



Welsh Government

**St Athan Northern Access Road,
Vale of Glamorgan**

Ecological Assessment

May 2017

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Document Control

Project: St Athan Northern Access Road, Vale of Glamorgan
 Client: Welsh Government
 Job Number: A097705
 File Origin: Z:\Projects\Projects A097000 on\A097705 Northern Access Road\REPORTS

Issue 1	March 2017	Pre-application consultation draft
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Issue 2	May 2017	Planning application issue
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Contents

Executive Summary	1
1.0 Introduction	2
1.1 Background	2
1.2 Site Location.....	3
1.3 Development Proposals	3
1.4 Survey and Reporting Objectives	3
2.0 Planning Policy and Legislation	5
2.1 National Planning Policy.....	5
2.2 Local Planning Policy	6
2.3 Environment (Wales) Act 2016.....	8
2.4 Legislation	9
2.5 Welsh Government Biodiversity Guidelines.....	9
3.0 Desk Study	10
3.1 Methodology.....	10
3.2 Results.....	11
4.0 Habitat Surveys	12
4.1 Methodology.....	12
4.2 Results.....	12
4.3 Assessment of Impacts and Recommendations	17
5.0 Great Crested Newt	20
5.1 Desk Study	20
5.2 Methodology.....	20
5.3 Results.....	22
5.4 Assessment of Impacts and Recommendations	23
6.0 Reptile	24
6.1 Desk Study	24
6.2 Methodology.....	24
6.3 Results.....	25
6.4 Assessment of Impacts and Recommendations	25
7.0 Badger	28
7.1 Desk Study	28
7.2 Methodology.....	28
7.3 Results.....	29
7.4 Assessment of Impacts and Recommendations	29
8.0 Otter and Water Vole	32
8.1 Desk Study	32
8.2 Methodology.....	32
8.3 Results.....	33
8.4 Assessment of Impacts and Recommendations	33
9.0 Invertebrates	35
9.1 Desk Study	35
9.2 Methodology.....	36



9.3	Results.....	37
9.4	Assessment of Impacts and Recommendations	38
10.0	Hazel Dormouse	40
10.1	Desk Study.....	40
10.2	Methodology.....	40
10.3	Results.....	41
10.4	Assessment of Impacts and Recommendations	42
11.0	Breeding Birds	47
11.1	Methodology.....	47
11.2	Results.....	48
11.3	Assessment of Impacts and Recommendations	50
12.0	Bats.....	52
12.1	Desk Study.....	52
12.2	Methodology.....	52
12.3	Results.....	57
12.4	Assessment of Impacts and Recommendations	62
13.0	Fish Species	66
14.0	Summary of Mitigation Measures.....	67
15.0	References.....	70

FIGURES

Figure ECO01 – Extended Phase 1 Habitat Plan West

Figure ECO02 – Extended Phase 1 Habitat Plan East

Confidential Figure ECO03 – Badger and Reptile

Figure ECO04 – Hazel Dormouse

Figure ECO05 – Breeding Birds: Red & Amber List

Figure ECO06 – Bat Transect and Remote Detector Location

Figure ECO07 – Summary Bat Transect Data West

Figure ECO08 – Summary Bat Transect Data East

APPENDIX A - Additional survey data



Executive Summary

WYG was commissioned by Welsh Government in April 2016 to undertake a series of ecological surveys of land to the north of MoD St Athan, Vale of Glamorgan. The surveys were carried out to provide ecological information on potential ecological constraints and to determine the requirements for mitigation to support an application for full planning permission to construct a new highway, which will provide access to the existing Aerospace Business Park (ABP) at St Athan in the Vale of Glamorgan.

No statutorily designated sites for nature conservation or non- statutory sites are present within the site. The site contains a mosaic of habitats, being largely dominated by grassland, subject to varying levels of agricultural improvement, and arable fields. Smaller areas of habitat present include dense scrub, semi-natural broadleaved woodland and amenity grassland (which is associated with the St Athan military base). The site is drained by Llanmaes Brook, which flows in a southerly direction through the centre of the site with Boverton Brook located to the south. Field boundaries within the site largely comprise hedgerows of varying species diversity.

Protected species surveys identified the presence of a number of species within the habitats on-site, including a hazel dormouse nest and single adult hazel dormouse recorded in the east of the site. Based on connectivity of suitable habitats, their presence has been assumed within hedgerows across the site. In addition, two badger setts were located on-site (a large main sett and an outlier sett) with slow worm found in low numbers associated with the Llanmaes Brook stream corridor. Surveys also recorded 12 notable invertebrate species, with a diverse breeding bird population recorded, largely comprising relatively common species associated with the hedgerow, scrub and woodland habitats. No evidence of water vole, otter or great crested newt was recorded during the surveys, but it has been assumed that otter may commute along Llanmaes Brook and Boverton Brook. No bat roosts were recorded within the site and bat activity surveys recorded relatively low levels of activity across the site, with six bat species recorded. Bat activity was largely associated with the field boundaries and streams.

The results of the surveys have informed the design of the development, which has focused on the retention, enhancement and protection of important habitats as far as is possible and the maintenance of habitat connectivity through and around the site (to allow species free movement and avoid fragmentation impacts). The development will require a Natural Resources Wales European Protected Species Licence for hazel dormice and a Natural Resources Wales licence to close an outlier badger sett. All mitigation has been designed with reference to best practice guidance.



1.0 Introduction

WYG was commissioned by Welsh Government in April 2016 to undertake a series of ecological surveys of land to the north of MOD St Athan, Vale of Glamorgan; hereafter referred to as 'the site'.

The surveys were carried out to provide ecological information on potential ecological constraints and to determine the requirements for mitigation to support an application for full planning permission to construct a new highway, which will provide access to the existing Aerospace Business Park (ABP) at St Athan in the Vale of Glamorgan. The road is referred to as the Northern Access Road (NAR) and will provide a direct link from the B4265, near Llanwit Major in the west to Eglwys Brewis Road in Picketon in the east.

The report was compiled by Chris Meddins MCIEEM, Associate Ecologist, who has over sixteen years' experience in ecological consultancy.

1.1 Background

Proposals for major development at St. Athan received outline planning permission in 2009 from the Vale of Glamorgan Council which granted two planning permissions for redevelopment of the military camp at St Athan:

- the first permission was for the Defence Technical College (DTC) then proposed by the Ministry of Defence, application no. 2009/00500/OUT;
- the other permission was for the Aerospace Business Park (ABP) proposed by the Welsh Government, application no. 2009/00501/OUT.

Common to both these applications was the NAR which was intended to serve as the principal access to both developments as well as to the service families' housing associated with the College. Although those applications were made in outline, the NAR was fully designed and full planning permission was granted for it.

The Defence Technical College did not proceed and the planning permissions have since expired. Nevertheless, the Welsh Government remains committed to the Aerospace Business Park and the Northern Access Road is considered essential in order to deliver the economic and social benefits associated with the Cardiff Airport St Athan Enterprise Zone.

The NAR will serve existing and proposed development at St Athan including:



- The Aerospace Business Park, which occupies a large part of the former RAF camp, including the operational runway;
- The proposed Aston Martin car manufacturing facility, which will occupy the existing super hangar building on the Aerospace Business Park; and
- Proposed residential development on land lying south of the proposed Northern Access Road and between it and Eglwys Brewis Road.

The Northern Access Road will not serve the MoD camp at St Athan, which will continue to be served via its existing access road at Main Gate.

1.2 Site Location

The site is located within and to the north west of MoD St Athan and is situated between Boverton and Eglwys Brewis, to the north of the existing Eglwys Brewis Road. The site is centred at Ordnance Survey (OS) National Grid Reference SS 989 691 and is approximately 35.4 ha in area. The site lies within the Vale of Glamorgan Council administrative area.

The site contains a mosaic of habitats being largely dominated by grassland, subject to varying levels of agricultural improvement, and arable fields. Smaller areas of habitat present includes dense scrub, semi-natural broadleaved woodland and amenity grassland (which is associated with the St Athan military base). The site is drained by Llanmaes Brook which flows in a southerly direction through the west of the site with Boverton Brook located to the south. Field boundaries within the site largely comprise hedgerows of varying species diversity.

The site boundary is shown in AECOM Drawing number 60509148-REF-00-0000-CT-3020.

1.3 Development Proposals

The proposed development includes the construction of a new highway (called the Northern Access Road) with footways and a cycleway, new junctions, lighting, signs, fencing, flood alleviation works, acoustic barriers and other environmental mitigation measures, landscaping, demolition of the garage at Rose Cottage, and all associated engineering and building operations.

1.4 Survey and Reporting Objectives

The ecological investigations undertaken by WYG included the following:



- A desk study to obtain existing information on statutory and non-statutory sites of nature conservation interest, and records of protected/notable species within the site and its surroundings for up to 2km of the site with an assessment of European sites within 15km;
- An extended Phase 1 habitat survey involving a walkover of the site to record habitat types and dominant vegetation, invasive species, a reconnaissance survey for evidence of protected fauna or habitats capable of supporting such species;
- Assessment of hedgerows under the Hedgerow Regulations 1997;
- Protected species surveys (including great crested newts, badgers, otter & water vole, reptiles, invertebrates, breeding bird, dormice and bats) to determine the presence of and level of use of the habitats within the site; and
- An assessment of the potential ecological constraints to the proposed works at the site and recommendations for avoidance, mitigation and enhancement where appropriate, to provide sufficient information for a planning application.

1.4.1 Report structure

The report is structured as follows:

Section	Title	Description
Section 1	Introduction	Background to the project
Section 2	Planning Policy and Legislation	Provides an overview of the national and local planning policy and legislation relevant to the assessment of ecological impacts associated with the development
Section 3	Desk Study	Provides details of the desk study completed to inform the field surveys including methodology and results
Section 4	Habitat Surveys	Details the habitat survey methodologies and results with an assessment of impacts of the scheme and required avoidance, mitigation and enhancement
Section 5 – 12	Various species specific sections	Provides separate species specific sections detailing the survey methodologies and results for each species with an assessment of impacts of the scheme and required avoidance, mitigation and enhancement
Section 13	Summary of Mitigation Measures	Summarises the mitigation measures proposed for the construction and operational phases (where required)
Section 14	References	Lists the references cited within the report



2.0 Planning Policy and Legislation

An overview of the planning policy that is applicable to the site is provided below, with further detail provided in the Planning Statement submitted with the application. A summary of the main wildlife legislation is also provided with species specific legislation provided in relevant sections.

2.1 National Planning Policy

Planning Policy Wales (PPW) Edition 9 (Welsh Government, November 2016) sets out the Welsh Government's national planning policies in Wales, and is supported by a series of Technical Advice Notes (TAN's).

Paragraph 5.1.2 of PPW set out the Welsh Government's objectives for the conservation and improvement of the natural heritage which are to:

- promote the conservation of landscape and biodiversity, in particular the conservation of native wildlife and habitats;
- ensure that action in Wales contributes to meeting international responsibilities and obligations for the natural environment;
- ensure that statutorily designated sites are properly protected and managed;
- safeguard protected species; and to
- promote the functions and benefits of soils, and in particular their function as a carbon store.

Paragraph 5.1.3 states that a key role of the planning system is to ensure that society's land requirements are met in ways which do not impose unnecessary constraints on development whilst ensuring that all reasonable steps are taken to safeguard or enhance the environment. In addition paragraphs 5.3.8– 10 of PPW state the planning system should ensure that the UK's international and national obligations for site, species and habitat protection are fully met in all planning decisions.

Technical Advice Note 5: Nature Conservation and Planning (TAN 5) provides advice on how the land use planning system should contribute to protecting and enhancing biodiversity and geological conservation.

Paragraph 4.6 of TAN 5 states that Local Planning Authorities should use planning conditions to avoid adverse impacts or remove the likelihood of adverse impacts occurring, reduce adverse impacts that may occur, compensate for losses or impacts that could not be avoided or mitigated, and enhance aspects of the natural heritage and its enjoyment. All conditions should be necessary, relevant to planning, relevant to the development permitted, enforceable, precise and reasonable.



Paragraph 5.1.6 of TAN 5 states that Local Planning Authorities, along with other public bodies, have a duty to take reasonable steps, consistent with the proper exercise of their functions, to further the conservation and enhancement of the features by reason of which international sites are of special scientific interest.

In addition Circular Letter CL-05-04 reaffirms the Welsh Government's commitment to ensuring that designated sites and species of nature conservation importance are protected from damage and deterioration, with their important features conserved by appropriate management. The letter seeks to remind planning authorities of the requirements of the Conservation of Habitats and Species Regulations 2010 (as amended) when considering development proposals through the planning system.

This guidance requires local planning authorities to take account of the conservation of protected species when determining planning applications and makes the presence of a protected species a material consideration when assessing a development proposal that, if carried out, would be likely to result in harm to the species or its habitat.

2.2 Local Planning Policy

The Vale of Glamorgan Adopted Unitary Development Plan 1996- 2011 constitutes the development plan for the area. Relevant UDP policies are summarised below.

Strategic policy 1 states '*The Vale of Glamorgan's distinctive rural, urban and coastal character will be protected and enhanced. Particular emphasis will be given to conserving areas of importance for landscape, ecology and wildlife, the best and most versatile agricultural land and important features of the built heritage. Proposals which enhance these areas will be favoured.* Strategic policy 2 deals with encouraging sustainable practices with proposals favoured that '*...contribute to energy conservation or efficiency; waste reduction or recycling; pollution control; biodiversity and the conservation of natural resources.*

Specific environmental policies included within the UDP that are of relevance to the ecology of the site are detailed below:

Policy ENV 11- Protection of Landscape Features

Development will be permitted if it does not unacceptably affect features of importance to landscape or nature conservation including: trees, woodland, hedgerows, river corridors, ponds, stone walls and species rich grasslands.



Policy Env 16- Protected Species

Permission will only be given for development that would cause harm to or threaten the continued viability of a protected species if it can be clearly demonstrated that:

- i. There are exceptional circumstances that justify the proposals;
- ii. There is no satisfactory alternative; and
- iii. Effective mitigation measures are provided by the developer.

The Vale of Glamorgan Deposit Local Development Plan 2011- 2026 was submitted to the Welsh Government and the Planning Inspectorate for independent examination on 24th July 2015. The LDP is currently undergoing examination and is expected to be adopted mid 2017; when adopted it will supersede and replace the UDP. It should be noted within the deposit draft proposals map the site is included as part of the larger Cardiff Airport and St Athan Enterprise Zone (Policy MG10) and the land is included in transport proposals (Policy MG 16). A summary of relevant policies included in the deposit draft is provided below.

Policy MD 10- Promoting Biodiversity

New residential, commercial and community development will be required, where possible, to positively contribute to biodiversity interests within the Vale of Glamorgan by:

1. *Maintaining and enhancing existing important biodiversity features such as woodland, trees, hedgerows, wetland, watercourses, ponds, green lanes, geological features and habitats; and*
2. *Incorporating new biodiversity features either on or off site to enable a net gain in biodiversity interest. Where it is demonstrated that the impact of development on biodiversity cannot be addressed on site, developers will be required to provide alternative off-site compensation to maintain net biodiversity interest.*
3. *Demonstrating how they maintain features of importance for ecological connectivity, including wildlife corridors and 'stepping stones' that enable migration, dispersal and/ or genetic exchange.*

Where proposals have a negative impact on sites shown to be important for biodiversity, developers will need to demonstrate that the development could not be located elsewhere.

In addition the 'Biodiversity and Development' supplementary planning guidance provides specific direction on how biodiversity will be conserved and enhanced through the planning process drawing on national planning policy in PPW (2010 version) and the policies contained in the adopted Vale of Glamorgan Unitary Development Plan 1996- 2011.



2.3 Environment (Wales) Act 2016

As part of Welsh Government's commitment to reversing the decline in biodiversity in Wales and increasing the resilience of its ecosystems, the Environment (Wales) Act introduces a new biodiversity duty, which highlights biodiversity as an essential component of ecosystem resilience.

Section 6 of the Act places a duty on public authorities to 'seek to maintain and enhance biodiversity' so far as it is consistent with the proper exercise of those functions. In so doing, public authorities must also seek to 'promote the resilience of ecosystems'. The duty replaces the section 40 duty in the Natural Environment and Rural Communities Act 2006 (NERC Act 2006), in relation to Wales, and applies to those authorities that fell within the previous duty.

Section 7 replaces the duty in section 42 of the NERC Act 2006. The Welsh Ministers will publish, review and revise lists of living organisms and types of habitat in Wales, which they consider are of key significance to sustain and improve biodiversity in relation to Wales. In producing the list or taking any measures to improve the listed organisms and habitats, the Welsh Ministers must apply the principles of sustainable management of natural resources. Therefore, they must consider any appropriate evidence, for example as provided in the State of Natural Resources Report, and also engage with any relevant stakeholders, including pertinent public authorities. Certain public authorities will also be required to consider the section 7 list, in complying with the new biodiversity duty under section 6 of the Act. The list is important in assisting public bodies to identify potential issues that they may wish to address in meeting their well-being objectives, in addition to contributing to the well-being goal 'a resilient Wales' (Goal 2).

In the absence of a revised list, the section 42 NERC Act list is still relevant: the S42 list includes 56 habitats of principal importance and over 500 species of principal importance.

Local authorities, in implementing their duties under Section 40 of the NERC Act 2006, must 'have regard' for the conservation of biodiversity in all their activities. The identification of Sites of Importance for Nature Conservation (SINCs) is an important mechanism in ensuring that the habitats and species identified as being of importance in the Vale of Glamorgan, for example through the Vale's Local Biodiversity Action Plan (LBAP), are protected. To ensure that the suite of SINCs included in the LDP was as comprehensive as possible, a review of previous survey data was undertaken in 2013 by the ecology team of The Vale of Glamorgan Council. This review amalgamated and re-assessed the data from all the previous surveys and commissions (including the 1999 cSINCs) as well as incorporating species data, where available, and any data newly available (for example data on ancient woodland sites, as published in the Ancient Woodland Inventory 2011). As a result of the 2013 SINC review, a total of 360 SINCs has been identified within LDP.



2.4 Legislation

Specific habitats and species of relevance to the site and the proposed development receive legal protection in the UK under various European and domestic legislative provisions, including:

- The Conservation of Habitats and Species Regulations 2010 (as amended), 'The Habitat Regulations';
- The Wildlife and Countryside Act 1981 (as amended) (WCA);
- The Countryside and Rights of Way Act 2000 (CRoW);
- The Natural Environment and Rural Communities Act 2006 (NERC Act); and
- The Protection of Badgers Act 1992.

Where relevant, this report takes account of the legislative protection afforded to specific habitats and species.

2.5 Welsh Government Biodiversity Guidelines

The Welsh Government Biodiversity Guidelines: Interim Technical Guidance for Project Managers (November 2011) provides 'desk instructions' with a set of detailed appendices to provide guidance on best practice in the avoidance, minimisation and management of biodiversity impacts, and to provide biodiversity gains in projects. The document has been referred to as required throughout the project.



3.0 Desk Study

3.1 Methodology

3.1.1 Local ecological record centre

Site and species-specific information has been sourced through direct consultation with the South East Wales Biological Records Centre (SEWBRc) regarding the presence of nature conservation designations and protected and notable species within 2 km of the centre of the site. In addition, a search for designations was made of Natural England's interactive, web-based MAGIC (Multi-Agency Geographic Information for the Countryside) database, which also covers Wales, which extends to 15km for European sites.

The data search covers:

- Statutory nature conservation designations, such as National Nature Reserves (NNRs) and Sites of Special Scientific Interest (SSSIs);
- Non-statutory nature conservation designations, such as Sites of Importance for Nature Conservation (SINCs);
- Protected species, such as badger *Meles meles*, great crested newt *Triturus cristatus* and bats; and
- Species of principal importance for biodiversity conservation such as those listed under the section 42 NERC Act list.

Neither the data search nor this report reviews landscape designations, such as whether the site lies within a conservation area or whether there are any tree preservation orders (TPOs) on the site. Species data prior to 2000 have been discounted from the data search results.

3.1.2 Previous reports

All available previous ecological reports for the site and surrounding area were reviewed for relevant information; the most up to date reports applicable to the site are detailed below:

- Capita Symonds. (2009). St Athan: Home of the Defence Technical College and Aerospace Park, Outside the Wire. Ecological Surveys;
- Capita Symonds. (2009). St Athan: Home of the Defence Technical College and Aerospace Park, Inside the Wire. Ecological Surveys;
- David Clements Ecology. (2008). Aerospace St Athan, Cowbridge: Surveys of the Airbase and Surrounding Area for Great Crested Newt.

The above data provided the ecological context for the field surveys completed at the site.

3.2 Results

3.2.1 Designated sites

No statutory sites are located within 2km of the site with the closest being East Aberthaw Coast SSSI located approximately 4.3km south-east; the closest internationally designated site is the Severn Estuary (Wales) SSSI, Special Protection Area (SPA) and Ramsar, located over 15km east of the site.

Furthermore, there are 7 non-statutory designated sites located within 2 km of the site, which are all Sites of Importance for Nature Conservation (SINC's). Details of the SINCs are summarised below in Table 1.

Table 1: Non statutory designated sites within 2 km of the site boundary

SINC ref	Site name	Distance & direction from the site	Summary of features
D39- P1	Frampton Court Farm	0.9km NW	Pond with tall herb and swamp vegetation
D39- G1	East of Meadowvale Nursery	1.2km NW	Site supports areas of purple moorgrass and rush pasture
D40- W1	East Flemington	1.8km ENE	Semi-natural broadleaved woodland
D32- W4	Coed yr Arglwydd	1.9km NNE	Three blocks of ancient semi-natural broadleaved woodland
C47- S2	Cwm Colhuw	1.9km WSW	Mosaic of semi-improved neutral and calcareous grassland with dense scrub and scrub woodland along Iron Age earthworks, supporting protected bird species including Yellowhammer
D48- W1	East Orchard Wood	1.9km SE	Semi-natural broadleaved woodlands, part ancient in character
C47- S1	West of Cwm Colhuw	1.9km WSW	Mosaic of semi-improved neutral and calcareous grassland with dense scrub and scrub woodland along Iron Age earthworks, supporting protected bird species including Yellowhammer

Relevant species records provided within the desk study (including both records from SEWBRc and previous reports) are detailed within Sections 5-12.



4.0 Habitat Surveys

4.1 Methodology

An extended Phase 1 habitat survey was carried out by Elliot Hughes, WYG Consultant Ecologist in June 2016, the survey being carried out in accordance with the Chartered Institute of Ecology and Environmental Management (CIEEM) *Guidelines for Preliminary Ecological Appraisal 2013* (CIEEM, 2013). The weather conditions at the time of the survey were good, dry, warm, partial cloud and a slight breeze. Following the initial survey a number of additional areas were included within the site boundary and these were surveyed in March 2017 with full details provided in Section 4.2.

4.1.1 Habitats

The vegetation and habitat types within the site were noted during the survey in accordance with the categories specified for a Phase 1 habitat survey (Joint Nature Conservation Committee (JNCC), 2010). Dominant plant species were recorded for each habitat present and target notes (TNs) were used to describe the features of interest where necessary. The site was also appraised for its suitability to support notable flora in accordance with the *Guidelines for Preliminary Ecological Appraisal* (CIEEM, 2013).

4.1.2 Protected and Notable Species

The site was inspected for evidence of and its potential to support protected or notable species, especially those listed under the Conservation of Habitats and Species Regulations 2010 (as amended), the Wildlife and Countryside Act 1997 (as amended), including those given extra protection under The Environment (Wales) Act 2006, the CRoWAct 2000 or local biodiversity action plans.

4.2 Results

Habitats recorded during the extended Phase 1 habitat survey are detailed below; the habitat descriptions should be read in conjunction with Figures ECO1 and ECO2, which show the locations and extents of the habitats recorded.



4.2.1 Grasslands

Improved grassland

The most abundant habitat type within the site comprises agriculturally improved grassland that is managed through grazing and/or cutting for silage or hay. The habitat is dominated by grass species with limited herb species present. Grass species present include perennial rye-grass *Lolium perenne* (dominant), Yorkshire fog *Holcus lanatus* and cock's foot *Dactylis glomerata* with herb species limited to occasional creeping buttercup *Ranunculus repens*, white clover *Trifolium repens*, red clover *Trifolium pratense*, broad-leaved dock *Rumex obtusifolius*, creeping thistle *Cirsium arvense* and field bindweed *Convolvulus arvensis*.

Semi-improved grassland

The semi-improved grassland habitats on site are located around Llanmaes Brook and in the east of the site, associated with the MoD owned land at Picketson Camp to the north of Eglwys Brewis Road.

The grassland around Llanmaes Brook is horse grazed and generally species poor whilst the grassland in the east of the site is occasionally cattle grazed and contains a greater diversity of species. Species typically present include cocks foot, Timothy *Phleum pratense*, Yorkshire fog, creeping bent *Agrostis stolonifera* and meadow grass *Poa trivialis* with broad-leaved dock, ragwort *Jacobaea vulgaris*, creeping thistle, selfheal *Prunella vulgaris*, creeping buttercup and bird's foot trefoil *Lotus corniculatis*. Additional species within Picketson Camp include sweet vernal grass *Anthoxanthum odoratum*, meadow vetchling *Lathyrus pratensis*, common knapweed *Centaurea nigra*, common sorrel *Rumex acetosa*, tufted vetch *Vicia cracca* and false oat grass *Arrhenatherum elatius*.

Amenity grassland

In addition large areas of heavily managed amenity grassland are associated with the St Athan MoD camp. The grassland within this area is regularly managed through mechanical cutting to maintain a sward height below 100 mm. The grasslands had limited species diversity, being dominated by perennial rye-grass.

4.2.2 Arable

An area of arable land was recorded to the east of the site comprising five fields sown with wheat *Triticum aestivum*. Field margins associated with the arable fields were limited and typically comprised species poor semi-improved grassland.



4.2.3 Semi- natural broadleaved woodland

A single small area of semi- natural broadleaved woodland is present in the west of the site. The canopy of the woodland largely comprised ash *Fraxinus excelsior* with additional species including hazel *Corylus avellana*, blackthorn *Prunus spinosa* and elder *Sambucus nigra*. The ground flora of the woodland was limited, with access available to adjacent grazing animals leading to a large amount of disturbance and associated bare ground with associated ruderal species including common nettle *Urtica dioica*.

4.2.4 Dense scrub

Several areas of scrub are present across the site; these are largely associated with the embankments of the B4265, Llanmaes Brook and to the east of the site adjacent to Eglwys Brewis Road.

The embankments to the north and south of the B4265 comprise a vegetated embankment at approximately 45° angle and 10-20m in width. Species present include hawthorn *Crataegus monogyna*, blackthorn, ash, field maple *Acer campestre* and silver birch *Betula pendula*. In addition large amounts of garden waste were recorded associated with the top of the southern embankment where there are adjacent residential houses.

Scrub across the remainder of the site typically comprised dense and scattered bramble *Rubus fruticosus* scrub.

4.2.5 Running water

The site is drained by a number of watercourses and wet ditches as detailed below:

- Llanmaes Brook (RW1) flows in a southerly direction through the west of the site. The watercourse has a moderate to fast flow and joins Boverton Brook to the far south of the site. Adjacent to the proposed NAR crossing point is an existing NRW flood alleviation structure consisting of a reinforced earth bund with culvert. The water course has a variable bank size being relatively open and shallow sided to the north of NRW flood alleviation structure and steeper sided downstream. The stream ranges from 2-4m in width with marginal vegetation including fool's water cress *Apium nodiflorum* and reed canary grass *Phalaris arundinacea*. Dense bramble scrub is located adjacent to the water course in places. Water quality was noted to be good throughout. The water course is open to stock along the majority of its length with poaching of the ground noted;



- Boverton Brook (RW2) flows in a south westerly direction and is located within the site for a small length in the south west (where the access will cross an existing bridge crossing), with the majority of its length located outside the site to the south. The water course has a moderate flow and runs through improved sheep and cattle grazed fields, with shallow banks which are eroded in places and heavily grazed with poaching of the ground noted. Marginal vegetation included abundant fool’s water cress;
- Ditch 1 (D1) is located to the east of the site adjacent to the field boundary that separates the arable fields from the species poor semi-improved grassland in MoD land ownership. The ditch ranges from 1-2 m in width with approximately 30 cm of standing/ slow flowing water that drains into Boverton Brook to the south. The ditch shows signs of eutrophication with areas of filamentous green algae recorded;
- Ditch 2 (D2) is located adjacent to the north of Eglwys Brewis Road in the east of the site. The ditch was approximately 0.5m in width and shallow, likely to be used for surface water run-off attenuation. Surveys noted the ditch only held water occasionally generally after periods of high rainfall;
- Ditch 3 (D3) is located adjacent to the south of Eglwys Brewis Road in the east of the site. The ditch is approximately 1m wide and 30cm deep with a slight flow and is culverted at its eastern extent.
- Ditch 4 (D4) located adjacent to the north of Eglwys Brewis Road in the east of the site associated with Nant y Stepsau watercourse. The ditch is located within an area of dense scrub and appeared to be largely silted-up and infilled except for some small, shallow puddles surrounded by very marshy ground.

4.2.6 Hedgerows

A number of hedgerows are present on site where they function as boundary features, with management largely comprising a flail cut on an annual basis. Hedgerows range from intact species rich hedgerows to defunct species poor hedgerows, all hedgerows were assessed to determine if they were likely to be considered ‘Important’ under the Hedgerow Regulations 1997, as detailed in Table 2 below with location shown in Figure ECO1 and ECO2.

Table 2: Assessment of hedgerows within the site potentially impacted

Hedge ref	Description	Species	Likely to be considered ‘Important’ under Hedgerow Regulations 1997
H1	Managed species poor defunct hedgerow with number of gaps separating agricultural fields	Hawthorn, blackthorn	No



Hedge ref	Description	Species	Likely to be considered 'Important' under Hedgerow Regulations 1997
H2	Relatively unmanaged outgrown hedgerow that has turned into line of scrub on raised bank. Linked to semi-natural broadleaved woodland and wider hedgerow network. Separating agricultural fields.	Hawthorn, field maple, dog rose, blackthorn, dog rose, hazel	Yes
H3	Unmanaged outgrown hedgerow on bank separating agricultural fields.	Hawthorn, blackthorn, elder and dog rose	No
H4	Managed species poor defunct hedgerow separating agricultural fields.	Hawthorn, blackthorn, elder, ash	No
H5	Managed species poor intact hedgerow with bank separating agricultural fields.	Hawthorn, blackthorn, elder, dog rose	No
H6	Managed species poor intact hedgerow with bank separating agricultural fields.	Hawthorn, elm, field maple, dog rose, blackthorn	No
H7	Managed intact hedgerow on bank separating agricultural field from adjacent highway, H8 parallel to hedge	Hawthorn, elm, elder, dog rose, blackthorn	Yes
H8	Managed intact hedgerow on bank separating agricultural field from adjacent highway, H7 parallel to hedge	Hawthorn, elm, elder	No
H9	Managed intact hedgerow on bank separating agricultural field from adjacent highway, parallel to hedge to other highway boundary	Hawthorn, hazel, blackthorn, elder, dog rose, elm	Yes
H10	A managed intact species-poor hedgerow separating agricultural fields.	Hawthorn, elder	No
H11	A managed intact species-poor hedgerow separating agricultural fields.	Hawthorn, elder, dogwood, ash, blackthorn, dog rose	Yes
H12	A managed intact species-poor hedgerow separating agricultural fields.	Hawthorn, elder, field maple, dog rose	No
H13	A managed intact species-poor hedgerow separating	Hawthorn, elder, dog rose,	No



Hedge ref	Description	Species	Likely to be considered 'Important' under Hedgerow Regulations 1997
	agricultural fields.	blackthorn	
H14	A managed intact species-poor hedgerow separating agricultural fields.	Hawthorn	No
H15	A managed intact species-poor hedgerow with some standard trees separating agricultural fields	Hawthorn, field maple, ash	No

4.2.7 Line of trees

A row of planted Leyland cypress *Cupressus × leylandii* trees, are present in the east of the site within the MoD owned land at Picketson Camp to the north of Eglwys Brewis Road.

4.2.8 Invasive species

Japanese knotweed *Fallopia japonica* was found to be present in the south east of the site along Eglwys Brewis Road. The Japanese knotweed plants were approximately 1.75m tall at the time of survey and roughly twenty plants were present.

No additional invasive species were recorded during the survey.

4.2.9 Buildings and hard standing

One building is present within the site comprising the garage to Rose Cottage. The building is of a stone and pebbledash render with a pitched slate tiled roof.

Areas of tarmac and concrete hard standing are scattered throughout the site associated with the adopted highways and internal roads associated with the MOD St Athan.

4.3 Assessment of Impacts and Recommendations

The main habitats impacted by the proposed development are areas of grassland of varying botanical diversity (including improved grassland, poor semi-improved grassland, semi-improved grassland and amenity grassland), arable farmland, dense scrub and a number of hedgerows (four of which are classified as likely to be 'important' under the Hedgerow Regulations 1997). In addition Llanmaes Brook will be culverted for a total length of approximately 85m to provide a crossing for the NAR and to act as a flood alleviation structure (see AECOM Flood Consequence Assessment). The extent of site



clearance is detailed in AECOM drawings 60509148-SHT-30-0000-CT-0201 to 60509148-SHT-30-0000-CT-0208.

The majority of habitats on site have little floral value and as such their loss is not considered to be a significant adverse impact. However, additional habitats, including the hedgerows, water courses, semi-improved grasslands and semi-natural broadleaved woodland, are likely to qualify as Section 42 habitats of principal importance for conservation of biological diversity in Wales. The following table details the areas of each important habitat impacted by the development (dense scrub has been included due to its potential value for wildlife):

Table 3: Areas of important habitats impacted by the proposed development

Habitat type	Area/ length to be impacted
Semi-improved grassland*	34,371 m ²
Dense scrub	12,930 (3,393 temporary) m ²
Hedgerows	710 linear metres
Running water (Llanmaes Brook)	85 linear metres

* does not include improved or amenity grasslands

4.3.1 Avoidance, Mitigation and Enhancement

Through ecologist input to the design process the proposed development has been designed to include the retention of all existing habitats of wildlife value (including trees and hedgerows) where possible with the translocation of all hedgerows impacted (subject to suitability) by the scheme and inclusion of additional extensive landscape planting as detailed within the landscape plans in AECOM drawings 60509148-SHT-30-0000-CT-3001 to 60509148-SHT-30-0000-CT-3008. The landscape strategy focuses on retaining and enhancing connectivity and providing habitats of value for biodiversity, including the use of native species of local provenance where appropriate, whilst also meeting the needs of other disciplines e.g. screening for visual purposes). A summary of the elements included within the landscape strategy is detailed in Table 4 below.

Table 4: Summary of habitats included in the landscape strategy

Habitat type	Area/ length included
Amenity Grass Areas	25118 m ²
Species Rich Grassland	8136 m ²
Open Grassland	44247 m ²
Linear Trees and Shrubs	7101 m ²



Habitat type	Area/ length included
Linear Trees and Shrubs- Mix 2	1889 m ²
Shrubs with Intermittent Trees	5187 m ²
Shrubs	1095 m ²
Native Hedgerow	4441 linear metres
Translocated Native Hedgerow	710 linear metres (where feasible)
Native Hedgerow- Amenity Mixture	373 linear metres
Native Hedgerow with Trees	402 linear metres
Individual Tree	63 no.

Additional mitigation to reduce impacts on retained habitats is provided below:

- All retained habitats will be protected in line with BS5837:2012 'Trees in Relation to Design, Demolition and Construction – Recommendations';
- Hedgerow translocation will be carried out in line with the methodology detailed within Section 10.4.1 for hazel dormice;
- To avoid any significant indirect impacts on the water quality of Llanmaes Brook and Boverton Brook an appropriate construction phase water management methodology will be detailed in a Construction Method Statement (CMS) for the site, to be approved pursuant to a planning condition. The CMS will include suitable techniques to constrain surface water runoff to within the construction area and if necessary, treat all flows prior to discharging to an existing water course or to the ground. The CMS will be produced with reference to the Environment Agency Guidance notes 'PPG 6 Working at construction and demolition sites' which was withdrawn on 14th December 2015 but still considered good practice and the recently produced NRW GPP5 Works and maintenance in or near water (January 2017);
- A Landscape and Ecological Management Plan (LEMP) will be produced, with input from the ecologist, to ensure all new and retained habitats are managed to provide suitable habitats for protected species within the area.



5.0 Great Crested Newt

5.1 Desk Study

SEWBRc identified sixteen records of great crested newt (GCN) *Triturus cristatus* within the search area, the closest located 0.61 km south of the central grid reference, on the far side of the MOD St Athan runway. Intervening habitat between this record and the site comprises an airfield and associated infrastructure and Eglwys Brewis Road.

Previous great crested newt surveys conducted by David Clements Ecology in 2008 covered the site and the surrounding area, including Llanmaes Brook, Boverton Brook and Ditch 4 (torching only). No GCN were found within the site with the closest GCN recorded approximately 475m south-east of the site. The peak count of GCN for this pond during a bottle trap survey was 29 adults on 30th May 2008. However this pond was subsequently destroyed as part of a previous planning permission, under a NRW licence, with the GCN population translocated to a purpose built mitigation area approximately 1.25km south east of the site.

5.2 Methodology

5.2.1 Habitat Suitability Index

The extended Phase 1 habitat survey highlighted the presence of a number of water bodies within and adjacent to the site. All water bodies were assessed according to the Habitat Suitability Index (HSI) to assess their suitability for GCN. The HSI score provides an objective method for assessing the suitability of a pond as habitat for GCNs (Oldham, *et al*, 2000; Herpetological Conservation Trust, 2008). The system provides an index between 0 and 1, with 0 indicating unsuitable habitat and 1 optimal habitat. Ten suitability indices are used to calculate the index score, each representing a factor considered to affect GCNs. These factors are listed and briefly explained below:

1. **Location** - i.e. where the pond is located in the British Isles. Lowlands are generally considered to be most suitable; suitability declines with increases in altitude;
2. **Pond area** - the water surface area of a pond. Suitability peaks at approximately 800 m²;
3. **Pond drying** - how often a particular pond dries out. Ponds which dry out more frequently are less suitable;
4. **Water quality** - an indication of water quality based on the invertebrate diversity present. High invertebrate diversity indicates high water quality and suitability;
5. **Shade** - an estimate of the total shaded perimeter of a pond. Shoreline shade below 60% is optimal;



6. **Fowl** - an indication of impact by waterfowl. High waterfowl numbers are generally considered detrimental;
7. **Fish** - an indication of fish abundance. High fish numbers are generally considered detrimental;
8. **Pond count** - the number of ponds occurring within 1 km. Suitability generally increases with increasing pond density;
9. **Terrestrial habitat** - the availability of suitable habitat in the pond vicinity, e.g. rough grassland, scrub and woodland. For this assessment the categories provided in the NARRS Survey Pack (Herpetological Conservation Trust, 2008) were used. This differs from the assessment criteria by Oldham, et al. (2000), and is based on work by Lee Brady (unpublished); and
10. **Macrophytes** - based on an estimate of the percentage cover by emergent and aquatic vegetation. Suitability peaks at between 70% and 80% cover.

The following calculation is used to calculate the HSI score:

$$\text{HSI} = (\text{SI1} \times \text{SI2} \times \text{SI3} \times \text{SI4} \times \text{SI5} \times \text{SI6} \times \text{SI7} \times \text{SI8} \times \text{SI9} \times \text{SI10})^{1/10}$$

The calculated HSI for a pond should score between 0 and 1. The results are compared against a categorical scale developed by Lee Brady (unpublished). Results from individual water bodies are categorised as follows:

- <0.5 = poor
- 0.5 – 0.59 = below average
- 0.6 – 0.69 = average
- 0.7 – 0.79 = good
- >0.8 = excellent

5.2.2 Presence/ likely absence surveys

Following the HSI Ditch 1 was classified as being of 'below average' suitability for GCN and Ditch 2 'poor' suitability for GCN (see Table 6) with Llanmaes Brook and Boverton Brook being discounted due to the associated flow (however small areas of slower flow were recorded) and Ditch 4 discounted due to lack of water. Based on the known presence of GCN in the wider area further presence/ likely absence surveys were undertaken of Ditch 1 & 2 despite their low suitability. The survey was undertaken between 17th May 2016 and 8th June 2016. All surveys were undertaken by Elliott Hughes who is a suitably qualified and trained ecologist who holds a NRW survey licence (licence number 70660:OTH:SA:2016).



All water bodies were visited at least four times, in accordance with the *Great Crested Newt Mitigation Guidelines* (English Nature, 2001) requirements for presence / absence surveys. Where possible, three survey methods were performed on each survey in accordance with guidelines given in the *Great Crested Newt Mitigation Guidelines* and the *National Amphibian and Reptile Recording Scheme* (The Herpetological Conservation Trust, 2008). Survey methods used included bottle trapping, torching and egg search of Ditch 1 but due to the limited water levels only torching and egg search were able to be completed in Ditch 2.

Table 5 summarises the dates of the surveys and the weather conditions. Bottle traps were set on the evening before sunset, whilst torchlight surveys were conducted after sunset. Bottle traps were then checked the following morning, when egg searches were also conducted. All surveys were undertaken when the predicted air temperature exceeded 5°C, when GCNs are most active.

Table 5: GCN survey dates and weather conditions

Survey	Date	Air temp °C	Precipitation	Wind speed - Beaufort
1	17/05/2016	13	None	1
2	25/05/2016	14	None	3
3	02/06/2016	14	None	3
4	07/06/2016	16	None	1

5.3 Results

5.3.1 Habitat Suitability Index

Four wet ditches and two water courses (Llanmaes Brook and Boverton Brook) are present within the site (as detailed within Section 4.2.5 and shown on Figure ECO01 and ECO02) with two further linked water bodies identified that are within 500m and linked to the site as detailed below:

- Two large attenuation ponds associated with the drainage for the super hangar and associated car parking/ road infrastructure located adjacent to the site in the east. No water was present during the survey and they are likely to contain standing water only for small periods during heavy rainfall- due to the limited standing water no HSI was completed and it was considered unsuitable for GCN.

Table 6 below provides the HSI scores for Ditch 1 and Ditch 2.

**Table 6:** HSI scores for the ditches onsite

Pond reference	D1	D2
SI1 Field location	0.5	0.5
SI2 Pond area	0.1	0.05
SI3 Pond drying	0.5	0.5
SI4 Water quality	0.33	0.33
SI5 Shade	0.6	0.2
SI6 Fowl	1	1
SI7 Fish	1	1
SI8 Ponds	0.67	0.67
SI9 Terrestrial habitat	0.67	0.67
SI10 Macrophytes	0.5	0.33
HSI SCORE :	0.51	0.41
Pond suitability :	Below average	Poor

5.3.2 Presence/ likely absence surveys

No amphibians were recorded within either Ditch 1 or Ditch 2 during the surveys.

5.4 Assessment of Impacts and Recommendations

Based on surveys it is considered unlikely GCN are present onsite, with no specific impacts predicted for GCN, and therefore no mitigation is proposed as part of the development.

Within the previous wider application and part of the wider mitigation strategy for GCN five new ponds were proposed at various locations either along the western carriageway edge of the NAR or within the enclosed floodplain of Boverton Brook. These have been removed from the current proposals as they are not considered necessary and appropriate to the current reduced development due to lack of impacts on the species.



6.0 Reptile

6.1 Desk Study

SEWBREC identified two records of slow worm *Anguis fragilis* within the search area, the closest located 0.92 km west of the central grid reference.

Targeted reptile surveys conducted by Capita Symonds in 2008 recorded no reptiles within the NAR site however slow worm were recorded in a number of areas within habitats adjacent to Eglwys Brewis Road: the closest record was for a small slow worm breeding population approximately 180m to the south of the site.

6.2 Methodology

In accordance with the guidance outlined in the Herpetofauna Workers' Manual (Joint Nature Conservation Committee, 2003) and Advice Sheet 10 – Reptile Survey (Froglife, 1999); surveys were completed to establish the presence or likely absence of reptile species. This involved seven visits from May 2016 to September 2016 in suitable weather conditions. All surveys were undertaken by a competent ecologist experienced in reptile surveys and identification.

Approximately 50 clearly numbered artificial refuges (sections of bitumen roofing felt/tins) were placed across in the site in all areas considered to have habitat suitable for reptiles (concentrated on the Llanmaes Brook corridor and less managed semi-improved grasslands located within the MoD owned land at Picketson Camp to the north of Eglwys Brewis Road). The refuges were then left undisturbed on the site for 4 weeks prior to the commencement of surveys; to allow for reptiles on the site to find and utilise them. Each refuge was then first checked for basking individuals from a distance before being slowly approached and hand searched for sheltering reptiles. Terrestrial habitat between refuges was also searched for reptiles during each survey visit, including natural refuges such as log piles etc. The location of each reptile sighting was recorded on site to allow for analysis of population distributions across the site.

As a guideline it is recommended that the optimal time to survey reptiles is between 08:30 to 11:00 and between 16:00 and 18:30 and when air temperature is between 9°C and 18°C. Strong rain and wind are considered unsuitable (Froglife, 1999). As reptile activity is heavily dependent on weather conditions, the surveyor also recorded air temperature; wind speed; precipitation and cloud cover. See Table 7 below for survey weather conditions.

**Table 7:** Reptile survey dates and weather conditions

Survey	Date	Air temp °C	Precipitation	Wind speed - Beaufort	Cloud Cover %
1	26/05/2016	13	None	3	40
2	03/06/2016	13	None	2	10
3	14/07/2016	14	None	1	20
4	07/09/2016	18	None	1	70
5	09/09/2016	17	None	1	90
6	15/09/2016	16	None	1	95
7	26/09/2016	14	None	2	50

6.3 Results

Slow worm were the only reptiles recorded onsite, being recorded in the Llanmaes Brook corridor with a peak count of 2 sub adults recorded on the second survey visit with no other reptiles recorded during the survey, see Table 8 below and Confidential Figure ECO03.

Table 8: Reptile survey results

Survey	Date	Records			
		Location	Species	No. adults	No. juveniles
1	26/05/2016	-	-	-	-
2	03/06/2016	Llanmaes Brook	Slow worm	2	-
3	14/07/2016	-	-	-	-
4	07/09/2016	-	-	-	-
5	09/09/2016	-	-	-	-
6	15/09/2016	-	-	-	-
7	26/09/2016	-	-	-	-

6.4 Assessment of Impacts and Recommendations

Based on Froglife guidelines (1999) as detailed in Table 9 below, a low population of slow worm (based on a peak count of 2 adults) is present within the Llanmaes Brook corridor and, in the absence of mitigation, the proposed development is likely to have adverse effects on this population through loss of habitat, killing and injury and disturbance during the construction and, to a lesser degree, the operational phase.

**Table 9:** Calculating reptile populations (Froglife, 1999)

Species	Low population	Good population	Exceptional population
Adder	<5	5-10	>10
Grass snake	<5	5-10	>10
Common lizard	<5	5-20	>20
Slow worm	<5	5-20	>20

* Figures in the above table refer to the maximum number of adults seen by observation and/or under mats, placed at a density of 10 per hectare, by one person in one day.

6.4.1 Avoidance, Mitigation and Enhancement

Construction phase- killing and injury

All species of reptile native to the United Kingdom are protected through inclusion under Schedule 5 of the Wildlife and Countryside Act 1981 (as amended) which makes it an offence to 'intentionally or recklessly kill or injure these animals'. In order to avoid killing and injury of reptiles recorded within the Llanmaes Brook corridor the vegetation in this area will be subject to a sensitive clearance strategy as detailed below; due to the small population size and relatively small loss of habitat (approximately 0.4ha) a full fence, trap and translocation exercise is not considered necessary or appropriate.

- Any suitable reptile refuge, such as rubble/ log piles, will be removed by hand and under the supervision of a suitably qualified Ecological Clerk of Works (ECoW) in the reptile active season April to September during suitable weather conditions (dry, light winds and ideally temperatures between 10°C and 18°C). Any reptiles found will be moved to the retained habitats to the south of the proposed development;
- All suitable reptile habitat requiring removal within the Llanmaes Brook corridor (including rough grass and scrub habitat) will be cut to a height of 150 mm during the reptile active season using strimmers or a wheeled vehicle with a flail cutter. Cutting will take place in a phased manner from north to south to encourage reptiles to move to the adjacent retained habitat and arisings will be removed from site. Prior to the cut the ECoW will complete a hand search of these areas. If any reptiles are found they will be relocated to the retained habitat. After a period of 24 hours the habitat will be cut to a height of 50mm using the same methodology with supervision by a suitably qualified ECoW.

In addition it is recommended that, where possible, the grassland and arable habitats across the site continue to be managed to prevent any encroachment or enlargement in area of suitable reptile



habitat, including continuation or grazing and cutting as appropriate. This will reduce the risk of colonisation by any reptiles present in the area prior to works commencing.

Operational phase- loss of foraging habitat

The loss of approximately 0.4 ha of suitable reptile habitat will be mitigated through the inclusion of extensive areas of new habitat within the proposed landscape scheme that are likely to offer suitable basking and foraging habitat for reptiles (including approximately 5 ha of open grassland/ species rich grassland), see Table 4 Summary of habitats included in the landscape strategy.

In addition the LEMP, produced to provide guidance in relation to how all new and retained habitats will be managed, and to provide suitable habitats for protected species within the area, will include a number of prescriptions and features for reptiles as summarised below:

- Areas of open grassland and species rich grassland will be managed to provide suitable structure and cover for reptiles, where there is not a requirement for regular cutting to maintain visibility splays for highways. This will likely involve a reduced cutting regime to maintain grassland at a minimum height of 300mm;
- Provision of two reptile brush/ log piles adjacent to the new attenuation pond located to the west of the Llanmaes Brook and Boverton Brook confluence. The brush and log piles will be designed in line with page 45 of the *Reptile Management Handbook* (Edgar et al, 2010) with use of onsite material i.e. logs/ brush from cleared vegetation and trees etc.



7.0 Badger

7.1 Desk Study

SEWBRc returned no records of badgers *Meles meles* within 2 km of the site.

Capita Symonds surveys conducted in 2008 found a number of mammal paths with a badger footprint recorded near Llanmaes Brook in the south of the site.

7.2 Methodology

The site was surveyed for evidence of badger setts or other badger activity such as paths, latrines or signs of foraging in association with the extended Phase 1 habitat survey in June 2016 and March 2017 with additional information recorded during all other surveys completed onsite. Methodologies used and any setts recorded were classified according to published criteria (Harris, Cresswell & Jefferies, 1989) as detailed below:

- Active setts: are clear of any debris or vegetation, and will have some of the following features, well-worn paths, spoil mounds, footprints, fresh bedding outside the entrance and / or footprints leading in;
- Partially used: are considered to not show signs of current use (e.g. have vegetation growing across the entrance), but could easily be reused if required;
- Disused setts: are partially or completely blocked, with substantial excavation required to allow reoccupation.

In addition setts were classified in line with the following guidance:

- Main sett: is considered to be the most important sett within the territory of a badger group, where breeding takes place. They tend to be large, with five or more entrances and large spoil heaps and to be used throughout the year;
- Annexe sett: also have many well used entrances, and tend to be 50-150m from the main sett, connected by well-worn paths, but may not be used all year round;
- Subsidiary sett: is not usually connected the main sett by obvious paths, and may have any number of entrances;
- Outlier sett: tend to have only one or two holes and is used occasionally. There may be no obvious path to the main sett.

As recommended in *Badgers and Development* (English Nature, 2011) a 50 m buffer around the site was investigated for evidence of badger activity, where possible.



7.3 Results

Two badger setts were recorded within the site as indicated below and shown in Confidential Figure ECO03 (confidential plan, to protect badgers from persecution):

- Main sett- a large active main sett consisting of 10 holes was recorded adjacent to Llanmaes Brook within an area of dense hawthorn and blackthorn scrub. The sett showed signs of high levels of activity with large spoil heaps recorded that had fresh bedding, containing badger hairs, and extensive mammal paths linking the holes. The sett was spread over a large area utilising the embankments to the adjacent brook;
- Annexe sett- a smaller three hole annexe sett was recorded approximately 50m north of the main sett within an area of bramble scrub adjacent to Llanmaes Brook. The sett was active with small spoil heaps associated showing signs of recent excavation in early 2017.

Signs of mammal activity were recorded across the site in the form of mammal paths, with specific signs of foraging badger (snuffle holes) recorded in the fields adjacent to Llanmaes Brook.

7.4 Assessment of Impacts and Recommendations

The site forms the home territory for at least one badger clan with a main and annexe sett recorded within the site. The proposed development will retain the main sett, however the NAR crossing to Llanmaes Brook will require the permanent closure of the annexe sett. Badgers and their setts are protected under the Protection of Badgers Act 1992 and TAN 5 stipulates that considering their welfare and mitigating for damage to their habitat are material considerations when considering planning applications.

In addition, in the absence of mitigation, the NAR is likely to form a barrier to the badger clan located within the site, potentially decreasing availability of foraging habitat to the north and increasing the risk of road traffic mortality.

7.4.1 Avoidance, Mitigation and Enhancement

Construction phase- sett closure and disturbance

To comply with legislation a Natural Resources Wales (NRW) licence will be required to facilitate the work and allow the closure of the Annexe sett. It should be noted a licence can only be applied for once planning permission has been received and NRW aim to process the application within 30 working days of receipt of all necessary information and sett exclusion can only be carried out during the licensable period July to November. As part of the licence process an application form is required



which is supported by a 'method statement' which details how the sett is to be closed. Based on previous experience the method statement will include the following:

- To provide an up to date assessment of the use of the site it is recommended an update survey is completed a maximum of three months prior to construction commencing to assess/ update the mitigation requirements as detailed below.
- Following receipt of the NRW licence all scrub immediately surrounding the annexe sett will be cleared using hand tools to allow free access to the sett entrances;
- In line with Natural England Technical Advice Note TIN025 one-way badger gates will be installed to all annexe sett entrances with an apron of chain-link mesh (or similar material) attached to the gates frame and firmly secured to the ground around the entrance, to prevent badgers digging around. All work will be supervised by a licensed ecologist;
- Following installation the gates at the sett entrances will be set to open one way only to prevent badgers (and potentially fox and rabbit) returning to the sett. The holes will then be monitored regularly (at least once every three days) for a twenty one day period by an experienced and qualified ecologist to check for potential re-entry to the sett and check gates are still swinging freely and closing;
- Assuming there is no evidence of badger returning to the sett during the monitoring period, the sett will be permanently closed by removing the exclusion gates and excavating the tunnels and chambers followed by leveling and re-profiling of the land. Should the hole be repeatedly re-entered by badger digging around the gate then additional measures will be discussed and agreed with NRW;
- The sett will be closed using the above techniques between July and November inclusive, which is the period sett closure is permitted;
- No artificial sett is proposed as the sett is only an annexe with the retention of the main sett in close proximity.

In addition during the construction phase there is potential to cause temporary disturbance to badger during the construction phase of the development. To reduce impacts the following additional measures will aim to minimise disturbance to badgers:

- Site personnel will be made aware of the presence of badgers through use of toolbox talks/inductions;
- The main sett will include a 30m minimum buffer that will be appropriately fenced to prevent access by construction plant and workers;
- At the end of each working day, open excavations should be covered over where possible to prevent animals falling in. If not practical (i.e. in large excavations), one or more roughened



wooden planks or a sloped side will be placed into any steep sided excavations, to allow any animals that accidentally fall into the excavation a means of climbing out;

- Daily checks of the excavations will be made by construction staff prior to commencing work to ensure that no badgers or other animals have become trapped in the excavations. Should a trapped badger be found within the works, the ECoW or the RSPCA will be immediately contacted for advice;
- Any pipes stored, or installed on site, with a diameter greater than 200mm will be covered or capped at night to reduce the risk of badgers becoming trapped inside.
- Consideration will be given to the placement of any topsoil storage, or piles of materials that may create mounds suitable for sett creation. It is advised that any such piles are placed well away from identified badger activity, and are checked on a daily basis by construction staff to ensure that no badger activity has taken place. Where mounds are to be in place for a significant period of time, the site contractor should install temporary badger proof covering over, or fencing around, them to ensure that badgers cannot access the fresh soil.
- Badgers are generally nocturnal and therefore works will be restricted to daylight hours wherever possible within 50m of the retained main sett in order to minimise disturbance to badgers;
- Some additional lighting may be required during the construction phase of the development. If any additional lighting is required the siting of this and use of directional lights will be discussed with an ecologist to minimise any risk of disturbance on badger and any other fauna that may potentially be present in the working area.

Operational phase- fragmentation of foraging habitat and increased risk of vehicle collision

To maintain connectivity and provide safe access otter and badger proof fencing, as specified in the *Design Manual for Roads and Bridges (DMRB) Volume 10 (1997)*, will be installed to the NAR boundaries to guide animals to use the agricultural vehicle underpass located to the east of Llanmaes Brook (see fencing plans as detailed in AECOM drawings 60509148-SHT-30-0000-CT-0301 to 0308).



8.0 Otter and Water Vole

8.1 Desk Study

SEWBRc returned no records of otter *Lutra lutra* or water vole *Arvicola amphibius* within 2 km of the central grid reference.

Capita Symonds conducted otter surveys on site in 2008 and recorded three otter spraints along Boverton Brook and one on Llanmaes Brook. The spraint on Llanmaes Brook was recorded beneath the footbridge approximately 240 m upstream of the NAR site; on Boverton Brook spraint were recorded near the confluence with Llanmaes Brook, within the channel behind the Old Brewery pub and beneath the railway arch. In addition, a suspected otter runway was recorded along Llanmaes Brook in the south of the site approximately 105m upstream of the confluence with Boverton Brook.

No evidence of water vole was recorded by Capita Symonds.

8.2 Methodology

8.2.1 Otter

An inspection was made of all potentially suitable freshwater habitats (i.e. watercourses and water bodies) on and up to 250m of the site (in this instance 250 m up stream of the proposed NAR on Llanmaes Brook and the section of Boverton Brook up to the railway). Inspections were made from within channels/ water bodies, where safe to do so, extending up to 50m from the water's edge to survey terrestrial habitat or further if deemed appropriate. Inspections of inaccessible areas were undertaken using binoculars, where possible. Weather conditions were deemed suitable to collect valid data (i.e. dry with no significant precipitation or any watercourses having been in spate for five days previously).

Survey methodology was based on Chanin (2003a) *Monitoring the Otter*. Field signs of otter activity were searched for within the survey area including footprints, feeding remains, spraints, sign heaps and slides. Particular attention was given to attempting to identify above and below ground places of otter shelter/rest (i.e. holts and couches).

8.2.2 Water Vole

The water vole survey followed the standard guidance described in Dean *et. al.* (2016) *The Water Vole Mitigation Handbook* with two surveys completed, in June 2016 and September 2016, to search for the following signs indicating the presence of the animal:



- Droppings and latrines;
- Tracks/ footprints;
- Burrows;
- Feeding remains;
- Feeding areas; and
- Sightings.

The survey was carried out in combination with the otter survey as described above.

8.3 Results

8.3.1 Otter

No definitive signs of otter were recorded during the surveys. However based on previous confirmed presence (Capita Symonds, 2008) it is assumed that otters occasionally use both Llanmaes Brook and Boverton Brook for commuting purposes. No otter holts were recorded during the survey.

8.3.2 Water Vole

No signs of water vole were recorded during the surveys; a number of burrows were recorded in the banks of Llanmaes Brook but these were attributed to brown rat *Rattus norvegicus* due to the presence of rat droppings in the vicinity.

8.4 Assessment of Impacts and Recommendations

To provide an up to date assessment of the use of Llanmaes Brook and Boverton Brook it is recommended an update survey is completed a maximum of three months prior to construction commencing, to assess/ update the mitigation requirements as detailed below.

8.4.1 Otter

Llanmaes Brook is likely to be used by commuting otter and in the absence of mitigation the NAR could disturb commuting otters during construction and once built it is likely to form a barrier to otter dispersal and increase the risk of road traffic mortality.

Construction phase- disturbance

No otter holts were recorded during the surveys and therefore it is considered unlikely a European Protected Species Mitigation (EPSM) Licence is required from NRW, however there is a risk that the proposed development has potential to cause temporary disturbance to otter (noise and increased



anthropogenic disturbance on site) during the construction phase of the development when in proximity to Llanmaes Brook and Boverton Brook.

To reduce the potential for temporary impacts during the construction phase the following measures will aim to minimise disturbance to otters:

- At the end of each working day, open excavations should be covered over to prevent animals falling in. If not practical (i.e. in large excavations), one or more roughened wooden planks or a sloped side will be placed into any steep sided excavations, to allow any animals that accidentally fall into the excavation a means of climbing out;
- Daily checks of the excavations will be made by construction staff prior to commencing work to ensure that no otters or other animals have become trapped in the excavations. Should a trapped otter be found within the works, the ECoW or the RSPCA will be immediately contacted for advice;
- Any pipes stored, or installed on site, with a diameter of greater than 200mm will be covered or capped at night to reduce the risk of otters becoming trapped inside;
- Otter movement up and downstream for foraging and commuting is more likely to be undertaken during the hours of darkness. Works will be restricted to daylight hours wherever possible in proximity to Llanmaes Brook and Boverton Brook in order to minimise disturbance;
- Some additional lighting may be required during the construction phase of the development. If any additional lighting is required it should be kept to the minimum required for security purposes and the siting of this and use of directional lights will be discussed with an ecologist to minimise any risk of disturbance on otter and any other fauna that may potentially be present in the working area;

Operational phase- fragmentation of foraging habitat and increased risk of vehicle collision

To maintain connectivity and provide safe access otter and badger proof fencing, as specified in the *Design Manual for Roads and Bridges (DMRB) Volume 10 (1997)*, will be installed to the NAR boundaries to guide animals to use the agricultural vehicle underpass located to the east of Llanmaes Brook (see fencing plans as detailed in AECOM drawings 60509148-SHT-30-0000-CT-0301 to 0308). In addition otter ledges in line with the DMRB will be installed the culverts to ensure the safe passage of otters during flood events.

8.4.2 Water Vole

Based on the lack of records it is considered unlikely water vole are present onsite, with no specific impacts predicted for water vole, and therefore no mitigation is proposed as part of the development.



9.0 Invertebrates

9.1 Desk Study

SEWBRc identified records of four notable invertebrates within the search area as summarised in Table 10 below. An additional seven notable invertebrate records were provided but these were located over 2km from the site.

Table 10: Notable invertebrate records within 2km provided by SEWBRc

Scientific name	Common name	Status	Closest record
<i>Gyrinus natator</i>	A water beetle	RD1 (UK) , RedList GB post 2001 RE	0.6 km
<i>Calopteryx splendens</i>	Banded demoiselle	LBAP, LI(SEWBRc) , RedList GB post 2001 LC	0.95 km
<i>Leptophyes punctatissima</i>	Speckled bush-cricket	LI(SEWBRc)	1.26 km
<i>Rhopalomesites tardyi</i>	A weevil	RD2 (UK), Notable Nb	1.09 km

Key:

LBAP – listed on the Local Biodiversity Action Plan for Vale of Glamorgan.

RD1 (UK) - UK Red Data Book listing based on IUCN guidelines.

RD2 (UK) - UK Red Data Book listing not based on IUCN guidelines (Nationally Rare and Scarce).

LI (SEWBRc) - Locally Important Species (as identified by local specialists) in SEWBRc area.

Red list GB post 2001 IUCN Red List: Critically Endangered (**CR**), Endangered (**E**), Vulnerable (**VU**), Near Threatened (**NT**), Least Concern (**LC**), Data Deficient (**DD**) and Not Evaluate (**NE**).

Notable / Na / Nb - Nationally notable species (**Na** is a species which is thought to occur in 30 or fewer 10km squares of the national grid, **Nb** is a species which is thought to occur in 31 to 100 10km squares of the national grid and **N** is a species which is thought to occur in 16 to 100 10 km squares of the national grid).

A review of the important invertebrate areas as identified within the Invertebrates of Wales (Fowles, 1994) shows that closest site is Aberthaw Lays (at approximately O.S. Grid Ref ST042658) located approximately 5.2 km south-east of the site. Aberthaw Lays has botanically diverse salt marsh communities supporting a good range of characteristic and scarce invertebrates, particularly among the phytophagous coleopteran beetle community. Aberthaw Lays is a nature reserve managed by Glamorgan Wildlife Trust.

Invertebrate surveys conducted by Capita Symonds in 2008 recorded a total of 20 butterfly species, seven species of bee, ten species of damsel/ dragonflies, three species of grasshopper/ cricket and four other species including common wasps and crane fly. Moth trapping recorded 48 species of moth.



No evidence of white-clawed crayfish was found in either Llanmaes Brook or Boverton Brook during the surveys.

9.2 Methodology

During the extended Phase 1 habitat survey the habitats within the site that will be directly impacted were considered largely to be of limited suitability to support rare or notable invertebrates, with surveys concentrating upon the grasslands, woodland edges, Llanmaes Brook corridor and areas of scrub along with any bare areas. This was because these were the locations where the vast majority of the invertebrates were seen and / or collected. Other areas which were surveyed included the trees and hedgerows where fewer invertebrates were recorded or collected.

The site was visited in suitable weather conditions on four sampling occasions in May, July, August and September 2016, as detailed in Table 11, to sample the invertebrate diversity present on the site. A walk-over survey of the site was carried out with sampling of the invertebrates using several different techniques (Eyre, 1996; Hill et al., 2005, Sutherland, 2004): The standing advice from Natural England (2011) and Drake et al. (2007) is for a minimum of four surveys between mid April through to September / October at approximately monthly intervals in suitable weather.

Table11: Invertebrate survey dates and weather conditions

Survey	Date	Air temp °C	Precipitation	Wind speed - Beaufort	Cloud Cover %
1	24/05/2016	16	None	2- 3	10
2	23/07/2016	17 → 16	None	3	40
	24/07/2016	16 → 18	None	5	50
3	10/08/2016	16 → 19	None	2- 3	70
4	07/09/2016	20 → 22	None	2	60

During each survey the following methods were applied:

Sweep netting: netting invertebrates in low vegetation using a stout-handled net which is moved vigorously through the vegetation to dislodge resting invertebrates.

Aerial Netting: netting and capturing for identification any flying invertebrate species.

Beating tray: beating trees and bushes with a stick using a sharp tap to dislodge the invertebrates which then fall onto the beating tray held beneath. This technique is effective in sampling arboreal invertebrate species.



Grubbing: looking for invertebrates in suitable habitats or microhabitats e.g. under stones, logs, under bark, in crevices within walls and rocks, leaf litter, around the base of plants, dead and decaying fungi, dung and carrion.

Direct searching: looking for invertebrates in the suitable habitats or microhabitats for species known or considered likely to occur within the site.

In addition during the July survey the following additional survey method was completed:

Light Trap: used for the collection of moths and other night flying invertebrates. The light used emits light in ultraviolet wavelengths. These traps vary in complexity from a spot light source over a white sheet to custom built moth traps.

9.3 Results

During the surveys 142 invertebrate species were recorded including the 12 notable species detailed in Table 12, a full species list is provided in Table A1 in Appendix A.

Table 12: Notable invertebrates recorded onsite

Scientific name	Common name	Status
<i>Calopteryx splendens</i>	Banded demoiselle	LBAP, LI(SEWBRcC), RedList GB post 2001 LC
<i>Coenagrion puella</i>	Azure blue damselfly	RedList GB post 2001 LC
<i>Diarsia rubi</i>	Small square-dot moth	Env Act (research only)
<i>Enallagma cyathigerum</i>	Common blue damselfly	RedList GB post 2001 LC
<i>Leptophyes punctatissima</i>	Speckled bush cricket	LI(SEWBRcC)
<i>Malacosoma neustria</i>	Lackey moth	Env Act (research only), LBAP
<i>Pyrrhosoma nymphula</i>	Large red damselfly	RedList GB post 2001 LC
<i>Rhagonycha fulva</i>	Common red soldier beetle	RedList GB post 2001 LC
<i>Scotopteryx chenopodiata</i>	Shaded broad-bar moth	Env Act (research only), LBAP
<i>Spilosoma luteum</i>	Buff ermine moth	Env Act
<i>Sympetrum striolatum</i>	Common darter	RedList GB post 2001 LC



Scientific name	Common name	Status
<i>Tyria jacobaeae</i>	Cinnabar moth	Env Act (research only)
Key: Env Act - Environment (Wales) Act 2016 Section 7 LBAP – listed on the Local Biodiversity Action Plan for Vale of Glamorgan. RD1 (UK) - UK Red Data Book listing based on IUCN guidelines. RD2 (UK) - UK Red Data Book listing not based on IUCN guidelines (Nationally Rare and Scarce). LI (SEWBRReC) - Locally Important Species (as identified by local specialists) in SEWBRReC area. Red list GB post 2001 IUCN Red List: Critically Endangered (CR), Endangered (E), Vulnerable (VU), Near Threatened (NT), Least Concern (LC), Data Deficient (DD) and Not Evaluate (NE).		

9.4 Assessment of Impacts and Recommendations

Due to the distance from the site no impacts are predicted on Aberthaw Lays which is identified as an important invertebrate area within the Invertebrates of Wales (Fowles, 1994).

Using the invertebrate habitat significance criteria defined by Colin Plant (undated) the site has been assessed as being of County importance due to the number of protected and/or notable invertebrates recorded. However in the surveyor's opinion, the site's habitats and species recorded should be re-assessed as being of Local importance especially as four species recorded during the surveys are notified for research purposes only (and not for conservation reasons). This is due to the vast majority of the habitats (by area) being either arable fields or grazed fields and intensively managed; as such these habitats are considered unlikely to be capable of supporting notable assemblages of invertebrates through lack of continuity of habitats (arable) or periodic cutting and/ or intensive grazing of larval food plants preventing long term populations from establishing. The important invertebrate habitats are considered to be Llanmaes Brook and the semi-improved grasslands located within the MoD owned land at Picketson Camp to the north of Eglwys Brewis Road as this area is not grazed and contains a diverse flower rich habitat along with the areas of species poor semi-improved grassland, scrub, hedgerows and trees.

9.4.1 Avoidance, Mitigation and Enhancement

No specific mitigation is proposed for invertebrates but the loss of invertebrate habitat will be mitigated through the inclusion of extensive areas of new habitat within the proposed landscape scheme that are likely to offer suitable habitat for invertebrate species (including approximately 5 ha of open grassland/ species rich grassland), see Table 4 Summary of habitats included in the landscape strategy.



In addition the LEMP, produced to provide guidance in relation to how all new and retained habitats will be managed and to provide suitable habitats for protected species within the area, will include a number of prescriptions that will enhance habitats for invertebrates through sensitive management to allow flora to flower providing important food and nectar sources.



10.0 Hazel Dormouse

10.1 Desk Study

SEWBREC returned no records of hazel dormouse within 2 km of the site.

Hazel dormouse surveys were not undertaken onsite by Capita Symonds during the 2008 assessment. However surveys undertaken by Capita Symonds at 'West Camp Access' in 2008 recorded a single dormouse nest located in a hedgerow to the south of Eglwys Brewis Road between the B4265 and the railway. The record is located outside the site approximately 110m from the south west access to the site off Eglwys Brewis Road, however it is 380m from the closest point of the NAR development itself. The record is separated from the site by Eglwys Brewis Road and the railway but arboreal connectivity may exist in places.

10.2 Methodology

A nest tube survey was undertaken following the methodology as described in *The Dormouse Conservation Handbook* (Bright *et al.*, 2006). Within the guidance it is recommended that a standard survey should use at least 50 nest tubes with an index of probability of detecting dormice presence in each month of the survey season, as detailed in Table 13 below, used to calculate a survey effort score. For example 50 nest tubes installed in March and left in situ until the end of November would score 25 (the sum of probability index figures for each month). A minimum search effort score of at least 20 is required in order to confidently determine likely absence.

Table 13: Index of probability of detecting dormice in each month of their active season (Bright *et al* 2006)

Month	Index of probability
April	1
May	4
June	2
July	2
August	5
September	7
October	2
November	2

70 artificial nest tubes were installed in suitable habitat on site in April 2016. These are readily used by hazel dormice for breeding and daytime shelter. Tubes are made from stiff double walled black plastic sheet, 5 x 5cm in cross section and 25cm long. A small plywood tray is placed inside, projecting 5cm beyond the tube's entrance to allow the animals' easy access. The opposite end of the tube is sealed with a wooden block mounted on the tray. The tubes are suspended by wire or tape, fixed firmly underneath horizontal limbs, where they resemble a hollow branch.

Nest tubes were located along suitable hedgerows and areas of scrub that will be impacted by the development approximately 20m apart. Tubes were positioned on trees and shrubs at between 1 and 2 metres from the ground.

Survey visits to check each tube for the presence of dormice, or evidence of dormice, were made monthly (or as a minimum every other month) between May and October 2016. This would achieve 22 points, which is considered to be a reasonable survey effort based on the index of probability scoring system, (see Table 13 - Bright *et al.*, 2006). Surveys were conducted by WYG experienced surveyors, Chris Meddins MCIEEM (NRW survey licence number 56681:OTH:SA:2014), Sarah Dillon and Elliott Hughes (who has been an accredited agent on Sarah Dillon ACIEEM NRW licence number 699968:OTH:SA:2016 since September 2016).

10.3 Results

Surveys recorded a single hazel dormouse nest and adult within hedgerow 12, adjacent to the arable fields in the east of the site (see Figure ECO04). No other signs of hazel dormice were recorded across the remainder of the site.

Table 14: Hazel dormouse survey results

Survey No.	Date	Records			Notes
		Tube No.	Nest	Individual	
1	26/05/2016	-	-	-	No small mammals recorded
2	15/06/2016	51	X	X	Hazel dormouse nest recorded with adult
3	16/08/2016	51	X	-	Hazel dormouse nest
4	14/09/2016	51	X	-	Hazel dormouse nest
5	20/10/2016	51	X	X	Hazel dormouse nest recorded with adult



10.4 Assessment of Impacts and Recommendations

Following the desk study and field survey, hazel dormice have been confirmed as being present within hedgerow 12 in the east of the site. Due to the elusive nature of the species, nest tube surveys can only be used to determine presence or likely absence of hazel dormice and cannot provide a population estimate for the species. Therefore based on suitable connective habitat, hazel dormice are considered likely to be present in low numbers in all hedgerows and scrub across the site. Based on the extent of site clearance is detailed in AECOM drawings 60509148-SHT-30-0000-CT-0201 to 60509148-SHT-30-0000-CT-0208 there are likely to be adverse effects on hazel dormice through loss of habitat, severance of connectivity, killing and injury and disturbance during the construction and operational phase. The hazel dormouse is listed on Schedule 2 of the Conservation of Habitats and Species Regulations 2010 (as amended) and is therefore a European Protected Species. They are also protected through inclusion on Schedule 5 of the Wildlife and Countryside Act 1981 (as amended). As adverse effects upon hazel dormice are anticipated, a EPSM licence from NRW will be required to facilitate the works.

In the absence of mitigation the development could result in the following impacts to hazel dormice;

- Habitat loss- removal of 710 m of hedgerow and 12,930 m² of dense scrub (3,393 m² temporary impacted i.e. only subject to first stage of two stage clearance method- see Section 10.4.1);
- Loss of connectivity- the NAR will act as a significant barrier to dispersal between suitable habitats to the north and south due to the severance of arboreal connectivity;
- Killing and injury- the removal of suitable vegetation to allow the NAR will risk killing and injury to dormice;
- Disturbance- construction and operational phase disturbance to dormice populations through indirect impacts such as noise and lighting.

10.4.1 Avoidance, Mitigation and Enhancement

An EPSM licence application can only be submitted once full planning permission is received and all pre-commencement planning conditions relevant to wildlife and have been discharged. All survey, mitigation and development information must be included in the licence application to be submitted to NRW for determination and final approval of the proposed mitigation scheme.

The Conservation of Habitats and Species Regulations 2010 (as amended) contain three "derogation tests" which must be applied by the LPA prior to granting planning permission, and again by NRW



when deciding whether to grant a licence to a person carrying out an activity which would harm a European Protected Species (such as hazel dormice). The three tests are that:

- The activity to be licensed must be for the purpose of preserving public health or public safety or other imperative reasons of overriding public interest;
- There must be no satisfactory alternative; and
- The favourable conservation status of the species must be maintained.

As requested by NRW as part of the statutory pre-application consultation a draft NRW 'Template Method Statement to be used within a Dormice Development Licence Application' has been included within the application to provide sufficient information to allow the Vale of Glamorgan Council to conclude a licence application with NRW is not likely to be refused and is in accordance with the three derogation tests and in accordance with planning policy. However a summary of how the development meets each derogation test is dealt with in turn below.

Imperative Reasons of Overriding Public Interest

The Welsh Government has designated eight enterprise zones in Wales: areas intended to create the best possible conditions in which businesses can thrive. The Cardiff Airport and St Athan Enterprise Zone – in which the NAR is located focuses on the aerospace and defence sectors. It is centred on two strategic airfield assets owned by the Welsh Ministers: Cardiff Airport, which serves passenger, freight and wide-bodied maintenance, repair and overhaul clients; and St Athan, a base for aerospace activity for more than fifty years, which specialises in narrow-bodied and rotary-wing operations.

At St Athan the purpose of the NAR is to provide high quality, direct access to existing and future employment development at the Aerospace Business Park (including the new Aston Martin car manufacturing facility) and to two new housing sites proposed by the Vale of Glamorgan Council.

Access to the ABP is currently achieved via the Main Gate (also known as West Gate) that serves the Ministry of Defence military camp. This is far from ideal because the necessary military security arrangements at the gate can result in delay and may be regarded as inimical to business enterprise. Moreover, the arrangement under which the ABP is accessed via Main Gate will end in 2019. It is essential, therefore, that the NAR should be in operation by then.

A new, high quality access road is required to ensure that future employment growth at the ABP is maximised. The successful future development of the ABP, as part of the Enterprise Zone, is a key objective not only of the Welsh Government but also of the Vale of Glamorgan Council. The Council's latest development plan strategy focuses employment growth on a limited number of key sites – of which the ABP is the largest – and regards the NAR as being of strategic importance.



To summarise the NAR is regarded as a strategically important piece of infrastructure, essential to the future development of the St Athan Aerospace Business Park (the largest employment allocation in the Vale of Glamorgan), while also providing access to two major housing site allocations. It is recognised by the Welsh Government and by the Vale of Glamorgan Council as being crucial to the future economic success of the Cardiff Airport and St Athan Enterprise Zone.

No Satisfactory Alternative

The wider planning assessment looked at two different access options, the 'Southern Access Road' and 'improvement of the existing Eglwys Brewis Road' although both options have various advantages and disadvantages and constraints that would need to be overcome, the NAR has fewer, less costly and less time-impactful constraints to overcome. See AECOM report 'St Athan Northern Access Road Eglwys Brewis Road Options Report; March 2017.

Within the Site itself, the design of the proposed development has been informed by an iterative process of design, engineering analysis and site suitability commencing with a preliminary constraints analysis exercise taking into account features of ecological value (which has led to a reduction in the development footprint compared to the previously approved application). If the site was not developed (the 'do nothing option'), this would reduce the important contribution to economic development and housing provision in the area.

Favourable Conservation Status

Action permitted under an EPS licence that would otherwise be unlawful must not be "detrimental to the maintenance of the populations of the species concerned at a favourable conservation status in their natural range" (European Commission 2007). A draft NRW 'Template Method Statement to be used within a Dormice Development Licence Application' has been included within the application which is subject to the agreement of NRW, however a summary of the measures that have been included to maintain the favourable conservation status of the hazel dormouse population are provided below:

- Loss of habitat- the proposed development has been designed to include the retention of all existing habitats of wildlife value (including trees and hedgerows) where possible with hedgerows impacted by the scheme translocated (where suitable) to the highway boundaries, which will allow rapid establishment of suitable habitats, and inclusion of additional extensive landscape planting as detailed within the landscape plans in AECOM drawings 60509148-SHT-30-0000-CT-3001 to 60509148-SHT-30-0000-CT-3008 and



summarised in Table 4. The development will result in the planting of 4843 m of new native hedgerow and 15, 272 m² of new shrub & tree planting.

- Loss of connectivity- the translocated hedgerows and new hedgerow and shrub & tree planting will create a connective corridor to the north and south of the NAR development. This will be maintained in the short term through the translocation of impacted hedgerows to maintain the amount of dormouse habitat in the short term. All translocated hedgerows will be relocated to the north of the NAR, where the hazel dormouse nest was recorded, with no hedgerows left 'isolated' by the NAR with no connectivity to offsite habitats. A north to south crossing point will be provided through the provision of a 'dead hedge' beneath the agricultural underpass adjacent to Llanmaes Brook, this will connect to adjacent habitats (see AECOM drawings 60509148-SHT-30-0000-CT-3002). The dead hedge will comprise a combination of brush and straw bales that provide cover and arboreal connectivity where planting cannot be sustained due to low light levels;
- Killing and injury- to prevent killing and injury of hazel dormice a two stage clearance methodology will be carried out in all suitable habitat as detailed below:
 - Firstly the above ground vegetation will be cut back to 300mm using hand tools during December to February with all arisings carefully removed from site. All works will be supervised by a suitably licensed ECoW who will perform hand searches of the vegetation prior to cutting. Any torpid dormice will be left undisturbed and insitu and the area where found will be appropriately fenced with linking vegetation at least 1m in height retained to provide a habitat corridor to the nearest retained habitat;
 - Hedgerow translocation/ stump removal will be undertaken in May, the following season after the hazel dormouse hibernation season ends and prior to the dormouse breeding season. All works will be supervised by a suitably licensed ECoW who will perform hand searches of the hedgerow/ stumps and roots to be removed prior to works commencing. All translocation/ removal will be undertaken directionally to retained habitat, in case dormice are present, to allow them to naturally disperse into the retained vegetation.
 - If any dormice are found that are not torpid, vegetation clearance will stop and the dormouse captured by the licensed dormouse ECoW and translocated to a mitigation nest box within an area of retained vegetation that is connected to existing habitat (where possible within their existing home range - approximately 100m of where they have been found).
- Disturbance- hazel dormice foraging and commuting is more likely to be undertaken during the hours of darkness. Works will be restricted to daylight hours wherever possible with



construction and operational lighting design discussed with an ecologist to minimise any risk of disturbance on hazel dormice.

A final detailed method statement will be submitted to NRW following receipt of planning permission. Post development monitoring will be included with the method statement in order to determine the success of the above mitigation strategy. It will also form a requirement of the NRW EPSM licence. Monitoring will be agreed as part of the EPSM licence but is likely to comprise two annual checks (June and September) of nest boxes/ tubes installed on retained habitat to be completed by a licenced surveyor for 5 years post-development. Results of the monitoring surveys will inform the long term management of the site by allowing management prescriptions to be revised. Results will also be supplied to the National Dormouse Monitoring Programme.



11.0 Breeding Birds

SEWBRc returned a large number of bird records within 2 km of the site, the closest bird records for each species listed under Schedule 1 are shown in the Table 15 below.

Table 15: SEWBRc records of Schedule 1 birds within 2km of the site (centred on NGR: SS989 691)

Species	Number of records	Closest record	Date of most recent record
Barn Owl	24	1.12km SSE	2015
Black Redstart	9	1.03km WNW	2010
Fieldfare	6	1.27km NWN	2015
Hobby	3	1.03km WNW	2008
Osprey	2	1.60km W	2006
Peregrine	32	1.92km S	2016
Quail	9	1.27km NW	2006
Red Kite	3	1.82km S	2006

Breeding bird surveys conducted by Capita Symonds in 2008 recorded over 40 species of birds within close proximity of the site, including six red list Birds of Conservation Concern (BoCC) and eight amber list BoCC. The remaining species were all listed under the green list BoCC.

11.1 Methodology

Surveys for breeding birds were carried out on four occasions on 27th April, 3rd May, 26th May and 29th June 2016 as detailed in Table 16 below. The survey methodology involved standard (registration) mapping techniques as detailed in Bibby *et al.* (2007). Registrations of birds, using standard British Trust for Ornithology (BTO) two letter species codes and activity codes (Gilbert *et al.*, 2002), were placed onto an appropriate field map along with the date, start and end times and weather conditions. This method is based on the observation that many species during the breeding season are territorial. This is found particularly amongst passerines, where territories are often marked by conspicuous song, display, and periodic disputes with neighbouring individuals.

For recording passerines (song birds), specific symbols were used for singing, calling, movements of the same bird between different areas, flying, carrying food, nest building, aggressive encounters and other notable behaviour. The expected outcome of this technique is that mapped registrations fall into clusters, approximately coinciding with territories. Where a species has closely packed territories, the mapping of simultaneously singing birds becomes essential. Territory boundaries are taken to be



between such birds. Additional notes were made of any nocturnal bird activity, e.g. barn owl, during the bat surveys onsite (see Section 12).

Table16: Breeding bird survey dates and weather conditions

Survey	Date	Air temp (°C)	Precipitation	Wind speed (beaufort)	Cloud Cover (%)
1	27/04/2016	7 → 11	None	3 → 4	40 → 75%
2	03/05/2016	7 → 12	None	3 → 5	30 → 60%
3	26/05/2016	11 → 17	None	4 → 3	60 → 25%
4	29/06/2016	14 → 18	None	4	60 → 40%

All boundary features e.g. hedgerows, ditches, field edges and roadsides were walked and the birds were recorded using binoculars from a distance so that they were recorded before any disturbance took place.

11.2 Results

A total of 38 bird species of bird were recorded during the surveys. Notable species recorded included 5 Red List BoCC species and eleven Amber list BoCC as summarised in Table 17 below with locations provided in Figure ECO05, no Schedule 1 species were recorded onsite.

The status of each species was checked against their respective entries in Eastern Glamorgan Bird Report 2015 (Glamorgan Bird Club, 2016) which covers the geographical area of the County Boroughs of Bridgend, Vale of Glamorgan, Cardiff, Rhondda Cynon Taff and Merthyr Tydfil together with the western part of Caerphilly.

Table17: Notable bird species recorded within the survey area

English Name (BTO code)	Scientific Name	Wales BoCC Status, Eastern Glamorgan status
Black-headed gull (BH)	<i>Chroicocephalus ridibundus</i>	BoCC Red list, common non-breeding resident, winter visitor and passage migrant S.42
Goldcrest (GC)	<i>Regulus regulus</i>	BoCC Amber list, common resident breeder and passage migrant, though numbers can be depleted due to harsh winters
Green Woodpecker (G.)	<i>Picus viridis</i>	BoCC Amber list, common resident breeder
Herring gull (HG)	<i>Larus argentatus</i>	BoCC Red list, common resident breeder, passage migrant and winter visitor. Breeds on Flat Holm, roof tops of coastal towns and on suitable cliffs,



English Name (BTO code)	Scientific Name	Wales BoCC Status, Eastern Glamorgan status
		S.42
House martin (HM)	<i>Delichon urbica</i>	BoCC Amber list, common breeding summer visitor and passage migrant, a small cliff nesting colony exists between Southerndown and Llanwit Major
House sparrow (HS)	<i>Passer domesticus</i>	BoCC Amber list, common resident breeder, S.42
Linnet (LI)	<i>Carduelis cannabina</i>	BoCC Red list, common resident breeder, passage migrant and winter visitor, S.42
Long-tailed tit (LT)	<i>Aegithalos caudatus</i>	BoCC Amber list, common resident breeder
Mallard (MA)	<i>Anas platyrhynchos</i>	BoCC Amber list, common resident breeder whose population is augmented by local hand-reared releases
Meadow pipit (MP)	<i>Anthus pratensis</i>	BoCC Amber list, common resident breeder, winter visitor and passage migrant
Skylark (S.)	<i>Alauda arvensis</i>	BoCC Amber list, LBAP, common resident breeder, winter visitor and passage migrant, S.42
Song thrush (ST)	<i>Turdus philomelos</i>	BoCC Amber list, LBAP, common resident breeder S.42
Starling (SG)	<i>Sturnus vulgaris</i>	BoCC Red list, common but declining resident and winter visitor
Swallow (SL)	<i>Hirundo rustica</i>	BoCC Amber list, common breeding summer visitor and passage migrant
Whitethroat (WH)	<i>Sylvia communis</i>	BoCC Amber list, common breeding summer visitor and passage migrant
Yellowhammer (Y)	<i>Emberiza citrinella</i>	BoCC Red list, locally common resident breeder and winter visitor, S.42

The remaining 20 species were common and widespread species as detailed in Table 18.

Table 18: Common and widespread bird species (Wales BoCC Green List) recorded within the survey area

English Name (BTO code)	Scientific Name	Eastern Glamorgan status
Blackbird (B)	<i>Turdus merula</i>	Common resident breeder
Blackcap (BC)	<i>Sylvia atricapilla</i>	Common breeding summer visitor and passage migrant, locally common winter visitor, especially to suburban parks and gardens
Blue tit (BT)	<i>Cyanistes caeruleus</i>	Common resident breeder
Buzzard (BZ)	<i>Buteo buteo</i>	Common resident breeder



English Name (BTO code)	Scientific Name	Eastern Glamorgan status
Carrion crow (C.)	<i>Corvus corone</i>	Common resident breeder
Chaffinch (CH)	<i>Fringilla coelebs</i>	Common resident breeder, winter visitor and passage migrant
Chiffchaff (CC)	<i>Phylloscopus collybita</i>	Common breeding summer visitor and passage migrant, locally common winter visitor
Collared dove (CD)	<i>Streptopelia decaocto</i>	Common resident breeder
Dunnock (D)	<i>Prunella modularis</i>	Common resident breeder, S.42
Goldfinch (GO)	<i>Carduelis carduelis</i>	Common resident breeder, passage migrant and winter visitor
Great tit (GT)	<i>Parus major</i>	Common resident breeder
Greenfinch (GR)	<i>Carduelis chloris</i>	Common resident breeder, passage migrant and winter visitor
Jackdaw (JD)	<i>Corvus monedula</i>	Common resident breeder, especially in the upland valleys
Magpie (MG)	<i>Pica pica</i>	Common resident breeder
Moorhen (MH)	<i>Gallinula chloropus</i>	Common resident breeder
Nuthatch (NH)	<i>Sitta europaea</i>	Common resident breeder
Pheasant (PH)	<i>Phasianus colchicus</i>	Locally common resident breeder, with numbers frequently augmented by releases from shooting clubs
Robin (R.)	<i>Erithacus rubecula</i>	Common resident breeder
Stock dove (SD)	<i>Columba oenas</i>	Locally common resident breeder
Treecreeper (TC)	<i>Certhia familiaris</i>	Common resident breeder
Woodpigeon (WP)	<i>Columba palumbus</i>	Common resident breeder, large flocks frequently noted on passage at coastal sites in late autumn
Wren (WR)	<i>Troglodytes troglodytes</i>	Common resident breeder

11.3 Assessment of Impacts and Recommendations

The site provides suitable habitats to support a range of bird species, including ground nesting species. The following habitats are considered to be important habitats for nesting and foraging birds i.e. hedgerows, poor semi-improved grassland, arable fields, woodlands, scrub and scattered trees along with the Llanmaes Brook and Boverton Brook corridor.

The Birds of Conservation Concern Red List species recorded and are considered to be breeding on or adjacent to the site are linnet, skylark, song thrush, starling and yellowhammer. Those species listed



as Amber are dunnock, kestrel, reed bunting and stock dove. The remaining notable species were recorded as either flying over the site or feeding within the site but showing no signs of breeding.

All wild birds in the UK are protected under Section 1 of the Wildlife and Countryside Act 1981 (as amended) which makes it an offence to intentionally kill, injure or take any wild bird or take, damage or destroy the nest (whilst being built or in use) or its eggs.

11.3.1 Avoidance, Mitigation and Enhancement

Construction phase- killing and injury of wild bird

To avoid an offence under wildlife legislation it is recommended that vegetation clearance is undertaken outside of the bird breeding season, which is usually considered to be between March and September inclusive (this will link to the requirement for the removal of hedgerow and scrub for hazel dormice- see Section 10). If additional clearance of vegetation suitable for breeding birds has to be undertaken during the bird breeding season then a suitably qualified ecologist will be required to survey for nesting birds prior to the vegetation clearance. If any active nests are located they must be left in situ with a suitable buffer until all the young have fledged and cease to return to the nest. The size of the buffer is dependent upon the species concerned but as a default a minimum of 5 m will be required.

Operational phase- loss of habitat

The loss of suitable nesting bird habitat will be mitigated through the inclusion of extensive areas of new habitat within the proposed landscape scheme that are likely to offer suitable nesting and foraging habitat for birds (including the planting of 4843 m of new native hedgerow and 15, 272 m² of new shrub & tree planting- see Table 4). In addition the 285m of hedgerows impacted by the scheme will be translocated to the highway boundaries resulting in no loss of habitat.

In addition the LEMP, produced to ensure all new and retained habitats will be managed to provide suitable habitats for protected species within the area, will include a number of prescriptions for breeding birds as summarised below:

- Areas of new and retained hedgerow and shrub habitat will be managed to provide suitable structure and cover for nesting birds and provide suitable foraging habitat, where there is not a requirement for regular cutting to maintain visibility splays for highways. This will likely involve a reduced cutting regime outside the nesting season to allow the hedgerow and shrub species to fruit to providing both nesting and foraging habitat.



12.0 Bats

12.1 Desk Study

SEWBReC returned 48 records of bats within 2 km of the site as summarised in Table 19 below.

Table19: SEWBReC records of bats within 2km of the site (centred on NGR: SS989 691)

Species	Number of records	Closest record	Date of most recent record
Brown Long-eared Bat	8	1.53km WSW	2015
Common Pipistrelle	8	1.48km ENE	2015
Lesser Horseshoe	18	1.48km ENE	2015
Noctule	5	1.94km N	2013
Unidentified Bat	8	1.17km SW	2005
Whiskered Bat	1	1.94km N	2011

In addition SEWBReC returned 12 records of bat roosts within 2 km of the site, species include Daubenton's *Myotis daubentonii*, greater horseshoe *Rhinolophus ferrumequinum*, natterer's *Myotis nattereri* and an unidentified pipistrelle *Pipistrellus* sp. The records are protected and therefore the exact locations are not available.

Previous surveys conducted by Capita Symonds in 2008 identified no bat roosts within the site however activity surveys recorded 117 bat passes from at least five species of bat comprising common pipistrelle *Pipistrellus pipistrellus*, soprano pipistrelle *Pipistrellus pygmaeus*, *Myotis* spp and noctule *Nyctalus noctula*. In addition a single lesser horseshoe bat *Rhinolophus hipposideros* was also heard near the railway bridge along Eglwys Brewis Road to the south of the site. General activity on site was considered to be low, with the majority of the bat activity associated with linear features such as hedge lines and field boundaries.

12.2 Methodology

12.2.1 Preliminary roost assessment

A preliminary roost assessment was completed of trees and buildings within and directly adjacent to the site that could potentially be impacted by the works. The survey was carried out in line with methodology outlined in the Bat Conservation Trust's Bat Surveys for Professional Ecologist: Good Practice Guidelines (Collins, 2016) hereafter referred to as the 'BCT Guidelines'. High powered optics



were used to inspect features that were assessed as having potential to support roosting bats, such as:

- Rot holes in trees;
- Splits and cracks in tree bark;
- Woodpecker nest holes;
- Access points to structures.

Other factors that may influence roost establishment were also taken into account, such as aspect, shading, disturbance, lighting and the presence of features in the adjacent habitat that could be used by bats for commuting and foraging. Evidence searched for included:

- Bat droppings;
- Staining from urine or from the natural oil on bats’ fur around well-used roosting places or access points; and
- Actual bat presence.

Features assessed as having potential to support roosting bats which could not be searched from ground level were also noted. Based on the findings, the buildings and trees on site were assigned a ‘suitability’ rating based on their potential to support roosting bats (see Table 20). The categories are based on a multitude of factors, including (but not limited to):

- Number of features suitable to support roosting bats;
- Type of feature;
- Age of the structure; and
- Location and disturbance of the structure.

Table20: Guidelines for assessing the potential suitability of structures for bats (taken from BCT Guidelines)

Suitability	Roosting Habitat Description
Negligible	Negligible habitat features likely to be used by roosting bats.
Low	A structure with one or more potential roost sites that could be used by individual bats opportunistically. However, these potential roost sites do not provide enough space, shelter, protection, appropriate conditions and/or suitable surrounding habitat to be used on a regular basis or by larger numbers of bats (i.e. unlikely to be suitable for maternity or hibernation). A tree of sufficient size and age to contain potential roosting features but with none seen from the ground or features seen with only very limited roosting potential.



Suitability	Roosting Habitat Description
Moderate	A structure or tree with one or more potential roost sites that could be used by bats due to their size, shelter, protection, conditions and surrounding habitat but unlikely to support a roost of high conservation status (with respect to roost type only – the assessments in this table are made irrespective of species conservation status, which is established after presence is confirmed).
High	A structure or tree with one or more potential roost sites that are obviously suitable for use by larger numbers of bats on a more regular basis and potentially for longer periods of time due to their size, shelter, protection, conditions and surrounding habitat.

12.2.2 Bat emergence/ re-entry surveys

During the external roost assessment Rose Cottage garage was identified as 'low' suitability for roosting bats. In addition one ash tree (T1) was identified that could be impacted by the development as having 'moderate' suitability for roosting bat (see Figure ECO01 for location).

Dusk emergence and pre-dawn re-entry surveys were completed by experienced ecologists (Elliott Hughes Consultant Ecologist GrCIEEM and Emmanuelle Amiral GrCIEEM) using Elekon Batlogger M (frequency division, time expansion and heterodyne) bat detectors. Emergence surveys commenced 15 minutes before sunset and continued for approximately 2 hours. Pre-dawn re-entry surveys started approximately 2 hours before sunrise and continued until 15 minutes after sunrise. The bat calls were recorded directly into the detector memory cards and later analysed on Bat Explorer software.

Table 21 summarises the dates of the emergence and re-entry surveys, location and weather conditions.

Table21: Emergence/ re-entry survey dates and weather conditions

Date	Sunrise/ sunset	Start	Finish	Air temp °C- start	Air temp °C- finish	Precipitation & wind speed	Cloud cover %
23/08/16	20.18	20.03	22.00	20	18	None & 3	50
27/09/16	07.08	05.15	07.23	16	16	None & 3	95
04/05/17	20.27	20.12	22.12	13	11	None & 4	100

During each survey surveyors recorded the time and a description of any activity which may indicate the presence of a roost (emerging from or returning to the trees). Additionally the activity of bats in flight was recorded, e.g. whether a bat was commuting or foraging, where bats could be seen, and



the patterns/directions of the bats' flight. This information helped to build a picture of bat use across the site and to identify areas of importance for bats.

12.2.3 Bat activity surveys

The site was appraised for its suitability to support bats during the extended Phase 1 habitat survey completed in April 2016 and was considered to have 'Moderate' suitability for foraging and commuting bats. One survey per month, comprising two separate transects to cover the entire site, was recommended with reference to the BCT Guidelines. The transect route (Figure ECO06) was designed to sample representative habitats within the site including hedgerows, Llanmaes Brook and grassland habitats which would provide potentially suitable habitat for foraging and commuting bats.

Surveys were completed using Elekon Batlogger M (frequency division, time expansion and heterodyne) bat detectors which directly GPS tag all bat passes. Six transect surveys were undertaken between early May and September 2016. Table 22 shows a summary of transect survey times and weather conditions.

Table22: Bat activity survey dates and weather conditions

Date	Sunrise/ sunset	Start	Finish	Air temp °C- start	Air temp °C- finish	Precipitation & wind speed	Cloud cover %
03.05.16	20:41	20:41		9	6	None & 2	10
18.05.16	21:07	21:07		11	9	None & 2	50
14.06.16	21:31	21:22		14	14	None & 3	90
27.07.16	21:08	21:08		16	13	None & 2	45
16.08.16	20:33	20:33		19	16	None & 2	10
15.09.16	06.50	04.50		12	12	None & 1	10

The direction the transect was walked was alternated to ensure varied temporal and spatial coverage of the survey area. The surveyor walked at a steady pace starting at sunset and continuing for approximately 2-3 hours afterwards. A series of 'listening points' were located at pre-defined positions along the transect route. The listening points comprised five minute stops during which any bat foraging and/or commuting was recorded. The nature of the bat activity was recorded along with the direction in which the bat was travelling, if the bat was observed. All transects were completed during suitable weather conditions.

Any bats recorded were identified to species (where possible) and recorded on a field map. The calls were recorded on the Elekon Batlogger M detectors were later analysed by an experienced bat ecologist using Bat Explorer software to allow identification to species or genus level.



Static detector surveys

Wildlife Acoustics Song Meter (SM2+ BAT) and Anabat Express bat detectors were used to sample bat activity, distribution and species across the site. In line with BCT Guidelines two detectors were placed on each transect for each month of survey. The static detector was placed at each location before dusk and was retrieved during the daytime after at least five nights of consecutive recording. Table 4 and Figure ECO06 present the static detector locations. The remote detector recordings were analysed using AnalookW software to gain further information on the species present and relative amount of activity through the night.

Detectors were deployed periods of suitable weather conditions based on long term forecasts with Table 23 summarising weather conditions during the automated detector surveys.

Table23: Static bat detector survey dates and weather conditions

Month	Date	Weather
April	03.05.16	7.0 °C; wind speed 6 km/h; Clear
	04.05.16	6.0 °C; wind speed 4 km/h; Clear
	05.05.16	9.0 °C; wind speed 6 km/h; Clear
	06.05.16	11.0 °C; wind speed 7 km/h; Clear
	07.05.16	14.0 °C; wind speed 7 km/h; Light rain
May	18.05.16	13.0 °C; wind speed 10 km/h; Passing clouds
	19.05.16	8.0 °C; wind speed 9 km/h; Light rain
	20.05.16	12.0 °C; wind speed 15 km/h; Low clouds
	21.05.16	13.0 °C; wind speed 11 km/h; Low clouds
	22.05.16	10.0 °C; wind speed 4 km/h; Passing cloud
June	10.06.16	16.0 °C; wind speed 6 km/h; Scattered cloud
	11.06.16	15.0 °C; wind speed 2 km/h; Low cloud
	12.06.16	14.0 °C; wind speed 6 km/h; Scattered cloud
	13.06.16	15.0 °C; wind speed 14 km/h; Over cast
	14.06.16	14.0 °C; wind speed 12 km/h; Overcast
July	07.07.16	15.0 °C; wind speed 6 km/h; Passing Cloud
	08.07.16	16.0 °C; wind speed 10 km/h; Overcast
	09.07.16	14.0 °C; wind speed 3 km/h; Passing cloud
	10.07.16	17.0 °C; wind speed 8 km/h; Overcast
	11.07.16	16.0 °C; wind speed 21 km/h; Scattered cloud
August	10.08.16	12.0 °C; wind speed 11 km/h; Thunderstorms/Low cloud



Month	Date	Weather
	11.08.16	15.0 °C; wind speed 12 km/h; Thunderstorms/Low cloud
	12.08.16	16.0 °C; wind speed 11 km/h; Overcast
	13.08.16	17.0 °C; wind speed 15 km/h; Overcast
	14.08.16	14.0 °C; wind speed 6 km/h; Overcast
September	17.09.16	15.0 °C; wind speed 9 km/h; Overcast
	13.09.16	18.0 °C; wind speed 7 km/h; Drizzle/overcast
	14.09.16	20.0 °C; wind speed 13 km/h; Mostly cloudy
	15.09.16	15.0 °C; wind speed 4 km/h; Drizzle/overcast
	16.09.16	16.0 °C; wind speed 15 km/h; overcast

12.3 Results

12.3.1 Preliminary roost assessment

Rose Cottage garage is a well maintained single storey stone and render building with a pitched slate roof with wooden bargeboard, fascias and soffits. Internally the roof was a simple softwood rafter construction with underlay to the roof tiles. No signs of roosting bats were recorded however potential roosting features included a number of gaps were noted between the wooden bargeboard, fascias and soffits. The building was assessed as 'low' suitability to the small number of features recorded.

In addition a number of trees were identified as having bat roost potential as detailed in Table 24 below:

Table24: Trees of bat roosting potential within the site

Tree ref	Description and potential roosting features	Suitability*
T1	Mature ash tree with natural holes, cracks/ splits and deadwood	Moderate
T2	Mature ash in field with crack/ splits, deadwood and large natural hole	High
T3	Mature pedunculate oak with deadwood and loose bark	Moderate
T4	Semi mature ash with small amount of deadwood	Low
T5	Mature ash with cracks/ splits and deadwood	Moderate
T6	Mature ash with deadwood	Low

* Based on BCT Guidelines (see Table 20)



Further emergence/ re-entry surveys were completed Rose Cottage garage as it will be demolished as part of the development, in addition surveys were completed of T1 due to potential indirect impacts from the NAR such as lighting/ noise. No surveys were completed of T2, T3, T5 and T6 as they will be retained within the development with no potential indirect impacts. T4 was not surveyed as trees of 'low' suitability do not require further surveys according to the current BCT Guidelines however precautionary removal methods are detailed in Section 12.4.

12.3.2 Bat emergence/ re-entry surveys

Rose Cottage garage

No bats were recorded roosting within Rose Cottage garage identified with bat roosting potential, with a summary of the survey results provided below.

04/05/17 (emergence survey)

No emerging bats were observed during this survey, bats recorded foraging and commuting were identified as common pipistrelle and noctule. A low amount of foraging activity was recorded throughout the survey by both surveyors. Bat were observed foraging and commuting up and down the road adjacent to the garage building as well as along the hedgerow and grassland west of the building.

Ash tree (T1)

No bats were recorded roosting within the ash tree (T1) identified with bat roosting potential, with a summary of the survey results provided below.

23rd August 2016 (emergence survey)

No emerging bats were observed during this survey, bats recorded foraging and commuting were identified as common pipistrelle, soprano pipistrelle and noctule. A low amount of foraging activity was recorded around the tree throughout the survey by both surveyors.

27th September 2016 (re-entry survey)

No re-entry behaviour was noted during the survey, bats recorded foraging and commuting in the area were identified as common pipistrelle and soprano pipistrelle. A very low amount of foraging activity recorded around the tree throughout the survey with half the calls noted to be passing bats.



12.3.3 Bat activity surveys

Transect surveys recorded up to six species of bats onsite including common pipistrelle, soprano pipistrelle, nathusius pipistrelle, noctule, serotine and Myotis sp (see Figures ECO07 and ECO08). However the level of activity recorded across the site was considered to be low to moderate and typical of habitats of this type, with the majority of activity associated with the field boundaries.

3rd May 2016- dusk activity

Western transect: The only species of bat recorded throughout the survey was common pipistrelle, with low activity recorded. The first bat was recorded at 21:04 approximately 25 minutes after sunset. Bats were recorded foraging and commuting along the field boundaries of the site with an increase in recordings associated with lane to the north of the site and near the small patch of woodland within the centre of the transect.

Eastern transect: The only species of bat recorded throughout the survey was common pipistrelle, with low activity recorded. The first bat was recorded at 21:12 approximately 33 minutes after sunset, at 21:16 up to four bats were seen foraging along Eglwys Brewis Road. During the survey all except one recording was recorded along Eglwys Brewis Road.

18th May 2016- dusk activity

Western transect: Three species of bat was recorded throughout the survey; common pipistrelle, soprano pipistrelle and noctule with moderate activity throughout the survey. The first bat was recorded at 21:29 approximately 26 minutes after sunset, after this point constant activity every 1-3 minutes was recorded until 23:03 where bat passes started to become intermittent. Constant activity was recorded along the hedgerow that border the lane to the north of the site, along with clusters of calls within central areas along the transect indicating foraging bat within these area.

Eastern transect: Five species of bat was recorded throughout the survey; common pipistrelle, soprano pipistrelle, noctule, serotine and Myotis sp. with moderate activity throughout the survey. The first bat was recorded at 21:35 approximately 28 minutes after sunset. The majority of the calls were located along the hedgerows that border the lane to the north and Eglwys Brewis Road with feeding noted. A few individual calls were recorded along hedgerows within the western extent of the transect, these calls are likely to have been recorded from commuting bats.



14th June- dusk activity

Western transect: Two species of bat was recorded throughout the survey; common pipistrelle and soprano pipistrelle with low activity throughout the survey. The first bat was recorded at 21:54 approximately 23 minutes after sunset, after this point constant activity every 1-4 minutes was recorded until 22:48 where bat passes started to become intermittent. The highest level of activity was located along the western boundary of the site with bats here recorded foraging up and down hedgerows. Bats were also recorded along the lane to the north of the site and clusters of foraging activity were recorded within listen stops in central locations of the transect indicating foraging bat within these area.

Eastern transect: Two species of bat was recorded throughout the survey; common pipistrelle and Myotis sp. with low activity throughout the survey. The first bat was recorded at 22:09 approximately 38 minutes after sunset, calls were sporadic picking up single passes from bats with some foraging activity recorded within the central area of the transect.

27th July 2016- dusk activity

Western transect: Four species of bat was recorded throughout the survey; common pipistrelle, soprano pipistrelle, nathusius pipistrelle and serotine with moderate activity throughout the survey. The first bat was recorded at 21:54 approximately 30 minutes after sunset. Bats were observed foraging up and down hedgerows along the lane to the north of the site, adjacent to the scrub associated with the B4265, and hedgerows within the centre of the site. Bats were also seen to be foraging over the field located near listening stop 8 between 22:46 – 22:54.

Eastern transect: Four species of bat was recorded throughout the survey; common pipistrelle, soprano pipistrelle, Myotis sp. and serotine with moderate activity throughout the survey. The first bat was recorded at 21:54 approximately 30 minutes after sunset. Foraging and commuting activity was recorded across the majority of the site with the exception of the arable field within the central area of the transect. Constant activity was recorded along the lane to the north and Eglwys Brewis Road, along with multiple myotis calls recorded around the line of Cypress trees within the eastern extent of the site.

16th August 2016- dusk activity

Western transect: Five species of bat was recorded throughout the survey; common pipistrelle, soprano pipistrelle, noctule, serotine, Myotis sp. with low activity throughout the survey. The first bat was recorded at 21:34 approximately an hour after sunset. Bats were observed foraging up and down



the lane to the north of the site; bats were then intermittently heard throughout the survey along field boundaries. The last bat was observed at 22:37 foraging near listing stop 13 close to surveyors.

Eastern transect: Three species of bat was recorded throughout the survey; common pipistrelle, soprano pipistrelle and Myotis sp. with low activity throughout the survey. The first bat was recorded at 20:57 approximately 27 minutes after sunset. The majority of activity for this survey was located within the western extent of the transect. Bats were recorded foraging along the lane to the north of the site and up and down hedgerows within the fields within the western extent. Intermittent passing calls were also recorded near Eglwys Brewis Road.

15th September- dawn activity

Western transect: Two species of bat was recorded throughout the survey; common pipistrelle and soprano pipistrelle with very low activity throughout the survey. Only four bats were recorded throughout the survey all of which were passing calls, with no foraging activity noted.

Eastern transect: Two species of bat was recorded throughout the survey; common pipistrelle, and noctule with very low activity throughout the survey. Only five bats were recorded throughout the survey, again all of which were passing calls and no foraging activity noted.

Static detector surveys

A total of 4616 bat passes were recorded using automated static detectors from at five different bat species. Of these passes, 4205 were common pipistrelles (91% of all passes), 281 were soprano pipistrelle (6% of all passes), 71 were Myotis sp. (1.5% of all passes), 43 were serotine (1% of all passes) and 16 were noctule (<0.5% of all passes). Table 25 summarise the total number of bat passes recorded each survey month with further breakdown provided in Table A2 in Appendix A. Figure ECO06 shows the locations of the static bat detectors.

Table25: Summary of bat passes per month across site

Survey month	Survey date	Species	Total number of passes
May	03/05/2016- 07/05/2016	Common pipistrelle	1435
		Soprano pipistrelle	121
		Serotine	16
		Noctule	5
		Myotis*	2
May	18/05/2016- 22/05/2016	Common pipistrelle	294



Survey month	Survey date	Species	Total number of passes
		Soprano pipistrelle	1
		Serotine	1
		Noctule	2
		Myotis*	4
June	10/06/2016- 14/06/2016	Common pipistrelle	113
		Soprano pipistrelle	31
		Serotine	1
		Noctule	1
		Myotis*	47
July	07/07/2016- 11/07/2016	Common pipistrelle	2088
		Soprano pipistrelle	60
		Serotine	8
		Noctule	-
		Myotis*	9
August	10/08/2016- 14/08/2016	Common pipistrelle	219
		Soprano pipistrelle	48
		Serotine	14
		Noctule	3
		Myotis*	4
September	12/09/2016- 16/09/2016	Common pipistrelle	56
		Soprano pipistrelle	20
		Serotine	3
		Noctule	5
		Myotis*	5

* likely to be Whiskered/ Brandts

12.4 Assessment of Impacts and Recommendations

No bat roosts were recorded onsite during the surveys however low to moderate levels of bat foraging/ commuting bat activity was recorded. Bat activity across the site was generally associated with linear features, including the hedgerows.

Based on the extent of site clearance is detailed in AECOM drawings 60509148-SHT-30-0000-CT-0201 to 60509148-SHT-30-0000-CT-0208 suitable habitat for commuting and foraging bats will be



impacted and in the absence of mitigation the development could result in the following impacts to bats;

- Habitat loss- removal of 710 m of hedgerow and 12,930 m² of dense scrub;
- Loss of connectivity- the NAR will act potentially as a significant barrier to foraging/ commuting bats between suitable habitats to the north and south due to the severance of suitable linear habitat;
- Killing and injury- increased risk of road collision where bats are crossing the NAR at low heights;
- Disturbance- construction and operational phase disturbance to bat populations through indirect impacts such as noise and artificial lighting.

12.4.1 Avoidance, Mitigation and Enhancement

Construction phase- disturbance

No bat roosts were recorded during the surveys and therefore it is considered unlikely a European Protected Species Mitigation (EPSM) Licence is required from NRW, however there is a risk that the proposed development has potential to cause temporary disturbance to bats (noise and artificial lighting) during the construction phase of the development.

To reduce the potential for temporary impacts during the construction phase the following measures will aim to minimise disturbance to bats:

- Bat foraging and commuting is undertaken during the hours of darkness. Works will be restricted to daylight hours wherever possible in order to minimise disturbance;
- Some additional lighting may be required during the construction phase of the development. If any additional lighting is required it should be kept to the minimum required for security purposes and the siting of this and use of directional lights will be discussed with an ecologist to minimise any risk of disturbance on bats and any other fauna that may potentially be present in the working area.

During construction bat commuting routes will be kept open for as long as possible however where connecting hedgerows are severed fencing, willow hurdles or straw bales will be used to join the severed ends of the hedgerow at the end of each working day (during the main bat active season, May to September) to reconnect the commuting route.



Operational phase- loss of habitat

The loss of suitable bat foraging and commuting habitat will be mitigated through the inclusion of extensive areas of new habitat within the proposed landscape scheme that are likely to offer suitable bat habitat and provide new and enhanced connective habitats (including the planting of 4843 m of new native hedgerow and 15, 272 m² of new shrub & tree planting- see Table 4). In addition all hedgerows impacted by the scheme will be translocated (where suitable) to the highway boundaries resulting in no loss of habitat.

In addition the LEMP, produced to ensure all new and retained habitats will be managed to provide suitable habitats for protected species within the area (including foraging and commuting bats).

Operational phase- disturbance and fragmentation of foraging habitat and increased risk of vehicle collision

To reduce the likelihood of operational lighting impacts a wildlife sensitive lighting scheme will be designed in consultation with a suitably experienced ecologist to make sure that retained and new habitats are undisturbed during the construction and operational phases of the development. The lighting strategy will focus on retaining a dark corridor along Llanmaes Brook to encourage bats to utilise the below to cross the NAR:

- A north to south crossing point will be provided beneath the NAR via the agricultural underpass adjacent to Llanmaes Brook, this will connect to adjacent habitats and include provision of a 'dead hedge' linked to retained and new hedgerows currently used by bats (see AECOM drawings 60509148-SHT-30-0000-CT-3002);
- Scrub, hedgerow and tree planting have been included adjacent to the NAR to reduce the likelihood of bats crossing the road at relatively low heights, reducing the chance of collision with road traffic.

In addition the following measures will be considered to reduce adverse effects from light spill:

- Consideration of hood design, lamp height, and angle, to reduce light spill particularly avoiding illuminating retained foraging and commuting habitat on the site;
- Use of less ultra violet (UV) light emitting bulbs, such as metal halide or high pressure sodium; and
- Minimising hours of lighting to those absolutely necessary for security and safety purposes, where possible lighting should avoid key periods of bat activity (i.e. sunset and sunrise). Consider how new technologies can be used to control lighting levels (e.g. dimming lights at certain times)



Further technical details are given in the BCT and the institute of Lighting Engineers' *Bats and lighting in the UK* (2009) (refer to Appendix C) and *Artificial lighting and Wildlife: Interim Guidance: Recommendations to help minimise the impact of artificial lighting* (BCT, 2014). Both publications are available at http://www.bats.org.uk/pages/bats_and_lighting.html.



13.0 Fish Species

Consultation with NRW has indicated that there has not been any monitoring of fish populations on the modelled watercourses. But based on habitat and location, there is a potential that the streams could be important for eels *Anguilla anguilla*, brown trout *Salmo trutta*, and potentially Atlantic salmon *Salmo salar*. Based on this it is proposed that the culvert designs will include provision for fish, with potential suggestions detailed below:

- Ensuring the invert level of the culverts are set so that they are not perched;
- Baffles through the culverts to create deep, slower moving water; and
- Bristle substrate to allow the passage of eels.

Where invert levels are set higher than upstream bed levels on Llanmaes Brook fish passes will be provided. The final detail on the culvert design will be provided by the contractor and be subject of a planning condition.



14.0 Summary of Mitigation Measures

Habitats

- All retained habitats will be protected in line with BS5837:2012 'Trees in Relation to Design, Demolition and Construction – Recommendations';
- All suitable hedgerows impacted by the scheme will be translocated to the NAR boundaries;
- To avoid any significant indirect impacts on the water quality of Llanmaes Brook and Boverton Brook an appropriate construction phase water management methodology will be detailed in
- A Construction Method Statement (CMS) will be produced by the contractor detailing mitigation to avoid any significant indirect impacts on the water quality of Llanmaes Brook and Boverton Brook;
- A Landscape and Ecological Management Plan (LEMP) will be produced to ensure all new and retained habitats are managed to provide suitable habitats for protected species within the area.

Great crested newt

- No specific impacts are predicted for GCN, and therefore no mitigation is proposed as part of the development.

Reptile

- In order to avoid killing and injury of reptiles recorded within the Llanmaes Brook corridor the vegetation in this area will be subject to a sensitive clearance strategy;
- The loss of suitable reptile habitat will be mitigated through the inclusion of extensive areas of new habitat within the proposed landscape scheme, these habitats will be managed appropriately in line with the LEMP;
- Two reptile brush/ log piles will be included as part of the development.

Badger

- To provide an up to date assessment of the use of the site by badger it is recommended an update survey is completed a maximum of three months prior to construction commencing
- To comply with wildlife legislation a Natural Resources Wales (NRW) licence will be required to facilitate the work and allow the closure of the Annexe sett, this will be completed in line with best practice as agreed with NRW;



- To reduce the potential for temporary impacts during the construction phase sensitive working methods for badgers will be employed;
- To maintain connectivity and provide safe access otter and badger proof fencing, as specified in the *Design Manual for Roads and Bridges (DMRB) Volume 10* (1997), will be installed to the NAR boundaries to guide animals to use the agricultural vehicle underpass located to the east of Llanmaes Brook.

Otter and water vole

- To provide an up to date assessment of the use of Llanmaes Brook and Boverton Brook by otter and water vole it is recommended an update survey is completed a maximum of three months prior to construction commencing
- To reduce the potential for temporary impacts during the construction phase sensitive working methods of otter will be employed;
- To maintain connectivity and provide safe access otter and badger proof fencing, as specified in the *Design Manual for Roads and Bridges (DMRB) Volume 10* (1997), will be installed to the NAR boundaries to guide animals to use the agricultural vehicle underpass located to the east of Llanmaes Brook.

Invertebrates

- No specific mitigation is proposed for invertebrates but the loss of invertebrate habitat will be mitigated through the inclusion of extensive areas of new habitat within the proposed landscape scheme that are likely to offer suitable habitat for invertebrate species

Hazel dormouse

- To comply with wildlife legislation a NRW a European Protected Species Mitigation licence from NRW will be required to facilitate the works, the licence will include details of the mitigation measures that have been put in place to maintain the favourable conservation status of the hazel dormouse population include translocation of hedgerows, sensitive clearance strategy, provision of additional hazel dormouse habitat as part of the landscape strategy and provision of a north to south crossing point of the NAR using the agricultural underpass. A draft of the method statement is included with the planning application.

Breeding birds

- To avoid an offence under wildlife legislation all vegetation clearance will be undertaken outside of the bird breeding season, which is usually considered to be between March and



September inclusive. If additional clearance of vegetation suitable for breeding birds has to be undertaken during the bird breeding season then a suitably qualified ecologist will be required to survey for nesting birds prior to the vegetation clearance. If any active nests are located they must be left in situ with a suitable buffer until all the young have fledged and cease to return to the nest;

- The loss of suitable bird habitat will be mitigated through the inclusion of extensive areas of new habitat within the proposed landscape scheme, these habitats will be managed appropriately in line with the LEMP.

Bats

- To reduce the potential for temporary impacts during the construction phase sensitive working methods for bats will be employed;
- A north to south crossing point will be provided for bats beneath the NAR via the agricultural underpass adjacent to Llanmaes Brook, this will connect to adjacent habitats and include provision of a 'dead hedge' linked to retained and new hedgerows currently used by bats;
- Scrub, hedgerow and tree planting have been included adjacent to the NAR to reduce the likelihood of bats crossing the road at relatively low heights, reducing the chance of collision with road traffic;
- A wildlife sensitive lighting scheme will be designed in consultation with a suitably experienced ecologist to make sure that retained and new habitats are undisturbed during the construction and operational phases of the development;
- The loss of suitable bat foraging and commuting habitat will be mitigated through the inclusion of extensive areas of new habitat within the proposed landscape scheme, these habitats will be managed appropriately in line with the LEMP.

Fish

- The final detail on the culvert design will be provided by the contractor and will include suitable mitigation to maintain fish and eel movement along Llanmaes Brook.



15.0 References

Ball, S.G. (1986) Terrestrial and freshwater invertebrates with red data book, notable or habitat indicator status. Invertebrate site register internal report number 66, NCC.

Bat Conservation Trust (2011) The state of the UK's bats: National Bat Monitoring Programme Population Trends.

Bat Conservation Trust (2009) Bats and Lighting in the UK: Bats and the Built Environment Series. Available at http://www.bats.org.uk/pages/bats_and_lighting.html

Bat Conservation Trust (2014) Artificial lighting and Wildlife. Interim Guidance: Recommendations to help

Bratton, J.H. (1991) British red data books 3 invertebrates other than insects. Joint Nature Conservation Committee, Peterborough.

Bright P., Morris P., and Mitchell-Jones T., 2006. The Dormouse Conservation Handbook 2nd Edition. English Nature.

Capita Symonds. (2009). St Athan: Home of the Defence Technical College and Aerospace Park, Outside the Wire. Ecological Surveys;

Capita Symonds. (2009). St Athan: Home of the Defence Technical College and Aerospace Park, Inside the Wire. Ecological Surveys;

Capita Symonds. (2009). St Athan: Home of the Defence Technical College and Aerospace Park, West Camp Access. Ecological Surveys

Chanin, P. (2003). *Monitoring the otter*. Conserving Natura 2000, Rivers Monitoring Series No. 10, English Nature, Peterborough

Collins, J. (ed.) (2016). *Bat Surveys for Professional Ecologists– Good Practice Guidelines (3rd edn)*. The Bat Conservation Trust, London.

David Clements Ecology. (2008). Aerospace St Athan, Cowbridge: Surveys of the Airbase and Surrounding Area for Great Crested Newt

Dean, M., Strachan, R., Gow, D. & Andrews, R. (2016). *Water Vole Mitigation Handbook*. Mammal Society Mitigation Guidelines Series. Mammal Society, London, UK.



Design Manual for Roads and Bridges. Volume 10 Environmental Design and Management. Section 4 Nature Conservation. Part 2 HA 59/92 Mitigating Against Effects on Badgers.

Drake, C.M., Lott, D.A., Alexander, K.N.A., and Webb, J. (2007) Surveying terrestrial and freshwater invertebrates for conservation evaluation. Natural England, Sheffield.

Eaton, M.A., et al. (2009). *Birds of Conservation Concern 3: the population status of birds in the United Kingdom, Channel Islands and Isle of Man*. British Birds 102:296-341

English Nature, (2002). *Badgers and Development*. English Nature, Peterborough, UK.

Eyre, M.D. (ed.) (1996) Environmental monitoring, surveillance and conservation using invertebrates. EMS publications, Newcastle upon Tyne.

Fowles, A. (1994) Invertebrates of Wales: a review of important sites and species. JNCC, Peterborough.

Gent, T. & Gibson, S. (2003). *Herpetofauna Workers' Manual*. JNCC, Peterborough.

Harris, S., Cresswell, P. & Jeffries, D. (1989). *Surveying Badgers. An occasional publication of the mammal society – No. 9*. Mammal Society, London.

Hill, D., Fasham, M., Tuicker, G., Shewry, M. and Shaw, P. (2005) Handbook of biodiversity methods survey, evaluation and monitoring. Cambridge University Press, Cambridge.

Institute for Ecology and Environmental Management (2013). *Guidelines for Preliminary Ecological Appraisal*.

IUCN. (2001). IUCN Red List Categories and Criteria: Version 3.1. IUCN Species Survival Commission. IUCN, Gland, Switzerland and Cambridge, UK.

Joint Nature Conservation Committee (2011) Spreadsheet of "Conservation Designations for UK Taxa" from <http://www.jncc.gov.uk/default.aspx?page=3409>, accessed 19th October 2016.

Joint Nature Conservation Committee (2010). *Handbook for Phase 1 Habitat Survey: A technique for environmental audit*. JNCC, Peterborough.

Langton, T.E.S., Beckett, C.L. and Foster, J.P. (2001). *Great Crested Newt Conservation Handbook*. Froglife, Halesworth.

Mitchell-Jones, A.J. & McLeish, A.P. (Eds) (2004). *Bat Workers Manual, 3rd Edn*. JNCC, Peterborough.



Natural England (2009). Guidance on 'Current Use' in the definition of a Badger Set

Natural England (2011). Badgers and Development: A Guide to Best Practice and Licensing. Interim Guidance published by Natural England

Oldham, R.S., Keeble, J., Swan, M.J.S. & Jeffcote, M. (2000). Evaluating the suitability of habitat for the great crested newt *Triturus cristatus*. *Herpetological Journal*, 10(4), 143-155.

Plant, C. (undated) Criteria used to define significance of invertebrate habitat. Colin Plant Associates, consultant entomologists.

Russ, J (2012). British bat calls: A guide to species identification. Pelagic publishing, Exeter.

RSPB (2002). *The Population Status of British Birds in the UK: Birds of Conservation Concern 2002-2007*.

Strachan, R. & Moorhouse, T. (2006). *Water Vole Conservation Handbook (2nd Edn)*. Wildlife Conservation Research Unit, Oxford.

Statutory Instrument 2000 No. 192; The Conservation (Natural Habitats &c.) Regulations 1994 (as amended), HMSO

Statutory Instrument 2010 No. 490; The Conservation of Habitats and Species Regulations 2010 (as amended), HMSO

Wildlife and Countryside Act, 1981 (as amended), HMSO



FIGURES

Figure ECO01 – Extended Phase 1 Habitat Plan West

Figure ECO02 – Extended Phase 1 Habitat Plan East

Confidential Figure ECO03 – Badger and Reptile

Figure ECO04 – Hazel Dormouse

Figure ECO05 – Breeding Birds: Red & Amber List

Figure ECO06 – Bat Transect and Remote Detector
Location

Figure ECO07 – Summary Bat Transect Data West

Figure ECO08 – Summary Bat Transect Data East

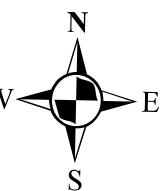
Legend

- I I Improved grassland
- SI SI Poor semi-improved grassland
- Semi-natural broadleaved woodland
- A A Arable
- Dense scrub
- Hardstanding
- Buildings
- Species-poor hedgerow
- Species-poor defunct hedgerow
- Species-poor hedgerow with trees
- Line of Cypress trees
- Brook
- Tree with moderate bat potential
- Tree with high potential
- Site boundary



Metres

Scale @ A3 - 1:5,000

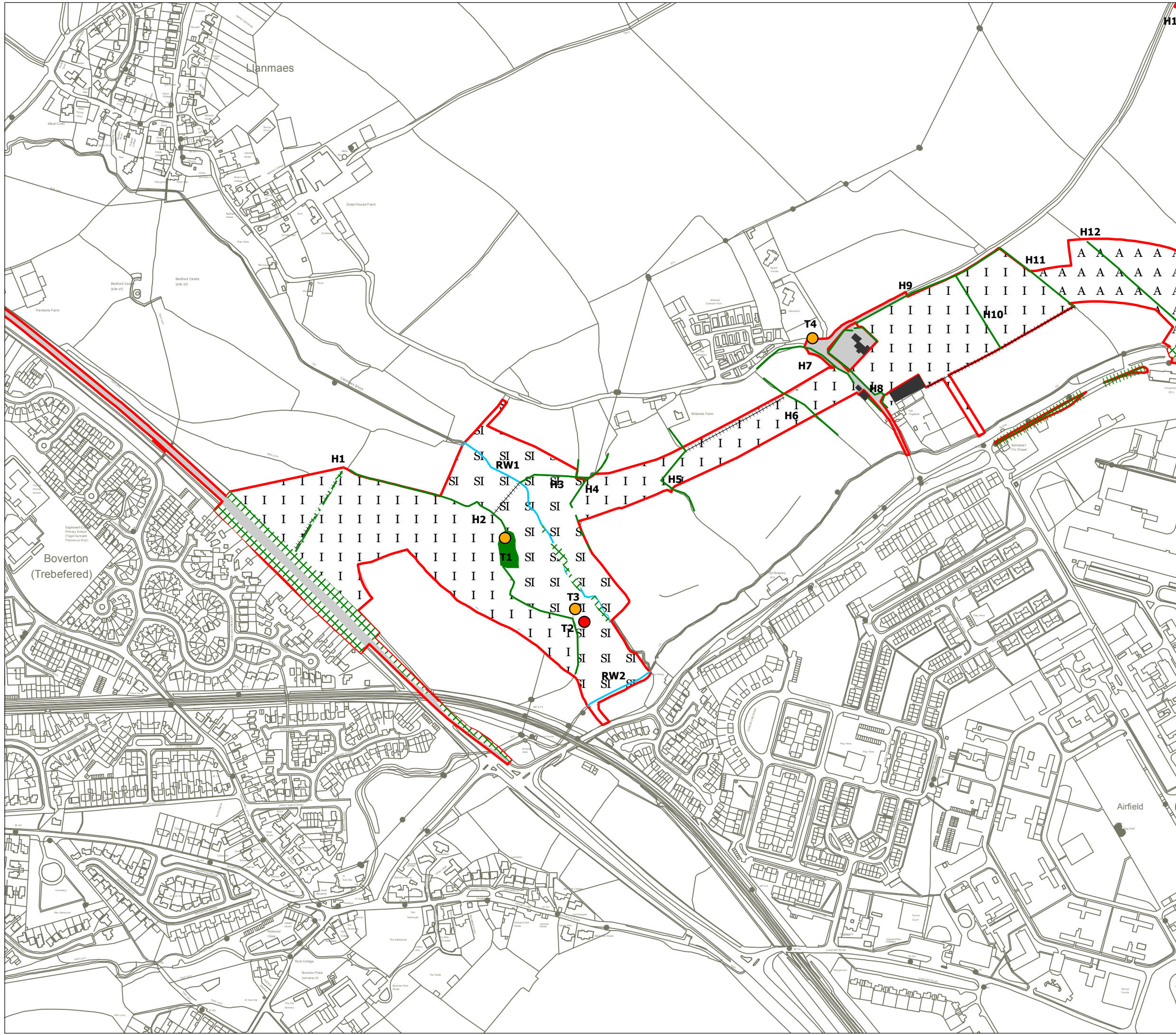


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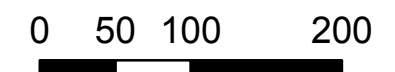
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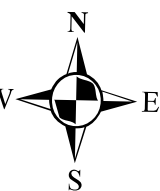
Legend

- Improved grassland
- Poor semi-improved grassland
- Arable
- Amenity grassland
- Semi-improved grassland
- Japanese knotweed
- Dense scrub
- Hardstanding
- Buildings
- Species-poor hedgerow
- Species-poor defunct hedgerow
- Species-poor hedgerow with trees
- Line of Cypress trees
- Wet ditch
- Fenceline
- Tree with low potential
- Tree with moderate bat potential
- Tree with high potential
- Site boundary



Metres

Scale @ A3 - 1:5,000



PH1

March 2017

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