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SIZEWELL C PROPOSED NUCLEAR DEVELOPMENT

HRA EVIDENCE PLAN

VOLUME II (of II)

OCTOBER 2014

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Appendix 3.1 Operational cooling water system impacts on red-throated diver

SIZEWELL C PROJECT HRA EVIDENCE PLAN - ASSESSMENT FRAMEWORK AND EVIDENCE REQUIREMENTS: OPERATIONAL COOLING WATER SYSTEM IMPACTS ON RED-THROATED DIVER

VERSION 5 - OCTOBER 2014

Important Note: The content of the example case studies is provisional as they represent work in progress which will be completed later in the Evidence Plan process. The example case studies illustrate the complex issues being explored and the types of data and methods being employed. At the end of each case study, preliminary comments from the stakeholders are presented. Any assessments that are provided should be regarded as indicative and preliminary and are subject to more detailed investigation.

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1. INTRODUCTION

1.1.1 This paper sets out the proposed assessment framework and the evidence requirements / approaches to assessing the possible effects of the cooling water system for Sizewell C (SZC) on the red-throated diver interest of the Outer Thames Estuary SPA.

1.1.2 The purpose of the paper is to define the key impact pathways associated with the cooling water system, outline the assumptions that, in the absence of definitive data/evidence at this stage, can be used in determining the potential impact and setting out the evidence / information requirements that will be needed in order to address the specifics of the issue.

1.1.3 The final section includes a list of questions that NNB GenCo asked the participants in the Evidence Plan process to consider, along with the responses received.

2. THE COOLING WATER SYSTEM

2.1.1 The proposed SZC cooling water system will comprise 2 intake tunnels each with 2 intake heads and 1 outfall tunnel with 2 outfall heads. The proposed total cooling water flow is 125 m3s-1 with a discharge temperature of 11.6°C above ambient.

2.1.2 In comparison Sizewell B (SZB) has 1 intake and 1 outfall tunnel each with 1 head. The total cooling water flow is 51.5 m3s-1 with a discharge temperature of 11°C above ambient.

2.1.3 SZB uses chlorination to control biofouling in the cooling water system and SZC would have to do the same. The detailed chlorination strategy for SZC has yet to be determined but the system would be designed to protect the entire system from the intake tunnels to the condensers.

2.1.4 SZB uses a capped intake that reduces the impingement of fish compared to SZA. SZC would employ embedded impingement mitigation features, including low velocity intakes, acoustic fish deterrents and a Fish Recovery and Return (FRR) system. The discharge of the FRR would be at a different location than the cooling water outfall and the discharge rate would be small in comparison with the cooling water plume (approx. 1 m^3s^{-1} compared to 125 m^3s^{-1}). The FRR discharge would contain chlorination products; Total Residual Oxidants (TROs) and Chlorinated By-Products (CBPs). The fish returned to sea by the FRR system would have been exposed to chlorination products in the cooling water system and some of these fish would be prey species for SPA designated birds.

2.1.5 EDF Energy, on operational risk management grounds, has decided that the cooling water intakes of SZC should be located offshore of the Sizewell - Dunwich Bank at approximately 3km from the Main Development Site. Different locations inside and outside of the Sizewell – Dunwich Bank are currently being modelled for the SZC cooling water outfalls, in order to predict:

- the extent of thermal plumes from SZC only, and the plumes from SZB and SZC together, compared to a modelled baseline without SZB;
- the impact of the SZC thermal plume on the operation of SZB; and
- ecological impact from SZC only, and SZC together with SZB, compared to a modelled baseline without SZB.

2.1.6 **Figure 1** shows the modelled extent of the existing SZB thermal plume at the seabed as areas >1 and >2°C annual mean excess temperatures.

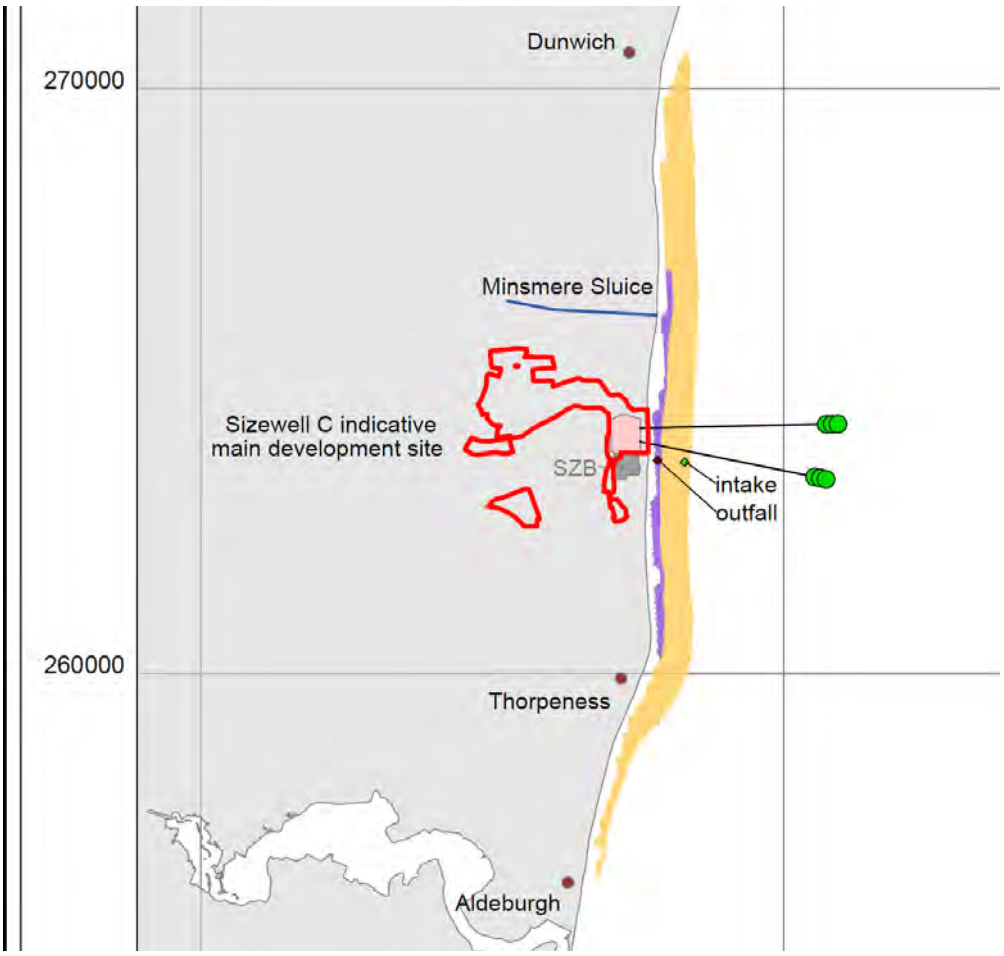

Figure 1 **Sizewell B intake and outfall with the modelled existing SZB thermal plume; purple is >2°C, yellow is >1°C annual mean excess temperatures. Green circles are potential positions of the SZC intakes**

3. POTENTIAL EFFECTS OF THE COOLING WATER SYSTEM

3.1.1 There are four aspects of the cooling water system that could have potential implications for red-throated diver. These all relate to the prey resource (i.e. fish):

- Entrainment impact on prey species.
- Impingement impact on prey species; including the potential effects of chlorination of the intake tunnels on fish survival from the FRR discharge.
- Influence of the thermal discharge plume on prey species.
- Influence of the chemical plume on prey species.
- Potential contamination of fish returned to sea by the FRR discharge from chlorination products in the cooling water system.

3.1.2 The thermal plume from the cooling water discharge is considered unlikely to have a direct impact on red-throated diver. Over wintering red-throated divers congregate in areas of prey availability, i.e. in shallow water fish nursery areas. The temperatures that the birds would experience in the surface thermal plume would, with the possible exception of a small region close to the outfall where peak winter temperatures of approximately 22^{o}C could be found, be within the normal range of seawater temperatures that the birds encounter during the year (8 - 15^{o}C) and, as such, would not be harmful to the birds.

3.1.3 There is no reason to believe that they would avoid such surface temperatures if prey were present in the vicinity. There is no evidence available on the response of red throated divers to the predicted levels of chlorination products in the chemical discharge plume from Sizewell C. EQSs for chemicals discharged into the marine environment are set at a level to protect the most sensitive species from acute and chronic effects from continuous expose to these chemicals. Red throated divers pursue their fish prey by sight, and their olfactory sensors will be blocked under water. The only impact pathway may be irritation to the bird's eyes, but at the levels predicted (ug/l) this is considered to be unlikely. However, given the lack of evidence on red throated diver response to chlorination products it will be assumed on a precautionary basis that they avoid those areas where the water concentration exceeds the EQS.

3.1.4 The focus of the assessment, therefore, will be on determining the potential effects that the cooling water system may have on the prey resource for red-throated diver.

4. RED-THROATED DIVER FEEDING STRATEGY AND DIET

4.1.1 Red-throated diver are opportunistic feeders and feed mainly on fish, particularly so during wintering periods in coastal areas. Various authors report diets that correspond to what fish are available locally, rather than any specific preferences.

4.1.2 Red-throated diver is most likely a visual feeder. Prey are seized and captured underwater after diving from the surface and active pursuit. Dives have been estimated to be in the range of 2-9m depth (mean 7.5m) and take up to 1 minute.

4.1.3 Typical diet components reported in the literature include sprat and herring and in some areas sandeel, gobies, whiting, cod and coley dependent upon availability. Stomach content analyses have shown that flatfish are not an important part of the diet even when they are numerous in an area. Small quantities of crustacea and molluscs have been found in red-throated diver stomach contents but some of this is probably derived from the meals of the prey species.

4.1.4 The size of individual fish prey ranges from 2.5cm (0.1g) to nearly 30cm (180g). Over wintering birds have been found to consume smaller prey in winter (mean 12cm, range 5-14cm) but this may just be a reflection of the local populations of over wintering juvenile fish that are commonly found in coastal areas. It has been estimated that red-throated diver have food requirements of approximately 500g/day.

4.1.5 In respect of the overall prey resource available to the wintering red-throated diver population of the Outer Thames Estuary SPA, it is pertinent to note that birds are not 'tied' to any specific part of the SPA through restriction of foraging range (as breeding birds would be). Birds are therefore free to range widely and take advantage of available prey where this occurs within areas of habitat (notably shallow sandbanks) utilised by the species within (and outside) the SPA. This aspect is reflected in the large fluctuations in the numbers of red-throated diver that occur temporally within the SPA and more locally at Sizewell as birds move between locations. Such movements and effective capacity to relocate to areas to take advantage of natural fluctuations in population levels / movements of prey may therefore make red-throated diver relatively insensitive to small-scale fluctuations and localised changes in prey availability.

5. POTENTIAL PREY SPECIES PRESENT AT SIZEWELL

5.1.1 From the BEEMS Sizewell B impingement studies (BEEMS Technical Report TR243) the following species are present in large numbers as juveniles at the Sizewell B intake during December to February (i.e. the main period during which red-throated diver are present in the area):

- The top 6 species sampled are bass, sprat and herring followed by whiting, mullet and gobies.
- Bass, sprat and herring constitute approximately 90% by number of the top 6 species sampled.
- Peak size range: bass 15-19cm, Sprat 8-10cm, herring 6-22cm (several age classes present for bass and herring).

5.1.2 The above species are widely distributed in the southern North Sea. The inshore coastal area is a known nursery area for juvenile fish and it is likely that the above fish assemblage is typical of the Suffolk coast and given the impingement risk zone for SZB it is also highly likely to be representative of the species composition between Minsmere and Thorpeness (at least inshore of the Bank).

5.1.3 At present, there is not sufficient information to say whether the measured assemblage is typical of the deeper water off shore of the Bank at about 3.5km offshore. Fishing surveys with Beam and Otter trawls indicate lower fish densities offshore of the bank for those species sampled. Larger pelagics have, however, not been well sampled but numbers for some species may also be lower offshore; particularly so for bass that are attracted to the warmer water inshore of the Bank.

6. POTENTIAL IMPACTS OF THE COOLING WATER SYSTEM ON PREY SPECIES FOR RED-THROATED DIVER

6.1 Introduction

6.1.1 As set out in Section 1 there are several aspects of the operation of the cooling water system that may have implications for the overall prey resource for red-throated diver due to the effects that the system may have on the fish assemblage in the local area.

6.1.2 This section provides a summary of these aspects and their potential effects.

6.2 Avoidance by Fish of Raised Water Temperatures within the Thermal Plume

6.2.1 It is possible that fish utilised as prey by red-throated diver may avoid areas of water where there is a thermal gradient above a certain threshold. In accordance with UK standards (BEEMS Scientific Advisory Report SAR008), the assumption will be that the area affected would be that which exceeds the Habitats Regulations screening threshold of >2ºC annual mean excess temperature.

6.2.2 The extent of this area will depend to a large degree on the location of the discharge and potential interactions with the discharge plume from Sizewell B.

6.2.3 Two different scenarios regarding fish avoidance of the thermal plume are considered possible:

- If the plume is effectively a surface feature only (around 1m in depth) fish avoidance will be limited to the surface layer and not the full water column. It is considered that this would have minimal impact on the feeding of any RTD present in the area as they would be able to dive through the surface layer to obtain prey; and
- With a well-mixed plume, fish in the full spatial extent of the plume are assumed to be displaced.

6.2.4 Modelling will enable information to be assembled on the spatial and vertical extent of the Sizewell C and B plumes at different excess temperatures in order to clarify which of the two situations above is likely to apply. (The quality of the model predictions will be supported by a validation data that includes comparisons with direct observations made on the Sizewell B plume).

6.2.5 There is very limited direct evidence for avoidance by fish of thermal plumes from power stations, and the hypothesis is based on laboratory thermal preference experiments on a limited number of species. Sizewell B impinges large numbers of fish but as can be seen from Figure 2 the SZB intake is in an area of the plume where the mean excess temperature is between 1°C and 2°C. Many fish will be able to detect such a temperature change but there is no evidence from laboratory experiments that it would promote fish avoidance.

6.2.6 At this stage, on a precautionary basis, it is assumed that the displacement of prey species would lead to an effective loss of habitat function (i.e. no prey resource) for red-throated diver with the result that red-throated diver would then avoid the area in which prey was no longer available. The impact on red-throated diver could be calculated based on the area of the thermal plume and the density of red-throated diver within this area. The consequences of displacement at the population level (i.e. the designated population of the Outer Thames Estuary SPA) would be determined based on the density approach that has been used in the assessment of displacement impacts for offshore wind farms.

Information / evidence requirements

- Evidence for displacement of fish from thermal plumes. The literature will be fully reviewed. It is not considered likely that fisheries survey data will have sufficient statistical power to determine if there are any significant differences between fish assemblages inside and outside of the influence of the existing Sizewell or Hinkley Point thermal plumes.
- Outputs from modelling of the extent and nature of the thermal plume from Sizewell C, including interaction with the existing thermal plume from Sizewell B;
- Data on the density of red-throated diver within the plume area (JNCC/NE dataset).
- Displacement assessment methods and information from relevant offshore wind farm projects (e.g. London Array II, Kentish Flats extension) – DECC (2013).

6.3 Avoidance by fish of the chemical plume associated with the cooling water discharge

6.3.1 Only oxidants resulting from chlorination of the cooling water system (Total Residual Oxidants - TROs) are likely to exceed their EQS at any distance from the outfalls. There is an extensive literature from the 1970s and 1980s on the effect of TROs on fish behaviour and on fish mortality. Most of this evidence is from laboratory preference experiments on freshwater species from the USA; the data on marine species are much more limited. The results indicate that fish avoid water with TROs at concentrations above those where lethal and sublethal effects occur. The avoidance threshold was highly dependent on species and on water temperature; the most sensitive species were salmon smolts (BEEMS Technical Report TR286). In the absence of better evidence the assumption would be made that prey fish at Sizewell avoid areas where the plume TRO concentrations exceed the EQS of 10µg l^{-1}.

6.3.2 This would only be a potential issue when chlorination is used. Chlorination is not used at Sizewell B when water temperatures are <10°C (i.e. Dec – March). Based on current knowledge, it is assumed that a similar chlorination strategy would be used at Sizewell C. Under such circumstances, no displacement of fish would arise from the chemical plume during December-March. Therefore, assuming that prey displacement equates to effective loss of habitat and, therefore displacement of red-throated diver, for the majority of the wintering period, there would be no effect on the red-throated diver population of the Outer Thames Estuary SPA. However, the chlorination regime for Sizewell C would have to be capable of protecting the station over its full operational lifetime during which time sea temperatures are expected to increase due to climate change. The potential for fish avoidance, therefore, will be

assessed against the chlorination level that EDF Energy requests in the WDA permit. The assessment of TRO plume effects would be undertaken by calculating the area of assumed displacement as the area of plume where TRO concentration exceeds the EQS. As with determining the effect of the thermal plume, the density of red-throated diver could be utilised to determine the likely numbers of birds that could be displaced over this two month period. It should be noted that there will be some overlap between the thermal discharge plume and the chemical plume, so the calculation of the cumulative effect on red-throated diver displacement would need to take this into account.

Information / evidence requirements

- Evidence for displacement of fish from chemical plumes.
- The proposed Sizewell C chlorination strategy.
- Outputs from modelling of the extent and nature of the chemical plume from Sizewell C, including interaction with the existing chemical plume from Sizewell B;
- Data on the density of red-throated diver within the plume area (JNCC/NE dataset).
- Displacement assessment methods and information from relevant offshore wind farm projects (e.g. London Array, Kentish Flats extension) – DECC (2013).

6.4 Impingement impact on the fish prey and overall resource available to red-throated diver

6.4.1 Impingement of fish on the intake screens for cooling water may, through mortality, cause a localised effect on overall fish numbers / biomass. Impingement may, therefore, potentially reduce the overall prey resource available to red-throated diver.

6.4.2 The detailed structure and temporal variability of the fish assemblage at Sizewell has been assessed from impingement studies at Sizewell B. As described above the measured assemblage consists predominantly of juvenile fish. Survey data to date has not shown any significant differences between the fish assemblage inside and outside of Sizewell Bank and unless data from more future surveys shows otherwise, it will be assumed that there is no systemic difference between the two areas.

6.4.3 In order to determine the potential loss of fish from the local fish stocks as a result of impingement, the following steps will be undertaken:

- Impingement losses at Sizewell B will be calculated as equivalent adult fish losses after scaling by natural mortalities.
- Impingement losses for Sizewell C will then be determined by scaling up the calculated adult losses for Sizewell B by the ratio of the cooling water flows (between Sizewell B and Sizewell C) and then applying factors for embedded mitigation (e.g. acoustic fish deterrents and fish recovery and return systems that are considered to represent Best Available Technology by the Environment Agency). The calculated environmental benefit from such systems will reflect experimental evidence and the conditions under which the systems are planned to be operated at Sizewell C.

- The magnitude of the impact on each prey species will be assessed by:
    - comparison with spawning stock biomass (SSB), where available, or local catches; and
    - consideration of the natural variability of the population.

6.4.4 The comparative scale of potential impingement loss as a function of overall biomass may be gained from determining the proportional difference between the existing impingement losses at Sizewell B and those that could arise from Sizewell C. The impingement calculations and assessment work for Hinkley Point C showed that with the incorporation of embedded design measures (low velocity intake) and mitigation measures (acoustic fish deterrent and fish recovery and return) overall impingement losses for virtually all fish species would be reduced in comparison to the existing Hinkley Point B station. In respect of some species such as sprat and herring, predicted reductions were significant with -57% and -82% calculated for these species respectively. It should also be noted that in respect of the fish assemblage and stocks of the Severn Estuary, there was no evidence from the 32 year impingement data record presented as part of the HRA evidence base to indicate that impingement associated with the cooling water system for Hinkley Point B has had any discernible impact.

6.4.5 The impact on prey availability will be assessed by consideration of the summed impact on those species considered to be the prey of red-throated diver. In this respect, the assumption will be that prey is composed of those species (pelagic fish) that represent 90% of the fish species by number during the months when red-throated diver are present in the vicinity of Sizewell.

6.4.6 The precautionary assumption used for the purposes of this scoping assessment is that local impacts (i.e. fish losses within the calculated abstraction risk zone for Sizewell C) will equate to population impacts, i.e. fish losses due to impingement will not be replaced by recruitment from outside the Sizewell local area. The intention will be to show the effect of this impact relative to the rate of natural background mortality for the key fish species.

6.4.7 In respect of determining the potential impact of a reduction in prey resource on red-throated diver, it cannot be simply assumed that fish biomass loss would directly translate into the loss of resource for red-throated diver and direct mortality because of this loss. If the foraging resource in a specific area were to be reduced, then the likelihood is that birds would seek alternative areas in which to obtain prey, particularly a species such as red-throated diver which exhibits frequent and extensive movements within its wintering grounds, which may be linked to prey availability. It is likely that overall reductions in biomass of prey species would have to be significant in order to elicit a potential response at the population level for red-throated diver. Setting a specific threshold in respect of this will be difficult. The influence on the red-throated diver population may therefore be better assessed in relation to theoretical considerations using a range of decreases in prey availability and directly relating these to effective displacement of birds from the area in proportion to the losses. So, as an example, a 5% reduction in local biomass, could be translated to a 5% reduction in red-throated diver numbers in the area due to the movement of these birds out of the local area. The impact of the displacement of these birds could then be assessed in line with the approach outlined for assessing the impacts of the thermal and chemical plumes.

Information / evidence requirements

- Data from existing fish impingement monitoring studies at Sizewell B.
- Information on the biomass and dynamics of the local fish populations. Some appropriate information may also be available from the Marine Aggregate Regional Environmental Assessment (MAREA) regional habitat assessments for herring and sandeel.
- Calculation of impingement losses based on data from Sizewell B, data on reduction in fish mortalities from impingement mitigation measures and fisheries survey data relevant to the proposed locations of the intakes.
- Calculation of proportion of impingement losses that would act as the potential prey resource for red-throated diver.
- Calculation of the percentage change in the local prey fish biomass.
- Data on the density of red-throated diver within the area in which biomass reduction could arise using the JNCC/NE dataset.
- Displacement assessment methods and information from relevant offshore wind farm projects (e.g. London Array, Kentish Flats extension) – DECC (2013).

6.5 Entrainment impact on prey species

6.5.1 Entrained organisms (e.g. fish larvae, small crustaceans) are not a major part of red-throated diver diet and therefore entrainment losses of organisms would need to be assessed as potential impact on prey population levels in future years.

6.5.2 Entrainment losses by species will be calculated by multiplying the entrainment risk volume (calculated from a particle tracking model) by the measured egg and larval density, scaled up to the cooling water flow rate and the predicted entrainment mortality from experiments and the literature.

6.5.3 Where possible this will be put into the context of estimated natural production and mortalities. This is a potential indirect impact only and is considered likely to be less important than the other impacts of the cooling water system on prey availability for red-throated diver.

Information / evidence requirements

- Calculations of entrainment losses and translation into population levels.
- Calculation of proportion of entrainment losses that would act as the potential prey resource for red-throated diver.
- Calculation of the percentage change in the local prey fish biomass.
- Data on the density of red-throated diver within the area in which biomass reduction could arise using the JNCC/NE dataset.
- Displacement assessment methods and information from relevant offshore wind farm projects (e.g. London Array, Kentish Flats extension) – DECC (2013).

6.6 Potential contamination of fish returned to sea by the FRR discharge from chlorination products in the cooling water system

6.6.1 In order to prevent bio-fouling of the cooling water system at Sizewell C it would be necessary to chlorinate the system from the intakes to the condensers. This would mean that fish discharged via the FRR system would have been exposed to chlorination products from the intakes to the FRR discharge. The exposure time would only be for a short period as the fish transit through the system and they are not expected to accumulate detectable levels of chlorination products before discharge to sea. The levels of TROs and CBPs in the discharged fish flesh will be assessed together with any potential effects on seabirds.

Information / evidence requirements

- Calculated time that fish take to transit through the cooling water system.
- Predicted accumulation of chlorination products with exposure time by prey fish from the scientific literature and if necessary from laboratory experiments.

7. ASSESSMENT OF THE CUMULATIVE EFFECT OF CHANGES IN PREY RESOURCE ON RED-THROATED DIVER

7.1.1 For the various components of the potential impact of the cooling water system described above, the total effect on the prey resource would be best dealt with through the use of a common unit that enables the assessment outputs from various impact pathways to be combined. In this respect, it is considered that treating changes in prey availability as effective habitat loss and translating this into a displacement impact for red-throated diver would be the most appropriate approach. It is recognised that displacement does not necessarily equate to mortality and displaced birds do not necessarily die, particularly where only a few birds may be involved.

7.1.2 Cumulative displacement losses could be assessed in the context of a density dependent mortality rate (as used for the appropriate assessment of the London Array II wind farm) e.g. a 2.5% or 5% increase in mortality for every 1% increase in density. This is an approach that has been utilised and accepted for previous infrastructure projects where the impact of displacement at the population level needs to be assessed in the context of the conservation objectives that apply to the Outer Thames Estuary SPA. Taking this approach would also enable a project cumulative assessment to be undertaken whereby the displacement impact of the project infrastructure and activities (during construction and operation) could be combined with that of the cooling water system.

8. QUESTIONS AND RESPONSES

8.1.1 In the context of the subject of this topic paper – an assessment framework and evidence requirements to assess potential operational cooling water system impacts on red-throated diver – questions that NNB GenCo asked the participants in the Evidence Plan process to consider were:

1. In principle, do you agree with the approach to the assessment and evidence requirements that have been proposed? If you have any concerns, could these please be explained.
2. Do you agree that the designated red-throated diver population is likely to be relatively insensitive to small-scale fluctuations and localised changes in prey availability?
3. Do you consider that the use of existing datasets and methodologies to determine potential displacement impacts, as set out in the paper, are appropriate to assessing the potential impact of the Sizewell C project?
4. Are you content with the assumption that the area which fish utilised as prey by red-throated diver may avoid is likely to be where the thermal gradient is >2ºC of the annual mean excess temperature?

8.1.2 Responses received are set out in the table that follows (except where the comment related to proposed changes to the text that have been actioned above or did not need to be recorded):

Consultee	Comment	Response
EA	We agree that you have picked out the main aspects of the cooling water system that could have potential detrimental impact on Red Throated Diver (RTD) – i.e. the impact on their prey, as a result of the thermal & chemical plumes/impingement and entrainment. Generally we consider that the approach taken to assessing the impacts of the cooling water system on RTD is sensible, and appears to be appropriately precautionary. However, the findings of the report would appear to be reliant upon the results of water quality modelling, the details of which have not yet been provided to us. We are unable to fully comment on this report without details of the modelling, for example model setups, verification or detailed outputs. This is expected as we commence our review of the BEEMS Reports.	Noted
EA	<u>6.2 Avoidance by fish of raised water temperatures within the thermal plume</u> 6.2.3 The bullet points within this section assume that the divers will feed through a shallow warm surface plume. We consider this to be a reasonable assumption as the birds are likely to encounter thermal stratification in natural circumstances, including very near the surface. No mention is given as to whether this behaviour is	Noted

Consultee	Comment	Response
	demonstrated in the Sizewell B plume. Discussions at the evidence plan workshop indicated that the plume is too close to the shore to influence the feeding of the divers, as they feed further out to sea. We would value confirmation that this is the case.	
EA	6.2.5 A statement claiming that there is 'no evidence' that fish avoid the higher temperature area is not necessarily the same as providing evidence to show that there is 'no impact'. We must be careful to ensure that the assessment is robust.	Noted
EA	**1. In principle, do you agree with the approach to the assessment and evidence requirements that have been proposed?** Based on the information available to us and the proposal as set out, the approach appears to be sensible and precautionary, and we broadly agree with the thinking and the evidence requirements identified.	Noted
EA	**3. Do you consider that the use of existing datasets and methodologies to determine potential displacement impacts, as set out in the paper, are appropriate to assessing the potential impact of the Sizewell C project?** We are concerned that we are being asked to accept data, and assumptions based on that data, which we have still not seen. It is important that models used are verified and shared with the Environment Agency. There is limited reference to the existing datasets and methodologies which will specifically be used in the assessment. We would like to see clearer reference made to the reports or pieces of work that exist, and that will be used in the assessment. We would also like confirmation that new data may also influence the displacement impacts assessment. The approach must consider the actual extent of the Sizewell B plume, as well as the modelled/assumed extent.	Noted Full data on model setup and validation will be presented to the Environment Agency. A fully referenced evidence base will be provided with the assessment. The modelling evidence will include comparisons with direct observations of the Sizewell B plume.
EA	**4. Are you content with the assumption that the area which fish utilised as prey by red-throated diver may avoid is likely to be where the thermal gradient is >2ºC of the annual mean excess temperature?** We have no clear evidence on the avoidance of red-throated diver prey where the thermal gradient is >2°C of the annual mean excess temperature. However, we understand that this figure is based upon the best available information for assessing adverse effect from changes in thermal regime. We recommend that your assessment should also consider excess temperature on ambient temperature in different scenarios.	Noted The assessment data will consider excess temperatures under different scenarios. The modelling runs to be undertaken will be agreed in advance with the Environment Agency.

Consultee	Comment	Response
EA (following initial comments set out above)	Section 3.1.3 states that "There is no reason to believe that they [Red Throated Diver - RTD] would avoid such [e.g. 22 degrees] surface temperatures if prey were present in the vicinity." If temperature were 22 degrees and therefore significantly higher than surrounding winter water temperatures then the RTDs might avoid the area - especially if fish were present elsewhere. Natural England should advise whether to conclude 'no reason' is a fair statement.	The reaction of red-throated diver to elevated surface water temperatures is made with respect to the statement in the previous paragraph (3.1.2), where it is stated that (with the possible exception of the small area of the plume in which surface temperatures might reach up to 22 degrees) overall surface water temperatures would be in the normal range of seawater temperatures that the birds encounter. The assumption that will be made in the assessment is that if surface water temperatures are sufficiently high such that prey fish species avoid the water column then red-throated diver will also avoid such areas. As such, the assessment will rely on the response of prey rather than red-throated diver to raised water temperatures.
EA (following initial comments)	Section 5.1.1. There is no mention of the useful BEEMs fish related data already collected e.g. fish data reported in TR201. This would provide a better basis for the assessment since the work presented is based on analysis of SZB intakes which are situated closer to shore than that of SZC. This data may provide a suitable assessment of the impact of SZB on fish stocks, and may be likely to reflect - to a certain extent - the fish that may be impinged by SZC; however the more relevant data from the extended area should be used to validate this.	The information presented in this case study regarding the composition of the fish fauna and the main prey species for red-throated diver, as stated, is likely to be representative of the overall fish assemblage. For the HRA assessment all sources of relevant data will be utilised to determine the makeup of the prey species available to red-throated diver.
EA (following initial comments)	Section 6.2.6 Evidence Requirements. There is no mention of the fish data from BEEMs surveys (i.e. BEEMS Report TR201) as evidence for consideration. This may be because it is already available. However, since this is not mentioned elsewhere we have included it as an evidence need here, for the purposes of completeness.	Noted. The information on the fish fauna contained in all of the relevant BEEMS reports will be utilised in assessing the potential impact of SZC on the fish fauna and, in turn, in relation to the prey resource availability for red-throated diver.
EA (following initial comments)	Section 6.3.1. BEEMS Technical Report TR286 is mentioned, and would appear to be of significant relevance to this matter, but we do not have this listed as a report for review. It would appear that this report is being used to determine the levels at which the avoidance concentration value should be set. However, it is not clear to us how the 10ug/l - quoted as representative of values that cause key fish species to demonstrate avoidance - has been	Noted. TR286 to be provided to the EA for review. Its purpose is to provide the evidence available on this topic.

Consultee	Comment	Response
	determined. We shall need to see the evidence that supports this assumption.	
EA (following initial comments)	Section 6.3.2 Evidence Requirements. Fish data will be required in line with our comment for Section 6.2.6 above.	Noted. See response to comment on Section 6.2.6.
EA (following initial comments)	Section 6.4.3. This section states that the impact on fish population would be calculated using a ratio approach and relies on the low velocity intake working effectively. Evidence will be required to demonstrate that this will be the case.	Relevant information regarding the proposed mitigation measures to minimise impingement losses will be provided in the HRA.
EA (following initial comments)	Section 6.4.5. This section makes the assumption that prey is composed of those species (pelagic fish) which represent 90% of the fish species, by number, during the months when red-throated diver are present offshore Sizewell. We believe that this statement is based on the data collected from impingement studies for Sizewell B. We reiterate the comment made earlier for Section 5.1.1. BEEMS Report data for the wider area - where SZC intakes may be located - is the evidence against which these statements must be tested, in order to justify that the key species in the SZB studies are a suitable list for the SZC intake locations as well.	Noted. See response above in respect to the comment made on Section 6.2.6.
NE	**4. Are you content with the assumption that the area which fish utilised as prey by red-throated diver may avoid is likely to be where the thermal gradient is >2ºC of the annual mean excess temperature?** We are not able to comment on this; our only observation is that this appears radically smaller than if an area of >1 degree change is considered. Also, we would like more clarity on the question - are we considering > 2 degrees over and above the already elevated temperatures from the Sizewell B plumes or the combined effect of both over and above the natural baseline?	Noted The assessment will provide data on the size of the plumes for Sizewell C operating in combination with Sizewell B and for Sizewell C operating alone. The excess temperature calculation will be based on the appropriate background temperature for each scenario.
SWT	**3. Do you consider that the use of existing datasets and methodologies to determine potential displacement impacts, as set out in the paper, are appropriate to assessing the potential impact of the Sizewell C project?** The use of existing datasets and methodologies would appear logical. However, from the information presented we query whether sufficient data is available on the prey fish resource offshore of the Sizewell Bank to allow robust assessment of impacts on red-throated divers.	Noted Observational data will be presented on the relative characterisations of the fish assemblage inshore and offshore of the Sizewell Bank.
RSPB	**1. In principle, do you agree with the approach to the assessment and evidence requirements that have been proposed?** In principle we agree with the approach, but are concerned that there is no evidence that divers will not be directly impacted upon. The assessment	Noted and addressed to some extent in the text. The full assessment of the impact of the Project on divers has not

Consultee	Comment	Response
	paper is rather unclear in some of the information it presents and lacks clear definitions. Much of the paper appears to be based on BEEMS reports which do not deal with ornithological issues. The paper lacks citations to back up both the ecological statements and assumptions made about divers; in particular, the assumption that there will be no direct impact on red-throated divers is made in the absence of any evidence. The statement that birds are not tied to any particular foraging area (4.1.5) is similarly not reinforced by any citation, and is in contradiction to aerial surveys and subsequent modelling of the red-throated diver distribution in the Greater Thames area, which showed a strong association with shallow sandbanks.	yet been undertaken.
RSPB	**1. Do you agree that the designated red-throated diver population is likely to be relatively insensitive to small-scale fluctuations and localised changes in prey availability?** In the absence of evidence, we do not agree that the designated red-throated diver population is likely to be relatively insensitive to small-scale fluctuations and localised changes in prey availability.	Noted
RSPB	**3. Do you consider that the use of existing datasets and methodologies to determine potential displacement impacts, as set out in the paper, are appropriate to assessing the potential impact of the Sizewell C project?** We agree with the use of displacement methodologies, although note that there are few data available to underpin them.	Noted
RSPB	**4. Are you content with the assumption that the area which fish utilised as prey by red-throated diver may avoid is likely to be where the thermal gradient is >2ºC of the annual mean excess temperature?** We agree with the threshold of >2ºC, as determined by the BEEMS advisory report.	Noted

9. REFERENCES

BEEMS Scientific Advisory Report SAR008. Thermal standards for Cooling Water from New Build Nuclear Power Stations, BEEMS Expert Panel.

BEEMS Technical Report TR243 Edition 1. Predictions of impingement by Sizewell C in relation to adjacent fish and crustacean populations and their fisheries. Cefas, Lowestoft

BEEMS Technical Report TR286. Evidence for fish avoidance of TRO plumes. Cefas, Lowestoft

Department of Energy and Climate Change (2013). Record of the appropriate assessment undertaken for projects consented under: Section 36 of the Electricity Act (1989) and Section 66 of the Marine and Coastal Access Act (2009). Review of the Outer Thames Estuary Special Protection Area (SPA).

Appendix 3.2 Construction disturbance effects on bittern and marsh harrier interests of the Minsmere to Walberswick SPA

SIZEWELL C PROJECT HRA EVIDENCE PLAN: CONSTRUCTION DISTURBANCE EFFECTS ON BITTERN AND MARSH HARRIER INTERESTS OF THE MINSMERE TO WALBERSWICK SPA

VERSION 4 - OCTOBER 2014

Important Note: The content of the example case studies is provisional as they represent work in progress which will be completed later in the Evidence Plan process. The example case studies illustrate the complex issues being explored and the types of data and methods being employed. At the end of each case study, preliminary comments from the stakeholders are presented. Any assessments that are provided should be regarded as indicative and preliminary and are subject to more detailed investigation.

NOT PROTECTIVELY MARKED

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1. INTRODUCTION

1.1.1 This paper sets out the framework for assessing the potential impact of disturbance effects on the designated bittern (*Botaurus stellaris*) and marsh harrier (*Circus aeruginosus*) populations of the Minsmere to Walberswick Marshes SPA. These two species are important indicators of reedbed/wetland habitat quality and function and also key species in respect of the ornithological interest of the nature reserves at Minsmere (RSPB) and Walberswick (Natural England).

1.1.2 The paper summarises some of the available ecological and project information and makes an initial assessment of the likely disturbance effects based on this information. In addition, the paper highlights key areas of uncertainty and identifies priorities for further evidence gathering to help address assessment concerns relating to these two species. The support of the RSPB in providing data on the use of the Minsmere Reserve by breeding bittern and marsh harrier is gratefully acknowledged.

1.1.3 The final section of this paper includes a list of questions that NNB GenCo asked the participants in the Evidence Plan process to consider, and provides their responses.

2. BASELINE DATA RELEVANT TO THE ASSESSMENT PROCESS

2.1 Project Information

Noise levels during construction

2.1.1 Initial modelling has been undertaken to determine the noise levels that could arise during the construction phase. For the purposes of this exercise, peak noise levels (L_{max}) have been determined. Noise levels from construction sources can be described by a number of different parameters, the most important of which are peak levels (known as L_{max} values) and typical levels (or L_{eq} values). Peak levels are the highest levels which might occur for a fraction of second during the noisiest component of an activity. In most instances for construction noise the L_{max} value represents sudden impulsive or impact sounds such as hammering. Such impulsive / impact sounds are those most likely to cause behavioural responses (e.g. startling, flight) in birds and other wildlife. For this reason, it has been selected as the best single parameter to model in this case.

2.1.2 Noise levels can also be characterised by a parameter which represents the typical overall level from a group of activities around the site (for which the L_{eq} is used). To predict this level, typical noise levels from each type of activity are considered along with the total number of activities of each type; the locations in which they might occur and the durations over which they might operate within a given assessment period (which is typically a busy working day). A model is currently being developed which will allow noise contours to be considered for a typical period and the intention is to update this paper once this evidence is available.

2.1.3 **Figures 1-3** in **Annex A** to this paper show initial model outputs (contours) for peak noise levels (L_{Amax}) for three representative scenarios during construction, taking account of each noise source that might contribute. The scenarios are considered to represent reasonable 'worst-case' conditions with no or limited noise mitigation. Actual 'with development' noise levels off-site are likely to be lower with the incorporation of further mitigation.

2.1.4 **Figure 1** (Scenario 1) shows the peak noise levels that could arise during the first 6 months of construction, when road and utility corridors would be under construction and works to prepare the working platform and install the cut-off wall would be taking place. For the purposes of this initial study, no acoustic mitigation measures are incorporated in order to represent theoretical 'worst-case' conditions prior to the construction of perimeter bunds. In reality, various types of acoustic mitigation are feasible and will be considered in due course, if necessary. To the north and south/west of the main site construction area, piling noise dominates off-site levels.

2.1.5 Scenario 2 shows the peak noise levels that could be generated when dewatering and bulk excavation works within the cut-off wall on the main site platform north of Sizewell B power station would take place. The main access road and the railhead would be in use as would the haul road transporting excavated materials to the stockpile area in the north-west of the site. Hammering (and other impact sounds) from within contractor's compounds and locomotive noise (particularly associated

with the rail head and batching plant) would have the most impact on noise levels off-site. Bucket slap from tracked excavators may also be significant. This scenario incorporates an acoustic fence and bunding as measures to attenuate noise levels off-site. This does not represent the full acoustic mitigation package for the site, but reflects a reasonable 'worst-case' scenario for the purposes of this scoping study, which focuses on receptors north and south/west of the site.

2.1.6 Scenario 3 represents the peak construction phase, when the main platform area has been raised, the foundations within the cut-off wall have been completed and the superstructure of the buildings within and around the nuclear and conventional islands are under construction. Hammering steel at height in this area and piling outside of the cut-off wall dominate the peak noise levels at all off-site locations. There would also be significant noise from locomotive movements and from hammering etc. within contractor's compounds located across the construction area north of Kenton Hills and within the main site itself. This scenario also incorporates an acoustic fence and bunding as measures to attenuate noise levels off-site.

2.1.7 Some initial measurements of existing ambient noise levels were undertaken in Minsmere South Levels in April 2014. The L_{Amax} values from birdsong and other natural sounds reached levels of between 55 and 62 dB. Further ambient noise monitoring of the study area is proposed to establish a representative baseline.

Human activity

2.1.8 There would be significant levels of activity associated with the project that would ramp up to a peak workforce of 5,600 split between a number of shifts. While activities would be largely confined to within specific corridors and areas within the Development Site, the levels of activity would be such that visual disturbance would be likely to arise throughout the site. However in view of the local topography, the earth bunds and acoustic fences that would run along the site's perimeter and the retained mature vegetation outside of the construction fence, these activities would be screened from off-site ecological receptors.

Lighting

2.1.9 A lighting strategy is to be developed for the construction areas that will provide appropriate levels of illumination to work safely while at the same time minimising light spill onto non-operational land. It is envisaged that a strategy similar to that developed for Hinkley Point C will be proposed. The key environmental buffer zones and wildlife corridors would be allocated as dark zones (<1 lux).

2.2 Marsh Harrier

Baseline information

National and local population trends

2.2.1 Between 1971 and 1991 marsh harrier numbers had an average annual increase of 19.6%. In 2008 a total of 374-392 breeding female marsh harriers were recorded in the UK.

2.2.2 In 2010, at least 50 pairs bred in Suffolk, of which 10 bred at Minsmere. In 2012 at Minsmere, 24 young fledged from 7 nests, compared to 21 young from 12 nests in 2011 (see **Figure 1** for location of nesting sites within the Reserve). The 2001 SPA review states that the Minsmere-Walberswick SPA supported 16 pairs of marsh harrier, representing at least 10.0% of the breeding population in Great Britain (5 year mean, 1993-1997).

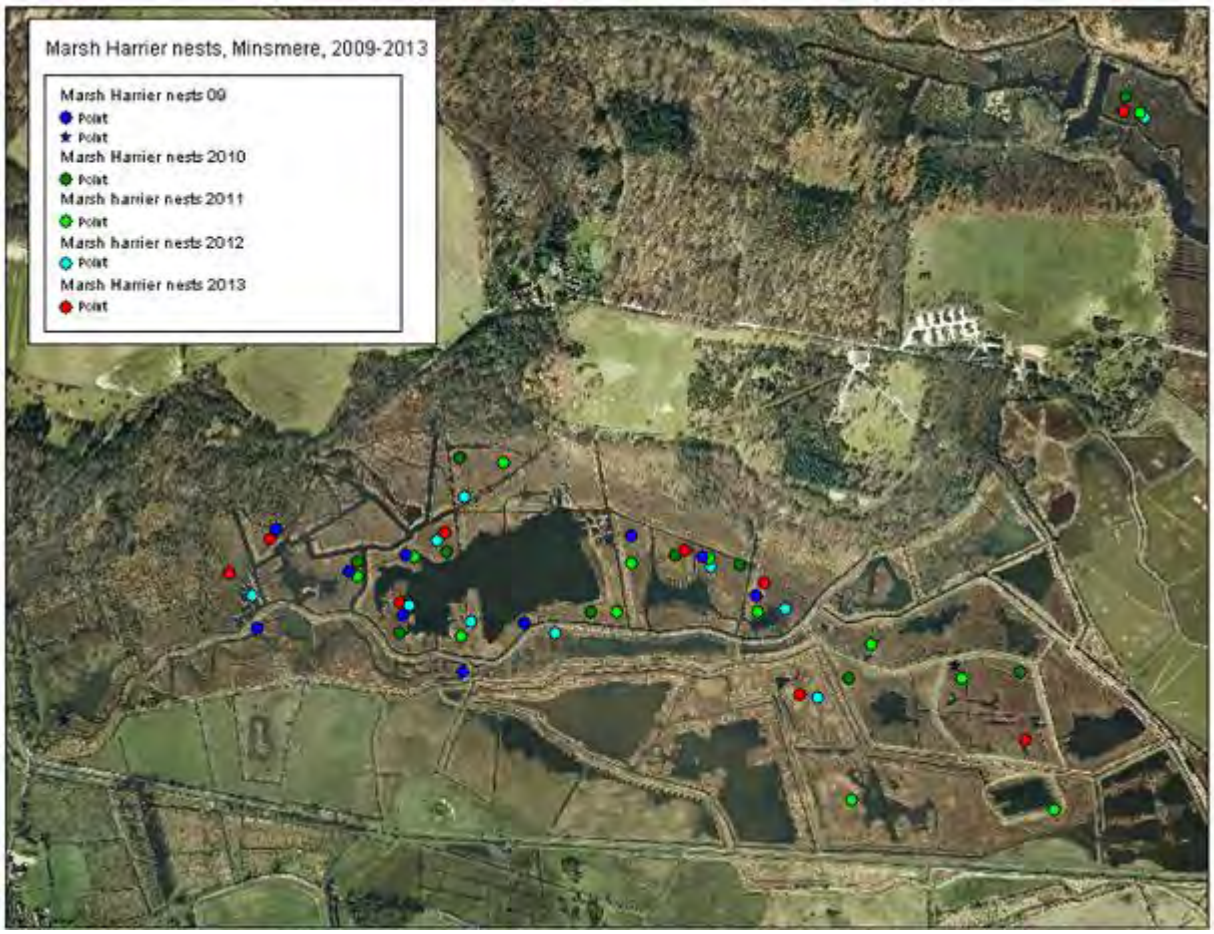

Figure 1 Aerial photograph of the RSPB Minsmere Reserve showing the location of marsh harrier nests 2009-2013; image courtesy of the RSPB

Summary of use of Sizewell Marshes area

2.2.3 Survey work in 2008 (undertaken by Entec for British Energy – see **Figure 2**) established that Sizewell Marshes are used as a foraging resource by marsh harrier breeding within the Minsmere-Walberswick SPA. The frequency with which birds were encountered in Sizewell Marshes was 1 sighting every 4.8 hours (2-3 visits a day). Survey work undertaken in 2011/2012, similar to 2008, indicated that marsh harrier commute from Minsmere to forage over Sizewell Marshes on a regular basis throughout the year. Based on this later survey data, it is calculated that a marsh harrier visits Sizewell Marshes every 3.6 hours (3-4 visits a day).

2.2.4 Likely provisioning rates when young are in the nest are in the region of 4-12 prey items per day depending on the age and number of chicks. This rate of provisioning suggests that Sizewell Marshes could represent approximately 20-75% of the foraging resource for a single breeding pair, assuming that each recorded sighting results in a successful foraging trip.

2.2.5 Minsmere South Levels were also used by foraging marsh harrier. **Figure 2** shows the foraging flights recorded in 2008 and **Figure 3** the flight lines recorded in 2011 and 2012.

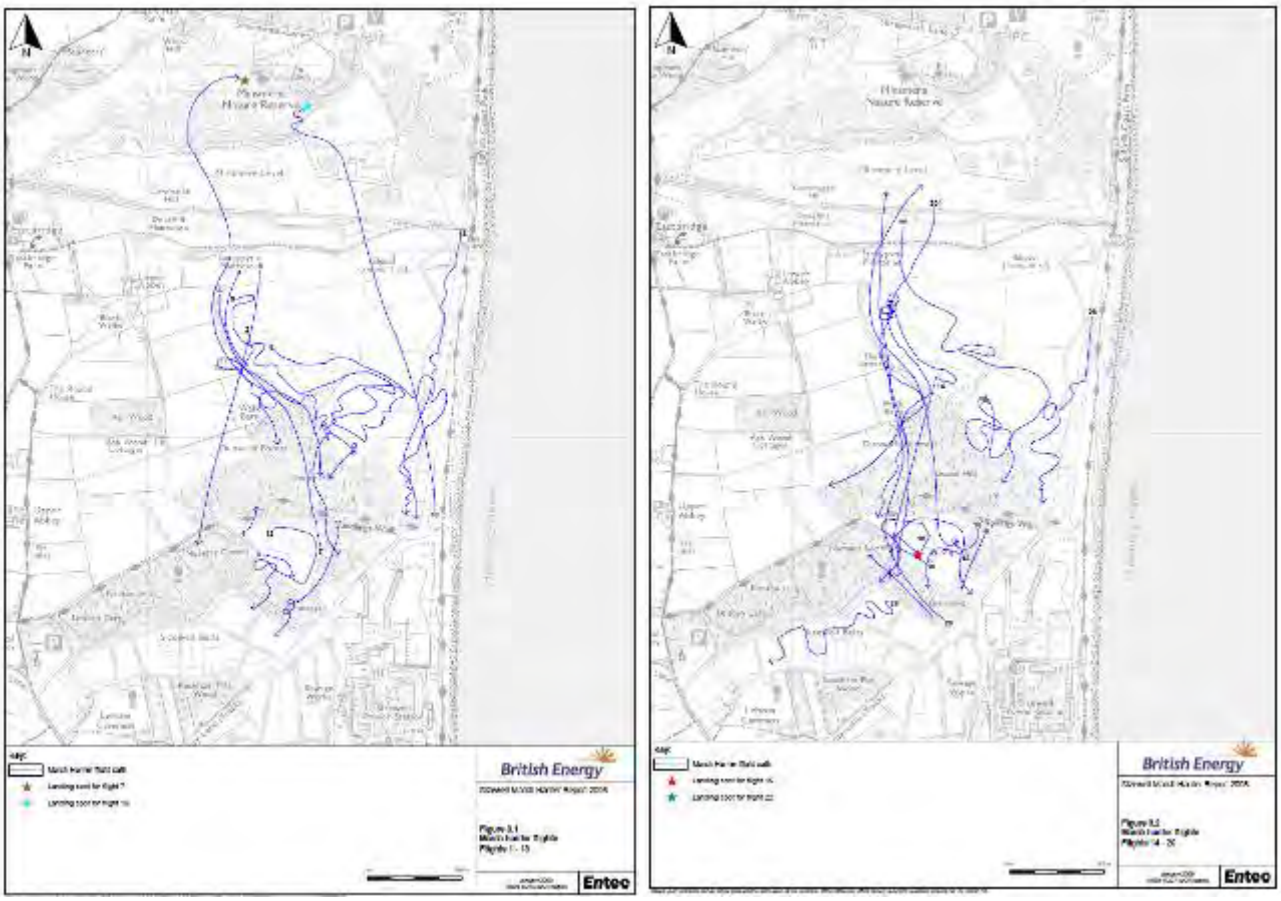

Figure 2 Harrier flight lines 2008

Breeding season ecology

2.2.6 The marsh harrier breeding season starts between mid-March and early May. Marsh harriers are ground-nesting birds, constructing a nest from reeds and grasses, preferentially within reed beds and away from both land and open water (15-47m from water in one study). Nests are normally found in freshwater or brackish reed beds, in other wetlands with tall emergent vegetation and few or no trees, or in tall crops adjacent to a wetland. Of 542 UK nests for which habitat was recorded between 1983-90 and 1995, most nests (86%) were in reed beds, with smaller numbers in arable crops (13%), and the remainder in rough grassland. The reed beds or wetlands can be extensive or small (less than 1 ha in size). They may breed as single pairs or loose colonies in which nests are often only 50–300 m apart (Cramp and Simmons, 1980).

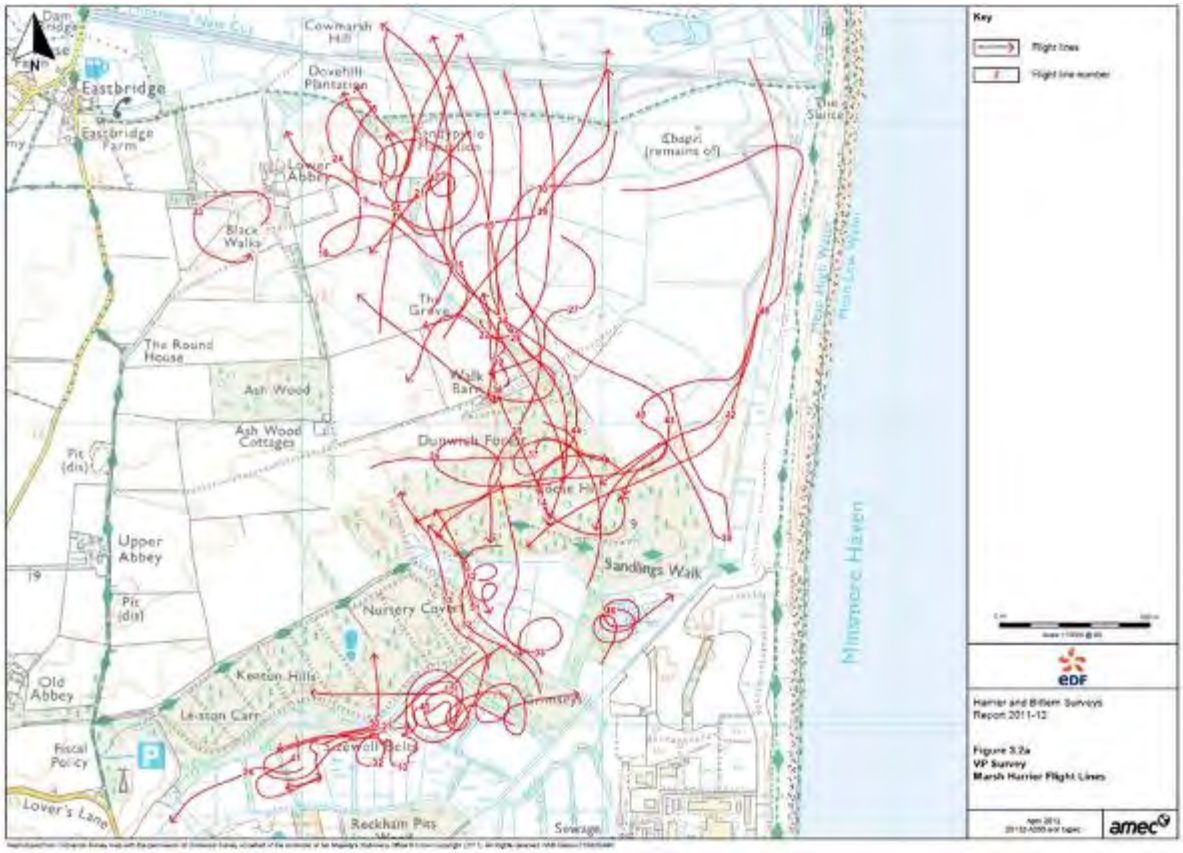

Figure 3 Marsh Harrier flight lines 2011 and 2012

2.2.7 Male marsh harriers defend only the immediate area around the nest, the 'nesting territory', which has a radius of about 100–300 m. In a study in East Anglia, the home range of males varied with the stage of the breeding cycle from 569 ha during courtship to 1,407 ha during the post-fledging period (Underhill-Day, 1990). Males may hunt up to 7 km from their nesting territory. Females have smaller home ranges, but these increase in size when they start to feed young (from 100–1,300 ha).

2.2.8 Marsh harriers hunt over a range of habitats, including reed beds and marshy agricultural land with large numbers of ditches. Marsh harriers feed by flying low, in general less than 3m above the ground, and dropping onto potential prey which includes small mammals, birds and amphibians. However, they do fly significantly

higher, especially when commuting to foraging areas. They are diurnal hunters and are most active at the periods around dawn and dusk.

Disturbance thresholds and behavioural responses to disturbance

Noise disturbance

2.2.9 Hirvonen (2001) conducted a study on a new road being built in Finland and found that the conservation value of adjacent wetlands decreased due to the loss of several wetland habitat specialist species, including marsh harrier, during and after construction of the road. No detailed mechanism for why marsh harrier should have been displaced was provided, but is likely to be related to the increase in noise levels rather than habitat change because the former increased significantly but the latter showed no obvious change.

2.2.10 Extreme tolerance of aircraft and missile bombing was recorded in one study of northern harrier (a North American sub-species of the hen harrier) where a harrier continued hunting during target practice, suspected to be capturing small birds flushed from cover by the bombings (Jackson *et al.*, 1977). The noise levels in the study were in the range 80 - 87 dB (although it is not known what parameter this was used to assess this) and the closest explosions occurred at 60m from the foraging bird.

Human disturbance

2.2.11 Human disturbance of marsh harrier has been shown to be a potential problem during the breeding season, with a study in (Underhill-day, 1984) attributing 8.7% of nest failures to human disturbance.

2.2.12 A study by Fernadez and Azcona (1993) looked in detail at the impacts of human disturbance, with disturbance rates varying from 1-5 disturbance events on weekdays and 50-100 at weekends. Return times following flushing varied from 1-89 minutes. However, breeding success was unaffected when comparing disturbed pairs and undisturbed pairs, indicating that the harriers had a coping mechanism to help offset the effects of disturbance. The chicks from disturbed nests had higher levels of malnutrition, however, suggesting that fledgling survival rates could be lower. There was also evidence that the regular presence of crayfish trappers near to breeding sites caused harriers to become habituated, with only limited displacement. This is thought to be because the crayfish trappers were visiting the same sites each day.

2.2.13 300 – 500m is suggested as an adequate buffer from human disturbance, noting that the reed bed habitat itself in which nests are located would also offer some protection (see Ruddock and Whitfield 2007, for a comprehensive review). Ruddock and Whitfield (2007) do note, however, that some caution in utilising this buffer may be necessary given that the sample size used in the assessment of disturbance effects on this species was low and the difficulty that observers may have in determining disturbance to this species given the habitat constraints imposed by the reeds. The upper buffer value agrees with the distance at which Fernandez and Azkona (1993) made their behavioural observations.

2.2.14 Cardador *et al.* (2011) provided evidence to suggest that marsh harriers show some adaptability to agricultural intensification, and are able to forage in intensive agricultural crops, if they support abundant small mammal prey species. This suggests that the wider landscape around Minsmere/Walberswick, including the

Sizewell estate and surrounding countryside, is likely to be suitable for extensive foraging by marsh harriers. The results of project surveys, focussing on Sizewell Marshes/Minsmere South Levels should be considered in this context.

Lighting disturbance

2.2.15 No information relating to potential disturbance caused by lighting has been identified. However, as marsh harrier is diurnal and typically most active at around dawn and dusk, lighting is considered unlikely to constitute a significant source of disturbance, even in the absence of any lighting mitigation.

Summary of key points from available evidence

- Potentially marsh harrier could breed within Sizewell Marshes, although there is no evidence to date to suggest that they have in recent years. If the Minsmere to Walberswick Marshes SPA population increases, then potentially outlying areas of habitat may become utilised for breeding.
- The levels of activity recorded over Sizewell Marshes, Goose Hill and the western part of Minsmere South Levels (see **Figures 2** and **3**) suggest that these areas are used as a foraging resource throughout the year by birds likely to originate from Minsmere and Walberswick.
- However, the frequency with which birds were encountered in the Sizewell Marshes area (1 sighting every 4 to 5 hours) indicates that this area is not intensively used and provides around 20-25% of the provisioning needs for a single breeding pair (assuming that each sighting constituted a successful foraging trip and based on a provisioning rate of 11-12 prey items per day) (Hardy *et al.*, 2006). This suggests that Sizewell Marshes is unlikely to represent a significant foraging resource for marsh harrier, in the context of the extensive foraging opportunities in the surrounding countryside.
- There is little published work on the disturbance effects due to noise. A single study indicated a potential link between traffic noise from a new road and displacement of marsh harrier from the area, another study indicated hen harrier can habituate to very high levels of anthropogenic noise.
- Breeding birds show some tolerance to disturbance from human activity as evidenced by their continued use of nest sites in areas subject to human presence and exploitation of areas subject to human management (e.g. agricultural production).
- Marsh harriers are diurnal with very little nocturnal activity; therefore construction lighting is unlikely to represent a source of disturbance even in the absence of any mitigation.
- 300 to 500m is suggested as an appropriate buffer from sources of human disturbance – therefore disturbance effects to birds breeding at Minsmere (i.e. north of Minsmere New Cut) and Walberswick Marshes is considered unlikely due to distance from the development site (approximately 1km in respect of Minsmere and over 3km to Walberswick), boundary screening around the construction site, intervening vegetation and screening of nesting sites within reedbed.

Initial assessment conclusions

Sizewell Marshes and Goose Hill

2.2.16 Even if the theoretical 'worst-case' position is taken that, during construction, the combination of human activity, lighting and anthropogenic noise would cause substantial disturbance, such that all marsh harrier activity is displaced from Sizewell Marshes/Goose Hill, it is considered that there would be no significant impact on the designated Minsmere-Walberswick SPA breeding population. The key reasons for this are:

- While Sizewell Marshes is used as a foraging area by marsh harrier, the frequency of use (as observed from survey work) suggests that it is unlikely to provide more than 20-75% of daily requirements for a single breeding pair of birds;
- Marsh harrier are flexible foragers and are likely to forage widely and it is therefore considered likely that the loss of Sizewell Marshes (via displacement due to disturbance) as a foraging resource could be met by resource exploitation elsewhere within their normal foraging range;
- The temporary displacement of Marsh harrier from existing foraging areas within the construction area (i.e. Goose Hill and the arable land) during construction is likely to be off-set to some degree by the arable conversion/habitat creation schemes associated with reptile mitigation and Aldhurst farm. Under these schemes more than 130ha of arable land/plantation woodland will be converted and would provide suitable habitat conditions for populations of marsh harrier prey species (e.g. small mammals); and
- It is likely that any displacement effect would be temporary and last for the duration of the construction phase. At the end of the construction phase, upon implementation of the landscape restoration plan, the foraging opportunities for Marsh harrier will be significantly improved.

2.2.17 Our preliminary conclusion is that in the context of the HRA, it will not be necessary to demonstrate the functionality of buffer zones/wildlife corridors around the site for foraging Marsh harrier because even under the theoretical 'worst-case' assumption of complete displacement from Sizewell Marshes/Goose Hill, significant SPA population level impacts are considered unlikely to arise. However, reasonable endeavours will be made to deliver such corridors subject to the EIA process.

Minsmere and Minsmere South Levels

2.2.18 The evidence indicates that breeding marsh harrier territories are confined to Minsmere (north of the Minsmere New Cut). The lower-lying and wetter western side of Minsmere South Levels is used for foraging. There is also evidence for the occasional use of Leiston drain / other ditches forming linear features.

2.2.19 Visual disturbance, resulting from activities within the Development Site, is considered highly unlikely to arise due to the distance (approximately 1km) of the breeding territories from the Development Site and the screening provided by bunds, retained vegetation and the reeds that marsh harrier nests are located within.

2.2.20 Disturbance resulting from construction lighting within the Development Site is considered unlikely to occur, even without any lighting mitigation, as marsh harrier are diurnal foragers.

2.2.21 Initial modelling of peak noise levels during construction (see **Figures 1-3** in **Annex A**) indicates that levels could reach 55dB at the Minsmere New Cut and range up to 60-70dB over the southern half of Minsmere South Levels. Measurements of peak levels under pre-construction conditions indicate that maximum levels are in the range of 52-62dB at the northern end of Minsmere South Levels. This suggests that peak noise levels during construction, for the scenarios examined, may be similar to peak levels under ambient conditions in that area. The initial implications of these data is that peak noise levels generated during construction may not act as a source of disturbance if of a similar level to existing sources of noise at Minsmere and the northern part of Minsmere South Levels, although it is recognised that the different character of the sound may also be important. In the southern part of Minsmere South Levels, predicted peak noise levels are higher and could exceed existing peak values. However, from the available survey data, this area would appear to be less well utilised for foraging by marsh harrier and any disturbance effect by construction noise is unlikely to be significant at the population level given this low usage and the extensive area available to birds in which to forage. Further survey work will provide additional information on the suitability of this area as a foraging resource. It is also possible that as marsh harrier forage over relatively wide areas, in areas crossed by roads and farmed with agricultural machinery, they are likely to be subject to intermittent peak noise levels that are higher than those in the Minsmere area and may therefore show tolerance to such levels as predicted for the southern part of the Minsmere South Levels.

Overall conclusion

2.2.22 Based on the preliminary measured and predicted peak noise levels it is considered unlikely that conditions within Minsmere and Minsmere North Levels would be altered such that conditions for breeding / foraging marsh harrier would be adversely affected. Additional noise modelling work and the development of a method to better assess the implications of noise levels generated during construction will be advanced as part of the overall assessment process (see Section 2.4).

2.2.23 Available data indicates that the habitats at Sizewell Marshes, Goose Hill and Minsmere South Levels provide a resource for foraging marsh harrier. Flight frequency data suggests that likely rates of provisioning from this area would be unlikely to represent the sole foraging resource for a breeding pair of marsh harrier. The available evidence indicates that marsh harrier demonstrate some tolerance to disturbance effects and flexibility in their foraging behaviour. This suggests that even complete displacement from areas where potential disturbance effects may manifest, particularly away from the Development Site, would be unlikely to occur. When coupled with the additional foraging resource that would be created as part of the habitat creation schemes, to be implemented ahead of commencement of the development as embedded mitigation, it is concluded that any displacement of foraging activity would be unlikely to have an adverse effect at the SPA breeding population level.

2.3 Bittern

Baseline information

National and local population tends

2.3.1 The breeding bittern population of the United Kingdom has shown a dramatic increase since the mid-1990s when the number of booming males recorded was below 25. In 2011 there were 104 booming males in the UK, up from 87 in 2010 and in 2012, 106 booming male bitterns distributed across 53 sites. This significant population increase is attributed to better management of existing reedbeds and the creation of new, large (more than 20 ha) areas of reed bed habitat.

2.3.2 Data from the RSPB indicate that, in 2008, 11 booming males and 7 nests were present at Minsmere Reserve. The nearest nesting location was to the north of Minsmere New Cut, approximately 600m west of the Minsmere sluice. There were 11 booming males at Minsmere in 2011 and 10 booming males with four confirmed nests in 2012. In 2012 there were a total of 25 booming males recorded across coastal sites in Suffolk as a whole (including Minsmere and Walberswick).

2.3.3 From RSPB data for the period 2010-2012, all bittern nests / territories were located to the north of the Minsmere New Cut, the nearest bittern nest being approximately 1km from the northern edge of the Sizewell C Development Site (see **Figure 4**).

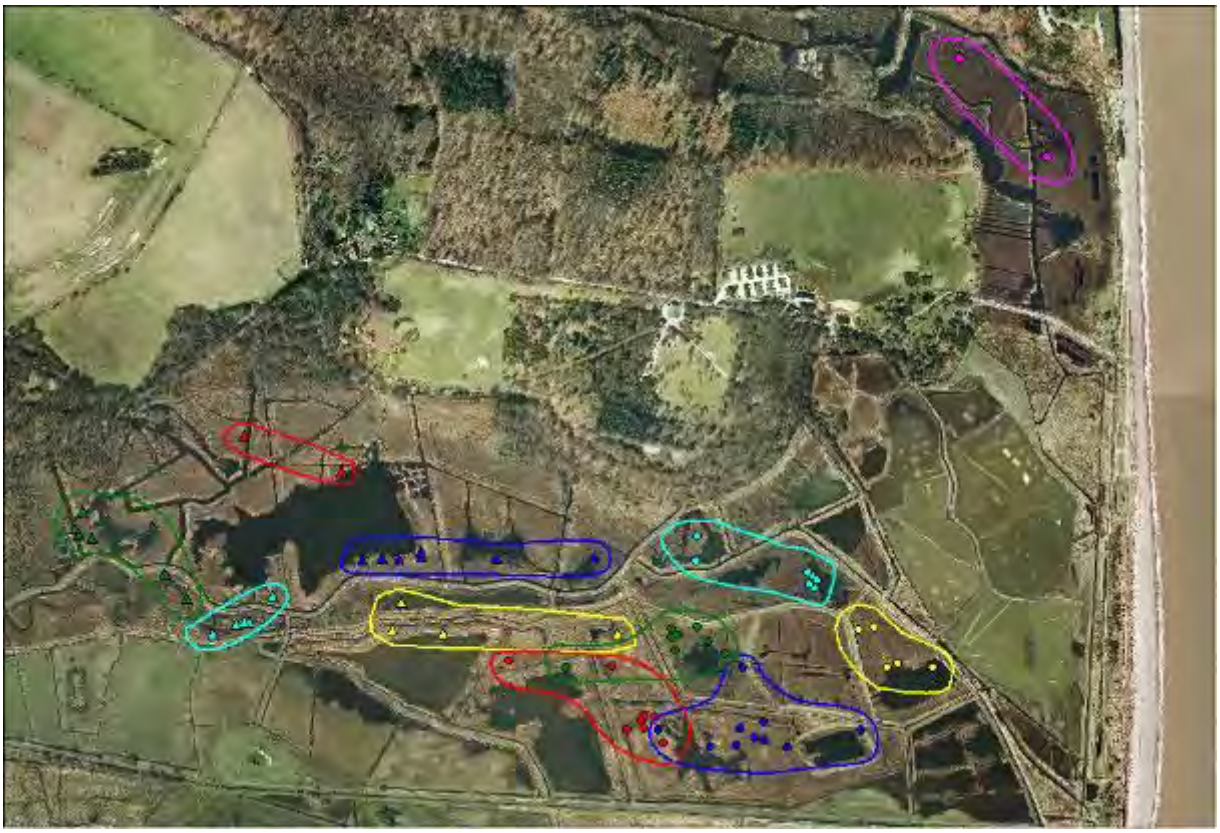

Figure 4 Aerial photograph of the RSPB Minsmere Reserve showing superimposed locations of territories held by male bittern in 2011. Image courtesy of the RSPB

2.3.4 The 2001 SPA review states that the Minsmere-Walberswick SPA supports up to 7 breeding pairs of Bittern, representing at least 35.0% of the breeding population in Great Britain (5 year mean, 1993-1997).

Summary of use of Sizewell Marshes area

2.3.5 A radio tracking study conducted by the RSPB in 2000/01 showed that Sizewell Marshes is used by 'first winter' birds from the Minsmere SPA population. A first-year bird radio-tagged at Minsmere was recorded commuting between Minsmere and Sizewell Marshes. A dead radio-tagged bird was also recovered from a ditch in Sizewell Marshes.

2.3.6 A review of the annual reports produced by Suffolk Wildlife Trust for the Sizewell Marshes reserve shows that bittern are recorded, on average, once or twice annually, suggesting some usage of the marshes, mainly during the winter months. Since 2011, male bittern have been heard booming on the site for 1-3 days each April. In February 2012, a bittern was flushed from the reed bed within the marshes and was heard booming for 4 days in March – however, there is no evidence to suggest that Bitterns have bred within Sizewell Marshes.

2.3.7 Survey work in 2008 indicated that female bitterns breeding at Minsmere (see **Figure 5**) did not provision their young from Sizewell Marshes, but some flights over Minsmere South Levels were recorded (mainly in the northern half of the area where a lot of ditches are located). Survey work in 2011/12 again found that bitterns breeding at Minsmere did not make use of Sizewell Marshes as a foraging resource, but a small number of flight lines over Minsmere South Levels and a single flight over Sizewell Marshes were recorded on the 1st February 2012 (see **Figure 6**). There was no evidence to suggest bitterns were breeding in Sizewell Marshes.

2.3.8 These survey data indicate that Sizewell Marshes is unlikely to be used by foraging bittern during the breeding season, but that it may be used during the winter by young dispersing from Minsmere.

Breeding and wintering ecology

2.3.9 In the UK, male bittern home range size, estimated from the booming location of males, ranges from a few hectares to more than 100 ha (Gilbert *et al*. 2005a). Quantitative information from radio-tracking data on home range size in the UK came from eight radio-tagged males. The average home range size was about 20 ha. Male home ranges are significantly larger during the winter period (Gilbert *et al*. 2005a; White *et al.* 2006).

2.3.10 Bitterns' nests consist of a 30cm platform of reeds and are constructed in standing reed beds. In a UK study, nests were situated in continuous blocks of reed that were on average 2.8 ha in size and 100 m at their narrowest width. These were blocks of reed uninterrupted by ditches or other features, but set within a larger wetland or reed bed site (Gilbert *et al*. 2005b). The nests were on average within 70 m of open water, within 30 m of a ditch and surrounded by water 22 cm deep at the time the first egg was laid. The eggs are laid between mid-March and April.

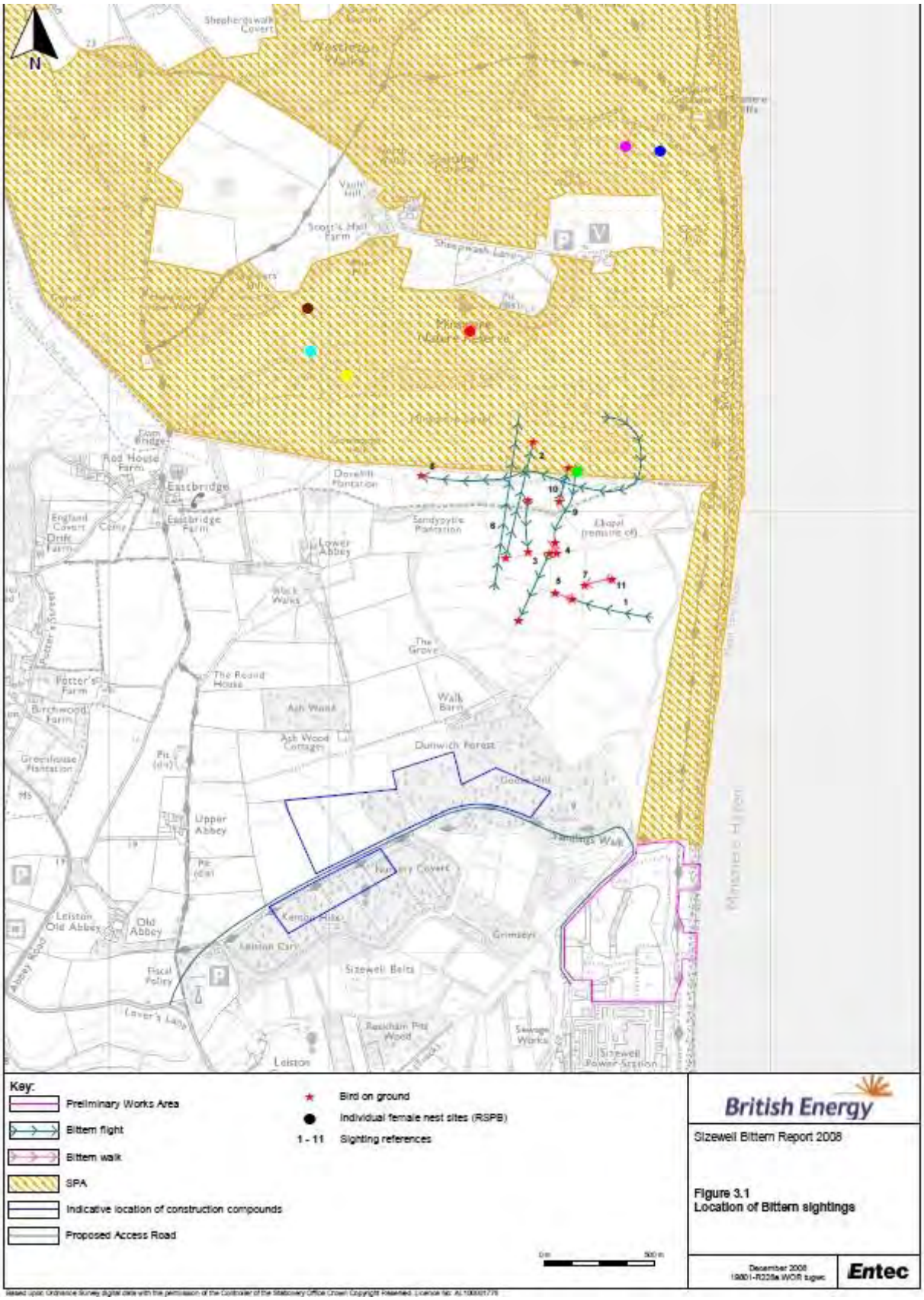

Figure 5 Bittern nesting locations and recorded flight lines in 2008

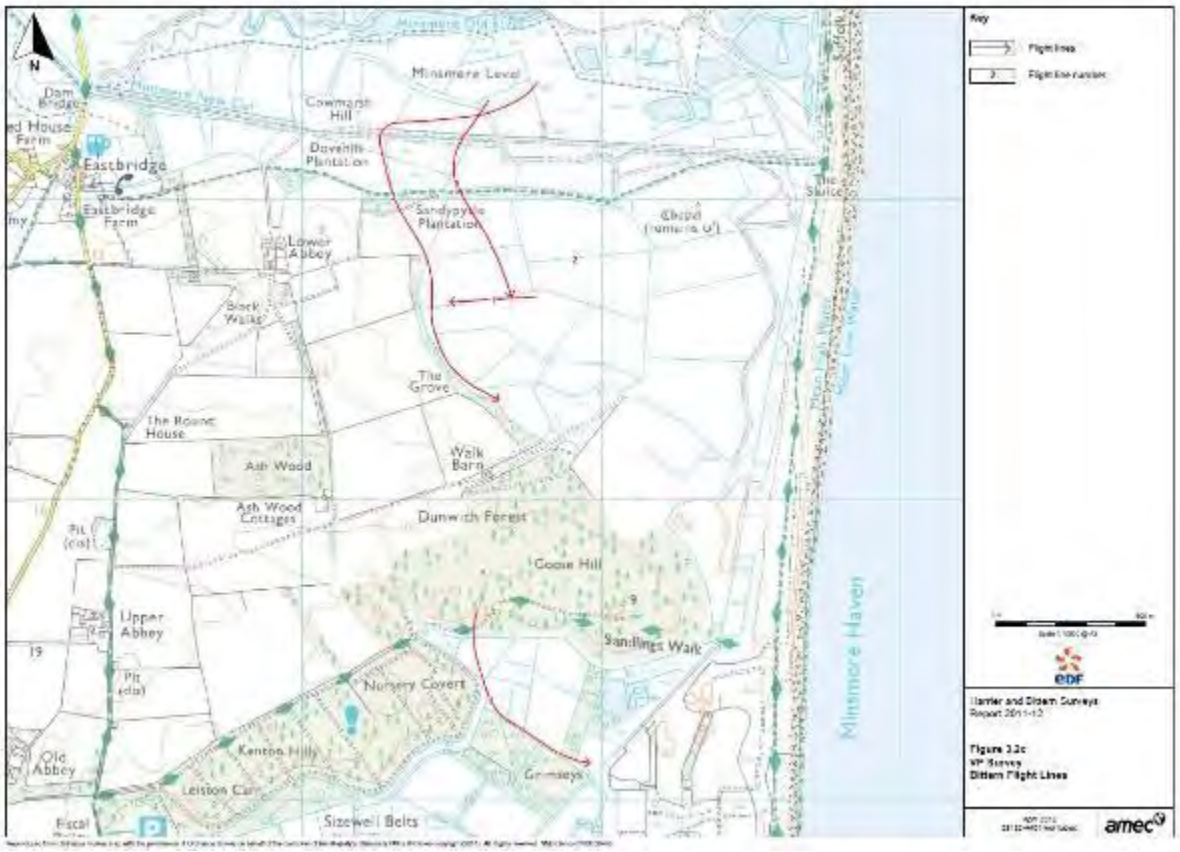

Figure 6 Bittern flight lines recorded during surveys undertaken in 2011 and 2012

2.3.11 Bitterns feed on a range of vertebrates, including fish, amphibians and small rodents. They are mostly found hunting along reed bed margins in shallow water; however, they are also known to forage along marshy ditches/linear features. During the breeding season, feeding flights become more regular, with flights tending to be low, hugging the tops of reed beds at less than 3m above reed bed height.

2.3.12 Bitterns forage during daylight hours. This has been established through observations of captive birds, wild birds and radio-tagging studies. In Italy, 11 radio-tagged males and one female were usually inactive at night. Radio-tagging of male birds in the UK revealed that they were mostly inactive at night (80% of locations recorded no activity, 20% recorded some activity) (White *et al*. 2006).

2.3.13 The UK breeding population of bitterns seems to remain resident through the winter. Territorial males mainly remain on site, youngsters disperse from their natal sites and female movements are relatively unknown. In winter, numbers of bitterns in the UK are boosted by the arrival of birds from the Continent. Radio-tracking studies of young bitterns in the UK have shown that they disperse widely from natal sites, travelling as far 200 km to seek out new sites in their first winter (White *et al*. 2006). Bitterns may roost up to 2 km from their foraging sites and flights back to roosting locations may occur at dusk (Puglisi *et al* 1995, Puglisi 1998 in White *et al.* 2006)

2.3.14 During the winter bittern may utilise rank waterside vegetation at gravel pits, fish farms, reservoirs, ditches, riversides and any other small wetlands. The only criteria seemingly necessary for wintering sites is a source of food with enough emergent vegetation to provide cover.

Sensitivity and behavioural responses to disturbance

Noise disturbance

2.3.15 Hirvonen (2001) conducted a study on a new road being built in Finland and found that birds such as bittern specialising in wetland habitat were the most vulnerable to disturbance. Bird populations were monitored before, during and after the road construction. The results indicated that after the highway had been opened for traffic, the mean conservation value of the wetland bird community in the target area had decreased by 25% compared with the control area. Bitterns were recorded as being displaced and noise disturbance by traffic was considered to be the most likely explanation.

2.3.16 Abundance of breeding wader birds also declined in areas near the highway (within 200m), where the traffic noise level exceeded 56 dB (although it is not known whether this was a measurement of peak or typical levels), but did not change much in areas with lower noise levels (up to 800m away). The noise levels from the road (53-55dB, again, parameter unknown) in areas of wetland habitat utilised by bittern prior to the construction of the road was postulated to have been sufficient to have hindered the females from hearing booming male bitterns so that males moved away from the area although this apparent mechanism was not proven and should be treated with caution. It is not stated in the Hirvonen (2001) paper whether the quoted noise levels are mean or peak values which is an important omission that significantly limits the value of the study in drawing conclusions in respect of the information presented here.

Human disturbance

2.3.17 In 2012, AMEC undertook a review of sites with known, regular wintering bittern populations; the aim was to characterise the land use and, therefore, likely disturbance levels within these areas at the time of the study. This is summarised in **Table 1.1**.

2.3.18 Based on the surrounding types of land use, it is considered that the majority of the case study sites are likely to be subject to some degree of regular disturbance. The Turnford and Cheshunt Pits SSSI site is particularly of note. This site is bordered on two sides by residential development, with the construction works for the Lee Valley White Water Centre, which occurred over the 2009/10 winter period, immediately adjacent to the site's southern boundary. As well as the disturbance from activities in the surrounding area, all these sites are open to visitors, albeit along designated paths and, in some cases, with access to bird watching hides.

2.3.19 Despite the levels of disturbance these sites are likely to be subject to, Barnes WWT, Radipole Lake and Turnford and Cheshunt Pits SSSI, have all recorded bittern every winter since 2001/02 with overall peaks of seven, four and five birds, respectively. This suggests that anthropogenic disturbance of wintering bittern habitat does not necessarily displace them and that some level of habituation to disturbance may be occurring.

Table 1.1 Nature of land use around sites supporting wintering bittern

Site	Agricultural and open land (%)	Residential / commercial development (%)	Industrial areas (%)	Other (%) (land use type in brackets)	Breeding site
Radipole Lake, RSPB	20.2	72.2	2.1	5.5 (Sea)	Booming males have occurred
Barnes, WWT	17.6	67.7		14.6 (River)	No
Marazion Marshes, RSPB	50	28		22 (Sea)	No
Newport Wetlands Reserve, RSPB / CCW	57.7	1.4	20.2	20.7 (Sea)	No
Sevenoaks Wildlife Reserve, KWT	43	55.2	1.8		No
Turnford and Cheshunt Pits SSSI, Lee Valley Country Park	42.5	56.3	0.4	0.8 (Recently developed White Water Centre)	No

Lighting disturbance

2.3.20 No specific data have been identified to indicate the potential effect of lighting on the behaviour of bittern. However, it is apparent from observations of captive birds, wild birds and radio-tagging studies that bittern forage during daylight hours. On this basis it is considered that even without mitigation lighting would be unlikely to act as a source of disturbance to foraging bittern.

Summary of key points from available evidence

- The available data suggests that bittern use Sizewell Marshes, occasionally, during the winter months (i.e. for foraging) and most likely by young birds dispersing from breeding sites.
- Given their habitat requirement it is considered unlikely that Sizewell Marshes is a suitable breeding site for bittern and there is no evidence to date that they have bred there.
- Based on survey work and other data sources there is no evidence to indicate that bittern breeding at Minsmere/Walberswick use Sizewell Marshes to provision their young.
- Survey data indicates that Minsmere South Levels are utilised by bittern for foraging (restricted mainly to the northern half of the area furthest from Sizewell C).
- There is some circumstantial evidence to suggest anthropogenic noise may displace bittern under certain circumstances although from available studies there would appear to be no usable levels which could be applied to determine the specific range/thresholds at which this may arise.

- Bittern are diurnal with very little nocturnal activity; therefore construction lighting is unlikely to represent a source of disturbance, even in the absence of any mitigation.

Initial assessment conclusions

Sizewell Marshes

2.3.21 Even if the theoretical 'worst-case' position is taken that, during construction, the combination of human activity, lighting and anthropogenic noise would cause substantial disturbance, such that all bittern activity is displaced from Sizewell Marshes, it is considered that there would be no significant effects on the designated Minsmere-Walberswick Marshes SPA bittern population (breeding or wintering). The key reasons for this are:

- There is no evidence to indicate that Sizewell Marshes is used to breed or as a foraging resource by bittern during the breeding season;
- Use of Sizewell Marshes by bittern during the winter would appear to be limited and probably largely involves young birds moving away from breeding sites. Post-breeding, birds disperse widely from breeding sites so overall resources available to wintering bittern are significantly greater than those available to breeding birds. There is some evidence to indicate that birds using areas for wintering may tolerate relatively high levels of human disturbance;
- It is likely that any displacement effect would be temporary and last for the duration of the construction phase. The proposed SSSI replacement habitat may create additional habitat suitable for overwintering bittern within a few years of establishment.

2.3.22 Our preliminary conclusion is that in the context of the HRA, it will not be necessary to demonstrate the functionality of buffer zones/wildlife corridors around the site for overwintering bittern because even under the theoretical 'worst-case' assumption of complete displacement from Sizewell Marshes, significant SPA population level impacts are considered unlikely to arise. However, reasonable endeavours will be made to deliver such corridors subject to the EIA process. The proposed SSSI replacement habitat at Aldhurst farm may, in this context, off-set habitat loss.

Minsmere South Levels and Minsmere

2.3.23 The evidence indicates that breeding bittern territories are confined to Minsmere (north of the Minsmere New Cut) and that only limited use of Minsmere South Levels is made for foraging. There is also evidence for the occasional use of ditches / linear features closer to Sizewell C.

2.3.24 Visual disturbance, resulting from activities within the Development Site, is considered highly unlikely to arise due to the distance (approximately 1km) of the breeding territories from the Development Site and the screening provided by bunds, retained vegetation and the reedbed habitat that bittern spend the majority of their time within. As feeding flights tend to be relatively low to the ground, birds potentially moving out over Minsmere South Levels from the Minsmere reedbeds would also be screened from any potential sources of visual disturbance associated with Sizewell C.

2.3.25 As referenced above, monitoring following the development of a new road in Finland found that traffic noise in the range of 53-55dB may have been the cause of the observed displacement of breeding bittern from wetland areas in the vicinity of the new road (Hirvonen 2001). However, it is not known whether these noise levels relate to peak or mean values. Initial modelling of peak noise levels during construction for Sizewell C (see **Figures 1-3** in **Annex A**) indicates that levels could reach 55dB at the Minsmere New Cut and range up to 60-70dB over the southern half of Minsmere South Levels. Measurements of peak levels under ambient conditions in that area indicate that levels are in the range of 55-62dB. This suggests that peak noise levels during construction, for the scenarios examined, may be similar to peak levels under ambient conditions at Minsmere and the northern part of Minsmere South Levels although it is recognised that the different character of the sound may also be important. The initial implications of this data is that peak noise levels generated during construction may not act as a source of disturbance if of a similar level to existing sources of noise at Minsmere and the northern part of Minsmere South Levels. In the southern part of Minsmere South Levels, predicted peak noise levels are higher and could, potentially, be above existing peak values. However, from survey data this area would appear to be rarely utilised by foraging bittern and any disturbance effect (displacement) elicited by noise during construction is considered unlikely to be significant at the population level (for either the breeding or wintering populations of bittern) given this low usage.

Overall conclusion

2.3.26 Based on the preliminary measured and predicted peak noise levels it is considered unlikely that conditions within Minsmere and Minsmere North Levels would be altered such that conditions for breeding / wintering bittern would be adversely affected. Additional noise modelling work and the development of a method to better assess the implications of noise levels generated during construction will be advanced as part of the overall assessment process (see **Section 2.4**).

2.3.27 Available data indicates that the habitats at Sizewell Marshes and Minsmere South Levels provide a limited resource for foraging bittern, as, other than Sizewell Marshes, much of the habitat is not typical of favoured foraging habitat. Use of Sizewell Marshes appears to be largely confined to young wintering birds and there is no indication to date that bittern have bred at Sizewell Marshes. The available evidence indicates that wintering bittern may demonstrate some tolerance to disturbance effects. This suggests that complete displacement from areas where potential disturbance effects may manifest, particularly outside of the Development Site, would be unlikely to occur. SSSI replacement habitat may create additional habitat suitable for overwintering bittern within a few years of establishment. Based on this initial assessment work, it is concluded that any displacement of foraging activity would be unlikely to have an adverse effect at the SPA breeding / wintering population level.

2.4 Further work / evidence requirements

2.4.1 This initial assessment has highlighted a number of uncertainties where further evidence / work is required in order to ensure that a suitably robust assessment of the potential impact of disturbance effects on these two species of birds can be undertaken. These limitations in our current understanding and therefore ability to assess potential impacts can be grouped into two areas: understanding of the sensitivities and ecology of both bittern and marsh harrier in respect of disturbance effects (particularly noise), and the noise levels likely to be generated during construction and the context of such noise levels in respect of existing conditions.

2.4.2 The proposed areas of work and additional information required to deal with these uncertainties in the assessment process are set out below. As the project proceeds, further items of work / studies may be identified that contribute to the assessment:

Baseline data and ecology

- Further survey work to better understand the frequency of marsh harrier foraging flights over Sizewell Marshes and Minsmere South Levels to confirm the importance of each area for foraging.
- Further review of literature to identify any additional information relating to the sensitivities of bittern and marsh harrier to disturbance effects, including any evidence for potential habituation to noise and human activities. In particular, it is proposed to work with the SNCB and the RSPB in order to confirm the availability of published and unpublished studies.

Assessment of disturbance from construction noise

- Survey work to determine noise levels (peak and mean) in areas utilised by both marsh harrier and bittern. Further background noise measurements are required in order to establish a good baseline for the areas used by both species (for breeding and foraging). It is envisaged that this will include further work to confirm foraging activity and relate this to breeding sites as far as possible.
- Further modelling work (of average construction noise to supplement the peak modelling reported herein). It is intended to update this paper once these data are available.
- Establish if noise data are available for any of the sites used by wintering bittern listed in **Table 1.1** in order to help establish noise levels that have the potential to cause disturbance. Consider gathering primary data (i.e. carrying out noise surveys) and other relevant information on these sites if deemed appropriate.
- Determine from the RSPB the nature (timing, location, duration) of any construction / noise-generating activities within their wetland reserves so that the potential noise levels generated during these activities can be estimated and their effects on bitterns/marsh harriers assessed.

3. QUESTIONS AND RESPONSES

3.1.1 In the context of the subject of this topic paper – disturbance effects on the bittern and marsh harrier interests of the Minsmere-Walberswick SPA – questions that NNB GenCo asked the participants in the Evidence Plan process to consider were:

1. In principle, do you agree with the approach to the preliminary assessment work and the assumptions that have been utilised? If you have any concerns, could these please be explained.
2. Do you agree that the initial conclusions reached regarding the possible ecological implications of disturbance effects on bittern and marsh harrier are reasonable in the context of the available project information (as presented)?
3. What is the view of participants on the capacity of the existing wider and proposed new habitat in the vicinity of Sizewell / Minsmere to provide suitable foraging opportunities for marsh harrier and/or bittern?

3.1.2 Responses received are set out in the table that follows (except where the comment related to proposed changes to the text that have been actioned above or did not need to be recorded):

Consultee	Comment	Response
NE	**1. In principle, do you agree with the approach to the preliminary assessment work and the assumptions that have been utilised?** Natural England has concerns with the approach and the assumptions that have been made. We consider that there are significant methodological issues with this approach which is reliant on the frequency of sightings compared to expected prey deliveries, to devise a proportion of a home range affected. Generally, the approach seems to be weaker in relation to marsh harriers (displacement of breeding birds linked to a nest site within the SPA) as opposed to displacement of non-breeding bitterns (which can range much greater distances without such an explicit link to the designated site). Most of the following text relates to marsh harriers (unless specified): The % of a home range affected is high and would almost certainly lead to desertion / nest failure, unless the birds were able to exploit an alternative resource – for which there is no evidence. Owing to overlapping home ranges, it is likely the effect would be spread between more than one pair (potentially reducing effect per pair, but exposing more pairs to that risk). Understanding the usage of an area is useful, but it is very difficult to make accurate predictions based on limited survey effort. We would recommend that the limitations to this approach are more clearly understood, and that it is combined with an approach which quantifies the area of habitat potentially affected and assumes usage where habitat is favourable and within the foraging range of the species in question.	Noted
NE	<u>Clarifying potential displacement area</u> The noise maps are useful – but note that for wintering waterbirds, effects start to be experienced at 55dB(A)max, with worst effects > 70dB(A)max. It would be useful to confirm the area of habitat for SPA birds that falls within buffers encompassed by these noise levels. The use of a 300-500m buffer for marsh harriers is sufficiently precautionary in relation to visual disturbance. As above, these zones	Noted

Consultee	Comment	Response
	surrounding development should be mapped, providing us with a clear agreed figure for the area from which birds could potentially be displaced.	
NE	Clarifying potential barrier effect In additional to displacement, barrier effect is another possible effect of development. A large area of Sizewell Marshes will be separated from the SPA to the north. Many birds will be unwilling to overfly the intervening area. This area must be quantified.	Noted
NE	Clarifying total area of indirect and direct losses A single agreed figure (whether selecting 300m or 500m for visual displacement or the dB(A)max level) has to be the starting point for agreeing impact.	Noted
NE	Monitoring methodology We consider that determining significance in relation to the number of flights observed in relation to the number of flights expected, given a certain amount of usage, is problematic: The number of vantage points (VPs) needs to be clarified; no point within the survey area should fall >1km from a VP. Within a flat landscape with no high points, this could involve a number of locations. In addition, foraging marsh harriers fly low to the ground and are likely to follow linear features, such as hedgerows and ditches. Within a flat landscape, their presence can be screened from an observer by vegetation (even from an observer at a VP within 1km of a bird). Unless there was simultaneous coverage from multiple VPs, then bird movements detected must be interpreted accordingly; movements will represent just a proportion of the site in the time allocated, and not the whole site.	Noted
NE	Timing of counts also needs to be clarified. The significance of sightings is related to the expected number of prey deliveries. During incubation there will be very few prey deliveries / food passes as only the male will be foraging, having to provide for the energetic needs of a sedentary female. During the early phase of chick rearing, enough food is required for small chicks with just the male bird foraging. Later in the chick rearing period, both sexes will forage to provide for older / bigger / hungrier chicks. We need to know timing, duration and also prevailing weather conditions before extrapolating to make predictions about the importance a specific discrete area makes to the wider home range.	Noted
NE	We do not know the outcome of the breeding attempts of the nearest pair(s) and whether or not they were representative during the years' of survey. Also, we do not know the productivity where nests have been successful. There will be inherent differences in provisioning rates between birds as some individuals are simply better providers (regardless of food availability).	Noted
NE	Marsh harriers are a generalist predator and will exploit the most readily available food resource. The location of the most available food resource will change within the home range both within and between years.	Noted
NE	Was any attempt made to identify individual birds? This is often possible amongst a reasonable proportion of individual marsh harriers owing to variation / changes in plumage with age, missing feathers etc.? In our opinion, this would be quite straightforward (where plumage details allow), compared to mapping 100% of activity over quite a large area. This might help to determine whether this was an exclusive home range.	Noted

Consultee	Comment	Response
NE	The impact will have been over-estimated by assuming all foraging attempts were successful. Conversely, the impact will have been under-estimated as it is likely that a proportion of activity was missed. Prey deliveries are potentially much lower than assumed depending on the variables described above. In addition, the situation is potentially more complex than suggested as home ranges of individual birds will overlap.	Noted
NE	**2. Do you agree that the initial conclusions reached regarding the possible ecological implications of disturbance effects on bittern and marsh harrier are reasonable in the context of the available project information (as presented)?** Natural England disagrees that the effective loss of a foraging range from such a small population is not significant. The significance test is designed to be a broad filter which is set at 'low threshold' 'the question is simply whether the plan or project is simply capable of having an effect' (Sweetman, ECJ Judgement).	Noted
NE	**3. What is the view of participants on the capacity of the existing wider and proposed new habitat in the vicinity of Sizewell / Minsmere to provide suitable foraging opportunities for marsh harrier and/or bittern?** Unless the area of direct loss, for which mitigation is being provided, is not in an area utilised by marsh harriers (or suitable habitat for harriers within a foraging range of a nest), then this cannot be mitigation for indirect effects as well. We consider that the mitigation at present does not represent best practice for impacts on marsh harrier and bittern. Natural England would like to see significantly more mitigation to offset the displacement of the proportion of a marsh harrier's home range that is predicted.	Noted
NE	<u>Additional comments</u> The mitigation proposed does not overcome any W&CA Part I / Schedule 1 issues (i.e. disturbance whilst breeding).	Noted
NE	<u>Bittern dispersal</u> Any information about the dispersal of bitterns would be useful to support the conclusions (i.e. evidence to show that, post-breeding, birds are not reliant on this area to the same degree as breeding marsh harriers). RSPB or BTO may be able to supply this information.	Noted
RSPB	With regard to noise levels, we consider that the type of noise should also be considered when determining whether an impact is likely to occur. For example, studies of waterbirds have shown that noise levels of 55-70dB (as projected on the South Levels) can be sufficient to cause disturbance if the sounds are percussive (or impulsive). The statements in paras. 2.1.4 – 2.1.6 indicate that this is likely to be the case, as in all three scenarios hammering and piling noise are considered to be dominant at off-site locations. Further consideration should therefore be given to impacts of percussive noise when determining the level of impact and need for mitigation. We note that in Scenario 3, percussive noise will result from hammering steel at height. We therefore request further detail as to how impacts from this could be mitigated.	Noted
RSPB	In relation to the above, further consideration should also be given to the distinction between natural and anthropogenic noise. We note the discussion of ambient noise levels in para. 2.2.21, and the recognition that the different character of the construction sound (in comparison to ambient noise) may be important. Again, further evidence should therefore be	Noted

Consultee	Comment	Response
	presented to show whether birds are likely to respond differently to noises at similar levels, but of varying types (e.g. percussive versus continuous) or frequencies.	
RSPB	We also consider that lower noise levels could be important depending on the frequency of the emitted noise and would ask that further explanation and/or modelling is provided to show the dominant frequency of noise experienced at different receptor areas. This is of relevance in particular for bittern, as a study has reported that highway noise may have affected the ability of female bitterns to hear to booms of males (para. 2.3.16). For these reasons, we also consider that it would be useful to extend the range of noise levels shown on the noise maps to levels below 55dB, and to extend the modelled area north of the New Cut to provide clarity regarding potential impacts on nesting areas.	Noted
RSPB	With regard to lighting impacts, we consider that there is potential for unmitigated lighting of the construction area to affect dawn and dusk feeding flights in the vicinity, and that this may therefore contribute to the displacement of foraging marsh harrier from Sizewell Marshes.	Noted
RSPB	**2. Do you agree that the initial conclusions reached regarding the possible ecological implications of disturbance effects on bittern and marsh harrier are reasonable in the context of the available project information (as presented)?** The RSPB do not consider it appropriate to agree conclusions at this stage. We are aware that survey work on this topic is ongoing this year and would wish to see the full results and analyses before agreeing or disagreeing with this point. However, we do wish to raise here that the significance of any impact on bittern or marsh harrier should be considered in the context of the qualifying population of the SPA, for example, in para 2.2.16 it is stated that complete displacement of marsh harrier foraging from Sizewell Marshes would not have a significant effect on the population of the SPA. We note that Sizewell Marshes is currently thought to provide 20-75% of the foraging resource for a single pair of harriers, but that some displacement from the South Levels should also be assumed. Given that together these could result in the displacement of c.1 pair from their foraging grounds and that the qualifying SPA population is 16 pairs3, we argue that this should be considered significant and will require mitigation, should these impacts be confirmed by the final analyses.	Noted
RSPB	**3. What is the view of participants on the capacity of the existing wider and proposed new habitat in the vicinity of Sizewell / Minsmere to provide suitable foraging opportunities for marsh harrier and/or bittern?** The RSPB note that if creation of new habitat to mitigate the loss of foraging for bittern and/or marsh harrier at Sizewell Marshes is proposed, it would need to be accessible without the requirement for birds to fly over the construction site. If birds have been displaced from existing habitats by disturbance, we do not consider it a safe assumption that they will fly over construction site to access new areas. We also note that, as raised elsewhere, we consider that mitigation of impacts on bittern and marsh harrier should be treated separately to the compensation proposed for the loss of part of the Sizewell Marshes SSSI.	Noted

Consultee	Comment	Response
SWT	**1. In principle, do you agree with the approach to the preliminary assessment work and the assumptions that have been utilised?** We agree that noise impacts on sensitive receptors need to be assessed based on the likely sources at the site. This assessment needs to take account of both peak and typical noise levels for these sources to ensure that the full range of likely impacts is assessed. In combination assessment of peak and typical noise levels for all possible mixes of sources should also be undertaken to ensure that a full assessment is carried out.	Noted
SWT	**2. Do you agree that the initial conclusions reached regarding the possible ecological implications of disturbance effects on bittern and marsh harrier are reasonable in the context of the available project information (as presented)?** The initial conclusions presented appear to be based on the assessment of a limited amount of data and do not take account of the typical noise levels that will be generated at the site. Nor does the assessment take account of the likely changing value of the Sizewell area as a foraging resource for these species over the life of construction phase. In particular the assessment needs to include the predicted impacts of coastal process on existing marsh harrier and bittern habitat.	Noted
SWT	There is also some uncertainty on the figures presented in the report, paragraphs 2.2.3 and 2.2.4 state that survey work undertaken in 2011/2012 indicates that marsh harriers visited Sizewell Marshes every 3.6 hours (3-4 visits per day) and that this represents approximately 20-75% of the foraging resource of a single breeding pair. However, paragraph 2.2.15 (bullet 3) states that birds were encountered in Sizewell Marshes every 4 to 5 hours and that the area provides around 20-25% of the provisioning needs for a single breeding pair. This discrepancy in provisioning rate is potentially significant and it is unclear which figure has been used to conclude that Sizewell Marshes is unlikely to represent a significant foraging resource for marsh harrier.	Noted
SWT	Paragraph 2.2.15 (bullet 7) goes on to reference a suggested buffer zone of 300-500m to protect nesting marsh harriers from human disturbance. It is our understanding that relates to disturbance by the presence of people (e.g. walkers) and does not relate to anthropogenic noise such as that generated by large scale construction activities.	Noted
SWT	The report also makes a number of references to the 'temporary' displacement of marsh harriers as a result of construction activities (e.g. paragraph 2.2.16 bullets 3 and 4). Given the length of the construction period required (estimated approximately 10 years) and the life expectancy of marsh harriers (typically 6 years) construction could effect multiple generations and have a long term impact on the marsh harrier population.	Noted
SWT	**3. What is the view of participants on the capacity of the existing wider and proposed new habitat in the vicinity of Sizewell/Minsmere to provide suitable foraging opportunities for marsh harrier and/or bittern?** The wider habitat around Sizewell may provide some foraging opportunity for marsh harrier where suitable habitat for prey species exists. However, it appears likely that an important amount of foraging habitat is located within the network of designated sites which are present along the Suffolk coast. Bittern require much more specific foraging habitat and it appears likely that this is largely limited to the existing network of designated sites.	Noted

3.1.3 Following the receipt of the comments detailed above, a meeting was held between NNB GenCo, Hyder Cresswell, Royal HaskoningDHV and Natural England on 27 June 2014 to discuss existing marsh harrier data and ongoing survey work. The Minutes of this meeting follow.

MINUTES OF TELECOM	27.06.14
Issue date	3rd July 2014
Issued by	Mark Lang/Richard Cottle
Subject	**Sizewell C - Marsh Harrier and Bittern**
Client	NNB GenCo (EDF)
Meeting date	27th June 2014
Time	2pm
Location	Telephone Conference
Present	Mark Lang ML (Hyder), Richard Cottle RC (Royal HaskoningDHV) Judith Linnane JL (EDF), Steve Mannings(EDF), Allison Collins AC(NE), Richard Saunders RS (NE).

Item	Comments	Action by
1	ML summarized the survey data that had been collected to date, namely the level of flight activity recorded over Sizewell Marshes and the Minsmere South Levels. Current survey work is aimed at providing additional information on the importance of Sizewell marshes and the Minsmere South Levels as a foraging resource for Marsh Harriers by undertaking the following: • Flight activity over the marshes and south levels, recording flight height and when prey items are being carried, to distinguish foraging activity from other flight activity. • Recording provisioning rates at known nest sites within the Minsmere Reed bed, in order to have a comparison with the level of foraging activity recorded at Sizewell marshes • Vantage points recording flight activity away from the Minsmere reed bed (to the north and west) in order to have a comparison with the foraging activity recorded to the south. ML would produce a report outlining the survey work carried out during 2014 and the results to date.	ML Autumn 2014
2	RS expressed concern at the conclusions that were reached in the evidence plan topic paper, using the marsh harrier survey data from 2008 and 2011 and 2012. In particular, he was concerned that attempting to express Marsh Harrier usage of Sizewell Marshes in terms of percentage of a pairs foraging territory, or a proportion of likely nest provisioning rates was fraught with difficulties. This was because there are inherent uncertainties associated with the survey methodologies and significant variability in the environmental and behavioral variables that influence foraging activity. Basing conclusions on site usage and provisioning, particularly from one season of data, would therefore need to be heavily caveated to the extent that any conclusions would have to be considered with a high level of precaution. RS suggested an alternative approach might be to determine levels of harrier usage (based on survey data) for each area (Sizewell Marshes, Minsmere South Levels and Minsmere Levels), set disturbance thresholds and potential levels of displacement from these areas to calculate a displacement figure (e.g. birds/ha). Available data could be utilized to determine a buffer area around the development site and displacement rates applied to the buffer. The number of birds affected would then need to be assessed in relation to the known breeding population to determine the percentage of birds affected. Information on foraging ranges could be utilized to determine the context of displacement (e.g. in respect of likelihood for birds to obtain prey resources elsewhere if displaced)..	All

3	RS asked a number of questions in relation to proposed mitigation for harriers, to compensate for loss of, or displacement from, areas of foraging habitat. He was concerned that any proposed mitigation areas did not fall within any potential disturbance buffers. In addition, to ensure that habitat mitigation was not being double-counted. It was agreed that following agreement on a suitable methodology for conducting the HRA assessment that the issue of harrier mitigation measures would be revisited. RS also suggested that during construction that the main development site might act as an effective barrier to foraging harriers, as they may not be willing to overfly the site and flying around to the west might involve additional energy expenditure, again preventing harriers from foraging to the south of the Sizewell C development. It was agreed that it would be worthwhile to check whether harriers flying south over the marshes at elevation are carrying prey on outward/return flights. This would provide information on the possible location of breeding birds relative to the development site and, therefore, provide some information on the possible barrier effect that the development site may have in respect of foraging flights.	All
4	RS also raised a number of questions relating to noise levels and noise contour mapping. RS stated that to the best of his knowledge there is no bittern or harrier evidence re noise thresholds and that, on a precautionary basis, EDF should use those thresholds developed for wintering wildfowl. RS considered that harriers/bitterns are likely to be less sensitive to noise levels when foraging although likely to be more sensitive at nest sites during the breeding season.	All
5	RS suggested it would be worth contacting RSPB and or the BTO to ascertain if there is additional background data that can be used to inform the movements of bitterns away from Minsmere during the winter months. If bittern disburse widely during the winter months, then it will be reasonable to conclude that they will be less reliant on Sizewell Marshes during the winter period.	ML
6	It was agreed that once the majority of the marsh harrier survey work was completed (End of July 2014) that another meeting be held at Sizewell to discuss the best approach using the data to inform the HRA assessment. This would cover aspects such as noise modelling, mitigation measures and analysis of the latest survey data. NNB GenCo requested that RS consult with colleagues to determine the applicability of the displacement approach undertaken in respect of marine birds (e.g. red-throated diver) to marsh harrier in order to ensure that a consistent approach is used where appropriate	All RS

4. REFERENCES

AMEC (2012) S-IN049-Harrier & bittern Survey Report 2011-12.

AMEC (2012) Review of Tolerance to Disturbance by Bittern - Draft

Cardador L., Carrete M. and Manosa S. (2011). Can intensive agricultural landscapes favour some raptor species? The Marsh harrier in north-eastern Spain Animal Conservation 14 (2011) 382–390.

Cramp S. & Simmons K.E.L. (1980). Handbook of the Birds of Europe, the Middle East and North Africa. Oxford University Press.

Entec (2008). Sizewell Bittern Report. British Energy.

Fernández C. and Azcona P. (1993). Human disturbance affects parental care of marsh harriers and nutritional status of nestlings. J. Wildl. Manage. 57, 602–608.

Gilbert, G, Tyler, G A & Smith, K W (2005a) Behaviour, home range size and habitat use by male Great Bittern *Botaurus stellaris* in Britain. Ibis 147: 533–543.

Gilbert G, Tyler G A, Dunn C J & Smith K W (2005b). Nesting habitat selection by Bitterns in Britain and the implications for wetland management. Biol. Cons. 124: 547–553.

Hardy et al (2006) Raptors, a field guide to survey and monitoring. The Stationary Office Edinburgh.

Hirvonen H. (2001). Impacts of highway construction and traffic on a wetland bird community, Road Ecology Centre

Jackson, J.A., Schardien, B.J. & McDaniel, T.H. (1977). Opportunistic hunting of a marsh hawk on a bombing range. Raptor Research, 11, 86.

Ruddock M. and Whitfield D.P. (2007). A review of disturbance distances in selected bird species, Natural Research (Projects) for SNH

White G. Purps J. and Alsbury S. (2006). The bittern in Europe: a guide to species and habitat management. The RSPB, Sandy.

Underhill-Day J.C. (1990). The status and breeding biology of marsh harrier *Circus aeruginosus* and Montague's harrier *Circus pygargus* in Britain since 1900. Open University.

ANNEX A PRELIMINARY CONTOUR PLOTS OF PREDICTED PEAK NOISE LEVELS FOR THREE SCENARIOS DURING CONSTRUCTION

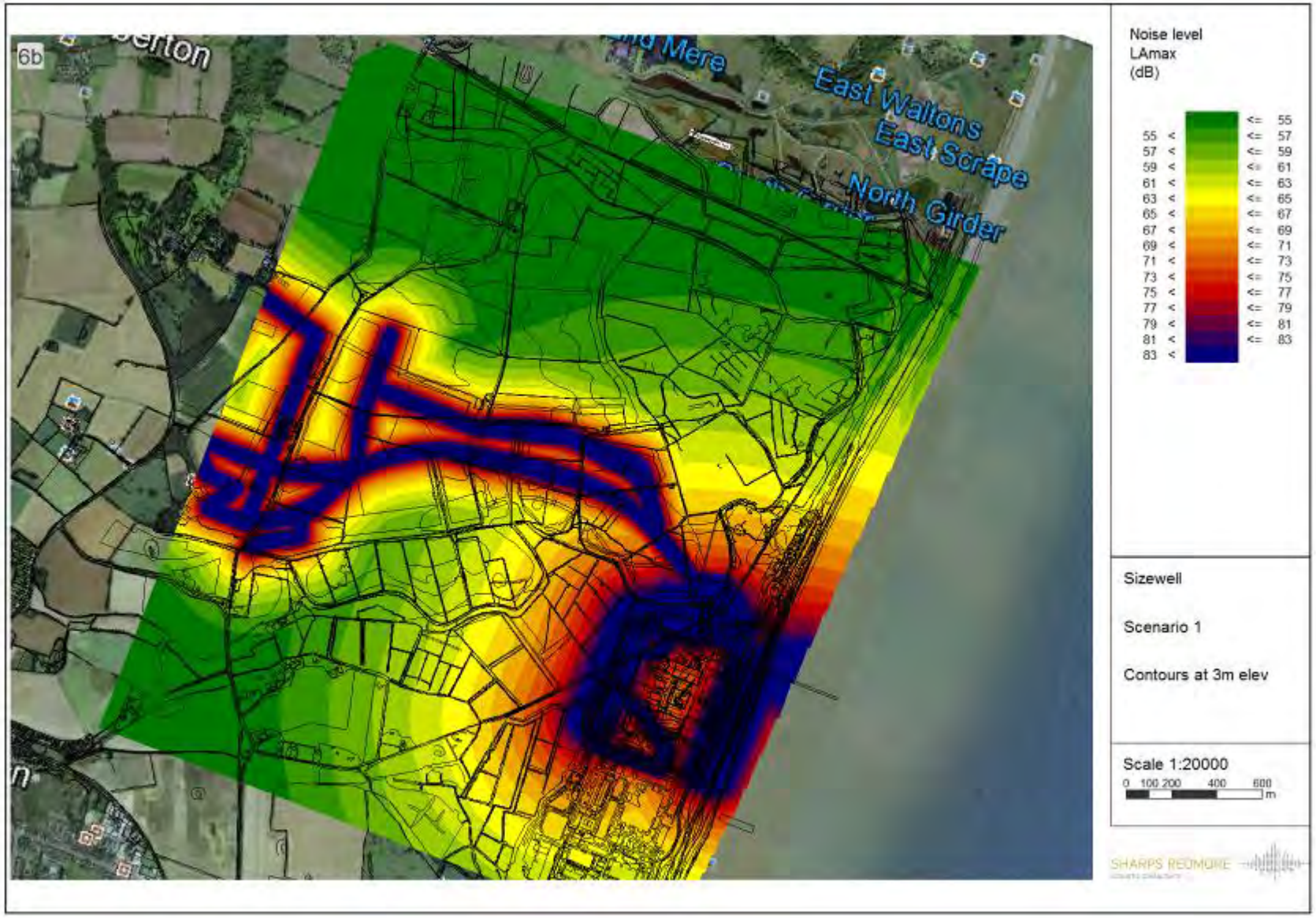

Figure 1 **Scenario 1. Preliminary modelled peak noise levels (LAmax) during initial 6 months of the construction phase for SZC. No earth bunds or acoustic fences**

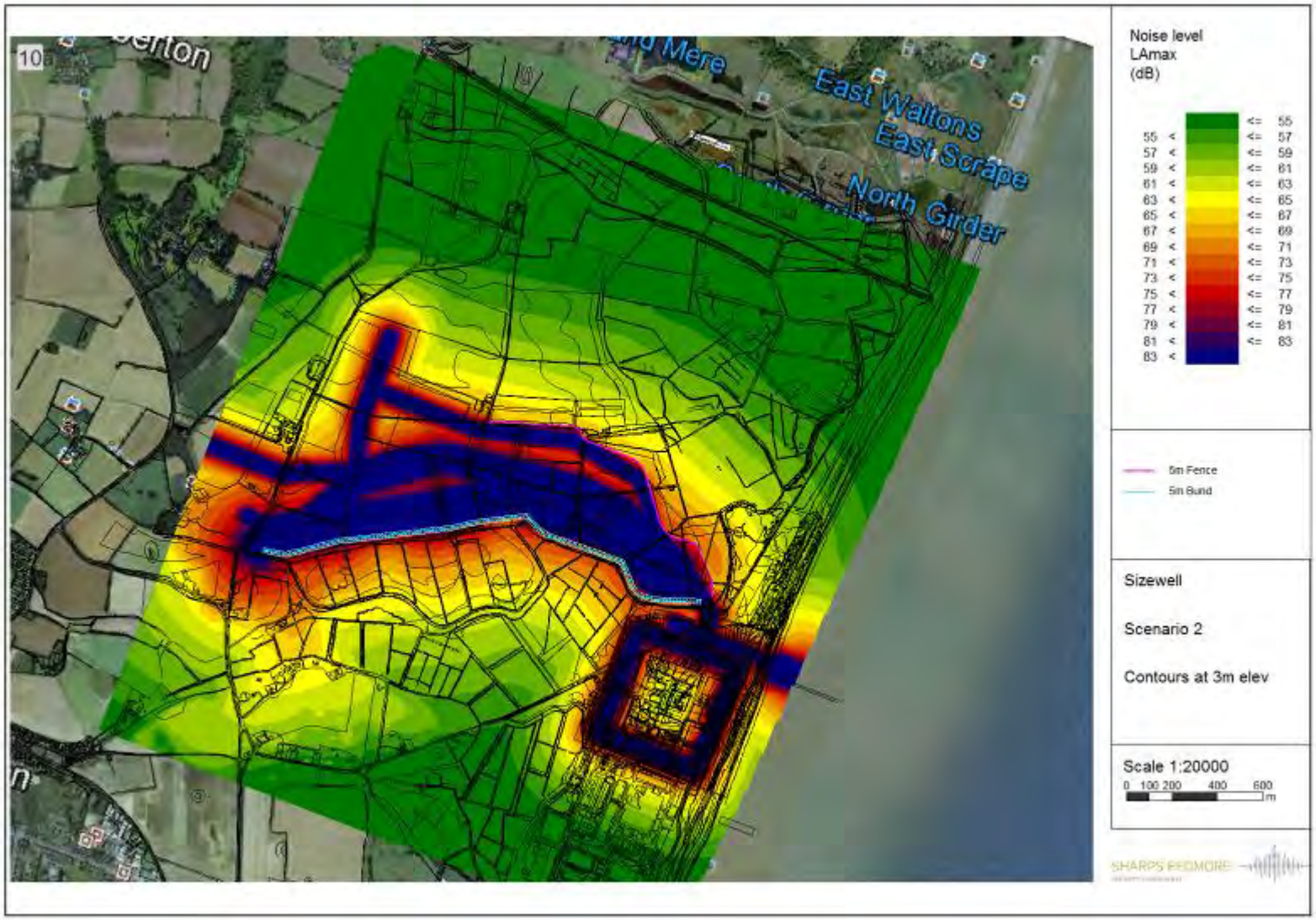

Figure 2 **Scenario 2. Preliminary modelled peak noise levels (LAmax) when dewatering and bulk excavation works within the cut-off wall on the main site platform north of Sizewell B power station would take place. Predicted levels include the incorporation of 5m fence along the north-eastern perimeter of the Main Development Site and a 5m bund along the southern boundary (details of mitigation measures to be reviewed and may change)**

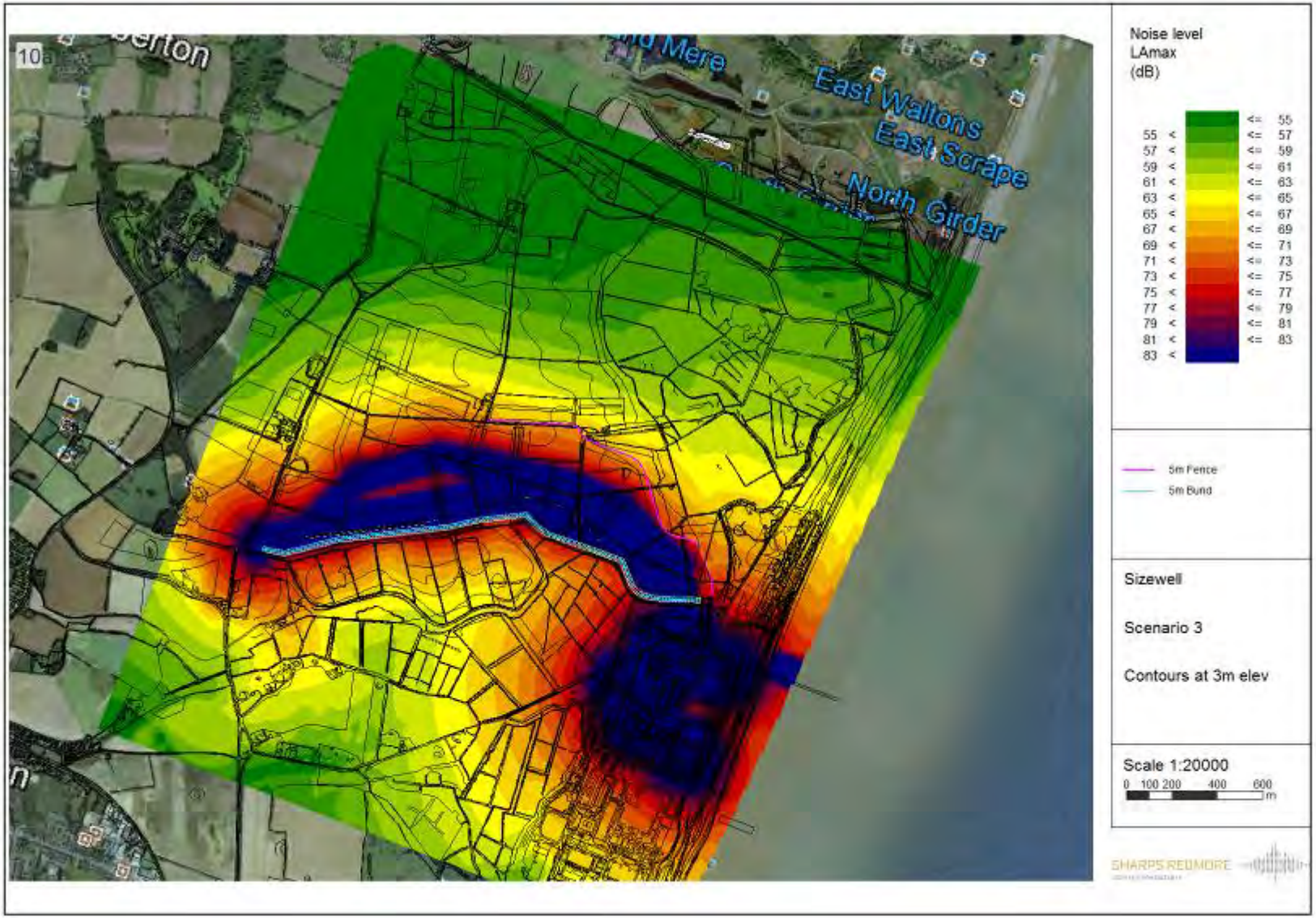

Figure 3 **Scenario 3. Preliminary modelled peak noise levels (LAmax) during peak construction phase and including incorporation of 5m fence along the north-eastern perimeter of the main Development Site and a 5m bund along the southern boundary (details of mitigation measures to be reviewed and may change)**

Appendix 3.3 Groundwater conceptualisation

SIZEWELL C PROJECT HRA EVIDENCE PLAN: GROUNDWATER CONCEPTUALISATION

VERSION 4 - OCTOBER 2014

Important Note: The content of the example case studies is provisional as they represent work in progress which will be completed later in the Evidence Plan process. The example case studies illustrate the complex issues being explored and the types of data and methods being employed. At the end of each case study, preliminary comments from the stakeholders are presented. Any assessments that are provided should be regarded as indicative and preliminary and are subject to more detailed investigation.

NOT PROTECTIVELY MARKED

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1. INTRODUCTION

1.1.1 This paper considers the likely effects of the Sizewell C development on groundwater levels outside of the site, and the extent to which any changes could affect interest features of European sites in the vicinity, in particular the function of existing areas (Sizewell Marshes SSSI to the west of the site and Minsmere – Walberswick Heaths and Marshes SSSI to the north) in relation to the foraging requirements of bittern, and to a lesser extent marsh harrier.

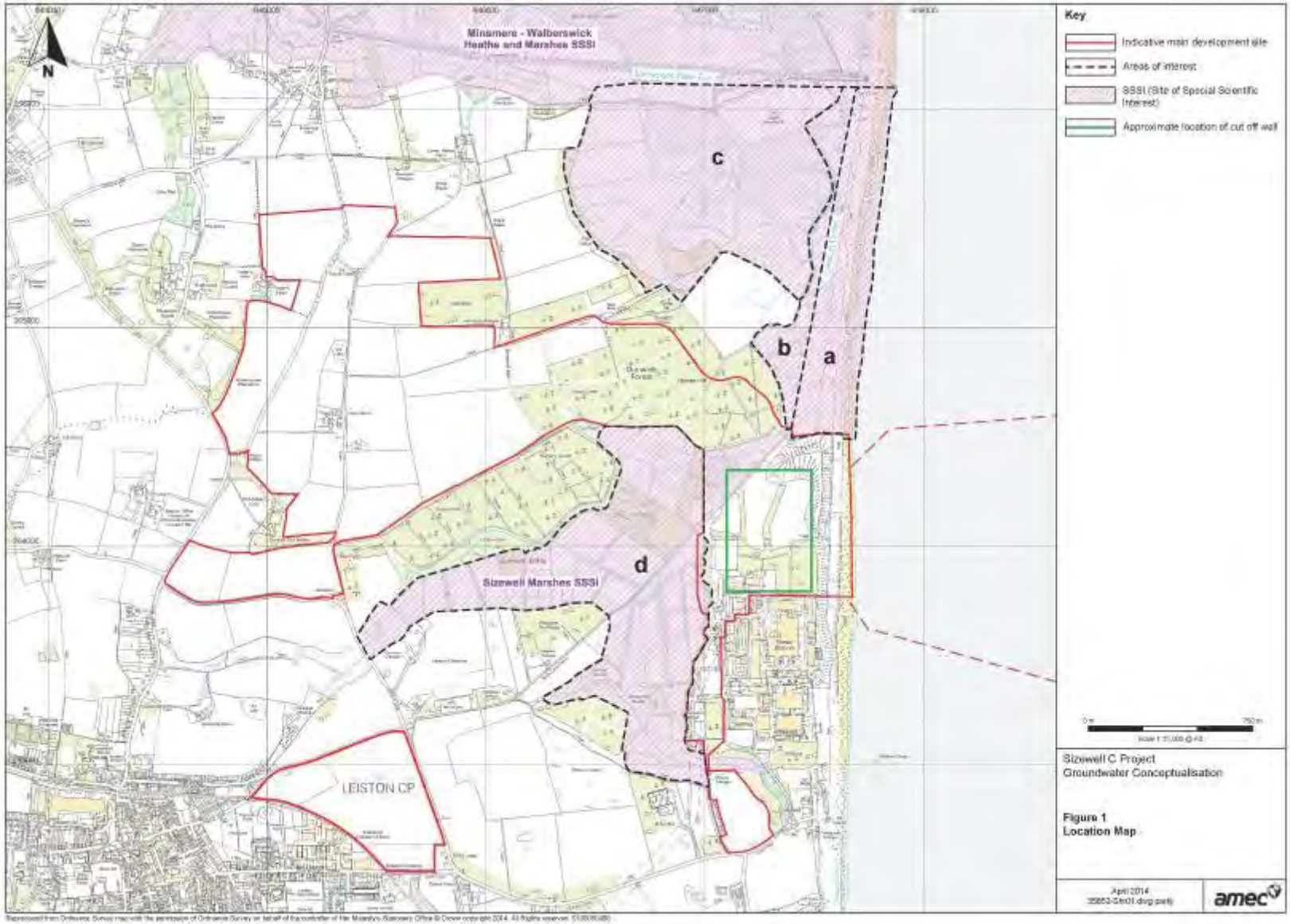
1.1.2 In addition, a preliminary assessment has been made of likely water quality effects associated with predicted changes in water levels.

1.1.3 Four specific areas where changes in water level could potentially affect the habitat for bittern and marsh harrier have been identified, and these are shown on **Figure 1** (Areas a, b, c and d). Changes in water level may be caused by the construction of a cut-off wall around the nuclear and conventional islands, and as a result of changes in infiltration to the ground from development within the construction area, incorporating the campus, potential borrow pit, spoil stockpile areas, site infrastructure and contractors compounds etc.

1.1.4 This technical paper has been prepared to provide a high level conceptualisation of the groundwater/surface water regime and the potential impacts associated with the presence of a cut-off wall and changes in rainfall infiltration across the construction area.

1.1.5 The study has been carried out on a without mitigation basis to provide a conservative assessment of potential impacts, on a precautionary basis.

1.1.6 The final section of this paper includes a list of questions that NNB GenCo asked the participants in the Evidence Plan process to consider, and sets out the responses received.


Minsmere - Walberswick
Heaths and Marshes SSSI
Sizewell Marshes SSSI
LEISTON CP
a
b
c
d
N
Key
Indicative main development site
Areas of interest
SSSI (Site of Special Scientific Interest)
Approximate location of cut off wall
Sizewell C Project
Groundwater Conceptualisation
Figure 1
Location Map
April 2014
amec

2. APPROACH AND METHOD

2.1.1 The activities that are most likely to affect groundwater levels and the groundwater/surface water regime are as follows:

- Construction of a hydraulic cut-off (diaphragm) wall around the proposed nuclear and conventional islands (**Figure 1**). This cut-off wall would be constructed to the base of the Crag and keyed into the underlying clay (at a depth of about 40m below ground level (bgl)) to prevent groundwater ingress into the area where deep foundations and subsurface structures will need to be created. The linear length of the wall (perpendicular to the prevailing regional groundwater flow direction) would be about 500m. Within the cut-off wall dewatering would take place, with groundwater levels with groundwater levels progressively lowered to the base of the deepest foundation depths within the Crag. The cut-off wall would remain in place after construction.
- The cut-off wall would be characterised by a low hydraulic conductivity and would act as a barrier to groundwater flow. Up-gradient of the wall, groundwater levels would be expected to rise, as baseline groundwater flow is towards the east. The unmitigated rise in groundwater levels has the potential to increase groundwater discharge to surface watercourses with an associated potential rise in surface water levels.

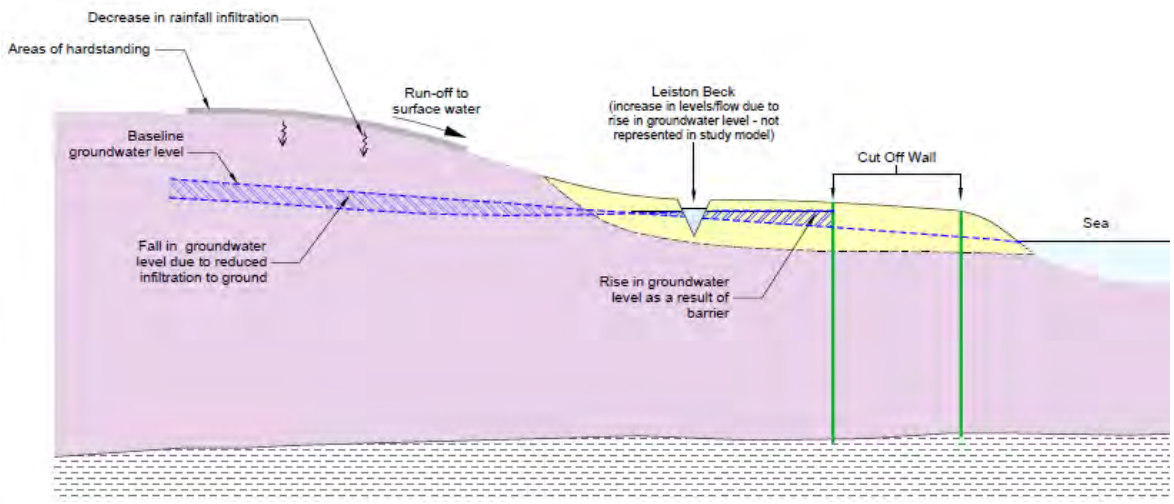


Figure 2 Conceptual section illustrating changes in groundwater level

- The influence of the cut-off wall would be dependent on the length of the wall perpendicular to local groundwater flow and the hydraulic conductivity of the Crag. The Crag is characterised by a high hydraulic conductivity (~20 m/d), which would facilitate flow around the barrier created by the wall (and hence limit the rise in groundwater levels). Surface watercourses and drains (existing and proposed) which are in hydraulic continuity with groundwater would also reduce the rise in groundwater levels.
- Around the outside (western edge) and some 20 to 100m from the cut-off wall (western and northern boundaries), a sheet pile wall would also be constructed to a nominal depth of about 10m to provide slope stability (depth/design to be confirmed). This wall would have some effect on groundwater flow, but the likely influence is considered to be small when

compared to the potential effect of the main cut-off wall, nevertheless the effect of this wall has been considered in the assessment.

- Temporary development in the construction area (**Figure 1**) would limit the infiltration of rainfall to the ground, with the potential for a subsequent and temporary fall in groundwater levels. The layout of the construction area and details of the surface water drainage strategy are still to be determined. For this study it has been assumed that infiltration could be reduced by 25, 50 or 100%. Furthermore, it has been assumed that surface water run-off from these areas would be routed to surface water and not to ground e.g. infiltration via sustainable drainage systems. On completion of the construction works, the construction area will be re-instated and infiltration rates would increase.

2.1.2 To support this scoping study a simplified numerical groundwater model (MODFLOW) has been constructed to examine the influence of constructing a cut-off wall on groundwater levels, and of changing the rate of infiltration over the construction area. This is referred to in this report as the 'study model'. The main features of the study model are summarised in **Table 1**.

Table 1 Summary of Study Model Parameters

Model parameter / boundary	Model set up	Supporting information
Eastern boundary	Constant head set at -0.5 metres Above Ordnance Datum (m AOD) to represent the sea	
Western boundary	General boundary set at 4m AOD	Estimated from groundwater level data for the area (AMEC, 2013).
Northern boundary	Constant head set at 0 to 2 m AOD to represent the Minsmere River	Estimated from Ordnance Survey.
Southern boundary	No flow boundary	Perpendicular to flow direction.
Base of Crag aquifer	Base set at -40 m AOD	Site investigation boreholes.
Hydraulic conductivity	20 m/d Crag 0.5 m/d superficial deposits	Jacobs (2010). The model was set up as two layers to represent Crag and superficial deposits. London Clay set as base of model.
Hydraulic conductivity (cut-off wall)	0.001 m/d for prediction runs	Jacobs (2010). Main cut-off wall fully penetrating. Sensitivity analysis undertaken using lower values (e.g. 0.00001 m/d) and these values did not affect model results. Sheet pile wall also represented within model, note this feature is not fully penetrating.

Model parameter / boundary	Model set up	Supporting information
Aquifer recharge	0.075m/d to 0.2m/d Infiltration reduced by 25, 50 and 100% over the main power station development area for prediction runs	Environment Agency NEAC model. For design and scenario testing.

2.1.3 The power station/construction area lies within the area of the Environment Agency North East Anglian Chalk (NEAC) regional groundwater flow model. NNB GenCo is developing a groundwater model to provide a detailed assessment of the changes in the groundwater and surface water regime associated with the development. Due the time-scale available for this study, it was not practical to use either of these models for this assessment. However, an initial assessment of the effect of the cut-off wall on groundwater levels has previously been undertaken by Jacobs as part of a preliminary site preparation study (Jacobs, 2010). The study indicated that groundwater levels in the Crag could rise by up-to 0.36m (up-gradient of the cut-off wall) and that the area of influence was approximately 1400m by 750m.

2.1.4 It is important to note that the current study is a scoping exercise and the results from the modelling exercise presented here should be regarded as indicative. The study model is based on a simplified conceptual understanding and model representation of the system. For example, the study model does not incorporate the network of drains (e.g. Leiston Beck) which cross the area and which may influence changes in groundwater level, and therefore the predicted changes described in this report are likely to represent an over-estimate and therefore conservative. The model also does not incorporate any mitigation measures e.g. drainage of surface water run-off from impermeable surfaces to infiltration areas or construction of diversion drains around the cut-off wall to intercept and route groundwater around the wall and therefore limit the changes in water level. These simplifications are considered to be reasonable for the purposes of this study, but will be addressed by subsequent detailed modelling to be undertaken in due course. Modelled changes in water level of less than 0.05m are considered not to be significant and likely to be within the uncertainty that could be associated with this simplified model.

2.1.5 The main sources of information that have been used for this study are as follows:

- The Environment Agency NEAC regional groundwater flow model, with respect to the following:
  - modelled groundwater levels for wet (March 2001), dry (August 1991) and average (1994) conditions; and
  - model parameters.
- Baseline groundwater and surface water monitoring (AMEC, 2014).

3. AREA A (SHINGLE DUNE AREA)

3.1 Description

3.1.1 Area A forms a coastal strip between the Sizewell C permanent power station site and Minsmere New Cut. Leiston Beck forms the western boundary to this area. The strip comprises a sand and shingle ridge and beach deposits. The Leiston Beck flows to the north to join the Minsmere New Cut just upstream of Minsmere Sluice. Operation of the sluice can have a significant effect on the water levels in the Leiston Beck and the lower part of Sizewell Marshes SSSI. There are three local drains within Area A, which run less than 200m in length each, and drain directly into Leiston Beck. Reedbeds are associated with the watercourse channels.

3.1.2 The area is underlain by Beach Deposits (Sand and Gravels) with the Crag at depth.

3.1.3 Ground levels vary from about 5m AOD (top of the dunes) to less than 1m AOD in the vicinity of the drains and reedbeds.

3.1.4 There are no groundwater level monitoring points located in this area. The nearest borehole is located just to the south of the area, and groundwater levels in the Crag vary from -0.5 to -0.9m AOD (below sea level). Groundwater levels in the superficial deposits are slightly higher and vary from -0.2 to 0m AOD.

3.1.5 Modelled water levels for the Crag, taken from the NEAC model, indicate that groundwater levels range from 0 (dry conditions) and 0.8 m AOD (wet conditions), but are more typically in the range 0.2 to 0.4m AOD with a typical seasonal variation of about 0.2m.

3.2 Impacts on groundwater levels

Cut-off Wall Alone

3.2.1 Groundwater levels would be expected to rise in the southern part of the area as a result of groundwater flow being diverted around the cut-off wall. The study model indicates a small rise in groundwater levels across the area of less than 0.05m (**Annex A**, Figure A1), but also the potential for a small fall (less than 0.05m) in the southern part of the area as a result of a 'shadow effect' (extending several hundred metres to the north and south) from the cut-off wall (this assumes no reduction in recharge over the main development area). Both modelled changes are considered to be insignificant.

Cut-off Wall and Infiltration Reduction Combined

3.2.2 The study model indicates that the net effect of reducing infiltration by 100% would be to reduce groundwater levels slightly (0.05 to 0.1m) below the southern part of Area A (**Annex A**, Figure A2), but the change is less than 0.05m (i.e. insignificant) if infiltration is reduced by 50% or less (**Annex A**, Figure A3).

Summary

3.2.3 No significant change in groundwater levels is predicted when the cut wall is combined with a reduction in infiltration of 50% or less.

3.2.4 From an ecological perspective, the predicted changes in groundwater levels are considered unlikely to lead to any measurable change in water levels within Area A that would influence aspects such as vegetation characteristics or the physical presence / function of surface water features. This is particularly so given the small-scale nature of the predicted change when viewed within the context of natural and seasonal variations in groundwater levels. It should also be noted that this initial conclusion is based on a conservative non-mitigated scenario using precautionary model assumptions. Measures such as Sustainable Drainage Systems (SuDS) within the Development Site could be used to maintain rainfall infiltration rates and other water level management measures employed within the area potentially affected if so required. On the basis of this preliminary assessment it is concluded that the function of this area in providing a foraging resource to SPA designated bird populations would be unlikely to be affected.

4. AREA B (LAND WEST OF SHINGLE DUNE)

4.1 Description

4.1.1 Area B extends as a strip to the west of Leiston Beck, extending from the Sizewell C permanent power station site to the Minsmere New Cut. The western boundary constitutes a drainage ditch lying within the southern part of Minsmere-Walberswick Heaths and Marshes SSSI, which drains to the north and joins the Leiston Beck near its northern limit.

4.1.2 The area is low-lying and ground levels are typically around 1m AOD. A number of drainage ditches cross the area, and there are a few small open water features (i.e. scrapes).

4.1.3 The area is underlain by Tidal Flat deposits (clay and silt) and Peat, with the Crag present at depth.

4.1.4 A groundwater monitoring point, P13 (peat), is located in southern part of area and indicates that groundwater levels are near-surface (within 0.5m) and typically between 0.4 and 0.6m AOD. Modelled groundwater levels, taken from the NEAC model, are near-surface and typically 0.5 to 1 m AOD, with a seasonal variation of 0.5m. Under drought conditions modelled levels can fall to less than 0.1 mAOD.

4.2 Impacts on groundwater levels

Cut-off Wall Alone

4.2.1 Groundwater levels would be expected to rise in the southern part of the area as a result of groundwater flow being diverted around the cut-off wall. The study model indicates a small rise in groundwater levels across the area of less than 0.05m (**Annex A**, Figure A1). This change is considered to be insignificant.

Cut-Off Wall and Infiltration Reduction Combined

4.2.2 The study model indicates that the net effect of reducing infiltration by 100% would be to reduce groundwater levels slightly (0.05 to 0.1m) below Area B (**Annex A**, Figure A2), but the change is less than 0.05 m if infiltration is reduced by more than 50% (**Annex A**, Figure A3). This change is considered to be insignificant.

Summary

4.2.3 No significant change in groundwater levels is predicted when the cut wall is combined with a reduction in infiltration of 50% or less.

4.2.4 From an ecological perspective, the predicted changes in groundwater levels are considered unlikely to lead to any measurable change in water levels within Area B that would influence aspects such as vegetation characteristics or the physical presence / function of surface water features. This is particularly so given the small-scale nature of the predicted change when viewed within the context of natural and

seasonal variations in groundwater levels. It should also be noted that this initial conclusion is based on a conservative non-mitigated scenario using precautionary model assumptions. Measures such as SuDS within the Development Site could be used to maintain rainfall infiltration rates and other water level management measures employed within the area potentially affected if so required. On the basis of this preliminary assessment it is concluded that the function of this area in providing a foraging resource to SPA designated bird populations would be unlikely to be affected.

5. AREA C (MINSMERE SOUTH LEVELS)

5.1 Description

5.1.1 This area constitutes the southern part of Minsmere – Walberswick Heaths and Marshes SSSI, south of Minsmere New Cut. The area is referred to as the Minsmere South Levels and is an area of grazing marsh that is frequently flooded. The area is low lying (typically 0 to 1m AOD) and crossed by a network of drainage ditches.

5.1.2 The southern boundary of Area C is located approximately 1km to the north of the cut-off wall and at its nearest point is approximately 250m from the main power station development area.

5.1.3 The area is underlain by Tidal Flat deposits (clay and silt) and Peat, with the Crag present at depth.

5.1.4 There are no NNB GenCo groundwater monitoring points within this area, although it is noted that there are some Environment Agency groundwater monitoring points and these indicate that groundwater levels vary between 0.3 and 0.7m AOD.

5.1.5 The NEAC model indicates groundwater levels are near surface (<0.5 depth), and typically vary from 0.5 to 1m AOD across the area, with a seasonal variation of 0.5m

5.2 Impacts on groundwater levels

Cut-off Wall Alone

5.2.1 Due to the distance of this area from the cut-off wall (approximately 1km), groundwater levels would not be expected to be significantly influenced by this structure. This is confirmed by the study model, which indicates a rise of less than 0.05m across most of the area (i.e. insignificant).

Cut-off Wall and Infiltration Reduction Combined

5.2.2 The study model indicates that reducing infiltration by 100% across the main development site could result in a fall in groundwater levels of 0.05 to 0.2 below Area C (**Annex**, Figure A2). For a reduction in infiltration of 50%, the fall is less than 0.05m (**Annex A**, Figure A3), and less than 0.01m for a reduction of 25%. Both predicted changes are considered to be insignificant.

Summary

5.2.3 Construction of the cut-off wall is unlikely to influence groundwater levels below Area C. A fall (0.05 to 0.2m) is predicted if rainfall infiltration is reduced by 100% across the construction area, but this is not a credible scenario. For more realistic scenarios (less than 50% reduction in infiltration), the change is not likely to be significant (less than 0.05m).

5.2.4 From an ecological perspective, the predicted changes in groundwater levels are considered unlikely to lead to any measurable change in water levels within Area C that would influence aspects such as vegetation characteristics or the physical presence / function of surface water features. This is particularly so given the small-scale nature of the predicted change when viewed within the context of natural and seasonal variations in groundwater levels. It should also be noted that this initial conclusion is based on a conservative non-mitigated scenario using precautionary model assumptions. Measures such as SuDS within the Development Site could be used to maintain rainfall infiltration rates such that any project-related influence would be unlikely to be discernible within Area C. On the basis of this preliminary assessment it is concluded that the function of this area in providing a foraging resource to SPA designated bird populations would be unlikely to be affected.

6. AREA D (SIZEWELL MARSHES SSSI)

6.1 Description

6.1.1 This area comprises the Sizewell Marshes SSSI. The area is low-lying and crossed by a network of drains which discharge to the Leiston Beck. Water levels in the drains are controlled by 'stop logs'. Ground levels rise from around 1m AOD in east to 4m AOD in west.

6.1.2 The area is underlain by Peat and Clay (1 to 5m thick) which overlie the Crag.

6.1.3 There is an extensive NNB GenCo surface water and groundwater monitoring network. Groundwater levels in the Crag are near-surface and typically in the range 0.5 to 1m AOD, with a seasonal variation of about 0.5m. Groundwater levels in the peat are similar, but there is a smaller seasonal variation.

6.1.4 The NEAC groundwater model indicates that groundwater levels are near-surface (<0.5m depth), and typically vary from 0.5 to 1m AOD.

6.2 Impacts on groundwater levels

Cut-off Wall Alone

6.2.1 Area D is directly up-gradient of the cut-off wall, and therefore would be expected to show the greatest rise in groundwater levels as a result of its construction.

6.2.2 The study model indicates that groundwater levels would rise by 0.1 to 0.4m below Area D (**Annex A**, Figure A1). The greatest rise, about 0.4m, would occur immediately up-gradient of the cut-off wall, which is consistent with the Jacobs study. In practice, as groundwater levels rise there would be increased groundwater discharge to the surface water drains which would help to reduce the rise in groundwater level.

Cut-Off Wall and Infiltration Reduction Combined

6.2.3 The study model indicates that reducing infiltration by about 50% would partially offset the rise in groundwater level due to construction of the cut-off wall, but overall groundwater levels would still be expected to show a net rise. Reducing rainfall infiltration by 100% would still result in a net rise in groundwater level below the eastern part of Area D, but a fall (up to 0.15m) below the western part of the area (**Annex A**, Figure A2).

Summary

6.2.4 Construction of the cut-off wall would result in a rise in groundwater levels below Area D in the absence of mitigation and not accounting for the moderating effect of any surface water drains. This theoretical worst case effect would be partially offset during construction by reducing rainfall infiltration across the temporary construction area.

6.2.5 The predicted changes in groundwater levels potentially could lead to long-term change in water levels within Sizewell Marshes, particularly immediately up-gradient of the cut-off wall. Within the SSSI, the unmitigated rise in groundwater levels is likely to be of the order to 0.1m. In the context of the overall site, this effect is unlikely to have a material influence on its overall suitability for foraging bittern during the winter. Furthermore it is considered that marsh harrier foraging would not be sensitive to this change. This will be verified through the detailed modelling that NNB GenCo proposes to undertake (inclusive of mitigation and work to determine the potential linkage between groundwater levels and surface flows and the role that Leiston Brook may have in enabling discharge of increased surface water flows from the area) to provide a robust basis for the EIA.

7. SUMMARY

7.1.1 The study has indicated the following:

- Area A: No significant change in groundwater levels is predicted when the cut wall is combined with a reduction in infiltration of 50% or less.
- Area B: No significant change in groundwater levels is predicted when the cut wall is combined with a reduction in infiltration of 50% or less.
- Area C: Construction of the cut-off wall is unlikely to influence groundwater levels below Area C. A fall (0.05 to 0.2m) is predicted if rainfall infiltration is reduced by 100% across the construction area, but this is not a credible scenario. For more realistic scenarios (less than 50% reduction in infiltration), the change is not likely to be significant (less than 0.05m).
- Area D: Construction of the cut-off wall would result in a rise in groundwater levels below Area D in the absence of mitigation and not accounting for the moderating effect of any surface water drains. This theoretical worst case effect would be partially offset during construction by reducing rainfall infiltration across the temporary construction area.

7.1.2 Changes in groundwater level and flow have the potential to affect groundwater chemistry, notably as a result of changes in redox conditions. A fall in groundwater levels could potentially affect shallow groundwater quality due to oxidation of the peat, where present. However for Areas A to C the predicted unmitigated fall in groundwater levels, due to the shadow effect of the cut-off wall, would be highly localised, so unlikely to affect the foraging habitat for SPA designated bird species. The predicted unmitigated rise in groundwater levels within Area D (Sizewell Marshes) is not likely to be accompanied by a significant change in groundwater chemistry because redox conditions within the peat would not be affected.

7.1.3 The findings of this scoping study should be treated as preliminary, as they are based on a simplified, and unmitigated representation of the groundwater system and would need to be confirmed by more detailed studies taking account of embedded mitigation measures. However, it serves to demonstrate that groundwater levels are unlikely to be affected north of Sizewell, towards Minsmere, irrespective of the width of the retained corridor within the Sizewell Marshes SSSI.

7.1.4 The results of this preliminary study indicate that groundwater levels beneath Areas A to C inclusive are unlikely to be significantly affected by Sizewell C and, hence, would be unlikely to influence wetland habitat function to a degree considered of significance in the context of designated European site interests.

7.1.5 Changes within Sizewell Marshes (Area D) may be significant due to the proximity of the site to the cut-off wall. However, even in the context of this modelled, unmitigated change, it is not considered that foraging opportunities for bittern and marsh harrier would be significantly affected (particularly given natural variations). Furthermore, taking into account potential embedded mitigation and water level management measures it is considered that the any effects of changes in groundwater levels could be managed to ensure that overall functionality with regard to the provision of foraging habitat for wintering bittern could be maintained.

7.1.6 Further studies will be undertaken to examine the linkages between possible groundwater and surface water levels, and to determine the likely ecological implications within Sizewell Marshes.

8. QUESTIONS AND RESPONSES

8.1.1 In the context of the subject of this topic paper – groundwater conceptualisation – questions that NNB GenCo asked the participants in the Evidence Plan process to consider were:

1. In principle, do you agree with the approach to the preliminary modelling work and the assumptions that have been utilised? If you have any concerns, could these please be explained.
2. Do you agree that the initial conclusions regarding possible ecological implications for bitterns and marsh harriers are reasonable in the context of the outputs of the modelling work as presented?
3. Based on your knowledge of the Sizewell area, do you consider that the predicted changes in groundwater water levels (for the unmitigated scenario) could be managed to ensure that existing wetland functionality for bitterns and marsh harriers is maintained?

8.1.2 Responses received are set out in the table that follows (except where the comment related to proposed changes to the text that have been actioned above or did not need to be recorded):

Organisation	Comment	Response
EA	We have made the assumption that the conceptualisation report describes the potential impacts on bittern and marsh harrier feeding and breeding areas only. The conceptualisation, as submitted, is not considered sufficiently robust for any other conclusion. Our comments, based on impacts on the feeding and breeding areas only, are given below.	Assumption is correct
EA	<u>Figure 1 Location Map.</u> We have concern that there could potentially be a large impact on levels between Area A/B and Area D. We would expect to agree the areas that are to be assessed, and recommend an additional area - or extension to Area D - is included in the conceptualisation. This area could be brought into consideration by including impacts to the north of the development.	Changes in groundwater levels were modelled for the area between Area D and Areas A/B, as illustrated by the figures in Annex A. However, only areas where there was a potential implication to foraging by bitterns and marsh harriers were considered in the report. Other areas (outside of A, B, C and D) will be considered as part of the wider assessment, but note that to the north of Area D the main effect is likely to be a fall in water level (cut-off wall and reduced recharge) and, for the more likely scenario of a 50% reduction in recharge (with no mitigation), the change in level is less than 0.1m. For a cut-off wall only, rises in groundwater level are predicted but these are less than for Area D and, therefore, the conclusions for this area would apply.
EA	<u>Table 1 Summary of Study Model Parameters</u> There are some strange units used (e.g. –0.5o m), we have assumed these are typos, but would be	Text error has been corrected. The model was also run with a lower value of hydraulic conductivity (0.000001

Organisation	Comment	Response
	grateful for an explanation if this assumption is incorrect. The Hydraulic conductivity at the cut-off wall is high. This is acceptable if the conceptualisation is for post construction impact and no dewatering. However, it is not considered acceptable if the conceptualisation is to be used in the stressed, or dewatered state.	m/d), but this dot affect the model results.
EA	2. Approach and Method 2.1.3 The area of impact is quite significant, at 1400m x 750m, with a maximum increase of 0.36m. We shall need to discuss this further with an aim to reaching agreement.	This text refers to the Jacobs report
EA	2.1.4 We consider the 'trivial' impact of 0.05m acceptable for conceptualisation. However, it will also need to be agreed with Natural England if this approach is to be taken further.	Noted
EA	3. Area A (Shingle Dune Area) 3.2 Impacts on groundwater levels Cut-off Wall Alone 3.2.1 We are concerned that there would appear to be an emphasis on impacts to the southern area, where the existing Sizewell infrastructure exists. We would expect to agree impact on flows to the northern area.	Noted
EA	6. Area D (Sizewell Marshes SSSI) 6.2 Impacts on groundwater levels 6.2.5 As discussed at the evidence plan workshop... a 0.1m change could lead to water balance changes; and therefore water chemistry changes; leading to potential ecological changes; and a related impact on breeding/feeding areas for Bitterns and Marsh Harriers. There is potential for LSE and a possible associated AA.	Additional text added to Section 7.
EA	1. In principle, do you agree with the approach to the preliminary modelling work and the assumptions that have been utilised? If you have any concerns, could these please be explained. As commented above, we have made the assumption that the conceptualisation report describes the potential impacts on bittern and marsh harrier feeding and breeding areas only. The conceptualisation, as submitted, is not considered sufficiently robust for any other conclusion.	Assumption is correct
EA	2. Do you agree that the initial conclusions regarding possible ecological implications are reasonable in the context of the outputs of the modelling work as presented? In principle, we agree that the initial conclusions are reasonable in the context of the modelling work presented. However, further assessment and analysis will be required to fully understand the ecological implications and so our future comments will be based on this further evidence.	Noted

Organisation	Comment	Response
EA	Q3 Based on your knowledge of the Sizewell area, do you consider that the predicted changes in groundwater water levels (for the unmitigated scenario) could be managed to ensure that existing wetland functionality is maintained? We consider it is difficult to provide assurances on this aspect as Natural England are now requiring a higher level of proof in terms of level and water balance impact and the potential to affect the in-situ chemistry. However based purely on a quantitative groundwater approach (not chemical) there should be a site management and engineering solution that could mitigate for any rise or fall in wetland water levels.	Noted
NE	1. In principle, do you agree with the approach to the preliminary modelling work and the assumptions that have been utilised? If you have any concerns, could these please be explained. In principle, we agree with this approach to preliminary modelling work. However, this is a simplified model and any outcomes must be viewed as preliminary and subject to amendment following further detailed modelling. We do not think it appropriate to extrapolate conclusions relating to marsh harrier and bittern foraging from this preliminary model as there are complex ecological 'pathways' which need to be considered, for example effects on hydrology may have implications for soil and water chemistry, vegetation and prey items for these birds. A key issue for Natural England is the need for a more detailed explanation of the use of 25% 50% and 100% reduction in infiltration for aquifer recharge and further explanation of the conclusions that "No significant change in groundwater levels is predicted when the cut wall is combined with a reduction in infiltration of 50% or less." The model shows that there is unlikely to be significant changes in groundwater levels when infiltration is reduced by 50% in areas A, B and C; we would like more evidence to demonstrate that this is a realistic scenario. We would like to see the data from the model if this is available.	Once details of the construction are available it will be possible to make a more detailed assessment of changes in infiltration
NE	2. Do you agree that the initial conclusions regarding possible ecological implications are reasonable in the context of the outputs of the modelling work as presented? We agree that changes within Sizewell Marshes (Area D) are significant due to the proximity of the site to the cut-off wall. The figure of a rise in groundwater levels of 0.1m to 0.4m within the SSSI is likely to significantly adversely affect the designated features. This demonstrates the need for accurate modelling of the likely changes to hydrology and hydrogeology arising from the installation of the cut-off wall, and other features of the proposed development, in order that the impacts on the SSSI and nearby wetlands and their interest features can	As noted in the report, further more detailed modelling is proposed which will consider mitigation measures

Organisation	Comment	Response
	be done with confidence. As stated above, we consider that it is an over-simplification to conclude that foraging opportunities for bittern and marsh harrier in all areas (A, B, C and D) would not be significantly affected as this will depend on other factors in addition to groundwater level. Therefore, we are not able to agree with the initial conclusions.	
NE	3. Based on your knowledge of the Sizewell area, do you consider that the predicted changes in groundwater water levels (for the unmitigated scenario) could be managed to ensure that existing wetland functionality is maintained? Changes in surface water levels are currently managed effectively within the Sizewell and Minsmere wetlands. The paper states that further work is required to determine the relationship between surface and groundwater levels. However, we are currently unable to say how effective any groundwater management measures would be in maintaining existing wetland functionality.	Noted
RSPB	1. In principle, do you agree with the approach to the preliminary modelling work and the assumptions that have been used? If you have any concerns, could these please be explained. The RSPB note the assumption that a 50% reduction (or less) in infiltration will occur is realistic based on project parameters, but that the layout of the construction area and surface water drainage strategy has not yet been confirmed. We request that further evidence is provided to support this assumption once these details have been confirmed.	Noted
RSPB	Do you agree that the initial conclusions regarding possible ecological implications are reasonable in the context of the modelling work as presented? The RSPB do not agree with the initial conclusions that no significant impact on wetland function or bittern and marsh harrier foraging will be likely. Although we acknowledge that not all the likely impacts are covered here due to the focus on HRA, we note that further details and assessment will be required regarding the impacts on Sizewell Marshes SSSI. In the context of bittern and marsh harrier foraging, we consider that a rise in water levels of up to 0.4m (or up to c.0.5m at the edge of the SSSI based on slide 7 of the presentation) on top of natural variation could significantly affect the habitat type and ability of these species to forage within the SSSI. We also consider that effects on water quality will be relevant to foraging birds (through impacts on prey species) and hence should be considered.	As noted the modelled results are for the unmitigated scenario and further text provided in the report on water quality changes. Also note that the surface water drainage system and its interaction with groundwater has not been incorporated within this preliminary model. The surface water system would be expected to reduce any rise in groundwater level.

Organisation	Comment	Response
RSPB	3. Based on your knowledge of the Sizewell area, do you consider that the predicted changes in groundwater levels (for the unmitigated scenario) could be managed to ensure that existing wetland functionality is maintained (as far as bittern and marsh harrier foraging is required). We consider that if the groundwater level were to rise in line with the worst case scenario, that it may not be possible to mitigate these effects. We also note that potential impacts and possible mitigation for bittern and marsh harrier would need to be considered in-combination with the effects of construction-related disturbance.	Further assessment will be undertaken to examine how rises in groundwater level could be mitigated
RSPB	4. Additional comments The RSPB have serious concerns with the statement in para. 6.2.5 regarding the "role that Leiston Brook may have in enabling discharge of increased surface water flows from this area [Sizewell Marshes]". The RSPB request the provision of further details of this proposal and evidence to show how this may affect the functioning of the Minsmere sluice and the management of the South Levels.	The change in surface water flow will be quantified as part of further studies, but the volumes of groundwater flow are not expected to significant in comparison with surface water flows.
SWT	1. In principle, do you agree with the approach to the preliminary modelling work and the assumptions that have been utilised? If you have any concerns, could these please be explained. We do not agree with the assumptions that have been utilised in the preliminary modelling work. There appear to be a number of variables which are not clearly defined, but which could have a significant impact on the outcomes of the model. For example it is unclear how the differing location of the cut-off wall described in paragraph 2.1.1 (bullet point 4) has been factored in to the model. As acknowledged in the report (paragraph 7.1.3) the findings of the scoping study are preliminary and we expect that the results of more detailed modelling and assessment will be available in due course.	The sheet pile wall has been incorporated into the model as a low permeability barrier in the upper part of the aquifer (report text has been up dated).
SWT	2. Do you agree that the initial conclusions regarding possible ecological implications are reasonable in the context of the outputs of the modelling work as presented? We do not agree that the initial conclusions regarding the possible ecological implications, as presented, are reasonable. No evidence is presented in the report to demonstrate that the predicted hydrological impacts have been used to assess the specific impacts on the named ecological receptors (bittern and marsh harrier). Raising of groundwater levels has the potential to flood out prey species that these species, in particular marsh harrier, rely on. This would reduce prey availability and potentially result in a significant effect on the features for which the European site is designated. It is also noted that the report references three further reports which contain details of ground investigation	Noted

Organisation	Comment	Response
	studies. We have not seen any of these reports and therefore cannot comment on whether the conceptualisation report accurately reflects their findings. Also the plans within the report do not identify the European sites on which impacts are being assessed and the do not feature any keys to identify the colours and styles used. This makes consideration of likely significant effects very difficult.	
SWT	3. Based on your knowledge of the Sizewell area, do you consider that the predicted changes in groundwater levels (for the unmitigated scenario) could be managed to ensure that existing wetland functionality is maintained? We do not consider that sufficient detail about the likely impacts on groundwater levels is available to enable accurate answer of this question. However, the increase in levels predicted in this preliminary report, particularly in 'area d' (Sizewell Marshes SSSI), is of serious concern as it has the potential to significantly alter the habitat within the SSSI.	Note predictions are for the unmitigated scenario

9. REFERENCES

AMEC, 2014. Sizewell C. Groundwater and Surface Water Monitoring - Preliminary Report.

Jacobs, 2010. Sizewell C Excavation and Site Preparation Studies. Stage 1. Final Report.

Structural Soils Ltd., 2009. Factual report on supplementary ground investigation at proposed nuclear development at Sizewell 'C'. Report No. 722201.

ANNEX A PRELIMINARY MODEL RESULTS

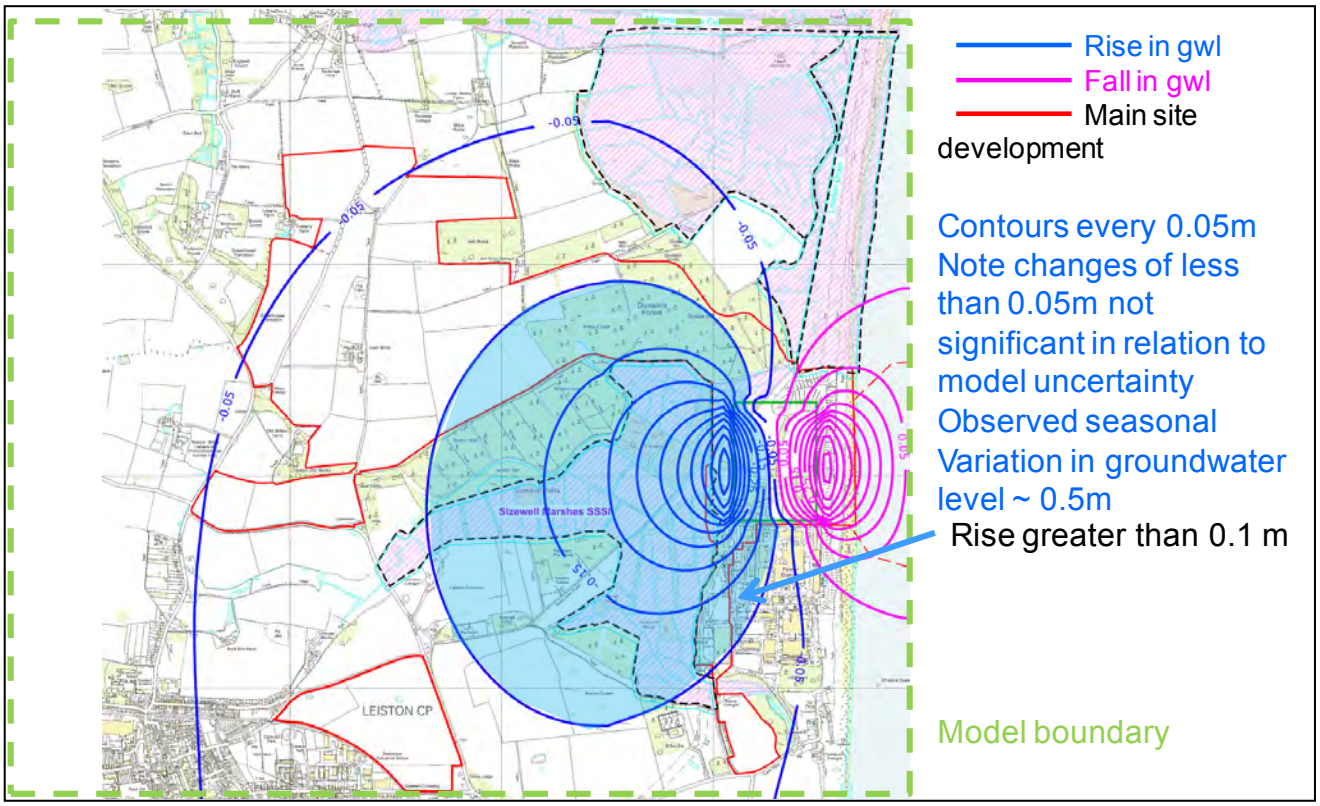


Figure A1 **Change in groundwater levels due to construction of cut-off wall (coloured areas indicate a rise in groundwater levels, blank areas a fall in groundwater level)**

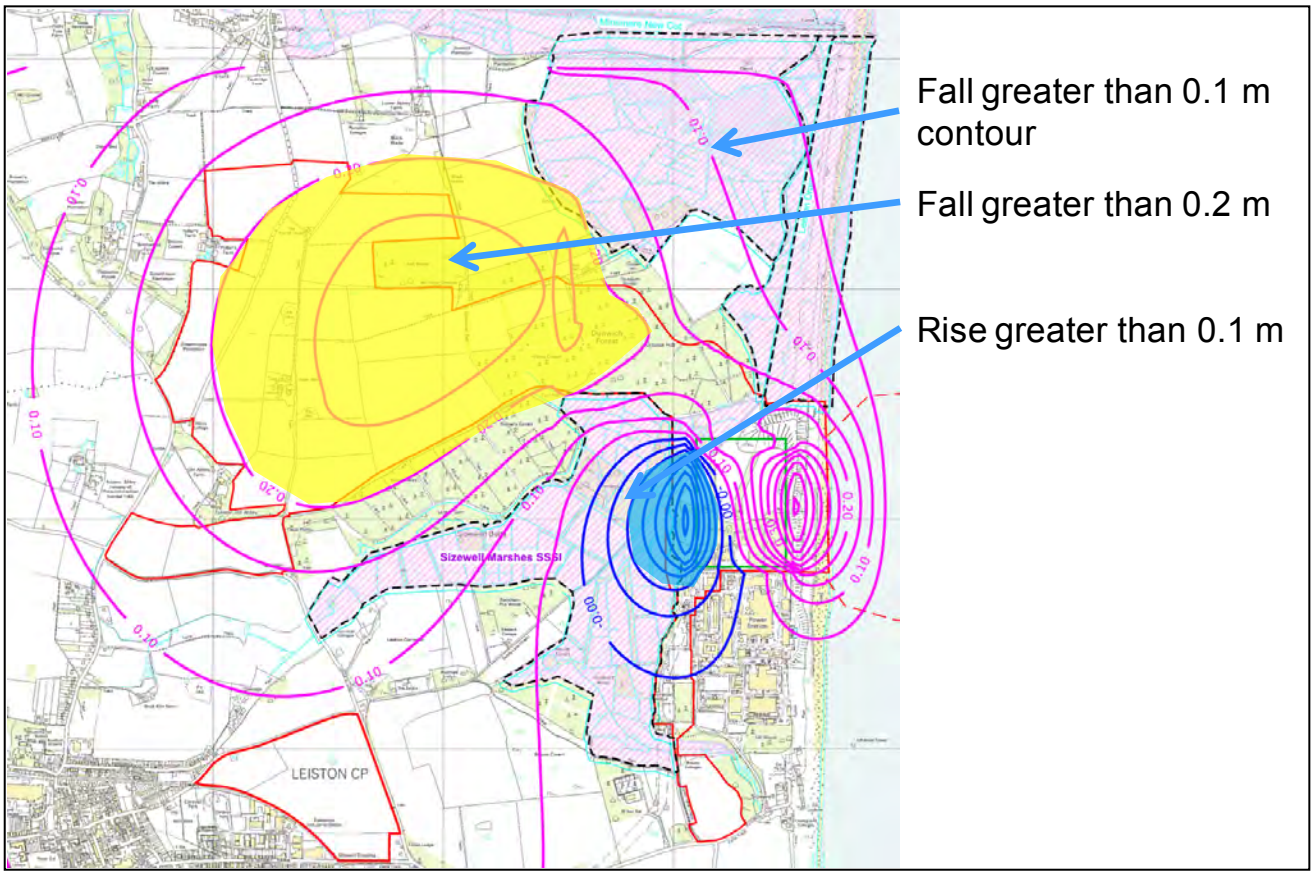


Figure A2 **Change in groundwater levels due to construction of cut-off wall and 100% reduction in infiltration**

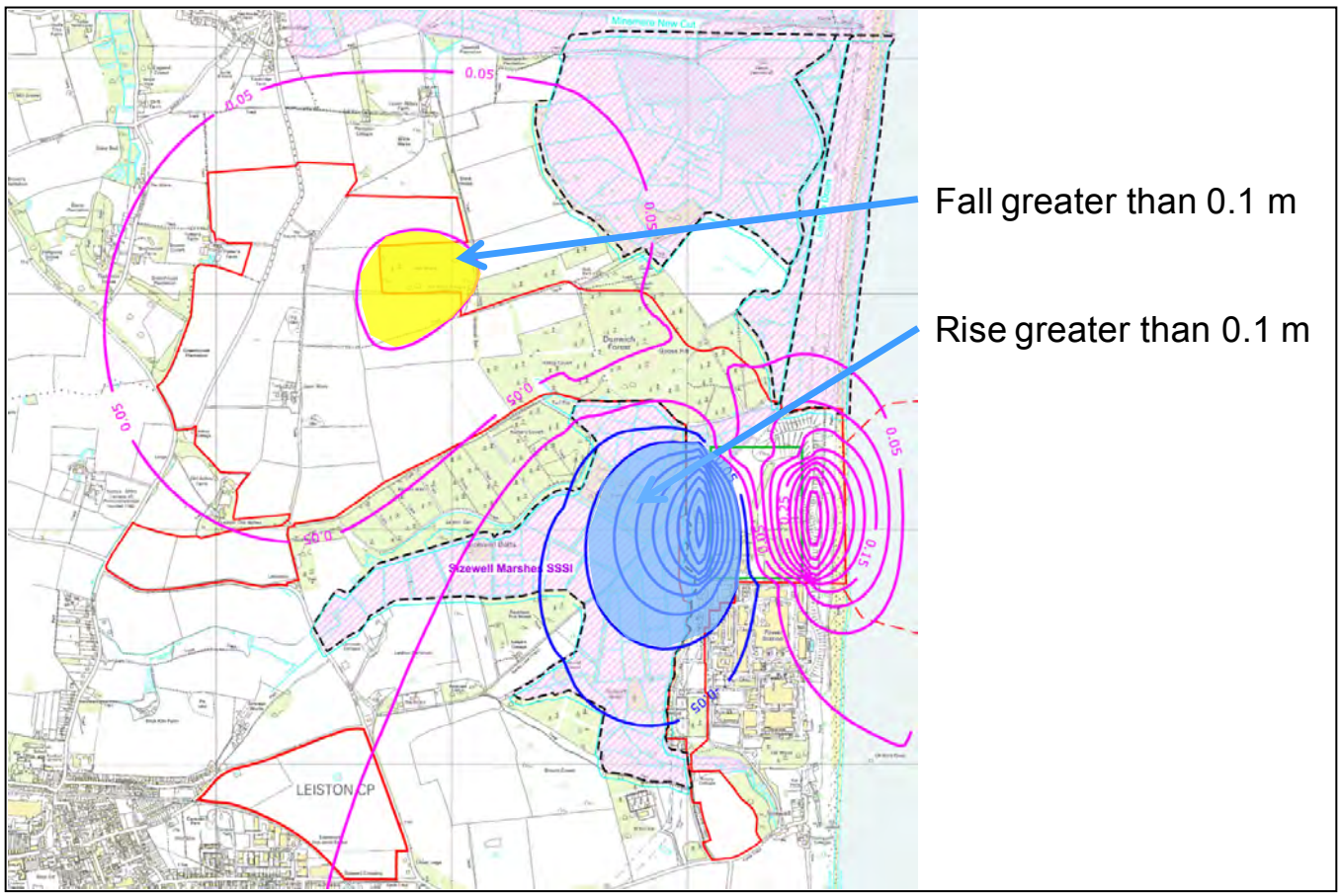


Figure A3 **Change in groundwater levels due to construction of cut-off wall and 50% reduction in infiltration**

Appendix 3.4 Air quality topic paper

SIZEWELL C PROJECT HRA EVIDENCE PLAN: AIR QUALITY TOPIC PAPER

VERSION 3 - OCTOBER 2014

Important Note: The content of the example case studies is provisional as they represent work in progress which will be completed later in the Evidence Plan process. The example case studies illustrate the complex issues being explored and the types of data and methods being employed. At the end of each case study, preliminary comments from the stakeholders are presented. Any assessments that are provided should be regarded as indicative and preliminary and are subject to more detailed investigation.

NOT PROTECTIVELY MARKED

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1. INTRODUCTION

1.1.1 The purpose of this note is to outline the proposed approach to the screening of construction and operational air quality effects on European designated sites as part of the Habitats Regulations Assessment (HRA) for the proposed Sizewell C development. In particular this note will be provided to the Sizewell C Evidence Plan Workshop Group for comment.

2. NOTE STRUCTURE

2.1.1 The note includes the following sections:

- Information sources reviewed and used to inform the proposed approach;
- Identification of European designated sites with the potential to be affected by air emissions from the construction and operation of the development;
- Screening of activities that could give rise to air quality effects and their associated air pollutants;
- Identification of Screening Tools and assumptions to screen out European designated sites from air quality effects from specific activities;
- Discussion of In-Combination Effects and HRA Air Quality Screening;
- Potential Likely Significant Effect (LSE) scoping exercise for air quality (see Section 5 of Volume I of the Evidence Plan for further details);
- Summary of Amber and/or Red Risk Linkages; and
- Outline of the evidence base required to determine Likely Significant Effects (LSE).

3. INFORMATION SOURCES

3.1.1 The source of information reviewed in the preparation of this proposed methodology includes the following documents:

- Draft Site Screening and Consideration of Potential Impact Pathways for Sizewell C – Construction and Operation tables;
- Natural England and Environment Agency comments on Screening and Consideration of Potential Impact Pathways for Sizewell C – Construction and Operation tables;
- Environment Agency (EA), Horizontal Guidance Note H1 – Annex (f) (2011);
- Department for Environment, Food and Rural Affairs (Defra), Local Air Quality Management Technical Guidance 2009 (LAQM.TG(09));
- Institute of Air Quality Management (IAQM), Guidance on the Assessment of the Impacts of Construction on Air Quality and the Determination of their Significance, January 2012, Institute of Air Quality Management;
- Highways Agency, Design Manual for Roads and Bridges (DMRB), Volume 11 Environmental Assessment, Section 3 Environmental Assessment Techniques, Part 1, HA207/07 Air Quality (2007);
- UK Air Pollution Information System (APIS), 2014;
- BSI (1994), BSI, BS6069 (Part 2) (1994), Characterization of Air Quality – Glossary; and
- Environmental Protection UK (EPUK) document 'Development Control: Planning for Air Quality (2010 Update).

4. EUROPEAN DESIGNATED SITES

4.1.1 The European designated sites that have been considered within the air quality screening assessment are consistent with those previously considered within the Site Screening and Scoping Likely Significant Effects Construction and Operation tables for Sizewell C (see Appendix 2, Tables A2.2, A2.3a and A2.3b of the Evidence Plan).

4.1.2 These tables have been developed in conjunction with the Sizewell C Evidence Plan Workshop Group, which includes Natural England (NE), Suffolk County Council (SCC), the Environment Agency (EA), the Royal Society for the Protection of Birds (RSPB) and Suffolk Wildlife Trust; the Group has held three workshops to date.

4.1.3 The identified sites include 17 Special Areas of Conservation (SAC), Special Protection Areas (SPA) and Ramsar sites as listed below. The list also identifies the distance of each site from the Sizewell C Main Development Site.

- Alde-Ore and Butley Estuaries SAC (5km away from the Main Development Site);
- Alde-Ore Estuary SPA (5km away from the Main Development Site);
- Alde-Ore Estuary Ramsar (5km away from the Main Development Site);
- Benacre to Easton Bavents Lagoons SAC (15.5km away from the Main Development Site);
- Benacre to Easton Bavents Lagoons SPA (15km away from the Main Development Site);
- Deben Estuary SPA (>20km away from the Main Development Site);
- Deben Estuary Ramsar (>20km away from the Main Development Site);
- Dew's Ponds SAC (9km away from the Main Development Site);
- Minsmere to Walberswick Heaths and Marshes SAC (adjacent to the Main Development Site);
- Minsmere to Walberswick SPA (adjacent to the Main Development Site);
- Minsmere to Walberswick Ramsar (adjacent to the Main Development Site);
- Orfordness to Shingle Street SAC (8km away from the Main Development Site);
- Outer Thames Estuary SPA (Main Development Site within and adjacent to SPA);
- Sandlings SPA (0.7km away from the Main Development Site);
- Staverton Park and the Thicks SAC (15.5km away from the Main Development Site);
- Stour and Orwell Estuaries SPA (>20km from the Main Development Site); and
- Stour and Orwell Estuaries Ramsar (>20km from the Main Development Site).

5. ACTIVITIES AND POLLUTANTS OF CONCERN

5.1.1 The construction and operation of the Sizewell C Main Development Site has the potential to affect air quality and directly affect sensitive plant species/habitats of European designated ecology sites and also thereby indirectly affect other species reliant upon these sensitive plants/habitats. These supporting habitats may exist inside or outside of the designation, and both require consideration in the HRA.

5.1.2 The study pollutants that are of relevance to European designated habitats and their origin is described below:

- **Dust (Smothering)** - Particulate matter in air is made up of particulates of a variety of sizes, from less than 1 micrometre (µm) in diameter up to more than 100µm, which can be sorted by their 'size fraction', the term used to describe particulates with sizes in a defined range. Each size fraction is associated with different types of impact, as larger particles tend to settle out of the air more readily than finer particles. In this HRA assessment approach, the term 'dust' is used to mean particulate matter in the size fraction 1µm - 75µm in diameter, as defined in BS 6069:1994 (BSI, 1994). Dust deposited in high concentrations can block a plant's ability to receive the sunlight and moisture it requires, smothering the plant/habitat.
- **Toxicity** – Related to dust smothering and where habitats are subject to increased concentrations of toxic metals (e.g. heavy metals) contained within deposited dust.
- **Oxides of nitrogen (NOx)** - Formed as a by-product of high temperature combustion by the oxidation of nitrogen in the air and the fuel, NOx on emission primarily consists of nitric oxide (NO), which is subsequently oxidised in the atmosphere to produce NO_2, as well as small quantities of NO_2 produced directly during combustion.
- **Nitrogen deposition** – Primarily relates to 'dry' deposition of nitrogen onto plants (as opposed to wet deposition through the washout of pollutants in the air by rain) and '*the direct input of atmospheric pollutants onto surfaces or uptake by plants upon contact with the ground*' (APIS, 2014).
- **Sulphur dioxide (SO_2)** - Formed by the oxidation of any sulphur, if present in the fuel, during the combustion process.
- **Acidification** – 'a decrease in pH of surface waters and soils. As soils naturally become acidified over time; acidification generally refers to the enhanced changes due to anthropogenic deposition of sulphur and nitrogen species' (APIS, 2014).
- **Ammonia (NH_3)** - Ammonia is a potential pollutant possibly from the chemical lay-up of steam generators during shut down. Ammonia is a concern with respect to the nitrification, acidification and eutrophication of sensitive habitats, as this can cause the degradation of sensitive habitats.

5.1.3 Table 1 presents a matrix showing which air pollutants may be associated with which construction or operational activities. Shipping and rail emissions are related to construction phase only.

5.1.4 Short term and long term ambient air quality objectives, background concentrations, critical levels, critical loads and deposition rates would be used, as appropriate, for designated sites that are scoped in, taking account of the location and sensitivity of relevant designated features and their supporting habitat.

Table 1 Activity and Study Pollutant Matrix (indicative-to be confirmed in Stage 3 Topic Group meetings)

Activity	Study Pollutants						
	Dust (Smothering)	Toxicity	NOx	Nitrogen deposition	SO_2	Acidification	NH_3
Construction Activities (e.g. Stockpiling)	X	X					
Construction On-Site Plant	X		X	X			
Construction Off-site Traffic *	X		X	X			
Combustion – Commissioning Phase			X	X	X	X	X
Shipping Emissions			X	X	X	X	
Rail Emissions			X	X	X	X	
Operational Traffic			X	X			
Combustion – Operational Phase			X	X	X	X	X

Note: * Trackout of construction dust within close proximity of the Main Development Site only (See Section 6 below).

6. SCREENING CRITERIA

6.1.1 This section outlines the screening criteria that are proposed to identify which activities, pollutants and European designated sites can be screened out of any further assessment, which are denoted as 'Green – No potential LSE is predicted' and those which may require further consideration, which are denoted as either – Orange potential weak pathway / trivial or inconsequential impact or Red – moderate to strong impact pathway / potential Likely Significant Effects (LSE).

6.2 Construction

6.2.1 This sub-section presents the proposed screening criteria for the construction phase.

Dust (Smothering)

6.2.2 At present, there are no statutory UK or EU standards relating to the assessment or control of dust. The emphasis of the regulation and control of demolition and construction dust is therefore typically placed on the adoption of good working practices on site. Development of good design is a process that is informed by impact assessments to avoid the potential for significant adverse environmental effects, through the use of embedded mitigation (e.g. best practice). This approach assumes that any mitigation measures beyond those inherent in the proposed design, that are identified as being necessary in the impact assessment, will be applied during works (possibly secured by planning obligations and/or permit conditions) to ensure potential significant adverse effects do not occur.

6.2.3 Based on IAQM guidance, an assessment is required if there are ecological receptors within 50m of the site boundary or within 50m of the route(s) used by construction vehicles on the public highway, up to 500 m from the site entrance(s).

6.2.4 Given the size and scale of the site construction operations (and therefore potential for construction dust impacts further afield) a distance of 200m has been conservatively used to select receptors from the site boundary instead of 50m. For ecological receptors in areas with particularly high risk of dust generating activities a distance of 350m from the site boundary is proposed to add further conservatism to the assessment for these locations only.

6.2.5 If there are ecological sites within the above distance bands then it is considered necessary to complete a dust assessment at these locations (i.e. either Orange – potential weak pathway / trivial or inconsequential impact or Red - moderate to strong impact pathway / potential LSE.

6.2.6 If the criteria are not met then a site is considered to be 'Green – No potential LSE is predicted'.

Rail Emissions

6.2.7 Stationary locomotives, both diesel and steam powered, can give rise to elevated levels of sulphur dioxide (SO_2) close to the point of emission. Recent evidence suggests that moving diesel locomotives, in sufficient numbers, can also give rise to high NO_2 concentrations close to the track.

6.2.8 There is no specific guidance providing screening criteria to determine the need for a detailed assessment of rail emissions in relation to ecological sites. The screening criteria applied are therefore taken from Defra local air quality management guidance (LAQM.TG(09)). The criteria differ between stationary and moving locomotives and each is presented in turn below:

6.2.9 For stationary locomotives the following approach is taken to determine the need for a detailed assessment:

1. Identify locations where diesel or steam locomotives are regularly stationary for periods of 15 minutes or more.
2. Establish whether there is a potential sensitive receptor within 15m of the stationary locomotives.
3. Obtain information on the number of trains per day that might affect these locations, and the typical duration that they are stationary with their engines running.

6.2.10 If there are three or more occasions a day when there might be a locomotive stationary with its engine running for 15 minutes or more within 15m of sensitive receptors, then it is considered necessary to complete a detailed assessment for SO_2 at these locations.

6.2.11 For moving locomotives, the following steps are taken:

1. Identify sections of track that may have a 'large' number of movements of diesel locomotives.
2. Identify whether the background annual mean NO_2 concentration is above 25 $\mu g/m^3$.
3. Establish whether there is the potential for long-term exposure of a sensitive receptor within 30 m of the edge of the tracks.

6.2.12 If there are any sections of rail line or there is a railhead that meets the above criteria then it is considered necessary to complete a detailed assessment for NO_2 and/or SO_2 at these locations (i.e. either Orange – potential weak pathway / trivial or inconsequential impact or Red).

6.2.13 If the criteria are not met then a site is considered to be 'Green – No potential LSE is predicted'.

Ship Emissions

6.2.14 As with Rail Emissions, there is no specific guidance providing screening criteria to determine the need for a detailed assessment of shipping emissions in relation to ecological sites. The screening criteria applied are therefore taken from Defra local air quality management guidance (LAQM.TG(09)).

6.2.15 Large ships are generally fuelled using oils with a higher sulphur content than road vehicles. If there are sufficient movements in a port they can give rise to 15-minute periods that exceed 266 $\mu g/m^3$, which is the 15-minute objective. Auxiliary engines used while berthed (hotelling) usually use a lower sulphur fuel, and are considered

unlikely to be significant. If the shipping is using fuel with a sulphur content of less than 1% then it will not be necessary to take the assessment further.

6.2.16 The guidance indicates that the following steps should be followed to screen for the need for a detailed assessment:

1. Establish whether there is relevant exposure within:

    a. 250 m; and

    b. 1 km

   of the berths and main areas of manoeuvring.

2. Collect information on the number of ship movements per year.

6.2.17 If there are between 5,000 and 15,000 movements per year and exposure within 250 m, or there are more than 15,000 movements per year and exposure within 1 km, it is considered necessary to complete a detailed assessment for SO_2 (i.e. either Orange – potential weak pathway / trivial or inconsequential impact or Red).

6.2.18 If the criteria are not met then a site is considered to be 'Green – No potential LSE is predicted'.

Construction Traffic Emissions (On-Site and Off-Site)

6.2.19 The Design Manual for Roads and Bridges (DMRB) HA207/07 provides guidance on the assessment of emissions from road traffic sources. The DMRB guidance provides screening criteria for determining affected roads and indicates that impacts from affected roads are likely to be insignificant at receptors beyond 200m of those roads. These criteria have been developed to assist in the identification of potential effects on European designated ecosystems.

6.2.20 The screening criteria for affected roads presented in DMRB include:

- Change in road alignment of 5m or more;
- Change in Annual Average Daily Traffic (AADT) of 1,000 vehicles or more;
- Change in Heavy Duty Vehicle (HDV) AADT of 200 vehicles or more;
- Change in daily average speed of 10 km/hr or more;
- Change in peak hour speed of 20 km/hr or more.

6.2.21 Environmental Protection UK also provide screening criteria for affected roads. The criteria for the identification of significant traffic changes outlined in the Environmental Protection UK (EPUK) document 'Development Control: Planning for Air Quality (2010 Update)' have therefore been considered. The EPUK criteria, which are very similar to DMRB criteria, are listed below:

- Proposals that will generate or increase traffic congestion, where 'congestion' manifests itself as an increase in periods with stop start driving; or

- Proposals that will give rise to a significant change in either traffic volumes, typically a change in annual average daily traffic (AADT) or peak traffic flows of greater than ±5% or ±10%, depending on local circumstances (a change of ±5% will be appropriate for traffic flows within an AQMA), or in vehicle speed (typically of more than ±10 km/hr), or both, usually on a road with more than 10,000 AADT (5,000 if 'narrow and congested'); or
- Proposals that would significantly alter the traffic composition on local roads, for instance, increase the number of HDVs by say 200 movements or more per day, due to the development of a bus station or an HGV park (professional judgement will be required, taking account of the total vehicle flow as well as the change); or
- Proposals that include significant new car parking, which may be taken to be more than 100 spaces outside an AQMA or 50 spaces inside an AQMA. Account should also be taken of car park turnover, i.e. the difference between short-term and long-term parking, which will affect the traffic flows into and out of the car park. This should also include proposals for new coach or lorry parks. These criteria are designed to trigger the requirement for the assessment of traffic on the local roads. It may also be appropriate to assess the emissions from within the car park itself; or
- Large, long-term construction sites that would generate large HGV flows (>200 movements per day) over a period of a year or more.

6.2.22 Where the above criteria are met and there are receptors within 200m of the road, it may be considered necessary to complete a detailed assessment for NO_2 and Nitrogen deposition (i.e. either Orange – potential weak pathway / trivial or inconsequential impact or Red).

6.2.23 If the criteria are not met then a site is considered to be 'Green – No potential LSE is predicted'.

Combustion Emissions - Commissioning Phase

6.2.24 The need to consider point source emissions at European designated sites will be based upon Environment Agency Guidance (H1, Annex F) and the combustion screening criteria utilised by the EA and NE, as presented in Table 2. These indicate that for combined (aggregated) plant of more than 50 MW thermal input rating, ecological sites should be considered up to a distance of 10km from the emissions sources (i.e. either Orange – potential weak pathway / trivial or inconsequential impact or Red), although the approach to be adopted at Sizewell C is to be discussed further with the EA and other stakeholders in the Stage 3 Topic Group meetings. It is noted that for Hinkley Point C, a 15km radius was conservatively assumed for modelling combustion emissions.

6.2.25 If the distance criteria are not met then a site is considered to be 'Green – No potential LSE is predicted'.

6.2.26 It is noted that the assessment of air quality impacts for the Environmental Permits will consider all additional receptors as required in Environment Agency H1 Guidance (details to be agreed).

Table 2 EA and NE Air Quality Screening Criteria

Combined rated thermal input (MWth)[1]	Distance to European site		Basis
	Gas engine combustion appliances[2]	All other combustion plant appliances	
> 50	15 km for coal and oil fired power stations 10 km for all other applications		OI 66_12: Assessing the impact of aerial emissions from new or expanding IPPC regulated industry for impacts on nature conservation
20 – 50	2 km for all applications		Consistency with distances set out for Part B combustion processes in Defra guidance for Part A and Part B installations[3].
5 – 20	1 km	500 metres	Consistency with distances set out for all other Part B installations[3]. Larger boilers in this range are unlikely to be problematic beyond 1 km because of plant and stack design.

6.3 Operation

6.3.1 This sub-section presents the proposed screening criteria for the operational phase and traffic and combustion emissions.

Operational Traffic Emissions

6.3.2 It is proposed that the screening criteria applied to road traffic in the construction phase are also applied to operation phase traffic.

Combustion Emissions – Operational Phase

6.3.3 It is proposed that the screening criteria applied to combustion emissions in the commissioning phase are also applied to operation phase.

[1] Combined rated thermal input should be used to ensure worst-case impacts are assessed

[2] IED/EPR definition of a gas engine is “an internal combustion engine which operates according to the Otto cycle and uses spark ignition or, in the case of dual fuel engines, compression ignition to burn fuel”.

[3] General guidance manual on policy and procedures for Part A2 and B installations, Part B of the manual (http://www.defra.gov.uk/publications/files/env-permitting-general-guidance-b.pdf)

7. IN-COMBINATION EFFECTS

7.1.1 In-combination effects are not considered explicitly as part of as part of this potential LSE scoping exercise, but will be considered in the shadow LSE screening assessment that will be carried out in due course.

8. AIR QUALITY SCREENING MATRIX

8.1.1 Potential LSE scoping has been carried out for the construction and operational phases of Sizewell C in consultation with stakeholders to inform the Evidence Plan.

8.1.2 This section presents the results of the screening exercise disaggregated into the different activities and pollutants described above. In summary:

- No sites are anticipated to meet the screening criteria for rail emissions;
- No sites are anticipated to meet the screening criteria for ship emissions;
- Only the adjacent Minsmere European designated sites and nearby Sandlings SPA require consideration for construction dust smothering and toxic metals;
- Only the adjacent Minsmere European designated sites and nearby Sandlings SPA are currently envisaged to potentially require an assessment of construction traffic;
- Only the nearby Sandlings SPA site and Minsmere European designated sites are anticipated at this stage to require assessment for operational traffic, with this to be confirmed upon receipt of traffic data; and
- Eight sites are considered likely to require detailed assessment for combustion emissions in the commissioning and operational phases.

Table 3: Site Screening and Consideration of Potential Air Quality Impact Pathways for Sizewell C – Construction

KEY

Green – No potential LSE is predicted. Divided into the following categories:

a – No discernible impact pathway. **b** – No direct impact. **c** – Receptor not sensitive to the effect. **N/A** – Not applicable / no pathway (marine vs terrestrial; habitats vs species).

✓ = identified impact pathway

Orange – potential weak pathway / trivial or inconsequential impact.

Red – moderate to strong impact pathway / potential LSE.

Note: No consideration has been given at this stage as to project specific management measures or mitigation to avoid or reduce potential impact likelihood.

Site Name and Features [Descriptions of the effects itemised in the adjacent columns are provided at the end of the table]	Construction Dust Emissions	Construction Traffic Emissions*	Rail Emissions	Shipping Emissions	Commissioning Point Sources Emissions
Alde-Ore and Butley Estuaries SAC					
1130 – Estuaries	a	a	a	a	✓
1140 Mudflats and sandflats not covered by seawater at low tide	c	c	c	c	c
1330 Atlantic salt meadows (Glauco-Puccinellietalia maritimae)	a	a	a	a	✓
Alde-Ore Estuary SPA					
Supporting habitat to SPA designated interests	a	a	a	a	✓

Site Name and Features [Descriptions of the effects itemised in the adjacent columns are provided at the end of the table]	Construction Dust Emissions	Construction Traffic Emissions*	Rail Emissions	Shipping Emissions	Commissioning Point Sources Emissions
Breeding **Avocet** *Recurvirostra avosetta*	b	b	b	b	b
Breeding **Marsh Harrier** *Circus aeruginosus*	b	b	b	b	b
Breeding **Little Tern** *Sterna albifrons*	b	b	b	b	b
Breeding **Sandwich Tern** *Sterna sandvicensis*	b	b	b	b	b
Breeding **Lesser black-backed gull** *Larus fuscus*	b	b	b	b	b
Over winter **Avocet**	b	b	b	b	b
Over winter **Redshank** *Tringa totanus*	b	b	b	b	b
Assemblage qualification: A seabird assemblage of international importance	b	b	b	b	b
Waterfowl assemblage	b	b	b	b	b

Site Name and Features [Descriptions of the effects itemised in the adjacent columns are provided at the end of the table]	Construction Dust Emissions	Construction Traffic Emissions*	Rail Emissions	Shipping Emissions	Commissioning Point Sources Emissions
Alde-Ore Estuary Ramsar					
Ramsar criterion 2 Nationally-scarce plant species and British Red Data Book invertebrates	a	a	a	a	✓
Ramsar criterion 3 The site supports a notable assemblage of breeding and wintering wetland birds	a	a	a	a	✓
Ramsar criterion 6 Species/populations occurring at levels of international importance	a	a	a	a	✓
Benacre to Easton Bavents Lagoons SAC					
1150 Coastal lagoons * Priority feature	a	a	a	a	a
Benacre to Easton Bavents Lagoons SPA					
Supporting habitat to SPA designated interests	a	a	a	a	a
Breeding **Bittern** *Botaurus stellaris*	b	b	b	b	b
Breeding **Little Tern** *Sterna albifrons*	b	b	b	b	b
Breeding **Marsh Harrier** *Circus aeruginosus*	b	b	b	b	b
Wintering **Bittern** *Botaurus stellaris*	b	b	b	b	b

Site Name and Features [Descriptions of the effects itemised in the adjacent columns are provided at the end of the table]	Construction Dust Emissions	Construction Traffic Emissions*	Rail Emissions	Shipping Emissions	Commissioning Point Sources Emissions
Deben Estuary SPA					
Supporting habitat to SPA designated interests Wintering **Avocet** *Recurvirostra avosetta* Wintering **Dark-bellied brent goose** *Branta bernicla bernicla*	a	a	a	a	a
Deben Estuary Ramsar					
Ramsar criterion 2 Supports a population of the mollusc *Vertigo angustior* **Ramsar criterion 6** Species/populations occurring at levels of international importance - **Dark-bellied brent goose**	a	a	a	a	a
Dew's Ponds SAC					
1166 Great crested newt *Triturus cristatus*	b	b	b	b	b
Minsmere to Walberswick Heaths and Marshes SAC					
1210 Annual vegetation of drift lines	✓	✓	a	a	✓
4030 European dry heaths	✓	✓	a	a	✓
1220 Perennial vegetation of stony banks	✓	✓	a	a	✓
Minsmere to Walberswick SPA					
Supporting habitat to SPA designated interests	✓	✓	a	a	✓
Breeding **Avocet** *Recurvirostra avosetta*	b	b	b	b	b
Breeding **Bittern** *Botaurus stellaris*	b	b	b	b	b

Site Name and Features [Descriptions of the effects itemised in the adjacent columns are provided at the end of the table]	Construction Dust Emissions	Construction Traffic Emissions*	Rail Emissions	Shipping Emissions	Commissioning Point Sources Emissions
Breeding **Little Tern** *Sterna albifrons*	b	b	b	b	b
Breeding **Marsh Harrier** *Circus aeruginosus*	b	b	b	b	b
Breeding **Nightjar** *Caprimulgus europaeus*	b	b	b	b	b
Breeding **Shovelor** *Anas clypeata*	b	b	b	b	b
Breeding **Teal** *Anas crecca*	b	b	b	b	b
Breeding **Woodlark** *Lullula arborea*	b	b	b	b	b
Wintering **Avocet**	b	b	b	b	b
Wintering **Bittern**	b	b	b	b	b
Wintering **Gadwall** *Anas strepera*	b	b	b	b	b
Wintering **Hen Harrier** *Circus cyaneus*	b	b	b	b	b
Wintering **Shovelor**	b	b	b	b	b
Wintering **White Fronted Goose** *Anser albifrons albifrons*	b	b	b	b	b
Minsmere to Walberswick Ramsar					
Ramsar criterion 1 Mosaic of marine, freshwater, marshland and associated habitats	✓	✓	a	a	✓
Ramsar criterion 2 Supports nine nationally scarce plants and at least 26 red data book invertebrates	✓	✓	a	a	✓
Ramsar criterion 2 An important assemblage of rare breeding birds associated with marshland and reedbeds	b	b	b	b	b
Orfordness to Shingle Street SAC					
1150 Coastal lagoons * Priority feature	a	a	a	a	✓

Site Name and Features [Descriptions of the effects itemised in the adjacent columns are provided at the end of the table]	Construction Dust Emissions	Construction Traffic Emissions*	Rail Emissions	Shipping Emissions	Commissioning Point Sources Emissions
1210 Annual vegetation of drift lines	a	a	a	a	✓
1220 Perennial vegetation of stony banks	a	a	a	a	✓
Outer Thames Estuary SPA					
Supporting habitat to SPA designated interests	c	c	c	c	c
Wintering /passage **Red-throated diver** *Gavia stellata*	b	b	b	b	b
Cormorant *Phalacrocorax carbo*	b	b	b	b	b
Little Tern *Sterna albifrons*	b	b	b	b	b
Little Gull *Larus minutus*	b	b	b	b	b
Common Tern *Sterna hirundo*	b	b	b	b	b
Sandlings SPA					
Supporting habitat to SPA designated interests	✓	✓	a	a	✓
Breeding **Nightjar** *Caprimulgus europaeus*	b	b	b	b	b
Breeding **Woodlark** *Lullula arborea*	b	b	b	b	b
Staverton Park and the Thicks SAC					
9190 Old acidophilous oak woods with *Quercus robur* on sandy plains	a	a	a	a	a
Stour and Orwell Estuaries SPA					
Breeding **Avocet** *Recurvirostra avosetta*	b	b	b	b	b
Passage **Redshank** *Tringa totanus*	b	b	b	b	b

Site Name and Features [Descriptions of the effects itemised in the adjacent columns are provided at the end of the table]	Construction Dust Emissions	Construction Traffic Emissions*	Rail Emissions	Shipping Emissions	Commissioning Point Sources Emissions
Wintering: **Hen Harrier** *Circus cyaneus*, **Black-tailed Godwit** *Limosa limosa islandica*, **Dark bellied Brent goose** *Branta bernicla bernicla,* **Dunlin** *Calidris alpina alpina*, **Grey Plover** *Pluvialis squatarola*, **Pintail** *Anas acuta*, **Redshank** *Tringa totanus*, **Ringed Plover** *Charadrius hiaticula,* **Sanderling** *Calidris canutus*, **Shelduck** *Tadorna tadorna* and **Turnstone** *Arenaria interpres*	b	b	b	b	b
Internationally important waterbird assemblage	b	b	b	b	b
Stour and Orwell Estuaries Ramsar					
Ramsar criterion 2 Supports seven nationally scarce plants and five British Red Data Book invertebrates	a	a	a	a	a
Ramsar criterion 5 Waterbird assemblage of international importance	b	b	b	b	b
Ramsar criterion 6 Waterbird species/populations occurring at levels of international importance	b	b	b	b	b

Notes:

- * Traffic to be confirmed upon receipt of traffic data and construction drawings.

Table 4 – Updated Site Screening and Consideration of Potential Air Quality Impact Pathways for Sizewell C – Operation[1]

KEY

Green – No potential LSE is predicted. Divided into the following categories:

a – No discernible impact pathway. **b** – No direct impact. **c** – Receptor not sensitive to the effect. **N/A** – Not applicable / no pathway (marine vs terrestrial; habitats vs species).

✓ = identified impact pathway.

Orange – potential weak pathway / trivial or inconsequential impact.

Red – moderate to strong impact pathway / potential LSE.

Note: No consideration has been given at this stage as to project specific management measures or mitigation to avoid or reduce potential impact likelihood.

Site Name and Features [Descriptions of the effects itemised in the adjacent columns are provided at the end of the table]	Operational Traffic Emissions*	Operational Point Sources Emissions
Alde-Ore and Butley Estuaries SAC		
1130 – Estuaries	a	✓
1140 Mudflats and sandflats not covered by seawater at low tide	c	c
1330 Atlantic salt meadows (Glauco-Puccinellietalia maritimae)	a	✓

[1] Assumptions: MOLF removed; beach landing facility (BLF) in place above high water; outfalls and intakes in place; coastal hydrodynamic effects local to the site.

Site Name and Features [Descriptions of the effects itemised in the adjacent columns are provided at the end of the table]	Operational Traffic Emissions*	Operational Point Sources Emissions
Alde-Ore Estuary SPA		
Supporting habitat to SPA designated interests	a	✓
Breeding **Avocet** *Recurvirostra avosetta*	b	b
Breeding **Marsh Harrier** *Circus aeruginosus*	b	b
Breeding **Little Tern** *Sterna albifrons*	b	b
Breeding **Sandwich Tern** *Sterna sandvicensis*	b	b
Breeding **Lesser black-backed gull** *Larus fuscus*	b	b
Over winter **Avocet**	b	b
Over winter **Redshank** *Tringa totanus*	b	b
Assemblage qualification: A seabird assemblage of international importance	b	b
Waterfowl assemblage	b	b
Alde-Ore Estuary Ramsar		
Ramsar criterion 2 Nationally-scarce plant species and British Red Data Book invertebrates	a	✓
Ramsar criterion 3 The site supports a notable assemblage of breeding and wintering wetland birds	a	✓

Site Name and Features [Descriptions of the effects itemised in the adjacent columns are provided at the end of the table]	Operational Traffic Emissions*	Operational Point Sources Emissions
Ramsar criterion 6 Species/populations occurring at levels of international importance	a	✓
Benacre to Easton Bavents Lagoons SAC		
1150 Coastal lagoons * Priority feature	a	a
Benacre to Easton Bavents Lagoons SPA		
Supporting habitat to SPA designated interests	b	b
Breeding **Bittern** *Botaurus stellaris*	b	b
Breeding **Little Tern** *Sterna albifrons*	b	b
Breeding **Marsh Harrier** *Circus aeruginosus*	b	b
Wintering **Bittern** *Botaurus stellaris*	b	b
Deben Estuary SPA		
Supporting habitat to SPA designated interests Wintering **Avocet** *Recurvirostra avosetta* Wintering **Dark-bellied brent goose** *Branta bernicla bernicla*	a	a
Deben Estuary Ramsar		
Ramsar criterion 2 Supports a population of the mollusc *Vertigo angustior* **Ramsar criterion 6** Species/populations occurring at levels of international importance - **Dark-bellied brent goose**	a	a

Site Name and Features [Descriptions of the effects itemised in the adjacent columns are provided at the end of the table]	Operational Traffic Emissions*	Operational Point Sources Emissions
Dew's Ponds SAC		
1166 Great crested newt *Triturus cristatus*	b	b
Minsmere to Walberswick Heaths and Marshes SAC		
1210 Annual vegetation of drift lines	✓	✓
4030 European dry heaths	✓	✓
1220 Perennial vegetation of stony banks	✓	✓
Minsmere to Walberswick SPA		
Supporting habitat to SPA designated interests	✓	✓
Breeding **Avocet** *Recurvirostra avosetta*	b	b
Breeding **Bittern** *Botaurus stellaris*	b	b
Breeding **Little Tern** *Sterna albifrons*	b	b
Breeding **Marsh Harrier** *Circus aeruginosus*	b	b
Breeding **Nightjar** *Caprimulgus europaeus*	b	b
Breeding **Shovelor** *Anas clypeata*	b	b
Breeding **Teal** *Anas crecca*	b	b
Breeding **Woodlark** *Lullula arborea*	b	b
Wintering **Avocet**	b	b
Wintering **Bittern**	b	b
Wintering **Gadwall** *Anas strepera*	b	b

Site Name and Features [Descriptions of the effects itemised in the adjacent columns are provided at the end of the table]	Operational Traffic Emissions*	Operational Point Sources Emissions
Wintering **Hen Harrier** *Circus cyaneus*	b	b
Wintering **Shovelor**	b	b
Wintering **White Fronted Goose** *Anser albifrons albifrons*	b	b
Minsmere to Walberswick Ramsar		
Ramsar criterion 1 Mosaic of marine, freshwater, marshland and associated habitats	✓	✓
Ramsar criterion 2 Supports nine nationally scarce plants and at least 26 red data book invertebrates	✓	✓
Ramsar criterion 2 An important assemblage of rare breeding birds associated with marshland and reedbeds	b	b
Orfordness to Shingle Street SAC		
1150 Coastal lagoons * Priority feature	a	✓
1210 Annual vegetation of drift lines	a	✓
1220 Perennial vegetation of stony banks	a	✓
Outer Thames Estuary SPA		
Supporting habitat to SPA designated interests	b	c
Wintering /passage **Red-throated diver** *Gavia stellata*	b	b
Cormorant *Phalacrocorax carbo*	b	b
Little Tern *Sterna albifrons*	b	b
Little Gull *Larus minutus*	b	b
Common Tern *Sterna hirundo*	b	b

Site Name and Features [Descriptions of the effects itemised in the adjacent columns are provided at the end of the table]	Operational Traffic Emissions*	Operational Point Sources Emissions
Sandlings SPA		
Supporting habitat to SPA designated interests	✓	✓
Breeding **Nightjar** *Caprimulgus europaeus*	b	b
Breeding **Woodlark** *Lullula arborea*	b	b
Staverton Park and the Thicks SAC		
9190 Old acidophilous oak woods with *Quercus robur* on sandy plains	a	a
Stour and Orwell Estuaries SPA		
Breeding **Avocet** *Recurvirostra avosetta*	b	b
Passage **Redshank** *Tringa totanus*	b	b
Wintering: **Hen Harrier** *Circus cyaneus*, **Black-tailed Godwit** *Limosa limosa islandica*, **Dark bellied Brent goose** *Branta bernicla bernicla,* **Dunlin** *Calidris alpina alpina*, **Grey Plover** *Pluvialis squatarola*, **Pintail** *Anas acuta*, **Redshank** *Tringa totanus*, **Ringed Plover** *Charadrius hiaticula,* **Sanderling** *Calidris canutus*, **Shelduck** *Tadorna tadorna* and **Turnstone** *Arenaria interpres*	b	b
Internationally important waterbird assemblage	b	b
Stour and Orwell Estuaries Ramsar		
Ramsar criterion 2 Supports seven nationally scarce plants and five British Red Data Book invertebrates	a	a
Ramsar criterion 5 Waterbird assemblage of international importance	b	b
Ramsar criterion 6 Waterbird species/populations occurring at levels of international importance	b	b

Notes:

- * Traffic to be confirmed upon receipt of traffic data.

9. SUMMARY OF SITES REQUIRING FURTHER ASSESSMENT

9.1.1 The potential LSE scoping exercise has identified that for air quality only a sub-set of eight of the seventeen European designated sites require further consideration (i.e. either Orange – potential weak pathway / trivial or inconsequential impact or Red).

9.1.2 A summary of these sites and activities requiring further consideration is presented in Table 5 below.

Table 5 Orange or Red sites for Air Quality

European Designated Site	RAG	Distance from Main Development Site (km)	Construction Dust and Smothering	Construction Traffic*	Commissioning Phase Combustion Emissions	Operational Phase Combustion Emissions	Operational Phase Traffic
Alde-Ore and Butley Estuaries SAC	Orange	5	No	No	Yes	Yes	No
Alde-Ore Estuary SPA	Orange	5	No	No	Yes	Yes	No
Alde-Ore Estuary Ramsar	Orange	5	No	No	Yes	Yes	No
Minsmere to Walberswick Heaths and Marshes SAC	Red	Adjacent	Yes	Yes*	Yes	Yes	Yes*
Minsmere to Walberswick SPA	Red	Adjacent	Yes	Yes*	Yes	Yes	Yes*
Minsmere to Walberswick Ramsar	Red	Adjacent	Yes	Yes*	Yes	Yes	Yes*
Orfordness to Shingle Street SAC	Orange	8	No	No	Yes	Yes	No
Sandlings SPA	Orange	<0.7	Yes	Yes*	Yes	Yes	Yes*

Note: * The need for construction and operational traffic assessment will be confirmed at a later stage of assessment following receipt of traffic data and site layout design details.

10. FURTHER ASSESSMENT APPROACH

10.1 Green Linkages

10.1.1 In the later stages of the HRA process, it is proposed that evidence will be presented to confirm 'Green – No potential LSE is predicted' sites. This will include a series of tables, similar to those presented in the potential LSE scoping exercise (Section 8) and also a set of constraints drawings. This information will be presented in the Shadow LSE Screening to confirm that these sites can reasonably be screened out of the HRA. No additional evidence will be provided (e.g. air quality modelling results).

10.2 Orange and Red Linkages

10.2.1 The eight European designated sites that require further consideration (i.e. either Orange – potential weak pathway / trivial or inconsequential impact or Red) will be subject to additional investigation as part of the subsequent shadow appropriate assessment.

10.2.2 The adjacent Minsmere SAC, SPA and Ramsar sites and potentially the Sandlings SPA will be the only sites considered further for deposition of construction dust and toxic metals. These sites will be subject to an assessment of construction dust, initially using the IAQM qualitative assessment procedure. This will enable development of a suite of site specific dust mitigation and monitoring measures that may be required to avoid significant air quality effects. These measures will be outlined in a Construction Environmental Management Plan (CEMP). Separate to the HRA process, baseline dust deposition data will be collected to enable the effectiveness of dust mitigation during construction works to be evaluated.

10.2.3 The Minsmere SAC, SPA and Ramsar sites and potentially the Sandlings SPA are also the only sites envisaged to potentially require an assessment of construction traffic/mobile plant within the construction site, dependent upon the location of haul routes/spine road on-site, using ADMS-Roads detailed modelling. These sites may also be considered for operational traffic. This will be confirmed at the later stages of the assessment once further site layout and traffic data is available.

10.2.4 As the combined thermal input of Sizewell C is likely to be over 50 MWth, it is currently envisaged that all the Orange and Red sites will require detailed modelling assessments for point source emission effects. Any such assessment will be undertaken using ADMS5 detailed modelling.

10.2.5 The details of any detailed assessment, using either ADMS-Roads or ADMS5 would be discussed in advance with stakeholders. However, in summary the assessment would consider relevant short and long term air quality objectives for the protection of ecosystems and relevant critical levels and thresholds. The selection of relevant assessment criteria, and identification of specific receptor locations within each habitat and the interoperation of results would be undertaken in conjunction with the NNB Ecology team.

The members of the HRA Evidence Plan Working Group were invited to comment on this paper. No specific questions were posed. No comments were received; however Natural England reserved their right to comment in Stage 3.

Appendix 3.5 Disturbance due to potential increase in recreational pressure

SIZEWELL C PROJECT HRA EVIDENCE PLAN: DISTURBANCE DUE TO POTENTIAL INCREASE IN RECREATIONAL PRESSURE

VERSION 3 - OCTOBER 2014

Important Note: The content of the example case studies is provisional as they represent work in progress which will be completed later in the Evidence Plan process. The example case studies illustrate the complex issues being explored and the types of data and methods being employed. At the end of each case study, preliminary comments from the stakeholders are presented. Any assessments that are provided should be regarded as indicative and preliminary and are subject to more detailed investigation.

NOT PROTECTIVELY MARKED

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1. EXECUTIVE SUMMARY

1.1.1 This report sets out the proposed method for defining and collecting evidence on users of recreational resources, whose behaviour may be affected by the construction and operation of Sizewell C (SZC). The gathering of this evidence will enable an assessment to be made of predicted changes in recreational pressure resulting from SZC and their effects on designated features of European sites.

1.1.2 Behavioural patterns of users of recreational resources within a certain distance of SZC will be affected by SZC, either directly (e.g. via temporary or permanent closures of Public Rights of Way (PRoW), or footpath diversions); or indirectly (e.g. by the displacement[2] of recreational users from one recreational resource to another). The affected users may temporarily or permanently use other recreational resources which could potentially affect European-designated features. This report describes the proposed approach and methodology for the recreational study.

1.1.3 A summary of the proposed method is as follows.

1. **Definition of study area**. The proposed study area is based on the following zones of potential influence of SZC as shown on Figure 01 (Section 7):

- Zone of Physical Change (defined by a 2km buffer around Main Development Site).

  Based on our current understanding of the potential effects on PRoW and access, the Zone of Physical Change is likely to occur within 2km of the Main Development Site. This includes potential PRoW closures and the location of diverted or newly created routes.

- Displacement Zone (defined by 8km buffer around the Main development Site).

  Based on initial research, and to be confirmed through field based questionnaires, the median[3] distance likely to be travelled by people to reach a location for recreational activities is 8km. As such, this zone is judged to be the appropriate extent of the catchment area for visitors that have the potential to be displaced by changes to PRoW and access within the Main Development Site during construction and operation of Sizewell C. The Displacement Zone captures a number of settlements which have been used to define the Receptor Zone (see below).

- Receptor Zone (defined by 8km buffer around settlements within the Displacement Zone)

  This zone defines the geographic extent around settlements within the Displacement Zone that people may be displaced as a result of changes to

[2] The displacement of recreational users from recreational resources to alternative recreational resources, either directly due to construction or operational proposals, or indirectly as a result of the perception of disturbance or change

[3] The mid-point of the data collected

PRoW and access or perceptions within the Main Development Site, based on the 8km median distance discussed above. A recreational user from a settlement who might have travelled up to 8km towards SZC to use a recreational resource may, therefore, potentially be displaced up to 8km away from SZC to use an alternative recreational resource.

The outer edge of the Receptor Zone defines the extent of the study area and provides a generous area that will capture the potential extension of recreational movement along the coast and appropriate European Sites. The proposed study area extends for approximately 16km around the Main Development Site.

2. **Identification of recreational resources to be surveyed** within the study area. Two surveys will be undertaken within the 2km Zone of Physical Change plus two coastal locations to the north and south beyond 2km. Depending on the results of these surveys, surveys may also be undertaken at targeted recreational resources, at key access points into European Sites within the wider Displacement and Receptor Zones.

3. **Identification of questions to be asked during surveys**. The objective will be to identify key issues including the type of recreational users (e.g. dog walker, walker, cyclist etc), recreational behaviour and travel/movement patterns and distances, whether they consider that they could be displaced elsewhere, and where they might move to and for what period (e.g. during construction only, or during construction and operation). The survey will include quantitative and qualitative questions.

1.1.4 The data will enable the actual zone of influence to be established and will provide the evidence for robust assessment of the potential effects of changes in recreational pressure on sensitive features of relevant European sites.

2. INTRODUCTION

2.1 Introduction and Objectives

2.1.1 This report sets out the proposed method for defining and collecting evidence on users of recreational resources, whose behaviour may be affected by the construction and operation of Sizewell C (SZC). The gathering of this evidence will enable, via a separate study, an assessment of the effects on designated sites of European level significance 'European sites' to be undertaken through Habitat Regulations Assessment (HRA) as well as the Environmental Impact Assessment (EIA).

2.1.2 SZC lies close to a number of habitat sites of European level significance, as designated under the European Union Habitats Directive. The European sites comprise 'Special Protection Areas' (SPA), 'Special Area of Conservation' (SAC) and Ramsar designations. These are, hereafter, referred to collectively as 'European sites'.

2.1.3 Behavioural patterns of users of recreational resources within a certain distance of SZC will be affected by SZC, either directly (e.g. via temporary or permanent closures of PRoW, or footpath diversions); or indirectly (e.g. by the displacement of recreational users from one recreational resource to another). The affected users may temporarily or permanently use other recreational resources, including European sites.

2.1.4 This report defines a Zone of Physical Change where the direct physical effects associated with the proposed construction or operation of SZC, including the closure and diversion of PRoW, are considered, and wider zones where the potential effects of displacement in relation to European sites may occur.

2.1.5 The report also sets out the evidence required in order address specific issues in determining potential effects. Proposed data collection is intended to inform the assessment of likely significant effects, and the form of data and methodology for its collection has been agreed in conjunction with the project ecologists, in order to ensure that it is robust and can be used for its intended purpose.

2.1.6 Figures are included in Section 7.

2.2 Background

a) The Proposal

2.2.1 The SZC construction phase is anticipated to last for a period of 7 – 9 years. The construction phase area (the Main Development Site), PRoW, permissive paths, long distance routes and open access land are illustrated on Figure 02. The Main Development Site will extend across the SZC power station location, onto the beach to the east, to the north-west at Goose Hill, across the agricultural fields to the west of Goose Hill and either side of a minor road between Leiston and East Bridge, which also functions as Sustrans regional route 42.

2.2.2 It is proposed that there will be no public access into the construction area during the construction phase due to safety reasons. A diversion strategy for the construction phase will be developed in consultation with stakeholders.

2.2.3 A landscape strategy, including permanent landscape proposals, for the wider EDF Energy estate is being developed and will be implemented in a phased manner (details to be agreed).

i. Construction

2.2.4 Direct impacts on PRoW/displacement effects have already been highlighted. In addition, consultees have indicated that the large number of workers living in the area during construction, in particular at the accommodation campus, may result in increased recreational activity in the surrounding countryside, potentially adding further recreational pressure to the European sites. The design of the accommodation campus will incorporate features to support a strategy for self-containment e.g. indoor and outdoor recreational facilities, good quality accommodation, limited means of egress/access, and management controls such as implementing a workers code of conduct.

ii. Operation

2.2.5 The operational phase of SZC includes the landscape strategy for the EDF Energy estate which will take account of recreational amenity as outlined above. The operational staffing levels for SZC will be considerably reduced from those during construction and as such changes and increases in recreational pressure in the area are anticipated to be much less of an issue.

2.2.6 Consultees have indicated concerns relating to the possibility that closures and diversions to PRoW and permissive routes during the construction phase will result in long-term behavioural change (habituation) in the recreational use in the area. Habituation will be considered, in relation to people forming new habits during the construction phase of SZC.

b) Approach to the Assessment

2.2.7 The approach to the assessment of effects on ecological resources arising from a change in recreational use as a result of the construction and operational phase of SZC has been developed since the EIA scoping phase of the project. A 2km study area extending from the boundary of the SZC Main Development Site was initially proposed in the EIA Scoping Report based on the extent of physical effects on recreational resources within the SZC Main Development Site. This area included the likely extent of closures or obstructions to PRoW and Permissive Paths. It also incorporated the land that was anticipated to be required to accommodate potential diversion routes as a result of the PRoW closures or obstructions.

2.2.8 The responses to the EIA scoping and consultation via the HRA Evidence Plan Working group and the Amenity and Recreation (A and R) group have suggested a larger study area is defined for the A and R assessment of the EIA. Following this consultation feedback, and taking into consideration potential recreational displacement based on findings in relevant literature (see section 4.1 and Annex A) the study area has been extended to encompass a wider zone in which changes in recreational pressure could potentially occur. This is discussed in section 3.2.

2.2.9 An approach will be adopted that combines the needs of the A and R assessment, the EIA and the HRA in a single framework methodology, to ensure effective and efficient baseline data and evidence gathering.

2.2.10 The approach includes the development of recreational user surveys that can be used both within the Zone of Physical Change and at coastal locations to the north and south of this Zone, and potentially at European sites within a wider study area. The survey methodology has been developed so that it will collect suitable quantitative and qualitative data, to understand the current recreational patterns, the likely effects of the SZC construction upon displacement, and the potential need for mitigation.

2.2.11 Comprehensive initial surveys are proposed during the summer and winter seasons and, based on results received, supplementary surveys may also be carried out at European sites to gather further information. It will be important to ensure that these additional surveys are proportionate, taking account of the location and sensitivity of designated features and likely changes in recreational pressure or activity resulting from SZC.

2.3 Report Structure

2.3.1 This report is structured as follows:

Section 3 sets out the proposed methodology for gathering data, which is the main objective of this report. It also briefly introduces how this data will be used for the HRA.

Section 4 provides an initial baseline assessment of relevant factors learnt from similar studies, drawing on these to define the study area and recreational resources for this study.

Section 5 records the comments received from the HRA Evidence Plan Working group on this paper following the 4th Evidence Plan Workshop in July 2014.

Annex A presents a review of relevant case studies.

Annex B presents the results of the informative May 2014 recreational surveys.

Annex C presents the questionnaire to be used in the recreational surveys.

Annex D presents a proposed matrix for baseline evaluation of European sites.

3. METHODOLOGY

3.1 Overview

3.1.1 The recreation pressure assessment methodology will follow the following six stages:

1) Agreement of Study Area.

2) Identification and Evaluation of Recreational Resources.

3) Baseline Evaluation of European Sites.

4) Assessment of Effects.

5) Potential Additional Mitigation.

6) Development of Monitoring Strategy.

3.1.2 This report sets out stages 1 and 2 in detail. Stages 3, 4, 5 and 6 will be the subject of separate work at a later date.

3.2 Study area

3.2.1 The three zones that have been developed to define the study area are shown on Figure 01 and described below:

- Zone of Physical Change (defined by a 2km buffer around Main Development Site).

  Based on our current understanding of the potential effects on PRoW and access, the Zone of Physical Change is likely to occur within 2km of the Main Development Site. This includes potential PRoW closures and the location of diverted or newly created routes.

- Displacement Zone (defined by 8km buffer around the Main development Site).

  Based on initial research (see Annex A), and to be confirmed through field based questionnaires, the distance likely to be travelled by people to reach a location for recreational activities is 8km or less. As such, this zone is judged to be the appropriate extent of the catchment area for visitors that have the potential to be displaced by changes to PRoW and access within the Main Development Site during construction and operation of SZC. The Displacement Zone captures a number of settlements which have been used to define the Receptor Zone (see below).

- Receptor Zone (defined by 8km buffer around settlements within the Displacement Zone)

  This zone defines the geographic extent around settlements within the Displacement Zone that people may be displaced as a result of changes to PRoW and access or perceptions within the Main Development Site, based on

the 8km distance discussed above. A recreational user from a settlement who might have travelled up to 8km towards SZC to use a recreational resource may, therefore, potentially be displaced up to 8km away from SZC to use an alternative recreational resource. The settlements and the 8km offset from them are shown on Figure 04.

3.2.2 The outer edge of the Receptor Zone defines the extent of the study area and provides a generous area that will capture the potential extension of recreational movement along the coast and appropriate European Sites. The proposed study area extends for approximately 16km around the Main Development Site. It will capture where people displaced from the SZC site would go, as well as where people travelling these distances to alternative sites from their homes would go, for example from Saxmundham or Leiston.

3.2.3 Within this proposed study area, a 2km radius around the Main Development Site defines the Zone of Physical Change, within which effects upon recreational users are anticipated to arise as a result of construction phase activities. User surveys will be undertaken within this Zone and at two coastal locations at Dunwich Heath and Thorpeness.

3.2.4 The coastal location at Dunwich Heath has been included to ensure that the user surveys provide reliable evidence along the coastal environment given the relatively high levels of recreation that occur.

3.3 Proposed Surveys and Programme

3.3.1 A programme of surveys will be undertaken. Site-based user surveys will be used to gather data, in addition to the use of existing data available from relevant authorities/consultees and studies, to form an understanding of recreational user patterns in the study area and across the resources identified.

3.3.2 Surveys will be carried out on two occasions, a summer survey in late August 2014 (which has now been completed) and a winter survey in early November 2014.

3.3.3 If the August 2014 surveys indicate that people may be displaced to European sites within the wider study area and information needs to be gathered on users of these sites, supplementary surveys (scope to be agreed) will be undertaken at appropriate locations to help establish baseline conditions. The early surveys will also be used to review the appropriateness of the study area. At the request of Stakeholders following the 4th Evidence Plan Workshop an additional survey location has been added to the November programme of surveys, in the Deben Estuary, in order to enhance our understanding of recreational activity further along the coast.

a) User Surveys

3.3.4 The purpose of the surveys will be to gather both qualitative and quantitative data to on recreational user patterns, which will inform an understanding of likely displacement effects. Whilst visitor numbers (quantitative data) are helpful, the qualitative data will provide an insight into the likely extent of potential recreational pressure on receptor sites that may be reasonably predicted as a result of displacement.

i. Survey Methodology

Informative Survey

3.3.5 Informative surveys undertaken in May 2014 have been used to inform the development of subsequent formal surveys. A summary of the results of these informative surveys is included in Annex B. These surveys were undertaken at the following locations (see Figure 01 which shows the survey locations):

- on Bridleway 19 at the entrance to Kenton Hills car park;
- on the Sandlings Walk junction with the Coastal Path; and
- at the Sizewell Café/Sizewell beach.

Survey Questionnaire

3.3.6 Following discussions with EDF Energy and consultees, a single form of questionnaire has been developed which was used in the August survey and will also be used at all 7 locations shown on Figure 01 in the November survey. It comprises 11 questions, with the first 6 focussed to elicit key information on recreational activity, should respondents not wish to complete the full questionnaire.

3.3.7 The survey method has been developed in consultation with Dr Alison Millward who is the principal of Alison Millward Associates Ltd, an environmental consultancy (established in 1984) specialising in community engagement and facilitation. This company has been appointed to undertake all of the recreational surveys.

3.3.8 These questions will establish the type of visitor, the nature of the activity they are undertaking and the reasons why they have chosen that location, as opposed to elsewhere. Importantly, the early questions also seek to establish if the respondent would prefer to avoid SZC during construction, where else they would be likely to go or how far they would be prepared to travel, and whether they walk a dog (including on or off the lead), both at that location and elsewhere.

3.3.9 A brief explanatory note has been included in the questionnaire to provide a summary of the extent and duration of the construction phase with a standardised verbal summary provided by the surveyor. This will help ensure that in answering the questions participants have an appreciation of the scale and nature of the development. This description was agreed with members of the Rights of Way consultation group. Surveyors will work in teams of two people.

Survey Locations

3.3.10 Three teams of surveyors will be deployed at each location shown on Figure 01. One surveyor in the team will undertake the questionnaire surveys, whilst the other will undertake the visitor count survey. The Rights of Way consultation group agreed the following six principal survey locations based on the rational set out below:

- on Bridleway 19 at the entrance to Kenton Hills car park, there will be two survey points here – one in the car park and one on the bridleway;
- on the Sandlings Walk junction with the Coastal Path;

- at Sizewell beach car park;
- at Aldringham Walks within Sandlings SPA;
- in Eastbridge south of The Eels Foot Inn; and
- at the car park at Dunwich Heath.

3.3.11 A seventh location representative of the Deben Estuary was added by EDF Energy to gather additional information at the request of stakeholders following the 4th Evidence Plan Workshop. This survey point will be included in the November survey.

3.3.12 The seven survey locations have been selected for the following reasons.

On Bridleway 19 at the entrance to Kenton Hills car park

3.3.13 At this survey location, surveyors will be located at two points – one in the car park and one on the bridleway.

3.3.14 This is to capture people using the bridleway, i.e. footpath users, dog walkers and horse riders; and people that have driven to the car park to walk or walk their dog, or bird watch etc. As the bridleway lies slightly removed from the car park, and there is a separate footpath from the car park into the Kenton Hills, there is a risk that people may pass one and not the other, and as such it is necessary to cover both locations. The bridleway will be closed during construction; however the Kenton Hills will remain open. The surveys will aid the understanding of how people use the Kenton Hills, how many people drive to the car park and what activities they undertake there, how far they walk from the car park, and whether they walk to the beach or on the bridleway. They will also aid understanding of how many people use the bridleway and for what activities, which will aid an understanding of the likely extent of displacement, what activities those displaced people will be doing and where they are likely to go instead.

On the Sandlings Walk junction with the Coastal Path

3.3.15 This location picks up people using both the coast path, which could be walkers (on a short walk or following the Recreational Route 'The Suffolk Coast Path'); dog walkers; horse riders; bird watchers; sea anglers etc; and people walking on the Sandlings Walk, another Recreational Route, which at this point comes from Kenton Hills and Goose Hill.

At the Sizewell beach car park

3.3.16 This location will pick up both people driving to the car park to access the beach, and those walking along the beach following the Suffolk Coast Path. It will provide an understanding how many drive to reach this location, how far they have come, what they wish to do there (i.e. walk, walk their dog, go fishing, visit the café etc.), and how much the temporary closure to parts of the beach during construction will affect them, i.e. will they walk the other direction to the south along the beach, or will they drive to another location altogether?

Aldringham Walks within Sandlings SPA

3.3.17 This location is located within the Open Access Land and Registered Common Land at Aldringham Common, and it also lies within the series of PRoW called the Aldringham Walks. This will capture people using the Walks for walking, dog walking and horse riding, and will gather people's opinions on whether the construction, whilst not physically affecting the Walks, will result in perceptual effects that prevent people wanting to use them, and if so where else will they go.

In Eastbridge south of The Eels Foot Inn

3.3.18 This location captures people using the east west public right of way that connects the Minsmere Sluice and Eastbridge, and a network of public rights of way that provide a popular circular walk and cycle route, with recreational facilities along the route (The Eels Foot Inn and facilities at Sizewell beach car park). It will pick up those using the rights of way network, where people are walking with their dogs, as well as those using longer distance routes (Suffolk Coast Path) which will include both locals and visitors potentially from further afield.

Car park at Dunwich Heath

3.3.19 This location lies in the heathland just inland from the beach near the coastguard cottages. It will capture people driving to Dunwich Heath to walk or walk their dogs, and will also capture people walking along the Suffolk Coast Path along the beach. This location will gather information on how many people are visiting the heathland, and what activities they are doing there. It will also capture how many people are using the Coast Path, and where they would go during the temporary diversions of the coast path at Sizewell beach to the south during construction.

Deben Estuary SPA

3.3.20 This survey location lies just outside of the proposed 16km Study Area and has been included, on a precautionary basis, at the request of stakeholders following the 4th Evidence Plan Workshop to provide recreational user information along this stretch of coast. It is intended to scope this site into the planned November survey and to use the information that it generates to help inform the extent of the potential affected environment. The exact location has yet to be agreed but it is envisaged that it will capture recreational users of the area including day-trippers, hikers, dog walkers etc.

3.3.21 A copy of the full questions to be provided in the questionnaire is included in Annex C.

Detailed Survey Methodology

3.3.22 Details of the survey methodology are as follows:

- The aim is to collect as many responses as practically possible from each set of surveys per day per location.
- The survey will last 12 hours (7am – 7pm) in a single location during the summer and 10 hours (7am – 5pm) during the autumn/winter, per location on a week day and a weekend. The timings of breaks will ensure that the surveys cover

anticipated patterns of activity related to patterns of work etc. Relevant welfare facilities will be available including mobile telephones and water.

- Target weekend days and week days to secure differences in user activity.
- Each survey location will be surveyed for two days in August and two days in November 2014.
- Questionnaire designed for self-completion where possible, with surveyors on hand who are trained in public engagement and communication to assist should this be required.
- Participants will also have the option of taking the survey away with a stamped addressed envelope to send back.
- A map indicating the extent of the SZC Main Development Area will be provided to inform those surveyed of the extent of the SZC Main Development Area (based on the plan on Figure 02). People will be able to use this to mark on their route/possible alternative routes.
- An OS map of the study area at a scale to enable people to clearly read (for example they need to be able to see PRoW) will also be provided with each questionnaire, with a large scale OS base held by each of the surveyors which may, for example, help people identify where else they might go to recreate if they are displaced (note – this will be an unaltered OS map).
- Protection will be provided from harsh weather conditions to encourage people to complete the full survey.
- The team of two will organise their time to allow user counts to be recorded in a robust manner, as well as assisting with the completion of questionnaires.

b) Use of Existing Data

3.3.23 Additional quantitative and qualitative data will be gathered on recreational users that may already exist, and subject to consultation with:

- the local authority, PRoW and access manager/area PRoW manager;
- access forums;
- gate counter data from Suffolk County Council;
- traffic count data from Suffolk County Council;
- count data at Fiscal policy area/car park at Kenton Hills;
- information/visitor number data provided by wardens at surrounding nature reserves/SSSIs/RSPB sites/European Sites, or from Suffolk Wildlife Trust; and
- other local resources such as dog waking clubs.

3.3.24 The South Sandlings Living Landscape Project - Visitor Survey Report provides extensive survey information on recreational user patterns across the two southern

parts of the Sandlings SPA, as of 2009/2010. The results of this report are discussed in Annex A. The report provides a detailed insight into how people use the South Sandlings area and will be used to inform this study.

3.3.25 Data will also be gathered on access strategies used at identified sites, such as whether dogs are permitted (on or off leads), seasonal alterations to access, and entrance fees etc.

3.4 Assessment of Effects

3.4.1 This will take account of both direct and indirect effects on amenity and recreational resources and receptors throughout the study area, the displacement of recreational users, and the resultant changes in recreational pressure.

3.4.2 Direct effects relate to the physical changes that will occur due to closures or obstructions to PRoW within the Zone of Physical Change. Indirect effects relate to changes in traffic due to construction or operational traffic; and whilst these effects will generally be limited to the Zone of Physical Change, it is anticipated that effects due to changes in traffic may extend throughout the wider study area. The assessment will take account of proposed embedded mitigation e.g. PRoW diversion routes, planting and noise screening etc.

3.5 Assessment of Implications for European Sites

3.5.1 In order to properly assess the implications of the potential increases in recreational disturbance on the European sites within the study area it will be necessary to understand the various factors influencing the capacity of the qualifying features to accept change (e.g. their sensitivity to disturbance, likelihood of interface with the public, magnitude of increased disturbance, etc.), and to relate this to their Conservation Objectives. It is likely that this will require a more detailed review of the literature to better understand the likely responses of different habitats and species to the predicted changes in exposure to people and dogs.

3.5.2 Table A in Annex D sets out how these contributing factors and a final 'risk rating' (in the end column) will be recorded to show where the most sensitive areas are with regard to potential impacts upon designated sites.

3.5.3 Table A will be completed for all qualifying features of the European Sites within the study area which it is considered could be affected by recreational pressure, and will be used to create risk/sensitivity maps. This information, combined with the results of the surveys, will be used to scope the extent of the HRA assessment.

3.6 Potential Additional Mitigation

3.6.1 This will include consideration of the requirements for additional mitigation (e.g. fencing or wardening to protect the qualifying features of European sites, increased signage, etc.), or changes to the recreational mitigation strategy following the outcome of the assessment.

3.7 Develop Monitoring Strategy

3.7.1 This will include monitoring for both the construction and operational phases of the project as relevant.

4. INITIAL BASELINE ASSESSMENT

4.1 Review of Relevant Case Studies

4.1.1 A review of relevant studies which have been used to help defined the study area for this project is provided in Annex A and is summarised below.

4.1.2 The following studies were reviewed to help inform the study area for the SZC HRA assessment:

- South Sandlings Living Landscape Project – Visitor Survey Report (2011, Footprint Ecology) – hereafter referred to as 'Sandlings';
- Visitor Access Patterns on the Thames Basin Heaths (2005, Footprint Ecology), which formed part of the Thames Basin Heaths SPA Access Management Report (2007, LDA Design and Natural England) – hereafter referred to as 'TBH';
- Visitor Survey Results from Breckland SPA (2011, Footprint Ecology) – hereafter referred to as 'Breckland';
- The Solent Disturbance and Mitigation Project. Phase II on-site visitor survey results from the Solent Region (Oct 2010, Footprint Ecology) – hereafter referred to as 'Solent';
- Exe Disturbance Survey (Dec 2011, Footprint Ecology) – hereafter referred to as 'Exe';
- An Assessment of the Recreational Impacts on the European Sites of the River Medina and Ryde Sands on the Isle of Wight (March 2012, Natural Enterprise) – hereafter referred to as 'Isle of Wight'; and
- Thames Basin Heath's SPA Delivery Plan.

4.1.3 The following is a précis of the analysis; the full analysis is given in Annex A.

4.1.4 The aim of the first six studies was to understand recreational patterns and visitor behaviour in these European sites and the likely effects on ecological resources resulting from changes in recreation pressure that may result from development in areas considered close enough to generate changes in recreational activity. The Thames Basin Heath's SPA Delivery Plan drew on the TBH report and included the definition of zones around SPA sites that provide useful information for informing the definition of the extent of the Displacement Zone and wider study area for SZC HRA.

4.1.5 The findings of all of these reports assist in understanding the nature of typical recreational use and patterns that could be reasonably applied to the SZC context, with allowance made for the particular characteristics of the coastal environmental using professional judgement.

4.1.6 From the typical median travel distances identified in the reports and the findings of the Thames Basin Heaths SPA Delivery Plan it can be assumed that the majority of visitors drive relatively short distances and most commonly visit to walk their dogs, and that this pattern of movement can be applied to the SZC context. An 8km Displacement Zone is therefore considered to be a reasonable basis to define the likely extents of displacement occurring from the SZC Main Development Site area capturing typical movement profile for recreational users. This offset has been used to define a wider study area which extends the study area to almost 16km from the Main Development Site, as described in Section 3.2.

4.2 Summary of the Existing Environment

4.2.1 Sections a, b and c below introduce the recreation resource and the landscape resource where people experience the landscape within the study area, and the European sites which may be affected by changes to recreational use patterns caused by the proposed SZC works.

a) Recreation Resource

4.2.2 The following recreational resources have been identified within the approximately 8km of the Main Development Site, and serve to illustrate the range of recreational resources available within the study area (refer to Figures 03a and 03b).

- Suffolk Coast Path - Recreational Route: this extends along the coast within the AONB in a north-south direction.
- Sandlings Walk - Recreational Route: this lies mostly inland and within the AONB, occasionally extending to the coast. It extends along definitive PRoW, roads and permissive routes.
- Permissive footpaths across Kenton Hills and Goose Hill.
- PRoW throughout the study area, including footpaths, bridleways, byways and restricted byways.
- Sustrans Regional Cycle Route 42 lies within the Main Development Site and extends throughout the study area.
- Beaches that extend in north-south direction from Aldeburgh, Thorpeness, Sizewell, Minsmere, Dunwich to Walberswick.
- Registered Common Land and Open Access Land at Aldringham and Aldringham Common; The Fens near Thorpeness; Sizewell Hall; Thorpeness Common; Knodishall Common; Middleton Moor; and Westleton Common.
- Open Access Land at Snape Warren; North Warren near Aldeburgh; Aldringham Walks; Theberton Woods; Dunwich Heath; Westleton Heath; Greyfriars Wood; Dunwich Forest; Brick Kiln Walks; Newdelight Walks; and Lumphall Walks.
- Snape Warren SSSI/RSPB reserve; Alde-Ore Estuary SSSI; Leiston-Aldeburgh SSSI/North Warren RSPB reserve; Sizewell Marshes SSSI;

- Minsmere-Walberswick Heaths & Marshes SSSI/Minsmere RSPB reserve and Dingle Marshes RSPB reserve; Potton Hall Fields, Westleton SSSI.
- National Nature Reserves at Westleton Heath, Suffolk Coast, and Orfordness-Havergate; and a Local Nature Reserve at The Haven, Aldeburgh.
- Lonely Farm Country Park.
- Parks and green spaces of appropriate scale.

b) Landscape Resource

ii. Landscape Character Assessment

4.2.3 The Suffolk Landscape Character Assessment (2008) (LCA) provides an assessment of the County's landscape character based on structured criteria. This study is considered appropriate to inform an understanding of the landscape character of the study area at an appropriate scale to inform an understanding of the landscape resource and how this may influence displacement patterns. The assessment identifies Landscape Character Types (LCTs) that represent tracts of land with similar characteristics. The character of the landscape within the study area follows a logical pattern from the coast to inland LCTs. Each of these LCTs has a unique character which will contribute to the recreational experience. For example, the 'Coastal Dunes and Shingle Ridges' LCT form a narrow strip along the coast, the name of which summarises the character and which will afford a different recreational experience (with extensive open beaches and long coastal or seaward views), inland to the low lying 'Coastal Levels' and to the slightly higher 'Estate Sandlands' comprising where people may visit heathland landscapes such as the Sandlings.

4.2.4 Within the 2km Zone of Physical Change around the SZC Main Development site, the PRoW provide access to 'Estate Sandlands', 'Coastal Levels', 'Coastal Dunes and Shingle Ridges', 'Ancient Estate Claylands', 'Rolling Estate Claylands' and Valley Meadows and Fens' LCTs. These areas provide access to a variety of landscapes and habitats including shoreline, conifer plantation/forest, wet woodland, arable and livestock farmland and heathland, much of which can also be found beyond the 2km Zone of Physical Change and within the study area. Therefore, whilst people may be displaced from recreational resources in the Zone of Physical Change, there will remain areas of countryside of a similar character which will remain accessible within the wider study area.

iii. Nationally Designated Landscapes

4.2.5 There are two nationally designated landscapes within the study area, the Suffolk Coast and Heaths Area of Outstanding Natural Beauty (AONB) and the Suffolk Heritage Coast.

4.2.6 The Suffolk Coast and Heaths AONB extends from the northern side of the Stour estuary to the south of Ipswich, to Kessingland in the north and covers much of the land between the A12 trunk road and the coast. The AONB consists of a mosaic of different habitats and land uses including farmland; heathland; ancient woodland; commercial forestry; reedbeds; estuaries; grazing marsh; small towns and villages; low, crumbling cliffs and shingle beaches. The Suffolk Heritage Coast (discussed below) also lies within the AONB, and is noted as containing some of England's few remaining areas of ancient open heathland, known locally as the Sandlings. Within

the AONB there are also small patches of ancient woodlands, three large commercial forests, now important for recreation, and areas of open arable farmland, the largest land use type in the AONB.

4.2.7 Visitor activity is centred around Aldeburgh and Southwold, towns that offer a traditional seaside experience, and in smaller towns and coastal hamlets such as Orford, Dunwich, Bawdsey and Walberswick. Towns on the edge of the AONB such as Woodbridge are also noted for their popularity amongst visitors. The popularity of water-sports is noted as having brought considerable leisure usage to the Stour, Deben, Blyth and Alde/Ore estuaries.

4.2.8 The Suffolk Heritage Coast is a designated area of coastline located within the Suffolk Coast and Heaths AONB and extending offshore, covering the Suffolk coast between Kessingland and Felixstowe. The designation of this narrow coastal strip recognises the local importance of its high scenic quality and its largely unspoilt nature and the need for these assets to be safeguarded.

iv. Locally Designated Landscapes

4.2.9 The study area also includes land designated locally as Special Landscape Areas (SLAs), which follow a number of valleys and tributaries.

c) European Sites

4.2.10 The European sites protected for their habitat and/or species interests (in particular, birds) identified in the study area consist of four main areas and are illustrated on Figure 01:

The Sandlings

- Sandlings SPA.

The Alde-Ore Estuary

- Alde-Ore Estuary SPA;
- Alde-Ore Ramsar site; and
- Alde-Ore & Butley Estuaries SAC.

Minsmere-Walberswick

- Minsmere-Walberswick SPA;
- Minsmere-Walberswick Ramsar site; and
- Minsmere to Walberswick Heaths and Marshes SAC.

Orfordness-Shingle Street SAC extends across the Alde-Ore Estuary SSSI and Orfordness-Havergate National Nature Reserve.

4.2.11 Benacre to Easton Bavents Lagoons SPA lies just beyond the study area to the north.

4.3 Seasonality and Dog Walking Restrictions

4.3.1 Dog walking restrictions exist at the beaches at Thorpeness and Aldeburgh between 1st May and 30th September each year to prevent dog fouling on the beaches during the peak summer period. These areas are illustrated on Figures 03a and 03b.

4.3.2 At Aldeburgh, the restriction at the south of the beach ends just before the car park at Fort Green, and dog walkers are able to use the beach to the south of Fort Green with access from the car park. To the north of Aldeburgh beach the restriction ends south of the car park on Thorpe Road and dog walkers are able to use the beach north of car park. At Thorpeness the restriction extends along a small section of the beach adjacent to the car park and dog walkers are able to use the beach either north or south of the car park.

4.3.3 Whilst these restrictions are in place between May and the end of September, extensive stretches of beach remain accessible. It is anticipated that, in general, residents that live within Aldeburgh and Thorpeness continue to use these beaches in the non-restricted areas, whilst residents that live further from the coast and have the option of driving to a range of beaches, may choose to visit another beach due to the restrictions. As such there may be a slight increase in dog walkers on other beaches such as Sizewell between May to September. Sizewell beach alongside the SZC Main Development Site will be closed for portions of the construction phase, and it will be necessary to consider where else these dog walkers will go. However, it should be noted that the beach south of Sizewell will remain open and accessible to dog walkers throughout the construction phase.

4.3.4 Dunwich Heath and Westleton Heath/Westleton National Nature Reserve lie within the Minsmere-Walberswick SPA and SAC, and whilst they are accessible all year round it is a requirement that dogs are kept on leads or under close control. This is particularly important between March to September when birds are nesting and rearing young on the ground. These restrictions do not extend onto the beach, and Dunwich beach remains accessible to dog walkers all year.

4.3.5 Recreational user surveys at certain beaches (Dunwich) will assist in determining how many people use the beaches during the restricted months, where they go instead, and where they would go when part of Sizewell beach is closed during the construction phase. These surveys are discussed further in Section 3.3.

5. COMMENTS RECEIVED ON THIS PAPER

Table 5.1 - Comments received in relation to the Sizewell C Project HRA Evidence Plan: Disturbance due to Potential Increase in Recreational Pressure

Consultee	Comment	Response
Suffolk Wildlife Trust	Comment in relation to the extent of the Displacement Zone and Receptor Zone: *'It is noted that this distance* (extent of displacement Zone/Receptor Zone) *will be updated using the data collected during the field surveys…We consider that the recreational usage of the suite if habitats in the vicinity of the proposed power station could vary considerably from that recorded in the published studies…It is therefore essential that this update is carried out to ensure that the zones correctly relate to the recreational patterns currently present.*	Noted
Suffolk Wildlife Trust	Comment in relation to the Survey Methodology: query as to whether the volume of questionnaire completion aimed for is realistic.	Noted
Suffolk Wildlife Trust	Comment in relation to the Survey Methodology: *'…recommend that an additional survey is undertaken in the spring to provide better coverage.'*	Noted
Suffolk Wildlife Trust	Comment in relation to Explanatory Text: *'…unclear as to when this agreement* (in relation to the Explanatory Text) *took place, as at the Evidence Plan Workshop on the 24 July 2014 whilst the text was discussed no agreement was reached. The meeting note for the workshop records that NNB GenCo were to undertake further work on the text and any supporting information.* *'*(Explanatory Text) *should be combined with visual representation of the construction and operational impacts of the power station. The use of a display by the surveyors would offer the opportunity to provide a better representation of the likely effects of these activities and give a fairer picture of the likely impacts on recreational amenity.'*	Noted. No further comments have been received from HRA working group following issue of the updated questionnaire and explanatory text issued on 24 July [note this was an update from that which was included within the SCZ-EP-W4-002 issued on 9 July] The Explanatory Text was updated to simplify the presentation into a series of bullet points and agreed with the A & R working group post 24 July. In relation to examples of construction images at similar sites eg Flamanville/SZB, it was considered during an A and R meeting that these are different buildings in different contexts, and do not help explain construction activities and therefore such images should not be included.

Consultee	Comment	Response
Suffolk Wildlife Trust	Comment in relation to Survey Questionnaire: *'…the methodology for this survey states that questionnaires will be completed by interviewees independently and returned to the surveyor. We have significant reservations about this method as our experience in other parts of the country show that the best way to maximise questionnaire returns and to get accurate data is for the surveyor to engage with the interviewee in completing the questionnaire'*	Noted. During the questionnaires, the surveyors have used and will continue to use their professional experience to interpret whether an interviewee would like to engage with the surveyor or whether they would rather complete the questionnaire on their own. As such, each interviewee is judged on an individual basis.
Suffolk Wildlife Trust	Comment in relation to Survey Questionnaire: *'Question 3 – answer 'Going to work' should be replaced with 'Close to work'* *Question 4(b) – the answer to this question should include a 'Don't know' category* *Question 5 – the question should start with 'Do you walk your dog off the lead', with a 'Yes' answer leading to the rest of the question being asked* *Question 7 – answer to this question should include an 'Other activities' box* *Question 8 – query where 'beach footpaths' are'*	Noted.
Suffolk Wildlife Trust	Comments in relation to construction works and other new developments (in-combination impacts): *'Assessment of recreational impacts must include the presence of these* (construction) *workers during the construction period.'*	Noted.
Suffolk Wildlife Trust	Comments in relation to construction works and other new developments (in-combination impacts): *'The methodology also does not include any detail on how population increase through new residential development in the wider area will be incorporated into the assessment.'*	Noted.
Suffolk Wildlife Trust	Comments in relation to potential recreational impacts on other statutory and non-statutory designated sites: *'We would expect these impacts* (on other statutory and non-statutory designated sites) *to be addressed through the Environmental Impact Assessment process and therefore recommend that the survey methodology is sufficient to collect data that allows assessment of impacts on such sites to be undertaken.*	Noted.
Suffolk Wildlife Trust	Comments in relation to maritime recreation: *'It is unclear whether construction or operation activities would have any impact on maritime recreation activities. The potential for such impacts should be addressed through the Habitats Regulations Assessment process.'*	Noted.
RSPB	Comments in relation to paragraph 2.2.6: '*Para. 2.2.6 states that habituation (long-term behavioural change in recreational use) is not expected to be a significant issue in the context of European sites, given the proposed landscape strategy for the EDF Energy estate. The RSPB disagree with this assertion at this stage, as no evidence is provided*	Noted. Reference to the landscape strategy removed as this is still being prepared and therefore no certainty can be provided in relation to its mitigation benefits.

Consultee	Comment	Response
	to support this statement. The landscape strategy should be provided alongside this document, and clear links should be drawn to illustrate how this will mitigate any effects on European sites.'	
RSPB	Comments in relation to paragraph 7.2.1: *'We understand that the Zone of Influence will be revised if survey results show this is necessary and consider that this should be reflected in the documentation for clarification.'*	Noted. Text amended. (ref para no 8.2.2)
RSPB	Comments in relation to figures accompanying questionnaire ref paragraph 3.3.21: '*We also consider that the map presented to visitors during the survey (referred to in para. 3.3.21) should give at least a basic indication of the types of construction activity within different parts of the site, in order that people can give an informed opinion as to whether this is likely to affect their use of the site. A short presentation (either electronically or through displays) as suggested at the workshop could address these issues.*	Noted. In relation to examples of construction images at similar sites eg Flamanville/SZB, it was considered during an A and R meeting that these are different buildings in different contexts, and do not help explain construction activities and therefore such images should not be included.
RSPB	Comments in relation to Annex D 'Implications for European Site': *'…impacts of recreational disturbance on qualifying features of European sites outside the designation boundary are likely to be less important for the site as these areas are essentially buffers. We consider that this statement should be reworded to reflect that, whilst in some cases such impacts may be less important, where habitat or populations using these habitats are functionally linked to those of the European site, this assumption would not apply. We therefore consider that such assessments of importance must be made on a case by case basis.'*	Noted.
RSPB	Comments in relation to Annex D Table A: *'Whilst we acknowledge that the cells completed within Table A in Annex D are examples at this stage, we wish to note that we disagree with the green risk rating currently given to little terns of the Minsmere-Walberswick SPA. Disturbance is a significant threat to little terns on the Suffolk coast, and whilst some controls are in place, these are not fully effective at all times and in all locations (for example, enforcement/compliance with requests for dogs to be on leads). We therefore request that in the final version the risk rating for this species is changed to red.'*	Noted.
RSPB	Comments in relation to paragraph 3.5.12: *'Construction RAG table note 13 refers to potential increases in recreational pressure due to the construction/operational workforce, but we note that these issues are not covered within the recreational disturbance paper. We consider that these impacts will require assessment alongside the impacts from displacement of existing users in order to give a full understanding of recreational impacts arising from the development.'*	Noted. These impacts will be considered within the A & R methodology for the EIA.

Consultee	Comment	Response
Suffolk County Council	Comment from the Survey Questionnaire Final Review Meeting 30 July 2014: *'Remove survey point at the beach car park at Thorpeness as this will not provide any helpful data and replace with a survey point in Eastbridge, at the junction with the Minsmere Sluice east west public right of way and Eastbridge Road, south of The Eels Foot Inn.'*	Noted. Section 3. Methodology amended. NOTE August survey adapted to include The Eels Foot Inn and exclude Thorpeness car park.
Suffolk County Council	Comment in relation to user survey locations: *'We would like to see the Deben SPA included for additional surveys 1.6.2 in SZC_A&R_Survey Methodology , particularly given the potential for in-combination effect with Adastral Park'.*	Noted. Survey point added and to be included as part of the November surveys.
Suffolk County Council	Comment in relation to paragraph 3.3.3: *paragraph states that the additional survey locations will only be used if the results of the first (Aug 2014) surveys identify pressures on other EU sites from displacement. We can understand this rationale, but we are concerned that EDF are placing too much reliance in the outcomes of the surveys. Also, of course, user information may be skewed by the timing of these surveys (August), as use is likely to be quite different during the summer holidays.* *Whilst we agree 'additional surveys' should focus on the first 6 questions, we believe the precautionary principle would point to the need to get a better understanding of how people use the Suffolk coast, and this requires surveys to be undertaken at the additional locations from the outset. This point was also picked up in your presentation as a key message from June 11th meeting ("understanding the habituation of users to be addressed"). As we have stated all along, users of the coast are not just local dog walkers, but include day-trippers, particularly from Ipswich and other large towns to the south, west and north. It is the use of the coast by these visitors principally, that EDF need to better understand, to be confident that impacts of recreational displacement on other EU sites, across a much wider area on the Suffolk coast, can be scoped out in the RAG tables.'*	Noted.
Suffolk County Council	Comments in relation to general disturbance from construction activity and noise: *'Changes in use of the beach at Sizewell may not just be associated with temporary closure of beach, but also by the perception of disturbance in the general area from construction activity and noise (MOLF, traffic movements on the road etc). These factors may well be enough in themselves to keep people away and drive them to other coastal areas. Also of course there is the fact that several thousand workers may be living on site and thus it is likely local recreational sites will be busier as a result. This may in turn drive existing local users to other locations further afield, and for those coming from further away, mean that they stop off for a similar coastal (or hinterland) experience well short of Sizewell to the south or north.'*	Noted

Consultee	Comment	Response
Suffolk County Council	Comments in relation to paragraph 2.2.6: *'…we do not agree with EDF's assertion that long term displacement is not expected to be a significant issue in the context of other EU sites. As yet we have insufficient information about the vision for the SZC estate and data is not yet in from the surveys. EDF has as yet not undertaken sufficient work, and therefore not yet gathered sufficient evidence on habituation of users to come to such a conclusion. At this stage we are concerned that much of EDF's thinking is focussed on local and regular users of the immediate Sizewell area and where they will go, with less regard to day-trip use of the coast and how perceptions of, or actual, disturbance in the Sizewell area generally, may drive day-trippers to other locations on the coast. We have made this point a number of times, yet the survey methodology still does not seem to take this into account. Our concern stems from the fact that recreational disturbance is already cited in 2010 by Natural England as posing a high risk to European Marine Site features on a number of sites up and down the Suffolk coast. Any additional recreation pressure resulting from displacement from SZC, to any of these sites, is a matter for serious consideration.'*	Noted.
Suffolk County Council	Comment in relation to habituation of users: *'We understand the relationship between displacement and receptor zones which extends the study area to 16km, however we do not feel this deals with the need to better understand the habituation of users and nor does it adequately deal with other potential in-combination effects, such as Adastral Park and the Deben SPA.'*	Noted.
Natural England	Natural England has reserved comment until Stage 3.	Noted
PINS	Comments in relation to the Explanatory Text accompanying the questionnaire.	Noted and amendments made.

Note: The paper has been updated to reflect the following areas of agreement with the Amenity & Recreation Working Group subsequent to the 4th HRA Evidence Plan Workshop (which were all actioned prior to undertaking the August 2014 summer recreational survey):

- Six core survey locations
- Final version of questionnaire
- Final version of project description

In addition, the paper has been updated to provide for inclusion of an additional recreational survey location at The Deben Estuary on the advice of SCC. The Evidence Plan Working Group has not seen or commented on this version of the paper which will be discussed in detail in the Topic Group meetings in Stage 3.

6. REFERENCES

Footprint Ecology. South Sandlings Living Landscape Project – Visitor Survey Report, 2011.

Footprint Ecology. Visitor Access Patterns on the Thames Basin Heath, 2005.

LDA Design and Natural England. Thames Basin Heaths SPA Access Management Report, 2007.

Footprint Ecology. Visitor Survey Results from Breckland SPA, 2011.

Footprint Ecology. The Solent Disturbance and Mitigation Project. Phase II on-site visitor survey results from the Solent Region, Oct 2010.

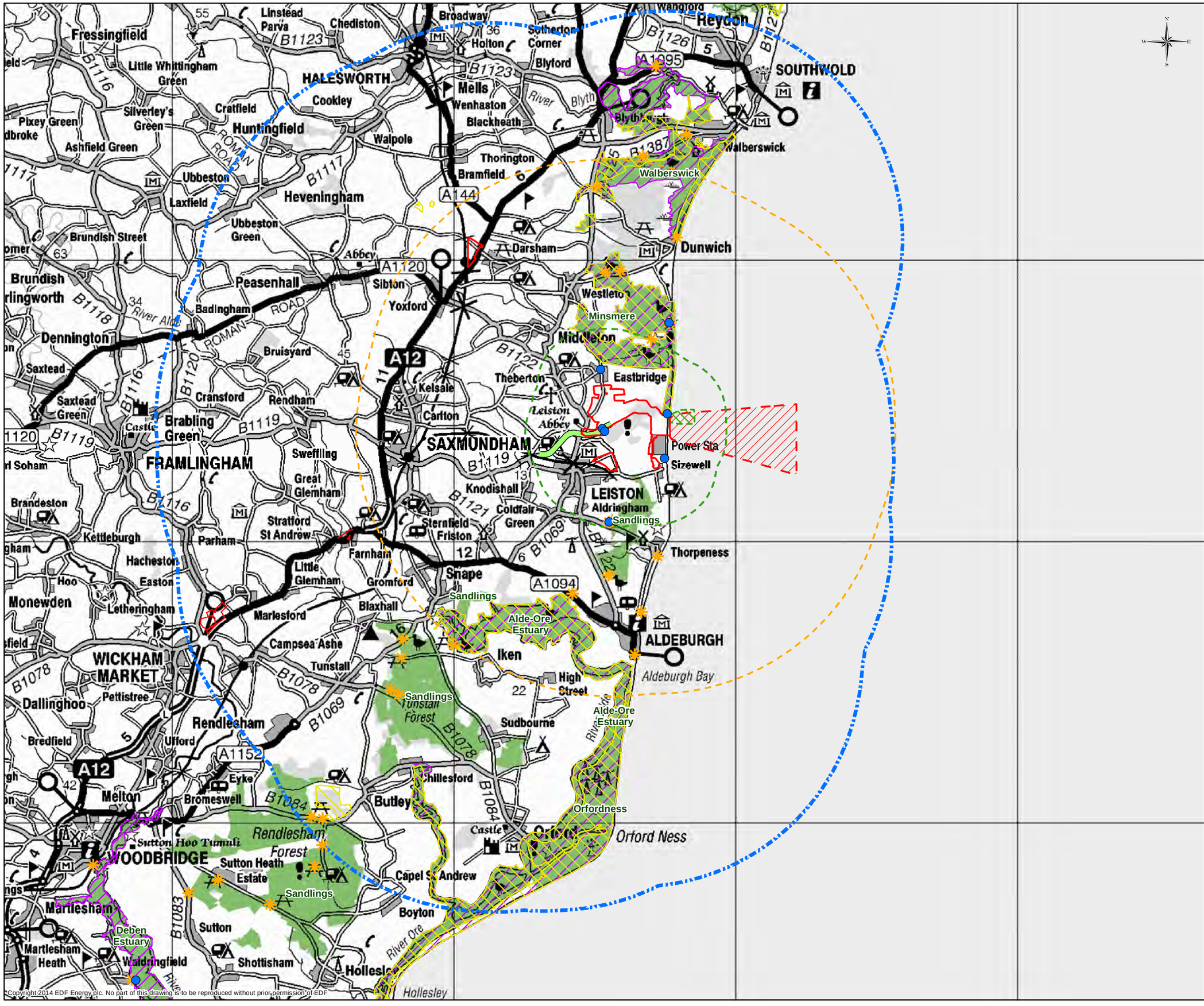
Footprint Ecology. Exe Disturbance Survey, Dec 2011.

Natural Enterprise. An Assessment of the Recreational Impacts on the European Sites of the River Medina and Ryde Sands on the Isle of Wight, March 2012.

Thames Basin Heath's SPA Delivery Plan.

7. FIGURES

Figure 01	Study Area, Survey Locations and European Sites
Figure 02	Extent of Main Development Site
Figure 03a	Recreational Resources (North)
Figure 03b	Recreational Resources (South)
Figure 04	Receptor Zone Offset from Settlements



INTERNAL BUSINESS COLLABORATOR REFERENCE

Not applicable for all figures

NOTES:

ONLY SOME OF THE OFF-SITE ASSOCIATED DEVELOPMENTS ARE SHOWN.
SOURCES: NATURAL ENGLAND.

KEY

- INDICATIVE MAIN DEVELOPMENT SITE AND OFF-SITE ASSOCIATED DEVELOPMENT SITES
- AREA FOR COOLING WATER AND ASSOCIATED INFRASTRUCTURE
- AREA FOR JETTY
- RAILWAY LINE
- ZONE OF PHYSICAL CHANGE (2KM BUFFER AROUND INDICATIVE MAIN DEVELOPMENT SITE)
- DISPLACEMENT ZONE (8KM BUFFER AROUND INDICATIVE MAIN DEVELOPMENT SITE)
- RECEPTOR ZONE (8KM BUFFER AROUND SETTLEMENTS IN DISPLACEMENT ZONE)
- CAR PARK LOCATIONS AT EUROPEAN SITES AND SURVEY LOCATIONS
- SURVEY LOCATIONS

EUROPEAN SITES

- SPECIAL PROTECTION AREAS
- SPECIAL AREAS OF CONSERVATION
- RAMSAR SITES

REVISION	DATE	DRAWN	CHECKED	REASONS FOR REVISIONS / COMMENTS	APPROVED

SIZEWELL C

DOCUMENT:

SIZEWELL C PROJECT
HRA EVIDENCE PLAN

DRAWING TITLE:

STUDY AREA, SURVEY LOCATIONS AND EUROPEAN SITES

DRAWING NO:	REVISION:
FIGURE 01	3

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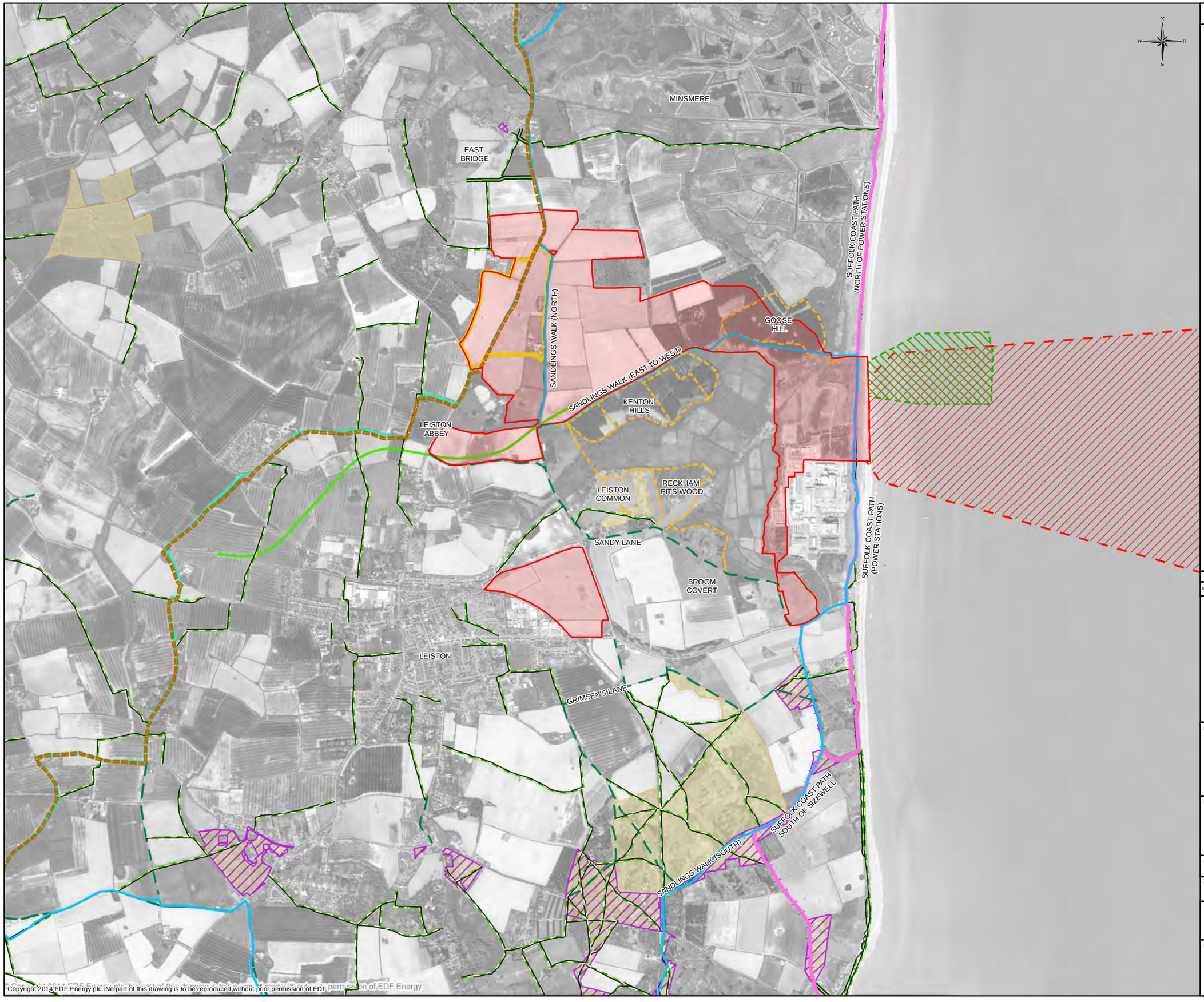

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Not applicable for all figures

NOTES:

ONLY SOME OF THE OFF-SITE ASSOCIATED DEVELOPMENTS ARE SHOWN.
SOURCES: NATURAL ENGLAND.

KEY

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- AREA FOR COOLING WATER AND ASSOCIATED INFRASTRUCTURE
- AREA FOR JETTY
- ACCOMMODATION CAPUS SITE
- RAILWAY LINE

PUBLIC RIGHTS OF WAY

- FOOTPATH
- BYWAY
- BRIDLEWAY
- RESTRICTED BYWAY
- PERMISSIVE PATHS WITHIN THE EDF ENERGY ESTATE
- SUSTRANS REGIONAL ROUTE
- SUSTRANS / CYCLE DETOURS (ON-ROAD AND OFF-ROAD)

LONG DISTANCE ROUTE

- SANDLINGS WALK
- SUFFOLK COAST PATH
- REGISTERED COMMON LAND
- OPEN ACCESS LAND

REVISION	DATE	DRAWN	CHECKED	REASONS FOR REVISIONS / COMMENTS	APPROVED

SIZEWELL C

DOCUMENT:

SIZEWELL C PROJECT
HRA EVIDENCE PLAN

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EXTENT OF MAIN DEVELOPMENT SITE

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REVISION: 2

DATE: JULY 2014

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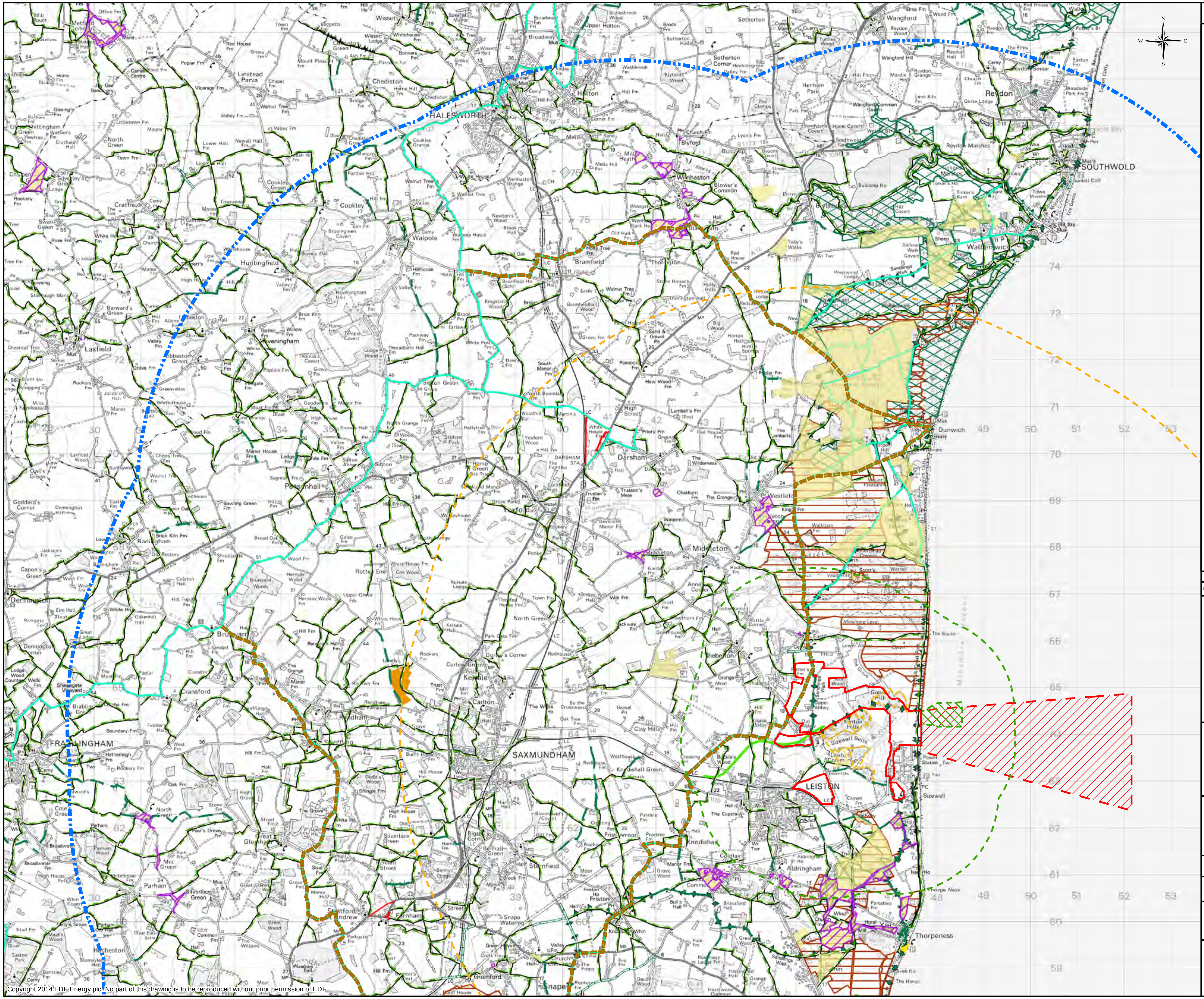

INTERNAL BUSINESS COLLABORATOR REFERENCE

Not applicable for all figures

NOTES:

ONLY SOME OF THE OFF-SITE ASSOCIATED DEVELOPMENTS ARE SHOWN.
SOURCES: NATURAL ENGLAND, RSPB.DOF RESTRICTION AREAS DIGITISED BY LDA DESIGN FROM SUFFOLK COASTAL DISTRICT COUNCIL MAP, PRODUCED ON 29 OCTOBER 2008. RYA LAYERS CREATED BY LDA DESIGN BASED ON RECREATIONAL BOATING AREAS FROM FEBRUARY 2014

KEY

- INDICATIVE MAIN DEVELOPMENT SITE AND OFF-SITE ASSOCIATED DEVELOPMENT SITES
- AREA FOR COOLING WATER AND ASSOCIATED INFRASTRUCTURE
- AREA FOR JETTY
- RAILWAY LINE
- ZONE OF PHYSICAL CHANGE (2KM BUFFER AROUND INDICATIVE MAIN DEVELOPMENT SITE)
- DISPLACEMENT ZONE (8KM BUFFER AROUND INDICATIVE MAIN DEVELOPMENT SITE)
- RECEPTOR ZONE (8KM BUFFER AROUND SETTLEMENTS IN DISPLACEMENT ZONE)

RECREATIONAL RESOURCES
- LOCAL NATURE RESERVE
- NATIONAL NATURE RESERVE
- RSPB RESERVE
- REGISTERED COMMON LAND
- OPEN ACCESS LAND
- COUNTRY PARK

PUBLIC RIGHTS OF WAY
- FOOTPATH
- BYWAY
- BRIDLEWAY
- RESTRICTED BYWAY

OTHER ACCESS ROUTES
- PERMISSIVE PATHS IN EDF ENERGY ESTATE
- SUSTRANS REGIONAL ROUTE
- SUSTRANS / CYCLE DETOURS (ON-ROAD AND OFF-ROAD)
- RECREATIONAL ROUTES

OTHER FEATURES
- DOG RESTRICTIONS ON BEACH

REVISION	DATE	DRAWN	CHECKED	REASONS FOR REVISIONS / COMMENTS	APPROVED

SIZEWELL C

DOCUMENT:
SIZEWELL C PROJECT
HRA EVIDENCE PLAN

DRAWING TITLE:
RECREATIONAL RESOURCES (NORTH)

DRAWING NO: FIGURE 03a
REVISION: 2

DATE: JULY 2014
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INTERNAL BUSINESS COLLABORATOR REFERENCE

Not applicable for all figures

NOTES:

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SOURCES: NATURAL ENGLAND, RSPB.DOF RESTRICTION AREAS DIGITISED BY LDA DESIGN FROM SUFFOLK COASTAL DISTRICT COUNCIL MAP, PRODUCED ON 29 OCTOBER 2008. RYA LAYERS CREATED BY LDA.DESIGN BASED ON RECREATIONAL BOATING AREAS FROM FEBRUARY 2014

KEY

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- DISPLACEMENT ZONE (8KM BUFFER AROUND INDICATIVE MAIN DEVELOPMENT SITE)
- RECEPTOR ZONE (8KM BUFFER AROUND SETTLEMENTS IN DISPLACEMENT ZONE)

RECREATIONAL RESOURCES

- LOCAL NATURE RESERVE
- NATIONAL NATURE RESERVE
- RSPB RESERVE
- REGISTERED COMMON LAND
- COUNTRY PARK
- OPEN ACCESS LAND

PUBLIC RIGHTS OF WAY

- FOOTPATH
- BYWAY
- BRIDLEWAY
- RESTRICTED BYWAY

OTHER ACCESS ROUTES

- PERMISSIVE PATHS IN EDF ENERGY ESTATE
- SUSTRANS REGIONAL ROUTE
- SUSTRANS / CYCLE DETOURS (ON-ROAD AND OFF-ROAD)
- RECREATIONAL ROUTES

OTHER FEATURES

- DOG RESTRICTIONS ON BEACH

REVISION	DATE	DRAWN	CHECKED	REASONS FOR REVISIONS / COMMENTS	APPROVED

EDF ENERGY

SIZEWELL C

DOCUMENT:

SIZEWELL C PROJECT
HRA EVIDENCE PLAN

DRAWING TITLE:

RECREATIONAL RESOURCES (SOUTH)

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FIGURE 03b	2

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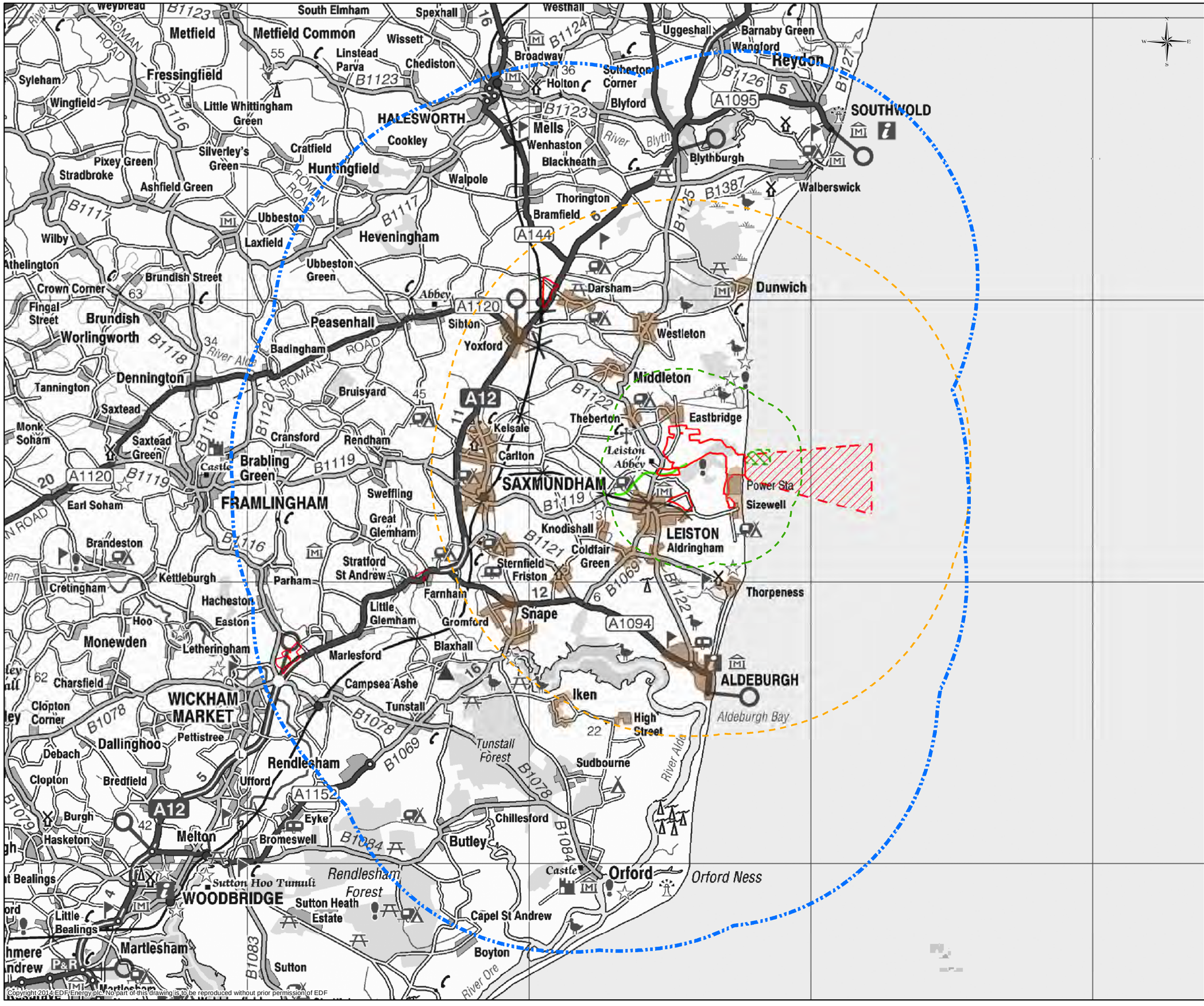
- ☐ PROTECTIVE MARKING REQUIRED
- ☒ NOT PROTECTIVELY MARKED



INTERNAL BUSINESS COLLABORATOR REFERENCE

Not applicable for all figures

NOTES:

ONLY SOME OF THE OFF-SITE ASSOCIATED DEVELOPMENTS ARE SHOWN.
SOURCES: NATURAL ENGLAND.

KEY

- INDICATIVE MAIN DEVELOPMENT SITE AND OFF-SITE ASSOCIATED DEVELOPMENT SITES
- AREA FOR COOLING WATER AND ASSOCIATED INFRASTRUCTURE
- AREA FOR JETTY
- RAILWAY LINE
- ZONE OF PHYSICAL CHANGE (2KM BUFFER AROUND INDICATIVE MAIN DEVELOPMENT SITE)
- DISPLACEMENT ZONE (8KM BUFFER AROUND INDICATIVE MAIN DEVELOPMENT SITE)
- RECEPTOR ZONE (8KM BUFFER AROUND SETTLEMENTS IN DISPLACEMENT ZONE)
- SETTLEMENTS WITHIN DISPLACEMENT ZONE

REVISION	DATE	DRAWN	CHECKED	REASONS FOR REVISIONS / COMMENTS	APPROVED

SIZEWELL C

DOCUMENT:

SIZEWELL C PROJECT
HRA EVIDENCE PLAN

DRAWING TITLE:

RECEPTOR ZONE OFFSET FROM SETTLEMENTS

DRAWING NO:	REVISION:
FIGURE 04	2

DATE:	DRAWN:	SCALE:
JULY 2014	J.H.	1:125,000 @A3

SCALE BAR:

0 5Kilometers

DRAWING SECURITY CLASSIFICATION:

- ☐ PROTECTIVE MARKING REQUIRED
- ☒ NOT PROTECTIVELY MARKED

8. ANNEX A: REVIEW OF RELEVANT CASE STUDIES

8.1 Introduction

8.1.1 This report draws upon information and learning from selected published reports on recreational visitor surveys in landscapes of a similar type to that within the study area, in particular either heathland landscapes or estuary landscapes associated with European habitat designations, including SPA and SAC designations. The aim of the studies was to understand recreational patterns and visitor behaviour in these European sites and the likely effects on ecological resources resulting from changes in recreation pressure that may result from development in areas considered close enough to generate changes in recreational activity. The findings of these surveys assist in understanding the nature of typical recreational use and patterns that could be reasonably applied to the Sizewell context.

8.1.2 The reports reviewed were:

- South Sandlings Living Landscape Project – Visitor Survey Report (2011, Footprint Ecology) – hereafter referred to as 'Sandlings';
- Visitor Access Patterns on the Thames Basin Heaths (2005, Footprint Ecology), which formed part of the Thames Basin Heaths SPA Access Management Report (2007, LDA Design and Natural England) – hereafter referred to as 'TBH';
- Visitor Survey Results from Breckland SPA (2011, Footprint Ecology) – hereafter referred to as 'Breckland';
- The Solent Disturbance and Mitigation Project. Phase II on-site visitor survey results from the Solent Region (Oct 2010, Footprint Ecology) – hereafter referred to as 'Solent';
- Exe Disturbance Survey (Dec 2011, Footprint Ecology) – hereafter referred to as 'Exe';
- An Assessment of the Recreational Impacts on the European Sites of the River Medina and Ryde Sands on the Isle of Wight (March 2012, Natural Enterprise) – hereafter referred to as 'Isle of Wight'; and
- Thames Basin Heath's SPA Delivery Plan.

8.1.3 The aim of the first six studies was to understand recreational patterns and visitor behaviour in these European sites and the likely effects on ecological resources resulting from changes in recreation pressure that may result from development in areas considered close enough to generate changes in recreational activity. The Thames Basin Heath's SPA Delivery Plan includes the definition of zones around SPA sites that provide useful information for informing the definition of the extent of the Displacement Zone and wider study area for SZC HRA.

8.1.4 The findings of these reports assist in understanding the nature of typical recreational use and patterns that could be reasonably applied to the Sizewell context.

8.1.5 The review has identified typical recreational patterns in SPAs in lowland heathland habitats and estuary environments. The Sandlings SPA is also within an Area of Outstanding Natural Beauty and located within the proposed study area for this project. The review also established a baseline understanding of profiles of movement of the people visiting the SPAs, for example, their typical travel distance to reach the site, their main activity at the site and reasons for visiting. This has identified the possible extent that existing recreational users may be prepared to travel to alternative locations for recreation and the profile of these users. In understanding this information it is considered reasonable to establish the likely distance that users, who may be affected by the SZC construction phase, will be prepared to travel to an alternative location for recreation and whether this has potential to impact protected habitats as a consequence of the SZC construction phase. The review has underpinned the extent of the study area and the European sites that may be subject to changes in recreational behaviour as a result of displacement by SZC construction activities.

8.1.6 A detailed summary of the review is outlined below.

8.2 Summary of Visitor Survey Reports Review

8.2.1 Similar themes emerged from the reports. The notable themes that are of relevance to this paper are as follows.

a) Visitor Behaviour within the SPAs

- Most visitors tended to visit for less than 2 hours (at Sandlings, Breckland and Isle of Wight).
- Median route lengths for dog walkers were similar at Sandlings, TBH, Breckland and Solent, at 2.9km, 2.3km, 2.5km, and 2.55km respectively. The TBH report indicated that despite the average dog walk route being 2.5km, 78% of dog walkers do not walk further than 1km into the heath.
- Median route lengths for walkers at Sandlings, TBH, Breckland and the Solent were 3.9km, 2.1km, 2.7km, and 3.1km respectively.
- Cyclists took noticeably longer routes at Sandlings, TBH, Breckland, and Solent. The median cycling routes were 10.34km, 4.4km, 15.6km, and 4.16km respectively.
- Horse riders at Sandlings and TBH took median routes of 6.32km and 2.5km respectively.
- The surveys indicated that certain locations proved more popular with visitors, particularly where there were key facilities, attractions, or large car parks.
- At Sandlings, the heaths were more heavily visited than forestry areas. There were notable ‘hotspots’ at Sutton Heath and at Tangham, where there were good facilities and large car parks or were near housing areas.

- At Solent, dog walking and walking were the most frequently recorded activities on intertidal areas, with 19.1% of dog walking routes, and 23.3% walking routes on intertidal areas.

b) Activities undertaken

- Dog walking was the most popular activity across all reports, other than at the Exe Estuary, where it was the most common activity on the intertidal area[4] but walkers without dogs were most common on the shore; and at the Solent, where dog walking was slightly less popular than walking without a dog.

- Dog walking was stated as the main activity by 52.8% of participants at Sandlings; 59% at TBH; 36% at Breckland; 26% at Exe; 42% at Solent; and it was identified as the predominant recreational pressure at Isle of Wight.

- At Solent, 25% dog walkers stated they visited most days; compared to 14% of walkers.

- At Sandlings, TBH, and Breckland; walking was the second most popular activity.

c) Reasons for visit

- Closeness to home/proximity to nearby settlements was the most common reason behind people's visits at Sandlings (for all visitors and specifically for dog walkers), at Solent and at the Medina on the Isle of Wight.

- At Sandlings, the second most common reason for visiting related to enjoyment for dogs, which relates to the fact that more than half of Sandlings visitors were dog walkers. This was followed by other reasons including the habitat and attractive scenery/views.

- At Ryde on the Isle of Wight, the setting was stated as the most important reason; whilst at Solent 'attractive scenery and or views' featured as the second most important reason.

- The most popular reason at Breckland was 'good for activity', followed by 'close to home' and 'particular facilities at site'; whilst car parking and a choice of routes also featured near the top of the list.

d) Seasonality (Sandlings only)

- More holiday makers visit in summer than winter (19% of visitors during the summer were holiday makers; and 6% of visitors during winter were holiday makers).

- 67% of visitors during winter months had dogs and 55% in spring/summer had dogs.

[4] At the Exe estuary, the survey illustrated that it was dog walkers on the intertidal area with their dogs off leads that caused the high percentage of major flight events for birds from all observed potential observed disturbance events.

- There were more responses to cycling as people's main activity in the summer than winter (9.4% of all responses in summer and 5.5% in winter).
- There were more responses to bird watching as people's main activity in the winter than summer (3.6% of all responses in winter and 2.2% in summer).
- There were more visits after 5pm during the summer, with 10.6% of all spring/summer visits occurring after 5pm; and 2% of all winter visits occurring after 5pm.

e) Distance travelled

- The reports used a straight line calculator to measure the distance from people's home post codes to the survey locations.
- The majority of visitors arrived by car/van (79% at Sandlings; 83% at TBH; 91% at Breckland; 79% at Medina and 58% at Ryde at the Isle of Wight; 58% at Solent).
- Car/van driving distances for all visitors were: a winter median of 6.71km and summer median of 8.18km at Sandlings (and an annual median of 6.17km excluding those on holiday); a median of 3.1km at TBH; a median of 8.81km at Breckland; and a median of 4km at the Solent (excluding those on holiday).
- The year round median at Sandlings for non-holiday makers was 6.17km which included people arriving by horse, bike or on foot. The median specifically for non-holiday makers arriving by car was 7.53km.
- Travelling distances for dog walkers were: a winter median of 4.9km and summer median of 4.7km at Sandlings; a median of 5.6km at Breckland, with an interquartile range[5] between approximately 3-10km; and a median of 1.2km at Solent, with an interquartile range between approximately 0.5-2km.
- At Sandlings approximately three quarters of dog walkers lived within 10km, and half lived within 5km. Walkers travelled a median distance of 13.5km in winter, and 19.54km in spring/summer to reach survey locations.
- At TBH just under 75% of respondents coming from within 5km. The maximum travel distance for car/van drivers was 555.4km and the minimum was 0.4km, whilst the median distance was 3.1km. The median travel distance for those arriving on foot was 0.5km, for those on bikes it was 1.5km, and for those arriving by horse it was 3.1km.

f) Travelling to other sites

- Over three quarters of dog walkers at TBH also visit other sites for the same primary activity of dog walking. 80% of the dog walkers that arrived by car visited other sites; whilst 57% of dog walkers that arrived on foot also visited other sites.

[5] the interquartile range is the mid 25%-75% of the data thereby ignoring extreme values

- At TBH 44% of participants would travel between 1.6 – 8km to reach alternative sites; whilst 16% would travel less than 1.6km, 28% would travel more than 8km, and 12% chose several categories. Of the dog walkers, 51% would travel between 1.6 – 8km; whilst 17% would travel less than 1.6km, 20% would travel more than 8km, and 11% chose several categories.

- Of the dog walkers, 59% of those in cars would travel 1.6-8km, and 81% of those on foot would travel to within 1km to alternative sites. Of all the groups, dog walkers were the group with the smallest proportion of people willing to travel more than 8km to reach alternative sites (20%).

- At Breckland, dog walkers and walkers (excluding holiday makers) visited the greatest variety of other sites.

- At Sandlings 59% of groups stated they also visit coastal and estuary locations. These other locations included Aldeburgh (9%), Minsmere/Dunwich (8%), and Thorpeness (3%). Further additional locations were identified from free text descriptions in the surveys, of which Sizewell was the most commonly stated location visited.

- At Solent, when asked what features would be necessary to make another site attractive for use as an alternative to the site where they were interviewed, 34% of visitors indicated that nothing would deflect their use while 17% would be deflected by attractive scenery, 11% if the site were dog friendly and 11% if it were close to home.

- At the Isle of Wight, Ryde (in particular at Appley) was considered a popular location due to its unique characteristics, and not just due to its convenience and availability, and that this strong sense of place would mean that strategies to deflect or distract visitors would be unlikely to succeed.

g) Survey Method

- The Sandlings surveys were carried out in the winter and summer; whilst TBH, Breckland surveys only occurred in the summer. The Exe surveys were undertaken at various times of year across numerous years. The Solent and Isle of Wight surveys were undertaken in winter only.

- The Sandlings, TBH, Breckland and Solent surveys interviewed 'groups' rather than individuals in a group, with answers recorded per group, with the number of people and dogs per group recorded. Some of these groups consisted of only one person.

- The Exe survey counted individuals or groups; and the Isle of Wight surveys interviewed individuals.

8.2.2 The methodology used in these surveys has informed the proposed methodology for a series of surveys on users of PRoW within the SZC Main Development Site and the wider study area. These are discussed further in Section 3. Methodology. Dependent upon the results of the user surveys undertaken in August and the distances that people are found to travel to recreational assets, this will also influence the extent of the Study Area defined in Section 3. Methodology, and this will be revised as necessary following analysis of the questionnaires.

8.3 Inferring Recreational Movements and Consequences for Disturbance

8.3.1 These reports illustrate that in both the lowland heathland and estuarine environments, dog walking was the most common activity at the SPA sites (generally within intertidal areas of the estuarine environments), and that walking tended to follow as the second most common activity. Dog walkers tended to go for relatively short walks between 2.3 - 2.9km. Walkers tended to go for walks between 2.1 – 3.9km.

8.3.2 The majority of visitors arrived by car or van, and had usually travelled relatively short distances from home. Median travelling distances varied between 4km - 6.17km at the Solent and Sandlings (excluding those on holiday); and between 3.1km – 8.81km for all visitors including those on holiday at TBH and Breckland.

8.3.3 For dog walkers, the median distances travelled from home varied between 2.1km - 5.6km.

8.3.4 At TBH, the majority of dog walkers stated they would be willing to travel 1.6 – 8km to visit alternative locations. At TBH figures indicated that there was some evidence that dog walkers tended to travel shorter distances to alternative locations as dog walkers were the group with the smallest proportion of people travelling more than 8km.

8.3.5 These TBH figures, and the median travel distances suggest that dog walkers will generally limit the distance that they will travel by car to take their dogs for a walk, which informs the possible extent of displacement, and restricts the extent of the study area to distances that we can reasonably expect dog walkers to travel to. The figures highlight that walkers may travel further, but this may cause less of an issue in relation to ground breeding birds as walkers do not result in the same threat to ground nesting birds.

8.3.6 At Sandlings seasonal differences were apparent, in particular the increase in holiday makers during the summer. The figures show that there were proportionally fewer participants with dogs in the summer; however it is likely that these summer numbers are diluted by the increase in holiday makers, and it cannot necessarily be inferred that there were fewer numbers of dog walkers in summer. It does suggest that fewer holiday makers had dogs, in which case the increased recreational pressure due to their displacement could present less of a threat to species that could be disturbed by them, such as ground breeding birds.

8.3.7 There were also more cyclists at Sandlings in the summer than in the winter which suggests that displaced summer cyclists may present more of a threat to summer ground breeding birds. More people also visited Sandlings later in the day in the summer than in the winter which indicates that potential increases in disturbance may go on for longer in the day during the summer, and the intensity of displacement may increase into the evenings.

8.4 Thames Basin Heath's SPA Delivery Plan

8.4.1 The Thames Basin Heaths Draft Delivery Plan report, prepared by Natural England, set out a series of zones around SPA sites, where development should and should not occur, and what proportion of 'Suitable Accessible Natural Green Space' (SANGS) should be provided as part of a development.

8.4.2 SANGS is the name given to green space that is of a quality and type suitable to be used as mitigation within the Thames Basin Heaths Planning Zone. Its role is to provide alternative green space to divert visitors from visiting the Thames Basin Heaths SPA. SANGS are intended to provide mitigation for the potential impact of residential development on the SPA by preventing an increase in visitor pressure on the SPA. The zones utilised in the SANGS delivery plan provide useful information for informing the definition of the extent of the Displacement Zone and wider study area for SZC HRA. The decision making on the extent of the zones is based on the expected distance that people will travel for recreation, derived from information taken from the TBH visitor survey report that is discussed above, and therefore is of relevance to determining the study area for the SZC HRA project.

8.4.3 Natural England originally proposed three zones. The Assessor's Report of the TBH Delivery Plan found the Natural England proposals unsound, but provided a series of recommendations and guidance points as to the extent of SANG that should be provided depending on which zone housing development would occur in.

8.4.4 Zone A (400 metres originally proposed by Natural England and agreed in the Assessor's Report) - No development to be allowed within 400m of the SPA unless it can be demonstrated that it would not lead to further recreational use of the SPA or have any other significant effect on its integrity. The definition of this zone is based mainly on possible impacts from cat predation, but also on other possible 'edge effects' such as fly tipping and dumping of garden rubbish.

8.4.5 Zone B (400 metres to 2 kilometres originally proposed by Natural England and changed to 1km in the Assessor's Report) – Residential development to provide suitable mitigation.

8.4.6 The definition of this zone was the subject of the strongest criticism by the Inspector and Peer Review. In particular, the Peer Review found that the evidence to support it was extremely weak. Natural England argued that it was sensible as it covered 95% of visitors on foot and would capture 38% of the total number of visitors based on the findings from the survey undertaken by Liley et al in 2005 (this is the TBH visitor survey we have referred to above).

8.4.7 However, the Inspector said he could see no particular reason why this distance constituted the most pragmatic definition for the mid-zone. Since a distance of 1.5kms would capture the highest rate of increase of visitors by car or van and 90% of foot visitors and that thereafter the number of foot visitors tails off rapidly, he considered that it would actually form a more robust definition when considering the visitor survey data on its own. The Inspector felt it would also be appropriate to factor in the more recent findings of the TBH visitor survey, which showed a significant correlation between urban development and nightjar density up to a distance of 800 metres. When these two figures are considered he found that it would be pragmatic to define the outer boundary of Zone B at 1 kilometre. We note that this was in fact the distance which was recommended by the Peer Review.

8.4.8 Zone C (2 kilometres to 5 kilometres originally proposed by Natural England and defined as 5km in the Assessor's Report).

8.4.9 Less concern was raised about the definition of the boundaries of this zone. However the Peer Review and others questioned the robustness of the evidence underlying the definition of the outer boundary. Since up to 30% of vehicle drivers in the study

were found to come from beyond 5kms and the graph at Figure 5 of the DDP indicates that a rapid levelling off of visitors by car occurs at 7kms from the SPA, it was felt that it could be argued that it would be more robust to set the outer boundary at 7 kilometres. The Inspector introduced a further requirement for individual assessment of larger schemes up to 7km away (residential development of over 50 houses between 5 and 7kms from the edge of the SPA should be assessed on an individual basis and required to provide appropriate mitigation if it is concluded that it would lead to increased use of the SPA).

8.5 Conclusion

8.5.1 From the typical median travel distances identified in the reports and the findings of the Thames Basin Heaths SPA Delivery Plan it can be assumed that the majority of visitors, in the context of these reports, drive relatively short distances and most commonly visit to walk their dogs and that this pattern of movement can be applied to the SZC context. An 8km Displacement Zone is therefore considered to be a reasonable basis to define the likely extents of displacement occurring from the SZC Main Development Site area capturing typical movement profile for recreational users. This offset has been used to define a wider study area which extends the study area to almost 16km from the Main Development Site.

8.5.2 It is clear from the Sandlings study that Sizewell, coastal and estuary locations comprise the main alternative locations for those using the SPA areas for dog walking.

9. ANNEX B: INFORMATIVE MAY 2014 SURVEY

Summary of Informative May 2014 Survey Results

9.1.1 Initial results from the informative surveys in May 2014 will be formally reported to consultees. They have provided the following background information to help understand the displacement area and its use, and the perceptions and opinions of recreational users there.

- Most people indicated that as there were so many options for walks in the area around Leiston and beyond, they would easily find alternative places to go if they wished to avoid the SZC site.
- Sizewell Beach and the Suffolk Coastal Path, heading north from Sizewell Beach were the busiest areas.
- People reported the Suffolk Coastal Path south of Sizewell as eventually petering out and becoming very gravelly/uncomfortable underfoot.
- Kenton Hill Car Park was well used, mainly by dog walkers using the permissive rights of way through the Kenton Hills south of the Sandlings Walk east-west bridleway, which offer a range of circular routes.
- From Kenton Hills Car Park to get to the coast and back again along Sandlings Walk east-west takes a good hour and a half at pace making it less desirable for dog walkers.
- Cyclists and horse riders cannot easily access the Sandlings Walk east-west bridleway due to a locked five bar gate and stile at intersection with north-south section and kissing gate at Kenton Hills Car Park.
- Sandlings Walk north and east-west bridleways were little used, the former mainly by cyclists and the latter by walkers/dog walkers/bird watchers.
- Kenton Hills is very popular with dog walkers as it is free (unlike the beach); and the woodland is popular as it provides shelter and shade, whatever the weather on the coast.

10. ANNEX C: QUESTIONNAIRE

Rights of Way User Surveys - Sizewell C

Please tick the boxes that apply.

1 Where do you live/where are you staying?

Home postcode:

Holiday accommodation (name of town/village):

If you're on holiday, how often do you visit this area?

Once a year		More than 5 times a year	
2/3 times a year		First time	
4/5 times a year		Not applicable	
		Day trip	

2 What are the main activities you will be doing here today? Tick ONE primary reason, and as many secondary reasons as applicable.

	Primary	Secondary		Primary	Secondary
Walking			Bird watching		
Dog walking			Botany		
Cycling			Sea fishing/angling		
Exercise			Getting some fresh air		
Running			Picnicking		
Horse riding			Access to beach		
Enjoying wildlife					

Other

3 What are your main reasons for visiting this place in particular, rather than other local areas? Tick ONE primary reason, and as many secondary reasons as applicable.

	Primary	Secondary		Primary	Secondary
Close to home			Good for children		
Easy access from/to car parks			Good for families		
Close to work			Archaeology		
Scenery/AONB landscape			Local history		
Peace and quiet			As a short cut/route through		
Good access to a network of footpaths			To see/get close to the Nuclear Power Stations		
Dog friendly walk - on lead			Enjoying the wildlife		
Dog friendly walk - off lead					

Other

4 a) Would you stop using the area around Sizewell C during the construction of the Nuclear Power Station?

Yes ☐ Reason .....
No ☐ .....

4 b) If you would prefer to avoid the paths around the construction site…

i) which other areas are you likely to visit instead (please refer to OS map and give reasons)?

Place 1: ..... Reasons: .....

Place 2: ..... Reasons: .....

Place 3: ..... Reasons: .....

Dont know ☐

ii) how far would you be prepared to travel to alternative areas?

Less than 2 miles ☐ Up to 20 miles ☐
Up to 5 miles ☐ More than 20 miles ☐
Up to 10 miles ☐ Nowhere ☐

iii) how would you get there?

Drive ☐ Use public transport ☐
Walk ☐ Share lifts ☐
Cycle ☐ Other ☐

5 a) Do you walk your dog off the lead?

Yes ☐
No ☐

5 b) If yes, where do you feel able to walk your dog off its lead?

Place 1: .....

Place 2: .....

Place 3: .....

How often do you walk your dog off its lead?

More than once a day ☐ Monthly ☐
Daily ☐ Less often ☐
Weekly ☐ First time ☐

6 What route are you taking today?

Start:

End:

Via:

How did you get to the start of your route?

Walked from home/tourist accommodation	☐	Used public transport	☐
Drove	☐		
Cycled	☐	Other	

How long will your visit be?

Less than 30 mins	☐	Up to 2 hours	☐
Up to 1 hour	☐	More than 2 hours	☐

7 How often do you use this route? Please tick all those that apply.

	Walking	Dog Walking	Cycling	Horse Riding	Running	Wildlife	Other Activities
More than once a day							
Daily							
Weekly							
Monthly							
Less often							
This is the first time							

At what times of year do you use this route?

Jan/Feb/March	☐	July/August/September	☐
April/May/June	☐	October/November/December	☐
	☐	All year round	☐

8 If you visit Sizewell, which rights of way/locations around Sizewell do you visit most? (please refer to Figure 1). Please tick all those that apply.

Aldringham Walks	☐	Sandlings Walk (north)/Bridleway 19	☐
Broom Covert	☐	Sandlings Walk (east-west)	☐
Goose Hill	☐	Sandlings Walk (Aldringham Walks)	☐
Leiston Common	☐	Sandy Lane	☐
Kenton Hills	☐	Suffolk Coastal Path (Aldringham Walks)	☐
Paths north out of Leiston to Abbey/ Theberton	☐	Suffolk Coastal Path (beach in front of Power Stations)	☐
Paths south of Leiston leading to Golf Course/beach	☐	Suffolk Coastal Path (north of Power Stations)	☐
Beach south of Power Stations	☐	Sustrans Route	☐
Reckham Pits Wood	☐	Not applicable	
		Other	

9 What is it about these routes that encourages you to use them? Please tick all those that apply.

Aim to reach a specific destination	☐	Views	☐
Circular routes	☐	Peace and quiet	☐
Part of a long distance path	☐	Wildlife to be seen	☐
Can let dog off the lead	☐	Car park provided	☐
Hard surface	☐	Good for less mobile/buggy	☐
Soft surface	☐	It feels safe	☐
Close to home or tourist accommodation/convenience	☐	Paths are well signed/ interpretation boards	☐
Toilets/Cafe	☐		
		Other	

Do you have any comments about these routes? For example, how could it be improved?

10 Would you be interested in visiting a viewing platform, or visitor centre, to see and learn more about the progression of the Sizewell C Nuclear Power Station construction?

Yes	☐	Not sure	☐
No	☐		

11 Any other comments or suggestions:

About You:

Gender

Male	☐	Alone	☐
Female	☐	In a group of how many people	

Age group

under 20	☐	Do you have a disability that requires you to use a:	
20-44	☐	Wheelchair	☐
45-65	☐	Mobility scooter	☐
over 65	☐		

Thank you

If you have any questions or want to know the latest news on Sizewell C you can reach us by:

Website: *http://sizewell.edfenergyconsultation.info*
Email: *sizewell@edfconsultation.info*
Freephone: *0800 197 6102*

Explanatory Note

- EDF Energy plans to build a new Nuclear Power Station, known as Sizewell C, on land next to Sizewell B.
- Figures 1 and 2 show the likely extent of the temporary construction area and the location of the proposed Power Station.
- It would take between 7-9 years to build the Power Station. The development would include the construction of sea defences along the beach, similar to those in front of Sizewell B, a temporary jetty, and rail extension.
- The scale of construction will be similar to that of the Olympic Park.
- The Coast Path would remain open during construction, but may need to be closed for short periods to ensure public safety.
- Some permissive paths along Kenton Hills extending to the coast would be diverted around the outside of the site (routes being explored).
- Kenton Hills car park and the Permissive Paths within Kenton Hills would remain open, although there would be no access to the coast.
- The Bridleway would be closed throughout construction.
- The boundaries of the construction site would be screened with substantial landscaped bunds and/or acoustic fencing, where necessary, to help protect footpaths, bridleways and cycle paths.

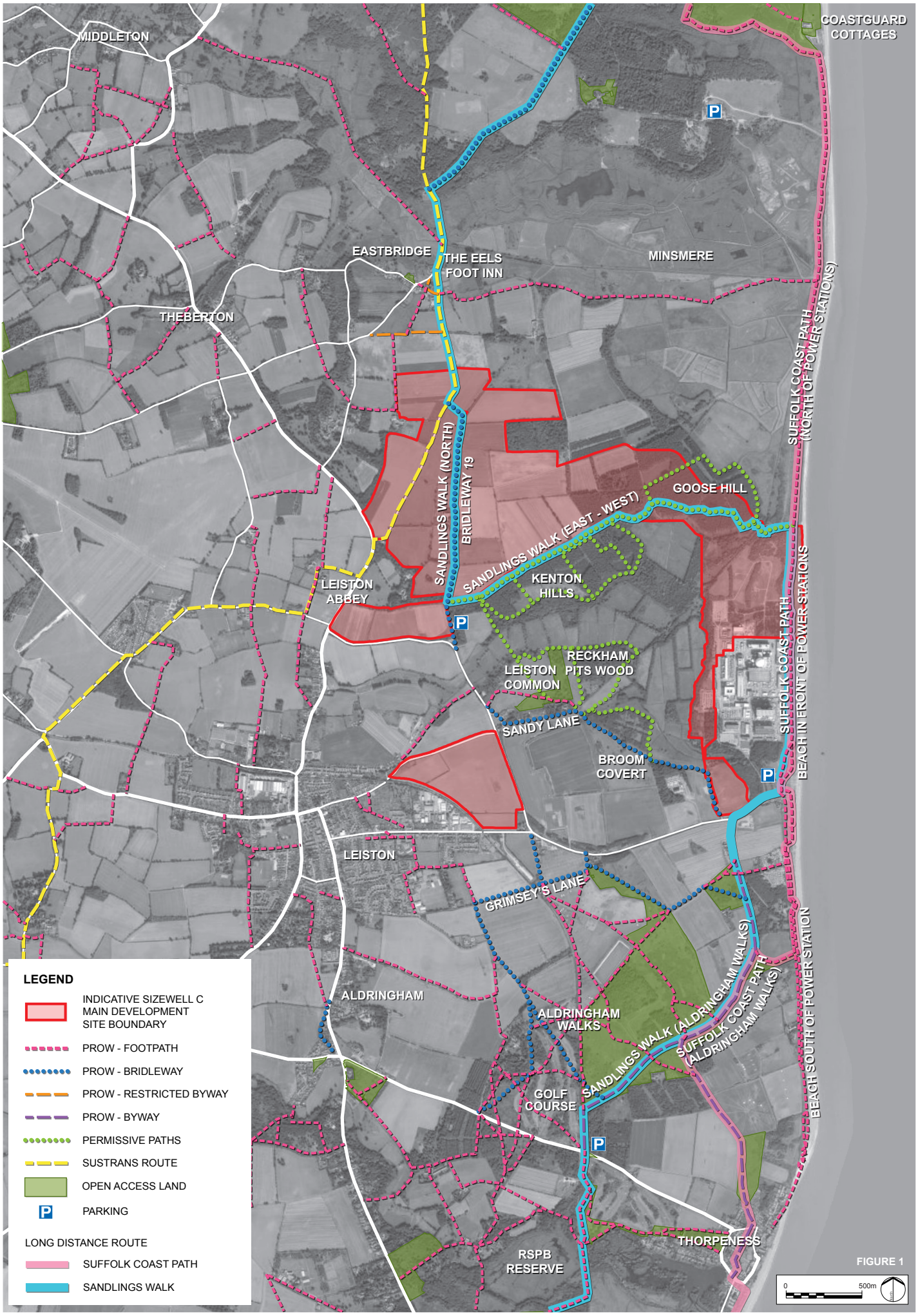


FIGURE 1

Aerial Photography © BING Maps

This map is an illustrative representation of PRoW, Permissive Paths and Open Access Land and does not represent all such access in its entirety.

There were some minor variations in earlier versions of this plan used in August surveys. This is the definitive plan used for all future surveys.

FIGURE 2

There were some minor variations in earlier versions of this plan used in August surveys. This is the definitive plan used for all future surveys.

11. ANNEX D: MATRIX FOR BASELINE EVALUATION OF EUROPEAN SITES

Implications for European Sites

In order to properly assess the implications of the potential increases in recreational disturbance (as discussed above) on the European Sites within the study area it is necessary to understand the various factors influencing the capacity of the qualifying features to accept change (e.g. their sensitivity to disturbance, likelihood of interface with the public, magnitude of increased disturbance, etc.), and to relate this to their Conservation Objectives. Table A, below, therefore sets out these contributing factors and provides a final 'risk rating' (in the end column) to show where the most sensitive areas are with regard to potential impacts upon designated sites.

In order to underpin the HRA (LSE screening and/or appropriate assessment), this table will be completed for all qualifying features of the European Sites within the study area which it is considered could be affected by recreational pressure. Therefore, only those qualifying features identified in the LSE screening (i.e. RAG) tables for which recreational impacts have been screened in (i.e. shaded Amber or Red) are included in the table.

A map will subsequently be produced indicating where the highest risk areas are located, that is, those locations where, without mitigation, significant effects upon qualifying features are considered possible.

The definitions of the columns in the table are provided below.

European Site and qualifying features
These are only those qualifying features for which recreational impacts have been screened in (i.e. shaded Amber or Red) in the LSE screening tables.

Inside or outside the Site
This column is included in order to allow for a separate analysis of those locations where qualifying species and/or supporting habitats are outside designation boundaries. Whilst the impacts of recreational disturbance in these areas may be the same, the importance for the Designated Site is likely to be lower than when the impacts are experienced within the Site. This is because these areas are essentially buffer areas rather than the Site itself.

Map ref/ target note
When the sensitive areas are mapped, it will be necessary to mark them with reference numbers to denote which habitats and/or species they refer to (as some areas will support more than one feature and will therefore need to have a number of target notes within them).

Nature of feature and sensitivity to recreational impacts
With regards to species, this column should describe those elements of the qualifying species' behaviour that could be affected by recreational disturbance (e.g. nesting, foraging), how this could be affected by increased visitor pressure (e.g. displacement from nest due to human/dog disturbance, dog predation, nest trampling, etc.) and, on the basis of existing research, how sensitive the species are to such impacts. Similarly, with regard to habitats it should describe the key elements of the habitats that are susceptible to recreational pressure (e.g. lichen communities in heathland, annual vegetation on shingle, etc.), how the habitats could be affected by recreational disturbance (e.g. trampling, litter, nutrient loading, etc.) and, on the basis of existing research, how sensitive the habitats are to such impacts.

Accessibility to the feature(s)

This will include not only how readily the Site can be accessed from the outside (i.e. close to settlements, good car park, abundant signing, etc.) but also how close the qualifying habitats and species are to commonly-used footpaths within the site. It should therefore include an assessment of the footpath network within the site and the extent to which it penetrates into key areas for the qualifying habitats and species. It should also flag up where recreational management measures are already in place (e.g. dogs-on-lead requirement at Minsmere, presence of wardens, breeding season signage, etc.).

Magnitude of recreational change predicted
This column will need to be completed once questionnaire and other recreational surveys have been undertaken. It may be that quantitative data can be included (e.g. predicted increase form 8 visitors per day to 12) or that a qualitative assessment only can be provided.

Conservation Objectives
This column should summarise the Conservation Objectives for the relevant qualifying feature (e.g. no loss of habitat area, x% increase in population per year, etc.).

Risk rating
This column will qualitatively bring together the various factors described in the previous columns into an overall rating of the capacity of the qualifying feature to accept change. It therefore represents an assessment of the risk that the Conservation Objective for the feature may be undermined by the predicted changes in visitor pressure resulting from the Scheme.

Red = High risk of Conservation Objective being compromised
Amber = Moderate risk of Conservation Objective being compromised
Yellow = Low risk of Conservation Objective being compromised
Green = Negligible risk of Conservation Objective being compromised

These colours will then be marked on a map of the Receptor Zone to show where the most sensitive areas are with regard to potential impacts upon designated sites (note that this could include areas outside designated site boundaries where mobile species are known to forage beyond the designation limits). These will not only be used to inform the impact assessment for the HRA and the scoping of any subsequent survey work that might be required to strengthen the assessment (potentially including both ecology surveys and more targeted recreational questionnaire surveys), but will also be used to identify where mitigation measures (such as warning signs, fencing, wardening, etc.) would be most necessary or beneficial.

A small number of cells within the table have been filled in to give an example of how the completed table might look.

Table A. Assessment of the implications of predicted changes in recreational pressure on the qualifying features of European Sites within the Receptor Zone.

European Site and qualifying features	Inside or outside Site?	Map ref/ target note	Nature of feature and sensitivity to recreational impacts	Accessibility to the feature(s)	Magnitude of recreational change predicted	Conservation Objectives	Risk rating
Minsmere-Walberswick SPA							
Supporting habitat to SPA designated interests	Inside	1	Wetland and grassland habitats used for foraging and roosting by SPA species.	Minsmere is very accessible to the public and is a popular destination. Whilst there are many paths across the site, access to the qualifying habitats and species is carefully managed through signs and hides. Dogs are only allowed on leads.	It is predicted that the effect of the Sizewell works will be to displace x visitors per day to Minsmere increasing visitor numbers by x%.	N/A	It is considered very unlikely that the supporting habitats within Minsmere will be significantly affected.
Supporting habitat to SPA designated interests	Outside	2	Wetland and grassland habitats used for foraging and roosting by SPA species.				
Avocet	Inside	3	Breeding				
Bittern	Inside	4	Breeding				
Little tern	Inside	Etc.	Breeding	Minsmere is very accessible to the public and is a popular destination. Whilst there are many paths across the site, access to the nesting site for little terns is strictly controlled. Dogs are only allowed on leads.	It is predicted that the effect of the Sizewell works will be to displace x visitors per day to Minsmere increasing visitor numbers by x%.	No net decrease in population of x pairs…	It is considered very unlikely that the breeding little terns within Minsmere will be significantly affected by increased visitor pressure associated with the project, owing to the strict controls in place.
Marsh harrier	Inside		Nesting and foraging				
Marsh harrier	Outside		Foraging only (e.g. over Sizewell Marshes				
Nightjar	Inside						
Nightjar	Outside						
Etc..							
Minsmere-Walberswick SAC							
Annual vegetation of drift lines	Inside		Annual vegetation of drift lines is particularly sensitive to trampling…	The areas of drift vegetation are located in a number of places, x of which are close to the xx car park.	It is predicted that the effect of the Sizewell works will be to displace x	No net loss of habitat…	Without mitigation, the predicted increase in recreational use of the

European Site and qualifying features	Inside or outside Site?	Map ref/ target note	Nature of feature and sensitivity to recreational impacts	Accessibility to the feature(s)	Magnitude of recreational change predicted	Conservation Objectives	Risk rating
				Anyone displaced form Sizewell beach could readily drive to the car park and walk on the shingle where this vegetation is found…	visitors per day to the beach at Minsmere, increasing visitor numbers by x%.		beach at Minsmere could lead to the trampling and loss of areas of drift vegetation.
Perennial vegetation of stony banks							
European dry heaths							
Sandlings SPA							
Supporting habitat to SPA designated interests	Inside						
Supporting habitat to SPA designated interests	Outside						
Nightjar	Inside						
Nightjar	Outside		Nightjars breed and forage within the areas indicated by Target Note x, even though this is outside the SPA boundary. The species is relatively sensitive to disturbance by dogs, with breeding productivity shown to decrease even if eggs and chicks are not taken (i.e. through energetic stress).	These areas (indicated by Target Note x) show where nightjars are known to nest. Access to these areas is relatively limited, as there is no car park and there are no formal footpaths through the area. Dense gorse around the perimeter of this are makes access even more difficult.	It is considered very unlikely that recreational pressure in these Areas will increase as a result of the Sizewell works.	No net decrease in population of x pairs…	Because these areas are outside the SPA, and access is very restricted, it is considered that the risk to these birds is low.
Woodlark	Inside						
Woodlark	Outside						
Minsmere to Walberswick Ramsar							
Ramsar criterion 1 Mosaic of marine, freshwater, marshland and associated habitats							
Ramsar criterion 2 Supports nine nationally scarce plants and at least 26 red data book invertebrates							

European Site and qualifying features	Inside or outside Site?	Map ref/ target note	Nature of feature and sensitivity to recreational impacts	Accessibility to the feature(s)	Magnitude of recreational change predicted	Conservation Objectives	Risk rating
Ramsar criterion 2 An important assemblage of rare breeding birds associated with marshland and reedbeds							
Orfordness to Shingle Street SAC							
Coastal lagoons							
Annual vegetation of drift lines							
Perennial vegetation of stony banks							
Alde-Ore Estuary SPA							
Avocet			Breeding and overwintering				
Marsh harrier			Breeding				
Little tern			Breeding				
Sandwich tern			Breeding				
Lesser black-backed gull			Breeding				
Redshank			Overwintering				
Seabird assemblage			Breeding and overwintering				
Waterbird assemblage							
Alde-Ore Estuary Ramsar							
Criterion 2 Nationally-scarce plant species and British RDB invertebrates							
Criterion 3 Notable assemblage of breeding & wintering wetland birds							
Criterion 6 Bird populations occurring at international level of importance							
Stour and Orwell							

European Site and qualifying features	Inside or outside Site?	Map ref/ target note	Nature of feature and sensitivity to recreational impacts	Accessibility to the feature(s)	Magnitude of recreational change predicted	Conservation Objectives	Risk rating
Estuaries SPA and Ramsar							
Screen out as outside Receptor Zone?							
Benacre to Easton Bavents Lagoons SPA							
Screen out as outside Receptor Zone?							
Deben Estuary Ramsar and SPA							
Screen out as outside Receptor Zone?							

APPENDIX 4 – ANALYSIS OF HINKLEY POINT C PROJECT HRA

NOT PROTECTIVELY MARKED

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1. INTRODUCTION

1.1.1 This paper provides an analysis of the potential environmental effects associated with the Hinkley Point C (HPC) Project that were tested for a Likely Significant Effect (LSE) upon one or more European sites and considered in the Appropriate Assessment (AA) phase of the Habitats Regulations Assessments (HRAs) undertaken for the project.

1.1.2 The objective of the analysis is to identify those effects that could have been screened out at the LSE stage and not taken through to AA, as well as those assessments that could equally apply to the Sizewell C Project.

1.1.3 This analysis has been undertaken in order to answer the question as to whether more work was undertaken as part of the HPC Project HRA than was necessary, based on a view held by the consultant team that more issues could have reasonably been screened out at an earlier stage in the process. A secondary concern of the consultant team is that by focussing on issues that were not central to the issue of integrity, less time was available to invest in examining the issues that had real potential to adversely affect the integrity of a European site. By contrast, in some cases the focus on certain issues obscured others that then were not raised until very late in the process. For example, a lot of effort was focussed on attempting to define a potential effect on Barbastelle bats commuting from the Exmoor and Quantock Oakwoods SAC, where only a weak impact pathway was established; whereas the concern relating to the use of tugs potentially generating shipwash effects in the Parrett Estuary was identified late in the process, as more project information became available.

2. POTENTIAL HPC PROJECT EFFECTS

2.1 Activities with the potential to influence designated sites – HPC

2.1.1 Based on the scoping process undertaken on behalf of NNB GenCo for the HPC Project and consultation responses provided, the main effects (and activities) of HPC itself considered to have the potential to influence the screened in European designated sites were identified. These effects are listed in **Table 2.1** below, split into the construction, operation and decommissioning phases.

Table 2.1 Effects predicted to be associated with HPC

During construction
• Terrestrial habitat loss and alteration due to construction of the power station.
• Marine habitat loss and alteration due to construction of a Temporary Jetty (including dredging of a berth), Sea Wall, cooling water infrastructure, and Fish Recovery and Return system.
• Disturbance effects to waterbirds and fish related to human presence, noise and night time lighting, particularly during construction, operation and dismantling of the Temporary Jetty, and construction of the Sea Wall.
• Underwater noise and vibration from works for the Temporary Jetty and the cooling water infrastructure.
• Underwater noise and vibration from operation of the conveyor for the Temporary Jetty.
• Change in water quality due to discharges from land-based activities (e.g. site clearance) and tunnelling works for the cooling water system (including tunnelling operations).
• Change in water quality due to sediment re-suspension during construction of the Temporary Jetty, dredging of the berth for the Jetty, and infrastructure works for the cooling water system and FRR system.
• Change in water quality due to accidental or emergency discharges of polluting substances.
• Localised changes in air quality due to emissions from construction activities and construction related transport.

During operation
• Disturbance effects to waterbirds related to human presence, noise and night time lighting.
• Change in water quality due to discharges from land-based activities.
• Change in water quality due to chemical and thermal properties of the cooling water discharge.
• Change in water quality due to accidental or emergency discharges of polluting substances.
• Entrainment and impingement effects of the cooling water system on marine organisms.
• Localised changes in air quality due to emissions from operational activities.

During decommissioning
• Disturbance effects to birds and fish related to human presence, noise and night time lighting.
• Short to medium-term change in water quality due to chemical and thermal properties of the alternative cooling water discharge.
• Change in water quality due to discharges from land-based activities (site clearance of power generation plant, ancillary plant and offices, and welfare facilities).
• Short-term change in water quality due to sediment disturbance at the seabed during removal/decommissioning of cooling water structures.
• Change in water quality due to accidental or emergency discharges of polluting substances.

During decommissioning
• Localised changes in air quality due to emissions from decommissioning activities and decommissioning related transport.

2.2 Activities with the potential to influence designated sites – off-site associated development

2.2.1 There were also specific effects considered to have the potential to influence European designated sites associated with the various off-site associated developments of the HPC Project. These are identified in **Table 2.2** for the construction, operation and (where relevant) removal/reinstatement phases of the off-site associated developments, whose construction and operation phases occur during the construction phase for the main site.

Table 2.2 Effects predicted to be associated with off-site associated development

During construction
• Terrestrial habitat loss and alteration due to construction of the Combwich freight laydown facility, Junction 23 park and ride and freight management facility, Junction 24 park and ride and freight management facility, Cannington park and ride facility and Cannington bypass. • Marine habitat loss and alteration due to construction works at Combwich for the development of an upgraded wharf facility. • Disturbance effects to birds related to human presence, noise and night time lighting particularly at Combwich Wharf, Combwich freight laydown facility, Junction 23 park and ride and freight management facility, and Cannington bypass. • Underwater noise and vibration from works at and the operation of Combwich Wharf. • Change in water quality due to discharges from land-based activities (e.g. site clearance, excavation, etc.) at Combwich Wharf, Combwich freight laydown facility, Junction 23 park and ride and freight management facility, Cannington park and ride facility and Cannington bypass. • Changes in water quality due to accidental or emergency discharges of polluting substances. • Localised changes in air quality due to emissions from construction activities and construction related transport at Combwich Wharf, Combwich freight laydown facility, Junction 23 park and ride and freight management facility, Junction 24 park and ride and freight management facility, Cannington park and ride facility and Cannington bypass.

During operation
• Disturbance effects to waterbirds related to human presence, noise and night time lighting particularly at Combwich Wharf, Combwich freight laydown facility, Junction 23 park and ride and freight management facility and Cannington bypass. • Disturbance from vessel movements and berth bed dredging activities during operation Combwich Wharf. • Changes in water quality due to accidental or emergency discharges of polluting substances. • Localised changes in air quality due to emissions from operational activities at Combwich Wharf, Combwich freight laydown facility, Junction 23 park and ride and freight management facility, Junction 24 park and ride and freight management facility, Cannington park and ride facility and Cannington bypass.

During removal/reinstatement

- Disturbance effects related to human presence, noise and night time lighting particularly at Combwich freight laydown facility and Junction 23 park and ride and freight management facility.
- Change in water quality due to discharges from land-based activities (e.g. site clearance, soil placement, etc.) at Combwich freight laydown facility, Junction 23 park and ride and freight management facility, and Cannington park and ride facility.
- Change in water quality due to accidental or emergency discharges of polluting substances.
- Localised changes in air quality due to emissions from post-operation activities and post-operation related transport at Combwich freight laydown facility, Junction 23 park and ride and freight management facility, and Cannington park and ride facility.

During post-operation

- Disturbance effects related to ongoing human presence, noise and night time lighting at Combwich Wharf and Cannington bypass.
- Underwater noise and vibration from operation at Combwich Wharf.
- Change in water quality due to surface water run-off from Cannington bypass.
- Change in water quality due to accidental or emergency discharges of polluting substances at Combwich Wharf and Cannington bypass.
- Localised changes in air quality due to emissions from operational activities at Combwich Wharf and Cannington bypass.

3. OUTCOME OF LIKELY SIGNIFICANT EFFECT ASSESSMENT

3.1.1 On the basis of the known presence and distribution of designated interest features relevant to the study area and the likely effects of the development, a LSE test was undertaken as part of NNB GenCo's Shadow HRA (the HRA Report) to determine the potential for the project activities/effects to influence the designated features of the relevant European sites.

3.1.2 These effects are set out in the context of HPC and its off-site associated development in **Tables 3.1 to 3.6** (for construction, operation and decommissioning/ post-operation) for each relevant European site interest feature, along with the reason each effect was tested for LSE and the determination of whether the effect required AA. Each effect has been given a code (e.g. HPC1, HPC2 etc.) to allow cross referencing between the effects considered in **Tables 3.1** to **3.6** and the review of the impacts assessed in the AA, presented in **Section 4**.

Table 3.1 Analysis of potential effects on designated sites/features of the construction of HPC with respect to the determination of LSE

Site Name	Interest Feature	Activity/effect	Reason considered for LSE	Was AA determined to be necessary?
Severn Estuary SPA/Ramsar/SAC	SPA/Ramsar Internationally important bird populations, wintering populations and bird assemblage	HPC1 - Construction of Temporary Jetty including approach bridge, jetty head, berthing pocket and jetty root (disturbance to birds and loss of or alteration to supporting habitat).	Potential for disturbance of birds or loss/alteration of habitat from construction within intertidal/marine environment within the SPA	Yes. Construction footprint within SPA boundary.
		HPC2 - Cliff top and foreshore construction phases for the Sea Wall (disturbance to birds and loss or alteration of supporting habitat).	Potential for disturbance of birds or loss/alteration of habitat from construction within intertidal/marine environment within or adjacent to the SPA	Yes. Construction footprint within SPA boundary.
		HPC3 - Operational presence of Temporary Jetty, including berthing operations, conveyor, vehicle/people movement and maintenance (disturbance to birds).	Potential for disturbance to birds from presence of structures/vehicles and people and maintenance works	Yes. Structures within SPA boundary.
		HPC4 - Construction of cooling water infrastructure FRR system (tunnels) (disturbance to birds and loss or alteration to supporting habitat).	Potential for disturbance of birds or alteration/loss of habitat from construction within intertidal/marine environment within or adjacent to the SPA	Yes. Construction footprint within SPA boundary.
		HPC5 - Decommissioning of Temporary Jetty (disturbance to birds and loss of or alteration to supporting habitat).	Potential for disturbance of birds or loss/alteration of habitat from work within intertidal/marine environment within the SPA	Yes. Construction footprint within SPA boundary.
	Annex I species	HPC6 - Construction of the Temporary Jetty, Sea Wall, cooling water infrastructure and FRR system (effects on Annex I species – Bewick's swan).	Potential for disturbance to Annex I species (Bewick's swan) from construction activities	No potential for impact, as Annex I species (Bewick's swan) do not occur within the vicinity of the main site or the influence of its potential effects. **No LSE.**
	SAC/Ramsar Migratory fish populations	HPC7 - Construction and dismantling of the Temporary Jetty, berth pocket dredging and maintenance dredging, construction of the Sea Wall, cooling water infrastructure, and FRR system (disturbance to fish – noise and artificial lighting)	Potential for disturbance to fish from construction works within SAC	Yes. Construction footprint within SAC boundary.
		HPC8 - Changes in water quality due to sediment disturbance during construction and dismantling of the Temporary Jetty, berth pocket dredging and maintenance dredging, construction of the Sea Wall, cooling water infrastructure and associated discharges (effects on fish integrity)	Potential for disturbance to fish from construction works within SAC	Yes. Construction footprint within SAC boundary.
	SAC/Ramsar Estuaries feature	HPC9 - Construction of the Temporary Jetty, Sea Wall, cooling water infrastructure and	Potential for construction activities to affect the estuaries features of	Yes. Construction footprint within SAC boundary.

Site Name	Interest Feature	Activity/effect	Reason considered for LSE	Was AA determined to be necessary?
	and other habitats, including *Sabellaria* reef	FRR system (effecting estuaries feature and other habitats through changes in hydrodynamics, geomorphology, water quality and habitat loss).	the SAC through changes in hydrodynamics and water quality	
		HPC10 - Discharges into the Severn Estuary from construction works (i.e. land-based, Temporary Jetty, berth pocket dredging and maintenance dredging, Sea Wall, cooling water infrastructure), and FRR system (effects on estuaries feature and other habitats, for example *Sabellaria* reef, through changes in water quality).	Potential for effects on estuaries feature and other habitat from discharges into SAC	Yes. Construction footprint within SAC boundary.
		HPC11 - Operational presence of the jetty and berth pocket (hydrodynamic and sediment transport effects on estuaries feature and other habitats).	Potential for hydrodynamic and sediment transport effects on estuaries feature and other habitats due to presence of structures within SAC	Yes. Structures within SAC boundary.
		HPC12 - Removal of the jetty (effects on estuaries feature and other habitats).	Potential for effects on estuaries feature and other habitat from removal works	Yes. Construction footprint within SAC boundary.
		HPC13 - Accidental or emergency discharges during construction (effects on the estuaries and other habitats through changes in water quality).	Potential for pollution to estuaries feature and other habitats from discharges into SAC.	Yes. Although very low likelihood of LSE due to mitigation at the design phase, it was determined to be necessary to consider the issue of potential discharges in the AA.
		HPC14 - Construction of the Temporary Jetty, Sea Wall, cooling water infrastructure and FRR system (effects on subtidal sandbanks).	Potential for effects on subtidal sandbank feature from construction works	No. Nearest area of subtidal sandbank habitat to HPC is approximately 2.5km from the Sea Wall and Temporary Jetty and 1km to the east of the cooling water intakes. No potential for impact, as the feature would not be directly influenced by any of the planned works and, hence, no habitat loss or modification would occur. **No LSE.**
		HPC15 - Dredging for the Temporary Jetty (effects on subtidal sandbanks through changes to water quality) and construction of the cooling water infrastructure (sediment disturbance to the subtidal sandbanks).	Potential for effects on subtidal sandbanks feature from dredging (through changes to water quality) and construction works (sediment disturbance)	No. Nearest area of subtidal sandbank habitat is approximately 2.5km from the site and 1km from the location of the cooling water intakes. No potential for impact, as the physical and biological attributes of the sandbanks would be unlikely to be influenced by the planned works. **No LSE.**
		HPC16 - Construction of the Temporary Jetty, Sea Wall, cooling water infrastructure and FRR system (effects on intertidal mudflats and sandflats).	Potential for effects on intertidal mudflats and sandflats from construction works.	No. The nearest area of this feature is located 2.3km to the east of the works, hence, no habitat loss or modification would occur. **No LSE.**
		HPC17 - Dredging for the Temporary Jetty (effects on intertidal mudflats and sandflats	Potential for effects on intertidal mudflats and sandflats from	No. Natural sediment loadings in the water column are high, the proposed dredging is relatively small scale and

Site Name	Interest Feature	Activity/effect	Reason considered for LSE	Was AA determined to be necessary?
		through changes to water quality) and construction of the cooling water infrastructure (sediment disturbance to the intertidal mudflats and sandflats).	dredging (through changes to water quality) and construction works (sediment disturbance).	the distance between the works and the nearest area of mudflats is approximately 2.3km at the nearest point. No potential for impact, as the physical and biological attributes of the feature would be unlikely to be influenced by the planned works. **No LSE.**
		HPC18 - Construction of the Temporary Jetty, Sea Wall, cooling water infrastructure and FRR system (effects on Atlantic saltmeadows).	Potential effects on Atlantic saltmeadows from construction works	No. The nearest area of saltmarsh is located 2.6km to the east of the Sea Wall, in excess of 3.3km to the east of the cooling water outfall and 3.3km from the Temporary Jetty. No habitat loss or modification would occur. **No LSE.**
		HPC19 - Dredging for the Temporary Jetty (effects on Atlantic saltmeadows through changes to water quality) and construction of the cooling water infrastructure (sediment disturbance to the Atlantic saltmeadows).	Potential effects on Atlantic saltmeadows through changes to water quality and sediment disturbance.	No. The sediment loadings in the water column are high, the proposed dredging is relatively small scale and the distance between the works and the nearest area of saltmarsh is approximately 2.6km. No potential for impacts, as the physical and biological attributes of the feature would be unlikely to be influenced by the planned works. **No LSE.**
Somerset Levels and Moors SPA/Ramsar	Internationally important bird populations	HPC20 - Potential effects on the Somerset Levels and Moors SPA/Ramsar birds are similar to those described for the Severn Estuary SPA/Ramsar	Some of the birds recorded during the survey work could form part of the designated Somerset Levels SPA populations	Yes. AA was determined to be necessary in light of initial survey findings.
	Annex I species	HPC21 - Construction of the Temporary Jetty, Sea Wall, cooling water infrastructure and FRR system (effects on Annex I species – Bewick's swan).	Disturbance effects during construction	No. There was no evidence to suggest that this species regularly occurs in proximity to Hinkley Point C development site. No potential for impact by any of the planned works. **No LSE.**
	Invertebrate assemblage	HPC22 - Construction of the Temporary Jetty, Sea Wall, cooling water infrastructure and FRR system (effects on the invertebrate assemblage).	Potential for effects on the invertebrate assemblage from construction works	No. The invertebrate assemblage is confined to the designated site. There is no identified impact pathway by which the proposed HPC Project could have an effect upon the assemblage. **No LSE.**

Site Name	Interest Feature	Activity/effect	Reason considered for LSE	Was AA determined to be necessary?
Exmoor and Quantock Oakwoods SAC	Barbastelle bat	HPC23 - Hinkley Point C site construction, including increased lighting (effects on Barbastelle bats through vegetation/habitat loss and potential influence on Barbastelles' foraging/commuting behaviour).	Survey work found that barbastelle bats make use of land within the footprint of the HPC development site.	Yes. AA was determined to be necessary in light of initial survey findings.
	Old sessile oakwoods	HPC24 - Hinkley Point C site construction, including emissions to air (effects on old sessile oakwoods).	Potential for effects on old sessile oakwoods from construction works and emissions to air	No. Any emissions at the construction site would be negligible compared to background levels at the SAC due to the distance (>5km). No potential for impact by any of the planned works. **No LSE.**
	Alluvial forests	HPC25 - Hinkley Point C site construction, including emissions to air (effects on alluvial forests).	Potential for effects on alluvial forests from construction works and emissions to air.	No. Any emissions at the construction site would be negligible compared to background levels at the SAC due to the distance (>5km). No potential for impact by any of the planned works. **No LSE.**
	Otter	HPC26 - Hinkley Point C site construction, including reduced fish populations (effects on otter).	Potential effects on otter from construction works, including reduced fish populations.	No. There are no watercourses that provide a linkage between the development site and the SAC that could potentially be used by otter. Survey work indicated that there was no evidence for any use of the watercourses within the Development Site by otter and usage appears to be confined to Bum Brook. The function and capacity of this watercourse to support otter would not be significantly affected by construction works within the development site. No potential for impact by any of the planned works. **No LSE.**
Mendip Limestone Grassland SAC	Annex I habitats (semi-natural dry grasslands and scrubland facies on calcareous substrates; European dry heaths; caves not open to the public, *Tilio-Acerion* forests of slopes, screes and ravines).	HPC27 - Hinkley Point C site construction, including emissions to air (effects on Annex I habitats).	Potential for effects from construction works on Annex I habitats, including emissions to air.	No. Any emissions at the construction site would be negligible compared to background levels at the SAC due to the distance (>14km). No potential for impact by any of the planned works. **No LSE.**
	Annex II species including the greater horseshoe bat.	HPC28 - Hinkley Point C site construction, including increased lighting (effects on greater horseshoe bats through vegetation/habitat loss and potential influence on foraging/commuting behaviour).	Potential for effects on greater horseshoe bats from construction works	No. Greater horseshoe bats have been recorded from the main site but are highly unlikely to have ventured to this SAC which is over 20km away. No potential for impact by any of the planned works. **No LSE.**

Site Name	Interest Feature	Activity/effect	Reason considered for LSE	Was AA determined to be necessary?
Hestercombe House SAC	Lesser horseshoe bat	HPC29 - Hinkley Point C site construction, including increased lighting (effects on lesser horseshoe bats through vegetation/habitat loss and potential influence on foraging/commuting behaviour).	Potential for effects on lesser horseshoe bats from construction works	No. Lesser horseshoe bats have been recorded from the main site but are highly unlikely to have ventured to this SAC which is over 16km away. A radio tracking study found the average foraging radius from the roost was 2km, maximum 4km. No potential for impact by any of the planned works. **No LSE.**
River Usk SAC	Migratory fish populations	HPC30 - Potential effects on SAC fish could be similar to those described for the Severn Estuary SAC (albeit that the sites are far more remote from the proposed development).	Sites share migratory fish populations (twaite shad and river lamprey) with Severn Estuary SAC	Yes, but the inclusion of this site was highly precautionary and based solely on the potential impact of the development on the population at the wider 'catchment' level.
	Bullhead	HPC31 - Hinkley Point C site construction, including underwater noise levels (effects on bullhead).	Potential for effects from construction works on bullhead, including underwater noise.	Fish confined to the River Usk and therefore outside of any influence of project effects. **No LSE.**
	Otter	HPC32 - Hinkley Point C site construction, including reduced fish populations (effects on otter).	Potential for effects from construction on otter, including reduced fish populations	No. Otter confined to the River Usk and any reduction in fish would be negligible in respect of dietary requirements for this species. No potential for impact by any of the planned works. **No LSE.**
River Wye SAC	Migratory fish populations	HPC33 - Potential effects on SAC fish could be similar to those described for the Severn Estuary SAC (albeit that the sites are far more remote from the proposed development).	Sites share migratory fish populations (twaite shad and river lamprey) with Severn Estuary SAC	Yes, but the inclusion of this site was highly precautionary and based solely on the potential impact of the development on the population at the wider 'catchment' level.
	Annex I river habitat	HPC34 - Hinkley Point C site construction (effects on Annex I river habitats).	Potential for effects from construction works on Annex I river habitats.	No. Habitats confined to the River Wye and outside of the influence of any construction effects of the main site. **No LSE.**
	White-clawed crayfish	HPC35 - Hinkley Point C site construction (effects on white-clawed crayfish).	Potential for effects from construction on white-clawed crayfish	No. Species confined to the River Wye and outside of the influence of any construction effects of the main site. **No LSE.**
	Bullhead	HPC36 - Hinkley Point C site construction, including underwater noise levels (effects on bullhead).	Potential for effects from construction on bullhead, including underwater noise.	No. Fish confined to the River Wye and therefore outside of any influence of project effects. **No LSE.**
	Otter	HPC37 - Hinkley Point C site construction, including reduced fish populations (effects on otter).	Potential for effects from construction on otter, including reduced fish populations	No. Otter confined to the River Wye and any reduction in fish would be negligible in respect of dietary requirements for this species. No potential for impact by any of the planned works. **No LSE.**

Site Name	Interest Feature	Activity/effect	Reason considered for LSE	Was AA determined to be necessary?
Afon Tywi SAC	Migratory fish populations	HPC38 - Potential effects on SAC fish could be similar to those described for the Severn Estuary SAC (albeit that the sites are far more remote from the proposed development).	Sites share migratory fish populations (twaite shad and river lamprey) with Severn Estuary SAC	Yes. However the inclusion of this site was highly precautionary.

Table 3.2 Analysis of potential effects on designated sites/features of the operation of HPC with respect to the determination of LSE

Site Name	Interest Feature	Activity/effect	Reason considered for LSE	Was AA determined to be necessary?
Severn Estuary SPA/Ramsar/SAC	SPA/Ramsar Internationally important bird populations, wintering populations and bird assemblage	HPC39 - Disturbance to feeding and roosting birds during the operation of the Hinkley Point C site	Potential for disturbance of birds	Yes. Development footprint within SPA boundary.
		HPC40 - Small-scale intertidal habitat loss for feeding and roosting birds through the presence of the Sea Wall	Potential for loss of bird habitat	Yes. Development footprint within SPA boundary.
		HPC41 - Influence of thermal and chemical properties of cooling water discharge on intertidal mudflat and sandflat invertebrate communities to the east of the main site and the potential for any change to these communities to affect food resources for foraging birds.	Potential impact on bird food resources	Yes. Discharge footprint within SPA boundary.
	Annex I species	HPC42 - Disturbance during the operation of the Hinkley Point C site (effects on Annex I species – Bewick's swan).	Potential for disturbance to Annex I species (Bewick's swan) from operational activities	No. There is no evidence to indicate that the Bewick's swan regularly occurs in proximity to Hinkley Point C development site. **No LSE.**
	SAC/Ramsar Migratory fish populations	HPC43 - Development and operation disturbance to fish due to an increase in underwater noise and artificial lighting levels.	Potential noise and lighting disturbance to fish	Yes. Noise and artificial lighting within SAC boundary.
		HPC44 - Entrainment and impingement of life cycle stages of fish via cooling water system.	Potential for loss of migratory fish life cycle stages	Yes. Cooling water intakes within the SAC. AA required due to the presence of migratory fish populations within Severn Estuary.
		HPC45 - Influence of thermal plume on migratory behaviour (e.g. obstruction to migration into and out of the River Parrett and Bridgwater Bay).	Potential impact of thermal plume on fish migration	Yes. Discharge of cooling water directly into SAC, in close proximity to River Parrett.
		HPC46 - Localised changes to water chemistry associated with the addition of chemicals to the cooling water system (e.g. chlorination).	Potential for chemical effects on migratory fish	Yes. Introduction of chemicals to the SAC determined to require AA.
		HPC47 - Small-scale habitat loss from presence of structures in the marine	Potential for fish habitat loss and reduction in food availability	Yes. Habitat loss was quantifiable and demonstrated early on as a very small proportion of the SAC. Given

Site Name	Interest Feature	Activity/effect	Reason considered for LSE	Was AA determined to be necessary?
		environment and influence on food availability for fish		this the structures' influence on habitat and food availability was highly unlikely to have the potential to adversely affect migratory fish. Suggest AA may have been an unnecessary precaution and this issue could have been screened out at the LSE stage.
	SAC/Ramsar Estuaries feature and other habitats, including subtidal sandbanks, intertidal mudflats sandflats, Atlantic salt meadows, reef	HPC48 - Presence of Sea Wall, cooling water infrastructure and FRR system (hydrodynamic, geomorphology and sediment transport effects on estuaries and other habitats, for example *Sabellaria* reef, intertidal mudflats and sandflats).	Physical effects on estuaries and other habitats	Yes. Sizeable structures within SAC boundary.
		HPC49 - Discharge to foreshore (i.e. groundwater drainage via Sea Wall) affecting marine/estuaries feature and other habitats.	Potential for discharges to affect marine/estuaries feature and other habitats	Yes. Discharge directly into SAC.
		HPC50 - Discharge of process water chemicals, including hydrazine and chlorination products (affecting estuaries feature and other habitats through changes in hydrodynamics, geomorphology, water quality, and habitat loss).	Potential for physical and chemical effects and habitat loss	Yes. Discharge directly into SAC.
		HPC51 - Accidental or emergency discharges during operation (effects on estuaries feature and other habitats through changes in water quality).	Potential for pollution to estuaries feature and other habitats from discharges into SAC.	Yes. Although very low likelihood of LSE due to mitigation at the design phase, it was determined to be necessary to take potential discharges through to AA.
		HPC52 - Disturbance of seabed sediments associated with scour effects from marine cooling water system, FRR system and from maintenance dredging around the intakes (affecting estuaries feature and other habitats through change in hydrodynamics, geomorphology, water quality and habitat loss).	Potential for physical and water quality effects and habitat loss	Yes. Sediment disturbance occurring within the SAC.
		HPC53 - Implications of Sea Wall with respect to coastal squeeze	Loss of intertidal habitat	Yes. Loss of intertidal habitat within SAC requires AA.

Site Name	Interest Feature	Activity/effect	Reason considered for LSE	Was AA determined to be necessary?
Somerset Levels and Moors SPA/Ramsar	Internationally important bird populations	HPC54 - Potential effects on the Somerset Levels and Moors SPA/Ramsar birds would be similar to those described for the Severn Estuary SPA/Ramsar.	Some of the birds recorded during the survey work were thought to form part of the Somerset Levels SPA population rather than that of the Severn Estuary SPA	Yes. AA was determined to be necessary in light of initial survey findings.
	Annex I species	HPC55 - Disturbance during the operation of the Hinkley Point C site (effects on Annex I species – Bewick's swan).	Potential for effects on Annex I species (Bewick's swan) from HPC operation	No. There is no evidence to indicate that the Bewick's swan regularly occurs in proximity to the Hinkley Point C development site. No potential for impact by any of the planned works. **No LSE.**
	Invertebrate assemblage	HPC56 - Disturbance during the operation of the Hinkley Point C site (effects on the invertebrate assemblage).	Potential for effects on invertebrate assemblage from operation of HPC	No. The invertebrate assemblage is confined to the designated site. There is no identified impact pathway by which the proposed project could have an effect upon this assemblage. **No LSE.**
Exmoor and Quantock Oakwoods SAC	Barbastelle bat	HPC57 - Hinkley Point C site operation including lighting (effects on Barbastelles' foraging/commuting behaviour).	Survey work found that barbastelle bats make use of land within the footprint of the HPC development site.	Yes. AA was determined to be necessary in light of initial survey findings.
	Old sessile oakwoods	HPC58 - Effects during operation of Hinkley Point C site, including emissions to air (effects on old sessile oakwoods).	Potential for effects on old sessile oakwoods from operation of HPC, including emissions to air	No. The SAC is located outside of any potential main site effects (direct or indirect). Changes in air quality during operation at the development site would be very localised and would not influence air quality parameters within the SAC. **No LSE.**
	Alluvial forests	HPC59 - Effects during operation of Hinkley Point C site, including emissions to air (effects on alluvial forests).	Potential for effects on alluvial forests from HPC operation, including emissions to air.	No. The SAC is located outside of any potential main site effects (direct or indirect). Changes in air quality during operation at the development site would be very localised and would not influence air quality parameters within the SAC. **No LSE.**
	Otter	HPC60 - Effects during operation of Hinkley Point C site, including reduced fish populations (effects on otter).	Potential for effects on otter from HPC operation, including reduced fish populations.	No. There are no watercourses that provide a linkage between the development site and the SAC that could potentially be used by otter. Survey work indicated that there was no evidence for any use of the watercourses within the Development Site by otter and usage appears to be confined to Bum Brook. The function and capacity of this watercourse to support otter would not be adversely affected by the presence and operation of the new power station. **No LSE.**

Site Name	Interest Feature	Activity/effect	Reason considered for LSE	Was AA determined to be necessary?
Mendip Limestone Grassland SAC	Annex I habitats (semi-natural dry grasslands and scrubland facies on calcareous substrates; European dry heaths; caves not open to the public, *Tilio-Acerion* forests of slopes, screes and ravines).	HPC61 - Effects during operation of Hinkley Point C site including emissions to air (effects on Annex I habitats).	Potential for effects on Annex I habitats from HPC operation, including emissions to air.	No. The SAC is located outside of any potential main site effects (direct or indirect). **No LSE.**
	Annex II species including the greater horseshoe bat.	HPC62 - Effects during operation of Hinkley Point C site including lighting (effects on greater horseshoe bats through vegetation/habitat loss and potential influence on foraging/commuting behaviour).	Potential for effects on greater horseshoe bats from HPC operation, including increased lighting.	No. Greater horseshoe bats have been recorded from the main site but are highly unlikely to have ventured to this SAC which is over 20km away. No potential for impact by any of the planned works. **No LSE.**
Hestercombe House SAC	Lesser horseshoe bat	HPC63 - Hinkley Point C site operation, including increased lighting (effects on lesser horseshoe bats through vegetation/habitat loss and potential influence on foraging/commuting behaviour).	Potential for effects on lesser horseshoe bats from HPC operation, including increased lighting.	No. Lesser horseshoe bats have been recorded from the main site but are highly unlikely to have ventured to this SAC which is over 16km away. A radio tracking study found the average foraging radius from the roost was 2km, maximum 4km. No potential for impact by any of the planned works. **No LSE.**
River Usk SAC	Migratory fish populations	HPC64 - Potential effects on SAC fish could be similar to those described for the Severn Estuary SAC	Sites share migratory fish populations (twaite shad and river lamprey) with Severn Estuary SAC	Yes, but the inclusion of this site was highly precautionary and based solely on the potential impact of the development on the population at the wider 'catchment' level.
	Bullhead	HPC65 - Hinkley Point C site operation, including underwater noise levels (effects on bullhead).	Potential for effects on bullhead from HPC operation, including underwater noise.	No. Fish confined to the River Usk and therefore outside of any influence of project effects. **No LSE.**
	Otter	HPC66 - Hinkley Point C site operation, including reduced fish populations (effects on otter).	Potential for effects on otter from HPC site operation, including reduced fish populations.	No. Otter confined to the River Usk and any reduction in fish would be negligible in respect of dietary requirements for this species. No potential for impact by any of the planned works. **No LSE**.

Site Name	Interest Feature	Activity/effect	Reason considered for LSE	Was AA determined to be necessary?
River Wye SAC	Migratory fish populations	HPC67 - Potential effects on SAC fish could be similar to those described for the Severn Estuary SAC	Sites share migratory fish populations (twaite shad and river lamprey) with Severn Estuary SAC	Yes, but the inclusion of this site was highly precautionary and based solely on the potential impact of the development on the population at the wider 'catchment' level..
	Annex I river habitat	HPC68 - Hinkley Point C site operation (effects on Annex I river habitats).	Potential for effects on Annex I river habitats from HPC site operation.	No. Habitats confined to the River Wye and outside of the influence of any operational effects of the main site. **No LSE.**
	White-clawed crayfish	HPC69 - Hinkley Point C site operation (effects on white-clawed crayfish).	Potential for effects on white-clawed crayfish from HPC site operation.	No. Species confined to the River Wye and outside of the influence of any operational effects of the main site. **No LSE.**
	Bullhead	HPC70 - Hinkley Point C site operation, including underwater noise levels (effects on bullhead).	Potential for effects on bullhead from HPC site operation, including underwater noise.	No. Fish confined to the River Wye and therefore outside of any influence of project effects. **No LSE.**
	Otter	HPC71 - Hinkley Point C site operation, including reduced fish populations (effects on otter).	Potential for effects on otter from HPC site operation, including reduced fish populations.	No. Otter confined to the River Wye and any reduction in fish would be negligible in respect of dietary requirements for this species. No potential for impact by any of the planned works. **No LSE.**
Afon Tywi SAC	Migratory fish populations	HPC72 - Potential effects on SAC fish could be similar to those described for the Severn Estuary SAC	Sites share migratory fish populations (twaite shad and river lamprey) with Severn Estuary SAC	Yes, but the inclusion of this site was highly precautionary and based solely on the potential impact of the development on the population at the wider 'catchment' level.

Table 3.3 Analysis of potential effects on designated sites/features of the decommissioning of HPC with respect to the determination of LSE

Site Name	Interest Feature	Activity/effect	Reason considered for LSE	Was AA determined to be necessary?
Severn Estuary SPA/Ramsar/SAC	SPA/Ramsar Internationally important bird populations, wintering populations and bird assemblage	HPC73 - Disturbance to feeding and roosting birds due to decommissioning works on site, including alterations to cooling water infrastructure and FRR system.	Potential for disturbance to birds	Yes. Decommissioning works within/adjacent to SPA.
	SAC/Ramsar Migratory fish populations	HPC74 - Disturbance to fish due to an increase in underwater noise levels and artificial lighting during decommissioning of the site, Sea Wall, cooling water infrastructure and FRR system	Potential noise and lighting disturbance to fish	Yes. Noise and artificial lighting within SAC boundary.
		HPC75 - Changes in water quality (increase in suspended sediment concentrations and	Potential for changes in water quality to affect fish	Yes. Decommissioning works within SAC boundary.

Site Name	Interest Feature	Activity/effect	Reason considered for LSE	Was AA determined to be necessary?
		potential contaminants) and sediment disturbance during decommissioning (effects on fish integrity)		
		HPC76 - Changes in water quality as a result of decommissioning of cooling water infrastructure (effects on fish integrity)	Potential for changes in water quality to affect fish	Yes. Decommissioning works within SAC boundary.
	SAC/Ramsar Estuaries feature and other habitats, including *Sabellaria* reef	HPC77 - Removal/dismantling of the cooling water infrastructure (affecting estuaries feature and other habitats, for example *Sabellaria* reef, through changes in hydrodynamics, geomorphology, water quality and habitat loss).	Potential for physical and water quality effects and habitat loss	Yes. Decommissioning works within SAC boundary.
		HPC78 - Accidental or emergency discharges during decommissioning (effects on estuaries feature and other habitats through changes in water quality).	Potential for pollution to estuaries feature and other habitats from discharges into SAC.	Yes. Although very low likelihood of LSE due to mitigation at the design phase, it was determined to be necessary to take potential discharges through to AA.
Somerset Levels and Moors SPA/Ramsar	Internationally important bird populations	HPC79 - Potential effects on the Somerset Levels and Moors SPA/Ramsar birds would be similar to those described for the Severn Estuary SPA/Ramsar.	Some of the birds recorded during the survey work were thought to form part of the Somerset Levels SPA population rather than that of the Severn Estuary SPA	Yes. AA was determined to be necessary in light of initial survey findings.
Exmoor and Quantock Oakwoods SAC	Barbastelle bat	HPC80 - Hinkley Point C site decommissioning including lighting (effects on Barbastelles' foraging/commuting behaviour).	Survey work found that barbastelle bats make use of land within the footprint of the HPC development site.	Yes. AA was determined to be necessary in light of initial survey findings.
River Usk SAC	Migratory fish populations	HPC81 - Potential effects on SAC fish could be similar to those described for the Severn Estuary SAC.	Sites share migratory fish populations (twaite shad and river lamprey) with Severn Estuary SAC	Yes, but the inclusion of these sites was highly precautionary and based solely on the potential impact of the development on the population at the wider 'catchment' level.
River Wye SAC				
Afon Tywi SAC				

Table 3.4 **Analysis of potential effects on designated sites/features of off-site associated development during the construction phase of HPC with respect to the determination of LSE**

Site Name	Interest Feature	Activity/effect	Reason considered for LSE	Was AA determined to be necessary?
Severn Estuary SPA/Ramsar/SAC	SPA/Ramsar Internationally important bird populations, wintering populations and bird assemblage	OAD1 - Refurbishment and extension of Combwich Wharf, including operation/movement of machinery/vessels, and construction of the Combwich freight laydown facility, Junction 23 freight management facility and Cannington Bypass (disturbance to birds and loss of or alteration to supporting habitat for feeding and roosting birds)	Potential for disturbance to birds or loss/alteration of bird habitat	Yes. Works within or adjacent to SPA boundary.
		OAD2 - Operation of the Cannington bypass, Cannington Park and Ride, Combwich Wharf, Combwich freight laydown, and Junction 23 (disturbance to birds).	Potential for disturbance to birds	Yes. Activities within or adjacent to SPA boundary.
	Annex I species	OAD3 - Refurbishment and extension of Combwich Wharf (effects on Annex I species – Bewick's swan).	Potential for effects on Annex I species (Bewick's swan) from construction works.	No. There is no evidence to indicate that this species regularly occurs in proximity to any of the proposed associated development sites. No potential for impact by any of the planned works. **No LSE.**
	SAC/Ramsar Migratory fish populations	OAD4 - Increase in underwater noise and artificial lighting levels at Combwich Wharf (disturbance to fish)	Potential for disturbance to fish from underwater noise and artificial lighting	Yes. Noise and artificial lighting within SAC boundary.
		OAD5 - Changes in water quality due to sediment disturbance and berthing operation and required maintenance dredging at Combwich Wharf.	Potential for adverse effects on migratory fish from changes in water quality	Yes. Activities within SAC boundary.
		OAD6 - Changes in water quality due to discharges into the River Parrett from land-based works and areas of hard standing during construction, operation and post-operation of Cannington park and ride, Combwich Wharf, Combwich freight laydown and Junction 23, and during construction and operation of Cannington Bypass.	Potential for adverse effects on migratory fish from changes in water quality	Yes. Discharges directly into SAC.
	SAC/Ramsar Estuaries feature and other habitats including subtidal sandbanks; intertidal mudflats and sandflats; Atlantic salt meadows; reef	OAD7 - Upgrade works to Combwich Wharf, including maintenance dredging (affecting the estuaries feature and other habitats, for example saltmarsh, intertidal mudflats and sandflats, through changes in hydrodynamics, geomorphology, water quality, and habitat loss).	Potential for physical/chemical effects on estuaries feature and other habitats and habitat loss	Yes. Activities within SAC boundary.
		OAD8 - Operational presence of upgraded	Potential for physical/chemical	Yes. Structures within SAC boundary.

Site Name	Interest Feature	Activity/effect	Reason considered for LSE	Was AA determined to be necessary?
		Combwich Wharf (affecting estuaries feature and other habitats for example, saltmarsh; intertidal mudflats and sandflats through changes in hydrodynamics, geomorphology, water quality, and habitat loss).	effects on estuaries feature and other habitats and habitat loss	
		OAD9 - Surface water discharges into the River Parrett from land-based works and areas of hardstanding during construction, operation and post-operation of Cannington park and ride, Combwich Wharf, Combwich freight laydown, and Junction 23, and during construction and operation of Cannington bypass (affecting the estuaries feature and other habitats through changed in hydrodynamics, geomorphology, water quality, and habitat loss).	Potential for physical/chemical effects on estuaries feature and other habitats and habitat loss	Yes. Discharges directly into SAC.
		OAD10 - Accidental or emergency discharges into the River Parrett during construction (effects on the estuaries feature and other habitats through changes in water quality).	Potential for pollution to estuaries feature and other habitats from discharges into SAC.	Yes. Although very low likelihood of LSE due to mitigation at the design phase, it was determined to be necessary to take potential discharges through to AA.
		OAD11 - Refurbishment and extension of Combwich Wharf, construction of the freight logistics facility at Combwich and the freight logistics and park and ride facility at J23 (effects on subtidal sandbanks through physical disturbance or changes in water quality).	Potential for effects on subtidal sandbanks through physical disturbance or changes in water quality from construction works.	No. The distribution of this habitat in the estuary would preclude it from any direct effects or significant indirect effects during the construction phase. The nearest sub-tidal sandbank to the associated development (Combwich Wharf) is approximately 10km downstream, offshore of the mouth of the River Parrett. **No LSE.**
		OAD12 - Refurbishment and extension of Combwich Wharf, construction of the freight logistics facility at Combwich and the freight logistics and park and ride facility at J23 (effects on reef habitat through physical disturbance or changes in water quality).	Potential effects on reef habitat through physical disturbance or changes in water quality from construction works.	No. The distribution of this habitat in the estuary would preclude it from any direct effects or significant indirect effects during the construction phase. The nearest area of potential reef habitat to the associated development (Combwich Wharf) is approximately 10km downstream. **No LSE.**
Somerset Levels and Moors SPA/Ramsar	Internationally important bird populations	OAD13 - Potential effects on the Somerset Levels and Moors SPA/Ramsar birds are similar to those described for the Severn Estuary SPA and Ramsar.	Some of the birds recorded during the survey work were thought to form part of the Somerset Levels SPA population rather than that of the Severn Estuary SPA	Yes. AA was determined to be necessary in light of initial survey findings.
	Annex I species	OAD14 - Disturbance during the construction of the associated development at Combwich Wharf, construction of the freight logistics facility at Combwich and the freight logistics and park and ride facility at J23 (effects on	Potential for effects on Annex I species (Bewick's swan) from construction works.	No. There is no evidence to suggest that the Bewick's swan regularly occurs in proximity to the associated development sites. No potential for impact by any of the planned works.

Site Name	Interest Feature	Activity/effect	Reason considered for LSE	Was AA determined to be necessary?
		Annex I species – Bewick's swan).		**No LSE.**
	Waterbird populations / assemblage	OAD15 - Refurbishment and extension of Combwich Wharf, including operation/movement of machinery/vessels, and construction of the Combwich freight laydown facility, and the freight logistics and park and ride facility at J23 (disturbance to birds but only with respect to those species – teal, wigeon and pintail – for which the Somerset Levels and Moors Ramsar site is designated and which utilise habitats within the Severn Estuary SPA adjacent to Combwich Wharf, the fright logistics facility at Combwich or the freight logistics and park and ride facility at J23).	Potential for disturbance to teal, wigeon and pintail during construction works.	No. The designated species do not occur in the vicinity of the off-site associated developments and their potential effects. No potential for impact by any of the planned works. **No LSE.**
	Invertebrate assemblage	OAD16 - Refurbishment and extension of Combwich Wharf (effects on the invertebrate assemblage).	Potential for effects on invertebrate assemblage from construction works.	No. The invertebrate assemblage is confined to the designated site. There is no identified impact pathway by which the proposed associated development could have an effect upon this assemblage. **No LSE.**
Exmoor and Quantock Oakwoods SAC	Barbastelle bat	OAD17 - Associated development site construction (all sites), including increased lighting (effect on Barbastelle bats through vegetation/habitat loss and potential influence on Barbastelles foraging/commuting behaviour.	Survey work found that barbastelle bats make use of land within the footprint of the off-site developments	Yes. AA was determined to be necessary in light of initial survey findings.
	Old sessile oakwoods	OAD18 - Associated development site construction (all sites), including emissions to air (effects on old sessile oakwoods).	Potential for effects on old sessile oakwoods from construction works, including emissions to air.	No. SAC is located outside of any potential off-site associated development construction effects (direct or indirect) including emissions to air. Changes in air quality during construction would be very localised and would not influence air quality parameters within the SAC. No potential for impact by any of the planned work. **No LSE.**
	Alluvial forests	OAD19 - Associated development site construction (all sites), including emissions to air (effects on alluvial forests).	Potential for effects on alluvial forests from construction, including emissions to air.	No. SAC is located outside of any potential off-site associated development construction effects (direct or indirect) including emissions to air. Changes in air quality during construction would be very localised and would not influence air quality parameters within the SAC. No potential for impact by any of the planned work. **No LSE.**
	Otter	OAD20 - Associated development site construction (all sites), including reduced fish populations (effects on otter).	Potential for effects on otter from construction works, including reduced fish populations.	No. The nearest extent of the SAC is approximately 7km from the nearest associated development (Williton). There are no identified direct impact

Site Name	Interest Feature	Activity/effect	Reason considered for LSE	Was AA determined to be necessary?
				pathways that would affect this species during construction. No watercourses that link into the SAC would be affected by the works. **No LSE.**
Mendip Limestone Grassland SAC	Annex I habitats (semi-natural dry grasslands and scrubland facies on calcareous substrates; European dry heaths; caves not open to the public, *Tilio-Acerion* forests of slopes, screes and ravines).	OAD21 - Associated development site construction (all sites), including emissions to air (effects on Annex I habitats).	Potential for effects on Annex I habitats from construction works, including emissions to air.	No. SAC is located outside of any potential off-site associated development construction effects (direct or indirect) including emissions to air. No potential for impact by any of the planned work. **No LSE.**
	Annex II species including the greater horseshoe bat.	OAD22 - Associated development site construction (all sites), including increased lighting (effects on greater horseshoe bats through vegetation/habitat loss and potential influence on foraging/commuting behaviour).	Potential for effects on greater horseshoe bats from construction works, including increased lighting.	No. Greater horseshoe bats have been recorded in the area of Cannington bypass but are highly unlikely to have ventured to this SAC which is over 19km away from the bypass. No potential for impact by any of the planned works. **No LSE.**
Hestercombe House SAC	Lesser horseshoe bat	OAD23 - Associated development site construction (all sites), including increased lighting (effects on lesser horseshoe bats through vegetation/habitat loss and potential influence on foraging/commuting behaviour).	Potential for effects on lesser horseshoe bats from construction works, including increased lighting.	No. Lesser horseshoe bats have been recorded in the area of Cannington bypass but are highly unlikely to have ventured to this SAC which is over 10km away from the bypass. A radio tracking study found the average foraging radius from the roost was 2km, maximum 4km. No potential for impact by any of the planned works. **No LSE.**
River Usk SAC	Migratory fish Populations	OAD24 - Potential effects of Combwich Wharf construction on SAC fish could be similar to those described for the Severn Estuary Ramsar.	Sites share migratory fish populations (twaite shad and river lamprey) with Severn Estuary SAC	Yes, but the inclusion of this site was highly precautionary and based solely on the potential impact of the development on the population at the wider 'catchment' level.
	Bullhead	OAD25 - Combwich Wharf construction activities, including underwater noise levels (effects on bullhead).	Potential for effects on bullhead from construction activities, including underwater noise.	No. Fish confined to the River Usk and therefore outside of any influence of any off-site associated development construction effects. **No LSE.**
	Otter	OAD26 - Combwich wharf construction activities, including reduced fish populations (effects on otter).	Potential for effects on otter from construction works, including reduced fish populations.	No. Fish present in the River Parrett would not form part of the prey population that support otter in the River Usk catchment. No potential for impact by any of the planned works. **No LSE.**

Site Name	Interest Feature	Activity/effect	Reason considered for LSE	Was AA determined to be necessary?
River Wye SAC	Migratory fish Populations	OAD27 - Potential effects of Combwich Wharf construction on SAC fish could be similar to those described for the Severn Estuary Ramsar.	Sites share migratory fish populations (twaite shad and river lamprey) with Severn Estuary SAC.	Yes, but the inclusion of this site was highly precautionary and based solely on the potential impact of the development on the population at the wider 'catchment' level.
	Annex I river habitat	OAD28 - Combwich Wharf construction activities (effects on Annex I river habitats).	Potential for effects on Annex I river habitats from construction activities.	No. Habitats confined to the River Wye and outside of the influence of any construction effects of the off-site associated developments. **No LSE.**
	White-clawed crayfish	OAD29 - Combwich Wharf construction activities (effects on white-clawed crayfish).	Potential for effects on white-clawed crayfish from construction activities.	No. Species confined to the River Wye and outside of the influence of any construction effects of the off-site associated developments. **No LSE.**
	Bullhead	OAD30 - Combwich Wharf construction activities, including underwater noise levels (effects on bullhead).	Potential for effects on bullhead from construction activities, including underwater noise levels.	No. Fish confined to the River Wye and therefore outside of any influence of any off-site associated developments construction effects. **No LSE.**
	Otter	OAD31 - Combwich Wharf construction activities, including reduced fish populations (effects on otter).	Potential for effects on otter from construction activities, including reduced fish populations.	No. Fish present in the River Parrett would not form part of the prey population that support otter in the River Wye catchment. No potential for impact by any of the planned works. **No LSE.**
Afon Tywi SAC	Migratory fish Populations	OAD32 - Potential effects of Combwich Wharf construction on SAC fish could be similar to those described for the Severn Estuary Ramsar.	Sites share migratory fish populations (twaite shad and river lamprey) with Severn Estuary SAC.	Yes, but the inclusion of this site was highly precautionary and based solely on the potential impact of the development on the population at the wider 'catchment' level.

Table 3.5 Analysis of potential effects on designated sites/features of off-site associated development during the operation phase of HPC with respect to the determination of LSE

Site Name	Interest Feature	Activity/effect	Reason considered for LSE	Was AA determined to be necessary?
Severn Estuary SPA/Ramsar/SAC	SPA/Ramsar Internationally important bird populations, wintering populations and bird assemblage	OAD33 - Traffic movement to and from the Combwich Wharf, operation/movement of machinery/vessels in the River Parrett Estuary.	Potential for disturbance to birds from traffic and vessels	Yes. Activities within/adjacent to SPA boundary.
		OAD34 - Disturbance to birds using intertidal areas at Combwich Wharf, and field close to the Cannington bypass due to noise and human activity during operation.	Potential for disturbance to birds from noise and human activity	Yes. Activities within/adjacent to SPA boundary.
	Annex I species	OAD35 - Operation of Combwich Wharf, the freight logistics facility at Combwich and the freight logistics and park and ride facility at J23 (effects on Annex I species – Bewick's swan).	Potential for effects on Annex I species (Bewick's swan) during operation.	No. There is no evidence to indicate that the Bewick's swan regularly occurs in proximity to any of the proposed associated development sites. No potential for impact by any of the planned works. **No LSE.**
	SAC/Ramsar Migratory fish populations	OAD36 - Disturbance to fish in the vicinity of Combwich Wharf due to an increase in underwater noise and artificial lighting levels.	Potential disturbance to fish from noise and lighting	Yes. Activities within SAC boundary.
		OAD37 - Changes in water quality due to sediment disturbance and berthing operations and any required maintenance dredging at Combwich Wharf.	Potential adverse effects on fish from changes in water quality	Yes. Activities within SAC boundary.
		OAD38 - Changes in water quality due to discharges into the River Parrett from any works and areas of hard standing during the operation of the Combwich freight laydown facility.	Potential for adverse effects on migratory fish from changes in water quality	Yes. Activities within SAC boundary.
	SAC/Ramsar Estuaries feature and other habitats including subtidal sandbanks; intertidal mudflats and sandflats; Atlantic salt meadows; reef	OAD39 - Presence of upgraded Combwich Wharf, including maintenance dredging (hydrodynamic, water quality, geomorphology, and sediment transport effects on the estuaries feature and other habitats, for example saltmarsh, intertidal mudflats and sandflats).	Potential for physical effects on estuaries feature and other habitats	Yes. Activities within SAC boundary.
		OAD40 - Increased vessel movements in the River Parrett estuary associated with Combwich Wharf (effect on the estuaries feature and other habitats).	Physical effects of increased vessel movements on estuaries feature and other habitats (e.g. erosion)	Yes. Activities within SAC boundary.
		OAD41 - Berthing operations, dredging and the disposal of dredged material associated with Combwich Wharf (effects on estuaries	Potential for physical/chemical effects on estuaries feature and other habitats	Yes. Activities within SAC boundary.

Site Name	Interest Feature	Activity/effect	Reason considered for LSE	Was AA determined to be necessary?
		feature and other habitats).		
		OAD42 - Changes in water quality due to discharges into the River Parrett from any works and areas of hardstanding during the operation of the Combwich Wharf.	Potential for changes in water quality to affect estuaries feature and other habitats	Yes. Discharges directly into SAC.
		OAD43 - Accidental or emergency discharges during operation of Combwich Wharf (effects on estuaries feature and other habitats through changes in water quality).	Potential for pollution to estuaries feature and other habitats from discharges into SAC.	Yes. Although very low likelihood of LSE due to mitigation at the design phase, it was determined to be necessary to take potential discharges through to AA.
		OAD44 - Operation of Combwich Wharf, the freight logistics facility at Combwich and the freight logistics and park and ride facility at J23 (effects on subtidal sandbanks through physical disturbance or changes in water quality).	Potential for effects on subtidal sandbanks through physical disturbance or changes in water quality.	No. The distribution of this habitat in the estuary would preclude it from any direct or indirect effects during operation. The nearest subtidal sandbank to the associated development (Combwich Wharf) is approximately 10km downstream, offshore of the mouth of the River Parrett. Vessel movements to and from Combwich would not influence this feature as it does not occur within the navigation channel. No potential for impact by any of the planned works. **No LSE.**
		OAD45 - Refurbishment and extension of Combwich Wharf, construction of the freight logistics facility at Combwich and the freight logistics and park and ride facility at J23 (effects on reef habitat through physical disturbance or changes in water quality).	Potential for effects on reef habitat through physical disturbance or changes in water quality.	No. The distribution of this habitat in the estuary would preclude it from any direct or indirect effects during operation. The nearest area of potential reef habitat is approximately 10km from Combwich. Vessel movements to and from Combwich would not influence this feature as it does not occur within the navigation channel. No potential for impact by any of the planned works. **No LSE.**
Somerset Levels and Moors SPA/Ramsar	Internationally important bird populations	OAD46 - Potential effects on the Somerset Levels and Moors SPA/Ramsar birds are similar to those described for the Severn Estuary SPA and Ramsar.	Some of the birds recorded during the survey work were thought to form part of the Somerset Levels SPA population rather than that of the Severn Estuary SPA	Yes. AA was determined to be necessary in light of initial survey findings.
	Waterbird populations / assemblage	OAD47 - Operation of Combwich Wharf, the Combwich freight laydown facility, and the freight logistics and park and ride facility at J23 (disturbance to birds but only with respect to those species – teal, wigeon and pintail – for which the Somerset Levels and Moors Ramsar site is designated and which utilise habitats within the Severn Estuary SPA adjacent to Combwich Wharf, the fright logistics facility at Combwich or the freight logistics and park and ride facility at J23).	Potential for disturbance to teal, wigeon and pintail darting operation.	No. The designated species do not occur in the vicinity of the off-site associated developments and their potential effects. **No LSE.**

Site Name	Interest Feature	Activity/effect	Reason considered for LSE	Was AA determined to be necessary?
	Annex I species	OAD48 - Disturbance during the operation of Combwich Wharf, the Combwich freight laydown facility, and the freight logistics and park and ride facility at J23 (effects on Annex I species – Bewick's swan).	Potential for effects on Annex I species (Bewick's swan) during operation	No. There is no evidence to indicate that the Bewick's swan regularly occurs in proximity to the associated developments sites. No potential for impact by any of the planned works. **No LSE.**
	Invertebrate assemblage	OAD49 - Operation of Combwich Wharf (effects on the invertebrate assemblage).	Potential for effects on invertebrate assemblage from operation of Combwich Wharf.	No. The invertebrate assemblage of the Somerset Levels and Moors Ramsar site is confined to the designated site. There is no identified pathway by which the associated development could have an effect upon this assemblage. **No LSE.**
Exmoor and Quantock Oakwoods SAC	Barbastelle bat	OAD50 - Operation of Cannington bypass (effects on barbastelle bat through vegetation/habitat loss and potential influence on barbastelles' foraging/commuting behaviour).	Survey work found that barbastelle bats make use of land within the footprint of the off-site developments	Yes. AA was determined to be necessary in light of initial survey findings.
	Old sessile oakwoods	OAD51 - Associated development site operation (all sites), including emissions to air (effects on old sessile oakwoods).	Potential for effects on old sessile oakwoods during operation, including from emissions to air.	No. The nearest extent of the SAC is approximately 7km from the nearest associated development site (Williton park and ride). There are no identified direct impact pathways that would affect this feature. No watercourses that link into the SAC would be affected by the works. Changes in air quality during operation at the facility at Wilton would be very localised and would not influence air quality parameters within the SAC. **No LSE.**
	Alluvial forests	OAD52 - Associated development site operation (all sites), including emissions to air (effects on alluvial forests).	Potential for effects on alluvial forests during operation, including from emissions to air.	No. The nearest extent of the SAC is approximately 7km from the nearest associated development site (Williton park and ride). There are no identified direct impact pathways that would affect this feature. No watercourses that link into the SAC would be affected by the works. Changes in air quality during operation at the facility at Wilton would be very localised and would not influence air quality parameters within the SAC. **No LSE.**

Site Name	Interest Feature	Activity/effect	Reason considered for LSE	Was AA determined to be necessary?
Mendip Limestone Grassland SAC	Annex I habitats (semi-natural dry grasslands and scrubland facies on calcareous substrates; European dry heaths; caves not open to the public, *Tilio-Acerion* forests of slopes, screes and ravines).	OAD53 - Associated development site operation (all sites), including emissions to air (effects on Annex I habitats).	Potential for effects on Annex I habitats during operation, including from emissions to air.	No. SAC is located outside of any potential off-site associated development construction effects (direct or indirect) including emissions to air. No potential for impact by any of the planned works. **No LSE.**
	Annex II species including the greater horseshoe bat.	OAD54 - Associated development site operation (all sites), including increased lighting (effects on greater horseshoe bats through vegetation/habitat loss and potential influence on foraging/commuting behaviour).	Potential for effects on greater horseshoe bats during operation, including from increased lighting.	No. Greater horseshoe bats have been recorded in the area of Cannington bypass but are highly unlikely to have ventured to this SAC which is over 19km away from the bypass. No potential for impacts by any of the planned works. **No LSE.**
Hestercombe House SAC	Lesser horseshoe bat	OAD55 - Associated development site operation (all sites), including increased lighting (effects on lesser horseshoe bats through vegetation/habitat loss and potential influence on foraging/commuting behaviour).	Potential for effects on lesser horseshoe bats during operation, including from increased lighting.	No. Lesser horseshoe bats have been recorded in the area of Cannington bypass but are highly unlikely to have ventured to this SAC which is over 10km away from the bypass. A radio tracking study found the average foraging radius from the roost was 2km, maximum 4km. No potential for impacts by any of the planned works. **No LSE.**
River Usk SAC	Migratory fish Populations	OAD56 - Potential effects on SAC fish could be similar to those described for the Severn Estuary Ramsar.	Sites share migratory fish populations (twaite shad and river lamprey) with Severn Estuary SAC	Yes, but the inclusion of this site was highly precautionary and based solely on the potential impact of the development on the population at the wider 'catchment' level.
	Bullhead	OAD57 - Combwich Wharf operational activities, including underwater noise levels (effects on bullhead).	Potential for effects on bullhead during operation, including from underwater noise.	No. Fish confined to the River Usk and therefore outside of any influence of any off-site associated development operational effects. **No LSE.**
	Otter	OAD58 - Combwich wharf operational activities, including reduced fish populations (effects on otter).	Potential for effects on otter during operation, including reduced fish populations.	No. Fish present in the River Parrett would not form part of the prey population that support otter in the River Usk catchment. **No LSE.**
River Wye SAC	Migratory fish Populations	OAD59 - Potential effects on SAC fish could be similar to those described for the Severn Estuary Ramsar.	Sites share migratory fish populations (twaite shad and river lamprey) with Severn Estuary SAC	Yes, but the inclusion of this site was highly precautionary and based solely on the potential impact of the development on the population at the wider 'catchment' level.
	Annex I river habitat	OAD60 - Combwich Wharf operational activities (effects on Annex I river habitats).	Potential for effects on Annex I river habitats during operation	No. Habitats confined to the River Wye and outside of the influence of any operational effects of the off-site

Site Name	Interest Feature	Activity/effect	Reason considered for LSE	Was AA determined to be necessary?
				associated developments. **No LSE.**
	White-clawed crayfish	OAD61 - Combwich Wharf operational activities (effects on white-clawed crayfish).	Potential for effects on white-clawed crayfish during operation.	No. Species confined to the River Wye and outside of the influence of any operational effects of the off-site associated developments. **No LSE.**
	Bullhead	OAD62 - Combwich Wharf operational activities, including underwater noise levels (effects on bullhead).	Potential for effects on bullhead during operation, including from underwater noise.	No. Fish confined to the River Wye and therefore outside of any influence of any off-site associated developments operational effects. **No LSE.**
	Otter	OAD63 - Combwich Wharf operational activities, including reduced fish populations (effects on otter).	Potential for effects on otter during operation, including from reduced fish populations.	No. Fish present in the River Parrett would not form part of the prey population that support otter in the River Wye catchment. **No LSE.**
River Tywi SAC	Migratory fish Populations	OAD64 - Potential effects on SAC fish could be similar to those described for the Severn Estuary Ramsar.	Sites share migratory fish populations (twaite shad and river lamprey) with Severn Estuary SAC	Yes, but the inclusion of this site was highly precautionary and based solely on the potential impact of the development on the population at the wider 'catchment' level.

Table 3.6 Analysis of potential effects on designated sites/features of off-site associated development during the post operational phase of HPC with respect to the determination of LSE

Site Name	Interest Feature	Activity/effect	Reason considered for LSE	Was AA determined to be necessary?
Severn Estuary SPA/Ramsar/SAC	SPA/Ramsar Internationally important bird populations, wintering populations and bird assemblage	OAD65 - Disturbance to birds due to an increase in noise, lighting and human activity during operations at Combwich Wharf during decommissioning of Hinkley Point C.	Potential for disturbance to birds due noise lighting and human activity.	Yes. Activities within SPA boundary.
	SAC/Ramsar Migratory fish populations	OAD66 - Disturbance to fish due to an increase in underwater noise and artificial lighting levels during operations at Combwich Wharf.	Potential for disturbance to fish due to an increase in underwater noise and artificial lighting levels.	Yes. Activities within SAC boundary.
		OAD67 - Changes in water quality due to discharges into the River Parrett from decommissioning activities at Combwich Wharf.	Potential for effects on fish from changes in water quality.	Yes. Discharges directly into SAC.
	SAC/Ramsar Estuaries feature and other habitats including subtidal sandbanks; intertidal	OAD68 - Berthing operations and maintenance dredging associated with Combwich Wharf during decommissioning stage of Hinkley Point C (effects on estuaries feature and other habitats).	Potential for effects on estuaries feature and other habitats from berthing operations and dredging.	Yes. Activities within SAC boundary.

Site Name	Interest Feature	Activity/effect	Reason considered for LSE	Was AA determined to be necessary?
	mudflats and sandflats; Atlantic salt meadows; reef	OAD69 - Changes in water quality due to discharges into the River Parrett from decommissioning activities at Combwich Wharf.	Potential for effects on estuaries feature and other habitats from changes.	Yes. Discharges directly into SAC.
		OAD70 - Accidental or emergency discharges into the River Parrett during construction (effects on the estuaries feature and other habitats through changes in water quality).	Potential for effects on estuaries feature and other habitats through changes in water quality.	Yes. Discharges directly into SAC.
Somerset Levels and Moors SPA/Ramsar	Internationally important bird populations	OAD71 - Potential effects on the Somerset Levels and Moors SPA/Ramsar birds are similar to those described above for the Severn estuary SPA and Ramsar.	Some of the birds recorded during the survey work were thought to form part of the Somerset Levels SPA population rather than that of the Severn Estuary SPA.	Yes. AA was determined to be necessary in light of initial survey findings.
Exmoor and Quantock Oakwoods SAC	Barbastelle bat	OAD72 - Operation of Cannington bypass during the decommissioning phase of Hinkley Point C (effects on barbastelle' bat through vegetation/habitat loss and potential influence on barbastelles' foraging/commuting behaviour).	Survey work found that barbastelle bats make use of land within the footprint of the off-site developments.	Yes. AA was determined to be necessary in light of initial survey findings.
River Usk SAC	Migratory fish Populations	OAD73 - Potential effects on SAC fish could be similar to those described for the Severn estuary Ramsar.	Sites share migratory fish populations (twaite shad and river lamprey) with Severn Estuary SAC	Yes, but the inclusion of these sites was highly precautionary and based solely on the potential impact of the development on the population at the wider 'catchment' level.
River Wye SAC				
Afon Tywi SAC				

4. OUTCOME OF THE AA STAGE

4.1.1 Potential effects screened in with respect to LSE were taken forward to the AA stage. The HPC HRA Shadow AA has been reviewed and impacts for which it was possible to conclude, often without the need for detailed consideration, that there was no credible evidence that an impact pathway existed (i.e. a likely significant effect with respect to that pathway would not arise), or the effect would be trivial or inconsequential in the context of the relevant site's conservation objectives, have been identified in **Tables 4.1** and **4.2**. For the purposes of **Tables 4.1** and **4.2**, these impacts are referred to as impacts 'ruled out without the need for detailed consideration'.

4.1.2 The aim of this exercise is to identify those impacts that may not have warranted inclusion in the AA and may reasonably have been screened out at the LSE stage.

Table 4.1 Analysis of potential impacts of main site activities taken through to AA that were ruled out without the need for detailed consideration

Site Name	Potential impact	Reference to Section 3 Screening tables	How/why was impact ruled out without the need for detailed consideration?
Severn Estuary SAC	Changes in hydrodynamics and sediment transport during construction	HPC9	Construction is defined in the AA as the process of building (rather than the built structure itself) and is temporary by nature. Disturbance events during this phase are likely to be localised and transient and, therefore, small scale in magnitude.
	Re-suspension and deposition of sediment during dismantling of the Temporary Jetty	HPC12	Limited potential for sediment disturbance in the intertidal and associated water quality impacts.
	Alteration to the tidal prism, cross section of the estuary due to the presence of the sea wall	HPC48, HPC53	The pre-existing cliff and the proposed sea wall stand on the upper shore well above mean high tides, and it is only in more extreme conditions of either tidal level or storm that there will be any hydrodynamic interaction with the structure. As the structure will replace the existing upper shore boundary with a very similar plan form and steepness, no effect on the tidal regime (prism and cross section) was anticipated.
	Alteration to tidal properties (prism and cross-section) of the estuary due to the presence of the cooling water infrastructure and the FRR	HPC48	Intake and outfall structures are subtidal and would not influence the tidal prism. In the context of the Inner Bristol Channel (20km wide at this location) the footprint of the intake and outfall structures is negligible. No interruption to either local hydrodynamics was expected and no issue of localised scour.
	Effect of the discharge of cooling water on suspended solid concentrations	Not applicable	As no suspended material is removed from the water taken into the cooling water system, what is then discharged will be virtually identical to the surrounding water, and the effect on the receiving water's turbidity regime will be negligible. Light penetration into the water column, governed by turbidity and suspended matter, will also not be altered significantly.
	Loss of or alteration to estuaries feature and habitats due to the presence of the cooling water infrastructure	HPC47 (in the context of migratory fish populations interest feature)	Very small area of habitat loss relative to overall extent of habitat type impacted, specifically 1800m^2 out of 76km^2.
	Loss of or alteration to estuaries feature and habitats due to hydrodynamic, geomorphology and sediment transport alterations as a result of the cooling water infrastructure	HPC48	Localised effects and extensive nature of habitat type effected.
	Loss of or alteration to estuary feature and habitats (Sabellaria) due to the presence of the Temporary Jetty	HPC9	No Sabellaria present within 500m of the Jetty.
	Increased scour or deposition as a result of the presence of the Temporary Jetty and berth pocket	HPC11	Worst case radial scour for jetty piles calculated to be 2.7m and limited scour expected at jetty berthing pocket due to the dredge slope. No Sabellaria present within 500m of Jetty.
	Alteration to tidal properties and sediment transport due to the removal of the cooling water infrastructure	HPC77	Presence of infrastructure would have a very localised and negligible influence upon hydrodynamics and sediment transport. Dismantling of the cooling water structures would remove any localised effects.
	Noise disturbance to fish from tunnelling operations	HPC7	Any avoidance reaction in fish would be likely to be confined to the immediate corridor above the tunnel.

Site Name	Potential impact	Reference to Section 3 Screening tables	How/why was impact ruled out without the need for detailed consideration?
	Light disturbance to fish during operation of the Temporary Jetty	HPC7	Due to the temporary nature of the impact, the seasonal presence and movement of migratory fish and the rapid attenuation of light with depth in turbid waters.
Severn Estuary SPA	Loss of habitat due to presence of the Temporary Jetty	HPC1	Scale of loss insignificant in comparison to extent of effected habitat.
Exmoor and Quantock Oakwoods SAC	Loss of or alteration to (Barbastelle bat) foraging habitat and/or fragmentation of the available foraging habitat due to decommissioning	HPC80	No expected loss of or alteration to habitat outside HPC site. Habitat within the site would be unlikely to provide suitable foraging.
	Loss and/or fragmentation of (Barbastelle bat) commuting corridors, which in turn affects access to foraging habitats due to decommissioning	HPC80	No commuting corridors identified within the HPC operational site. No loss of or alteration to commuting corridors during decommissioning.

Table 4.2 Analysis of potential impacts of associated off-site development taken through to AA that were ruled out without the need for detailed consideration

Site Name	Potential impact	Reference to Section 3 Tables	How/why was impact ruled out without the need for detailed consideration?
Severn Estuary SAC	Loss of or alteration to inter-tidal and sub-tidal habitats due to the upgrade of Combwich Wharf	OAD7	Upgrade works are located outside the boundary of the SAC.
	Loss of or alteration to habitats due to scour or deposition as a result of increased vessel movements in the River Parrett (travelling to and from Combwich Wharf)	OAD40	Due to low vessel speeds and movement of vessels at high tide no noticeable alteration to the erosional or deposition regime is expected.
	Sediment mobilisation resulting from vessel movements and berthing around Combwich Wharf and effects on estuarine features	OAD39, OAD40	Limited potential for sediment mobilisation due to berthing at high tide and speed limits, and limited sediment re-suspension in the context of estuary conditions.
	Direct and/or indirect loss or alteration of inter-tidal mudflat habitat due to works at Combwich Wharf	OAD7	Works outside boundary of SAC. Very small scale loss of habitat will not have any implications for habitat within SAC.
	Direct and/or indirect loss or alteration of saltmarsh habitat due to works at Combwich Wharf	OAD7	Works outside boundary of SAC. No discernible change to the hydrodynamic, geomorphological or sediment transport processes will occur as a result of the installation and operation of Combwich Wharf, therefore no loss or change to extent of saltmarsh vegetation.

5. COMPETENT AUTHORITY HRAs

5.1 Introduction

5.1.1 In addition to the HRA Report produced by NNB GenCo, in due course the Environment Agency produced an HRA as competent authority for the applications for Environmental Permits and the Secretary of State subsequently produced the HPC Project HRA as the competent authority for the Development Consent Order (DCO). While these HRAs adopted different formats to the format adopted for the Shadow HRA (and for the Environmental Permits had a different focus), ultimately their outcomes and conclusions were consistent.

5.1.2 The approach adopted, and conclusions reached, by each of the competent authority HRAs is described briefly below.

5.2 Environment Agency HRA

5.2.1 The main areas of potential concern covered in the Environment Agencies 628 page HRA were related to water discharge activities, i.e. toxic contamination, thermal impacts, entrainment and impingement of fish and planktonic organisms, but also considered disturbance to birds. These impacts were assessed in respect of the HPC Project itself and the combined impact of the HPC project with other on-going activities and planned projects in the area.

5.2.2 To assess likely significant effect, a risk assessment consisting of three elements was completed. The elements were based on answering the following questions:

- Is there a potential hazard by which the proposal could affect the interest features of the site either directly or indirectly? Are the interest features sensitive to this hazard? Sensitivity matrices were used to plot the potential hazards of the HPC Project against sensitive features of the relevant European sites.
- Is there a pathway such that the potential hazard could affect the interest features of the site alone and/or in combination. What is the exposure of the feature to this hazard?
- For each hazard is the potential scale or magnitude of any effect likely to be significant?

5.2.3 An initial and a detailed LSE assessment was undertaken by the Environment Agency (mirroring in some respects the Shadow HRA scoping and then screening stages adopted for SZC), the outcomes of which included:

- Unless local circumstances require otherwise, licences should not be considered further for likely significant effect for those habitats/species not sensitive to the permitted activity, providing that any cumulative, indirect and/or synergistic effects can and have been adequately considered.
- No discharges were screened out as insignificant, prior to the assessment of whether they had a LSE.

- The assessment of operational discharges concluded that the Environment Agency could not be satisfied that there would not be a LSE from the proposed discharge and that an AA was, therefore, necessary.
- Within the estuaries feature toxic contamination assessment, only chlorine and hydrazine were concluded to have a likely significant effect within the estuaries feature, as the amounts proposed to be discharged exceeded the relevant targets in the receiving waters (EQS).
- No other contaminants in any of the other waste streams are considered to have a likely significant effect on the integrity of the Severn Estuary SAC.
- Neither the increase in nutrient inputs nor the increase in organic load arising from the operational discharges from HPC was considered to have a LSE on the integrity of the Severn Estuary SAC, because the discharges made a very small contribution, about 0.1% or less, to the overall annual loadings to the SAC and would not affect an area with habitat or species unique to the site.
- Emissions of NO_x, NO_2 and SO_2 were considered to have the potential to have a LSE, but no LSE was determined with respect to consequent nutrient enrichment and acidification of the Severn estuary, because predicted process contributions and environmental concentrations at habitat sites were well below Air Quality Standard (AQS) thresholds.
- The Environment Agency determined that the operation of the diesel generators was not likely to have a significant effect on the interest features of relevant designated sites.
- In-combination, the only discharge with a likely significant effect was determined to be the combined discharges from the Package STWs. However, in the context of the size of the mixing zone related to this feature this effect was considered to be negligible; being about 0.00004%.

5.2.4 The AA reached the following conclusions:

- The maximum load for hydrazine and the potential mixing zone potentially could have a significant impact on the features of the Severn Estuary SAC. However, removing hydrazine from the relevant waste streams before discharge would eliminate that risk.
- Temperature increases from cooling water discharges would have no significant effect on intertidal invertebrates.
- With the proposed fish removal and return and acoustic fish deterrent systems in place, the predicted rates of fish impingement and entrainment at HPC should not adversely affect the protected species, estuarine assemblage or integrity of the Severn Estuary SAC.
- The Environment Agency was unable to conclude that there would be no adverse effect on the birds listed in the Severn Estuary SPA designation due to disturbance (noise and visual) at the construction stage of the Combwich Wharf. It strongly advised that the Secretary of State implement measures related to the timing of piling work and to stop work in the event of severe winter weather.

5.3 Secretary of State HRA

5.3.1 The Secretary of State's HRA is divided into two main sections comprising a no significant effects (screening) report in respect of eleven European sites and an AA. The screening section drew on the information presented by NNB GenCo in the Shadow HRA and the Environment Agency's HRA. The Secretary of State's HRA adopted a tabular approach that differed from the HRAs produced by NNB GenCo and the Environment Agency.

5.3.2 For four European sites (i.e. the Severn Estuary SAC/Ramsar and SPA, Somerset Levels and Moors SPA/Ramsar and Exmoor and Quantock Oakwoods SAC) a risk of likely significant effects could not be excluded and AA was undertaken.

5.3.3 Taking the Severn Estuary SAC/Ramsar as an example, LSE was identified with respect to:

- Estuary features and other habitats - the temporary jetty, sea wall, cooling water infrastructure and Combwich Wharf could lead to habitat loss and modification. Dredging works could also result in sediment transport changes, as could scour around the temporary jetty structure. Coastal "squeeze" could be worsened as habitats are trapped behind the sea wall.
- The thermal and chemical properties of the cooling water discharge have the potential to affect water quality. The increased temperature of the cooling water discharges could result in a thermal "plume", with potential impacts on benthic species. Discharges from land-based works, increased areas of hard-standing, sewage and runoff from construction works also could affect water quality.
- Any change in water quality could potentially affect estuary features - *sabellaria* reef; subtidal sandbanks; Atlantic salt meadows; and intertidal mud/sandflats.
- Migratory fish populations, the fish assemblage, planktonic organisms and *sabellaria* larvae could be affected by impingement/entrainment. Fish may also be disturbed by underwater noise due to piling and the operation of Combwich Wharf. The thermal plume may affect migratory behaviour, causing an obstruction to migration in/out of the River Parrett and Bridgwater Bay. There may also be disturbance to fish from an increase in underwater noise levels and artificial lighting around Combwich Wharf, the temporary jetty, sea wall and cooling water infrastructure.
- Changes in water quality and hydrodynamic regimes may result from increased vessel movements; sediment disturbance during berthing operations; maintenance dredging; and accidental or emergency spillages.

5.3.4 The AA considered (and reflected the need for) mitigation by cross-referencing the requirements proposed in the DCO or the Environment Agency's Environmental Permit conditions (as the means for securing this mitigation).

5.3.5 With these safeguards in place, it was concluded that there would be no adverse effect on any European site as a result of the HPC Project alone or in combination with other plans and projects. This coincided with the conclusion reached in the Shadow HRA.

6. RESULTS AND CONCLUSIONS

6.1 Effects and impacts that may not have warranted AA

6.1.1 **Sections 3** and **4** record the review undertaken to identify those potential effects/impacts that may not have warranted AA with respect to the HPC Project (**Tables 4.1** and **4.2** describe impacts for which it was possible to conclude that there was no credible evidence for an impact pathway or the effect would be trivial or inconsequential in the context of the relevant site's conservation objectives). **Section 5** then considers the issues that were screened into the AA process by the Environment Agency and the Secretary of State.

6.1.2 Overall, the LSE screening and AA for the HPC Project were well scoped and avoided taking effects through to the AA stage that did not warrant detailed assessment. However, it has been possible to identify a number of effects/impacts where inclusion in the AA may have been an unnecessary precaution. These effects/impacts are described in turn below. The assessments made and arguments presented within the HPC Project HRA Report (the Shadow HRA) are also identified.

Potential effects on migratory fish populations of Rivers Usk/Wye/Tywi SACs

6.1.3 The HPC Project HRA Report states that these sites share migratory fish populations (specifically twaite shad and river lamprey) with the Severn Estuary SAC, within which some elements of the project are located.

6.1.4 The inclusion of these sites in the AA was highly precautionary and based on the 'shared' nature of the migratory fish populations at the wider catchment level (i.e. including the Rivers Usk/Wye/Tywi SACs, which are directly linked to the Severn Estuary). The outcomes of the HRA indicate that the inclusion of these sites may have been an unnecessary precaution. The Competent Authorities HRAs did not consider this potential effect to be significant.

Small-scale habitat loss from presence of structures in the marine environment and influence on food availability for Severn Estuary SAC/Ramsar fish populations

6.1.5 The screening processes undertaken as part of the Shadow HRA and the Secretary of State's HRA concluded that this was a potential LSE. However, the habitat loss was quantifiable and limited to a very small proportion of the SAC. Given this, the structures' influence on habitat and food availability was highly unlikely to have the potential to adversely affect migratory fish. It is therefore concluded that taking this effect through to the AA stage may have been an unnecessary precaution and it could have been screened out at the LSE stage.

Changes to hydrodynamics, sediment transport and sediment re-suspension and deposition due to construction (of main site), dismantling of the Temporary Jetty, presence of the Sea Wall, presence of the cooling water infrastructure and the FRR, and cooling water discharge

6.1.6 As presented in **Table 4.1**, potential impacts relating to changes in hydrodynamics were determined not to have the potential to cause an adverse effect due to the

localised nature of the physical effects predicted and/or the location of the structures. It is concluded that these impacts could have been screened out at the LSE stage.

Loss of or alteration to estuaries feature and habitats

6.1.7 A number of the potential effects on estuaries feature and habitats taken through to the AA stage in the Shadow HRA and by the Secretary of State were determined not to have the potential to cause an adverse effect due to the small area of habitat loss predicted relative to the overall extent of the habitat type available, the localised nature of effects, or the distance of the habitat type (Sabellaria) from the proposed structure (Temporary Jetty) (see Table 4.1).

Noise disturbance to fish from tunnelling operations

6.1.8 No adverse effect on integrity was predicted in the Shadow AA due to the localised nature of any avoidance reaction by fish. Depending on the nature of tunnelling operations required for Sizewell C, this assessment may be applicable to the Sizewell C Project.

Light disturbance to fish during operation of the Temporary Jetty

6.1.9 No adverse effect on integrity was predicted in the Shadow or Secretary of State's AAs due to the temporary nature of the impact, the seasonal presence and movement of migratory fish and the rapid attenuation of light with depth in turbid waters. It is concluded that this impact could have been ruled out at the screening stage. This assessment may also be applicable to Sizewell C.

Loss of or alteration to (Barbastelle bat) foraging habitat and/or fragmentation of the available foraging habitat due to decommissioning

6.1.10 No adverse effect on integrity was predicted in the Shadow AA, as no loss of or alteration to habitat outside the HPC site was anticipated and habitat within the site was not expected to be likely to provide suitable foraging. It is concluded that this impact could have been ruled out at the screening stage, but this was not accepted by the relevant local authorities.

Loss of or alteration to inter-tidal and sub-tidal habitats due to the upgrade of Combwich Wharf

6.1.11 No adverse effect on integrity was predicted in the AAs on the basis that the upgrade works are outside the boundary of the Severn Estuary SAC. It is concluded that this impact could have been ruled out at the screening stage.

Loss of or alteration to habitats due to scour or deposition as a result of increased vessel movements in the River Parrett (travelling to and from Combwich Wharf)

6.1.12 Due to low vessel speeds and the movement of vessels at high tide, no noticeable alteration to the erosional or deposition regime was expected and therefore the AAs determined that an adverse effect on integrity would not arise. It is concluded that this impact could have been ruled out at the screening stage.

Sediment mobilisation resulting from vessel movements and berthing around Combwich Wharf and effects on estuarine features

6.1.13 No adverse effect was predicted in the AAs as there is limited potential for sediment mobilisation due to berthing at high tide and speed limits, and limited sediment re-suspension in the context of estuary conditions. It is concluded that this impact could have been ruled out at the screening stage.

Direct and/or indirect loss or alteration of inter-tidal mudflat habitat/saltmarsh habitat due to works at Combwich Wharf

6.1.14 No adverse effect on integrity was predicted in the AAs as the works at Combwich Wharf are outside the boundary of the Severn Estuary SAC and no discernible effects on conditions within the SAC were predicted to result. It is concluded that these impacts could have been ruled out at the screening stage.

6.2 Conclusion

6.2.1 The main objective of this analysis was to identify those effects that could have been screened out at the LSE stage and not taken through to AA because there was no credible evidence that an impact pathway existed or the effect would be trivial, and this is addressed in **Section 6.1** above. It also aimed to answer the question as to whether unnecessary work was undertaken as part of the HPC Project (Shadow) HRA. In response to this, the conclusion drawn from our analysis is that the work undertaken could have been better focused on issues of real significance at an earlier stage in the process, allowing a better use of resources and time. However, it is recognised that, in large part, the need for the inclusion of certain sites in the post-screening process was due to project data being insufficient to enable robust assessment and, therefore, a precautionary approach was adopted. The Evidence Plan being undertaken for the Sizewell C Project allows this focus to be provided in order to support good decision making.

6.2.2 Attention is also drawn to the effort that was invested in the production of three very different HRAs that ultimately reached the same conclusions regarding site integrity (secured through DCO requirements and Environmental Permit conditions). It is suggested that the Evidence Plan process could reduce the requirement for duplication of effort by recording the agreement of evidence requirements and assessment outcomes (where appropriate). Based on such a record, the formal HRAs could rely on these agreements and not repeat agreed data/results, focussing instead on points of difference and key conclusions only.

6.2.3 The objective of the SZC Project HRA Evidence Plan process is to provide a shadow HRA that includes all of the information necessary to inform the competent authorities' decision making in terms of the SZC Project's predicted effects on European sites.

7. STAKEHOLDER COMMENTS

Consultee	Comment	Response
EA	*Comment in relation to Section 6.1.4 'The inclusion of these sites in the AA was highly precautionary'.* It was a legal requirement under the Habitats Regulations. If there had been a potential adverse effect to the migratory fish populations in the estuary then this would have had a direct impact on the fish populations migrating to the rivers designated for the fish. Since fish were of huge concern due to cooling water requirements the inclusion of 'off site impacts' was fully justified.	Noted
EA	*Comment in relation to Section 6.1.7 'A number of the potential effects on estuaries feature and habitats taken through to the AA stage in the Shadow HRA and by the Secretary of State were determined not to have the potential to cause an adverse effect due to the small area of habitat loss predicted relative to the overall extent of the habitat type available, the localised nature of effects, or the distance of the habitat type (Sabellaria) from the proposed structure (Temporary Jetty) (see Table 4.1).* Any direct habitat loss should be assessed within the HRA and be part of the in-combination assessment.	Noted
EA	*Comment in relation to Section 6.1.8 'Depending on the nature of tunnelling operations required for Sizewell C, this assessment may be applicable to the Sizewell C Project.* We have yet to establish what concerns fish migratory routes, or designated areas may pose to the SZC project.	Noted
EA	*Comment in relation to Section 6.1.9 'No adverse effect on integrity was predicted in the Shadow or Secretary of State's AAs due to the temporary nature of the impact, the seasonal presence and movement of migratory fish and the rapid attenuation of light with depth in turbid waters. It is concluded that this impact could have been ruled out at the screening stage. This assessment may also be applicable to Sizewell C.* As per comment above, we must establish whether there are any relevant designations for fish, or migratory routes of concern, and - if so - how this assessment may relate to those instances. *Comment in relation to Section 6.1.11 'No adverse effect on integrity was predicted in the AAs on the basis that the upgrade works are outside the boundary of the Severn Estuary SAC. It is concluded that this impact could have been ruled out at the screening stage.'* We wouldn't agree with this conclusion, as the works were directly adjacent to the designated saltmarsh and mudflat habitats and needed to be assessed in detail.	Noted
EA	*Comment in relation to Section 6.1.12 'Due to low vessel speeds and the movement of vessels at high tide, no noticeable alteration to the erosional or deposition regime was expected and therefore the AAs determined that an adverse effect on integrity would not arise. It is concluded that this impact could have been ruled out at the screening stage.* We don't agree. A lot of the information supplied in the shadow HRA in relation to vessel movement speeds proved to be incorrect and we had to re-assess the impacts - which generated a much fuller investigation. This was therefore much more complex than first expected.	Noted

Consultee	Comment	Response
EA	*Comment in relation to Section 6.1.14 'No adverse effect on integrity was predicted in the AAs as the works at Combwich Wharf are outside the boundary of the Severn Estuary SAC and no discernable effects on conditions within the SAC were predicted to result. It is concluded that these impacts could have been ruled out at the screening stage.* We don't agree. A lot of the information supplied in the shadow HRA in relation to vessel movement speeds proved to be incorrect and we had to re-assess the impacts - which generated a much fuller investigation. This was therefore much more complex than first expected.	Noted
EA	*Comment in relation to Section 6.2.2 'It is suggested that the Evidence Plan process could reduce the requirement for duplication of effort by recording the agreement of evidence requirements and assessment outcomes (where appropriate). Based on such a record, the formal HRAs could rely on these agreements and not repeat agreed data/results, focussing instead on points of difference and key conclusions only.* We agree that the Evidence Plan process will allow us all to discuss and conclude the evidence necessary to support LSE and AA, however it is our view that the EA's own independent assessment of LSE and AA - in our role as a competent authority - is absolutely essential if we are to demonstrate the robust scrutiny required of us as an independent regulator of this process.	Noted