Preliminary Ecological Apprisal
Castle Square

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Executive summary

Overview

Eight Associates has been commissioned by Spider Project Management Ltd to carry out a Preliminary Ecological Appraisal (PEA), including desktop study, Phase 1 habitat survey and protected species risk assessment for the proposed Castle Square development in Swansea. A table summarising the key findings of this report can be found to the right of this page.

This report details the existing ecology of the site, its potential for relevant protected species and how the development will enhance the ecological value of the surrounding area. It also outlines the legislation for these protected species, as well as reviewing Swansea biodiversity policy.

The site currently comprises predominantly of hardstanding and amenity grassland with scattered trees and introduced shrub within the segments of Castle Square. The site is bounded by retail units to the north and west, Castle Bailey Street and Swansea Castle to the east and Care Street and retail units (restaurants) to the south. In the centre of the site is a large electronic advertisement board (TN2 on the Phase 1 Habitat Plan in Appendix B). Prior to any work being carried out on site, the site was deemed to have low ecological value. The site covers approximately 0.88ha, and the National Grid Reference (NGR) for the centre of the site is SS 65641 93049, with postcode SA1 1JE.

There are no statutory designated sites and four non-statutory designated sites within 1km of the site. Given the scale of the works and the physical separation of the site from designated sites, it is believed that there will be a negligible effect on designated sites as a result of the development works.

During the Phase 1 habitat survey, existing buildings' walls and roofs, trees and habitats on and adjacent to the site were inspected for their potential to support protected species. It was noted that some of the trees within the site may harbour the to support nesting birds.

Recommendations have been made to mitigate against the loss of ecological features, and to enhance the site in line with Swansea biodiversity policies, with the aim to provide a net gain for biodiversity on the site.

Table 1 Summary of results provided within this report.

Habitats	Scattered trees, standing water, amenity grassland, introduced shrub and hardstanding
Protected Species Potential	Bats and birds
Further Surveys Required	No further surveys
Mitigation	• If trees are to be felled as part of the works, a nesting bird watching brief will be required where clearance/demolition works are to commence within the bird nesting season (March-August) • General advice concerning mammals during construction should be followed
Ecological Enhancements	• Installation of at least four bat boxes on the site • External lighting in line with BCT guidelines • Installation of at least four bird nesting boxes on the site • Installation of two invertebrate houses • Native planting • Extensive green roof

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Introduction

Eight Associates has been commissioned by Spider Project Management Ltd to carry out a desktop study, Phase 1 habitat survey and protected species risk assessment in connection with the proposed Castle Square development in Swansea. This report details the existing ecology of the site, its potential for relevant protected species and how the development will enhance the ecological value of the surrounding area. It also outlines the legislation for these protected species, as well as reviewing Swansea biodiversity policy.

Site Description

The site currently comprises predominantly of hardstanding and amenity grassland with scattered trees and introduced shrub within the segments of Castle Square. The site is bounded by retail units to the north and west, Castle Bailey Street and Swansea Castle to the east and Caer Street and retail units (restaurants) to the south. Prior to any work being carried out on site, the site was deemed to have low ecological value. The site covers approximately 0.88ha, and the National Grid Reference NGR for the centre of the site is SS 65641 93049, with postcode SA1 1JE.

Building Proposals

The current proposals include the regeneration of a public realm space in Swansea city centre, including two green roofed pavilions that will provide retail opportunities and covered outside seating areas for pedestrians. The initial proposal drawings are provided in Appendix A[1].

Preliminary Ecological Appraisal (PEA)
A PEA is a rapid assessment of the ecological features present, or potentially present, within a site its surrounding area (the zone of influence[2]). A PEA normally comprises two parts: a desk study and a Phase 1 habitat survey.

There are four key objectives of a Phase 1 habitat survey:

- To identify likely ecological constraints associated with the project;
- To identify mitigation which may be required;
- To identify any additional surveys which may need to be undertaken; and,
- To identify any ecological enhancement which can be carried out.

The purpose of this report is to achieve all four of these objectives.

National and Local Biodiversity Policies

The following UK legislation, policies and strategic plans are considered to be relevant to this site, with citations provided within Appendix C, D & E.

- The Conservation of Habitats and Species Regulations, 2017 – provides European protection for a variety of habitats and protected species including bats;
- The Wildlife & Countryside Act 1981 (as amended) – provides UK legal protected for a variety of habitats and protected species including bats, birds and hedgehogs;
- The National Planning Policy Wales (11th Ed. February 2021) - Planning Policy Wales (PPW) sets out the land use planning policies of the Welsh Government. It is supplemented by a series of Welsh Government Circulars, and policy clarification letters, which together with PPW provide the national planning policy framework for Wales. Further details are provided in Appendix D.
- The Local Planning Policy for Swansea Council is the Swansea Local Development Plan (LDP) 2020 – 2025. Further details can be found within Appendix E.

[1] Appendix A - ACME (November 2020), Castle Square, Swansea, Initial Proposal Plan. Swansea Council.
[2] "The 'zone of influence' for a project is the area over which ecological features may be affected by biophysical changes as a result of the proposed project and associated activities. This is likely to extend beyond the project site, for example where there are ecological or hydrological links beyond the site boundaries." - CIEEM (2018) Guidelines for Ecological Impact Assessment in the UK and Ireland, p. 14. This can be found at the following link: https://cieem.net/wp-content/uploads/2019/02/Combined-EclA-guidelines-2018-compressed.pdf [Last accessed on date of first issue]

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Methodology

Desk study

The desk study was undertaken in September 2021. The following steps were followed:

1. The zone of influence1 for the development was established in accordance with CIEEM guidelines[3]. The zone of influence is based on the characteristics of the project, as well as the present ecological features (including habitats, species and ecosystems) and their sensitivity to environmental change.
2. A high-level desktop review on statutory designated sites to consider within 1km of the site was carried out using MAGIC[4]. Examples of such sites include:
    - Internationally designated sites such as Special Protection Areas (SPAs), Wetlands of International Importance (Ramsar sites) and Special Areas of Conservation (SACs)
    - Nationally designated sites such as Sites of Special Scientific Interest (SSSI) and National Nature Reserves (NNRs)
    - Locally designated sites such as Local Nature Reserves (LNRs)
3. A data search report was obtained from Local Environmental Records Centres Wales (LERC Wales)[5]. The LERC Wales report provided the following:
    - Records of non-statutory designated sites within 1km of the site (known as Sites of importance for Nature Conservation (SINC)
    - Records of legally protected and notable species within a 1km radius of the site boundary.

    The data was reviewed to identify any habitats or species within the surrounding area that may be negatively impacted by the development. Records from over 10 years ago were removed from the analysis to give a more accurate view of the area's current notable species assemblage.
4. MAGIC was used to provide evidence of notable habitats within a 500m radius of the site. This was in order to identify the potential for any habitats or species within the surrounding area to be negatively impacted by the development.
5. MAGIC, Ordnance Survey (OS) maps and aerial imagery were used to identify waterbodies within 500m of the site with the potential to support protected species, such as great crested newt. This species typically uses suitable terrestrial habitat up to 500m from a breeding pond. However, there is a notable decrease in great crested newt abundance beyond a distance of 250m from a breeding pond.
6. The Woodland Trust Ancient Tree Inventory[6] was used to identify any ancient trees within 50m of the site.
7. Local planning policy was reviewed. This includes documents such as Local Plans and Biodiversity Action Plans (BAPs).

Limitations

It is important to consider that the biological records employed during a desk study come from a wide variety of sources, and as a result, these findings might not always provide an accurate or comprehensive description of the site's ecology on their own. However, when used alongside a Phase 1 Habitat Survey to provide a better understanding of the wider region, the findings of a desk study contribute to the production of a robust ecological assessment of the site.

[3] CIEEM (2017) Guidelines for Preliminary Ecological Appraisal, 2nd edition, p15. This is available at https://cieem.net/wp-content/uploads/2019/02/Guidelines-for-Preliminary-Ecological-Appraisal-Jan2018-1.pdf [Last accessed on date of first issue]
[4] Multi-Agency Geographic Information for the Countryside (MAGIC). This is available at https://magic.defra.gov.uk/MagicMap.aspx [Last accessed on date of first issue]
[5] Data search obtained from Local Environmental Records Centres Wales (LERC). This is available at https://aderyn.lercwales.org.uk/commercial_enquiries/results/4PgJJRGtJkCuWfsvnLtC8NKRpcotaVR1yTk0rjFtIJs2lBA4J1 [Last accessed on date of first issue]
[6] The Woodland Trust (2021) Ancient Tree Inventory. This is available at https://ati.woodlandtrust.org.uk/ [Last accessed on date of first issue]

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Phase 1 Habitat Survey

A survey was carried out to assess the ecology of the site on 7th October 2021, conducted by ecologist Charles Jennings. This survey involved a Phase 1 habitat survey, which included the identification of habitat types present and assessment of the possibility for protected species on site. The survey was carried out prior to any works being done at the site. The time of year was sub-optimal for Phase 1 habitat surveys

The site survey was based upon the standard Phase 1 survey methodology[7] (JNCC, 2010). An inventory of habitats present on site was recorded and mapped. The site was also checked for the presence of invasive plant species as defined by Schedule 9 of the Wildlife and Countryside Act, 1981, as amended. A Phase 1 Habitat Plan, contained within Appendix B, shows the habitats present at the site survey, with photographs to illustrate key habitat features observed within the site[8].

An assessment of the site's potential to support protected species was carried out, based on the results of the desk study, observations made during the site survey, an assessment of the suitability of on-site and adjoining habitat, and information on the distribution of these species. Species generally considered when carrying out this kind of assessment include bats, birds, badgers, common species of reptiles, great crested newts, hazel dormice, water voles, otters and invertebrates. Protected species thought to be relevant to this site include the following:

Bats - Consideration was made on suitability of site on and adjacent to the site for foraging and commuting, presence and suitability of crevices and other places for bats to roost in and signs of bat activity and presence. This assessment was based on the best practice guidelines set out by the Bat Conservation Trust (BCT)[9]

Birds - In particular, this includes areas of trees, scrub and built environment features that could support nests for common or notable species.

Limitations

Ecological surveys are limited by any factors which could affect the presence of plants and animals. These include the time of year, weather conditions, migration patterns, and behaviour. Accordingly, any ecology assessment must be considered as a 'snapshot' of the site conditions at the time of the survey as ecological constraints will change over time. Furthermore, many species are mobile in nature and might leave the site frequently. The evidence (or absence of evidence) of a species should therefore not be taken as conclusive proof that this species is or is not present, or that it will or will not be present in the future

The survey undertaken for this report was conducted in October, and it is therefore based on and limited by the conditions encountered and information available at the time. At this time of year most botanical species are not readily identifiable. However, due to the urban location of the application site and nature of the habitats present, the timing of the survey is not considered to be a significant limitation to this report. According to CIEEM guidance[10], the findings of this report are considered to be valid for a period of 12 to 18 months from the date in which the survey was undertaken, after which the survey should be revisited to ensure the baseline conditions have not changed.

[7] Joint Nature Conservation Committee, JNCC (2010) Handbook for Phase 1 habitat survey - A technique for environmental audit. This is available at https://data.jncc.gov.uk/data/9578d07b-e018-4c66-9c1b-47110f14df2a/Handbook-Phase1-HabitatSurvey-Revised-2016.pdf [Last accessed on date of first issue]
[8] Phase 1 Habitat Plan, created by Charles Jennings using QGIS 3.8. Base map: OpenStreetMap, 2019. Contains OS data © Crown Copyright [OS Open Map - Local] (2021). All photographs of the site taken by Charles Jennings during site survey on 7th October 2021.
[9] BCT (2016) Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd edition). This is available at https://www.bats.org.uk/resources/guidance-for-professionals/bat-surveys-for-professional-ecologists-good-practice-guidelines-3rd-edition [Last accessed on date of first issue]
[10] CIEEM (2019) Advice Note on the Lifespan of Ecological Reports and Surveys. This is available at https://cieem.net/wp-content/uploads/2019/04/Advice-Note.pdf [Last accessed on date of first issue]

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Desk Study Results

Statutory designated sites

There are no sites with European or National statutory designation within the 1km search area. The site does not fall within a Natural England SSSI Impact Risk Zones (IPZ).

Non-Statutory designated sites

The site is located within a B-lines corridor. B-line corridors are a series of 'insect pathways' running through our countryside and towns, creating a series of wildflower-rich habitat stepping stones for invertebrates[11]. There are four non-statutory designated sites within 1km of the site. These four sites are summarised in the Table 2. Site descriptions within the table are taken from the Swansea Green Spaces Map[12].

Table 2 Non-Statutory designated sites within 1km of the site.

Site Name	Approximate distance from site (at closest point)	Site Description
Tawe Corridor **SINC**	491m east of the site	The Tawe Wildlife Corridor SINC runs alongside the River Tawe and out to the sea. This corridor supports a wide variety of wildlife including otters, herons, kingfishers, salmon and trout.
Swansea Bay **SINC**	710m south of the site	Swansea Bay is nationally important for its wildlife and habitats. This includes physical geology, natural processes, climate, built environment and wildlife. At each low tide, a large expanse of seashore is uncovered along the 8km long sweep of the bay. Swansea Bay SINC stretches across the whole bay, from Swansea Marina to Mumbles Pier
Hillside Wildlife Corridors Townhill **SINC**	827m north west of the site	The Hillside Wildlife Corridor is part of the Rosehill Community park. The site contains a wide variety of habitats including woodland, heathland, scrub and wetlands. In addition there is also field boundaries and hedge banks dating back to the Enclosures Act of the 18th Century.
Kilvey Hill **SINC**	941m north east of the site	Kilvey Hill is a site on the east side of Swansea. This site provides a refuge for wildlife in the city, incorporating a variety of habitats including woodland, heathland, wetland and meadow. It is home to one of Swansea's largest urban fringe woodlands - which commands stunning views over the city and Swansea Bay. Skylark, night jar, linnet, peregrine, redwing, song thrush, fieldfare, raven and whitethroat.

[11] Buglife (2021), B-Lines. This is available at: https://www.buglife.org.uk/our-work/b-lines/ [Last accessed on date of first issue]
[12] Sustainable Swansea (2017), Swansea Green Spaces Map. This is available at: http://www.sustainableswansea.net/uploads/5/8/4/7/5847606/swansea_green_spaces_maps.pdf [Last accessed on date of first issue]

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Notable habitats
There is one parcel of intertidal substrate 491m east of the site, which runs along the River Tawe.

Ancient woodland
There are no parcels of ancient woodland within 500m of the site.

Bats
LERC Wales returned records for four species of bat within 1km of the site boundary. These include;

- Noctule *Nyctalus noctula*
- Brown long-eared bat *Plecotus auritus*
- Common pipistrelle *Pipistrellus pipistrellus;*
- Soprano pipistrelle *Pipistrellus pygmaeus*
-

The closest record provided was for Noctule, 101m east of the site in 2013.

Birds
LERC Wales returned records for 24species of bird within 1 km of the site boundary. These include;

- Long-tailed Tit *Aegithalos caudatus*
- Kingfisher *Alcedo atthis*
- Mallard *Anas platyrhynchos*
- Swift *Apus apus*
- Turnstone *Arenaria interpres*
- Greenfinch *Chloris chloris*
- Black-headed gull *Chroicocephalus ridibundus*
- Whitethroat *Curruca communis*
- Peregrine *Falco peregrinus*
- Kestrel *Falco tinnunculus*
- Swallow *Hirundo rustica*
- Herring gull *Larus argentatus*
- Lesser black-backed gull *Larus fuscus*
- Iceland Gull *Larus glaucoides*
- Grey wagtail *Motacilla cinerea*
- Wheatear *Oenanthe oenanthe*
- House sparrow *Passer domesticus*
- Tree sparrow *Passer montanus*
- Cormorant *Phalacrocorax carbo*
- Black redstart *Phoenicurus ochruros*
- Willow tit *Poecile montanus*
- Marsh tit *Poecile palustris*
- Dunnock *Prunella modularis*
- Eurasian bullfinch *Pyrrhula pyrrhula*
- Goldcrest *Regulus regulus*
- Song thrush *Turdus philomelos*
- Mistle thrush *Turdus viscivorus*
- Linnet *Linaria cannabina*

Bird species included those listed on Schedule 1 of the Wildlife and Countryside Act 1981, Section 41 of the NERC Act, Bern Convention Appendix 2 and birds listed on Birds of Conservation Concern 4: The Red List for Birds. The closest record provided was for Peregrine, 135m north of the site in 2018.

Reptiles
LERC Wales returned no records for species of reptile within 1km of the site boundary.

Great Crested Newt
LERC Wales returned no records for great crested newt *Triturus cristatus* within 1km of the site boundary.

Great crested newts typically use suitable terrestrial habitat up to 500m from a breeding pond. However, there is a notable decrease in great crested newt abundance beyond a distance of 250m from a breeding pond. Using MAGIC, OS maps and aerial imagery, no waterbodies with the potential to support great crested newt were identified within 500m of the site

Hazel dormouse
LERC Wales returned no records for hazel dormouse *Muscardinus avellanarius* within 1km of the site boundary.

Badger
LERC Wales returned no records for European badger *Meles meles* within1km of the site boundary.

Other mammals
LERC Wales only returned records for West European hedgehog *Erinaceus europaeus*. The closest record was 148m south east of the site in 2015.

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Invasive Species

LERC Wales returned records for 19 species of non-native invasive species within 1km of the site boundary.

Flora

- Butterfly-bush *Buddleja davidii*
- Cherry laurel *Prunus laurocerasus*
- Entire-leaved Cotoneaster *Cotoneaster integrifolius*
- Heath star moss *Campylopus introflexus*
- Himalayan Cotoneaster *Cotoneaster simonsii*
- Hollyberry Cotoneaster *Cotoneaster bullatus*
- Wall cotoneaster *Cotoneaster horizontalis*
- Indian balsam *Impatiens glandulifera*
- Japanese Knotweed *Fallopia japonica*
- Japanese rose *Rosa rugosa*
- Montbretia Crocosmia *Pottsii crocosmiiflora*
- Pampas-grass *Cortaderia selloana*
- Wall Cotoneaster *Cotoneaster horizontalis*
- White stonecrop *Sedum album*
- Wilson's honeysuckle *Lonicera nitida*

Invertebrates

American slipper limpet *Crepidula fornicata*
Harlequin ladybird *Harmonia axyridis*
Western conifer Seed Bug *Leptoglossus occidentalis*

Mammals

Eastern grey squirrel Sciurus carolinensis

The closest record provided was for Harlequin ladybird, 155m south east of the site in 2013

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Survey Results

Hardstanding
Hardstanding is present throughout the site. The areas of hardstanding present are in the form of pavements, roads and walkways around Swansea, which is directly adjacent to the east of the site Castle (TN1 on the Phase 1 habitat map in Appendix B). This habitat affords negligible ecological value.

Scattered Trees
Scattered trees are present throughout the site. This habitat provides birds with suitable habitat to create nests in for breeding. Scattered trees found within the site boundary include the following:

- Five London plane *Platanus x hispanica* trees on the south east of the site and one London plane tree on the north boundary of the site. There were no features identified with the potential to support roosting bats in any of these trees. All four trees were subsequently categorised as providing negligible potential to support roosting bats.
- Two small silver birch *Betula pendula* trees on the east of the site. No features with the potential to support roosting bats were identified on either tree. Both trees were subsequently categorised as providing negligible potential to support roosting bats.
- Within the western segment and to the rear of the electronic billboard (TN2 on the Phase 1 habitat map in Appendix B) there is a Japanese maple *Acer Japonicum*. This had no features present that could provide potential for roosting bats.
- To the north of the site there is a large English oak *Quercus robur* tree and two large Field maple *Acer campestre* trees that have no features for the potential of roosting bats.

During the Phase 1 Habitat survey, a high density of feral pigeons *Columba livia domestica* were observed flying around adjacent trees within the western segment. As a result there is potential for nesting birds within the tree canopy of (TN3 on the Phase 1 habitat map in Appendix B).

Whilst all the scattered trees were categorised as providing negligible potential to support roosting bats, mature trees arranged linearly do have the potential to contribute to an ecological corridor to other nearby greenspaces such as St Marys church 90m to the south. This can provide suitable commuting habitat for bats, that use linear green habitat features to aid navigation.

Standing Water
There are two small ornamental water features located in the centre of the site. One of these has a fountain in the middle (TN4 on the Phase 1 habitat map in Appendix B), and the other an ornamental sculpture. These water features were considered unlikely to support amphibians, including great crested newt due to levels of disturbance caused by the fountain, the absence of any ponds within 500m of the site and the surrounding habitat being largely dominated by hardstanding.

Amenity Grassland
There are four areas of amenity grassland located around the site. These are well maintained through regular mowing. This habitat provides little ecological value for protected species.

Introduced Shrub
An area of habitat (TN5 on the Phase 1 habitat map in Appendix B) made up of a combination of native and non-native species is present within the northern most segment of Castle Square. This has been planted for ornamental purpose with species including, common ivy *Hedera helix*, holly *Ilex aquifolium,* box *Buxus sempervirens*. Due to the density of the vegetation present, this habitat has the potential to support nesting birds.

Invasive Species
No invasive species were identified within or adjacent to the site boundary.

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Evaluation and Mitigation

The site is deemed to have low ecological value. An evaluation and recommendations for mitigation are provided below.

Impact on Designated Sites

Given the scale of the works (which are likely to be localised to the site), and physical separation of the site from designated sites, it is believed that there will be a negligible effect on designated sites as a result of the proposed development. No further recommendations are made.

Impact on Notable Habitats

Given the small scale of the works (which are likely to be localised to the site), urban nature of the site and physical separation of the site from the limited notable habitats within 500m of the site, it is believed that there will be a negligible effect on any notable habitats as a result of the development works. No further recommendations are made.

Bats

All trees within the site were categorised as providing negligible potential to support roosting bats. However, bats are likely to use the areas of introduced shrub and the scattered trees within and adjacent to the site for foraging and commuting. Within the site there is a large electronic billboard (TN2 on phase 1 map)As well as this the majority of the trees located around the site have lighting fitted to them. Lighting such as around the trees or emitted by the electronic billboard can have a negative impact on the activity of bats which may be looking to use the area for roosting, foraging or commuting. Adjacent to site is the historical landmark, Swansea Castle. Swansea Castle and the surrounding grounds has a number of features on the castle walls which could hold potential for foraging, commuting and roosting bats. No further recommendations are made with respect to bats.

Birds

Suitable bird nesting habitat was present throughout the site in the form of scattered trees and introduced shrub.

The following recommendation is made:
Demolition and vegetation clearance work should be undertaken outside of the bird nesting season (March-August inclusive). If works are scheduled to take place within the bird nesting season, an ecologist should visit to inspect the site within 24 hours prior to confirm the presence/absence of nesting birds. If birds are found to be nesting, then works in the area around the nest must be delayed until after the young have fledged.

Other Species

There was not considered to be habitat within the site or adjacent areas suitable to support reptiles, great crested newt, hazel dormouse, badger, otter, water vole or white clawed crayfish. Therefore, these species groups were considered likely absent.

The following recommendation is made:
General advice concerning mammals (including hedgehogs) during construction should be followed as below:

1. Any man-made excavations, trenches or pits relating to the development are either securely fenced off or covered up overnight to avoid entrapment mammals or, if left open, an egress point (e.g. mammal ladders or a roughened plank) will be placed within the excavation to form a ramp to allow any mammals to escape.
2. Any excavations should be inspected each morning to ensure no mammals have become trapped overnight. If a mammal is found within any excavations, an ecologist should be contacted immediately for appropriate advice.
3. If evidence of mammal digging indicative of sett creation is seen within the site during construction, work in this area should cease and an ecologist should be contacted immediately for the appropriate advice.

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Ecological Enhancements

To ensure the proposed development improves on the current ecological value of the site, the proposals should include a number of ecological enhancements. This is to ensure the ecological value found on the existing site is mitigated against, and the development contributes to the greening of the borough and an increase in biodiversity, whilst contributing to the requirements set out in Swansea local biodiversity policies.

Recommendations include:

- Installation of at least four bat boxes on the site
- External lighting in line with BCT guidelines
- Installation of at least four bird nesting boxes on the site
- Two Invertebrate houses to support the adjacent B-lines.
- Native planting
- Extensive green roof

Bat Boxes

To support local bat populations, it is recommended that at least four bat boxes are installed retained trees within the site boundary. Boxes should be located between 3 – 5m, on a relatively flat aspect on the main trunk. Boxes should be positioned on the south or south westerly aspect of the tree. site. Bat boxes made from untreated wood or 'woodcrete' (a mixture of wood shavings and cement) can be used. Schwegler 1FF or Vivara Pro Woodstone Bat Box are recommended as they are likely to be of interest to a wide range of species and they typically have longer lifespans than wooden boxes (example images are given below). The boxes should be located as high as possible, at a minimum of 4m, preferably 5-6m to try and avoid predation. On buildings, bricks/boxes should be placed as close to the eaves as possible. Bats use dark tree lines or hedgerows for navigation, so putting boxes near these features, for example in trees, could help bats locate boxes.

External lighting in line with the BCT guidelines

Bats are likely to use green spaces in the area for foraging and commuting. To reduce the impact on bats any new external lighting that will be installed on the site, should be designed in line with the Institution of Lighting Professionals and Bat Conservation Trust's "Bats and Lighting in the UK" guideline[13], to reduce the impact the development has on bat populations. These guidelines have been summarised in Appendix F of this report.

Bird Boxes

It is recommended that at least four bird boxes are installed on the site on retained trees. These should contain a mix of 26mm hole boxes for tits and robins and open-fronted boxes for larger birds such as thrushes. Boxes should be fixed two to four metres on a flat aspect of the tree or facade, out of the reach of predators such as domestic cats. Boxes should be placed on a north to north easterly direction. Further information on the positioning of bird boxes can be found on the Royal Society for the Protection of Bird (RSPB) website[14]. There are no buildings proposed onsite, therefore no locations for swift, swallows or house sparrow boxes onsite and alternative boxes have been proposed.

[13] Institution of Lighting Professionals Bats and BCT (2018) Bats and artificial lighting in the UK – Bats and the Built Environment series (Guidance Note 08/18). This is available at https://cdn.bats.org.uk/uploads/pdf/Resources/ilp-guidance-note-8-bats-and-artificial-lighting-compressed.pdf?v=1542109349 [Last accessed on date of first issue]
[14] Positioning of bird boxes – Royal Society for the Protection of Bird (RSPB). This is available at https://www.rspb.org.uk/birds-and-wildlife/advice/how-you-can-help-birds/nestboxes/nestboxes-for-small-birds/making-and-placing-a-bird-box/ [Last accessed on date of first issue]

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Invertebrate Houses

The installation of two invertebrate houses is recommended at suitable locations within the soft landscaping. This is because the site is located within a B-lines corridor, an area which promotes habitats of benefit to invertebrates. These houses should preferably be located in a shaded, warm location to provide over- wintering sites for insects. For example, fixed against a wall where it is warm but not too hot. These should be installed before spring, ready for when bees emerge. The front should be tilted slightly when hanging, so water can drain out. The invertebrate house should be left to be colonised naturally. These can provide egg laying and larval habitat for invertebrates, such as solitary bees. Increasing the habitat for invertebrates can in turn benefit foraging birds and bats as well as providing pollinators for flowering plants.

Native Planting

Where new planting is installed, this should include native species or species of benefit to wildlife. Planting should include a diverse mix of species, including a variety of fruiting and flowering species, grasses and herbaceous plants to provide a nectar source and overwintering habitat for invertebrates and in turn a foraging habitat for birds. The planting should be biased towards (and preferably exclusively) wildlife-friendly species, such as the following:

Beech *Fagus sylvatica*, box *Buxus sempervirens*, lavender *Lavendula angustifolia*, hazel *Corylus avellana*, common dogwood *Cornus sanguinea*, wild privet *Ligustrum vulgare*, holly *Ilex aquifolium*, blackthorn *Prunus spinosa*, ivy *Hedera helix*, hawthorn *Crataegus monogyna*, guelder rose *Viburnum opulus*, honeysuckle *Lonicera periclymenum*, dog rose *Rosa canina*, heather *Calluna vulgaris*, viper's burgloss *Echium vulgare*, primrose *Primula vulgaris*, daffodil *Narcissus pseudonarcissus*, wood anemone *Anemone nemorosa*.

Many of the native shrubs listed above would also provide valuable and shelter and foraging habitat for breeding birds

Night scented plants may also be beneficial to attract insects and in turn bats. Species such as evening-primrose *Oenathera biennis*, night-scented stock *Mattiola bicornia*, lemon balm *Melissa officinalis*, borage *Borago officinalis*, may be appropriate for this purpose

Extensive green roof

An area of green roof is recommended for the roof of the building. A substrate depth ranging from 80-150mm and a diversity of at least 12 plant species is recommended. The substrate should be a commercial brick-base aggregate (or equivalent).

It is recommended the green roof is designed with biodiversity in mind and be broadcast with an appropriate seed mix (often wildflowers and grasses), and/or planted with species of plug plants (often wildflowers, sedums and grasses) to encourage plant types that will support a variety of bird and invertebrate species. If sedum species are used, ideally, they should be species that are native to the UK. These include: *Sedum acre, Sedum fosterianum, Sedum reflexum, Sedum telephium*.

Substrate depths may vary across the roof deck to promote a diversity of both shallow and deep rooted plants and ones which are more and less drought tolerant. Undulating substrate depths also create differing habitats for a greater range of invertebrate species. Pebbles, boulders, gravels, sands, branches and logs may also be placed within the system to offer suitable habitats. Areas of bare shingle and bare sand should be incorporated into the green roof's landscaping in order to provide habitat for burrowing invertebrates and black redstarts.

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Conclusion

A desk study and Phase 1 habitat survey were undertaken for Castle Square in Swansea, to review the ecology of the site to assist in a planning application for the site. The four key aims of a PEA were fulfilled;

- To identify likely ecological constraints associated with the project;
- To identify mitigation which may be required;
- To identify any additional surveys which may need to be undertaken; and,
- To identify any ecological enhancement which can be carried out.

The site was found to have low ecological value, providing habitat for nesting birds, foraging and commuting bats and invertebrates. The development is expected to have little impact on designated sites near to the development. Local Biodiversity Policy and compliance with UK legislation for protected species is also reviewed and discussed.

Recommendations have been made to mitigate any impact from the development and ensure that the site is enhanced for wildlife and a gain for biodiversity in line with national and local policy. It is considered that if all recommendations within this report are implemented, it is thought that the development will have minimal impact on the ecology of the site and zone of influence.

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Validation

Site visit and report produced by Charles Jennings	
Ecologist's Qualifications:	BSc – Conservation Biology and Ecology
Evidence of practicing Ecologist	Eight Associates, Ecologist and Sustainability Consultant, conducting habitat and protected species surveys (2021 to present date); Corylus Ecology, Field Ecologist. habitat and protected species surveys (2019 – 2021).

Report verified by Stacey Cougill:	
Ecologist's Qualifications:	BSc – Environmental Science MSc – Conservation Biology UCert – Species Identification and Biological Recording
Evidence of practicing Ecologist	Eight Associates, Sustainability Consultant specialising in Ecology (2011 to present date), Open University, iSpot, Biodiversity Mentor (2009 – 2012) and Westminster City Council, Biodiversity Project Manager (2007-2010).
Professional Code of Conduct	I am a full member of the Chartered Institute of Ecology and Environmental Management.

Validation	
I confirm the information provided in this document is truthful and accurate at the time of completion.	
Suitably Qualified Ecologist	Stacey Cougill
Signature of Ecologist	SC
Date	27/04/2022

Preliminary Ecological Apprisal
Castle Square

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Appendix A – Initial Development Proposal

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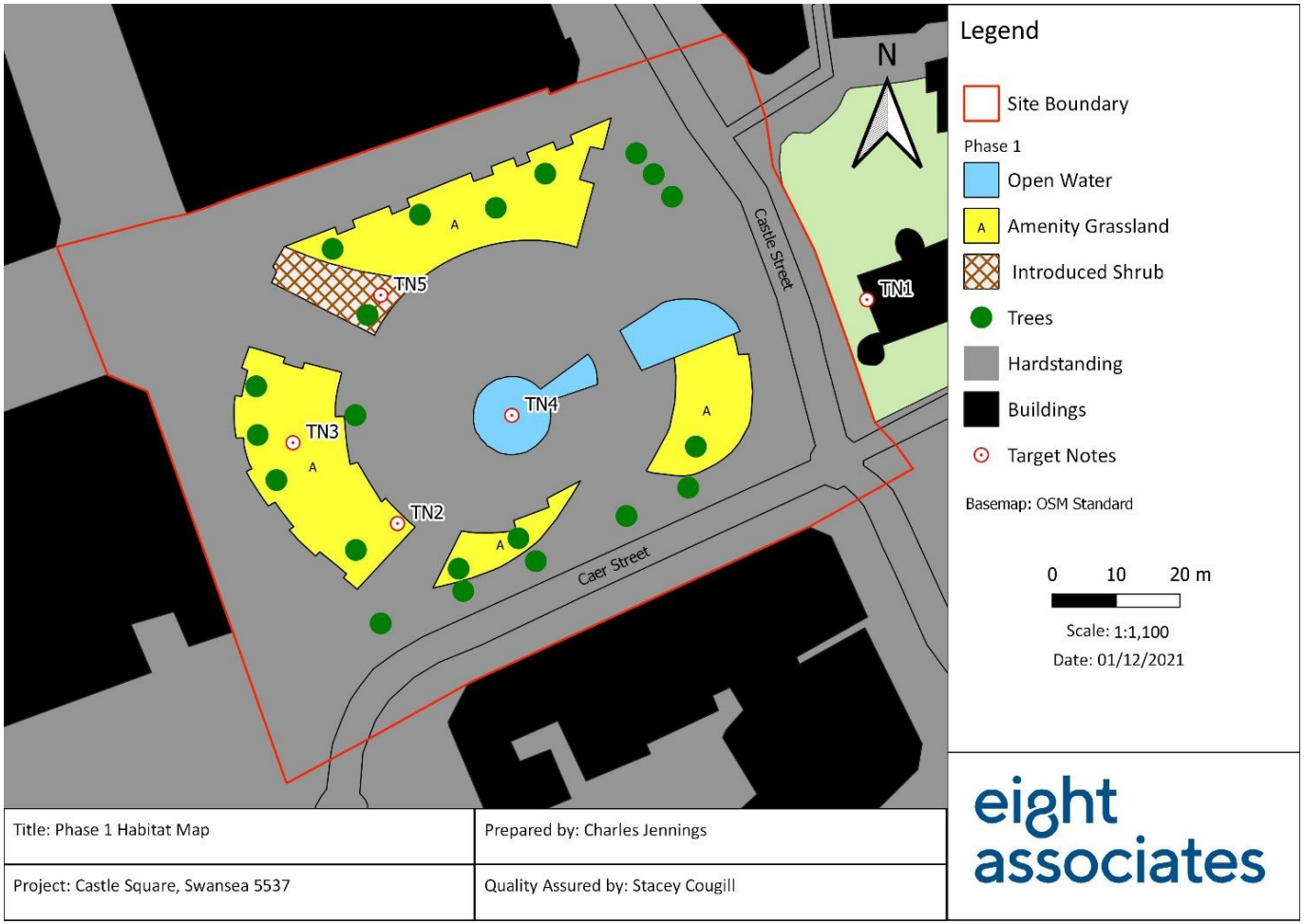
Appendix B – Phase 1 Habitat Plan and Photos



Target notes	Description	Relevant Photo
TN1	Swansea castle – A number of features on facades hold potential for roosting bats. However, this is outside the site boundary.	1
TN2	Large electronic billboard – Large amount of light pollution when active.	2
TN3	Scattered trees in the south-west of the site -possible location for potential nesting birds due to the high density of Feral pigeons Columba livia domestica that were active around adjacent trees at time of survey.	3
TN4	Water fountain – this is located in the centre of Castle Square.	4
TN5	Introduced shrub - this is located in the northern section of Castle Square.	5

Preliminary Ecological Apprisal

Castle Square

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1. Swansea Castle, adjacent to the east of the site

2. Electronic advertisement billboard

3. Scattered trees throughout the west of the site provide the potential to support nesting birds

4. Water fountain in the center of Castle Square

5. Introduced shrub

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Appendix C – Relevant Legislation

Bats

All species of bat are fully protected under the Conservation of Habitats and Species Regulations 2017. It is illegal to injure, kill, capture or disturb a bat. It is also illegal to damage, destroy or obstruct trees, buildings or other places used for roosting, even if bats are not present.

Most development and maintenance work affecting bats and / or roosts e.g. bridge / tree maintenance works, demolition, barn conversions etc., therefore require a Habitats Regulations License for work to take place legally.

All bat species are also protected under the Wildlife and Countryside Act 1981 (as amended). This means they are additionally protected from intentional or reckless disturbance, intentional or reckless obstruction of access to any place of shelter or protection; and/or, selling, offering or exposing for sale, possession or transporting for purpose of sale.

Wild Birds

The Wildlife & Countryside Act 1981 (as amended) is domestic legislation for Great Britain. The Act includes the UK's domestic implementation of the species protection of the European Directive on the Conservation of Wild Birds (79/409).

Under the Wildlife and Countryside Act 1981 all birds, their nests and eggs are protected by law and it is thus an offence, with certain exceptions to intentionally:

- Kill, injure or take any wild bird.
- Take, damage or destroy the nest of any wild bird while it is in use or being built.
- Take or destroy the egg of any wild bird.
- Have in one's possession or control any wild bird (dead or alive) or any part of a wild bird that has been taken in contravention of the Act or the Protection of Birds Act 1954.
- Have in one's possession or control any egg or part of an egg that has been taken in contravention to the Act. This includes items taken or killed before the passing of the Act.
- Have in one's possession or control any live bird of prey of any species in the world (with the exception of vultures and condors) unless it is registered and ringed in accordance with the Secretary of State's regulations.
- Have in one's possession or control any bird of a species occurring on Schedule 4 of the Act unless registered (and in some cases ringed) in accordance with the Secretary of State's regulations.
- Disturb any wild bird listed on Schedule 1 while it is nest building, or at a nest containing eggs or young, or disturb the dependent young of such a bird.

Invertebrates

A number of invertebrate species are listed under Schedule 5 of the Wildlife and Countryside Act 1981 (as amended). Under Section 9(1) of this act, it is an offence to intentionally kill, injure or take any wild animal included in Schedule 5.
Some are also protected under the Conservation of Habitats and Species Regulations 2010 (as amended).

The Regulations enact the European Union's Habitats Directive (92/43/EEC) in the UK. The Habitats Directive was designed to contribute to the maintenance of biodiversity within member states through the conservation of sites, known in the UK as Special Areas of Conservation (SACs), containing habitats and species selected as being of EC importance (as listed in Annexes I and II of the Habitats Directive respectively). Member states are required to take measures to maintain or restore these natural and semi-natural habitats and wild species at a favourable conservation status.

The Regulations also require the compilation and maintenance of a register of European sites, to include SACs and Special Protection Areas (SPAs) classified under Council Directive 79/409/EEC on the Conservation of Wild Birds (the Birds Directive). These sites constitute the Natura 2000 network. The Regulations impose restrictions on planning decisions likely to significantly affect SPAs or SACs.

The Regulations also provide protection to European Protected Species that largely overlaps with the WCA 1981, albeit the provisions are generally stricter. Under Regulation 41 it is an offence, inter alia, to:

- Deliberately capture, injure or kill any wild animal of a European Protected Species;
- Deliberately disturb any wild animals of any such species, including in particular any disturbance likely to impair their ability to survive, to reproduce or to hibernate, or migrate, or which is likely to significantly affect their local distribution or abundance;
- Deliberately take or destroy the eggs of such an animal;
- Damage or destroy a breeding site or resting place of such an animal

The Regulations do provide a licensing system that permit otherwise illegal activities in relation to European Protected Species, subject to certain tests being fulfilled.

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Appendix D – National Biodiversity Policy

Planning Policy Wales (Edition 11 February 2021)
Sets out the land use planning policies of the Welsh Government' which is supplemented by a series of Technical Advice Notes (TANs). The relevant policies from the Distinctive & Natural Places chapter within the Planning policy are included below:

6.2 Green Infrastructure

6.2.1
Green infrastructure is the network of natural and semi-natural features, green spaces, rivers and lakes that intersperse and connect places. Component elements of green infrastructure can function at different scales. At the landscape scale green infrastructure can comprise entire ecosystems such as wetlands, waterways and mountain ranges. At a local scale, it might comprise parks, fields, public rights of way, allotments, cemeteries and gardens. At smaller scales, individual urban interventions such as street trees, hedgerows, roadside verges, and green roofs/walls can all contribute to green infrastructure networks.

6.2.2
The Environment (Wales) Act 2016 provides a context for the delivery of multi-functional green infrastructure. Its provision can make a significant contribution to the sustainable management of natural resources, and in particular to maintaining and enhancing biodiversity and the resilience of ecosystems in terms of the diversity between and within ecosystems and the extent, condition and connectivity of ecosystems and their ability to adapt. This means that the development of green infrastructure is an important way for local authorities to deliver their Section 6 duty.

6.2.3
Green infrastructure is capable of providing several functions at the same time and as a result offers multiple benefits, for social, economic and cultural as well as environmental resilience. The components of green infrastructure, by improving the resilience of ecosystems, can result in 113 Section 6 of the Environment Act 2016 positive benefits to well-being including flood management, water purification, improved air quality, reduced noise pollution and local climate moderation, climate change mitigation and food production.

These benefits are important in urban environments where they can facilitate health and well-being related
benefits of open space, clean air and improved tranquility, for example, as well as creating a sense of place and improved social cohesion. In addition, green infrastructure has a role in protecting local distinctiveness, providing economic benefits and social and community opportunities.

6.2.4
Green infrastructure plays a fundamental role in shaping places and our sense of well-being, and are intrinsic to the quality of the spaces we live, work and play in. The planning system should protect and enhance green infrastructure assets and networks because of these multi-functional roles. The protection and enhancement of biodiversity must be carefully considered as part of green infrastructure provision alongside the need to meet society's wider social and economic objectives and the needs of local communities. The multiple benefits that resilient ecosystems and green infrastructure offer to society, including the economic and social contribution they make to local areas, should be taken into account when balancing and improving these needs.

6.2.5
The quality of the built environment should be enhanced by integrating green infrastructure into development through appropriate site selection and use of creative design. With careful planning and design, green infrastructure can embed the benefits of biodiversity and ecosystem services into new development and places, helping to overcome the potential for conflicting objectives, and contributing towards health and well-being outcomes. There are multiple ways of incorporating green infrastructure, dependent on the needs and opportunities a site presents. Landscaping, green roofs, grass verges, sustainable urban drainage and gardens are examples of individual measures that can have wider cumulative benefits, particularly in relation to biodiversity and the resilience of ecosystems as well as in securing the other desired environmental qualities of places.

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Green Infrastructure Assessments

6.2.6
Planning authorities should adopt a strategic and proactive approach to green infrastructure and biodiversity by producing up to date inventories and maps of existing green infrastructure and ecological assets and networks. Such Green Infrastructure Assessments should use existing datasets, and the best available information, to develop an integrated map-based evidence resource. Doing so will facilitate a proactive approach and enable contributions towards the well-being goals to be maximised.

6.2.7
The Green Infrastructure Assessment should be used to develop a robust approach to enhancing biodiversity, increasing ecological resilience and improving well-being outcomes, and should identify key strategic opportunities where the restoration, maintenance, creation or connection of green features and functions would deliver the most significant benefits.

6.2.8
The outcomes of the Green Infrastructure Assessment should draw from the evidence base provided by Area Statements and well-being assessments and be integrated into development plans to ensure the early and co-ordinated consideration of opportunities to inform the development, design and land related strategies of the plan. The Green Infrastructure Assessment should also be given early consideration in development proposals and inform the implementation of projects.

6.2.9
Considering how significant benefits can be delivered through green infrastructure will be a key aim of the assessment. This may involve identifying opportunities to improve water management and flood mitigation through the provision of Sustainable Drainage Systems, including design measures such as green roofs. In a similar way, identifying how the provision of green infrastructure could form an integral part of strategies for growth will be an important factor in maintaining good air quality and appropriate soundscapes.

6.2.10
The need for ecosystems, habitats and species to adapt to climate change should be considered as part of the Green Infrastructure Assessment. This should include identifying ways to minimise or reverse the fragmentation of habitats, and to improve habitat connectivity through the promotion of wildlife corridors and identifying opportunities for land rehabilitation, landscape management and the creation of new or improved habitats. Planning authorities should ensure that development minimises impact and provides opportunities for enhancement within areas identified as important for the ability of species to adapt and/or to move to more suitable habitats.

6.2.11
Planning authorities must encourage the appropriate management of features of the landscape which are of major importance for wild flora and fauna in order to complement and improve the ecological coherence of the Natura 2000 network114. The features concerned are those which, because of their linear and continuous structure or their function as 'stepping stones' or 'wildlife corridors', are essential for migration, dispersal or genetic exchange. The development of networks of statutory and non-statutory sites and of the landscape features which provide links from one habitat to another can make an important contribution to ecosystem resilience and the maintenance and enhancement of biodiversity and the quality of the local environment, including enabling adaptation to climate change.

6.2.12
Green Infrastructure Assessments should be regularly reviewed to ensure that information on habitats, species and other green features and resources is kept up-to-date, so that development management decisions are informed by appropriate information about the potential effects of development on biodiversity and green infrastructure functions. Where information is submitted as part of a development proposal (for example, a green infrastructure statement) it should consider the Green Infrastructure Assessment.

Planning authorities should use the best available data to monitor a set of key species and habitats and incorporate these indicators into both their Annual Monitoring Reports (AMRs) and, where appropriate, into the appropriate Section 6 Plan and Report. The monitoring of success and delivery of habitat and species mitigation requirements secured through conditions and obligations can also usefully feed into this process. At the end of each reporting period they should use this data to indicate whether there has been a net gain or loss of biodiversity, and should use the trends identified to determine future priorities for planning and decision making, with the aim of furthering the goals of the Section 6 Duty.

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6.3 Landscape

6.3.1
Landscape is an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors. Landscape policy is guided by the European Landscape Convention.

6.3.2
The landscapes of Wales are rich and varied. Many Welsh landscapes are iconic, and a quarter of the land area of Wales is designated as either a National Park or Area of National Outstanding Beauty (AONB). The character and special qualities of all our places and landscapes, both urban and rural, can provide a strong sense of place, inspiration and belonging, and contribute to the distinctive cultural identity of Wales.

6.3.3
All the landscapes of Wales are valued for their intrinsic contribution to a sense of place, and local authorities should protect and enhance their special characteristics, whilst paying due regard to the social, economic, environmental and cultural benefits they provide, and to their role in creating valued places. Considering landscape at the outset of formulating strategies and polices in development plans and when proposing development is key to sustaining and enhancing their special qualities, and delivering the maximum well-being benefits for present and future generations as well as helping to deliver an effective and integrated approach to natural resource management over the long term. Collaboration and engagement with adjacent planning authorities, Natural Resources Wales (NRW), Cadw and the third sector will be necessary to draw on a wide range of expertise and evidence.

This means:

- ensuring Wales contributes to meeting international responsibilities and obligations for landscapes;
- ensuring statutorily designated sites are properly protected and managed;
- ensuring that the value of all landscapes for their distinctive character and special qualities is protected;
- ensuring the opportunities landscapes provide for tourism, outdoor recreation, local employment, renewable energy and physical and mental health and well-being are taken into account and multiple well-being benefits for people and communities secured.

6.4 Biodiversity and Ecological Networks

6.4.1
Biodiversity underpins the structure and functioning of ecosystems. It is the diversity of living organisms whether at the genetic, species or ecosystem level. An ecosystem is made up of living organisms, plants, animals and micro-organisms, in conjunction with their non-living environment, air, water, minerals and soil, and all the diverse and complex interactions that take place between them.

6.4.2
The Environment (Wales) Act 2016 introduced an enhanced biodiversity119 and resilience of ecosystems120 duty (Section 6 Duty). This duty applies to public authorities in the exercise of their functions in relation to Wales and will help maximise contributions to achieving the well-being goals. The Nature Recovery Action Plan supports this legislative requirement to reverse the decline in biodiversity, address the underlying causes of biodiversity loss by putting nature at the heart of decision-making and increasing the resilience of ecosystems by taking specific action focused around the 6 objectives for habitats and species.

6.4.3
The planning system has a key role to play in helping to reverse the decline in biodiversity and increasing the resilience of ecosystems, at various scales, by ensuring appropriate mechanisms are in place to both protect against loss and to secure enhancement. Addressing the consequences of climate change should be a central part of any measures to conserve biodiversity and the resilience of ecosystems. Information contained in SoNaRR, Area Statements and species records from Local Environmental Record Centres should be taken into account. Development plan strategies, policies and development proposals must consider the need to:

- support the conservation of biodiversity, in particular the conservation of wildlife and habitats;
- ensure action in Wales contributes to meeting international responsibilities and obligations for biodiversity and habitats;
- ensure statutorily and non-statutorily designated sites are properly protected and managed;
- safeguard protected and priority species and existing biodiversity assets from impacts which directly affect their nature conservation interests and compromise the resilience of ecological networks and the components which underpin them, such as water and soil, including peat; and
- secure enhancement of and improvements to ecosystem resilience by improving diversity, condition, extent and connectivity of ecological networks.

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6.4.4
It is important that biodiversity and resilience considerations are taken into account at an early stage in both development plan preparation and when proposing or considering development proposals. Since these considerations are not confined by administrative boundaries they must be addressed strategically through consultation and collaboration with adjoining planning authorities and other bodies such as NRW and the third sector. All reasonable steps must be taken to maintain and enhance biodiversity and promote the resilience of ecosystems and these should be balanced with the wider economic and social needs of business and local communities. Where adverse effects on the environment cannot be avoided or mitigated, it will be necessary to refuse planning permission.

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Appendix E – Local Biodiversity Policy

Swansea's Local Development Plan 2010 – 2025
Relevant policies from Swansea's Local Development Plan are included below.

ER 6 - Designated Sites of Ecological Importance
This Policy seeks to ensure that the nature conservation value of designated sites is protected from harmful development and that the Council fulfils its obligation to maintain and enhance biodiversity and ecosystem resilience. A Biodiversity and Development SPG will be produced to provide further information on how biodiversity should be conserved and enhanced through development. The Policy will also play a significant role in achieving the Plan's Vision for Swansea as a County that 'capitalises on the distinctive relationship between its vibrant urban areas and outstanding rural and coastal environments' and 'conserves its unique natural heritage'. In addition, protection of designated sites will contribute to climate change resilience.

ER 8 – Habitats
Development proposals should aim to minimise detrimental impacts on protected habitats and species and ecosystem resilience. This policy should be implemented in conjunction with ER 6 and ER 9 to ensure no net loss in overall biodiversity as a result of development and where possible there should be biodiversity gains.

Protected habitats and species are those protected under European and UK legislation, as identified in TAN 5 Nature Conservation and Planning (2009). The legislation includes the Habitats Directive, Birds Directive, Wildlife and Countryside Act 1981, Environment (Wales) Act 2016. Protected habitat and species include priority habitats and species that are protected in Local Biodiversity Action Plans and emerging Nature Recovery Plans. A biodiversity and development SPG will be produced to provide further information on how biodiversity should be conserved and enhanced through development.

Factors to be taken into consideration in assessing the significant adverse effect development proposals are likely to have on habitats and species are:

- The current distribution and status of the protected habitat or species within the County;
- All likely effects, including cumulative effects and impacts during construction;
- The role of the habitats as connectivity pathways;
- Whether effective mitigation and/or compensatory measures have been provided.
- Maintaining and enhancing ecosystem resilience.

Where habitats and species are likely to be disturbed or harmed, development proposals will be assessed in accordance with National Planning Policy and Guidance58. Developers will be expected to provide: an ecological survey; an assessment of the likely impact of the proposal on the protected species/habitats; and, where necessary, make appropriate provision for their safeguarding, mitigation and/or compensatory measures. In addition, measures to enhance biodiversity, such as through habitat creation, will be expected.

ER-9 Ecological Networks and features of importance for biodiversity
There are a significant number of ecological habitats and features within the County, in addition to those that are legally protected, that lie outside the designated areas and make a significant contribution to the overall biodiversity resource. These include linear wildlife corridors such as rivers, hedgerows and cycle tracks; 'stepping stones' such as ponds and copses and landscape features such as stone walls, ornamental gardens, ruined buildings and dead trees, that provide valuable habitats and are of importance for wild fauna and flora.

The wildlife corridors, stepping stones and landscape features are a vital part of the ecological network. Whilst it is important to protect and enhance biodiversity sites and species of importance dispersed throughout the County this cannot be achieved without protecting and enhancing the intervening habitats and spaces that provide crucial links between the designated sites.

The protection, management and enhancement of ecological networks is recognised as being particularly important for nature conservation. Wildlife corridors allow species to move between fragmented habitats, to recolonise areas and to move in response to climate change and development that may have destroyed part of their habitat. For example, the water vole, which is a priority species will not travel through unvegetated ground. If its habitat becomes isolated through development and then the colony within this isolated habitat become endangered, for example through disease, it is likely that it will not survive.

The Plan has been informed by an assessment of ecological connectivity across the whole of the County. This assessment maps the existing ecological connectivity network and also identifies locations where ecological connectivity has the potential to be enhanced. The latest version of the Swansea Ecological Connectivity Assessment will inform the implementation of this policy.

Providing ecological connectivity is an important ecosystem service of the Green Infrastructure network and its protection and/or enhancement accords with Policy ER 2 Strategic Green Infrastructure Network.

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ER11 – Trees hedgerows and development

National Planning Policy and Guidance provides for the protection of trees and woodlands. Throughout the County it is estimated that over 50,000 trees are protected by individual/group orders, area orders or woodland orders. This is in addition to trees in conservation areas whilst hedgerows are protected by separate legislation.

In recognition of the importance of trees to the County, the Plan seeks to ensure that suitable trees, whether they are protected by legislation or not, are retained and protected on any development site. Further information relating to the protection of trees on development sites is provided in SPG. NRW i-tree Eco assessment provides useful information on the ecosystem services provided by trees. Where appropriate planning conditions or Tree Preservation Orders will be used to protect important trees and woodlands. The Council will pursue appropriate enforcement action against unauthorised works to protected trees.

The circumstances in which further information in support of a planning application will be required are outline in the policy This information must be in accordance with the current British Standard BS5837 and have regard to the long-term impact of the proposed development on the trees as they grow and wherever possible seek to avoid future Swansea Local Development Plan conflict, such as that caused by over-hanging branches, shading and dominance.

Planning Permission will normally only be granted where the trees on the site are fully protected in the long term, or appropriate replacement trees will be planted when the removal of a tree or trees is unavoidable. The removal of trees would only be acceptable where there is no other alternative location for the development; and the need for and benefits from the development, outweighs the importance of the tree or trees. Replacement trees will be planted in accordance with British Standard BS8545. Tree Preservation Orders (TPOs) will normally be placed on the replacement trees.

Planning Conditions, Article 4 Directions and/or Planning Obligations will be used to secure any necessary mitigation/compensation/enhancement measures in relation to trees and development proposals.

New tree or mitigation planting should be designed to achieve maturity and to ensure that there is an ongoing contribution to amenity with negligible negative impacts. New landscape schemes should follow the principles set out in “Trees in the Townscape: A Guide for Decision Makers” and be delivered using guidance in “Trees in Hard Landscapes: A Guide for Delivery”.

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Appendix F – Artificial Lighting For Bats

Illuminating a bat roost can cause disturbance (Downs et al 2003) and this may result in the bats deserting the roost or even becoming entombed within it (Packman et al 2015). Light falling on a roost access point will at least delay bats from emerging and this shortens the amount of time available to them for foraging (Boldogh et al 2007). In addition, the associated flightpath to and from the access point is just as valuable and vulnerable as the roost itself. Severing a key flightpath some distance from the roost could cause desertion in its own right. In addition to causing disturbance to bats at the roost, artificial lighting can also affect the feeding behaviour of bats. There are two aspects to this. One is the attraction that light from certain types of light sources has to a range of insects; the other is the presence of lit conditions posing a barrier to movement.

Sources of lighting which can disturb bats are not limited to roadside or external security lighting, but can also include light spill via windows, permanent but sporadically operated lighting such as sports floodlighting, and in some cases car headlights. Additionally, glare (extremely high contrast between a source of light and the surrounding darkness – linked to the intensity of a luminaire) may affect bats over a greater distance than the target area directly illuminated by a luminaire and must also be considered on your site.

Luminaires come in a myriad of different styles, applications and specifications which a lighting professional can help to select. The following should be considered when choosing luminaires.

All luminaires should lack UV elements when manufactured. Metal halide, fluorescent sources should not be used.

- LED luminaires should be used where possible due to their sharp cut-off, lower intensity, good colour rendition and dimming capability.
- A warm white spectrum (ideally <2700Kelvin) should be adopted to reduce blue light component.
- Luminaires should feature peak wavelengths higher than 550nm to avoid the component of light most disturbing to bats (Stone, 2012).
- Internal luminaires can be recessed where installed in proximity to windows to reduce glare and light spill.
- The use of specialist bollard or low-level downward directional luminaires to retain darkness above can be considered. However, this often comes at a cost of unacceptable glare, poor illumination efficiency, a high upward light component and poor facial recognition, and their use should only be as directed by the lighting professional.
- Column heights should be carefully considered to minimise light spill.
- Only luminaires with an upward light ratio of 0% and with good optical control should be used – See ILP Guidance for the Reduction of Obtrusive Light.
- Luminaires should always be mounted on the horizontal, i.e. no upward tilt.
- Any external security lighting should be set on motion-sensors and short (1min) timers.
- As a last resort, accessories such as baffles, hoods or louvres can be used to reduce light spill and direct it only to where it is needed.

For further information on designing artificial lighting for bats, please see the Bat Conservation Trust and Institution of Lighting Professionals' Guidance Note 08/18.