

Swansea University Bay Campus Centre for Integrative Semiconductor Materials (CISM) Preliminary Ecological Appraisal

Swansea University

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1. Executive Summary

AECOM was instructed by Swansea University to carry out a Preliminary Ecological Appraisal (PEA) of the proposed Centre for Integrative Semiconductor Materials (CISM), to be located at the eastern perimeter of the Swansea University Bay Campus, Fabian Way, Skewen, Swansea SA1 8EN, hereafter referred to as 'the Site'. The central grid reference for the Site is SS 70204 92884. The boundary of the Site is shown on Figure 1.

The Site is a courtyard area between existing University buildings, predominately of hardstanding paving and gravel with areas of native-species rich planting.

The development proposals are to construct a new building – The Centre for Integrative Semiconductor Materials (CISM). The building's occupied spaces will include primarily research and development laboratories, workshops, academic offices and seminar spaces. The building will be served by a substantial amount of mechanical services plant, located primarily in large plant rooms on the ground and the second floors. The development will require the complete removal of all habitats within the footprint of the building.

It is understood that construction is programmed to commence in February 2020 and be completed by July 2021.

The Crymlyn Burrows SSSI is located within 10 m adjacent to the Site and Crymlyn Bog SAC/Ramsar/SSSI is located 0.7 km from the Site.

The Phase 1 habitats on Site comprise semi-improved grassland, poor semi-improved grassland, ephemeral short perennial, introduced shrub, other habitats (native shrub planting), amenity grassland, species-poor hedgerow, standalone trees and hardstanding. The Semi-improved grassland is a wildflower garden called 'Flora Industria', this has been seeded with a diverse mix of wildflowers and grasses as part of an initiative between Kew Gardens, Grow Wild and Swansea University via National Lottery grant funding in 2018. The Swansea University Biodiversity Offer states that 'This forms a hotspot for biodiversity on the campus' which is mostly comprised of hardstanding and buildings.

The Site has potential to support Priority invertebrates, breeding birds (low potential) and foraging and commuting bats (low suitability).

Through the implementation of standard best practice in regard to dust and pollution control measures there will be no impacts on internationally and locally designated Sites. Without mitigation, there is potential for impacts on nationally designated Site, Crymlyn Burrows SSSI from construction related pollution and non-native species planting.

All habitats will be removed; this includes semi-improved grassland which is a valuable resource of biodiversity on campus. Further impacts include loss of invertebrate habitat, loss of bat foraging habitat, potential killing/injury of Priority invertebrate species (small blue butterfly), and damage/destruction of active bird nests.

Recommendations with regards to further surveys, mitigation and enhancements are provided in the main text.

The Executive Summary is not a substitute for the full report. Refer to the full text for further detail.

2. Introduction

2.1 Introduction

AECOM was instructed by Swansea University to carry out a Preliminary Ecological Appraisal (PEA) of the proposed Centre for Integrative Semiconductor Materials (CISM), to be located at the eastern perimeter of the Swansea University Bay Campus, hereafter referred to as 'the Site'.

This PEA was commissioned to identify whether there are known or potential ecological receptors (nature conservation designations, and Protected and notable habitats and species) that may constrain or influence the design and implementation of the proposed development. The approach applied when undertaking this PEA pays due regard to the Guidelines for Preliminary Ecological Appraisal published by the Chartered Institute of Ecology and Environmental Management (CIEEM, 2017a). The PEA addresses relevant wildlife legislation and planning policy as summarised in this report.

In order to deliver the PEA, a desk study and an extended Phase 1 Habitat Survey were undertaken by an appropriately experienced ecologist, to identify ecological features within the proposed development site and the wider potential zone of influence of the proposed development. The potential zone of influence was defined with reference to the project description provided by Swansea University as shown on Figure 2. Additional details are provided in Section 3: Methodology.

A BREEAM Ecology report is being prepared using the results of the PEA. Recommendations for further surveys, mitigation and enhancement will be provided in the BREEAM report which should be read alongside this PEA Report.

2.2 Site Location and Description

The Site is approximately 3400 (m²) and located in the Swansea University Bay Campus, Fabian Way, Skewen, Swansea SA1 8EN. The central grid reference for the Site is SS 70204 92884. The boundary of the Site is shown on Figure 1.

The Site is a courtyard area between existing University buildings, predominately of hardstanding paving and gravel with areas of native-species rich planting. There is a bicycle store and one other wooden building used as a base for management of Crymlyn Burrows SSSI.

2.3 Proposed Development

The development proposals are to construct a new building – The Centre for Integrative Semiconductor Materials (CISM).

The building's occupied spaces will include primarily research and development laboratories, workshops, academic offices and seminar spaces. The building will be served by a substantial amount of mechanical services plant, located primarily in large plant rooms on the ground and the second floors. The development will require the complete removal of all habitats within the footprint of the building.

It is understood that construction is programmed to commence in February 2020 and be completed by July 2021.

2.4 Objectives

The purpose of the PEA was to:

- Identify any designated nature conservation sites on or within proximity to the Site;
- Identify any known records of Protected or Priority Species within proximity to the Site;
- Identify and categorise the main habitats and features of ecological interest present within the Site ;
- Appraise the potential for Protected or Priority Species of fauna and flora;
- Provide advice on any potential ecological constraints and opportunities on or within proximity to the Site;

- Identify the requirement for further habitat and/or Protected Species surveys;
- Make recommendations to avoid and mitigate ecological impacts as well as opportunities for biodiversity enhancements; and,
- Provide a map showing the Phase 1 habitats on Site and any features of ecological interest.

The purpose of this report is to inform the design of the proposed development to support the submission of a planning application. The report will be submitted alongside a BREEAM Ecology report.

The PEA report identifies the scope of further work (where necessary) that would be required to support a planning application. High level recommendations are made on potential options for the avoidance, mitigation or compensation of the potential impacts of the proposed development (where known) on the identified ecological receptors. The BREEAM Report will provide potential enhancement options to the biodiversity and ecosystem services.

2.5 Wildlife Legislation and Planning Policy

2.5.1 Wildlife Legislation

There are several different acts of legislation and regulations which refer to the protection of wildlife. These are summarised in Appendix A. In particular, the legislation relating to possible protected species on site is outlined. This is a brief summary of the legislation and is not to be regarded as a definitive legal opinion. When dealing with individual cases, the client is advised to consult the full texts of the relevant legislation and obtain further legal advice.

The following wildlife legislation is potentially relevant to the proposed development:

- The Wildlife and Countryside Act (WCA) 1981 (as amended);
- The Countryside and Rights of Way (CROW) Act 2000;
- The Conservation of Habitats and Species and Planning (Various Amendments) (England and Wales) Regulations 2018; and,
- Environment (Wales) Act 2016.

The above legislation has been considered when planning and undertaking this PEA, when identifying potential constraints to the proposed development, and when making recommendations for further survey, design options and mitigation. Compliance with legislation may require the attainment of relevant protected species licences prior to the implementation of the proposed development.

2.5.2 National Planning Policy

2.5.2.1 Planning Policy Wales (9th Ed. November 2016)

Planning Policy Wales (PPW) sets out the land use planning policies of Welsh Government.

Chapter 5, Conserving and Improving the Natural Heritage and the Coast, outlines Welsh Government's objectives for the conservation and improvement of natural heritage. The relevant measures in place to conserve landscape and biodiversity include:

- Statutory designations;
- Non-statutory designations;
- LANDMAP Information System (LANDMAP describes and evaluates aspects of the landscape and provides the basis of a consistent Wales-wide approach to landscape assessment);
- Development plans and the conservation and improvement of the natural heritage;
- Development management and the conservation and improvement of the natural heritage;
- Development management and statutory designations;

- Trees and woods; and,
- Protected species.

Paragraph 5.3.10 states that "potential SPAs and candidate SACs (included in the list sent to the European Commission) should be treated in the same way as classified SPAs and designated SACs. Sites which the UK and the European Commission have agreed as Sites of Community Importance and which are to be designated as SACs attract the same legal protection as if they had already been designated. The same considerations should, as a matter of policy, be applied to listed Ramsar sites".

Paragraph 5.2.9 states that "Local planning authorities should seek to protect trees, groups of trees and areas of woodland where they have natural heritage value or contribute to the character or amenity of a particular locality. Ancient and semi-natural woodlands are irreplaceable habitats of high biodiversity value which should be protected from development that would result in significant damage."

Paragraph 5.5.4 states that "For all planning applications likely to result in disturbance or harm to a protected species or likely to have a significant adverse effect on sites of more than local importance, or on a designated area, local planning authorities should seek the advice of Natural Resources Wales and should always consult them before granting permission".

2.5.2.2 Technical Advice Note 5 (TAN5) Nature Conservation and Planning (September 2009)

The Planning Policy Wales (PPW) is supplemented by a series of Technical Advice Notes. TAN 5 provides guidance on how the land use planning system should contribute to protecting and enhancing biodiversity and geological conservation. It provides advice on areas including the key principles of positive planning for nature conservation, nature conservation in Local Development Plans and development management procedures. It also provides advice on development affecting designated sites and habitats, in addition to protected or priority habitats and species.

Key Principles include that the town and country planning system in Wales should integrate nature conservation into all planning decisions; that the town and country planning system should look for development to provide a net benefit for biodiversity conservation with no significant loss of habitats or populations of species, locally or nationally and that they should ensure that the UK's international and national obligations for site, species and habitat protection are fully met in all planning decisions.

2.5.3 Local Planning Policy

Local Development Plans (LDPs) must be produced by every Local Planning Authority in Wales. Any development proposal will be tested against the policies within the LDP. The LDPs follow the planning guidance provide in PPW, including biodiversity and natural heritage policies. These include protecting designated sites and other areas of importance for biodiversity conservation; safeguarding protected species and priority species, including those listed in local biodiversity action plans and retaining, creating and enhancing features of importance for biodiversity conservation where appropriate.

Relevant local planning policies for Neath Port Talbot Council are detailed in the following document:

- Neath Port Talbot County Borough Council Local Development Plan 2011 – 2026. Adopted January 2016.

Relevant policies are set out in Appendix A.

Appendix A provides a summary of relevant local planning policies. For the precise wording of each specific policy please refer back to the source document. This planning policy has been considered when assessing potential ecological constraints and opportunities identified by the desk study and field surveys; and, when assessing requirements for further survey, design options and ecological mitigation.

2.6 Quality Assurance

This survey and subsequent report was undertaken in line with AECOM's Integrated Management System (IMS). Our IMS places great emphasis on professionalism, technical excellence, quality, environmental and Health and Safety management. All staff members are committed to maintaining our certification to the international standards BS EN ISO 9001:2015 and 14001:2015 and BS OH SAS 18001:2007. In addition our IMS requires careful selection and monitoring of the performance of all sub consultants and contractors.

All AECOM Ecologists who worked on this project are members of (at the appropriate level) the Chartered Institute of Ecology and Environmental Management (CIEEM) and follow their code of professional conduct (CIEEM, 2017b) when undertaking ecological work.

3. Methodology

3.1 Desk Study

The objectives of the desk study are to review the existing information available in the public domain concerning species and habitats to identify the following:

- Internationally, nationally and locally designated sites, up to 2 km from the Site boundary using the Multi Agency Geographic Information for the Countryside (MAGIC) website (www.magic.gov.uk);
- Locally designated sites, up to 2 km from the Site boundary using the data from South East Wales Biodiversity Records Centre (SEWBRc);
- Protected and Priority species records and records of locally designated sites up to 2 km from the Site, boundary using data from SEWBRc;
- Special Areas of Conservation (SAC) and Sites of Special Scientific Interest (SSSI) designated for bats within a 10 km radius of the Site boundary in accordance with Bat Conservation Trust (Collins, 2016) recommendations;
- Section 7 list of Species and Habitats of Principal Importance for Conservation in Wales;
- Ancient Semi-Natural Woodland (ASNW), Plantation on Ancient Woodland Site (PAWS), Restored Ancient Woodland Site (RAWS) or Ancient Woodland Site of Unknown category (AWSU) within or adjacent to the Site boundary using Forestry Commission Wales 2011 Ancient Woodland Inventory data set downloaded from the Lle website (NRW, 2018);
- Trees with a Tree Protection Orders (TPO) within or adjacent to the Site, from Neath Port Talbot Council;
- The local bat group, Neath Port Talbot County Ecologist and Swansea University Biodiversity Officer were contacted for local records or knowledge about the project area; and,
- Aerial photographs and Ordnance Survey (OS) maps were reviewed to identify features of ecological interest surrounding the Site including ponds within 500 m, nearby areas of ecological interest and features connecting these habitats (hedgerows, watercourses, railway lines).

3.2 Extended Phase 1 Habitat Survey

A Phase 1 Habitat Survey (JNCC, 2010) of the Site was undertaken by an experienced AECOM ecologist (BSc, CIEEM) on 27 June 2019.

The survey involved a site walkover and preliminary assessment of habitats, land use and ecological features. The main habitats present were recorded using standard Phase 1 Habitat Survey methodology as described in the Handbook for Phase 1 Habitat Survey: A technique for Environmental Audit (JNCC, 2010). The plant species defining the habitat types on Site were recorded. Evidence of any Invasive Non-Native Species (INNS) of plant subject to legal controls was recorded.

The Phase 1 Habitat Survey was 'Extended' by including a desk study, as described above, and an assessment of the potential for the Site to support Protected or Priority Species in order to identify potential ecological constraints and to guide recommendations for further surveys.

Habitat outside of but adjacent to the Site boundary was noted to aid in the determination of the Zone of Influence.

3.3 Assessment of Bat Habitat Suitability

During the Phase 1 Habitat Survey, where access allowed, trees and buildings throughout the Site were classified into categories dependent on the presence of features suitable as bat roost habitat. This was conducted via an external appraisal from the ground using binoculars where necessary. Table 3.1 provides descriptions of the categories for buildings and trees.

Habitats on Site were classified into categories dependent on the presence of features suitable for bats to commute and forage. Table 3.2 provides descriptions for commuting and foraging habitats.

Table 3.1 Building and Tree Bat Roost Suitability Categories

Roost Suitability	Descriptions for Buildings	Descriptions for Trees
Known or Confirmed	Confirmed signs of bat presence/ occupation (droppings, oily staining around entry points, insect remains, odour, scratching) and actual bat presence.	Confirmed signs of bat presence/ occupation (droppings, oily staining around entry points, insect remains, odour, scratching) and actual bat presence.
High	A structure with one or more potential roost sites that are obviously suitable for use by larger numbers of bats on a more regular basis and potential for longer periods of time due to their size, shelter, protection, conditions (e.g. temperature, humidity, height above ground level, light levels or levels of disturbance) and surrounding habitat. Can include structures with points of access to the interior of the building and poorly maintained fabric providing ready access points for bats into structures, but at the same time not draughty. Structures of traditional stone, brick or timber construction. Structures with large (>20cm) roof timbers with mortice joints, cracks and holes. Structures of pre or early 20th century construction. Structures with large complicated and/or uncluttered roof spaces providing unobstructed flying spaces. Structures with weather boarding and/or hanging tiles with gaps. Structures with accessible south facing roofs. Structures with proximity to good foraging habitat such as woodland, wetland, water and /or good hedgerows.	A 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 potential for longer periods of time due to their size, shelter, protection, conditions (e.g. temperature, humidity, height above ground level, light levels or levels of disturbance) and surrounding habitat.
Moderate	A structure with one or more potential roost sites that could be used by bats due to their size, shelter, protection, conditions (e.g. temperature, humidity, height above ground level, light levels or levels of disturbance) and surrounding habitat but unlikely to support a roost of high conservation status. Can include structures with some potential to support roosting bats, but fewer features than a high risk building. Features may include areas suitable for crevice dwelling and/or access points into structures. Some proximity to foraging habitat.	A 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.
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 habitat to be used on a regular basis or by large numbers of bats (i.e. unlikely to be suitable for maternity or hibernation).	Tree of sufficient size and age to contain potential roost features but with none seen from the ground or features seen have only very limited roosting potential.
Negligible	No features suitable for roosting bats. Can include structures constructed from unsuitable materials e.g. prefabricated with steel and sheet material. Structure is draughty, light and cool buildings with no roosting opportunities. High levels of regular disturbance including external and/or internal lighting. Building is isolated from areas of foraging habitat.	Trees with no potential to support bats.

Roost Suitability Descriptions for Buildings

Descriptions for Trees

Source: Category descriptions drawn from Collins, 2016 and Mitchell-Jones, 2004 to be applied using professional judgement

Table 3.2 Commuting and Foraging Habitat Suitability Categories

Commuting and Foraging Suitability Descriptions

High	Continuous high-quality habitat that is well connected to the wider landscape that is likely to be used regularly by commuting bats such as river valleys, streams, hedgerows, lines of trees and woodland edge. High-quality habitat that is well connected to the wider landscape that is likely to be used regularly by foraging bats such as broadleaved woodland, tree-lined watercourses and grazed parkland. Site is close to and connected to known roosts.
Moderate	Continuous habitat connected to the wider landscape that could be used by bats for commuting such as lines of trees and scrub or linked back gardens. Habitat that is connected to the wider landscape that could be used by bats for foraging such as trees, scrub, grassland or water.
Low	Habitat that could be used by small numbers of commuting bats such as a gappy hedgerow or un-vegetated stream, but isolated, i.e. not very well connected to the surrounding landscape by other habitat. Suitable, but isolated habitat that could be used by small number of foraging bats such as a lone tree (not in a parkland situation) or a patch of scrub.
Negligible	Negligible habitat features on site likely to be used by commuting or foraging bats.

Source: Category descriptions drawn from Collins, 2016 to be applied using professional judgement

3.4 Limitations

Biological records can be received from a wide variety of sources and may or may not be comprehensive and accurate. However, if assessed in conjunction with a Phase 1 Habitat survey, they can contribute to a robust ecological assessment of a site.

Where any conclusions and recommendations contained in this Report are based upon information provided by others, it has been assumed that all relevant information provided by those parties is accurate. Any such information obtained by AECOM has not been independently verified by AECOM, unless otherwise stated in the Report. AECOM accepts no liability for any inaccurate conclusions, assumptions or actions taken resulting from any inaccurate information supplied to AECOM from others.

The methodology adopted and the sources of information used by AECOM in providing its services are outlined in this Report. The work described in this Report was conducted between 27 June 2019 and 12 July 2019 and is based on the conditions encountered and the information available during the said period of time. The scope of this Report and the services are accordingly factually limited by these circumstances. AECOM disclaim any undertaking or obligation to advise any person of any change in any matter affecting the Report, which may come or be brought to AECOM's attention after the date of the Report.

There are deemed to be no significant limitations to this PEA.

4. Baseline Conditions

4.1 Desk Study Results

The designated habitats, sites and features within proximity to the site are listed in Table 4.1 below.

Table 4.1 Desk Study Results

Designation / Feature	Description
Internationally and Nationally Designated Sites Within 2 km	<u>Crymlyn Bog SAC</u>
	Distance and Direction: 0.7 km north
	Description: Designated for its Annex I habitats: Transition mires and quaking bogs and calcareous fens with <i>Cladium mariscus</i> and species of the <i>Caricion davallianae</i> . The transition mire and quaking bog habitats comprise locally rare mud sedge <i>Carex limosa</i> and, in places, the nationally rare slender cottongrass <i>Eriophorum gracile</i> (listed under schedule 8 of the Wildlife and Countryside Act as amended). Slender cottongrass is listed as declining throughout Europe (IUCN category C), is found only on four other sites in Britain. The site also has Alluvial forests with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i> (Alno-Padion, Alnion incanae, Salicion albae) as a qualifying feature (JNCC, 2018).
	<u>Crymlyn Bog Ramsar</u>
	Distance and Direction: 0.7 km north
	Description: Designated for the largest example of valley floodplain topogenous mire in South Wales, and one of the largest surviving fens in the west of Britain. Very few other sites are known to support a comparable complexity and diversity of vegetation. The site supports a substantial population of the nationally-rare slender cottongrass, and a rich invertebrate fauna including many rare and highly localised species. The site supports 199 vascular plant species including 17 regionally-uncommon and one nationally rare (JNCC,1993).
	<u>Crymlyn Burrows SSSI</u>
	Distance and Direction: 10 m east, adjacent to the campus boundary.
	Description: One of the last remaining sections of the Swansea Bay Coastline which has remained substantially unmodified by industrial development. Over the past one hundred and fifty years, parallel sand dune ridges have developed at right angles to the River Neath and these are continuing to accumulate at the present time. Salt water is able to gain access to the system at high tide via the river channel, with the result that the dunes are interspersed by tongues of saltmarsh. These grade westwards into wet dune slacks and carr woodland. Several plant species with local distribution occur within the site including rock sea lavender <i>Limonium binervosum</i> , dittander <i>Lepidium latifolium</i> , rock hutchinsia <i>Hornungia petraea</i> , round leaved wintergreen <i>Pyrola rotundifolia</i> , dutch rush <i>Equisetum hyemale</i> and the variegated horsetail <i>Equisetum variegatum</i> . The rare fen orchid <i>Liparis loeselii</i> is found occasionally within the slacks, whilst the sea stock <i>Matthiola sinuata</i> which was re-recorded in 1964 following its earlier disappearance, is widespread along the strandline and in the dunes. The rare strandline beetle <i>Eurynebria complanata</i> has been recorded from the site. This part of the Neath estuary is also used by part of the population of small waders overwintering in Swansea Bay. (CCW, 1987).
	<u>Cors Crymlyn/Crymlyn Bog SSSI</u>
	Distance and Direction: 0.7 km north
	Description: Crymlyn Bog is of special interest for its fen (topogenous mire) communities, wet woodland, associated invertebrate assemblages, a substantial population of the nationally rare slender cottongrass and a population of the nationally scarce hornet robberfly <i>Asilus crabroniformis</i> . It is the most extensive

Designation / Feature	Description
	area of lowland fen in South Wales and is situated 3.5km east of central Swansea within a landscape heavily influenced by past and present industrial activities (CCW 2003). <u>Crymlyn Bog and Pant Y Sais NNR</u> Distance and Direction: 0.8 km north Description: Large area of lowland fen. Habitats range from swamps, fen, water meadows and tall reed beds to waterlogged scrub where wetter areas merge with woodland. The area is one of only three locations in the UK at which the fen raft spider <i>Dolomedes plantarius</i> is found. Predatory visitors like the hen harrier <i>Circus cyaneus</i>, buzzard <i>Buteo buteo</i>, hobby <i>Falco Subbuteo</i> and the occasional marsh harrier <i>Circus aeruginosus</i> visit the site regularly. The site provides an important refuge for a range of wetland birds like the bittern <i>Botaurus stellaris</i>, water rail <i>Rallus aquaticus</i>, sedge warbler <i>Acrocephalus schoenobaenus</i>, reed warbler <i>Acrocephalus scirpaceus</i>, bearded tit <i>Panurus biarmicus</i> and grey heron <i>Ardea cinerea</i>. The site is notable for supporting summer populations in excess of 400 pairs of reed warblers and 200 pairs of sedge warblers. These populations are of regional importance in Wales. <u>Pant Y Sais SSSI</u> Distance and Direction: 1.4 km north east Description: Designated for its range of fenland communities including <i>Sphagnum</i> and bryophyte dominated areas of poorer fen vegetation, <i>Molinia caerulea</i> communities, swamp areas with abundant <i>Typha latifolia</i> and <i>Typha angustifolia</i>, and developing fen carr. Formerly part of the same hydrological system as Crymlyn Bog. The Tennant Canal section acts as a refuge for aquatic plants, including <i>Butomus umbellatus</i> which is rare in the county. Pant-Y-Sais Fen shares many ecological similarities with the nearby Crymlyn Bog (CCW, 1983).
Locally Designated Sites Within 2 km	<u>Fabian Way Wild Flower Verge SINC</u> Distance and Direction: 80 m north (Connectivity to SINC is prohibited by Crymlyn Way and a university building) Description: Located in main dual carriage way between M4 Junction 42 and Swansea city (A483). An established meadow type grassland verge which runs along the central reservation and in some parts along the sides. Habitat supports a diverse mix of flora and likely associated invertebrates and small mammals. Qualifying features include lowland meadow grassland, calcareous grassland and species-rich neutral grasslands. <u>Amazon Woodlands SINC</u> Distance and Direction: 0.5 km north (Connectivity prohibited by the A483 and an expanse of industrial units) Description: Lies approximately 1 km south of Jersey Marine. An area of wet woodland established on the blown sands of the coastal plain. Isolated by industrial developments to the east and west but functions as an important stepping stone between similar habitats. Qualifying features include native woodlands and vascular plants. Important species include common wintergreen <i>Pyrola minor</i>, royal fern <i>Osmunda regalis</i> and barn owl <i>Tyto alba</i>. <u>Tennant Canal SINC</u> Distance and Direction: 1 km north west (Connectivity prohibited by roads and industrial units) Description: Lies partly adjacent to Pant Y Sais and links to Crymlyn Bog. It supports aquatic and emergent flora along much of its length. Otters <i>Lutra lutra</i> are regularly seen on the canal's riparian zone. The bankside vegetation includes

Designation / Feature	Description
	numerous orchid species and typical emergent plants. The qualifying feature at this site is standing open water and canals. <u>Ancient Semi-Natural Woodland SINC</u> Distance and Direction: 1.1 km north east (No connectivity to Site) Description: An area of ancient semi-natural woodland <u>Neath Estuary SINC</u> Distance and Direction: 1.2 km south east (No connectivity to Site) Description: Starts inland at Tonna and runs westwards to BritonFerry where it meets the sea at Baglan Burrows. Including the River Neath, the Neath Estuary includes a variety of wetland habitats including Coastal Saltmarsh, Reedbeds, Intertidal mudflats and flood plain grazing marsh. Forms the central core of wetland habitats SINC's running along this length of the River Neath. <u>Baglan Bay SINC</u> Distance and Direction: 1.4 km south east (No connectivity to Site) Description: An expanse of mobile dune systems and saltmarsh adjacent to heavily contaminated post-industrial land. Baglan Bay is the only mobile dune system remaining in Neath Port Talbot, although its integrity is compromised due to persistent and continued development of surrounding land. Site also includes an area of land for one of the largest populations of Lapwing Vanellus vanellus in Wales. <u>Earlswood SINC</u> Distance and Direction: 1.5 km north east (No connectivity to Site) Description: Complex of habitats associated with the Earlswood Golf Course. Principal habitats are deciduous woodland, bracken slopes, lowland meadows and heath with a few parcels of dune vegetation, rock outcrops and ponds. <u>Red Jacket Fen SINC</u> Distance and Direction: 1.6 km north east (No connectivity to Site) Description: Rich fen site at 6 m above sea level, between the Tennant Canal and the railway line embankment immediately east of Pant-Y-Sais Fen. Primary habitats are fen, reed-swamp and wet woodland. Canal banks also contribute to the richness of habitats present. <u>Kilvey Hill SINC</u> Distance and Direction: 1.7 km north west (No connectivity to Site) Description: No information on this SINC has been provided by the LERC. <u>Jersey Marine Woods and Geli Bwch Farm SINC</u> Distance and Direction: 1.8 km north east (No connectivity to Site) Description: Mosaic of habitats established on a hill in-between the land of the former Llandarcy oil refinery and the fen complex of Red Jacket Pil and Pant-Y-Pais. Principal habitats are deciduous woodland (Some ancient woodland), bracken slopes with a few parcels of less improved pasture.
Designated Sites Within 10 km Designated for Bats	There are no SSSIs or SACs within 10 km designated for bats.
Protected and Priority Species Records from the last 10 years within 2 km	The following recent (last 10 years) species have been recorded within 2 km of the Site: Plants: Artemisia campestris subsp. Maritima Artemisia campestris subsp. Maritima, basil thyme Clinopodium acinos, bluebell Hyacinthoides non-scripta, field wormwood Artemisia campestris, prickly saltwort Salsola kali subsp. Kali,

Designation / Feature	Description
	Entire-leaved Cotoneaster <i>Cotoneaster integrifolius</i> Invertebrates: Fen raft spider <i>Dolomedes plantarius</i> Amphibians: Common frog <i>Rana temporaria</i> (0.1 km south east), common toad <i>Bufo bufo</i> (1 km west) Reptiles: Common lizard <i>Zootoca vivipara</i> (0.3 km south east), grass snake <i>Natrix helvetica</i> (0.7 km north east) Birds: Barn Owl <i>Tyto alba</i>, bar tailed godwit <i>Limosa lapponica</i>, bittern <i>Botaurus stellaris</i>, black redstart <i>Phoenicurus ochruros</i>, black-headed gull <i>Chroicocephalus ridibundus</i>, bullfinch <i>Pyrrhula pyrrhula</i>, Cetti's warbler <i>Cettia cetti</i>, common scoter <i>Melanitta nigra</i>, cuckoo <i>Cuculus canorus</i>, curlew <i>Numenius arquata</i>, dark-bellied brent goose <i>Branta bernicla</i> subsp. <i>bernicla</i>, duncock <i>Prunella modularis</i>, fieldfare <i>Turdus pilaris</i>, golden plover <i>Pluvialis apricaria</i>, grasshopper warbler <i>Locustella naevia</i>, great northern diver <i>Gavia immer</i>, greenshank <i>Tringa nebularia</i>, hen harrier <i>Circus cyaneus</i>, house sparrow <i>Passer domesticus</i>, Kentish plover <i>Charadrius alexandrinus</i>, kestrel <i>Falco tinnunculus</i>, kingfisher <i>Alcedo atthis</i>, lapwing <i>Vanellus vanellus</i>, lesser redpoll <i>Acanthis cabaret</i>, linnet <i>Linaria cannabina</i>, little ringed plover <i>Charadrius dubius</i>, long-tailed duck <i>Clangula hyemalis</i>, marsh harrier <i>Circus aeruginosus</i>, Mediterranean gull <i>Larus melanocephalus</i>, merlin <i>Falco columbarius</i>, osprey <i>Pandion haliaetus</i>, peregrine <i>Falco peregrinus</i>, pintail <i>Anas actuta</i>, red kite <i>Milvus milvus</i>, red-throated diver <i>Gavia stellata</i>, redwing <i>Turdus iliacus</i>, reed bunting <i>Emberiza schoeniclus</i>, ringed plover <i>Charadrius hiaticula</i>, scaup <i>Aythya marila</i>, skylark <i>Alauda arvensis</i>, snow bunting <i>Plectrophenax nivalis</i>, song thrush <i>Turdus philomelos</i>, spotted flycatcher <i>Muscicapa striata</i>, starling <i>Sturnus vulgaris</i>, whimbrel <i>Numenius phaeopus</i>, velvet scoter <i>Melanitta fusca</i>, yellow wagtail <i>Motacilla flava</i>, yellowhammer <i>Emberiza citrinella</i> Bats: Common pipistrelle <i>Pipistrellus pipistrellus</i> (0.7 km north), noctule <i>Nyctalus noctula</i> (1.3 km north east) soprano pipistrelle <i>Pipistrellus pygmaeus</i> (0.5 km west) Other Mammals: Brown hare <i>Lepus europaeus</i>, European otter <i>Lutra lutra</i> (0.7 km north, clustered around Tennant Canal), polecat <i>Mustela putorius</i>, western European hedgehog <i>Erinaceus europaeus</i> (0.2 km north east) *distances are approximate
Priority Habitats and Species – Section 7 List	The full list of Section 7 Habitats and Species of Principle Importance in Wales has been reviewed. Those priority habitats present on site and priority species with potential to be on site are listed in Table 4.2 and Table 4.3 respectively.
Surrounding Land Use	The Site is located within the Swansea University Bay Campus on Fabian Way, Skewen. Natural habitats within the Bay campus are limited to planted areas of landscaping. To the north of the Site are University buildings with the A483 Road (Fabian Way) located beyond the Campus. Further north of the A483 road are industrial buildings of the Bay Studios, Swansea Gate Business Park and former Elba Works. North of this is a railway line and the Tennant Canal located 600 m and 650 m north respectively. To the east of the Site is Crymlyn Burrows SSSI. The River Neath enters Baglan Bay 1.8 km east of the Site. To the south of the Site are University buildings and beyond the Campus is the coastline of Baglan Bay. To the west of the Site are University buildings. Beyond the Campus is brownfield land and further west is Swansea Docks.
Ancient Woodland	There are no ASNW, PAWS, RAWs or AWSU areas within or adjacent to the Site boundary.
Trees with a Tree Protection Order (TPO)	There are no TPOs within or adjacent to the Site boundary.
Ponds within 500 m	There are no ponds visible within the Site boundary or within a 500 m search area

Designation / Feature	Description
	of the Site Boundary. A drain runs adjacent to the A483 (Fabian Way) 70 m north of the Site.
Council Ecologist	County Council: Neath Port Talbot The County Ecologist was contacted. The County Ecologist responded stating all records are submitted to SEWBreC. The County Ecologist recommended consultation with Swansea University Biodiversity Officer. The County Ecologist stated that the Site includes an area which received grant funding to plant a wildflower garden (Flora Industria), and that this is now the most diverse area of the Campus. The County Ecologist recommended that the wildflower area is moved to a more prominent location on Campus and expanded.
Local Specialist Recorders	The local bat group were contacted. No response has been received to date. The Swansea University Biodiversity Officer was contacted. He responded stating that: 'This area is a hotspot for biodiversity on campus – we created a grant-funded post-industrial wildflower garden here last year, using a coastal wildflower meadow mix from Boston Seeds along with plug planting and it is really thriving and attracting large numbers of pollinating insects. It is a dry mound with wet margins so supports a wide range of species. I haven't carried out any formal monitoring, but some of the most noticeable thriving plants at present are: Common fleabane, yellow rattle, birds foot trefoil, hemp agrimony, kidney vetch, ox eye daisy, meadowsweet, viper's bugloss, teasel, common toadflax, wild thyme, sea campion, black knapweed, black medick, devil's bit scabious, sneezewort, betony, yarrow – but really a full survey should be carried out to get a true picture of the diversity. In addition, there is a grass-roofed building in the area that is used as a base for management of Crymlyn Burrows SSSI. The other beds within the site are also planted with native wildflowers, especially ragged robin, purple loosestrife, fleabane and oxeye daisy. As this is a biodiverse area and was funded by an external grant, I would hope that the garden could be moved to a permanent, prominent location on Campus and the landscaping of the new build incorporate a similar planting of native wildflowers. The University's Biodiversity Action Plan has the aim of all campus development having an overall biodiversity gain – given the rich nature of this area this may prove challenging and I would expect that offsetting elsewhere on Campus might be required.'
Swansea University Biodiversity Action Plan	The Swansea University Biodiversity Action Plan was reviewed. This outlines current habitats and species present on the Site and sets out objectives for maintaining and enhancing existing habitats and creating new habitats on Site. These include: – Objective 1: To ensure structured, multi-stakeholder management, monitoring and reporting of biodiversity issues on campus. – Objective 2: To implement efficient and robust data and information management to ensure that biodiversity action is based on the best available information. – Objective 3a: To improve the management of our campuses for wildlife. – Objective 3b: To create new areas of valuable wildlife habitat where appropriate. – Objective 3c: To ensure that maintenance and development of the University estate results in an overall biodiversity gain. – Objective 4a: To ensure all relevant stakeholders have sufficient training to enable them to play their part in managing biodiversity on campus.

Designation / Feature	Description
	– Objective 4b: To increase educational opportunities, raise awareness of the role our campus plays in supporting wildlife and encourage appreciation of the benefits of biodiversity and green space for health and wellbeing.

4.2 Extended Phase 1 Survey

4.2.1 Habitats

The habitats present within the site boundary and their descriptions are shown in Table 4.2. A plan of the site showing the location and distribution of these habitats is shown in Figure 1.

Table 4.2 Phase 1 Habitats and Descriptions

Habitat	Description	Section 7 Habitat
Semi-improved grassland	An area of semi-improved grassland is located in the centre of the Site. The Semi-improved grassland is a wildflower garden called 'Flora Industria'. It has been seeded with a diverse mix of wildflowers and grasses as part of an initiative between Kew Gardens, Grow Wild and Swansea University via National Lottery grant funding in 2018. It comprises mounded rough soil and gravel with coastal wildflower seed mix, plug planting and some self-seeding species. A diverse mix of species including oxeye daisy <i>Leucanthemum vulgare</i>, Yorkshire fog <i>Holcus lanatus</i>, fleabane <i>Pulicaria dysenterica</i>, medic species <i>Medicago</i> sp., greater knapweed <i>Centaurea scabiosa</i>, bristly ox tongue <i>Helminthotheca echioides</i>, greater willow herb <i>Epilobium hirsutum</i>, selfheal <i>Epilobium hirsutum</i>, birds foot trefoil <i>Lotus corniculatus</i>, yellow rattle <i>Rhinanthus minor</i>, ribwort plantain <i>Plantago lanceolata</i>, viper's bugloss <i>Echium vulgare</i>, yarrow <i>Achillea millefolium</i>, pendulous sedge <i>Carex pendula</i>, hazel <i>Carex pendula</i> sapling, willow <i>Salix</i> sp. saplings, marjoram <i>Origanum vulgare</i>, teasel <i>Dipsacus fullonum</i>, meadow vetchling <i>Lathyrus pratensis</i>, herb Robert <i>Geranium robertianum</i>, forget me not <i>Myosotis</i> sp., smooth stalked meadow grass <i>Poa pratensis</i>, soft rush <i>Juncus effusus</i>, sweet vernal grass <i>Anthoxanthum odoratum</i>, meadow buttercup <i>Ranunculus acris</i>, ladies bedstraw <i>Galium verum</i>, St Johns wort <i>Hypericum perforatum</i>, sea campion <i>Silene uniflora</i>, Devil's bit scabious <i>Succisa pratensis</i>, greater knapweed <i>Centaurea scabiosa</i>, sea thrift <i>Armeria maritima</i> and wild thyme <i>Thymus serpyllum</i> (Appendix C: Photographs 1 and 2). The original planting list for this area is provided in Appendix D.	No
Poor semi-improved grassland	A strip of poor semi-improved grassland is present in the south of the Site, either side of the planted hedgerow. On the north of the hedgerow, there is a mown area with diverse seed mix. Species include white clover <i>Trifolium repens</i>, black medic <i>Medicago lupulina</i>, meadow buttercup, broad plantain <i>Plantago major</i>, sow thistle, ragwort <i>Jacobaea vulgaris</i>, perennial rye grass <i>Lolium perenne</i>, dandelion <i>Taraxacum</i> sp., daisy <i>Bellis perennis</i>, common mouse ear <i>Cerastium fontanum</i> and germander speedwell <i>Veronica chamaedrys</i> (Appendix C: Photograph 8). On the south of the hedgerow, this area is dominated by poa grass species with occasional medic sp., sow thistle, birds foot trefoil. Becoming more dominated by forbs at the western end.	No
Ephemeral short perennial	Two areas of ephemeral short perennial are located in the east of the Site. These areas are thought to be self-seeded on gravel/rough ground from the adjacent 'Flora Industria' planting and are in an early successional stage. There are some areas of bare ground (soil, gravel) and some areas which are more densely vegetated and beginning to become semi-improved grassland (Figure 1: Target Note 1 and 2; Appendix C: Photograph 3 and 4). Species include oxeye daisy, willow saplings, medic species, Yorkshire fog, white clover, red clover <i>Trifolium pratense</i>, buddleia <i>Buddleja davidii</i>, marjoram, fleabane, curled leaf dock <i>Rumex crispus</i>, red dead nettle <i>Lamium purpureum</i>, may weed <i>Anthemis cotula</i>, herb Robert, sow thistle <i>Sonchus arvensis</i>, bittersweet nightshade <i>Solanum dulcamara</i>, great mullein <i>Verbascum thapsus</i>, birds foot trefoil, rosebay willowherb <i>Chamaenerion angustifolium</i>, poppy <i>Papaveroideae</i> sp., kidney vetch <i>Anhyllis vulneraria</i>, common century <i>Centaureum erythraea</i>, common mouse ear, self-heal <i>Prunella vulgaris</i>, teasel, meadow buttercup, yarrow, scarlet pimpernel <i>Anagallis arvensis</i>, red campion <i>Silene dioica</i> and hare's-foot clover <i>Trifolium</i>	

Habitat	Description	Section 7 Habitat
	arvense sp..	
Introduced shrub	Non-native ornamental planting is located in the south east and south west corners of the Site.	No
Other habitat (native species planting)	Areas of planted native species are located in the west of the Site (Appendix C: Photographs 5-7). An area planted with species typical of wetter habitats includes ragged robin and purple-loosestrife <i>Lythrum salicaria</i> , with fleabane, marjoram, toadflax, oxeye daisy (Figure 1: Target Note 3). The planted area in the north west corner. Species include rosebay willow herb, purple-loosestrife selfheal, oxeye daisy, fleabane and four birch <i>Betula</i> sp. trees (all less than 20 cm Diameter at Breast Height (DBH) (Figure 1: Target Note 4).	No
Amenity grassland	Frequently managed areas with regular mowing. Species include ribwort plantain, perennial rye grass and daisy.	No
Species poor intact hedgerow	A short, approx. 1m tall, 0.3m wide, Planted hawthorn <i>Crataegus monogyna</i> hedgerow in the south of the Site.	No
Standalone trees	Four birch trees with native species planting below. One birch tree within amenity grassland.	No
Wall	Retaining wall made from wooden 'sleepers' (Appendix C: Photograph 9).	No
Buildings	Building 1 - Cycle shed constructed of wood with a green roof. Building 2 – Wooden clad building with stone walled base topped with mud and a green roof. Used as a base for management of the Crymlyn Burrows SSSI.	No
Hardstanding	Gravel, paved and concrete areas (Appendix C: Photographs 9 and 10).	No

4.3 Protected and Priority Species

Details of protected and priority species recorded on Site are listed in Table 4.3.

A plan of the Site showing the location and distribution of features with potential for Protected or Priority Species is shown in Figure 1. Target notes of Protected Species evidence or features that have potential to support Protected Species are shown in Figure 1 and Appendix B.

Table 4.3 Protected and Priority Species Potential

Species/ Species Group	Associated habitat	Description	Section 7 Species
Invertebrates	Poor semi-improved grassland, semi-improved grassland, ephemeral short perennial, introduced shrub, native species planting, standalone trees, species-poor hedgerow, buildings (green roof and stone base).	The mosaic of habitats on Site provide a range of habitats for invertebrates. Cinnabar moth caterpillars <i>Tyria jacobaeae</i> (a S7 Priority Species)were recorded on ragwort in poor semi-improved grassland. Several butterfly species, hover flies, bee species, seven spot ladybird <i>Coccinella septempunctata</i>, beetles and dragonfly were noted within the semi improved grassland. The exact species were not recorded. But a diversity of invertebrates was noted. A 'blue' butterfly was noted on kidney vetch. Though a formal identification was not completed, it was likely this was a small blue <i>Cupido minimus</i>, because this species exclusively uses kidney vetch as a larval food plant. . Small blue butterfly is a S7 Priority Species. The stone wall base of Building 2 provides crevices and bare earth of benefit to invertebrates. Bare soil patches within the ephemeral short perennial provides similar value. The native species planting includes some 'wetter areas'/troughs within the planting which area of benefit to invertebrates. The mosaic of diverse native species planting on Site provides habitat for a range of common and Priority Species.	Yes
Reptiles	N/A	Grassland on Site is unsuitable to support reptiles due to its limited size and isolation from any other reptile habitat in the surrounding landscape. The Site was developed on a former an oil storage depot for BP, has been significantly re-worked to form the Swansea Bay Campus, so the presence of a relic population is unlikely.	Yes
Breeding birds	Species-poor hedgerow	Breeding birds within the species –poor hedgerow cannot be ruled out. Despite being species –poor and short, approx. 1 m tall, 0.3 m wide, the Hedgerow has some potential to support perhaps 1-2 nests of common nesting birds. It is near a public area, but is on a raised bank, so people don't walk directly past it. The grassland habitats and gravel are unsuitable to support ground nesting birds due to limited extent and structure of grassland and disturbance from people walking through the courtyard. Areas of bare ground are not extensive enough to support little ringed plover which are known to breed locally.	Yes
Bats	Poor semi-improved grassland, semi-improved	Habitats on Site offer limited opportunities for bats, and they may be visited on an occasional basis. Habitats are of Low suitability due to their small extent and limited connectivity of habitats across the Campus within an	Yes

Species/ Species Group	Associated habitat	Description	Section 7 Species
	grassland, native species planting, ephemeral short perennial, standalone trees, hedgerow.	area dominated by buildings and hardstanding. Lighting around the buildings and walkways further reduces suitability for bats. Crymlyn Burrows to the east provides high quality foraging and commuting habitats of greater value than those on Site. Potential for buildings to support roosting bats is discussed in Table 4.4	

4.4 Invasive Non-Native Species Subject to Legal Controls

No Invasive Non Native Species (INNS) species subject to legal controls were recorded during the Phase 1 Habitat Survey.

4.5 Bat Roost Assessment

Features suitable for supporting roosting bats were assessed during the site visit and are listed in Table 4.. The locations of suitable roost features are shown on Figure 1.

Surrounding buildings within the University campus are not suitable to support roosting bats as these are modern buildings in good condition. The University BAP mentions bat boxes are present but none were observed on the adjacent buildings during the Phase 1 Habitat Survey.

Table 4.4 Features Assessed as Having Suitability to Support Roosting Bats

Feature	Description	Bat Roost Suitability Category
Building 1 (Cycle Shed)	Open fronted wooden building with green roof. There are no features suitable to support roosting bats.	Negligible
Building 2	Wooden clad building with green roof. There are no features suitable to support roosting bats.	Negligible

5. Ecological Constraints and Potential Impacts

The potential impacts of the proposed Development on habitats and Protected Species are detailed below.

5.1 Development Proposal

The development proposals are to construct a new building – The Centre for Integrative Semiconductor Materials (CISM), to be located at the eastern perimeter of the university's Bay Campus. The building's occupied spaces will include primarily research and development laboratories, workshops, academic offices and seminar spaces. The building will be served by a substantial amount of mechanical services plant, located primarily in large plant rooms on the ground and the second floors. The development will require the complete removal of all habitats within the footprint of the building.

It is understood that construction is programmed to commence in February 2020 and be completed by July 2021.

5.2 Designated Nature Conservation Sites

5.2.1 Internationally Designated Nature Conservation Sites

Crymlyn Bog SAC and Ramsar is located 700 m north of the Site. Construction traffic produces fine matter that can travel up to 1 km from source but only presents a potential impact in association with human health and inhalation; construction typically produces medium and coarse material that will not travel more than 500 m from source. During construction, existing best practice methods will be in place to control dust. Due to these factors there is considered to be no likely impact of dust on Crymlyn Bog SAC and Ramsar.

There will be no further impacts during operation due to the nature of the development i.e. no chemicals or gases being released and no pollution pathways.

5.2.2 Nationally Designated Nature Conservation Sites

5.2.2.1 Crymlyn Burrows SSSI

Crymlyn Burrows SSSI is located 10 m east of the Site.

During construction, in the absence of mitigation, there is potential for impacts on the SSSI habitats due run-off of pollutants (including fuel and chemicals) and deposition of dust during construction work.

During construction, there are unlikely to be impacts from noise on wading birds. The SSSI habitats within 100 m of the Site are dune slacks and carr woodland and unlikely to support over wintering waders. The habitats of the SSSI which would support over wintering wader (salt marsh and estuarine mud flats) are over 1 km from the Site.

During operation, without mitigation, if there is an increase in students and staff at the Site there may be an increase in recreational pressure on the SSSI resulting in increased damage to habitats or disturbance to species for which the site is designated. There is a strategy for controlling visitor access to the SSSI, managed in part by Swansea University Wardens/Biodiversity Officer and there is no direct pedestrian access from the Site into the SSSI. Swansea University Bay Campus runs a Conservation Volunteer programme managed by the Swansea University Bay Campus Biodiversity Officer. They run weekly conservation days and beach clean which benefit the SSSI. Swansea University Bay Campus has produced the 'Crymlyn Code of Conduct' (Swansea Uni, Undated) which provides guidance on how visitors should conduct themselves within the SSSI to avoid and reduce impacts on the SSSI. Given this existing visitor management, it is considered that the addition of the CISM Building to the existing Swansea Bay Campus is unlikely to significantly impact the SSSI through recreation.

The Bay Campus Landscape Strategy (Atkins, 2012) states that the planting mixes along the boundaries adjacent to Crymlyn Burrows SSSI will be limited to native species only to prevent colonisation of species alien to the SSSI. If non-native species were to be planted, they could spread into the SSSI and affect the biodiversity of the SSSI.

5.2.2.2 Crymlyn Bog SSSI

Crymlyn Bog SSSI is located 0.7 km from the Site. Pant-Y-Sais SSSI is located 1.4 km from the Site. The potential impacts, without mitigation, on these SSSIs will be the same as Crymlyn Bog SAC discussed in Section 5.2.1.

5.2.3 Local Nature Conservation Sites

There are 10 SINCs located within 2 km of the Site.

There is potential for dust and/or pollution from construction and operation of the development to impact the nearest site, Fabian Way Wildflower Verges SINC; however, existing best practice in relation to control of dust and pollution will limit this and as such there is considered to be no likely impact on Fabian Way Wildflower Verges SINC as a result of the development.

All other SINCs are located more than 500 m from the Site. Construction traffic produces fine matter that can travel up to 1 km from source but only presents a potential impact in association with human health and inhalation; construction typically produces medium and coarse material that will not travel more than 500 m from source. During construction, existing best practice methods will be in place to control dust. Due to these factors there is considered to be no likely impact of dust on the other SINCs.

All other SINCs lack any connectivity to the Site, and as such there will be no further impacts during construction or operation due to the nature of the development i.e. no chemicals or gases being released and no pollution pathways.

5.3 Habitats

There will be complete removal of all habitats within the Site. This will have a negative impact at Site level, and for the biodiversity of the University Campus.

It is unlikely there will be an impact at a local level due to the limited extent of the habitats on Site and availability of alternative habitats of equal or greater value in the wider landscape.

5.4 Protected or Notable Species

5.4.1 Invertebrates

The Site supports a range of common and Priority invertebrates. Without compensation, there will be loss of invertebrate habitat on Site and for the University Campus. However, is unlikely to have a significant impact on local populations because habitat of similar or greater value is available in the surrounding landscape off-Campus.

Kidney vetch was recorded on Site in areas of ephemeral short perennial. This is the larval food plant of the small blue butterfly. The small blue butterfly is present as eggs or larvae on kidney vetch at all times of the year (UK Butterflies, 2019). Eggs are laid in summer, if the plant is mowed over summer the eggs will be damaged or destroyed. The larva over winter in the roots of kidney vetch. If vegetation is cleared over winter there is potential for killing of small blue butterfly larvae. This is unlikely to have an impact on the local population of small blue butterfly as kidney vetch is common in the surrounding area, but will impact the individuals within the Site. .

5.4.2 Breeding Birds

If the hedgerow is removed during the breeding bird season there is potential for damage or destruction of a nest and/or killing and injury of breeding birds.

5.4.3 Foraging and Commuting Bats

Removal of hedgerows, grassland, native species planting and ephemeral short perennial will result in a loss of foraging habitat for bats within the Site. The impact will be at Site level only, due to the limited size of habitats on Site and availability of habitat of greater value in the surrounding landscape.

6. Further Surveys, Mitigation and Enhancement

6.1 Further Surveys

Surveys for Protected or Priority Species are not required.

6.2 Recommendations for Mitigation

The mitigation hierarchy has been considered and implemented when designing the new development. The ecological constraints at the Site have been considered at an early stage and much of the mitigation has been included by design. Recommendations for mitigation are discussed in combination with LE04. A summary is provided below.

Mitigation Hierarchy:

1. Enhance positive impacts and opportunities;
2. Avoidance – Alternative site or technology, or timing to eliminate impact;
3. Minimise – Actions during design construction and operation to minimise or eliminate impacts; and,
4. Compensation – Used as last resort to offset impacts.

6.2.1 Designated Sites

6.2.1.1 Dust and Pollution

Pollution control measures as required Guidance for Pollution Prevention (GPPs) and where these have not been replaced the Environment Agencies Pollution Prevention Guidelines (PPGs) will be implemented in order to avoid and minimise adverse effects of pollution and runoff on designated sites and surrounding environment.

As of the 17th December 2015 all Pollution Prevention Guidance Documents published by the UK environment agencies were withdrawn. Although they provide useful advice on the management of construction to avoid, minimise and reduce environmental impacts, they should not be relied upon to provide accurate details of the current legal and regulatory requirements and processes. They are referred to in this document alongside other current guidance and in the context of scheme and site specific mitigation measures.

Measures will be employed to minimise dust during the construction works.

Measures will be in place in order to deal with pollution incidents efficiently.

In order to avoid potential pollution effects to the sites during construction, all refuelling and servicing of vehicles will be carried out within a designated area with an impermeable base. To prevent spillages, refuelling will be carried out by pumping through a trigger delivery nozzle. Fuel, oil and other potential contaminants will be stored within bunded tanks to 110% of the volume stored and only the minimum quantity required will be stored on Site. The designated area will be maintained in a secure and clean manner. An adequate quantity of oil absorbent material will be stored on Site and spillages cleared up immediately. All construction equipment will be maintained in good working order and checked regularly for spillages/leaks.

Concrete will either be imported from a local batching plant or a concrete batching plant will be established on Site. The final choice will depend on the chosen contractor, the availability of local supply and the time of year. If concrete is to be batched on Site, appropriate containment and clean-up measures and procedures will be put in place that are in accordance with industry standards. Particular care will be taken when pouring concrete at foundations, following specific method statements to ensure there is no spillage risk or contamination of soils and vegetation.

6.2.1.2 Planting

New landscape planting should comprise native species, to avoid on non-native species spreading into the SSSI.

6.2.1.3 Lighting

Lighting should be designed to avoid light spill onto adjacent SSSI habitats.

The following recommendations in line with the BCT, 2009, BCT, 2014 and Gunnell et. al., 2012, best practice guidance should be incorporated into any new lighting scheme at the Site:

- Light spill onto any new bat boxes must be avoided;
- In the first instance, external lighting should be designed to avoid light spill onto boundary features including rows of trees, hedgerows and woodland edges; and
- Light spill onto sensitive areas such as the Site boundaries which have the potential to be used by commuting and foraging bats and trees suitable to support roosting bats should be limited to levels of 3 Lux or less.
- Suggestions for mitigating external lighting and achieving the lighting recommendations above are outlined in the ILP Guidance Note (ILP, 2018) and best practice guidance (BCT, 2009, BCT 2014 and Gunnell et. al., 2012). These include:
- Only light areas which need to be lit, and use the minimal level of lighting required to comply with guidance such as Institute of Lighting Engineers Guidance Notes for the Reduction of Obtrusive Light (2005);
- LED luminaires should be used where possible due to their sharp cut off, low intensity, good colour rendition and dimming capability.
- A warm white spectrum (ideally <2700Kelvin) should be adopted to reduce blue light component.
- Eliminate bare lamps and any upward pointing light;
- The spread of light should be at or near the horizontal. Flat cut off lanterns are best;
- Use narrow spectrum lamps. Using lamps with the lowest UV output possible, avoid white and blue spectrums of light;
- Lights should peak higher than 550 nm or use glass lanterns to filter UV light;
- Reduce the height of lighting columns;
- Direct lighting to where needed and avoid spillage e.g. direct lighting towards the building front/foot path and design the luminaire appropriately, including the use of shields to avoid spillage behind the lamps onto adjacent habitats. Footways could, for example, be lit using bollards to keep the light below the tree canopy;
- Street lights can be located so that rear shields face the adjacent habitats or optics selected that stop back light thereby directing light into the task area, avoiding spill onto adjacent habitats.
- Where new lighting is proposed, use lighting modelling programs to indicate where the light spill will occur;
- Any external security lighting should be set to motion sensors and short (1 min) timers;
- Limit the times that the lights are on, to provide some dark periods;
- Avoid using reflective surfaces under lights; and
- Do not use a lamp greater than 150W for security lighting.

This will increase the value of the Site for a number of other nocturnal species, as well as mitigate light spill onto the adjacent SSSI.

6.2.2 Habitats

Habitats will not be retained. Compensation for loss of the semi-improved grass is recommended. This should include:

- Moving the existing semi-improved wildflower planting area soil to another part of the Campus where the areas will be retained and in a prominent position. Moving the soil will help retain the seed bank and soil composition;
- Doubling the area (extent) of semi-improved wildflower planting - to provide a biodiversity gain.

- Using nutrient-poor sub soil (similar to the wildflower planting area) and do not use nutrient rich top soil.

Landscaping at the Site should be designed to include locally native species suitable for the area (i.e. shade, sun, soil type). Recommendations to enhance habitats on Site are provided in the BREEAM Ecology Report LE04.

Where possible, any new shrub or tree planting should be designed to create a green corridor. Planting should be of locally native species, with native standard trees. A native species rich seed mix, suitable for the location (such as a woodland mix or verge mix) could be used at the base, to create a diverse ground flora. The green-corridor should be kept 'dark' and light spill onto the features should be avoided, to maximise its benefits.

A Landscape Habitat Management Plan (LHMP) will be produced as part of BREEAM LE05 which will help avoid and reduce any impacts from habitat loss or management during operation.

6.2.3 Invertebrates

6.2.3.1 Habitat Loss

To allow the continuation of the small blue butterfly population in the area, its larval food plant, kidney vetch, should be translocated from within the immediate footprint of the development and any construction areas where it may be damaged or destroyed into an 'invertebrate sanctuary'.

This area should be managed to increase botanical diversity to the benefit of invertebrates.

Specimens should be translocated to a location as close to the original location as possible. This will allow the small blue butterfly population to retain its distribution across the Site.

The following actions should be undertaken to ensure the successful translocation of the kidney vetch specimens:

- A suitable area for the 'invertebrate sanctuary' will be chosen in conjunction with the Client and an ecologist – kidney vetch typically prefers thin, recently disturbed soils;
- Specimens to be effected by the development will be chosen and moved in the autumn (October – mid-November), when the small blue butterfly larvae will be present in the rootstock of the plant, ensuring to remove the entire rootstock of the plant;
- Timing of the move will be dependent on the prevailing weather conditions during the summer months – a reasonably warm, dry summer will produce a second brood in which case a move in October/November will be best, a cold and/or wet summer will not produce a second brood and as such the move can be undertaken in September;
- Specimens will be planted immediately after removal either in the 'invertebrate sanctuary' in an appropriate location or in a safe location outside the fenced working area as close to the original location as possible; and,
- Works will be carried out under the supervision of an ecologist.

6.2.3.2 Lighting

New external lighting should be designed to avoid light spill onto any newly planted habitats to maximise their value to invertebrates and avoid disturbance to invertebrates.

6.2.4 Breeding Birds

To protect breeding birds all demolition works and vegetation clearance should be undertaken outside of the breeding bird season (works completed between 1st September and end February).

If works must be undertaken during the breeding bird season an ecologist must be consulted, a nesting bird check must be undertaken a maximum of 48 hrs prior to works commencing. If breeding birds are present then a buffer must be applied around the nest site and left undisturbed until chicks have fledged. This can take up to 8 weeks.

6.2.5 Bats

6.2.5.1 Planting

Any new planting should comprise locally native species, this will promote a diversity of invertebrates, which will be of value to bats, and help mitigate the loss of the semi-improved grassland on Site.

6.2.5.2 Lighting

New external lighting should be designed to avoid light spill onto any newly planted habitats to maximise their value to foraging bats,

6.3 Recommendations for Biodiversity Enhancements

The National Planning Policy Framework (March, 2012) and the Environment (Wales) Act 2016, requires that developments enhance biodiversity, as well as just mitigating impacts.

Recommendations for enhancement are also required as part of the BREEAM 2018 Assessment and are provided in the BREEAM Ecology Report (AECOM, 2019).

Enhancements will assist with the Swansea University Biodiversity Action Plan objectives below, for maintaining and enhancing existing habitats and creating new habitats on the Campus:

- Objective 3a: To improve the management of our campuses for wildlife.
- Objective 3b: To create new areas of valuable wildlife habitat where appropriate.
- Objective 3c: To ensure that maintenance and development of the University estate results in an overall biodiversity gain.
- Objective 4b: To increase educational opportunities, raise awareness of the role our campus plays in supporting wildlife and encourage appreciation of the benefits of biodiversity and green space for health and wellbeing.

Enhancements could include:

1. Improving Grassland Diversity/ Wildflower Planting;
2. Swale Creation;
3. Features for Invertebrates (e.g. a 'bee bank' and stone wall);
4. Bird and Bat Boxes;
5. Hedgehog habitat;
6. Promotion of Green Corridors;
7. Green Roof and/or Green Walls

6.3.1 Ecosystem Resilience (Section 2 Environment (Wales) Act 2016)

Small, isolated populations of species are far more vulnerable to extinction than populations that can disperse and interbreed with other populations. The effects of climate change are likely to increase local extinctions among small isolated populations. It is important to maintain and enhance ecological networks of semi-natural habitats that have a high degree of connectivity.

Any landscape planting at the Site should be designed to promote local landscape connectivity and create a mosaic of habitats on Site.

Any planting should be of native species suitable to the local context and in relation to climate change; they are likely to remain to be locally suitable within the next 25 to 50 years.

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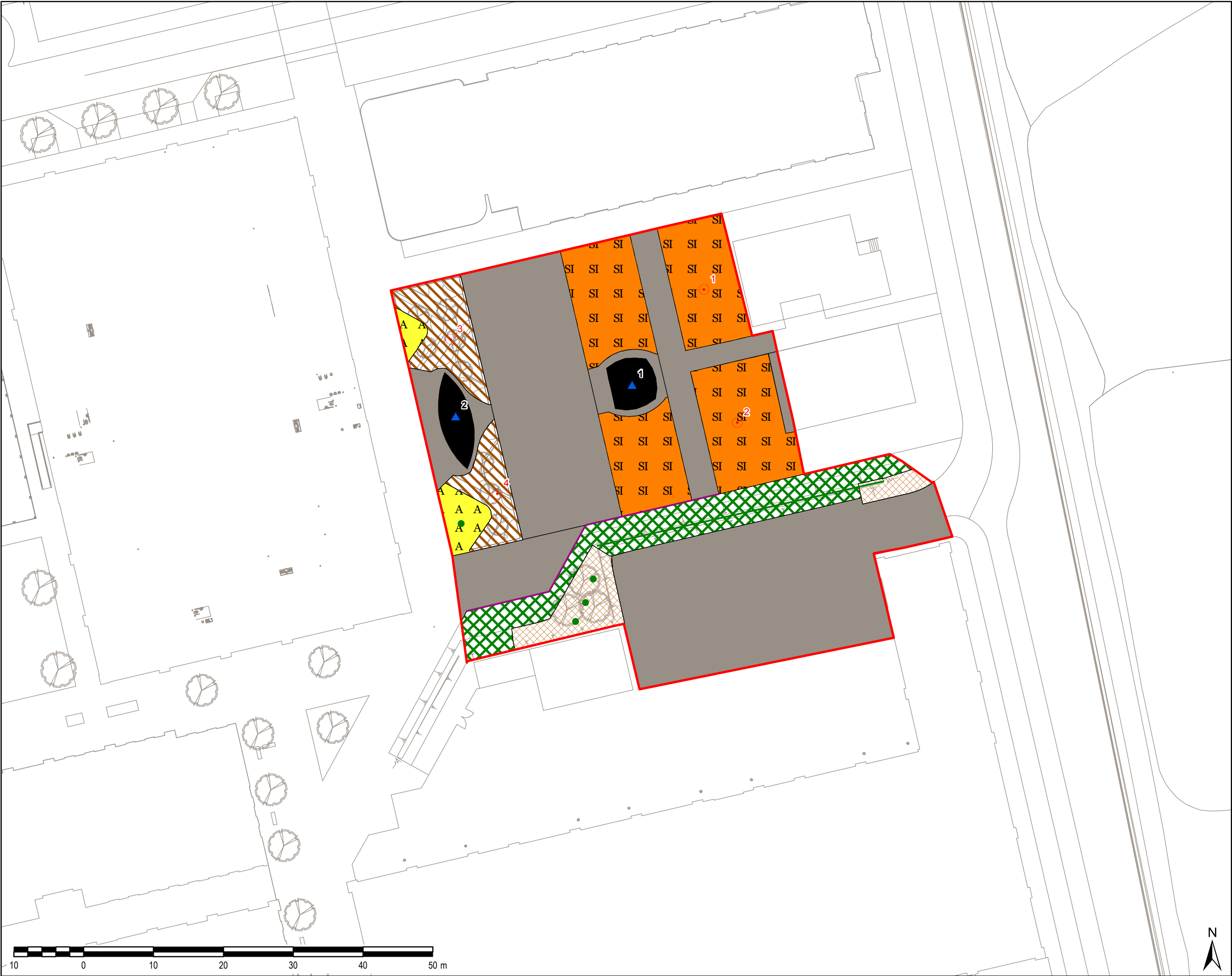
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Figure 1: Phase 1 Habitat Map



Appendix A Wildlife Legislation and Local Planning Policy

Legislation – Habitats

A variety of sites are designated in the UK, under Conventions, Directives and Regulations for their nature conservation importance and interest. The general aim of these designations is to conserve and protect ecological resources, as well as raising awareness and understanding. Other non-statutory sites are afforded some protection through local plans. The following outlines the most common statutory and non-statutory designations:

Designation	Brief Description
Special Areas of Conservation (SAC)	SACs are sites selected to conserve the natural habitat types and species of wild flora and fauna listed in the Annexes of the Habitats Directive (further information regarding the Habitats Directive is set out in more detail in the table below). They are the best areas to represent the range and variety of habitats and species within the European Union (EU).
Special Protection Area (SPA)	SPAs are strictly protected sites for the most important habitats for rare and migratory birds within the EU classified in accordance with Article 4 of the Birds Directive information regarding the Birds Directive is set out in more detail in the table below).
Ramsar Sites	Ramsar Sites are wetlands of international importance. Ramsar Sites are protected, through the planning system, under the Wildlife and Countryside Act 1981 (as amended), and the Countryside and Rights of Way Act 2000 through their notification as SSSIs and through other regulatory systems addressing water, soil and air quality.
National Nature Reserve (NNR)	NNRs are nationally important areas of wildlife habitat and geological formations in Britain. NNRs are designated and protected under the National Parks and Access to the Countryside Act 1949 and the Wildlife and Countryside Act 1981 (as amended). They receive additional protection under the Countryside and Rights of Way Act 2000. They are managed for the benefit of nature conservation.
Site of Special Scientific Interest (SSSI)	A SSSI is a site of at least national importance for nature conservation designated under the Wildlife and Countryside Act 1981 (as amended) due to its special interest in terms of flora, fauna or geological or physiographical features. Protection afforded to SSSI's was strengthened by the Countryside and Rights of Way Act 2000. It should be noted that under the Countryside and Rights of Way Act 2000 owners of SSSIs must give Natural Resources Wales (NRW) written notice before they begin any of the operations listed in the notification as likely to damage the special interest features, or if they allow others to carry out these activities. None of the listed operations can be carried out without NRW's consent.
County Wildlife Site (Local site)	A County Wildlife Site is a non-statutory site designated by a local authority as being of local nature conservation value.
Ancient Woodland Inventory	Ancient Woodland is a term applied to woodlands which have existed from at least Medieval times to the present without ever having been cleared for uses other than wood or timber production. A convenient date used to separate ancient and secondary woodland is about the year 1600. In special circumstances semi-natural woods of post-1600 but pre-1900 origin are also included.
Wildlife Trust Reserve	These non-statutory sites are managed by the Wildlife Trusts with

Designation

Brief Description

the purpose of conserving wildlife.

Legislation – Protected Species

In addition to habitats, a number of species have been afforded protection through international/European and national law. Other species are considered to contribute to our 'quality of life'. Although these species do not benefit from legal protection, they can be material considerations in the planning process. The table below outlines the key forms of protection afforded to species. The Countryside and Rights of Way Act, the Wildlife and Countryside Act 1981 (as amended), The Protection of Badgers Act 1992 and the Conservation of Habitats and Species Regulations 2018 are the main legislative framework for protection of wild animals in the UK. Schedule 1 of the Wildlife and Countryside Act 1981 (as amended) covers birds, Schedule 5 covers other animals and Schedule 8 covers plants.

Species including bats, otters and great crested newts are listed under Schedule 2 of the Conservation of Habitats and Species Regulations 2018. Badgers are protected under their own Act: The Protection of Badgers Act 1992. Activities affecting protected species must usually be conducted under licence obtained from the appropriate body (in Wales, this is Natural Resources Wales).

Developers must be able to show that all reasonable measures have been taken to ensure that protected species are not subject to disturbance. The habitats which regularly support the Conservation of Habitats and Species Regulations 2018 Schedule 2 species, the Wildlife and Countryside Act 1981 (as amended) Schedule 1 species and some Wildlife and Countryside Act 1981 (as amended) Schedule 5 species are also protected from disturbance and destruction. Again, all reasonable precautions should be taken to ensure that this does not happen. The Countryside and Rights of Way Act 2000 has strengthened enforcement powers and introduced a new offence of "reckless disturbance" that applies to both protected sites and species. The table below provides a summary of the relevant legislation with regards to protected and priority species.

Designation

Brief Description

The Habitats Directive	The Habitats Directive 1992 (Directive 92/43/EEC sets out the legal framework requiring EU member states to protect habitat sites supporting vulnerable and protected species, as listed within the Directive. The need for an assessment of impacts on Natura 2000 sites (the collective name for European designated sites, including SPAs and SACs) is set out within Article 6 of the Directive. The Directive is transposed into UK law through the Conservation of Habitats and Species Regulations 2018 (the "Habitats Regulations") and the Wildlife & Countryside Act 1981 (as amended).
The Birds Directive	The Directive on the Conservation of Wild Birds (Directive 2009/147/EC (the codified version of Council Directive 79/409/EEC as amended)) provides a framework for the protection, management and control of all species of naturally occurring wild birds in the European territory of Member States, including the UK. The provisions of the Birds Directive are transposed into UK law by the Conservation of Habitats and Species Regulations, 2018 and the Wildlife & Countryside Act 1981 (as amended).
Wildlife and Countryside Act (1981) (as amended)	The Wildlife and Countryside Act 1981 (as amended) is the principal mechanism for the legislative protection of wildlife in Great Britain. This legislation is the means by which the Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention) and (partially) the Birds Directive and the Habitats Directive are implemented in the UK. The Countryside and Rights of Way Act 2000 has strengthened this legal protection (see below). A small number of plant species are listed under Schedule 9 of the Wildlife and Countryside Act 1981, as amended, which includes species such as Japanese knotweed (<i>Reynoutria japonica</i>), Himalayan balsam (<i>Impatiens glandulifera</i>), montbretia (<i>Crococsmia x crocosmiiflora</i>), giant hogweed (<i>Heracleum</i>

Designation	Brief Description
	mantegazzianum) and some cotoneaster species (Cotoneaster sp.). It is illegal to plant or to cause these plants to grow in the wild, and legal disposal methods for vegetation and soil subject to disturbance or clearance from a site must be used.
Convention on Biological Diversity and the Countryside and Rights of Way Act 2000	The Countryside and Rights of Way Act 2000 provides a statutory framework for biodiversity conservation. The Act places a duty on Government Departments and the National Assembly for Wales to have regard for the conservation of biodiversity and maintain lists of species and habitats for which conservation steps should be taken or promoted, in accordance with the Convention on Biological Diversity. Schedule 9 of the Act amends SSSI provisions of the Wildlife and Countryside Act 1981, including provisions to change SSSIs and providing increased powers for their protection and management. The provisions extend powers for entering into management agreements; place a duty on public bodies to further the conservation and enhancement of SSSIs; increases penalties on conviction where the provisions are breached; and introduce a new offence whereby third parties can be convicted for damaging SSSIs. Schedule 12 of the Act amends the species provisions of the Wildlife and Countryside Act 1981, strengthening the legal protection for threatened species. The provisions make certain offences 'arrestable' and create a new offence of reckless disturbance. The UK Biodiversity Action Plan (BAP) was published in 1994, and was the UK Government's response to the Convention on Biological Diversity (CBD), which the UK signed up to in 1992. It provides the framework for fulfilling the UK's responsibilities towards the Convention on Biological Diversity. Conservation of biodiversity (the variety of life on earth) is an essential element of sustainable development.
Environment (Wales) Act 2016	The Environment (Wales) Act puts in place the legislation needed to plan and manage Wales' natural resources in a more proactive, sustainable and joined-up way. Part 1 relates to the sustainable management of natural resources. This ensures that the way in which the use of and the impacts on natural resources do not result in long term decline. The aim is to sustainably manage natural resources in a way and rate that meets the needs of present and current generations without compromising the needs of future generations. The Act also contains at section 7, a duty for the Welsh Ministers prepare and publish a list of the living organisms and types of habitat which in their opinion are of principal importance for the purpose of maintaining and enhancing biodiversity in relation to Wales. This section replaces the duty in section 42 of the NERC Act 2006.

Local Planning Policy

The table below provides a summary of relevant local planning policies found in the Neath Port Talbot County Borough Council Local Development Plan 2011 – 2026 (adopted January 2016). For the precise wording of each specific policy please refer back to the source document (NPTCBC, 2016).

Planning Policy	Purpose / Relevant Sections
SP1 Climate Change	Likely increased flood risk will be taken into account and addressed by ensuring that there is greater resilience by avoiding development on land that is at risk from flooding in the first instance in accordance with the sequential approach set out in national guidance or in locations that could increase the risk of flooding elsewhere. The fragmentation of habitats will be minimised and opportunities made for habitat and species change and migration where possible.
SP14 The Countryside and	The countryside and undeveloped coast, including landscapes, seascapes and

Planning Policy	Purpose / Relevant Sections
the Undeveloped Coast	agricultural land, will be protected and where feasible enhanced through the following measures: 1. The protection of the open countryside through the control of inappropriate development outside settlement limits; 2. The protection of the undeveloped coast through the control of inappropriate development; 3. The designation and protection of Special Landscape Areas; 4. The designation and protection of Green Wedges.
SP15 Biodiversity and Geodiversity	Important habitats, species and sites of geological interest will be protected, conserved, enhanced and managed through the following measures: 1. The identification of the following Internationally and Nationally designated sites within the County Borough to enable their protection: (a) Special Areas of Conservation (SACs) and Ramsar Sites; (b) Sites of Special Scientific Interest (SSSIs); (c) National Nature Reserves (NNRs). 2. The identification and protection of sites of regional and local importance; 3. The protection of important natural heritage features.
EN6 Important Biodiversity and Geodiversity Sites	Development proposals that would affect Regionally Important Geodiversity Sites (RIGS), Local Nature Reserves (LNRs), Sites of Interest for Nature Conservation (SINCs), sites meeting SINC criteria or sites supporting Local Biodiversity Action Plan (LBAP) or S42 habitats or species will only be permitted where: 1. They conserve and where possible enhance the natural heritage importance of the site; or 2. The development could not reasonably be located elsewhere, and the benefits of the development outweigh the natural heritage importance of the site. Mitigation and/or compensation measures will need to be agreed where adverse effects are unavoidable.
EN7 Important Natural Features	Development proposals that would adversely affect ecologically or visually important natural features such as trees, woodlands, hedgerows / field boundaries, watercourses or ponds will only be permitted where: 1. Full account has been taken of the relevant features in the design of the development, with measures put in place to ensure that they are retained and protected wherever possible; or 2. The biodiversity value and role of the relevant feature has been taken into account and where removal is unavoidable, mitigation measures are agreed.
SP16 Environmental Protection	Air, water and ground quality and the environment generally will be protected and where feasible improved through the following measures: 1. Ensuring that proposals have no significant adverse effects on water, ground or air quality and do not significantly increase pollution levels; 2. Giving preference to the development of brownfield sites over greenfield sites where appropriate and deliverable; 3. Ensuring that developments do not increase the number of people exposed to significant levels of pollution.
EN8 Pollution and Land Stability	Proposals which would be likely to have an unacceptable adverse effect on health, biodiversity and/or local amenity or would expose people to unacceptable risk due to the following will not be permitted: • Air pollution; • Noise pollution; • Light pollution; • Contamination;

Planning Policy	Purpose / Relevant Sections
	• Land instability; • Water (including groundwater) pollution. Proposals which would create new problems or exacerbate existing problems detailed above will not be acceptable unless mitigation measures are included to reduce the risk of harm to public health, biodiversity and/or local amenity to an acceptable level.
W3 Waste Management in New Development	Proposals for new built development will need to demonstrate that provision is made for the design, layout, storage and management of the waste generated by the development both during the construction phase and occupation. The following proposals will be required to produce Site Waste Management Plans: (a) Residential development for 50 or more dwellings; (b) Industrial or commercial development that would generate in excess of 1,000 tonnes of waste per annum; (c) Development that would generate hazardous waste.

Appendix B Target Notes

Target Note	Description
1	Early successional habitat of self-setting seeds on gravel substrate.
2	Early successional habitat of self-seeding species on gravel substrate.
3	'Wet' native species planting.
4	Native species planting.
5	Kidney vetch with 'blue' butterfly

Appendix C Site Photographs



Photograph 1: Semi-improved grassland.



Photograph 2: Semi-improved grassland.



Photograph 3: Ephemeral short perennial.



Photograph 4: Ephemeral short perennial.



Photograph 5: Native species planting and scattered trees.
With surrounding areas of hardstanding and Building 1 (cycle store) with green roof.



Photograph 6: Native species planting.



Photograph 7: 'Wet' native species planting.



Photograph 8: Species-poor hedgerow with adjacent mown poor semi-improved grassland strip, and semi improved grassland. .



Photograph 9: Hard standing gravelled area adjacent to poor semi-improved grassland.



Photograph 10: Hard standing concrete area.



Photograph 11: Stone wall at the base of Building 2



Photograph 12: Building 2 with green roof. Building used for management of Crymlyn Bog SSSI



Photograph 13: Semi-improved grassland.



Photograph 14: Semi-improved grassland., paving and Building 2

Appendix D: Planting List for 'Flora Industria'

BS10M Coastal Areas 80/20 Wildflower Meadow

bostonSEEDS

BS10M contains nineteen native British wildflowers and grasses typically found in coastal meadows.

Consisting of 80% grass and 20% wildflowers, BS10M creates a permanent meadow with flowers from May to October. Suitable for creating habitats in coastal areas, sandy or stony loams, calcareous loams and moderately saline soils.

BS10M supports bees, butterflies and other pollinators as 89% of the wildflowers included in this mixture are recommended by the Royal Horticultural Society (RHS) as 'Perfect for Pollinators'.



Mixture Contents:

Common Name	Latin Name	Quantity	Flowers	Height	Type
1 Bedstraw, Lady's	Galium verum	1.2%	Jun - Sep	50 - 80cm	Perennial
2 Campion, Bladder	Silene vulgaris	0.8%	May - Sep	25 - 60cm	Perennial
3 Carrot, Wild	Daucus carota	1.2%	Jun - Oct	30 - 100cm	Perennial
4 Cat's-ear, Common	Hypochaeris radicata	0.4%	Jun - Oct	15 - 50cm	Perennial
5 Clover, Haresfoot	Trifolium arvense	2%	Jul - Sep	10 - 30cm	Annual
6 Daisy, Ox-eye	Leucanthemum vulgare	1.2%	May - Sep	20 - 100cm	Perennial
7 Evening-primrose	Oenothera biennis	1%	Jun - Oct	60 - 100cm	Biennial
8 Goat's-beard	Tragopogon pratensis	1%	Jun - Sep	20 - 60cm	Biennial
9 Knapweed, Common	Centaurea nigra	2%	Jun - Sep	30 - 80cm	Perennial
10 Knapweed, Greater	Centaurea scabiosa	1.2%	Jun - Sep	50 - 90cm	Perennial
11 Marigold, Corn	Chrysanthemum segetum	0.6%	Jun - Oct	30 - 50cm	Annual
12 Poppy, Common	Papaver rhoeas	0.6%	May - Jul	50 - 70cm	Annual
13 St John's-wort, Common	Hypericum perforatum	0.8%	Jun - Sep	30 - 90cm	Perennial
14 Toadflax, Common	Linaria vulgaris	0.8%	Jun - Oct	30 - 90cm	Perennial
15 Trefoil, Bird's-foot	Lotus corniculatus	1.2%	Jun - Aug	10 - 40cm	Perennial
16 Vetch, Kidney	Anthyllis vulneraria	1.6%	May - Oct	15 - 50cm	Perennial
17 Viper's Bugloss	Echium vulgare	0.6%	May - Oct	50 - 100cm	Biennial
18 Yarrow	Achillea millefolium	0.8%	Jun - Oct	20 - 100cm	Perennial
19 Yellow-rattle	Rhinanthus minor	1%	Jun - Sep	25 - 50cm	Annual
Bent, Common	Agrostis castellana	4%		50 - 100cm	Grass
Bent, Creeping	Agrostis stolonifera	4%		40 - 100cm	Grass
Fescue, Sheeps	Festuca ovina	22.4%		15 - 50cm	Grass
Fescue, Slender Creeping Red	Festuca rubra, litoralis	28%		10 - 20cm	Grass
Saltmarsh Grass	Piccinellia maritima	4%		40 - 80cm	Grass
Meadow Grass, Smooth Stalked	Poa pratensis	8%		30 - 90cm	Grass
Timothy, Small Leaved	Phleum pratense ssp Bertolinii	9.6%		50 - 100cm	Grass

Contains:



Sowing Rate: 5g/sqm

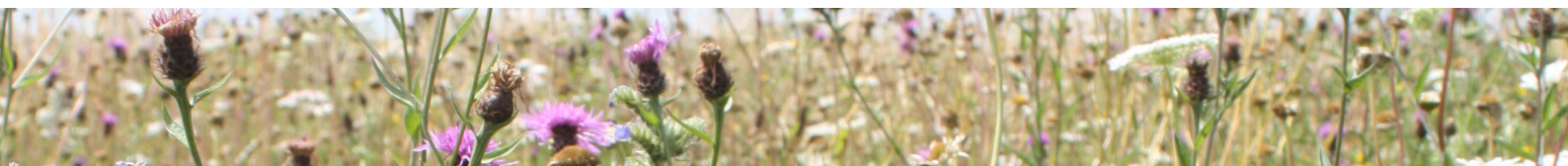
Wildflower seed in Boston Seeds mixtures is of UK native origin.

The definition of UK native seed provided by Natural England is: *British native-origin seed refers to seed originally collected from wild populations in Great Britain (from sites with no known history of sowing of amenity or agricultural varieties) and either sown directly, or grown on as a field crop to provide further seed. It includes seed collected in 'green hay'. It excludes certified amenity or agricultural varieties of native species.*

Boston Seeds UK native wildflower seed is sourced in two ways:

- 1) Seed collections from the wild which are field sown or sown in modules before being field planted as spaced plants. These are then harvested and cleaned to increase seed germination, vigour and purity.
- 2) Meadow collections are taken with owner permission or under license if the meadow is within a registered area. These seeds are then processed to remove excessive admixture and graded so they can be used in measurable amounts in prescribed mixtures.

Contents of wildflower mixtures will vary according to seed and species availability



Prepare the Ground

BS10M Coastal Areas Wildflower Meadow seed mixture performs best in low nutrient soils, which haven't been heavily fertilised in the past. For best results sow into bare soil after clearing all existing plants and weeds from the area.

Cultivate the ground to a depth of 10cm to relieve compaction and create a fine level tilth, free from obstructions (to allow for mowing at a later stage). Finish the seedbed by treading or lightly rolling the area, so that it is firm enough to stand on without leaving indentations.

Where weeds have been prevalent, allow a flush of weeds to germinate and remove these before sowing. In areas of high fertility, it may be necessary to remove the topsoil and sow into the subsoil. High nutrient soils encourage weeds and fast growing grasses which may outcompete the wildflowers in this mixture.

For overseeding into existing grassland, use a pure wildflower seed mixture such as BS10P or BSRE.

Sowing

BS10M should be sown between March and November. Spring and autumn provide ideal conditions as moisture and warmth are in good supply.

Distribute seed with a handheld or pedestrian spreader, at the recommended sowing rate of 5g/sqm. Mix the wildflower seeds with an inert carrier (such as sharp sand), at a ratio of four parts sand to one part seed (by weight). This makes it easier to achieve an even distribution and also provides a visual marker, making it easier to see any missed patches and avoid seeding areas twice.

Regularly mix the seed when sowing, as seeds will naturally separate due to variations in size and weight.

Once sown, ensure good 'seed to soil' contact by lightly raking to a depth of 0.5cm or rolling the area.

It is also possible to broadcast, drill or hydroseed this mixture for larger or hard to reach areas. However, broadcast spreading throws heavier seeds further so this may impact the distribution and when drilling, the seed must not be buried deeper than 0.7cm.

Sowing Rate

The sowing rate of 5g/sqm is designed to produce optimum results. Reducing the sowing rate is likely to result in invasion from weed species. Increasing the sowing rate generally leads to reduced diversity as the more aggressive species will outcompete slower growing plants.

Maintenance First Year

BS10M contains mainly perennial species, which can be slow to establish and are unlikely to flower in the first year. Therefore it is important to control weed and grass growth in year one.

During the first year remove any weeds which grow before they run to seed, either by topping, mowing or by hand for smaller areas. Weed growth is common due to the action of disturbing the ground (rather than being caused by contaminated seed mixtures).

The nurse grasses are the first to grow and require topping or mowing in March and again in May. Remove all clippings to ensure the grass canopy doesn't interfere with the germination and spring growth of the wildflowers.

In September / October cut the area to 10cm using a scythe, strimmer or mower, leaving the cuttings for up to a week before removing. This allows them to dry and shed seeds back into the soil. Mow or graze the re-growth through autumn/ winter and again in early spring if needed.

Second Year

After twelve months the sward should be well established. Simply follow the same cutting pattern (in March and September/October). Avoid cutting from mid spring to summer to ensure best flowering results.

As an ongoing process, observe and remove any weeds which invade the area.

Over time, some species within the mixture may become more dominant due to environmental factors and natural selection. To encourage diversity, simply reduce the number of dominant plants in order to restore the balance. In some areas with more dominant grasses, it may be necessary to overseed occasionally with a pure wildflower mixture such as BS10P or BSRE to ensure the wildflowers remain competitive.



As members of Flora Locale, Boston Seeds follows a strict code of practice to ensure wildflower seed is of UK native origin and is harvested and grown responsibly to aid conservation and help protect native UK wild plants.



In BS10M 89% of the wildflower species included are recognised by the Royal Horticultural Society as supporting many of the 1500 species of pollinating insects across the UK.

Order Confirmation and Invoice

Order number: 277991

Date: 13th Apr 2018

Invoice address

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Telephone: 01792606014
Comments: Delivery for the attention of Ben
Sampson

Product	Quantity	Packsize	Price each	Ex VAT	VAT	Total
BS10M: Coastal Areas Wildflower Meadow Seeds	2	1 Kg	£38.33	£76.66	£15.33	£91.99
Agrimony, Hemp (Eupatorium cannabinum) Plant	1	25 Standard Plug Plants (40cc)	£18.75	£18.75	£3.75	£22.50
Bedstraw, Lady's (Galium verum) Plant	1	25 Standard Plug Plants (40cc)	£18.75	£18.75	£3.75	£22.50
Betony (Stachys officinalis) Plant	1	25 Standard Plug Plants (40cc)	£18.75	£18.75	£3.75	£22.50
Campion, Sea (Silene maritima) Plant	1	25 Standard Plug Plants (40cc)	£18.75	£18.75	£3.75	£22.50
Fleabane, Common (Pulicaria dysenterica) Plant	1	25 Standard Plug	£18.75	£18.75	£3.75	£22.50

		Plants (40cc)				
Foxglove, Wild (<i>Digitalis purpurea</i>) Plant	1	25 Standard Plug Plants (40cc)	£18.75	£18.75	£3.75	£22.50
Loosestrife, Purple (<i>Lythrum salicaria</i>) Plant	1	25 Standard Plug Plants (40cc)	£18.75	£18.75	£3.75	£22.50
Meadowsweet (<i>Filipendula ulmaria</i>) Plant	1	25 Standard Plug Plants (40cc)	£18.75	£18.75	£3.75	£22.50
Ragged Robin (<i>Lychnis flos-cuculi</i>) Plant	1	25 Standard Plug Plants (40cc)	£18.75	£18.75	£3.75	£22.50
Restharrow, Common (<i>Ononis repens</i>) Plant	1	25 Standard Plug Plants (40cc)	£18.75	£18.75	£3.75	£22.50
Scabious, Devil's-bit (<i>Succisa pratensis</i>) Plant	1	25 Standard Plug Plants (40cc)	£18.75	£18.75	£3.75	£22.50
Sneezewort (<i>Achillea ptarmica</i>) Plant	1	25 Standard Plug Plants (40cc)	£18.75	£18.75	£3.75	£22.50
Soapwort (<i>Saponaria officinalis</i>) Plant	1	25 Standard Plug Plants (40cc)	£18.75	£18.75	£3.75	£22.50

Teasel (Dipsacus fullonum) Plant	1	25 Standard Plug Plants (40cc)	£18.75	£18.75	£3.75	£22.50
Thyme, Wild (Thymus polytrichus) Plant	1	25 Standard Plug Plants (40cc)	£18.75	£18.75	£3.75	£22.50
Toadflax, Common (Linaria vulgaris) Plant	1	25 Standard Plug Plants (40cc)	£18.75	£18.75	£3.75	£22.50
Trefoil, Bird's-foot (Lotus corniculatus) Plant	1	25 Standard Plug Plants (40cc)	£18.75	£18.75	£3.75	£22.50
Vetch, Kidney (Anthyllis vulneraria) Plant	1	25 Standard Plug Plants (40cc)	£18.75	£18.75	£3.75	£22.50
UK Mainland, standard delivery (NEXT DAY where shown)	1		£4.50	£4.50	£0.90	£5.40

Total: £502.39

Payment received - Thank you
VAT Number: 789718944

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