

7 Terrestrial Ecology

Introduction

- 7.1 This chapter presents a preliminary assessment of the likely effects of the proposed OMSSD project on terrestrial ecology and associated Important Ecological Features (IEFs).
- 7.2 A description of the approach and methodology adopted for this preliminary assessment is presented within this chapter along with a description of the current ecological baseline. This is followed by an assessment of the likely effects on the relevant IEFs arising from the Proposed Development within a defined Zone of Impact ('Zoi') during preparation and construction works, and once the Proposed Development is completed and operational.
- 7.3 This Chapter is supported by the following appendices and figures which are associated with the most recent (2018 – 2020) ecological survey work that has been undertaken at the Oikos Facility:
- Appendix 7.1: Preliminary Ecological Appraisal (PEA);
 - Appendix 7.2: Protected Species Report – Preliminary ('PSR');
 - Figure 7.1: Habitat Features Plan;
 - Figure 7.2: Reptile Refugia Locations and Survey Results;
 - Figure 7.3: Invertebrate Quality Areas;
 - Figure 7.4: Wintering Bird Survey Areas;
 - Figure 7.5: Calor Road Proposed Relocation Area.
- 7.4 Where relevant, this chapter is also supported by the results of previous surveys undertaken at the Oikos facility in 2015 associated with the earlier Deep Water Jetty development (planning permission ref: 16/0106/FUL) in relation to breeding birds; great crested newt (GCN) *Triturus cristatus*; reptiles; invertebrates; bats and water vole *Arvicola amphibious*.
- 7.5 It should be noted that there is an inevitable overlap between this and several other chapters which form part of this PEIR. A preliminary assessment of effects upon statutory designated sites in terms of air quality is provided within Chapter 12: Air Quality. Whilst a preliminary assessment of wintering birds and aquatic designated sites for which wintering birds are a designated feature is provided within this chapter, any other effects upon habitats and species associated with the marine environment are assessed within Chapter 9: Marine Ecology and Chapter 8: Water Environment. With regards to noise, modelling of noise levels occurring to adjacent ecological receptors is provided within Chapter 14 with an assessment of associated impacts presented within this Chapter.

Offsite Ecological Improvements

- 7.6 The OMSSD project will result in the loss of some ecological features currently located within parts of the Oikos Facility which will be re-developed as part of the scheme.
- 7.7 Existing ecological features at the Oikos facility include two ecological mitigation areas (known as Mitigation Areas 1 and 2 or MA1 and MA2) which are located respectively to the east of the existing Compound 4 and to the east of the existing Compound 5 in the south east corner of the Oikos facility. These two mitigation areas were created and provided as mitigation in connection with the earlier 2016 deep water jetty development (planning permission ref: 16/0106/FUL).
- 7.8 As explained in Chapter 3 of this PEIR, Oikos wishes to relocate these mitigation areas to a suitable off-site location. The steps required to process the relocation of these two mitigation areas have already been commenced in that, regardless of the OMMSD project, it is now considered inappropriate to have such areas on an operational site that stores and handles fuel and associated products.
- 7.9 For the purposes of this PEIR, however, Oikos has recognised that it may not be possible to secure the necessary consents and approvals for the relocation of these two mitigation areas before the submission of the OMMSD application. For that reason, Oikos has adopted a twofold strategy in order to provide certainty as to its ability to deliver the OMMSD scheme and whilst the relocation of these two areas will continue to be pursued under the provisions of the Town and Country Planning Act 1990³³, the OMMSD scheme will also be promoted as incorporating the relocation of the mitigation areas and the OMMSD application will be updated as appropriate. The PEIR has proceeded on this 'worst case' basis.
- 7.10 In addition to the possible need to incorporate the re-location of these existing mitigation areas, the offsite ecological measures being proposed as part of the OMSSD project will also mitigate for the loss of other, albeit limited, ecological value within the OMSSD development site together with providing an appropriate level of Biodiversity Net Gain (BNG).
- 7.11 Preliminary detail regarding the proposed offsite ecological measures is provided in later parts of this chapter. In summary, however, it is proposed that the OMSSD project will incorporate ecological mitigation, enhancement and improvement works on:
- (i) A stretch of land to the north of and adjacent to the Oikos facility lying alongside Howards Way, which is a private vehicle access road linking Haven Road to the Calor facility. The construction of the access road was permitted in 2012 (planning permission ref: CPT/613/12/FUL) and for the purposes of this project is described as the Calor Road site. The enhancement of this stretch of land for the relocation of invertebrates and reptiles will serve as mitigation for land within the Oikos site which will be developed as part of the OMSSD project.

³³ Town and Country Planning Act 1990

- (ii) Other land within the vicinity of the Oikos facility. At the time of writing the PEIR there are a number of potential land options being investigated for the provision of this element of the package. Those options include land to the north of the Oikos Facility at Brickhouse Farm and land within and adjacent to the Roscommon Way road corridor to the north west of the Oikos Facility. Works within the area ultimately chosen will provide Biodiversity Net Gain (BNG).
- 7.12 As a result, this chapter is also, therefore, further supported by survey information available for these locations. This includes previous surveys undertaken within the Calor Road site in 2011 / 2012. These include surveys in respect of reptiles; water vole; terrestrial invertebrates; wintering birds, and Great Crested Newts (GCN).
- 7.13 Oikos is also in discussions with the Land Trust – an organisation recognised for successfully delivering ecological enhancements and with land holdings on Canvey Island and elsewhere within the Thames Gateway – about other potential ways in which biodiversity enhancements or gain could be achieved. Oikos is also in discussions with the Land Trust about that organisation becoming Oikos' preferred delivery partner for such enhancements. Oikos is also investigating the possibility of being able to make a financial or management contribution to an existing scheme or programme of ecological enhancement works.

Definition of the Study Area

- 7.14 The Zol is the area in which IEFs would be affected by biophysical changes caused by the proposed development. The Zol was determined through a review of baseline conditions, results of the ecological data search, consideration of the wider local environment, and consideration of the type of development proposed. For the purpose of this assessment the study area is considered to be the same as the Zol. Given the nature of ecological features, however, the Zol is different for different ecological features. For example, the potential for significant effects in relation to protected and notable species and non-statutory and nationally designated sites is considered to be largely limited to the immediate and local environs. However, European sites designated for nature conservation reasons are present with the locality of the Oikos facility, and a wider area of consideration has been adopted for these. The study area / Zol for different ecological features is set out within Table 7.1 below.

Table 7.1: Study Area / Zol for ecological feature subject to assessment

Ecological Feature	Study Area / Zol
International nature conservation designations (Natura 2000 sites – Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and Ramsar)	5km
National nature conservation designations (Sites of Special Scientific Interest (SSSIs) and National Nature Reserves (NNRs))	5km
Local Nature Reserves (LNR)	2km
Non-statutory nature conservation designations (LWS)	2km
Protected and notable species	2km

Ecological Feature	Study Area / Zol
Habitats of Principal Importance (HoPI) (e.g. ponds, lowland mixed deciduous woodland, lowland meadow)	500m

Assessment Methodology

Data and Information Sources

Update Surveys

- 7.15 It should be noted that a number of update surveys at the Oikos Facility are currently in progress. This includes update surveys for breeding birds; GCN (eDNA); invertebrates; wintering birds, and water vole. The most recent and completed surveys undertaken to date are detailed within this chapter and form the basis upon which this preliminary assessment of significant effects has been made. Following completion of these surveys, and statutory consultation, an updated assessment of impacts based on the results of these surveys will be provided in the final ES.
- 7.16 Update surveys for reptiles were undertaken within the Calor Road site in 2019 as well as the remainder of the OMSSD project area. Given that any works proposed within the Calor Road site comprise enhancement works only, no further update surveys with regard to other species present within this area are considered to be required.
- 7.17 It should be noted that further surveys have and are being undertaken on other areas of land that may, in addition to the works to be undertaken at the Calor Road site, also form part of the OMSSD offsite ecological works. The findings of those surveys which have been undertaken are reported within the 'Preliminary Description of the Existing Environment' section of this chapter. Any further surveys required to inform the offsite ecological works associated with further improvements shall be completed as necessary once the preferred location has been confirmed.

Preliminary Ecological Appraisal (PEA)

- 7.18 The PEA comprised the following desk based and field survey assessments, full methodologies for which are provided within Appendix 7.1:
- Ecological data search;
 - 'Extended' Phase 1 habitat survey;
 - Common invasive plant species assessment;
 - Preliminary roost assessment (PRA) for bats; and
 - Habitat suitability index (HSI) assessment for GCN.
- 7.19 It should be noted that the most recent of the above desk based and field survey assessments were undertaken in 2020. However, previous desk based and field survey assessments were also undertaken in 2018, which informed the protected and notable

species surveys that have been undertaken at the Oikos Facility since 2018 to date (see 'Protected and Notable Faunal Species' below).

Protected and Notable Faunal Species

7.20 In order to determine the presence / likely absence of protected and notable species on the Oikos facility a series of protected species surveys have been undertaken. The most recent surveys are outlined below. The results of these surveys are presented within the 'Preliminary Description of the Existing Environment' section of this chapter, full methodologies for which are provided within Appendix 7.2. Information with regards to badger, however, is confidential and is therefore not provided within this chapter or appendices:

- Badger activity survey;
- GCN eDNA survey;
- Reptile presence / likely absence survey;
- Terrestrial invertebrate survey; and
- Wintering bird survey.

Constraints and Limitations

Preliminary Ecological Appraisal

7.21 Whilst the 2020 'Extended' Phase 1 Habitat Survey undertaken at the Oikos Facility was undertaken outside the recognised optimum survey period (April – September), given that a previous 'Extended' Phase 1 Habitat Survey was undertaken in September 2018 this is not considered to be a significant limitation to the findings of the PEA.

7.22 Due to health and safety considerations the jetties at the Oikos Facility were not subject to survey. Given the operational nature of the jetties, however, and consequential operational disturbance this is not considered to be a significant limitation to the findings of the 'Extended' Phase 1 Habitat Survey or this preliminary assessment.

Reptiles

7.23 No reptile surveys have been undertaken within MA1 and MA2. This is because a total of 252 common lizards (i.e. an 'exceptional' (high) population) and 2 grass snakes (i.e. a 'low' population) were translocated to these areas in 2016 as part of the previous Deep Water Jetty development at the Oikos Facility. Given that reptile fencing is still erected and maintained around these areas, the continued presence of an 'exceptional' (high) population of common lizard and a 'low' population of grass snake is assumed. The lack of actual survey information is, therefore, not considered to be a significant limitation with regard to the assessment of impacts upon this species group.

Invertebrates

- 7.24 For the invertebrate surveys, every attempt was made to undertake visits in sunny and dry conditions and on the three visits the weather was mostly dry and at least partially sunny. During the May visit, however, there was a cold wind and during the August visit a cool westerly wind. The June visit was in close to ideal conditions. The slightly suboptimal weather on two of the visits is unlikely to have made a significant difference to the results of this survey and therefore is not considered to be a significant limitation with regard to this assessment.
- 7.25 Due to the substrate present at the Oikos Facility, largely being compacted and / or comprising crushed material, it was not possible to install pitfall traps as part of the terrestrial invertebrate survey. Furthermore, given that the equipment comprises a petrol powered motor, it was also not possible to undertake vacuum sampling as part of this survey due to health and safety implications given the operational nature of the facility. Consequently, sweep netting was the main sampling methodology used together with ground searching. Given the results of the survey and those species (and numbers) recorded, this is not considered to be a significant limitation to this survey.

Determining Significance of Effects

- 7.26 This assessment was undertaken with reference to the Chartered Institute of Ecology and Environmental Management ('CIEEM') guidelines for ecological impact assessment (the 'Guidelines')³⁴. The Guidelines are recognised as current industry guidance, although they are also recognised as not being a prescriptive tool for carrying out ecological assessments. As such, the Guidelines provide guidance to practitioners for refining their own methodologies.

Important Ecological Features

- 7.27 Baseline data has been used to identify relevant ecological features (including designated sites, ecosystems, habitat and species) of value (or potential value). The main factors / elements contributing to their value have been described and related to available guidance.
- 7.28 Based on baseline data collection, ecological features that have been assessed to be 'important' and have the potential to be significantly affected by the proposed development, have been identified as IEFs and brought forward for assessment. Ecological features can be important for a variety of reasons with importance relating to, for example, the quality or extent of designated sites or habitats, to habitat / species rarity, to the extent to which they are threatened throughout their range, or to their rate of decline.
- 7.29 To identify IEFs, professional judgement and experience was used, informed by the results of the baseline data collection. Consideration was given to habitats and species of nature conservation importance, such as designated sites, BAP lists, red listed, rare and legally

³⁴ CIEEM (2018) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine version 1.1. Chartered Institute of Ecology and Environmental Management, Winchester.

protected species. When an ecological feature is not listed / designated, consideration was given to population, diversity and key functional role and connectivity within the wider environment.

- 7.30 Ecological features that are not considered ‘important’ or are unlikely to be significantly affected include (but are not limited to) species that are sufficiently widespread, unthreatened and / or resilient habitats or species, of insufficient size or diversity, or where no pathway of effect has been identified.
- 7.31 Ecological features that are not considered ‘important’ or unlikely to be significantly affected by the proposed development have not been assessed within this Chapter. This approach is in line with the Environmental Impact Assessment (EIA) Regulations (2017)³⁵, which requires the assessment to focus only on the likely significant effects of the proposed development. However, ecological features which are not considered ‘important’, including measures associated with legislative compliance, are discussed further in Appendices 7.1 and 7.2.
- 7.32 In summary, the ecological features either scoped in to (and therefore qualify as IEFs) or out of this assessment are detailed in Table 7.2.

Table 7.2: Ecological features scoped in / out of assessment

Ecological Feature	Scoped in or Out?	Rationale and Potential Effect Pathway
Statutory Designated Sites (Canvey Wick SSSI; Thames Estuary and Marshes SPA/Ramsar/SSSI; Holehaven Creek SSSI; Benfleet and Southend Marshes SPA/Ramsar/SSSI*; Vange and Fobbing Marshes SSSI)	In	<p>The proposed OMSSD project includes the provision of additional marine loading arms and pipelines on the existing jetties: habitats for wintering birds (i.e. intertidal mud) are not to be affected, however capital dredging within the immediate vicinity of Jetty 2 is required. The proposed OMSSD project also falls within the SSSI Impact Risk Zones.</p> <p>The construction and operational phases of the OMSSD project may generate disturbance upon notable bird species that are designating features for these designated sites. Therefore, the OMSSD project may potentially impact the qualifying features for their designations.</p> <p>Assessment of direct impacts upon habitats associated with these sites, such as mudflats, inter-tidal habitat and coastal saltmarsh is included as part of Chapter 9: Marine Ecology and Chapter 8: Water Environment</p> <p>The OMSSD project also has the potential to impact upon several of these designated sites as a result of air quality during the operational phase. An assessment of impacts as a result of air quality is included as part of Chapter 12: Air Quality.</p>
Statutory Designated Sites (Other)	Out	Given the qualifying features for their designation Pitsea Marsh SSSI; Northward Hill SSSI; and Canvey Lake LNR are considered to be located at a sufficient distance away from the Oikos facility that any direct and indirect effects

³⁵ Infrastructure Planning (Environmental Impact Assessment) Regulations 2017

Ecological Feature	Scoped in or Out?	Rationale and Potential Effect Pathway
		<p>upon these sites and the habitats and species they support are unlikely to occur.</p> <p>Chapter 12: Air quality has identified that there would be no effects to any other statutory designated sites as a result of air quality issues.</p> <p>The Oikos facility also lies beyond any Impact Risk Zones for any other SSSIs within the local area.</p>
<p>Non-statutory designated sites (West Canvey Marshes LWS; Brick House Farm Marsh LWS; Canvey Village Marsh)</p>	<p>In</p>	<p>The Calor Road site and one of the potential additional areas under consideration for offsite ecological improvements fall within or are located in close proximity to Brick House Farm Marsh LWS. As ecological improvements within such areas would provide enhancements to this designated site, no direct significant adverse effects are anticipated to occur on this non-statutory designated sites. Nevertheless, given that these areas may be required for mitigation, and that there is potential for this non-statutory designated site together with and Canvey Village Marsh LWS and West Canvey Marshes LWS to be indirectly impacted upon as a result of air quality during the operational phase, these sites have been scoped into the assessment. An assessment of impacts as a result of air quality is included as part of Chapter 12: Air Quality.</p> <p>Good practice construction measures – most likely to be secured through a Construction Environmental Management Plan (CEMP) – will be implemented which will, together with the undertaking of works in accordance with any licensing or Method Statement requirements, protect Brick House Farm Marsh LWS and Canvey Village Marsh LWS, together with the habitats and species they support, from any indirect adverse effects of preparation and construction activities occurring on the Oikos facility itself. Similar measures shall also be implemented during the course of any offsite ecological improvements.</p>
<p>Non-statutory designated sites (other)</p>	<p>Out</p>	<p>Those remaining non-statutory designated sites are considered to be located at a sufficient distance away from the Oikos facility that, any significant effects are unlikely to occur.</p> <p>Chapter 12: Air quality has identified that there would be no effects to any other non-statutory designated sites as a result of air quality issues.</p> <p>Good practice construction measures – most likely to be secured through a CEMP – will be implemented which will, in any case, protect other non-statutory designated sites within the local area, together with the habitats and species they support, during preparation and construction activities.</p>
<p>Habitats of Principal Importance</p>	<p>Out</p>	<p>No HoPI are present or associated with the terrestrial aspects of the Oikos facility.</p> <p>An assessment of impacts upon marine HoPIs is provided in Chapter 9: Marine Ecology.</p> <p>No significant adverse effects are anticipated to occur to terrestrial HoPIs as a result of the OMSSD project. Good practice construction measures – most likely to be secured through a CEMP – will be implemented which will, in any</p>

Ecological Feature	Scoped in or Out?	Rationale and Potential Effect Pathway
		<p>event, suitably protect such habitats, together with the species they support, within the local area during works.</p> <p>Whilst it is currently unknown whether the potential additional areas under consideration for offsite ecological improvements will fall within any HoPIs, should this be the case an updated assessment for HoPIs will be provided as part of the final ES.</p> <p>The offsite ecological improvement works will seek to create several HoPI as far as possible with an assessment provided within the final ES once the offsite ecological improvement proposals have been finalised.</p>
Other Habitats (Aquatic – Non-marine)	Out	<p>Aquatic habitats (ditches and artificial ponds) recorded within the OMSSD project boundary are both locally and nationally common and are not assessed to be of geographical or legal importance (i.e. they do not meet the requirements for being BAP / HoPIs). No significant effects are anticipated from their loss as a result of the OMSSD project.</p>
Other Habitats (Terrestrial)	Out	<p>Terrestrial habitats recorded within the OMSSD project boundary (buildings; hardstanding; bare ground; ephemeral / short perennial; tall ruderal; scrub; semi-improved grassland; man-made ponds and ditches) are commonly found at local and national levels and are not assessed to be of geographical or legal importance (i.e. they do not meet the requirements for being BAP / HoPIs). No significant effects are anticipated from their loss as a result of the OMSSD project.</p>
Notable Flora	Out	<p>No notable species of flora have been recorded to date. It is unlikely the Oikos facility would support notable flora due to the habitats present and the operational use of the Oikos facility, including regular disturbance / clearance activities. No significant effects are anticipated as a result of the OMSSD project.</p>
Amphibians	Out	<p>No evidence of GCN have been recorded on the Oikos facility to date and therefore GCN are considered likely to be absent from the Oikos facility. A small population is known to be present within the Calor Road site and farmland to the north of the Oikos facility. Any enhancement works undertaken within these areas would be of benefit to GCN and would be undertaken using precautionary working methodologies under a Method Statement, or license granted by Natural England, as appropriate.</p> <p>No significant effects are anticipated to occur upon as a result of the OMSSD project. Good practice construction measures – most likely to be secured through a CEMP – will be implemented which will, in any event, suitably protect GCN present within the local area during preparation and construction works.</p>
Badger	Out	<p>No badger setts have been recorded on the Oikos facility. The Oikos facility is not considered an area upon which the local badger population would be dependent, given more</p>

Ecological Feature	Scoped in or Out?	Rationale and Potential Effect Pathway
		<p>suitable habitats of greater value present within the local area.</p> <p>No significant effects are anticipated as a result of the OMSSD project. Good practice construction measures – most likely to be secured through a CEMP – will be implemented which will, in any event, suitably protect badgers present within the local area during preparation and construction works.</p>
Bats (roosting and foraging / commuting)	Out	<p>The buildings on the Oikos facility have been assessed to be of negligible suitability for roosting bats.</p> <p>It is unlikely that the Oikos facility would ever support any significant populations of foraging / commuting bats due to the quality of the habitats and connectivity present, together with limited commuting links to the wider locale.</p> <p>No significant effects are anticipated as a result of the OMSSD project.</p>
Breeding Birds (black redstart)	In	<p>Potential effects upon black redstart arising from loss of nesting habitat as a result of the OMSSD project.</p>
Breeding Birds (other)	Out	<p>Given the habitats present (i.e. mostly highly unsuitable for nesting birds comprising hard standing, bare ground, ephemeral, industrial buildings etc.), it is unlikely that the Oikos facility would ever support any significant populations of other (including notable) species of breeding bird.</p> <p>No significant effects are anticipated as a result of the OMSSD project. Measures to protect breeding birds during preparation and construction activities shall also be incorporated within the CEMP and implemented.</p>
Terrestrial Invertebrates	In	<p>Potential effects arising from habitat loss as a result of the OMSSD project.</p>
Aquatic Invertebrates	Out	<p>Ponds P1 and P2 within the Oikos facility comprise storage reservoirs for fire water and Pond P3 and Ditch D1 are considered to form part of the Oikos facility drainage network. The remaining ditches are also intermittently dry and likely to hold minimal levels of water other than during periods of heavy rain. The water quality of these ponds and ditches is also likely to be poor given the operational nature of the Oikos facility. As such, these waterbodies are likely to provide limited (non-marine) aquatic invertebrate interest and were scoped out as such by the PEA. For these reasons, no specific aquatic invertebrate sampling has been undertaken upon those waterbodies present on the Oikos facility.</p> <p>No significant effects are anticipated as a result of the OMSSD project. Good practice construction measures – most likely to be secured through a CEMP – will be implemented which will, in any event, suitably protect any aquatic invertebrates present within the local area during preparation and construction works.</p> <p>Assessment of impacts upon marine aquatic invertebrates is provided in Chapter 9: Marine Ecology</p>

Ecological Feature	Scoped in or Out?	Rationale and Potential Effect Pathway
Otter	Out	No records for this species were returned from the ecological data search. The Oikos facility and immediate surrounding areas do not contain suitable habitat for this species or suitable connecting habitat. No significant effects are anticipated as a result of the OMSSD project.
Reptiles	In	Potential effects arising from habitat loss as a result of the OMSSD project.
Wintering Birds	In	Potential effects arising from disturbance generated as a result of the OMSSD project.
Water vole	Out	<p>A 2015 habitat suitability assessment across the Oikos site found two water bodies with low potential to support water voles and two water bodies with moderate potential to support water vole. However, no evidence of water vole was actually recorded. No further evidence of water vole was recorded within the ditch systems present to the north of the Oikos facility in 2012.</p> <p>Waterbodies on the Oikos facility have limited, in any, suitable habitat connectivity for this species. No evidence of water vole has been recorded to date and consequently water voles are considered likely to be absent from the site of the Oikos facility.</p> <p>No significant effects are anticipated as a result of the OMSSD project. Good practice construction measures – most likely to be secured through a CEMP – will be implemented which will, in any event, suitably protect any water vole populations present within the local area.</p>

* Includes the Leigh NNR, which is present within the Benfleet and Southend Marshes SPA/Ramsar/SSSI boundary.

Sensitivity of receptors

7.33 In line with good practice, IEFs have been assessed according to their ‘sensitivity’, the definitions of which are set out in Table 7.3 below.

Table 7.3: EIA criteria for the assessment of ecological sensitivity

Sensitivity	Criteria
High	Feature/receptor has a very low capacity to accommodate the proposed form of change.
Medium	Feature/receptor has a low capacity to accommodate the proposed form of change.
Low	Feature/receptor has some tolerance to accommodate the proposed change.
Very Low	Feature/receptor is generally tolerant and can accommodate the proposed change.

7.34 Individual IEFs may show different levels of sensitivity, depending upon the type of impact being described as well as the predicted duration, extent and magnitude of the impact. The sensitivity of individual IEFs has been qualified, where sufficient information exists. In the absence of detailed information, professional judgement has been used to determine the sensitivity of individual IEFs.

Geographical Context

7.35 In addition, in line with the CIEEM guidelines, the importance of an ecological feature, as determined by legal, policy and/or nature conservation considerations, has been assessed within the following geographical context:

- International and European;
- National (i.e. England);
- Regional;
- District; and
- Local value, including within the Zol of the Proposed Development.

Magnitude of impacts

7.36 In accordance with CIEEM guidance: “*Magnitude refers to size, amount, intensity and volume. It should be quantified if possible and expressed in absolute or relative terms e.g. the amount of habitat lost, percentage change to habitat area, percentage decline in a species population.*”

7.37 A scale for the magnitude of the environmental change as a result of the proposed development is described in Table 7.4 to provide an understanding of the relative change from the baseline position, be that an adverse or beneficial change.

Table 7.4: Assessment of scale of magnitude

Scale of Change	Criteria
High	The change permanently (or over the long-term) affects the conservation status of a habitat/species, reducing or increasing the ability to sustain the habitat or the population level of the species within a given geographic area and relative to the wider habitat resource/species population, a large area of habitat or large proportion of the wider species population is affected. For designated sites, integrity is compromised. There may be a change in the level of importance of the receptor in the context of the proposed development’s Zol.
Medium	The change permanently (or over the long term) affects the conservation status of a habitat/species reducing or increasing the ability to sustain the habitat or the population level of the species within a given geographic area and relative to the wider habitat resource/species population, a small-medium area of habitat or small-medium proportion of the wider species population is affected. There may be a change in the level of importance of this receptor in the context of the proposed development’s Zol.
Low	The quality or extent of designated sites or habitats or the sizes of species’ populations, experience some small-scale reduction or increase. These changes are likely to be within the range of natural variability and they are not expected to result in any permanent change in the conservation status of the species/habitat or integrity of the designated site. The change is unlikely to modify the evaluation of the receptor in terms of its importance in the context of the proposed development’s Zol.
Very Low	Although there may be some effects on individuals or parts of a habitat area or designated site, the quality or extent of sites and habitats, or the size of species populations, means that they would experience little or no change. Any changes are also likely to be within the range of natural variability and there would be no

Scale of Change	Criteria
	short-term or long-term change to conservation status of habitats/species receptors or the integrity of designated sites.
Negligible	A change, the level of which is so low, that it is not discernible on designated sites or habitats or the size of species' populations.

- 7.38 Where possible, magnitude of impact has been quantified taking account of not only the habitat or species resource within the Oikos Facility but also within the wider area, as appropriate.
- 7.39 Under the CIEEM guidelines impacts on biodiversity are assessed not only by magnitude but are also characterised and described as beneficial / adverse, together with their extent, duration, timing and frequency. Table 7.5 provides impact criteria used in line with the CIEEM guidelines.

Table 7.5: Criteria for determining the impact on ecological features under CIEEM guidelines

Characteristic	Criteria
Beneficial or Adverse	Beneficial impact: a change that improves the quality of the environment. Beneficial impacts may also include halting or slowing an existing decline in the quality of the environment. Adverse impact: a change that reduces the quality of the environment.
Extent	The spatial or geographic area over which the impact/effect may occur.
Magnitude	Refers to the size, amount, intensity and volume. It will be quantified if possible and expressed in absolute or relative terms (see Table 7.4)
Duration	Duration will be defined in relation to ecological characteristics (such as a species' lifecycle), as well as human timeframes. The duration of an activity may differ from the duration of the resulting effect caused by the activity. Effects may be described as short, medium or long-term and permanent or temporary. Where possible, short, medium, long-term and temporary will need to be defined in months/years.
Frequency	The number of times an activity that will impact biodiversity will occur.
Timing	The timing of an activity or change caused by the project may result in an impact if this coincides with critical life-stages or seasons.

Significance criteria

- 7.40 Under CIEEM guidelines the significance of effect on an IEF is determined based on the analysis of the factors that characterise the impact, such as sensitivity, magnitude and those other factors stated within Table 7.5. A significant effect is defined as 'an effect that either supports or undermines biodiversity conservation objectives for the IEFs or for biodiversity in general'.
- 7.41 Using CIEEM guidelines and approach, significant effects are identified with regard to an appropriate geographical scale, using the following terms:
- significant at the International and European level;
 - significant at the National level;
 - significant at the Regional level;

- significant at the District level;
- significant at the Local level; and
- not significant.

7.42 To allow a consistent approach across all disciplines, the standard levels of significance defined in the CIEEM guidelines are set out in Table 7.6, alongside the equivalent definitions of effect used elsewhere in this PEIR. Therefore, as a deviation from the standard EIA methodology, minor effects identified within this chapter have been classified as significant at a local level. Professional judgement is applied where appropriate.

Table 7.6: Summary and comparison of EIA and CIEEM based measures of significance of ecological effects

Significance following the CIEEM guidelines	Equivalent effect categories and significance definitions used within this PEIR
Significant at the International level	Major (= significant) - Effects, both adverse and beneficial, which are likely to be important considerations at an international level because they contribute to achieving international objectives, or, which are likely to result in exceedance of statutory objectives and/or breaches of legislation.
Significant at the National level	Major (= significant) - Effects, both adverse and beneficial, which are likely to be important considerations at a national level because they contribute to achieving national objectives, or, which are likely to result in exceedance of statutory objectives and/or breaches of legislation.
Significant at the Regional level	Moderate (= significant) - Effects, both adverse and beneficial, that are likely to be important considerations at a regional level.
Significant at the District	Moderate (= significant) - Effects, both adverse and beneficial, that are likely to be important considerations at a district level.
Significant at the Local level	Minor (= significant) - Effects, both adverse and beneficial, that could be important considerations at a local level.
Not significant	Negligible (= not significant)

7.43 Impacts can also be defined as being direct or indirect. A direct impact is defined as an impact resulting in the direct interaction of an activity with an environmental or ecological component. An indirect impact is defined as an impact on the environment which is not a direct result of a project or activity, often produced away from or as a result of a complex impact pathway.

7.44 For the purpose of this chapter where species are legally protected from disturbance and / or killing or injury, an assessment in relation to the disturbance and / or killing and injury of such species has not been made. This is because the avoidance of disturbance and / or killing and injury of such species must be carried out by law.

Consultation

7.45 As part of this preliminary assessment consultation with regard to the OMSSD project has been undertaken with a number of statutory consultees. Results of these consultations with regard to the Scoping Opinion where specific comments in relation to terrestrial ecology and biodiversity have been raised are summarised within Table 7.7 below. It should also be

noted that consultation with Natural England through the Discretionary Advice Service (DAS) on a number of matters is still ongoing. A summary of this consultation which has been undertaken to date is also provided within Table 7.7.

Table 7.7: Summary of consultation to date

Consultee	Date	Summary of Response	How comments have been addressed in this Chapter
Planning Inspectorate	May 2020	4.1.1 The Scoping Report proposes scoping out breeding bird surveys on site. However, a pair of Black Redstarts bred on site in 2019. If no survey is undertaken to determine whether birds are present on site, then the baseline will remain uncertain.	A breeding bird survey, including for black redstart is to be undertaken at the Oikos Facility in 2021, with an updated assessment of effects provided as part of the final ES as necessary.
		4.1.2 The Scoping Report establishes that only ecological features deemed to be important will be taken forward for assessment in the ES. The Scoping Report does not explain how guidance referenced would be applied to inform professional judgement i.e. to categorise importance. Accordingly, the Inspectorate does not agree to the approach since there is a lack of clarity in this regard. The Inspectorate considers that the ES should assess impacts to ecological receptors of every description where significant effects are likely to occur. The Applicant should make effort to agree the relevant features to be assessed in the ES with relevant consultation bodies.	The ‘Determining Significance of Effects’ section of this chapter outlines how guidance has been applied to inform professional judgement and the categorisation of importance. This in turn has determined the importance of ecological features and which of these has been brought forward for assessment. This chapter therefore assess impacts to ecological receptors of every description where significant effects are likely to occur. Within their response dated May 2020, Natural England state that they are in agreement with the IEFs identified for assessment at this stage.
		4.1.3 Designated sites within the study area are identified in the Scoping Report, however, this omits Vange and Fobbing Marshes SSSI and Northward Hill SSSI which are identified within the 5km study area in Figure 6.1. The ES should either include these designated sites in the assessment or else provide sufficient evidence to scope them out.	Vange and Fobbing Marshes SSSI and Northward Hill SSSI have been included as part of the presented baseline information. Vange and Fobbing Marshes SSSI has been scoped into assessment due to potential impacts as a result of air quality. Northward Hill SSSI has been scoped out of assessment with sufficient evidence provided within this chapter.
		4.1.4 The Scoping Report does not consider there to be	Table 7.2 provides justification for the scoping in/out of

Consultee	Date	Summary of Response	How comments have been addressed in this Chapter
		<p>an impact to habitats with potential to support breeding birds, otters and water vole on site following the results of a desk study, current knowledge of the site and previous surveys undertaken. However, no evidence of these results/research is provided with the Scoping Report and it is unclear which other habitats are anticipated to be impacted by the Proposed Development and how/why.</p> <p>The initial anticipated potential impacts listed do not include breeding birds, otters or water voles but the Inspectorate considers possibility remains for them to be impacted by the Proposed Development.</p> <p>The Inspectorate considers that the ES should include an assessment of impacts to ecological receptors where significant effects are likely to occur.</p>	<p>ecological features that shall be subject to assessment. Evidence of results/research is provided within this chapter and relevant Appendices.</p>
		<p>4.1.5 The Scoping Report anticipates using previous surveys to inform the baseline in the ES what were conducted on and around the wider Oikos facility. Although information regarding these surveys are indicated, not enough detail is provided; any results of previous surveys, their locations and dates they were carried out should be provided in the ES as evidence supporting the assessment.</p>	<p>Details of survey information is provided within this chapter and accompanying appendices. Results of previous surveys, their locations and dates they were carried out have been provided within this chapter.</p>
		<p>4.1.6 The Scoping Report describes the baseline for the proposed off-site mitigation area however, it is unclear what has been used to inform this baseline (surveys are mentioned but there is no indication of what surveys were carried out or when and over what area) and the area being described is not delineated.</p>	<p>Those surveys which have been undertaken to determine the baseline conditions of the potential offsite ecological areas are described within this chapter. Delineation of the proposed Calor Road mitigation area is provided on Figure 7.5. Full details of the baseline of all of the off-site ecological areas – once fully defined - will be provided within the ES.</p>

Consultee	Date	Summary of Response	How comments have been addressed in this Chapter
		<p>The ES should explain how the baseline of the proposed off-site mitigation area has been determined and provide details of any surveys undertaken to inform this and the area should be delineated on a Figure.</p>	
		<p>4.1.7 The Scoping Report mentions the 'wider Oikos facility' a number of times in the Terrestrial Ecology chapter yet it is not determined exactly which area this is referring to. The ES should be clear in defining which areas are being referenced to ensure that this is consistent.</p>	<p>The wider Oikos facility refers to those areas of the Oikos facility out with the area directly affected by the OMSSD project which are to be retained and remain unchanged.</p>
		<p>4.1.8 The Scoping Report lists the anticipated potential impacts to European Sites. This excludes potential impacts from dredging such as vibration, change in turbidity and vessel displacement. Additionally, operation impacts are not specified, for example impacts occurring from disturbance due to increase vessel movement and pollution.</p> <p>The ES should assess all potential impact pathways likely to result in significant effects and occurring as a result of construction, operation and decommissioning of the Proposed Development.</p>	<p>An assessment of impacts upon European Sites in relation to the matters listed is provided within Chapter 9: Marine Ecology and has been cross referenced within this chapter where necessary.</p> <p>A standalone Habitat Regulations Assessment (HRA) associated with LSE upon European Sites is also to be produced in due course, with preliminary conclusions provided within this chapter.</p>
		<p>4.1.9 The Scoping Report anticipates that off-site mitigation will deliver enhancement, strengthening of existing ecological networks and re-creation of habitats lost as a result of the Proposed Development/ creation of new habitats with similar or higher distinctiveness.</p> <p>The ES should explain the reasoning behind and provide evidence for selecting off-site mitigation over other potential</p>	<p>The reasoning behind the proposed offsite ecological works will be fully provided within the ES. A preliminary explanation is provided within this chapter of the PEIR.</p>

Consultee	Date	Summary of Response	How comments have been addressed in this Chapter
		<p>mitigation methods in line with the mitigation hierarchy. The methods to deliver mitigation should be decided through consultation and effort should be made to agree the approach with the relevant consultation bodies.</p>	
		<p>4.1.10 Marine ecology and terrestrial ecology are considered in different aspect Chapters in the Scoping Report and are anticipated to be assessed separately in the ES. In the Terrestrial chapter of the Scoping Report, Table 6.4 includes aquatic protected sites yet aquatic invertebrates are not considered in either the terrestrial or marine ecology Chapters.</p> <p>The ES should cross reference between both the terrestrial and marine ecology Chapters and ensure that significant effects to sensitive receptors are assessed in the ES.</p>	<p>Impacts upon aquatic protected sites associated with wintering birds species which are designating features of such sites are assessed within this chapter. Impacts upon (non-marine) aquatic invertebrates have been scoped out of assessment (Table 7.3). Marine aquatic invertebrate matters are considered within Chapter 9: Marine Ecology.</p> <p>Cross reference between the terrestrial and marine ecology chapters has been made where necessary.</p>
		<p>4.1.11 Table 6.1 [of the Scoping Report] does not include BAP habitats or ancient woodland in the desk study undertaken. These are considered potential sensitive receptors and should be included in the desk-based study to inform the assessment in the ES.</p>	<p>A review of BAP / S41 habitats and ancient woodland within the local area has been included within the desk-based study information, however an assessment of impacts upon such terrestrial habitats has been scoped out for the reasons detailed within Table 7.3.</p>
<p>Canvey Island Town Council</p>	<p>May 2020</p>	<p>Concerns regarding the disturbance of wildlife and bird life in the Thames in and around the site while works are carried out.</p>	<p>A preliminary assessment where significant effects are likely to occur upon the wildlife and bird life in the Thames in and around the site while works are carried out has been included within this Chapter and Chapter 9: Marine Ecology where relevant.</p>
		<p>Holehaven is a Site of European Interest for the Protection of Wading Birds which is very close to where this work is to be carried out.</p>	<p>Holehaven Creek SSSI is not designated as a SPA or Ramsar. However, this nationally designated site contains important numbers of wintering black-tailed godwit <i>Limosa limosa islandica</i>. Consequently, this site, as well as those other SPA / Ramsar sites designated for their wading / wintering bird</p>

Consultee	Date	Summary of Response	How comments have been addressed in this Chapter
			importance, has been scoped in for assessment.
Environment Agency	May 2020	<p>From a terrestrial ecology perspective we broadly agree that the development will have little effect on aquatic species such as great crested newts and water vole which appear to be absent from the site. Surveys so far have recorded the presence of invasive species which will need to be removed from site before development commences. Effects on the invertebrate assemblage will need to be comprehensively mitigated. We note the intention to largely provide mitigation and compensation offsite due to operational reasons.</p>	<p>To confirm, no invasive species were returned from the ecological data search and no such species have been recorded on the Oikos facility to date. Nevertheless, the CEMP will include measures to remove and prevent the spread of any such species should they become established.</p> <p>A stand of Japanese knotweed has been recorded within the Calor Road site. It is understood that this stand is to be removed and the situation managed as part of the existing agreed ongoing management of that area.</p> <p>An assessment of impacts upon terrestrial invertebrates has been undertaken with mitigation details also outlined.</p>
		<p>We'd like to see the consideration of onsite mitigation/compensation wherever possible as there is always an inherent risk with translocation of species that populations may not establish at the receptor site. Effective corridors for movement of species need to be established between the Oikos site and the offsite compensation area. Carefully designed onsite SuDS could allow mitigation and enhancement of biodiversity onsite. Compensation should more than 1:1 to ensure enhancement of biodiversity in the long-term as a result of development. We would promote a 10% net gain in biodiversity through any mitigation and compensation scheme. We would like to be involved in discussions about the offsite and onsite compensation areas and to ensure they are effectively designed to benefit aquatic species and invertebrates.</p>	<p>Maximisation of provision of on-site enhancements for biodiversity, including effective corridors for species movement, has been, and will continue to be, considered as far as possible, whilst taking the operational nature of the Oikos facility and health and safety considerations into account.</p> <p>The delivery of BNG will be provided as part of the overall ecological improvements.</p> <p>Whilst impacts to (non-marine) aquatic habitats and species have been scoped out of assessment, proposed mitigation and the delivery of BNG will seek to provide enhancements for aquatic species as far as possible.</p>

Consultee	Date	Summary of Response	How comments have been addressed in this Chapter
Natural England	May 2020	The ES should thoroughly assess the potential for the proposal to affect designated sites.	This chapter provides a preliminary assessment of LSEs upon designated sites. Cross reference with other chapters which contain assessments of relevance to designated sites has also been made where applicable.
		Natural England advises that it is likely that the developmental footprint may overlap with SPA birds activity either directly or through overlap with functional land. Therefore, consideration should be given to ensuring no adverse impact on overwintering bird populations. For example, temporal work restrictions may need to be considered.	A preliminary assessment of potential impacts associated with SPA birds is provided within this chapter and will also be detailed within the HRA.
		Natural England advises that the development should thoroughly assess the impacts to all relevant designated sites using Natural England’s Impact Risk Zones.	A preliminary assessment of impacts to all relevant designated sites using Natural England’s Impact Risk Zones is provided within this chapter.
		We advise that the relevant conservation advice packages are referred to in order to establish that all impact pathways are considered in the Environmental Statement.	Relevant conservation advice packages have been referred to and all impact pathways have been considered.
		The EIA will need to consider any impacts upon local wildlife and geological sites. The Environmental Statement should therefore include an assessment of the likely impacts on the wildlife and geodiversity interests of such sites. The assessment should include proposals for mitigation of any impacts and if appropriate, compensation measures.	Local wildlife and geological sites have been scoped out of assessment (refer to Table 7.2) as no significant adverse effects are anticipated as a result of the OMSSD project. However, BNG delivery could provide an enhancement to local wildlife sites, depending upon which area is ultimately taken forward.
		The ES should assess the impact of all phases of the proposal on protected species (including, for example, great crested newts, reptiles, birds, water voles, and bats).	A preliminary assessment of the impact of the preparation and construction, and operational phases, of the OMSSD project on protected species where significant effects are likely to

Consultee	Date	Summary of Response	How comments have been addressed in this Chapter
		<p>Records of protected species should be sought from appropriate local biological record centres, nature conservation organisations, groups and individuals; and consideration should be given to the wider context of the site for example in terms of habitat linkages and protected species populations in the wider area, to assist in the impact assessment.</p>	<p>occur has been provided within this chapter.</p>
		<p>The area likely to be affected by the proposal should be thoroughly surveyed by competent ecologists at appropriate times of year for relevant species and the survey results, impact assessments and appropriate accompanying mitigation strategies included as part of the ES.</p>	<p>Areas likely to be affected by the OMSSD project have been subject to appropriate survey with further update surveys being undertaken in 2020 and 2021. A preliminary assessment of impacts has been provided within this chapter with accompanying proposed mitigation outlined. Final mitigation strategies / measures are still under development.</p>
		<p>The ES should thoroughly assess the impact of the proposals on habitats and/or species listed as ‘Habitats and Species of Principal Importance’ within the England Biodiversity List, published under the requirements of S41 of the Natural Environment and Rural Communities (NERC) Act 2006.</p> <p>Consideration should also be given to those species and habitats included in the relevant Local BAP.</p>	<p>A preliminary assessment of impacts upon terrestrial HoPIs and those terrestrial species and habitats included in the relevant Local BAP, where significant effects are likely to occur, has been provided within this chapter.</p> <p>A preliminary consideration of impacts upon Marine HoPIs and those marine species and habitats included in the relevant Local BAP has been provided within Chapter 9: Marine Ecology.</p>
		<p>Natural England advises that a habitat survey (equivalent to Phase 2) is carried out on the site, in order to identify any important habitats present. In addition, ornithological, botanical and invertebrate surveys should be carried out at appropriate times in the year, to establish whether any scarce or priority species are present. The Environmental Statement should include details of:</p>	<p>Given the findings of the ‘Extended’ Phase 1 Habitat Survey a habitat survey equivalent to Phase 2 is not considered to be required.</p> <p>Further surveys for protected and notable species – where appropriate - have been undertaken at the Oikos facility, details of which are presented within this chapter (and Appendices 7.1 and 7.2), together with an assessment of direct and indirect effects where</p>

Consultee	Date	Summary of Response	How comments have been addressed in this Chapter
		<p>Any historical data for the site affected by the proposal (e.g. from previous surveys);</p> <p>Additional surveys carried out as part of this proposal;</p> <p>The habitats and species present;</p> <p>The status of these habitats and species (e.g. whether priority species or habitat);</p> <p>The direct and indirect effects of the development upon those habitats and species;</p> <p>Full details of any mitigation or compensation that might be required.</p>	<p>significant effects are anticipated to occur.</p> <p>Further update surveys are also being undertaken as necessary in advance of the submission of the application.</p>
		<p>The ES should include an impact assessment to identify, describe and evaluate the effects that are likely to result from the project in combination with other projects and activities that are being, have been or will be carried out. The following types of projects should be included in such an assessment, (subject to available information):</p> <ul style="list-style-type: none"> a. existing completed projects; b. approved but uncompleted projects; c. ongoing activities; d. plans or projects for which an application has been made and which are under consideration by the consenting authorities; and e. plans and projects which are reasonably foreseeable, i.e. projects for which an application has not yet been submitted, but which are likely to progress before completion of the development and for which sufficient information is available to assess the likelihood of cumulative and in-combination effects. 	<p>An assessment of cumulative effects will be provided within the ES. Preliminary information on cumulative impact assessment matters is provided within Chapter 22 of this PEIR.</p>
<p>Port of London Authority (PLA)</p>	<p>May 2020</p>	<p>Figure 1.2 (Boundary Plan) identifies an 'envisaged location of ecological mitigation and enhancement' with the precise area to be</p>	<p>Full details of the proposed offsite ecological improvements will be provided within the ES.</p>

Consultee	Date	Summary of Response	How comments have been addressed in this Chapter
		<p>defined. Further details of this proposed area including the specific amount of land required for the ecological mitigation and enhancement must be provided as part of the ES.</p>	<p>Preliminary details are provided within this chapter of the PEIR.</p>
		<p>Figure 6.2 (Habitat Features) in the Terrestrial Ecology chapter identifies two areas of mitigation areas within the site boundary. The ES must confirm whether these areas are proposed in addition to the 'envisaged location of ecological mitigation and enhancement' identified in figure 1.2 or is an alternative, particularly as one of these identified areas, to the east of compound 4, appears unchanged in figure 3.1 (THE OMSSD PROJECT).</p>	<p>The two mitigation areas are existing mitigation areas which were created as part of the previous Deep Water Jetty development. The implications for these areas as a result of the OMSSD are explained in this chapter of the PEIR.</p>
		<p>The ES must detail how the project results in an appropriate level of biodiversity net gain, taking into the account the loss of environmental mitigation sites within the red line boundary and how the mitigation extent proposed offsite will address this loss as well as provide net gain.</p>	<p>A preliminary explanation of these matters is provided within this chapter of the PEIR.</p>
		<p>Table 6.1 (Desk study data/geographical radi) does not refer to UK Biodiversity Action Plan (BAP) Priority Habitats which are included under section 41 (41) of the Natural Environment and Rural Communities (NERC) Act. These must be considered under the desk-based study. In addition, it is noted that Aquatic Invertebrates are not included here but the birds that feed on them are. Also, Table 6.4 (Designated statutory sites within 5km of the development site boundary), although included in the Terrestrial ecology section, includes aquatic protected sites. The ES must ensure that the Terrestrial Ecology</p>	<p>UK BAP and S41 Priority Habitats are now considered as part of the desk-based study, however an assessment of impacts upon such terrestrial habitats has been scoped out for those reasons detailed within Table 7.3.</p> <p>Impacts upon aquatic protected sites and wintering birds, including species which are designating features of such sites are assessed on a preliminary basis within this chapter, with impacts upon (non-marine) aquatic invertebrates having been scoped out (Table 7.3). Marine aquatic invertebrates are considered within Chapter 9: Marine Ecology.</p>

Consultee	Date	Summary of Response	How comments have been addressed in this Chapter
		<p>and Marine Ecology sections are closely linked and cross-referenced in order they can be read as a whole, to ensure all relevant species and habitats are robustly assessed.</p>	<p>Cross reference between the terrestrial and marine ecology chapters has been made where necessary.</p>
		<p>The PLA recommends that as part of the ES, all potential sites within the redline boundary are considered for any potential environmental enhancements, such as the planting of wildflowers or marshland plants around drainage areas, before looking at off-site mitigation.</p>	<p>Maximisation of provision of on-site enhancements for biodiversity has been, and will continue to be, considered as far as possible, whilst taking the operational nature of the Oikos facility and health and safety considerations into account.</p>
		<p>As part of the identification of initial mitigation measures, paragraph 6.56 states that at the operational stage the applicant will provide an appropriate Ecological Management Plan for any off-site area to ensure its continuing value for biodiversity in the long term. This implies that the applicant will manage land owned by the PLA for mitigation currently without the PLAs consent.</p> <p>Details of the monitoring proposed for such a site must be provided as part of the ES and the PLA consulted.</p>	<p>Discussions on landowner matters are ongoing between Oikos and the PLA.</p> <p>It is intended that monitoring details will be provided within the ES and discussed with the PLA as appropriate.</p>
<p>Natural England (Discretionary Advice Service)</p>	<p>October 2020</p>	<p>Concerns over the relocation of MA1 and MA2 to an area north of the Oikos facility, particularly with regard to the requirement for their relocation and those proposals to be implemented with regard to invertebrates and the double handling of reptiles.</p> <p>Concerns that the proposed relocation area for MA1 and MA2 is already an existing</p>	<p>The reasoning behind the proposed off site ecological works will be fully provided within the ES. A preliminary explanation is provided within this chapter of the PEIR.</p> <p>Whilst discussions including finalisation and agreement of proposals with Natural England are ongoing, they will be fully provided within the ES. A preliminary indication of those measures to be implemented for invertebrates and reptiles, as well to account double handling, is provided within this chapter of the PIER.</p> <p>A fundamental aim of the Oikos ecological proposals for the Calor Road site is to ensure that</p>

Consultee	Date	Summary of Response	How comments have been addressed in this Chapter
		mitigation area in its own right.	they sit alongside and complement the existing strategy. This is reflected in the proposals which are discussed below within this chapter, however, the Oikos proposals would not impact on the ability for this existing mitigation site to deliver on its own objectives and targets as the two mitigation strategies are broadly similar and would be able to function in tandem.
		Natural England have suggested that the contribution which the area of land to the north of the Oikos facility (which is one of the proposed BNG delivery areas) makes to any functional linkages to designated sites with regard to overwintering and passage birds should look to be understood and any associated impacts included as part of the assessment.	<p>Wintering birds surveys within this area on land are currently ongoing.</p> <p>Given the low numbers of species for which the Benfleet and Southend Marshes and/or the Thames Estuary and Marshes SPAs were designated that were recorded utilizing these fields i.e. lapwing <i>Vanellus vanellus</i> – with other species recorded as flying over only, it is considered that these fields do not provide a functional linkage to these designated sites with regard to overwintering and passage birds.</p> <p>Update wintering bird surveys are however being undertaken within this area, and an updated assessment with regards to its functional linkage shall be provided as part of the final ES.</p>
		Natural England suggests that the wintering bird survey results are assessed against the most recent BTO data rather than designated site citation populations and that it is best practice to assess impacts against both the original and recent population data.	The most recent population data for those designated sites within 5km of the Oikos facility has been requested from the BTO, with update wintering bird surveys currently ongoing. An updated assessment of effects based on the results of these updated surveys and against the most recent BTO data will be provided as part of the final ES.

Implications of Legislation, Policy and Guidance

7.46 Legislation, policy and guidance of relevance to the OMSSD project is set out below.

Legislation

7.47 Specific habitats and species receive legal protection in England under various pieces of legislation, including:

- The Conservation of Habitats and Species Amendment (EU Exit) Regulations 2019³⁶;
- The Wildlife and Countryside Act (WCA) 1981 (as amended)³⁷; and
- The Natural Environment and Rural Communities (NERC) Act 2006³⁸.

7.48 Further summary details of this legislation in respect of legally protected and notable flora and fauna of potential relevance to the OMSSD project are provided below.

Flora

7.49 Certain wild plants are protected under the WCA 1981 (as amended) and the Conservation of Habitats and Species Amendment (EU Exit) Regulations. In summary, the legislation prohibits the collecting or cutting of certain wild plants, in addition to the picking, uprooting, destroying, selling or transporting of such wild plants.

7.50 A number of non-native invasive species are also listed under the WCA 1981 (as amended). Under the Act it is an offence to plant or otherwise cause the species to grow in the wild. In addition, any soil or plant material containing these species is likely to be classed as controlled waste.

Amphibians

7.51 Common species of amphibian (smooth newt *Lissotriton vulgaris*, palmate newt *L. helveticus*, common frog *Rana temporaria* and common toad *Bufo bufo*) are partially protected by the WCA 1981. This prohibits the trade (i.e. sale, barter, exchange, transporting for sale and advertising to sell or to buy) of these species.

7.52 GCN are protected under the Conservation of Habitats and Species Amendment (EU Exit) Regulations and the WCA 1981 (as amended). In summary, taken together, it is an offence to deliberately, intentionally or recklessly:

- Kill, injure or capture a great crested newt;
- Disturb GCN in such a way as to be likely significant to affect: (i) the ability of any significant group of GCN to survive, breed, or rear / nurture their young; or (ii) the local distribution of GCN;
- Damage or destroy any breeding or resting place used by GCN; or

³⁶ Conservation of Habitats and Species Amendment (EU Exit) Regulations 2019

³⁷ Wildlife and Countryside Act 1981 (as amended)

³⁸ Natural Environment and Rural Communities Act (2006)

- Obstruct access to any place used by great crested newts for shelter or protection and disturbing GCN while occupying such as place.

Bats

7.53 In summary, all UK bat species are protected by the Conservation of Habitats and Species Amendment (EU Exit) Regulations and by the WCA 1981 (as amended). Taken together it is an offence to deliberately, intentionally or recklessly:

- Kill, injure or capture a bat;
- Disturb bats in such a way as to be likely significant to affect, (i) the ability of any significant group of bats to survive, breed, or rear / nurture their young; or (ii) the local distribution of that species;
- Damage or destroy any breeding or resting place used by bats; or
- Obstruct access to any place used by bats for shelter or protection and disturbing bats while occupying such as place.

Birds

7.54 The level of protection afforded to birds under the law varies from species to species. All of the native bird species of Britain are covered by the relevant aspects of the WCA 1981 (as amended) and the Conservation of Habitats and Species Amendment (EU Exit) Regulations.

7.55 Statutory protection is given to all nesting birds in the UK under the WCA 1981 (as amended), which makes it an offence to intentionally kill, injure or take any wild bird, take, damage or destroy its nest whilst in use or being built, or take or destroy its eggs. In addition to this, for species listed on Schedule 1 of the WCA 1981 (as amended), it is an offence to intentionally or recklessly disturb birds while they are nest building, or at or near a nest with eggs or young, or to disturb the dependent young of such a bird.

7.56 In addition to statutory protection, the bird species of Britain are also subject to various conservation designations intended to indicate their rarity, population status and conservation priority. These do not have statutory force but may be instrumental in determining local, regional and national planning and development policy. The main categories of designation comprise the British Trust for Ornithology (BTO) 'Species Alert' lists, the Royal Society for the Protection of Birds (RSPB) 'Birds of Conservation Concern' lists and species listed under Section 41 of the NERC Act 2006 and local Biodiversity Action Plans (BAPs).

7.57 The BTO Conservation Alert System lists of 'Birds of Conservation Concern' include a 'Red List' for birds of high conservation concern and an 'Amber List' for birds of medium conservation concern. Red List species includes those that are globally threatened, have had historical population decline in UK during 1800–1995, or a severe (at least 50%) decline in UK breeding population over last 25 years, or longer-term period (the entire period used for assessments since the first BoCC review, starting in 1969), or a severe (at least 50%) contraction of UK breeding range over last 25 years, or the longer-term period. Amber List

species are those with an unfavourable conservation status in Europe, according to the International Union for Conservation of Nature (IUCN) criteria.

Invertebrates

- 7.58 The majority of invertebrate species are not legally protected. However, a total of seventy-two terrestrial and aquatic invertebrate species are protected under the WCA 1981 (as amended). Certain species of invertebrate are also protected under the Conservation of Species and Habitats Regulations 2017 (as amended).

Reptiles

- 7.59 All native British reptiles are protected in accordance with the WCA 1981 (as amended). In summary, common species of reptile such as common lizard, slow worm *Anguis fragilis*, grass snake, and adder *Vipera berus* are partially protected under the WCA 1981 (as amended); this prohibits the intentional killing and injuring and trade (i.e. sale, barter, exchange, transporting for sale and advertising to sell or to buy). It is not an offence under the WCA 1981 (as amended) to disturb or possess these species.

National Policy

National Policy Statement for Ports

- 7.60 The National Policy Statement for Ports³⁹ highlights the need for port development to satisfactorily address Habitats and Species Assessment requirements (Section 4.8) before then providing advice (Section 5.1) on how impacts on biodiversity and geological conservation should be considered.
- 7.61 Section 5.1 makes clear that the applicants ES should set out *“any effects on internationally, nationally and locally designated sites of ecological or geological conservation importance, on protected species and on habitats and other species identified as being of principal importance for the conservation of biodiversity. The applicant should provide environmental information proportionate to the infrastructure where EIA is not required to help the decision-maker consider thoroughly the potential effects of a proposed project”* (paragraph 5.1.4)
- 7.62 It is also made clear that, *“The applicant should show how the project has taken advantage of opportunities to conserve and enhance biodiversity and geological conservation interests”* (paragraph 5.1.5).
- 7.63 Section 5.1 of the NPSfP also provides guidance for the decision maker in respect of its consideration of biodiversity and geological matters (paragraphs 5.1.6 to 5.1.9) before then setting out the policies of relevance to different designated sites and features (paragraphs 5.1.10 to 5.1.18). Policy advice on mitigation matters is then provided (paragraphs 5.1.19 to 5.1.21). Further information with regard to each of the above aspects of Biodiversity and Geological Conservation are provided within Appendices 7.1 and 7.2, and due regard has

³⁹ Department for Transport (DfT) (2012) National Policy Statement for Ports

been had to this policy guidance in undertaking the preliminary assessment reported in this chapter.

Overarching National Policy Statement for Energy (EN-1)

- 7.64 The Overarching National Policy Statement for Energy (EN-1)⁴⁰ was published in 2011 and sets out the Government's policy for delivery of major energy infrastructure. This document sets out information with regard to impacts on Biodiversity and Geological Conservation that are not materially different to that set out within The National Policy Statement for Ports referred to in the preceding paragraphs.

National Planning Policy Framework 2019

- 7.65 Although the National Planning Policy Framework (NPPF) (2019) is not the key national policy document against which the OMSSD project is to be considered, due regard to the policies contained within the framework has been had in undertaking the preliminary assessment reported in this chapter of the PEIR.
- 7.66 The NPPF contains a section providing policies relating to the conservation and enhancement of the natural environment. Amongst other things, this section highlights that planning policies and decisions should contribute to and enhance the natural and local environment. This should be achieved by:
- a) *“Protecting and enhancing valued landscapes, sites of biodiversity or geological value and soils (in a manner commensurate with their statutory status or identified quality in the development plan);*
 - b) *recognising the intrinsic character and beauty of the countryside, and the wider benefits from natural capital and ecosystem services – including the economic and other benefits of the best and most versatile agricultural land, and of trees and woodland;*
 - c) *maintaining the character of the undeveloped coast, while improving public access to it where appropriate;*
 - d) *minimising impacts on and providing net gains for biodiversity, including by establishing coherent ecological networks that are more resilient to current and future pressures;*
 - e) *preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans; and*
 - f) *Remediating and mitigating despoiled, degraded, derelict, contaminated and unstable land, where appropriate” (Paragraph 170).*

⁴⁰ Department of Energy & Climate Change (2011) Overarching National Policy Statement for Energy (EN-1)

Local Policy

New Castle Point Borough Council Local Plan 2018-2033

7.67 The Castle Point Local Plan 2018 - 2033 was submitted to the Secretary of State on 2 October 2020 for examination. Section 19 addresses 'Conserving and Enhancing the Natural Environment' and the following draft policies are considered to be potentially of relevance to the OMSSD project with further information provided within Appendices 7.1 and 7.2.

- *Strategic Policy NE1: 'Green Infrastructure and the Undeveloped Coast'* encourages development which results in the creation, restoration, enhancement, expansion and improved connections between green infrastructure features.
- *Local Policy NE3: 'The South Canvey Green Lung'* does not support development within the Green Lung (identified on the Policies Map), and supports the creation of new habitats, having regard to the targets for the Nature Improvement Area.
- *Local Policy NE4: 'Local Wildlife Sites'* seeks the conservation and enhancement of Local Wildlife Sites and encourages proposals for the active conservation and where appropriate biodiversity enhancement of potential Local Wildlife Sites in order to meet the selection criteria for designation as a Local Wildlife Site at a future date.
- *Strategic Policy NE5: 'Ecologically Sensitive and Designated Sites'* supports proposals which can demonstrate a net gain in biodiversity and does not support proposals which have the potential to adversely impact European, internationally, and locally designated sites. Proposals which may result in adverse impacts to biodiversity, protected species, priority species and/or priority habitats will only be supported if certain criteria are met.

Castle Point Borough Council Local Plan, 1998

7.68 The current Local Plan was adopted in November 1998⁴¹. CPBC have undertaken an NPPF conformity check of the saved policies and in some instances, they conclude they are not in conformity with the NPPF. The following policies are considered to potentially be of relevance to the OMSSD project with further information provided within Appendices 7.1 and 7.2:

- *Policy EC12 'Sites of Special Scientific Interest'* controls development which would adversely affect notified SSSIs or NNRs and encourages proper maintenance and management in the interests of protecting and enhancing their nature conservation value.
- *Policy EC13 'Protection of Wildlife and their Habitats'* controls development which is prejudicial to the interests of all wildlife and the retention and management of important habitats.

⁴¹ Castle Point Borough Council (1998) Adopted Local Plan

- *Policy EC14 'Creation of New Wildlife Habitats'* promotes the creation of new wildlife habitats in conjunction with development proposals.

Biodiversity Action Plans

- 7.69 The Environment Departments of all four governments in the UK work together through the Four Countries Biodiversity Group. Together they have agreed a framework of priorities for UK-level work for the Convention on Biological Diversity. Published on 17 July 2012, the 'UK Post-2010 Biodiversity Framework'⁴² covers the period from 2011 to 2020. This now supersedes the UK Biodiversity Action Plan (UK BAP). However, many of the tools developed under UK BAP remain of use, for example, background information about the lists of priority habitats and species. The lists of priority species and habitats agreed under UK BAP still form the basis of much biodiversity work in the countries.
- 7.70 Although the UK Post-2010 Biodiversity Framework does not confer any statutory legal protection, in practice many of the species listed already receive statutory legal protection under UK and / or European legislation. In addition, the majority of Priority national (English) BAP habitats and species are now those listed as HoPI and Species of Principal Importance (SoPI) in England listed under Section 41 (S41) of the NERC Act 2006. For the purpose of this chapter of the PEIR, habitats and species listed under S41 of the NERC Act are referred to as having superseded the UK BAP. All public bodies have a legal obligation or 'biodiversity duty' under Section 40 of the NERC Act 2006 to conserve biodiversity by having particular regard to those species and habitats listed under S41.
- 7.71 At a local level, the site of the proposed OMSSD project is covered by the Essex Biodiversity Action Plan (LBAP)⁴³. This document identifies species of importance locally and contains local targets relevant for planning and mitigation within the county of Essex.

Guidance

National Planning Practice Guidance, 2019

- 7.72 The Government's National Planning Practice Guidance (NPPG)⁴⁴ provides guidance on ecology and biodiversity matters in the Natural Environment Chapter, which explains key issues in implementing policy to protect biodiversity, including local requirements.

Biodiversity 2020: A strategy for England's Wildlife and Ecosystem Services

- 7.73 In October 2010, over 190 countries signed an agreement which established a new global vision for biodiversity, including a set of strategic goals and targets to drive action. England's

⁴² JNCC and Defra (2012) UK Post-2010 biodiversity framework

⁴³ Essex Biodiversity Action Plan (LBAP).

⁴⁴ Ministry of Housing, Communities & Local Government (2019) *Planning Practice Guidance*. Available at: <https://www.gov.uk/government/collections/planning-practice-guidance>

response to this agreement was the publication of ‘Biodiversity 2020: A strategy for England’s wildlife and ecosystem services’⁴⁵. The mission for this strategy is:

“to halt overall biodiversity loss, support healthy well-functioning ecosystems and establish coherent ecological networks, with more and better places for nature for the benefit of wildlife and people.”

BS 42020: 2013 Biodiversity: Code of Practice for Planning and Development

- 7.74 The UK commitment to halt overall loss of biodiversity by 2020 is passed down mainly through planning policy. To assist organisations affected by these commitments, BSI has published BS 42020⁴⁶ which offers a coherent methodology for biodiversity management.
- 7.75 The standard has been produced with input from a number of organisations including the Chartered Institute of Ecology and Environmental Management (CIEEM) and the Association of Local Government Ecologists (ALGE) and provides:
- Guidance on how to produce clear and concise ecological information to accompany planning applications;
 - recommendations on professional ethics, conduct, competence and judgement to give confidence that proposals for biodiversity conservation, and consequent decisions/actions taken, are sound and appropriate; and
 - direction on effective decision-making in biodiversity management a framework to demonstrate how biodiversity has been managed during the development process to minimise impact.

Preliminary Description of the Existing Environment

Ecological Data Search Results

Statutory Designated Sites (International and National)

- 7.76 The OMSSD project is not located within or directly adjacent to any statutory designated sites. However, two international (SPA / Ramsar) designated sites and nine national (SSSI / NNR) designated sites are located within 5km, several of which have overlapping designations / boundaries. These sites are described in Table 7.8 below and are shown on Figure 2.3. It should be noted that the distances provided within Table 7.8 are the nearest approximate distance from the Oikos facility boundary to the boundary of the respective designated site.

⁴⁵ Defra (2011) Biodiversity 2020: A strategy for England’s wildlife and ecosystem services

⁴⁶ BSI (2013) BS 42020: 2013 Biodiversity: Code of Practice for Planning and Development

Table 7.8: Summary of statutory designated sites within 5km of the OMSSD project

Site name	Designation	Nearest approximate distance and direction from Oikos facility	Description
Holehaven Creek	SSSI	0.1km north west (from Jetty 1)	Holehaven Creek comprises intertidal mudflats and saltmarsh habitats regularly supporting nationally important numbers of wintering black-tailed godwit. The site is linked geographically and functionally with the wider Thames Estuary.
Canvey Wick	SSSI	0.76km north-west (from western Oikos facility boundary)	Canvey Wick supports a nationally important assemblage of invertebrates, associated with herb-rich grassland, early successional habitat and scrub edge and brackish habitats. Additionally, it supports a nationally important population of the shrill carder bee <i>Bombus sylvarum</i> .
Thames Estuary and Marshes	SPA / Ramsar	1.26km south (from Jetty 2)	<p>The Thames Estuary and Marshes SPA (and constituent SSSIs) includes both marine and terrestrial habitats. The marshes extend for around 15km along the south side of the estuary, and also include some intertidal areas found on the north bank. It encompasses brackish, floodplain grazing marsh ditches and saline lagoons as well as intertidal saltmarsh and mudflat.</p> <p>The Thames Estuary and Marshes SPA qualifies under Article 4.1 of the EU Birds Directive⁴⁷ as it supports internationally important populations of the regularly occurring Annex 1 species avocet <i>Recurvirostra avosetta</i> and hen harrier <i>Circus cyaneus</i>. This Site also qualifies as an SPA under Article 4.2 of the EU Birds Directive as it supports internationally important populations of regularly occurring migratory species including ringed plover <i>Charadrius hiaticula</i>, grey plover <i>Pluvialis squatarola</i>, dunlin <i>Calidris alpina</i>, knot <i>Calidris canutus</i>, black-tailed godwit <i>Limosa limosa islandica</i> and redshank <i>Tringa totanus</i>. This SPA site also supports an internationally important assemblage of waterfowl as stated in Section 4.2 of the Directive, which include gadwall <i>Anas strepera</i>, shoveler <i>Anas clypeata</i>, tufted duck <i>Aythya fuligula</i>, and pochard <i>Aythya ferina</i>.</p> <p>The Thames Estuary and Marshes Ramsar site qualifies under Criterion 2 as it supports 1 nationally rare and 14 nationally scarce plant species, as well as 1 endangered, 10</p>

⁴⁷ Implemented by the Wildlife and Countryside Act 1981 as amended by the Animal Health, Invasive Alien Species, Plant Breeders' Rights and Seeds (Amendment etc.) (EU Exit) Regulations

Site name	Designation	Nearest approximate distance and direction from Oikos facility	Description
			<p>vulnerable and 12 rare invertebrate species. It also qualifies under Criterion 5 for its internationally important assemblage of waterfowl, and Criterion 6 for its internationally important numbers of over-wintering waterfowl.</p> <p>Conservation objectives for this site are as follows:</p> <p>Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the aims of the EU Birds Directive, by maintaining or restoring:</p> <ul style="list-style-type: none"> • The extent and distribution of the habitats of the qualifying features; • The structure and function of the habitats of the qualifying features; • The supporting processes on which the habitats of the qualifying features rely; • The population of each of the qualifying features; and • The distribution of the qualifying features within the site.
South Thames Estuary and Marshes	SSSI	1.26km south (from Jetty 2)	<p>The South Thames Estuary and Marshes SSSI is a component feature of the Thames Estuary & Marshes SPA / Ramsar.</p> <p>See above entry for description.</p>
Canvey Lake	LNR	1.83km north east (from north eastern Oikos facility boundary)	<p>Canvey Lake is a former creek cut off by a seawall. It was renovated in 2013. This site supports a population of water vole.</p>
Benfleet and Southend Marshes	SPA / Ramsar / SSSI	2.95km north-east (from north eastern Oikos facility boundary)	<p>The Benfleet and Southend Marshes comprises a series of saltmarsh, mudflat and grassland habitats located on the north bank of the Thames Estuary.</p> <p>The Benfleet and Southend Marshes site qualifies under Article 4.2 of the EU Birds Directive as a designated SPA as it supports internationally important populations of regularly occurring migratory species. This includes Dark-bellied brent geese <i>Branta bernicla bernicla</i>, knot, and grey plover. This area also supports internationally important assemblages of waterfowl also covered under Article 4.2 of the Directive.</p> <p>The Benfleet and Southend Marshes Ramsar site qualified under Ramsar Criterion 5 as it supports assemblages of internationally important waterfowl. It is also notified under Criterion 6 as species occurring at</p>

Site name	Designation	Nearest approximate distance and direction from Oikos facility	Description
			<p>internationally important levels are recorded within the area.</p> <p>Conservation objectives for this site are as follows:</p> <p>Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the aims of the EU Birds Directive, by maintaining or restoring:</p> <ul style="list-style-type: none"> • The extent and distribution of the habitats of the qualifying features; • The structure and function of the habitats of the qualifying features; • The supporting processes on which the habitats of the qualifying features rely; • The population of each of the qualifying features; and • The distribution of the qualifying features within the site.
Vange & Fobbing Marshes	SSSI	3.79km north-west (from western Oikos facility boundary)	Vange & Fobbing Marshes lie on the alluvial plain of the lower River Thames. The unimproved coastal grassland and associated dykes and creeks support a diversity of maritime grasses and herbs. Many of these species are nationally uncommon or rare, and together form an outstanding assemblage of plants.
Leigh	NNR	4.85km north-east (from north eastern Oikos facility boundary)	The Leigh NNR is encompassed by the Benfleet and Southend Marshes SSSI boundary. The NNR encompasses Leigh Sands (an intertidal area) as far south as a channel called Ray Gut, and also included the eastern half of Two Tree Island. The island is the only part of the reserve that is accessible. The flats at Leigh NNR support a wide variety of birds, particularly migratory species.
Pitsea Marsh SSSI	SSSI	4.93km north-west (from north western Oikos facility boundary)	Pitsea Marsh SSSI comprises a mosaic of habitats, including scrub, grassland, reedbed and fen, open water and saltmarsh. Geologically, the site is split into two. The grazing marsh dykes and reedbed lie on alluvial deposits, whilst the scrub, grassland and ponds are found primarily on London Clay. The reedbed in Pitseahall Fleet is the largest known in South Essex. The diversity of habitats supports an outstanding range of invertebrates, including a number of local and nationally rare damselflies, dragonflies, moths, flies and beetles.
Northward Hill / High	SSSI / NNR	4.99km south (from Jetty 2)	The most important feature of the site is the heronry which at over 200 the pairs is the

Site name	Designation	Nearest approximate distance and direction from Oikos facility	Description
Halstow (covered by the same boundary)			largest in Britain. There is a diverse breeding bird community, and the insect fauna is also of interest particularly moths and butterflies. The site consists of mixed deciduous woodland and scrub with some open areas of grassland and bracken. A number of small ponds are present and also a few open ditches.

Non-statutory Designated Sites

7.77 The OMSSD project is not located within any non-statutory designated sites. However, Brick House Farm Marsh LWS is located north of the Oikos Facility and Canvey Village Marsh LWS is located to the west, on the opposite side of Haven Road. Three other non-statutory designated sites are located within 2km of the Oikos Facility. These sites are described in Table 7.9 below. It should be noted that the distances provided within Table 7.9 are the nearest approximate distance from the Oikos Facility boundary to the boundary of the respective designated site.

7.78 It should also be noted that through the emerging Local Plan process, CPBC are seeking to increase the size of Brick House Farm Marsh LWS, by extending its boundary to the east and removing an area to the south (an area which covers the Calor Road site).

Table 7.9: Summary of non-statutory designated sites within 2km of the OMSSD project

Site name	Designation	Nearest approximate distance and direction from Oikos facility	Description
Canvey Village Marsh	LWS	0.01km west (from the western Oikos facility, located on the opposite side of Haven Road)	This site consists of the remains of an old grazing marsh system, representing a scarce and declining Essex habitat, of which Canvey Island supports a significant amount. The fields that make up the site are variously cattle or horse-grazed, cut for hay or under no current management, each of these resulting in grasslands of different character. Although of significance in its own right, this site also provides an extension to the adjacent Canvey Wick SSSI and links it to Brickhouse Farm Marsh LWS to the east. This is particularly important for the maintenance of invertebrate populations at a landscape scale. Management of the areas outside of the RSPB's control is of variable quality from a nature conservation point of view, with more intensive grassland

Site name	Designation	Nearest approximate distance and direction from Oikos facility	Description
			management and the risk of arable cultivation.
Brick House Farm Marsh	LWS	0.04km north (from the northern Oikos facility boundary)	This site is said to represent a surviving area of the coastal grazing marsh habitat that would have once covered Canvey Island. Although managed agriculturally, some of the fields retain elements of their original topography, with seasonally wet low ways, which become fleets in wet years. Current management is not being carried out for conservation purposes. Site condition is likely to have been better in 2012 – when originally considered - due to the consistent wet weather. It should be noted that the LWS is not shown as Coastal and Floodplain Grazing Marsh (SoPI) on the MAGIC ⁴⁸ habitat inventory.
Northwick Farm and Sea Wall	LWS	0.76km north-west (from western Oikos facility boundary)	This Site is made up of a former landfill site at Northwick Farm and the adjacent sea wall, which runs alongside the Canvey Wick SSSI. It forms part of a complex of important conservation sites covering most of West Canvey, with links to others in Basildon District and Thurrock.
West Canvey Marshes	LWS	0.99km north west (from north western Oikos facility boundary)	West Canvey Marshes is a very extensive area of grazing-marsh, ditches, scattered scrub and inter-tidal habitats.
Thorneycreek Fleet	LWS	1km north east (from north eastern Oikos facility boundary)	This site largely consists of a wet reedbed, with associated marginal grassland and scrub. It is derived from one of the original main fleets draining Canvey Island prior to its reclamation.

S41 Habitats and Protected, BAP and other notable species

7.79 Records of S41 habitats and species, together with legally protected or otherwise notable species of flora and fauna within 2km of the Oikos facility were provided by Essex Wildlife Trust (EWT) and Essex Field Club (EFC) in 2020. A summary of the most significant results of relevance to the Oikos facility are provided in Table 7.10 below. Full results can be

⁴⁸ <http://www.magic.gov.uk>

obtained from the data providers but cannot be presented in this PEIR due to copyright issues. For some records a distance and four-figure grid reference only has been provided and therefore ‘no full grid reference provided’ has been stated in Table 7.10. It should be noted that the distances provided in Table 7.10 with regard to species are taken from the central grid reference of the OMSSD project and therefore are approximate. A summary of those UK BAP / S41 Habitats (as shown on the MAGIC Habitat Inventory) occurring within 500m of the Oikos facility is also provided within Table 7.10.

Table 7.10: Summary of S41 habitats and protected, BAP and other notable species

Habitats / Species	Category of Importance	Number of records (EWT & EFC combined)	Date range of Records	Nearest approximate distance and direction from Oikos facility
UK BAP / S41 Habitats				
Ancient Woodland	Irreplaceable, HoPI, LBAP	None	N/A	No ancient woodland occurs within 2km of the Oikos facility.
Deciduous Woodland	HoPI, LBAP (Coastal Grazing Marsh)	N/A	N/A	0.23km north
Coastal & Floodplain Grazing Marsh				No coastal and floodplain grazing marsh occurs within 500m of the Oikos facility as shown on the MAGIC Habitat Inventory (nearest record is 1km north west)
Mudflats				0.03km south
Intertidal Substrate Foreshore				0.03km south
Coastal Saltmarsh				1.27km west
Open Mosaic Habitat (draft)				0.55km north-west
Species				
Great crested newt	Hab regs, WCA, SoPI and LBAP	60	1986 – 2019	0.04km west (within Canvey Village Marsh)
Smooth newt	N/A	24	2005 - 2018	0.04km west (within Canvey Village Marsh)
Badgers	Badger Act	CONFIDENTIAL	CONFIDENTIAL	CONFIDENTIAL
Bats				

Habitats / Species	Category of Importance	Number of records (EWT & EFC combined)	Date range of Records	Nearest approximate distance and direction from Oikos facility
Common pipistrelle <i>Pipistrellus pipistrellus</i>	WCA, LBAP	5	2004 - 2011	0.86km north east
Soprano pipistrelle <i>Pipistrellus pygmaeus</i>	WCA, SoPI, LBAP	1	2007	1.73km north east
Birds				
Cuckoo <i>Cuculus canorus</i>	SoPI	13	2012	0.6km (no full grid reference provided)
Cetti's warbler <i>Cettia cetti</i>	WCA	12	2014	0.7km (no full grid reference provided)
Marsh harrier <i>Circus aeruginosus</i>	WCA	14	2017	1.4km (no full grid reference provided)
Hen harrier <i>Circus cyaneus</i>	WCA	1	2017	1.4km (no full grid reference provided)
Peregrine <i>Falco peregrinus</i>	WCA	9	2017	1km (no full grid reference provided)
Hobby <i>Falco subbuteo</i>	WCA	9	2016	0.7km (no full grid reference provided)
Red kite <i>Milvus milvus</i>	WCA	2	2015	1.4km (no full grid reference provided)
Dormouse <i>Muscardinus avellanarius</i>	No records were provided by EWT or EFC			
Invertebrates*				
Wall butterfly <i>Lasiommata megera</i>	SoPI	202	2005 - 2016	0.22km west
Small heath	SoPI	133	1993 - 2019	0.32km west
Saltmarsh short-spur <i>Anisodactylus poeciloides</i>	SoPI	7	1950 - 2012	0.45km west

Habitats / Species	Category of Importance	Number of records (EWT & EFC combined)	Date range of Records	Nearest approximate distance and direction from Oikos facility
Shrill carder bee	SoPI, LBAP	29	2002 - 2019	0.22km west
Brown-banded carder-bee <i>Bombus humilis</i>	SoPI	33	2012	0.22km west
Sea aster bee <i>Colletes halophilus</i>	SoPI	2	2006 - 2012	0.4km west
Shaded broad-bar <i>Scotopteryx chenopodiata</i>	SoPI	12	2003 - 2019	0.9km (no full grid reference provided)
Latticed heath <i>Chiasmia clathrata</i>	SoPI	1	1940 - 2019	0.9km (no full grid reference provided)
Scarce emerald damselfly <i>Lestes dryas</i>	Red list	15	2000 - 2017	0.3km west
Otter	No records were provided by EWT or EFC			
Reptiles				
Common lizard	SoPI	191	2001 - 2019	0.04km west
Adder	SoPI	15	2001 - 2019	0.40km west
Slow worm	SoPI	7	2012 - 2019	0.40km west
Grass snake	SoPI	16	2005 - 2019	0.04km west
European water vole	WCA, SoPI, LBAP	10	2012 - 2015	0.40km west
Flora				
Sea barley <i>Hordeum marinum</i>	SoPI	1	2012	0.40km west
Slender hare's-ear <i>Bupleurum tenuissimum</i>	SoPI	2	2012	0.4km west
Golden-samphire <i>Inula crithmoides</i>	SoPI	2	2012-2014	0.4km west
Sea clover <i>Trifolium squamosum</i>	N/A	4	2006 - 2012	0.15km north
Curved hard-grass	N/A	2	2006 - 2012	0.4km west

Habitats / Species	Category of Importance	Number of records (EWT & EFC combined)	Date range of Records	Nearest approximate distance and direction from Oikos facility
<i>Parapholis incurva</i>				
Annual beard-grass <i>Polypogon monspeliensis</i>	N/A	2	2009 - 2015	2.2km (no full grid reference provided)
Glaucous glasswort <i>Salicornia obscura</i>	N/A	2	2006	2km (no full grid reference provided)
Invasive Species	No species listed on Schedule 9 of WCA were provided by EWT or EFC			

* Numerous records for invertebrates were returned, full details of which can be obtained separately following permission from the copyright holder.

Hab Regs - Conservation of Habitats and Species Amendment (EU Exit) Regulations 2019

WCA - The Wildlife and Countryside Act 1981 (as amended)

SoPI – Species of Principal Importance under The Natural Environment and Rural Communities Act 2006

LBAP – Essex Biodiversity Action Plan

Description of the Existing Environment (Oikos Facility)

Habitats

7.80 The following habitat types, described in more detail below, were identified on and adjacent to the Oikos Facility during the 2020 ‘Extended’ Phase 1 Habitat Survey:

- Bare ground;
- Hardstanding;
- Buildings / structures;
- Ephemeral / short perennial;
- Tall ruderal;
- Scrub;
- Semi-improved grassland;
- Waterbodies;
- Running water; and
- Intertidal mudflats.

7.81 The above habitats are considered not to have changed to a significant extent from the findings of the 2018 'Extended' Phase 1 Habitat Survey, with the predominant changes largely comprising very gradual succession of areas of bare ground to ephemeral vegetation and the establishment of further areas of semi-improved grassland.

7.82 The habitat descriptions given below should be read in conjunction with Figure 7.1 which includes target notes, and the photographs (Plates) presented in Appendix 7.1.

Bare ground and Hardstanding

7.83 The Oikos facility consists predominantly of hard standing, in the form of pedestrian walkways and roads, and bare ground (gravel) surrounding the existing storage tanks. Areas of bare ground are also present as a result of on-going operational works.

Buildings

7.84 A total of seventeen buildings of various construction are currently present on the Oikos facility. The buildings are of a variety of constructions, a summary of which together with an assessment of their suitability to support roosting bats is provided within Appendix 7.1, a summary of which is provided below (see 'Protected and Notable Fauna' section that follows).

Ephemeral / Short perennial

7.85 Ephemeral / short perennial habitat dominated by bristly ox-tongue *Helminthotheca echioides* is scattered throughout the Oikos facility. A large proportion of this has become established from bare ground resulting from previous clearance works associated with the removal of storage tanks within the south-west of the Oikos facility.

7.86 The following species were also recorded: soft brome *Bromus hordeaceus*; common daisy *Bellis perennis*; cocks-foot *Dactylis glomerata*; dandelion *Taraxacum spp.*; white clover *Trifolium repens* and Canadian fleabane *Erigeron canadensis*.

7.87 Some small areas formed ephemeral shingle e.g. Figure 7.1, Target Note 4, where bird's foot trefoil *Lotus corniculatus* occurred.

Tall ruderal

7.88 A number of patches of tall ruderal vegetation occur across the Oikos facility, sometimes interspersed with industrial pipes and tanks.

7.89 Small patches of ruderal habitat were recorded to the south-west and central parts of the Oikos facility. The following species were recorded within such areas: redshank *Persicaria maculosa*; yarrow *Achillea millefolium*; goosefoot species *Chenopodium spp.*; broad-leaved dock *Rumex obtusifolius*; wild carrot *Daucus carota*; common toadflax *Linaria vulgaris*; ragwort *Jacobaea vulgaris*; cocks-foot; Canadian fleabane; bristly ox-tongue; common teasel *Dipsacus fullonum*; creeping thistle *Cirsium arvense*; and spear thistle *Cirsium vulgare*.

- 7.90 Several areas within the central southern areas of the Oikos facility were dominated by common reed *Phragmites australis*, which is subject to regular management. Common reed is also present to the south-west of MA1, associated with Ditch D1, as well as small areas within MA1 itself.
- 7.91 MA2 supports a diverse ruderal habitat mixed with semi-improved grassland. Species recorded include tufted vetch *Vicia cracca*; white melilot *Melilotus albus*; corn marigold *Glebionis segetum*, bird-foot trefoil; mugwort species *Artemisia spp.*; scented mayweed *Matricaria chamomilla*; oilseed rape *Brassica napus*; ribwort plantain *Plantago lanceolata* and greater plantain *Plantago major*.

Scattered scrub

- 7.92 Areas of scattered scrub were recorded across the Oikos facility, including within MA2, to the north and eastern edges of waterbody P2, along the eastern Oikos facility boundary, and within the centre and north of the Oikos Facility. The scrub is largely dominated by bramble *Rubus fruticosus* and buddleia *Buddleia davidii*, with species such as hawthorn *Crataegus monogyna* also present.

Semi-improved grassland

- 7.93 Regularly managed / cut (to c.50-100mm as part of routine operational management works) species poor semi-improved grassland is present within the centre, south and south-east of the Oikos Facility. Species recorded include cocks-foot; dandelion; perennial ryegrass *Lolium perenne*; Yorkshire fog *Holcus lanatus*; ribwort plantain; greater plantain; broad-leaved dock *Rumex obtusifolius*; meadow grass species *Poa sp.*; creeping cinquefoil *Potentilla reptans*; dandelion; daisy; barren brome *Bromus sterilis*; and other brome *Bromus sp.* The grassland is also interspersed with ephemeral / short perennial and ruderal vegetation as described above.
- 7.94 MA2 supports a mix of coarse semi-improved grassland, comprising the above species and subject to an annual management regime, with other habitats, including tall ruderals, ephemerals and scrub vegetation being present, including those species listed within paragraph 7.91 above.

Waterbodies

- 7.95 A total of six waterbodies were recorded on the Oikos facility, comprising three man-made ponds (Figure 7.1, Ponds P1; P2; and P3) and three ditches (Figure 7.1, Ditches D1, D2 and D3). Two of the ponds (P1 and P2) store fire water for the site.
- 7.96 Waterbody P1, is located to the north of Building B8 and is approximately 1,000m² in area. It is surrounded with emergent fringe vegetation comprising sea club-rush *Bolboschoenus maritimus*. Beyond this the pond is surrounded by hardstanding, ephemeral / short perennial vegetation and some small areas of semi-improved grassland. The pond has little to no suitable connectivity to other waterbodies present on the Oikos facility. Algae blooms were recorded within the waterbody during the 2018 'Extended' Phase 1 Habitat Survey and there was an absence of submerged vegetation.

- 7.97 Waterbody P2 is located to the south of MA2 and is approximately 3,600m² in area. Surrounding habitat comprises scrub, ephemeral / short perennial vegetation and semi-improved grassland and emergent fringe vegetation comprising sea club-rush as described above. As with Waterbody P1, the presence of algae blooms and an absence of submerged vegetation was recorded. The waterbody has some connectivity to off-site terrestrial habitats to the east and north-east, however the eastern and northern boundaries are largely surrounded by reptile exclusion fencing associated with MA2.
- 7.98 Waterbody P3 is approximately 80m² in area and as with the other ponds had algae blooms present and an absence of emergent and submerged vegetation. P3 is located within MA2 and is surrounded with scrub and ephemeral / short perennial vegetation. The fringes of this waterbody are dominated by common reed. MA2 is surrounded by existing reptile exclusion fencing, which has remained in place following a translocation exercise of reptiles from within other parts of the Oikos Facility to MA2 in 2016.
- 7.99 Ditch D1 is approximately 160m in length running north-south and is located within the north-east of the Oikos Facility (out with the area to be directly affected by the OMSSD project), to the east of Compound 4 and west of MA1. Its depth is unknown due to dense vegetation precluding access, however, it is considered likely to range between 20-40cm along its length. The ditch is dominated by common reed and is lined to the north by scrub vegetation with few areas of open water present. Water quality appears to be poor with no submerged plants or aquatic invertebrates noted. Other immediately adjacent habitats comprise hardstanding, bare ground and ephemeral vegetation to the west and south-east, and semi-improved grassland and scrub to the east within MA1. MA1 is surrounded by reptile exclusion fencing, which has remained in place following a translocation exercise of reptiles from within other parts of the Oikos Facility to MA2 in 2016.
- 7.100 Ditch D2 (Plate 15) is approximately 155m in length and 10-20cm in depth, running north of Building B6 and spurring to the west. Emergent vegetation is dominated sea club rush *Bolboschoenus maritimus* to the north of Building B6, and then runs into an area of managed common reed where it runs west (areas where common reed occur are marked as Target Note 5 on Figure 7.1). Water quality appears to be poor with no submerged plants or aquatic invertebrates noted and the ditch was dry during the summer/early autumn months.
- 7.101 Ditch D3, is approximately 55m in length and 10-20cm in depth and located west of D2, to the south of an area of previously cleared ground which now comprises ephemeral vegetation. As with D2, D3 is dominated by managed common reed. Water quality appears to be poor with no submerged plants or aquatic invertebrates noted and the ditch is likely to become dry during the summer/early autumn months.

Protected, BAP and other Notable Fauna and Flora

Amphibians

- 7.102 EWT and EFC provided numerous records for smooth newt and GCN within 2km of the Oikos facility. Previous GCN presence /absence surveys undertaken by Johns Associates in 2012, associated with the development of Howards Way to the north of the Oikos facility,

recorded a small population of GCN as being present within ponds and ditch systems. These are separated from the Oikos facility by the car storage facility which runs along the northern edge of the Oikos facility and further intervening habitats in the form of bare ground and hardstanding. GCN are both a SoPI and LBAP species.

- 7.103 Surveys undertaken by Thomson in 2015 also recorded the presence of a small population of GCN within ponds and ditch systems to the north of the Oikos facility.
- 7.104 No GCN were recorded within those waterbodies within the Oikos facility itself as part of the above surveys i.e. Ditch D1 by Johns Associates and Ponds P1, P2 and P3 by Thompson. It should also be noted that no GCN were recorded during the 2016 reptile translocation exercise.
- 7.105 An update Habitat Suitability Index assessment was undertaken on the six waterbodies recorded on the Oikos facility during the 2018 and 2020 'Extended' Phase 1 Habitat Surveys, a summary of which can be found within Table 7.11 below, with full results detailed in Appendix 7.1.

Table 7.11: Summary HSI results

Waterbody	Suitability for GCN
P1	Good
P2	Good
P3	Good
D1	Excellent
D2	Good
D3	Average

- 7.106 As detailed in Table 7.11 the waterbodies present on the Oikos facility range from average suitability to excellent suitability for GCN. Whilst Ditch D1 is noted as being of excellent suitability for GCN, it should also be noted that no GCN have been recorded within Ditch D1 and although the ditch will be retained it is out with the area to be directly affected by the OMSSD project.
- 7.107 The remaining waterbodies on the Oikos facility have limited to no suitable connectivity to Ditch D1 due to intervening areas predominantly comprising buildings and hardstanding together with regularly managed vegetation (Pond 1 and Ditches D2 and D3). Ditches D2 and D3 also lie approximately 250m beyond Ditch D1. Whilst Ponds P2 and P3 lie approximately 120m and 200m south-west of Ditch D1 respectively, it should be noted that reptile exclusion fencing remains in place around MA1 and MA2 from the 2016 reptile translocation. This would largely preclude GCN – even if they were present in Ditch D1 - from accessing Pond P3 / MA2 (as well as MA1) and would also result in GCN having to cross extensive areas of bare ground and hardstanding to access Pond P2. The reptile exclusion fencing for MA2 also extends south to the east of Pond P2.
- 7.108 No GCN eDNA was detected within any of the three ponds present on the Oikos facility as part of the eDNA survey. Full results are reported within the Environmental DNA Analysis

Report supplied by Applied Genomics Ltd (Appendix 7.2). No eDNA survey was undertaken on those ditches present within the Oikos facility due to these either being largely isolated or retained.

- 7.109 The Oikos facility provides limited suitable terrestrial habitats for GCN. In addition, connectivity between off-site water bodies and terrestrial habitats and those within the Oikos facility is limited with intervening habitats comprising bare ground and hardstanding as well as reptile fencing also being present in areas.
- 7.110 Given the above, it is also considered that GCN are unlikely to be present in those areas to be affected by the OMSSD project. Whilst the absence of GCN from Ditch D1 was not confirmed as part of the eDNA surveys undertaken in 2019, given the results of previous surveys undertaken by Johns Associates and Thompson in 2012 and 2015 respectively, it is considered unlikely that GCN are present within this waterbody.

Bats

- 7.111 EWT provided no records of bats, with EFC providing records for common and soprano pipistrelle bats within 2km of the Oikos facility. No bats, including incidental bat activity of any kind, was recorded during emergence / re-entry surveys undertaken on several buildings by Thomson in 2015 for the purposes of the previous Deep Water Jetty development application. This included Buildings B8 and B9 as shown on Figure 7.1, together with a third building which has since been demolished.
- 7.112 All seventeen buildings present on the Oikos facility were assessed for their suitability to support roosting bats during the 2018 and 2020 'Extended' Phase 1 Habitat Surveys, results of which are provided within Appendix 7.1. In summary, buildings B3, B7, B9 and B12 were assessed to be of low bat roosting suitability as part of the 2018 'Extended' Phase 1 Habitat Survey, with the remaining buildings assessed to be of negligible bat roosting suitability. As part of an internal building inspection undertaken in 2019, all buildings were downgraded to negligible bat roosting suitability. All buildings on the Oikos facility were considered to remain of negligible bat roosting suitability as part of the 2020 'Extended' Phase 1 Habitat Survey.
- 7.113 The Oikos facility is classified as poor in terms of potential commuting habitat due to the prevalence of buildings, hard standing and bare ground with a lack of suitable commuting linear features. The Oikos facility also experiences levels of night lighting given its 24hr operational nature. Lighting is present within bunds, up tank access stairways and operation areas, with flood (primarily security) lighting on stanchions, which is primarily focused on the Oikos facility perimeter. Furthermore, the Oikos facility is relatively exposed in nature, being situated within a coastal location.

Breeding birds

- 7.114 Numerous bird records were provided by EWT and EFC within 2km of the Oikos facility.
- 7.115 Thirty bird species were recorded during a breeding bird survey of the eastern half of the Oikos facility carried out by Thomson in 2015. Three species (house sparrow *Passer*

domesticus, blue tit *Cyanistes caeruleus* and moorhen *Gallinula chloropus*) were confirmed as breeding and starling *Sturnus vulgaris* were identified breeding close to the Oikos facility and using the Oikos facility for foraging.

- 7.116 Twenty species were recorded as possibly breeding (reed warbler *Acrocephalus scirpaceus*, mallard *Anas platyrhynchos*, linnet *Carduelis cannabina* (SoPI), goldfinch *Carduelis carduelis*, greenfinch *Chloris chloris*, feral pigeon *Columba livia*, wood pigeon *Columba palumbus*, carrion crow *Corvus corone*, reed bunting *Emberiza schoeniclus*, kestrel *Falco tinnunculus*, swallow *Hirundo rustica*, great tit *Parus major*, magpie *Pica pica*, green woodpecker *Picus viridis*, collared dove *Streptopelia decaocto*, wren *Troglodytes troglodytes*, whitethroat *Sylvia communis*, pied wagtail *Motacilla alba*, dunnock *Prunella modularis* and blackbird *Turdus merula*). This is because they were recorded within suitable nesting habitat or singing males of territorial species were recorded. Of those species confirmed or possibly breeding, five species (house sparrow, linnet, reed bunting, dunnock and starling) are listed as either priority species (listed as a SoPI) or are included on the red list of Birds of Conservation Concern⁴⁹.
- 7.117 During the 2018 'Extended' Phase 1 Habitat Survey, the following notable bird species were identified within the area of the Oikos facility: house sparrow; linnet; and starling.
- 7.118 The Oikos facility offers limited foraging and nesting opportunities for common and notable species of bird, including the buildings, waterbodies, scrub, grassland and ruderal habitats, though given the habitats present it is considered unlikely that any significant populations of such species are present.
- 7.119 In addition to the above, during the 2019 reptile survey a successful breeding pair of black redstart (listed under Schedule 1 of the WCA 1981 (as amended)) were observed on 4 occasions (survey visits 1, 4, 5 and 6) in the vicinity of Building B4 (Figure 7.1). Consequently, a breeding bird survey is scheduled to be undertaken at the Oikos facility at the correct time of year in 2021.

Terrestrial invertebrates

- 7.120 Numerous records of invertebrates of conservation importance were returned by EWT and EFC within 2km of the Oikos facility, many of which were associated with the nearby Canvey Wick SSSI. The invertebrate survey undertaken by Waterman in 2015 on part of the Oikos facility for the purposes of the Deep Water Jetty development application identified nine species of national conservation significance.
- 7.121 As part of the previous Deep Water Jetty application, and due to the adverse impacts upon notable species including invertebrates (and reptiles), MA1 and MA2 were created to mitigate those impacts, albeit with hindsight possibly mistakenly created on site. The majority of mitigation measures for invertebrates were provided within MA2 which included the enhancement of existing and provision of new habitats.

⁴⁹ <https://britishbirds.co.uk/wp-content/uploads/2014/07/BoCC4.pdf>

- 7.122 MA1 comprises areas of common reed, semi-improved grassland and scrub, whilst MA2 comprises scrub, tall ruderal, semi-improved coarse grassland and ephemeral / short perennial habitats, together with a boulder slope on a southerly aspect, a sandy slope on a southerly aspect, and provides suitable habitat for notable species of invertebrate.
- 7.123 The 2019 terrestrial invertebrate survey identified a total of 411 species of invertebrates on the area surveyed within the Oikos facility (Appendix 7.2). A broad range of invertebrate groups was covered to a greater or lesser extent and the species list includes representatives of the following groups: spiders; dragonflies and damselflies; grasshoppers; crickets and ground hoppers; earwigs; true bugs; froghoppers; planthoppers and leafhoppers' moths; butterflies; caddisflies; beetles; true flies; sawflies; ants; wasps and bees.
- 7.124 The main technique of sweep-netting was most efficient at sampling flying insects with Diptera found in the greatest number (157 species, 38%). The second largest group found was Hymenoptera (94 species, 23%). Third most diverse was Coleoptera (68 species 17%), then Hemiptera (39 species 9.5%), closely followed by Lepidoptera and (32 species 7.8%).
- 7.125 Of the 411 species identified by this survey, 55 (13.4%) are considered as Key Species (defined as RDB; Nationally Scarce; and / or BAP/SoPI and Locally Significant species). A list of these species is provided within Appendix 7.2. This result is better than found in 2015 for the Deep Water Jetty development (when 12.5% considered Key Species were found), but given the nature of this kind of sampling, this is not likely to be a significant difference.
- 7.126 The number of RDB species found (9 species 2.2%) is comparable with the 2015 position. This level is not too surprising given the presence Canvey Wick SSSI (which is designated for its notable invertebrate assemblages) to the west.
- 7.127 An analysis of the Key Species found reveals that several are no longer of great conservation concern. Appendix 7.2 provides a summary of those scarce species recorded on the Oikos facility, 23 of which are no longer of national conservation status despite still having this status officially. These are species that have significantly increased in range and numbers in recent years, possibly due to more favourable climatic conditions, or were much overlooked in the past and have subsequently been shown to be more common than previously thought. Consequently, it is worth noting that excluding these 23 species would reduce the number of Key Species referred to above to 32 (7.8%).
- 7.128 However, several of these species are of local significance, still being rare in Essex or at least hardly recorded. This proportion of scarce species that are becoming more common is about 40%, a little higher than normally found, possibly because the Thames corridor has been more favourable for many species at the edge of their range than most of the country in recent years. Sixteen species merit attention as they are judged to still be of national conservation significance. Many of these occur at the nearby Canvey Wick SSSI. Species such as *Bombus sylvarum*, *Lasioglossum pauperatum* and *Sphecodes rubicundus* all have nationally important populations in the Thames corridor to which the population on the Oikos facility will contribute. Others, such as the weevil *Hypera meles* are apparently not recorded

in Essex and the parasite fly *Cyrtophleba ruricola* with just one other record in county. A full description of those Key Species recorded, together with an assessment of each compartment surveyed within the Oikos facility, is provided within Appendix 7.2.

- 7.129 Overall, the terrestrial invertebrate sample taken in 2019 yielded results broadly similar to those in 2015 as part of the Deep Water Jetty Application, with similar proportion of scarce species within the variability expected of such samples. The slightly better results in 2019 are likely to be down to the warmer weather allowing a greater proportion of Hymenoptera to be found, many of which have conservation significance. Figure 7.3 highlights those areas of the Oikos facility that are assessed to be of the greatest value for invertebrates.
- 7.130 Most of the additional species found in 2019 are already known locally and have important populations along the Thames corridor, such as *Sphex rubicundus*, *Hylaeus pictipes* and *Priocnemis confusor (=gracilis)*.
- 7.131 The Oikos facility is highly unlikely to harbour invertebrate populations of conservation significance that do not occur outside the Oikos facility boundary, or even encompass the greater part of any such populations.
- 7.132 With regard to aquatic (non-marine) invertebrates, no aquatic species of conservation concern have been identified as part of the survey work undertaken to date and given the nature of those waterbodies present on the Oikos facility these are likely to be of limited value for supporting notable species of aquatic invertebrate.

Reptiles

- 7.133 Numerous records for common reptile species were returned by EWT and EFC within 2km of the Oikos facility. In addition, reptile surveys undertaken across the eastern and northern portions of the Oikos facility by Thompson in 2015 as part of the previous Deep Water Jetty development application recorded the presence of a 'good' population of common lizard and a 'low' population of grass snake (both SoPI).
- 7.134 Multiple locations on Oikos facility were identified during the 2018 and 2020 Extended Phase 1 surveys to offer foraging, commuting, basking, resting and hibernating opportunities for common species of reptiles. Such features are identified on Figure 7.1 as Target Note 3.
- 7.135 As already referred to, as part of the previous Deep Water Jetty development application, MA1 and MA2 were created to mitigate for impacts, including those effecting reptiles. This included the enhancement of existing and provision of new habitats, together with the translocation of those reptile populations present within the Deep Water Jetty planning application development area to MA1 and MA2.
- 7.136 No update reptile surveys were undertaken within MA1 and MA2 in 2019. This is because a total of 252 common lizards (i.e. an 'exceptional' (high) population) and 2 grass snakes (i.e. a low population) were translocated to these areas in 2016 and, given that reptile fencing is still erected around these areas, the continued presence of an 'exceptional' (high) population of common lizard and a low population of grass snake is presumed.

- 7.137 A summary of the findings of the reptile presence / likely absence survey undertaken at the Oikos facility in 2019 is provided below with full results detailed within Appendix 7.2. The below should also be read in conjunction with Figure 7.2.
- 7.138 Area 1 consists of mixed grassland, sparsely vegetated habitats and work zones, of which approximately 25% was good or suitable reptile habitat. The maximum count within this area was two common lizards and one grass snake. Area 2 consisted of similar habitat mix with the addition of extensive rubble and spoil piles, and bare ground / work zones. Approximately 60% was good or suitable reptile habitat. The maximum count within this area was nine common lizards and two grass snakes. Area 3 consisted largely of regularly mown grassland with longer vegetation and tussocks to the margins, bare ground and work zones, of which approximately 50% was suitable habitat. The maximum count within this area was six common lizards. Maximum counts summed across all survey areas comprise 13 common lizards on two occasions and 3 grass snakes on one occasion.
- 7.139 Given that three times the number of reptile refugia used for determining reptile population sizes were placed across the Oikos facility, using Froglife guidance, when the maximum counts are also divided by 3, this equates to a 'low' population of common lizard and a 'low' population of grass snake being present within those areas of the Oikos facility subject to survey in 2019.

Water vole

- 7.140 A total of 10 records for water vole (SoPI, LBAP) were returned from EWT and EFC within 2km of the Oikos facility.
- 7.141 The 2015 habitat suitability assessment undertaken by Thomson found two water bodies (Ditch D1 and Pond P2) with low potential to support water voles and two water bodies (Ponds P1 and P3) with moderate potential to support water vole. However, no sightings or evidence of water voles was recorded at these water bodies during the presence (or likely absence) survey also undertaken in 2015. Consequently, it was concluded that water voles are likely absent from the Site.
- 7.142 It should also be noted that no evidence of water vole was recorded within those ditch systems present to the north of the Site during surveys undertaken by Johns Associates in 2012 associated with the development of Howards Way.
- 7.143 Ditch D1 will be retained and is out with of the OMSSD project site and the Oikos facility and Calor Road site (as well as one of the potential BNG delivery areas options that is located to the north of the Calor Road site) and also provides limited connectivity, if any, to habitats within the local area of value to this species and where they have been recorded. No evidence of water vole was incidentally recorded during the 2018 and 2020 'Extended' Phase 1 Habitat Surveys however, for completeness, an update survey for water vole is being undertaken upon those waterbodies present on the Oikos facility.

Otter

- 7.144 No records for this species were returned from EWT and EFC within 2km of the Oikos facility. The Oikos facility and surrounding area does not provide any suitable habitat to support this species and as such otter are considered likely to be absent from the Oikos facility and surrounding area.

Wintering Birds

- 7.145 A total of 22 species were recorded during the 2018 - 2019 winter bird survey of the adjacent mudflats and inter-tidal zone, with full details, including individual numbers, provided in Appendix 7.2. Furthermore, a total of 19 species were recorded during the 2019 - 2020 winter bird survey, with 25 different species in total recorded over the two surveys (2018-19 and 2019-20).
- 7.146 The survey area can be divided into two sections (Figure 7.4):
- Area A 'Holehaven Creek Mudflats', part of Holehaven Creek SSSI: located to the west of Holehaven Point (the 'groyne' that extends immediately south of the Lobster Smack pub and itself located west of the Oikos facility) running eastwards to the long disused jetty within the creek lies the large expanse (at low tide) of mudflats that form the entrance to Holehaven Creek. The SSSI extends along the western side of the groyne.
 - Area B 'Oikos frontage': area to the east of the groyne that extends along and in front of the Oikos facility and is crossed by the Oikos jetties, and therefore already subject to operational activity at and along these jetties. This area is a much less extensive area of mudflats at low tide in comparison to Holehaven Creek.
- 7.147 The vast majority of the birds recorded during the surveys, especially at low tide, were recorded in Area A and these birds also used the extensive mudflats extending further westwards up Holehaven Creek. In the species accounts below, the proportion of birds in Areas A and B is set out in more detail.
- 7.148 The species accounts below only include relevant SPA or SSSI species, i.e. those species cited within the Holehaven Creek SSSI and Vange and Fobbing Marshes SSSI citations, or cited as features for Thames Marshes and Estuary SPA and Ramsar, or Benfleet and Southend Marshes SPA and Ramsar, as set out in Table 7.12 below. A wetland in Britain is considered nationally important if it regularly holds 1% or more of the estimated British population of one species or subspecies of waterbird.
- 7.149 For other species recorded, they are essentially common winter species for this area and occur in less than significant numbers (or waterbird 'species threshold levels' as set out by the British Trust for Ornithology (BTO⁵⁰)) to be required for the wetland to be defined as nationally important.

⁵⁰ <https://www.bto.org/our-science/projects/wetland-bird-survey/data/species-threshold-levels>

Table 7.12: Species cited in nearby SPA / Ramsar and SSSI designations

Species	Holehaven Creek SSSI	Thames Estuary & Marshes SPA / Ramsar	Benfleet & Southend Marshes SPA / Ramsar	Vange and Fobbing Marshes SSSI
Black tailed godwit <i>Limosa limosa</i> (SoPI)	Nationally important wintering numbers. 5-year peak mean of 1594	Article 4 species 1,699 max Assemblage species	-	-
Curlew <i>Numenius arquata</i> (SoPI)	Assemblage species – occasionally in nationally significant numbers	-	-	-
Dunlin	Assemblage species – occasionally in nationally significant numbers	Article 4 species 29,646 maximum count Assemblage species	Article 4 species 11,372 maximum count	-
Ringed plover	-	Article 4 species 1,324 maximum count	Article 4 species 359 maximum count	-
Grey plover	-	Article 4 species 2,593 maximum count Assemblage species	Article 4 species 3,789 maximum count	-
Redshank	-	Article 4 species 3,251 maximum count Assemblage species	-	Breeding
Brent goose <i>Branta bernicla</i> (SoPI)	-	-	Article 4 species 3,819 maximum count	-
Short-eared owl <i>Asio flammeus</i>	-	-	-	Wintering

7.150 Accounts for each of those species listed within Table 7.12 above recorded during both the 2018 - 2019 and 2019 – 2020 surveys are provided below.

7.151 *Black Tailed Godwit (2018 – 2019 Surveys)*: A maximum of 7 birds were recorded on the December low tide count in Area A. This amounts to 0.4% of both the SSSI and Thames Estuary SPA populations and is, therefore, not considered significant. No black tailed godwit were recorded in Area B.

- 7.152 *Black Tailed Godwit (2019 – 2020 Surveys)*: A single count of 4 birds at low tide in Area A. Again, a level not considered to be significant. No black tailed godwit were recorded in Area B.
- 7.153 *Curlew (2018 – 2019 Surveys)*: A maximum of 37 curlew were recorded on the low tide count in December. Of these 35 were feeding on Area A and only 2 on Area B. The Great Britain threshold for significance⁵¹ is 1,400 birds. Therefore, the numbers for Area B are not considered significant.
- 7.154 *Curlew (2019 – 2020 Surveys)*: The maximum count was 26 birds at low tide in the December 2019 count, with 23 birds on Area A and 3 birds on Area B. Therefore the 2019 – 2020 numbers would not be significant for either area.
- 7.155 *Dunlin (2018 – 2019 Surveys)*: Large counts of dunlin with a maximum of 450 (March 2019 low tide) were recorded feeding on the Holehaven Creek mudflats, Area A. This would equate to 1.5% of the Thames Estuary and Marshes SPA population and 4.0% of the Benfleet and Southend Marshes SPA population. The maximum count of dunlin in Area B was 28 (Nov 2018 low tide). The population on Area B is not considered significant in relation to both SPA populations. It is worth noting that the large dunlin flock (350-450 birds) moved either side of the large disused jetty in Area A i.e. the flock was often feeding further west up Holehaven Creek.
- 7.156 Dunlin were only recorded using Area B on 3 of the 12 visits, with a maximum count of 28 birds (representing 6% of the overall maximum figure of 450 birds) on the November 2018 low tide count. This figure of 28 is well below 1% of the SPA populations and not considered significant.
- 7.157 *Dunlin (2019 – 2020 Surveys)*: No dunlin were recorded in the 2019-20 surveys.
- 7.158 *Ringed Plover (2018 – 2019 Surveys)*: A maximum count of 17 ringed plover were observed on the Nov 2018 low tide count. These were all on Area B. This would equate to 1.3% of the Thames Estuary and Marshes SPA population and 4.7% of the Benfleet and Southend Marshes SPA population.
- 7.159 *Ringed Plover (2019 – 2020 Surveys)*: Ringed plover were recorded on just a single occasion in the 2019-20 survey, with 11 birds recorded on Area B on the November low tide survey. This equates to 0.83% of the Thames Estuary and Marshes SPA population and 3% of the Benfleet and Southend Marshes SPA population.
- 7.160 *Grey Plover (2018 – 2019 Surveys)*: One record of 5 birds on the January 2019 low tide count, on Area A. This is well under 1% of the local SPA populations and is not considered significant.
- 7.161 *Grey Plover (2019 – 2020 Surveys)*: No records of grey plover during the 2019-20 survey.

⁵¹ WeBS Report online

- 7.162 *Redshank (2018 – 2019 Surveys)*: A maximum of 21 birds was observed on the January 2019 low tide count, 12 of which were on Area A and 10 on Area B. The total of 21 represents 0.6% of the Thames Estuary and Marshes SPA population, with 10 birds representing 0.3%. Neither figure is considered significant.
- 7.163 *Redshank (2019 – 2020 Surveys)*: Numbers were lower in 2019-20 with a maximum of 9 birds overall and a maximum of just 5 birds in Area B and therefore not considered significant.
- 7.164 *(Dark bellied) Brent Goose (2018 – 2019 Surveys)*: Observed on just two occasions, both on Area A, with a maximum count of 14 on the February 2019 low tide count. This count represents just 0.4% of the Benfleet and Southend Marshes SPA population and is not considered significant.
- 7.165 *(Dark bellied) Brent Goose (2019 – 2020 Surveys)*: Recorded on 3 occasions in 2019-20 with a maximum of 26 birds (Areas A and B) on the March 2020 low tide count. The maximum recorded on Area B was 7 birds also on the March low tide count. The count of 26 would represent 0.86% of the Benfleet SPA population and the Area B count of 7 is just 0.18%: neither figure is considered significant.
- 7.166 *Short-eared owl*: This species was not recorded during any of those surveys undertaken.
- 7.167 The section of foreshore studied supports small numbers of waterbirds, the vast majority of which utilise Area A (and beyond further west) i.e. the large expanse of exposed mudflat that is part of Holehaven Creek SSSI. Much smaller numbers use the Oikos facility foreshore (Area B) at low and high tide. In absolute numbers, the total numbers of birds using Area B ranged from 23 birds to 88 birds over the 12 surveys in 2018-19 and 15 to 45 birds over the 2019-2020 surveys, of which a significant number were species of gulls.
- 7.168 Only ringed plover are present in Area B in numbers greater than 1% of nearby SPA populations⁵²: maximum count of 17 in 2018-19 equating to 1.3% of the Thames Estuary and Marshes SPA population and 4.7% of the Benfleet and Southend Marshes SPA population. Ringed plover were present on just 5 of the 12 2018-19 survey visits at both low and high tide and just one of the 2019-20 survey visits, but only between October and December. Therefore, they are not present all winter and the small numbers observed may be passage migrant birds, rather than wintering individuals. Only dunlin could be said to be present in Area A in numbers greater than 1% of nearby SPA populations: maximum count of 450 in 2018-19 equating to 1.5% of the Thames Estuary and Marshes SPA population and 4.0% of the Benfleet and Southend Marshes SPA population.
- 7.169 Both the Thames Estuary and Marshes SPA and Benfleet and Southend Marshes SPA lists ringed plover and dunlin as qualifying features for wintering (Thames Estuary and Marshes

⁵² The threshold for inclusion for an 'important population' is often considered to be a discreet area of habitat which regularly supports (i.e. recorded several times a year during the period when the birds are present) 1% of the relevant SPA population (i.e. to which a population is functionally linked) based on the 5 year mean figure. This is not an accepted threshold in any guidance.

SPA also lists ringed plover on passage) and therefore both Area A (including Holehaven Creek SSSI) and Area B i.e. the Oikos facility foreshore are considered to provide a functional linkage to these designated sites.

- 7.170 Given their presence adjacent to an active facility, with vessels coming and going, and alongside a public footpath along the sea wall, those wintering bird species recorded would appear to be largely acclimatised to the existing levels of noise and visual disturbance.
- 7.171 It should be noted that update passage and wintering bird surveys are currently being undertaken and the most recent webs data has been requested from the BTO. The above species accounts information will therefore be updated and provided as part of the final ES.

Notable Flora

- 7.172 Records for several notable species of flora were returned by EWT and EFC within 2km of the Oikos facility. No significantly notable flora was identified during the 'Extended' Phase 1 Habitat Surveys of the Oikos facility itself.

Invasive Plant Species

- 7.173 No records of invasive plant species listed on Schedule 9 of the WCA were returned by EWT or EFC within 2km of the Oikos facility and no such species were recorded on the Oikos facility during the 'Extended' Phase 1 Habitat Surveys.

Description of the Existing Environment (Calor Road Site)

Habitats

- 7.174 As part of mitigation works at the Calor Road site associated with the creation of Howards Way in 2014/15, a number of habitat creation and enhancement measures were implemented on land either side of the road to replicate open mosaic type habitats. In summary these works comprised:
- Retention, creation and management of Open Mosaic Habitat through maintaining a diversity of plant species and vegetation sward types/ structures/ heights to tie in with similar habitats within the local area, including:
 - open species-rich grassland;
 - bare ground;
 - south facing sandy banks;
 - depressions;
 - areas of tall ruderal vegetation; and
 - scattered scrub.
 - Enhancement of existing and creation of new ditches to provide enhancements for the Brick House Farm Marsh LWS designation which currently covers part of the Calor Road site, as well as for GCN and aquatic invertebrates;

- Limited tree and scrub planting and management of existing scrub and trees to maintain a complex and diverse habitat mosaic of scrub with Open Habitat Mosaic and grazing marsh water bodies; and
 - Measures to provide enhancements for reptiles, bats and breeding birds.
- 7.175 The Calor Road site was sub divided into three 'zones': east, west and central (as shown on Figure 7.5), with a walkover survey undertaken in March 2019 identifying the following details.
- 7.176 The western zone comprises rank grassed verges to the north of Howards Way, with two newly created attenuation ponds to the south of the road (dried out) and a wet ditch connecting to the eastern pond surrounded by rough grassland, with some fringing blackthorn scrub. The verges are dominated by coarse grasses (cock's-foot *Dactylus glomerata*, false oat grass *Arrhenatherum elatius* and red fescue *Festuca rubra*) with occasional tall herbs such as hemlock *Conium maculatum* and occasional planted tree saplings. The ditch contains greater bulrush *Typha latifolia* and common reed *Phragmites australis*. The grassland between the road and the bramble lined southern boundary comprises tussocky grassland with cow parsley *Anthriscus sylvestris* and hemlock. To the north of the road lies a pond, mostly dried out and further north are grazed fields.
- 7.177 A blackthorn lined ditch runs north-south at the eastern end of the western zone, separating it from the central zone. The central zone consists of a pond/ditch with fringing vegetation, more grassed verges and more extensive tall herbs and scrub species as above, plus teasel.
- 7.178 The eastern zone comprises a raised mound formed of rubble with areas of brash, hardcore/slabs and debris (including railway sleepers) together with areas of tall herbs including large nettle *Urtica dioica* patches, areas of reedmace, extensive areas of bramble scrub, scattered mixed scrub and more open ground. Rank grassed verges also occur to the north of the road.
- 7.179 The Calor Road site is currently subject to an ongoing Biodiversity, Mitigation and Management Plan as part of a condition (Condition 2) attached to the Howards Way Planning Permission, with the following habitat management objectives:
- Habitat Mosaic:
 - To maintain a diversity of plant species and vegetation sward types/structures/ heights (from early successional to tall closed grassland); and
 - To maintain areas of bare ground (with loose friable soil) whilst maintaining a varied microtopography.
 - Ditches:
 - To adopt a long-rotation for ditch cleaning to achieve a patchwork of ditches at different successional stages;
 - Where reprofiling is required to maintain drainage function, sensitive re-profile ditches to create a range of different profiles, including shallow bank

- slopes and marginal berms, as deemed appropriate by ecological monitoring; and
- To manage scrub next to ditches to maintain shading at minimum levels.
 - Scrub / scattered trees:
 - To carefully manage scrub within the site to prevent it from dominating at the expense of other habitats (i.e. to undertake scrub control/eradication where it is becoming invasive); and
 - To manage scrub habitat within the site in the long-term to maintain diverse habitat mosaics (i.e. a diverse horizontal spatial structure) and a diverse and varied vertical canopy structure.
- 7.180 The Calor Road site currently falls partly within the Brick House Farm Marsh LWS boundary; however, it is understood that it is proposed to be removed from this boundary as part of the emerging local plan currently being promoted by the local authority.

Invasive Plant Species

- 7.181 A stand of the invasive plant species Japanese knotweed *Reynoutria japonica*, listed on Schedule 9 of the WCA was recorded within the central zone of the Calor Road site during the March 2019 walkover survey.

Protected, BAP and other Notable Fauna

Amphibians

- 7.182 Presence / absence surveys undertaken by Johns Associates in 2012, associated with the development of Howards Way, and Thompson in 2015, associated with the Oikos Deep Water Jetty development application, recorded a small population of GCN as being present within ponds and ditch systems present within the Calor Road site.

Bats

- 7.183 All existing trees within and adjacent to the Calor Road Site were assessed by John's Associates in 2012 to be of low potential to support roosting bats.

Invertebrates

- 7.184 The invertebrate survey undertaken by John's Associates in 2012 recorded a total of 335 terrestrial invertebrate species. This included:
- three SoPI, being the brown-banded carder bee, small heath butterfly and the plant hopper *Ribautodelphax imitans*;
 - five RDB species, being the tachinid fly *Gymnosoma nitens*; scarce emerald damselfly; the plant bug *Lygus pratensis*; the Southern Bush-cricket *Meconema meridionale* and the flower beetle *Olibrus flavicornis*;

- four nationally scarce species (formerly Nationally Notable - Na), being the long-winged cone-head *Conocephalus discolor*, the yellow-faced bee *Hylaeus cornutus*, the flea beetle *Longitarsus parvulus*, and the dotted fan-foot moth *Macrochilo cribrumalis*;
- Fifteen species recorded featured in the Nationally Scarce (formerly Nationally Notable - Nb); and
- Thirty-five of the recorded species are listed formally as Nationally Local.

Reptiles

- 7.185 Small populations of grass snake, common lizard and slow worm (SoPI) were recorded on the Calor Road site as part of previous surveys undertaken by John's Associates in 2012. Peak counts recorded during any one survey were: 3 common lizard, 1 grass snake and 1 slow worm.
- 7.186 In order to determine whether the Calor Road site would serve as a suitable receptor site for those populations of reptiles present within MA1 and MA2 and the remaining areas of the OMSSD project area a reptile survey was undertaken at the Calor Road site (across the three 'zones': western, central, and eastern) in May 2019.
- 7.187 A peak count of 12 common lizards were recorded within the Calor Road site during the surveys undertaken in 2019. When examining the zones individually: the western zone had typically 0-1 common lizard per visit, with a maximum of 3 individuals; the central zone had similarly a typical count of between 0 and 2 common lizards, again with a maximum of 3 individuals; the eastern zone had typically 1-2 individuals per visit with a maximum of 5 individuals.
- 7.188 Given that approximately 2.5 times the number of recommended refugia were placed across the Calor Road site than advised in reptile site assessment guidance, the maximum count of twelve common lizard has been divided by 2.5 to give a maximum count of 4.8. Based on this figure, the common lizard population across the Calor Road site can be classified as 'low'. No other reptile species were recorded during the survey.

Water vole

- 7.189 No evidence of water vole was recorded within those ditch systems present within the Calor Road site during surveys undertaken by John's Associates in 2012.

Wintering and Breeding Birds

- 7.190 No wintering birds were recorded on the Calor Road site during wintering bird surveys undertaken by John's Associates in 2011. However, wintering bird species were recorded utilising the farmland area to the north (see 'Description of the Existing Environment (Potential BNG delivery areas' below).
- 7.191 Bird species considered likely to be potentially breeding at the Calor Road site comprise mallard *Anas platyrhynchos*; moorhen *Gallinula chloropus*; Cetti's warbler *Cettia cetti* (WCA

1981 (as amended) Schedule 1); song thrush *Turdus philomelos* (SoPI, LBAP); linnet *Carduelis cannabina* (SoPI); and reed bunting *Emberiza schoeniclus* (SoPI).

Description of the Existing Environment (Potential BNG delivery areas)

- 7.192 As previously mentioned, the provision of ecological improvements to provide an appropriate amount of Biodiversity Net Gain (BNG) is proposed to occur off-site. Whilst proposals are still under development, several options are currently being considered for this provision. The first potential BNG delivery option being investigated comprises a series of horse grazed fields within an area of farmland approximately 0.09km north of the Oikos facility, north of the Calor Road site. The second potential BNG delivery option being investigated comprises of an area of land located to the north of the Roscommon Way road north-west of the Oikos facility.

Farmland to the north of Oikos facility

Habitats

- 7.193 This potential BNG delivery area comprises part of a series of horse grazed fields, to the north and north east of the Calor Road site, the western fields of which currently fall within the current Brick House Farm Marsh LWS boundary. It should be noted that the new CPBC local plan proposes to extend the LWS boundary to encompass all of this farmland area and therefore, if this extension were to be adopted the land under this option would fall wholly within this extended LWS boundary.
- 7.194 The fields being investigated predominantly comprise modified grassland with a sward height of approximately 50mm. It is understood that some flooding of the western fields occur over winter months, however it should also be noted that these fields are not designated as Coastal and Floodplain Grazing Marsh (SoPI) on the MAGIC Habitat Inventory.

Wintering birds

- 7.195 A total of fifty-six species of bird were recorded on, or flying over, this proposed BNG delivery area during surveys undertaken by John's Associates in 2011. Of these, three (ringed plover, dunlin and black tailed godwit) were species for which the Benfleet and Southend Marshes and/or the Thames Estuary and Marshes SPAs were designated. In addition, lapwing (SoPI) was seen to utilise the farmland fields, with seven birds on the eastern area of inundation during the November high tide survey; two during the low tide survey of the same month; and two on Field 3 during the January low tide survey. All three of the other species were observed flying over only. Other wading birds present and seen utilising the fields were green sandpiper *Tringa ochropus*, seen in ones and twos around the areas of inundation, and curlew, which were seen as individuals or in small flocks of between two and twenty-three.
- 7.196 Given that species for which the Benfleet and Southend Marshes and/or the Thames Estuary and Marshes SPAs were designated were recorded as flying over only, it is considered that they do not provide a functional linkage to designated sites with regard to overwintering and

passage birds. Update wintering bird surveys are however being undertaken within this area, and an updated assessment with regards to its functional linkage shall be provided as part of the final ES.

Land to the north of Roscommon Way

- 7.197 Land north of Roscommon Way – close to its junction with Haven Road – is a further option being investigated.
- 7.198 The eastern part of this area, known as the ‘Orchard Land’ has been used to provide ecological mitigation for land lost elsewhere as a result of the construction of an extension to Roscommon Way. It is further understood that the current management plan for this area of land is due to expire in 2021.

Environmental Change without the OMSSD Project

- 7.199 In the absence of the OMSSD project it is considered likely that those ecological baseline conditions within the majority of the Oikos facility would remain as described. The Oikos facility is subject to an operational management regime and, will continue to be managed under this regime, therefore, these habitats are unlikely to significantly change in the absence of the OMSSD project.
- 7.200 This is, however, with the exception of MA1 and MA2, which – as already indicated - Oikos would seek to relocate to the Calor Road site. It is considered that relocating these areas to this location will provide those species currently present within MA1 and MA2 greater connectivity with surrounding landscapes and areas. In such circumstances, MA1 would be subject to regular management for operational and safety purposes, therefore retaining some ecological functionality. MA2 (with the exception of Pond P3, Figure 7.1) would however be reduced to bare ground and maintained as such.
- 7.201 As part of the re-location of MA1 and MA2, enhancement measures would, therefore, occur within the Calor Road site for both invertebrates and reptiles. Appropriate enhancement measures – to provide an appropriate level of biodiversity net gain – would also be carried out, most likely on one of the potential BNG areas that have already been discussed in the context of the OMSSD project.

In-Built Mitigation Measures

- 7.202 A number of the mitigation measures that are of relevance to the preliminary consideration of terrestrial ecology impacts and effects consist of in-built mitigation, namely measures which are features of the proposed OMSSD project. As such this chapter of the PEIR follows the approach of providing a description of those in-built mitigation measures, as described below, before then setting out the preliminary consideration of likely impacts and effects which takes these in-built mitigation measures into account. Following this, any additional mitigation measures required to be implemented are then described before then setting out the preliminary conclusion of residual effects.

Construction Measures

- 7.203 A range of measures that will assist in protecting ecological receptors and reduce adverse effects associated with disturbance and pollution events as far as reasonably practicable, including compliance with relevant best practice guidelines and legislation, will be put in place during the construction of the OMSSD project. It is most likely that such measures will be secured within a Construction Environmental Management Plan (CEMP). Measures to be incorporated will cover a series of matters, including:
- Whether works are able to be undertaken during daylight hours or construction lighting is controlled to ensure there is minimal light spill on habitats, including those adjacent to the Oikos facility;
 - The use of British Standards Best Practice Guidelines, where appropriate, to reduce disturbance resulting from noise, surface run-off, and vibration during preparation and construction works – matters which are touched on in other chapters of this PEIR;
 - The careful siting and appropriate bunding of storage facilities for fuel and hazardous materials;
 - The provision of relevant Emergency Response Procedures;
 - How the delivery of oils and fuels is supervised;
 - How dust build up and mud deposits are avoided and how run-off from stockpiled material is controlled;
 - How spillages entering the ground or drainage systems are avoided;
 - How any necessary controls on the timing of certain works is implemented;
 - How any necessary visual screening of construction activity is implemented;
 - The approach to covering open piping / trenches / pits / drains to prevent faunal species from entering and utilising them as a potential place of rest or shelter; and
 - The use of toolbox talks and ecological watching briefs, together with the provision of an Ecological Clerk of Works (ECoW) where relevant.
- 7.204 In addition to the above, works shall also be undertaken in accordance with any licencing requirements or standalone Method Statements as necessary to ensure that no significant adverse impacts in relation to killing and injury would occur to any legally protected faunal species utilising the Oikos facility itself.
- 7.205 Furthermore, as black redstart and Cetti's warbler are listed under Schedule 1 of the WCA 1981 (as amended) they are afforded additional protection from disturbance whilst nesting. As such, appropriate measures will be put in place to prevent any disturbance occurring to nesting black redstart during preparation and construction activities, and Cetti's warbler during enhancement works to the Calor Road site, as required by law. This shall include looking to commence preparation activities, including the undertaking of building / structure and pond demolition and vegetation removal as relevant outside of the recognised breeding bird season i.e. undertaken between September and February inclusive. Should this not be possible, a pre-works nesting bird check will be undertaken beforehand and should any

active nests be recorded, the nest would be provided with an appropriate buffer, including the use of any visual screening as necessary, until the young have fledged and left the nest. Such measures would also suitably protect any other species of breeding bird present at the Oikos facility.

Offsite Ecological Improvements

- 7.206 As already made clear, the OMSSD Project will include a package of offsite ecological improvement and enhancement works. In summary, that package includes (i) mitigation works undertaken within the Calor Road site to the north of the Oikos facility in relation to invertebrates and reptiles, and (ii) further works to provide an appropriate element of Biodiversity Net Gain on other land currently being considered.
- 7.207 As already explained, although Oikos wishes to separately and in advance of the OMSSD project relocate the existing mitigation areas MA1 and MA2 within the Oikos facility to a suitable off-site location, the PEIR proceeds on the basis that these existing ecology areas are not moved in advance of the OMSSD project but are subsequently re-located off-site through the OMSSD DCO process. This is considered to provide a worst-case position for the preliminary assessment recorded in this chapter of the PEIR.
- 7.208 The following paragraphs provide further preliminary information regarding the offsite ecological improvement and enhancement works. For the ES stage of the project it is envisaged that a separate Ecological Mitigation Strategy (EMS) document will be produced providing full details of the works envisaged and their ecological benefits.
- 7.209 As part of the improvement works protection measures similar to those described under 'Construction Measures' above would also be implemented to reduce adverse effects associated with disturbance and pollution events as far as reasonably practicable. This shall also include undertaking works in accordance with any licencing requirements or standalone Method Statements as necessary to ensure that no significant adverse impacts would occur to any faunal species which may be utilising these areas.

The Calor Road site

- 7.210 The Calor Road site is already the subject of an existing ecological management regime that was put in place as part of the development of the Calor road. A fundamental aim of the Oikos ecological proposals for the Calor Road site is to ensure that they sit alongside and complement the existing strategy for the Calor Road site. Discussions have been held with Calor and its advisors to agree a future joint approach to the management of the Calor Road site which satisfies both the existing requirements and Oikos' objectives for reptile and invertebrate mitigation. These discussions are reflected in the proposals which are discussed below. It should be noted, however, that the Oikos proposals will not impact on the ability for this existing mitigation site to deliver on its own objectives and targets as the two mitigation strategies are broadly similar and would be able to function in tandem.
- 7.211 Mitigation Areas MA1 and MA2 on the Oikos facility are approximately 0.225 ha and 1.338ha in area respectively (1.563ha in total). Preliminary calculations are that the Calor Road site

(excluding the roadway itself) is approximately 2.24ha in area and would, therefore, be capable of accommodating enhanced habitat for invertebrates and reptiles of some 0.677ha (43%) larger than that currently provided by MA1 and MA2. As such, and following appropriate enhancement, it is considered that the Calor Road site would provide sufficient habitat both in terms of extent, type and improved connectivity to provide suitable mitigation for the relocation of MA1 and MA2 and the reptile populations located therein, as well as to account for the double handling of these reptile populations and mitigation areas.

7.212 In addition, the enhancement of the Calor Road site would be sufficient to enable the site to accommodate the additional 'low' reptile population from within the remainder of the OMSSD project area.

7.213 The enhancement works proposed to be undertaken within the Calor Road site will, at this preliminary stage, consist of the following specifically for the benefit of terrestrial invertebrates:

- Creation of additional areas which provide a varied topography to create a range of microclimates, wet (scrapes) and dry areas, and diverse vegetation communities – 2 created in each zone (each approximately 10m² in area);
- Patches of dense scrub will be cleared/thinned within each zone to provide more open areas (i.e. a habitat mosaic);
- Provision of patches of gravel/shingle and sand to create more ephemeral, early successional waste ground habitat as well as basking and burrowing opportunities – 3 created in each zone (each approximately 25m² in area). This will also include an area approximately 0.17ha between the central and eastern zones which is currently dominated by tall herbs in the form of hemlock;
- Sowing 50% of above areas with plant species selected to be of value to bumblebees and other invertebrate species present in MA2, such as wild carrot, wild parsnip *Pastinaca sativa*, yellow goats-beard *ragopogon dubius*, bird's foot trefoil, kidney vetch *Anthyllis vulneraria*, hawksbeard *Crepis sp.*, sea aster, black horehound *Ballota nigra*, red bartsia *Odontites vernus*, common knapweed *Centaurea nigra*, fodder vetch *Vicia villosa*, broad-leaved everlasting-pea *Lathyrus latifolius*, clovers *Trifolium sp.*, lucerne *Medicago sativa* and thistles *Cirsium sp.*. Remaining 50% will be left to colonize naturally.
- Rotovating / turning 50% of above areas on a rotational basis to maintain areas of bare ground for basking / burrowing;
- Seeding interspersed areas of remaining grassland with above seed mix – 3 in each zone (each approximately 100m² in area), with the intention that these species would then naturally disperse;
- Retention and scalloping of areas of low and scattered scrub; and
- Retention of areas of flowering plants including sea aster, ragwort *Senecio sp.*, hawksbeard sp., clover sp., knapweed *Centaurea sp.*, and thistles *Cirsium sp.*

- 7.214 The enhancement works proposed to be undertaken within the Calor Road site will, at this preliminary stage, consist of the following specifically for the benefit of reptiles:
- Creation of an increased habitat mosaic. This will involve the sensitive clearance of some areas of denser scrub and its replacement with a mosaic of bare ground, grassland and tall herb communities – largely undertaken as part of the enhancement works for invertebrates described above;
 - Introduction of a more varied topography – including south facing areas, formed by the placement of material such as sand and rubble / crushed brick (which would also be of benefit to burrowing invertebrates) – two created in each ‘zone’: western, central and eastern (each approximately 20m³ in area);
 - Creation of stony/pebbly areas for basking – one in each ‘zone’ (each approximately 10m² in area);
 - Areas of railway sleepers/log piles - three created in each ‘zone’ (each approximately 5m³ in area);
 - The creation of further bespoke hibernacula in line with English Nature 2001 guidelines, or similar – two created in each ‘zone’;
 - Replacement of coarse grassland on northern bunds with mosaic of open areas, rank grassland, shorter grassland and tall herbs;
 - Creation of additional breeding areas for grass snake in the form of grass piles – two created in each Zone (each approximately 20m³ in area).
- 7.215 The enhanced Calor Road site would then be subject to an appropriate management and monitoring regime to ensure the enhancements for invertebrates and reptiles would remain in the long-term. This would likely be detailed within an Ecological Management and Monitoring Plan (EMMP) and would be written to ensure that the management and maintenance prescriptions currently being implemented for the site would also be undertaken in the long-term.

Potential Biodiversity Net Gain (BNG) sites

- 7.216 Due to the operational nature of the Oikos facility, no significant landscape planting or ecologically valuable habitat creation (or retention) is proposed within the facility itself, although some planting in the form of wildflower verges and screening is being considered, albeit that the final details are yet to be defined. As a consequence, BNG will be provided off-site with a number of options currently under consideration. Whilst the proposals for BNG delivery are currently under development, an outline of the approach being adopted is provided in the following paragraphs.
- 7.217 Preliminary information on the baseline environment of the sites being considered has already been provided. The intention is that, whichever site or sites is ultimately chosen, a combination of physical and management changes are undertaken to provide a net gain in biodiversity. Whilst those enhancements and improvements to be undertaken will heavily depend on the existing habitats present within the chosen BNG site or sites, the enhancements and improvements will look to be undertaken in accordance with the like for

like principle and avoid the trading down in habitat distinctiveness as far as reasonably practicable to secure the best possible outcomes for biodiversity. This would include for example the enhancement of existing habitats together with the creation of new ecologically valuable habitat to replace those habitats of greatest distinctiveness being lost as part of the OMSSD project. As well as delivering improvements and enhancements for habitats, these shall, in turn also provide intrinsic enhancements for faunal species such as invertebrates. The enhanced site or sites would then be subject to an appropriate management and monitoring regime to ensure the enhancements would remain in the long-term. This would likely be detailed within an Ecological Management and Monitoring Plan (EMMP).

- 7.218 Final BNG proposals will be detailed within the OMSSD ES and project application documentation.
- 7.219 In respect of the potential sites being considered, consideration is being given to opportunities to strengthen the existing network of wildlife sites by providing an enhanced corridor for species movement between those sites.
- 7.220 In addition, as already explained, as an alternative, or potentially in addition to these potential land options for the provision of BNG, Oikos is also investigating the possibility of being able to make a financial or management contribution to an existing scheme or programme of ecological enhancement works.

Operational Measures

Potential Biodiversity Net Gain (BNG) sites

- 7.221 Following the undertaking and establishment of offsite ecological improvements, the enhanced site or sites would then be subject to an appropriate management and monitoring regime to ensure the enhancements would remain in the long-term. This would likely be detailed within an Ecological Management and Monitoring Plan (EMMP).

Drainage Strategy

- 7.222 The drainage strategy for the area of the OMSSD project is explained further within Chapter 16 of this PEIR. In simple terms, the new drainage will tie into the existing Oikos drainage system and replicate the existing approach. The proposed new drainage will limit potential risks to ecological features.

Lighting Strategy

- 7.223 The lighting strategy for the OMSSD project is to be in line with the existing lighting across the remainder of the Oikos facility, further details of which are provided in Chapter 18 of this PEIR. Whilst there is likely to be lighting for the road loading area, night lighting would look to be minimised as far as possible. Lighting is currently present (generally as strip lighting) within bunds, up tank access stairways and operation areas, which are automatically activated as someone enters a specific area. Flood (primarily security) lighting on stanchions is also focused on the Site perimeter. The lighting strategy for the OMSSD project will be similar in approach and levels to that existing, except the aim will be to have the majority of

lighting controlled in such a way that it is switched off unless the area is in use, especially tank top and tank stairway lighting.

Preliminary Consideration of Likely Impacts and Effects

Preparation and Construction phase

Human health

- 7.224 It is considered that there would be **insignificant** effects associated with human health and terrestrial ecology during the preparation and construction phase.

Climate change

- 7.225 Waterbodies are able to act as heat and carbon 'sinks' to combat climate change. Given the extent of the existing waterbodies to be lost, however, it is considered that the magnitude of such impacts in respect of climate change matters would be negligible. As such, resulting effects in respect of climate change matters would be insignificant.

Inter-related effects

Lighting

- 7.226 There will be potential inter-related effects with regards to terrestrial ecology and lighting during preparation and construction stage. During construction in-built mitigation measures to either control working hours or provide measures to control night lighting will be considered and set out within a CEMP, with any lighting within works areas being directional and light spill upon adjacent areas minimised as far as possible.
- 7.227 In any event, utilisation of the Oikos facility by nocturnal species is limited and such species are already likely to be habituated to existing lighting levels in any case. With the envisaged control measures referred to, the magnitude of impact as a result of any increase in night lighting during the preparation and construction phase will be negligible. Consequently, any effects as a result of this will be insignificant.

Noise

- 7.228 There will be potential inter-related effects with regards to terrestrial ecology and noise during preparation and construction stage. Noise calculations have been provided, as set out further below, which identify there to be a 'worst-case' potential increase (i.e. in the absence of mitigation) in noise levels to a maximum of 76dB upon the intertidal habitats adjacent to the south of the Oikos Facility and a maximum of 67dB upon the extreme southern tip of Holehaven Creek SSSI. Whilst such levels have the potential to result in the disturbance of wintering birds utilising these habitats, given the distance and temporary nature of these works, as well as the fact that birds utilising these areas will already be habituated to existing

levels of similar disturbance events, the magnitude of this impact is considered to be very low. Consequently, it is considered that any resulting effects would be insignificant.

Air Quality

- 7.229 As identified within Chapter 12: Air Quality no adverse effects are anticipated to occur to any statutory and non-statutory designated sites as a result of air quality during the preparation and construction phase. Consequently, any indirect effects in relation to air quality would be insignificant.

Statutory Designated Sites

- 7.230 There would be no direct impacts upon statutory designated sites during preparation and construction works. As such direct effects will be insignificant.
- 7.231 Furthermore, implementation of the measures outlined earlier during the construction phase will reduce any indirect effects occurring to these sites, and the habitats and species they support, as a result of pollution events such as dust arisings, noise, lighting and surface run-off. Consequently, the magnitude of such impacts would be negligible, and any resulting indirect effects would be insignificant.

Effects of air quality upon statutory designated sites

- 7.232 As identified within Chapter 12: Air Quality no adverse indirect effects are anticipated to occur to statutory designated sites as a result of air quality during the preparation and construction phase. Consequently, any indirect effects in relation to air quality would be insignificant.

Effects of disturbance on bird species associated with statutory designated sites

- 7.233 Adjacent to the Oikos facility is an area of foreshore on the north bank of the Thames which stretches for approximately 1.4 km from Holehaven Creek (in the west) to Scars Point (in the east). Intertidal mud along this foreshore is exposed at low tide to a width of approximately 100m. This intertidal foreshore area is not within a SSSI or SPA but any birds feeding on these mudflats will most likely be from populations designated within a protected site and for the purposes of this assessment are considered as such (i.e. 'functional land'). It should also be noted, as previously stated, that only small numbers of birds use the Oikos facility foreshore (Area B) at low and high tide. In absolute numbers, the total numbers of birds using Area B ranged from 23 birds to 88 birds over the 12 surveys in 2018-19 and 15 to 45 birds over the 2019-2020 surveys, of which a significant number were species of gulls.
- 7.234 Birds respond to disturbance with intermediate reactions such as being alert and moving away. The ultimate response of avoidance behaviour in birds is by taking flight, which is energetically costly. The response of the animal is seen as a trade-off between the risk of tolerating the disturbance and the increased starvation risk from not feeding and avoiding

(Stillman & Goss-Custard 2002)⁵³. Bird's sensitivity to disturbance is greatest in migration periods during the spring and autumn and the effects of disturbance will be increased in hard weather conditions (Cutts, *et al.* 2009)⁵⁴. Disturbance can be defined as 'any situation in which human activities cause a bird to behave differently from the behaviour it would exhibit without the presence of that activity' (Oranjewoud 1982)⁵⁵.

- 7.235 Threshold criteria for effect levels on non-breeding waterbirds have been identified in a study initially focused on the Humber Estuary (Cutts *et al.*, 2009) and then developed for wider application to estuaries used by non-breeding waterbirds (Cutts *et al.*, 2013)⁵⁶. Cutts *et al.* (2013) suggest a generic and precautionary no response level of 55 dB(A) at the location of the bird and a more evidence based threshold for observed responses of 70 dB(A) at the location of the bird (describing up to 70 dB(A) as an "acceptable 'dose' level" where between 55 and 70 dB(A) such a noise level "might occasionally induce a low level behavioural response such as a heads up"). Sound pressure levels of 85 dB(A) and above at the location of the bird are described in Cutts *et al.* (2013) as "a flight response is almost certain to occur".
- 7.236 Notwithstanding the above, habituation of birds to noise, light and traffic disturbance is considerable, as birds are adaptable and can accommodate regular disturbance events, becoming tolerant to the disturbance over a relatively short period. A review carried out by Hill (1992)⁵⁷ found also evidence that suggests birds can adjust to noise levels, including sudden noise.
- 7.237 Free-field 'worst-case' (i.e. occurring to the nearest point of the ecological receptor in question) noise levels without any mitigation in place have been provided for the Oikos facility foreshore and Holehaven Creek SSSI as set out within Table 7.13 below. For completeness free-field noise levels have also been provided for Brick House Farm LWS (although not considered to be functional land), as well as Canvey Village Marsh LWS; which has the potential to form functional land given its proximity to the Oikos foreshore and Holehaven Creek SSSI. The way in which the noise levels have been predicted is explained further in Chapter 14 of this PEIR.

⁵³ Stillman, R.A. and Goss-Custard, J.D. (2002) Seasonal changes in the response of oystercatchers *Haematopus ostralegus* to human disturbance. *Journal of Avian Biology* **33**: 358-365

⁵⁴ Cutts, N., Phelps, A. and Burdon, B. (2009) Construction and waterfowl: defining sensitivity, response, impacts and guidance. Institute of Estuarine and Coastal Studies (IECS) Report to Humber INCA. Reference No: ZBB710-F-2009

⁵⁵ Oranjewoud (1982): Ecologische aspecten van gas winning in het Zuidwalgebied. Report, Heerenveen: 40 pp

⁵⁶ Cutts, N., Hemingway, K. and Spencer, J. (2013). *Waterbird Disturbance Mitigation Toolkit Informing Estuarine Planning & Construction Projects* [Version 3.2]. Institute of Estuarine & Coastal Studies (IECS) University of Hull.

⁵⁷ Hill, D. (1992): 'The impact of noise and artificial light on waterfowl behaviour: a review and synthesis of available literature'. BTO Research Report No. 61. British Trust for Ornithology, Thetford.

Table 7.13: Free-field* ambient noise levels during construction

Activity	Foreshore (with sea wall attenuation)	Holehaven Creek SSSI	Brickhouse Farm Marsh LWS	Canvey Village Marsh LWS
Site Preparation	51	59	57	71
New Workshop Building	51	56	46	60
Piling	50	49	47	54
Tank Construction	63	61	59	66
Firewater / Pipework	58	54	55	66
Erection of new MLAs, pipework and infrastructure on Jetty 2	76	54	40	42
Erection of new MLAs, pipework and infrastructure on Jetty 1	74	67	44	52
Office Extension	67	64	53	63
Road Works / Landscaping	52	58	63	61
Dredger from capital dredge	62	50	35	40

- 7.238 As shown within Table 7.13 no noise levels which exceed 70dB within Brick House Farm Marsh LWS are predicted, with a maximum ‘worst case’ of 63dB occurring at the southern boundary of this site (i.e. not significant). As such the magnitude of impact is considered to be negligible. Whilst noise levels exceed 70dB within Canvey Village Marsh, with a maximum of 71dB, given that this ‘worst case’ maximum would occur at the closest point to this receptor i.e. the eastern boundary, and that any wintering bird assemblage utilising this site would likely be located at a greater distance, the magnitude of impact is again considered to be negligible.
- 7.239 Although noise levels are anticipated to be a maximum ‘worst case’ of 67dB upon Holehaven Creek SSSI (i.e. not significant), Table 7.13 indicates that as a ‘worst case’ there is potential for those wintering birds utilising the Oikos foreshore to be disturbed due to an increase in noise as a result of the erection of a new Marine Loading Arm (MLA), pipework and infrastructure at Jetty 1 (74dB) and the erection of two new MLAs, pipework and infrastructure on Jetty 2 (76dB).
- 7.240 As already indicated, intertidal mudflats, suitable for feeding wintering birds, extend the length of Canvey Island and within Holehaven Creek. Due to the proximity of these high quality intertidal feeding mudflats if wintering birds do display avoidance behaviour, through flight, they will not incur a significant energetic cost. Furthermore, given that these maximum levels are a ‘worst case’ i.e. occurring to the nearest point of the Oikos foreshore, which is exposed at low tide to a width of approximately 100m. Such disturbance will also be of a temporary nature only and the bird assemblage utilising this area is also likely to undergo a degree of habituation within a relatively short period of time. Consequently, the magnitude of this impact is considered to be, at worst, very low.
- 7.241 There is also the potential for birds utilising the Oikos foreshore to be visually disturbed from the use of barges and cranes to deliver materials, together with the presence of site workers, to undertake the erection of new MLAs, pipework and infrastructure upon Jetty 1 and Jetty 2.

- 7.242 A report by Cutts *et al.* (2009) describes the impact of boat disturbance within 100m on waterbirds as low and those birds utilising the Oikos foreshore are likely to be already habituated to vessel movement and mooring at the jetties. Any increase in shipping traffic associated with the construction phase is also expected to be minimal compared to the number of vessels using the Thames Estuary on a day-to-day basis. Consequently, the magnitude of this impact is considered to be negligible.
- 7.243 Flight initiation distance (FID), the distance at which an animal flees an approaching predator, is highly species specific (Blumstein *et al.* 2003) and is also dependent on the size of the flock, the time of day and the location (Smit and Visser 1993⁵⁸). Depending on the species, FID ranges from 20m to 120m for roosting birds when approached by walking people (data from Tensen and van Zoest (1983) in Smit and Visser 1993). For foraging birds FID can range from 100m for dunlin, oystercatcher and gulls to 500m for curlew (Smit and Visser 1993).
- 7.244 From this information it can be inferred that any feeding birds on the intertidal mud flats within 100m of the jetties and sea wall may take flight and leave that area if disturbed by any visible human activity. However, as with vessel movements those birds utilising the Oikos foreshore are likely to be already habituated to site personnel undertaking maintenance works upon the jetties and public recreation along the sea wall. Furthermore, if disturbed these individuals will be able to move a short distance to undisturbed feeding or roosting areas nearby along the foreshore of Canvey Island and within Holehaven Creek SSSI. Consequently, the magnitude of this impact is considered to be negligible.
- 7.245 Wintering birds utilising the Oikos foreshore are also likely to already be habituated to existing dredge maintenance works and associated vessel movements. Furthermore, noise calculations predict 'worst case' noise levels of below 70dB upon the Oikos foreshore (62dB) and Holehaven Creek (50dB) as a result of the capital dredge works. As such, the magnitude of impact as a result of capital dredge works at Jetty 2, located approximately 250m from the Oikos foreshore is considered to be negligible.
- 7.246 Taking the above factors into consideration, any disturbance to the wintering bird assemblage utilising the Oikos foreshore and Holehaven Creek SSSI would be temporary only and the magnitude of impact as a result of such disturbance, when considered in combination, is considered to be, at worst, very low. Consequently, it is considered that the resulting overall effect upon wintering bird species associated with statutory designated sites would be insignificant.

Non-statutory Designated Sites

- 7.247 As mentioned previously within this Chapter, the Calor Road site and potential additional areas under consideration for offsite ecological improvements fall within or are located in close proximity to Brick House Farm Marsh LWS. In addition to those works within the Calor

⁵⁸ Smit, C.J. and Visser, G.J.M. (1993) Effects of disturbance on shorebirds: a summary of existing knowledge from the Dutch Wadden Sea and Delta area. Wader Study Group Bulletin **68**: 6-19

Road site, part of which falls within the current Brick House Farm Marsh LWS boundary, should offsite ecological improvements fall within Brick House Farm Marsh LWS, or potentially within any other non-statutory designated site, given that such works would be for enhancement purposes only, it is considered that no significant direct adverse impacts would occur as a result of these works. As such direct effects will be insignificant.

- 7.248 Furthermore, implementation of the measures outlined earlier during the construction phase will reduce any indirect effects occurring to these sites, and the habitats and species they support, as a result of pollution events such as dust arisings, noise, lighting and surface run-off. This includes both works occurring on the Oikos facility itself as well as works associated with offsite ecological improvements, should they fall within or be located in close proximity to Brick House Farm Marsh LWS, or potentially within or be located in close proximity to any other non-statutory designated site. Consequently, the magnitude of such impacts would be negligible, and any resulting indirect effects would be insignificant.

Effects of air quality upon non-statutory designated sites

- 7.249 As identified within Chapter 12: Air Quality no adverse indirect effects are anticipated to occur to non-statutory designated sites as a result of air quality during the preparation and construction phase. Consequently, any indirect effects in relation to air quality would be insignificant.

Breeding Birds (black redstart)

- 7.250 Preparation and construction activities will result in the loss of Building B4, upon which a pair of black redstart were recorded as successfully breeding in 2019. Breeding opportunities for this species within the remainder of the Oikos facility will continue to be present, given the combination of built features and sparsely vegetated feeding areas, and additional nesting habitat for black redstart is likely to be present within the local area. As a result, the magnitude of impact through the loss of building B4 is considered to be low and therefore the likely effect upon black redstart as a result of the loss of breeding opportunities associated with building B4 would be a direct, permanent effect of minor adverse significance upon a receptor of local value and of low sensitivity.
- 7.251 Whilst suitable areas of foraging habitat present within the OMSSD project boundary would also be lost as a result of preparation and construction activities, the existing Compounds 2, 4, 5 and 10 within the north of the Oikos facility comprise a gravel substrate. Whilst these areas are subject to regular operational management, ephemeral vegetation becomes periodically established and provides potential foraging opportunities for this species. This will also be the case with the new Compounds associated with the OMSSD project once constructed. Whilst the loss of foraging habitat associated within the OMSSD project would therefore be temporary, it is also considered that the local black redstart population would not be dependent upon this area for survival given that habitats associated with the sea wall to the south of the Oikos facility, together with brownfield habitats within the local area (such as the adjacent Calor Gas site and Canvey Wick SSSI) are also extensive and will also provide foraging habitat for this species beyond the OMSSD project boundary. Therefore

the magnitude of such impacts would be negligible and effects associated with habitat loss upon foraging black redstart would likely be insignificant.

- 7.252 Implementation of the construction mitigation measures referred to earlier would protect any black redstart (as well as any other breeding bird populations) present within retained areas of the Oikos facility as well as within the local area from any associated indirect effects. As such, the magnitude of such impacts would be negligible and any indirect effects upon such species would likely be insignificant.

Terrestrial Invertebrates

- 7.253 Of those habitats present within the Oikos facility, MA2 has been assessed to comprise the area of greatest invertebrate interest. In addition to MA2, preparation and construction activities would result in the loss of several areas within the OMSSD boundary considered to be of 'higher' quality for invertebrates (Figure 7.3).
- 7.254 As already detailed, specific enhancements measures to mitigate for the impact on terrestrial invertebrates are proposed to be undertaken at the Calor Road site. The measures currently proposed are broadly similar to measures undertaken to create MA2 and reflect other sites that accommodate invertebrate species found within the locality. There is, therefore, a high degree of confidence that the measures proposed will be successful.
- 7.255 It is further proposed that as part of the proposed BNG provision, the ecological enhancements to be undertaken will also provide intrinsic benefits for terrestrial invertebrates.
- 7.256 Whilst it is envisaged that these various measures are provided at the outset of the preparation and construction activities, it is estimated that it will take an estimated 1-5 years for individual measures to become established. However, given the large extent of suitable habitat present for notable invertebrate species present within the local area (such as Canvey Wick SSSI and further areas of brownfield habitat) and that the Oikos facility is not considered to accommodate invertebrate populations of conservation significance that do not occur outside the Oikos facility boundary, or even encompass the greater part of any such populations, the magnitude of such a temporary impact is considered to be low, and the likely direct effect upon terrestrial invertebrates as a result of preparation and construction activities would likely be a direct, temporary effect of minor adverse significance upon a receptor of local value and of medium sensitivity.
- 7.257 Implementation of the construction measures earlier referred to would reduce pollution events and would, therefore, further protect invertebrate populations present within retained areas of the Oikos facility as well as within the local area from any associated indirect effects. As such, the magnitude of such impacts would be negligible and any indirect effects upon terrestrial invertebrates would likely be insignificant.

Reptiles

- 7.258 In addition to the loss of MA1 and MA2, preparation and construction activities would result in the loss of additional areas within the OMSSD boundary where 'low' populations of reptiles have been recorded (Figure 7.2).
- 7.259 As already detailed, measures to enhance the Calor Road site for reptiles will be implemented, either as part of a standalone consenting process under the Town and Country Planning Act or as part of this DCO application – depending on timescale. Either way, the existing common lizard and grass snake populations will be translocated from the Oikos facility to the enhanced Calor Road site. In advance of construction of the OMSSD project.
- 7.260 Once the existing habitats features within the Calor Road site have been suitably enhanced, the relocated reptiles will immediately be able to use the newly created features, as well as those existing features, as well as dispersing into connecting habitats within the local area, such as the areas of farmland and associated hedges/ditches to the north.
- 7.261 Given the extent of the Calor Road site, and the works of enhancement to be undertaken within this area the magnitude of this temporary impact is considered to be very low. Consequently, direct effects upon reptiles as a result of preparation and construction activities would likely be insignificant.
- 7.262 Implementation of the construction measures earlier referred to would reduce pollution events and would protect those reptiles which have been translocated to the Calor Road site, as well as any further reptile populations present within the local area from any associated indirect effects. As such, the magnitude of any such impacts is considered to be negligible and any indirect effects upon reptiles would likely be insignificant.

Wintering Birds

- 7.263 It is considered that effects upon wintering birds during the preparation and construction phase would be as already assessed under the 'Statutory designated sites' assessment section.

Operational phase

Human health

- 7.264 It is considered that there would be insignificant effects associated with human health and terrestrial ecology during the operational phase.

Climate change

- 7.265 Modelling studies on the potential impact of climate change on species indicates that this results largely in range expansions or contractions. However, such studies highlight the individualistic nature of species' responses to climate change, which is likely to have a large

impact on future composition of ecosystems⁵⁹. In terms of those species recorded at the Oikos facility climate change is likely to have the greatest effect upon invertebrates, with an increase in temperatures likely to result in range expansion. Nevertheless, in terms of the OMSSD project in isolation, it is considered that there would be insignificant effects associated with climate change and terrestrial ecology during the operational phase.

Inter-related effects

Lighting

- 7.266 There will be potential inter-related effects with regards to terrestrial ecology and lighting during the operational phase. The lighting strategy for the OMSSD project is discussed above and outlined in more detail in Chapter 18 of this PEIR. With the implementation of this strategy, it is considered that the magnitude of impact as a result of any increase in night lighting during operation would be negligible. Consequently, any effects as a result of this would likely be insignificant.

Drainage

- 7.267 There will be potential inter-related effects with regard to terrestrial ecology and drainage during the operational phase. The drainage strategy for the OMSSD project is discussed above and outlined in more detail in Chapter 16 of this PEIR. With the implementation of this strategy, it is considered that the magnitude of impact as a result of any drainage or emergency incidents during operation would be negligible. Consequently, any effects as a result of this would likely be insignificant.

Air Quality

- 7.268 The air quality assessment, presented in Chapter 12, assesses the potential effects of the OMSSD project, in terms of operational road traffic, vessel movements and auxiliary generators, upon statutory and non-statutory designated sites.
- 7.269 As set out within Chapter 12, significant effects cannot be discounted at Canvey Wick SSSI; West Canvey Marshes LWS; Brickhouse Farm LWS; and Canvey Village Marsh LWS. This is because the total "With OMSSD facility" concentrations or fluxes exceed the respective critical levels or loads for these sites and the recognised screening criteria are exceeded. Modelling however suggests that the extent to which the critical levels or loads and screening criteria are exceeded within the boundaries of these designated sites would be very limited and, therefore, do not compromise the integrity of these sites.
- 7.270 It should also be noted that the assessment undertaken in Chapter 12 is based on a number of conservative assumptions, the detail of which is not repeated here.
- 7.271 Taking the above into consideration, the magnitude of impact in relation to air quality would be very low. Consequently, any resulting effects would likely be insignificant.

⁵⁹ 7. Impacts of climate change on biodiversity and ecosystem services | BirdLife

Statutory Designated Sites

- 7.272 There would be no direct impacts upon statutory designated sites during the operational phase. As such, any direct effects upon these designated sites would be insignificant.

Effects of air quality upon statutory designated sites

- 7.273 As set out within Chapter 12: Air Quality, significant effects can be discounted for all statutory designated sites with the exception of Canvey Wick SSSI. However, and as discussed within Chapter 12: Air Quality, total concentrations will only exceed critical levels for annual mean NO_x concentrations, and this will only be up to 4m from the edge of Roscommon Way. Maximum total ammonia concentrations will remain well below the critical level and Canvey Wick SSSI is not sensitive to nutrient nitrogen or acid nitrogen deposition.
- 7.274 Taking the above into consideration it is judged that there will be no adverse effect to the condition of habitats present and the NO_x exceedances are not perceived to compromise the integrity of this designated site. Consequently, the magnitude of impact upon statutory designated sites in relation to air quality would be very low and any resulting indirect effects as a result of air quality would likely be insignificant.

Disturbance to bird species associated with statutory designated sites

- 7.275 As explained in Chapter 3, it is estimated that the number of vessels using Jetty 1 and 2 will increase as a result of the OMSSD project.
- 7.276 Birds are adaptable and can accommodate regular disturbance events, becoming tolerant and readily habituated to the disturbance as a result of an increase in noise, light and traffic/movement over a relatively short period. The impact of this kind of disturbance is also likely to be influenced by the presence of alternative feeding and roosting areas nearby and, as previously highlighted, intertidal mudflats suitable for feeding wintering birds extend the length of Canvey Island and within Holehaven Creek.
- 7.277 Whilst birds utilising the Oikos facility foreshore, including within the southern portion of Holehaven Creek SSSI, have the potential to be subject to disturbance from vessel movements, a report by Cutts *et al.* (2009) describes the impact of boat disturbance within 100m on waterbirds as low. The intertidal area adjacent to the Oikos facility is approximately 250m or more from the head of Jetty 2 and as such it is considered that any effects associated with an increase in vessel movements at Jetty 2 would likely be insignificant. Whilst the intertidal area adjacent to the Oikos facility and Holehaven Creek SSSI (at the nearest point) are located approximately 0.04km and 0.12km from the head of Jetty 1 respectively, birds utilising these areas are likely to already be habituated to existing vessel movements at these distances. Consequently, the magnitude of the impact of vessel movements on wintering birds is considered to be negligible.
- 7.278 Further to the above, those wintering birds utilising the intertidal area adjacent to the Oikos facility and Holehaven Creek SSSI are also likely to already be habituated to the presence of site personnel undertaking maintenance works on the jetties themselves as well as ongoing

maintenance dredge works. Consequently, the magnitude of the impact as a result of site personnel upon the jetties and maintenance dredge works is considered to be negligible.

- 7.279 Taking the above into consideration, effects upon bird species associated with statutory designated sites during the operational phase are likely to be insignificant.

Effect of lighting on bird species associated with statutory designated sites

- 7.280 With the implementation of the lighting strategy, which would look to replicate existing lighting levels, it is considered that the magnitude of impact as a result of any increase in night lighting during operation would be negligible. Consequently, any effects as a result of this would likely be insignificant.

Non-statutory Designated Sites

- 7.281 Following the delivery and establishment of the enhancement works to the Calor Road site and additional offsite ecological improvement areas, should these works fall within Brick House Farm Marsh LWS and/or any other non-statutory designated site, it is considered that such works would likely provide a direct enhancement to these sites. Should the additional offsite ecological improvements be located in close proximity to Brick House Farm Marsh LWS and/or any other non-statutory designated site, it is considered that such works would likely provide an indirect enhancement through strengthening the connectivity of such sites to other sites and habitats of ecological value within the local area. Furthermore, the enhanced site or sites would be subject to an appropriate management and monitoring regime to ensure the enhancements would remain in the long-term, likely detailed within an EMMP. The magnitude of such a beneficial impact would be dependent upon the location and type of final and agreed enhancement measures to be provided, however, for the purposes of this assessment a precautionary magnitude of low has been adopted, which would therefore result in a direct or indirect, permanent beneficial effect of minor significance upon a receptor(s) of district value and of low sensitivity.

- 7.282 No lighting is present, or proposed, at the Calor Road site or additional offsite ecological improvement areas. With the implementation of the lighting strategy, which would look to replicate existing lighting levels for the OMSSD project itself, it is considered that the magnitude of impact as a result of any increase in night lighting upon non-statutory designated sites during operation would be negligible. Consequently, any indirect effects as a result of this would likely be insignificant.

Effects of air quality upon non-statutory designated sites

- 7.283 As set out within Chapter 12: Air Quality, significant effects can be discounted for all non-statutory designated sites with the exception of West Canvey Marshes LWS; Brickhouse Farm LWS; and Canvey Village Marsh LWS. A summary of the critical levels/loads occurring at these designated sites, including the contribution from the OMSSD project, is provided below with further detail provided within Chapter 12: Air Quality.
- 7.284 Total annual mean NO_x concentrations are predicted to exceed the critical level up to 40m from the edge of Roscommon Way for West Canvey Marshes LWS, and 4m and 10m from

the edge of Haven Road for Canvey Village Marsh LWS and Brick House Farm Marsh LWS respectively. It should, however, be noted that exceedances of the critical level in terms of NO_x with respect to West Canvey Marshes LWS are predicted in 2024 even without the OMSSD facility.

- 7.285 Ammonia concentrations are predicted to exceed the critical level up to 2m from the edge of Roscommon Way for West Canvey Marshes LWS but remain below the critical level for Canvey Village Marsh LWS and Brick House Farm Marsh LWS.
- 7.286 Nutrient nitrogen deposition fluxes are predicted to exceed critical loads up to 10m from the edge of Roscommon Way for West Canvey Marshes LWS and at 1m from the edge of Haven Road for Brick House Farm Marsh LWS. Nutrient nitrogen deposition fluxes are predicted to remain below the critical load for Canvey Village Marsh LWS.
- 7.287 Habitats at all three sites are not considered sensitive to the effects of acid nitrogen deposition.
- 7.288 At locations closest to Roscommon Way there are deep verges (extending up to 15m in some locations) and hedgerows; these are unlikely to be sensitive areas of the West Canvey Marshes LWS. In addition, the West Canvey Marshes LWS covers approximately 351 hectares⁶⁰, and this area up to 40m from Roscommon Way and Canvey Way represents only a very small proportion of the LWS. On this basis, the exceedances are considered not significant, since the integrity of the wider designated site is unlikely to be compromised, and a large proportion of the affected area is unlikely to accommodate the most sensitive features for which this site is designated owing to their proximity of Roscommon Way.
- 7.289 Since the areas within Brick House Farm Marsh and Canvey Village Marsh where exceedances of the screening criteria and critical levels/loads are constrained to within 10m of the roadside, it is judged that there will be no adverse effect to the condition of habitats present and the exceedances are not perceived to compromise the integrity of these designated sites.
- 7.290 Taking the above into consideration, the magnitude of impact upon non-statutory designated sites in relation to air quality would be very low. Consequently, any resulting indirect effects as a result of air quality would likely be insignificant.

Breeding Birds (black redstart)

- 7.291 Building B4 would be lost as part of preparation and construction activities. During the operational phase it is considered that the Oikos facility would continue to provide suitable nesting opportunities for this species. Following construction of the proposed new compounds, and whilst these areas would be subject to regular operational management, ephemeral vegetation would become established within these areas periodically and provide potential foraging opportunities for this species. Habitats associated with the sea wall to the south of the Oikos facility, together with brownfield habitats within the local area (such as the

⁶⁰ As noted within the citation description (Essex Wildlife Trust)

adjacent Calor Gas site and Canvey Wick SSSI) are also extensive and will also provide foraging habitat for this species beyond the OMSSD project boundary. As such it is considered that the magnitude of impacts would be negligible and therefore direct effects upon black redstart during the operational phase would be insignificant.

- 7.292 As a result of the implementation of the lighting and drainage strategies, it is considered that the magnitude of impacts upon black redstart during the operational phase would be negligible and consequently, any indirect effects upon this species would likely be insignificant.

Terrestrial Invertebrates

- 7.293 As noted, the relocation of MA1 and MA2, including those enhancements measures for invertebrates to be undertaken at the Calor Road site, will be undertaken prior to preparation and construction activities for the OMSSD project. Once fully established, the magnitude of the beneficial effect on terrestrial invertebrates as a result of the enhancements to the Calor Road site together with ongoing management, would be low. As such this would likely result in a direct, permanent effect of minor beneficial significance upon a receptor of local value and of medium sensitivity.
- 7.294 It should also be noted that, following establishment, those additional offsite ecological improvements would provide additional intrinsic benefits for invertebrates, including the provision enhanced connectivity for species movement at the landscape scale. Furthermore, following construction of the proposed new compounds, and whilst these areas would be subject to regular operational management, ephemeral vegetation would become established within these areas periodically, which would also provide some suitable invertebrate habitat across the OMSSD project area itself.
- 7.295 No lighting is present nor proposed, at the Calor Road site and any additional lighting at the Oikos facility as a result of the OMSSD project will be provided in accordance with the strategy already discussed and outlined in Chapter 18 of this PEIR. Furthermore, the Calor Road site and the Oikos facility itself have no public access. Given that the Calor Road site is separated from the Oikos facility the invertebrate assemblage would not be affected by any pollution events that may occur on the Oikos facility itself – albeit that measures as part of the existing and proposed lighting strategy are and will be in place to limit the prospect of such events and any implications arising. Consequently, the magnitude of any such impacts would be negligible and any indirect effects upon invertebrates during the operational phase of the OMSSD project would likely be insignificant.

Reptiles

- 7.296 As already explained, reptiles would be translocated from the Oikos facility to the Calor Road site prior to preparation and construction activities. Once fully established, the magnitude of beneficial impacts as a result of those enhancements to the Calor Road site, together with ongoing management, would be low. As such, this would likely result in a direct, permanent effect of minor beneficial significance upon a receptor of local value and of medium

sensitivity. The OMSSD project itself may also provide opportunities for reptiles on an opportunistic basis.

- 7.297 Those effects associated with night lighting upon reptiles during the operational phase are considered to be the same as those outlined for terrestrial invertebrates above. Consequently, it is considered that the magnitude of any such impacts would be negligible and any indirect effects upon reptiles during the operational phase of the OMSSD project as a result of night lighting would likely be insignificant.

Wintering Birds

- 7.298 It is considered that effects upon wintering birds during the operational phase would be as those assessed under the 'Statutory designated sites' assessment section.

Additional Mitigation Measures

- 7.299 Following preliminary consideration of likely impacts and effects, any additional mitigation measures considered to be required above and beyond those in-built mitigation measures which have already been considered are set out below.

Construction Measures

Statutory Designated Sites

- 7.300 Impacts upon wintering bird species utilising the Oikos foreshore and Holehaven Creek SSSI as a result of disturbance during the undertaking of construction activities at Jetties 1 and 2 are considered to be insignificant and consequently no mitigation is considered to be required.

Black Redstart

- 7.301 As building B4 will be demolished to facilitate the OMSSD project, replacement nesting opportunities for black redstart in the form nest boxes will be provided. This will be in the form of two nest boxes erected within a location, away from the majority of human disturbance and within close proximity to the sea wall.
- 7.302 Whilst these boxes would suitably replace those nesting opportunities lost as a result of the demolition of building B4 during preparation and construction, the magnitude of which is considered to be low, a direct, temporary residual effect of minor adverse significance upon a receptor of local value and of low sensitivity would remain until the end of preparation and construction when these features erected are available to be utilised by this species during the operational phase. Consequently, it is considered that, during the operational phase, there would be a residual effect of minor beneficial significance upon a receptor of local value and of low sensitivity.

Operation

7.303 Taking into consideration the in-built mitigation measures to be provided during operation, no further additional mitigation measures are considered to be required to be implemented for the operational phase of the OMSSD Project.

Limitations

7.304 Although the final proposals for BNG delivery are currently under development, this is not considered to be a limitation to the conclusions reached within this PEIR chapter. This is because there is a high degree of confidence that a substantial element of BNG will be able to be provided, and also because it is considered that sufficient mitigation is able to be provided within the Calor Road site.

Preliminary Conclusions on Residual Effects

7.305 The significance of residual effects as a result of the preparation and construction phase of the OMSSD project are detailed in Table 7.14. The significance of the residual effects as a result of the operational phase of the OMSSD project are detailed in Table 7.15.

Table 7.14: Residual effects as a result of preparation and construction phase

Effect	Likely Effect with In Built Mitigation	Additional Mitigation Required	Residual Effect
Human Health	Insignificant	None required	Insignificant
Climate Change	Insignificant	None required	Insignificant
Inter-related Effects			
Inter-related effects between terrestrial ecology and lighting	Insignificant	None required	Insignificant
Inter-related effects between terrestrial ecology and noise	Insignificant	None required	Insignificant
Inter-related effects between designated sites and air quality	Insignificant	None required	Insignificant
Statutory Designated Sites			
Direct effects upon statutory designated sites	Insignificant	None required	Insignificant
Indirect effects of dust arisings, lighting and surface run-off upon statutory designated sites	Insignificant	None required	Insignificant

Effect	Likely Effect with In Built Mitigation	Additional Mitigation Required	Residual Effect
Indirect effects of air quality upon statutory designated sites	Insignificant	None required	Insignificant
Indirect effects of disturbance upon bird species associated with statutory designated sites	Insignificant	None required	Insignificant
Non-statutory Designated Sites			
Direct effects upon non-statutory designated sites	Insignificant	None required	Insignificant
Indirect effects of dust arisings, lighting and surface run-off upon statutory designated sites	Insignificant	None required	Insignificant
Indirect effects of air quality upon statutory designated sites	Insignificant	None required	Insignificant
Breeding Birds (Black redstart)			
Direct effect from loss of nesting opportunities through demolition of building B4	Direct, permanent effect of minor adverse significance	Provision of two Schwegler 2HW nest boxes	Direct, temporary effect of minor adverse significance
Direct effect from loss of potential foraging habitat	Insignificant	None required	Insignificant
Indirect effects of dust arisings, noise and vibration	Insignificant	None required	Insignificant
Terrestrial Invertebrates			
Direct effect from habitat loss within OMSSD project boundary	Direct, temporary effect of minor adverse significance	None required	Direct, temporary effect of minor adverse significance
Indirect effects of dust arisings, vibration, surface run-off and lighting	Insignificant	None required	Insignificant
Reptiles			
Direct effect from habitat loss within OMSSD project boundary	Insignificant	None required	Insignificant
Indirect effects resulting from dust arisings, vibration, surface run-off and lighting	Insignificant	None required	Insignificant

Effect	Likely Effect with In Built Mitigation	Additional Mitigation Required	Residual Effect
Wintering Birds			
Effects as assessed within Statutory Designated Sites			

Table 7.15: Residual effects as a result of operational phase

Effect	Likely Effect with In Built Mitigation	Additional Mitigation Required	Residual Effect
Human Health	Insignificant	None required	Insignificant
Climate Change	Insignificant	None required	Insignificant
Inter-related Effects			
Inter-related effects between terrestrial ecology and lighting	Insignificant	None required	Insignificant
Inter-related effects between terrestrial ecology and drainage	Insignificant	None required	Insignificant
Inter-related effects between terrestrial ecology and air quality	Insignificant	None required	Insignificant
Statutory Designated Sites			
Direct effects upon statutory designated sites	Insignificant	None required	Insignificant
Indirect effects of air quality upon statutory designated sites	Insignificant	None required	Insignificant
Indirect effects of disturbance to bird species associated with statutory designated sites	Insignificant	None required	Insignificant
Indirect effects of lighting on bird species associated with statutory designated sites	Insignificant	None required	Insignificant
Non-statutory Designated Sites			
Effects as a result of additional offsite ecological improvement	Direct or indirect, permanent beneficial effect of minor significance	None required	Insignificant
Indirect effects of lighting on non-statutory designated sites	Insignificant	None required	Insignificant
Indirect effects of air quality upon non-	Insignificant	None required	Insignificant

Effect	Likely Effect with In Built Mitigation	Additional Mitigation Required	Residual Effect
statutory designated sites			
Breeding Birds (Black redstart)			
Direct effects upon nesting black redstart	Direct, permanent effect of minor beneficial significance	None required	Direct, permanent effect of minor beneficial significance
Direct effects foraging black redstart	Insignificant	None required	Insignificant
Indirect effects resulting from lighting and pollution events	Insignificant	None required	Insignificant
Terrestrial Invertebrates			
Direct effects upon terrestrial invertebrates	Direct, permanent effect of minor beneficial significance	None required	Direct, permanent effect of minor beneficial significance
Indirect effects resulting from lighting and pollution events	Insignificant	None required	Insignificant
Reptiles			
Direct effects upon reptiles	Direct, permanent effect of minor beneficial significance	None required	Direct, permanent effect of minor beneficial significance
Indirect effects resulting from lighting and pollution events	Insignificant	None required	Insignificant
Wintering Birds			
Effects as assessed within Statutory Designated Sites			

Habitat Regulations Assessment

- 7.306 As part of the final ES of the OMSSD project a Habitats Regulation Assessment (HRA) information document will be produced to allow the decision maker to discharge their duties under the Habitat Regulations⁶¹ as the competent authority. The process of HRA involves an initial ‘Screening’ stage followed by, if necessary, an Appropriate Assessment (AA).
- 7.307 The implications of any plan or project which is not directly connected with or necessary to the management of a European designated site must be assessed to determine whether the plan or project is likely to have a significant effect on the European site.
- 7.308 This assessment – typically referred to as the ‘Habitats Regulations Assessment’ – is required to take into account the potential effects both of the plan/project itself and in

⁶¹ Conservation of Habitats and Species Regulations 2017 (as amended)

combination with other plans or projects. Where the potential for likely significant effects cannot be excluded, the competent authority must make an AA of the implications of the plan or project for that site, in view the site's conservation objectives, and determine whether the plan or project will adversely affect the integrity of the European site.

- 7.309 The integrity of a site is the coherence of its ecological structure and function, across its whole area, that enables it to sustain the habitat, complex of habitats and/or the levels of populations of the species for which it was designated.
- 7.310 The competent authority may agree to the plan or project only after having ruled out adverse effects on the integrity of the habitats site. Where an adverse effect on the site's integrity cannot be ruled out, and where there are no alternative solutions, the plan or project can only proceed if there are imperative reasons of over-riding public interest and if the necessary compensatory measures can be secured.
- 7.311 The HRA information that will be provided will look at all potential pathways to impact on relevant European Wildlife Sites, including the following issues:
- Disturbance to passage and wintering bird species using the estuary foreshore, including from noise, lighting and visual/vessel disturbance;
 - Air quality impacts, construction or operational (including in-combination effects);
 - Impacts from dredging (sediment disturbance) including depositing dredgings in other parts of the estuary.
- 7.312 At this preliminary stage it is considered that the HRA will include the immediate Oikos foreshore and the Holehaven Creek SSSI (immediately to the west) as functional land for the nearby European Sites (Thames Estuary and Marshes SPA/Ramsar and Benfleet and Southend Marshes SPA/Ramsar). However, wintering/passage bird surveys over the last three years have shown that relevant SPA bird species are only present on the Oikos foreshore in insignificant numbers. Only ringed plover occur on the Oikos foreshore in numbers above 1% of nearby SPA populations: in 2018 – 2019, a maximum count of 17 ringed plover were observed on the Nov 2018 low tide count. This would equate to 1.3% of the Thames Estuary SPA population and 4.7% of the Benfleet SPA population. However, the birds using the Oikos foreshore at high and low tide during passage/winter are habituated to the operational use of the Oikos facility and its jetties. Temporary construction impacts (pollution events; visual disturbance (people); noise and lighting) are all considered insignificant.
- 7.313 Whilst operational use will increase, the distance of the new vessels from the inter-tidal shoreline is such that the small numbers of habituated birds will not be impacted.
- 7.314 Air quality impacts are not considered significant on roads within 200m of European Sites or functional land supporting SPA species.
- 7.315 As stated in the Water Environment Chapter, there may be a temporary minor adverse impact from disposal of dredgings on the Outer Thames Estuary SPA and Margate and Long Sands SAC. In accordance with the defined impact assessment methodology, mitigation

measures are only considered necessary if the level of significance is assessed as moderate or above. Based on the assessment outcomes, there is considered to be no requirement for secondary mitigation measures.

- 7.316 On the basis of the preliminary assessment work that has been undertaken and reported within this PEIR document, it is considered at this stage that the HRA information provided as part of the OMSSD application documentation will be able to ultimately conclude that the OMSSD project does not have a likely significant effect on a European Site. Even if, however, as a result of further work a likely significant effect cannot ultimately be excluded for whatever reason, the preliminary assessment work undertaken demonstrates that there will be no adverse effect on the integrity of a European Site.