/or the potential to create sufficient favourable habitat to support the dormouse population in the long-term. Results of surveys would inform the final *Hazel Dormouse Mitigation Strategy* and NRW licence application. The licence application would include a detailed long-term habitat management plan for Coed Mawr.
- 5.3.29 Should the results of the 2017 surveys indicate that Coed Mawr is unfavourable as a receptor site, and no other suitable off-site receptor site is located prior to construction, or should the number of dormice captured be too small to survive as an independent population, any captured dormice would need to be cared for in temporary captivity.
- 5.3.30 During the PTES/Paignton Zoo meeting in January 2017, it was suggested both that additional woodlands to Coed Mawr could be used as receptor sites (depending on survey results) and that any dormice that had to be kept in captivity would be better used as part of the NE reintroduction programme rather than being held for several years (i.e. until the Scheme's new planting becomes suitable).

### **Modification and Enhancement of Existing Habitat**

- 5.3.31 Habitat enhancement of receptor sites would be undertaken prior to the displacement or translocation of dormice. Details of this would be included in the *Hazel Dormice Mitigation Strategy* and NRW licence application. Details would include habitat management and the provision of dormouse nest boxes, as recommended in Bright *et al.* (2006) (Document 11.3.5).

5.3.32 Measures of habitat enhancement would require landowner permission and, therefore, are likely to be confined to land within the CPO boundary and/or other areas owned by the Welsh Government (including Coed Mawr).

### **Habitat Planting**

5.3.33 In addition to the woodland planting proposed for around the junctions to the existing M4, post-construction planting at Berryhill Farm would also provide suitable habitat in the long term (i.e. post-establishment and development, as described below). Detailed planting proposals would be included in the final *Hazel Dormouse Mitigation Strategy* and NRW licence application.

5.3.34 In the long term, dormice from areas adjacent to the Scheme (including dormice displaced from the works corridor) would be expected to naturally disperse into areas of new planting.

5.3.35 As explained in the September 2016 ES Supplement (Document 2.4.4) and shown on the Environment Master Plan (EMP) (Appendix 2.3 to the September 2016 ES (Document 2.3.2) and Figure R2.6 to the September 2016 ES Supplement (Document 2.4.4)), woodland planting would cover 83.6 hectares, planting of linear belts of trees and scrub/shrub would cover 20.8 hectares and planting of hedgerows would cover 4.10 km. These proposals would include woodland planting adjacent or close to those sites where dormice were recorded between 2014 and 2016.

5.3.36 With regard to the main area of habitat loss, around New Park Farm, Castleton and Berryhill Farm, 46.35 hectares would be planted to the north and south of the existing M4, in order to replace the 14.14 hectares of scrub and woodland to be lost. Therefore, the proposals would result in an increase of 32.21 hectares of woodland compared to

the existing conditions, with the new woodland linked to a wider landscape where dormice are known to exist (in other words these areas of new planting would not be isolated). Planting would comprise:

- a) 10.42 hectares to the north of the realigned existing M4;
- b) 5.89 hectares between the new road, the realigned existing M4 and the realigned A48(M);
- c) 3.90 hectares to the south of the new road;
- d) 8.12 hectares on Berryhill Farm, to the west of the new road;  
and
- e) 18.02 hectares on Berryhill Farm, to the east of the new road.

5.3.37 Planting mixes would comprise native species typical of the area and of potential benefit to dormice, including hazel and honeysuckle. Mixes would be agreed in advance with NRW and would be included in the *Environmental, Landscape and Ecology Aftercare Plan (ELEAP)* (as listed in the Register of Environmental Commitments Update (Appendix SR18.1 to the December 2016 ES Supplement (Document 2.4.14)) and the NRW dormouse licence application.

5.3.38 Where practicable, during woodland clearance on Berryhill Farm, coppice stools of hazel and other shrub species would be lifted and replanted in areas of early woodland planting to the east of New Park Farm/Castleton in order to help ensure the early establishment of new woodland.

### **Habitat Management Responsibilities**

5.3.39 Management responsibilities are discussed in the Proof of Evidence provided by Dr Keith Jones (WG1.18.1). Management and maintenance of new planting would be the responsibility of the Contractor for the first five years post-construction. SWTRA would be responsible thereafter. Should Coed Mawr be used as a receptor site for translocated dormice, this site would continue to be managed by NRW, with additional measures for dormouse habitat management

incorporated into the forestry plan for the site. It should be noted that these measures are also likely to have knock-on benefits for a wide variety of other species, including invertebrates, reptiles and birds.

5.3.40 Management requirements for dormice included in the *Hazel Dormouse Mitigation Strategy* would be incorporated into management plans.

### **Monitoring**

5.3.41 Requirements for monitoring would be set out in the *Hazel Dormouse Mitigation Strategy* and NRW dormouse licence application.

5.3.42 Taking into account recommendations by Chanin (2014), monitoring would include annual population and habitat monitoring, to be undertaken immediately post displacement/translocation and throughout the five-year habitat establishment period. After this, monitoring would be carried out at a frequency and duration to be agreed with NRW; this is likely to be for at least 10 years post-establishment. Monitoring of captive animals would also be carried out during any period of captivity.

5.3.43 Monitoring surveys would adopt the same methodologies used during the 2014 to 2016 surveys, and would be aimed at demonstrating the criteria for success suggested in Chanin (2014), including:

- a) evidence of breeding (preferably in the year of release and each subsequent monitoring year);
- b) animals recorded on site in May of the second year;
- c) a greater number of adults present on site in year three onwards;
- d) evidence of population stability for 5-10 years; and
- e) evidence of dispersal in and from the receptor site.

5.3.44 As described in the *Draft Hazel Dormouse Mitigation Strategy* (Appendix SS10.4 of the December 2016 ES Supplement (Document 2.4.14)), habitat management plans associated with the NRW licence application would be flexible so as to enable adaptations to be made in response to results of annual monitoring surveys. Should a significant amendment to management be considered necessary, this would be agreed in advance with NRW.

### **Reporting and Auditing**

5.3.45 The results of the monitoring surveys would be reported to NRW on an annual basis or as otherwise agreed with NRW. I consider it likely that monitoring of any captive bred populations (if captive breeding is required) would be reported on a more frequent basis.

5.3.46 An independent audit of all ecology works contained in the *Hazel Dormouse Mitigation Strategy* and NRW licence would be undertaken and reported on, as described for water voles above.

## **6 Residual Effects (After Mitigation)**

### **6.1 Water Vole**

#### **Effects of Land Take**

- 6.1.1 The proposals would result in the loss of a number of waterbodies (primarily reens and ditches) of known value to water voles. However, taking into account the mobile nature of water voles (shown by the results of surveys around GWT's water vole release site at Magor Marsh, Figures 1d and 2e of this evidence), the commitment to install and maintain culverts and mammal crossings at locations of value to water voles, the ditch/reen replacement ratio of just over 1:1, the design of replacement watercourses, and the proposed measures to displace or translocate voles prior to construction, it is my opinion that the adverse effect of habitat loss would be minor, at worst, in the medium term once new watercourses have established (as assessed in Chapter 10 of the March 2016 ES (Document 2.3.2)).
- 6.1.2 The commitment to ensure receptor sites are in favourable condition for water voles in advance of displacement or translocation could help to reduce this impact even further, as any loss of habitat availability for water voles would immediately be rectified with replacement habitat.
- 6.1.3 Over the longer term, as the new reens and ditches continue to mature and the WTAs start to provide additional habitat that water voles could readily use (including several hectares of open water and reedbed), I would anticipate that there would be no net loss in habitat for the species as a result of the Scheme. I would therefore agree with the assessment in the ES that in the medium and long term the magnitude of impact would be Negligible. Indeed, I consider that there could even be a net gain in suitable habitat.

#### **Effects of Construction**

### **Pollution of Habitats**

6.1.4 Construction would result in the production of sediments and pollutants that could impact upon watercourses being used by, or of potential value to, water voles. As explained in the Proof of Evidence produced by Mr Richard Graham (WG1.15.1), it is considered that both the comprehensive construction phase drainage design and the additional water protection measures set out in the *Pre-CEMP* (Appendix SR3.2 of the December 2016 ES Supplement (Document 2.4.14)) to limit the potential for, and likely impact of, pollutants would prevent significant environmental impacts on the ecosystems of watercourses. In my opinion, these measures would ensure that sediments and pollutants would present a negligible risk to water voles during construction.

### **Disturbance**

6.1.5 Water voles are diurnal; therefore, since most construction would occur during the day, construction could result in some disturbance to water vole activity in the immediate surrounding area as a result of expected increases in noise, movement and lighting in the area. However, water voles are known to be tolerant of relatively high levels of noise and disturbance, and continue to use ditches alongside roads and within industrial areas (indeed, noisy urban areas are often used by water voles, as human presence tends to deter their predators).

### **Disruption to Movement and Population Fragmentation**

6.1.6 The presence of the construction site is likely to represent a temporary barrier to water vole movement. However, a number of measures (detailed in the *Draft Water Vole Mitigation Strategy*, (Appendix SS10.7 of the December 2016 ES Supplement (Document 2.4.14)) would be implemented during construction to minimise fragmentation impacts upon water voles, including: the early provision of culverts to quickly

reinstate access for water voles across the Scheme; the displacement and/or translocation of water voles to appropriate locations with open access to the Levels to the south; and the enhancement of receptor sites to make them more attractive to water voles.

### **Injuries or Fatalities**

- 6.1.7 The culverting and infilling of watercourses inhabited by water voles could result in injuries and/or fatalities to individual animals during the construction phase. However, it is my opinion that the measures to displace or translocate water voles from working areas to favourable receptor sites prior to the commencement of construction activities, and the use of fencing to demarcate working areas and protect areas of ecological importance (including ditches with water vole burrows), would help to prevent any risk of injury or fatality.

### **Summary of Effects of Construction**

- 6.1.8 Taking into account measures described in the *Pre-CEMP* (Appendix SR3.2 of the December 2016 ES Supplement (Document 2.4.14)) and the *Draft Water Vole Mitigation Strategy* (Appendix SS10.7 of the December 2016 ES Supplement (Document 2.4.14)), in particular measures to displace or translocate water voles from working areas, it is my opinion that the assessment of likely significance of the effect of construction on water voles reported in Chapter 10 of the ES (Document 2.3.2) is correct, that is that the effect would be Minor adverse and of slight significance.

### **Effects of Operation**

### **Disturbance and Damage to Watercourses by Pollutants**

6.1.9 As explained in the evidence produced by Mr Richard Graham (WG1.15.1), it is considered that measures set out in the *Pre-CEMP* to limit the potential for, and likely impact of, pollutants (Appendix SR3.2 of the December 2016 ES Supplement (Document 2.4.14)) would prevent significant environmental impacts on watercourses and, therefore, water voles in the surrounding area. With regard to disturbance during the operational phase, it is my opinion that water voles would quickly become habituated to the new road, and would continue to occupy the watercourses alongside and underneath it.

### **Disruption to Movement and Population Fragmentation**

6.1.10 It is my opinion that the numerous culverts along the length of the Scheme, combined with the high mobility of water voles and their ability to adapt to disturbance, would ensure that the operational phase of the new road would have no significant effect on the movement of water voles across the Levels.

### **Summary of Effects of Operation**

6.1.11 Taking into account operational mitigation, in particular the pollution control measures, the maintenance of the culverts, the long-term monitoring of displaced and/or translocated water voles, and the long-term maintenance and management of habitats within the operational boundary of the Scheme and the SSSI Mitigation Areas, it is my opinion that the assessment of operational effects reported in Chapter 10 of the ES (Document 2.3.2) is correct, that is, that the likely magnitude of impact on water voles would be no more than minor adverse, and thus of slight significance.

## Overall Effects on Water Voles

6.1.12 Considering the above, it is my opinion that the assessment of overall effect reported in Chapter 10 of the ES (Document 2.3.2) is correct, that is, that the likely effect on water voles would be minor adverse, and slight significance, largely due to the temporary disruption to the local population during the construction phase.

6.1.13 Over time, as the new watercourses, SSSI mitigation areas and WTAs continue to mature, and the animals' familiarity with the Scheme (and in particular the culverts) develops, the long term adverse effects are likely to diminish further. Significantly, the total amount of water vole habitat will not have decreased (indeed it will have increased) and the ability of the population to expand further into currently-unoccupied territories will be unaffected.

## 6.2 Hazel Dormouse

### Effects of Land Take

6.2.1 In the long term, the woodland planting proposed as part of the Scheme would result in an increase in the amount of woodland of potential value to dormice, especially in the main area of dormouse disturbance and habitat loss (i.e. the New Park Farm/Castleton area).

6.2.2 However, the dormouse populations due to be affected would require replacement habitat with immediate effect. Therefore, measures of habitat enhancement for those dormice displaced into areas adjacent to the Scheme, combined with translocation to a favourable receptor site, as detailed in the *Draft Hazel Dormouse Mitigation Strategy* (Appendix SS10.4 of the December 2016 ES Supplement (Document 2.4.14)), would ensure that sufficient favourable habitat would be

available and that the short-term loss of habitat that currently supports dormice is mitigated.

- 6.2.3 Taking the above into account it is my opinion that the assessment in Chapter 10 of the ES (Document 2.3.2) of likely effects of land take on dormice is correct, and that the significance of effect would be no more than slight adverse. Indeed, I consider that in the long term the woodland planting proposals proposed to offset the land take would be beneficial .

### **Effects of Construction**

#### **Disturbance**

- 6.2.4 Construction works could result in noise, lighting and physical disturbance of dormice in areas of woodland and scrub immediately adjacent to the Scheme. However, hazel dormice are nocturnal, and construction would largely be confined to daylight hours (i.e. 07.00 to 19.00 hours during Monday to Friday, and 07.00 to 17.00 hours on Saturdays); therefore, works would be unlikely to significantly disturb dormouse activity. Furthermore, dormouse populations already inhabit the embankments of the existing M4 and are therefore already accustomed to relatively high levels of noise and lighting.
- 6.2.5 Nevertheless, elevated levels of noise, lighting and human disturbance during the construction phase could have impacts on dormice in neighbouring habitats, especially those currently buffered from the existing M4.
- 6.2.6 With regard to noise impacts, as explained in the March 2016 ES Chapter 13: Noise and Vibration (Document 2.3.2), earthworks would create the greatest noise, with driven piling also a significant noise source where a higher embankment is required (including around the

existing the M4 locations, where dormice are currently present). Noise modelling data (March 2016 ES Chapter 13: Noise and Vibration and Figure 13.3 (Document 2.3.2)) indicates that the range in current background noise levels in the vicinity of the Scheme is currently approximately 45-50 dB(A)<sub>L10(18h)</sub>. Without any specific mitigation, the predicted noise level from plant and activities associated with the construction phase is estimated to be in the region of 68-74 dB at 50 m from a construction worksite, 60-66 dB at 100 m from a worksite, 50-56 dB at 250 m from a worksite, and 43-49 dB at 500 m from a worksite.

- 6.2.7 The expected impact of predicted construction noise is thus considered to be: major within approximately 45 m of a worksite; moderate within approximately 115 m of a worksite; and minor within approximately 180 m of a worksite. At some locations, more substantial construction works may be required, for example where more major earthworks or piled foundations occur.
- 6.2.8 Whilst this noise would have some effect on dormice in any retained habitats adjacent to the Scheme, it should be noted that the majority of the dormice within the Scheme will have been translocated away from the area of impact, and would not therefore be affected by noise and lighting. However, they would, of course, be disturbed by the translocation or displacement process itself (although this would be relatively short term), and there would still be some dormice in the retained adjacent habitats that would be affected by noise.

### **Disruption to Movement and Population Fragmentation**

- 6.2.9 The loss of habitat and the presence of the construction site would result in the severance of habitats and potential fragmentation of populations during construction and for a period beyond. However, certainly at the western end of the Scheme, dispersal and movement are already significantly restricted by the presence of the existing M4.

Furthermore, where dormice are to be displaced, this will only be into favourable habitat with good links to other habitat areas, so these animals will not be isolated or fragmented.

### **Risk of Injuries or Fatalities**

6.2.10 It is my opinion that the proposed mitigation, in particular the displacement and/or translocation to favourable receptor sites prior to habitat clearance and construction, along with the fencing off of important ecological areas (including retained dormouse habitat) would significantly reduce any risk of injury or fatality during construction.

### **Summary of Effects of Construction**

6.2.11 Taking into account the mitigation measures to be implemented prior to and during construction, in particular the displacement and/or translocation of dormice to favourable pre-prepared receptor sites in accordance with an NRW licence (as detailed in the *Draft Hazel Dormouse Mitigation Strategy*, Appendix SS10.4 of the December 2016 ES Supplement (Document 2.4.14)), it is my opinion that the assessment reported in Chapter 10 of the ES (Document 2.3.2) is correct, and that the impact of the construction phase on hazel dormice would be minor adverse, and of no more than slight significance.

### **Effects of Operation**

#### **Disturbance**

6.2.12 The operational phase of the Scheme could have lighting and noise disturbance effects on dormice in the immediately surrounding area. However, where operational lighting is required, measures to limit light spill into adjacent habitats, including areas of woodland and scrub of value to dormice, would minimise the potential disturbance effect of

lighting.

### **Disruption to Movement**

6.2.13 Movement of dormice in the areas around the existing M4 junctions is already limited by the presence of the M4. Although the new junctions would increase disruption to movement by widening the overall width of hard-standing in these areas, woodland and scrub planting proposed around the existing M4 junctions would provide enhanced habitat connections for dormice both along the M4 and to the immediately surrounding area. The planting of substantial parcels of woodland at Berryhill Farm and to the north of Undy would also provide, in the long term, considerable additional areas of continuous habitat for dormice to use to move across the landscape.

6.2.14 With regard to the population on the Tata Steel Llanwern Steelworks site, although the new road would increase the hard-standing barrier to the Gwent Levels to the south, the deep reens around the Tata Steel site already present a barrier to the south. Furthermore, given the absence of substantial parcels of woodland on the Levels it is unlikely that there would be substantial movement between the two areas.

6.2.15 With regard to the Knollbury and Minnett's Lane sub-populations, the new road would approximately follow the line of the existing M4 in the area and, therefore, would not present a novel obstacle to the movement of dormice along hedgerows and between woodland parcels to the north of the existing M4.

6.2.16 I consider that once the extensive planting has matured, and should the mammal underpasses prove effective for dormice, the operational M4 corridor is likely to be more permeable to the movement of dormice than the existing motorway. It should be noted, though, that the success of the mitigation strategy is not dependent upon the mammal

underpasses being used, as there is currently little research regarding how effective they are (other than that referred to by PTES in the meeting of 18 January 2017, see meeting note presented in the Appendices).

### **Risk of Injuries or Fatalities**

6.2.17 It is unlikely that dormice from surrounding areas or areas of matured woodland planting would attempt to cross the new road; therefore, it is also unlikely that injury or death on the road would be a significant concern.

6.2.18 With regard to any translocated dormice, measures to be agreed with NRW in the *Draft Hazel Dormouse Mitigation Strategy* (Appendix SS10.4 of the December 2016 ES Supplement (Document 2.4.14)), including monitoring both the health of captive and/or translocated populations and the condition of habitat in the receptor areas (in order to inform ongoing habitat management), would help to minimise the risk of fatalities due to the Scheme.

### **Summary of Effects of Operation**

6.2.19 Taking into account the mitigation measures to be implemented during operation (in particular the long term management and maintenance of habitats of potential value to dormice (including at Coed Mawr), the long term monitoring of dormouse populations and the maintenance of mammal crossings) it is my opinion that the assessment reported in Chapter 10 of the ES (Document 2.3.2) is correct, and that the impact of the operational phase on hazel dormice would be negligible adverse leading to effects of neutral or slight significance.

### Overall Effects on dormice

- 6.2.20 Taking into account the various mitigation measures discussed above, in particular the displacement and/or translocation of dormice from the footprint of the Scheme (as detailed in the *Draft Hazel Dormouse Mitigation Strategy*, Appendix SS10.7 of the December 2016 ES Supplement (Document 2.4.14)), the extensive habitat planting, the monitoring of populations, and the maintenance of mammal crossings, it is my opinion that the magnitude of the likely impact of the Scheme on hazel dormice, at least in the short term, is assessed correctly in the ES (Document 2.3.2) as minor adverse, which would have an effect of slight adverse significance.
- 6.2.21 In the longer term, however, once new planting has matured sufficiently to support dormice, overall habitat availability would increase, populations could expand and there would be potential connections under the road that do not currently exist for dormice.
- 6.2.22 Furthermore, the proposals to use translocated dormice to start a new colony in Coed Mawr, where the existing conifer plantation is due to be replaced with broadleaved woodland, combined with the very extensive woodland planting within the Scheme boundaries (considerably more than is being lost), means that the proposals could lead to a significant expansion of the range of dormice in the wider area.
- 6.2.23 On the basis of the dormouse mitigation strategy that has been developed since publication of the ES, I therefore consider that the Scheme is likely to result in a net beneficial effect for dormice in the long term.

## **7 Consultees' Responses and Objections to the M4CaN Scheme**

- 7.1 Consultation responses and objections to the Draft Orders for the M4CaN Scheme which are relevant to water voles and hazel dormice were from following organisations:
- a) Natural Resources Wales (OBJ0268)
  - b) Gwent Wildlife Trust (OBJ0270)
  - c) Newport City Council (SU0192)
- 7.2 These responses are addressed, as far as is possible, in the following paragraphs. Responses and objections relating to other aspects of ecology and nature conservation are covered in the following Proofs of Evidence:
- a) Mr Richard Green – Bats (WG 1.20.1)
  - b) Dr Simon Zisman – Ornithology (WG 1.21.1)
  - c) Dr Keith Jones – all other aspects of Ecology and Nature Conservation (WG 1.18.1)

### **7.1 Water Vole**

#### **National Resources Wales (NRW)**

In their letter of 4 May 2016 to Welsh Government, NRW commented that pre-construction surveys for water voles were not yet complete and detailed mitigation measures and methods of working not submitted and, therefore, they could not fully assess impacts on this species.

- 7.1.1 The assessment carried out in the ES was based on a set of mitigation principles. A more detailed description of the proposed mitigation measures is presented in the *Draft Water Vole Mitigation Strategy*

(Appendix SS10.7 of the December 2016 ES Supplement (Document 2.4.14)) which was developed in consultation with NRW and GWT. Pre-construction surveys for water voles will be undertaken immediately prior to construction in order to identify any changes to water vole distribution and to fine-tune the mitigation requirements as set out in the detailed strategy.

***NRW requested more information regarding the presence or otherwise of water vole in the SSSI Mitigation Areas, including current population density and suitability of the habitats to support them.***

- 7.1.2 The surveys within the SSSI Mitigation Areas identified the presence of water vole burrows and other field signs in reens along the northern and southern boundaries of Maerdy Farm (Figure 2b of this evidence). However, no burrows were recorded elsewhere on the farm, and watercourses were considered to be unfavourably over-shaded by bankside hedgerow and scrub.
- 7.1.3 Surveys also confirmed the presence of water voles on Tatton Farm (Figure 2c), although no burrows were identified. The majority of watercourses on Tatton Farm were considered to be sub-optimal for water voles, again largely due to the presence of scrub and hedgerows over-shading the ditches and the banks.
- 7.1.4 Management of watercourses on both holdings would provide a real enhancement opportunity for water voles; by removing or cutting back bankside scrub, ground vegetation could recover, which in turn would provide cover and foraging opportunities for water voles. Enhancement proposals form part of the *Draft Water Vole Mitigation Strategy* (Appendix SS10.7 of the December 2016 ES Supplement (Document 2.4.14)), which was developed in consultation with NRW and GWT.

This is likely to significantly increase the suitability of these areas to support a healthy water vole population.

- 7.1.5 In addition, pre-construction surveys would include activity surveys and habitat condition assessments of potential receptor sites for displaced or translocated water voles, including the SSSI Mitigation Areas. These surveys would inform the final *Water Vole Mitigation Strategy*, to be agreed with NRW, and would ensure that water voles are only translocated into watercourses where they could survive and thrive.

***NRW requested further detail be included in the Water Vole Mitigation Strategy (or Method Statement).***

- 7.1.6 As discussed above, consultation with NRW and GWT is ongoing specifically in order to ensure that all concerns are taken into account in the draft (and indeed final) *Water Vole Mitigation Strategy*. The strategy therefore includes more detail on the fencing of the Scheme, the translocation process, the captive breeding facilities, and the design (and subsequent management) of the replacement reens and ditches.

#### **Gwent Wildlife Trust (GWT)**

GWT report concern with regard to the impact of the Scheme on their water vole reintroduction project at Magor Marsh. *They offered to “... contribute to discussion and fine tuning” of any mitigation strategy.*

- 7.1.7 As discussed in this evidence and in the March 2016 ES, numerous measures are to be implemented to protect water voles and to maintain their favourable conservation status within the Levels, and this includes the population at Magor Marsh. Whilst the assessment carried out in the March 2016 ES was based on a set of mitigation principles, a more detailed set of mitigation measures has since been developed, and these are presented in the *Draft Water Vole Mitigation Strategy*

(Appendix SS10.7 of the December 2016 ES Supplement (Document 2.4.14)) which was developed in consultation with NRW and GWT.

- 7.1.8 RPS, on behalf of the Welsh Government, have been consulting with Alice Rees, Water Vole Conservation Officer of GWT regarding the content of the *Draft Water Vole Mitigation Strategy*, specifically to ensure that all concerns are addressed, where practicable, and will continue to do so.

GWT suggested floating rafts should have been used to survey water voles in areas where access was not possible. GWT suggested population estimates made in areas that were difficult to survey would have been under-estimated.

- 7.1.9 I consider that sufficient access was obtained in order to determine the broad distribution of water voles and to assess the likely significant effects for the purpose of the EIA. In order to provide the more accurate survey information required to inform the final mitigation design, pre-construction surveys will be carried out along watercourses that would be affected by the Scheme in order to take into account changing baseline conditions and to inform the final *Water Vole Mitigation Strategy*.

GWT stated that well established sites are needed for water vole relocation and these would take at least 1.5 to 2 years to establish and must be mink and water vole free.

- 7.1.10 Receptor site preparation would commence as soon as practicable, and all created reens and ditches will be seeded with material from existing watercourses, wherever possible. I do not agree that 1.5 to 2 years is required for habitat to establish; in my experience, one growing season (i.e. as little as six months, depending on the timing of the creation) can easily result in sufficient growth to provide water vole

habitat. Pre-construction surveys for water voles, along with a mink control programme, are included in the *Draft Water Vole Mitigation Strategy* (Appendix SS10.7 of the December 2016 ES Supplement (Document 2.4.14)); this will ensure that receptor sites are free of mink and other water voles, and are therefore in favourable condition prior to displacement or translocation.

## 7.2 Hazel Dormouse

### National Resources Wales (NRW)

NRW requested further information regarding the proposed strategy for dormice, and commented that no consideration had been given to differing requirements of the three dormouse populations. NRW suggested off-line habitat improvement as potential receptor sites for displaced dormice.

7.2.1 A *Draft Hazel Dormouse Mitigation Strategy* has now been developed in consultation with NRW (Appendix SS10.4 of the December 2016 ES Supplement (Document 2.4.14)). The strategy includes different approaches for each of the three dormouse populations, and off-site habitat enhancement is included, where appropriate and practicable. However, this would require permission from land owners located outside the CPO boundary and cannot therefore be relied upon as the main mitigation technique.

7.2.2 Off-site habitat enhancement may not, therefore, be able to provide favourable habitat conditions in time for the start of the Scheme, so alternative/additional options have been included in the strategy, including potential translocation and temporary captivity (if required), and the use of a newly-developing woodland (at Coed Mawr) as a large receptor site.

**Gwent Wildlife Trust (GWT)**

GWT take the view that the Gwent Levels requires more survey. The extent of the population on the Gwent Levels and around the Tata Steel Llanwern Steelworks area must be established before the scheme is progressed.

- 7.2.3 In consultation with NRW, areas surveyed in 2014-2016 were selected taking into account habitat preferences of the species and historic records of dormice. The 2015 surveys extended the survey coverage to include the area surrounding the location of the dormouse nest found to the south of the Tata Steel Llanwern Steelworks site. Further surveys in this area will be carried out in 2017, and the results will inform the final *Hazel Dormouse Mitigation Strategy* and NRW dormouse licence application.

GWT confirmed support for dormouse mitigation planting at the west of the scheme. They requested more effort to be targeted at the south of the Scheme.

- 7.2.4 Surveys along the route of the Scheme (including areas within the Gwent Levels and at the eastern end, around the M4/M48 junction) are ongoing, and the results will inform the final *Hazel Dormouse Mitigation Strategy* and NRW licence application. However, the amount of woodland planting that can be included within the levels is minimal, as this would conflict with the qualifying features of the SSSIs. Instead the aim is to significantly strengthen the existing populations at the western and eastern ends of the Scheme, where the landscape lends itself better to woodland creation.

GWT reported they cannot support the proposal to move dormice to Bristol Zoo as an interim measure. However, they would favour the option of moving the animals to a nearby large woodland containing

dormice with additional adjacent planting provided as an interim measure should habitat creation areas not be ready. GWT stated effort should be made to ensure planting is established in advance of the scheme. GWT do not support the moving of the dormice to a woodland with no records of dormice.

- 7.2.5 Following discussions with PTES and Paignton Zoo, it is now considered that direct translocation to Coed Mawr is the preferred option, and that dormice will only be held in captivity if insufficient habitat is available to accommodate them.
- 7.2.6 We understand the concern regarding translocating dormice into a woodland with no previous records of dormice, as this always prompts the question as to why there are no dormice there. However, the main reason that the proposed receptor site at Coed Mawr does not currently support dormice is that it is a replanted ancient semi-natural woodland that currently supports largely conifer cover with some areas of broadleaf (see Figure 7 of this evidence).
- 7.2.7 However, the forest plan for the site aims to reinstate broadleaved woodland over the next few years, and this is already underway through clear-felling of the conifer. Already areas that were felled 1-2 years ago are starting to scrub up, and these will become even more suitable for dormice with some targeted planting of broad-leaved species appropriate to dormice (e.g. oak, hazel, honeysuckle). The woodland is surrounded by records of dormice, but the extensive survey work within the wood has so far only found one possible dormouse nest. Therefore, the site is clearly suitable for dormice (at least the areas of scrub and broadleaved woodland are), but the species has only just started to colonise (colonisation is a slow process in dormice).

GWT reported insufficient time to review all documents provided. Considering the documents they were able to review, they expressed concern with regard to survey coverage and/or incompleteness. They request a review of surveys is undertaken with input from NRW and other key organisations.

- 7.2.8 NRW were consulted with regard to survey coverage and results, as well as mitigation strategies. GWT are being consulted with regard to the results of surveys and the content of the mitigation strategies.

### **Newport City Council**

Clarification was requested as to why dormouse nest tubes were not installed on the Tata Steel Llanwern Steelworks land until late in the survey season of 2015.

- 7.2.9 Access issues delayed installation of nest tubes at Tata Steel. Additional nest tubes were installed on Tata Steel land in September 2015 in response to the discovery of a dormouse nest in a 2014 nest tube. Nest tubes have now been monitored from installation in 2015 through until the end of the 2016 survey season. An updated dormouse survey report has been published as Appendix SS10.1 of the December 2016 ES Supplement (Document 2.4.14).
- 7.2.10 Section 3.5 of Appendix 10.26 to the March 2016 ES (Document 2.3.2) sets out the survey effort based on Natural England guidance. In all areas, the survey effort exceeded the required threshold to determine presence/absence of dormice.

## 8 Conclusions

- 8.1 My evidence describes the extensive survey work that has been undertaken to inform the assessment of effects of the Scheme on dormice and water voles. The scope of this work has been developed in consultation with NRW, and has been followed up by subsequent surveys to address specific issues (for example, the dormouse surveys at Coed Mawr). I therefore consider the survey work to have been both appropriate and sufficient to inform a robust assessment of effects.
- 8.2 I have also described the potential impacts of the Scheme on both water voles and hazel dormice, and have summarised the measures that have been proposed in the March 2016 ES (Document 2.3.2) to mitigate for these. Given the importance of these two species, and in response to consultee requests, further work has since been carried out to further clarify and develop the mitigation proposals. A *Draft Water Vole Mitigation Strategy* and *Draft Hazel Dormouse Mitigation Strategy* (Appendices SS10.7 and SS10.4, respectively, of the December 2016 ES Supplement (Document 2.4.14)) have been developed in consultation with both NRW and, with regard to water voles, GWT.
- 8.3 Assuming the effective implementation of these detailed mitigation strategies, it is my opinion that neither species would be significantly adversely affected by the Scheme, especially in the medium to long term. Indeed, with regard to hazel dormice, I consider that the extensive woodland planting for the Scheme, combined with the creation of a new population at Coed Mawr, will lead to a net gain for hazel dormice locally, with a long-term increase both in population and range.
- 8.4 With regard to water voles, there will be no net loss of habitat (indeed there will be a slight increase in the amount of ditch and reed habitat,

and also more areas of reedbed associated with the Water Treatment Areas), and the population will continue to be able to access all areas of the Gwent Levels currently available to them (owing to the considerable number of over-sized culverts incorporated into the Scheme design to maintain the Levels drainage system). It is therefore my opinion that the Scheme will not inhibit the continued expansion of water voles across the Levels.

- 8.5 My evidence includes all facts which I regard as being relevant to the opinions which I have expressed, and the Inquiry's attention has been drawn to any matter which would affect the validity of that opinion.
- 8.6 I believe the facts which I have stated in this Proof of Evidence are true and that the opinions expressed are correct.
- 8.7 I understand my duty to the Inquiry to assist it with matters within my expertise, and I believe I have complied with that duty.