

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



Llywodraeth Cymru
Welsh Government

Objection Ref OBJ0268

File Ref WG/REB/OBJ0268.4 – NRW/Matthews

**Response to Objector's Evidence: Jean Matthews
(Natural Resources Wales – Bats)**

1. GROUNDS FOR OBJECTION

1.1. Details

1.1.1. Jean Matthews on behalf of Natural resources Wales has submitted a Statement of Evidence in relation to the draft statutory Orders associated with the Welsh Government's proposals for the M4 Corridor around Newport, which has been received via the Programme Officer.

1.1.2. The Welsh Government understands the evidence submitted within their Statement to be based on the following:

Ecology - Bats

1. Considers that the Environmental Statement (ES) (Document 2.3.2) and additional information does not adequately demonstrate that the crossing point mitigation measures put forward are likely to function effectively for the range of species present. Based on the available information, NRW cannot conclude that the mitigation needed to prevent detrimental impacts to bat populations (from fragmentation effects and mortality impacts) can be delivered by the scheme proposals.
2. Considers that best practice principles for bat mitigation along linear transport infrastructure include:
 - a. Crossing structures should be placed on the exact locations of existing bat commuting routes
 - b. Crossing structures should not require bats to alter flight height or direction
 - c. Crossing structures should maintain connectivity with existing bat commuting routes
 - d. Over-the-road structures such as green bridges should be planted with vegetation and should be of sufficient width (30m wide was found to be effective)
 - e. Underpasses should be of sufficient height. The minimum requirements for underpass height will be species-specific. Required heights will generally be lower (3m) for woodland adapted species compared to the generalist edge adapted species (~6m).
 - f. Crossing structures should be unlit

3. States that of the 15 bat species known to occur in Wales, all except one (Bechstein's bat) were recorded on static bat detectors in bat surveys undertaken for the road scheme (ES Section 10.4.257).
4. Considers that Richard Green's proof (Section 3.4.3) appears to seek to downplay the ES assessment of the corridor as being of regional value, citing the effects of species rarity on the evaluation. In NRW's view, rarity is an important consideration. Loss of foraging habitat through severance and loss of even small numbers of rarer animals through mortality arising from vehicle collision can potentially be significant for populations of rarer species.
5. Considers that Richard Green's proof (Section 3.4.3) also suggests that habitats to the north of the existing road are of greater value to most bat species. It suggests that perhaps 'the scheme corridor is of county value to bats given the availability of better habitat in the region'. Whilst we would agree that there are important habitats for bats in the wider landscape, we do not agree that their presence should be used to downgrade the importance of the route corridor for bats, which confirmed significant bat activity and 14 of our 15 bat species.
6. Considers that the mosaic of habitats along the scheme corridor including wetland habitats such as that provided by the Gwent levels system are recognised as important foraging areas for many bat species in providing an abundant source of insect prey (Section 10.4.272) and this is reflected in the diversity and abundance of species found to be present.
7. Considers that Richard Green's proof (Section 3.1.5) suggests that in certain areas the relatively high levels of *Myotis* spp is probably due to existing roadside and railside woodland planting in those areas. NRW considers that there is no evidence to support this conclusion. In our view, the presence of a mosaic of habitats in these areas including the presence of watercourses providing rich food source for bats is an alternative likely reason for the relatively high levels of these species.
8. Bats were recorded by the schemes ecologists across the length of the scheme. Considers that there is a need to ensure the new road corridor is permeable to bats along its length and appropriate proposals for safe

- road crossing provision delivered specific to the range of bat species present.
9. Considers that the crossing points referred to in the ES are generally culverts required to take watercourses under the road, overbridges intended for traffic and underbridges generally intended for road or rail traffic. These are not specific measures designed or located to mitigate the impacts on bats.
 10. Considers that the proposals to minimise the impacts of the road on the movement of bats as set out in the ES indicate that there is potential for some of the structures and design to mitigate for the impacts of the scheme. However, NRW consider that whether these function as effective crossing points depends whether full account is taken of the principles of designing mitigation measures specifically for the range of species which may use them. The ES does not currently give sufficient assurance that this is the case.
 11. ES Section 10.7.240 states that there is potential for some overbridges to act as safe crossing points for bats. One example (Halcrow) is cited in support. However, Berthinussen and Altringham (2015) consider that overbridges are unlikely to be used by bats unless they are of sufficient width and are vegetated. Concerned that there are no proposals for vegetated structures in the ES. The ESS Bat MS acknowledges that the use of bridges by bats is less likely than the use of culverts and underpasses (Section D.3.31).
 12. ES Table 10.18 “Crossing Points for Bats at Locations of High to Very High Level Bat Activity and for Rarer Bat Species” identifies proposed features of the road including overbridges, underpasses and culverts that could act as bat crossing points. Table 10.18 also sets out the amount of bat activity during surveys and an assessment of the value of individual locations to bat species groups. Concerned, however, that the table is not collated to form conclusions about the expected effectiveness of the crossing features as mitigation either in preventing habitat fragmentation, or minimising the risk of mortality.
 13. Considers that the ES does not adequately demonstrate that the crossing points listed will function effectively for the species concerned.

14. Considers that the table should also state what additional measures will be used to encourage bats to use the mitigation feature and discourage unsafe crossing.
15. Considers that Table 10.18 should be reviewed in the light of the evidence and recommendations from Berthinussen & Altringham and in the context of relevant species at each location, so that higher priority can be given to additional measures (such as increasing the size of underpasses, or planting overbridges) to increase the chances of mitigation being effective.
16. Section 10.5.38 of the ES states 'Where practicable the detailed design of planting would take account of the need to guide bats into culverts, mammal crossings underpasses and/or overbridges'. This introduces doubt as to what can be achieved. NRW is seeking confirmation that where planting is required to provide links to crossing provision, this will be delivered and timetabled as early as possible in the construction period. In addition it should be designed so as to have maximum benefit for safe road crossing, whilst discouraging crossings in places where structures are not provided.
17. It is NRW's view that insufficient evidence has been provided to support the conclusion that there will be no detrimental impact to bats from the proposed M4 CaN.
18. Common pipistrelle bat, soprano pipistrelle bat, brown long eared bat, noctule bat, greater horseshoe bat, lesser horseshoe bat and Bechstein's bat are included in the interim list of priority species (organisms) for the purposes of section 7 of the 2016 Act. In NRW's opinion, the evidence presented, including the information provided in the ES, is not adequate to demonstrate that the proposals for the M4 CaN scheme (including mitigation) would constitute reasonable steps to 'enhance and maintain' bat populations affected by the construction of the M4 Corridor around Newport scheme.

2. REBUTTAL

2.1. Points Raised

2.1.1. Some of the above points have already been addressed in previous proofs of evidence. Others are dealt with by topic by the relevant witness in the following sections, in addition to their general proofs of evidence, to which readers should also make reference in their entirety for a full understanding of the Welsh Government's case. For ease of reference the places where the above points are addressed in this Rebuttal are listed in the table below:

Objector's point reference	Rebuttal paragraph reference	Objector's point reference	Rebuttal paragraph reference
1	2.2.1	10	2.2.10
2	2.2.2	11	2.2.11
3	2.2.3	12	2.2.12
4	2.2.4	13	2.2.13
5	2.2.5	14	2.2.14
6	2.2.6	15	2.2.15
7	2.2.7	16	2.2.16
8	2.2.8	17	2.2.17
9	2.2.9	18	2.2.18

2.2. Richard Green (Ecology - Bats)

2.2.1. Response to **Point 1** (Considers that the ES and additional information does not adequately demonstrate that the crossing point mitigation measures put forward are likely to function effectively for the range of species present. Based on the available information, NRW cannot conclude that the mitigation needed to prevent detrimental impacts to bat populations (from fragmentation effects and mortality impacts) can be delivered by the scheme proposals.):

1. WG recognise that roads have detrimental effects on bats, including habitat loss, severance and mortality of bats, leading to a reduction in bat abundance and species diversity up to 1.6 km distance from a major road. Whilst mitigation is proposed and is to be refined as detailed design progresses in consultation with NRW, particularly given the restrictions of headroom in culverts, WG are in agreement that all adverse effects cannot be prevented and residual effects will remain, assessed as of moderate adverse significance.
2. Whilst several studies have been undertaken on bats and roads, most notably Berthinussen and Altringham 2015¹, precise predictions cannot be made on exactly how roads will affect bats, i.e., to what extent crossing structures will be effectively used by bats and to what extent bat populations will be affected, e.g., causing bats to move away from the area or a decrease in reproductive success. The mitigation proposed and to be designed in detail aims to minimise the effects on bats within the constraints posed by the road alignment, both vertically and horizontally.

¹ Development of a cost-effective method for monitoring the effectiveness of mitigation for bats crossing linear transport infrastructure. Anna Berthinussen & John Altringham, School of Biology, University of Leeds, Leeds LS2 9JT. Final report 2015

2.2.2. Response to **Point 2** (Considers that best practice principles for bat mitigation along linear transport infrastructure include:

- a. Crossing structures should be placed on the exact locations of existing bat commuting routes
- b. Crossing structures should not require bats to alter flight height or direction
- c. Crossing structures should maintain connectivity with existing bat commuting routes
- d. Over-the-road structures such as green bridges should be planted with vegetation and should be of sufficient width (30m wide was found to be effective)
- e. Underpasses should be of sufficient height. The minimum requirements for underpass height will be species-specific. Required heights will generally be lower (3m) for woodland adapted species compared to the generalist edge adapted species (~6m).
- f. Crossing structures should be unlit.)

1. In response to lettered points:

- a. Crossing structures are proposed along existing bat commuting routes, e.g., hedges & reens, where possible and practical. Where reens are to be diverted, it is expected that bats will follow the new reen course, which will lead them to culverts under the road.
- b. It is not possible to provide structures that would allow bats to fly under the road without altering flight height when approaching from, for example, canopy height of a severed tree line. The vertical alignment of the road is fixed, for reasons including landscape effects, engineering and economic reasons. Given that the water level in the reens on the levels is penned, headroom/freeboard through culverts is limited. However, there is availability to increase culvert height at some locations and this has been considered further (refer to response to 4.4.10). Precise dimensions cannot be given at this stage because detailed topographic survey has not been undertaken (refer to 5.3.5, 7.3.4 & 7.3.15 of my proof and D.3.29, D.3.30 & D.3.33 of the Draft Bat Mitigation Strategy (Appendix SS10.5 of the December 2016 ES Supplement [DOC 2.4.14])). Landscaping will aim to bring flight

height down and guide bats to culvert entrances, rather than flying over the road. It is not economically feasible to provide green bridges over the road at all locations of high bat activity or where rarer species have been recorded.

- c. Refer to a. Landscaping/planting will be used to maintain connectivity with existing bat commuting routes and crossing locations, e.g., culverts.
- d. Refer to b.
- e. Refer to b.
- f. Crossing structures will be unlit.

2.2.3. Response to **Point 3** (States that of the 15 bat species known to occur in Wales, all except one (Bechstein's bat) were recorded on static bat detectors in bat surveys undertaken for the road scheme (ES Section 10.4.257).)

1. ES section 10.4.257 reads, "During the 2014 Arup bat activity surveys a total of nine individual bat species was recorded, along with long-eared bat species and Myotis bats likely to include whiskered bat, Brandt's bat, Natterer's bat and Daubenton's bat, bringing the total to 14 out of the 17 species known to breed within the UK." Note that Myotis bat species are very difficult to differentiate by bat detector, as there is considerable overlap in call structure. Therefore, assumptions are made based on bat species included in the desk study. There are no records of Brandt's bat within 5 km of the new motorway but it is recognised that this does not mean that the species is absent from the area. Similarly, there is overlap in call structure between serotine Leisler's and noctule bat and whilst some calls are very characteristic, it is not always possible to differentiate between these species, particularly Leisler's, who's call characteristics sit between those of the other two species.
2. It is therefore not possible to determine relative abundance of Myotis species in particular.

2.2.4. Response to **Point 4** (Considers that Richard Green's proof (Section 3.4.3) appears to seek to downplay the ES assessment of the corridor as being of regional value, citing the effects of species rarity on the evaluation. In NRW's view, rarity is an important consideration. Loss of foraging habitat through severance and loss of even small numbers of rarer animals through mortality arising from vehicle collision can potentially be significant for populations of rarer species.)

1. As stated in 3.4.2 & 3.4.3 of my proof, Wray et al. state that their approach should be used as a framework rather than a rulebook. Their approach was the first attempt in the UK to assign values for bat in EclA, and although not strictly a recognised standard, it has been adopted by ecologists, as published in the CIEEM journal 'In Practice' (December 2010), in the absence of any alternative.
2. The method of evaluation relies heavily on knowing the approximate number of bats (individuals, small number or large number) using a commuting route or foraging area. Unfortunately, without direct observation, it is impossible to determine the number of bats foraging in an area. Even with direct observation, if an individual bat flies out of site and then returns, it is not possible to be certain if this is one or two bats. It is also impossible to observe bats effectively after dusk and before dawn, when it is too dark to see them. Static bat detectors are therefore a suitable alternative for measuring bat activity. However, activity level is all that can be deduced from their recordings. They cannot count individual bats. Where high levels of bat activity are recorded, it is impossible to say whether this is due to a high number of bats flying past or one bat foraging for a prolonged period in the same area, repeatedly flying past the bat detector, which records each pass.
3. Pipistrelle bats have relatively loud calls and are readily recorded by bat detectors. They also have a habit of foraging in the same location for prolonged periods, particularly along the edge of tree canopies and tall hedges, and around street lights, as they feed on the insects attracted to them. In my experience of undertaking an extensive amount of bat activity survey, other species that forage for prolonged periods in an area include Myotis and serotine bats and to a lesser extent, barbastelle, noctule and Leisler's bats, particularly when foraging along hedgerows.

4. In my experience, long-eared and horseshoe bats tend to be more wandering species, not repeatedly flying up and down the same hedgerow for extensive periods. Some bat species, e.g., long-eared, have very quiet calls and therefore may be under-recorded.
5. Therefore, it is very difficult to determine even an approximate number of bats commuting or foraging along a hedgerow, for example. The following activity levels were used to assign 'number of bats' in the valuation for bats. Over, on average, 100 passes per night = large number; on average, between 10 and 100 passes per night = small number; and on average, less than 10 passes per night = individuals. This is a reasonable conversion but as there is no way of confirming numbers, the valuation could be grossly affected by an over (or under) estimation. It would not take long for one bat to generate 100 bat passes when foraging up and down the same hedge repeatedly. One pass does not even equate to one actual pass of the detector, as it is possible for the detector to record two or more passes as the bat approaches and passes the detector.
6. Therefore, the assessment based on bat activity alone could be misleading and the landscape is an important consideration in valuing the area for bats. As discussed in my proof (3.4.3) the fields between the hedges and reens over the levels are unlikely to provide valuable bat foraging habitats. It is acknowledged that the hedges/tree lines and reens do provide a valuable habitat network but when one considers the results of the walked transect surveys, the more open and exposed areas over the levels tended to have less bat activity. The highest levels of bat activity tend to be found where there is more tree cover.
7. As the valuation for bats uses a geographical reference, I looked at the area around Newport and South Wales using aerial photography on Google Earth. For the most part, excluding cities and large towns, South Wales contains a relatively high density of woodland, compared to the rest of the UK, and comprises of a patchwork of many small fields bounded by a network of hedges and tree lines. There are also many wooded valleys and river systems. These habitats provide favourable habitats for bats because of a high insect abundance and diversity and, in particular, more shelter from the wind than would be present on the levels, meaning that prey availability is likely to be greater on average, as

open habitats provide little available insect prey in windy conditions. Therefore, if one considers the valuation of bat foraging habitat based on habitats available in the region, rather than just basing it on numbers of bat calls recorded on bat detectors, the Levels are, in my opinion, likely to be less valuable than other areas in South Wales. Coupled with this, the areas at each end of the Scheme are currently subject to 'disturbance' and habitat degradation from the existing M4 and A-roads, industrial areas and housing development, whilst Newport docks provides low value bat habitat.

8. I suspect that if bat survey was undertaken across the whole of Wales (excluding urban areas and coastal habitats). The whole of Wales would be valued (using the Wray et al. method) as of at least regional value. If the purpose of having a geographical frame of reference for valuation is so that one can identify the most important areas for bats within a larger area, such as the 'region', my suggestion that the levels may be of county value seeks to compare the area with the rest of the 'region'.
9. I have already raised in my Proof of Evidence at 3.4.3 how the presence of one greater horseshoe bat over all of the surveys undertaken assigns a level of regional value for this species. Whilst rare, individual greater horseshoe bats are wide ranging. For example, an individual bat ringed in Gloucester was subsequently found in North Wales. Therefore, the greater horseshoe bat recorded could simply have been 'passing through' or exploring the area, rather than regularly foraging in the area.
10. Despite my suggestion that the levels may be of county value for bats, I do not disagree with the precautionary approach of valuing the Scheme corridor as of regional value for bats but simply raise the difficulties of determining value to demonstrate that a precautionary approach has been taken to the valuation and impact assessment.

2.2.5. Response to **Point 5** (Considers that Richard Green's proof (Section 3.4.3) also suggests that habitats to the north of the existing road are of greater value to most bat species. It suggests that perhaps 'the scheme corridor is of county value to bats given the availability of better habitat in the region'. Whilst we would agree that there are important habitats for bats in the wider landscape, we do not agree that their presence should be used to downgrade

the importance of the route corridor for bats, which confirmed significant bat activity and 14 of our 15 bat species.)

1. Refer to responses to points 3 and 4 above. It is recognised that the area is of value to bats. An attempt is made, given the limitations of survey data, to consider value in the context of the wider area/region. However, a precautionary approach of valuing the Scheme corridor as of regional value has been taken for the assessment.

2.2.6. Response to **Point 6** (Considers that the mosaic of habitats along the scheme corridor including wetland habitats such as that provided by the Gwent levels system are recognised as important foraging areas for many bat species in providing an abundant source of insect prey (Section 10.4.272) and this is reflected in the diversity and abundance of species found to be present.)

1. Jean Matthews appears to be quoting the ES. The actual text at 10.4.272 states, "Recognising that all bats are European Protected Species and taking the results of the 2014 and 2015 reports together, based on the methodology of Wray et al. (2010), the corridor of the proposed new section of motorway is of at least district level importance for lesser horseshoe bats and brown long-eared bats and between district and county level importance for pipistrelles. For all other bat species, results of the surveys indicate that the route is of regional value with regard to foraging and commuting behaviour. Overall the route corridor is thus assessed as being of Regional (Medium)."
2. I cannot find similar text in the ES to that quoted.

2.2.7. Response to **Point 7** (Considers that Richard Green's proof (Section 3.1.5) suggests that in certain areas the relatively high levels of *Myotis* spp is probably due to existing roadside and railside woodland planting in those areas. NRW considers that there is no evidence to support this conclusion. In our view, the presence of a mosaic of habitats in these areas including the presence of watercourses providing rich food source for bats is an alternative likely reason for the relatively high levels of these species.)

1. Section 3.2.8 (to which I think Jean Matthews intended to refer) is part of a summary of bat survey findings. The specific locations I was considering are static detector locations 27 (2015) – *Myotis* BAI=30.5, 3(2014) – BAI=21.2, 40(2015) – BAI=91.1, & 33(2015) – BAI=20.2. These are all in/adjacent to existing road or railside planting. However, it is acknowledged that there are higher levels of *Myotis* activity elsewhere but these are also associated with tree cover. I agree that when tree cover is combined with wetland habitats, such as a reed, this is likely to provide better foraging habitat than trees alone. However, it is my opinion that tree cover is the primary reason for higher levels of *Myotis* bat species activity, as a whole. For Daubenton's bat *Myotis daubentonii*, water is likely to be the primary reason; however, tree-lined watercourses provide better habitat for this species than watercourses with no trees.

2.2.8. Response to **Point 8** (Bats were recorded by the schemes ecologists across the length of the scheme. Considers that there is a need to ensure the new road corridor is permeable to bats along its length and appropriate proposals for safe road crossing provision delivered specific to the range of bat species present.)

1. Refer to my responses to Points 2 and Point 12.

2.2.9. Response to **Point 9** (Considers that the crossing points referred to in the ES are generally culverts required to take watercourses under the road, overbridges intended for traffic and underbridges generally intended for road or rail traffic. These are not specific measures designed or located to mitigate the impacts on bats.)

1. Existing flight paths exist along reens, roads and railways, particularly where lined with trees/hedges. It therefore makes sense to utilise culverts on reens and underbridges taking roads and railways as bat crossing points. These structures also offer the greatest amount of headroom, given the constraints raised in my response to 2.5.1. 900 mm dry wildlife culverts are also proposed in areas of high bat activity. However, it is recognised that these will be limited in terms of their effectiveness to act as safe bat crossings for all species. For the reasons given in my response to 2.5.1, it is not possible to increase the size of these culverts or provide green bridges over the road at all locations of high bat activity.

2.2.10. Response to **Point 10** (Considers that the proposals to minimise the impacts of the road on the movement of bats as set out in the ES indicate that there is potential for some of the structures and design to mitigate for the impacts of the scheme. However, NRW consider that whether these function as effective crossing points depends whether full account is taken of the principles of designing mitigation measures specifically for the range of species which may use them. The ES does not currently give sufficient assurance that this is the case.)

1. ES Table 10.18 has been updated to include approximate available headroom in culverts, an assessment of likely effectiveness for different bat species and proposals for increasing individual culverts. The updated table is provided in the updated Bat Mitigation Strategy. NRW were consulted on this table on the 16th of March and responded on the 26th of April 2017. NRW welcomed the increase in sizes of culverts at the locations specified, as the increases in culvert size increase the likelihood of use of the culverts by individual bats. However, NRW consider that the majority do not deliver the minimum heights advised in either DEFRA Science and Research Project W1060 (Berthunissen and Altringham 2015) or Conference of European Directors of Roads (CEDR): Roads and Wildlife. Safe Bat Paths. Fumbling in the dark – effectiveness of bat

mitigation measures on roads (November 2016). It is recognised in the table that the majority of the culverts are unlikely to be effective for the full range of bat species present. In terms of increasing culvert sizes to provide safe crossing points for bats across the new road, NRW recognise that the nature of the route corridor places particular constraints upon what can be provided. NRW are keen to continue to work with Welsh Government to ensure that, should the Road Orders be made, crossing points for bats are designed to maximise their chances of success. Current landscape plans are not sufficiently detailed at this stage to show exactly how bats would be guided to structures. However, the principle would involve reducing canopy height as bats approach the culverts, and planting 'arrowheads' pointing at the culvert entrances, so that approaching bats are guided towards the culverts.

2. As previously acknowledged, there are limitations on the design of crossings and the effectiveness of structures cannot be guaranteed. The larger structures, such as over-sized culverts where headroom permits and underbridges, are likely to be most effective.

2.2.11. Response to **Point 11** (ES Section 10.7.240 states that there is potential for some overbridges to act as safe crossing points for bats. One example (Halcrow) is cited in support. However, Berthinussen and Altringham (2015) consider that overbridges are unlikely to be used by bats unless they are of sufficient width and are vegetated. Concerned that there are no proposals for vegetated structures in the ES. The ESS Bat MS acknowledges that the use of bridges by bats is less likely than the use of culverts and underpasses (Section D.3.31).)

1. ES section 10.7.240 states "...overbridges constructed as part of the Scheme would also provide potential crossing points for bats." It is not suggested that these would be 'effective' but their potential to be used by bats can be increased by using solid parapets and planting to guide bats to them.
2. The assessment considers that effectiveness is likely to be low for such structures, hence the conclusion of a moderate adverse effect.

2.2.12. Response to **Point 12** (ES Table 10.18 "Crossing Points for Bats at Locations of High to Very High Level Bat Activity and for Rarer Bat Species" identifies

proposed features of the road including overbridges, underpasses and culverts that could act as bat crossing points. Table 10.18 also sets out the amount of bat activity during surveys and an assessment of the value of individual locations to bat species groups. Concerned, however, that the table is not collated to form conclusions about the expected effectiveness of the crossing features as mitigation either in preventing habitat fragmentation, or minimising the risk of mortality.)

1. ES Table 10.18 has been updated to include approximate available headroom in culverts, an assessment of likely effectiveness for different bat species and proposals for increasing individual culverts (refer to response to Point 10 in 2.2.10).
2. The assessment takes a precautionary approach and assumes that severance effects will remain, despite provision of culverts, underpasses and overbridges.

2.2.13. Response to **Point 13** (Considers that the ES does not adequately demonstrate that the crossing points listed will function effectively for the species concerned.)

1. Their effectiveness cannot be guaranteed, hence the assessment of residual effects of moderate adverse.

2.2.14. Response to **Point 14** (Considers that the table should also state what additional measures will be used to encourage bats to use the mitigation feature and discourage unsafe crossing.)

1. The Bat Mitigation Strategy states that strategic planting of trees and shrubs will be undertaken in order to provide habitat corridors to guide bats into entrances to culverts and dry underpasses, and also includes the proposed use of artificial “bat corridors” to guide bats to culverts until vegetation has sufficiently established. It is proposed to agree the detail of this with NRW.

2.2.15. Response to **Point 15** (Considers that Table 10.18 should be reviewed in the light of the evidence and recommendations from Berthinussen & Altringham and in the context of relevant species at each location, so that higher priority can be given to additional measures (such as increasing the size of underpasses, or planting overbridges) to increase the chances of mitigation being effective.)

1. ES Table 10.18 has been updated to include approximate available headroom in culverts, an assessment of likely effectiveness for different bat species and proposals for increasing individual culverts. The updated assessment is based on Møller et al (2016)², who have tentatively categorised some of the European bat species according to their flight height and manoeuvrability when commuting in open areas. The categories are based on their own experiences, as well as information from various authors, including Berthinussen & Altringham (2015). Berthinussen & Altringham do not specify sizes of culvert that are considered effective for each species.
2. It will not be possible to increase the height of culverts so that they are effective for all bat species. The large underbridges are likely to be the only structures that can be used effectively by bat to cross the road.

2.2.16. Response to **Point 16** (Section 10.5.38 of the ES states 'Where practicable the detailed design of planting would take account of the need to guide bats into culverts, mammal crossings underpasses and/or overbridges'. This introduces doubt as to what can be achieved. NRW is seeking confirmation that where planting is required to provide links to crossing provision, this will be delivered and timetabled as early as possible in the construction period. In addition it should be designed so as to have maximum benefit for safe road crossing, whilst discouraging crossings in places where structures are not provided.)

1. The use of the term 'where practicable' was included to cover the unlikely eventuality that there may be an over-riding reason that means that planting cannot be provided at a particular location. One of the reasons was the concern from NRW that planting trees along reens is not desirable for their SSSI interest. However, short sections of planting along reens, as they approach culverts, is not likely to significantly detract from their SSSI interest. Other than this, in practice there are unlikely to be many other reasons why planting cannot be provided. The details of which will be agreed with NRW.

² CEDR(Conference of European Directors of Roads) Call 2013: Roads and Wildlife. Safe Bat Paths. Fumbling in the dark – effectiveness of bat mitigation measures on roads. Effectiveness of mitigating measures for bats – a review (November 2016).

2. Away from reens, planting will be set back from the hard-shoulder of the new road so as to help deter bats away from the road.

2.2.17. Response to **Point 17** (It is NRW's view that insufficient evidence has been provided to support the conclusion that there will be no detrimental impact to bats from the proposed M4 CaN.)

1. The ES conclusion is not that there will be no detrimental impact to bats from the proposed M4 CaN. It is assessed that effects will be of moderate adverse significance.

2.2.18. Response to **Point 18** (Common pipistrelle bat, soprano pipistrelle bat, brown long eared bat, noctule bat, greater horseshoe bat, lesser horseshoe bat and Bechstein's bat are included in the interim list of priority species (organisms) for the purposes of section 7 of the 2016 Act. In NRW's opinion, the evidence presented, including the information provided in the ES, is not adequate to demonstrate that the proposals for the M4 CaN scheme (including mitigation) would constitute reasonable steps to 'enhance and maintain' bat populations affected by the construction of the M4 Corridor around Newport scheme.)

1. Section 7 of the Environment (Wales) Act 2016, part 3(a), states "Without prejudice to section 6, the Welsh Ministers must take all reasonable steps to maintain and enhance the living organisms and types of habitat included in any list published under this section". Section 6, part 1 states "A public authority must seek to maintain and enhance biodiversity in the exercise of functions in relation to Wales, and in so doing promote the resilience of ecosystems, so far as consistent with the proper exercise of those functions." Emphasis added in bold.
2. Certain activities and projects, such as road building, cannot be undertaken without having an adverse effect on biodiversity. The WG has sought to minimise and remedy biodiversity effects, including on bats, within the constraints of delivering the Scheme.
3. With regard to enhancement, proposals include considerable planting of woodland, trees and scrub that would in the long-term provide an increase in the extent of habitats of value to bats.

2.2.19. I confirm that the statement of truth and professional obligations to the inquiry from my main proof still applies.