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Ecological Impact Assessment

Land at Hampton Quay, Littlehampton

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Report Summary

1. The Ecology Co-op has been commissioned by Stolon Studio Ltd to undertake an Ecological Impact Assessment of a proposed development of land at Hampton Quay, Littlehampton. Phase 1 Habitat mapping of the site was undertaken in June 2019, and surveys for breeding birds, bat activity, reptile and water voles were undertaken between May and September 2019. Together with winter bird surveys between October 2019 and March 2020 these surveys provide baseline information for this assessment. This document presents the findings of these surveys, and an Ecological Impact Assessment in accordance with CIEEM Guidelines to inform an outline planning application for 105 residential units, 300-400sqm of commercial space, 250m of jetties and c32 leisure moorings, visitor drop-off and ferry/water taxi pontoon.
2. The site is located on the east bank of the River Arun approximately 1.7km north of the mouth at Littlehampton, West Sussex, and comprises an area of land containing scrub, ruderal vegetation and grassland mosaic including the sea wall, together with an area of intertidal mudflat and fringing saltmarsh habitat. Part of the site has been subject to a 'managed realignment' of the sea defences by the Environment Agency.
3. The most ecologically important feature of the site is the coastal saltmarsh habitats, which support a specialist plant community. This habitat is scarce on the River Arun and the examples contained within the site represent as much as 29% of the total extent of salt marsh priority habitat present along the River Arun. The terrestrial habitats contained by the site support a small population of common lizard, an assemblage of common breeding birds, and a drainage ditch running through the site supports water voles intermittently. Surveys revealed that the site is not important for foraging bats, and no notable invertebrate species were found. Wintering bird surveys have shown that the intertidal mudflat and saltmarsh supports only a small number of common and widespread shorebirds and gulls foraging at low tide and no significant high-tide roosts.
4. The proposed development involves the construction of five permanent buildings and associated parking, hard and soft landscaping. It includes floating pontoons and moorings along the River Arun frontage. In the absence of mitigation, there is potential for impacts upon all ecological receptors including damage to priority salt marsh habitat and intertidal mudflat, disturbance to wintering birds, harm to nesting birds, common lizard and water voles, together with the permanent loss of habitats for these species.
5. The scheme is designed to form a transition between the urban and natural environments; this reduces visual intrusion of the built environment. The floating pontoon has been repositioned into the river beyond low water and reduced in scale to avoid direct impacts on intertidal habitats and reduce disturbance to wintering shorebirds. Pre-construction mitigation is proposed to reduce the impacts on protected species to an acceptable level including trapping and translocation of common lizard and careful timing



of site clearance works to avoid nesting birds. The watercourse will be realigned and restored for the long-term benefit of water voles. On-going monitoring for this species will determine the need for licensed trapping and translocation to a pre-determined receptor site.



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1 INTRODUCTION

1.1 Background

The Ecology Co-op has been commissioned by Stolon Studio Ltd to undertake an Ecological Impact Assessment of a proposed development of land at Hampton Quay, Littlehampton, West Sussex, BN17 5RA. The central grid reference for the site is TQ 0154 0265. Figure 1 shows the boundary of the proposed development site and local context.

The site measures approximately 2.7 Ha and lies to the west of the coastal town of Littlehampton on the east bank of the River Arun, approximately 1.7km upstream of where it discharges into the English Channel. The A259 trunk road passes along the eastern boundary of the site, the planted embankment of which forms the site's eastern boundary. To the east of the A259 there is light industrial development, a retail park and residential development beyond, forming a highly urbanised landscape that extends eastwards into Littlehampton. Across the River Arun to the west, the land use is more rural with grazing marsh and arable farmland, intersected with drainage ditches and patches of scrub and trees.

The proposed development includes up to 105 residential units, 300-400sqm of commercial space and associated landscaping and infrastructure, along with c. 32 leisure moorings, visitor drop-off and a ferry/water taxi pontoon.

In June 2019, The Ecology Co-op undertook Phase 1 Habitat mapping of the site. From May-September 2019, specialist surveys were undertaken concerning the following species/groups of species in order to provide baseline ecological information for an Ecological Impact Assessment for the proposed development scheme;

- breeding birds,
- bat activity,
- common reptiles
- water voles

Winter bird surveys were undertaken between October 2019 and March 2020. The water vole survey of the site was repeated on 18th June 2020. This revised EcIA document replaces preceding versions and presents the findings of these surveys and updated impact assessment and mitigation proposals.

1.2 Purpose of this Report

This document brings together all the findings of the ecological baseline surveys and an ecological impact assessment for the proposed scheme.

The purpose of this report is to:

1. Present the results of baseline ecological surveys;
2. Identify and evaluate the most ecologically important features present on the site and within the zone of influence of the proposed development;
3. Describe the effects of the proposed development and determine the significance of



- impacts on these ecologically important features in terms of nature conservation;
4. Set out the proposed impact avoidance, mitigation, and compensation measures that will be undertaken to reduce these impacts to an acceptable level;
5. Finally, describe the habitat creation and enhancement measures that will be put into place during the development. These are designed to ensure that it contributes to both local and national biodiversity objectives.

This report is intended to be submitted as part of the outline planning application for the development. The surveys and report were carried out and produced at the request of Stolon Studio Ltd and supervised by Dan Bennett BSc, a full member of the Chartered Institute of Ecology and Environmental Management (MCIEEM).

1.3 Policy and Legislation

Legal protection applying to relevant bird, mammal, herpetofauna and invertebrate species and current nature conservation planning policy is outlined in Appendix 1 of this report.

Where possible, this report provides information on how the development proposal will be designed to meet the requirements of the National Planning Policy Framework (NPPF). Details of the NPPF is provided in Appendix 1.



Figure 1. An aerial image showing the location of the site and local context. The approximate site boundary is outlined in red. Images produced courtesy of Google maps (map data ©2019 Google).



1.4 Environment Agency Littlehampton -River Arun East Bank Flood Protection Scheme

The proposed development site was formerly part of the Environment Agency's Littlehampton – River Arun East Bank Flood Protection Scheme, which was constructed between 2013-15 and was aimed at upgrading the existing flood protection for Littlehampton to a 1 in 200 year standard along the eastern side of the River Arun from the harbour mouth to 500m upstream from the A259 bridge, using mainly steel sheet piling to replace existing in urban areas, and raising the existing earth bank and reinforcing the erosion protection on the seaward side on the more rural section upstream from the A259 (i.e. the southern part of the proposed development site). The area of the site landward of the raised embankment was formerly used by the Environment Agency as the construction compound and for materials storage.

Since the Environment Agency scheme resulted in small losses of intertidal mudflat, compensation was provided for by 'managed realignment' in the northern section by removing the embankment and setting back the new flood protection by reinforcing the highways embankment. The original earth embankment material was regraded to create a net gain of 0.75 ha of intertidal habitat. The establishment of saltmarsh habitat inside the created intertidal area of the managed realignment scheme was subject to a monitoring scheme by the Environment Agency in 2015, 2017 and 2019.

In advance of these works, the Environment Agency undertook protected species mitigation on the area of the managed realignment and construction compound. This included translocation of reptiles to a pre-determined receptor site, vegetation clearance outside of the breeding season for birds, and bat roost inspections of trees prior to felling¹.

2 SURVEY METHODOLOGY

The following sections describe the methods used in the desk study and protected species/habitat survey(s). All survey methods are in accordance with current best practice guidance for the respective species/taxonomic group and any limitations encountered during the survey are explained in Section 2.14.

This document is written in accordance with the CIEEM Guidelines for Ecological Impact Assessment² and CIEEM Guidelines for Ecological Report Writing³ Details of the ecological impact assessment methods are provided in Section 2.13.

¹Environment Agency (2013) *Littlehampton Arun East Bank Tidal Walls Flood Defence Scheme Environmental Statement: Non-technical Summary*. The Environment Agency, Horizon house, Deanery Road, Bristol BS1 5AH, available from: <http://publications.environmentagency.gov.uk>

² CIEEM (2018) *Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine*. Chartered Institute of Ecology and Environmental Management, Winchester.

³ CIEEM (2017) *Guidelines for Ecological Report Writing, 2nd edition*. Chartered Institute of Ecology and Environmental Management, Winchester.



2.1 Desk Studies

A search for existing records of protected species, species of conservation concern and invasive non-native species was requested from the Sussex biodiversity records centre (SxBRC) within a radius of 2km of the site.

A search of online mapping resources was undertaken to identify the location of any features of potential ecological interest including ponds within 500m (relevant to great crested newts), watercourses (relevant to riparian mammals and crayfish) and connectivity to woodland, scrub, and hedgerow networks (relevant to bats, dormice) in the wider landscape around the site. The connectivity of the site to these features, buildings, and other semi-natural habitats such as grassland and heathland are also relevant to bats, great crested newts and reptiles.

The MAGIC website resource (www.magic.gov.uk) was used to identify the location of statutory designated sites for nature conservation and granted EPS licences in relation to the survey site.

2.2 Phase 1 Habitat Survey

A site walkover survey was undertaken on 10th June 2019, during which the habitats contained within the site were described and evaluated in accordance with standard Phase 1 Habitat Survey Methodology⁴. All habitat types contained within the site, together with the dominant botanical species and indicators of important habitat types such as salt marsh, have simply been listed and described where identified.

A Phase 1 habitat survey presents a standardised system for classifying and mapping wildlife habitats in all parts of Great Britain, including urban areas. The aim of Phase 1 survey is to provide, relatively rapidly, a record of the vegetation and wildlife habitats present over large areas of countryside. The habitat classification is based principally on vegetation, augmented by reference to topographic and substrate features, particularly where vegetation is not the dominant component of the habitat.

Data was gathered through a site walk-over survey and use of online aerial photography to broadly categorise the habitats present using the JNCC Phase 1 classifications. The results are presented as a map showing the distribution of habitat categories across the site. Target notes are used to describe specific features of biodiversity interest and record indicator species where appropriate. In addition to this, priority habitats (Section 41 NERC Act 2006) are highlighted.

The Phase 1 Survey methodology is a recognised tool for initial scoping of potential ecological constraints and identifying potential impacts as part of the planning application process.

⁴ JNCC (2010) *Handbook for Phase 1 habitat survey: A technique for environmental audit*. Joint Nature Conservation Committee, Peterborough.



2.3 Badgers

Badgers tend to live in family groups with clearly defined territories with the main sett, used throughout the year, as a focal point. The territory often also contains a number of 'annex', 'subsidiary' and outlier setts that are used intermittently. Badgers can exist in a variety of habitats, but a mixed farmland landscape containing pasture and arable land, studded with woodland, scrub and hedgerows support the highest population density.

Evidence of badger activity was recorded during the Phase 1 habitat survey, during which surveyors searched for badger setts, latrines, foraging marks, footprints and worn pathways, and trapped hairs on fences, with special attention paid to linear features.

2.4 Bats

2.4.1 Natural Roost Features – Trees

Trees contained within the site were broadly assessed for their potential to support roosting bats and detailed surveys were undertaken as appropriate. The potential for roosting bats for each feature, or group of features was assessed as either negligible, low, moderate, or high, in accordance with the Bat Conservation Trust Survey Guidelines⁵.

2.4.2 Built Structures

There are two disused water treatment filter beds contained within the site comprising sealed concrete structures filled with a granular filter material. They are not suitable for roosting bats. There are no other existing buildings within the proposed development site that are potentially suitable for roosting bats and therefore no bat roost surveys were required.

2.4.3 Bat Activity Surveys – Walked Transects

Bat activity surveys followed best practice guidelines⁶. Five activity surveys were completed in 2019, Pre-determined transect routes were followed by two surveyors (Figure 2), focussing on all linear features within the site boundary (treelines, woodland edge and hedgerows). The transect routes were walked at a slow pace during the period from sunset to two hours after sunset by a team of surveyors, such that each part of the route was passed approximately every twenty minutes. All surveys were undertaken during weather conditions suitable for bat activity and at ambient temperatures above 10°C. The surveyors recorded bat activity using 'Echo Meter Touch' bat detectors featuring auto-identification of bat species and automatically triggered recording for later review. The locations of all bat 'registrations' was recorded onto a field map during the survey to correspond with all sound recordings.

These were led by Natural England Level 2 class bat licence holders; Owen Crawshaw, Paul Whitby, Nick Gray and Daniel Bennett.

⁵ Collins, J.(ed.) (2016) *Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd edn)*. The Bat Conservation Trust, London.



2.4.4 Bat Activity Surveys – Automated Static Bat Detecting

One Elekon Batlogger A+ static bat detector was deployed east of the northern section of the ditch on the 10th to the 16th of June 2019 (see figure 2).

The static bat detector was left in the field for at least five days; the expected maximum lifetime of the battery. Static bat detectors comprise a passive recording device with real-time full-spectrum calls that can be viewed in detail once downloaded on analysis software, allowing accurate identification of most bat calls to species level (or genus level in the case of *Myotis* and *Plecotus* spp.).

The walked transect and static bat detector ('bat logger') survey methods complement each other with the transect surveys providing information on foraging and commuting patterns, and distribution across the site, and automated static detector surveys giving more prolonged coverage through consecutive nights, thus increasing the likelihood of detecting scarce species.



Figure 2. Map of bat transect route walked (shown as red dashes) during bat activity surveys around the site. The red star indicates the location of the bat logger deployment deployed on the 10th to the 16th of June 2019. Images produced courtesy of Google maps (map data ©2019 Google).



2.5 Breeding Birds

The method used for the breeding bird survey was adapted from the Breeding Bird Survey (BBS) methodology, designed by the British Trust for Ornithology (BTO)⁶ as an accessible means of monitoring British bird population trends over the UK using volunteers. Three survey visits have been undertaken to provide a representative 'snapshot' of the bird assemblages present at the site during one survey season.

A pre-determined transect was walked slowly on each visit (Figure 3), during which the observer recorded all birds encountered. As recommended in the BTO guidelines, all bird survey visits were carried out between 6am and 11am and were only undertaken during favourable weather conditions for bird activity with periods of persistent or heavy rain, high winds or fog avoided. The transect route was walked at a constant slow pace by a competent bird observer, recording all birds detected either by sight or calls/song. Notes regarding the behaviour of birds identified were made, to determine their breeding status. Birds were said to be 'confirmed as breeding' if they were observed carrying nesting material, food or faecal pellets; or nests, eggs, or recently fledged young were discovered. Birds were recorded as 'likely breeding' if observed singing or displaying, repeatedly visiting the same locations and showing agitated or distraction behaviour. Each bird 'registration' was recorded on a field map of the survey site using standard BTO Common Birds Census (CBC) notation, which includes behaviours and flight movements.

2.6 Wintering Bird Surveys

A field survey of the bird assemblages comprising one high-tide and one low-tide count per month of all intertidal habitat contained within the site and on the adjacent River Arun between October 2019 and March 2020 inclusive. The survey visits were completed within the period 1.5hrs before and after low or high tide times. The dates of surveys were dependant on suitable tides during daylight hours and were made at various points during the monthly spring-neap tidal cycle to account for changes in the distribution of birds in response to this cycle. Since there was a limited number of survey 'windows' in each month period, the survey visits were undertaken across a range of weather conditions, although extreme high winds and heavy rain were avoided since accurate bird observation becomes difficult under these conditions.

During each visit, the same route was walked, and vantage points visited. All birds observed were recorded onto field maps in their approximate locations using standard BTO two-letter codes, thus providing a 'snapshot' of the distribution of birds at that time. The general behaviour of birds/bird groups was also recorded under the following categories: foraging (f), roosting (r), loafing (l) and flying (arrowed direction).

⁶ <https://www.bto.org/about-birds/birdtrends/2018/methods/breeding-bird-survey>



The data was used to generate peak counts for high and low tides across the winter season for each part of the site. Weather conditions and any human disturbance/activity observed was noted during each survey visit.

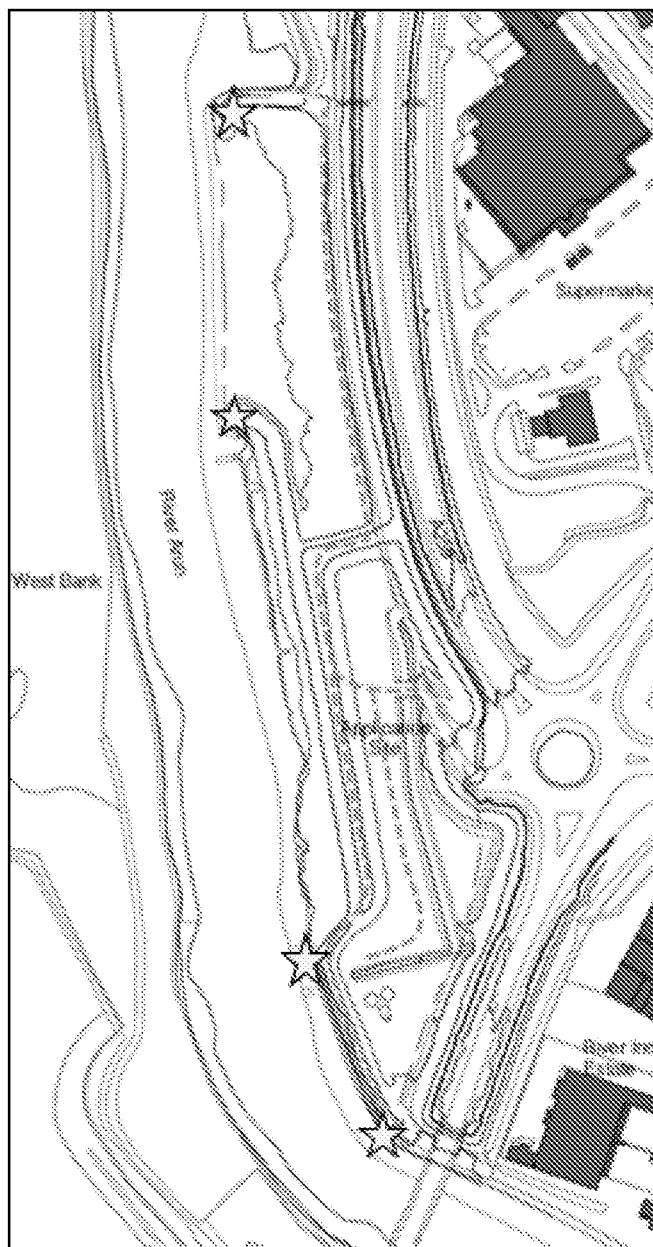


Figure 3. Map of breeding bird transect route walked (shown as blue dashes). The yellow stars indicate winter bird survey vantage points.

2.7 Common Dormice

Common dormice are typically associated with broadleaved woodland habitat, hedgerows and scrub. They tend to occur at low density and good habitat connectivity is important. Common dormice need a constant supply of food throughout the active season over a large home range. A diversity of tree and shrub species will provide a range of fruit, nuts and insects. They hibernate during the winter typically



at ground level amongst leaf litter and mosses protected by coppice stools, tree stumps or piles of brash wood. The site was broadly assessed for its potential to support hazel dormouse. This included use of on-line mapping resources to assess the surrounding area for connectivity to large blocks of woodland, scrub and extensive hedgerow networks. Further surveys are recommended as appropriate in accordance with best practice guidance⁷.

2.8 Great Crested Newts

Great crested newts require ponds for breeding that meet a series of habitat criteria including good quality water, aquatic plants and an absence of predatory fish. The ponds must have good connectivity to semi-natural terrestrial habitats that provide their invertebrate food sources and suitable safe places to rest and hibernate outside the breeding season. Great crested newts tend to occur more frequently in areas of high pond density across the landscape in 'metapopulations' where habitat occupancy ebbs and flows according to changes in conditions.

A desk study was undertaken to identify ponds and wet ditches within 500m of the site that might support breeding great crested newts. Where access permission was granted, or ponds could be viewed from public roads or footpaths, the ponds were assessed for their potential to support great crested newts using the Habitat Suitability Index (HSI)⁸. The value of the site for terrestrially foraging great crested newts and any features that might be used by hibernating newts has also been assessed.

2.9 Reptiles

The common lizard *Zootoca vivipara*, slow-worm *Anguis fragilis* grass snake *Natrix helvetica* and adder *Vipera berus* are widespread species that can be found in many semi-natural habitats, such as rough grassland, scrub, heathland and open woodland where there is good vegetation cover, an abundance of invertebrate, amphibian or small mammal prey and areas of open ground for basking.

Standard reptile presence/likely absence surveys involve setting out artificial refugia (reptile 'mats' or 'tins') in potentially suitable habitat. Reptile mats are pieces of roofing bitumen felt and reptile tins are pieces of corrugated metal sheet approximately 0.5 m x 0.5 m in size, which absorb heat from the sun more rapidly than the surrounding vegetation and provide cover and basking places attractive to reptiles. These are then checked for presence of animals under suitable weather conditions. They are placed in areas of potentially suitable habitat at an approximate density of 20 per ha, or 20 m apart along linear features. There are no up-to-date best practice guidelines for reptile surveys, but a minimum of seven survey visits under suitable weather conditions is generally considered to be adequate when determining their presence/likely absence, and 15–20 visits are used to calculate a 'peak count' for population size class assessment.

⁷ Bright, P., Morris, P. and Mitchell-Jones, T. (2006) *The dormouse conservation handbook 2nd Ed.* English Nature, Peterborough.

⁸ Oldham, R.S., Keeble, J., Swan, M.J.S. and Jeffcote, M. (2000) *Evaluating the suitability of habitat for the great crested newt (Triturus cristatus)*. Herpetological Journal 10, 143-155.



A presence/absence survey was completed between July and September 2019. During this a total of 34 roofing felt mats were used in this survey (see Figure 3). The mats were left *in situ* for a minimum of one week to 'bed in' and allow reptiles to locate them before the first check. The mats were checked at least seven times and all observations of reptiles were recorded, together with the weather conditions, temperature and time of day.



Figure 3. The location of reptile refuges (identified with red dots). Images produced courtesy of Google maps (map data ©2019 Google).



2.10 Water Voles

Water voles *Arvicola amphibius* inhabit a range of riparian habitats including slow-moving rivers, drainage ditches, streams, lakes, ponds, canals, reedbeds and upland streams and bogs. Water voles typically require steep earth banks for digging burrows (although they can weave nests in reedbeds), and dense bankside/emergent vegetation for food and cover from predators. Water voles leave characteristic field-signs of their presence including burrows into banksides, grazed 'lawns', and caches of chopped segments of emergent vegetation ('food piles'). The most reliable field sign for water voles are latrines containing distinctive droppings.

The application site contains one drainage ditch south-east of the site. While this ditch is not directly connected to a wider ditch network (it is culverted at both ends), there is a much more extensive ditch network and grazing marshes nearby to the north that may support an extensive water vole population. A walkover survey of the drainage ditch contained within the proposed development site was carried out on the 29th of July 2019. This involved walking along the ditch and searching bankside vegetation for field-signs in accordance with current best practice guidance⁹. This was repeated on 18th June 2020 to update on survey information together with a local search to find suitable receptor sites, should the need arise.

2.11 Other Notable Species

The site's habitats were broadly assessed for their potential to support species of principal importance for nature conservation 'priority species' (Section 41 Natural Environment and Rural Communities (NERC) Act 2006) and other notable species.

A thorough search of all tall grassland and reedbed habitat contained within the site for harvest mouse *Micromys minutus* nests were undertaken in December. The late autumn and early winter period are considered to be the most suitable time for this survey, as it follows the peak in the population of this species and nests are more easily found. The survey was led by Paul Whitby, an experienced surveyor trained in harvest mouse surveys.

The site was broadly assessed for its potential to support important invertebrate assemblages with specific attention paid to features such as standing deadwood, wet flushes, bare earth banks and botanically rich areas. This included a walkover survey on 24th June 2019, during which insects that are readily identified such as butterflies, bumblebees and grasshoppers were recorded, and a selection of hoverflies, beetles and other insects were taken as specimens to identify later. The main purpose of this work was to gain an understanding of the overall importance of the site for its invertebrate assemblage rather than obtain a comprehensive inventory of all species present.

⁹ Dean, M., Strachan, R., Gow, D. and Andrews, R. (2016). *The Water Vole Mitigation Handbook (The Mammal Society Mitigation Guidance Series)*. Eds. Fiona Mathews and Paul Chanin. The Mammal Society, London.



2.12 Invasive Non-native Species

No specific surveys for invasive non-native species (INNS) were undertaken. However, the presence of any invasive non-native species encountered during the course of other fieldwork, was recorded.

2.13 Impact Assessment Methodology and Mitigation

The assessment of ecological impacts and mitigation recommendations in this report follow CIEEM Guidelines for Ecological Impact Assessment (EclA)². This involves evaluating the importance of an 'ecological feature' (habitat, vegetation community, population of a single species or assemblages of species) in terms of nature conservation priority, followed by the application of the 'Mitigation hierarchy'.

2.13.1 Importance of Ecological Features

A level of importance was assigned to all existing ecological features, through consideration of the rarity and distribution of a habitat or species, the population size, ecological function, and trends (declining/expanding), together with any designations, legal status, or conservation policies. CIEEM recommend that the importance of an ecological feature, in terms of nature conservation priority, should be considered within a defined geographical context (for definitions used by The Ecology Co-op, see Appendix 2):

- international and European;
- national;
- regional
- county;
- local or parish and
- site/negligible.

Where protected species are present and there is the potential for a breach of the legislation as a result of the development proposals, those species are considered as 'important' features and included in the EclA. However, the level of importance assigned to the affected population of a protected species will vary depending on contextual information about the population size, distribution, abundance and trends across the range of geographical scales.

Similarly, irreplaceable habitats such as ancient broadleaved woodland are considered as 'important' features and included in the EclA. The level of importance will vary depending on the size of the habitat parcel, its distribution and abundance at different geographical scales.

Features that are considered to be important at site level only, or are of negligible importance, (such as paved ground or amenity grassland) are excluded from this EclA and it should be reasonable to assume that if a feature is not mentioned, it is not ecologically important.

2.13.2 Significance of Impacts and Effects

In accordance with EclA (CIEEM 2018)², a significant effect is defined as "an effect that either supports or undermines biodiversity conservation objectives for important ecological features". Conservation



objectives may be specific (e.g. for a designated site) or broad (e.g. national/local nature conservation policy). The effects may be described as significant at a range of geographic scales as defined above.

The impacts are identified and described in relation to the following characteristics:

- *Adverse or positive* – does the impact result in the loss or gain in biodiversity/quality of the environment?
- *Extent, magnitude* – the spatial area over which the impact may occur, the area of habitat lost, or the number of individuals/populations affected.
- *Timing* – in relation to the life cycle of the ecological feature (e.g. nesting bird season)
- *Duration, frequency* – is the impact temporary or permanent, frequently repeated or a one-off event?
- *Reversibility* – is the impact temporary or permanent? Would the ecological feature recover after the impact?
- *Cumulative impacts* – in combination with other plans/projects

This report has only sought to describe in detail the impacts that are likely to be significant. Impacts that are either unlikely to occur, or if they did occur are unlikely to have a significant effect have been discounted or 'scoped out' at an earlier stage. Effects on the conservation status of ecological features are only assessed in detail if they have a high enough value (local or above) and impacts upon them may be a material consideration in decision-making in terms of legislation and planning policy. Impacts on features below local value are categorised as of neutral significance and are not considered further. However, where it has not been possible to robustly conclude that there is no significant effects (due to insufficient survey data or scientific research for example), then the precautionary principle will be applied and a significant effect is assumed.

2.13.3 The 'Mitigation Hierarchy'

The assessment of the significance of an impact is made initially in the absence of mitigation. This is followed by a sequential process of determining the most appropriate way to remove or minimise significant impacts and effects. The preferred option is to avoid impacts in the first place, for example by redesigning the scheme to retain an important area of habitat, or timing works sensitively. Mitigation measures such as translocation or displacement of populations is only applied as a last resort where significant impacts and effects are unavoidable.

When residual significant adverse impacts and effects remain after all practicable measures to avoid and/or minimise these have been applied, compensation measures are required. Compensation measures include habitat creation in alternative locations that offset unavoidable habitat loss.

Finally, enhancements are proposed that do not relate to a specific impact and effect but provide net gains in biodiversity – taking advantage of opportunities in the design and operation of the development. These measures are intended to ensure that the proposed development contribute towards national and local biodiversity objectives.



2.14 Constraints/Limitations to Surveys

Surveys record any flora or fauna that is present at the time of the survey visits. It is therefore possible that some species may not have been present during the survey but may be evident at other times of the year and may appear or disappear from the site if habitat conditions change. For this reason, the surveys are considered valid for up to eighteen months for badgers and bats, two years for reptiles and three years for great crested newts and dormice. If the habitat conditions change significantly in the intervening period, then it is recommended that the surveys be updated.

During the survey period, there was some interference with the reptile mats with several removed and threatening signs left at the site. While efforts were made to improve on security at the site, and reptile mats were replaced, using automatic bat detectors on the site was subsequently deemed to be too risky and therefore only one deployment was made. Based on the low level of bat activity recorded during walked transects, this is unlikely to represent a significant limitation.

The breeding bird surveys visits were completed on the 23rd May 6th June and 24th June 2019. While these dates are relatively late in the season for breeding birds, given the habitat types present, it is unlikely that earlier nesting species would have been overlooked.

The best practice guidance on water vole surveys recommends that searches for evidence of water voles is undertaken on two separate visits in spring and autumn. Due to timing constraints, this was not undertaken, but given that the presence of water voles was confirmed based on one survey visit, this does not represent a significant limitation to the survey findings. Water vole surveys were repeated in summer 2020 to update the findings.

3 ECOLOGICAL BASELINE

3.1 Designated Sites

There are two statutory and three non-statutory designated sites within a 2km radius of the application site, however none of these lie within or adjacent to it. These are listed in Table 1 and their locations are shown in Figures 4 and 5. All sites apart from the Designated Roadside Verge are located more than 1km away from the application site.

The 'priority habitats' listed on Section 41 of the NERC Act (2006) that are identified on MAGiC maps within 2km are shown on Figure 6. Of these, the most important observation is that the saltmarsh habitat shown within the boundary of the application site represents the largest extent of this habitat type (0.404 Ha) within the lower reaches of the river (i.e. downstream from Arundel). This represents 29% of the total area of coastal salt marsh priority habitat on the River Arun, as recognized by the Environment Agency¹⁰.

¹⁰ Based on an online search of the Magic maps resource accessed on 21 July 2019. Habitats/ Coastal/ coastal saltmarsh; details of each habitat parcel including area measurement are available by pressing the 'information'



It is important to note that these figures are based on mapping data that pre-dates the Environment Agency's "Littlehampton Arun East Bank Tidal Walls Flood Defence Scheme", in which part of the sea wall was realigned to recreate intertidal habitats at the northern end of the proposed development site. The coastal salt marsh developing as a result of this scheme is therefore not accounted for in the above calculation. The current condition of this recently created intertidal zone is described in Section 4.2 (habitats section) of this report. The application site contains no other priority habitats as identified by Magic maps.

There are no granted EPS licences for mitigation projects within 1km of the site boundaries. The closest EPS licence to the site concerns the destruction of a common pipistrelle resting place, 1.5km south-east, dated 01/04/17 – 30/04/18.

Table 1. Designated sites within 2km of Hampton Quay, Littlehampton

	Site name	Designation	Features listed on citation	Proximity
Statutory Designated Sites				
1.	Climping Beach	Site of Special Scientific Interest (SSSI)	The site is a stretch of coast with a vegetated shingle beach, behind which is a sand dune system. The intertidal zone supports important populations of wintering birds and the numbers of wintering sanderling, in particular, are of European significance.	1.4km south
2.	West Beach	Local Nature Reserve (LNR)	The West Beach LNR is part of the Climping Beach Site of Special Scientific Interest (SSSI), and includes sand flats, the tide line, shingle and sand dunes.	1.5km south-east
Non-statutory Designated Site				
1.	Littlehampton Golf Course & Atherington Beach	Local Wildlife Site (LWS)	Littlehampton Golf Course is of outstanding importance botanically, with areas of species-rich turf, dry dune and vegetated shingle beach. Several rare plants occur here, including Sea-holly <i>Eryngium maritimum</i> . It is the only site in West Sussex for two very rare plants, Sand Catchfly <i>Silene conica</i> and Nottingham Catchfly <i>Silene nutans</i> .	1km south-east
2.	Climping Sand Dune System	Local Geological Site (LGS)	One of the few good sand dune systems preserved in Sussex. About 1.3km long and up to 70m wide. The highest dunes are in a fenced area at the eastern end.	1.4km south
3.	Eldon Way	Designated Road Verge (DRV)	Details of this road verge were not available from SxBRC.	0.2km north-east and 0.3km north-east

button. <https://magic.defra.gov.uk/MagicMap.aspx>

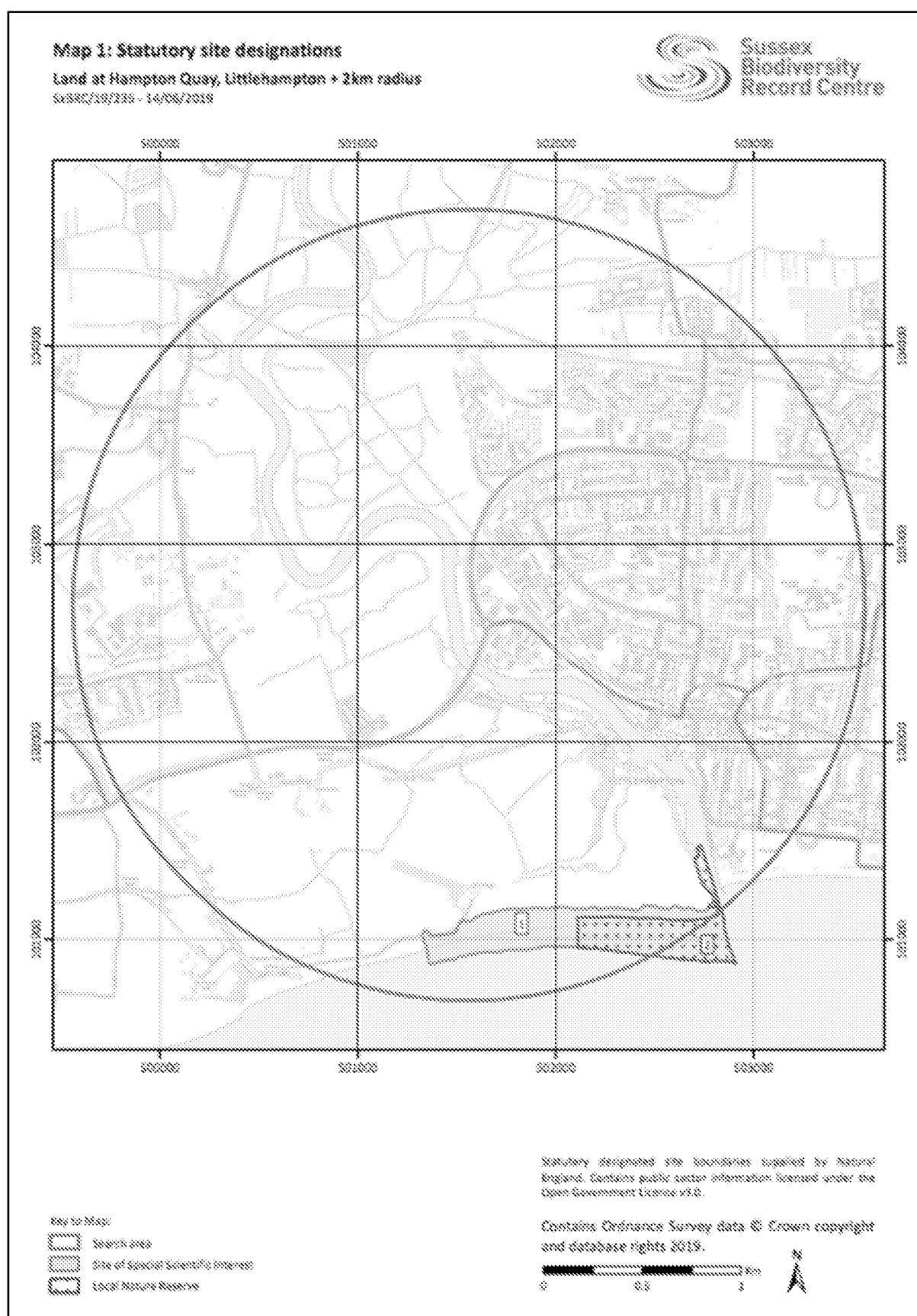


Figure 4. Statutory designated sites within a radius of 2km of the application site. Images produced courtesy of SxBRC.

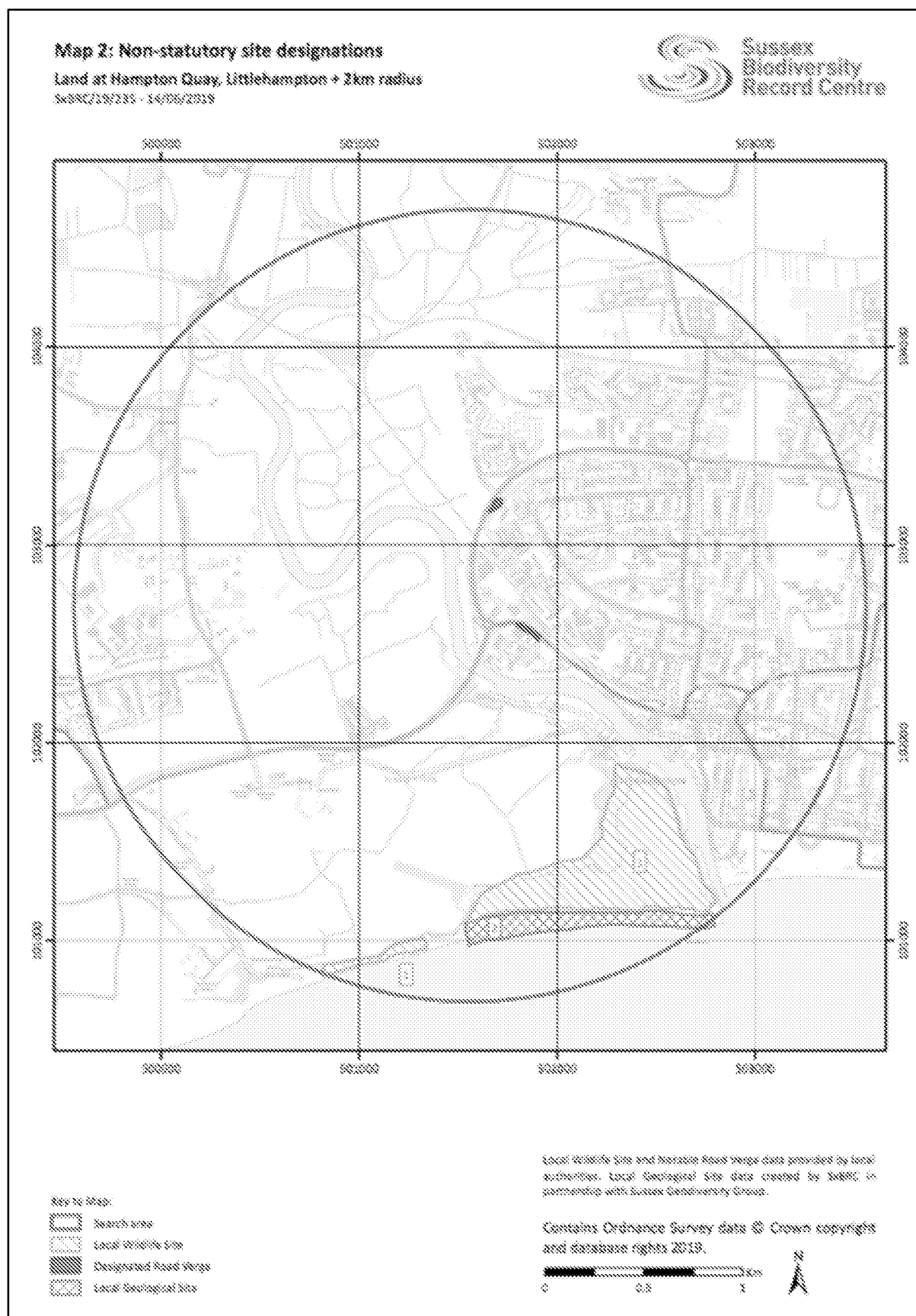


Figure 5. Non-statutory designated sites within a radius of 2km of the application site. Images produced courtesy of SxBRCC.

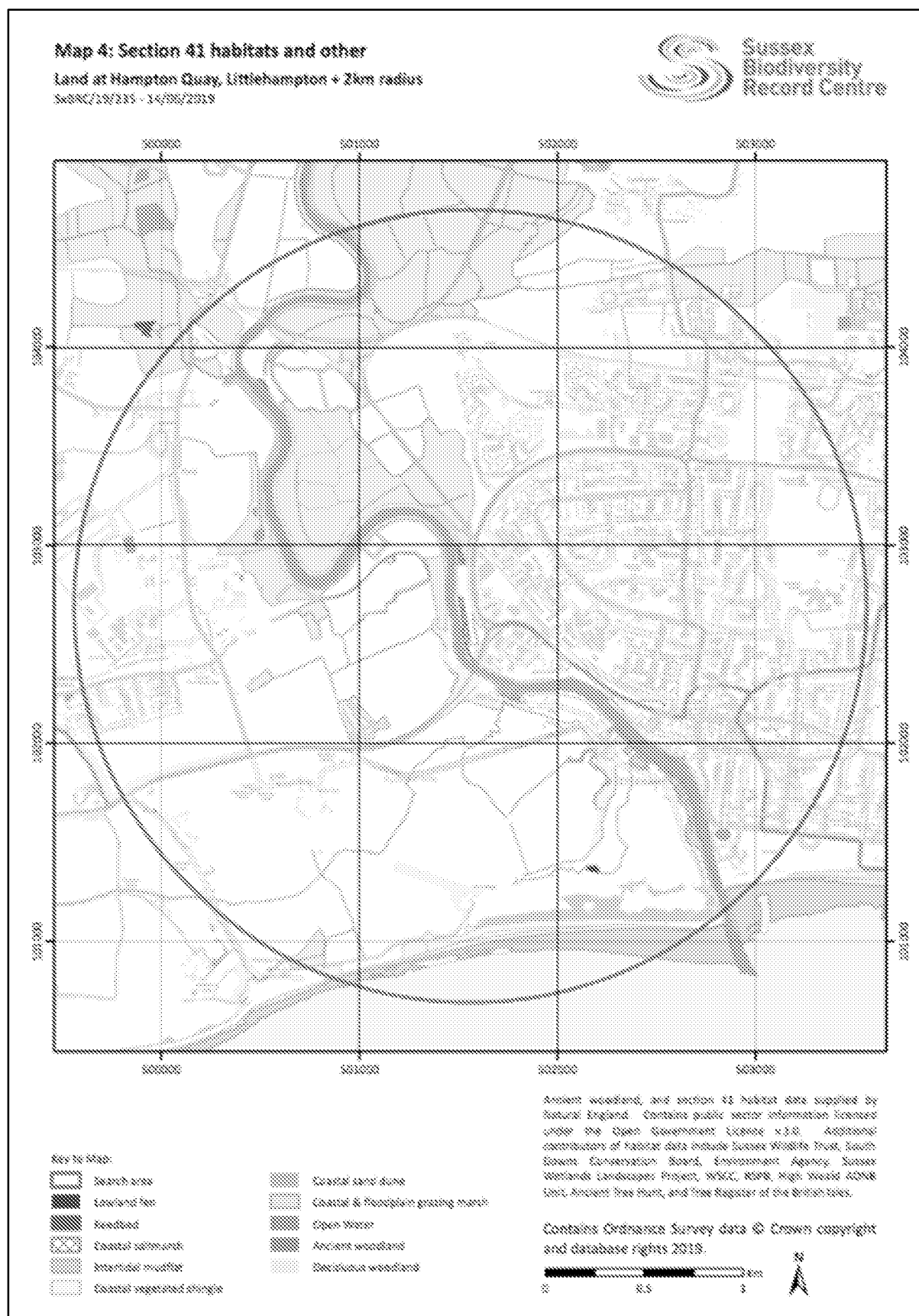


Figure 6. Section 41 habitats within a radius of 2km of the application site. Images produced courtesy of SxBRC.



3.2 Habitats

The most important habitats contained within the site are in the intertidal zone, with a distinct zonation from bare intertidal mudflat at the low water mark, to scattered saltmarsh dominated by annual glassworts *Salicornia spp.* and Annual sea blight *Suaeda maritima*, with sea purslane *Sesuvium portulacastrum* and sea aster *Tripolium pannonicum*, higher up. The high-water mark is fringed by sea heath *Frankenia laevis*, sea beet *Beta vulgaris*, sea plantain *Plantago maritima*, sea couch grass *Elytrigia repens*, and occasionally hard grass *Parapholis strigosa*. This zone sometimes extends onto the seaward side of the seawall.

The intertidal zone is separated into two distinct areas on the site. The northern part of the site has been subject to a 'managed realignment' project by the Environment Agency. It is characterised by an expanse of flat mud in the process of being colonised by salt marsh. This area is dominated by annual species and young plants typical of perennial saltmarsh and there is a distinct marginal zone of 'shingle/sand above high-tide mark', which is dominated by sea heath. There is no sea wall in this part of the site and the road embankment rises directly from this marginal zone. The southern part retains the original sea wall, which is fringed by a narrow berm of dense mature saltmarsh dominated by sea purslane and marginal vegetation forms the seaward side of the sea wall. The seaward edge of this dense saltmarsh area supports small quantities of common saltmarsh grass *Puccinellia maritima* before the mud falls away steeply to the low water mark.

The sea wall itself is predominantly semi-improved grassland, dominated by false-oat grass *Arrhenatherum elatius* and oxeye daisy *Leucanthemum vulgare* and ribwort plantain *Plantago lanceolata* on the top and landward slope. There are patches of tall ruderal vegetation dominated by common nettle *Urtica dioica* and clustered dock *Rumex conglomeratus*. The seaward side of the sea wall is reinforced with bitumen covered rock armour to protect against erosion and supports coastal species that occupy the splash zone above high tide. To the south there is a section of steel piling through the middle of the sea wall, providing extra protection against erosion and a hard edge between terrestrial and coastal habitats.

A brackish-water ditch passes across this part of the site, originating from a culvert under the A259 and discharging through a tidal flap into the River Arun after passing two right angles. The water appears to be brackish and of poor quality; the channel contains substantial amounts of litter and debris and gives off a hydrocarbon type odour. The channel itself is dominated by common reed *Phragmites australis* giving way to sea club rush *Bolboschoenus maritimus* downstream, and the steep sided banks are very overgrown with bramble scrub, making access almost impossible.

The landward side of the southern part of the site, i.e. behind the sea wall, comprises a flat area of stony ground, supporting a mosaic of vegetation types from annual/short perennial vegetation, neutral semi-improved grassland through to tall ruderal vegetation and scrub. The site boundary is formed by the bottom of the road embankment, which comprises semi-mature landscape plantation scattered trees, dense continuous scrub with patches of tall ruderal vegetation and improved grassland.

Table 2 below describes the habitats present together with a list of the species found; a Phase 1 Habitat Map is presented in Figure 8. Photographs of key areas of habitat 1-5 support these descriptions.



Table 2. Phase 1 habitats contained within the site. The list of species recorded for the site are not exhaustive, and are categorised in accordance with the DAFOR scale of abundance, where D= dominant, A= abundant, F= frequent, O= occasional, and R= rare, for that parcel of habitat

Habitat type	JNCC Code	Area(Ha)/ Length (meters)	Target note including general species composition
Scrub – scattered	A2.2	1.19 ha	Frequent: Field maple <i>Acer campestre</i>, cherry (ornamental) <i>Prunus</i> sp., common hawthorn <i>Crataegus monogyna</i>, willows <i>Salix</i> sp., aspen <i>Populus tremula</i>, bramble <i>Rubus fruticosus</i>, Occasional: Ash <i>Fraxinus excelsior</i>, elder <i>Sambucus nigra</i> mugwort <i>Artemisia vulgaris</i>, teasel <i>Dipsacus fullonum</i>, Rare: oak <i>Quercus robur</i>
Neutral grassland – semi-improved	B2.2	0.44 ha	Dominant: Oxeye daisy <i>Leucanthemum vulgare</i>, Abundant: False oat grass <i>Arrhenatherum elatius</i>, ribwort plantain <i>Plantago lanceolata</i>. Frequent: Common knapweed <i>Centaurea nigra</i>, ribwort plantain, creeping thistle <i>Cirsium arvense</i>, cocksfoot grass <i>Dactylis glomerata</i>, perforate St John's Wort <i>Hypericum perforatum</i>, black melick <i>Medicago lupulina</i>. Occasional: Perennial ryegrass <i>Lolium perenne</i>, musk mallow <i>Malva moschata</i>, prickly sow thistle <i>Sonchus asper</i>, teasel, Field forget-me-not <i>Myosotis arvensis</i>, bristly ox-tongue <i>Helminthotheca echioides</i>, Rare: Wild Alium <i>Alium</i> sp., common mouse-ear <i>Cerastium fontanum</i>, Field bindweed <i>Convolvulus arvensis</i>, meadow grasses <i>Poa</i> spp., red clover <i>Trifolium pratense</i>, Vetch <i>Vicia</i> sp. Crested dog's tail <i>Cynosurus cristatus</i> On the seaward side only: Sea beet <i>Beta vulgaris</i> subsp. <i>Maritima</i> sea plantain <i>Plantago maritima</i>, sea arrowgrass <i>Triglochin maritima</i>, sea wormwood <i>Artemisia maritima</i>, sea couch grass <i>Elytrigia repens</i> and hard grass <i>Parapholis strigose</i>.
Tall herb and fern – ruderal	C3.1	0.31 ha	Abundant: Clustered dock <i>Rumex conglomeratus</i>, common nettle <i>Urtica dioica</i>, Frequent: Common ragwort <i>Jacobaea vulgaris</i>, mugwort, ribwort plantain, teasel, black horehound <i>Ballota nigra</i>, hemlock <i>Conium maculatum</i>, creeping thistle <i>Cirsium arvense</i>. Occasional: Hedge mustard <i>Sisymbrium officinale</i>, hedge woundwort <i>Stachys sylvatica</i>, greater willowherb <i>Epilobium hirsutum</i>, ground ivy <i>Glechoma hederacea</i>, bristly oxtongue <i>Helminthotheca echioides</i>, creeping buttercup <i>Ranunculus repens</i>, red campion <i>Silene dioica</i>, cleavers <i>Galium aparine</i>, false oat-grass, perforate St John's Wort <i>Hypericum perforatum</i>, musk mallow, prickly sow thistle. Rare: Spanish broom <i>Spartium junceum</i>, lesser burdock <i>Arctium minus</i>, buddleia <i>Buddleia davidii</i>, common mallow <i>Malva sylvestris</i>, white campion <i>Silene latifolia</i>, bittersweet <i>Solanum dulcamara</i>,
Standing water – brackish	G1.6	0.13 ha	Dominant: Common reed <i>Phragmites australis</i> Frequent: Bramble Occasional: Sea club rush <i>Bolboschoenus maritimus</i>, soft rush <i>Juncus effusus</i>



Intertidal mud/sand	–	H1.1	0.27 ha	Bare mud with no vegetation.
Intertidal boulders/rocks	–	H1.3	0.04 ha	No vegetation
Saltmarsh scattered plants	–	H2.4	0.49 ha	Dominant: <i>Salicornia Salicornia spp.</i> , annual sea blight <i>Suaeda maritima</i> Frequent: Filamentous green algae. Rare: Sea purslane <i>Sesuvium portulacastrum</i> , cordgrass <i>Spartina sp.</i>
Saltmarsh continuous dense	–	H2.6	0.15 ha	Dominant: Sea purslane Frequent: Sea plantain Occasional: Glassworts <i>Salicornia spp.</i> , sea plantain, common salt marsh grass <i>Puccinellia maritima</i> (seaward edge), filamentous green algae. Rare: Sea aster <i>Tripolium pannonicum</i> Sea arrowgrass <i>Triglochin maritima</i> , cordgrass <i>Spartina sp.</i> , annual sea blight.
Shingle above high tide mark		H3	0.13 ha	Dominant: Sea heath <i>Frankenia laevis</i> . Abundant: Annual sea blight. Frequent: <i>Salicornia Salicornia spp.</i> , Occasional: Red fescue <i>Festuca rubra</i> , sea spurry <i>Spergularia sp.</i> , sea purslane, Rare: Sea aster, sea beet <i>Beta vulgaris</i> .
Cultivated/disturbed land – ephemeral/short perennial	–	J1.3	0.35 ha	Frequent: Scentless mayweed <i>Tripleurospermum inodorum</i> , Ribwort plantain, Yorkshire fog, Bird's-foot trefoil <i>Lotus corniculatus</i> , white clover <i>Trifolium repens</i> , False oat grass Yorkshire fog <i>Holcus lanatus</i> , Red deadnettle <i>Lamium purpureum</i> , Occasional: Great plantain <i>Plantago major</i> , creeping cinquefoil <i>Potentilla reptans</i> , Lesser trefoil <i>Trifolium dubium</i> . Rare: Selfheal <i>Prunella vulgaris</i> , biting stone crop <i>Sedum acre</i> , Weld <i>Reseda luteola</i> , great plantain <i>Plantago major</i> , Yarrow <i>Achillea millefolium</i> .
Artificial sea wall		J3.5	49m	Sparse vegetation with sea beet <i>Beta vulgaris</i> , Sea spurrey <i>Spergularia sp.</i> , Sea wormwood <i>Artemisia maritima</i> , sea couch grass <i>Elytrigia repens</i> , hard grass <i>Parapholis strigose</i> , lichens and mosses growing in gaps between bitumen sealed rockwork.

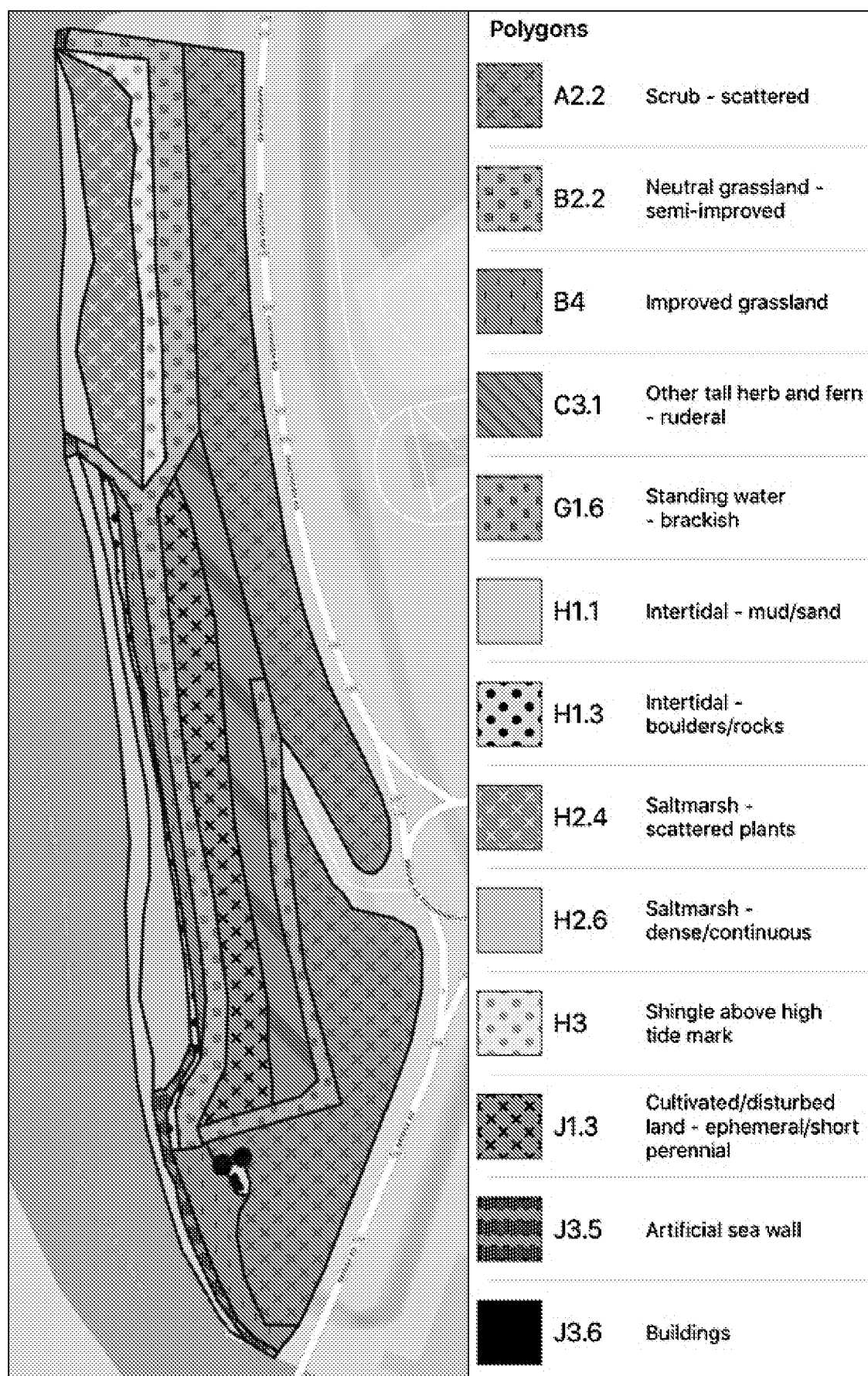
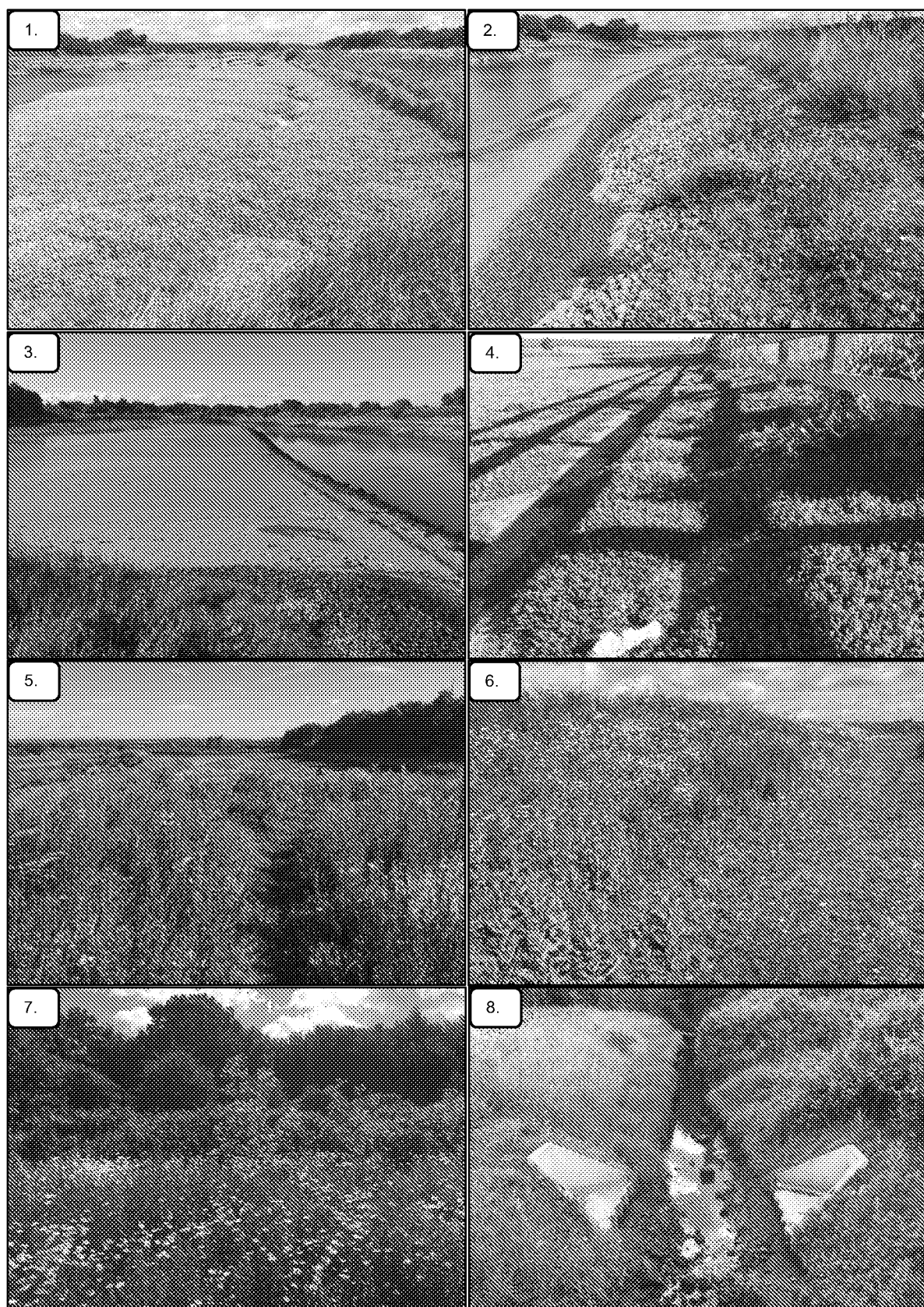


Figure 8. Phase 1 map of the habitats within the site.



Photographs. 1. View of dense continuous saltmarsh; 2. Sea wall seaward side, showing engineered reinforcement and fringing coastal vegetation; 3. Intertidal mudflat created by managed realignment; 4. Shingle above high tide mark, at the edge of the managed realignment zone; 5. Top of sea wall showing tall ruderal vegetation; 6. Landward side of seawall with semi-improved grassland and annual/short perennial vegetation on stony ground; 7. View towards A259 (behind screen of trees and scrub) showing semi-improved grassland and dense bramble scrub.; 8. Downstream section of ditch before outfall to the River Arun.



3.2.1 Pre-existing Records

The recent history of the proposed development site as part of the Environment Agency's Flood Protection scheme may explain the condition of some of the habitats found on the site during the current surveys. For example, the managed realignment area was created in 2015 and remains an early succession salt marsh vegetation community dominated by annual species. Following the raising and reinforcement of the earth embankment, the seaward side was reseeded with a 'maritime grass seed mix' containing native species, and the landward side and former compound area was reseeded with a wildflower mix 'to encourage butterflies and bees into the scheme whilst providing seasonal interest and colour'¹¹. The A259 embankment adjacent to the managed realignment area was planted with native trees and shrubs to provide a screen from the A259. All these areas are of recent origin and the vegetation communities have yet to mature.

3.2.2 Interpretation

The intertidal habitats contained within the proposed development site are priority habitats under S 41 of the NERC Act, 2006 and are considered important at district level.

3.3 Badgers

No signs of any badger activity were seen during the survey assessment. The context of this site sandwiched between the large intertidal River Arun and the A259, a busy trunk road, makes it unlikely to regularly support badgers, though they may be able to visit from time to time.

Records of badgers are not provided by the SxBRC, due to the sensitive nature of this information.

3.4 Bats

3.4.1 Natural Roost Features – Trees

Trees contained within the site were all relatively young and unlikely to support features potentially suitable for roosting bats. The largest trees found on site were located on the A259 trunk road embankment, and comprised the species white poplar, and English oak. These were all estimated to be less than 30 years old and there were no potential roost features visible at the time of the assessment.

3.4.2 Bat Activity Surveys – Walked Transects

The results of each walked transect survey is summarised in Figure 9. This shows the distribution of all bat 'observations' on each walked transect, during which the route was covered at least three times in a session. Survey conditions and timings are presented in Table 3.

¹¹ Environment Agency (2013) *Littlehampton Arun East Bank Tidal Walls Flood Defence Scheme Environmental Statement: Landscape Masterplan Reach 6 Sheet 2 of 2, Drawing No. 3483_PL_112*, dated May 2013. The Environment Agency, Horizon house, Deanery Road, Bristol BS1 5AH, available from: <http://publications.environmentagency.gov.uk>.



During the walked transects, most of the time there was no bat activity, but occasionally three bat species were detected using the site for foraging. These were common pipistrelle *Pipistrellus pipistrellus*, soprano pipistrelle *Pipistrellus pygmaeus* and noctule bat *Nyctalus noctula*.

Table 3 Walked transect metadata: dates, times, temperature, weather conditions

Date	Survey start time/end time	Temp. degrees centigrade, weather conditions	Surveyors
27/05/19	21:00- 23:00 Sunset – 21:00	Max/Min temp: 18/13°C 90% cc 0-5mph wind, intermittent light showers	Nick Gray Charlie Gardiner
03/06/19	21:18 – 22:48 Sunset – 21:18	Max/Min temp.: 19 / 12°C 0% cloud cover, 0-5mph wind and dry.	Owen Crawshaw Sophie Bradfield
29/07/19	20.54 – 22.54 Sunset – 20:54	Max/Min temp: 18/ 12°C 0% cloud cover and 0 mph wind and dry.	Paul Whitby Sophie Bradfield
21/08/19	20:11-22:11 Sunset – 20:11	Max/Min temp.: 16 / 14°C 0% cloud cover and 0 mph wind and dry.	Nick Gray Ben Nesbit
25/09/19	19:00 – 21:00 Sunset –19:00	Max/Min temp.: 16C / 14°C 50% cc, 0-5mph wind, dry but recent rain.	Dan Bennett Sophie Bradfield



Figure 9. Cumulative distribution of bats detected over five separate visits across the season. Coloured dots represent bat activity. Black = common pipistrelle, blue = soprano pipistrelle, orange = pipistrelle species and green = noctule bat. The size of the dot indicates the intensity of activity: Small dot = a single pass of one bat; medium dot = multiple passes on two to three separate occasions; large dot = activity recorded on four or more occasions at that location during the night indicating continuous foraging activity.

3.4.3 Bat Activity Surveys – Automated Static Bat Detecting

The results of the automated static bat detector surveys are summarised in Table 4. Five species of bat were recorded during the one deployment in June with Nathusius' pipistrelle *Pipistrellus nathusii* recorded in addition to those recorded during the walked transects together with a single brown long-eared bat *Plecotus auritus* pass.



Table 4. Mean number of passes recorded by the automatic static detector (rounded to the nearest whole number) per night over seven nights.

Location	Date	Common pipistrelle	Soprano pipistrelle	Nathusius pipistrelle	Brown long-eared bat	Noctule bat
West of ditch	10-17 th June 2019 (7 nights)	6	1	3	<1	1

3.4.4 Pre-existing records

The SxBRC provided 60 bat records in the search area comprising 7 identified species (Table 5).

Table 5. Bat records returned within a 2km radius of the site.

Species	No. of Records
Common pipistrelle <i>Pipistrellus pipistrellus</i>	13
Soprano pipistrelle <i>P. pygmaeus</i>	2
Nathusius's Pipistrelle <i>P. nathusii</i>	3
Brown long-eared <i>Plecotus auritus</i>	3
Serotine <i>Eptesicus serotinus</i>	4
Whiskered/Brandt's <i>Myotis mystacinus/brandtii</i>	1
Daubenton's bat <i>Myotis daubentonii</i>	3
Long-eared <i>Plecotus</i> sp. (unidentified to species)	3
<i>Myotis</i> sp. (unidentified to species)	1
Unidentified bats	9

Prior to the Flood Protection Scheme, the Environment Agency carried out bat roost potential assessments for trees within the managed realignment and construction compound sites and found that most trees had negligible potential for roosting bats, although a small number of them located on the A259 embankment had medium-low potential¹².

3.4.5 Interpretation

The activity surveys have demonstrated that the habitats contained within the development site do support foraging bats, but in relatively low numbers, and are not sustained throughout the season. Bats are opportunistic and will exploit a range of habitats across the landscape in response to the rise and fall of insect populations. These surveys indicate that the habitats contained on the site are utilised intermittently as part of the wider landscape by common and widespread bat species.

As such, the development site is not considered to be important to bat conservation beyond the **local level**.

¹² Environment Agency (2013) *Littlehampton Arun East Bank Tidal Walls Flood Defence Scheme Environmental Statement*: Volume 2 Main Text. The Environment Agency, Horizon house, Deanery Road, Bristol BS1 5AH, available from: <http://publications.environmentagency.gov.uk>



3.5 Breeding Birds

3.5.1 Breeding Bird Surveys

In total, 30 species of bird were recorded during the survey; of these, three species are 'red' listed under the Birds of Conservation Concern (BoCC) and eight are 'amber' listed. The following species recorded during the survey are also listed under Section 41 of the NERC Act (2006); song thrush *Turdus philomelos*, starling *Sturnus vulgaris*, herring gull *Larus argentatus*, dunnoek *Prunella modularis* and reed bunting *Emberiza schoeniclus*.

Table 6 presents the dates, times and survey conditions recorded for each visit. Table 7 presents the bird survey results combined for all three visits. The table is divided into red, amber and green lists from the BoCC categories.

Table 6. Weather conditions recorded during breeding bird surveys at Hampton Quay

Survey date	Survey time	Weather notes	Surveyor
23 rd May 2019	07:40 – 09:00	13 degrees Celsius and 0-5mph wind, 0% cloud cover	Owen Crawshaw BSc Hons ACIEEM
6 th June 2019	05:42-06:45	8 degrees Celsius and 0-5mph wind, 0% cloud cover	Paul Whitby BSc, MCIEEM, CEcol
24 th June 2019	07:10-09:00	18 degrees Celsius and 9-5mph wind, 0% cloud cover	Dan Bennett BSc, MCIEEM

Table 7. Breeding bird survey summary list. Numbers represent the number of bird 'registrations' recorded across the site on each date.

RESULTS Species	23 rd May	6 th June	24 th June	Breeding status
Song thrush <i>Turdus philomelos</i>	2	2	1	Likely breeding – territorial singing
Common starling <i>Sturnus vulgaris</i>	25	20		Non-breeding
Herring gull <i>Larus argentatus</i>	3	2	2	Non-breeding, on River Arun
Black-headed gull <i>Chroicocephalus ridibundus</i>	4	2	11	Non-breeding, on River Arun
Dunnoek <i>Prunella modularis</i>	1	1	2	Likely breeding – territorial singing
Kestrel <i>Falco tinnunculus</i>			1	Non-breeding, single bird passing through
Mallard <i>Anas platyrhynchos</i>	5	1		Non-breeding, on River Arun
Mute Swan <i>Cygnus olor</i>	2			Non-breeding, on River Arun
Redshank <i>Tringa totanus</i>			1	Non-breeding, on River Arun
Reed bunting <i>Emberiza schoeniclus</i>			1	Non-breeding, on sea wall foraging
Oystercatcher <i>Haematopus ostralegus</i>	1		1	Non-breeding, on River Arun
Blackbird <i>Turdus merula</i>	2	3	4	Likely breeding – territorial singing



RESULTS Species	23 rd May	6 th June	24 th June	Breeding status
Blackcap <i>Sylvia atricapilla</i>			1	Likely breeding – territorial singing
Blue tit <i>Cyanistes caeruleus</i>	1	1	1	Likely breeding – territorial singing
Buzzard <i>Buteo buteo</i>	1	1		Non-breeding, single adult passing through
Carrion crow <i>Corvus corone</i>	1			Non-breeding, single adult passing through
Chiffchaff <i>Phylloscopus collybita</i>	1		1	Non-breeding
Collared dove <i>Streptopelia decaocto</i>	1			Non-breeding, single adult passing through
Common whitethroat <i>Sylvia communis</i>	2	2	3	Likely breeding – territorial singing
Feral pigeon <i>Columba livia</i>	2			Non-breeding
Great spotted woodp. <i>Dendrocopos major</i>	1			Non-breeding
Great tit <i>Parus major</i>	1	1		Likely breeding – territorial singing
Greenfinch <i>Carduelis chloris</i>	1		1	Likely breeding – territorial singing
Grey heron <i>Ardea cinerea</i>	1			Non-breeding, on River Arun
Jay <i>Garrulus glandarius</i>	1			Likely (territory call)
Little Egret <i>Egretta garzetta</i>			1	Non-breeding, on River Arun
Magpie <i>Pica pica</i>	1		1	Non-breeding
Robin <i>Erithacus rubecula</i>	1		1	Likely breeding – territorial singing
Woodpigeon <i>Columba palumbus</i>	3			Likely breeding – territorial singing
Wren <i>Troglodytes troglodytes</i>	3	3	1	Likely breeding – territorial singing

3.5.2 Pre-existing Records

The SxBRC provided numerous bird records for the search area concerning a total of 285 species. Most of these species are relatively common and widespread, but the list includes 39 species of principle importance for conservation (S41 NERC Act 2007), also commonly referred to as 'priority species', and 66 species listed on Schedule 1 of the Wildlife and Countryside Act. In addition, 61 species are red listed on the Birds of Conservation Concern.

Of these species, many relate to rare or scarce visitors, or non-breeding wintering species for which the application site does not contain suitable habitat or is not likely to be important for their conservation. With the possible exception of garganey *Anas querquedula*, Mediterranean gull *Larus melanocephalus*, barn owl *Tyto alba*, kingfisher *Alcedo atthis*, Cetti's warbler *Cettia cetti*, and black redstart *Phoenicurus phoenicurus*, all the species listed that are on Schedule 1 of the Wildlife and Countryside Act (1981) are non-breeding visitors to the southern region of England. Since the special protection from



disturbance afforded by this legislation only applies when they are breeding, it is not relevant to this application site. While the application site does contain potentially suitable habitat for breeding Cetti's warbler, the breeding bird survey revealed that this species is not likely to be present.

There are no precise details of the wintering bird or breeding bird assemblage given in the Environmental Statement for the Flood Protection Scheme by the Environment Agency, other than an observation of the red-listed starling *Sturnus vulgaris* and house sparrow *Passer domesticus*¹².

3.5.3 Interpretation

Based on the results of the breeding bird survey, the existing terrestrial habitats (scrub, woodland and tall ruderal vegetation) contained by the proposed development site support an assemblage of common breeding passerine birds in small numbers. Of these, the most notable is song thrush and dunnoek, which although they have suffered historical population declines, remain common and widespread species across the UK and the numbers supported by the application site represent a very small proportion of the total population. Very few birds were recorded using the intertidal habitats and River Arun adjacent to the site during the breeding season. Based on these findings, the breeding bird assemblage at Hampton Quay is not considered to be important for the conservation of birds beyond the **local level**.

3.6 Wintering Birds

3.6.1 Winter Bird Surveys

The winter bird surveys indicate that this section of the River Arun supports only a small assemblage of foraging shorebirds with a peak count of less than five of the following regularly occurring shorebird species; common sandpiper *Actitis hypoleucos*, redshank *Tringa totanus* and oystercatcher *Haematopus ostralegus*, together with regularly occurring black-headed gull *Chroicocephalus ridibundus* and herring gulls at both low tide and high tide. A solitary lapwing *Vanellus vanellus* was recorded once at low tide, and a solitary curlew *Numenius arquata* was recorded once at high tide. Most of these birds were using the intertidal zone of the main river Arun, and not on that newly created by the Environment Agency, apart from one curlew and several black headed gulls. Most birds were either feeding or loafing at the time of the surveys. Tables 8 and 9 present a summary of the results of winter bird surveys at low tide and high tide respectively.

Table 8. Summary of winter bird surveys – total counts for each species recorded on each low tide survey visit.

Species	22 Oct 19	18 Nov 19	24 Dec 19	17 Jan 20	6 Feb 20	4 Mar 20	Peak Count
Black headed gull	32	29		30	20+	11	32
Common sandpiper		2				2	2
Common gull		1					1
Cormorant	4		1				4
Curlew							0
Great crested grebe							0



Greater black-backed gull	2						2
Grey Heron	1			1			1
Herring gull	8	1		7	1		8
Kingfisher	1		1				1
Lapwing	1						1
Little grebe			1				1
Little egret		1			1		1
Mallard							0
Oystercatcher						2	2
Redshank	1	3	2		1	2	3

Table 9. Summary of winter bird surveys – total counts for each species recorded on each high tide survey visit.

Species	17 Oct 19	1 Nov 19	13 Dec 19	31 Jan 20	24 Feb 20	20 Mar 20	Peak Count
Black-headed gull		3		1	1		3
Common sandpiper	2	3	5	2	2	2	5
Common gull							0
Cormorant	1						1
Curlew	1						1
Great crested grebe						1	1
Greater black-backed gull		1	3				3
Grey Heron	1				1		1
Herring gull	2	3		7	5	3	7
Kingfisher							0
Lapwing							0
Little grebe		1					1
Little egret	1	1					1
Mallard	25	4	10	2	2	2	25
Oystercatcher					2	2	2
Redshank			1	1	1	1	1

3.6.2 Interpretation

Based on the wintering bird surveys to date, the intertidal habitat present at the proposed development site does not support regularly occurring significant numbers of shorebirds of conservation concern and, most importantly no significant high-tide roosts were observed. Based on these findings, the wintering bird assemblage at Hampton Quay is not considered to be important for bird conservation beyond the **local level**.



3.7 Common Dormice

The scrub habitat bordering the east of site is suitable for common dormouse. However, this area of habitat is small in extent and ecologically isolated from other similar habitat and woodland. As such, it is considered unlikely that the site will support a population of dormouse, which usually requires extensive interconnected woodland and scrub habitat across the local landscape.

No records of this species were provided by SxBRC. Based on these factors, the scrub and habitats contained within the site have **negligible** importance to dormice, and they are not considered further in this ecological impact assessment.

3.8 Great Crested Newts

3.8.1 Survey Results

The desk study revealed that there are no ponds within 250m of the proposed development site. Whilst there are two ponds within 500m of the site (Figure 7), both are separated from the proposed development site by a busy road and railway line, or the River Arun. The ditch contained within the proposed development site is a flowing watercourse and its flora indicates a saline influence that makes it unsuitable for great crested newts.

3.8.2 Pre-existing Records

The SxBRC provided 218 amphibian records in the search area. This included 71 records for great crested newt *Triturus cristatus*, 49 records for smooth newt *Lissotriton vulgaris*, 3 records for palmate newt *Lissotriton helvetica*, 78 records for common frog *Rana temporaria* and 17 records for common toad *Bufo bufo*. All the great crested newt records relate to the area of Climping, approximately 2km to the west. This is on the other side of the River Arun, which acts as a significant barrier to dispersal for great crested newts between these records and the application site.

3.8.3 Interpretation

Based on the above analysis, the application site is considered highly unlikely to support great crested newts, despite the presence of potentially suitable terrestrial habitats. This is because the nearest suitable breeding site and known populations are both more than 250m away and separated by significant barriers to dispersal. Based on these factors, the terrestrial habitats contained within the proposed development site have **negligible** importance to great crested newts and they are therefore not considered further in this ecological impact assessment.

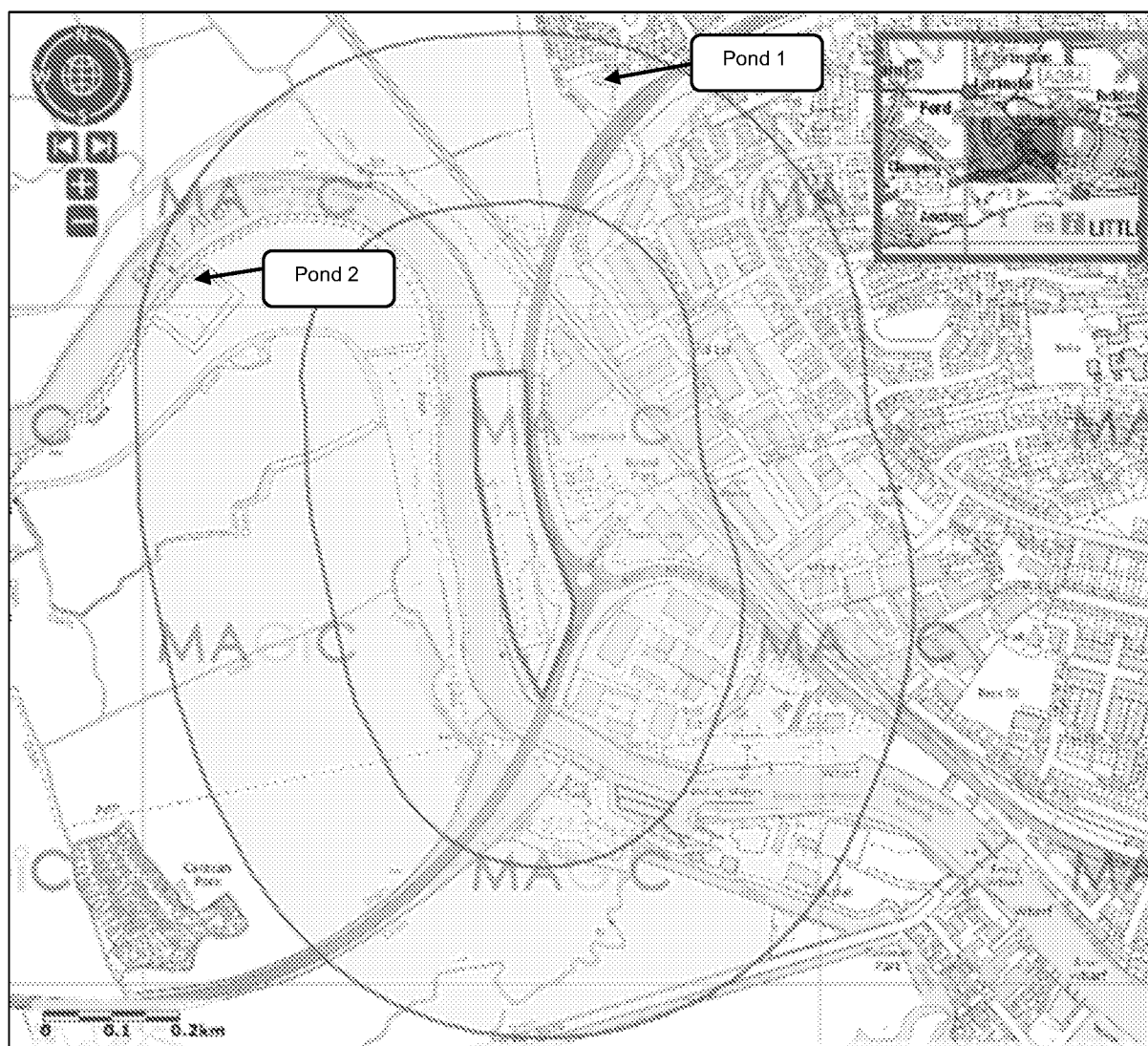


Figure 11. Ponds with 500m (outer red line) and 250m (middle red line) from the site (inner red line).

3.9 Reptiles

3.9.1 Survey Results

The survey confirmed presence of common lizard with a peak count of five adults on 20th August. Most of these were found on the southern part of the site, but they were also found along the bottom of the A259 embankment, see Figure 10. It is therefore reasonable to assume that common lizards may be present in any patch of suitable habitat on the proposed development site. No other reptile species were found.

The survey findings, dates and conditions are presented in Table 8.

**Table 8.** Reptile survey results for Hampton Quay.

Date	Start time	Air temp. °C	Refugia temp. °C	Weather conditions	Results
12 th July 2019	7:30 am	18	26	70%cc, BF 1 dry	Female common lizard
8 th August 2019	7:40 am	18	23	50%cc BF0 dry	Female common lizard Adult unsexed common lizard 2x juvenile common lizards
20 th August 2019	9:00 am	15	25	0%cc BF0 dry	5x unsexed adult common lizards
29 th August 2019	9:00 am	14	18	5%cc BF1 dry	Female common lizard
10 th September 2019	11.00 am	18	23	50%cc BF2 dry	2x juvenile common lizard
25 th September 2019	6:30pm	16	17	80%CC BF 2 dry	2x adult common lizards Juvenile common lizard
2 nd October 2019	12:00pm	13	28	0%CC BF 1 dry	4x adult common lizard



Figure 10. The distribution of common lizards found during the reptile surveys. The yellow dots indicate where reptiles have been found; red dots indicate location of reptile mats where no animals were found.



3.9.2 Pre-existing Records

The SxBRC provided 131 reptile records in the search area. This included 55 records for slow-worm, 2 records for sand lizard, 2 records for grass snake and 72 records for common lizard. The closest of these was for a slow-worm and common lizard at 100m north from the boundary of the site, dated June 2010.

Prior to the Flood Protection Scheme, the Environment Agency surveys found low numbers of common lizard and slow worms and implemented a trapping and translocation mitigation exercise to two pre-determined receptor sites, one located to the north-east of the designated main river section of the drainage ditch on the proposed development site, and the other outside the proposed development site immediately north of the railway line and west of the A259¹².

3.9.3 Interpretation

Common lizards are common and widespread species in south-east England and are likely to be present in most areas of suitable habitat. Based on the small numbers involved, the small extent of habitat identified, and absence of other reptile species, the population contained within the development site is not considered important to reptile conservation beyond the **local level**.

3.10 Water Voles

3.10.1 Survey Results

The section of ditch contained within the site boundaries measures approximately 210m long and is culverted under the A259 at the upstream end and outfalls through the sea wall into the River Arun. This section is believed to drain the superstore and was very overgrown with bramble and dense reeds, providing excellent cover from predators and a source of food for water voles. It joins a second drainage ditch that is designated as main river and drains the light industrial area on the opposite side of the A259 and outfalls into the River Arun via a tidal flap. It has a variable water level influenced by the tide and supports plants indicative of brackish conditions – sea club rush and red goosefoot. Both watercourses are not directly connected to any other watercourses or the ditch network across the grazing marshes to the north.

The search revealed feeding remains and latrines along most of the ditch, apart from the channel leading west (see Figure 12, and Figure 13, Photographs 1-4,). In addition to this, one possible burrow was identified west of the northern section of the ditch, however holes were obscured by areas of dense bramble scrub (Figure 13, Photograph 5). During the first winter bird surveys in October 2019, several burrows were identified below the water level close to the tidal gate of the main river section.

The repeat survey on 18th June 2020 revealed a completely dry channel from the upstream culvert down to the confluence with the main river channel. At low tide, the main river section flow was reduced to a trickle over exposed mud and a matt of white stringy bacterial/fungal growth on the substrate ('sewage fungus') indicated severe contamination by sewage and/or hydrocarbons, particularly where it emerges from the culvert under the A259. No evidence of water vole activity was found despite thorough searches, instead the reed growth in the dry bed was being grazed by rabbits now that it was accessible.



Figure 12. The red dots indicate the location of feeding stations and latrines identified in the ditch. The possible water vole burrows are indicated by the green dots.

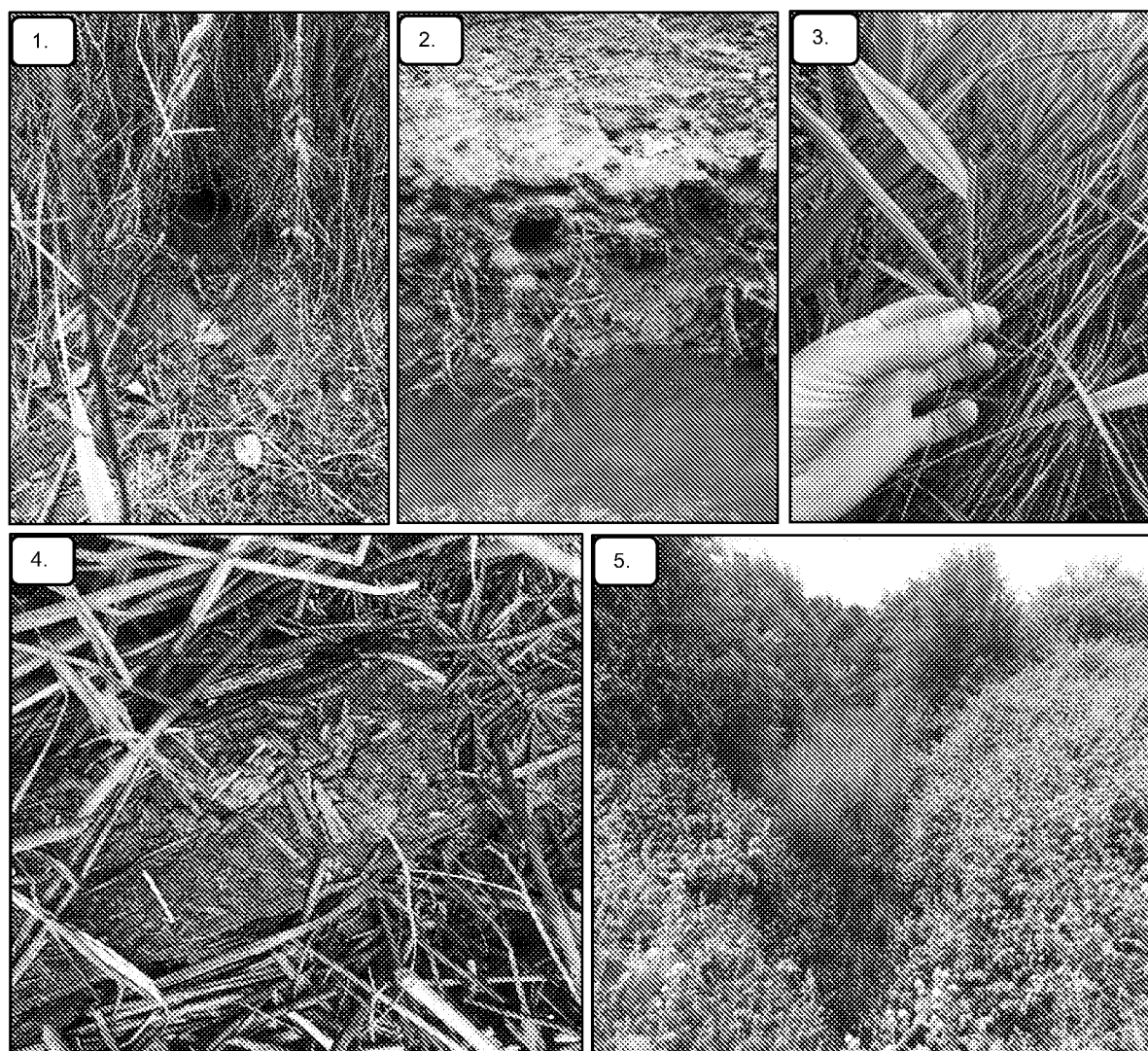


Figure 13. Photographs of water vole evidence taken on 29th July; **1-2.** Examples of active water vole burrows found during the survey. **3.** Fresh feeding remains – section of common reed *Phragmites australis*, cut at a 45-degree angle. **4.** Example of a water vole latrine. **5.** Suitable water vole habitat, looking downstream from bridge.

3.10.2 Pre-existing Records

The SxBRC provided 13 records of water vole in the search area. The closest of these was at 0.9km south-west from the boundary of the site, dated 11/09/2014. The clustered distribution of these records probably reflects surveys on behalf of previous development projects. However, they indicate that this species is likely to be widely distributed across the grazing marshes of the lower River Arun.

The Environment Agency surveys undertaken in advance of the Flood Protection Scheme in 2013 did not find evidence of the presence of water voles in the ditch contained within the proposed development site¹².

3.10.3 Interpretation

Based on the observations that the ditch completely dried out in both years, and that the main-river section is tidally influenced and does not support vegetation typically used by water voles, these watercourses are considered to be sub-optimal for water voles. The watercourses contained on the site



are sub-optimal habitat for water voles, although the evidence suggests that they are colonised intermittently.

Due to the short life span and rapid breeding potential of water voles, populations are often reported to have distinct peaks and troughs with numbers building during the summer months and young animals dispersing into sub-optimal habitats, followed by contractions in range during winter. The core water vole population is probably supported by the extensive ditch network across the grazing marshes to the north, and although the ditch contained in the proposed development site is not directly connected, and comprises sub-optimal habitat, presence of water voles in July 2019 probably represents this dispersal of young animals rather than an established breeding population. Considering the wider landscape around the site that contains a network of superior ditches and pond habitats that probably support an extensive water vole population, the ditch contained on the site represents a very small proportion and is not important to water vole conservation beyond **local level**.

3.11 Other Notable Species

3.11.1 Survey Results/Incidental Observations/Habitat Potential

Searches for evidence of harvest mouse were undertaken in December 2019 in conjunction with wintering bird surveys. These revealed that most suitable grassland habitat had been grazed short by the rabbit population, rendering the habitat unsuitable for harvest mouse. Checks of the fringing common reed along the ditch revealed no evidence that this species is present on the proposed development site.

The otter *Lutra lutra* has made a dramatic recovery in the UK in recent years, and populations exist across East and West Sussex. Whilst no evidence of the presence of otters was found during surveys for other species/groups, the application site contains suitable vegetation cover to shelter otters and therefore has potential to support otter at other times, as part of a wider habitat resource on the River Arun.

Table 9 lists the invertebrate species recorded during the walkover survey on 24th June. The species recorded during this survey are predominantly common and widespread and are typical of the habitats present. No notable or priority species were found.

Table 9. List of invertebrate species found during a walkover survey at Hampton Quay on 24th June 2019.

Latin name	English name/type	Typical habitat	Conservation status
Order NEUROPTERA; family CHRYSOPIDAE (green lacewings)			
<i>Chrysopa perla</i>	A green lacewing	Tall herb vegetation, scrub and woodland	Common and widespread
Order LEPIDOPTERA; family CRAMBIDAE (grass veneers)			
<i>Chrysoteuchia culmella</i>	Garden grass veneer	Ubiquitous	Common and widespread



Latin name	English name/type	Typical habitat	Conservation status
Order LEPIDOPTERA; family GEOMETRIDAE ('micromoths')			
<i>Camptogramma bilineata</i>	Yellow shell	Ubiquitous	Common and widespread
Order LEPIDOPTERA; family LYCAENIDAE			
<i>Polyommatus icarus</i>	Common blue	Flower-rich grasslands	Common and widespread
Order LEPIDOPTERA; family SATYRIIDAE			
<i>Melanargia galathea</i>	Marbled white	Flower-rich grasslands	Common and widespread
Order HYMENOPTERA; family APIDAE			
<i>Bombus terrestris/lucorum</i>	Buff-tailed and white-tailed bumblebee	Flower rich grassland, hedgerows, gardens	Common and widespread
<i>Bombus lapidarius</i>	Red-tailed bumblebee	Flower rich grassland, hedgerows, gardens	Common and widespread
<i>Bombus pascuorum</i>	Common carder-bee	Flower rich grassland, hedgerows, gardens	Common and widespread
<i>Bombus pratorum</i>	Early bumblebee	Flower rich grassland, hedgerows, gardens	Common and widespread
<i>Apis mellifera</i>	Honeybee	Flower rich grassland, hedgerows, gardens	Common and widespread
Order DIPTERA; family Syrphidae (hoverflies)			
<i>Syrphus ribesii</i>	A hoverfly	Flower rich grassland, hedgerows, gardens	Common and widespread
<i>Eupeodes luniger</i>	A hoverfly	Flower rich grassland, hedgerows, gardens	Common and widespread
<i>Helophilus pendulus</i>	A hoverfly	Grasslands, marshes	Common and widespread
<i>Eristalis tenax</i>	Drone fly	Ubiquitous	Common and widespread
<i>Sphaerophoria</i> sp.	A hoverfly	Flower rich grassland, hedgerows, gardens	Common and widespread
Order HETEROPTERA; family COREIDAE (leather bugs)			
<i>Coreus marginatus</i>	Dock bug	Hedgerows, scrub, tall ruderal vegetation	Common and widespread in southern England
Order HETEROPTERA; family MIRIDAE (Mirid bugs)			



Latin name	English name/type	Typical habitat	Conservation status
<i>Stenotus binotatus</i>	A mirid bug	Grassland – all types	Common and widespread
<i>Stenodema laevigata</i>	A mirid bug	Flower rich grassland – all types	Common and widespread
<i>Apolygus lucorum</i>	A mirid bug	Flower rich grassland – all types	Common and widespread
Order HEMIPTERA; family APHROPHORIDAE (froghopper bugs)			
<i>Philaenus spumarius</i>	Common froghopper	Tall ruderal vegetation, grassland, scrub and hedgerows	Common and widespread
Order COLEOPTERA; family CANTHARIDAE (soldier beetles)			
<i>Cantharis rufa</i>	A soldier beetle	Flower-rich grassland, hedgerows and dense vegetation	Common and widespread
<i>Rhagonycha fulva</i>	A soldier beetle	Flower-rich grassland, tall ruderal vegetation and scrub	Common and widespread
Order COLEOPTERA; family OEDEMERIDAE (beetles)			
<i>Oedemera nobilis</i>	(beetle)	Flower-rich grassland, hedgerows and dense vegetation	Common and widespread in southern England
<i>Oedemera lurida</i>	(beetle)	Flower-rich grassland, hedgerows and dense vegetation	Common and widespread in southern England
Order COLEOPTERA; family MALCHIIDAE (Malachite beetles)			
<i>Cordylepherus viridis</i>	(beetle)	Flower-rich grassland, hedgerows and dense vegetation	Common and widespread in southern England
Order COLEOPTERA; family COCCINELLIDAE (ladybird beetles)			
<i>Coccinella septempunctata</i>	Seven-spot ladybird	Ubiquitous	Common and widespread
Order COLEOPTERA; family CARABIDAE (ground beetles)			
<i>Notiophilus biguttatus</i>	Common springtail stalker	Ubiquitous	Common and widespread
Order ORTHOPTERA; family TETTIGONIDAE			
<i>Metrioptera roeselii</i>	Roesel's bush-cricket	Tall grasslands	Common and widespread, expanding range northwards



Latin name	English name/type	Typical habitat	Conservation status
Order ORTHOPTERA; family ACRIDIDAE			
<i>Chorthippus parallelus</i>	Common meadow grasshopper	Tall grasslands, meadows	Common and widespread
<i>Chorthippus brunneus</i>	Common field grasshopper	Short grasslands, disturbed ground	Common and widespread
<i>Chorthippus albomarginatus</i>	Lesser marsh grasshopper	Marshes and coastal grasslands	Common and widespread, increasing range inland along road verges
Order ARANEA, family ARANIDAE (Orb Spiders)			
<i>Mangora acalypha</i>	Cricket bat orb spider		Common and widespread
Gastropod snails, family HYGROMYIIDAE and GEOMITRIDAE			
<i>Monacha cantiana</i>	Kentish snail	Ubiquitous	Common in England
<i>Cochlicella acuta</i>	Pointed snail	Coastal grasslands, salt marsh fringes, sand dunes	Common in coastal areas

3.11.2 Pre-existing Records

SxBRC provided 56 recent records for the hedgehog (most within the last decade), indicating that this species persists in the local area despite recent national declines, and four records for harvest mice. Both of these species are listed on Section 41 of the NERC Act (2006) also referred to as S41 priority species. SxBRC also provided records for 45 S41 priority invertebrate species. This list is dominated by moths (91%) that are listed as a priority for research, because their conservation status is unclear, but also includes the small heath butterfly *Coenonympha pamphilus*, white-letter hairstreak *Satyrion w-album*, and red shanked carder-bee *Bombus rudarius*.

The tidal River Arun supports a variety of fish species including roach *Rutilus rutilus*, flounder *Platichthys flesus*, sand goby *Pomatoschistus minutes*, mullet spp., bass *Dicentrarchus labrax*, plaice *Pleuronectes platessa* and solenett *Buglossidium luteum*, all of which are generally common and widespread species. The migratory European eel *Anguilla anguilla* and the sea lamprey *Petromyzon marinus* have also been recorded within the Arun catchment by the Environment Agency¹². Both species are listed on the UKBAP priority species list, with sea lamprey also being protected under Annex II of the EU Habitats directive Appendix III and the European eel as critically endangered on the IUCN red list and a species of principal importance under the NERC Act 2006.

3.11.3 Interpretation

The application site does contain habitats suitable for West European hedgehog *Erinaceus europaeus* and harvest mouse.

The terrestrial invertebrate walkover survey did not reveal any scarce species. The priority species that could potentially be present at the site (as indicated by the SxBRC records) include small heath butterfly



and red-shanked carder bee, however these species were not found during any of the site visits, despite some fragmented habitats contained in the site appearing to be potentially suitable. The site does not contain elm trees that might support white-letter hairstreak, and it is therefore not likely to be present. The terrestrial invertebrates recorded during the site visit included a wide range of common and widespread species and no notable species have been found. It is possible that, as the site is formerly a construction site compound for the Environment Agency, these semi-natural habitats are of recent origin and have not matured. As such, they are unlikely to support important invertebrate assemblages. Based on the species recorded and the habitat conditions within the site, it is considered that the invertebrate assemblage is not likely to be important beyond the **local level**.

3.12 Invasive Non-native Species

3.12.1 Survey Results/Incidental Observations/Habitat Potential

The butterfly bush or buddleia *Buddleia davidii* was the only invasive non-native species (INNS) recorded on site. No INNS were found that are currently listed on Schedule 9 of the Wildlife and Countryside Act (1981) as amended.

3.12.2 Pre-existing Records

The SxBRC provided records of 40 INNS within the search area. This included at least 17 plant species listed on Schedule 9 of the Wildlife and Countryside Act (1981) as amended, as well as a wide range of birds, mammals and invertebrates.

The Environment Agency recorded only one area of Japanese knotweed *Reynoutria japonica* to the south of the A259 bridge, outside the proposed development site¹².

3.12.3 Interpretation

Whilst there are many records of INNS in the local area, since none listed on Schedule 9 were found on the proposed development site, the presence of INNS is not considered a significant constraint to development on the site. However, buddleia has the potential to become invasive, and the presence of this species will be addressed through the proposed development of the site.



4 IMPACT ASSESSMENT

The assessment of ecological impacts and mitigation recommendations in this report follow CIEEM Guidelines for Ecological Impact Assessment (EcIA)². This involves valuing the importance of an 'ecological feature' (habitat, vegetation community, population of a single species or assemblages of species) in terms of nature conservation priority, followed by the application of the 'Mitigation hierarchy'.

In this section, the predicted impacts and effects of the proposed scheme are described for each important ecological feature in turn. This is based on the best available information, both on the baseline ecological condition and on the method of construction, timescale and other development/planning constraints known at the time. The significance of the impact on nature conservation is recorded in accordance with CIEEM guidance and the degree of uncertainty relating to the occurrence and severity of an impact is discussed.

The proposed development includes the construction of five permanent buildings behind (i.e. landward side of) the sea wall and provision of 32 leisure moorings along the River Arun itself. This will result in direct impacts upon all the above identified ecological receptors to varying degrees. Construction related impacts during site preparation in the absence of mitigation, could potentially include direct harm to nesting birds and their nests, common lizard and water voles, which would constitute a breach in wildlife legislation, together with the permanent loss of habitats for these species.

The original drainage design has been revised and adjusted in response to comments received from Arun District Council's Drainage Engineer at the Pre-application stage¹³. The existing 'ordinary watercourse' that emerges from a culvert under the A259 is to be culverted across the development site through the flood defences to a new outfall. A section of designated 'main river' running across the southern part of the site will remain intact, with an attenuation pond added. The introduction of floating pontoons and 32 leisure moorings along the River Arun could lead to significant damage to intertidal habitats including mud flat and saltmarsh priority habitat (physical damage, erosion and shading/compaction) if they were positioned in the intertidal zone. The presence of tall structures (moored leisure craft) in this location and increased human activity could also lead to increased disturbance of small numbers of wintering shorebirds that currently use this section of the river.

4.1 Designated Sites

Hampton Quay lies over a kilometre away from all statutory designated nature conservation sites and therefore the proposed development site is outside the zone of influence from all statutory and non-statutory designated sites. Based on this, the type of habitat represented by the designated sites and

¹³ Ambiental Environmental Assessment (2019) *Comment Response Sheet – 'a systematic record of the comments received related to the above documents, and Ambiental's proposed approach to dealing with the comments received from Arun District Council, Drainage Engineer Karl McLaughlin'*. Ref. 4732_Kingman_Littlehampton_FRA_Final_v2 Consultation Response 11 November 2019, received by the Ecology Co-op from Stolon Studio Ltd. on 9th December 2019.



the scale of the development, there are no identified mechanisms of impact on designated sites as a result of the proposed development and as such they are not considered further in this EclA.

4.2 *Priority habitats*

4.2.1 Impact Characterisation

The application site contains a variety of terrestrial and coastal habitat types. The most important of these is the intertidal zone, which includes intertidal mudflat and saltmarsh, and the transitional zone above high tide mark. These habitats support ecologically important plant communities and benthic marine invertebrates that, in turn, provide a source of food for wintering shorebirds.

The proposed development includes the provision of 32 leisure moorings along the frontage of the River Arun and a new drainage outfall, which, together with the associated watercraft movements, if positioned in the intertidal zone, could lead to direct damage to these intertidal habitats (e.g. physical damage, boat-wash erosion and shading/compaction).

The proposed scheme will result in the permanent loss of terrestrial habitats contained within the site that support an assemblage of common and widespread species. Recommendations for assessing the importance of these ecological features to protected and priority species is discussed in the following sections of this report.

4.2.2 Significance of Impacts

The saltmarsh habitat at the proposed development site represents at least 29% of the total area of saltmarsh habitat on the River Arun estuary. Damage to this habitat as a result of the scheme is likely to be significant at up to **district level**. Intertidal mudflat is equally scarce in this river system and any damage to this habitat type could potentially lead to adverse impacts on wintering birds (see below).

The direct loss of terrestrial habitats contained within the proposed development site are not considered to be significant beyond **local level**, as they are low value habitat types that only support common and widespread species.

4.3 *Badgers*

As no signs of badger activity were identified during the assessment and no badger setts are situated on or near the proposed development site, the proposed development is not expected to result in impacts on badgers. However, if any signs of digging by large animals is identified on or near to the site prior to construction, then an ecologist should be contacted for further advice.

4.4 *Bats*

4.4.1 Impact Characterisation

There are no buildings or trees with potential to support roosting bats on or adjacent to the site, therefore no impacts on roosting bats are predicted. The addition of built structures upon the site will potentially



result in new opportunities for roosting bats, representing a beneficial impact. However, the proposed development has potential to result in disturbance to commuting and foraging bats, both during construction and in the long term after completion, through increased artificial lighting, disturbance and loss of semi-natural habitats used for foraging and commuting by bats.

4.4.2 Significance of Impacts

Based on the bat activity survey findings, which indicated low levels of bat activity by a small number of common species of bat, these impacts are not expected to be significant beyond **local level**.

4.5 *Breeding Birds*

4.5.1 Impact Characterisation

In the absence of mitigation, clearance of existing vegetation in preparation for construction has potential to result in the destruction of nests, eggs and young of nesting bird species. This would constitute an offence under current legislation. Development of the site results in a permanent loss of some dense scrub and bramble, used as nesting and foraging habitat for common breeding bird species, and replacement with a built environment that is likely to displace part of the existing breeding bird assemblage that use these habitats. However, much of the existing tree screen on the A259 boundary will be retained throughout the development. These trees will continue to provide suitable nesting opportunities, but the proximity of the new development may result in disturbance impacts.

4.5.2 Significance of Impacts

Based on the breeding bird survey findings, which recorded an assemblage of common and widespread bird species, the permanent loss of nesting habitat is not expected to be significant beyond **local level**.

4.6 *Wintering Birds*

4.6.1 Impact Characterisation

The provision of 32 leisure moorings, visitor drop-off and ferry / water taxi pontoon and the associated watercraft movements, could potentially adversely affect a small number of the regularly occurring wintering shorebird species; redshank, common sandpiper, oystercatcher. The increased human activity, especially dog walking, could potentially lead to increased disturbance to these wintering shorebirds leading to more frequent flight initiation responses and higher energy expenditure. While the area of intertidal flats created by the Environment Agency does not currently support important numbers of these species, there is potential for it to attract higher numbers in future as the benthic invertebrate community matures. In the absence of any mitigation, the presence of new tall structures along the river frontage could potentially act as a visual barrier to birds, which could prevent them from using this area in future.

4.6.2 Significance of Impacts

The findings of the winter bird survey show that this section of the River Arun does not support an important high-tide roost and the intertidal mudflats adjacent to the development site are not regularly used by high numbers of wintering shorebirds for foraging. Therefore, in the worst case, a reduction in



suitability of these habitats and displacement of the small number of regularly occurring common species of shorebirds would not be considered significant beyond **local level**.

4.7 Reptiles

4.7.1 Impact Characterisation

The development will result in the permanent loss of all the existing tall ruderal vegetation and grassland habitat, which supports a small population of common lizards. In the absence of mitigation, clearance of this existing vegetation in preparation for construction has a high risk of killing and injuring common lizards. This would constitute an offence under current legislation. However, a small proportion of existing habitat will remain intact along the zone between the A259 embankment and the northern part of the site containing the Environment Agency's managed realignment.

4.7.2 Significance of Impacts

Common lizards are common and widespread reptiles, and the existing population on the proposed development site represents a very small proportion of the total population. Therefore, the complete loss of this population is not considered to be significant beyond **local level**.

4.8 Water Voles

4.8.1 Impact Characterisation

The existing 'ordinary watercourse' that emerges from a culvert under the A259 is to be culverted across the development site through the flood defences to a new outfall. The 'main river' running across the southern part of the site will remain open but will be modified into a two-stage channel with an attenuation pond added to improve their capacity and resistance to erosion. In the absence of mitigation, the earthworks and construction of the culvert carries a high risk of direct harm to water voles if present at the time of the construction. This would constitute an offence under current legislation. The culverting of the ordinary watercourse represents a permanent loss of sub-optimal habitat. However, in the long term, the modified two stage channel and attenuation pond may provide improved habitat for water voles once marginal vegetation has re-established.

4.8.2 Significance of Impacts

Water voles have suffered widespread declines in populations and any negative impacts upon this species is significant. Based on the information available on the status of water voles in the local area, and taking a precautionary approach, the combined impacts of the proposed development are potentially significant at up to **local level**.

4.9 Other Notable Species

4.9.1 Impact Characterisation

Based on the habitats contained within the development site and high number of records, it is reasonable to assume that hedgehogs could be present on the application site and harvest mouse are likely absent.



Most of the annual/short perennial, grassland, tall ruderal vegetation, bramble and scrub habitats that support a diverse assemblage of common terrestrial invertebrates lie within the location of the proposed buildings and hard landscaping and will therefore be permanently lost to the development, including the landward side of the sea defences. However, the intertidal saltmarsh and marginal zones will remain intact.

4.9.2 Significance of Impacts

The hedgehog has suffered dramatic population declines in recent decades, although it remains widespread and has declined less in urban areas than rural areas¹⁴. There is a high degree of uncertainty of impacts occurring, but the proposed scheme is considered unlikely to result in impacts that are significant beyond **local level**.

The semi-natural habitats lost to this development are relatively small-scale compared to other schemes and, based on the habitat types present and their recent origin, the findings of the walkover survey and pre-existing records, it is not likely to be significant to invertebrate populations beyond a **local level**.

4.10 Invasive Non-native Species

4.10.1 Impact Characterisation

The application site is relatively free from invasive species apart from buddleia, which is not listed on Schedule 9. However, the site is vulnerable to the establishment of invasive non-native plants such as Japanese knotweed *Reynoutria japonica*, three-cornered garlic *Allium triquetrum*, monbretia *Crocosmia pottsii x aurea* (*C. x crocosmiiflora*) and species of *Cotoneaster*. These species could become established as a result of fly-tipping, bird vectors and other sources, contaminated imported soil material, or vehicles and plant that are brought onto the site during construction.

4.10.2 Significance of Impacts

The establishment of any invasive species into adjacent retained habitats as a result of the development could lead to adverse impacts at a **local level**, but the likelihood is low given that the rigors of construction activity and post construction management of the built environment is likely to prevent establishment and spread.

¹⁴ Warwick, H. (2016) *Britain's Hedgehogs: research and the conservation effort in the face of serious decline*. British Wildlife Vol. 28, pp78-86



5 MITIGATION PROPOSALS

5.1 Priority Habitats

5.1.1 Impact Avoidance

The scheme design has been developed to avoid direct impacts on the intertidal habitats (mud flat and salt marsh). The pontoons and houseboats are to be positioned into the River Arun beyond the Mean Low Water Springs (MLWS) mark so that loss of salt marsh vegetation, shading and erosion is completely avoided. It is possible that these structures will reduce wave action and erosion of the salt marsh leading edge, potentially resulting in saltmarsh accruing behind the floating pontoon and a positive impact on this habitat type.

This means that the area of mudflat and saltmarsh created by the Environment Agency's managed realignment project, will therefore remain completely intact, and the fringing saltmarsh vegetation along the eastern earth flood protection bank of the River Arun is protected.

5.1.2 Mitigation Measures

The extent and species composition of the saltmarsh vegetation will be monitored annually through the first five years of the development by utilising aerial photography using drones and fixed-point quadrats. This will enable any losses or gains in the extent of habitat to be identified and the appropriate remedial action taken. For example, localised erosion could be remediated by installing bank protection (e.g. faggots) or adjusting the position of moorings and floating pontoons.

5.1.3 Residual Impacts

These mitigation measures and monitoring are likely to remove any residual impact on intertidal mudflat and saltmarsh habitats. Loss of terrestrial habitats to the development remains a residual impact that is significant at **local level**, certain and unavoidable.

5.1.4 Compensation Measures

The proposed development will be accompanied by a soft landscape design that is sensitive to the coastal surroundings and will incorporate a planting scheme using appropriate native species to enhance the development site and maximize its potential value to biodiversity.

Whilst culverting of much of the existing drainage ditch is unavoidable, to compensate for this the scheme includes a new 'bio-swale' along the frontage of the buildings designed to provide aquatic habitat that includes the retention and enhancement of two short sections at either end of the existing channel as open watercourses. These sections will be widened and deepened to provide permanent water and reprofiled to allow a range of vegetation types to develop in the margins.



5.2 *Bats*

5.2.1 Impact Avoidance

To minimise the effects of artificial light disturbance on foraging bats, the proposed development shall include an 'ecologically sensitive lighting scheme' in accordance with guidance produced by the Bat Conservation Trust (summarised in Appendix 3) and considering the local context of the site (e.g. existing background artificial light spill). This shall include measures to create a 'dark corridor' through the development site where possible, and measures to minimize light spill onto all semi-natural habitats. All street lighting should be directed downwards and screened, use light wavelengths that are less attractive to insects. Reflective white line marking should be used in preference to artificial lighting in all non-essential applications.

The proposed development will retain most of the existing scrub and tree cover on the A259 embankments, as these habitats fall outside the red-line boundary of the scheme and will act as a landscape screen. This will provide a linear feature along which bats can continue to use for foraging and commuting throughout the life of the development.

5.2.2 Mitigation Measures

All trees to be felled will be subject to appropriate surveys to determine the risk of impacts on roosting bats. All felling will be supervised by a suitably qualified ecologist and mitigation put in place in accordance with best practice guidance where necessary.

5.2.3 Residual Impacts

By undertaking sensitive clearance works and retaining the existing linear planting features on the A259 embankment, and incorporating a sensitive lighting plan, the residual impacts of the proposed development on bats will be reduced to **negligible**.

5.2.4 Compensation Measures

A soft landscape design that is sensitive to the coastal surroundings and uses native species to maximise biodiversity including insects will benefit foraging bats and compensate for the small impact of the development.

5.3 *Breeding Birds*

5.3.1 Impact Avoidance

In advance of construction, all trees and scrub including brambles will be cleared from the site during the winter months to avoid the breeding bird season. The proposed development avoids most of the existing scrub and tree cover on the A259 embankments, as these habitats fall outside the red-line boundary of the scheme and will act as a landscape screen. Therefore, nesting habitat for the existing breeding bird assemblage has been retained where possible.



5.3.2 Mitigation Measures

In advance of construction all trees and scrub removal will be timed outside of the nesting bird season (typically 1st March to 31st August). Where this is not possible, small areas of vegetation and individual trees may be felled/cleared during the breeding bird season provided that they are first subject to a 'breeding bird check' by a suitably qualified ecologist and no active nests are found. The clearance operation should then take place within 24 hours of the check. Where active bird nests are found, an exclusion zone shall be set up around the nest where no works are permitted until the chicks have fledged.

5.3.3 Residual Impacts

The permanent loss of some trees and scrub to the development is unavoidable and represents a residual impact on breeding birds. However, given that trees and shrubs on the A259 embankment will be retained, this habitat loss is small in extent. By following the mitigation measures outlined in section 5.3.2, no breeding birds or their nests will be harmed, and this residual impact will not be significant beyond **site level**.

5.3.4 Compensation Measures

The soft landscaping scheme will incorporate tree and shrub planting where appropriate that will provide new nesting opportunities for common breeding birds and therefore offers compensation for the habitat lost to the scheme.

5.4 *Wintering Birds*

5.4.1 Impact Avoidance

Considerable efforts have been made to lessen the landscape impact of the proposal through building massing, landscaping and green coverage. The overall massing of the proposal has been designed so the highest building is set in the more urbanised southern end of the site, stepping down to 2-3 storeys in the more rural north of the site. This design will help to reduce the potential visual impact of the new buildings on wintering shorebirds.

The landscaping design corresponds with this; blending from more hard landscaping in the south of the site, to more soft landscaping in the north of the site. The proposed development will be accompanied by a soft landscape scheme that is sensitive to the coastal surroundings and will incorporate a planting plan using appropriate native species to enhance the development site and maximise its potential value to biodiversity.

The proposed development has been revised and redesigned to ensure that the fringing saltmarsh and intertidal mudflat habitats, used by wintering shorebirds for foraging, is protected from physical damage throughout the life of the development. The relocation of the floating pontoons onto the River Arun beyond the low water mark not only protects the intertidal zone from boat wash but also places them at least 10m away from the intertidal zone and therefore reduces the potential of disturbance. The earlier proposals for permanently moored houseboats has been replaced by c. 32 moorings for private leisure craft and a drop-off point for water taxi/ferry services. The current pattern of use of these craft are during the summer months, with most owners taking them out of the water for maintenance during winter. This



is not expected to change and means that the impact of disturbance on wintering shorebirds is effectively avoided. Furthermore, the height of watercraft is restricted by the low bridges and is not expected to exceed 2m above the water level. The floating pontoons are no more than 450mm above the water level. Both are therefore lower than the line of sight of shorebirds using the managed realignment mudflat area (see Figure 14), and therefore very unlikely to result in increased perceived predation risk associated with visual intrusion, or disturbance from human activity.

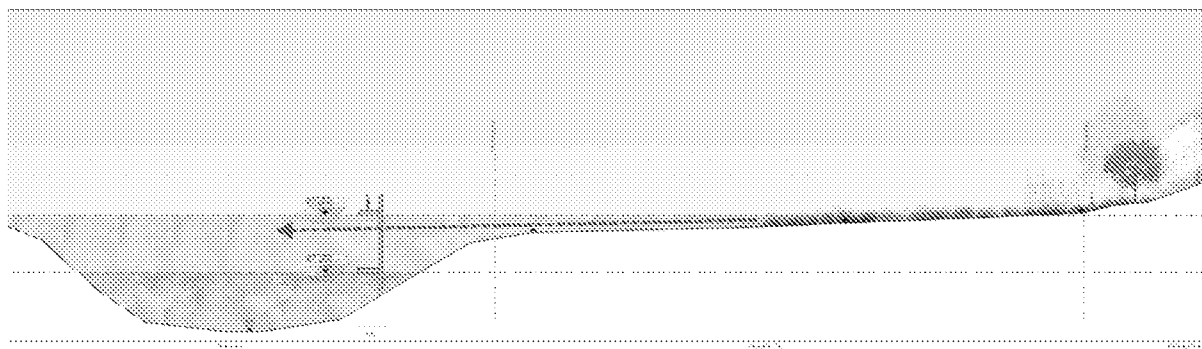


Figure 14. Cross section of completed scheme across the managed realignment area. Note that the height of the floating pontoon and watercraft are below the line of sight at low tide for birds using the intertidal mudflats (dotted red line).

5.4.2 Mitigation Measures

Since the wintering bird surveys demonstrate that the intertidal habitats along the frontage of the proposed scheme do not support important numbers of wintering shorebirds, the impact is not expected to be severe.

The impact avoidance measures described in section 5.4.1 are 'embedded mitigation' measures intended to reduce the impact of the proposed development on wintering shorebirds.

5.4.3 Residual Impacts

The influence of human disturbance on wintering shorebirds has been the subject of considerable scientific research and debate, and there is a high degree of uncertainty in assessing impacts as it is highly dependent on local circumstances¹⁵¹⁶¹⁷. At the time of this assessment, the intertidal habitats at the development site does not support an important shorebird assemblage but the value of the managed realignment area to shorebirds could be expected to improve, as benthic invertebrate populations establish and mature.

¹⁵ Goss-Custard, J. (2016) *Mud, birds and poppycock*. Available at: e_law 96, September to October 2016 [Accessed February 2017].

¹⁶ Gill, J., Norris, K., Sutherland, W.J. (2001a) *Why behavioural responses may not reflect the population consequences of disturbance*. Biological Conservation, 97, pp 265-268.

¹⁷ Liley, D & Fearnley, H. (2011). *Bird Disturbance Study, North Kent 2010/11*. Footprint Ecology. Available at <http://gtgkm.org.uk/documents/nk-bird-report-1317294981.pdf> [Accessed March 2017].



The embedded mitigation measures described above will ensure that overall, the proposed scheme is likely to have **negligible** disturbance impacts on wintering shorebirds and that it is highly unlikely to prevent birds from exploiting this area in future.

5.4.4 Compensation Measures

Compensation measures can be designed to offset the residual impact of development schemes that impact on wintering shorebirds. These could be through a financial contribution to another project that benefits wintering shorebirds elsewhere, or in more extreme cases involve the creation of intertidal habitat elsewhere in the River Arun estuary, which could be secured through planning conditions or a Section 106 Agreement between the developer and the local planning authority. However, given the predicted low severity of this impact on the existing winter shorebird assemblage, the on-site embedded mitigation designed into the scheme and the level of uncertainty, a comprehensive compensation package is not considered necessary for this proposal.

5.5 Reptiles

5.5.1 Impact Avoidance

Most of the suitable reptile habitat lies within the area where permanent buildings are proposed and impacts on common lizard cannot be avoided.

5.5.2 Mitigation Measures

To mitigate for harm to individual reptiles, a trapping and translocation programme is proposed to a suitable pre-determined reptile receptor site. This involves the installation of a reptile-proof fence around the development site, followed by a period of trapping, typically a minimum of 60 visits in advance of site clearance. The receptor site should be of equivalent size to the habitat being lost and contain tussock forming grassland vegetation and suitable cover for common lizards. Potential locations for such a receptor site have been identified along the existing A259 road verge bordering the development site, although their requirements may conflict with the requirement for scrub and trees acting as a landscape screen. An alternative location is the former receptor site used by the Environment Agency, though the suitability of this site for receiving more animals requires full assessment including a survey to determine the current population - if it supports a low population of reptiles (a peak count of <10) then the site may be suitable, together with the inclusion of appropriate management/enhancement to improve carrying capacity. Trapping and translocation of common lizard may be aided by staged vegetation clearance to remove cover and progressively concentrate animals into smaller areas, making them easier to catch.

5.5.3 Residual Impacts

The mitigation measures proposed above do not fully address the permanent loss of suitable habitat for common lizard. However, as this population and extent of habitat involved is small, and common lizards are a common and widespread species, this residual impact is not considered to be significant beyond **site level**.



5.5.4 Compensation Measures

Compensation measures specifically tailored for common lizard are not considered necessary for the scale of impacts predicted on this species. However, it is important that the receptor site that is selected is fit for purpose, is ecologically connected, contains suitable habitat and has enough capacity to support the additional animals translocated. This means that an existing site and habitat that supports a population must either be enhanced, or additional areas of habitat are created.

5.6 Water Voles

5.6.1 Impact Avoidance

The existing drainage ditch that supports water voles lies within the area where permanent buildings are proposed and cannot be retained. The loss of water vole habitat is therefore unavoidable. However, a short section of the ordinary watercourse will remain where it emerges under the A259, and most of the designated main river section will remain open, although the earthworks to create the attenuation pond and a two-stage channel to improve capacity for surface water attenuation cannot be avoided.

5.6.2 Mitigation Measures

Based on the survey information gathered to date, the presence of water voles at the time of construction is not certain. Therefore, regular monitoring is proposed to ensure that decisions are based on the most up-to-date circumstances. Repeat surveys shall be undertaken at 3 monthly intervals from April – October in advance of construction. It may be possible to time construction activities outside the late summer to autumn peak in water vole abundance, and therefore avoid direct impacts on water voles by carrying out earthworks when they are not present.

However, this may be unreliable as the sole mitigation strategy as there are likely to be many other factors determining the timing of construction. Mitigation under a 'conservation licence' from Natural England may become necessary if water voles are present at the time of commencement. As the site is relatively isolated and displacement techniques are unlikely to work, this is likely to involve trapping and translocation to a pre-prepared receptor site that will either be incorporated into the site design or is established at an off-site location. The proposed 'bio-swale' created along the frontage of the development may be a potential location for translocated water voles. However, this will be constructed a long time after the existing ditch has been infilled, and so is not a practical solution¹⁸.

In order to justify issuing a conservation licence for a development project, Natural England must be satisfied that the mitigation strategy results in a 'net gain' in water vole conservation status— it is not generally considered enough to replace habitats 'like for like'.

¹⁸ A potential solution in this situation would be to bring water voles into captivity in the intervening period and release them once the scheme has been built and habitat in the on-site receptor site is fully established. While this is a tried and tested method used multiple times on other schemes, it is time consuming, expensive and carries risks of failure and should therefore be viewed as a last resort.



To achieve this, and for practical reasons, the mitigation strategy would include an off-site receptor site into which trapped water voles can be directly 'soft released' from the development site. The receptor site must contain newly created or enhanced suitable water vole habitat and, owing to the highly territorial nature of water voles, must not already support a water vole population. Ideally the habitat created for the receptor site should be adjacent to an existing water vole metapopulation rather than an ecologically isolated site. Local investigations are on-going to find a suitable receptor site for water voles and potential sites on the west side of the River Arun are being considered at the time of writing.

The procedure for translocating water voles, including timing, methodology, selection and establishment of suitable receptor sites and on-site habitat compensation, will be set out in a detailed method statement submitted with the conservation licence application. These measures would be secured through that licence.

5.6.3 Residual Impacts

The loss of the existing ditch would represent a local residual impact that requires compensation (see below).

5.6.4 Compensation Measures

Compensation for the loss of water vole habitat would be secured through the water vole conservation licence, if it is required. The habitat enhancements required for the establishment of a suitable receptor site will be designed to deliver adequate compensation for the loss of the existing ditch to development as it will need to have enough carrying capacity to support the translocated population.

In order to satisfy the conditions of a conservation licence, Natural England will require a 'net gain' in water vole habitat. The proposed scheme sustainable drainage design includes a 'bio swale', together with widened retained sections of the watercourse into a 'two stage' ditch with attenuation capacity and a balancing pond at the culvert into the site. These features provide an opportunity to create new 'optimal' water vole habitat and therefore provide a net gain for water voles that would be provided irrespective of whether a licence is required or not.

5.7 Other Notable Species

5.7.1 Impact Avoidance

The proposed scheme will result in unavoidable loss of terrestrial habitat supporting other notable species and an invertebrate assemblage of relatively low ecological importance.

5.7.2 Mitigation Measures

The progressive vegetation clearance measures put in place to aid capture of common lizard will also prevent harm to hedgehogs prior to construction, should they occur on the site. This work will be carried out during the active season and since it will have to be carried out outside the breeding bird season, it will also avoid sensitive periods in the life cycle of these species by default. Vegetation clearance will be undertaken slowly and with due care and vigilance for the occurrence of these species. If hedgehogs are discovered, they will be carefully moved to a safe position away from the construction zone.



5.7.3 Residual Impacts

The severity of this impact is uncertain as it is unclear whether the site supports hedgehogs but based on the extent of habitat loss, and provided that individual animals are not harmed, it is not likely to be significant beyond **site level**.

The loss of the annual/short perennial, grassland, tall ruderal vegetation, bramble and scrub habitats that support a diverse assemblage of common terrestrial invertebrates remains a residual impact of the scheme that is significant at **local level**.

5.7.4 Compensation Measures

The soft landscape design that is sensitive to the coastal surroundings and uses native species to maximise biodiversity will compensate for this small potential impact of the development.

5.8 *Invasive Non-native Species*

5.8.1 Impact Avoidance

Continued vigilance for the establishment of any INNS listed on Schedule 9 of the Wildlife and Countryside Act (1981) as amended, is recommended. If any invasive species are discovered, appropriate measures should be put into place to ensure their eradication and to prevent causing them to spread to other site, before the start of construction activity. The inclusion of any potentially invasive species, such as Cotoneaster, should be avoided in the landscape planting scheme for the proposed development.

5.8.2 Mitigation Measures

The existing stands of Buddleia will be removed as part of normal site clearance operations. Reestablishment of this species will be prevented through the soft landscape planting scheme and maintenance operations.

6 **BIODIVERSITY ENHANCEMENTS**

The proposed development scheme will incorporate habitat enhancements into the soft landscape design to encourage biodiversity into the site. The proposed development site lies at the edge of the existing town of Littlehampton on the boundary between the built urban environment and the natural landscape. The design concept has given this transition careful consideration so that the buildings fit into the surroundings and integrate between the urban and natural environments.

The completed development can be viewed as three overlapping character zones, from 'Bridge Reach' (in the north), 'Riverside' (in the centre) and 'The Saltings' (in the north) forming a transition between built environment and natural environment. These zones set the character of the buildings, the landscape, and public open spaces, and together form the backdrop to the river frontage and flood



protection. This means that buildings are taller in the southern, more urban part of the site, and are progressively lower towards the north where it meets the natural environment.

This provides a range of opportunities for biodiversity enhancements, including the provision of new nesting sites for birds on taller buildings in Bridge Reach in the more urban setting, such as house sparrow terraces and integral swift boxes) together with integral bat roosting boxes on south facing elevations. The plant species selected for the soft landscape planting between the buildings on Bridge Reach and Riverside character areas shall include fruiting shrubs and trees, and flowering plants that provide a source of food and nectar and maximise insect diversity.

The landscape planting along the 'Riverside Walk' along the River Arun frontage across the whole development site shall include a more maritime influenced species mix with low height to maintain the open vistas of the river and limit the visual intrusion/clutter of the development from the perspective of wintering shorebirds.

The Saltings character zone marks the northern extremity of the development site with low buildings and public open space set back from the waterfront. It is envisaged that the spit formed by the end of the former flood embankment that was removed by the Environment Agency will form a vantage point for bird watchers to view the habitats formed by the managed realignment project. This will be screened from the intertidal zone on the landward side to reduce human disturbance impacts on wintering shorebirds.

The Saltings lies adjacent to the existing intertidal mudflat and establishing salt marsh vegetation of the Environment Agency's managed realignment project. Direct public access to this area shall be discouraged by the lack of footpaths and low maritime landscape planting. This area will be protected from any disturbance for continued natural establishment of salt marsh vegetation to meet the Environment Agency's objectives and encourage future use by wintering shorebirds.

Finally, the sustainable drainage design for the development proposes the retention of two short sections of the original drainage ditch in Bridge Reach and The Saltings. These will be widened and connected to a balancing lagoon to improve storage capacity at high tide. The bank profiles will be adjusted to be suitable for water voles, and appropriate emergent vegetation planted to provide cover from predators and a source of food. Finally, the drainage scheme includes the formation of a 'bio-swale' along the frontage of The Saltings to Riverside character zones. This small channel will be designed to hold water and be planted with a range of aquatic plant species to maximise its potential value to water voles.

All the biodiversity enhancement features proposed for this development will be managed in an appropriate manner to ensure that their value to wildlife is maintained throughout the life of the development.

The above biodiversity enhancement measures could be secured through the production of a Landscape and Ecological Management Plan (LEMP) document that sets out the number, type and location of habitat enhancements that will be provided, the on-going maintenance needs and responsibilities.



7 CONCLUSIONS

A summary of the EclA process is presented in Table 9 below.

Table 9. Ecological Impact Assessment summary table for the development at Hampton Quay

Ecological feature	Importance	Impact characterisation	Level of significance	Mitigation	Residual impact	Compensation required? (Y/N)
Designated sites	Negligible; none nearby	None identified	N/A	N/A	N/A	No
Priority habitats	Salt marsh; district level	Damage to/loss of intertidal zone	Up to district (adverse; likely)	Avoidance, monitoring for change	Negligible	No
Badgers	Negligible	None identified	N/A	N/A	N/A	No
Bats	Local level	Displacement due to loss of foraging habitat and low potential trees	Up to local level (adverse; likely)	Sensitive lighting plan, controlled felling operations, retain scrub/trees on A259 embankment	Negligible	No
Breeding birds	Local level	direct harm to nests/eggs; permanent displacement due to habitat loss	Up to local level (adverse; certain)	Avoid nesting season; retain scrub/trees on A259 embankment	Site level	Yes – soft landscape planting to include native species tree and shrub planting to replace lost trees
Wintering birds	Up to local level	Displacement through disturbance of a small number of common shorebirds	Local level (adverse; uncertain)	Embedded mitigation – buildings designed with low profile, screening.	Negligible	No
Dormice	Negligible	None identified	N/A	N/A	N/A	No
Great crested newts	Negligible	None identified	N/A	N/A	N/A	No
Common reptiles	Common lizard population; local level	Direct harm of individual animals; permanent habitat loss	Local level (adverse; certain)	Trapping and translocation to receptor site nearby	Site level	No but receptor site must be suitable



Ecological feature	Importance	Impact characterisation	Level of significance	Mitigation	Residual impact	Compensation required? (Y/N)
Water voles	Present; local level	Direct harm of individual animals; permanent habitat loss	Local level (adverse; certain)	Trapping and translocation to receptor site nearby	Local level	Yes – replace lost habitat to achieve net gain
Terrestrial inverts.	No priority spp. found; local level	Permanent habitat loss	Local level (adverse; uncertain)	No specific measures possible	Local level	Yes – soft landscape plan to include planting scheme to encourage invertebrate diversity and to reflect surroundings
Hedgehog	Potentially local level based on BRC search	Direct harm of individual animals; permanent habitat loss	Local level (adverse; uncertain)	Controlled site clearance at appropriate time of year; scrub/trees retained on A259 embankment	Local level (habitat loss; uncertain)	No specific proposals but replace suitable habitat where possible



APPENDIX 1 – LEGISLATION AND POLICY

Introduction

The following text is intended for general guidance only and does not constitute comprehensive professional legal advice. It provides a summary of the current legal protection afforded to wildlife in general and certain species. It includes current national planning policy relevant to nature conservation.

The ‘Birds Directive’, ‘Habitats Directive’ and ‘Natura 2000 Sites’.

The Council Directive 79/409/EEC on the Conservation of Wild Birds (“the Birds Directive”) sets a framework for the protection of wild birds. Under the directive, several provisions are made including the designation and protection of ‘Special Protection Areas’ (SPAs) – areas which support important bird populations, and the legal protection of rare or vulnerable species.

The Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora (the “Habitats Directive”) directs member states of the EU to take measures to maintain favourable conservation status of important habitats and species. This requires the designation of a series of sites which contain important populations of species listed on Annex II of the directive. Together with ‘Special Areas of Conservation’ (SPAs), designated under the Birds Directive, SACs form a network across Europe of protected areas known as the ‘Natura 2000’.

Annex IV lists species in need of more strict protection, these are known as “European Protected Species (EPS)”. All bat species, common dormice *Muscardinus avellana*, otter *Lutra lutra* and great crested newts *Triturus cristatus* are examples of EPS that are regularly encountered during development projects.

The ‘Habitats Regulations’

The Conservation of Habitats and Species Regulations 2010 (the Habitats Regulations”) is the principle means of transposing the Habitats Directive and the Birds Directive, and updates the Conservation (Natural Habitats, &c.) Regulations 1994 (“the 1994 regulations”) in England and Wales.

‘Natura 2000’ sites receive the highest level of protection under this regulation which requires that any activity within the zone of influence of these sites would be subject to a Habitats Regulations Assessment (HRA) by the competent authority (e.g. planning authority), leading to an Appropriate Assessment (AA) in cases where ‘likely significant effects on the integrity of the site are identified.

For European Protected Species, Regulation 41 makes it a criminal offence to;

- Deliberately capture, injure or kill any such animal;
- Deliberately disturb wild animals of such species;
- Deliberately take or destroy their eggs (where relevant);
- Damage or destroy a *breeding or resting place* of such an animal;
- Possess, control, sell or exchange any live or dead animal or plant, of such species;
- Deliberately pick, collect, cut, uproot or destroy a wild plant of such species.

The Habitats Directive and Habitats Regulations provide for the derogation from these prohibitions for specific reasons provided certain conditions are met. An EPS licensing regime allows operations that would otherwise be unlawful acts to be carried out lawfully. Natural England is the licensing Authority



and, in order to grant a license, ensures that three statutory conditions (sometimes referred to as the 'three derogation tests') are met:

- A licence can be granted for the purposes of "preserving public health or safety or for other imperative reasons of overriding public interest including those of a social or economic nature and beneficial consequences of primary importance for the environment" (Regulation 53 (2) (e).
- A licence can be granted if "there are no satisfactory alternatives" to the proposed action.
- A licence shall not be granted unless the action authorised will not be detrimental to the maintenance of the population of the species concerned at a favourable conservation status in their natural range.

Wildlife and Countryside Act (1981) as amended.

The Wildlife and Countryside Act (1981)¹⁹ remains one of the most important pieces of wildlife legislation in the UK. There are various schedules to the Act protecting birds (Schedule 1), other animals including insects (Schedule 5), plants (Schedule 8), and control of invasive non-native species (Schedule 9).

Under the Wildlife and Countryside Act (WCA) 1981, all wild birds (with the exception of those listed on Schedule 2), their eggs and nests are protected by law and it is an offence to:

- Take, damage or destroy the nest of any wild bird while it is in use or being built.
- Take or destroy the egg of any wild bird.
- Disturb any bird listed on Schedule 1, while it is nest building, or at a nest with eggs or young, or disturb the dependant young of any such bird.

Schedule 5 lists all non-avian animals receiving protection to a varied degree. At its strongest, the Act makes it an offence to intentionally kill, injure or take any wild animal listed on Schedule 5, and prohibits interference with places used for shelter or protection, or intentionally disturb animals while occupying such places. Examples of species with *full protection* include all EPS, common reptile species, water vole *Arvicola amphibius*, white-clawed crayfish *Austropotamobius pallipes* and Roman snail *Helix pomatia*. Other species are protected from sale, barter or exchange only, such as white letter hairstreak *Satyrrium w-album*.

The Act makes it an offence to intentionally pick, uproot or destroy any plant or seed, and sell or possess any plant listed on Schedule 8. It is also an offence to intentionally uproot any wild plant not listed on Schedule 8 unless authorised [by the land owner]. Species on Schedules 5 and 8 are reviewed every 5 years when species can be added or removed.

Measures for the prevention of spreading non-native species which may be detrimental to native wildlife is included in the Act, which prohibits the release of animals or planting of plants into the wild of species listed on Schedule 9 (for example Japanese knotweed *Fallopia japonica*, Himalayan balsam *Impatiens glandifera*, New Zealand Pygmyweed *Crassula helmsii*).

The Wildlife and Countryside Act 1981 (as amended) also prohibits certain inhumane methods of traps and devices for the capture or killing of wild animals and certain additional methods such as fixed trap, poisoning with gas or smoke, or spot-lighting with vehicles for killing species listed on Schedule 6 of the Act (this includes all bat species, badger, otter, polecat, dormice, hedgehog and red squirrel).

¹⁹ Wildlife and Countryside Act (WCA) (1981). HMSO London.



Natural Environment and Rural Communities (NERC) Act (2006)

The NERC Act (2006)²⁰ places a statutory duty under Section 40 on all public bodies, including planning authorities, to take, or promote the taking by others, steps to further the conservation of *habitats and species of principal importance for the conservation of biodiversity* in England (commonly referred to as the 'Biodiversity Duty'). This duty extends to all public bodies the biodiversity duty of Section 74 of the Countryside and Rights of Way (CROW) Act 2000, which placed a duty only on Government and Ministers. Section 41 lists the habitats and species of principle importance. This includes a wide range of species from mosses, vascular plants, invertebrates through to mammals and birds. It originates from the priority species listed under the UK Biodiversity Action Plan (UK BAP) with some omissions and additions.

Protection of Badgers Act (1992)

The Badger *Meles meles* is afforded specific legal protection in Britain under the Protection of Badgers Act (1992)²¹, and Schedule 6 of the Wildlife and Countryside Act 1981 (as amended) (see above).

Under this legislation, it is a criminal offence to:

- intentionally kill, injure, take, possess, or cruelly ill-treat, a Badger, or to attempt to do so;
- interfere with a sett, by damaging or destroying it;
- to obstruct access to, or any entrance of, a Badger sett; or
- to disturb a Badger when it is occupying a sett.

A licence may be obtained from Natural England to permit certain prohibited actions for a number of defined reasons including interference of a sett for the purpose of development, provided that a certain number of conditions are met. Note that licenses are not normally granted for works affecting badgers between the end of November and the start of July.

National Planning Policy Framework

The National Planning Policy Framework (NPPF 2019)²² sets out the Government's view on how planners should balance nature conservation with development and helps ensure that Government meets its biodiversity commitments regarding the operation of the planning system.

Paragraph 174b, which states that council policies should “promote the conservation, restoration and enhancement of priority habitats, ecological networks and the protection and recovery of priority species; and identify and pursue opportunities for securing measurable net gains for biodiversity”. In accordance with the NPPF, it is important that developments should contribute to and enhance the natural and local environment by:

²⁰ Natural Environment and Rural Communities Act (2006). HMSO London.

²¹ Protection of Badgers Act (1992). HMSO London.

²² HM Government (2019). National Planning Policy Framework. Department for Communities and Local Government. Available online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/779764/NPPF_Feb_2019_web.pdf.



- Minimising impacts on existing biodiversity and habitats,
- Providing net gains in biodiversity and habitats, wherever possible,
- establishing coherent ecological networks that are more resilient to current and future pressures.

UK Post-2010 Biodiversity Framework

The UK Biodiversity Action Plan (UK BAP), published in 1994, was the UK's response to the commitments of the Rio Convention on Biological Diversity (1992). The UK BAP was replaced by the UK Post-2010 Biodiversity Framework. This framework covers the period 2011 to 2020 and forms the UK government's response to the new strategic plan of the United Nations Convention on Biodiversity (CBD) published in 2010. This promotes a focus on individual countries delivering target for protection for biodiversity through their own strategies.

The most recent biodiversity strategy for England, 'Biodiversity 2020: A strategy for England's wildlife and ecosystem services' was published by Defra (2011)²³, and a progress update was provided in July 2013 (Defra 2013)²⁴.

'Biodiversity 2020' builds on the Natural Environment White Paper for England – 'The Natural Choice', published on 7 June 2011, and sets out the strategic direction for biodiversity policy for the next decade.

Biodiversity 2020 deliberately avoids setting specific targets and actions for local areas because Government believes that local people and organisations are best placed to decide how to implement the strategy in the most appropriate way for their area or situation.

Birds of Conservation Concern (BoCC)

In 1996, the UK's leading non-governmental bird conservation organisations reviewed the conservation status of all bird species in the UK against a series of criteria relating to their population size, trends and relative importance to global conservation. The lists, known as the 'Red', 'Amber' and 'Green' lists (in order of decreasing concern) are used to inform key conservation policy and decisions. The lists are reviewed every 5 years and are a useful reference for determining the current importance of a particular site for birds. The most recent review was undertaken in 2015²⁵ (Eaton et al, 2015), which provides an up to date assessment of the conservation status of birds in the UK.

²³ Defra (2011) Biodiversity 2020: A strategy for England's wildlife and ecosystem services. Available at: <https://www.gov.uk/government/publications/biodiversity-2020-a-strategy-for-england-s-wildlife-and-ecosystem-services>.

²⁴ Defra (2013) Progress Update. Available at: <https://www.gov.uk/government/publications/biodiversity-2020-simple-guide-and-progress-update-july-2013>.

²⁵ Eaton, M., Aebischer, N., Brown, A., Hearn, R., Lock, L., Musgrove, A., Noble, D., Stroud, D., and Gregory, R. (2015) Birds of Conservation Concern 4: the population status of birds in the UK, Channel Islands and Isle of Man. British Birds 108. December 2015. 708–746



APPENDIX 2 – IMPORTANCE OF ECOLOGICAL FEATURES

Table 1: Determining importance of an ecological feature

Level of importance	Criteria
International	Internationally designated site; Special Protected Area (SPA), Special Areas of Conservation (SAC), Ramsar, Biosphere Reserves; Regularly occurring population of internationally important species listed in Annex 1, 2 or 4 of the Habitats Directive and Annex 1 of the Birds Directive; A viable area of a habitat listed in Annex 1 of the Habitats Directive or area important for maintaining viability listed as in Annex 1 of the Habitats Directive; Areas outside designated sites that are important for supporting and maintaining the viability of the above designated habitats and/or species.
National	Nationally designated sites; Site of Special Scientific Interest (SSSI), National Nature Reserve (NNR), Local Nature Reserves (LNR). A sufficiently large population of a species or area of habitat listed as a priority for nature conservation (S41 NERC Act) to make a significant contribution to the national conservation status (e.g. greater than 1% of the national total). A viable or regularly occurring population of a species that is nationally scarce, threatened or declining on a national scale. A habitat type that is nationally scarce, threatened or declining on a national scale.
Regional	A habitat type that is scarce, threatened or declining on a regional scale. A sufficiently large population of a species or area of habitat listed as a priority for nature conservation (S41 NERC Act) to make a significant contribution to the regional conservation status (e.g. greater than 1% of the national total).
County	Locally designated sites; Local Wildlife Sites (LWSs), Sites of Nature Conservation (SNCIs) and Site of Importance for Nature conservation (SINCs). A sufficiently large population of a species or area of habitat listed as a priority for nature conservation (S41 NERC Act) to make a significant contribution to the conservation status of the species at county level (e.g. greater than 10% of the county total). A viable or regularly occurring population of a species that is rare in the county, but may be common and widespread elsewhere, For example, a population at the edge of a species' range. A habitat type that is scarce in a county but may be more frequent elsewhere.
Local/parish	Habitats and species which are scarce in the local area but are sufficiently common and widespread elsewhere that they do not meet the above criteria.
Site / negligible	Habitats with little to no ecological value (e.g. amenity grassland and hardstanding)



APPENDIX 3 ARTIFICIAL LIGHTING AND WILDLIFE

Bright external lighting can have a detrimental impact upon foraging and commuting bat flight paths, but more importantly can also cause bats to remain in their roosts for longer. Artificial lighting can also cause significant impacts on other nocturnal species, most notably moths and other nocturnal insects. It can also result in disruption of the circadian rhythms of birds, reducing their fitness. Guidelines issued by the Bat Conservation Trust²⁶ should be considered while designing the lighting scheme. A simple process which should be followed where the impact on bats is being considered as part of a proposed lighting scheme. It contains techniques which can be used on all sites, whether a small domestic project or larger mixed-use, commercial or infrastructure development. This includes the following measures:

Avoid lighting on key habitats and features altogether

there is no legal duty requiring any place to be lit. British Standards and other policy documents allow for deviation from their own guidance where there are significant ecological/environmental reasons for doing so. It is acknowledged that in certain situations lighting is critical in maintaining safety, such as some industrial sites with 24-hour operation. However, in the public realm, while lighting can increase the perception of safety and security, measurable benefits can be subjective. Consequently, lighting design should be flexible and be able to fully consider the presence of protected species

Apply mitigation methods to reduce lighting to agreed limits in other sensitive locations – lighting design considerations

Where bat habitats and features are considered to be of lower importance or sensitivity to illumination, the need to provide lighting may outweigh the needs of bats. Consequently, a balance between a reduced lighting level appropriate to the ecological importance of each feature and species, and the lighting objectives for that area will need to be achieved. The following are techniques which have been successfully used on projects and are often used in combination for best results;

- Dark buffers, illuminance limits and zonation
- Sensitive site configuration, whereby the location, orientation and height of newly built structures and hard standing can have a considerable impact on light spill
- Consider the design of the light and fittings, whereby the spread of light is minimised ensuring that only the task area is lit. Flat cut-off lanterns or accessories should be used to shield or direct light to where it is required. Consider the height of lighting columns. It should be noted that a lower mounting height is not always better. A lower mounting height can create more light-spill or require more columns. Column height should be carefully considered to balance task and mitigation measures. Consider no lighting solutions where possible such as white lining, good signage, and LED cats' eyes. For example, light only high-risk stretches of roads, such as crossings and junctions, allowing headlights to provide any necessary illumination at other times.
- Screening, whereby light spill can be successfully screened through soft landscaping and the installation of walls, fences and bunding
- Glazing treatments, whereby glazing should be restricted or redesigned wherever the ecologist and lighting professional determine there is a likely significant effect upon key bat habitat and

²⁶ Bat Conservation Trust and Institute for Lighting Professionals (2018) Guidance note 8. Bats and Artificial Lighting. <https://www.theilp.org.uk/documents/guidance-note-8-bats-and-artificial-lighting/>



features.

- Creation of alternative valuable bat habitat on site, whereby additional or alternative bat flightpaths, commuting habitat or foraging habitat could result in appropriate compensation for any such habitat being lost to the development.
- Dimming and part-night lighting. Depending on the pattern of bat activity across the key features identified on site it may be appropriate for an element of on-site lighting to be controlled either diurnally, seasonally or according to human activity. A control management system can be used to dim (typically to 25% or less) or turn off groups of lights when not in use.

Demonstrate compliance with illuminance limits and buffers

- *Design and pre-planning phase*; It may be necessary to demonstrate that the proposed lighting will comply with any agreed light-limitation or screening measures set as a result of your ecologist's recommendations and evaluation. This is especially likely to be requested if planning permission is required.
- *Baseline and post-completion light monitoring surveys*; baseline, pre-development lighting surveys may be useful where existing on or off-site lighting is suspected to be acting on key habitats and features and so may prevent the agreed or modelled illuminance limits being achieved.

Post-construction/operational phase compliance-checking