The Sizewell C Project

9.73 Comments at Deadline 7 on Submissions from Earlier Deadlines and Subsequent Written Submissions to ISH1-ISH6 - Appendices

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1 INTRODUCTION

1.1.1 This report provides SZC Co.'s responses to the responses by Natural England, and by the RSPB and Suffolk Wildlife Trust submitted at Deadline 6, contained within the following documents:

- Natural England - Comments on Terrestrial Ecology Documents [REP6-042], Section 6 Recreation Disturbance.
- RSPB and Suffolk Wildlife Trust - Comments on Other Submissions (submitted at Deadline 5) [REP6-046], Sections:
  - 5. Monitoring and Mitigation Plan for Minsmere – Walberswick European Sites and Sandlings (North) European Site;
  - 6. Monitoring and Mitigation Plan for Sandlings (Central) and Alde-Ore Estuary European Sites; and
  - 7. Aldhurst Farm Technical Note.

1.1.2 SZC Co. refer the Examining Authority to the following separate document submitted at Deadline 7 which is relevant to this report, setting out the current positions of SZC Co., Natural England, the RSPB and Suffolk Wildlife Trust, and the National Trust on the additional numbers of people who may visit European sites due to the construction of the Sizewell C Project, arising from displaced people and construction workers:

- **Statement on Recreational Disturbance Numbers, to Present the Current Position of SZC Co., Natural England, the RSPB and Suffolk wildlife and the National Trust** (Doc Ref. 9.94).

2 NATURAL ENGLAND - COMMENTS ON TERRESTRIAL ECOLOGY DOCUMENTS [REP6-042]

Natural England comment at paragraph 6.3

2.1.2 Natural England's submission is focused on the draft Monitoring and Management Plans submitted by SZC Co. at Deadlines 2 and 5. *"... We do not believe that the Minsmere Monitoring and Mitigation Plan and associated recreational disturbance mitigation strategies currently have the capacity to exclude adverse effects on integrity beyond reasonable scientific doubt, therefore our comments on this document are on the basis that further work is required in conjunction to this plan to progress this issue further."*

SZC Co.'s response

2.1.3 SZC Co. disagrees with Natural England and considers that the **Monitoring and Mitigation Plan (MMP) for Minsmere – Walberswick and Sandlings (North)** [REP5-105] combined with other mitigation proposals committed to by SZC Co., will exclude Adverse Effects on the Integrity (AEoI) of European sites beyond reasonable scientific doubt. SZC Co.'s position summarising the measures to reduce and mitigate effects, and the Shadow HRA conclusion, is set out in paragraphs 11.23.4 and 11.23.5 of SZC Co.'s **Comments on Written Representations submitted at Deadline 3** [REP3-042] (pdf page 174).

2.1.4 SZC Co. notes that Natural England welcomes the two pronged approach to monitoring which they state "*has the potential to be highly effective*", as discussed in paragraphs 2.1.15 and 2.1.16 below.

2.1.5 Whilst Natural England's Deadline 6 submission makes clear that it is concerned that the measures do not "currently" have the capacity to exclude all adverse effects, it is apparent that the parties are moving closer together, with the benefit of the additional information and proposals put forward by SZC Co. at Deadline 5 and with the benefit of closer engagement on the terms of the monitoring and mitigation plans. SZC Co. is very grateful for that engagement.

2.1.6 Helpfully, Natural England's submission reserves its concern on the effectiveness of mitigation to issues arising from the potential impact of construction workers, rather than wider recreational displacement. The submission suggests that further enhancement is necessary in the form of information distribution to educate workers about the issues, the potential need for additional wardens and suggestions for extra firebreaks in the monitoring and mitigation plans (see further below). In principle, these measures are acceptable to SZC Co. and can be reflected in the plans.

2.1.7 However, Natural England maintains that there is a need for alternative recreational green space for construction workers close to the proposed accommodation campus and the caravan site at the Land East of Eastlands Industrial Estate (LEEIE). Natural England's position on this is was originally set out in their Written Representation submitted at Deadline 2 [REP2-153] (key issue 29 starting on pdf page 70), and more recently in the 'Statement on Recreational Disturbance Numbers, to Present the Current Position of SZC Co., Natural England, the RSPB and Suffolk wildlife and the National Trust', Appendix C, submitted at Deadline 7 (Doc. Ref. 9.94). In case that cannot yet be submitted, it is relevant here to record that Natural England has stated its position in a letter to SZC Co. in the following terms:

> *"1.4.13 We advise that, on this basis and in accordance with the precautionary principle which is enshrined in the Habitats Regulations, adverse effects on the integrity of the nearby designated sites (as agreed within scope) cannot be ruled out beyond reasonable scientific doubt based on the mitigation which is currently proposed by the applicant. To address the significant amount of residual uncertainty regarding impacts from construction workers, we advise that an alternative green space integrating Suitable Alternative Natural Greenspace (SANG) principles should also form part of the package, specifically to address impacts from workers within close proximity of the worker's accommodation."*

2.1.8 What is less clear is whether the proposals put forward by SZC Co. at Aldhurst Farm are now sufficient to meet that requirement, although the focus on impacts from construction workers is helpful and consistent with Natural England's stated position at Deadline 2 that any alternative greenspace would need in close proximity to the workers accommodation.

2.1.9 As noted at paragraph 3.3.8 below, the RSPB and Suffolk Wildlife Trust also recommend that alternative outdoor recreational provision is sought for construction workers, advising that they accept that Aldhurst Farm is likely to provide alternative greenspace which will provide a contribution to a reduction of recreational impacts of the Application and that its development for families, walkers and dog walkers is also continued with the aim of reducing recreational visits to designated sites by displaced existing recreational users (RSPB and Suffolk Wildlife Trust - Comments on Other Submissions (submitted at Deadline 5) [REP6-046], paragraph 7.8 on pdf page 18)).

2.1.10 Natural England (and also the RSPB and Suffolk Wildlife Trust) appear to accept that the current monitoring and mitigation measures committed to by SZC Co. have the potential to be effective in ruling out AEoI due to displaced people. This is not surprising given the comprehensive nature of monitoring and mitigation measures proposed, and that the potential precautionary percentage increase over existing visitors due to displaced people at European sites is relatively small for all locations within European sites except the outer areas of Minsmere. The percentage increases for displaced people, which Natural England consider should be used, are presented in column 5[1] of Table 3.5 in Appendix A of the 'Statement on Recreational Disturbance Numbers, to Present the Current Position of SZC Co., Natural England, the RSPB and Suffolk wildlife and the National Trust' submitted at

[1] SZC Co.'s position is that the lower percentage increases in column 5A of Table 3.5 should be used.

Deadline 7 (Doc. Ref. 9.94). The potential precautionary percentage increase at Thorpeness in Table 3.5 is also high, but this town lies outside a European site and most people accounted for in the displacement numbers are actually likely to visit the town and beach and not enter the Sandlings SPA as noted in paragraph 3.2.3 of SZC Co.'s Responses to the Examining Authority's First Written Questions (ExQ1) - Volume 3 - Appendices Part 1 of 7 Chapter 6, Appendix 6A Response to AR.1.12 [REP2-108] (pdf page 552).

2.1.11 The mitigation proposed is extensive and comprehensive and there is every reason to expect that it would both limit displacement and construction worker visits to European sites, and manage visitors effectively where they do visit – indeed with the wardening and other measures proposed SZC Co. believes that there would be benefits from the enhanced control and management of existing visitors.

Natural England comment at paragraph 6.4

2.1.12 *"Mitigation measures to educate workers on sensitive features of protected sites such as breeding birds and vegetated shingle are currently proposed via printed literature in the form of leaflets or similar. This form of information may be easily discarded by workers. We advise in addition to printed literature this information is delivered orally within worker inductions or as a toolbox talk to ensure these vulnerable features are properly highlighted to workers. Further guidance and best practice can be found within the Working with wildlife: guidance for the construction industry (C691)."*

SZC Co.'s response

2.1.13 SZC Co. agrees with Natural England and text on delivery of this information orally within worker inductions or as a toolbox talk will be included in the initial mitigation measures in a future revision of the MMP. SZC Co. is also considering other ways in which it can commit to ensure a good understanding by workers of expected behaviour and the need to respect nearby habitats, for example through the Workers Code of Conduct and the measures in the CoCP.

Natural England comment at paragraph 6.5

2.1.14 *"The creation and maintenance of firebreaks has been proposed as a contingency measure at Westleton Heath, the outer areas of RSPB Minsemre, Dunwich Heath, Aldringham Walks and North Warren. We understand that many of these areas (for example Westleton Heath) already have and maintain firebreaks. Therefore, we request further clarity on whether the Applicant is proposing additional firebreaks to the existing (which are unlikely to be any more effective and would reduce the quantity of natural*

habitat), whether there were specific areas they felt could benefit from additional firebreaks (which we would need to see further justification for), whether they are proposing taking over their management of firebreaks, or whether some sites were identified in error."

SZC Co.'s response

2.1.15 The creation and maintenance of firebreaks was included in the MMP as a potential additional mitigation measure, at the request of the RSPB and Suffolk Wildlife Trust, at *"Heathland areas close to the campus (e.g. around Westleton)"*, and at "*Heathland areas around the periphery of RSPB Minsmere and at North Warren and Aldringham Walks (Sandlings SPA)"* in their comments on the draft MMP before it was submitted to the Examination (the quotes are from RSPB and Suffolk Wildlife Trust's comments). The sites were therefore not identified by SZC Co. and SZC Co. has no further information on these potential firebreaks, except that this is a measure that could be considered if the need is shown as a result of monitoring, although it seems unlikely that this is a matter that could arise in relation to recreational disturbance.

Natural England comment at paragraph 6.6

2.1.16 *"We welcome the two-pronged approach to monitoring that have been outlined in this document which we believe has the potential to be highly effective. However, as much of this mitigation is contingent on the wardening resource, we question whether the provision of two wardens over 10+ sites tasked with monitoring visitor attendance, educating visitors, monitoring field signs of recreational disturbance, in addition to their other day to duties have the capacity to provide fulfil the above roles adequately. We suggest that the wardening resource is carefully considered and the capacity assessed in more detail potentially providing an additional warden from the outset."*

2.1.17 SZC Co. welcomes Natural England's opinion that the two-pronged approach to monitoring has the potential to be highly effective.

2.1.18 Two wardens are proposed as part of the initial mitigation measures that would be implemented at the commencement of construction (see Table 5.1 of the MMP [REP5-105]). Additional wardens could be provided as additional mitigation measures, if it is considered necessary by the Environment Review Group on recommendation of the Ecology Working Group, following the results of monitoring, as noted in paragraphs 5.2.4 and 5.2.5, and Table 5.2 of the MMP. SZC Co. is, however, discussing these issues further with RSPB and the National Trust as part of the discussions relating to Resilience Funds.

2.1.19 In principle, new wardening resource for the designated sites should bring benefits compared to the current position, particularly as any displacement and construction worker visits from the Sizewell C Project is likely to represent only a small increment on existing visitor numbers.

2.1.20 The RAMMS payment into ESC's Recreational Disturbance Avoidance and Mitigation Strategy, to which SZC Co. has committed in Schedule 11 of the draft Deed of Obligation should also assist in this regard and SZC Co. is discussing with ESC whether this payment can be targeted at measures most likely to complement the measures to which SZC Co. is already committed.

3 RSPB AND SUFFOLK WILDLIFE TRUST - COMMENTS ON OTHER SUBMISSIONS (SUBMITTED AT DEADLINE 5) [REP6-046]

3.1 Section 5. Monitoring and Mitigation Plan for Minsmere – Walberswick European Sites and Sandlings (North) European Site

3.1.1 SZC Co. welcomes the RSPB and Suffolk Wildlife Trust's positive support for the items included in the MMP noted in paragraph 5.1 of their comments.

3.1.2 SZC Co. makes the following comments on the points that the RSPB and Suffolk Wildlife Trust consider still need addressing noted in paragraph 5.2 of their comments.

RSPB and Suffolk Wildlife Trust comments at paragraph 5.2 first bullet

3.1.3 *"We query how mitigation and monitoring of impacts on species and habitats other than those that are features of the European sites, as required by the EIA28, will be addressed and secured."*

SZC Co.'s response

3.1.4 Whilst this an Environmental Impact Assessment matter and not a HRA matter, SZC Co. anticipates that the monitoring undertaken under these proposals would helpfully complement the monitoring committed to within the **Terrestrial Ecology Monitoring and Mitigation Plan** [REP5-088].

RSPB and Suffolk Wildlife Trust comments at paragraph 5.2 second bullet

3.1.5 *"As beaches in the area could see increased footfall, we consider that this impact is likely to require mitigation and that little terns should therefore be*

included in the primary list of 'species and habitats of concern'. Little terns should also be included in the species monitored (covered in Table 4.3)."

SZC Co.'s response

3.1.6 The MMP already includes reference to little tern at para 2.1.2 (amongst a list of other species relevant to the Minsmere SPA) and says that this species is included in the scope of the MMP. The sHRA concludes that subject to the continuation of existing management measures, no adverse effect is predicted for little terns (which have declined in the SPA).

3.1.7 In order to address the potential need for monitoring we will, in an updated version of the MMP, include a new row in Table 4.3 for little tern, which would have similar wording to the existing row for breeding nightjar referring to existing data (collected as part of the little tern recovery project) being used to provide a good understanding of the baseline populations and similar data will be used in future to monitor change on an annual basis.

RSPB and Suffolk Wildlife Trust comments at paragraph 5.2 third bullet

3.1.8 *"We note that the process by which the need for additional mitigation measures would be agreed and such measures implemented is outlined in Section 3 Governance. We have previously queried whether it will be possible to implement additional mitigation in a timely manner based on this process [See paragraph 7.31 of the RSPB and SWT's Comments on Other Submissions (submitted at Deadline 2) [REP3-074]]. Given the importance of putting mitigation in place before potentially significant impacts occur, we recommended that consideration is given to streamlining this process as far as possible. We note that paragraph 5.2.3 states that a strategy will be developed to avoid delays in this process and consider that this will be important to ensure that no adverse effects on integrity of the Minsmere-Walberswick or Sandlings SPAs arise. We therefore recommend that further consideration is given to this strategy during the Examination and would be pleased to engage in discussions of potential options."*

SZC Co.'s response

3.1.9 In principle, the type of mitigation measures that might be appropriate to address impacts of behaviours identified through monitoring should be relatively quick to implement. SZC Co. welcomes the RSPB and Suffolk Wildlife Trust's offer to engage in discussions of potential options to refine the process of decision and implementation, and will arrange a meeting to discuss this.

RSPB and Suffolk Wildlife Trust comments at paragraph 5.2 fourth bullet

3.1.10 *"Given the breadth of the monitoring and reporting remit of the two wardening staff (described in paragraph 5.3.1), we query whether the initial resourcing of two wardens will be sufficient to also enable adequate provision of the educational and engagement roles described in Table 5.1?"*

SZC Co.'s response

3.1.11 Please see SZC Co.'s response at paragraph 2.1.17 above.

RSPB and Suffolk Wildlife Trust comments at paragraph 5.2 fifth bullet

3.1.12 *"We remain of the view that in order to fully mitigate impacts of the Application on the designated sites, proposals for alternative greenspace should be developed alongside this mitigation and monitoring plan."*

SZC Co.'s response

3.1.13 SZC Co.'s position, as stated in **Comments on Written Representations submitted at Deadline 3** [REP3-042] (see section 11.23), and in **Written Summaries of Oral Submissions made at ISH7: Biodiversity and Ecology Parts 1 and 2** (15-16 July 2021) [REP5-112] (see paragraphs 1.2.91 to 1.2.92) is that the RAMS payment and the proposed package of mitigation measures together will prevent AEoI of European sites, and that a SANG, or further green space provision following the SANG principles, is not necessary. In addition to the mitigation measures summarised in paragraph 11.23.4 of **Comments on Written Representations submitted at Deadline 3** [REP3-042], SZC Co. has subsequently committed to providing further improvements for recreation at Aldhurst Farm in the **Aldhurst Farm Technical Note** submitted at Deadline 5 [REP5-126] (see sections 1.8 and 1.9), which will provide even further assurance that there will be no AEoI of European sites. These proposals have been acknowledged and welcomed by East Suffolk Council (Deadline 6 submission section 9.60) [REP6-032] and the RSPB and Suffolk Wildlife Trust (Deadline 6 submission paragraph 7.1 [REP6-046]) (see further below).

3.2 Section 6. Monitoring and Mitigation Plan for Sandlings (Central) and Alde-Ore Estuary European Sites

RSPB and Suffolk Wildlife Trust comments at paragraph 6.1

3.2.2 *"… we wish to reiterate our concerns around the lack of mitigation and monitoring of impacts on species and habitats required by the EIA. The shingle beach between Aldeburgh and Thorpeness forms part of the Leiston-*

Aldeburgh SSSI and hosts important shingle flora which are sensitive to trampling. As yet, we have not seen plans to address these potential impacts at the EIA level."

SZC Co.'s response

3.2.3 The purpose of the MMP for the Sandlings (Central) and Alde-Ore Estuary European Sites is to address impacts that may arise on these European sites via way of recreational disturbance. In addition, the Environmental Statement (ES) identifies no significant adverse effects to shingle habitats present in the SSSIs assessed, arising as a result of trampling (or dog fouling). Given this context no mitigation or monitoring is proposed for these sites in relation to this potential impact. Those measures in the MMP which are deployed in respect of the European sites (such as information directing people to non-sensitive sites and subsidising the beach car park at Sizewell) as well as measures such as the recreational provision at Aldhurst Farm are also likely to indirectly benefit nationally designated sites such as the Leiston-Aldeburgh SSSI. This further supports the conclusions reached in the ES.

3.2.4 A comprehensive programme of monitoring of sites, habitats and species is already provided in the Terrestrial Ecology Monitoring and Mitigation Plan (TEMMP) and this includes an extensive programme of monitoring for the re-establishment of shingle habitats on the Sizewell Beaches CWS, where a significant adverse effect was identified in the ES.

RSPB and Suffolk Wildlife Trust comments at paragraph 6.2

3.2.5 *"In relation to Section 2 Scope – we have previously queried the omission of the Orfordness to Shingle Street SAC from this plan and the Applicant responded to this in paragraph 11.2.5 of their Comments on submissions at earlier deadlines* [REP5-119] *stating that access to Orfordness from Slaughden (south of Aldeburgh) is prohibited. We understand that non-permitted access is however an issue to the south of Slaughden and any increase in such access could affect the vegetated shingle feature along this coastline (noting the proximity of the SAC to the parking to the south side of Aldeburgh). We would therefore support provision of monitoring in this location and consideration of what measures might be needed and possible should the monitoring show an increase in use."*

SZC Co.'s response

3.2.6 SZC Co.'s opinion is that additional survey point at this location is unnecessary, and we set out our reason why in para 11.2.5 of SZC Co. Comments on Submissions from Earlier Deadlines (Deadlines 2-4) [REP5-119]. The HRA refers to more reasons that just "access is prohibited" which

the RSPB quotes, such as the fact that the main access point is by boat or a long walk from Aldeburgh. For those reasons, the Shadow HRA Report [APP-145 to APP-149] concluded that there would not be an adverse effect on the integrity of the SAC, and no monitoring is proposed for this SAC.

3.3 Section 7. Aldhurst Farm Technical Note

3.3.1 Paragraph 7.1. SZC Co. welcomes the RSPB and Suffolk Wildlife Trust's support for the access improvements being proposed for Aldhurst Farm, and in particular the attention being given to the provision of suitable facilities and education aimed at dog walkers (paragraph 7.1).

3.3.2 Paragraph 7.1. SZC Co. notes and welcomes that the RSPB and Suffolk Wildlife Trust state that, whilst they consider that alternative greenspace is required, it may not need to be formally considered SANGS. SZC Co. consider that SANGS, as defined by Natural England to mitigate for new residents and their dogs associated with new residential development, is not strictly applicable to the Sizewell C Project but agrees that the important issue is the quality and effect of the resource proposed.

3.3.3 Paragraph 7.2. SZC Co. notes RSPB and Suffolk Wildlife Trust's comment that displacement of existing users may persist beyond the construction phase as new habits may have formed during the construction phase. SZC Co. agrees that there is potential for this to occur, which is why monitoring and the potential for additional mitigation during the early years of the operation phase is committed to in the MMPs (see paragraphs 1.1.5, 4.1.1, 4.2.4, 4.5.1, 4.5.2 and 5.1.1 of the **MMP for Minsmere – Walberswick and Sandlings (North)** [REP5-105], and paragraphs 4.1.1, 4.2.5, 4.5.2, 4.5.2 and 5.1.2 of the **MMP for Sandlings (Central) and Alde, Ore and Butley Estuaries European Sites** [REP5-122]).

3.3.4 Paragraph 7.3. SZC Co. notes that the RSPB acknowledges that, using the Natural England standard metric, that the 27ha of new Open Access land at Aldhurst Farm would be sufficient for the equivalent of more than 3,000 permanent residents, which exceeds the number of construction workers present at the accommodation campus and caravan site the peak of the Sizewell C Project construction. SZC Co. welcomes this acknowledgement, but emphasises that permanent residents are very different to temporary construction workers staying in the accommodation campus and caravan site, who would recreate at informal outdoor locations such as European sites less than typical residents, for reasons discussed in **SZC Co.'s Responses to the Examining Authority's First Written Questions (ExQ1) - Volume 3 - Appendices Part 1 of 7 Chapter 6, Appendix 6A Response to AR.1.12** [REP2-108] (sections 3.7 and 3.8, pdf pages 556, and 560, and section 3.2

on pdf page 550). A key reason why construction workers at the accommodation campus and caravan site would not need the same hectarage of open space as applied by Natural England's SANGS calculation for residential development is that they would not have dogs that need regular daily dog walks and larger areas of land to exercise in.

3.3.5 It is helpful, however, to establish that the Aldhurst Farm is at least quantitatively sufficient to meet the suggested requirement for accommodation campus and caravan site based workers at peak, which SZC Co. consider exceeds the area necessary by a considerable margin.

3.3.6 SZC Co. notes RSPB and Suffolk Wildlife Trust's comparison of the proposals at Aldhurst Farm with Natural England's SANGS criteria in Table 1, and the comment that *"Aldhurst Farm generally meets most of these guidelines and we welcome the recreational features proposed within the Technical Note"* (paragraph 7.5).

3.3.7 SZC Co. agrees with the majority of the RSPB and Suffolk Wildlife Trust's extensive checklist under the heading 'Aldhurst Farm Provision' in Table 1 of their submission, with comments or points of disagreement limited to those noted in Table 3.1 below. The access provision at Aldhurst Farm was designed to, as far as possible, respond to the principles of Natural England's SANGS guidelines for the Thames Basins Heaths [LINK], and it provides an excellent recreational facility for potential displaced people and construction workers.

Table 3.1: SZC Co.'s response to the RSPB and Suffolk Wildlife Trust's Table 1 [REP6-046]

SANGS Guidelines	Aldhurst Farm Provision (RSPB SWT's comments)	SZC Co.'s response
2. Circular walk of 2.3-2.5km	Circular route of 3.5-4km stated – this is not one completely route but has out and back sections linking circular routes around the three sections of the site	The RSPB and SWT's comment is correct. SZC Co. make the following additional points. The length of walk is substantially greater than the SANGS guidance, and the paths connect to a wider network of Public Rights of Way, permissive footpaths and accessible landscapes inlcuding Leiston Common, permissive footpaths and

SANGS Guidelines	Aldhurst Farm Provision (RSPB SWT's comments)	SZC Co.'s response
		Bridleway 19 to the east (which will be connected to Aldhurst Farm by a new controlled crossing over Lover's Lane as part of the DCO), to Kenton Hills woodlands where dogs can be exercised off-lead, to the new off-road bridleway between the accommodaton campus at Eastbridge Road in the north and Sizewell Gap in the south, and elsewhere.
3. Car parks easily and safely accessible by car and clearly sign posted	Easily accessible (road signage not covered in the Aldhurst Farm Technical Note)	Although the Aldhurst Farm Technical Note [REP5-126] does not specifically mention *"road signage"*, clear signage at the car park entrance from the B1122 (Abbey Lane) will be provided, and is covered by item 1 Car Park Expansion on PLAN 3: ALDHURST FARM PLAN, and paragraph 1.8.5 which states *"Clear signage, bins for general litter and dog waste and fencing will ensure that the car park is welcoming and safe to use."*
6. Circular walk which starts and finishes at the car park	No - car park connected to other routes via an out and back section	The first approximately 190m from the car park is along a new surfaced footpath, which walkers will need to return along when walking back to their cars at the end of their walks.
12. No unpleasant intrusions (e.g.	Site surrounds Leiston Sewage Treatment Works –	New screen planting on the north-western edge of the sewage works was

SANGS Guidelines	Aldhurst Farm Provision (RSPB SWT's comments)	SZC Co.'s response
sewage treatment smells etc)	views screened by trees but smells possible/likely	implemented in the winter of 2020/2021, and further screen planting on the south-eastern edge will be implemented in the winter of 2021/2022. This will strengthen the screening effect of existing vegetation. There may at times be localised odours emitted from the existing Leiston sewage works but if they did occur the odours will dissipate with distance and are expected to be very localsied.

3.3.8 SZC Co. note the RSPB and Suffolk Wildlife Trust's concluding comments at paragraphs 7.8 and 7.9 as follows:

3.3.9 Paragraph 7.8. *"As explained above, we accept that Aldhurst Farm is likely to provide alternative greenspace which will provide a contribution to a reduction of recreational impacts of the Application. However, we do not consider it sufficient in extent or recreational features provided to provide acceptable mitigation of impacts of both construction workers and displaced existing recreational users. Given the recreational features accommodated by Aldhurst Farm, we recommend that its development for families, walkers and dog walkers is continued with the aim of reducing recreational visits to designated sites by displaced existing recreational users and that alternative outdoor 'active' recreational provision is sought for construction workers in addition to this.*

3.3.10 SZC Co.'s position is that a proper understanding of the likely recreational characteristics of construction workers would enable a conclusion to be reached that there is no risk of adverse effects on designated sites arising from those characteristics. In particular:

- The accommodation campus and caravan site based construction workers will not have dogs, as dogs will not be allowed in the

accommodation. For the reasons, explained at paragraph 3.3.4 above, construction workers are less likely to pursue active recreation than permanent residents. The recreational measures proposed, however, would be more than sufficient to meet their calculated recreational requirements even if they did share the characteristics (including dog walking) of permanent residents.

- The RSPB and Suffolk Wildlife Trust state that they may also undertake more active activity, such as waters ports (paragraph 7.6). In this respect, it is relevant to recognise that:

  - The proposals for the accommodation campus includes a circular recreation / fitness trial of approximately 1.9km (**Design and Access Statement** (DAS) Part 3 of 3 - Revision 2 [REP5-075] Figure A.26: Access and Movement Strategy) and the provision of a gym (DAS Part 3 of 3 - Revision 2 [REP5-075] paragraph A.30.9, and **Main Development Site Description of Construction** (Volume 2 Chapter 3 of the ES) [APP-184] paragraph 3.4.178);

  - Specific provision is made for the provision of active sports in the provision proposed at the Alde Valley Academy in Leiston, comprising a 3G pitch and two multi-use games courts;

  - The worker accommodation and the open space at Aldhurst Farm will be connected to an almost limitless network of enhanced footpath and cycleways.

3.3.11 In these circumstances it is not reasonable to assert that construction workers may somehow be driven to visit European designated ecological sites and create adverse effects there on wildlife (by ignoring available advice and wardening) for want of a different form of alternative recreation provision.

3.3.12 SZC Co. is continuing to discuss these issues with stakeholders and continually reviewing options for further recreational access improvements within the area between Leiston, the caravan site and the accommodation campus, and within the wider Sizewell C Estate. There is an excellent existing and already committed network of recreational routes and areas within this area, where a diverse range of landscapes can be experienced within a localised area close to these areas of accommodation and close to Leiston, including:

- Aldhurst Farm access provision;

- Kenton Hills woods including the carpark and network of permissive footpaths;

- Leiston Common including Open Access Land, and permissive footpaths and Public Rights of Way;
- A network of permissive footpaths around and through woodlands adjoining Leiston Common, within the Sizewell C Estate;

3.3.13 These will all be connected by existing footpaths, bridleways, and proposed footpaths, bridleways and road crossings already committed to by the Sizewell C Project.

3.3.14 SZC Co. has identified further improvements to this area that could be delivered including further footpaths and off-road cycle routes, and improvements to facilities such as signage, gates and paths to make the area even more welcoming and accessible, and proposals to actively promote this recreational area to construction workers. Proposals will be discussed with consultees, and submitted to the Examination at a future deadline.

3.3.15 Paragraph 7.9. *"Monitoring of recreational usage of the Aldhurst Farm will be important to determine the success of the site as mitigation and we note that paragraph 3.2.9 of the TEMMP [Terrestrial Ecology Monitoring and Mitigation Plan (TEMMP) [REP5-088]] commits to such monitoring. We recommend that this includes visitor surveys and engagement with user groups to seek to continue to refine recreational provision and design to ensure usage is maximised."*

3.3.16 SZC Co. monitored recreational usage of Aldhurst Farm in 2019 and the results are presented in Volume 2, Chapter 15, Appendix 15D of the ES [APP-270]. SZC Co. is undertaking further surveys, which commenced in August 2021, and will continue in winter 2021 and in 2022 (pre-construction) and during the construction phase to determine the success of the site as mitigation and identify opportunities for further improvements.

APPENDIX B: COASTAL GEOMORPHOLOGY TOPIC BASED RESPONSE TO WRITTEN REPRESENTATIONS

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1 INTRODUCTION

1.1.1 The WRs from certain IPs (listed below) received at Deadline 3 raise several common themes that are addressed below. Separate responses (on a point-by-point basis) are also provided to the WRs of the National Trust and the Jackson and Cooper report submitted by Stop Sizewell C[1] , as these contain the majority of technical detail underpinning the WRs received.

- Stop Sizewell C
- National Trust (received Deadline 3)
- Nick Scarr
- Bill Parker
- SCAR
- Minsmere Levels Stakeholders Group
- Alde & Ore Association
- Natural England
- Environment Agency

Table 1 provides a summary of the WRs reviewed and signposts where the Applicant's responses can be found.

2 SUFFICIENCY OF SPATIAL COVERAGE: GREATER SIZEWELL BAY AS ZONE OF INFLUENCE (ZOI)

2.1.1 IPs have criticised the scale of the assessments presented with respect to the scale of the wider coastal system, which they consider should encompass the entire 70+km of Suffolk coastline. The WRs refer to a lack of systems thinking or system dynamics methods.

2.1.2 It is the Applicant's view that the geomorphic effects will not extend beyond the proposed monitoring extent.

2.1.3 Evidence for this is provided by:

[1] The Stop Sizewell C Written Representation contains a review of **Volume 2, Appendix 20A of the ES** [APP-312] conducted by Derek Jackson and Andrew Cooper. The review does not contain affiliations of the authors and was not introduced by Stop Sizewell C in their Written Representation; therefore its provenance is presently unknown.

i. Shingle tracer studies showing most sediment moves around 100 m or less per storm, which is reversed if the next storm comes from the opposite direction.

ii. Shingle tracer studies and wave modelling also show a sediment cell between Minsmere Sluice and north of the Thorpe Ness headland – effectively the hard features at these locations confine horizontally the coarser pebble-sized beach material that dominates the part of the beach above low tide (see **Volume 2, Appendix 20A, Section 2.4.2 of the ES** [APP-312]).

iii. For the southern Thorpe Ness boundary these results confirm what is already well known and reported in the Applicant's studies, the Shoreline Management Plan (SMP) and the scientific literature, i.e, there is limited net lateral movement of shingle over the ness.

iv. The results show the northern boundary for beach shingle is the Minsmere Sluice, and with net transport predominantly southward (**Volume 2, Appendix 20A, Section 2.3.4.2, the scientific literature and the SMP of the ES** [APP-312]) any significant adverse impacts to sediment transport and geomorphology are not expected to reach as far, or beyond, the Minsmere Sluice.

2.1.4 A systems-led approach underpins the methods that have been implemented by the Applicant. Specifically, this has addressed the fundamental flows of the natural system and examined how and where the impacts of Sizewell C (SZC) could have their most significant potential effect.

2.2 Spatial scale of proposed monitoring in the CPMMP

2.2.1 With respect to the assessments presented: all of the coastal processes-based evidence (**Volume 2 Appendix 20A of the ES** [APP-312]) shows that the impacts of the individual elements are localised. The spatial scale of the Coastal Geomorphology and Hydrodynamics assessment was restricted to the Greater Sizewell Bay (GSB) as the evidence indicates that there are no identified pathways for impacts to extend beyond that. This approach was agreed with Regulators early in the consultation process via the scoping process.

2.2.2 The evidence demonstrates that the baseline monitoring and mitigation proposals do not need to extend as far south as Thorpeness or Aldeburgh or as far north as Southwold. The EIA has not identified any pathway for impacts from Sizewell C; this includes the avoidance of the exposure of the Hard Coastal Defence Feature (HCDF) across the life of the station owing

to the Soft Coast Defence Feature (SCDF) mitigation. It is SZC Co.'s view therefore that there is no need to extend the monitoring area beyond that described in the Coastal Process Marine Monitoring Plan (CPMMP [REP5-059]. In any case, if impacts were to extend as far north or south as suggested, they would radiate out gradually from the Sizewell C site and be identified by the monitoring described in the CPMMP, thus providing 'early warning' that the monitoring in the CPMMP needs to be amended (which, as a live document, it can be).

2.2.3 SZC Co. has developed the draft adaptive CPMMP [REP5-059] on this basis, i.e., that the impacts are, and will remain, localised. If the impact footprint exceeds the monitored area, the spatial extent will be adjusted accordingly (see **CG.1.3 response to ExA at D2** [REP2-100] and the CPMMP [REP5-059]). That is, the CPMMP will take an adaptive approach to monitoring. Such changes would be secured through MTF consultation and require approval from the approving authority (ESC and the MMO) pursuant to Requirement 7A of the DCO and Condition 17 of the DML. This is a standard approach to the development of monitoring plans. SZC Co. is aware of no other similar development which has been required to monitor or project natural changes over spatial scales of >70km. The wide range of suggested monitoring scopes[2] amongst the WRs indicate that there is no shared or convincing systemic reasoning for alternative scopes.

2.2.4 The CPMMP itself is the plan which outlines the monitoring (geographical extent, methods and frequency) and mitigation measures (recharge of SCDF, sediment by-passing or recycling) to mitigate any potential impacts of the project on coastal geomorphology receptors. A draft CPMMP was submitted as part of the January 2021 submission [**Volume 3, Appendix 2.15A** [AS-237]]. Revision 2, taking cognisance of the most recent modelling work for the SCDF and MTF feedback, was updated and submitted at Deadline 5 [REP5-509].

2.2.5 Net transport rates are slow and shingle is retained within the Minsmere Sluice – Thorpe Ness sub-cell (as indicated by the Applicant's studies and several external reports, including the SMP). Nevertheless, if impacts were to persist and grow, they would radiate out from the activity source. This means that they would travel slowly and within the confines of monitored extents and the GSB. The Applicant has followed a precautionary approach. The extents set out in the CPMMP [REP5-059] are always larger than the predicted impacts, to allow for any uncertainty.

2.2.6 Furthermore, the impact extents are not expected to change (significantly) throughout the development lifetime. For example, the impact of the BLF piles on a wave of period T, height Hs and direction D will be the same now

[2] Varying from Southwold to Shingle Street, Dunwich to Thorpeness, or Lowestoft to Felixstowe.

as in 10 or 200 years, as the wave physics (hydrodynamics) is unaffected by time or climate change. Any given wave state may become more or less prevalent (and/or the geometry of water depths relative to pier positions), but the change on the forcing (shear stress) at the equivalent point on the beach, e.g., in 2m water depth, will be largely of comparable magnitude.

2.2.7 The assessment recognises that future change will potentially increase beach steepening, reduce the beach volume or lead to the bars becoming less pronounced. Overall, this means that identical offshore waves 100 years apart would arrive at the beachface slightly differently. However, all these changes are a consequence of natural processes and are not affected by the presence of SZC. SZC Co. has no responsibility to mitigate natural change. Stakeholders can reliably assume a similar order of scale of direct impact from unchanged marine infrastructure despite natural morphological change. IPs have not challenged this aspect of the evidence.

2.2.8 Preparation and compliance with the CPMMP is a requirement on the DCO (Requirement 7A) and a Condition on the Marine Licence (Condition 17); see the latest version of the draft DCO (Doc Ref. 3.1(C) [REP5-027]). The CPMMP is to be specifically maintained as a 'live' document that will require review and update as needed to reflect prevailing conditions or perceived impacts at the time.

2.2.9 The implementation of the CPMMP will be initiated at the start of construction and remain in place until the end of decommissioning (see **CG.1.5 response to ExA at D2** [REP2-100]).

2.2.10 SZC Co. is therefore committed through the DCO and DML to implement the measures identified in the **CPMMP** [REP5-059] and **Volume 2, Chapter 20 of the ES** [APP-311].

2.3 Wider System Dynamics

2.3.1 Many IPs, however, raise system dynamics as a missing element of this assessment, for several reasons, including 'autogenic events' or 'emergent behaviour' which arise unpredictably for no discernible reason, and the potential for large-scale dynamics to generate small-scale changes. SZC Co. has considered system dynamics (see the conceptual model presented in **Volume 2 Appendix 20A of the ES** [APP-312] and recognises that aspects of the shoreline behaviour such as small-scale variability are not coherent alongshore. Furthermore, the Applicant considers that the development of the deepening Sizewell sub-bay between Minsmere outfall and Thorpeness is constrained by these hard control points. Indeed, systems thinking is fundamental to the monitoring approach proposed in the CPMMP (and as outlined in the following paragraph). However, as

previously noted, mitigation of wider system dynamics and, in particular, the projection of all possible future natural change is not the responsibility of SZC Co.

2.3.2 SZC Co. is required to identify and minimise the impacts of SZC on natural change. All IPs have identified the fundamental unpredictability of future change to 2190[3]. There is no possibility of developing system dynamics descriptions of all possible futures, even if systems modelling were sufficiently developed to unequivocally underpin such an assessment, which is not presently the case. Recognising this, the approach taken to all assessments and the CPMMP is to determine the processes by which SZC could affect any future system. Fundamentally, there are a limited number of ways this could occur – essentially, by interrupting longshore continuity between specific sectors of the 70km coastline.

2.3.3 It is not the case that this 70km shoreline is presently continuous and that SZC would be the sole potential systems disruptor. There are clear sub-sections already defined and separated by hard points, such as Walberswick and Southwold defences. The assessments and the CPMMP are predicated on the view that these features have previously, and do still, control shoreline evolution over the regional scales of concern to the IPs (in the manner they describe in their written representations). IPs refer to Pye and Blott (2006) for example, who considered that the shoreline between Walberswick and Thorpeness was a contained 'sub-system', hence IPs are not unfamiliar with this basic approach to the contained zone of influence[4].

2.3.4 Of particular relevance to SZC and the conceptual model presented in **Volume 2, Appendix 20A of the ES** [APP-312], the Minsmere sluice outfall has long been identified as the major control on shoreline change between Walberswick and Thorpeness. There is no sense in which the importance of the outfall has been diminished by the assessment (as suggested in some WRs) – the conceptual model identifies that the shoreline has rotated around this feature for over 150 years since its construction. Additional developments within this bay (the SZB outfall salient for example) have impacts confined within the sub-bay defined by the controls at the sluice and the Ness; the apparently incoherent responses of individual 100m sections are also evidence that natural change is constrained – there is no evidence that any changes within the sub-bay are presently transmitted beyond the limits set by these controlling features.

2.3.5 The timescale of change is a key aspect for consideration – systemic effects would not be generated in the short term and would require detectable

[3] Note that the timeframe of the development is until 2140, which marks the end of SZC decommissioning.
[4] The Zone of Influence – the Greater Sizewell Bay – was agreed with the marine regulators at the scoping phase.

effects to evolve prior to triggering wider impacts. In order for any SZC impact to propagate via system processes to affect the wider geomorphic system of the whole Suffolk coast (i.e., longer-term indirect imacts), it would first need to propagate beyond the controlled sub-bay. The assessments have shown that local-scale impacts would affect longshore processes of sediment transport within the bars and beach to a very limited degree and that there is no clear mechanism for impacts to reach beyond the control points – i.e., little evidence of shingle loss at each end; no clear reason for a deficit of longshore sand transport to reach the limits of the sub-bay, since no sand pathway is blocked. Maintenance of the longshore transport corridor by the SCDF also mitigates for any losses to sediment supply that might have otherwise occurred across the station life.

2.3.6 Nevertheless, by monitoring these impacts pathways, the potential for systemic propagation of changes can be continually monitored and checked.

2.3.7 Longer-term, larger-scale effects could occur if the coastal authority and SZC agreed to retain the HCDF post-decommissioning (although the default position recorded in Section 10 of the CPMMP is for HCDF removal). The effects of exposed coastal engineering (the HCDF, forming a control point or headland) would be disruption to sediment movement, beginning after 2140 once mitigation measures have ceased. A reduction in down-drift sediment supply could lead to an expanding zone of increased erosion propagating alongshore as part of longshore transport processes. However, the disruption to sediment supply is expected regardless of whether the Sizewell C project proceeds or not, because natural shoreline recession would encounter the other hard infrastructure at Sizewell and the Bent Hills. That natural process is likely to occur on a broadly similar decadal time scale. That is, a disruption to longshore supply can reasonably be expected by early-middle 2100, regardless of whether Sizewell C is built.In that respect, the presence (and maintenance) of the SCDF would provide a form of protection along this stretch of the coast that does not presently exist.

2.3.8 External system changes, such as the IPs postulated but not well-evidenced changes at Thorpeness, could (if they occurred) have implications for shoreline planform, but the fundamental responsibility of the Applicant, and hence the concern of the CPMMP, is only those changes that are caused by SZC. This is a fundamental principal of monitoring applied to any and all marine works under the regulation of the MMO.

3 ADEQUACY OF EGA, VALIDITY OF ASSUMPTIONS AND FUTURE TIMESCALES

3.1.1 It is not true to state (as many IPs do) that the timescale considered by the Applicant for **Volume 2 Chapter 20 of the ES** [APP-311] only extends to 2080. It is the case, however, that this timescale was adopted as part of the Expert Geomorphological Aassessment's scope in its investigtion regarding whether the HCDF would become exposed without secondary mitigation (beach maintenance). That was the remit of the EGA. Their remit was not to consider shoreline change projections over the full life of the development.

3.1.2 The panel for the EGA comprised three Cefas senior geomorphologists with varying specialities, an external Emeritus Professor and three further independent experts drawn from academia, industry and consultancy. A single BEEMS Technical Report TR403 (summarised in **Volume 2 Appendix 20A of the ES** [APP-312]) reports the EGA exercise, which identified a date around this time when it was most likely that the initially terrestrial HCDF would be exposed to marine conditions without mitigation (to prevent such an outcome). The same report also identified that uncertainty in the projection of future environmental parameters affecting geomorphic change becomes too great at around this same time for any attempt to project shoreline change any further into the future to be plausible.

3.1.3 The stated date of 2080 has not been used as an upper limit to the period of impact assessment – on the contrary, the envelope 2053-2087 given in TR403 is the earliest date from which impacts of the HCDF were anticipated. Based on this exercise undertaken by the EGA, stakeholders (as part of the Marine Technical Forum) identified exposure of the HCDF as an undesirable impact[5]. As a consequence, mitigation via the SCDF has been developed further.

3.1.4 The EGA lists the 'assumptions' made therein to clarify the outcome of deliberations with respect to the environmental parameters applied – they were not universally applied 'a priori' to the projection of future change. The EGA is discussed at great length in BEEMS Technical TR403 (synthesized in **Volume 2 Appendix 20A of the ES** [APP-312]).

3.1.5 Since any future change must by definition proceed from the present state and be driven by environmental forcing also starting from its present state, the evidence for the rate and timing of changes in forcing and in

[5] The effect of unmitigated exposure of the HCDF was recognised as potentially generating long-term system impacts (as also identified by the IPs) – however, the Applicant's position, as set out in this document, is that preventing exposure of the HCDF mitigates against this scale of impact.

environmental response away from the present case was assessed. In most cases, evidence suggested that the rate of change of factors from the bank configuration, regional coastal sediment supply, changes in wave height, storm frequency and intensity etc, were not yet expected to become unpredictable for several decades, perhaps as many as 50 years in some cases. Present shoreline change was therefore projected for 50 years based on comparable length of historical record, and potential acceleration or deceleration of change assessed to provide a date range. The EGA concluded that, under present day conditions, the HCDF was likely to be exposed within the period for which projections of environmental conditions could be made with certainty (see **Volume 2 Appendix 20A of the ES** [APP-312]).

3.1.6 WRs have challenged the assumption that no accretion could take place – clearly some accumulation may take place (such as the SZB salient), but since wholesale accretion would result in no predicted exposure of the HCDF (and therefore no need for an SCDF or its maintenance for a 100+ year period), this was ruled out as not worst case. Changes in beach slope were included in the initial projection of shoreline change, by comparison of rates of change of subtidal and supra-tidal contours, with steeper beaches the focus of faster retreat.

4 ADEQUACY OF TIMESCALES AND REFERENCE TO HISTORICAL DATA

4.1.1 The EGA considered the applicable timescale for definition of 'present trends' and plausible future rates. For projection of 50 years forward, a comparable length of historical change was considered reasonable. Datasets of 30 years and 75 years were reviewed. This analysis showed that longer timescales of projection result in more homogenous, generally lower rates of average change.

4.1.2 Several IPs suggest that erosion 1736-1836 was considerably faster than any period since (Pye and Bott, 2005). However, on the basis of a systems dynamics approach advocated by the IPs, the application to impact assessment is limited. The system conditions prompting erosion in 1736-1836 do not pertain in the present day. Pye and Blott (2005) describe a large Broad prone to frequent freshwater flooding (prompting installation of the sluice 1810-1830, and drainage such that the Broad identity is effectively lost by 1890). This phase of erosion ended with the sluice and was partially reversed in the 20th Century. Given this, it makes no sense to emphasise data from this period.

4.1.3 BEEMS Technical Report TR223 (synthesised in Section 2.3.6 of Appendix 20A) also showed that an average erosion rate of 1m/year for 1000 years

is a reasonable average rate for the Suffolk coast as a whole, and is almost representative of the erosion rate in the centre of the deepening Sizewell sub-bay. An 'average' erosion applied across a wider area than is presently affected would not be sufficient to identify the detail of likely Sizewell C impact.

4.1.4 Nevertheless, it is recognised in **Volume 2 Appendix 20A of the ES** [APP-312] and **Volume 2 Chapter 20 of the ES** [APP-311] that lifetime summation of plausible environmental change and coastal dynamics is likely to lead to recession of shorelines adjacent to SZC and development of a headland containing the nuclear sites of SZA, SZB and (if developed) SZC. Secondary mitigation for the impact of this incipient headland is presented in the ES, limiting the longshore extent of impact (by ensuring no longshore deficit in sediment, such that natural processes of change are unaltered beyond the localised window of impact).

4.1.5 These measures apply whatever the rate of recession implied. Faster (natural) erosion requires more frequent secondary intervention, but neither the rate of change, nor the direction of net transport (as a function of total environmental forcing) affect the fundamental definition of either impact (disruption of longshore continuity) or mitigation (restoration of transport volumes downstream).

5 CONSIDERATION OF SEA LEVEL RISE (SLR)

5.1.1 SLR is a primary driver for future coastal change, as it will promote wave energy to erode sediments from higher up on the GSB's beaches and cliffs. The local UKCP18 climate change predictions for the Sizewell area show that wave energy is predicted to remain similar or decrease (**Volume 2 Appendix 20A of the ES** [APP-312], **Section 2.4.2**) and this has been considered throughout all modelling and assessment **Volume 2 Chapter 20 of the ES** [APP-311]. The dominant pattern of shoreline behaviour is a varying patchwork of erosion and accretion superimposed on zones of longer-term erosion, accretion or stability (**Volume 2 Appendix 20A of the ES,** [APP-312], **Section 2.3.6**).

5.1.2 Rising sea levels over the SZC station life (to 2140) are expected to:

i. cause erosion of the Dunwich Cliffs, releasing sand and pebbles into the south-bound longshore transport corridor (NB pebbles are unlikely to

reach the south Minsmere frontage and SZC until the Minsmere Outfall is removed, however subtidal sand readily bypasses it);

ii. increase breaching and cause the shingle ridge to roll back at Minsmere North (RSPB reserve);

iii. prevent the Minsmere Sluice from being able to drain, at which point its outfall pipe may need to be removed or left to decay, removing the disruption to longshore shingle transport and releasing sediment trapped there;

iv. potentially lead to breaching on the south Minsmere frontage near Sizewell C, although this may be inhibited through deposition of SCDF sediments, and

v. increase the frequency and/or magnitude of beach recharge to maintain the SCDF (although **BEEMS Technical Reports TR544** and **TR545** [REP3-048 and REP3-032] very conservatively test the SCDF against extreme 1:107 years storms).

5.1.3 The RCP4.5 95th percentile for SLR has been used throughout the assessment process for impact modelling as well as for establishing the viability of the SCDF. RCP4.5 is the intermediate representative concentrations pathway used in UKCP18, alongside the lower RCP2.6 and extreme RCP8.5. The climate change scenario selected should be proportionate to the risk level involved – in this case the assessment of impacts to coastal geomorphology. RCP4.5 was selected to consider the impacts of the station on coastal geomorphology because:

- Coastal geomorphology will respond to the actual level of sea level rise - choosing an RCP that is too high or too low will increase errors and uncertainty. Therefore, a plausible case was adopted and is considered appropriate.
- RCP4.5 is an intermediate scenario that is considered to be more extreme than the current trajectory (including current policies). It was therefore selected as a plausible case, suitable for consideration of the impacts of Sizewell C on coastal geomorphology.
- Under current policies the RCP trajectory is under the RCP4.5 curve (Reference 1).

5.1.4 Assessment of the viability of the SCDF has been conducted with SLR projections for 2099 to date (**BEEMS Technical Report TR545** [REP3-032] and **BEEMS Technical Report TR544** [REP3-048]) and this will be

extended to encompass the decommissioning phase, the results of which will be reported at D7.

5.1.5 The EGA did not seek to minimise the contribution of SLR. The fact that there is little evidence of regionally coherent shoreline change due to historic SLR does not alter the fact that SLR has been continuous throughout the past century and that the effect it has had on shoreline change is encoded in the measured change. For example, the observation that change was not uniform or coherent highlights the complexity of system responses to SLR and that there is no simple way of projecting its impact into the future. The EGA noted that the rate of SLR is projected to accelerate gradually during the operations period, and along with similar slow change in other contributing factors, the overall systems response has been interpreted as likely to be similar for a number of decades. The effect of accelerated SLR beyond 2080 cannot be projected as no shoreline change data set provides a precedent for this rate of SLR - a worst case assumption of shoreline retreat has therefore been applied.

5.1.6 The impact of bank lowering on erosion rates is dependent on many factors. **Volume 2 Chapter 20 of the ES** [APP-311] has considered the impact of Sizewell C marine elements on coastal processes and shown these to be minor in magnitude and assessed likely effects as localised and not significant. Natural changes in regional conditions (including 'storminess') will not alter the general scale of these impacts. The principal aim of the proposals within the CPMMP is to ensure that residual Sizewell C impacts do not propagate to regional scale effects.

6 CONFLICT WITH THE SMP

6.1.1 The Shoreline Management Plan policy for the Sizewell C frontage is ‘Hold the Line’ (HtL). Definition of ‘the line’ is not explicit within the SMP but is proposed by ESC and other IPs as being the line of the 10m defence of SZB (BP, ESC etc) rather than the present soft defences (5m bund) or shoreline.

6.1.2 This interpretation of the line to be held is not contained or documented in the SMP. The SMP states that, for Policy Development Zone 4, “The intent of the SMP is to maintain a natural coastline where possible”. The Sizewell C development does not conflict with this statement and the SCDF specifically addresses it by eliminating or minimising obstructions to longshore shingle transport.

6.1.3 A HtL policy typically relates to a combination of hard and soft features seaward of development infrastructure i.e., the same as is proposed at

Sizewell C. "The Line" is not a defined feature in the SMP because HtL is a concept, meaning the frontage is protected.

6.1.4 The overall aim of the SCDF is to maintain the present-day shoreline (as modelled and reported on in **BEEMS Technical Reports TR544 and TR545** [REP3-048 and REP3-032]. Notwithstanding the natural erosion and recharge of the SCDF's sacrificial layer, the present-day shoreline would be maintained (or 'held') in position, but not advanced. The planned HCDF and SCDF therefore do not conflict with the SMP statements to provide support for "any future development of the site" and "to allow the variation of sediment drift across the frontage" (**SMP PDZ4v9g pages 7 & 22** [REP1-072]).

7 STABILITY OF THE SIZEWELL – DUNWICH BANK

7.1.1 For the present: the Suffolk Coast of the Sizewell Bay is acknowledged to be an eroding shore, however, the shoreline in front of the Sizewell power stations including the Sizewell C frontage is by comparison somewhat stable. This is because of the shape of the coastline, sediment movement in the Bay and the coralline crag outcrop at Thorpeness which acts as a 'hard point' and helps to stabilise the southern part of the Bay. Sand movement locally is southerly, it then reaches the crag outcrop and is funnelled offshore to the southern end of the Sizewell Bank. The southern end of the Sizewell Bank is anchored in a stable position at the north-east corner because of the stable tidal circulation and redirection of sand to the bank caused by the rocky coralline crag outcrop. The Sizewell-Dunwich Bank complex is slowly rotating anti-clockwise, owing to shoreward movement at its northern end. The Sizewell Bank (and, to the north the Dunwich Bank) serves to provide some shelter from very large storms and thus helps to mitigate erosion.

7.1.2 However, the assessment has not assumed that this present case is fixed. Up-to-date assessment of bank dynamics over varying timescales up to centuries was presented in considerable detail in BEEMS Technical Report TR500 which contributed to the system conceptual model developed in **Volume 2 Appendix 20A of the ES** [APP-312]. Modelling has been carried out to examine the potential for significant reductions in bank height (reduction in sheltering, including complete removal of the bank for wave modelling and propagation of offshore waves inshore of the bank for **BEEMS Technical Report TR545** [REP3-032]). Modelling illustrates that changes in the bank are just one factor in a complex system and the affect of bank elevation changes on inshore wave energy is not a simple match to erosion or accretion. These changes do not, however, affect the fundamental impact of Sizewell C infrastructure on longshore processes.

Natural changes in bank influence on inshore wave climate will therefore not alter the scale of the direct impacts in the nearshore.

7.1.3 Parts, but not all, of the Sizewell-Dunwich Bank will affect inshore wave energy during severe storms; but the bank itself has less energy reducing capability on the more common moderate storms, which make up most of the energy at the coast. This is not to say that large, rare storms are not important – they have particular relevance for other topics, like flood risk assessment and safety case, and over several decades into the future, such events may stimulate erosion and roll-back of the Minsmere Shingle Ridge.

7.1.4 The role of the banks would be to increase or decrease inshore wave energy subject to how deep or shallow it is, speeding up or slowing down these processes. The depth of water over banks will vary with sea level rise, sand supply (that originates from cliff erosion along the 20 km frontage north of Sizewell C), and coastal processes that shape the bank.

7.1.5 Cliff erosion, and therefore supply of sediment, is expected to increase with rising sea levels i.e., the available length of cliff available to be eroded will rise. Sand in the subtidal nearshore moves south under tidal currents and waves, along the subtidal longshore bar sand transport corridor. The sand and the bars are highly mobile, bypassing engineering structures that protrude into the nearshore, namely Southwold Pier, the harbour jetties at the mouth of the Blyth, the Minsmere Sluice outfall pipe and the SZB outfall.

7.1.6 The Thorpe Ness headland, north of Thorpeness village, represents the southern boundary of the sediment cell (the sediment cell boundaries along this coast are defined by geological or engineered barriers to sediment transport and exchange). Sand transport is deflected offshore on the north side of the Thorpeness headland by the coralline crag ridges and the persistent tidal flows. Hence the regional longshore sand transport feeds the bank system.

7.1.7 Recent changes to Dunwich bank are seemingly creating a wide sand platform which continues to absorb wave energy; merging of banks landward would increase (not reduce) shoreline protection and reduce the potential for Sizewell C to have significant impacts on coastal processes. Alternatively, lowering of the protection afforded by the bank (by some other, unknown mechanism for loss of sediment mass) is likely to be one of the drivers for increased erosion of Dunwich cliffs, leading to a general increase in sediment availability within the regional system feeding sediment southward toward Sizewell. Since transport rates generally decline toward Thorpeness, both pathways to bank lowering would indicate no likely future shortfall in sediment availability within the system which

would prompt accelerated erosion within the Sizewell sub-bay. Even so, subject to spatial patterns in longshore transport, any bank reconfiguration leading to shoreline recession adjacent to Sizewell C could increase (or decrease) the maintenance requirement on the SCDF. This has been taken into account through very conservative steps used to model and assess the performance of the SCDF in **BEEMS Technical Report TR545** [REP3-032] and **BEEMS Technical Report TR544** [REP3-048].

7.1.8 IPs have questioned the stability of the Coralline Crag underpinning the present stability of the bank and the ness, marking the southern limit of the Sizewell Bay. The role of the Coralline crag is well understood by Sizewell C, Sizewell B and the offshore wind developers who avoid the crag when bringing cables onshore. No element of the Sizewell C development has any pathway to affect or expose the Coralline Crag, since these are too distant from the localised construction and operations impacts.

7.1.9 SZC Co.addressed the resistance of the Crag to ocean acidification due to climate change (**Written Submissions Responding to Actions Arising from ISH6** [REP5-118]). Furthermore, change in aragonite saturation depth is only an issue at depths > 1500m. Therefore there is no potential for acidification to impact the substrate in any IPCC future scenario over the time scale of the development.

8 DESIGN OF HCDF

8.1.1 Many representations made the statement that SZC Co. could not adequately assess the impacts on coastal geomorphology without a confirmed design for the Hard Coastal Defence Feature (HCDF). SZC Co.'s position is that the Applicant had sufficient information to underpin assessments by using the basic parameters – the detailed design was not required.

8.1.2 The location of the HCDF is known in sufficient detail for assessment since the intention is to retain the fronting beach seaward of the structure in its present position. Furthermore, the assessments of SCDF viability have assessed the rate of sediment loss from the SCDF (a term which can be taken as functionally equivalent to the fronting beach once the SCDF has begun to supply sediment to the system). The assessments of beach volume also indicate that the volumes at either end of the HCDF design (as submitted in **Sizewell C Coastal Defences Design Report** [REP2-116]) are sufficient for the proposed management measures to achieve this aim. Modelling work in **BEEMS Technical Report TR544** [REP3-048] and **BEEMS Technical Report TR545** [REP3-032], together with ongoing work to extend assessments to the end of decommissioning (that will be reported at D7), illustrate the function of the SCDF as shoreline change advances.

These reports also consider the maintenance of a 'natural' shoreline transition from the Sizewell C frontage to adjoining areas (principally the retreating Minsmere frontage) and the longshore sediment corridor.

9 DEFINITION OF 'WORST CASE'

9.1.1 Many WRs question the definition of 'worst case' as applied in the ES and give examples of radically different environments as examples. Frequently, these WRs suggest that extreme shoreline change scenarios have not been applied. However, for the ES, the requirement is to define worst-case impacts, not worst-case geomorphology. The distinction is not trivial, but absolutely fundamental to justifying the approach taken. SZC Co.has no responsibility to protect the entire 70km coastline from natural change, but only to identify (and mitigate if necessary) processes which would be negatively affected by the presence of Sizewell C. In short, wholesale changes and geomorphic reconfiguration of the coast may be perceived by various stakeholders as 'worst case' for Minsmere, or for Dunwich, or for Sizewell itself, but if Sizewell C has no effect on the processes driving these changes, it is not a worst-case impact and not the responsibility of SZC Co.to mitigate[6].

9.1.2 As identified previously, increasingly dramatic scenarios which create a headland generally imply a discontinuous longshore pathway and in these extreme settings the presence of Sizewell C or otherwise is largely immaterial (as the nuclear platform of SZA and SZB, plus the Bent Hills, are already elevated and defended and would form just such a headland in any case, with essentially similar systemic impacts). A 'catastrophic' extreme event (such as a tsunami) which precipitated such major change 'instantly' would be largely unaffected by the presence of Sizewell C, so was not considered a context in which impacts from Sizewell C would require assessment (and for similar reasons was expressly discounted by the EGA). The worst-case impacts from Sizewell C would occur in the period of transition leading to major changes of context, not as a result of the change i.e., once the context has changed (to an emerged headland) then the cases with and without Sizewell C are not substantially different – but a slow process of evolution leading to this situation would be significantly affected. Thus, less extreme scenarios can simply be viewed as a continuum of more or less rapidly-evolving analogies for the present day context of a continuous shoreline and sediment pathway from along the Sizewell C frontage.

9.1.3 The EGA identified that impacts on geomorphic processes would be confined to the localised hydrodynamic impacts of marine structures

[6] Site safety and geomorphic risk to the site operations are not a matter for the Coastal Geomorphology and Hydrodynamics chapter.

(intakes, outfalls, piles, grounded barges) assessed in the ES for as long as the HCDF (which is terrestrial in the present-day setting and for as long as the SCDF is maintained) was not part of the marine environment. Erosion is naturally creating a deepening embayment north of Sizewell C - hence, a continuation of this developing sinuosity is not an impact, and so also the presence of the SCDF maintaining this shoreline curvature is not an adverse impact. There is only a demonstrable negative impact if this curvature is not continuous due to a hard structure or an artificial interruption to sediment passage. Hence, 'worst case' was identified as an emergent HCDF cutting the longshore pathway and affecting natural development of the bay. This would be the case whether the bay is deepening to the south or north of the site, or if erosion were to focus on the frontage itself.

9.1.4 The systems-led approach is the reasoning for defining 'present-like' conditions as the worst case for assessment, as the EGA determined that present-like conditions were most likely to cause the HCDF to form a longshore barrier that would not otherwise arise.

9.1.5 Removal of Minsmere sluice is likely to lead to a shift in the point of erosion northward, as coastal catch-up reshapes the bay to compensate for the 150-years of control which has created its present form. Imposition of more widespread coherent behaviour within the bay (whether from lowering of the bank, removal of the sluice, removal of SZB outfall, or other changes) is likely to reduce the impact of Sizewell C, because the focus of 'net balance' at the Sizewell C frontage will almost certainly be lost. Maintenance of the bi-directional exchange along this frontage may be simplified into a 'unidirectional' pathway with less complex shoreline dynamics (as presently for the Dunwich frontage). Substantial movement away from the present balance of wave forcing is likely to simplify the conservation setting as the balanced processes which maintain vegetated drift lines adjacent to Sizewell C will be lost and the stability of the Minsmere frontage will be either naturally increased (by accretion) or naturally lost (to erosion), each of which reduce the assumed significance of adverse impacts from Sizewell C. Throughout all possible natural (or engineered) change, the direct impacts of Sizewell C remain localised to within a few hundred metres of the station and their significance beyond this range decreases as the gradient and extent of longshore changes increases (e.g., as alongshore gradients in longshore transport rate increase, so the impact of any artificial sediment deficit is more swiftly overtaken by the natural deficit, or surfeit, and the less significant it is as a consequence).

9.1.6 In summary, the impact of Sizewell C is likely to be greatest when the low-magnitude impacts have a proportionally larger potential effect. As the

magnitude of natural change increases, the difference that Sizewell C can make to what will happen anyway (increased natural change) will diminish.

10 CONSIDERATION OF RISK TO SIZEWELL C

10.1.1 The ES presents worst case impacts attributable to the Sizewell C Project, not 'worst case natural change' unrelated to the Sizewell C Project. Site safety and geomorphic risk to the site operations are outside of the DCO and the coastal geomorphology and hydrodynamics EIA topic: this includes all concerns relating to flood risk and overtopping of the defences and the suitability of extremes modelling (such as the type of model used), including tsunami; and concerns over nuclear fuel removal and long-term waste storage.

11 FUNCTION OF THE SCDF AND SHINGLE RECHARGE

11.1.1 Many IPs have queried the form and function of the SCDF as proposed and discussed in **Volume 2 Appendix 20A of the ES** [APP-312] and presented as mitigation in **Volume 2 Chapter 20 of the ES** [APP-311]). Outstanding concerns include the viability of the SCDF over the long term, the conservatism of the assumptions made and of the modelling of storm impacts, as well as the long-term impact of coarsening beach sediment. Many of these queries, including viability, have been addressed in **BEEMS Technical Report TR545** [REP3-032] and **BEEMS Technical Report TR544** [REP3-048], which employ a range of 1D and 2D models for both sand and gravel sediments extending well into the decommissioning phase assessed to the (projected) 2099 SLR; the period to 2140 will be assessed in modelling work and the results will be reported at D7.

11.1.2 The stochastic nature of erosive events is recognised in presenting representative volume and recharge interval indications for the SCDF. Beach response, including volume and slope changes, are assessed for changes in water level, storm power and shoreline angle, all of which affect the function of the SCDF as mitigation.

11.1.3 The impact of the sediment on shoreline change processes is more difficult to assess as no model for beaches with sand and pebble mixtures currently exists. Current 2D models can represent longshore processes, but cannot simulate the shoreline development over decades. However, **BEEMS Technical Report TR545** [REP3-032] and **BEEMS Technical Report TR544** [REP3-048] demonstrate the basic principles of sediment transport away from the SCDF onto adjacent frontages as these recede, and hence the potential for maintenance of a continuous transport pathway, 'natural'

shoreline curvature and prevention of a transport barrier forming due to exposure of the HCDF.

11.1.4 The SCDF would be maintained over the station life and would release shingle during storms. During southerly storms some of that sediment will be transported short distances north and deposit on the frontage immediately north of Sizewell C (and vice versa for northerly storms).

11.1.5 Over time (years – decades) these sediments are expected to reduce erosion rates and deposits may re-establish the wider supra-tidal shingle habitat needed for annual vegetated drift lines and used by nesting little tern. This is the major (beneficial) significant effect identified in **Volume 1, Section 2.15 g) iii) b) b) of the ES Addendum** [AS-181].

11.1.6 The proposal is to use sediment within the native size-distribution (with the exception of the fine cobble layer within the buffer, which is a mitigation option under discussion with the Marine Technical Forum). The total worst-case volume required (based on an assumption of sand-sized sediment storm-erosion volumes rather than gravel, and simultaneous erosion of the entire SCDF rather than specific sections) is 270,000m3 over 70 years. This sediment will be entrained from the SCDF in small quantities and mixed into the subtidal sand-gravel mix in transport, where any resultant change in dynamics will not be detectable.

11.1.7 The ability to trap shingle (both natural and SCDF sediments) will rise as adjacent shorelines naturally recede i.e., a feedback loop in which natural recession (adjacent to the maintained SCDF) will increase trapping efficiency leading to subsequent reductions in recession. That situation would also increase the supply of SCDF sediments to the adjacent frontages as shown in **BEEMS Technical Reports TR544** [REP3-048] and **TR545** [REP3-032].

11.1.8 As a result, the SCDF potentially increases the resilience of the south Minsmere frontage against future regime change, by increasing the volume of sediment in the beach over the long period of Sizewell C beach maintenance (i.e., until the end of decommissioning). That is, it is likely to delay or reduce breaching and saline intrusion into freshwater habitats. The assessments made in the ES and ES addendum clearly show that there would be no significant impact from the Sizewell C project on the Minsmere frontage. A detailed response to the potential impacts of Sizewell C on the Minsmere frontage was submitted at Deadline 2 in response to **ExA Question BIO.1.75** [REP2-110, Appendix 7G].

11.1.9 In brief, some of this sediment from the SCDF will be transported north onto the more rapidly eroding Minsmere frontage. Some WRs indicate that

increased accretion is undesirable here for preservation of the vegetated drift line habitat (although the Natural England site survey suggests that accretion would be beneficial for SSSI unit 113). However, there is limited risk of significant net accretion at an eroding site such as this i.e., net transport will still be away from this section as presently– any sediment fed out from the SCDF will be removed from the eroding section at the natural rate, with the net effect of simply slowing the rate of retreat. Cross-shore process generating drift lines would not be affected – but the space available for drift line formation may be maintained longer than if the shoreline were allowed to retreat as rapidly (or faster) than at present.

11.1.10 Discussions in **BEEMS Technical Reports TR544** [REP3-048] of progressive coarsening of the SCDF material and potential for a cobble core as a final line of defence against exposure of the HCDF were presented for discussion as a means for managing the potential for rapid environmental change in future (to maintain the longshore connectivity of sediment transport pathways), but are not indispensable design elements of the SCDF. As stated in the report, coarsening beach sediments is viewed as a valid beach management mechanism for preservation of the soft coastlines of the East of England in a climate changing world. Simply allowing events to take their course may not be viewed as favourably as today and mitigation / adaptation of climate change may be preferred i.e., the impact of slightly coarser sediment on 'natural' dynamics may be preferable under the unnatural forcing of anthropogenic climate change. As previously stated, the assessment has accepted that significant change is inevitable with or without Sizewell C and has applied systemic thinking to propose design options to mitigate the potential for the HCDF to be exposed.

REFERENCES

1. Hausfather, Z. and Peters, G.P., 2020. Emissions – the 'business as usual' story is misleading. *Nature*, Volume 577, 618 – 620.

Table 1:Summary of key issues and potential solutions from Written Representations. The EDF written response should be considered in its entirety as the various elements of the document are inter-linked; however, the following table points out the sections in which the main elements of the response to the specific point are made.

Source WR	Key Issues	Response Reference
Nick Scarr Deadline 2 submission- Written Representation [REP2-393]	• Concerns over Sizewell- Dunwich banks: the stability of the feature- banks are composed of uncemented deposits and recent lowering of crest height/contour changes will expose Sizewell C (recognised by EDF). '**Reductions in Dunwich Bank are not considered to be a worst-case' for Sizewell C is misleading.** It could represent increased/unaccounted for erosion and flood risk to Sizewell C and a return to extreme historic erosion rates. No provision of bathymetric data (for Sizewell-Dunwich banks) or a Flood Risk Assessment modelling scenarios with the Sizewell-Dunwich banks removed or compromised. • The wave-breaking Sizewell-Dunwich banks protect the shoreline from storms by creating a lower inshore wave climate. EDF's modelling is therefore seemingly using a best-case geomorphological scenario (the Sizewell-Dunwich banks in situ) while suggesting the modelling to be reflecting a safety case of 'conservative,' 'worst-case' modelling. BEEMS TR319 • The stated benefits of sea level rise resulting in relocation of sediment supply from Easton-Benacre cliffs to Sizewell-Dunwich bank are 'unsupportable'. Assumptions that eroded sediment will settle in pre-determined places has 'little or no validity'. • There is a requirement for Independent, authoritative bodies to agree on high-end climate change recommendations for nuclear planners to 2200. It is not clear that EDF's 'reasonably foreseeable' parameters fully acknowledge the flood risk- eg. the need to consider increased still water volumes created by waves breaking onto the wetlands/marshlands surrounding the landward side of the main nuclear platform. • Issues with assumptions made in TR311 and TR403 (Expert Geomorphological Assessments): timescale (2070) and extent (3km) needs to both be extended. Issues with the use of 'reasonably foreseeable conditions' and states the explicit exclusion of extreme events is an unsupportable premise. To assume the 'inshore wave climate to remain unchanged' is to explicitly state the panel's full reliance and dependency on the Sizewell-Dunwich offshore bank feature remaining in its current form, which has been proven to have changed recently (reduction in height etc.) • Issues with BEEMS TR319 (which have helped determine FRA modelling) – claimed 'present bathymetry has accurately been surveyed ' which has 'no relevance or validity for defining a remit for subsequent work;'. Surveys of the Sizewell-Dunwich banks show them to be predominantly in a state of flux such that bathymetric data are ephemeral. Not logical to focus on present bathymetry. The recommendations/questions for Cefas/EDF stated in the report: 1. Confirm the view on the stability and resilience to erosion and change of the Sizewell and Dunwich banks and the nearshore longshore bars. 2. What is the justification in the statement that loss of the Dunwich bank would not represent a worst-case scenario for Sizewell C. EDF's premise is based on 'cliff erosion and increased sediment supply minimising the chance or degree of exposure of the HCDF'. This does not appear consistent with its own evidence: "The last 2 to 3 decades of strong erosion at Dunwich were not matched by ongoing accretion in the south." 3. Fully justify the assumption that Easton-Benacre cliff erosion will supply and maintain the Sizewell shoreline, the Dunwich banks and the longshore bars as claimed 4. Ask Cefas to explain exactly what they mean by 'present bathymetry', namely, what features are deemed to be its constituent parts, where are the 'accurate' bathymetric data and when were they established? Request EDF to clarify why it has not undertaken regular, full bathymetric surveys of the Sizewell-Dunwich banks. There should also be an assurance from EDF that it will regularly perform full bathymetric surveys of the banks during station lifetime. 5. Explain its 'plausible time window' for the 'exposure' of the Hard Coastal Defence Feature HCDF by 2053 – 2087— is this forecast assuming a stable Dunwich bank? 6. Explain why does BEEMS TR311 does not consider the period of extreme Sizewell shoreline erosion, 1736-1836 (a period that seems pivotal in understanding the impacts on coastal processes)? Why is this period of extreme erosion is not expected to repeat itself in event of climate change and the loss or compromise of the Sizewell-Dunwich banks, particularly the Dunwich bank?	SZC Co Written Response Section 7 **Stability of Sizewell-Dunwich Bank** SZC Co Written Response Section 3 **Adequacy of EGA** SZC Co Written Response Section 9 **Definition of 'worst case'** SZC Co Written Response Section 7 **Stability of Sizewell-Dunwich Bank** SZC Co Written Response Section 9 **Definition of 'worst case'** SZC Co Written Response Section 7 **Stability of Sizewell-Dunwich Bank** SZC Co Written Response Section 10 **Consideration of risk to SZC** SZC Co Written Response Section 3 **Adequacy of EGA** SZC Co Written Response Section 10 **Consideration of risk to SZC** 1. SZC Co Written Response Section 7 **Stability of Sizewell-Dunwich Bank** 2. SZC Co Written Response Section 9 **Definition of 'worst case'** 3. SZC Co Written Response Section 7 **Stability of Sizewell-Dunwich Bank** 4. SZC Co Written Response Section 7 **Stability of Sizewell-Dunwich Bank** 5.SZC Co Written Response Section 3 **Adequacy of EGA** 6. SZC Co Written Response Section 4 **Adequacy of timescales** 7. SZC Co Written Response Section 3 **Adequacy of EGA** SZC Co Written Response Section 5 **Consideration of Sea Level Rise** SZC Co Written Response Section 9 **Definition of 'worst case'**

Source WR	Key Issues	Response Reference
	7. Has climate change coastline energy supply change been considered in their shoreline change assessments? It appears that dated, simplistic models (Wolman, Miller) have been relied on. 8. Explain their mandate that "extreme events' that could occur have a low (or poorly determined) chance of occurrence". Please explain with clear reference to climate science predictions of greatly increased storm frequency. 9. Explain why their assessment is limited to 2070; end of plant life is 2190. 10. Explain the spatial restriction of the assessment to a 3km stretch of coastline when it is well understood that geomorphic systems are linked, and longer-range impacts must be understood. 11. There is a need to establish how extreme sea 'return periods' should be considered beyond 2050. The IPCC states that "Extreme sea level events that are historically rare (once per century in the recent past) are projected to occur frequently (at least once per year)". When the probability of an event occurring increases, it means that it becomes more likely and therefore the return period for that event decreases. There is a lack of clarity on how and whether this decreasing return period is appraised. 12. A need a need to qualify the methodology and data found in Cefas' BEEMS TR319 report; the position taken by Cefas/Haskoning/EDF that extrapolates 'present bathymetry' to become 'worst-case' modelling' Flooding Queries for EDF that may be of interest: 1. For the flood risk assessment: 'Explain Cefas' Tomowac wave transformation data which appear to have limited compliance with the orthodox, academic, and empirically validated position that the Sizewell-Dunwich banks create inshore stability through a lower energy wave climate'. 2. How the wave energy relief features—primarily the Sizewell-Dunwich banks but including the nearshore bars—have they been used in its Flood Risk Assessment wave overtopping modelling. Has offshore morphological change been considered? 3. A Sizewell C Flood Risk Assessment that includes a compromised Sizewell-Dunwich bank and missing longshore bars over all epochs and provide the reassurance of using the industry standard EurOtop modelling package instead of the Tomawac modelling used in the DCO application. There is a requirement for all epochs, of increased water volumes caused by waves breaking onto the South Minsmere levels feeding the contiguous Sizewell marshlands and consequent risk to inundation of the nuclear platform from the landward side. The extent and application of EDF's current 'horizontal projection' is not clear.	8. SZC Co Written Response Section 3 **Adequacy of EGA** SZC Co Written Response Section 5 **Consideration of Sea Level Rise** 9. SZC Co Written Response Section 3 **Adequacy of EGA** 10. SZC CO Written Response Section 2 **Sufficiency of spatial coverage** 11. Local climate change predictions need to be used where they are available, as national or regional scale predictions can be locally misleading, especially in fetch-limited semi-enclosed seas like the southern North Sea. The climate change evidence for the Sizewell area does not support the statement made; there is no evidence on changing storm surge and wave climate is predicted to remain the same or decrease. 12. SZC Co Written Response Section 10 **Consideration of risk to SZC** SZC Co Written Response Section 10 **Consideration of risk to SZC** See also SZC Co's point-by-point response to Jackson and Cooper Report (Stop Sizewell C Written Representation [REP2-449r]
Bill Parker Deadline 2 submission - Written Representation [REP2-230]	The following are issues related to Sizewell-Dunwich and are similar to queries made by Nigel Scarr previously. 1. Sizewell-Dunwich Banks have a fundamental role (TR309) in protecting the coastline from erosion- EDF have later dismissed from being a critical control factor "Reductions in Dunwich Bank are not considered to be a worst-case scenario for Sizewell C as they would eventually lead to cliff erosion and increased sediment supply, minimising the chance or degree of exposure of the HCDF (or the amount of mitigation required to prevent this)." 2. The effect of sea level rise on Easton-Benacre cliff erosion will according to EDF not only protect the Sizewell shoreline but "will result in slow growth of the Sizewell – Dunwich Bank… that keeps pace with sea level rise will deliver similar patterns of inshore waves and shoreline change to those presently experienced." (TR311). This is at best rash and is using a closed loop and that sediment is deposited on the banks. The loss of onshore sediment equating to the accumulation rates on offshore banks is regarded by independent academics as unlikely (Carr, 1979). 3. Cefas / EDF state the worst-case scenario (ie most conservative) is when the near shore sand banks remain as is and that a reduction or loss of sand banks will reduce wave height and therefore have less energy. However, the banks play a significant role in protecting Sizewell with wave refraction and energy dissipation. The absence or reduction in the banks will mitigate existing wave refraction that currently helps protect the coast from SE storms by causing higher energy waves to strike the coast less obliquely. This will increase water levels and heighten risk of erosion and flooding. 4. The 3km monitoring extent is limited and unjustified (especially since the reliance of sediment from Benacre cliffs, 8 miles north)- an area between Lowestoft and Felixstowe would be seen as the minimum to be considered. 5. Initial analysis of the EDF / Cefas approach has been to simplify the processes and more complex inter-relationships are not considered- the use of the Tomawac rather than the usual Euro-top models in the analysis could also come into question.	1 SZC Co Written Response Section 7 **Stability of Sizewell-Dunwich Bank** SZC Co Written Response Section 3 **Adequacy of EGA** SZC Co Written Response Section 9 **Definition of 'worst case'** 2. SZC Co Written Response Section 7 **Stability of Sizewell-Dunwich Bank** Response to Jackson and Cooper, point 22 3. SZC Co Written Response Section 9 **Definition of 'worst case'** 4. SZC Co Written Response Section 2 **Sufficiency of spatial coverage**

Source WR	Key Issues	Response Reference
	6. Expert Geomorphological Assessment- only opinion and 4 out of 7 were Cefas employees. Concerns over the assumptions made by the EGA including that the intervention on the shoreline of the BLF and the HCDF does not have a potential impact on accretion or shape of the shoreline is unexplained. Other key comments made: 1. The use of 'reasonably foreseeable' conditions which explicitly excludes extreme events. It is statistically probable that a high-magnitude but low frequency event will occur during this and the full life time. 2. Minimisation of the impact of sea level rise using assumptions that are based on extrapolations of historic trends. There is no evidence of a coherent trend rate regionally for this. 3. Inshore wave climate is un-changed on the assumption that the off shore bank morphology doesn't change. The assumption that the sandbanks (esp. Sizewell-Dunwich bank) will remain stable is contrary to evidence presented in the DCO. This is an untenable assumption given the known bank observations with the cyclical and decadal timescale changes. 4. No shoreline accretion and sinuosity similar to present. The assumption that the intervention on the shoreline of defences etc. will not have a potential impact on accretion and the shape of the shoreline is unexplained and should be challenged. 5. Beach landing facility, jetties and Minsmere sluice; proposals still seem subject to significant change and there is no analysis how this should be managed in the long term and its implications for water levels in Minsmere and the marshes. 6. The draft Coastal Monitoring and Mitigation Plan lacks meaning as the detail on the coast defence measures are still not available. The ExA is asked to ensure that the issue of monitoring across a wide spectrum of issues is examined in detail and that meaningful controls are recommended. 7. Sizewell C site is located on a former river bed on peaty material- no natural protection from erosion and requires a built defence which will impact on natural coastal processes with long term consequences which are inadequately unexplained or mitigated for by EDF in their documentation. 8. Coralline Crag – potential gap here, there has been no risk analysis into its vulnerability to increasing ocean acidification, warming or damage from more frequent and potentially violent storms. 9. The Sizewell beach shoreline has been relatively stable over the past 160 years - the corner stone in the rational of the proposal. However, if the base line for review is changed from 1836 to 1736 it can be noted that this area suffered significant erosion for 300+ meters and not stable at all. The selective use of the timeframe used to examine the evidence can alter the perception of a stable or unstable coastline. 10. HCDF and SCDF - the lack of clarity on design from EDF question what the real implications are for this part of the coastline and more design details are needed. 11. Concerns that the long-term impacts of these proposals are being ignored -it is difficult to visualise what 2190 will look like. EDF / Cefas have a responsibility to follow precautionary principle and to ensure appropriate and robust mitigation and not a vulnerable location for spent fuel storage.	5. SZC Co Written Response Section 10 **Consideration of risk to SZC** 6. SZC Co Written Response Section 3 **Adequacy of EGA** 1. SZC Co Written Response Section 9 **Definition of 'worst case'** SZC Co Written Response Section 11 **Function of the SCDF** 2. SZC Co Written Response Section 5 **Consideration of Sea Level Rise** 3. SZC Co Written Response Section 7 **Stability of Sizewell-Dunwich Bank** SZC Co Written Response Section 3 **Adequacy of EGA** 4. SZC Co Written Response Section 3 **Adequacy of EGA** SZC Co Written Response Section 9 **Definition of 'worst case'** 5.Minsmere drainage is not the responsibility of EDF. Impacts on coastal geomorphology are addressed in the ES. 6.CPMMP in development with regulators. 7. SZC Co Written Response Section 8 **Design of HCDF** SZC Co Written Response Section 11 **Function of the SCDF** 8. SZC Co Written Response Section 7 **Stability of Sizewell-Dunwich Bank** 9. SZC Co Written Response Section 4 **Adequacy of timescales** 10. SZC Co Written Response Section 8 **Design of HCDF** SZC Co Written Response Section 11 **Function of the SCDF** 11. SZC Co Written Response Section 3 **Adequacy of EGA** SZC Co Written Response Section 9 **Definition of 'worst case'**
Natural England Deadline 2 submission [REP2-152]	Issues of concern are: 1. In the context of our remit, a significant amount of further information is still required before it can be determined whether or not the proposal will have significant impacts on a number of internationally designated sites (Special Areas of Conservation (SACs), Special Protection Areas (SPAs), Ramsar sites), nationally designated sites (Sites of Special Scientific Interest (SSSIs)), protected species, ancient woodland, a nationally protected landscape (Suffolk Coast and Heaths Area of Outstanding Natural Beauty (AONB)) and the Aldeburgh to Hopton on Sea stretch of the England Coast Path (ECP). 2. The permanent loss of fen meadow habitat from Sizewell Marshes SSSI continues to be an issue which NE considers is unlikely to be overcome within the examination period and remains our only 'red' issue at this stage. 3. The applicant has provided insufficient information to establish the significance of impacts or efficacy of avoidance, mitigation and/or compensation proposals. While NE considers these to be potentially resolvable with the submission of further information, they remain complex issues and may prove challenging to resolve in the remaining timeframe.	1. SZC Co Written Response Section 2 **Sufficiency of spatial coverage** 2. Not within Coastal Geomorphology topic remit

Source WR	Key Issues	Response Reference
	4. Impacts from changes to coastal processes/ geomorphology arising from a number of the MDS project elements (e.g. HCDF, BLF) and subsequent ecological effects on internationally designated sites (SACs, SPAs and Ramsar sites) and their notified features. 5. Potential indirect effects extend beyond the immediate foreshore. The Minsmere Valley, part of the Minsmere to Walberswick protected area (SAC/SPA and SSSI) is for all intents and purposes a low-lying coastal wetland, buffered from the sea by the shingle beach and ridges, and impacted by predicted future sea level rise and frequency and intensity of storm surge breaching and over-topping. The integrity of the foreshore habitats in turn helps conserve the wetland habitats in the valley behind, building resilience and time to plan future adaptation. Any potential effects of the project on the geomorphology and hydrodynamic processes which effect the alignment of the coast, need to be thoroughly and properly understood and assessed.	3. SZC Co Written Response Section 2 **Sufficiency of spatial coverage** SZC Co Written Response Section 11 **Function of the SCDF** 4. SZC Co Written Response Section 2 **Sufficiency of spatial coverage** 5. SZC Co Written Response Section 2 **Sufficiency of spatial coverage** SZC Co Written Response Section 11 **Function of the SCDF** Comments on Written Representations for RSPB [REP3-042].
Suffolk Coast Acting for Resilience (SCAR) Deadline 2 submission- Written Representation [REP2-509]	SCAR lists the following three profound concerns: 1. The notion that there is a discreet geographical entity, labelled the Greater Sizewell Bay by EDF, that is a discreet, self-contained unit in which the coastal processes and effects are capable of assessment and measurement with no material effect on the wider Suffolk coastline. SCAR submits that this is obviously not the case and it is certain that the development will eventually be detrimental to adjoining areas and property. 2. The uncertainty of coastal forces and sediment transfer forecasting and the effects of climate change. 3. The very limited Coastal Monitoring and Mitigation Plan which seeks to contain the liability for coastal damage flowing from the development and which will pass costs of mitigation, repair and loss to the local population for generations to come. Other issues are: 4. Detailed construction plans for the HCDF/BLF are yet to be provided. 5. Our expectation is that the final plans, when available, are likely to show a HCDF deeper and even more extensive to the east than present sketches show. This will almost certainly require SCDF replenishment earlier than current expectations. There seems to be little realistic understanding of what this is likely to mean. An exposed HCDF will stop sediment movement to the south. The good news for the north will be bad news for the south. The prevention of sediment flow towards Thorpeness will leave it very exposed to a faster rate of erosion than if there was no SZC with adverse consequences for property owners and the village as a whole. In time the loss of southerly sediment movement will deplete the beaches to the south giving rise to faster and greater rates of erosion. 6. SZA is not demolished and, at present, there are no plans to remove spent nuclear fuel from the site so the future of the SZA building is unknown. If the SZC development is not demolished it will last for hundreds of years. As the adjoining coast recedes it will protrude to seaward more and more and will remain a permanent block on southerly sediment movement. It is likely that all locations to the south will suffer depletion and consequent erosion damage. This longer term issue was not addressed by the panel of experts. 7. Pye & Blott 2006 (referred to in the DCO) indicate the possibility that the coast between Southwold and Thorpeness behaves largely as a closed system. However, this conclusion relies on previous interpretation of map evidence from 1867-1965. No actual field research was carried out. This should not be the basis for a conclusion that the GSB is a self-contained unit and that it is prudent to limit concern for the Suffolk coast to the immediate vicinity of a new nuclear power station. 8. It is clear that the longer term effects of the SZC scheme will be much more far reaching and will last much longer than the applicant suggests in the draft CMMP. The worst effects on land to the south of the development will not even have occurred at the date of final assessment. SCAR submits that this is a situation where the precautionary principle should apply and, should the Secretary of State approve the development, the Examining Authority should recommend the imposition of parameters into the CMMP along the following lines: 9. The geographical area for monitoring should be extended to the entrance to Southwold harbour in the north and Shingle St in the south. 10. At the time of the end of operations responsibility for further monitoring, mitigation and compensation for damage be passed to a UK government body. It should be unacceptable for such liabilities to be left for the local population. There should be a	1. SZC Co Written Response Section 2 **Sufficiency of spatial coverage** 2. SZC Co Written Response Section 3 **Adequacy of EGA** SZC Co Written Response Section 9 **Definition of 'worst case'** 3. SZC Co Written Response Section 9 **Definition of 'worst case'** SZC Co Written Response Section 11 **Function of the SCDF** There is no provision in the CPMMP to pass on costs. 4. SZC Co Written Response Section 8 **Design of HCDF** 5. SZC Co Written Response Section 8 **Design of HCDF** SZC Co Written Response Section 11 **Function of the SCDF** 6. SZC Co Written Response Section 9 **Definition of 'worst case'** 7. SZC Co Written Response Section 2 **Sufficiency of spatial coverage** SZC Co Written Response Section 4 **Adequacy of timescales** 8. SZC Co Written Response Section 2 **Sufficiency of spatial coverage** SZC Co Written Response Section 9 **Definition of 'worst case'** SZC Co Written Response Section 11 **Function of the SCDF**

Source WR	Key Issues	Response Reference
	winding up agreement which seeks to forecast and agree terms for a capital sum to be transferred to cover those future liabilities. Assessment of these costs should form part of the financial agreement between EDF and the UK government for building the power station and covered by the costs of electricity to the nation. In this way the adverse consequences for coastal damage and repair should be a national liability rather than fall upon the local population.	9. SZC Co Written Response Section 2 **Sufficiency of spatial coverage** 10. Regulatory, not a CG matter. A cessation report is specified in **Volume 2 Chapter 20 of the ES** [APP-311] and the **CPMMP** [REP5-059].
Stop Sizewell C Deadline 2 submission- Written Representation [REP2-449r]		See this response.
Minsmere Levels Stakeholders Group (MLSG) Deadline 2 submission- Written Representation [REP2-377]	Issues of concern are: 1. MLSG is concerned that the Sizewell C (SZC) Development Consent Order Application (DCO) submitted by SZC Co remains significantly incomplete and fails to provide answers to questions raise consistently during four rounds of consultation and despite the opportunity to address some of these shortcomings in the non-statutory consultation on potential changes to the Development Consent Order, failed to do so across many of the issues raised in the proposed changes and which have been requested throughout previous consultation stages. 2. The Hard Coastal Defence Feature (HCDF) toe at 0m OD will be subject to undermining by wave action if exposed. Reliance on the proposed Soft Coastal Defence Feature (SCDF) is unproven and unrealistic given the episodic nature of coastal erosion on the Suffolk coast. 3. No design for the HCDF has been made available for examination, yet SZC Co have unevidenced confidence about its likely exposure and have submitted a Coastal Processes Monitoring and Mitigation Plan without a design being available to assess it against. 4. The permanent Beach Landing Facility (BLF) will be the most north easterly point of the construction site and with its undefined HCDF protection will be a significant groyne when exposed. No design, beyond the piles, roadbed and docking facilities, for its integration with the HCDF have been presented and, perhaps more than any other part of the HCDF, this structure will be the most impactful on coastal processes. 5. MLSG consider SZC Co's assessment of the impact of both the HCDF/SCDF and BLF to still be inadequate on a number of points and defer to Mr Nick Scarr's submission AS-028 and updates that may be submitted at Deadline 2. They believe the reliance on the existing CPMMP is inappropriate given no plans of the permanent BLF, HCDF and SCDF in relation to the existing coastal frontage has been made available. 6. The current parameter plans and HCDF Figures are too vague to be of use in any assessments. Figures 2.2.20, 2.2.22 and 2.2.25 in Environmental Statement Addendum, Vol 2, Chapter 2 (AS-190) alongside the Main Site Parameter Plan (AS-118) are insufficient to define the construction and location of the combined defence and their relationship to the existing sacrificial dune and beach. 7. No consideration has been given to a tsunami event triggered by an undersea slide from the Norwegian Coast, similar to the Storrega event 8,200 years ago which was estimated to produce a 30m tsunami in the North Sea.	1.No response (no specific question – regulatory matter) 2. SZC Co Written Response Section 8 **Design of HCDF** SZC Co Written Response Section 11 **Function of the SCDF** 3. SZC Co Written Response Section 8 **Design of HCDF** 4. SZC Co Written Response Section 8 **Design of HCDF** 5. SZC Co Written Response Section 8 **Design of HCDF** SZC Co Written Response Section 11 **Function of the SCDF** The BLF is a transmissive pier structure with little impact, as assessed. The abutment with the HCDF has been recessed relative to earlier designs and will be prevented from having significant impact by mitigation with SCDF. 6. SZC Co Written Response Section 8 **Design of HCDF** SZC Co Written Response Section 11 **Function of the SCDF** 7. SZC Co Written Response Section 9 **Definition of 'worst case'** SZC Co Written Response Section 10 **Consideration of risk to SZC**
National Trust	Issues of concern are: 1. NT have concerns about the ability of the trampled strandline and perennial vegetation habitat to evolve and recover to favourable condition if impacted by the installation of the proposed hard and soft coastal defence features (including shingle recharge) the nature and extent of which often arrest natural processes and active roll back of beaches. 2. The National Trust notes that the provision of the HCDF and SCDF advances the line of the development seaward and that this is contrary to the policy set out in the SMP. As such the development proposal is replacing Hold the Line with an Advance the Line approach and identifies alteration to the shoreline to the north of the development whereby Managed Realignment effectively becomes Hold the Line. These approaches were rejected through the SMP process.	1. SZC Co Written Response Section 8 **Design of HCDF** SZC Co Written Response Section 11 **Function of the SCDF** 2. SZC Co Written Response Section 6 **Conflict with the SMP**

Source WR	Key Issues	Response Reference
	3. The National Trust believes the application does not adequately assess the potential range of impacts the proposal (included the features bullet pointed above) may have on long term coastal geomorphological processes. NT believes impacts could include: • Ecological and geomorphological impacts from the alteration of natural coastal processes. • Impacts on visitor infrastructure (including loss or limitations to access along beach frontage) from accelerated coastal erosion. • Changes to material entering the coastal system and nourishment of the frontage, impacts on accretion, ridge formation and the development of vegetated shingle habitat. • Loss of freshwater designated habitat and supporting habitat at a faster rate than through natural processes (100 yrs). • Loss of landscape and ecological value particularly if hard defences or soft defences that pin the shoreline position creep along the frontage.	3. SZC Co Written Response Section 2 **Sufficiency of spatial coverage** SZC Co Written Response Section 11 **Function of the SCDF**
	4. NT note that the worst-case scenario for the operator of the site is that the impacts of coastal processes on the development could lead to an exposure of the hard defence. However, the worst-case scenario for the NT is that the proposal would lead to a substantial change to the profile, plan form or sedimentary make up of the beach and cliffs and how the natural system (including the sub tidal system) functions throughout the lifespan of the development, decommissioning, and the period following decommissioning where the coast may be recovering from the influences and changes imposed by the development. For these reasons NT are of the view that any proposals for the monitoring of the coast should be extended further to cover their property.	4. SZC Co Written Response Section 2 **Sufficiency of spatial coverage** SZC Co Written Response Section 9 **Definition of 'worst case'**
	5. The NT believes there is uncertainty in the assessment of large scale, long term, accelerated coastal change. This uncertainty results from: • A lack of detail behind assumptions presented to support the baseline assessment – o There is insufficient consideration of the interchange of coastal erosion/accretion and sediment supply. • The omission of certain factors from the assessment – o There is no evident consideration of changes that might arise in the offshore banks over time. The approach disregards any change in these features and / or to incident conditions that might be altered by them e.g. wave height or direction, alongshore subtidal channels and tidal flows, sediment transport pathways both at the shoreline and offshore etc. o It is unclear why periods of higher historic change (such as significant erosive phases around the 1850s) have not been drawn out from the Historic Trend Analysis (HTA) and used in the assessment as part of a change envelope, let alone including scenarios that could be above those in severity in the future. o There are inherent difficulties and uncertainty in assessing and modelling long-term cliff change. This may mean conclusions in assessments of the impacts of cliff change (including results from modelling) do not accurately represent any future condition in the long-term and so only present short-term (≤ 20 years) impacts. The approach adopted seems to not address important matters such as potential changing orientation of the coastline as a result of climate change scenarios, change in direction of wave and tidal forces as a result of sea level rise and climate change possibilities over the next century, or the consequence of change in pluvial events to mass movement processes on cliffs. o The approach to modelling has been to model individual components of the development, there does not appear to be any modelling that combines all the structures and management measures to be applied to the development to show how they interact; the cumulative effects taken together may not behave the same as individual components, we believe this is important on a coastline where there are known interactions between the shoreline and nearshore and offshore processes, sediments and geomorphology. o The impact of ship movements to and from the temporary and permanent BLFs is not covered by modelling (nor assessed in terms of its long-term implications). o The design of the permanent HCDF is absent from the submission and the changes submission. • The approach to and complexity of modelling long term coastal change – o The Trust notes that following the submission of further changes to elements of the proposal impacting the coast such as to the HCDF, SCDF and BLFs by EDF there has been no update provided to the EGA. o The applicant's work from Chapter 20 also does not seem to carry forward the concept of coastal scale and evolution which identifies (in essence) that longer a timescale that is applied to a matter the larger the geographical extent needs to be considered.	5. SZC Co Written Response Section 9 **Definition of 'worst case'** SZC Co Written Response Section 7 **Stability of Sizewell-Dunwich Bank** SZC Co Written Response Section 7 **Stability of Sizewell-Dunwich Bank** SZC Co Written Response Section 3 **Adequacy of EGA** SZC Co Written Response Section 4 **Adequacy of timescales** SZC Co Written Response Section 2 **Sufficiency of spatial coverage** SZC Co Written Response Section 8 **Design of HCDF** SZC Co Written Response Section 8 **Design of HCDF** SZC Co Written Response Section 3 **Adequacy of EGA** SZC Co Written Response Section 2 **Sufficiency of spatial coverage** SZC Co Written Response Section 7 **Stability of Sizewell-Dunwich Bank**

Source WR	Key Issues	Response Reference
	o The National Trust is concerned that offshore banks and their role in sediment exchange with the shoreline does not appear to be included in the applicant's assessment and modelling in support of their submission. o The Trust is concerned that there is a lack of clarity around a large number of factors supporting assumptions regarding sediment supply. o The sediment transport modelling presented doesn't go far enough north to include the identified sources of Covehithe and Easton. These rapidly retreating sediment-rich cliffs don't form part of the Greater Sizewell Bay (GSB) which is the modelling focus presented in Chapter 20 (Figure 12), so it is unclear what the boundary conditions to the north of the region are and how future change was incorporated in line with the timescale of the development. o The model analysis for the temporary and permanent BLFs shows some matters of concern by concentrating on the dynamics of the outer and inner longshore bars when an important morphological unit controlling inshore hydrodynamics and sediment transport is the Sizewell-Dunwich Bank. The modelling approach appears to only apply sand-sized sediment to nearshore bed processes and shoreline, a 1:20 year return wave height, and assumes that other factors (such as Sea Level Rise and bank elevation) remain fixed into the future. It is unclear why a wider variance in these factors is not considered over the lifetime of the development. 6. The way sea level rise figures have been applied, for example in ES Volume 2 Chapter 20, para. 20.4.64 sea level rise of 0.76m is identified at Sizewell by the end of operation (2090; RCP8.5 70th percentile scenario). It seems strange to take a single sea level rise projection rather than explore how the range of conditions might interact with the development and hence influence impacts from it. The 70th percentile is not commonly seen in the literature. A more usual approach, used in several coastal vulnerability studies (e.g. Hinkel et al., 2014) would be to choose a range from the 5% percentile for RCP2.6 (Low emission), 50% for RCP4.5 (Intermediate emission) and 90% for RCP8.5 (High emission), for the years 2050 and 2100; if the 70th percentile is believed to hold some significance then that could be included to such assessment as well. 7. EDF cite an increase in precipitation but there is no consideration as to how this could affect coastal change and therefore vulnerability. 8. The applicant and NT acknowledge that modelling coastal processes over the long term is difficult. For this reason, NT wish to see an independent and transparent CPMMP for long term coastal change (until the HCDF is removed following decommissioning) that includes Dunwich Heath and Beach. NT believe the CPMMP requires a wider scope than currently proposed as there is a high degree of uncertainty regarding the developments impact on long term coastal change. Therefore, it is appropriate that EDF should monitor coastal change for the lifetime of the development (through to full decommissioning) and include the designated sites to the north of the development site up to the northern boundary of our land. The NT should also be involved in the any steering group overseeing the reporting of findings and decisions related to future monitoring. 9. The National Trust notes that Requirement 7a of the **draft DCO** makes provision for Coastal Processes Monitoring and Mitigation Plan (CPMMP). The National Trust does not agree that its land at Dunwich Heath and Beach should be excluded from this plan and believes it should be a stakeholder in its development and party to on-going review.	SZC Co Written Response Section 2 **Sufficiency of spatial coverage** SZC Co Written Response Section 2 **Sufficiency of spatial coverage** SZC Co Written Response Section 7 **Stability of Sizewell-Dunwich Bank** SZC Co Written Response Section 3 **Adequacy of EGA** SZC Co Written Response Section 9 **Definition of 'worst case'** 6. SZC Co Written Response Section 3 **Adequacy of EGA** SZC Co Written Response Section 5 **Consideration of Sea Level Rise** 7. Increased precipitation has potential to decrease the entrainment threshold of beach sediments that would otherwise be above the ground water table, however this is only relevant when raised a raised water table coincides with storms. This process is subtle with respect to precipitation, but is significant where breaching occurs, as intrusion of sea water will rapidly raise the water table. Whilst not directly considered, the effect of precipitation could amount to a minor factor affecting SCDF recharge, taken into account as uncertainty addressed by taking a very conservative approach to beach recharge (**TR544** [REP3-048]). 8. SZC Co Written response Section 2.1 **Spatial scale of monitoring in CPMMP**. SZC Co Written Response Section 2 **Sufficiency of spatial coverage** 9.CPMMP in development with regulators. SZC Co Written Response Section 2 **Sufficiency of spatial coverage**
Alde & Ore	Alde-Ore D3 says that D2 submission was answered with reference to EDF/BEEMS previous documents therefore not addressed. EDF's papers dismiss the need to consider anything but the immediate shoreline on which SZC would sit but the coast is not a series of bite size self-contained segments. In the light of historical evidence, there's no justification for the Applicant 's papers to maintain that the Greater Sizewell Bay is a self-contained zone and the coast to the south will be unaffected by what is a very long-term project. Any development which is likely to affect coastal sedimentation flows and currents needs to take account of impacts along the length of the coast. Issues with the assumptions made in EDF Principles for assessment of coastal change: (6.3 Vol 2 Ch 20 Table 26);	BEEMS documents presented sound evidence that the Alde Ore is well beyond the influence of SZC impacts for coastal geomorphology receptors SZC Co Written Response Section 2 **Sufficiency of spatial coverage** 1. SZC Co Written Response Section 3 **Adequacy of EGA**

Source WR	Key Issues	Response Reference
	1. Over the stations 160 year lifetime, an assumption of 'reasonably foreseeable' conditions, that is extreme events would have a low chance of occurrence, is too minimalist. Have seen events in the past- such as cliff falls in Thorpeness (2017) which drastically change coast overnight, as well as high number of storm surges. 2. Sea level rise has been projected to 2070 which is not far enough into the future – there is a need to look at SLR impacts further into the future. 3. The assumption that offshore wave climate remains unchanged - Pr David Sear (Southampton University) with Pr Mark Bailey evidence which shows coastal change in Suffolk is markedly affected by waves influenced by the North Atlantic Oscillation (NAO). This long-term consideration is missing from the principles. 4. How can the inshore wave climate remain unchanged when waves are dominated by climatic oscillations which are likely to change during the next 160 years, the minimum physical life of the plant? 5. The impact of changes to Minsmere Sluice- if, the sluice is no longer a functional element of Minsmere Levels drainage (due to SLR) this event is of relevance to the whole of the coastline. If the sluice is silted up that is likely to be due impacts of the construction projecting into the sea which is likely to block sediment normally going south. 6. To state that there will be 'no shoreline accretion, and shoreline sinuosity remains similar to that at present' is too simplified- the presence of structural control (manmade or natural) exerts a complex influence on erosion processes and sediment movement. 7. The Association notes that the assumptions take no account of the fact that all forecasts indicate climate change will not only bring sea level rises but more frequent and more violent storms. As a coast already subject to considerable winter surges, these, combined with sea level rise, will heighten the damaging effect of the sea on the coast. There needs long term provision for continuing monitoring and for mitigation for all parts of the coast likely to be affected in the CMMP, particularly of sediment drift levels in both directions, particularly before and during the time of shingle recycling at SZC covering the wider area from Southwold in the north to Shingle Street in the south. In the CMMP proposed by EDF the scope is highly localised and makes no allowance for longshore impacts in neighbouring parts of the coast	Cliff falls are considered a reasonably foreseeable process – "extreme events" as used is intended to refer to single events which change the overall context 'instantly' , not gradually. 2. SZC Co Written Response Section 5 **Consideration of Sea Level Rise** SZC Co Written Response Section 6 **Adequacy of EGA** 3.See response to Jackson and Cooper, point 46 4. SZC Co Written Response Section 7 **Stability of Sizewell-Dunwich Bank** SZC Co Written Response Section 8 **Adequacy of EGA** SZC Co Written Response Section 9 **Definition of 'worst case'** 5. SZC Co Written Response Section 2 **Sufficiency of spatial coverage** SZC Co Written Response Section 9 **Definition of 'worst case'** 6. SZC Co Written Response Section 2 **Sufficiency of spatial coverage** SZC Co Written Response Section 9 **Definition of 'worst case'** 7. SZC Co Written Response Section 9 **Definition of 'worst case'** SZC Co Written Response Section 2 **Sufficiency of spatial coverage** The adaptive CPMMP is proposed ensure that residual SZC impacts do not propagate to regional scale effects. Evidence shows that shingle is retained within the Sizewell Bay.
Environment Agency	Issues of concern: Coastal Processes – The sustainability of the Hard and Soft Coastal Defence Features (HCDF and SCDF) has not been demonstrated, and insufficient evidence has been provided to allow the impact on geomorphology and coastal processes to be understood. 1. EA have reviewed report TR545 Modelling of the Temporary and Permanent Beach Landing Facilities (BLF) at Sizewell C and are generally satisfied that the study is rigorous. However, EA will be unable to comment on their impact in combination with the HCDF and SCDF, and potential Habitat Regulation Assessment (HRA) impacts as a consequence, until EA have received the outstanding studies relating to the sea defences. 2. Need to review the necessary modelling and evidence report – this information should include an evidenced explanation of why NNBGenCo (SzC) has changed their approach from a scheme which would have accepted exposure of the HCDF over time by design to one that will require the ongoing replenishment of the SCDF as a part of the planned coastal protection infrastructure. The significance of this change lies in the fact that although previously the SCDF was designed as mitigation for the environmental impacts which would result from exposure of the HCDF, it now seems to be an integral element of the functioning of the sea defences. EA are therefore now seeking greater certainty over the long term viability of the SCDF throughout the full lifetime of the development. 3. EA consider that TR531 and TR544 ought to be considered in parallel, and EA will therefore not be able to provide detailed feedback until the accompanying report TR544 has been received. However, it is already clear that significant areas of clarification are required to give us confidence that the approach being taken is appropriate and fit for purpose. 4. EA were due to receive report TR544 Preliminary design and maintenance requirements for the Sizewell C Soft Coastal Defence Feature for our review on 30 April, but this has not yet been provided by NNBGenCo (SzC).	1.Further modelling to extend **BEEMS Technical Reports TR545** [REP3-032] and **TR544** [REP3-048] over the decommissioning phase will be presented at Deadline 7. 2.EDF to respond re: design change. Exposure of HCDF was unacceptable to stakeholders due to potential regional impacts, as evident from the D3 WRs and MTF. Further modelling to extend **BEEMS Technical Reports TR545** [REP3-032] and **TR544** [[REP3-048] over the decommissioning phase will be presented at Deadline 7. 3. **BEEMS Technical Reports TR544** [[REP3-048] and **TR545** [REP3-032] submitted at D5. 4. **BEEMS Technical Reports TR544** [[REP3-048] and **TR545** [REP3-032] submitted at D5.

APPENDIX C: COASTAL GEOMORPHOLOGY RESPONSE TO JACKSON AND COOPER WRITTEN REPRESENTATIONS

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1 COASTAL GEOMORPHOLOGY 1

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FIGURES

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Figure 1.2: (Insert title)

APPENDICES

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1 COASTAL GEOMORPHOLOGY

1.1.1 The following table considers each paragraph of the unaffiliated Jackson and Cooper (May 2021) review of **Volume 2 Appendix 20A** of the **ES** [APP-312]), which was submitted as the Written Representation of Stop Sizewell C at Deadline 2. This Written Representation did not include any introduction or preamble to clarify provenance of the report, nor whether it is solely a work of the authors.

Ref	Stop Sizewell C (Jackson & Cooper)	SZC Co response
1	The 70 km-long Suffolk coast between Harwich and Lowestoft consists of alongshore alternations of topographic highs and lows (Burningham and French, 2018). The highs consist of headlands of soft, erodible Quaternary sediments where cliffs are fronted by gravel and sand beaches. There are local outcrops of consolidated pre-Quaternary lithologies (e.g. Coralline Crag). The lows comprise wetlands impounded by mixed gravel and sand barriers. Both types of coast exhibit distinctive behaviour. The cliffs exhibit historic retreat via progressive (and likely episodic) erosion, punctuated by periods when sediment supply enables frontal beach accretion and shoreline stability or advance. The barriers retreat through erosion and landward rollover (Pye and Blott, 2006) but may also experience periods of vertical aggradation and/or seaward accretion. Alternations between shoreline retreat, stability and advance at any given location depend partly on the rate of sediment supply from alongshore and from cliff erosion but are also influenced by longshore gradients in wave energy, and the surrounding geomorphology and underlying geological framework. Sites of progressive accumulation over several decades and longer are marked by nesses. The cliff and barrier systems are linked inasmuch as the topographic highs provide anchors for development of the barrier planforms and yield sediment for beach and barrier construction. Furthermore, changes in one part of the system affect	No material comments on the description of context. Minor note that the subtle headlands referred to as nesses are not all "*Sites of progressive accumulation over several decades and longer are marked by nesses*". For example, Thorpeness broadly shows fluctuations with little long term net change (although its southern face has recently experience~~s~~ phases of erosion), rather than showing progressive accumulation (**BEEMS Technical Report TR223**; synthesised in **Volume 2 Appendix 20A** of the **ES** [APP-312]).

Ref	Stop Sizewell C (Jackson & Cooper)	SZC Co response
	areas downdrift. Human intervention in the coastal landscape has involved construction of artificial headlands in the form of jetties and sea defences that stabilise cliffs and reduce/eliminate the rate of sediment input from cliff sources. Nearshore sandbanks form in the lee of headlands and appear to act both as long-term sediment sinks and as modifiers of incident wave conditions. As such, they from an additional component of the coastal system. They interact with the other onshore components via complex and, as yet poorly understood, feedback relationships. At historic timescales, losses of sediment from onshore have been found to be broadly equivalent to accumulation rates on offshore banks, although a straightforward erosion-accumulation relationship between the two was regarded as unlikely (Carr, 1979).	
2	The construction of the proposed Sizewell C power station and its associated infrastructure has the potential to significantly alter coastal behaviour in both the short and long term and is potentially at risk from coastal processes and shoreline change.	The evidence base and EIAs clearly show that the impacts of Sizewell C's marine structures and activities on sediment transport are small, and the effects have been appropriately classified as not significant. Numerical modelling has shown that the SCDF is an effective means of mitigation to maintain the longshore transport corridor and avoid impacts to it arising from an exposed HCDF (**BEEMS Technical Reports TR545** [REP3-032] and **TR544** [REP3-048]). Further modelling to be submitted at Deadline 7 (Doc. Refs. 9.31(A) and 9.12(B), respectively) will complete the modelling for the middle and latter decommissioning phase.
3	Inadequate future timescale. Consideration of shoreline change (and mitigation activities) in this report does not extend beyond 2080 whereas the site requires protection until 100 years post-decommissioning (ca. 2200). Since the proposed work is intended as a permanent intervention, it will have implications for the coast in perpetuity;	The Applicant does not recognise the date of 2200. The Environment Agency (EA) and East Suffolk Council (ESC) indicated at the ISH6 (Coastal Geomorphology) that they are both satisfied with the work up to date which proves the viability of the soft coastal defence feature up to 2099. The viability of the SCDF has been explored further in **BEEMS Technical Reports TR545** [REP3-032] and **TR544** [REP3-048] and this will be extended in further modelling of the SCDF

Ref	Stop Sizewell C (Jackson & Cooper)	SZC Co response
		through the decommissioning phase to 2140. That is due for submission at Deadline 7 (Doc. Refs. 9.31(A) and 9.12(B), respectively). Therefore, the timescale considered by the Applicant extends beyond 2080. A **BEEMS Technical Report TR403** (summarised in [APP-312], assessing future shoreline projection, identified a timeframe (2053 - 2087) when initially the terrestrial HCDF would be likely to be exposed to marine conditions in the absence of mitigation. Following this report, the Applicant then committed to implementing the SCDF as mitigation to avoid the exposure of the HCDF. This time frame was also identified as being the limit of reasonable projection (e.g. associated with SLR) before uncertainty in environmental conditions become too great.
4	Insufficient spatial scale. The entire 70 km-long Suffolk coast and adjacent seabed comprises a single large-scale coastal system within which geomorphic changes are intimately interlinked. The geomorphology of this system operates spatially from deep water (far seaward of the Dunwich Banks) involving wave shoaling (energy loss) in water depths down to 30m, to the back beach and beyond. The study only considers the 3 km coastal stretch centred on the site of the proposed Sizewell C development. Although this has been argued to be a discrete cell, it is geomorphologically linked to areas both north and south that form part of the same larger coastal system; changes in the Sizewell area have the potential to affect adjacent areas and vice versa. Any change in morphology of the anchoring headland at Thorpeness, for example, would have large implications for the shoreline planform. This spatial restriction flies in the face of current dogma regarding large scale coastal behaviour and system dynamics. Linked to this is at best a lack of acknowledgement (and at worst a	We agree that there are geomorphic linkages, but the authors are referring to broad-scale geomorphic processes, which differs from the approach needed for impact assessment. Impacts, which start at their source location, can only reach the broad-scale if they persistently interfere with sediment transport (i.e., removal or blockages). This is not the case for the proposed development. Changes at a large scale require changes at a smaller scale (impacts in this case) to propagate through the system and (with allowances for the specific impact), the greater the scale, the longer the time required for effects at a distance. The SZC impacts identified are localised and low magnitude and the effects assessed in [APP-311] as likely not significant. Nevertheless, an extensive CPMMP has been developed (secured via Requirement 7A of the DCO, and Condition 17 of the DML) with high-frequency, high-resolution monitoring of all coastal receptors within the local cell which will identify any effects arising from the development either

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	denial) of the long-range impacts (10s of km at century timescales) of both soft and hard coastal defences;	individually or cumulatively. There is no evidence to suggest that the erosion-resistant coralline crag that anchors the Thorpeness headland would change over the timeframe of the development. Furthermore, external system changes may indeed have implications for shoreline planform, but the responsibility of the Applicant, and hence the concern of the CPMMP, is only those changes that are affected by SZC (noting that there is no evidence to support planform change due to Thorpeness). Far field geomorphic changes that are not impacts cannot be considered the responsibility of the Applicant to monitor. This is a fundamental principle of monitoring applied to any and all marine works under the regulation of the MMO.
5	Inadequate consideration of the dynamics of nearshore banks. Significant surface morphological changes have been documented on adjacent banks and their relationship to shoreline behaviour has been shown to be complex. Their decadal scale behaviour and longer-term response to sea-level rise are crucial to predicting future shoreline configuration but these have not been considered.	Up-to-date assessment of bank dynamics over varying timescales up to centuries was presented in considerable detail in **BEEMS Technical Report TR500** which contributed to the system conceptual model developed and used in the Synthesis of evidence for Environmental Impact Assessment (**Volume 2, Appendix 20A** [APP-312].
6	No consideration of complex system behaviour - i.e. beyond straightforward process-response geomorphology. Contemporary geomorphology recognises that system linkages and resulting feedbacks can lead to “emergent behaviour” unrelated to immediate forcing mechanisms. This possibility is not considered;	Emergent behaviour is not considered to be especially relevant to the assessment of impacts at the local scale, since the scale of impacts on wave and tidal flows, quantities of sediment in suspension and scour around outfalls or piles etc, depend on local hydrodynamic forcing only. Since the assessment identified only minor impacts within a sub-bay constrained by the controls points at Minsmere sluice and SZB outfalls, Thorpeness and the Sizewell - Dunwich Bank, capacity for SZC to generate 'emergent behaviour' via feedback into the regional system is limited.

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		Only in the case that SZC were to generate impacts on these control points would emergent dynamics affecting the entire Suffolk coast be plausible, which would require a permanent emergent HCDF beyond the life of the station. However, SZC Co have agreed to the principle default position of HCDF removal requested by ESC and SCC (recorded in the draft CPMMP [REP5-059]), noting that the decision would be made by assessment much closer to the time when impacts could be accurately assessed. In the absence of a suitably competent and verifiable system dynamics modelling framework demonstrably capable of accurately simulating feedback from 100m to 100km scales, the principle that impacts are confined within a monitored zone many times smaller than the extent of direct effects is believed to be suitable for as long as it illustrates no impact on the geomorphic control points at the limit of the monitoring. This is the principle of the adaptive CPMMP.
7	Use of false assumptions underlying the Expert Geomorphological Analysis. These relate to, inter alia, stability of the offshore Dunwich and Sizewell Banks, consistency of inshore wave climate, limited alongshore impact of the defence structures, explicit exclusion from consideration of high-magnitude/low frequency events and assumption of similar future shoreline sinuosity to the present.	The EGA assumptions are not 'false'. They are a defined subset of the natural range of possibilities and are detailed as 'assumptions' to demonstrate the boundaries of the assessment conducted in **BEEMS Technical Report TR403** (and used in the Synthesis of evidence for Environmental Impact Assessment (**Volume 2, Appendix 20A** [APP-312]). The validity (or uncertainty) associated with each in turn was then reviewed in considerable detail within the report. Finally, as stated (Ref #3 above), BEEMS Technical Report TR403 was a single study with a narrow scope associated with determining the likelihood of exposure of the HCDF and the requirement for mitigation. It was explicit in stating that the projected future shoreline was not considered a prediction and that none of the environmental factors

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		considered could be extrapolated with sufficient certainty beyond 2080.
8	Offshore wave energy dissipation plays a crucial role in dictating the height and therefore the wave energy reaching beaches and soft sedimentary shorelines, acting as natural buffering zones during storms. The Dunwich and Sizewell Banks are in themselves not fixed or static landforms and are prone to storm and current changes offshore, making their future form (vertical and lateral extent) and therefore buffering ability unclear.	Agreed, although it is noteworthy that Sizewell - Dunwich Bank is sufficiently deep that the wave energy change associated with most storms passing over the banks is small. Only the largest storms are affected by the banks, and then only across the shallower sections.
9	Offshore sandbanks occupy an important position for coastal protection particularly during high-energy storm events. Previous modelling simulation work by Halcrow working only on a single direction scenario and spring tide level, showed that the Dunwich Bank, under modal conditions, reduced shoreline wave heights by 0.5m. Storm waves, however, would likely be reduced much more significantly in height given the substantial energy dissipation role they play. Directionality of storms can also play an important role on their effective shoreline impact with wave directions traversing over the large stretches of the Banks accentuating the dissipation of wave energy.	Considerably more detailed modelling of storm wave propagation over the banks has been conducted by the Applicant (various BEEMS Technical Reports synthesised into the evidence base for Environmental Impact Assessment (**Volume 2, Appendix 20A** [APP-312])).
10	Wave attenuation (reaction with the seabed) begins much further out than the nearshore sand bars mentioned and ignoring their presence in modelling is a serious oversight. Ignoring the influence of Dunwich and Sizewell Sandbanks oversimplifies the wave regime that is implemented over the nearshore sand bars and will produce inaccurate and unrealistic modelling results as incident waves will be unrealistic.	Modelling work conducted by the Applicant meeting the IP's description has been reported over the past decade in BEEMS Technical Reports summarised in the conceptual model and synthesised into the evidence base for Environmental Impact Assessment (**Volume 2, Appendix 20A** [APP-312]).

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	Full hydrodynamic wave modelling must therefore start sufficiently seaward of (i.e. beyond shoaling zones) of features such as the Dunwich and Sizewell Banks and they should contain multiple wave directionality (largely bimodal (N/NE and S) at this site and be run for a number of return period storm wave heights.	
11	Lowering and/or a major shifting of the Dunwich Banks as acknowledged is occuring by EDF/Cefas, could lead to wave energy being released much closer to the shoreline, with dissipation/breaking focussed more at the shoreline than the present under any such scenario. Modelling under these changed offshore bank configurations are not considered in any modelling by EDF. It is highly likely that historical shoreline retreat will resume to previous levels under any lowered/diminished extent of the Dunwich Banks. Rate of retreat of any adjacent undefended coastline will be dependent on storm frequency and magnitude as well as feed-back involving linkages to nearshore sand bar formation and dynamics. Increased sea levels in the region will add to the vulnerability of the shoreline in this area as storm and even modal wave energy events will occur on a higher base level and reach the supratidal shoreline and beyond.	The Applicant has conducted modelling of potential changes to the bank (acknowledging these would occur very slowly and are not possible to reliably predict) for flood risk purposes. The IP's comments fail to separate Sizewell and Dunwich Bank, which each evolve very slowly, on the timescale of decades or longer, and have very different characteristics and behaviours, and which affect different parts of the coast. The shorelines in the lee of Dunwich Bank are from Minsmere Sluice to the north. Over decadal to centurial timescales, Dunwich has varied in terms of extent, elevation and location, with its much-reduced historical form considered responsible for severe erosion that took place at Dunwich over a century ago. The Sizewell C site is not directly affected by changes in Dunwich Bank, so the~~y~~ erosion concerns raised are not relevant. Indeed, as observed during the Dunwich erosive phase, longshore transport delivered sediment south and deposited it where the shoreline orientation changed, which included the Sizewell frontage. Were Dunwich Bank to be substantially lowered/diminished (which is possible but given the difficulty in predicting banks is not considered by The Applicant to be highly likely), it is possible that shoreline retreat at Dunwich will resume. However, this has not yet occurred despite significant lowering observed in the last 1 - 2 decades. Modelling work conducted by the Applicant meeting the IP's

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		description has been reported over the past decade in BEEMS Technical Reports synthesised into the evidence base for Environmental Impact Assessment (**Volume 2, Appendix 20A** [APP-312]). These future possibilities highlighted by the IP have been identified in **BEEMS Technical Report TR403** (and considered in the evidence base for the Environmental Impact Assessment (**Volume 2, Appendix 20A** [APP-312]), which agrees that future shoreline behaviour will depend on complex future dynamics.
12	Modelling simulations, incorporating a range of multiple storm scenarios, has not been carried out. In addition to storm magnitude and return period, directionality of storms appears to have been (be) crucial in the behaviour of this coastline. Specific direction arcs from which storm approach the site may increase the potential for coastline erosion. The modelling appears to be too broadly focussed to pick up such detail.	Modelling work conducted by the applicant meeting the IP's description has been conducted and reported over the past decade in various BEEMS Technical Reports, which are synthesised in the evidence base for Environmental Impact Assessment (**Volume 2, Appendix 20A** [APP-312]).
13	Future storm directions more from the North or South could indeed partially avoid the dissipating influence of the Dunwich and Sizewell Banks significantly and retain more storm energy for release at the shoreline. Fetch is as important as duration and intensity of wind events for the formation of extreme waves and future simulations by Grabemann and Weisse (2008) show that the highest waves will generally approach from more northwesterly and southerly directions in their study area (English East coast). Future wave extremes therefore are likely to highly impact the coast, effectively bypassing the Banks, retaining their wave energy more effectively as they are travelling over	Future storm and wave conditions have been assessed using the latest UKCP18 guidance and assessments, incorporating the findings of the reference given and a considerable quantity of further work in the interim. The predictions show wave energy is expected to decrease, not increase, the degree of which varies subject to the RCP climate change scenario considered. Modelling work conducted by the Applicant meeting the IP's description has been reported over the past decade in BEEMS Technical Reports synthesised in the evidence base for Environmental Impact Assessment (**Volume 2, Appendix 20A** [APP-312]).

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	relatively deeper nearshore waters compared to waves traversing the Banks.	
14	Report TR 311 states (p. 30) that "Successive marine surveys of the Sizewell – Dunwich Bank, indicate that there is no present sediment transport mechanism that could give rise to seaward migration; trends over the last 70+ years to date have shown stability (Sizewell) or landward migration of the bank flanks (particularly of the landward flank on the saddle and Dunwich Bank). Hydrodynamic modelling (BEEMS Technical Report TR357) also suggests that the flows patterns that maintain the bank in its present position would still occur even if there were no bank at this location – implying that sediment accumulation at the bank position is a natural condition and that the bank position is therefore likely to be enduring"	Agreed.
15	This is highly contradictory to what we know about offshore wave attenuation processes over subtidal banks such as Dunwich. These are submerged at shallow enough depths to invoke very significant wave attenuation (interaction with the sea bed) and energy dissipation (release) and therefore will most definitely have a sheltering effect on the shoreline at present. The above statement contradicts the previous section 2.3.2.2.3 where the Banks are said to play a significant role in wave refraction and energy dissipation responses. In the absence/reduction of such banks, wave refraction effects from obliquely approaching storm waves from a SE direction in particular, would then strike the coast with less obliquity, producing more wave set-up (water levels), heightened water levels from storm surge and ultimately induce an increased risk of coastal retreat. The addition of further human infrastructure along the largely natural shoreline under these conditions will have consequences for shoreline change dynamics both locally and down coast.	The quoted paragraph in Ref# 14 above does not refer to shoreline sheltering effects. Nor does it discuss waves at the coast. See SZC Co.'s reply in Ref#8 for how the Sizewell-Dunwich Bank affects waves. The statement regarding the basics of wave propagation over banks "*In the absence/reduction of such banks, wave refraction effects from obliquely approaching storm waves from a SE direction in particular, would then strike the coast with less obliquity, producing more wave set-up (water levels), heightened water levels from storm surge...*" is incorrect. Loss or reduction of banks would equate to less refraction, and therefore waves at the shoreline would be more oblique, not less oblique, and indeed to set-up would be less. The quoted paragraph references modelling of persistent circulatory dynamics around the bank and a lack of offshore-directed forcing which control its form/location. The modelling is consistent with the

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		formation and retention of sandbanks near headlands elsewhere in the UK and around the world.
16	TR311 cites the National Policy Statement for Energy (EN-1, sec 4.8.6) as requiring assessment of the impacts of anticipated climate change to "cover the estimated lifetime of the new infrastructure". The report, however, only considers sea-level change up to 2070 and therefore does not cover the entire lifespan of the infrastructure, and perhaps not even the full operational phase, depending on when production begins. Judging by the current situation it seems reasonable to assume that if production started in 2030, it would end around 2090 (20 years beyond the current scope of future shoreline change) and be followed by a decommissioning period of 100 years, extending to 2190.	Sea level rise (SLR) to 2070 was referenced in one context only (to indicate the relative SLR represented by work conducted under UKCP09 advice). All other modelling assessments of marine infrastructure have applied UKCP18 RCP4.5 95th percentile to 2100 as a standard for worst case SLR. Regarding the SCDF mitigation, further modelling is being conducted to 2140 (the end of decommissioning) and will be reported at Deadline 7 (Doc. Ref. 9.31(A)).
17	UKCP18 provides indicative sea-level rise to 2200 and beyond. The Environment Agency's 2019 report SC150009 cites a median RCP 8.5 sea level for 2200 as 1.8 m (range 1.3 - 2.9 m). The equivalent figures for RCP 4.5 are 1.1 m (range 0.7 - 1.8m). Since the lifetime of the infrastructure is of this order, future coastal change up to that time must be considered. The implications of sea-level rise for the sandbank-shoreline interaction are particularly important- whether the bank migrates, erodes or is overstepped (becomes decoupled from the shoreline) is of great importance for shoreline behaviour. This has not been addressed.	Please refer to response to Ref#4. The activities and structures remaining through the operation and decommissioning phase are SCDF maintenance and the BLF. Scour and dredging requirements for the BLF will lessen with sea level rise. It is reasonably likely that access dredging may not be required, for example. SZC Co. has committed to maintaining the SCDF. In addition, modelling has been conducted to assess its viability and performance to 2099. Further modelling to the end of decommissioning (2140) will also be undertaken and submitted at Deadline 7 (Doc. Ref. 9.31(A)). This work does include the appropriate sea levels for the timescale mentioned. The influence of the bank may affect the SCDF maintenance requirements, however this will be offset to a degree by the reducing wave climate predicted by UKCP18 for Sizewell. The reporting on the BLF and the SCDF (**BEEMS Technical Reports**

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		TR543 and **TR545** [PDB-010 and REP3-048]) assess the impacts and mitigation performance from the station.
18	North Sea sandbanks have not been well-studied, but modelling studies on the morphologically similar shoreface-connected ridges (Nnafie et al., 2014) show that they form during stable or slowly changing sea level. During sea-level rise they aggrade (grow upwards), but do not migrate and are ultimately "drowned" (i.e. become disconnected from the active coastal system). If this is the case, such coasts will undergo dramatic changes in morphology and behaviour with continuing sea-level rise as sandbanks become less important in wave energy attenuation. This possibility has not been adequately addressed in the present report.	Many peer-reviewed and published studies of North Sea sandbanks exist - they are in fact quite well-studied [References 1-5]. The scales of sea level rise and shoreline recession leading to palimpsest banks is far beyond that which could occur in the life of the stations. Such banks in the Norfolk Banks complex are more than 40 km from shore.
19	In TR 311 (p. 50) the southern North Sea and Lowestoft (the closest point of UKCP18 data to Sizewell) are described as showing a reduction in the mean annual maximum significant wave height of around 5% under RCP8.5 In contrast, Bonaduce et al. (2019) in a study of future wave climates by the end of the 21st century (2075–2100) within the North Sea region (also using a regional wave climate projection under the RCP8.5 scenario), showed that annual 95th percentile significant wave height (Hs), normalised difference between the future run and historical runs in winter, would increase by around 5-10%. This would lead to a more energetic wave region and therefore enhance the erosion potential for the coastline. If the Dunwich and Sizewell Banks were depleted in volume and/or extent, then the erosion potential would be further enhanced under these heightened future wave conditions. See Bonaduce et al.'s Fig. 11. for graphic representation of this.	The Applicant disagrees with the IP's interpretation of the Bonaduce et al (2019) paper. Its conclusions are in agreement with UKCP18 with respect to a reduction of 5-10% of wave heights at Sizewell. The Bonaduce et al (2019) paper does not show an increase in wave heights as the authors assert.

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20	Report TR311 (p. 52) states that "A natural increase in supply is likely because the Easton – Benacre Cliffs are likely to remain unprotected (see Section 2.4.3.4) and as the cliff-line retreats in this area, the volume of sediment released per unit retreat will rise due to increases in cliff height and available cliff length (Brooks and Spencer, 2012). Cliff exposure will rise with rising sea levels. The likely consequence is a rise in, or maintenance of, sediment supply. Additional sediment will slow rates of shoreline retreat and potentially increase accretion rates where it occurs, and over a long period of time it could counter shoreline retreat (i.e., reduce erosion rates) and result in slow growth of the Sizewell – Dunwich Bank"	Agreed.
21	This deduction (which is of course, favourable to the argument for minimisation of shoreline change) assumes that eroded sediment will remain on the shoreline. This perspective is, however, at odds with observations that onshore sediment losses through erosion are matched at historical scales by sediment accumulation on the offshore banks (Carr, 1979). Although the sedimentary linkage between the shoreline and banks is unlikely to be straightforward (Carr, 1979), the banks have historically been a sink for eroded sediment and there is no reason or justification for the assumption that eroded sediment in the future will, instead, remain on the shoreline. This is especially true of sand and finer-grained sediment that accumulates offshore while gravel is preferentially retained onshore.	There is no presumption of matching volumes, nor of sediment remaining and accumulating onshore, in the statement from TR311 referred to at Ref 20. It contends that erosion will increase sediment supply to the wider system i.e., there will be no automatic regional deficit if erosion pressure increases, because sediment is available to be eroded. This material will be available to feed the southward-directed longshore pathway, ultimately leading toward the bank. In feeding south, there will be less chance that southern sections are sediment starved and subject to increased erosion. The sedimentological nature of Sizewell Beach is also relevant - it is dominated by pebble sized sediments, which have been shown by sediment sampling, tracing studies and modelling to be largely confined above the subtidal zone and also within the Minsmere - Thorpeness sub-cell. There is no significant means for loss of this material; indeed additional supply presently occurs by erosion of the shingle ridge and, in future, supply increases are expected from

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		degradation or removal of the Minsmere sluice and erosion of the Dunwich Cliffs.
22	Furthermore, in contrast to the assertion that increased sediment supply will counter shoreline retreat, ongoing sediment to the offshore banks supply via coastal erosion is likely to lead to changes in bank configuration. As sea-level rises, it creates increased accommodation space for the banks to aggrade vertically. If there is increased sediment supply from more cliffline exposure and higher cliffs being eroded, then changes on the nearshore banks are likely to be more pronounced. Their elevation and distance from the future shoreline is likely to be an important aspect of future shoreline behaviour that has not been adequately considered in the assessment	This possibility for vertical aggrading supports the position that the Sizewell-Dunwich Bank could maintain height and protective facility into the future under SLR, thereby maintaining the nearshore wave conditions similar to those of the present.
23	3.2. It is stated that "for much of its operation" the hard defences would have a natural or maintained beach frontage. This statement does not explain the circumstances under which no beach frontage might exist, nor their likely duration.	SZC Co has committed to maintaining a soft coastal defence feature for the life of the station. The concept has been proven for the operation phase in **BEEMS Technical Reports TR545** [REP3-032] and **TR544** [REP3-048]. Although not expected, the mitigation measures already in place in the ES (**Volume 2, Chapter 20 and Appendix 20A** [APP-311 and APP-312]) would be used in the event of HCDF exposure (in addition to recharging the SCDF) (see the CPMMP [REP5-059]).
24	120,000 m3 of shingle is to be added to create the artificial beach. Subsequent maintenance of this "sacrificial" defence is to be considered by a subsequent beach monitoring and mitigation plan (MMP) to be agreed with the MMO (Marine Management Organisation) after approval of the overall scheme. Additional mitigation plans for future impacts on longshore sediment transport as a result of potential future exposure of the hard coastal defences are also to be agreed. There is no mention of what happens after 2080. If the sea defences	The imported shingle is used to create a sediment reservoir, enlarging the beach volume at Sizewell C. There is no mention within this report of limiting the CPMMP to 2080. The CPMMP will run until the end of the station life (2140) unless otherwise agreed by the authorising authority (for example as part of Sizewell C's Cessation of Monitoring and Mitigation Report; see Section 10 of the **CPMMP** [REP5-059]).

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	are to remain, they will continue to act as a headland, affecting the adjacent coast in perpetuity. Ultimately, as erosion continues, the defences could be outflanked, placing adjacent areas at risk. With the loss of the sacrificial soft defences, the hard defences themselves would come under increasing exposure to weathering and wave action and will require maintenance. With ongoing sea-level rise, they may need to be raised to continue to fulfil a protective function. If the defences are eventually to be removed, the fate of any hazardous material would have to be considered. None of these longer-term issues are addressed.	The maintained SCDF may form a promontory if, in future, adjacent shorelines recede past the present shoreline position (the deepening of the bay is a natural process). The role of the SCDF as mitigation is to maintain longshore continuity in this situation, and modelling work investigating the SCDF viability presented in **BEEMS Technical Reports TR545** [REP3-032] and **TR544** [REP3-048] highlights the feedback mechanism which is intended to limit the extent to which a headland develops (ie net supply from the SCDF will accumulate on adjacent beaches). This work will be extended to cover the decommissioning phase (to 2140) reported at Deadline 7 (7 (Doc. Ref. 9.31(A)). Following discussions with East Suffolk Council, SZC Co has agreed that the default position is for removal of the HCDF. However, both parties acknowledge that the final decision should be made closer to that time so that the impacts of retention and removal can be fully assessed, including impacts on what are likely to be different conservation designations. This stance - the need to take decisions closer to the time in order to undertake a suitable and robust assessment, is presented in both the ES (**Volume 2, Chapter 20** [APP-311]) and the **CPMMP** [REP5-059]).
25	With managed realignment and no active intervention designations in terms of SMP on coastal stretches either side of Sizewell, the site will progressively protrude as a headland as the coast on either side retreats. It will then act as an anchor point that will contribute to future changes in shoreline planform manifest as large-scale coastal configuration changes. There will be an impact on the managed realignment at Minsmere of both this headland development, and any sediment added to the system via mitigation.	The SZC site represents the transition between these two shoreline management strategies and as such requires a strategy which links the two sections, to prevent the situation described from arising in any case. The measures described in the CPMMP are designed to ensure that the local impact of the shoreline realignment do not propagate as wider scale effects - ie the longshore transport corridor is kept open and over more than 100 years SZC will add additional sediment into the longshore transport system by way of SCDF erosion and

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		replenishment. Whilst much of the frontage is expected to be stable, recession of the adjacent shorelines would increase erosion pressure on the northern and southern SCDF extents - if adjacent shorelines become highly receded, the end sections of the SCDF (10s of metres long) are likely to need more frequent beach recharge (as shown in **BEEMS Technical Report TR544** [REP3-048]).
26	As the headland protrudes, waves will have access to the flanks of the hard and soft defences and the hard defences could be outflanked, putting the landward infrastructure at risk. Edge effects of sea defence structures are well known and lead to enhanced erosion directly adjacent to hard structures (Morton, 1988). Griggs and Tait (1988), noted that rock armoured structures in California led to accelerated berm erosion and beach scour up to 150 m downdrift of the structure.	The role of the SCDF as mitigation is precisely to avoid exposure of hard structures and, thus, the consequences noted by the IP. Modelling work investigating SCDF viability presented in **BEEMS Technical Reports TR545** [REP3-032] and **TR544** [REP3-048] highlights the feedback mechanism which is intended to limit the extent to which a headland develops (ie net supply from the SCDF will accumulate on adjacent beaches). This work will be extended to cover the decommissioning phase (to 2140) reported at Deadline 7 (7 (Doc. Ref. 9.31(A)).
27	Development of a headland would also affect longshore sediment transport past the site and potentially lead to changes in behaviour (frequency of rollover, longshore sediment transport, sediment accumulation) of the adjacent gravel barrier at Minsmere. These have not been sufficiently considered in the assessment.	Mitigation outlined in the **CPMMP** [REP5-059] is also proposed to limit the longshore extent of impacts on longshore transport (restoring transport volumes by recycling or bypassing, as required). The CPMMP techniques will be used to ascertain whether there is a reduction to longshore transport (using a sediment budget) in order to determine if additional mitigation is required.
28	It also appears that the alongshore impacts of the armouring structures have been minimised in the EGA. They extend for only ca. 1 km alongshore. In contrast, in a large-scale modelling study investigating the century-scale impact of hard structures and beach nourishment	There are many reasons to conclude that impacts from placement of a relatively small amount of shingle at SZC will remain localised. **BEEMS Technical Report TR420** (summarised in **Volume 2, Appendix 20A** [APP-312]) illustrated that shingle is largely conserved

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	interventions that fix the position of the shoreline, Ells and Murray (2012) concluded (p.1) that "both forms of stabilization [hard structures an dbeach nourishment] are found to significantly alter patterns of erosion and accretion at distances up to tens of kilometers". Under certain circumstances the impacts extended 100 km from the initial human intervention. There is no reason to expect that the sea defences at Sizewell, which is part of a 70 km-long continuous, mobile sandy shoreline, would be any less impactive on areas alongshore. In contemporary coastal management, the consequences for adjacent areas of planned interventions, must be properly considered.	within the bay defined by control points at Minsmere sluice outfall and Thorpeness, with relatively little leakage or net alongshore movement. Since the SCDF is a soft feature avoiding significant impacts to the longshore transport pathway (and no barrier to the subtidal sand transport), there is no obvious pathway or mechanism for propagation of the effects of localised changes in alignment beyond the bay.
29	P.129 states that no works affecting the coast could proceed until mitigation plans are agreed. It is important that this be the case and that mitigation is agreed and is legally enforceable for entire operational and decommissioning phase.	The CPMMP [REP5-059] is secured by Requirement 7A of the DCO and Condition 17 of the DML.
30	It seems bizarre to state (p. 129) that there is a low chance of impacts on the nearshore bar and then describe measured and apparently unanticipated impacts of similar (admittedly smaller) structures on bar migration patterns at Sizewell B (p. 129). The Sizewell B outfall was noted to have affected the position of the nearshore bar, preventing its migration in comparison to adjacent sections of the bar and leading to shoreline accretion. The fact that the proposed Sizewell C outfalls will be located "on the seaward flank" of the nearshore bar does not mean that it will necessarily have less impact- the very reverse could even be true as it affects incoming waves and sediment movement.	The impacts at SZB are due to very considerable differences in scale of operational flows (100 times larger), a much larger head, and the position of the outfall head landward of the outer longshore bar, but into which it has migrated. The SZC nearshore outfalls are much smaller and already seaward of the outer bar and so would only have minor localised scour effects. The reasons for the different assessment are clearly stated in **Volume 2, Chapter 20** of the **ES** [APP-311] based on evidence provided in **Volume 2, Appendix 20A** of the **ES** [APP-312].
31	It is not possible to state (p.132) that there will be no regime shift. In fact, the introduction of an artificial headland into a mobile coastal system is the kind of action that could precipitate just such a change. It	The statement made is to the effect that regime shift is not assumed (not denying that it could occur). The baseline is defined on the basis of 'incipient exposure' i.e., to illustrate the condition of a nascent

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	changes the boundary conditions within which the coastal dynamics operate in the same way that other artificial structures alter their coastal surroundings from long distances alongshore. Ells and Murray (2012, p. 2) note that "even slight shifts in offshore wave energy distribution (as may be expected from global warming related changes in storm patterns) can induce rapid coastline shape change and accelerated erosion). Specifically, with reference to gravel beaches, Carter and Orford (1993) note (p. 158) that "Morphodynamic and morphosedimentary organization of coarse clastic shorelines provides a strong feedback with the incident wave field, and may be overcome only by domain shifts, which often result from sediment supply fluctuations or extreme events."	headland and thus the onset of a requirement for mitigation - in this context, a headland which has not yet formed cannot be the cause of a regime shift. Rapid changes in offshore conditions are not of concern, since these are external factors not caused by impacts from SZC - the scale of impacts from SZC on wave processes will remain similar to that assessed (low magnitude and local), and hence the degree to which SZC influences a regime shift will be negligible. Furthermore, UKCP18 does not suggest significant changes in offshore wave conditions - it shows slight reductions.
32	Several authors (e.g. Jennings et al. 1998; Carter and Orford, 1993) have documented morphological changes on gravel barriers and beaches that involve changing rates of sea-level rise in similarly geologically complex settings with headlands and embayments. The interaction between sea-level change and rates of coastal erosion influenced changes in sediment supply that can lead to a variety of shoreline behaviours including enhanced barrier rollover and, ultimately, breaching of the gravel barrier. The possibility of such changes occurring in response to changing rates of sea-level rise, sediment supply and feedback between the two has not been adequately considered in the report but cannot be ruled out on the basis of current evidence. They would have important implications for nature conservation at Minsmere, for example.	Modelling of the viability of the SCDF (**BEEMS Technical Reports TR545** [REP3-032] and **TR544** [REP3-048]) has illustrated the increasing vulnerability to breach of the southern Minsmere frontage as SLR increase to 2099 projections. The northern Minsmere frontage, which has a lower elevation and substantially smaller volume barrier, is already overtopped and expected to breach before the low point at the southern end of the Minsmere frontage. These processes, as mentioned by Jackson and Cooper, are expected, although the likelihood/degree of overtopping and breaching on the southern Minsmere frontage will be reduced owing to several decades of deposition of SCDF sediments in that area (increasing barrier volume and potentially height compared to a no SZC scenario). The case is assessed in **Section 2.15, Volume 1, Chapter 2** of the **ES Addendum** [AS-181]). SZC Co. has committed to maintaining the SCDF over the station life

Ref	Stop Sizewell C (Jackson & Cooper)	SZC Co response
		in order to avoid exposure of the HCDF and disruption to longshore transport. However, HCDF exposure would be preceded by natural geomorphic regime change on the Minsmere frontage. As a consequence, natural geomorphic regime change would not support the habitats and conservation designations of the outer Minsmere Levels as they are today, because of erosion, breaching of the shingle ridge and saline intrusion via temporary or permanent inlets, allowing the tide to flow in and out of the levels. The impacts that SZC would have on this natural process are largely beneficial – the provision of additional (SCDF) sediment to the southern Minsmere frontage over several decades or longer and, following exposure, the trapping of (net southward moving) sediment against the HCDF, which would lead to sediment accumulation on the southern Minsmere frontage (at the expense of shorelines immediately to the south). Therefore, the SCDF potentially increases the resilience of the Minsmere frontage against possible future regime change, by increasing the volume of sediment in the beach over the long period before exposure (which is expected to be after decommissioning).
33	The EGA involved two stages. In the first, 25-year measured shoreline change trends (1992-2018) were extrapolated 50 years into the future by which time the hard sea defences at Sizewell C were predicted to be exposed to direct wave action as the gravel frontage was eroded. The second stage involved a qualitative assessment to derive future shoreline positions with and without the Sizewell C defences in place. None of these extend beyond 2080, which appears to be no more than 50 years after operations begin. Yet, Volume 2, chapter 5 Decommissioning, Section 5.7.45 refers to "...any future climate change impacts during both decommissioning process on the site and	The EGA was primarily used to determine and justify the need for SCDF mitigation. It only extended as long as it needed to, to demonstrate that HCDF exposure would occur without maintaining the beach and SCDF. The longer period is inconsequential in this regard as the case for mitigation (secured by the CPMMP [REP5-059]) had already been made. However, it is incorrect to say that longer periods have not been considered, as shown in **BEEMS Technical Reports TR545** [REP3-032] and **TR544** [REP3-048].

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	surrounding environment for approximately 100 years following decommissioning"	
34	If production started in 2030 and ended in 2090 with 100 years of decommissioning, we conclude that some assessment of the situation up to at least 2190 is required, by which time sea-level rise is likely to be much more than the scenarios presented here and the likelihood of extreme events occurring in that interval is very much higher.	The end of decommissioning has been set at 2140 (not 2190). The assessment has proceeded appropriately based in UKCP18 climate change predictions for assessment of sea level rise and decreased wave conditions.
35	The first stage of the process assumes straightforward continuation of past rates of shoreline change to which is added an additional amount of retreat. Yet, it appears that the behaviour of the Sizewell shoreline over the past 25 years has not been typical of its longer-term behaviour. The Sizewell shoreline appears to have exhibited retreat for most of the past 500 years, (over 300m) except for a brief interval (1836-1920) when it accreted. This accreted coastline on which subsequent erosion has been recorded is not at all typical of conditions pertaining for most of the past half millennium. It cannot therefore be regarded as typical of conditions in the next century or two. In addition, during most of the past 500 years, sea-level change was minimal in comparison to the past 50 years and the projected changes in the next 100 years and so past changes cannot be used to infer likely future trends.	The EGA was an exercise in attempting to determine plausible future change from an examination of past behaviour. Future change will not begin from the condition of 'as it was 500 years ago' but from the present day, be it typical of the past millennium or otherwise. The conditions of the present day are demonstrably the most appropriate starting point for the projection of future change.
36	The Expert Geomorphological Assessment (EGA) is prefaced with the statement "Shoreline change is driven by several factors whose importance and interaction several decades into the future cannot be accurately predicted (Nichols et al., 2012), either separately or in combination." This in part, illustrates the challenge in providing a future assessment based on process-response-type interactions such as attempted in the report. In this regard, while we support and advocate the use of EGA (over numerical morphodynamic modelling, for	No comment required.

Ref	Stop Sizewell C (Jackson & Cooper)	SZC Co response
	example), there are some shortcomings in this particular example that undermine its credibility.	
37	In particular, in complex coastal systems, such as that under investigation, there is often no direct relationship between process and response. Instead, "autogenic events can arise from feedbacks internal to the system, without any variation in the forcing or boundary conditions" (Murray et al., 2014, p.2). This means that relatively sudden changes in the system can occur without any identifiable cause. An additional and important aspect of considering coastal systems in this way is not only do small scale changes affect large scale changes, but that large scale changes also affect small scale changes. This latter possibility is often (as in this study) overlooked. Without acknowledgement of this possibility and of the long-range impacts of coastal structures, the EGA is severely flawed in its approach.	The behaviour of dynamic systems is of great interest and indeed can generate changes with no identifiable cause, as noted in the comment, but the value of this observation is limited - unless an outcome has an identifiable cause, there is no possibility of management. The control of large-scale dynamics forcing small-scale change is not overlooked - on the contrary, it is invoked in the conceptual model in **Volume 2, Appendix 20A** of the **ES** [APP-312] as manifest in the incoherent, small scale fluctuations at longshore scales of order 100m that characterise shoreline change in the bay, and the recognition of unexplained cyclic behaviours. The long-range impact of coastal structures appears to invoke the opposite process - of small-scale change affecting the larger scales. This is not neglected either, since the CPMMP uses the conceptual model to identify that large-scale, long range impacts can be minimised by confining the effects arising from local impacts within the Sizewell sub-bay defined by the control points at Minsmere sluice and Thorpeness.
38	To simplify the future coastline projections several a priori assumptions have been made by the expert group. These assumptions underly the subsequent analysis and their validity is central to the subsequent assessment. Here we assess some of those assumptions and show them to be invalid.	It is not a matter of simplification, but of analytical assessment of the most likely short-term status of these environmental factors over the time window of the projection (initially set at up to 50 years). **BEEMS Technical Report TR403** (synthesised in **Volume 2, Appendix 20A** of the **ES** [APP-312]) also provided a detailed assessment of each assumption in respect of its possible range of states (and the geomorphic consequences of such variation) over the time horizon.

Ref	Stop Sizewell C (Jackson & Cooper)	SZC Co response
39	Detailed studies on past coastal behaviour (Pye and Blott, 2006; Burningham and French, 2018; Reeve et al., 2019) show that changes along this coast are spatially and temporally variable and that there are certainly alongshore linkages between behavioural patterns at different sections of the shoreline and most probably onshore-offshore linkages in terms of sediment supply and storage (Carr, 1978).	Agreed. Regarding onshore - offshore linkages, sand is exchanged between the subaerial and subtidal beach, and is largely funnelled offshore to Sizewell Bank due to the Coralline Crag ridges on the north-east side of Thorpe Ness.
40	Burningham and French (2018 p.134) note that over the past century 89% of Suffolk intertidal beaches have narrowed and steepened through more rapid retreat of the LWM than HWM. This important change in morphology (in which the final stages of wave energy dissipation occur across a narrower zone close to shore) could very well be indicative of a forthcoming system change (when a critical steepness is reached). It certainly points to a system-wide change in decadal-scale morphodynamics and argues against linear extrapolation of past trends (when beaches were wider and more gently sloping) into the future. At the very least, the foreshore steepening points to a reduced sediment volume in the intertidal beach and this decreases the system response time to dynamic impacts, making the coast more volatile particularly under any heightened future wave regime.	Shoreline change and beach profiles for the relevant section of the Suffolk coastline have been reviewed in depth (**BEEMS Technical Reports** synthesised in **Volume 2, Appendix 20A** of the **ES** [APP-312]). **Volume 2, Chapter 20 of the ES** [APP-312] has considered the impact of SZC marine elements on coastal processes and shown these to be minor in magnitude and assessed likely effects as localised and not significant. Natural changes in regional conditions (including 'storminess') will not alter the scale of these impacts. The principal aim of the proposals within the CPMMP is to ensure that residual SZC impacts do not propagate to regional scale effects. Furthermore, the comment regarding decreasing beach volumes will not apply to Sizewell C as the beach and SCDF volume will be enlarged and maintained.
41	The assumption (TR311, p.134) that the worst-case impacts would arise when the HCDF first begins to affect coastal processes and would decline into the future is not tenable. The presence of the artificial headland of the Sizewell C coastal defences will continue to exert a major influence on coastal evolution from its first emergence and thereafter.	This statement is superseded by the changes presented and assessed in **Sections 2.2 and 2.15, Volume 1, Chapter 2 of the ES Addendum** [AS-181] which have committed SZC Co to maintaining the beach and SCDF from the outset across the station life. In the unlikely event that the HCDF is exposed, the SCDF would be reinstated in accordance with the CPMMP [REP5-059]. The consideration of the longer term (post-decommissioning) will be

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		determined closer to that time, when the impacts of retaining or removing the HCDF (including on future conservation designations, which cannot be presently known) can be confidently assessed. The CPMMP proposes the assessment be conducted ten years prior to the end of decommissioning. It is worth noting that were the HCDF to be retained, its impacts would be similar to those occurring in the absence of SZC. That is, exposure of the Bent Hills and SZA and SZB platforms will have the same effect. Given the timescale and sea level rise, the headland in the Sizewell area (with or without SZC) is likely to be alongside a recessed shoreline with breaches and saline intrusion / flooding. The closer to this context the future shoreline approaches, the greater the decline in significance (relative impact) of SZC (because the two futures with and without SZC are less and less distinct).
42	This explicit exclusion of the impact of extreme meteorological events (wind, waves, storm surge, water set-up etc.) from a forecast looking 50 years ahead is extraordinary, as it is statistically probable that a high-magnitude, low-frequency event will occur in that time period. If the analysis is extended to the post-decommissioning stage, as it should be, this principle is even more ridiculous. Consideration of such events is crucial in properly assessing flood risk and coastal erosion risk, especially as even the short-term effects of an extreme event could be sufficient to render elements of the planned infrastructure at risk. While it is likely of very low probability, the potential of tsunami impact should also be considered.	The **ES** also includes consideration of extreme events for the flood risk assessment, in which 1:10,000 year return intervals are considered with extreme climate change over the life of the station [APP-093]. Regarding coastal geomorphology, assessment of the degree to which high-magnitude low frequency events could affect the shoreline projection was made in **BEEMS Technical Report TR403**. Furthermore, modelling for **BEEMS Technical Reports TR545** [REP3-043] and **TR544** [REP3-048] included events up to a 1:107 year event for wave power with SLR up to 2099 with wave dissipation effects from the bank excluded). This magnitude event is also contained within the historical record of beach erosion and recovery and these studies indicate they would precipitate no likely significant

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		deviation from the projected pathway of change. The impact of SZC on coastal processes is not expected to be significant during a tsunami or equivalent storm event with multi-millennial return periods.
43	Previous work (Burningham and French 2018) on the Suffolk coast found little evidence of regionally coherent shoreline change, such as might be attributed to SLR. It is disingenuous then to surmise that historic rates of shoreline change incorporate a SLR signal. They could equally be masking or even accentuating any potential signal.	Even were such a signal masked, there are clearly systemic dynamics at work masking the signal, hence these too would be captured by such a method. There is no reason to suspect that more SLR will impose regional coherence. While SLR does not significantly accelerate (as expected for the period covered by the EGA, to which this assessment applies), similar dynamics are likely to apply.
44	This assumption [The inshore wave climate remains unchanged.] seems to be partly based on an earlier implicit assumption that sandbank morphology does not change. As discussed above, this is an untenable assumption given observations on adjacent sandbanks that show cyclic and episodic changes at decadal timescales. These inevitable changes will certainly alter the nearshore wave climate even if the offshore wave climate is unaltered.	Decadal scale cyclicity and change are captured in the assumption of an unchanged climate since this is based on 30+ years of data. The assumption is made to indicate that substantial bank change (loss of mass/height) appears neither imminent, nor possible on decadal timescales. UKCP18 wave predictions indicate a decrease in wave climate - this may be counterbalanced over the decades to some degree based on the difference between sea level rise and rising bank elevation. As the bank mainly reduces energy in severe storms (having little effect of frequent moderate storms), the bulk of the energy at work on the coast would be similar or less than present (due to predicted climate change reductions in waves). Were the bank elevation relative to sea level to decrease, slightly more energy can be expected on the Minsmere and Sizewell frontages. For Sizewell this could equate to occasional increases in the expected beach recharge mitigation for the SCDF but would not lead to any worsening of adverse impacts (e.g., from the BLF).

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45	Although UKCP18 projections of global climate change do not foresee near-future changes in wave climate, other subsequent studies (Grabemann and Weisse, 2018; Bonaduce et al., 2019) do predict changes, particularly an increase in the extreme significant wave heights. Other work (e.g. Pye and Blott, 2006, and cited in TR403, p. 23.) has attributed some historical changes in coastal behaviour directly to changes in wave climate. It seems reasonable to assume that if there were historical changes in wave climate during the 20th century (linked to the NAO for example), that in an era of global climate change, future changes can also be anticipated.	The quoted studies show wave height declines on the UK east coast at Sizewell, in line with UKCP18. The Applicant disagrees with the IP's interpretation of the Bonaduce et al., 2019 paper, which shows decreasing wave energy, not increases as claimed. Furthermore, future wave climates may indeed change (eg beyond the UKCP18 predictions) but the magnitude of local impact from SZC on those waves will not i.e., the impact on a 2m NE wave will be the same in both epochs.
46	Related assumptions regarding longshore transport are similarly questionable. Since the contemporary wave regime comprises almost equal N and S-directed components, even subtle variations in wave regime and/or bathymetry have the potential to cause changes in the net drift direction. Working on the south Suffolk coast, Blanco and Brampton (2017) linked increased erosion since 2013 to a reversal of longshore transport direction. This, in turn was linked to two high positive NAO index years following a high negative NAO index in 2013.	Influences of the NAO at Sizewell are not distinct, and the NAO is not forecast by UKCP18. Changes are possible and are acknowledged as such - modelling for the conceptual model [APP-312] indicates that the impacts on the shoreline at Sizewell are dependent on the magnitude of the increase in SE wave dominated years. However, even in an extreme switch effectively reversing longshore transport, the impacts from SZC remain minor as long as the pathway (or volumetric sediment transport) past the site is maintained. Regarding the Blanco and Brampton paper (which was not peer reviewed), this nearby work shows a local link between the NAO and patterns of modelled longshore transport. However, the Bawdsey site is rather different from Sizewell in that the wave climate and transport there are not in balance. Furthermore, changes in the shoreline at Sizewell have little correlation with forcing conditions (as shown in **BEEMS Technical Report TR403**; synthesised in **Volume 2, Appendix 20A of the ES** [APP-312]).

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47	For poorly understood reasons, long-term shoreline accretion dominated Sizewell's coastal change between 1836 and 1926. This coincided with northward growth of the Sizewell-Dunwich Bank (Pye and Blott, 2005) but the mechanism and relationship between Bank and shoreline remain unclear. Without a knowledge of the reasons for this period of accretion, it cannot simply be presumed that no future accretion will occur. Changes in sinuosity are natural outcomes of the emergence of headlands and the subsequent development of very large-scale promontories and indentations, e.g. the Carolina Capes, can result from positive feedback operating on initially small scale coastal protuberances like these (Ashton et al., 2001). Ashton et al. (2001) demonstrated how an initial small perturbation in the shoreline can grow through positive feedback (between the proturberance and longshore drift) to create very large-scale shoreline features. The accentuated shoreline planform promontories at Sizewell B and Minsmere outfall identified in TR 403, are clear evidence of the possibility of cuspate features to form. This would lead to a major change in coastal planform involving large areas of erosion and accretion and certainly negates the simple assumption of no change in sinuousity.	Accretion of the shoreline would mean that the possible impact of HCDF exposure does not occur. For this reason, there was no value in further considering this case as it is not worst case. It would seem likely that the coincidence of eroding Dunwich-Minsmere cliffs with accreting shorelines a few kilometres south at Sizewell and southern Minsmere, where the wave obliquity under the inferred NE dominant wave climate decreases (due to the change in shoreline orientation south of the sluice) is a likely explanation for the 1836 - 1926 observations of accretion. Accretion at the SZB outfall, if extrapolated, would lead to unreasonably large and pointy cusps, and accretion appears to have ceased within a decade (hence comparable sinuosity and no accretion were reasonable assumptions). The identification of promontories at Minsmere and SZB outfalls is apposite, since these are considered to act as controls on the planform around the SZC frontage at present. The future of Minsmere sluice outfall in particular is likely to exert a far greater control over the planform than any minor promontory at SZC for as long as the outfall is in place, since it has held the shoreline position for over 150 years with no mitigation.
48	While we agree that the migration of the whole bank is unlikely, the possibility of surface morphological changes is high (subtidal ridges are mobile). These could cause significant changes in wave conditions onshore. Aldridge et al. (2018) modelled centimetre-scale topographic change on the Sizewell Bank at a one-week scale. Carr (1979) documented significant changes in the volume and morphology of the Sizewell-Dunwich bank between 1824 and 1965 involving migration at rates of 101 m/year. Subsequent detailed work on adjacent banks in the region (Newcombe Sands, off Lowestoft) where more data are	Up-to-date assessment of bank dynamics over varying timescales up to centuries was presented in considerable detail in **BEEMS Technical Report TR500** which contributed to the system conceptual model developed in **Volume 20, Appendix 20A** of the **ES** [APP-312]. Relevant hydrodynamic modelling has been carried out (see response to Ref# 11). The authors appear to have examined literature on both the Sizewell - Dunwich Banks and Newcombe Bank (adjacent to Lowestoft) as the Applicant has. The Applicant considers that these banks are

Ref	Stop Sizewell C (Jackson & Cooper)	SZC Co response
	available revealed several important aspects of bank behaviour that appear to have been disregarded in this assessment.	disconnected and have no common behavioural patterns. It is therefore inappropriate to apply any conclusions about Newcombe Sands to the Sizewell - Dunwich Bank.
49	These observations appear to undermine the assumptions of the EGA when assessing future stability of the Dunwich and Sizewell banks and related impacts on the shoreline. The fact that the shoreline has exhibited dramatic reversals in shoreline behaviour (Pye and Blott, 2006) attests to the potentially strong influence of bank morphology. Equally, the statement that increased cliff erosion via bank lowering would lead to augmentation of the sediment volume and prolong the life of the soft coastal defences, is invalid; the locus of increased wave erosion could just as well be located at Sizewell C as on any cliffed coastline.	Up-to-date assessment of bank dynamics over varying timescales up to centuries was presented in considerable detail in **BEEMS Technical Report TR500** which contributed to the system conceptual model developed in **Volume 20, Appendix 20A of the ES** [APP-312]. Natural changes in regional conditions (including variations in bank influence) will not alter the scale of these impacts. The locus of increased wave erosion is much more likely at Dunwich (where the severe historical erosion occurred) than at Sizewell (where it did not and the bank has remained positionally stable and without large scale variations observed at Dunwich).
50	Just as the Minsmere Outfall has “had a significant role in anchoring the shoreline immediately adjacent to the outfall structure by trapping shingle moving north and south during storms, resulting in the formation of a promontory and accretion observed over c. 500 m of frontage” (TR311, p 136), so too, is the emergent hard defence fronting Sizewell C likely to have a role.	Agreed - hence mitigation to prevent an emergent HCDF is proposed by the Applicant (secured via the CPMMP [REP5-059]). The exposure of the HCDF is not expected to occur because SZC Co. has committed to maintaining the SCDF over the station life. Any short-term exposure would have limited effect as the SCDF would be reinstated.
51	In both this and the “with Sizewell C” analyses, the geographical restriction of the study area cannot be justified. On a continuous soft-sediment mobile coast like that of Suffolk, changes in one part of the system are intimately related to changes elsewhere. This basic principle has been established locally through published works by members of the EGA team (Burningham and French, 2018) and is uniformly acknowledged in large scale coastal geomorphology (e.g. Terwindt et al., 1991; Ashton et al., 2001; Sabatier et al., 2009) that	Sizewell C activities have minor and localised impacts to sediment transport (typically up to 100 – 200 m). And were impacts to persist and grow, they would radiate out from the activity source. This means that they would travel slowly and within the confines of monitored extents and the GSB; There is no SZC structure that reduces bulk transport to the south (excluding an exposed HCDF which the SCDF will mitigate); No sediment is removed from the system; indeed, quite the opposite,

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	underpins modern Shoreline Management Plan applications (Cooper and Jay, 2002). Although sub-cells of shoreline behaviour can be identified, they are intrinsically linked to adjacent stretches of coast; they can both cause, and be affected by, changes in adjacent sections.	sediment would be added to the system via beach recharge for over 100 years, although as this is shingle it will largely be retained locally. Net transport rates are slow and shingle is retained within the Minsmere Sluice – Thorpe Ness sub-cell (as indicated by our reporting and several external reports, including the SMP). The Applicant is of the view that it has followed the precautionary approach (see SoCG; Ref. 9.10.12). The extents set out in the Coastal Processes MMP (**Volume 3, Appendix 2.15.A of the ES Addendum** [REP5-059]) are always larger than the predicted impacts, to allow for uncertainty. If the impact footprint exceeds the monitored area, the spatial extent will be adjusted accordingly (CG.1.3 response to **ExA** at D2 [REP2-100]). That is, the CPMMP will take an adaptive approach to monitoring. Such changes would be secured through MTF consultation and require approval from the approving authority (ESC and the MMO) under the terms of Requirement 7A of the DCO and Condition 17 of the DML. Changes at a large scale require changes at a smaller scale to propagate through the system and (with allowances for the specific impact), the greater the scale, the longer the time required for effects to occur at a distance. The SZC impacts identified are localised and low magnitude and the effects assessed in **Volume 2, Chapter 20 of the ES** [APP-311] as likely not significant. Nevertheless, an extensive CPMMP has been developed with high-frequency, high-resolution monitoring of all coastal receptors within the local cell which will identify any effects arising from the cumulative development.

Ref	Stop Sizewell C (Jackson & Cooper)	SZC Co response
		Whilst external system changes may indeed have implications for shoreline planform in the very long-term, the responsibility of the Applicant, and hence the concern of the CPMMP, is only those changes (impacts) that are affected by SZC. Far field geomorphic changes that are not impacts cannot be considered the responsibility of the Applicant to monitor. This is a fundamental principle of monitoring applied to any and all marine works under the regulation of the MMO.
52	The lack of projected recession in the vicinity of the proposed Sizewell C installation in this scenario is perplexing. One would expect edge effects (Morton,1988; Griggs and Tait, 1988) from wave refraction from the existing sea defences at Sizewell B to enhance erosion in this location.	The scenario only explored the period leading to exposure of the HCDF, by recession in the vicinity of SZC. The defences at SZB, set further back, have no impact during this period.
53	Assumptions regarding the continuation of the slow erosion rate are called into question by the observed long-term beachface steepening (see above). This pattern suggests progressive loss of sediment and an incipient phase change, perhaps even resulting in dramatic change on the upper beach as wave dissipate closer to the backshore. A similar steepening has also been noted on the Sussex coast (Dornbusch et al., 2008; Hurst et al., 2016) where it was deemed responsible for recent changes in rates of cliff retreat. On the sandy Rhone delta coast coastal structures are at risk of being undermined as the regional nearshore slope has steepened, permitting increased wave action at the shoreline. Such potential linkages appear not to have been not considered in the Sizewell investigation. In any case, the accretion and stability observed during the past century is at odds with the longer-term observed erosion at Sizewell and needs to be viewed in the context of the wider coastal system.	Shoreline change and beach profiles for the relevant section of the Suffolk coastline have been reviewed in depth (BEEMS Technical Reports that have been synthesised into **Appendix 20A of the ES** [APP-312]). **Volume 20, Chapter 20 of the ES** [APP-311] has considered the impact of SZC marine elements on coastal processes and shown these to be minor in magnitude and assessed likely effects as localised and not significant. Natural changes in regional conditions (including beach steepening) will not alter the local scale of these impacts. The principal aim of the proposals within the CPMMP is to ensure that residual SZC impacts do not propagate to regional scale effects.

Ref	Stop Sizewell C (Jackson & Cooper)	SZC Co response
54	The single variation from the "without Sizewell C" scenario is that erosion would be higher up to ca. 1 km north of the Sizewell C hard defences. This deduction is untenable, in view of the much greater alongshore impacts of coastal structures at long timescales discussed above (Ells and Murray, 2012). Confining the longshore impact of the emergent hard defences headland to ca. 1 km is not consistent with observations and simulations elsewhere. Sabatier (2009), for example, reported impacts from sea defences > 10 km alongshore from their location while Ells and Murray, (2012) simulated longshore impacts for 10s (up to 100) km from sea defences.	Please see response at Ref 41.
55	It is also argued (Tr137, p.140) that "The existing 'mound' of high ground at this location (the Sizewell Bent Hills) would have a similar bounding effect on the beach roll-back without Sizewell C". This is not true because the natural hills would erode, changing shape and yield sediment to the coastal system whereas the sea defences will not.	SZC Co. does not recognise the report number TR137. Although SZC co. does hold a BEEMS report by this number, it is not on coastal geomorphology, was not part of the ES submission, and therefore was not publicly circulated. It is unclear as to which report is being referred. The role described is indeed similar to the SCDF, which would likewise erode, change shape and yield sediment.
56	Slott et al. (2010, p.17) concluded "long-term effects may spread on the order of tens of kilometers away from the nourishment area itself" while Ells and Murray (2012, p.6) noted that "stabilization through hard structures can have long-range effects in the long term." and (p1) conclude that "In centurial model experiments where localized stabilization is maintained in the context of changing climate forcing, both forms of stabilization [nourishment and hard sea defences] are found to significantly alter patterns of erosion and accretion at distances up to tens of kilometers" (italics added). The accentuated	Stabilisation by hard defences is not proposed - the impacts described for hard structures are specifically mitigated / avoided by the SCDF. The low rates of transport indicate that the impacts of additional sediment (primarily pebbles) supply at the SCDF will be local (unlike those examples cited that perhaps are not relevant to the Sizewell case). Furthermore, as described, the CPMMP would identify/track any adverse impacts radiating away from Sizewell and were these to be of concern (ie significant in EIA terms) the existing beach mitigation would be adapted as necessary.

Ref	Stop Sizewell C (Jackson & Cooper)	SZC Co response
	shoreline planform promontories that have developed in a relatively short time at Sizewell B and Minsmere outfall, provide evidence of the propensity for cuspate features to develop.	It is noted that the Minsmere outfall, with Thorpeness, has defined the Sizewell sub-bay over 150+ years (i.e., a long period, not "...a relatively short time..." of its presence and that within this controlled zone of interest, the SZB outfall has created a minor cuspate feature within the bay, with no discernible consequences beyond its immediate vicinity.
57	When the hard defences are exposed through shoreline recession, the a priori assumption regarding future shoreline sinuosity is needed to enable the assertion that the headland would not protrude as much as the Minsmere outfall. Since such an assumption is not justified (see above), it cannot be concluded that the hard defences would have no impact on sediment supply to the adjacent beaches. The extension of this line of reasoning to suggest that drift line vegetation might be re-established and erosion of the SSSI would be postponed, also cannot be justified. Any implied environmental gain should therefore be discounted	This comment has been superseded - see SZC Co.'s reply to Ref#54 The HCDF is not exposed due of the presence of the SCDF - hence the assumption of sinuosity is applied to the shoreline with a continuous sediment pathway, upon which natural redistribution and feedback between shoreline angle and sediment supply from the SCDF would act to soften any tendency to create exaggerated cuspate forms. Hard defences will have no impact on sediment supply as they are not exposed to the marine environment. Were an unexpected phase of exposure to occur, the SCDF would be reinstated and appropriate mitigation applied as outlined in the CPMMP [REP5-059].
58	Shoreline mitigation involving replenishment and recycling is considered viable given the low erosion rates (p 147). However, as stated above, the past century has not been typical and more rapid erosion has been the longer-term condition. The foreshore steepening could be indicative of a return to such erosive conditions. If this is the case, the volumes of sediment required for nourishment/recycling may be very much greater than anticipated and the costs and logistical implications may need to be more fully considered in the event that more frequent nourishment is required. A shortfall in the perceived amount of sediment necessary would leave infrastructure at risk. In	Viability of the SCDF has been investigated in **BEEMS Technical Reports TR545** [REP3-032] and **TR544** [REP3-048] including 1:107 year storm events and sea level rise up to 2099 projections. This will be extended to consider the decommissioning phase in further work to be submitted at Deadline 7. Behaviour enduring for a century would be considered typical of the century concerned but in any case contains periods of contrasting activity. The adaptive CPMMP includes provision for assessment of monitoring data for any signals of shift in the long-term or net trends

Ref	Stop Sizewell C (Jackson & Cooper)	SZC Co response
	addition, neither the system-wide and long term impacts of nourishment (they can extend for 10s of kilometres alongshore and cause impacts for decades: Ells and Murray, 2012) nor the longevity and fate of emplaced sediment volumes, have been properly considered.	relative to those of the present day, which can be expected to emerge gradually from the data as a result of natural short-term variability.

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APPENDIX D: PLANTING PHASING STRATEGY

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1 PLANTING PHASING STATEGY

1.1 Introduction

1.1.1 The project design principles contained within **Chapter 5** of the **Design and Access Statement** state that new planting will be established at the earliest practicable opportunity. This document provides information on the indicative timing of these works in relation to the construction phase programme identified in **Chapter 3 (Description of Construction)** of the **Environmental Statement** and as amended by subsequent ES Addenda, which identifies the following phases:

- Phase 1: Site establishment and preparation for earthworks (Years 1 – 2)
- Phase 2: Main earthworks (Years 1 – 4)
- Phase 3: Main civils (Years 3 – 9)
- Phase 4: Mechanical and electrical installation (Years 4 – 11)
- Phase 5: Commissioning and land restoration (Years 10 – 12)

1.1.2 The planting phasing strategy is aligned to the landscape proposals set out in the **Chapter 8** of the **Design and Access Statement** and the relevant design principles set out in **Chapter 5**. These are:

- DP2 - Promote appropriate new landscape design (planting and landform) to mitigate the landscape and visual effects of the development.
- DP3 - Establish new planting and landform at the earliest practicable opportunity.
- DP 9 - Seek to retain / provide areas of habitat connectivity and continuity as far as possible.

1.1.3 The specific timing of planting is largely dependent on the construction phasing programme with some areas to be restored in advance of others following cessation and removal of construction activity. The following sections provide a brief description of the new areas of planting proposed within the main development site (MDS) and identify which construction phase they are envisaged to be implemented. The description should be read in conjunction with **Drawings SZC-SZ0100-XX-000-DRW-100291 to SZC-SZ0100-XX-000-DRW-100293**.

1.1.4 An additional 'Advanced Planting Phase' is included prior to the start of construction activity to show areas of planting to be implemented in advance of, or as part of, enabling works to provide initial screening and integration of built features. Some of this planting has already been completed with further planting planned for 2021 / 2022 tree planting season. All areas shown are indicative and subject to detail design.

1.2 Advanced Planting Phase

1.2.1 Refer to **Drawing SZC-SZ0100-XX-000-DRW-100291**;

- P1, Pillbox Field – woodland and scrub planting in accordance with the consented Sizewell B relocated facilities planning application (ref. DC/19/1637/FUL). Implemented in 2021.
- P2, northern edge of Goose Hill – scalloping of the northern edge of Goose Hill woodland and inter-planting of new stock. Implemented in 2015.
- P3, northern boundary of Dove House Hill – tree planting along the northern boundary of Dove House Hill field. Implemented in in 2021.
- P4, northern Boundary of Long Walk – supplementary planting to the existing hedgerow along the northern boundary of Long Walk. Implemented in 2015.
- P5, eastern boundary of Eastbridge Road – supplementary planting to the existing hedgerow to the east of Eastbridge Road. Implemented in 2020.
- A1, northern area of Dove House Hill – woodland planting within the northern area of Dove House Hill field, between Dove Hill Plantation and Sandy Pytle. Scheduled for the 2021/2022 tree planting season.
- A2, eastern boundary of Sandy Pytle – woodland planting along the eastern boundary of Sandy Pytle and the proposed wetland area. Scheduled for the 2021/2022 tree planting season.

1.3 Construction Phase 1

1.3.23 Refer to **Drawing SZC-SZ0100-XX-000-DRW-100292**;

- E1, Wetland Area – wet woodland and wetland planting within Sandy Pytle and the adjoining fields.

1.4 Construction Phase 2

1.4.23 No new areas of planting are proposed during this phase of work.

1.5 Construction Phase 3

1.5.23 Refer to **Drawing SZC-SZ0100-XX-000-DRW-100293**;

- C1, Main platform – boundary planting to the western and northern edges of the main platform following completion of engineering works.
- C2, SSSI Corridor – planting of the SSSI crossing embankments and other engineering interfaces with the SSSI.
- C3, Northern Mound – planting of the northern mound following completion of engineering works.
- C4, Pillbox Field – planting the remainder of Pillbox Field in accordance with Option 1 or Option 2 of the DCO application.
- C5, Lover's Lane – supplementary planting to existing tree and hedgerow boundary east of Lover's Lane.
- C6, LEEIE – boundary planting at the edges of Land East of Eastlands Industrial Estate following completion of engineering works.
- C7, Realigned Lover's Lane – boundary planting on either side of the re-aligned Lovers Lane following completion of highway works.
- C8, Abbey Road – supplementary planting to existing highway boundaries on either side of Abbey Road following completion highway works.
- C9, B1122 Roundabout Junction – tree and hedgerow planting surrounding the proposed B1122 roundabout junction following completion of highway works.
- C10, Borrow Pit boundary – supplementary planting to the existing hedgerows on the western and northern boundaries of borrow pit field 2.
- C11, Sea Defences – planting of the permanent sea defences following the completion of engineering works.

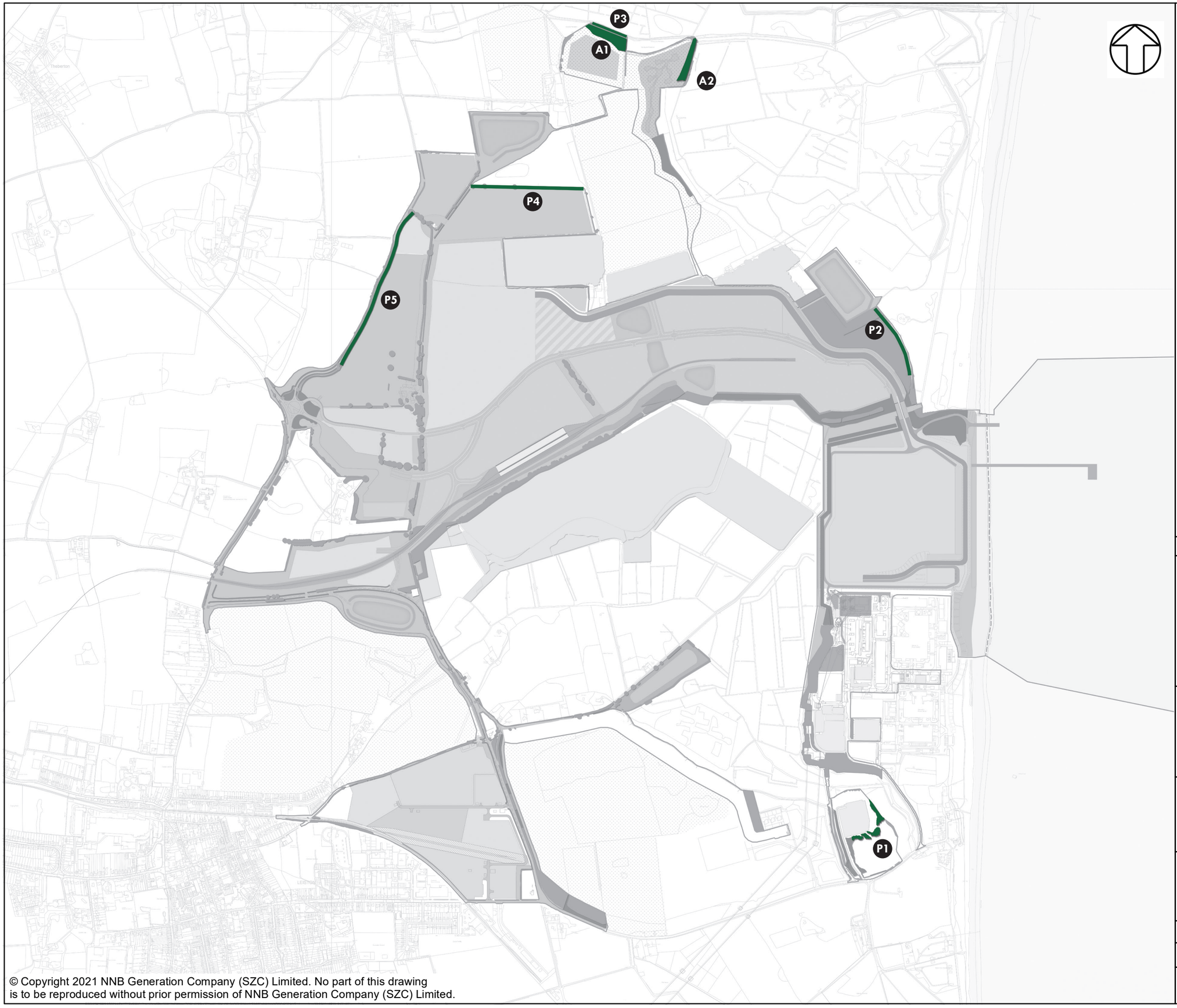
1.6 Construction Phase 4

1.6.23 No new areas of planting are proposed during this phase of work.

1.7 Construction Phase 5

1.7.23 The final phase of construction would include all remaining planting associated with the restoration of the MDS in accordance with the Landscape Masterplan (**Drawing SZC-SZ0701-XX-000-DRW-100141**) and the landscape proposals set out in the **Chapter 8** of the **Design and Access Statement.**

APPENDIX A: DRAWINGS SZC-SZ0100-XX-000-DRW-100291 TO SZC-SZ0100-XX-000-DRW-100293



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KEY

Woodland / Tree / Hedgerow Planting

Existing Advanced Planting

- P1 Pillbox Field
- P2 Northern edge of Goose Hill
- P3 Northern boundary of Dove House Hill Field
- P4 Northern boundary of Long Walk Field
- P5 Eastern boundary of Eastbridge Road

Proposed Advanced Planting

- A1 Northern area of Dove House Hill Field
- A2 Eastern boundary of Sandy Pytle

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EDF CGN

DOCUMENT:

DRAWING TITLE:
ILLUSTRATIVE PLANTING PHASING STRATEGY
ADVANCED PLANTING

DRAWING NO:
SZC-SZ0100-XX-000-DRW-100291

DATE:	DRAWN:	SCALE :	REVISION:
SEP 2021	LDA	NTS	1.0

SCALE BAR
NTS

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KEY

Woodland / Tree / Hedgerow Planting

Wetland Planting

Early Planting (during Construction Phase 1)

E1 Wetland Area

Planting during Construction Phase 1 once ground works are complete.

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DOCUMENT:

DRAWING TITLE:
ILLUSTRATIVE PLANTING PHASING STRATEGY PLANTING DURING CONSTRUCTION PHASE 1: SITE ESTABLISHMENT AND PREPARATION FOR EARTHWORKS

DRAWING NO:
SZC-SZ0100-XX-000-DRW-100292

DATE:	DRAWN:	SCALE :	REVISION:
SEP 2021	LDA	NTS	1.0

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KEY

Woodland / Tree / Hedgerow Planting

Grassland Planting

Early Planting (during Construction Phase 3)

- C1 Main Platform boundaries
- C2 SSSI Corridor / interfaces
- C3 Northern Mound
- C4 Pillbox Field
- C5 Lover's Lane highway
- C6 Land to the East of Eastlands Industrial Estate field boundaries
- C7 Realigned Lover's Lane
- C8 Abbey Road boundaries
- C9 B1122 Roundabout Junction
- C10 Borrow Pit Field 2 boundaries
- C11 Permanent Sea Defences

Planting during Construction Phase 3 once associated ground works and infrastructure are complete.

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DOCUMENT:

DRAWING TITLE:
ILLUSTRATIVE PLANTING PHASING STRATEGY
PLANTING DURING CONSTRUCTION PHASE 3:
MAIN CIVILS

DRAWING NO:
SZC-SZ0100-XX-000-DRW-100293

DATE:	DRAWN:	SCALE :	REVISION:
SEP 2021	LDA	NTS	1.0

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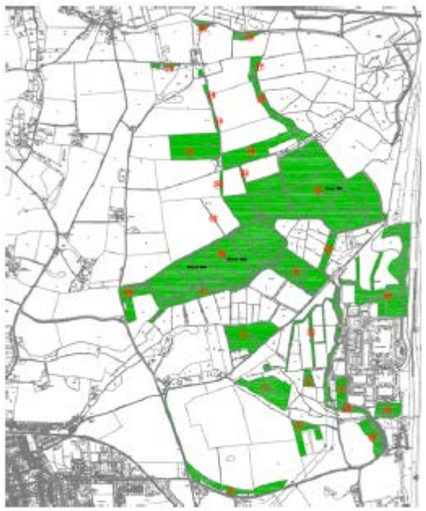
APPENDIX E: ESC RESPONSE TO THE APPLICANT'S RESPONSE ON BAT IMPACTS RAISED IN THE LIR

ESC Response to the Applicant's Response on Bat Impacts raised in the LIR

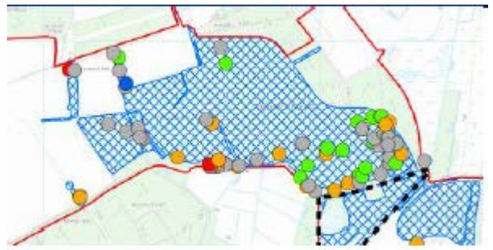
General comment on the proposed construction phase commuting corridors for bats – The bat mitigation strategy relies heavily on the maintenance of three habitat corridors through the site (Western – Bridleway 19; Central – through the Temporary Construction Area (TCA) Water Management Zones (WMZs) and Eastern – through the SSSI Crossing) during the construction phase. Notwithstanding our comments and concerns about the proposed routes set out in the table below, it is noted the Construction Parameter Plans secured by the DCO (most recently [REP2-008]) do not include these corridors. ESC consider that this is a significant omission given the importance placed on these routes for delivering ecological mitigation and request that they are included as part of the plans proposed for approval under the DCO.

SZC response: This document provides a response to the ESC responses. It also includes details of where further information was discussed in stakeholder meetings on 04/08/2021 and 24/8/2021

ESC Response to the Applicant's Table 8.2 in REP3-044

LIR Comment	SZC Co. Response	ESC Response to SZC Co. Response at D5	SZC Co. Response 23/8/21
Construction - Habitat Loss (Roosts)*: It is understood that the assessment of impacts on bat roosts as a result of direct loss of habitat during construction is based on consideration of the total roost resource available vs that which will be lost during construction. Whilst the Councils understand the principle of this approach, we are concerned that no quantification of the total roost resource available on the wider Sizewell Estate is included. In the absence of this we do not consider that the assertion that, following mitigation, the loss of roosting habitat will only result in a Minor Adverse, Not Significant impact on all bat IEFs can be evidenced. Even with the implementation of mitigation measures (primarily the installation of bat boxes) there is no demonstration that an equal or greater roosting resources is available to all bat species roosting on or adjacent to the development area.* *With regard to Goose Hill, the area of greatest woodland loss, the conclusions on roost resource presented in the ES and Updated Bat Impact Assessment appears contradictory. Section 5.3.5 of the Updated Bat Impact Assessment [AS-208] notes that potential roosts of barbastelle (and noctule) have been recorded in Goose Hill. It is additionally noted that Section 8.7.13 of the assessment suggests that there were thought to have been pipistrelle roosts within Goose Hill plantation in 2020. Section 5.3.6 then states that, "Several locations on and close to the site boundary have significant numbers of trees with roosting potential for bats, including (…) Goose Hill (…).". The paragraph notes the principal locations of trees with potential for roosting*	A roost resource approach to the assessment of roost loss has been taken within the assessment. This is outlined in **Volume 2**, **Chapter 14** of the **ES** [AS-033] and **Appendix 2B** of the **ES Addendum** [AS-208]. This recognises the fission/fusion roosting ecology (frequent roost switching) demonstrated by many woodland bat species, in particular barbastelle bat. Overall, the amount of roosting resource to be lost is a small percentage of the resource within the Sizewell Estate. Within the estate, 165.65ha of woodland managed (the location of the managed woodlands in the baseline state are presented in the image below) and 70.23ha of vegetation is to be removed. The 70.23 ha includes scrub vegetation, scattered trees and hedgerows which are not included within the figure of 165.65ha for the managed woodlands.  Of the 70.23ha of vegetation to be removed, the majority is in Goose Hill plantation woodland, a largely	As set out in the LIR, ESC understands the roost resource approach to assessing roost habitat loss which the applicant has used in the EIA. However, as described in the LIR, our concern remains that the survey data used to inform this assessment only draws on surveys undertaken within (or very close to) the order limits and trees and woodland outside of this area but within the wider Sizewell Estate were not assessed for the contribution that they make to the whole available roost habitat resource for each bat population. The area of SSSI wet woodland to be lost has also not been surveyed so, notwithstanding the comments below, the consideration of roost resource loss within the Order Limits is incomplete. The assessment provided, and the applicant's response to the LIR, assume the roost habitat suitability of the retained and surrounding habitats, it does not quantify them. Only the potential roost resource to be lost has been (incompletely) quantified, but the absence of assessment of the wider retained trees and woodlands means that a quantitative comparison of potential roost resource loss/retention is not possible. The assessment presented instead relies on professional judgement based on the retained habitat types (vs those to be lost). With regard to the Applicant's statement that "*The ES does not state that there is no roosting potential in Goose Hill. Moreover, the surveys conducted to date were not intended to identify every feature that a bat has ever or will ever roost in, this would show a misunderstanding of the ecology of woodland roosting bats*", it appears that the LIR paragraph on this matter has been misunderstood. The LIR does not claim that the ES states that there is no roosting potential in Goose Hill, instead it queried the apparent difference in value assigned to the importance of these roosting habitats in different parts of the ES. ESC notes that in relation to this the	This issue was discussed at the meeting on 04/08/2021 and 24/8/2021 There is in principle agreement between parties that replacing the roost resource being lost as a result of construction with roost mitigation features being made available within the wider Sizewell Estate, is an acceptable approach to maintain bat favourable conservation status of the relevant bat species in respect of roosting provision. The replacement of the roost resource will be undertaken prior to and during the construction phase. As a dynamic habitat, ground level assessments of impacted woodland areas will be undertaken to re-assess trees and number of potential roost features (PRFs) prior to construction activities. Trees with PRFs will be climbed/inspected immediately prior to felling and any bats relocated. Such activities will avoid the maternity and hibernation period. The approach to roost resource loss, proposes a ratio of bat roost replacement (using boxes, reclaimed PRFs and/or veteranisation) to each PRF or known roost being lost. This ensures a continuity of available roost resource throughout the construction period. Replacement PRFs will be provided in the known home ranges of the bat populations affected (informed by radio tracking data) and in areas that will not be affected by short or long term impacts from the Sizewell C Project. Text from an email for Natural England is presented below explaining the approach (sent by Sonya Gray, Natural England Wildlife Management Lead Adviser). *"The level of mitigation/compensation will need to be enough to mitigate and compensate for the maximum impact of the licensed activity. Due to the uncertainty around roost loss, and to ensure compensation is provided for a worst case scenario, the minimum ratio*

LIR Comment	SZC Co. Response	ESC Response to SZC Co. Response at D5	SZC Co. Response 23/8/21
within the plantation and comments on the lack of suitability of large parts of it due to the (young) age of the trees. This is restated (in part) in Section 8.3.13. In 5.3.7, however, it is stated that Goose Hill offers "minimal roosting resource for bats." The 2020 reports are cross referred in providing an evidence base for this assertion, which is not subject to qualification. Section 8.3.9 further notes that conifer plantation, such as that principally present within Goose Hill, is sub optimal for roosting barbastelle, providing, "limited availability of roost features.". Figure 2.9.B.1 appears to show a barbastelle roost in Hilltop Covert, which forms the western block of the Goose Hill plantation (this is separated from Kenton Hills by an access track). However, this location is referred to as being in Kenton Hills in 8.3.50 of the bat assessment, and as being in Nursery Covert (Nursery Covert is the eastern part of Kenton Hills, so these references are not necessarily incompatible. It is less apparent why the roost is shown north of the track, and where Kenton Hills is considered to extend to if the roost is considered to be in Kenton Hills) in Table 8.21. *The ground level tree roost assessment completed by Arcadis in 2020 concluded that there were 104 trees within Goose Hill that offered medium roosting potential for bats, and a further seven with high roosting potential. The statement in Section 5.3.7 (that there is minimal roosting resource for bats) does not therefore appear to accord with this finding, particularly in the absence of details of the wider roosting resource available in the area, and it is unclear what the quoted statement in 8.3.9 means in this context. Overall, the Councils consider that there is insufficient evidence to support the ES conclusion that roost loss (following mitigation) will result in only a Minor Adverse, Not Significant adverse impact on all bat IEFs. Dependent on the roost resource available in the wider area and the actual number of known roosts or suitable roost trees to be lost, the actual impact for some bat IEFs may be significantly greater (even up to Moderate*	coniferous plantation with homogenous area of managed pines. These offer limited roosting resource, as stated in **Volume 2**, **Chapter 14** of the **ES** [AS-033] and **Appendix 2B** of the **ES Addendum** [AS-208]. Conifer plantations generally have fewer potential roost features compared to broadleaved woodland and the vast majority of trees within the Goose Hill Plantaion Woodland area are of negligible or low value to tree roosting bats. Taking the habitat approach to bat roosting habitat and the quantification of the available roosting resource, the mitigation will ensure no detrimental effect to favourable conservation status of barbastelle and other species that rely on tree roosts. Taking this approach into context with the roost resource available in retained areas of woodland and areas outside the development areas (e.g. Minsmere), it is considered that the roost loss impact following mitigation is minor adverse. With regards to the statement in the relation to the roost resource in Goose Hill: "*The ground level tree roost assessment completed by Arcadis in 2020 concluded that there were 104 trees within Goose Hill that offered medium roosting potential for bats, and a further seven with high roosting potential. The statement in Section 5.3.7 (that there is minimal roosting resource for bats) does not therefore appear to accord with this finding, particularly in the absence of details of the wider roosting resource available in the area, and it is unclear what the quoted statement in 8.3.9 means in this context."* The ES does not state that there is no roosting potential in Goose Hill. Moreover, the surveys conducted to date were not intended to identify every feature that a bat has ever or will ever roost in, this would show a misunderstanding of the ecology of woodland roosting bats. The assessments identified "*104 trees within Goose Hill that offered medium roosting potential for bats, and a further seven with high roosting potential*", and it is the word potential that is important. These trees are in an area with thousands of trees, and the proportion of trees within this area that have any roosting potential is extremely low. Furthermore, additional quantification of the available bat roosting resource being affected by the scheme has subsequently been established through ground and aerial inspections of trees in 2021, building on previous datasets. Within this assessment, all trees with moderate or high roosting potential were climbed and	applicant has submitted a further survey report at Deadline 3 which provides further assessment of the trees with bat roost features present within the Main Development Site Order Limits. We have provided separate comments on this survey as part of our Deadline 5 response; however, we do not consider that the submission of this information changes our above comments in relation to how the principle of roost resource assessment has been undertaken. Also, in relation to the Applicant's statement that "*the surveys conducted to date were not intended to identify every feature that a bat has ever or will ever roost in, this would show a misunderstanding of the ecology of woodland roosting bats"*, the Council has never suggested that this is the case. However, in order for each tree's roost potential to be categorised in accordance with published best practice guidance (Collins, J. (ed). (2016) Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd edn). The Bat Conservation Trust, London) an assessment of potential roost features (PRFs) present has to be made and this is what is referred to in the LIR.	*of what replacement roosting features should be provided for potential roosts/ new roosts found is:* *1:1 potential roosting features* *2:1 low status roost of common species* *4:1 maternity roosts of common species* *4:1 low status roost of Annex 2 species* *Maternity roost of Annex 2 species would need to be covered by a separate licence."* Roost mitigation (including direct and indirect impacts) will be secured via Natural England bat mitigation licence which has been submitted to Natural England and into examination at Deadline 7 (Doc Ref. X).

LIR Comment	SZC Co. Response	ESC Response to SZC Co. Response at D5	SZC Co. Response 23/8/21
Adverse, Significant dependent on the particular IEF). *Overall, the Councils consider that there is insufficient evidence presented to support the ES conclusion that roost loss (following mitigation) will result in only a Minor Adverse, Not Significant adverse impact on all bat IEFs. Dependent on the roost resource available in the wider area and the actual number of known roosts or suitable roost trees to be lost, the actual impact for some bat IEFs may be significantly greater (even up to Moderate Adverse, Significant dependent on the particular IEF).*	inspected (with the exception of the trees in the SSSI triangle that could not be accessed and trees that were not possible to climb) to positively ascertain the number and value of the roosting features to be lost. It was ascertained that, of the trees initially identified from the ground as having roosting potential, once climbed many of these features were not suitable for bats. In total, within Goose Hill Plantation woodland, only 14 trees were found when climbed with moderate roosting potential and 1 tree with high roosting potential (within the areas of woodland to be removed). The location of these trees is presented in the image below (red dots are high roosting potential, orange dots are moderate roosting potential, green dots are low roosting potential, and grey dots are negligible roosting potential).  The replacement of roost resource under the mitigation proposals can be guaranteed as the placement of bat boxes is tied to the features to be lost and secured via way of the protected species licence. Appropriate replacement ratios for mitigation potential roost features will be agreed with a minimum of 1:1 replacement, with up to 3:1 replacement for high potential roost features. The mitigation approach will include a combination of bat boxes (cavity and crevice designs), reclaimed potential roost features from felled trees and veteranisation of retained trees.		
In addition to the above, a number of tree roosts have been identified along the northern edge of Kenton Hills. Whilst it is stated in the assessment that these are retained, some figures appear to show them conflicting with the bund to be constructed along this edge. It therefore appears that these trees may also be at risk and that these roosts could potentially be lost which would further increase the impact on bat IEFs.	Within the DCO application, no woodland removal along the north of Kenton Hills is required. The bund can be constructed without the need to remove trees (tree removal presented below in blue). 	The Applicant's confirmation on this point is noted and welcomed.	N/A no response required.

LIR Comment	SZC Co. Response	ESC Response to SZC Co. Response at D5	SZC Co. Response 23/8/21
	The presentation of the bund within this area is likely due to the indicative nature of the plans referred to showing the approximate locations of bunds etc. These plans do not have the same spatial accuracy as the drawings used to inform the required vegetation removal.		
The geographical location and importance of Goose Hill to foraging and commuting barbastelle and Natterer's bat, and the impact of the loss of much of the area will have been a consideration in concluding a significant adverse effect on barbastelle as a result of habitat fragmentation. However, the evidence provided with regard to both species indicates it may well also comprise a locally important foraging area for the respective populations, particularly breeding female barbastelles. In the absence of definitive evidence of how the area is used by different bat species throughout the year, but following the evidence which is available, a precautionary approach needs to be taken. This should be that the area does form an important foraging area of barbastelle and Natterer's bats for at least part of the year. The Councils consider that this is particularly around the breeding season when female bats will be foraging closer to their maternity roosts, and the area may also be important for newly-volant bats (those just beginning to fly).	It is recognised that all woodland habitat provides a foraging resource to barbastelle and other bat species. Goose Hill is also considered a commuting corridor for barbastelle bats. It is considered that the most significant impact will occur during the construction period. To address these impacts further foraging habitat will be created in the retained woodland areas in particular conifer plantations where glades, and rides will be created (in Kenton Hills) to provide edge habitats which is selected by barbastelle and other bat species. This approach will be explained further in an Estate-wide management Plan (EWMP) which is being developed which will further explain the habitats across the EDF Energy estate and explains how these will be managed. The EWMP will be submitted to examination. Three large dark corridors will also be retained within development area during construction as shown on the indicative lighting plans. These corridors will ensure bats have the ability to commute from roosting grounds in the north and foraging areas to the south, whilst dark boundaries will also ensure bats can move around the boundaries of the development.	Whilst the proposed submission to the examination of an Estate-wide Management Plan (EWMP) detailing further areas to be managed as bat foraging habitat is noted and welcomed, it must be ensured that these areas not only have connectivity to new and retained roosting and commuting habitat, but also that they are adequately protected from construction impacts such as those arising from noise and lighting. We will provide further comment on this matter at the appropriate Deadline once the EWMP has been submitted and reviewed. With regard to the three proposed dark corridors, it is noted that the Applicant has submitted additional lighting modelling at Deadline 3. Comments on this modelling are provided as part of our Deadline 5 submission and in the *Construction - Disturbance (Lighting) section* below.	The lighting modelling provides for light levels of 0.01lux in the bat dark corridors and adjacent to important bat areas which exceeds the darkness requirements recommended by general bat/lighting guidance and other rare species-specific guidance (Trowbridge Bat Mitigation Strategy for Annex II bat species). It is agreed in principle that the lighting levels proposed for bat sensitive areas (dark corridors and adjacent roost woodlands) are acceptable and that the parameters can be secured within **the Lighting Management Plan** (Doc Ref 6.3 2B (A)). Where lighting initially exceeds agreed levels, mitigation including cowling, fencing and removing light sources close to bat sensitive areas will occur to achieve the target lighting levels. The noise modelling takes a precautionary approach (worst case). As presented in **Annex B**, the noise emitters in each of the areas used to model the maximum noise levels are largely mobile plant and machinery. • In Phase 1, in the vicinity of the Bridleway 19 retained commuting route, it is excavators in the earthworks compound A and Plaza/campus area which generate the noise identified in the contour plan. • In Phase 2, in the vicinity off Bridleway 19, it is the stripping / site prep east of the bridleway and the stockpiling and the plaza campus excavation that creates the noise modelled. • In Phase 3+ and beyond, it is the excavators in the stockpile area and the bowsers in the borrow pit area that generate the noise modelled in the contours in the vicinity of Bridleway 19. Due to the nature of large-scale construction activities, it is not possible to predict the exact movements of the plant over the construction period. However potential impacts can be identified and managed. As such, a management approach is agreed in principle to be as the most effective method to manage/avoid noise impacts on sensitive bat areas. Spatial, temporal

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			related noise thresholds will be established to identify working areas and times of the year that will be avoided. The approach will be outlined in an update to the Code of Construction Practice (CoCP) (Doc Ref. 8.11(D)). In addition, as outlined in the **TEMMP** [REP5-088], there is potential for unforeseen impacts from the noise generated, and monitoring is outlined to identify these impacts and address them.
Following this precautionary approach, it is not clear that there is robust data presented in the application to confirm that habitat creation has (or will) offset the reduction in foraging resource *currently available. As a result, it would be more robust to conclude a residual significant effect on both species rather than conclude a Minor Adverse, Not Significant effect.* *Construction - Habitat Fragmentation: The ES concludes that, with the exception of barbastelle, subject to the implementation of the identified mitigation measures the impact on bat IEFs from habitat fragmentation will be Minor Adverse, Not Significant. For barbastelle the conclusion is that there will be a Moderate* *Adverse, Significant impact. It is noted that the changes to the project (including the revised SSSI Crossing design and the proposed inclusion of a vegetation link across the Temporary Construction Area between Kenton Hills and Ash Wood) have not altered the applicant's conclusion in relation to this.*	Bats are mobile species and will seek out new roosting and foraging and roosting area where they are created. There are numerous examples of recently created habitats being used by barbastelle bats in fragmented agricultural landscapes. As stated above, in the construction phase there will be loss of 70.23 ha of woodland and scrub vegetation. As stated in **Appendix 2B** of the **ES Addendum** [AS-208], once the construction phase is complete, there will be a significant increase in the availability of foraging habitats of bats. Approximately 250 ha of arable land is being or has been repurposed – the majority of which will be used for creation of habitat types suitable for foraging bats. This will include dry sandlings grassland (a mosaic of grassland, trees and heathland), heathland and shrub, and wetland and woodland habitats. Table 8.6 in the chapter presents the habitat availability for each of the habitats of value for the species present. The most important element of the mitigation approach to bats will be to ensure these new habitats are available to bats from the earliest opportunity. Some habitats of value have already been created. In addition, where practicable there will be some transplantation of existing trees where this is viable, the planting of new tree lines of fast growing native species and an acceptance that such mitigation is aimed at the short term with longer term mitigation such as planting of other species of tree as a second phase of mitigation. This approach will be defined explained in the EWMP which is being developed which will further explain the habitats across the EDF Energy estate and explains how these will be managed. The EWMP will be submitted to examination.	Whilst it is acknowledged that bats are mobile and, to varying degrees, inquisitive species, they can also be very site (particularly roost site) faithful. Although "*there are numerous examples of recently created habitats being used by barbastelle bats in fragmented agricultural landscapes*", the role these habitats will be playing in supporting particular barbastelle populations is potentially much more complex than can be determined by simple consideration of presence/absence in an area. The "repurposing" of arable land to semi-natural habitats post construction will in principle allow the creation of a significant amount of habitat suitable for foraging bats, albeit this will take a considerable amount of time to fully establish. However, this needs to be both adequately secured as part of the DCO (such as via the OLEMP) and complimentary to the creation, retention and long-term management of other parts of the Sizewell Estate to ensure that maximum biodiversity value is achieved. ESC therefore welcomes the Applicant's intention to produce an Estate-wide Management Plan (EWMP) and will provide further comment on this at the appropriate Deadline. With regard to the Applicant's comment that "*the most important element of the mitigation approach to bats will be to ensure these new habitats are available to bats from the earliest opportunity*", the council do not agree that this is the case. The proposed development has a long construction period (10 to 12 years) which will encompass multiple generations of each of the bat species recorded at the site. Therefore, it essential that sufficient roosting, foraging and commuting habitat is retained and protected during the construction period in order to ensure that these populations survive in good enough condition so that they are able to benefit from the new habitats. If this is not achieved and the existing populations (particularly of barbastelle) decline significantly, even if local extinction does not occur, then it will take a	Foraging habitat preference is primarily based Zeale, Davidson-Watts and Jones (2012). In addition to the radio tracking surveys relating to the scheme, other grey literature relating to habitat use of barbastelle bats from Norfolk, Herts, Lincs and Cambs has also been used to inform the assessment of foraging habitat provision. The 49ha Aldhurst Farm habitat creation will provide preferred foraging habitat for barbastelle bats including wetlands, unimproved grassland/heath, scrub and trees. In addition, 0.7 ha of wet woodland is being created on the northern boundary of the main development site. The reptile mitigation at studio field, will provide approximately 16ha of scrub/unimproved grassland mosaic. Furthermore, approximately 5 km of additional tree lines and rides will be created within the Kenton Hills plantations, the latter to provide immediate edge habitat creation and therefore providing further foraging habitat to barbastelle bats within dense existing plantations. All habitat creation/improvement is being undertaken within the known home ranges of the local barbastelle population. The bat foraging habitat mitigation will be secured as part of the **Estate Wide Management Plan** (Doc Ref. 9.88).

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		considerable amount of time (likely well into the operational life of the power station) for populations to recover to their pre-construction condition. ESC therefore consider that construction mitigation and post-construction habitat creation are equally important in protecting and enhancing bat populations present in the area in the short and long term.	
Whilst the Councils agree with the conclusion in relation to the significant impact on barbastelle, we are concerned about the limited detail currently available on a number of the strategic mitigation measures proposed. In particular, there is a lack of detail on the parameters of the retained and created habitat corridors along Bridleway 19; across the Temporary Construction Area between Kenton Hills and Ash Wood and in the SSSI Crossing area (in addition linked concerns related to noise and light are set out below). In the absence of knowing how these corridors will be retained, established and managed (including for example widths, vegetation type, vegetation structure) it is not possible to be certain that they will be adequate to maintain the required linkages to prevent significant adverse impacts not just on barbastelle but on other species, particularly Natterer's bat, as well. It is essential that this detail is provided so that stakeholders can be confident that the parameters set will be adequate to provide the commuting habitats required. The lack of a figure showing the proposed link between Kenton Hills and Ash Wood is considered particularly limiting in this respect.	As stated above, three large dark corridors will be retained within development area during construction as shown on the indicative lighting plans appended to updated **Lighting Management Plan** at Deadline 3 (Doc Ref. 6.3 2B (A)). These corridors will ensure bats have the ability to commute from roosting grounds in the north and foraging areas to the south, whilst dark boundaries will also ensure bats can move around the boundaries of the development. One of these corridors is centred on two realigned water management zones with retained and new tree plantings, which will provide a connection between Kenton Hills and the Ash Wood cottages area. This new corridor is shown on the indicative lighting plans appended to updated **Lighting Management Plan** at Deadline 3 (Doc Ref. 6.3 2B (A)). Further commentary is provided in the rows below and long-term habitat proposals are covered in the row above.	The additional information submitted by the applicant at Deadline 3 in relation to the proposed dark corridors is noted. Comments on the submitted lighting information are provided separately as part of our Deadline 5 submission and in the *Construction - Disturbance (Lighting) section* below. Although it is noted that the material submitted at Deadline 3 is a Technical Note, not an updated Lighting Management Plan. With regard to the proposed corridors, as set out in the sections below, we remain concerned about the impact which high frequency construction noise will have on their functionality for commuting bats. In the absence of demonstration that they will not be significantly adversely affected by noise we do not consider that it can be certain that they will adequately perform the mitigation function required.	The approaches/methods to addressing lighting and noise mitigation is addressed above.
In addition to the above, the Councils do not consider the cumulative impacts from the Main Development Site (including the Temporary Construction Area) and the Sizewell Link Road have been adequately considered (please also see the ecology section of the Sizewell Link Road chapter). Both developments will require the removal of habitats suitable for foraging and commuting bats and, as the two developments connect, it is highly likely that it will be the same bat population which will	Further consideration will be given to this point and a response provided at Deadline 5 if relevant.	The Applicant's comment on this matter is noted, the council will review the information when it is submitted at Deadline 5 and respond at the next relevant Deadline.	This is presented as **Annex A** and replicated that submitted at Deadline 5 [REP5-120] .

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experience this impact. Given that the species most likely to suffer from this impact is barbastelle (and to lesser extent maybe Natterer's bat as well), this will compound the existing conclusion of a Moderate Adverse, Significant level impact and may even give rise to a Major Adverse, Significant level impact.			
Construction - Disturbance (Noise): The Updated Bat Impact Assessment [AS-208] provides detail of noise modelling undertaken at 8kHz and 22kHz and assesses the likely impact on roosting and foraging/commuting bats using 8kHz for roosting and 22kHz for foraging/commuting. However, it is noted that the conclusions on construction noise impacts presented in the ES and ES Addendum only refer to 8kHz and this is used for assessing both roosting and foraging/commuting impacts. The Councils consider that this is a significant discrepancy given that the ES chapter sets out the conclusions in relation to the significance of impact. The Councils agree with the noise assessment methodology set out in the Updated Bat Impact Assessment and the use of the two different frequencies. This should form the basis for the assessment presented in the ES, not the sole use of 8kHz as currently included.	The following figures in the ES Addendum show where noise at both 8khz and 22khz was assessed: • **Figure 2.9.B.5** Barbastelle roosts overlaid onto projected construction noise at 8khz in Phase 1 [AS-208]; • **Figure 2.9.B.6** Natterer's roosts overlaid onto projected construction noise at 8khz in Phase 1 [AS-208]; • **Figure 2.9.B.7** Brown long-eared and other bat roosts overlaid onto projected construction noise at 8khz in Phase 1 [AS-208]; • **Figure 2.9.B.8** Barbastelle roosts overlaid onto projected construction noise at 8khz in Phase 2 [AS-208]; • **Figure 2.9.B.9** Natterer's roosts overlaid onto projected construction noise at 8khz in Phase 2 [AS-208]; • **Figure 2.9.B.10** Brown long-eared and other bat roosts overlaid onto projected construction noise at 8khz in Phase 2 [AS-208]; • **Figure 2.9.B.11** Barbastelle roosts overlaid onto projected construction noise at 8khz in Phase 3/4 [AS-208]; • **Figure 2.9.B.12** Natterer's roosts overlaid onto projected construction noise at 8khz in Phase 3/4 [AS-208]; • **Figure 2.9.B.13** Brown long-eared and other bat roosts overlaid onto projected construction noise at 8khz in Phase 3/4 [AS-208]; • **Figure 2.9.B.14** Key bat commuting and foraging areas (summary) overlaid onto construction noise contours at 22khz or above at Phase 1 [AS-208];	It is understood that noise at 8khz and 22khz was assessed in appendix to the ES Addendum, however the point in the LIR on the discrepancy is that this assessment was never presented in the appropriate ES or ES Addendum chapter. The difference between the assessment presented in the ES Addendum and its appendix (which included the Updated Bat Impact Assessment) was highlighted by ESC as a potential cause of confusion in considering the overall likely impacts of the development.	8khz+ is considered to be the frequency at which bats may be impacted whilst roosting and 22khz+ is the frequency range likely to impact bats whilst foraging / commuting. The noise contours modelled at these frequency ranges was used to identify locations where bats may be impacted by noise. As presented in the ES chapters [AS-033 and AS-208], 22khz and 8khz are used throughout – please see below: 8.2.23 → Noise modelling was used to assess the likely noise lev sensitive locations across the site during the peak noise works. Within **Volume 2, Chapter 14** of the **ES** (Doc Re high-frequency noise modelling is utilised to inform the impa at both 22khz and 8khz. ¶ 8.2.26 → When determining the potential impact upon bats from noise to distinguish the noise that bats can hear (i.e. at which fr are sensitive to noise). Bats can hear sounds at different humans, and this varies between species, however the fr bats can hear are generally 'high frequency'. For example, t eared bat, likely to be the UK species with the most se indicates that they have good auditory sensitivity (less than Sound Pressure Level) in the range 7–55 kilohertz (kHz), wit likely to have auditory thresholds a little higher than this: perh *Myotis* and *Nyctalus* species. As such, the frequency of impact bats the most is 'high-frequency', which for the purpo **2, Chapter 14** of the **ES** (Doc Ref 6.3) [AS-033]) is noise a roosting bats and over 22khz for foraging and commuting ba • → While there is no clear consensus, there is the potential that exceeding 60dB (at 8kHz) may have an effect upon bats (i.e. delay emergence and/or cause abandonment of roosts). There noise modelling above 60dB has been applied as an indic threshold for potential disturbance within this assessment. ¶ There is a typographical error in the addendum chapter [AS-208] where 8khz is stated as opposed to 22 khz (paragraph 8.2.60). Presented below.

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	• **Figure 2.9.B.15** Key bat commuting and foraging areas (summary) overlaid onto construction noise contours at 22khz or above at Phase 2 [AS-208]; and • **Figure 2.9.B.16** Key bat commuting and foraging areas (summary) overlaid onto construction noise contours at 22khz or above at Phase 3/4 [AS-208]. Foraging and commuting impacts from noise at 22khz was assessed, within the **Appendix 2B** of the **ES Addendum [AS-208]**, as shown below: 8.3.50 → **Table 8.22** below presents potential key commuting and foraging areas (for barbastelle) where modelling of potential high frequency noise is at 65 dB and above at 22khz (noise modelling data and results presented the Bat Mitigation Strategy (**Volume 2**, **Appendix 14C1A** of the **ES** (Doc Ref 6.3) [APP-253])). In this table the peak noise at any Phase of the development is presented. ¶ **Table 8.22: Barbastelle foraging/ commuting areas with predicted noise levels** dB at 22k Hz: Below 65 dB Within Site Boundary: Retained area of Goose Hill to the east of the SSSI crossing NOISE LEVEL Lmax (dB): <= 30; 30 - 35; 35 - 40; 40 - 45; 45 - 50; 50 - 55; 55 - 60; 60 - 65; 65 - 70 (legend used throughout table) Outside Site Boundary: **Kenton Hills/ Fiscal Policy/ Nursery Covert complex** – remaining woodland complex approximately 50m beyond development site boundary **The Grove / Barn Walk** – commuting route north from Goose Hill		▪ **Potential Foraging/ Commuting Disturbance** 8.2.60 → The majority of studies of noise disturbance on bats rela From these studies the following is inferred: • → Areas subject to noise levels at or below 50dB (a considered likely to have any effect on foraging a activities. • → Noise levels between 50 and 65dB (at above 22kh the potential to affect foraging and commuting ba literature is varied and there is evidence to sugges become habituated to noise within these param studies have shown the ability of bats to habituat these parameters and tolerate even higher noise lev • → The evidence suggested that noise exceeding 65d disturb bats, result in noise avoidance and/or efficiency. 8.2.61 → In summary, for the purposes of this assessment, 65dB is used as a threshold for potential foraging disturbance. **Table 8.21: Barbastelle roosts with predicted noise levels above 60dB (during construction phase), with drawings extracted from Figures 2.9.B.5, 2.9.B.8 and 2.9.B.11** dB at 8k Hz: Below 60 dB Within Site Boundary: None Outside Site Boundary: **Areas of Kenton Hills/ Fiscal Policy/ Nursery Covert complex** – woodland resource and confirmed tree roosts beyond site boundary Above 60 dB NOISE LEVEL Lmax (dB): <= 30; 30 - 35; 35 - 40; 40 - 45; 45 - 50; 50 - 55; 55 - 60; 60 - 65; 65 - 70 (legend used throughout) **Nursery covert (R11)** **Ash Wood** – (southern, western & northern boundaries) woodland resource and confirmed roosts (R3, R9, R13, R14, R26) **Table 8.22: Barbastelle foraging/ commuting areas with predicted noise levels** dB at 22k Hz: Below 65 dB Within Site Boundary: Retained area of Goose Hill to the east of the SSSI crossing NOISE LEVEL Lmax (dB): <= 30; 30 - 35; 35 - 40; 40 - 45; 45 - 50; 50 - 55; 55 - 60; 60 - 65; 65 - 70 (legend used throughout table) Outside Site Boundary: **Kenton Hills/ Fiscal Policy/ Nursery Covert complex** – remaining woodland complex approximately 50m beyond development site boundary **The Grove / Barn Walk** – commuting route north from Goose Hill However it is through the noise management protocols to be developed in the **CoCP** that potential noise impacts will be minimised.
Notwithstanding the above, we are concerned that the modelling indicates that several of the retained/created habitat links	The use of noise barriers, vegetation/screening and working protocols for mobile work/noise issues will	As set out in the LIR, it is ESC's understanding that Figures 2.9.B.14 to 2.9.B.16 in the within the Updated Bat Impact Assessment [AS-208] show the	It is agreed in principle that a noise threshold protocol can be developed as part of the **CoCP** to ensure the

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to be used by foraging/commuting bats (see section on habitat fragmentation above) will experience noise levels of above the threshold set for the assessment (above 65dB at 22kHz). This is particularly the case during construction phases 1 and 2. Figures 2.9.B.14 to 2.9.B.16 in the Updated Bat Impact Assessment [AS-208] show the 22kHz noise modelling outputs with important bat foraging and commuting areas overlaid. It is understood that these figures show noise modelling with the mitigation measures described in the application in place (primarily a 5m acoustic fence and/or earth bund). These appear to indicate that during all construction phases the important habitat linkages at Bridleway 19, the link between Kenton Hills and Ash Wood and the SSSI Crossing area will be exposed to noise levels at or above the threshold set as being disturbing to foraging and commuting bats. Also, the north, south and west edges of Ash Wood, an area known to support a range of bat roosts including maternity roosts for barbastelle, will also experience similar noise levels during all phases, as will the northern edge of Kenton Hills during at least phase 1. Based on this modelling, and acknowledging that it presents a worst-case scenario, we have significant concerns that high noise levels in the range known to the disturbing to foraging/commuting bats will render the strategic mitigation measures put in place to address habitat fragmentation impacts unsuccessful. This is of particular concern for species which will rely on these linkages, including barbastelle for which a population level adverse impact is already predicted from habitat fragmentation.	employed to reduce effects to an acceptable level where such impacts occur. The approach of the Sizewell C ES is to incorporate best practice and utilise precautionary assessment of the impact from noise. Within the assessment in **Volume 2**, **Chapter 14** of the **ES** [AS-033], the impact assessment in relation to noise is considered to have applied the level of information that could be reasonably expected at this stage. The monitoring is designed to confirm the effectiveness of the best practice mitigation employed to address the effects (as such mitigation is expected to be effective), but where wider research is not entirely conclusive. Few peer reviewed studies have been conducted specifically in relation to the impact of noise on barbastelle, however available information has been consulted. Therefore, it is considered that the proposed mitigation measures will allow impacts to be controlled, however the ES acknowledges monitoring will need to confirm the success of the implemented mitigation. This is a strength of the application approach, wherein any impacts which are not foreseeable under current understanding can be identified and addressed. The monitoring proposed in the **TEMMP** [REP1-016] for bats provides some opportunity for remedial actions, e.g. to reduce noise levels, but these measures are to provide confidence that active mechanisms are in place and are secured to ensure that impacts are controlled, rather than a reliance being placed on them. The primary mechanism of noise control will be via the primary and secondary mitigation, which is secured by Requirement. The monitoring will also support any necessary modifications to mitigation that can be made to achieve or further the objectives of the mitigation strategy. Clearly updating surveys etc over time for various stages (i.e. licensing) is also appropriate, however the overall impacts and mitigation strategy has been developed with the significant level of survey information gained to date that provides confidence in the effectiveness of the mitigation, and the assessment of no significant effect.	likely construction noise thresholds across the site after mitigation measures have been implemented. The model outputs clearly show that several of the retained/created habitat links intended as mitigation for commuting/foraging bats will experience noise levels of above the threshold set for the assessment (above 65dB at 22kHz). This is particularly the case during construction phases 1 and 2. While the applicant's response to this point makes reference to the monitoring which will be undertaken during construction, if the modelling outputs are correct all this will do is confirm that noise levels are above the threshold at which disturbance effects on foraging/commuting bats are considered likely to occur. Given the noise modelling outputs presented by the Applicant, ESC remains concerned that the mitigation measures proposed to address construction habitat fragmentation will not be successful because of the impacts of construction noise (bats will avoid using them due to noise disturbance). If this is the case and the mitigation measures for habitat fragmentation are less successful than predicated, then it is unclear how the conclusion that there will be no significant impacts on bat IEFs from fragmentation (with the exception of barbastelle) can be justified.	avoidance and reduction of noise impacts on bats on a temporal and spatial basis.
The Updated Bat Impact Assessment draws on the results of monitoring at the construction of Hinkley Point C to provide demonstration that bats (including barbastelle) will continue to use corridors around and through construction areas. Whilst the results of this	Monitoring from static bat detectors will be a key component of baseline and future monitoring of bat activity pre-during and post development. Static loggers provide a quantitative method for assessing bat activity levels at different locations over time.	In paragraphs 8.141 to 8.148 of the LIR [REP1-045] ESC set out in detail their concerns regarding an overreliance on the use of static detectors to attempt to monitor population level impacts on bat species across the Sizewell Estate. The use of static detectors as the primary tool for this type of monitoring is considered to be flawed as, whilst they	The **TEMMP** [REP5-088] has been updated and a detailed monitoring programme and further baselining via Radio Tracking (RT) is proposed. The monitoring objectives of assessing changes to bat activity, population levels, use of mitigation roosts and bat responses to the construction activity (changes in

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monitoring are interesting, the Councils do not consider that they are directly relatable to the situation at Sizewell. At Hinkley the habitats within the construction area are on the fringe of those relied on by that barbastelle population for foraging and commuting, whereas at Sizewell the affected habitats are within the core area understood to be used by the population. There is likely to be a significant difference in population responses to the loss (be it temporary or permanent) of fringe habitat when compared to core habitat. Also, we have reservations on the sole use of static detector surveys for population monitoring, particularly as static detectors have limitations on the data that they can collect and how this can be interpreted - please see the Monitoring Strategy section below for further comment on what we consider these limitations to be.	However, this is not the only monitoring approach to be employed. For a landscape level response to the development, further radio tracking studies will be undertaken on the barbastelle and Natterer's bat population pre-construction, during and post construction to assess any changes in activity patterns, and overall response to the commencement of construction. Roost mitigation monitoring to assess use/uptake will also be undertaken to provide a holistic approach at both the site and landscape level.	will give quantifiable data, it will be limited to the number of bat passes in a particular area at a given time. Only limited information on bat behaviour is gathered by static detectors, and it is not possible to assess the numbers of individual bats present or how this relates to the overall population size/status. However, ESC notes and welcomes the confirmation from the Applicant that further advanced survey techniques (including radio tracking) will be undertaken on the barbastelle and Natterer's bat populations pre-construction, during and post construction. We would expect further details of this to be submitted to the examination as part of an updated Terrestrial Ecology Monitoring and Mitigation Plan (TEMMP).	homes ranges and roost locations) are agreed in principle as the key monitoring objectives. It is also agreed that; 1. Static surveys are considered an appropriate way to monitor the bat activity levels in response to the development. Static logger monitoring is repeatable, generate large datasets for statistical analysis and modelling and as a result are regularly used on multiple large DCO projects. We are proposing to use control static loggers which can provide a three-way assessment of mitigation effectiveness, including comparisons pre and post construction, but also be able to compare bat activity against controls loggers to account for climate differences etc between years. We have also proposed this for this for bat crossing points on the SLR. 2. Direct roost monitoring of retained and mitigation roost features will be able to determine the success of roost mitigation and the response of bats to construction activities. 3. Trapping and radio tracking will assess the impacts to primary affected barbastelle and natterer's bat at the landscape scale through changes in home ranges and the location of roosting foci. These three approaches combined will provide a holistic monitoring approach secured in the **TEMMP** [REP5-088].
In addition to the above, it also remains unclear how, in practical terms, unacceptable levels of noise will be defined and mitigated during construction. There appear to be potential conflicts between health and safety and further controls being implemented. At present there is nothing included in the application documentation that could be easily adapted to provide the basis for a Working Method Statement for an Ecological Clerk of Works (team). *Given the concerns set out above in relation to construction noise and the mitigation measures included to address it, the Councils consider that bat IEFs will experience impacts above the Minor Adverse, Not Significant level set out in the ES. Dependent on the mitigation measures*	The monitoring proposed in the **TEMMP** [REP1-016] for bats does provide some opportunity for remedial actions, e.g. to reduce noise levels, but these measures are to provide confidence that active mechanisms are in place and are secured to ensure that impacts are controlled, rather than a reliance being placed on them. Noise will be controlled by the measures in the CoCP [REP2-056], which is secured by Requirement. Through discussions with the Councils, further detail may be added to the TEMMP for Deadline 5.	As set out above ESC considers that as currently proposed adverse impacts from construction noise remain likely. ESC would welcome further discussion with the Applicant and would expect to see an updated version of the TEMMP submitted to the examination at a suitable Deadline.	It has been agreed in principle that noise impacts can be managed via protocols and thresholds contained within the **CoCP** (see above).

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achievable, the actual night-time noise levels generated during the works and the duration of these, it is possible that some bat IEFs may experience an adverse impact of at least a Moderate Adverse, Significant level.			
Construction - Disturbance (Lighting): In relation to impacts arising from construction lighting, whilst the Councils note the additional modelling presented in the Updated Bat Impact Assessment, it is unclear why this has only been undertaken at parts of the site and we are concerned that this hasn't adequately considered lighting at all critical points along the corridors identified as being required to be kept dark. For example, there does not appear to be any detailed modelling of the southern end of Bridleway 19 where the site access plaza will be. Also, the modelling presented for the SSSI Crossing appears to be for the culvert and embankment option not the open span bridge and embankment option, it is therefore not possible to conclude the that the lighting strategy proposed for this area will be adequate to maintain sufficient darkness so that the area does not become a barrier to foraging and commuting bats. As set out in the Habitat Fragmentation section above, details of the parameters for these corridors need to be set out and these should include acceptable light levels. *We are also concerned that reference continues to be made to keeping areas as dark as is 'reasonably practicable' and that no parameters for acceptable light levels have been set out. This does not provide confidence that bats will be a key driver in terms of limiting / controlling light during construction. It also remains unclear how, in practical terms, unacceptable levels of lighting will be defined and mitigated during construction. There appear to be potential conflicts between health and safety and further controls being implemented. At present there is nothing included in the application documentation that could be easily adapted to provide the basis for a Working Method Statement for an*	The approach of the Sizewell C ES is to incorporate best practice and utilise precautionary assessment of the impact from lighting. Within the assessment in **Volume 2**, **Chapter 14** of the **ES** [AS-033], the impact assessment in relation to lighting is considered to have applied the level of information that could be reasonably expected at this stage. As stated above, three large dark corridors will be retained within development area during construction as shown on the indicative lighting plans appended to the updated **Lighting Management Plan** at Deadline 3 (Doc Ref. 6.3 2B (A)). These corridors will ensure bats have the ability to commute from roosting grounds in the north and foraging areas to the south, whilst dark boundaries will also ensure bats can move around the boundaries of the development. The monitoring proposed is designed to confirm the effectiveness of the best practice mitigation employed to address the effects (as such mitigation is expected to be effective), but where wider research is not entirely conclusive. Few peer reviewed studies have been conducted specifically in relation to the impact of lighting on barbastelle, however available information has been consulted, and there are examples / observations of barbastelles foraging 25m from street lights where vegetation screening is present (IDW pers. obs.). Therefore, it is considered that the proposed dark corridors will allow impacts to be controlled, however the ES acknowledges monitoring will need to confirm the success of the implemented mitigation. This is a strength of the application approach, wherein any impacts which are not foreseeable under current understanding can be identified and addressed. The monitoring proposed in the **TEMMP** [REP1-016] for bats provides some opportunity for remedial actions, e.g. to reduce lighting levels, but these measures are to provide confidence that active mechanisms are in place and are secured to ensure that impacts are controlled, rather than a reliance being placed on them. The primary mechanism of lighting control will be via the	ESC notes the submission of updated construction lighting modelling at Deadline 3; however, this appears to be a Technical Note on Indicative Lighting Modelling [REP3-057], rather than an update of the Lighting Management Plan [current version submitted as APP-182]. Whilst it is helpful as an indication of the degrees of lighting that can be achieved at the site, it is not clear how these thresholds are then secured in the DCO. We have provided further comments on the submitted Technical Note separately as part of our Deadline 5 submission. ESC acknowledge that from the modelling provided, based on the horizontal plane isolux plans submitted, it appears that dark corridors can be maintained along the western (Bridleway 19), and may be possible on the central (through the TCA) route and the eastern (SSSI Crossing) route, although it appears that there may still be light spill onto the central route boundary vegetation and the embankments and entrances at the SSSI Crossing. Also, as set out above, the plans provided do not appear to be secured as part of the DCO and therefore are not fixed thresholds which can be constructed and monitored against. This is a significant concern and must be corrected so that appropriate lighting thresholds are set and secured by the DCO.	The lighting contours show that across the majority of the site, low light levels will be secured through lighting design and control. The contours do not account for the additional mitigation included, for example the bunds and fences, where these are implemented, the lighting levels will be below the currently presented thresholds (for example within Ash Wood, where light attenuation fencing is proposed). This will be secured through the **Lighting Management Plan** (Doc Ref. 6.3 2B (B)) and Natural England licence will also require that lighting impacts do not affect roosts and the avoidance of lighting impacts and/or the provision of light reduction measures.

LIR Comment	SZC Co. Response	ESC Response to SZC Co. Response at D5	SZC Co. Response 23/8/21
Ecological Clerk of Works (team). The absence of suitable parameters and controls will lead to an impact on bat IEFs greater than the Minor Adverse, Not Significant set out in the ES.	Section 1.3 of the **Lighting Management Plan** (Doc Ref. 6.3 2B (A)), which is secured by Requirement. The monitoring will also support any necessary modifications to mitigation that can be made to achieve or further the objectives of the mitigation strategy. Clearly updating surveys etc over time for various stages (i.e. licensing) is also appropriate, however the overall impacts and mitigation strategy has been developed with the significant level of survey information gained to date that provides confidence in the effectiveness of the mitigation, and the assessment of no significant effect.		
***Assessment of Significance of Residual Effects**: Notwithstanding the Council's concerns set out above that construction habitat loss, noise and lighting will result in greater impacts than presented in the ES, no conclusion is drawn in the application documents on what the predicted significant residual effect of habitat fragmentation on barbastelle will mean for the population.*	The fragmentation of habitats within the home ranges of the local barbastelle population has been identified as a significant adverse effect. It is accepted that the construction phase will have the greatest level of effect, however the habitat enhancement created in the long term will be produce a beneficial effect for the barbastelle population. Fragmentation impacts during construction will be addressed through the provision of wide dark corridors at three locations to limit the distances bats will need to travel to retained and created foraging and roost areas. It is considered, based on the activity patterns of barbastelle populations elsewhere, that after a period of habituation barbastelles will continue to use foraging areas initially fragmented by the development. Whilst the mitigation developed is based on the best information available, there remains a level of uncertainty resulting in a precautionary residual significant moderate adverse effect on the local barbastelle population bat during the construction phase of the scheme.	The Applicant's comment on this point is noted, however it remains disappointing that no conclusion is being drawn in the application documents on what the predicted significant residual effect of habitat fragmentation on barbastelle will mean for the population.	Since the original assessment of impacts on bats, further information around lighting impacts and noise mitigation has been provided. Mitigation approaches including the provision of further foraging habitats in the short term and wide dark corridors have been developed. Therefore it is considered that with the application of the following mitigation: 1. Dark corridors (i.e. artificial light intrusion no greater than 0.01 Lux and glared appropriately shielded). 2. Noise levels being managed in line with bat sensitivities (i.e. through **CoCP**). 3. Provision of 65ha of foraging habitat and 5km of linear foraging habitat being created prior to and during construction 4. Provision of pre and during construction replacement PRFs The scheme is unlikely to have a significant residual effect on the barbastelle (and other) bats.
For 9-12 years during construction connection of local landscape features known to be used by barbastelle will be affected, as some of these features and linking hedgerows will be within the footprint of the site and its construction area. The construction footprint will result in both east-west and north-south commuting features being lost. This is likely to result in barbastelles taking more circuitous routes to foraging areas: for males, which range considerable distances this may be sustainable; for females, which forage close to roost sites when breeding, and for volant	As outlined above the creation of large north south dark corridors will aim to address impacts of fragmentation, limiting the distances travelled by bats between roosts and foraging areas to the south. Furthermore, newly created foraging areas will provide replacement foraging sites.	The Applicant's comment on bats using newly created foraging sites is noted, however it is not clear whether the sites referred to are areas of habitat creation which have been undertaken for other species (e.g. marsh harrier and reptiles) or whether additional habitat creation for bats is proposed (which is alluded to elsewhere in the Applicant's Deadline 3 response). Clarification on this should be provided as soon as possible.	It is agreed in principle that the dark corridors will provide the most direct commuting routes for barbastelle and other bats species through the construction areas. Foraging habitat creation in the short term is as per earlier foraging habitat response.

LIR Comment	SZC Co. Response	ESC Response to SZC Co. Response at D5	SZC Co. Response 23/8/21
young with limited ranging ability, this may prevent them reaching preferred areas for feeding.			
If barbastelle continues to roost within the EDF Estate, there is likely to be a population level effect on the species as a result of this effective displacement of females and young bats from foraging habitats due to the construction area representing a partial barrier to movement. Alternatively, the colony might relocate into the wider area, potentially competing with other colonies for resources. The extent of decline might be possible to model, but how populations will respond cannot be concluded with certainty. In the very worst case, the development could result in the local extinction of the barbastelle population. The lack of conclusion on this in the ES and the Updated Bat Impact Assessment is considered to be a significant omission and effects not only consideration of the robustness of the conclusions presented but also consideration of how an adequate monitoring strategy can be designed.	The mitigation approach is to provide access to higher quality and replacement foraging habitats within the existing home ranges of the barbastelle bat population in areas unaffected by the construction. The holistic monitoring approach will assess the use of mitigation areas and be used to make adjustments to mitigation where required.	To the best of ESC's understanding, as currently submitted the development does not include the creation of areas specifically designed to provide high quality bat foraging habitat (although it is acknowledged that some of the areas of habitat creation undertaken for other species will provide improvements for foraging bats over the arable habitats previously present). It is therefore unclear what is meant by the statement that "*The mitigation approach is to provide access to higher quality and replacement foraging habitats within the existing home ranges of the barbastelle bat population in areas unaffected by the construction*". Given the impacts on bats will primarily occur during the construction phase, any replacement foraging habitats will need to be established prior to the original habitats being lost in the early stages of construction. ESC would welcome clarification on this as soon as possible so that any such areas can be assessed and their likely success as mitigation considered. With regard to monitoring, as set out above the council considers that the submitted TEMMP [REP1-016] requires updating to reflect the required changes to the monitoring strategy.	The response to this point is as per the response provided for foraging habitat. The **TEMMP** [REP5-088] has been updated and monitoring objectives are agreed in principle.
For Natterer's bat, the assessment concludes that due to the more generalist habitat preferences of the species, the colony is likely to adapt to habitat fragmentation impacts resulting from construction, but that it will become more 'vulnerable'. It is unclear in this context whether vulnerability could result in a population-level effect as a result of additional impacts arising from the Sizewell Link Road, for example. This, and inherent uncertainty in the conclusions regarding the magnitude of effect on the county-level important population are of significant concern. As with barbastelle, the lack of conclusion on this in the ES and the Updated Bat Impact Assessment is considered to be a significant omission and effects not only consideration of the robustness of the conclusions presented but	The response for Natterer's bat is the same as for barbastelle.	To the best of ESC's understanding, as currently submitted the development does not include the creation of areas specifically designed to provide high quality bat foraging habitat (although it is acknowledged that some of the areas of habitat creation undertaken for other species will provide improvements for foraging bats over the arable habitats previously present). It is therefore unclear what is meant by the statement that "*The mitigation approach is to provide access to higher quality and replacement foraging habitats within the existing home ranges of the barbastelle bat population in areas unaffected by the construction*". Given the impacts on bats will primarily occur during the construction phase, any replacement foraging habitats will need to be established prior to the original habitats being lost in the early stages of construction. ESC would welcome clarification on this as soon as possible so that any such areas can be assessed and their likely success as mitigation considered.	The response to this point is as per the response provided for foraging habitat. The **TEMMP** [REP5-088] has been updated and monitoring objectives are agreed in principle.

LIR Comment	SZC Co. Response	ESC Response to SZC Co. Response at D5	SZC Co. Response 23/8/21
also consideration of how an adequate monitoring strategy can be designed.		With regard to monitoring, as set out above the council considers that the submitted TEMMP [REP1-016] requires updating to reflect the required changes to the monitoring strategy.	
***Bats – Conclusion**: The ES concludes that, subject to the implementation of the identified mitigation measures, with the exception of the impact of habitat fragmentation on barbastelle,* *no bat IEFs will experience construction impacts above Minor Adverse, Not Significant. For barbastelle, habitat fragmentation is considered likely to result in a construction impact at a Moderate Adverse, Significant level. For the reasons set out above, the Councils consider that there are a number of limitations in the assessment which undermine these conclusions. Impacts from construction habitat loss, construction noise and construction lighting all have the potential to result in impacts of greater significance than those predicted in the ES. Of additional particular concern is the fact that construction noise and lighting have the potential to adversely impact the mitigation measures being put in place to address impacts arising from fragmentation of connectivity due to habitat loss. In the absence of parameters* *relating to the retained habitat corridors we do not consider that it is possible to be confident that the habitat mitigation measures identified can be adequately implemented. It is the Council's opinion that the failure of these measures would result in adverse impacts for all bat IEFs (particularly foraging and commuting) of at least a Moderate Adverse, Significant level.*	The responses and further information provided above support the conclusions made in the **ES** [AS-033 and AS-208].	Whilst acknowledging the additional information, interpretation and commitment to submitting further details made by the Applicant, for the reasons set out in the sections above ESC maintain their consideration that the proposed development, as currently submitted, will have a greater impact on bat IEFs than presented in the ES. In particular, concerns remain over: 1. The assessment of roost resource availability pre and during construction. 2. The loss of foraging areas in Goose Hill (particularly for barbastelle and Natterer's bats). 3. The impact of construction noise on the proposed mitigation corridors. 4. The impact of construction lighting on the proposed mitigation corridors and how the required thresholds are secured by the DCO. 5. The in-combination effects of the Main Development Site and Sizewell Link Road in relation to habitat fragmentation impacts. 6. How the proposed construction mitigation corridors are secured by the DCO. 7. The need for additional monitoring techniques to be secured in the TEMMP (as recognised by the Applicant). 8. Lack of detail on provision of additional bat foraging habitat as part of the mitigation package (as referenced in the Applicant's response to the LIR [REP3-044].	Each of the comments below (renumbered for clarity) is responded to below. Summary of agreed points (in principle) 1) Within the bat licence, replacement of roost resource approach is proposed which is tied to the loss of roosting features. The mitigation approach does not rely on existing woodland within the wider Sizewell estate to account for roost loss. The approach to roost loss, which proposes a ratio of bat roost replacement (using boxes and other mitigation PRFs) which was advised by Natural England based on other organisational mitigation licences will be secured in the organisational bat mitigation licence for Sizewell. Bat roost mitigation will be provided prior to the removal of trees for which they are mitigating. This ensures a continuity of available roost resource throughout the construction period. 2) In the operational phase, extensive areas of habitat creation is proposed that will lead to an increase in overall bat foraging habitat. During the construction phase, additional areas of habitat creation are proposed, which have been added to the design since the bat impact assessment addendum was finalised. This is in addition to the habitat creation at Aldhurst Farm, the Marsh Harrier mitigation area and other areas across the wider Sizewell estate that has already occurred. 3) Noise contours provide a precautionary assessment of impacts, and due to the likely variability of construction noise it is proposed that a protocol and noise thresholds will be developed as part of the **CoCP** to avoid or reduce noise effects in bat sensitive areas and time periods. 4) The lighting contours show that the bat sensitive areas will remain dark with levels at 0.01 lux. A dark corridor plan appended to the **Lighting Management Plan** (Doc Ref. 6.3 2B(B)) will secure the lighting parameters relating to retained and newly created bat mitigation areas. 5) The MDS will lead to the greatest fragmentation effect on bats and dark corridors will be provided o address the fragmentation effect. The SLR is not likely

LIR Comment	SZC Co. Response	ESC Response to SZC Co. Response at D5	SZC Co. Response 23/8/21
			to present a fragmentation impact, but mitigation is proposed in the form of hop-overs to reduce chances of collision risk. 6) The dark corridors will be secured through the dark corridor plan appended to the **Lighting Management Plan** (Doc Ref. 6.3 2B(B)) 7) The **TEMMP** [REP5-088]has been updated to show the holistic approach to monitoring which will enable an assessment of any changes in bat activity and populations I response to the construction and operational phases. 8) Further details are currently being developed to provide further rides and glades within Kenton Hills Plantation.
ESC comments on the MDS and SLR note *Paragraphs 1.3.2 to 1.3.6. - Provide further detail on bat crossings ('hop-overs') for road schemes.*			Bat hop-overs have not been systematically studied as pointed out by Berthinussen et al 2019. There is evidence that bats will cross roads at greater heights in the presence of high canopy cover or roadside embankments (Russell et al. 2009, Berthinussen & Altringham 2012b). This is confirmed by radio tracking studies of barbastelle and Bechstein's bat at the A120 Bishop's Stortford, A27 Hampshire and Horndean Hampshire, where mature vegetation occurs and is either close or closed canopy. Effects are likely to be species specific. For instance, observations of horseshoe bats show they have a tendency to drop into the road corridor Also a road corridor may encourage bat foraging increasing collision risk. However it will be important to consider traffic movements here as well, and their timing. Barbastelles on many of radio tracked studies cross roads in very open landscapes (A303 Stonehenge) but usually after midnight. It's often the first couple of hours after dark that bats use linear features to reduce predation risk. Barbastelles are observed crossing the relatively busy B1188 at Metheringham (Lincs) at the height above vehicles at tree canopy height and on the A120 near Bishop's Stortford, the latter where the A120 bisected the roost woodland, they used both an underpass as tree canopy to cross. In one of the most cited studies of bats crossing roads (Kerth and Melber, 2009) in a forest in which a motorway passed through. Only three of 34 radiotracked Bechstein's bats *Myotis bechsteinii* crossed the motorway, all using the underpass. Five of six radiotracked barbastelle bats *Barbastella*

LIR Comment	SZC Co. Response	ESC Response to SZC Co. Response at D5	SZC Co. Response 23/8/21
			barbastellus crossed the motorway but flew over the road (21 crossings at six different sites) more often than through the underpass (16 crossings). The motorway had four to five lanes carrying an average of 84,000 vehicles/day. The underpass (5 m wide x 4.5 m high x 30 m long) was located within a motorway section surrounded by forest. Barbastelle are therefore not affected by roads as some other species, they will use underpasses and cross above the road. Other examples include road mitigation monitoring of the A477 in Pembrokeshire (Davidson-Watts Ecology 2018). It is proposed and agreed in principle as part of mitigation for barbastelles (and other bats) on the SLR, that creating a hop overs with retained mature vegetation (5m+) where possible (even if transplanted trees die earlier than hoped) has the best opportunity of working. An image of an example of the proposed planting to create hop-overs are presented below. Planting/transplanting methods and design will need to be agreed with the highway authority and will be focussed on the key crossing points associated with dark corridors. Such measures are to be outlined and secured within the **Sizewell Link Road LEMP** (Doc Ref. 8.3 B(B)).
ESC comments on the MDS and SLR note *Paragraphs 1.3.2 to 1.3.6. - Fully consider all fragmentation impacts arising from both the MDS and SLR, not just those arising from lighting*			As discussed on the call on 04/08/2021 and 24/08/2021, it is agreed that the main development site and Sizewell link road have different impacts and by addressing each independently there is no in combination effect.

LIR Comment	SZC Co. Response	ESC Response to SZC Co. Response at D5	SZC Co. Response 23/8/21
			The main fragmentation issue arises from the loss of habitat as a result of the Main development site and this is addressed primarily through the provision of dark corridors to ensure bat movement between the Kenton Hills and areas north of the Main development site. The Sizewell link road is unlikely to present a fragmentation impact to barbastelle bats, as this species is not considered to have barrier effects to this species. The main role of hop-over mitigation is to reduce any collision risk from the operation of the Sizewell link road. In any case the bat populations have been assessed together in relation to loss of habitat and fragmentation. This mitigation provided addresses the impacts taken together.
ESC comments on the MDS and SLR note *Paragraphs 1.3.7 to 1.3.11. - Reconsider use of eastern end of SLR route by bats from populations around MDS and how the presence of both the MDS and SLR will impact on them*			The response to this is presented in Annex A and replicated that submitted at Deadline 5 [REP5-120].
ESC comments on the MDS and SLR note *Paragraphs 1.3.7 to 1.3.11. - Provide further detail on embedded mitigation required for commuting bats, particularly the proposed bat road crossings ('hop-overs').*			

ANNEX A: IN COMBINATION EFFECT SIZEWELL LINK ROAD AND MAIN DEVELOPMENT SITE ON BATS

In Combination Effect Sizewell Link Road and Main Development Site on Bats

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PLATES

None Provided

FIGURES

Figure 1: Adult female Natterer's bat - MCP 95% comparison

Figure 2: Bat 21 - breeding female Natterer's bat - triangulation points

ANNEXE

ANNEX A. FIGURES 5

1 BACKGROUND TO THIS NOTE

1.1.1 This note provides a supplementary response to those already provided by SZC Co at Deadline 3 [REP3-044] which responded to the detailed points made by the Councils in respect of bats. That response deferred two points which required further consideration, in respect of (i) cumulative effects between the main development site and the Sizewell link road and (ii) in-combination effects arising primarily from noise and light.

1.1.2 This note provides a response to the first of these points. The second point will be addressed at Deadline 6 when new graphics will be available.

1.2 Issue (from the LIR)

1.2.1 "*In addition to the above, the Councils do not consider the cumulative impacts from the Main Development Site (including the Temporary Construction Area) and the Sizewell Link Road have been adequately considered (please also see the ecology section of the Sizewell Link Road chapter). Both developments will require the removal of habitats suitable for foraging and commuting bats and, as the two developments connect, it is highly likely that it will be the same bat population which will experience this impact. Given that the species most likely to suffer from this impact is barbastelle (and to lesser extent maybe Natterer's bat as well), this will compound the existing conclusion of a Moderate Adverse, Significant level impact and may even give rise to a Major Adverse, Significant level impact*"

1.3 SZC Co.'s Response

1.3.1 It is considered that the approach employed in relation to the in-combination effect of the main development site and the Sizewell link road adequately captures and assesses the potential combined impact of these two components of the Sizewell C Project on bats. The conclusion of the assessment is that there is no pathway for the impacts identified in the updated bat impact assessment [AS-208] and **Volume 5**, **Chapter 7** of the **ES** [APP-461] for each of the project components to combine to create a significant project-wide effect, and that this has been adequately assessed in the two ES chapters.

1.3.2 There are two key reasons for the conclusion:

- The residual effects from the main development site and the Sizewell link road are such that they are unlikely to combine to produce project-wide effects. The main residual effect on the main development site is fragmentation in the construction Phase (years 0-12) and is considered moderate adverse (significant). In contrast, fragmentation is not

considered to lead to significant effects in either the construction phase (years 0-3) or operational phase (3+) for the Sizewell link road (due to the nature of the development and embedded mitigation).

- The bat populations associated with the two project components are different (due to geographical locations and habitat types in the vicinity) and support different species assemblages. The survey information from the radio tracking surveys also suggests limited movement of bats between the two areas.

1.3.3 Each of these aspects is discussed in more detail below:

a) Point 1 – Residual Effects

1.3.4 For the Sizewell link road, no significant adverse effects are foreseen on bats, in the construction or operational phase. The main development site assessment identifies a significant adverse effects on bats in the construction phase (years 0 -12) of the Sizewell C Project, through habitat fragmentation.

Table 1: Summary of impact Assessment of potential cumulative impact pathways

Scheme	Construction	Operation
Main Development Site (ES Bat Addendum) [AS-208]	YEARS 0 -12 Moderate adverse (significant)	YEARS 12+ No residual impact
Sizewell Link Road (ES) [APP-461]	YEARS 0 -3 Minor adverse (**not significant**).	YEARS 3+ Minor beneficial (**not significant**)

1.3.5 Given this, there is no clear pathway for project-wide effect to occur or to be under-valued in the ES assessments. The pathway for the fragmentation impact within the main development site relates to the location of the construction area, which will be lit, and is likely to reduce commuting routes for bats to three dark corridor and around the site boundaries. In contrast the Sizewell link road will remain dark other than lighting provided at the A12 and B1122 roundabouts and so there is limited risk of fragmentation. The potential for fragmentation effects arising from the Sizewell link road is also considered low given that there are a number of examples of rare woodland bats ‘using’ road corridors as flyways. Examples include A27 Emsworth (Bechstein’s), B2149 Rowlands Castle (Bechstein’s), A120 west of Bishop’s Stortford (Barbastelle) and A417 Cheltenham (All four annex II species).

1.3.6 In addition, once the Sizewell link road is operational, the new plantings will provide greater connectivity and this further reduces the potential for a project-wide effect from Year 3 onwards. This will become beneficial (see Table 1), once the plantings are mature.

b) Point 2

1.3.7 The bat populations associated with the main development site and the Sizewell link road area are different. Radio tracking on the main development site [APP-245] indicates that the barbastelle populations on the site are associated with the EDF estate and Minsmere to the north, with minimal usage of the areas to the west through which the Sizewell link road is located (to the north-west of the main development site). The text below is from the main development site bat impact assessment [AS-208]:

1.3.8 *'Radio-tracking surveys have identified an interchange of bats between Minsmere and the EDF Energy estate as well as the use of the EDF Energy estate by bats throughout the bat active season. Tagged barbastelle were recorded using the EDF Energy Estate all year round and moving between the two areas on a number of occasions throughout the 2014 radio-tracking survey. Of the seven female barbastelle trapped in Minsmere, four were confirmed to be active within the EDF Energy Estate, whilst of the seven females trapped within the EDF Energy Estate, at least six were confirmed to be active within Minsmere. All three of the male barbastelle trapped within the EDF Energy Estate were recorded within Minsmere (no adult males were caught within Minsmere). One tagged female was recorded roosting in both locations.'*

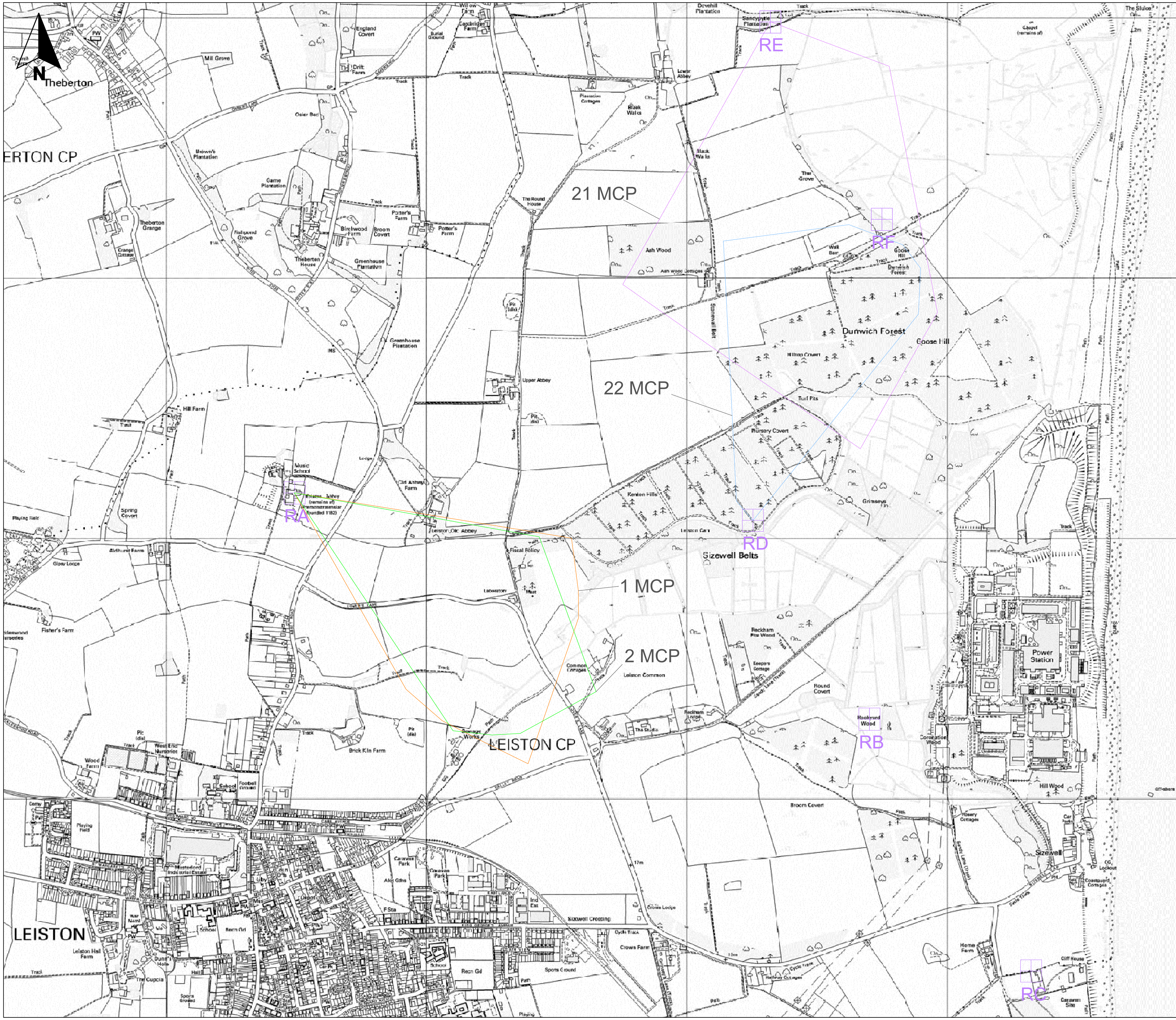
1.3.9 This is also true for Natterer's bats, which were associated within the Kenton Hills area and Aldhurst Farm to the west, and not the area where the Sizewell link road will be located to the north-west (accepting that only a low number of bats were tracked). The images in **Annex A** show the location of Natterer's bats tracked across the EDF site.

1.3.10 In recent surveys, the Sizewell link road site has been found to support smaller populations of Natterer's bats and barbastelle than the main development site [APP-242 to APP-246 and APP-462]. These populations are likely to form different meta populations, although there will be some population overlap.

1.3.11 Activity surveys within the Sizewell link road site boundary revealed common and soprano pipistrelle as the mostly frequently recorded species with other species recorded at very low levels [APP-462]. *Myotis* sp. had only low levels of activity identified specifically to Natterer's. Barbastelle were recorded at low levels in 2019 during activity surveys [APP-462]. No

evidence within (and low likelihood) of barbastelle breeding roosts within the site was identified [APP-462].

ANNEX A. FIGURES



KEY

Bat 1	
Bat 2	
Bat 21	
Bat 22	

Sizewell Bat Report 2011

Figure C37
Adult female Natterer's bat - MCP 95% comparison

January 2012
28130_A278.dwg tugwc

amec

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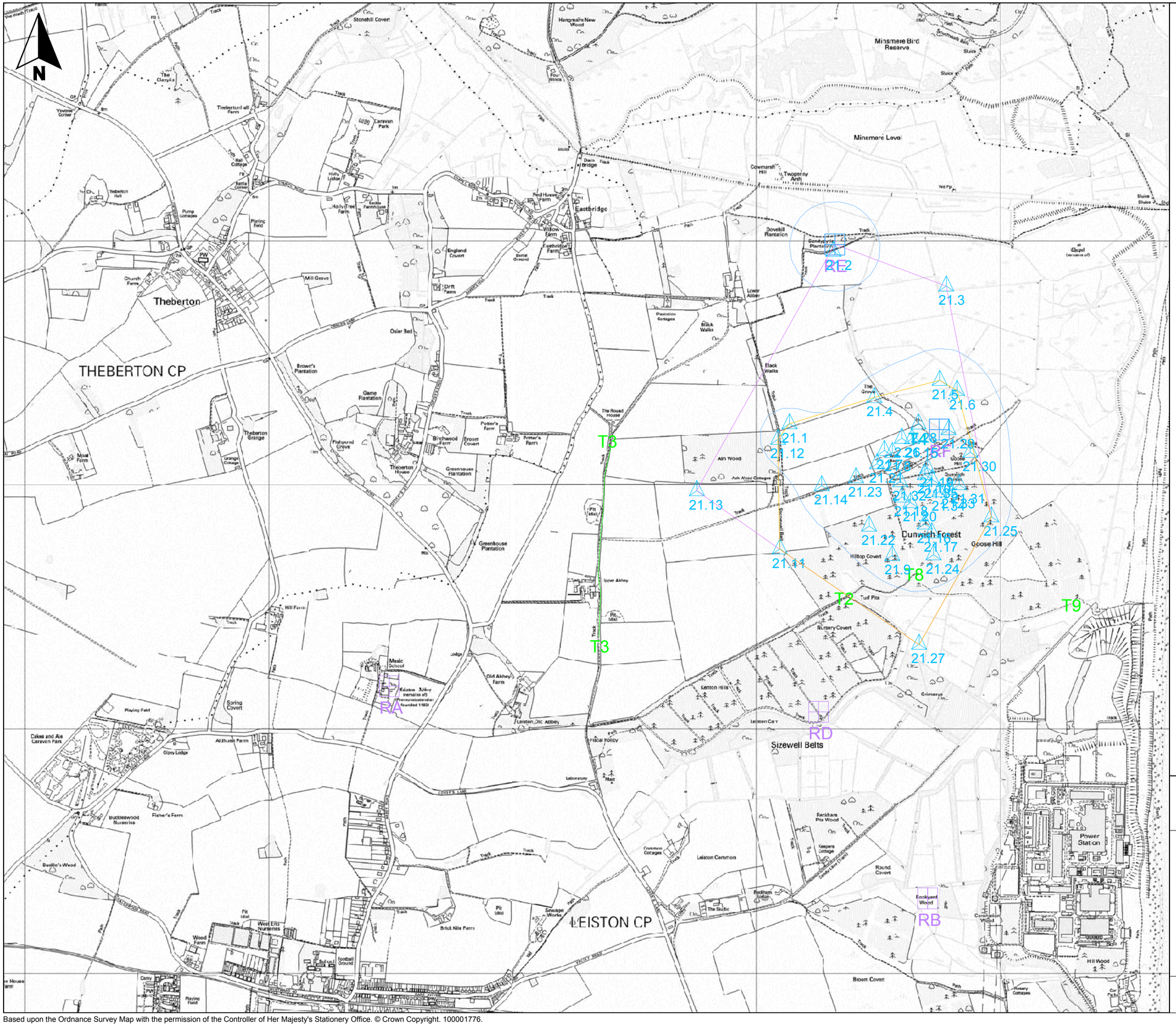

KEY

- Roost A
- Roost E used by bat 21
- T4 — Mist net/harp trap trapping location 4 - bat 21 caught here
- 21.24 — Bat 21 joint bearing triangulation point 24
- 95% kernel analysis
- 95% cluster analysis
- 95% MCP analysis

Sizewell Bat Report 2011

Figure C22
Bat 21 - breeding female Natterer's bat - triangulation points

January 2012
28130_A263.dwg tugwc

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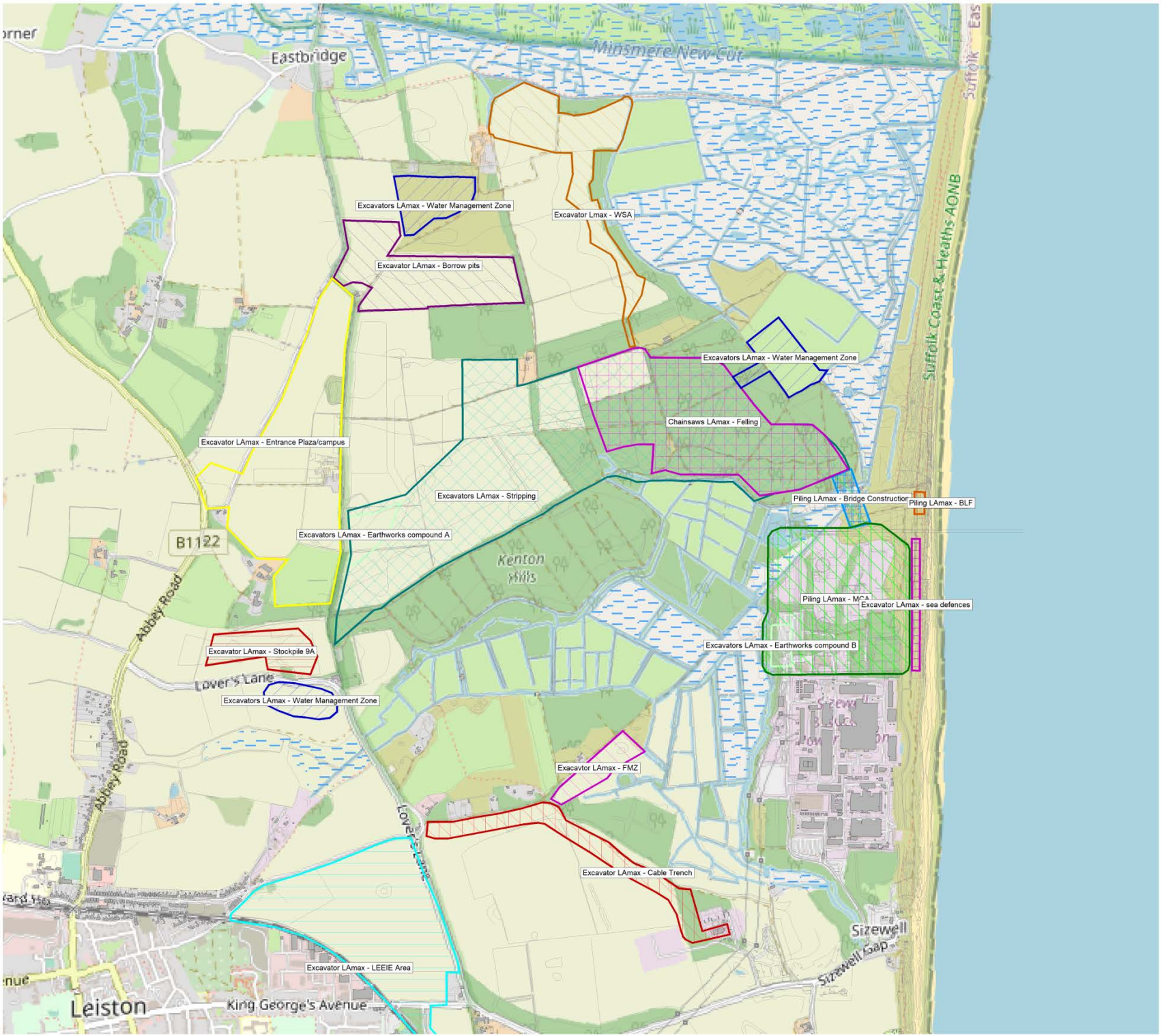
ANNEX B: SHARPS REDMORE DRAWINGS ILLUSTRATING THE NOISE SOURCES USED TO GENERATE THE NOISE CONTOURS.



Sizewell Construction Noise Phase 1 Lmax sources (22KHz)

Activity Areas

- Excavators stripping LEEIE
- Chainsaws - Tree Felling
- Piling MCA
- Excavators WSA
- Excavators WMZ's
- Excavators Cable Trench
- Excavators Plaza/Campus
- Excavators Borrow PIts
- Piling BLF
- Excavators Sea Defences
- Excavators Stockpiling area
- Excavators Compounds
- Excavators Stripping TCA
- Excavators FMZ
- Bridge Piling SSSI Crossing

Notes:

Excavator noise levels at 22KHz from individual Lmax events of around 60dB at 10m from source

Piling activity noise levels at 22KHz of around 60 to 85dB at 10m from the source location depending upon method.

Tree felling noise level from chainsaw activity at 22KHz of 25dB at 10m from source

All modelled as an array of point sources covering area where activity may occur

Plant cannot be located at all locations at the same time

Scale 1:20000

0 100 200 400 600 800 1000

SHARPS REDMORE
ACOUSTIC CONSULTANTS

Sizewell Construction Noise Phase 2 Lmax sources (22KHz)

Activity Areas

- Excavators Stockpile area
- Piling MCA
- Excavators Cable Trench
- Excavators Plaza/Campus
- Excavators Borrow PIts
- Excavators Stockpiling area
- Excavators Stripping TCA
- ADT Haul Road & Loco Lmax
- Container 'bumping' Railhead

Notes:
Excavator noise levels at 22KHz from individual Lmax events of around 60dB at 10m from source

Container 'bumping' during railhead operation Lmax noise levels at 22KHz of around 50dB at 10m from the source

ADT movements along Haul Road Lmax noise levels at 22KHz of around 50dB at 10m from source

Locomotive movements under full power Lmax noise levels at 22KHz of around 75 at 10m from source.

Piling activity Noise levels at 22KHz of around 60 to 85dB at 10m from the source location depending upon method

All modelled as an array of point sources covering area where activity may occur with exception of ADT's on Haul Road and Locomotive modelled as moving point sources along defined route

Plant cannot be located in all locations at the same time

Scale 1:20000

0 100 200 400 600 800 1000

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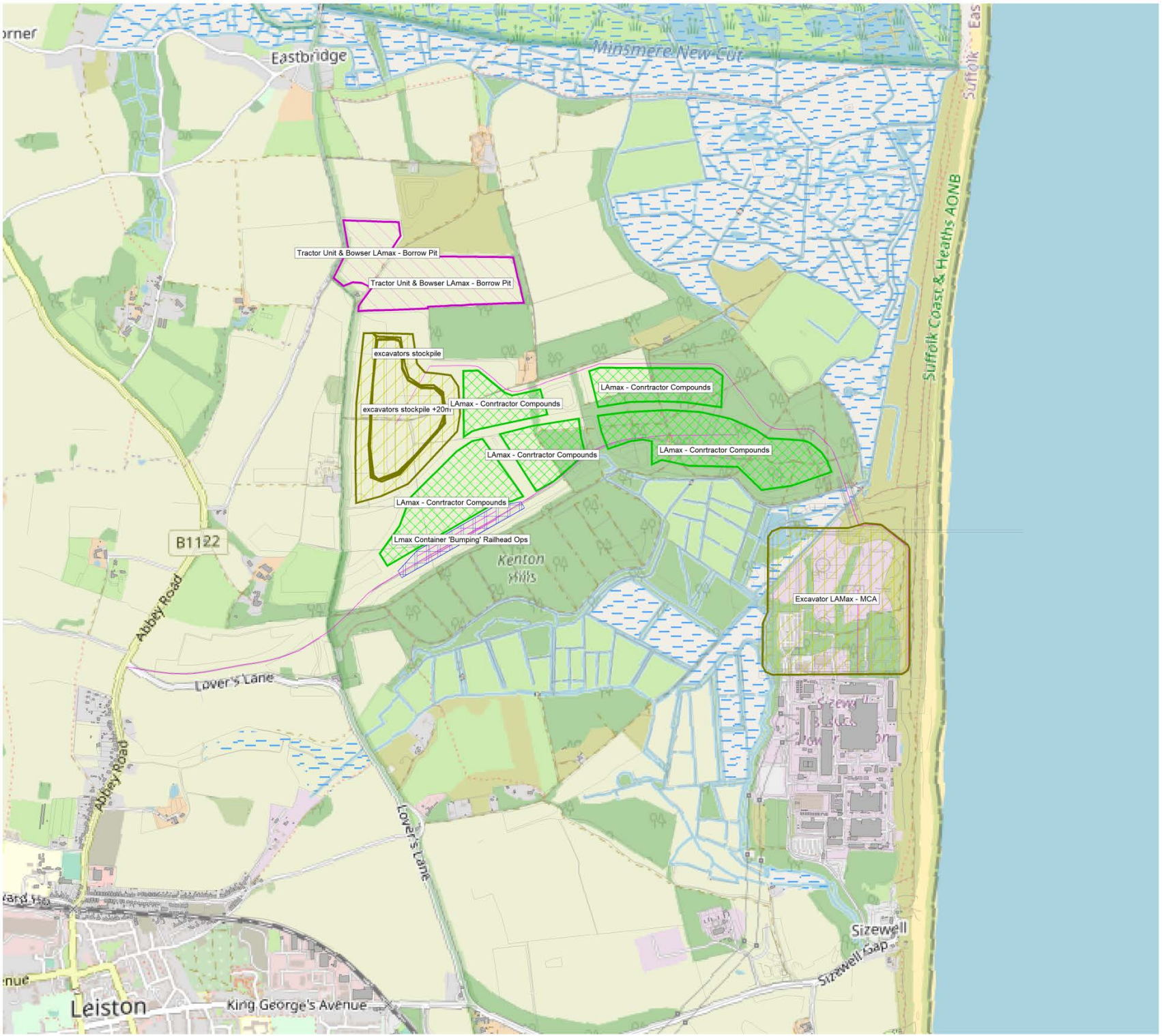

Sizewell Construction Noise Phase 3 Lmax sources (22KHz)

Activity Areas

- Excavators Stockpile area
- Excavators MCA
- Tractor/Bowser Borrow PIt
- Excavators Stockpiling area
- ADT Haul Road & Loco Lmax
- Contractor Compound Lmax
- Container 'bumping' Railhead

Notes:

Excavator noise levels at 22KHz from individual Lmax events of around 60dB at 10m from the source

Container 'bumping' during railhead operation Lmax noise levels at 22KHz of around 50dB at 10m from the source

ADT movements along Haul Road Lmax noise levels at 22KHz of around 50dB at 10m from source

Locomotive movements under full power Lmax noise levels at 22KHz of around 75 at 10m from source.

Contractor Compounds Lmax noise events at 22KHz of around 50dB at 10m from individual sources

All modelled as an array of point sources covering area where activity may occur with exception of ADT's on Haul Road and Locomotive modelled as moving point sources along defined route

Plant cannot be located at all locations at the same time

Scale 1:20000

0 100 200 400 600 800 1000

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APPENDIX F: SOUTHERN PARK AND RIDE DRAINAGE DESIGN NOTE

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1 INTRODUCTION

1.1.1 NNB Generation Company (SZC) Limited (SZC Co.) submitted an application for a Development Consent Order (DCO) to the Planning Inspectorate under the Planning Act 2008 for the Sizewell C Project (referred to as the 'Application') in May 2020. The Application was accepted for examination in June 2020.

1.1.2 The southern park and ride development forms part of the Application to build and operate a new nuclear power station to the north of Sizewell B.

1.1.3 SZC Co. has undertaken work to validate and develop the design of the southern park and ride that was originally submitted as part of the DCO application. This document forms one of a series of design validation and evolution documents being provided to the Examining Authority in support of the **Outline Drainage Strategy** [REP2-033] and subsequent **Drainage Strategy** submitted at Deadline 7.

1.1.4 The southern park and ride forms one of the Associated Developments (AD) which are required to mitigate traffic impacts arising from the main development site. The southern park and ride is located alongside the A12 at Wickham Market. Its function is to provide a transport hub from which construction workforce are driven to site by coach thus reducing the construction traffic needing to access the main development site. Full details of its facilities are contained in **Volume 4 Southern Park and Ride Chapter 2 Description of the Southern Park and Ride** [APP-380] and are described in summary below.

1.1.5 The site will consist of workforce parking, welfare, security and amenity buildings. The workforce parking includes car parking spaces, accessible spaces, minibus/van spaces, pick up and motorcycle spaces. It also has a Traffic Incident Management Area (TIMA). The TIMA is a holding park to which vehicles can be diverted in the event of an incident on the highway network or at the construction site.

1.1.6 The site access entrance from the B1078/A12 Hacheston slip road will be designed to Suffolk County Council's (SCC) adoptable standards but will remain unadopted.

1.1.7 The southern park and ride site will generate surface water runoff from paved areas and roofs which will require to be removed, treated as necessary and disposed.

1.1.8 The site access entrance road access from the B1078/A12 Hacheston northbound on slip road will generate surface water highway runoff which will require to be removed, treated as necessary and disposed.

1.1.9 The southern park and ride welfare facilities will generate foul water flows which will require to be removed, treated as necessary and disposed.

1.1.10 The southern park and ride facility and its associated site access entrance will remain in place and use during construction of the SZC power station. Once construction is complete the site will be closed and decommissioned. It will then return to current agricultural use.

2 PURPOSE

2.1.1 The **Outline Drainage Strategy** [REP2-033] identified at concept level the proposed drainage approach required for:

- The effective removal of highway and surface water runoff from the proposed southern park and ride and site entrance access road, together with its treatment and disposal, and
- The effective removal of foul water generated by the workforce from the proposed southern park and ride

2.1.2 The proposed drainage infrastructure was described in the concept drainage design submitted as part of the Application. This concept design was based on data and information available at that time. The design was supported by the submission of the **Southern Park and Ride Flood Risk Assessment** (FRA) [APP-117].

2.1.3 This concept drainage strategy was developed in consultation with drainage regulators and local authorities, including SCC and the Environment Agency (EA). The observations/requirements of drainage regulators were incorporated in the strategy.

2.1.4 The purpose of this technical note is to provide details of data which validates the **Outline Drainage Strategy** [REP2-033] and subsequent **Drainage Strategy** (Doc. Ref. 6.3 2A (B) submitted at Deadline 7), a description of how the proposed concept drainage infrastructure is developing and evolving and to demonstrate that it continues to provide for the effective and satisfactory drainage of the southern park and ride and its associated external road modification, without unacceptable adverse impact on the water environment, both in terms of flood risk and pollution.

3 DESCRIPTION OF DCO DRAINAGE DESIGN STRATEGY

3.1.1 The southern park and ride concept drainage strategy at DCO stage was developed by SZC Co. Proposals were developed for both the southern park and ride development site and associated site access entrance road.

3.1.2 Subject to achievable infiltration rates making infiltration a viable option, all surface water generated within the southern park and ride red line boundary, which includes the site access entrance road from the B1068/A12 slip road, would be contained within the site and discharged to ground by infiltration.

3.1.3 No surface water runoff from the site would be permitted to flow onto the B1078/A12 public highway.

3.1.4 Liaison with Anglian Water took place and it was confirmed that there are no public foul or surface water sewers near to the development site. Accordingly, the proposed infrastructure would be a local private foul water network discharging into a package sewage treatment plant. The treated effluent would discharge to ground by infiltration.

3.1.5 If the flow generation is too low or intermittent to be treated to the required standard or infiltration is not viable, then a sealed tank (cess tank) would be provided with sewage being collected and removed by tanker for offsite treatment.

3.1.6 A single remote security cabin at the site entrance would drain to a septic tank with infiltration to ground. If infiltration rates are inadequate the septic tank would be replaced by a cess tank.

3.1.7 The internal site layout showing the position of proposed drainage including swales, and infiltration basins is shown in **Plates 1** and **2** which are an extract from Application drawing **"Chapter 2 Description of the Southern Park and Ride** Figure 2.4" [APP-382].

Plate 1: Southern park and ride internal layout showing concept drainage infrastructure to the north

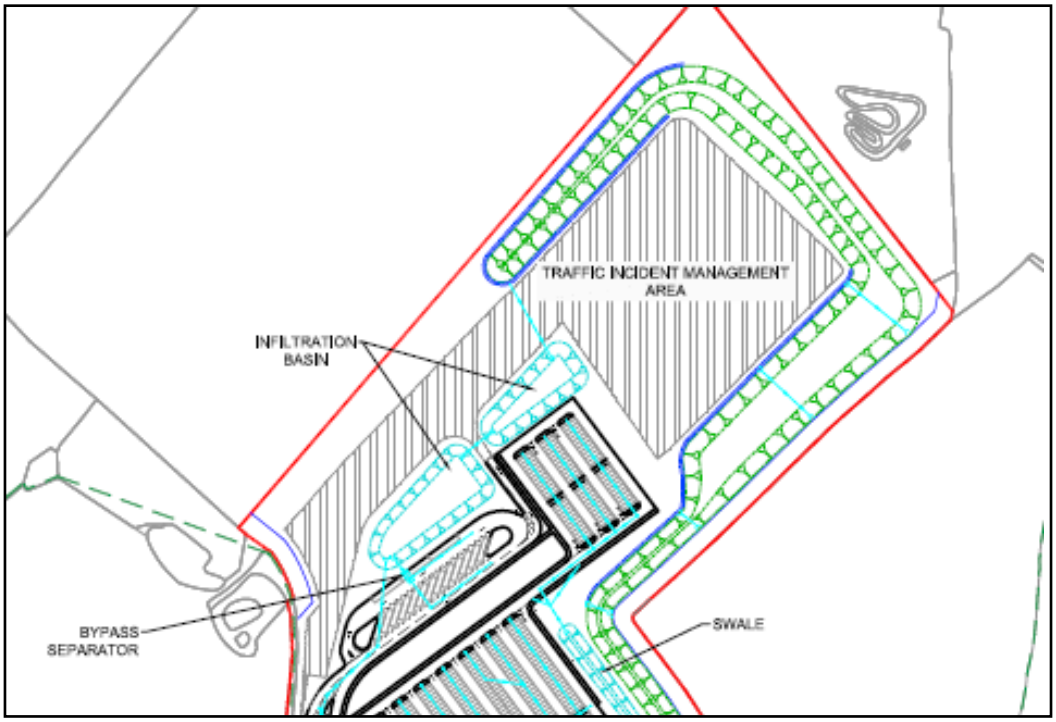
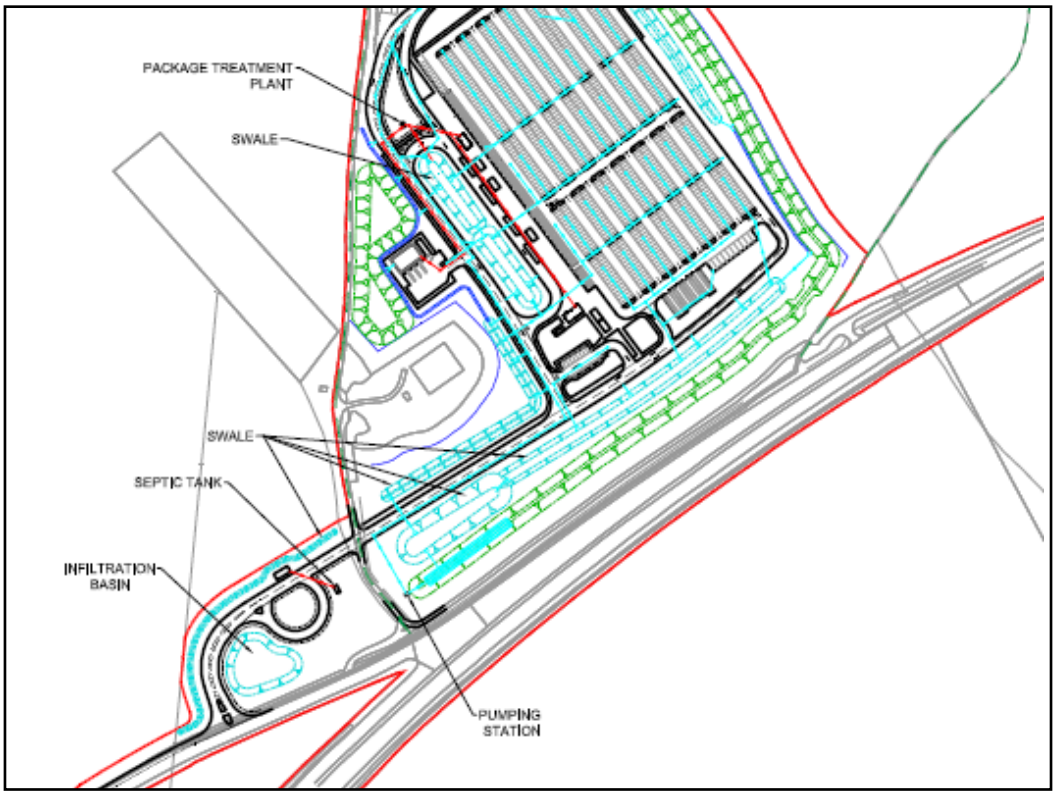
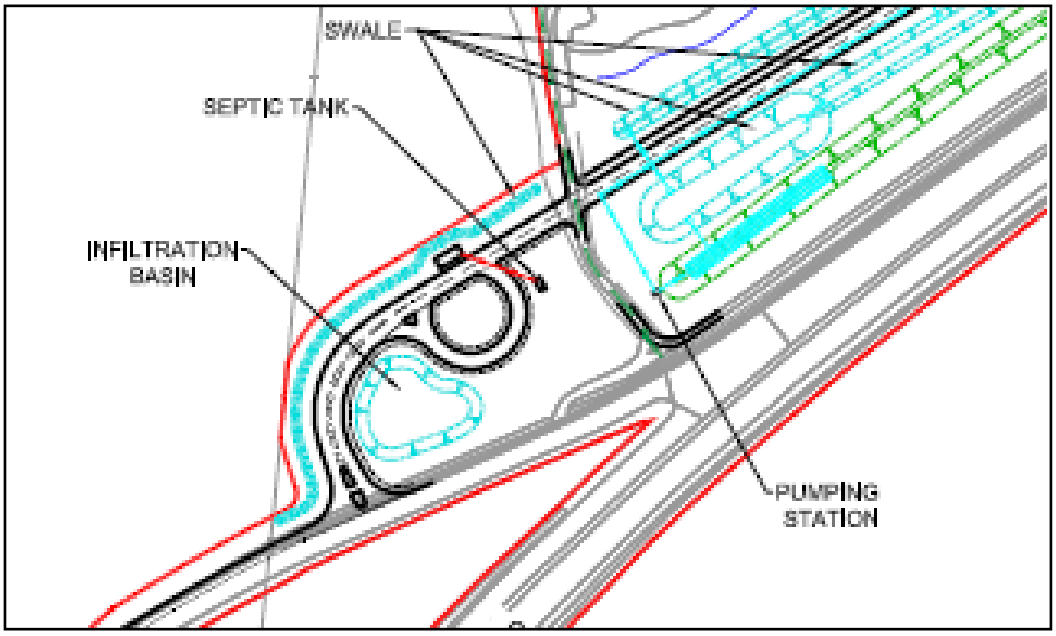


Plate 2: Southern park and ride internal layout showing concept drainage infrastructure to the south



3.1.8 The external site layout showing the road modifications with swales and infiltration basin is shown in **Plate 3**.

Plate 3: Southern park and ride access entrance road



4 EXISTING SITE AND ADJACENT HIGHWAY DRAINAGE ARRANGEMENTS

4.1.1 Subsequent to development of the initial drainage strategy some site investigation has been undertaken within the site red line boundary.

4.1.2 Except for one pond there are no obvious surface drainage features within the proposed site. Given the general topography with a reasonable fall in ground levels approximately 28-29 mAOD at the northern extent of the site to 23 mAOD adjacent to the B1078 A12 slip road and no evidence of ditches or erosion channels etc, it is assumed that surface water overland flow across the site is relatively limited, implying infiltration to ground takes place.

4.1.3 This view, that the site currently infiltrates into the existing soils, is reinforced by desktop study of predicted ground conditions and observation of the surface. Soil Index descriptions from the Institute of Hydrology Flood Studies Report indicate that superficial soil types may be suitable for infiltration. Soil was observed to be sandy in some parts of the site but more cohesive clay closer to the road at lower elevation.

4.1.4 From inspection of the B1078/A12 slip road it is noted that the road is drained by a series of highway gullies and there are manholes located in the footpath. This indicates the presence of highway drainage network. Enquiries have been made with SCC to obtain details of this drainage. Unfortunately, SCC has no asset records or local knowledge of the network. The Wickham Market bypass was constructed by the predecessor body to Highways England in 1976.

4.1.5 The EA Surface Water Flood Map predicts no effective risk of flooding of the site or the slip road and SCC also has no knowledge of flooding issues on the highway.

5 REVISED DRAINAGE DESIGN STRATEGY INPUT DATA

5.1.1 The concept design which was included in the original DCO drainage design has been modified to take account of data which has become available since the Application.

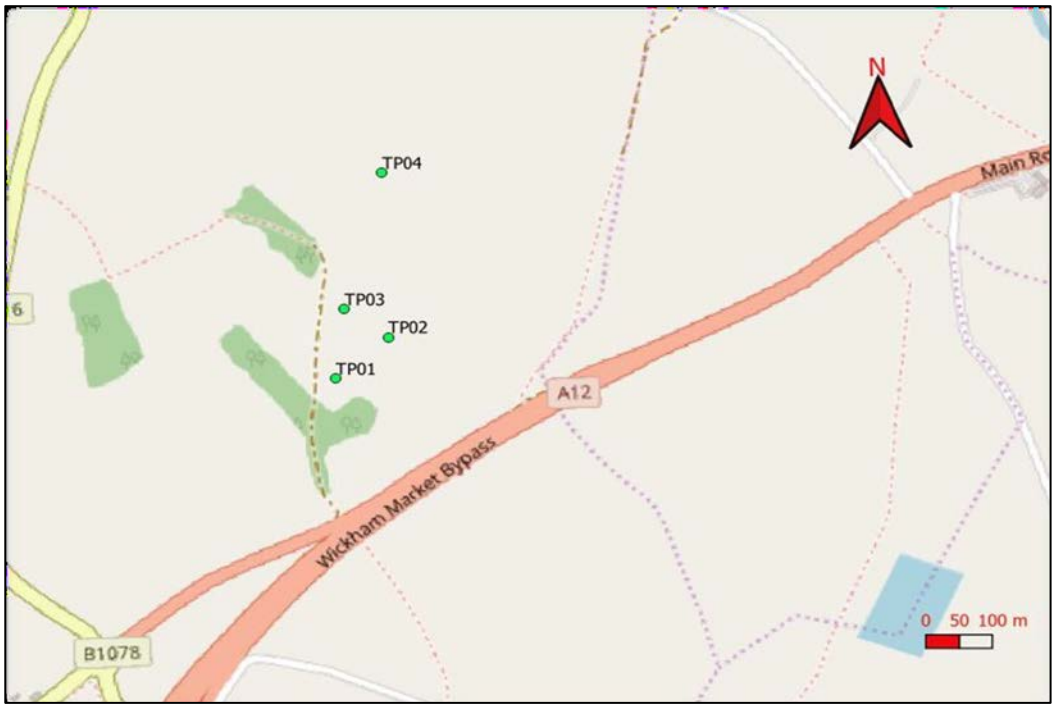
5.1.2 The new data which informs the design development is listed below:

- Ground Investigation and infiltration testing undertaken in November 2019
- Site visit and inspection of southern park and ride extent in 2020
- Site visit and inspection of southern park and ride extent on 3 August 2021

6 GROUND INVESTIGATION AND INFILTRATION TESTING RESULTS

6.1.1 Four trial pits were excavated within the site at locations shown in **Plate 4**.

Plate 4: Southern park and ride site infiltration test trial hole locations



6.1.2 Infiltration testing in accordance with BRE365 (Ref. 1) was undertaken and the results are shown in **Table 1**

Table 1: Southern park and ride site infiltration test trial hole results

Location	Depth (m)	Test 1(m/s)	Test 2(m/s)
TP01	1.25	0	0
TP02	1.30	0	0
TP03	1.32	0	0
TP04	2.1	3.13×10^{-5}	3.01×10^{-5}

6.1.3 In the case of TP01, TP02 and TP03 it was recorded that there was negligible infiltration achieved in 60 hours.

6.1.4 It is not clear as to why TP01, TP02 and TP03 were excavated to a shallower depth.

6.1.5 The nature of the strata in TP01, TP02 and TP03 is stated to be stiff but slightly gravelly clay, Lowestoft Formation Diamicton. At TP04 this changes to a slightly gravely, slightly clayey Lowestoft Formation Sand and Gravel.

6.1.6 The results align with the British Geological Survey data which is noted in the **Southern Park and Ride FRA** [APP-117]. The BGS map records superficial geology for the site to be two types of the Lowestoft Formation; formed of sand and gravel in the south-western and north-eastern sections of the site, with an approximate 500m strip of diamicton running through the site centre. As shown in Figure 4 TP01, TP02 and TP03 are located in the centre of the site and TP04 is to the north east. No trial pits were excavated in the west or south west of the site.

6.1.7 The superficial Lowestoft Formation is underlain by Crag Formation at about 6 m below ground level. Crag Formation is described as shallow-water marine and estuarine sands, gravels, silts and clays. Crag has variable permeability but will have greater potential for infiltration.

6.1.8 In summary these results demonstrate that disposal of surface water runoff by infiltration is achievable but only at TP04 which is to the north and at higher elevation. SCC consider that an infiltration rate in excess of 1.4 x 10-6 m/s is viable for infiltration to ground.

6.1.9 At the time of visit on 3 August 2021 further ground investigation works were in progress and include additional infiltration testing. The results of the further infiltration testing will be taken into account at preliminary design stage. It is hoped that these results will demonstrate that infiltration is viable in other parts of the site but if this is not the case, it is considered that the current concept proposals will provide for suitable and effective drainage of the site.

7 REVISED SURFACE WATER CONCEPT DRAINAGE DESIGN STRATEGY – SOUTHERN PARK AND RIDE SITE

7.1.1 The arrangements for removal of surface water remain as broadly as described in document **"Environmental Statement Volume 4 Chapter 2 Description of the Southern Park and Ride"** [APP-381] but are modified to take account of the site inspections.

7.1.2 It is intended that all surface water runoff is to be contained within the site and removed by infiltration to ground. However, taking account of the proven lack of infiltration in the middle of the site, it is intended that that runoff will be removed and collected in the lowest elevation in the south west and then pumped to the north where infiltration is viable. If the latest infiltration testing demonstrates that infiltration is viable in the south west corner of the site as is suspected, then this would be modified to remove the pumping requirement.

7.1.3 Runoff from roofs will be drained via downpipes and gullies, as appropriate to underground carrier drains and discharge into attenuation basins and swales.

7.1.4 Runoff from the internal roads, the bus/HGV standing areas and the Traffic Incident Management Area, which must have an impermeable surface will be drained via surface outlets, gullies, linear channels and drains etc. These will discharge into underground carrier drains which will convey the runoff to the same attenuation basins and swales or in the north to infiltration basins.

7.1.5 Bypass interceptors will be installed downstream of the bus/HGV standing areas in order to remove hydrocarbon and silt contaminants which will improve the water quality of discharge to the attenuation basins, swales and infiltration basins.

7.1.6 The extensive car parking areas will have a permeable surface allowing runoff to permeate into and be temporarily stored in the sub-base. This will assist with attenuating peak flow rate, provide some storage and initial treatment of the runoff. The sub-base will allow flow to drain into the carrier drains.

7.1.7 In the centre and south parts of the site, the underground carrier drains will discharge all surface water into a series of swales and attenuation basins which will provide suitable treatment in accordance with CIRIA C753 The SuDS Manual (Ref. 2). The swale/attenuation basin network will discharge into a pumping station which will pump runoff to the infiltration basins to the north.

7.1.8 In the north part of the site, the underground carrier drains will discharge all surface water into one of two infiltration basins by gravity. The infiltration basins will provide suitable treatment in accordance with CIRIA C753 The SuDS Manual.

7.1.9 At concept design stage, the footprint for each swale and basin was based on indicative calculations using the UK SUDS Storage Estimating Tool (Ref. 3) and assuming an outfall discharge based on a rate of 2 l/s/Ha.

7.1.10 The infiltration basin storage requirements have now been updated with more detailed calculations using MicroDrainage with proven infiltration rates measured at the northern infiltration basin location. They assume discharge of local runoff discharged by gravity to the north plus pumped flows from the centre and south west of the site.

7.1.11 The layout drawing in **Appendix A** shows the existing DCO submitted layout but superimposed with required storage volumes and footprints for infiltration and attenuation basins or underground storage. These have been determined by the hydraulic modelling calculations. The calculations are shown in **Appendix B**.

7.1.12 The attenuation storage for the central and south area is provided using underground storage. The available area and volume has been maximised. A required pump rate has been determined to ensure that the storage capacity is not exceeded.

7.1.13 The calculations allow for Option 1 shown in **Appendix A**, a discharge of 5l/s from the site entrance access road attenuation basin into the pumping station.

7.1.14 The storage requirements for the infiltration basin to the north allow for the pumped flow at 50 l/s.

7.1.15 Hydraulic calculation based requirements are summarised in **Table 2**.

Table 2: Southern park and ride site drainage attenuation and infiltration infrastructure requirements at concept design stage

Infrastructure Location	Dimensions
South central area attenuation storage tank	9,888 m^3
Entrance road Attenuation Basin	338 m^3
Pump Discharge Rate to north Infiltration Basin	50 l/sec
Average Infiltration Rate at north Infiltration Basin (TP04)	104.04 mm/hour
North Infiltration Basin	3209 m^3
North Infiltration Basin Half Drain Time	471 minutes (~8 hours)

7.1.16 It can be seen that the required volumes for the gravity and pumped catchments are linked. If the pumped flow rate is increased required storage volume in the upstream attenuation basins and swales is reduced. However, the higher pumped flow rate will increase the infiltration basin storage volume requirements to the north.

8 REVISED FOUL WATER DRAINAGE CONCEPT DESIGN STRATEGY – SOUTHERN PARK AND RIDE SITE

8.1.1 The foul water drainage strategy remains unchanged with foul water flows collected by an underground gravity pipe drainage network and discharged into a package sewage treatment plant. However, whilst previously the treated effluent would discharge to ground via infiltration through a drainfield network, the current infiltration test results demonstrate that this is not feasible. Therefore, the treated effluent is proposed to discharge into a swale and ultimately having mixed with surface water runoff will be pumped to the north infiltration basin where the treated effluent will infiltrate to ground.

8.1.2 Given that that foul water flow rates generated will be low and intermittent with a range of flow it may make the delivery of a consistent treated effluent to meet the requirements of the required environmental permit more challenging. If a suitable package plant and associated treatment infrastructure cannot be developed during preliminary design or consent to a discharge of treated effluent by infiltration to ground cannot be agreed, the alternative will be to collect the foul water sewage in an underground sealed cess tank from which it can be collected and regularly removed by tanker for treatment offsite.

8.1.3 The remote security cabin arrangement of discharge into a septic tank will remain. Solids will be collected in the tank and removed by tanker for treatment offsite. Liquid effluent will discharge to ground via a drainfield network. The drainfield typically consists of an arrangement of trenches containing perforated pipes and porous material (often gravel) covered by a layer of soil to prevent animals (and surface runoff) from reaching the wastewater distributed within those trenches.

8.1.4 During design development should it be determined that the infiltration rate is insufficient for the provision of a drainfield and therefore create a flood risk it will be necessary to collect wastewater and sewage in a cesspit from which it can be collected and regularly be removed by tanker for treatment offsite.

9 REVISED SURFACE WATER DRAINAGE CONCEPT DESIGN STRATEGY – B1078/A12 HACHESTON SLIP ROAD AND SITE ENTRANCE ACCESS ROAD

9.1.1 The surface water drainage strategy for the highway drainage remains unchanged being infiltration to ground to the extent that this is achievable. As noted in Section 5 no infiltration testing is currently available for this part of the site. Additional infiltration testing is in progress, but additional results are not currently available.

9.1.2 The level of the site entrance access road will be set to ensure that there is no additional surface water highway runoff that can discharge into the existing B1078 A12 slip road highway drain.

9.1.3 The site entrance access road will remain in SZC Co. private ownership.

9.1.4 Highway surface water runoff will discharge either by “over the edge” or kerb and gullies into a swale. The swale will include for an underlying filter drain. Since infiltration viability is unconfirmed the filter drain will discharge flow that does not infiltrate into an infiltration basin located between the slip road boundary, the access road and the vehicle roundabout.

9.1.5 The roundabout will be drained by gullies which will discharge into the infiltration basin.

9.1.6 If following infiltration testing at the infiltration basin location it is established that infiltration will not be viable, the infiltration basin will change to an attenuation basin. The basin will outfall to the pumping station with discharge to the infiltration basins to the north where viability of infiltration is proven.

9.1.7 SCC do not consider that infiltration is viable where the infiltration rate is proven to be les than 1 x 10^{-6} m/s. Hydraulic calculations have been undertaken to determine whether for available space and this infiltration rate, infiltration is viable. The results are shown as Option 2 in **Appendices A and C**. They are also summarised in **Table 3.**

Table 3: Southern park and ride site entrance drainage infiltration infrastructure requirements at concept design stage

Infrastructure Location	Dimensions
Entrance Road Infiltration Basin	596 m^3
Minimum Infiltration Rate	1 x 10^{-6} m/sec
Half Drain Time	More than 7 days

9.1.8 The results demonstrate that infiltration is not viable due to the extended half drain down time.

9.1.9 The alternative Option 1 shown in **Appendices A and C** is for an attenuation basin which will contain the required volume of runoff whilst releasing it at a controlled rate to the pumping station which will discharge flow to the north infiltration basin. This is described in more detail in Section 7.

10 SUMMARY AND CONCLUSION

10.1.1 The purpose of this technical note is to validate the Outline Drainage Strategy and subsequent Drainage Strategy (submitted at Deadline 7) for the southern park and ride. It describes how the concept design has needed to evolve as a result of design development and the lack of certainty as to the viability of removal of surface water runoff by infiltration across the whole site.

10.1.2 Based on the infiltration rates measured at TP04 in the northern part of the site, removal of surface water runoff and treated effluent by infiltration to ground remains viable. It is noted that the alternative options of discharge to local watercourse or sewer are not available.

10.1.3 Subject to the results of DCO examination and acceptance of the drainage design strategy principles contained in this report, the drainage designs will be developed to preliminary design stage.

10.1.4 At this stage subject to the additional infiltration test results particularly in the south west at lowest elevation it is intended that the need to pump flow to the north for removal can be removed. However, if necessary it can be retained. If pumping is required then back up provision in case of pump failure will be incorporated in the design with provision of passive additional storage being the preferred option.

10.1.5 The southern park and ride facility drainage design will be based on CIRIA C753 SuDS Manual, Design and Construction Guidance for Foul and Surface Water Sewers (formerly Sewers for Adoption) (Ref. 4), and PPG4 Treatment and Disposal of Sewage where no Foul Water Sewer is Available (Ref. 5).

10.1.6 The site access entrance road will be based on Design Manual for Roads and Bridges (DMRB) (Ref. 6), Manual of Contract Documents for Highway Works (MCHW) (Ref. 7) and SCC specific guidance (Refs. 8 and 9).

10.1.7 As preliminary design progresses SZC will liaise with SCC and the EA through design review meetings to ensure acceptance of the drainage infrastructure and to ensure compliance with regulatory requirements and environmental permits.

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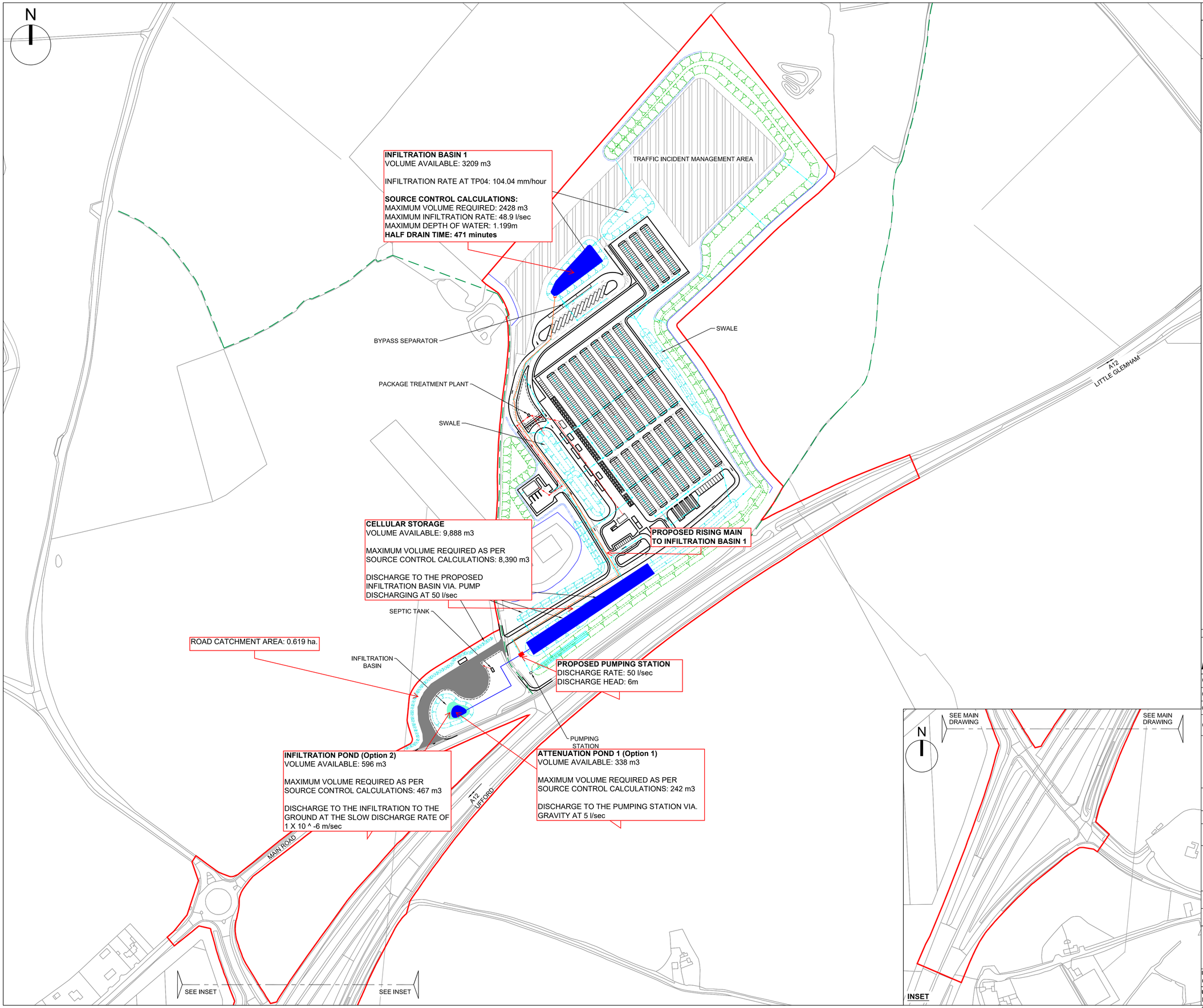
APPENDIX A: LAYOUT PLAN SHOWING ATTENUATION STORAGE REQUIREMENTS



UK PROTECTIVE MARKING:
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NOTES:
1. Do not scale from this drawing. All dimensions are in metres unless noted otherwise.

KEY
- DEVELOPMENT SITE BOUNDARY
- BUFFER ZONE
- SWALE / INFILTRATION BASIN (INDICATIVE)
- LANDSCAPE BUND
- PROPOSED SURFACE WATER DRAINAGE (INDICATIVE)
- PROPOSED FOUL WATER DRAINAGE (INDICATIVE)
- PROPOSED GEOCELLULAR UNDERGROUND STORAGE (64M x 6M)
- PROPOSED DITCH (INDICATIVE)
- PROPOSED BYPASS SEPARATOR (INDICATIVE)

NOT FOR CONSTRUCTION

NOT FOR APPROVAL

REV.	DATE	PREPARED BY	CHECKED BY	STATUS	REASONS FOR REVISION	APPROVED BY
K	21.02.20	NKS	KA	S3	MINOR AMENDMENTS FOLLOWING HSF REVIEW	PJ
J	31.01.20	NKS	KA	S3	MINOR AMENDMENTS FOLLOWING HSF REVIEW	PJ
I	20.01.20	NKS	KA	S3	MINOR AMENDMENTS FOLLOWING HSF REVIEW	PJ
H	12.11.19	NKS	KA	S3	MINOR AMENDMENTS	PJ
G	06.11.19	NKS	KA	S3	BUFFER ZONE SOUTH OF INFILTRATION TRIMMED	PJ
F	31.10.19	NKS	KA	S3	MINOR AMENDMENTS FOLLOWING TEAM REVIEW	PJ
E	25.09.19	NKS	KA	S3	MINOR AMENDMENTS	PJ
D	02.08.19	NKS	KA	S3	MINOR AMENDMENTS	PJ
C	24.07.19	NKS	KA	S3	MINOR AMENDMENTS	PJ
B	09.07.19	NKS	KA	S3	MINOR AMENDMENTS	PJ
A	01.07.19	NKS	KA	S3	FIRST ISSUE	PJ

NNB GenCo
EDF ENERGY

1st partner	2nd partner
EDF ENERGY	NNB GENCO

CONTRACTOR COMPANY TRADE NAME : ROYAL HASKONINGDHV

CONTRACTOR REF. No. PB7869

CONTRACT NUMBER : SZ0204

CONTRACTOR WBS CODE : N/A

QRA RELATED Yes ☐ No ☒

APPLICABILITY:
1: Document related to Unit 1
2: Document related to Unit 2
9: Document that applies to buildings/systems common to Unit 1 & 2
0: Documents that relate exclusively to buildings or systems that are common to the whole site (e.g. parking, ancillary buildings...)

NUCL/REP/EPR/UKX							
HPC (doc: HK)				SZC (doc: SZ)			
0	1	2	9	0	1	2	9

BUILDING 000

SYSTEM 000

SCALE 1:2000

SIZE A1

PAGE 1/1

DESCRIPTION
SIZEWELL C
SOUTHERN PARK AND RIDE SITE
DRAINAGE LAYOUT

DOCUMENT REFERENCE No.

SZC	SZ0204	FP	000	DRW	100053
Project	Contract No. / Orig. Co	Asset / Zone	System / Building	Doc. type	Chrono No.

DOCUMENT SUB -TYPE N/A

EDF CLASSIFICATION CODE N/A

SUBCONTRACTOR COMPANY TRADE NAME N/A

SUBCONTRACTOR DOCUMENT REF. No N/A

This pattern must be entirely readable
For A0 and A1 : ABERPFTHLIJOGCGQUVWMNSZXKY
zsaieocmuvnwqfkhbdxpgjfk 7142365569
10.31 m
0 1 2 3 4 5 6 7 8 9 10

INTELLECTUAL PROPERTY: O-Property of Owner

NNB:

EDF: NNB GenCo © 2018

UK PROTECTIVE MARKING: Not Protectively Marked

EDF ACCESSIBILITY: INTERNE ☐ RESTREINT ☐ CONFIDENTIEL ☐

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APPENDIX B: MAIN DEVELOPMENT INFILTRATION AND ATTENUATION STORAGE REQUIREMENTS

Cascade Summary of Results for SRC-SPR-CS-Area 1.SRCX

Upstream Structures	Outflow To	Overflow To
(None)	SRC-SPR-Infiltration Basin.SRCX	(None)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	22.870	0.620	50.0	3064.9	O K
30 min Summer	23.060	0.810	50.0	4006.5	O K
60 min Summer	23.252	1.002	50.0	4956.8	O K
120 min Summer	23.436	1.186	50.0	5865.3	O K
180 min Summer	23.532	1.282	50.0	6339.7	O K
240 min Summer	23.590	1.340	50.0	6626.2	O K
360 min Summer	23.659	1.409	50.0	6968.1	O K
480 min Summer	23.697	1.447	50.0	7156.6	O K
600 min Summer	23.716	1.466	50.0	7250.6	O K
720 min Summer	23.723	1.473	50.0	7283.6	O K
960 min Summer	23.713	1.463	50.0	7233.5	O K
1440 min Summer	23.658	1.408	50.0	6961.8	O K
2160 min Summer	23.575	1.325	50.0	6552.3	O K
2880 min Summer	23.495	1.245	50.0	6155.8	O K
4320 min Summer	23.343	1.093	50.0	5403.3	O K
5760 min Summer	23.203	0.953	50.0	4711.9	O K
7200 min Summer	23.075	0.825	50.0	4080.0	O K
8640 min Summer	22.960	0.710	50.0	3509.4	O K
10080 min Summer	22.856	0.606	50.0	2998.0	O K
15 min Winter	22.946	0.696	50.0	3439.6	O K
30 min Winter	23.160	0.910	50.0	4497.6	O K
60 min Winter	23.376	1.126	50.0	5569.4	O K
120 min Winter	23.586	1.336	50.0	6605.3	O K
180 min Winter	23.697	1.447	50.0	7154.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	99.025	0.0	3017.2	30
30 min Summer	64.904	0.0	3798.4	45
60 min Summer	40.510	0.0	5109.6	74
120 min Summer	24.421	0.0	6140.9	134
180 min Summer	17.920	0.0	6731.6	192
240 min Summer	14.300	0.0	7128.3	252
360 min Summer	10.377	0.0	7663.3	370
480 min Summer	8.265	0.0	7997.7	488
600 min Summer	6.922	0.0	8181.6	606
720 min Summer	5.986	0.0	8236.4	724
960 min Summer	4.756	0.0	8121.7	962
1440 min Summer	3.434	0.0	7842.5	1218
2160 min Summer	2.475	0.0	11259.2	1580
2880 min Summer	1.960	0.0	11882.0	1972
4320 min Summer	1.409	0.0	12723.0	2776
5760 min Summer	1.114	0.0	13511.7	3584
7200 min Summer	0.927	0.0	14065.8	4336
8640 min Summer	0.798	0.0	14530.3	5104
10080 min Summer	0.703	0.0	14931.4	5848
15 min Winter	99.025	0.0	3341.2	30
30 min Winter	64.904	0.0	4095.8	44
60 min Winter	40.510	0.0	5714.7	74
120 min Winter	24.421	0.0	6845.4	132
180 min Winter	17.920	0.0	7466.5	188

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Cascade Summary of Results for SRC-SPR-CS-Area 1.SRCX

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
240 min Winter	23.766	1.516	50.0	7494.3	O K
360 min Winter	23.851	1.601	50.0	7913.8	O K
480 min Winter	23.901	1.651	50.0	8161.0	O K
600 min Winter	23.929	1.679	50.0	8302.1	O K
720 min Winter	23.944	1.694	50.0	8374.6	O K
960 min Winter	23.947	1.697	50.0	8390.2	O K
1440 min Winter	23.897	1.647	50.0	8142.8	O K
2160 min Winter	23.785	1.535	50.0	7588.8	O K
2880 min Winter	23.676	1.426	50.0	7052.4	O K
4320 min Winter	23.454	1.204	50.0	5953.7	O K
5760 min Winter	23.243	0.993	50.0	4910.7	O K
7200 min Winter	23.051	0.801	50.0	3958.4	O K
8640 min Winter	22.879	0.629	50.0	3111.6	O K
10080 min Winter	22.732	0.482	50.0	2381.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
240 min Winter	14.300	0.0	7855.1	246
360 min Winter	10.377	0.0	8284.4	362
480 min Winter	8.265	0.0	8387.6	478
600 min Winter	6.922	0.0	8333.6	594
720 min Winter	5.986	0.0	8278.9	708
960 min Winter	4.756	0.0	8166.8	934
1440 min Winter	3.434	0.0	7926.7	1366
2160 min Winter	2.475	0.0	12603.7	1700
2880 min Winter	1.960	0.0	13286.2	2148
4320 min Winter	1.409	0.0	14071.9	3036
5760 min Winter	1.114	0.0	15133.4	3872
7200 min Winter	0.927	0.0	15754.0	4680
8640 min Winter	0.798	0.0	16276.7	5376
10080 min Winter	0.703	0.0	16724.1	6056

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Cascade Rainfall Details for SRC-SPR-CS-Area 1.SRCX

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.404	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 16.854

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	4.214	4	8	4.214	8	12	4.213	12	16	4.213

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Cascade Model Details for SRC-SPR-CS-Area 1.SRCX

Storage is Online Cover Level (m) 24.250

Tank or Pond Structure

Invert Level (m) 22.250

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	4944.4	2.000	4944.4

Pump Outflow Control

Invert Level (m) 22.250

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.200	50.0000	1.400	50.0000	2.600	50.0000	3.800	50.0000	5.000	50.0000
0.400	50.0000	1.600	50.0000	2.800	50.0000	4.000	50.0000	5.200	50.0000
0.600	50.0000	1.800	50.0000	3.000	50.0000	4.200	50.0000	5.400	50.0000
0.800	50.0000	2.000	50.0000	3.200	50.0000	4.400	50.0000	5.600	50.0000
1.000	50.0000	2.200	50.0000	3.400	50.0000	4.600	50.0000	5.800	50.0000
1.200	50.0000	2.400	50.0000	3.600	50.0000	4.800	50.0000	6.000	50.0000

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Cascade Summary of Results for SRC-SPR-CS-Area 2.SRCX

Upstream Structures	Outflow To	Overflow To
(None)	SRC-SPR-Infiltration Basin.SRCX	(None)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	23.441	0.691	4.9	111.2	O K
30 min Summer	23.586	0.836	4.9	143.7	O K
60 min Summer	23.710	0.960	4.9	174.6	O K
120 min Summer	23.803	1.053	4.9	199.5	O K
180 min Summer	23.835	1.085	4.9	208.4	O K
240 min Summer	23.842	1.092	4.9	210.5	O K
360 min Summer	23.830	1.080	4.9	207.0	O K
480 min Summer	23.807	1.057	4.9	200.6	O K
600 min Summer	23.784	1.034	4.9	194.4	O K
720 min Summer	23.762	1.012	4.9	188.3	O K
960 min Summer	23.719	0.969	4.9	176.9	O K
1440 min Summer	23.629	0.879	4.9	154.1	O K
2160 min Summer	23.479	0.729	4.9	119.3	O K
2880 min Summer	23.344	0.594	4.9	91.3	O K
4320 min Summer	23.131	0.381	4.9	52.7	O K
5760 min Summer	22.997	0.247	4.6	32.0	O K
7200 min Summer	22.921	0.171	4.3	21.3	O K
8640 min Summer	22.879	0.129	3.9	15.8	O K
10080 min Summer	22.861	0.111	3.5	13.4	O K
15 min Winter	23.505	0.755	4.9	125.0	O K
30 min Winter	23.661	0.911	4.9	162.0	O K
60 min Winter	23.794	1.044	4.9	197.1	O K
120 min Winter	23.897	1.147	4.9	226.5	O K
180 min Winter	23.936	1.186	4.9	238.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	99.025	0.0	114.8	19
30 min Summer	64.904	0.0	150.5	33
60 min Summer	40.510	0.0	188.2	64
120 min Summer	24.421	0.0	226.9	122
180 min Summer	17.920	0.0	249.8	182
240 min Summer	14.300	0.0	265.8	242
360 min Summer	10.377	0.0	289.3	360
480 min Summer	8.265	0.0	307.2	414
600 min Summer	6.922	0.0	321.6	476
720 min Summer	5.986	0.0	333.8	540
960 min Summer	4.756	0.0	353.5	674
1440 min Summer	3.434	0.0	382.9	952
2160 min Summer	2.475	0.0	414.2	1320
2880 min Summer	1.960	0.0	437.4	1676
4320 min Summer	1.409	0.0	471.5	2376
5760 min Summer	1.114	0.0	497.1	3056
7200 min Summer	0.927	0.0	517.5	3744
8640 min Summer	0.798	0.0	534.5	4408
10080 min Summer	0.703	0.0	549.1	5136
15 min Winter	99.025	0.0	128.6	18
30 min Winter	64.904	0.0	168.6	33
60 min Winter	40.510	0.0	210.8	62
120 min Winter	24.421	0.0	254.2	120
180 min Winter	17.920	0.0	279.8	178

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Cascade Summary of Results for SRC-SPR-CS-Area 2.SRCX

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
240 min Winter	23.949	1.199	4.9	241.9	O K
360 min Winter	23.945	1.195	4.9	240.9	O K
480 min Winter	23.925	1.175	4.9	234.7	O K
600 min Winter	23.896	1.146	4.9	226.0	O K
720 min Winter	23.870	1.120	4.9	218.5	O K
960 min Winter	23.816	1.066	4.9	203.2	O K
1440 min Winter	23.698	0.948	4.9	171.3	O K
2160 min Winter	23.470	0.720	4.9	117.3	O K
2880 min Winter	23.266	0.516	4.9	76.3	O K
4320 min Winter	22.995	0.245	4.6	31.7	O K
5760 min Winter	22.885	0.135	4.0	16.5	O K
7200 min Winter	22.856	0.106	3.4	12.7	O K
8640 min Winter	22.841	0.091	2.9	10.9	O K
10080 min Winter	22.832	0.082	2.6	9.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
240 min Winter	14.300	0.0	297.7	236
360 min Winter	10.377	0.0	324.0	348
480 min Winter	8.265	0.0	344.1	454
600 min Winter	6.922	0.0	360.2	542
720 min Winter	5.986	0.0	373.8	570
960 min Winter	4.756	0.0	396.0	722
1440 min Winter	3.434	0.0	428.8	1036
2160 min Winter	2.475	0.0	463.9	1424
2880 min Winter	1.960	0.0	489.9	1760
4320 min Winter	1.409	0.0	528.1	2380
5760 min Winter	1.114	0.0	556.7	3000
7200 min Winter	0.927	0.0	579.6	3672
8640 min Winter	0.798	0.0	598.7	4408
10080 min Winter	0.703	0.0	615.1	5136

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Cascade Rainfall Details for SRC-SPR-CS-Area 2.SRCX

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.404	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.620

Time (mins) From:	To:	Area (ha)
0	4	0.620

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Cascade Model Details for SRC-SPR-CS-Area 2.SRCX

Storage is Online Cover Level (m) 24.250

Tank or Pond Structure

Invert Level (m) 22.750

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	113.8	1.500	367.8

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0098-5000-1500-5000
Design Head (m)	1.500
Design Flow (l/s)	5.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	98
Invert Level (m)	22.750
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.500	5.0	Kick-Flo®	0.878	3.9
Flush-Flo™	0.431	4.9	Mean Flow over Head Range	-	4.3

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.2	0.800	4.3	2.000	5.7	4.000	7.9	7.000	10.3
0.200	4.4	1.000	4.1	2.200	6.0	4.500	8.4	7.500	10.7
0.300	4.8	1.200	4.5	2.400	6.2	5.000	8.8	8.000	11.0
0.400	4.9	1.400	4.8	2.600	6.5	5.500	9.2	8.500	11.3
0.500	4.9	1.600	5.1	3.000	6.9	6.000	9.6	9.000	11.6
0.600	4.8	1.800	5.4	3.500	7.4	6.500	10.0	9.500	11.9

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Cascade Summary of Results for SRC-SPR-Infiltration Basin.SRCX

Upstream Structures	Outflow To	Overflow To
SRC-SPR-CS-Area 1.SRCX	(None)	(None)
SRC-SPR-CS-Area 2.SRCX		

Half Drain Time : 471 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	27.328	0.578	35.3	1040.3	O K
30 min Summer	27.462	0.712	38.2	1315.5	O K
60 min Summer	27.572	0.822	40.5	1551.4	O K
120 min Summer	27.661	0.911	42.5	1748.4	O K
180 min Summer	27.704	0.954	43.4	1845.8	O K
240 min Summer	27.731	0.981	44.0	1906.7	O K
360 min Summer	27.765	1.015	44.8	1986.2	O K
480 min Summer	27.788	1.038	45.3	2039.5	O K
600 min Summer	27.805	1.055	45.7	2078.4	O K
720 min Summer	27.817	1.067	46.0	2108.5	O K
960 min Summer	27.818	1.068	46.0	2111.2	O K
1440 min Summer	27.809	1.059	45.8	2088.8	O K
2160 min Summer	27.876	1.126	47.3	2248.3	O K
2880 min Summer	27.886	1.136	47.5	2272.3	O K
4320 min Summer	27.898	1.148	47.8	2303.2	O K
5760 min Summer	27.908	1.158	48.0	2326.3	O K
7200 min Summer	27.897	1.147	47.7	2299.8	O K
8640 min Summer	27.887	1.137	47.5	2274.5	O K
10080 min Summer	27.875	1.125	47.3	2247.3	O K
15 min Winter	27.384	0.634	36.5	1153.0	O K
30 min Winter	27.519	0.769	39.4	1436.1	O K
60 min Winter	27.627	0.877	41.8	1672.2	O K
120 min Winter	27.713	0.963	43.6	1864.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	99.025	0.0	838
30 min Summer	64.904	0.0	1140
60 min Summer	40.510	0.0	1468
120 min Summer	24.421	0.0	1814
180 min Summer	17.920	0.0	2024
240 min Summer	14.300	0.0	2174
360 min Summer	10.377	0.0	2402
480 min Summer	8.265	0.0	2580
600 min Summer	6.922	0.0	2728
720 min Summer	5.986	0.0	2856
960 min Summer	4.756	0.0	2880
1440 min Summer	3.434	0.0	2880
2160 min Summer	2.475	0.0	3872
2880 min Summer	1.960	0.0	4272
4320 min Summer	1.409	0.0	5020
5760 min Summer	1.114	0.0	5736
7200 min Summer	0.927	0.0	6232
8640 min Summer	0.798	0.0	6760
10080 min Summer	0.703	0.0	7304
15 min Winter	99.025	0.0	952
30 min Winter	64.904	0.0	1294
60 min Winter	40.510	0.0	1660
120 min Winter	24.421	0.0	2050

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Cascade Summary of Results for SRC-SPR-Infiltration Basin.SRCX

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
180 min Winter	27.753	1.003	44.5	1958.2	O K
240 min Winter	27.778	1.028	45.1	2016.0	O K
360 min Winter	27.810	1.060	45.8	2090.7	O K
480 min Winter	27.830	1.080	46.2	2138.4	O K
600 min Winter	27.830	1.080	46.3	2139.5	O K
720 min Winter	27.830	1.080	46.3	2139.7	O K
960 min Winter	27.830	1.080	46.2	2138.1	O K
1440 min Winter	27.826	1.076	46.2	2128.8	O K
2160 min Winter	27.911	1.161	48.1	2334.8	O K
2880 min Winter	27.921	1.171	48.3	2359.6	O K
4320 min Winter	27.935	1.185	48.6	2393.6	O K
5760 min Winter	27.947	1.197	48.9	2423.1	O K
7200 min Winter	27.949	1.199	48.9	2428.0	O K
8640 min Winter	27.940	1.190	48.7	2405.3	O K
10080 min Winter	27.929	1.179	48.5	2377.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
180 min Winter	17.920	0.0	2286
240 min Winter	14.300	0.0	2452
360 min Winter	10.377	0.0	2704
480 min Winter	8.265	0.0	2880
600 min Winter	6.922	0.0	2880
720 min Winter	5.986	0.0	2880
960 min Winter	4.756	0.0	2880
1440 min Winter	3.434	0.0	2880
2160 min Winter	2.475	0.0	4264
2880 min Winter	1.960	0.0	4652
4320 min Winter	1.409	0.0	5368
5760 min Winter	1.114	0.0	6048
7200 min Winter	0.927	0.0	6592
8640 min Winter	0.798	0.0	7008
10080 min Winter	0.703	0.0	7464

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Cascade Rainfall Details for SRC-SPR-Infiltration Basin.SRCX

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.404	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

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Cascade Model Details for SRC-SPR-Infiltration Basin.SRCX

Storage is Online Cover Level (m) 28.250

Infiltration Basin Structure

Invert Level (m) 26.750 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.10404 Porosity 1.00
Infiltration Coefficient Side (m/hr) 0.10404

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	1606.4	1.500	2720.9

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APPENDIX C: SITE ENTRANCE INFILTRATION STORAGE REQUIREMENTS

Summary of Results for 100 year Return Period

Half Drain Time exceeds 7 days.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	23.153	0.403	0.2	0.0	0.2	115.0	O K
30 min Summer	23.260	0.510	0.2	0.0	0.2	150.6	O K
60 min Summer	23.365	0.615	0.2	0.0	0.2	187.7	O K
120 min Summer	23.466	0.716	0.3	0.0	0.3	225.7	O K
180 min Summer	23.523	0.773	0.3	0.0	0.3	247.8	O K
240 min Summer	23.561	0.811	0.3	0.0	0.3	263.0	O K
360 min Summer	23.614	0.864	0.3	0.0	0.3	285.0	O K
480 min Summer	23.653	0.903	0.3	0.0	0.3	301.2	O K
600 min Summer	23.683	0.933	0.3	0.0	0.3	313.9	O K
720 min Summer	23.707	0.957	0.3	0.0	0.3	324.4	O K
960 min Summer	23.744	0.994	0.3	0.0	0.3	340.7	O K
1440 min Summer	23.793	1.043	0.3	0.0	0.3	362.9	O K
2160 min Summer	23.837	1.087	0.4	0.0	0.4	383.1	O K
2880 min Summer	23.863	1.113	0.4	0.0	0.4	395.2	O K
4320 min Summer	23.888	1.138	0.4	0.0	0.4	407.1	O K
5760 min Summer	23.894	1.144	0.4	0.0	0.4	410.2	O K
7200 min Summer	23.891	1.141	0.4	0.0	0.4	408.5	O K
8640 min Summer	23.882	1.132	0.4	0.0	0.4	404.3	O K
10080 min Summer	23.873	1.123	0.4	0.0	0.4	400.2	O K
15 min Winter	23.195	0.445	0.2	0.0	0.2	128.8	O K
30 min Winter	23.312	0.562	0.2	0.0	0.2	168.7	O K
60 min Winter	23.426	0.676	0.3	0.0	0.3	210.3	O K
120 min Winter	23.536	0.786	0.3	0.0	0.3	252.9	O K
180 min Winter	23.597	0.847	0.3	0.0	0.3	277.7	O K
240 min Winter	23.638	0.888	0.3	0.0	0.3	294.8	O K
360 min Winter	23.696	0.946	0.3	0.0	0.3	319.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	99.025	0.0	17.2	19
30 min Summer	64.904	0.0	19.1	34
60 min Summer	40.510	0.0	40.9	64
120 min Summer	24.421	0.0	44.3	124
180 min Summer	17.920	0.0	46.1	184
240 min Summer	14.300	0.0	47.2	244
360 min Summer	10.377	0.0	48.6	364
480 min Summer	8.265	0.0	49.5	484
600 min Summer	6.922	0.0	50.0	604
720 min Summer	5.986	0.0	50.2	724
960 min Summer	4.756	0.0	50.3	964
1440 min Summer	3.434	0.0	49.3	1444
2160 min Summer	2.475	0.0	103.6	2164
2880 min Summer	1.960	0.0	101.8	2884
4320 min Summer	1.409	0.0	95.5	4320
5760 min Summer	1.114	0.0	203.4	5760
7200 min Summer	0.927	0.0	198.0	7200
8640 min Summer	0.798	0.0	191.1	8040
10080 min Summer	0.703	0.0	182.9	8664
15 min Winter	99.025	0.0	18.0	19
30 min Winter	64.904	0.0	20.0	34
60 min Winter	40.510	0.0	43.0	64
120 min Winter	24.421	0.0	46.8	124
180 min Winter	17.920	0.0	48.7	182
240 min Winter	14.300	0.0	50.0	242
360 min Winter	10.377	0.0	51.5	362

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Summary of Results for 100 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
480 min Winter	23.737	0.987	0.3	0.0	0.3	337.9	O K
600 min Winter	23.770	1.020	0.3	0.0	0.3	352.3	O K
720 min Winter	23.796	1.046	0.3	0.0	0.3	364.1	O K
960 min Winter	23.836	1.086	0.4	0.0	0.4	382.6	O K
1440 min Winter	23.890	1.140	0.4	0.0	0.4	408.2	O K
2160 min Winter	23.938	1.188	0.4	0.0	0.4	431.7	O K
2880 min Winter	23.968	1.218	0.4	0.0	0.4	446.2	Flood Risk
4320 min Winter	23.999	1.249	0.4	0.0	0.4	461.6	Flood Risk
5760 min Winter	24.010	1.260	0.4	0.0	0.4	467.3	Flood Risk
7200 min Winter	24.011	1.261	0.4	0.0	0.4	467.8	Flood Risk
8640 min Winter	24.005	1.255	0.4	0.0	0.4	465.0	Flood Risk
10080 min Winter	23.996	1.246	0.4	0.0	0.4	460.2	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
480 min Winter	8.265	0.0	52.4	480
600 min Winter	6.922	0.0	52.9	598
720 min Winter	5.986	0.0	53.2	718
960 min Winter	4.756	0.0	53.2	954
1440 min Winter	3.434	0.0	52.1	1428
2160 min Winter	2.475	0.0	109.9	2140
2880 min Winter	1.960	0.0	107.9	2828
4320 min Winter	1.409	0.0	100.9	4232
5760 min Winter	1.114	0.0	216.5	5592
7200 min Winter	0.927	0.0	210.6	6920
8640 min Winter	0.798	0.0	202.9	8216
10080 min Winter	0.703	0.0	193.8	9480

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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.404	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.620

Time (mins) From:	To:	Area (ha)
0	4	0.620

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Model Details

Storage is Online Cover Level (m) 24.250

Infiltration Basin Structure

Invert Level (m) 22.750 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00360 Porosity 1.00
Infiltration Coefficient Side (m/hr) 0.00360

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	250.0	1.500	565.8

Weir Outflow Control

Discharge Coef 0.544 Width (m) 0.300 Invert Level (m) 24.250

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APPENDIX G: FREIGHT MANGEMENT FACILITY DRAINAGE DESIGN NOTE

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1 INTRODUCTION

1.1.1 NNB Generation Company (SZC) Limited (SZC Co.) submitted an application for a Development Consent Order (DCO) to the Planning Inspectorate under the Planning Act 2008 for the Sizewell C Project (referred to as the 'Application') in May 2020. The Application was accepted for examination in June 2020.

1.1.2 The freight management facility development was originally submitted to the Planning Inspectorate (PINS) as part of the Application to build and operate a new nuclear power station to the north of Sizewell B.

1.1.3 SZC Co. has undertaken work to validate and develop the design of the freight management facility that was originally submitted as part of the Application. This document forms one of a series of design validation and evolution documents being provided to the Examining Authority in support of the **Outline Drainage Strategy** [REP2-033] and subsequent **Drainage Strategy** (submitted at Deadline 7).

1.1.4 The freight management facility forms one of the Associated Developments (AD) which are required to mitigate traffic impacts arising from the main development site. The freight management facility is located alongside the A14 near to its interchange with the A12 at Seven Hills near Ipswich. Its function is to provide a hub from which a controlled pattern of deliveries to the main development site can be provided, reducing freight movements during peak and sensitive hours on the road network. It will act as a holding area in the event of problems or congestion on the approaches to the Sizewell C main development site. Full details of its facilities are contained in **Volume 8 Freight Management Facility Chapter 2 Description of the Freight Management Facility** [APP-151] and are described in summary below.

1.1.5 The site will consist of parking for approximately 150 HGVs, workforce parking, welfare, security and amenity buildings. The workforce parking includes car parking spaces, accessible spaces, cycle spaces and motorcycle spaces.

1.1.6 The site access will be from Felixstowe Road where the road will be widened to accommodate a right turn ghost island. The modification of the highway to accommodate the access will be designed to Suffolk County Council's (SCC) adoptable standards.

1.1.7 The freight management facility site will generate surface water runoff from paved areas and roofs which will require to be removed, treated as necessary and disposed.

1.1.8 The site entrance and access from Felixstowe Road will generate highway runoff which will require to be removed, treated as necessary and disposed.

1.1.9 The freight management facility welfare facilities will generate foul water flows which will require to be removed, treated as necessary and disposed.

1.1.10 The freight management facility and its associated access and local road changes will remain in place and use during construction of the Sizewell C power station. Once construction is complete the site will be closed and decommissioned. It will then return to current agricultural use.

1.1.11 It is intended that the proposed access will be removed and Felixstowe Road will be returned to its current alignment.

2 PURPOSE

2.1.1 The **Outline Drainage Strategy** [REP2-033] identified at concept level the proposed drainage approach required for:

- The effective removal of highway and surface water runoff from the proposed freight management facility and its site access entrance, together with its treatment and disposal; and
- The effective removal and treatment of foul water generated by the workforce from the proposed freight management facility.

2.1.2 The proposed drainage infrastructure was described in the concept drainage design submitted as part of the Application. This concept design was based on data and information available at that time. The design was supported by the submission of the **Freight Management Facility Flood Risk Assessment** (FRA) [APP-141].

2.1.3 The purpose of this technical note is to provide details of data which validate the **Outline Drainage Strategy** [REP2-033] and subsequent **Drainage Strategy** (submitted at Deadline 7), a description of how the proposed concept drainage infrastructure is developing and evolving and to demonstrate that it continues to provide for the effective and satisfactory drainage of the freight management facility and its associated external road modification, without unacceptable adverse impact on the water environment, both in terms of flood risk and pollution.

3 DESCRIPTION OF DCO DRAINAGE CONCEPT DESIGN

3.1.1 The freight management facility concept drainage at DCO stage was developed by SZC Co. Proposals were developed for both the freight management facility development site and associated modification of existing public highway required in order to provide access to and from the site.

3.1.2 Given the proven infiltration rates, all surface water generated within the freight management facility red line boundary would be contained within the site and discharged to ground.

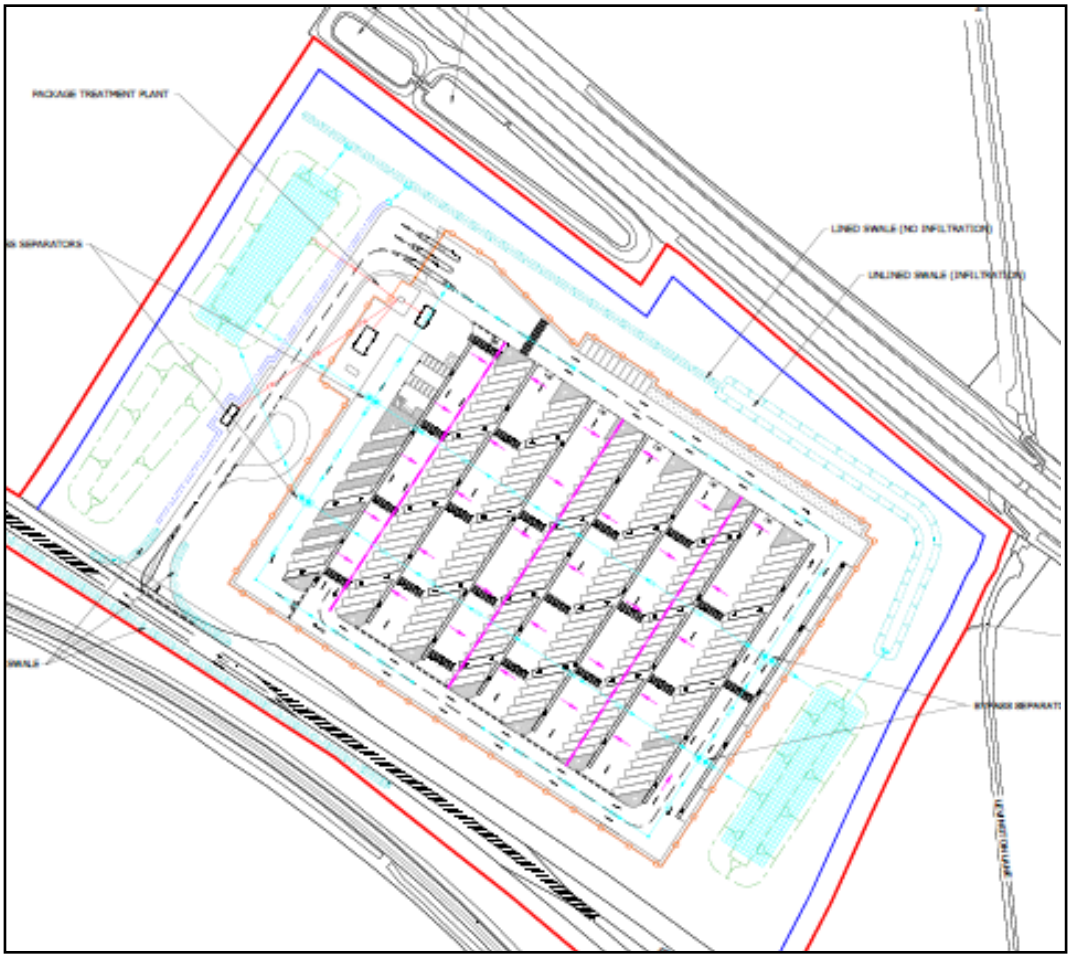
3.1.3 External roads modified to access the site would discharge surface water highway runoff to swales and filter drains where flows will infiltrate to ground.

3.1.4 Liaison took place with Anglian Water to establish whether there are any public foul sewers, in proximity to the freight management facility, to which foul water could be discharged by gravity. Since it was confirmed that there are no foul water sewers in vicinity it would be necessary to pump over long distance offsite to discharge into a public sewer.

3.1.5 Given that freight management facility is a temporary facility and will only operate during construction of Sizewell C the option of treatment on site using a package treatment plant is proposed. The treated effluent would discharge to ground by infiltration.

3.1.6 The internal site layout showing the proposed layout of drainage infrastructure and the sewage treatment plant is shown in **Plate 1**, an extract from the Application drawing ”Chapter 2 Description of the FMF Figure 2.4” [APP-153].

Plate 1: Freight management facility internal layout showing concept drainage infrastructure

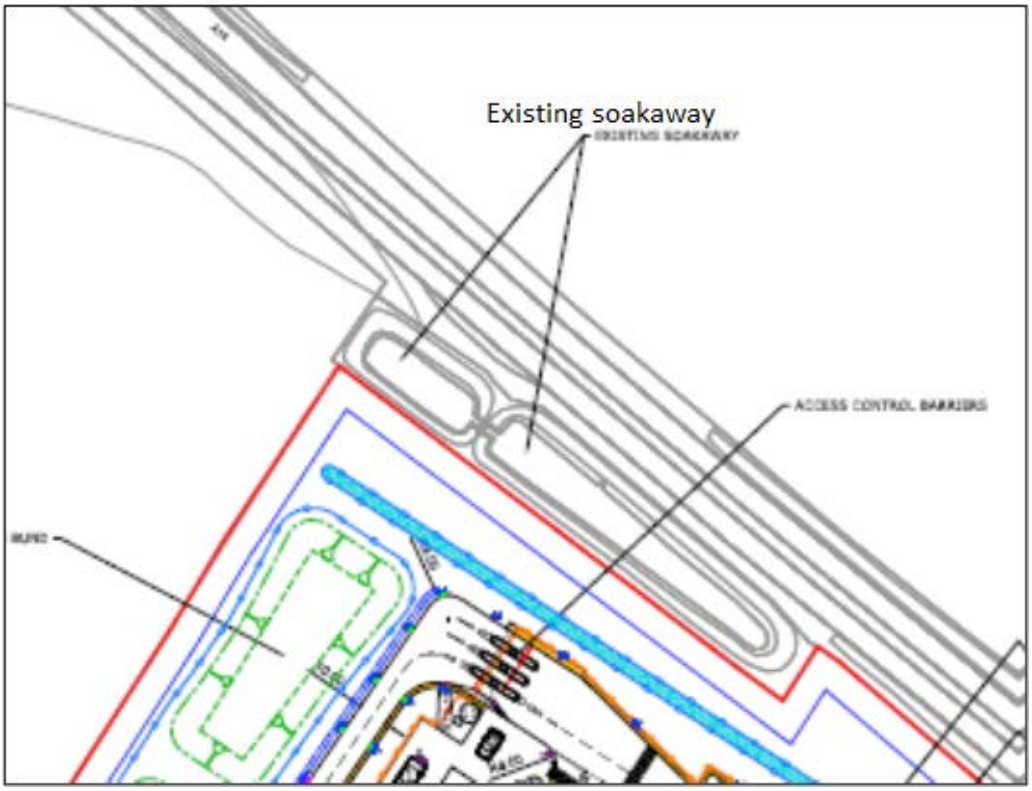


4 EXISTING SITE AND ADJACENT HIGHWAY DRAINAGE ARRANGEMENTS

4.1.1 The extent of the freight management facility within the red line boundary forms agricultural land and has no obvious sign of drainage infrastructure.

4.1.2 The A14 located to the north of the red line boundary appears to have highway drainage infrastructure which outfalls to an infiltration basin facility. This is shown in **Plate 2** and abuts the red line boundary.

Plate 2: Existing A14 infiltration basin location



4.1.3 Given the close proximity of the existing A14 infiltration basin adjacent to the site, the proposed freight management facility site drainage infrastructure must not provide for infiltration to ground in this area as this could compromise the absorption capacity of the ground for A14 highway runoff.

4.1.4 No detailed site inspection of Felixstowe Road has been undertaken. However, based on remote inspection of the road using Google Streetview there is no sign of obvious highway drainage infrastructure. It is assumed that currently highway runoff is removed “over the edge” with infiltration into the verge.

4.1.5 The Environment Agency Surface Water Flood Map shows a predicted overland flow path with minor flooding passing through the A14 infiltration basins and through the north west corner of the freight management facility. This is shown in **Plate 3**.

Plate 3: A14 predicted surface water flood risk at the freight management facility

4.1.6 If flooding does occur, it would be captured by the lined swale and would then be infiltrated to ground.

5 GROUND INVESTIGATION AND INFILTRATION TESTING RESULTS

5.1.1 Three trial pits were excavated within the site at locations shown in **Plate 4**.

Plate 4: Freight management facility site infiltration test trial hole locations

5.1.2 Infiltration testing in accordance with BRE365 (Ref. 1) was undertaken and the results are shown in **Table 1**.

Table 1: Freight management facility site infiltration test trial hole results

Location	Test 1(m/s)	Test 2(m/s)	Test 3 (m/s)
TP01	3.53×10^{-6}	1.73×10^{-6}	9.89×10^{-7}
TP02	4.72×10^{-5}	4.66×10^{-5}	3.32×10^{-5}
TP03	5.80×10^{-7}	5.36×10^{-7}	5.70×10^{-7}

5.1.3 These results demonstrate that disposal of surface water runoff by infiltration is achievable. SCC consider that an infiltration rate in excess of 1.4 x 10^{-6} m/s is viable for infiltration to ground. However, the variation in infiltration rate is noted and has been taken into consideration as part of developing the concept layout as described in this technical note in Section 6.

6 UPDATED SURFACE WATER DRAINAGE DESIGN STRATEGY

6.1.1 The surface water arrangements for removal currently remain, in principle, as described in document "Environmental Statement Volume 8 Chapter 2 Description of the Freight Management Facility" dated July 2020 and shown in DCO Figure 2.4. An extract of this Figure is shown in **Plate 1** of this report. The Environmental Statement takes account of the infiltration test results obtained in October 2019.

6.1.2 Surface water runoff from roofs will be drained via downpipes and gullies, as appropriate to underground carrier drains.

6.1.3 All of the internal roads and the HGV parking areas will have an impermeable surface. Surface water runoff will be drained via surface outlets, gullies, linear channels and drains, etc. These will discharge into underground carrier drains.

6.1.4 Bypass interceptors will be installed on the carrier drains downstream of the bus/HGV standing areas in order to remove hydrocarbon and silt contaminants which will improve the water quality of the runoff before discharge to ground.

6.1.5 The concept design submitted for DCO and shown in **Plate 1** provided for underground carrier drains which will discharge all surface water runoff into two underground attenuation storage tanks from where it will infiltrate to ground. The tanks are proposed to be located beneath the landscape bunds located on the east and west sides of the site.

6.1.6 The size of the tanks calculated for concept design stage was 88 m long x 22 m wide x 0.6 m deep. The surface water drainage network capacity was assessed by hydraulic calculation. The calculation was based on the average of measured infiltration rates at TP01, TP02 and TP03 and a requirement for the tanks to drain down by half their storage volume in 24 hours. For a 1 in 30 year return period rainfall event it was found that there

was insufficient storage and as a result it is proposed that additional storage volume be provided by swales.

6.1.7 The swales were located over the full length of the northern side of the site and the lowest part of the eastern side of the site. Since ground levels fall from south to north the swales will also intercept runoff from surface water overland flow which does not drain into the underground drainage network.

6.1.8 The swales will also remove surface water runoff by infiltration to ground. However due to the proximity of the western portion of the swale to the A14 infiltration basin facility, this length of the swale is lined making it impermeable. This will avoid any risk of infiltration causing adverse impact on the performance of the A14 infiltration basin.

6.1.9 Whilst the concept design provided sufficient evidence and confidence that removal of surface water runoff by infiltration is viable, as part of development of the concept drainage design the location and performance of the two storage tanks has been reviewed.

6.1.10 The position of the west storage tank is noted to be in proximity to TP01 infiltration test trial hole whilst the east storage tank is noted to be in proximity to TP03. These tanks are located clear of the paved area and beneath the landscaping bunds. It was considered desirable to avoid locating tanks beneath the paved area in order to minimise loading issues on the tank.

6.1.11 In review of the storage tank sizes it has been considered more appropriate to use infiltration rates obtained in proximity to the tank location rather than an average value. This is because of the variation in infiltration rate, as shown in **Table 1.**

6.1.12 In using individual infiltration rates, it is apparent that the east storage basin is unfavourably located because the infiltration rate stated in Table 1 is less than the 1.4×10^{-6} m/s considered by SCC as the minimum viable value for infiltration to ground. Accordingly, the location of a storage tank at this location is discounted.

6.1.13 Calculations have been undertaken for two alternative options. Option 1 provides for a single tank in the west and Option 2 provides for a single tank in the centre of the site in proximity to the TP02 location. The approximate location and footprint of the tanks is shown in Appendix A. Hydraulic calculations which validate the tank sizes are provided in Appendices B and C.

6.1.14 The Option 1 tank size has been determined by a requirement for it to be located within the unpaved area to the west. The available size has been

used in hydraulic modelling. A summary of predicted hydraulic performance is shown in Table 2 with full results in Appendix B.

Table 2: Freight management facility option 1 storage tank parameters

Parameters	Values
Cellular Soakaway Storage Dimension	135m (L) x 22m (B) x 1.2m (D)
Volume Available	3564 m^3
Average Infiltration Rate at TP01	7.5 mm/hour
Half Drain Time	8004 minutes (~5.5 days)

6.1.15 The results demonstrate that infiltration is viable in that the stored volume will eventually be removed by infiltration. However, the half drain time is excessive. In the event of follow on rainfall events within days of the design event, there may not be sufficient storage volume which could result in surface flooding. For this reason, Option 1 is not acceptable.

6.1.16 The Option 2 tank size is not constrained since it can be located anywhere within the central paved area. As a result, the tank size has been determined by the hydraulic modelling. A summary of predicted hydraulic performance is shown in Table 3 with full results in Appendix C.

Table 3: Freight management facility option 2 storage tank parameters

Parameters	Values
Cellular Soakaway Storage Dimension	56m (L) x 50m (B) x 0.6m (D)
Volume Available	1680 m^3
Average Infiltration Rate at TP02	152.4 mm/hour
Half Drain Time	212 minutes (~3.5 hours)

6.1.17 The infiltration rate at TP02 is significantly greater that that at TP01, and thus the required storage tank volume is substantially less. Accordingly, it is proposed that the site be drained to a storage tank for infiltration to ground located within the central paved area. The shape of the tank whether square or rectangular will be developed as design progresses. This will also need to take account of the structural design of the tank and the required depth of cover to accommodate surface loading.

6.1.18 Although the storage tank can accommodate all surface water runoff within the site, it is intended to retain the swale at the northern and eastern sides of the site in order to intercept and capture exceedance overland flow from adjacent 3rd party land.

7 UPDATED FOUL WATER DRAINAGE DESIGN STRATEGY

7.1.1 The foul water drainage strategy remains unchanged with foul water flows collected by an underground drainage network and discharged into a package sewage treatment plant. Treated effluent is drained into an attenuation tank from where it will infiltrate to ground. The question as to whether it is more appropriate to provide a separate treated effluent attenuation tank or to discharge into the surface water storage tank, as currently proposed will be determined as design progresses and in accordance with environmental permit requirements.

7.1.2 It is noted that foul water flow rates generated will be low and intermittent with a range of flow. This makes the delivery of a consistent treated effluent more challenging. Once the environmental permit requirements - which will set quality standards - have been determined, it will be necessary to ensure that a suitable package plant and associated treatment infrastructure can reliably produce a compliant treated effluent.

7.1.3 In the event of any doubt regarding the ability of a package treatment plant being able to produce the required quality of treated effluent, the alternative will be to collect the foul water sewage in an underground sealed cess tank from which it can be collected and removed by tanker for treatment offsite.

8 UPDATED SURFACE WATER DRAINAGE DESIGN STRATEGY – MODIFIED LOWESTOFT ROAD SITE ACCESS ENTRANCE

8.1.1 The surface water drainage strategy for the highway drainage subject to adoption by SCC remains unchanged being infiltration to ground.

8.1.2 Surface water highway runoff will be removed by “over the edge” flow and collected in swales for disposal by infiltration to ground. The proven infiltration rates in the locale demonstrate that this is feasible. When the swales dimensions are determined at detailed design, if necessary, an underlying filter drain will be provided to increase the efficiency of infiltration.

9 SUMMARY AND CONCLUSION

9.1.1 The purpose of this technical note is to validate the **Outline Drainage Strategy** [REP2-033] and subsequent **Drainage Strategy** (submitted at Deadline 7) for the freight management facility. It describes how the concept design is evolving to provide for the effective drainage of the freight management facility.

9.1.2 The drainage design for both the internal freight management facility and modification to Lowestoft Road and site entrance has been developed to a level of detail to provide sufficient evidence of an achievable drainage strategy that is compliant with national planning and environmental regulatory requirements.

9.1.3 Subject to the results of DCO examination and acceptance of the drainage design strategy principles contained in this report, the drainage designs will be developed to preliminary design stage.

9.1.4 The freight management facility drainage design will be based on CIRIA C753 SuDS Manual (Ref. 2), Design and Construction Guidance for Foul and Surface Water Sewers (formerly Sewers for Adoption) (Ref. 3), and PPG4 Treatment and Disposal of Sewage where no Foul Water Sewer is Available (Ref. 4).

9.1.5 The adoptable highway drainage design will be based on Design Manual for Roads and Bridges (DMRB) (Ref. 5), Manual of Contract Documents for Highway Works (MCHW) (Ref. 6) and SCC specific guidance (Refs. 7 and 8).

9.1.6 As preliminary design progresses, SZC Co. will liaise with SCC and the Environment Agency through design review meetings to build acceptance of the drainage infrastructure and to enable compliance with regulatory requirements and environmental permits.

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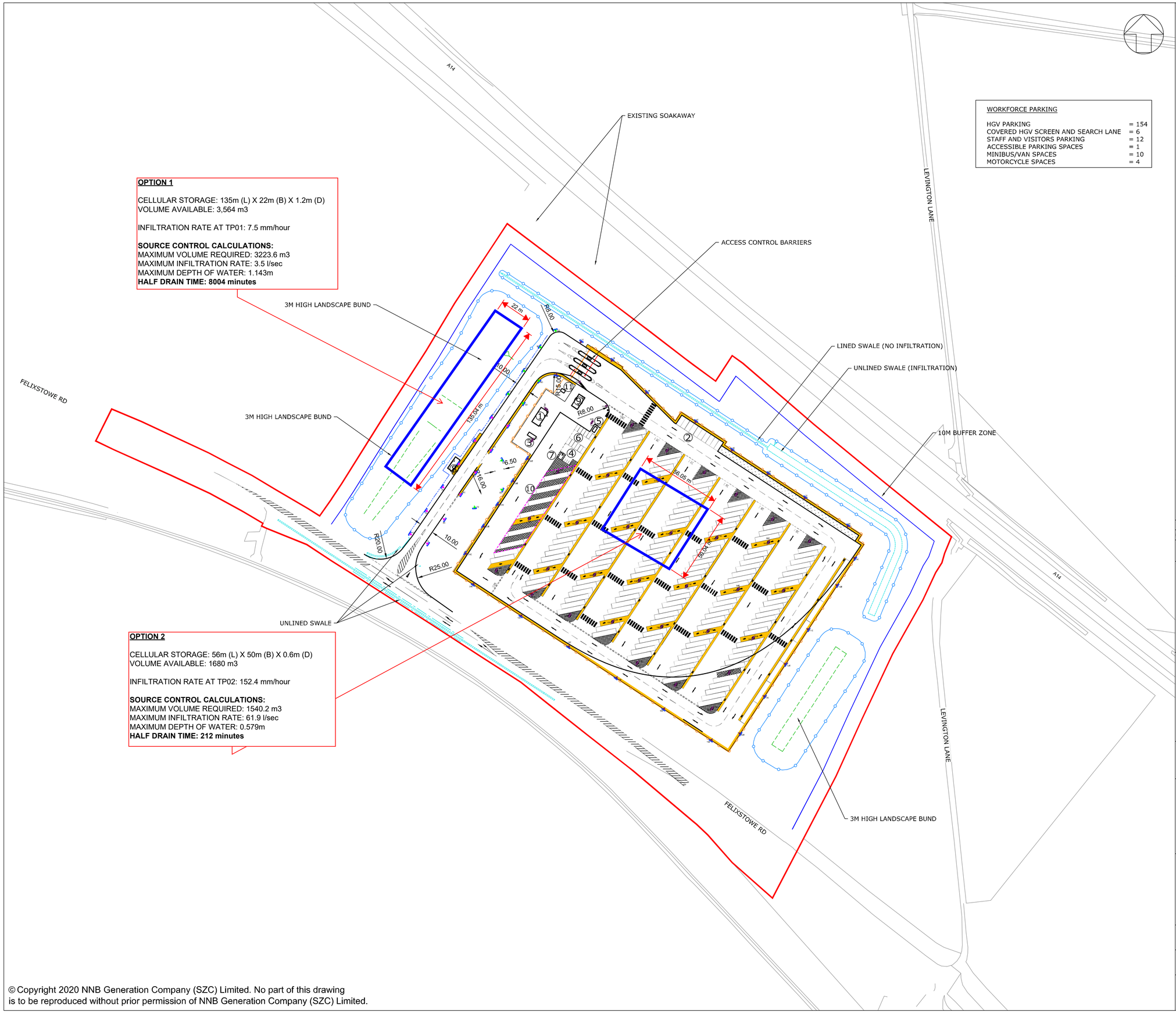
APPENDIX A: OPTIONS 1 AND 2 STORAGE TANK LOCATIONS



OPTION 1

CELLULAR STORAGE: 135m (L) X 22m (B) X 1.2m (D)
VOLUME AVAILABLE: 3,564 m3

INFILTRATION RATE AT TP01: 7.5 mm/hour

SOURCE CONTROL CALCULATIONS:
MAXIMUM VOLUME REQUIRED: 3223.6 m3
MAXIMUM INFILTRATION RATE: 3.5 l/sec
MAXIMUM DEPTH OF WATER: 1.143m
HALF DRAIN TIME: 8004 minutes

OPTION 2

CELLULAR STORAGE: 56m (L) X 50m (B) X 0.6m (D)
VOLUME AVAILABLE: 1680 m3

INFILTRATION RATE AT TP02: 152.4 mm/hour

SOURCE CONTROL CALCULATIONS:
MAXIMUM VOLUME REQUIRED: 1540.2 m3
MAXIMUM INFILTRATION RATE: 61.9 l/sec
MAXIMUM DEPTH OF WATER: 0.579m
HALF DRAIN TIME: 212 minutes

WORKFORCE PARKING

HGV PARKING	= 154
COVERED HGV SCREEN AND SEARCH LANE	= 6
STAFF AND VISITORS PARKING	= 12
ACCESSIBLE PARKING SPACES	= 1
MINIBUS/VAN SPACES	= 10
MOTORCYCLE SPACES	= 4

NOTES:

1. Do not scale from this drawing. All dimensions are in metres unless noted otherwise.
2. For Lighting Column specifications see drawings SZC-SZ0204-FP-000-DRW-100031-32.
3. For HGV Search and Screen canopy see drawing SZC-SZ0204-FP-000-DRW-100104.

KEY:

- DEVELOPMENT SITE BOUNDARY
- (1) AMENITY AND WELFARE BUILDING (12M X 6M)
- (2) VAN / MINIBUS PARKING
- (3) SMOKING SHELTER (6M X 2.5M)
- (4) MOTORCYCLE PARKING
- (5) CYCLE SHELTER (4M X 2M)
- (6) STAFF AND VISITORS PARKING
- (7) ACCESSIBLE PARKING
- (8) SECURITY BOOTH (10M X 4M)
- (9) SECURITY BUILDING (10M X 5M)
- (10) COVERED HGV SCREEN & SEARCH LANE
- (11) PACKAGE TREATMENT PLANT
- BUFFER ZONE
- SECURITY FENCE (1.8M HIGH)
- ECOLOGICAL FENCING
- GATE
- SWALE (INDICATIVE)
- LANDSCAPE BUND
- PROPOSED DITCH (INDICATIVE)
- LANDSCAPING
- PEDESTRIAN WALKWAY
- MANUAL RISING ARM BARRIERS
- BOLLARD
- TACTILE PAVING
- PROPOSED LIGHTING COLUMNS (INDICATIVE)
- LIGHTING LANTERN DEMOUNTABLE SHIELD
- COVERED HGV SCREEEN AND SEARCH LANE

REVISION	DATE	DRAWN	CHECKED	REASONS FOR REVISION / COMMENTS	APPROVED
01	FEB 2020	NKS	KA	DCO SUBMISSION	PJ

NOT PROTECTIVELY MARKED

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PROJECT:
SIZEWELL C

DOCUMENT:
APPLICATION DRAWING - FOR APPROVAL
REGULATION 5(2)(o)

DRAWING TITLE:
FREIGHT MANAGEMENT FACILITY
PROPOSED GENERAL ARRANGEMENT

DRAWING NO: SZC-SZ0204-FP-000-DRW-100026
REVISION: 01

DATE: FEB 2020
DRAWN: NKS
SCALE: 1:1250@A1

SCALE BAR:
25m 0 25 50 75 100m
SCALE IN METRES 1:1250

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APPENDIX B: OPTION 1 STORAGE TANK HYDRAULIC CALCULATIONS

Summary of Results for 100 year Return Period

Half Drain Time : 8004 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	24.803	0.303	3.2	854.0	O K
30 min Summer	24.897	0.397	3.2	1120.8	O K
60 min Summer	24.996	0.496	3.3	1398.9	O K
120 min Summer	25.096	0.596	3.3	1682.8	O K
180 min Summer	25.154	0.654	3.3	1846.5	O K
240 min Summer	25.194	0.694	3.3	1958.3	O K
360 min Summer	25.250	0.750	3.3	2115.6	O K
480 min Summer	25.291	0.791	3.4	2230.5	O K
600 min Summer	25.322	0.822	3.4	2318.7	O K
720 min Summer	25.347	0.847	3.4	2389.5	O K
960 min Summer	25.385	0.885	3.4	2497.0	O K
1440 min Summer	25.433	0.933	3.4	2633.6	Flood Risk
2160 min Summer	25.471	0.971	3.4	2739.8	Flood Risk
2880 min Summer	25.487	0.987	3.4	2785.5	Flood Risk
4320 min Summer	25.488	0.988	3.4	2786.5	Flood Risk
5760 min Summer	25.466	0.966	3.4	2724.2	Flood Risk
7200 min Summer	25.436	0.936	3.4	2640.6	Flood Risk
8640 min Summer	25.409	0.909	3.4	2563.4	Flood Risk
10080 min Summer	25.383	0.883	3.4	2490.9	O K
15 min Winter	24.839	0.339	3.2	956.9	O K
30 min Winter	24.945	0.445	3.2	1256.0	O K
60 min Winter	25.056	0.556	3.3	1568.0	O K
120 min Winter	25.169	0.669	3.3	1887.4	O K
180 min Winter	25.234	0.734	3.3	2072.3	O K
240 min Winter	25.279	0.779	3.3	2198.8	O K
360 min Winter	25.343	0.843	3.4	2377.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	97.600	0.0	31
30 min Summer	64.093	0.0	46
60 min Summer	40.092	0.0	76
120 min Summer	24.228	0.0	136
180 min Summer	17.804	0.0	196
240 min Summer	14.222	0.0	254
360 min Summer	10.328	0.0	374
480 min Summer	8.231	0.0	494
600 min Summer	6.897	0.0	614
720 min Summer	5.967	0.0	734
960 min Summer	4.744	0.0	972
1440 min Summer	3.428	0.0	1450
2160 min Summer	2.473	0.0	2168
2880 min Summer	1.960	0.0	2888
4320 min Summer	1.410	0.0	4324
5760 min Summer	1.115	0.0	5760
7200 min Summer	0.929	0.0	6416
8640 min Summer	0.800	0.0	7096
10080 min Summer	0.705	0.0	7776
15 min Winter	97.600	0.0	31
30 min Winter	64.093	0.0	45
60 min Winter	40.092	0.0	76
120 min Winter	24.228	0.0	134
180 min Winter	17.804	0.0	192
240 min Winter	14.222	0.0	252
360 min Winter	10.328	0.0	370

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Summary of Results for 100 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
480 min Winter	25.389	0.889	3.4	2509.1	O K
600 min Winter	25.425	0.925	3.4	2610.8	Flood Risk
720 min Winter	25.454	0.954	3.4	2692.8	Flood Risk
960 min Winter	25.499	0.999	3.4	2818.9	Flood Risk
1440 min Winter	25.557	1.057	3.4	2983.2	Flood Risk
2160 min Winter	25.605	1.105	3.5	3119.1	Flood Risk
2880 min Winter	25.630	1.130	3.5	3187.7	Flood Risk
4320 min Winter	25.643	1.143	3.5	3223.6	Flood Risk
5760 min Winter	25.630	1.130	3.5	3188.7	Flood Risk
7200 min Winter	25.604	1.104	3.5	3116.2	Flood Risk
8640 min Winter	25.571	1.071	3.4	3022.9	Flood Risk
10080 min Winter	25.535	1.035	3.4	2921.4	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
480 min Winter	8.231	0.0	488
600 min Winter	6.897	0.0	606
720 min Winter	5.967	0.0	724
960 min Winter	4.744	0.0	960
1440 min Winter	3.428	0.0	1432
2160 min Winter	2.473	0.0	2136
2880 min Winter	1.960	0.0	2832
4320 min Winter	1.410	0.0	4204
5760 min Winter	1.115	0.0	5544
7200 min Winter	0.929	0.0	6848
8640 min Winter	0.800	0.0	8056
10080 min Winter	0.705	0.0	8976

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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.800	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 4.691

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	1.172	4	8	1.173	8	12	1.173	12	16	1.173

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Model Details

Storage is Online Cover Level (m) 25.700

Cellular Storage Structure

Invert Level (m) 24.500 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00750 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00750

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	2970.0	2970.0	1.200	2970.0	3346.8

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APPENDIX C: OPTION 2 STORAGE TANK HYDRAULIC CALCULATIONS

Summary of Results for 100 year Return Period

Half Drain Time : 212 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	24.793	0.293	60.6	778.6	O K
30 min Summer	24.879	0.379	61.0	1008.8	O K
60 min Summer	24.953	0.453	61.3	1205.0	O K
120 min Summer	24.996	0.496	61.5	1319.7	O K
180 min Summer	24.995	0.495	61.5	1316.2	O K
240 min Summer	24.982	0.482	61.4	1282.4	O K
360 min Summer	24.954	0.454	61.3	1208.4	O K
480 min Summer	24.928	0.428	61.2	1138.3	O K
600 min Summer	24.902	0.402	61.1	1069.4	O K
720 min Summer	24.877	0.377	61.0	1002.4	O K
960 min Summer	24.829	0.329	60.7	874.3	O K
1440 min Summer	24.743	0.243	60.4	647.0	O K
2160 min Summer	24.645	0.145	59.9	385.8	O K
2880 min Summer	24.583	0.083	59.6	220.4	O K
4320 min Summer	24.545	0.045	53.2	118.9	O K
5760 min Summer	24.536	0.036	42.5	94.7	O K
7200 min Summer	24.530	0.030	35.4	79.4	O K
8640 min Summer	24.526	0.026	30.6	67.9	O K
10080 min Summer	24.523	0.023	27.1	60.0	O K
15 min Winter	24.831	0.331	60.8	880.1	O K
30 min Winter	24.930	0.430	61.2	1142.5	O K
60 min Winter	25.016	0.516	61.6	1373.0	O K
120 min Winter	25.073	0.573	61.8	1523.9	O K
180 min Winter	25.079	0.579	61.9	1540.2	O K
240 min Winter	25.065	0.565	61.8	1502.8	O K
360 min Winter	25.028	0.528	61.6	1403.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	97.600	0.0	28
30 min Summer	64.093	0.0	42
60 min Summer	40.092	0.0	68
120 min Summer	24.228	0.0	124
180 min Summer	17.804	0.0	176
240 min Summer	14.222	0.0	204
360 min Summer	10.328	0.0	266
480 min Summer	8.231	0.0	334
600 min Summer	6.897	0.0	402
720 min Summer	5.967	0.0	468
960 min Summer	4.744	0.0	602
1440 min Summer	3.428	0.0	856
2160 min Summer	2.473	0.0	1212
2880 min Summer	1.960	0.0	1536
4320 min Summer	1.410	0.0	2204
5760 min Summer	1.115	0.0	2936
7200 min Summer	0.929	0.0	3672
8640 min Summer	0.800	0.0	4400
10080 min Summer	0.705	0.0	5136
15 min Winter	97.600	0.0	28
30 min Winter	64.093	0.0	42
60 min Winter	40.092	0.0	70
120 min Winter	24.228	0.0	124
180 min Winter	17.804	0.0	178
240 min Winter	14.222	0.0	230
360 min Winter	10.328	0.0	286

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Summary of Results for 100 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
480 min Winter	24.991	0.491	61.5	1305.6	O K
600 min Winter	24.952	0.452	61.3	1203.4	O K
720 min Winter	24.914	0.414	61.1	1101.8	O K
960 min Winter	24.841	0.341	60.8	906.1	O K
1440 min Winter	24.712	0.212	60.2	564.6	O K
2160 min Winter	24.580	0.080	59.6	213.5	O K
2880 min Winter	24.545	0.045	53.8	120.2	O K
4320 min Winter	24.533	0.033	39.0	86.6	O K
5760 min Winter	24.526	0.026	31.2	69.2	O K
7200 min Winter	24.522	0.022	25.9	57.3	O K
8640 min Winter	24.519	0.019	22.3	49.3	O K
10080 min Winter	24.517	0.017	19.9	44.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
480 min Winter	8.231	0.0	362
600 min Winter	6.897	0.0	438
720 min Winter	5.967	0.0	510
960 min Winter	4.744	0.0	650
1440 min Winter	3.428	0.0	904
2160 min Winter	2.473	0.0	1216
2880 min Winter	1.960	0.0	1476
4320 min Winter	1.410	0.0	2204
5760 min Winter	1.115	0.0	2928
7200 min Winter	0.929	0.0	3608
8640 min Winter	0.800	0.0	4320
10080 min Winter	0.705	0.0	5144

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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.800	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 4.691

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	1.172	4	8	1.173	8	12	1.173	12	16	1.173

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Model Details

Storage is Online Cover Level (m) 25.700

Cellular Storage Structure

Invert Level (m) 24.500 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.15240 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.15240

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	2800.0	2800.0	0.600	2800.0	2927.2

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